

THE UNIVERSITY OF CHICAGO

THE ECOLOGICAL AND EVOLUTIONARY DYNAMICS
OF SPECIES INTRODUCTIONS AND ENVIRONMENTAL CHANGE:
FROM EAST AFRICAN CICHLIDS TO THE GREAT AMERICAN BIOTIC INTERCHANGE

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BY

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To my parents, Lynn and James, for teaching me to ask questions since I was a toddler, and for giving me the support I needed to complete this dissertation.

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Abstract

My research illuminates new aspects of the ecological and evolutionary controls on species invasions of new ecosystems and of the consequences of species invasions for their new ecosystems. First, I develop a new modeling framework for analysis of morphological evolution in cases without extensive phylogenetic or fossil information, and I apply that framework to a study of East African cichlids in Lake Tanganyika. Such work provides critical new insight into the evolutionary and ecological processes underlying their fantastic adaptive radiations that have followed their introductions to East African Great Lakes.

Second, I lay the foundations for a fresh analysis of the Great American Biotic Interchange (GABI), in which the formation of the Panamanian Isthmus allowed exchange between the long isolated faunas of North and South America. The middle Miocene fauna of La Venta, Colombia, provides an ideal opportunity for such analysis. I synthesize studies on this fauna with paleoecological and paleobiological studies for closely related taxa from other times and/or locations. Stable isotope analysis of fossil and authigenic minerals indicates mean annual temperature of 30-35°C, with high relative humidity (60-70%) and limited seasonality. Further analysis supports a wet and likely forested ecosystem, but not under a closed canopy. Implications for vegetation composition and mammalian behavior and physiology are also explored.

Finally, I apply metadata analysis of mammalian autecology to the dynamics of the GABI. Today, over half of South American species are of North American descent, but only three terrestrial genera in temperate North America have South American origins. The reasons for this imbalance are unknown, but hypotheses include competitive exclusion, ecological replacement, or intense predation of South American native taxa, as well as insinuation, in which North American immigrants filled adaptive zones that were previously unoccupied by South American native

taxa. Data on diet, locomotion, and body mass from literature sources and new calculations define adaptive zones for all known native and immigrant South American taxa, which allows the testing of these hypotheses. Insinuation is by far the dominant mode for immigrant taxa ($\geq 74\%$), whereas potential cases of competitive replacement are the least common and quite rare ($\leq 5.9\%$).

Chapter 1: Introduction to species invasions, biotic interchanges, and adaptive radiations

Today's ecosystems are changing at an unprecedented rate, both because of changes in the abiotic environment and because of human-caused species introductions. These changing environments are accompanied by our recognition that ecological and evolutionary time-scales and processes overlap and directly affect each other (Carroll et al. 2007). Thus, in order to fully understand what the biological consequences of these environmental changes are likely to be, a more complete understanding of the connections between the abiotic environment, ecological interactions, and evolution will be necessary.

For instance, the introduction of new taxa to a community has the potential to alter inter-specific interactions, such as competition and predation, immediately. For native taxa, invasive species may result in character displacement, changes in behavior and resource use, defensive adaptations, and extinction. Which combination of these responses is most likely depends on the combined characteristics of each native taxon, the invasive species, and the existing community structure. However, the relative importance of these different influences and the likelihood of different outcomes in specific scenarios remains the subject of debate.

With regard to the taxa with access to new regions or ecosystems, both the paleontological record and human-induced species introductions demonstrate that species differ in their abilities to invade and diversify in new habitats. Some taxa may give rise to spectacularly speciose adaptive radiations, such as the cichlids in the East African Great Lakes and the sigmodontine radiation in South America, while others may not be able to diversify or invade the new ecosystems at all. Possible reasons for these differences include evolutionary constraints, competitive

fitness, and ecospace occupation of the recipient region. Close investigation of the historical record of biotic invasions, interchanges, and adaptive radiations provides the opportunity to investigate the reasons behind the different success rates of both native and immigrant taxa and understand the ecological and evolutionary controls on these dynamics.

The cichlids of the East African Great Lakes represent a recent adaptive radiation that today accounts for 4% of all extant vertebrate species (Salzburger and Meyer 2004; Hulsey 2009). Chapter 2 builds on prior work (Sidlauskas 2007) and develops a new modeling framework for comparing speciation, extinction, and morphological evolution rates in tribes of Lake Tanganyika cichlids with different divergence times. Such comparisons are difficult for East African cichlids because their extremely poor fossil record limits study of the processes in the radiation to neontological methods, but their extremely rapid diversification has also resulted in poorly resolved phylogenies.

Consequently, the diversity and disparity (morphological diversity) of East African cichlids are often compared without analysis of the influence of evolutionary rates, which strongly influences the interpretation of the ecological and evolutionary processes that created the diversity we see today. Knowledge of evolutionary rates is necessary in order to determine whether any clades have diversified faster or slower than others in morphological or taxonomic terms. Thus, the rates of evolution rather than the current standing diversity are most informative in understanding the ecological and evolutionary processes involved in this extraordinary adaptive radiation. The comparisons of evolutionary rates presented here thus allow new inferences and hypotheses about the ecological and evolutionary dynamics underlying the differences in diversification among clades of East African cichlids.

In contrast to the work presented here on East African cichlids, the remaining chapters focus primarily on what the fossil record reveals about evolution, particularly in South American Neogene mammals. The review provided in Chapter 3 lays the foundation for subsequent analyses of mammalian paleoecology. In particular, this chapter provides a comprehensive survey of the La Venta fauna from the middle Miocene of Colombia and highlights some outstanding questions about the climate and ecology. This fauna is remarkably diverse and provides unusual insight into the composition and structure of the Miocene Neotropical ecosystems (Kay et al. 1997). In so doing, it also provides a much more complete picture of what South American communities were like shortly before the onset of the Great American Biotic Interchange (GABI), given that the earliest immigrants may have arrived as early as 10.3 Ma (Campbell, Frailey, and Romero-Pittman 2009; Campbell Jr. et al. 2010; Frailey and Campbell 2012; Prothero et al. 2014; Cione et al. 2015) and were undisputedly in South America by 9-7.3 Ma (Woodburne 2010; Prevosti and Soibelzon 2012; Prevosti, Forasiepi, and Zimicz 2013; Forasiepi et al. 2014; Cione et al. 2015).

Stable isotope methods allow an in-depth investigation of questions which are otherwise difficult to answer in paleobiology. These methods play a critical role in Chapter 4, which focuses on climate reconstruction for the Honda Group reviewed in Chapter 3. In particular, oxygen isotope paleothermometry and combined analysis of fish and mammal tooth enamel following the methods of Fricke and Wing (2004) allow estimation of the mean annual temperature (MAT) for this important ecosystem. Furthermore, serial sampling of mammalian teeth provides a record of the extent of seasonality (Fricke, Clyde, and O'Neil 1998).

Both MAT and seasonality of precipitation have profound implications for the ecology of La Venta. MAT is one of the primary abiotic characteristics used to define biomes on a global

scale because of its effect on vegetation structure and community composition. Furthermore, estimates of the total annual precipitation (Kay and Madden 1997a; Anderson et al. 2016) place the ecosystem in the transitional range that can support vegetation structures from grasslands to rainforests, depending on the degree of seasonal variation (Kay and Madden 1997a; Madden pers. comm.). Thus, while these characteristics are difficult to reconstruct in ancient terrestrial ecosystems, they have a substantial and important impact on all communities.

Chapter 5 builds on the climate analysis of Chapter 4 with ecological interpretation of the isotope data. The ratio of C_3 to C_4 plants in the vegetative biomass can be determined using $\delta^{13}C$ values of pedogenic carbonates. The La Venta ecosystem represents an exciting opportunity because recent studies (Fox and Koch 2003; Fox and Koch 2004; Edwards and Smith 2010) suggest that C_4 plants may have originated in the time and environment represented here. Furthermore, with a known ratio of $C_3:C_4$ for the ecosystem, the $\delta^{13}C$ values of mammalian bioapatite provide insight into the humidity and vegetation structure. More closed and wetter environments have lower $\delta^{13}C$ and more open, drier environments have higher $\delta^{13}C$ values for any given ratio of $C_3:C_4$.

Isotopic records from mammalian bioapatite are also useful in reconstruction of autecology, including differentiation between fully terrestrial, semiaquatic, and fully aquatic habits (Clementz and Koch 2001; Clementz et al. 2006). This is an important aspect of the autecology for a species because it reflects not only on locomotion, but also may affect other aspects of ecology such as diet and defenses against predation. Three megafaunal families with possible semiaquatic habits are represented in the La Venta fauna: astrapotheres (Astrapotheria, Astrapotheriidae), toxodonts (Notoungulata, Toxodontidae), and leontiniids (Notoungulata, Leontini-

idae). Semiaquatic habits are often difficult to establish on the basis of morphology alone, and oxygen isotope variability provides an independent line of evidence on this topic.

Body mass, the main focus of Chapter 6, is another critically important aspect of mammalian paleobiology. Body mass affects a wide variety of other aspects of physiology and ecology, and is also relevant on evolutionary time scales as it has been linked to extinction risk (McNab 1990; Cardillo et al. 2005; Barnosky 2008). Several approaches currently exist for body mass estimation of fossil taxa, but these have greater uncertainty when applied to completely extinct clades or to extinct taxa well outside the range of body masses observed among their extant relatives. This is a particular problem for South American mammals such as notoungulates, astropotheres, litopterns, polydolopimorphs, and sparassodonts, which are entirely extinct at the order level, and many extinct xenarthrans and rodents which were much larger and ecologically very different from their extant relatives.

Chapter 6 advances paleobiological studies involving mammalian body mass in three main ways. It presents eight new regression equations to allow the estimation of body mass for extinct “ground sloths.” Then, I use these equations, other allometric regressions from the literature, and assumptions of geometric similarity to calculate body masses for 146 taxa, most of which lack other body mass estimates. Finally, this work presents body mass for South American mammals occurring between 15 Ma-11.7 ka using a combination of estimates from the literature along with the new calculations.

Chapter 7 integrates the biological and ecological findings of Chapters 3-6 with information garnered from an extensive literature review in order to quantitatively evaluate the ecological processes at work during the GABI. During the course of the GABI, mammalian fauna crossed the newly formed Panamanian Isthmus to mix the long-separated North and South

American faunas, but this exchange had much more profound long-term impacts on the South American mammalian composition than on North America (Webb 1985; Faurby and Svenning 2016); however, the reasons for this imbalance have long been the subject of debate. Potential reasons include competitive displacement or intense predation on South American faunas, passive ecological replacement of extinct South American ecological equivalents, or filling of empty ecospace (Patterson and Pascual 1968; Webb 1976; Marshall 1981; Prevosti, Forasiepi, and Zimicz 2013; Faurby and Svenning 2016). This study provides a systematic comparison of ecospace occupation between native South American taxa and North American immigrants to test these hypotheses.

The GABI has long been renowned as a fantastic natural experiment, which in many ways parallels experiments that humans are conducting today through intentional and accidental species introductions around the world. For instance, many species of the East African cichlids that are the subject of Chapter 2 are facing the threat of extinction because of environmental change and predation (Witte et al. 1992; Gurevitch and Padilla 2004). Thus, in addition to providing new insight into the interaction between ecological processes and their consequences on evolutionary timescales, this study has the potential to influence the way that we think about priorities in current conservation efforts.

Chapter 2: Testing for differences in rates of speciation, extinction, and morphological evolution in four tribes of cichlids endemic to Lake Tanganyika, East Africa

1. INTRODUCTION

1.1 Cichlid diversity and morphology

Cichlids are a highly diverse fish family which constitutes approximately 4% of extant vertebrate species (Salzburger and Meyer 2004; Hulsey 2009) and are one of the most rapidly diversifying vertebrate lineages (Genner et al. 2007; Moyle et al. 2009). This species richness is largely contained in the endemic species flocks of the East African Great Lakes (Farias, Ortí, and Meyer 2000). Standing diversity and disparity in cichlids have generally been explained using ecological opportunity and/or key innovations in trophic and reproductive adaptations (Albertson et al. 1999; Seehausen 2006); references therein). Studies of disparity patterns within and between clades and ecological groups have helped to establish the adaptive nature of the cichlid radiation (Chakrabarty 2005; Clabaut et al. 2007; Hulsey 2009) and the processes involved in the ecological diversification within clades (Albertson et al. 1999; Streelman and Danley 2003).

Several broad patterns have emerged from these studies of cichlid disparity. Lake Tanganyika cichlids are more morphologically disparate than Lake Malawi cichlids (Chakrabarty 2005), and some tribes within Lake Tanganyika, such as Ectodini and, to a lesser extent, Lamprologini, have higher morphological disparity than other Great Lake tribes (Chakrabarty 2005). However, the biological significance of such differences is unclear because the tribes are of different ages (Genner et al. 2007; Day, Cotton, and Barraclough 2008) and disparity increas-

es nearly linearly with time under constant diversification and morphological evolution rates (Foote 1996; Pie and Weitz 2005; Ricklefs 2006a). Thus, older clades should be more disparate than younger clades. Furthermore, stochastic variation in morphological divergence or species turnover can produce different disparity among clades even if age and rates of origination, extinction, and morphological change are the same.

Because differences in disparity can be generated by differences in evolutionary rates, age, or stochastic variation, comparing turnover and morphological change rates rather than standing disparity is likely to yield insight into the most evolutionarily meaningful differences among groups. However, previous analyses of evolutionary rates in East African cichlids have examined rates of diversification and genetic evolution, but not rates of morphological evolution. While species richness and net diversification rates are very high in the East African lacustrine cichlids, genetic diversification rates in this clade are significantly lower than in Neotropical cichlids (Farias et al. 1999; Farias, Ortí, and Meyer 2000). Coupled high speciation and extinction rates in the African cichlids could account for their low genetic diversity (Farias et al. 1999). Net diversification rates are also highly variable among the different species flocks of East African cichlids; the diversification rates of the Lake Victoria and Lake Malawi flock are approximately six times greater than those of the cichlid tribes of Lake Tanganyika (Day, Cotton, and Barraclough 2008).

Evolutionary rates have not been studied in detail partially because of the ongoing difficulty in resolving the biogeographic origin of East African cichlids (Farias, Ortí, and Meyer 2000; Salzburger et al. 2002; Salzburger and Meyer 2004; Salzburger et al. 2005; Koblmüller, Sefc, and Sturmbauer 2008). Further, the scarcity of cichlid fossils (Murray 2001a; Murray 2001b; Genner et al. 2007), incomplete lineage sorting of many clades (Seehausen 2006), and

considerable morphological convergence (Clabaut et al. 2007; Hulsey 2009) have made the resolution of phylogenetic trees and time calibration of molecular clocks very difficult. Recently published dates for the origin of many of the tribes of East African cichlids (Genner et al. 2007; Day, Cotton, and Barraclough 2008) make analysis of evolutionary rates a possibility. Because calibration of molecular clocks in East African cichlids is still a controversial topic, model designs which are dependent on relative rather than absolute clade ages will provide the most robust conclusions.

1.2 Models of diversification and morphological evolution

Many studies reconstruct taxonomic diversification from modern phylogenies through comparisons of simple null models of evolution with observed data on disparity patterns (Yule 1925; Raup et al. 1973; Hey 1992; Nee 2001; Nee 2004; Nee 2006; Sims and McConway 2003; McConway and Sims 2004; Ricklefs 2006a; Rabosky 2009; Rabosky 2010). These studies allow the calculation of speciation and extinction rates, inferences about patterns of diversification, comparisons of diversification patterns among clades, and identification of changes in diversification rates over time (Zink and Slowinski 1995; Barraclough and Nee 2001; Ricklefs 2006b; Bininda-Emonds et al. 2007; Rabosky and Lovette 2008; Alfaro et al. 2009; Crisp and Cook 2009; Quental and Marshall 2009). One important result of these studies is that clade size and age are independent (Magallon and Sanderson 2001; Ricklefs 2006b; Ricklefs, Losos, and Townsend 2007; Rabosky 2009) which indicates that speciation and extinction are relatively balanced over time (Ricklefs 2007).

Diversification models can also incorporate morphology in order to determine rates of morphological evolution (e.g., Foote 1993; Harmon et al. 2003; Agrawal et al. 2009; Hulsey et

al. 2010), often by comparing the observed disparity of clades to that produced by a null model of Brownian motion. Brownian motion allows traits to increase or decrease in any given instant with a magnitude and direction that is independent of the current state of the trait (O'Meara et al. 2006). In a Brownian model, older clades or clades with early speciation should have higher disparity (Ricklefs 2006a).

Sidlauskas (2007) developed a simulation-based approach for comparing the effects on extant disparity of morphological change rate, diversification rate, and timing of the onset of diversification without using a detailed phylogeny. However, while his model suggested differences in morphological change rates between two sister clades of South American fishes, it revealed a surprising lack of sensitivity to turnover rates (Sidlauskas 2007). Simulation studies suggest that higher turnover rates should result in lower variance in time-dependent models of Brownian Motion due to the decreased average node age (O'Meara et al. 2006; Ricklefs 2006a), so conditioning on the number of extant species actually observed may have biased the results against detection of turnover rates between clades (Sidlauskas 2007).

This study seeks to test the sensitivity of the Sidlauskas (2007) model to its underlying assumptions and to further assess the importance of turnover rate in determining standing disparity. Then, an adaptation of the approach used by Sidlauskas (2007) will be used to determine whether or not differences in evolutionary rates are likely to account for the disparity patterns of four tribes of cichlids from Lake Tanganyika.

The tribes of Lake Tanganyika provide an optimal system for two reasons. First, unlike the Lake Malawi and Lake Victoria cichlid flocks, the Lake Tanganyika cichlid flock is polyphyletic, and contains sixteen (Koblmüller, Sefc, and Sturmbauer 2008) or seventeen (Takahashi 2003) tribes of known ages (Genner et al. 2007; Day, Cotton, and Barraclough 2008), many of

which have now been conclusively demonstrated to be monophyletic (Salzburger et al. 2002; Takahashi 2003; Salzburger et al. 2005). Thus, within Lake Tanganyika, there are well established monophyletic clades of the same taxonomic rank among which rates may be compared without depending on phylogenetic resolution at the genus level.

Second, feeding preferences strongly predict Tanganyikan cichlid morphology, as do depth preferences, although to a lesser extent (Rüber and Adams 2001; Clabaut et al. 2007). In particular, post-cranial morphology tends to correlate with water depth preferences while head and mouth shape tend to correlate with feeding preferences (Clabaut et al. 2007). Thus, rates of morphological change would be expected to be higher in tribes which have diversified into have a wide range of trophic strategies and depth preferences, whereas groups that specialize on particular niches might exhibit lower rates of morphological evolution. These factors make rate comparisons within these tribes both feasible using available data and biologically informative.

2. METHODS

2.1 Calculations of disparity

Many measures of disparity have been proposed, including total variance, total range, mean distance, number of unique pairwise character combinations, principal coordinate analysis volume, average pairwise dissimilarity, and participation ratio (Ciampaglio, Kemp, and McShea 2001). Because variance does not depend on the number of species in a clade or the sample size, it is preferable as a measure of disparity over morphospace volume and range (Foote 1997; Ricklefs 2006a). Therefore, total multidimensional variance (Van Valen 1974; Foote 1993) is used as the measure of disparity for this study.

Morphological data was obtained from FishBase for 80 species in four tribes of Lake Tanganyika endemic cichlids (Froese and Pauly 2010, see Table 2.1). These tribes were selected because they are the monophyletic clades of Tanganyikan cichlids with morphological data available for more than five species. Furthermore, these species include the tribes of Tanganyikan cichlids with the highest disparity (Ectodini, followed by Lamprologini), lowest disparity (Cyprichromini) (Chakrabarty 2005), and the highest estimated diversification rates (Tropheini followed by Lamprologini) (Day, Cotton, and Barraclough 2008), making these tribes interesting for rate comparisons. The species were divided by tribe using the morphological phylogeny of Takahashi (2003), which agrees well with molecular phylogenies (Koblmüller, Seftc, and Sturmbauer 2008). The characters include standard length (% total length), pre-anal length (% total length), pre-dorsal length (% total length), pre-pelvic length (% total length), pre-pectoral length (% total length), body depth (% total length), head length (% total length), eye diameter (% head length), pre-orbital length (% head length), and the aspect ratio (calculated as height squared divided by surface area) of the caudal fin. The data are based on single specimens for all but two species, for which the data are based on two specimens and are available online via DRYAD (doi:10.5061/dryad.1ps0t).

To test whether analyses of this data were biased by sampling effects, the traditional morphometric FishBase data were also compared with the geometric morphometric data used by Chakrabarty (2005). The Chakrabarty dataset includes 18 landmarks, 10 of which are cranial landmarks. Cranial morphology is more variable than post-cranial morphology in cichlids (Clabaut et al. 2007), and so this dataset ensures that the most variable morphological features are analyzed. The two datasets yield highly consistent results with respect to the relative disparity of the four tribes included in this study. Given that the Chakrabarty dataset is a different kind

of data, has larger sample sizes per species (over nine specimens per species on average), and has more information on cranial morphology than the FishBase data, the consistency between the Chakrabarty and FishBase datasets suggests that the results described in this study are not an artifact of sampling. Furthermore, the analyses described in the following sections were repeated using the Chakrabarty data and produced very similar results to analysis of the FishBase data. Further details are provided in Appendix 1.1.

Principal components analysis of the variance-covariance matrix of the data was conducted using the `eigen` function in R. The first four principal components represented 46.5%, 21.6%, 11.3%, and 7.8% of the total variance, for a total of 87.2% of the total morphological variance (Table 2.2). The first principal component correlates most strongly and negatively with pre-pelvic length, eye diameter, and pre-orbital length, the second correlates negatively with pre-dorsal length and pre-pectoral length, the third correlates positively with pre-anal length and negatively with head length, and the fourth correlates positively with standard length and negatively with body depth. The eigenvalues from this analysis were then used to scale the change on each principal component axis in the simulations (see Simulations).

2.2 Simulations

The simulations are based on the description of the Matlab script “morphtreegen” (Sidlauskas 2007). The simulations presented in the main text use a speciation-dependent model in which morphological evolution occurs at speciation events. This is most similar to a punctuated equilibrium model of evolution (Ricklefs 2006a; Agrawal et al. 2009; Bokma 2010). The alternative to a speciation-dependent model is a time-dependent model, in which morphological evolution occurs in each extant species during each time step. Time-dependent models are more

representative of morphological evolution by anagenesis (Ricklefs 2006a; Agrawal et al. 2009; Bokma 2010). The results from the two types of models were compared to assess the robustness of the model results to assumptions about the processes involved in morphological evolution. The parameters for this model are speciation rate (p), extinction rate (q), time (t , in 100,000 year time steps), rate of morphological change (r), a vector of the eigenvalues of the first four PC axes (λ), and for some model variations, the minimum and maximum number of species. See Figure 2.1 for a schematic diagram of the simulations and analysis.

The model is a discrete-time, time-homogeneous birth-death model with a speciation-dependent morphological evolution component. During each time step, each extant species can persist unchanged, give rise to a new species, or go extinct, using the assumption that only one event can occur in any given time step. For each new species, the program selects a random number from a normal distribution with a mean of 0 and a standard deviation of 1 for each of the four PC axes, and then multiplies these random numbers by $(r\lambda)^5$, where r is the rate of morphological change and λ is the eigenvalue of the corresponding PC axis calculated from the empirical data. Scaling the change to λ therefore causes greater change to occur along axes with greater empirical disparity. If either branching or extinction occurs, the standing diversity count is adjusted accordingly. If all lineages are extinct, the simulation terminates.

After the last time step, or after all lineages are extinct, the final standing diversity is compared with the selected condition for the model. If the model has no condition, then all simulations are counted, including those in which all species went extinct. If the model is conditioned on the survival of the clade, then only trials in which the simulated tribe has at least one extant species after the last time step are counted. Likewise, for simulations conditioned on

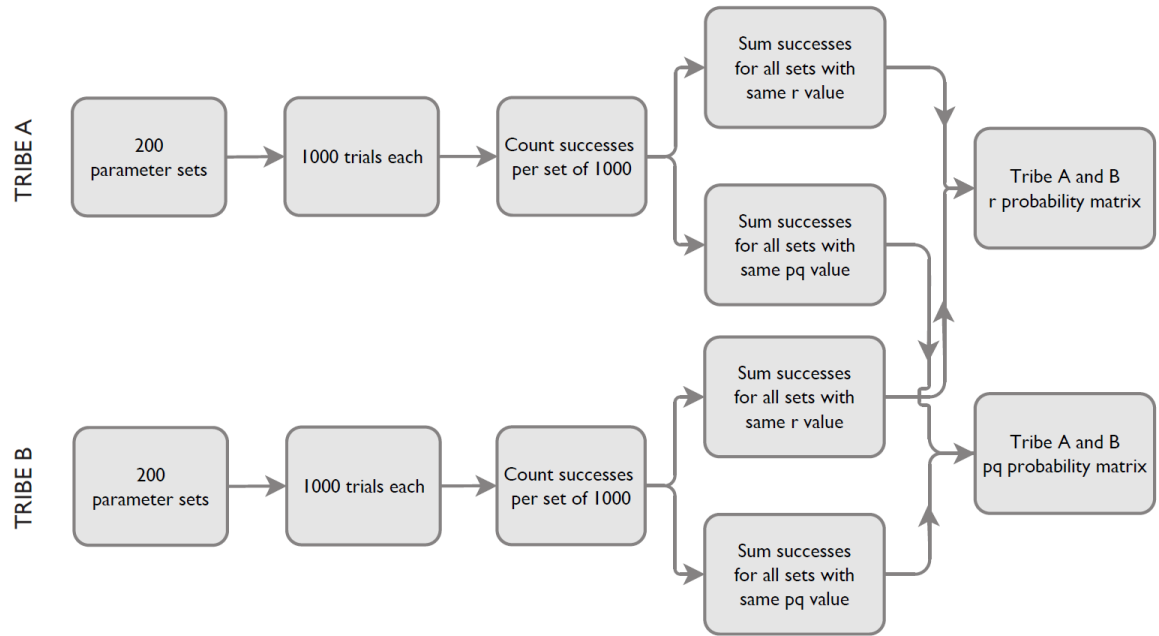


Figure 2.1: Schematic of simulations and analysis. The schematic represents a complete set of runs of any given model variation, meaning that this approach was repeated using the No Condition, Extant, Min, or Min-Max versions. In each trial, the simulation runs for a number of time steps equivalent to the age of the simulated tribe (each time step is equivalent to 100,000 years using the Gondwanaland calibration of the Lake Tanganyika cichlid ages from Genner et al. 2007). Successes are defined as trials in which the simulated variance equals either the empirical PC1-PC4 variance or total variance (Supplement 1). The “Same Age” analysis compares tribes when the trials are run for the same number of time steps to determine the relative contribution of clade age to standing disparity patterns (Supplement 3). See the main text for additional details on how each step is conducted.

the minimum or minimum and maximum number of species, then only simulations producing species richness within the specified bounds are recorded and counted towards the number of trials. These bounds are the minimum and maximum species diversities for all four tribes; thus, for this study, the minimum species number is 10 (the species diversity of Cyprichromini) and the maximum species number is 83 (the species diversity of Lamprologini) for all simulations (Table 2.1). For convenience, models using these four conditions will be referred to as the “No Condition”, “Extant”, “Min”, and “Min-Max” versions for the remainder of the paper. An addi-

tional version, in which the species richness is confined to the bounds of only the two species compared in any one pairwise analysis, was also included to verify that the results were consistent with those given by other model variations (Appendix 1.2).

If the simulation meets all model criteria, then the program calculates the variance of the clade. The model output is a table of the final morphological variance for each simulation. Once the specified number of trials (1000 in all cases for this study) has been completed, the simulation moves to the next set of parameter values and begins again. Code for the model and subsequent analyses was written in R and is available online via DRYAD (doi:10.5061/dryad.1ps0t).

2.3 Comparison of evolutionary rates

Once the simulations for all parameter values have run, the program counts the total number of simulations producing variance within one standard error of the empirical PC1-PC4 variance of the tribe. The probability of generating the empirical disparity using a given set of origination and extinction rates or a given rate of morphological change is assumed to be the number of trials producing the observed disparity divided by the total number of simulations with that parameter value. For each value of r , there were 10,000 total simulations (1000 trials at each of ten p and q values) and for each value of p and q there were 20,000 trials (1000 trials at each of twenty r values). The values used for p , q , and r are discussed in the Parameter Estimation section below.

After calculating the probabilities of achieving the observed disparity of each tribe for each of the values of r (rate of morphological change), p (origination rate), and q (extinction rate), matrices were constructed to compare each combination of tribes based on the approach of Sidlauskas (2007). 20x20 cell probability matrices were used to compare values of r , and 10x10

cell matrices were used to compare values of p and q , between each possible pair of tribes. Each cell in the matrix represents the probability of generating the empirical disparity of both tribes, and is therefore the product of the total probability of generating each individual tribe given the relative parameter values. For example, in an r probability matrix, cell (i, j) is equal to

$$P(M_L|r_i, M_H|r_j) = P(M_L|r_i) \times P(M_H|r_j),$$

where M_L stands for the morphological diversity (PC1-PC4 variance) of the tribe with lower disparity and M_H stands for that of the tribe with higher disparity.

Because this study, unlike that of Sidlauskas (2007), uses tribes with very different ages and numbers of species, the prior probabilities for turnover rates are not uniform. Therefore, the value in each cell was also multiplied by the prior probability of achieving the current number of species for each clade given the turnover rate. Thus, in a pq probability matrix, cell (i, j) is given by the equation

$$P(M_L|r_i, M_H|r_j) = P(M_L|pq_i) \times P(M_H|pq_j) \times P(n_L|pq_i) \times P(n_H|pq_j),$$

where n_L and n_H are the observed species richness for the clades with low and high morphological diversity, respectively. The prior probabilities are calculated using the equation

$$P_{n,t} = (1-\alpha) \times (1-\beta) \times \beta^{n-1},$$

where $P_{n,t}$ is the probability of n species at time t , and α and β are given by the equations of (Raup 1985):

$$\alpha = [q (e^{(p-q)t} - 1)] / [p e^{(p-q)t} - q], \text{ and}$$

$$\beta = \alpha (p/q).$$

For a pure-birth process, the prior probabilities are given by the equation (Aldous 2001):

$$P_{n,t} = e^{-pt} (1 - e^{-pt})^{n-1}.$$

Thus, each cell in the probability matrix represents the probability of the observations (observed disparity of the two tribes) given the corresponding model and parameter values. Therefore, these probabilities are the likelihoods of the model given the disparity data:

$$P(M_L|r_L, M_H|r_H) = c L(r_L|M_L, r_H|M_H),$$

where c is a proportionality constant. Because the entire probability matrix is multiplied by the constant c , the constant does not affect the differences in likelihoods and thus these probabilities can be treated as likelihoods. Thus, the probability matrix allows the calculation of the total likelihood of each of the two opposing hypotheses that rates of morphological change or turnover of the more disparate clade were either higher or were less than or equal to the evolutionary rates in the clade with lower disparity. The likelihood of higher evolutionary rates in the more disparate tribe is the sum of all cells above the diagonal of the matrix, while the likelihood of equal or lower rates in the high disparity clade is the sum of the cells in and below the diagonal. Sidlauskas (2007) found that the lower turnover rates generated higher empirical disparity. However, initial simulations indicate that in the speciation-dependent model used for this study, all four model conditioning variations yielded statistically higher disparity given higher turnover rates because speciation is the only available way to change morphology (t -test, $p < 0.001$ in all variations). Results were very similar from a time-dependent model (Appendix 1.3). Thus, for this study, high turnover rates are considered to result in higher disparity, and the likelihood that the difference in disparity resulted from higher turnover rates in the clade with higher disparity is the sum of the cells above the diagonal. Note that this approach compares the likelihoods for differences in evolutionary rates, but does not provide an estimate of the values of p , q , and r .

Support for each of these hypotheses is then calculated as the natural log of the likelihood. Then, ΔAIC_C and Akaike weights are used to compare alternative models. Akaike

weights compare models on equal footing with a penalty for additional complexity. This approach provides more power and is more biologically reasonable than rejecting a null model with 95% confidence (Hunt, Bell, and Travis 2008).

In situations where rate differences are not well supported, differences in disparity may be due to differences in clade age or to stochastic differences in evolutionary processes. An additional set of analyses in which the tribes are treated as if they were all the same age is designed to test the relative contribution of clade age in determining differences in disparity.

2.4 Parameter estimation

This model requires the specification of the values of p , q , and r to be tested. In order to determine the range of realistic possibilities for p and q , the diversification rates for all four Lake Tanganyikan tribes in the analysis were estimated. These parameters were estimated using the clade age and species richness of each clade and the method-of-moments estimator of Magallon and Sanderson (2001) for values of ϵ ranging from 0 to 0.9 in 0.1 increments using the function `rate.estimate` in the R package `GEIGER` (Harmon et al. 2008), where $\epsilon = p/q$. Although the large number of ages and rates made it impractical to use every combination of p and q provided by this approach, the range of origination and extinction rates used here spans the full range of rates calculated for all clades. For the simulations, the speciation rate, p , ranges from 0.01 to 0.21 in increments of 0.02, and the extinction rate q is set to 90% of the p value, giving a total of 10 different p and q combinations. Magallon and Sanderson (2001) suggest that higher values of ϵ than 0.9 are not realistic, and high coupled speciation and extinction rates have been suggested for East African cichlids (Farias et al. 1999). However, other researchers have indicated that adaptive radiations may have low or even zero extinction rates, especially early in diversification

(Purvis 2008), and recent molecular work has found no evidence for non-zero extinction rates (Day, Cotton, and Barraclough 2008). Thus, a second set of simulations was run using pure-birth assumptions (zero extinction) in order to compare the results with those from a birth-death model. The values of p ranged from 0.01 to 0.06 in increments of 0.005, to include the full range of maximum likelihood estimates for p under zero extinction.

Preliminary simulations were used to determine a range of rates of morphological change which produce the observed variance of the four tribes examined in this study. Based on these results, r values were selected to include these values and extend to values that were somewhat too high or too low in order to ensure that the full range of reasonable possibilities was examined. The values used in this study span r values from 0.005 to 0.15 in increments of 0.075.

The ages and species richness of the four tribes described in this study are provided in Table 2.1. The ages of the divergence of the cichlids are calibrated on the interpreted Gondwanaland origination of cichlids, which is favored by Genner et al. (2007) over calibration using fossils of distant relatives of the East African cichlids. However, for this study, it is the relative ages of the tribes rather than the absolute ages which are important (See Discussion: Assessment of the model). Ages were also estimated by Day et al. (2008). The estimates are similar to those of Genner et al. However, the differences between the ages of the Ectodini, Lamprologini, Cyprichromini, and Tropheini are slightly reduced in the Day et al. study. Therefore, using the Genner et al. ages will slightly deemphasize the likelihood of differences in rates, making any findings of rate differences using the Genner et al. ages a conservative estimate.

Table 2.1: Tribe and sample data. Tribe data includes the estimated ages using both Gondwanaland and fossil calibrations and the total number of species of the tribes discussed in this study (**Genner et al. 2007**). The number of species for which data was available is also provided. Note that the ratios between ages of tribes are almost identical for the two sets of dates, though the absolute age estimates are very different. Age estimates from a second source are also included (**Day, Cotton, and Barraclough 2008**).

Tribe	Age (Gondwanaland)	Age (Fossil)	Age (Day)	Number of spp.	Number of samples
Ectodini	23.53	10.80	0.4	33-41	19
Lamprologini	16.01	7.29	0.6	79-83	44
Tropheini	6.76	3.02	0.4	19-36	11
Cyprichromini	10.22	4.60	0.8	10	6
Limnochromini	10.83	4.88	0.3	13	5
Perrisodini	9.24	4.15	0.1	8	5

3. RESULTS

3.1 Morphology

The calculated variance and standard errors for each of the four tribes used in simulations (Ectodini, Lamprologini, Tropheini, and Cyprichromini) and for Limnochromini and Perrisodini are given in Table 2.2. The principal components analysis was conducted using the morphological data for all six tribes. Although the inclusion of the morphological data for Limnochromini and Perrisodini did not substantially alter the calculation of eigenvalues or the percent of total variation described by the PC axes due to the small number of species in each clade, they were included in the eigenvalue calculations because of their use in linear regressions. The model generates simulated data for the first four PC axes, which is then compared with the real data for the first four PC axes only. However, comparing the simulated data with total morphological variance rather than PC1-PC4 variance does not substantially alter the results (Appendix 1.4). Bootstrap iterations demonstrate that variance does not decrease with small sub-samples of spe-

cies from the more disparate tribes and thus, that the low disparity of Cyprichromini is not due to the number of species (Appendix 1.5). The consistency in variance regardless of the number of samples selected is expected because variance is not dependent on the number of species or the sample size (Foote 1993; Foote 1997; Ricklefs 2006a).

Table 2.2: Variance data. Empirical total multi-dimensional variance, calculated using the Froese and Pauly (2010) data, standard errors (SE) as estimated from 1000 bootstrap repetitions, the variance of the first 4 PC axes, and the standard errors of the first 4 PC axes are provided.

Tribe	Total Variance	SE	PC1-4 Variance	SE PC Variance
Ectodini	174.18	37.53	152.15	38.49
Lamprologini	164.44	19.25	141.07	18.24
Tropheini	109.35	24.50	96.53	23.84
Cyprichromini	33.39	10.07	21.36	7.70
Limnochromini	118.96	45.01	105.31	42.11
Perrisodini	109.35	44.35	107.31	39.62

3.2 Differences in rates

The results of the rate comparisons are summarized in Tables 2.3 and 2.4, and in Appendices 2, 3, 4, 6, and 7. Note that there is little support for higher turnover rates in tribes with higher disparity except for between Cyprichromini and both Lamprologini and Tropheini. Ectodini may also have experienced higher turnover rates than Cyprichromini, although the support for this hypothesis is too low to be conclusive. There is also substantial support for lower rates of morphological change in Cyprichromini than the other three tribes. Support for differences in morphological change rates tends to be most pronounced with the Min-Max model variation and least pronounced with the No Condition model variation. The analyses in which tribes are treated as the same age indicates that age differences, in addition to stochasticity, are important and can account for all of the differences in disparity among tribes with the exception of the low disparity of Cyprichromini (Appendix 1.6).

The pure birth model also yields results that are consistent with the results in Tables 2.3 and 2.4 (Appendix 1.7). The interpretations for morphological change rates are identical to those obtained from the birth-death model, and the Akaike weights are actually higher than those presented in Table 2.3. There are some differences in interpretations of turnover rates from those made using a birth-death model, but the general patterns are largely consistent.

Table 2.3: Comparisons of rates of morphological change. These are the results of the analyses for each pairwise comparison of morphological change rates when a success is defined as the simulated variance being within one standard error of the observed PC1-PC4 total variance. Tribe names (Ectodini, Lamprologini, Tropheini, and Cyprichromini) are abbreviated by their first letter in the subscripts.

	Model	AICc	Δ AICc	Akaike wt.
Tropheini-Cyprichromini				
No Condition	$r_T > r_C$	5.824	0.000	0.714
	$r_T \leq r_C$	7.659	1.834	0.286
Extant	$r_T > r_C$	-1.177	0.000	0.732
	$r_T \leq r_C$	0.830	2.007	0.268
Min	$r_T > r_C$	-1.568	0.000	0.841
	$r_T \leq r_C$	1.769	3.337	0.159
Min-Max	$r_T > r_C$	-1.706	0.000	0.847
	$r_T \leq r_C$	1.714	3.421	0.153
Cyprichromini-Lamprologini				
No Condition	$r_L > r_C$	7.990	0.000	0.633
	$r_L \leq r_C$	9.080	1.090	0.367
Extant	$r_L > r_C$	0.376	0.000	0.651
	$r_L \leq r_C$	1.625	1.248	0.349
Min	$r_L > r_C$	0.206	0.000	0.767
	$r_L \leq r_C$	2.587	2.381	0.233
Min-Max	$r_L > r_C$	-0.308	0.000	0.827
	$r_L \leq r_C$	2.816	3.124	0.173

Table 2.3: Comparisons of rates of morphological change, cont.

Ectodini-Cyprichromini				
No Condition	$r_E > r_C$	7.213	0.000	0.563
	$r_E \leq r_C$	7.723	0.510	0.437
Extant	$r_E > r_C$	-0.468	0.000	0.578
	$r_E \leq r_C$	0.161	0.629	0.422
Min	$r_E > r_C$	-0.633	0.000	0.694
	$r_E \leq r_C$	1.002	1.635	0.306
Min-Max	$r_E > r_C$	-1.641	0.000	0.807
	$r_E \leq r_C$	1.217	2.858	0.193
Ectodini-Lamprologini				
No Condition	$r_E > r_L$	9.284	0.725	0.410
	$r_E \leq r_L$	8.559	0.000	0.590
Extant	$r_E > r_L$	1.014	0.775	0.404
	$r_E \leq r_L$	0.239	0.000	0.596
Min	$r_E > r_L$	0.656	0.744	0.408
	$r_E \leq r_L$	-0.088	0.000	0.592
Min-Max	$r_E > r_L$	-0.412	0.460	0.443
	$r_E \leq r_L$	-0.872	0.000	0.557
Ectodini-Tropheini				
No Condition	$r_E > r_T$	7.797	1.418	0.330
	$r_E \leq r_T$	6.379	0.000	0.670
Extant	$r_E > r_T$	0.146	1.484	0.323
	$r_E \leq r_T$	-1.338	0.000	0.677
Min	$r_E > r_T$	-0.503	1.424	0.329
	$r_E \leq r_T$	-1.927	0.000	0.671
Min-Max	$r_E > r_T$	-1.609	0.728	0.410
	$r_E \leq r_T$	-2.336	0.000	0.590
Tropheini-Lamprologini				
No Condition	$r_L > r_T$	8.490	0.923	0.387
	$r_L \leq r_T$	7.566	0.000	0.613
Extant	$r_L > r_T$	0.872	0.931	0.386
	$r_L \leq r_T$	-0.059	0.000	0.614
Min	$r_L > r_T$	0.202	0.902	0.389
	$r_L \leq r_T$	-0.700	0.000	0.611
Min-Max	$r_L > r_T$	-0.364	0.490	0.439
	$r_L \leq r_T$	-0.854	0.000	0.561

Table 2.4: Comparisons of turnover rates. The results of the analyses for each pairwise comparison of turnover rates when a success is defined as the simulated variance being within one standard error of the observed PC1-PC4 total variance are presented below. Tribe names (Ectodini, Lamprologini, Tropheini, and Cyprichromini) are abbreviated by their first letter in the subscripts.

	Model	AICc	ΔAICc	Akaike wt.
Tropheini-Cyprichromini				
	No Condition	$pq_T \leq pq_C$ 34.575	2.997	0.183
		$pq_T > pq_C$ 31.578	0	0.817
Extant		$pq_T \leq pq_C$ 27.062	2.826	0.196
		$pq_T > pq_C$ 24.236	0.000	0.804
Min		$pq_T \leq pq_C$ 26.798	2.729	0.203
		$pq_T > pq_C$ 24.069	0	0.797
Min-Max		$pq_T \leq pq_C$ 26.607	2.576	0.216
		$pq_T > pq_C$ 24.031	0.000	0.784
Cyprichromini-Lamprologini				
	No Condition	$pq_L \leq pq_C$ 41.146	3.642	0.139
		$pq_L > pq_C$ 37.504	0	0.861
Extant		$pq_L \leq pq_C$ 32.677	3.049	0.179
		$pq_L > pq_C$ 29.628	0.000	0.821
Min		$pq_L \leq pq_C$ 32.810	3.157	0.171
		$pq_L > pq_C$ 29.654	0	0.829
Min-Max		$pq_L \leq pq_C$ 32.422	3.194	0.168
		$pq_L > pq_C$ 29.228	0.000	0.832
Ectodini-Cyprichromini				
	No Condition	$pq_E \leq pq_C$ 36.011	0.193	0.476
		$pq_E > pq_C$ 35.817	0.000	0.524
Extant		$pq_E \leq pq_C$ 27.855	0.000	0.519
		$pq_E > pq_C$ 28.007	0.000	0.481
Min		$pq_E \leq pq_C$ 29.077	1.413	0.330
		$pq_E > pq_C$ 27.664	0	0.670
Min-Max		$pq_E \leq pq_C$ 28.808	1.636	0.306
		$pq_E > pq_C$ 27.172	0.000	0.694
Ectodini-Lamprologini				
	No Condition	$pq_E \leq pq_L$ 42.198	0.000	0.903
		$pq_E > pq_L$ 46.652	4.454	0.097
Extant		$pq_E \leq pq_L$ 33.360	0.000	0.822
		$pq_E > pq_L$ 36.414	3.054	0.178
Min		$pq_E \leq pq_L$ 33.291	0.000	0.901
		$pq_E > pq_L$ 37.710	4.419	0.099
Min-Max		$pq_E \leq pq_L$ 32.637	0.000	0.874
		$pq_E > pq_L$ 36.516	3.878	0.126

Table 2.4: Comparisons of turnover rates, cont.

Ectodini-Tropheini				
No Condition	$pq_E \leq pq_T$	36.262	0.000	0.861
	$pq_E > pq_T$	39.916	3.654	0.139
Extant	$pq_E \leq pq_T$	28.063	0.000	0.882
	$pq_E > pq_T$	32.092	4.030	0.118
Min	$pq_E \leq pq_T$	27.697	0.000	0.870
	$pq_E > pq_T$	31.501	3.805	0.130
Min-Max	$pq_E \leq pq_T$	27.432	0.000	0.828
	$pq_E > pq_T$	30.569	3.136	0.172
Tropheini-Lamprologini				
No Condition	$pq_L \leq pq_T$	41.331	0.000	0.532
	$pq_L > pq_T$	41.584	0.253	0.468
Extant	$pq_L \leq pq_T$	32.478	0.000	0.547
	$pq_L > pq_T$	32.853	0.375	0.453
Min	$pq_L \leq pq_T$	32.400	0.000	0.532
	$pq_L > pq_T$	32.654	0.254	0.468
Min-Max	$pq_L \leq pq_T$	31.175	0.000	0.513
	$pq_L > pq_T$	31.283	0.108	0.487

3.3 Sensitivity Analysis

The effect of using different conditions in the model is also analyzed. The first approach to comparing the models is to determine whether the interpretations of results change when different conditions are used. In the results of this study, there are no cases in which changing the model conditions changes which tribe is interpreted to have the higher rate of morphological evolution, and interpretations of which tribe experiences higher turnover rates do not change as long as $\Delta AIC_c > \sim 0.3$ (Table 2.4 and Appendix 1.4). Figure 2.2 provides a visualization of the variations in support for hypotheses of rate differences using different model variations. The second approach to assessing the sensitivity of the model to different types of conditioning uses the number of successes under each parameter set. The model results correlate well with each other, which also suggests that the type of model conditioning does not significantly affect

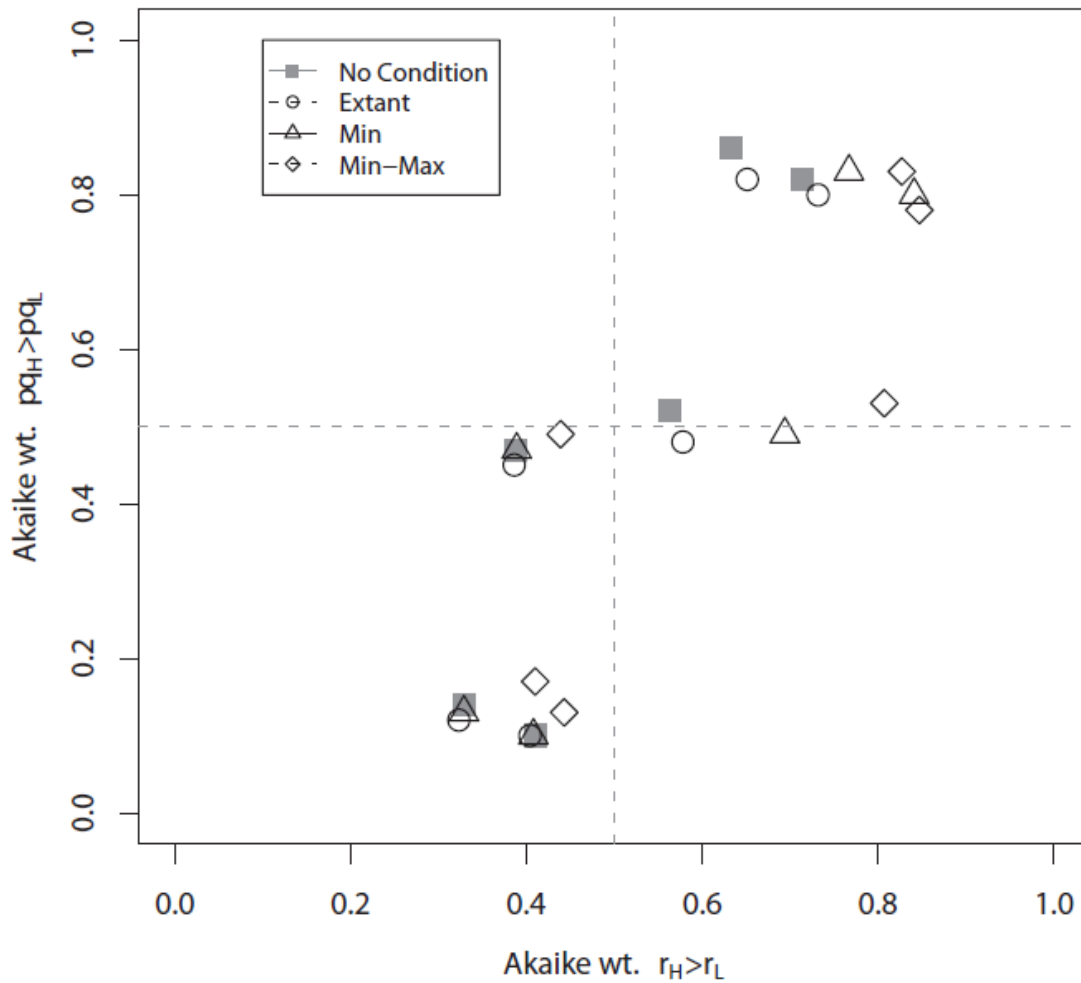


Figure 2.2: Akaike weights for higher evolutionary rates in more disparate tribes. Each point represents a pair-wise comparison between two tribes under a single model. The dashed lines are at Akaike weights of 0.5, and indicate equal support for higher vs. lower or equal rates in the tribe of higher disparity. Points which fall below or to the left of the dashed lines indicate that lower or equal rates in the more disparate tribe are more likely, while higher evolutionary rates in the dashed lines are supported for the comparisons above or to the right of the dashed lines. Note that comparisons between tribes using different models are clustered together, indicating that the model is robust to the conditioning scenario chosen.

interpretations (Appendix 1.8). Also note that the simulations conducted under a time-dependent model (Appendix 1.3), a pure-birth model (Appendix 1.7), and a Min-Max model in which final species diversity is conditioned on the observed diversity of the two tribes in each pair-wise

comparison (Appendix 1.2) all provide results which are very similar to those given in Tables 2.3 and 2.4. It is also important to note that the results presented in this study are not dependent on the number of clades included in the analysis because analyses are all done by pairwise comparisons.

3.4 Correlation between age and disparity

Regression of the multivariate variance on clade age for the six tribes presented in Tables 2.1 and 2.2 was used as a separate assessment of the relationship between clade age and disparity. Figure 2.3 shows the resulting correlation between age and morphological disparity. Note that, although a significant correlation is expected, the correlation is only moderate and is not statistically significant when all tribes are included (Figure 2.3A, $r^2=0.39$, $p=0.18$). However, the correlation is very strong when Cyprichromini is excluded (Figure 2.3C, $r^2=0.92$, $p=0.009$). The variance for Cyprichromini falls well below that predicted by its age and outside the 95% confidence interval, as demonstrated by the large negative residual (Figure 2.3B, residual = -70.5) in comparison with those of the other tribes (see also Figure 2.3D).

4. DISCUSSION

4.1 Patterns of disparity in East African cichlids

Before assessing possible reasons for differences in disparity among the tribes, it is necessary to establish that differences in disparity are real and not simply sampling artifacts. In particular, since Cyprichromini has both the smallest sample size and the lowest disparity of the tribes that were simulated for this study, the low disparity could be due to poor sampling. However, several lines of evidence suggest that the low variance of Cyprichromini is not due to differences in sample size. First, there are only an estimated ten species in the tribe Cyprichromini.

Furthermore, all six confirmed, described species (Brandstätter, Salzburger, and Sturmbauer 2005; Day, Cotton, and Barraclough 2008) are included in this study. There are an estimated three (Day, Cotton, and Barraclough 2008) or four (Genner et al. 2007) possible species which have yet to be described and are currently classified as geographic variants of *Cyprichromis leptosoma*. Thus, the six species for which data were available represent at least 60% of the total species within the tribe Cyprichromini, and the remaining possible species are unlikely to add significantly to the total disparity due to their similarity to *Cyprichromis leptosoma*.

In contrast, less than 60% of the total estimated species diversity is represented by the data for the other three tribes (Table 2.1). Moreover, variance is independent of the sample size or the number of species in a clade (Foote 1993; Foote 1997; Ricklefs 2006a). This is further supported by the bootstrap analyses, which indicate that sampling only six species with replacement yields the same variance as sampling the full sample size of Ectodini, Lamprologini, and Tropheini (Appendix 1.5). Moreover, both Limnochromini and Perrisodini have smaller sample sizes than Cyprichromini (both are represented by only five species), but have variance roughly comparable to that of Tropheini, which has a similar age. Finally, there is not a significant correlation between morphological variance and the number of samples for Ectodini, Lamprologini, Tropheini, Cyprichromini, Limnochromini, and Perrisodini ($r^2=0.35$, $p=0.21$). Overall, this suggests that the differences in variance among the tribes are due to factors such as stochasticity, clade age, or differences in evolutionary rates rather than sample size.

There is no indication that the greater disparity of Ectodini is due to differences in either morphological change or turnover rates when compared with Lamprologini and Tropheini. In fact, there is strong support from the speciation-dependent model that Ectodini may have experienced a lower turnover rate than Lamprologini and Tropheini. For a speciation-dependent

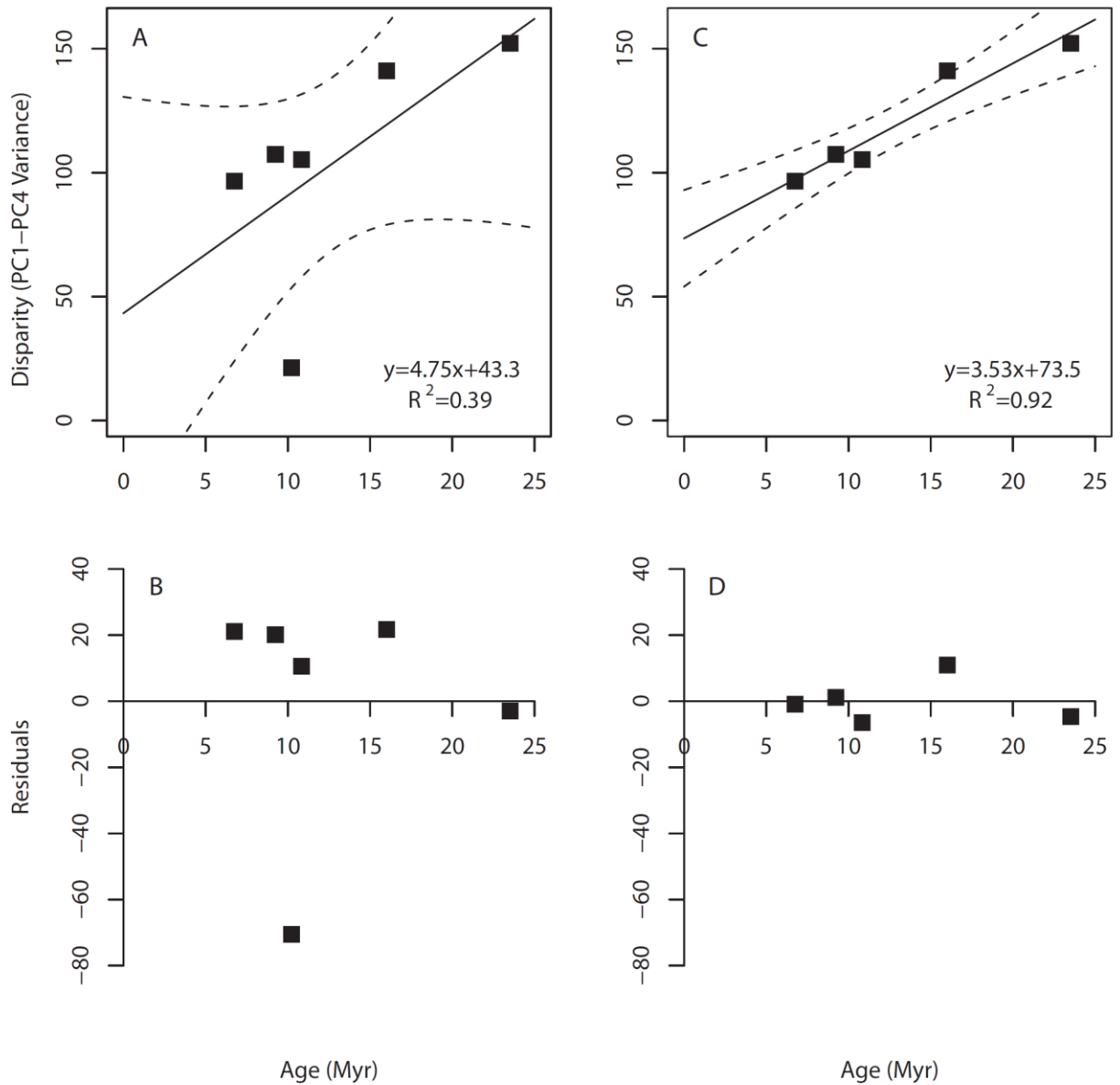


Figure 2.3: Correlation between age and disparity. (A) The correlation between variance and age for the tribes Ectodini, Lamprologini, Tropheini, Perrisodini, Limnochromini, and Cyprichromini ($r^2=0.39$, $p=0.18$). (B) Residuals for the regression in Part A. Note that Cyprichromini has a very large negative residual. (C) Correlation between variance and age for the tribes in A, excluding Cyprichromini. Note that the correlation is much stronger ($r^2=0.92$, $p=0.009$). If rates of morphological change, speciation, and extinction are equal, then the increase in variance over time would be expected to be nearly linear (Foote, 1996, Pie and Weitz, 2005). (D) Residuals for the correlation in Part C.

model, disparity increases with turnover rates. Thus, the high disparity of Ectodini relative to the other tribes is due to its greater age, similar morphological change rate, and equivalent or lower turnover rate. Likewise, there is little support for differences in evolutionary rates between Tropheini and Lamprologini, and thus, the disparity differences between these tribes are also likely due largely to age differences.

However, rates of morphological change are substantially greater in Ectodini, Lamprologini, and Tropheini when compared with Cyprichromini. Under the Min-Max model, the Akaike weights for lower rates in Cyprichromini than the other three tribes were all greater than 0.80 (Table 2.3). The other model variations provide slightly lower support for rate differences, but the interpretations are consistent with the findings from the Min-Max model. These results are even more strongly supported under pure birth conditions (Appendix 1.7), suggesting that these results are highly robust to assumptions about the value of ϵ . Furthermore, there is considerable support for higher turnover rates in both Lamprologini and Tropheini in comparison to Cyprichromini with average Akaike weights over 0.80 in both cases. Support for higher turnover rates in Ectodini than Cyprichromini is lower, with an average Akaike weight of only 0.60, which is too low to be conclusive. Under a pure birth model, higher rates in the more disparate tribe are only supported for Tropheini relative to Cyprichromini (Appendix 1.7). Thus, interpretations of turnover rate differences may be slightly more susceptible to assumptions regarding the value of ϵ than those for morphological change rates.

The linear regression analysis provides a second approach to examining rate differences among the tribes. According to Foote (1996) and Ricklefs (2006), for a constant number of species, disparity increases linearly with time if rates of speciation, extinction, and morphological change are constant. Pie and Weitz (2005) found that for the more realistic branching random

walks, the relationship between variance and time is nonlinear, but is approximately linear after a short initial period ($t=1/\lambda$). Thus, given maximum likelihood estimates for origination rates for the tribes in this study ($\epsilon=0.9$), disparity should increase linearly after about 0.5-2 My if the evolutionary rates are constant. All of the tribes examined in this study, including Perrisodini and Limnochromini, are substantially older than this threshold. Thus, if the rates are the same among the tribes, a linear relationship is expected between clade age and disparity.

While age and morphological variance are strongly positively correlated in the five tribes other than Cyprichromini, the latter falls well below the expected variance. Cyprichromini falls outside the 95% confidence intervals, based on the calculated regression error (Figure 2.3A), indicating that Cyprichromini is a statistical outlier. Further, if Cyprichromini is included in the regression, there is not a significant correlation between age and variance even though one is expected under equal rates of evolution. This suggests that the differences between the tribes Ectodini, Tropheini, Lamprologini, Perrisodini, and Limnochromini are all consistent with evolution under the same turnover and morphological change rates, but that Cyprichromini likely had lower evolutionary rates in order to have the currently low standing disparity. This evidence, combined with the general agreement among all model variations, indicates that the Cyprichromini evolved with lower morphological change and turnover rates.

This approach may also provide a means for comparing rates among large numbers of clades without simulations. However, in order to use this approach without simulations, further testing is required to determine how much variation from a calculated correlation would be consistent with constant rates. Furthermore, linear regressions do not provide information on whether differences in turnover vs. morphological change rates are most likely responsible for disparity patterns. Thus, the regression approach may be most useful as a way to determine

whether simulation studies are likely to reveal information on rate differences or, as in this study, as a supplement to simulation based study, rather than as the only method for assessing rate differences.

The strong linear correlation between disparity and age indicates that age differences are largely responsible for standing disparity patterns among Ectodini, Lamprologini, and Tropheini. Further evidence that these patterns are due at least partially to age differences and cannot be explained simply by stochastic variation comes from the simulations in which all tribes are treated as if they are the same age. There would be moderate support for turnover rate differences if the tribes were of the same age, but there is no support for rate differences given the actual ages of the tribes. These results indicate that older tribes may have higher disparity because the three tribes evolved under similar evolutionary rates, but have had different amounts of time to diversify (Appendix 1.6).

The lower evolutionary rates experienced by Cyprichromini are most useful within an ecological context. On the basis of previous work on the adaptive character of cichlid morphology, tribes with a low diversity of trophic niches and preferred water depths might be expected to have lower evolutionary rates in an adaptive radiation as these are the ecological traits which correlate most strongly with morphology. Cyprichromini, which has lower rates than in the other tribes described in this study, has become progressively more adapted to a pelagic lifestyle, and perhaps more importantly, to the planktotrophic niche (Brandstätter, Salzburger, and Sturmbauer 2005). In contrast, members of the Ectodini, Lamprologini, Tropheini, Limnochromini, and Perisodini all consume multiple food types (Konings 1998; Koblmüller, Salzburger, and Sturmbauer 2004; Duftner, Koblmüller, and Sturmbauer 2005; Day, Santini, and Garcia-Moreno 2007; Koblmüller et al. 2007; Koblmüller et al. 2010).

Given the ecology of Cyprichromini, there are two possible explanations for standing disparity patterns. The first is that the species of Cyprichromini reached an adaptive optimum as open-water planktotrophs which subsequently resulted in a low rate of morphological change. That the Cyprichromini species have become progressively more specialized (Brandstätter, Salzburger, and Sturmbauer 2005) may provide support for this hypothesis in that it indicates that the tribe has been evolving towards a particular niche, and perhaps thus also towards a particular morphological optimum. This might also indicate that the morphological evolution of Cyprichromini could be better explained by an Ornstein-Uhlenbeck model than a Brownian Motion model (e.g. Hunt et al. 2008). Sidlauskas (2008) found that the approach used in this study may indicate low morphological change rates in clades which repeatedly evolve the same morphology as opposed to those which diffuse through a larger portion of morphospace. A species-level phylogeny would be required to test this hypothesis (Sidlauskas 2008). The second possibility is that Cyprichromini have only succeeded in specializing for one trophic niche because their low morphological change and turnover rates do not enable them to diversify as rapidly into the range of trophic niches occupied by the other tribes. However, if this second option is the case, then the underlying reason for low rates of morphological change in this group remains to be determined.

Regardless of the ordering of cause and effect, these results suggest congruence between trophic diversity and rate of morphological evolution. Similarly, in comparing the lack of disparity in younger clades (for example, the species flocks of Lake Malawi and Lake Victoria) with the more morphologically disparate assemblage of Lake Tanganyika, the differences in taxonomic diversity, clade age and stochastic variation should be examined. The results presented here emphasize the importance of establishing differences in evolutionary rates before making biological interpretations in order to avoid these confounding factors.

4.2 Model assessment and sensitivity analysis

This study develops an approach for comparing rates among clades which are not sister taxa. However, the approach requires the use of ages calculated using fossil or Gondwanaland calibrations of molecular clocks are necessary for comparing clades of different ages. These two calibrations yield very different ages (Genner et al. 2007) and the results are controversial (Stauf-fer Jr. et al. 2006; Genner et al. 2007). However, this study does not seek to calculate diversification or morphological rates, but rather, only to determine whether these rates are greater in some clades relative to others. As should be the case, the ratios between the ages of the tribes are identical (Table 2.1), regardless of whether the fossil calibrations or the Gondwanaland calibrations are used. Therefore, the assertion that each time step represents 100,000 years may be inaccurate, but the relative proportions of time for diversification of each tribe should represent the actual ages very well. Accordingly, inaccuracies in the absolute age estimates of the tribes should have a minimal effect on the results of this study.

While it is the ratio of the ages rather than the absolute ages of the tribes that are important for this model, it is also informative to consider how errors in the estimates of these ages are likely to influence the interpretations presented in this paper. Note that some phylogenies place Cyprichromini as the sister group to Ectodini (e.g. Takahashi et al., 2003), although many studies differ in their interpretations of the relationships of the Tanganyikan cichlids (Koblmüller, Seftc, and Sturmbauer 2008). The age used for Cyprichromini in this study is less than half that of Ectodini, and therefore, the expected variance in Cyprichromini would be significantly lower than in Ectodini due to the differences in clade age alone. Furthermore, the Day et al. (2008) ages for the six tribes examined in this study also indicate that the tribe Cyprichromini is older relative to the other tribes than estimated by Genner et al. (2007, See Table 2.1). If Cypri-

chromini is in fact relatively older than Genner et al. estimated, then the expected variance of Cyprichromini would be higher if the evolutionary rates were equal, and thus the expected disparity of Cyprichromini would be even higher relative to its observed disparity. In this scenario, support for rate differences between Cyprichromini and the other tribes would be higher than estimated by this study. Therefore, this study represents conservative findings with respect to the likelihood of lower evolutionary rates in Cyprichromini.

Either a pure birth or a birth-death model may be appropriate in representing the radiation of cichlids. However, these two models yield similar results. In particular, morphological change rate comparisons are very similar between the two types of model, although differences in turnover rates among clades are somewhat more dependent on the extinction rate (Appendix 1.7). This provides further support that the results of this model are robust to its underlying assumptions, and that the interpreted similarities and differences in evolutionary rates among cichlid tribes are not artifacts of model design.

One of the previously unresolved questions regarding this model (Sidlauskas 2007) was that differences in turnover rates were not determined to be a major factor in generating clades of differing levels of disparity, despite simulation studies which suggest that turnover rates should play a major role in determining standing disparity (O'Meara et al. 2006; Ricklefs 2006a). In contrast, differences in turnover rate are strongly supported by this study. Sidlauskas (2007) suggests that his model does not indicate differences in turnover rate because the model is conditioned upon achieving the modern species diversity (equivalent to the Min-Max model of this study). However, the Min-Max model of this study yielded results that are consistent with results from the other three model conditions (the No Condition, Extant, and Min models). All four models generally produce numbers of successes for each parameter combination that corre-

late well with each other (Appendix 1.8). It may be that including the non-uniform priors for turnover rates results in more support for differences in turnover rates. It is also possible that turnover rates have played a more substantial role in shaping the disparity of Tanganyikan cichlids than that of South American characiform fishes. Either way, the results presented here indicate that this model can distinguish differences in turnover rates, regardless of the model conditioning variation that is employed.

Further research could further our understanding of the effects of turnover rates on standing disparity in cichlids. For example, time homogeneous rates or simple random extinction could contribute to the disparity patterns generated by the model. Temporally constant rates are less likely in large clades, and many studies suggest that evolutionary rates are heterogeneous with respect to time (Purvis 2008). Furthermore, simulations indicate that random extinction of 95% of species may reduce total branch length in a phylogeny by as little as 19%, while selective extinction may have a much more substantial influence on phylogenetic diversity (Nee and May 1997) and thus also on disparity. Thus, simulations which incorporate these elements could further assess the robustness of the results presented here.

While future research may provide insight into the nature of evolutionary processes in East African cichlids, the interpretations presented in this study are generally robust to the type of conditioning and to multiple assumptions of the model. This includes time-dependent and speciation-dependent models, five different approaches to conditioning model results, pure-birth vs. birth-death models, and two different approaches to comparing model results with empirical disparity. This finding has encouraging implications for future studies. That the results are generally consistent across such a wide range of assumptions implies that the choice of model conditioning does not substantially alter the interpretations of results and the models may be used in-

terchangeably to some extent. However, when possible, using multiple versions of the model and testing assumptions to demonstrate the robustness of the model is advised.

5. CONCLUSIONS

The results presented here provide strong evidence that the tribe Cyprichromini evolved with a low rate of morphological change in comparison with Lamprologini, Tropheini, and Ectodini, and a low turnover rate in comparison to Lamprologini and Tropheini. It is less clear that the turnover rate differed significantly between Cyprichromini and Ectodini. These low evolutionary rates may be associated with their low trophic diversity. However, there is little indication of differences in evolutionary rates among the latter three tribes. Simulation and regression analyses indicate that differences among these tribes are due to differences in age and stochastic variation. These patterns are consistent regardless of model variations or approaches to data analysis.

The exploration of model conditions strongly suggests that these results are not highly sensitive to differences between pure-birth and birth-death models, time-dependent and speciation-dependent models, or five variations of model conditioning. Although the Min-Max variation of the model is somewhat more sensitive to rate differences among groups, the conditioning of the model does not change the direction of interpretations of rate heterogeneity among clades for any significant difference in AIC_C . This implies that interpretations of differences in rates are unlikely to be substantially altered by choice of model conditions.

Chapter 3: Ecology and biology of the pivotal La Venta fauna of the Honda Group, Colombia

The vertebrate assemblage of La Venta from the Honda Group of Colombia is one of the most important mammalian faunas from South America. To date, it is the Neotropical fauna with by far the greatest known diversity in the Neogene (Carrillo et al. 2015). The fauna at La Venta also includes many of the first undisputed representatives of modern taxonomic groups (Flynn et al. 2012). The Honda Group dates to the Middle Miocene (13.5-11.6 Ma) and fills a temporal gap for which there were previously no South American faunas (Guerrero 1997; Flynn, Guerrero, and Swisher III 1997; Madden et al. 1997). Finally, its age places it shortly before the Great American Biotic Interchange that began with ground sloths 9-8.5 Ma, with the exception of a recently discovered overwater dispersal event of monkeys to Central America before 20.9 Ma (Bloch et al. 2016).

Between 1985 and 1992, Duke University and INGEOMINAS made extensive collections (Madden, Savage, and Fields 1997), and the resulting research was published in a comprehensive volume several years later (Kay et al. 1997). Since then, a relatively small number of additional studies have focused specifically on the Honda Group and its fauna. However, major advancements have occurred in geology, phylogenetics, biogeography, and ecological reconstruction for these and closely related organisms from other regions of the continent. In conjunction with the research that has been produced specifically on the fauna of La Venta, such new information has the capacity to greatly increase our understanding of this critically important tropical Miocene ecosystem, and to highlight questions that might now be addressed with new methodology.

1. Geology

The Honda Group, which contains the La Venta fauna, consists of the La Victoria Formation overlain by the Villavieja Formation. The La Victoria Formation was deposited 13.5-12.9 Ma, and the Villavieja Formation represents a longer duration of 12.9-11.6 Ma (Guerrero 1997; Flynn, Guerrero, and Swisher III 1997). Together, these units represent the Laventan South American Land Mammal Age (Madden et al. 1997). The region was part of the Pebas mega-wetland that filled the Amazon basin and surrounding regions during the Middle Miocene, as shown by sedimentological evidence of eastward flowing rivers. Uplift of the Eastern Cordillera isolated the Magdalena basin hydrologically around 11.8 Ma, beginning the subdivision and reduction of the extent of the mega-wetland (Guerrero 1997; Lundberg et al. 1998; Hoorn et al. 2010; Lundberg et al. 2010).

Alternating poorly cemented mudstone and pebbly, volcanic litharenites characterize the La Victoria Formation. The lower member of the Villavieja Formation, the Baraya Member, consists of grey mudstones and sandstones, while the upper member, the Cerro Colorado, consists mainly of red mudstones and sandstones. The Baraya Member is the most fossiliferous unit of the Honda Group.

There is a firm consensus that Honda Group as a whole represents a periodically flooded, meandering river depositional setting with low relief and low elevation. Furthermore, the significant input of volcanic materials that typically weathers quickly, such as biotites and pumice, and the immature state of clay development suggest that volcanic sources were close to the depositional basin (Royo y Gómez 1942; Royo y Gómez 1945; Stirton 1953; Fields 1959; Wellman 1970; Takai et al. 1992; Guerrero 1993; Guerrero 1997; Villarroel et al. 1996; Kay and Madden 1997b). Primary productivity and wood growth rate tend to be phosphorus-limited in tropical

forests and thus, are highest for regions with input from fertile volcanic soils, both in the modern Amazon and elsewhere (Quesada et al. 2009; Quesada et al. 2012; Bloomfield, Farquhar, and Lloyd 2014). Thus, the sedimentology of the Honda Group suggests that the soils could have supported a highly productive forest.

2. Ecology

The ecology of tropical South America during the Middle Miocene is poorly known. Overall, the paleoecological and paleoenvironmental research of the last two decades has focused much more heavily on the higher latitudes during this interval. This is due in part to the relative sparsity of fossil sites at low latitudes, although coeval faunas are now known from Peru (Antoine et al. 2007) and Bolivia (Croft 2007). Of the low latitudes sites, La Venta has been one of the most extensively studied.

When interpreting the autoecology of La Ventan mammals, studies of closely related taxa from the Southern Cone of the continent may be informative so long as several important caveats are recognized. First, these fossil species differed from each other in both time and space, and in fact the wide latitudinal difference between La Venta and the Southern Cone suggests that at least some ecological differences almost certainly existed. Such comparisons also depend on correct interpretations of both phylogenetic relationships between taxa and ecological assessment of the southern species. Some species may demonstrate flexibility in diet, habitat preferences, or other ecological traits depending on local resource availability. This variation, of course, makes it difficult to apply any specific ecological characteristics to a given site except by analyses that reveal the ecology at that particular site (e.g. stable isotope and dental microwear analyses). However, even given these various shortcomings of the approach, ecological reconstructions for

closely related species may still inform analysis as long as the information is considered within the context of its limitations.

2.1 Paleobotany

Paleobotanical fossils from the Honda Group are limited to assorted wood fragments that have been identified as *Goupioxylon stutzeri* (Schönfeld 1947; Pons 1969). This species resembles living species of *Goupia*, a genus of large trees that grows only in lowland tropical rainforests with mean annual temperatures of 23-30°C and mean annual precipitation of at least 2000 mm (Kay and Madden 1997b).

Although it was originally classified as belonging to Celastraceae, subsequent phylogenetic analyses have determined that *Goupia* rather represents its own family, the Goupiaceae (Simmons et al. 2001; Davis et al. 2005; Wurdack and Davis 2009; Soltis et al. 2011; Xi et al. 2012). Accordingly, *Goupioxylon stutzeri* has also been moved to the Goupiaceae (Estrada-Ruiz et al. 2012). While closest living relative methods are tentative at best when dealing with the family level, *G. stutzeri* is clearly more closely related to the extant *Goupia* than any other trees, which is suggestive of warm, tropical rainforest conditions. Even so, the paleobotanical evidence for paleoenvironment of the Honda Group should be viewed with caution.

2.2 Invertebrates and fish

Fossil trichodactylid crabs (*Sylviocarcinus piriformis*) have been reported from the La Venta fauna. In modern ecosystems, this species lives in freshwater rivers and lakes in lowland basins (Rodríguez 1997). Tridactylid crabs, including *S. piriformis*, provide evidence for the Laventan continuity between the Magdalena Valley region and the rest of Amazonia (Morrone and Lopretto 2001).

There are almost no records of extinctions in Neotropical fish in groups closely related to extant lineages. Consequently, the fish of La Venta are congeneric or conspecific with modern Amazonian fish. Of the twenty two actinopterygian, one dipnoan, and one chondrichthyan fish species known from La Venta, at least thirteen taxa are morphologically indistinguishable from modern taxa at the generic or even species level (Lundberg 1997; Lundberg 2005). As a result of their extremely close affinities, the ecologies of modern Amazonian fishes are likely similar to those of La Venta.

The La Ventan fishes are characterized as a lowland assemblage, with all of their closest living relatives living in the Amazon basin below 200 m of elevation today. Large, benthic to semibenthic river species include a potamotrygonid ray, a loricariid catfish cf. *Acanthicus*, piscivorous pimelodid catfishes *Brachyplatystoma* cf. *B. vaillanti*, *B. promagdalenae*, and *Phractocephalus*, and an ariid catfish (Lundberg 1997; Lundberg 2005). The piscivorous *Hydrolycus* is the only large pelagic river species currently known from the fauna. Shallow water fishes include *Colossoma macropomum*, a cichlid, *Leporinus*, and four fishes with aerial respiration, the first three of which are often found in anoxic and sometimes even temporary bodies of water: *Lepidosiren paradoxa*, *Hoplias*, *Hoplosternum*, and *Arapaima* (Lundberg 1997).

The range of aquatic habitat preferences in this fish assemblage is consistent with meandering river ecosystems (Kay and Madden 1997b; Lundberg et al. 2010). The presence of *Colossoma macropomum* is of particular interest for paleoenvironmental reasons because, in the modern Amazon, this species inhabits the flooded forest for almost half of the year (Lovshin 1995), and thus its presence at La Venta implies the existence of seasonally flooded forests along the rivers.

2.3 Amphibians and reptiles

A toad from La Venta has been identified as the extant species *Bufo marinus*, a species which lives in diverse habitats in the Neotropics that include floodplain forests, dry forests, and grasslands (Estes and Wassersug 1963). The one or possibly two taxa of caecilians known from the La Venta fauna were subterranean and preferred mildly humid soil (Hecht and LaDuke 1997). The caecilian was likely a member of the family Typhlonectidae (Kay and Madden 1997b), which is a small group of semiaquatic to aquatic caecilians today is found only in Neotropical rivers, ponds, and marshes, often in forests (Wilkinson and Nussbaum 1999; Kupfer et al. 2006; Hoogmoed, Maciel, and Coragem 2011).

At least three of the six snake taxa known from La Venta are believed to have preferred fossorial or leaf-litter habitats and at least one was aquatic, on the basis of living relatives and morphology. The others are inadequately known to determine their ecologies (Hecht and LaDuke 1997). The extinction of one of the snakes, *Colombophis portai*, is linked to the uplift and aridification of the Magdalena valley (Albino and Brizuela 2014).

The lizards of La Venta belong almost exclusively to an extinct genus, *Paradracaena*, which is intermediate between two extant genera, *Dracaena* and *Crocodilurus* (Estes 1961; Estes 1983; Sullivan and Estes 1997). Its dentition indicates that *Paradracaena* was ecologically similar to *Dracaena*, which would indicate a malacophagous, semiaquatic lifestyle in densely vegetated lowland swamps (Albino, Brizuela, and Montalvo 2006). This genus has now been discovered from another Middle Miocene site in the Peruvian Amazon (Pujos et al. 2009). The extirpation of this *Paradracaena* in both areas is linked to orogenic changes that eliminated lowland wetland ecosystems (Albino, Brizuela, and Montalvo 2006; Pujos et al. 2009). Remains tentatively assigned to *Paradracaena* have been recovered from a third Miocene locality in Brazil, indicating

a broad distribution for this taxon throughout the Pebas wetland (Hsiou, Albino, and Ferigolo 2009).

A single specimen of the lizard *Tupinambis*, for which most species have similar ecological requirements, is also known from La Venta (Sullivan and Estes 1997). Like *Paradracaena*, it became locally extinct in the Magdalena Valley region due to Andean uplift (Albino, Brizuela, and Montalvo 2006; Pujos et al. 2009).

Turtle remains, representing three families, are reasonably abundant in the Honda Group (Wood 1997). The aquatic species include two or three species of the genus *Podocnemis* (Wood 1997) and one species in the genus *Chelus* (Wood 1976). Land tortoises are represented by *Geochelone hesternae* and possibly a second, larger species (Auffenberg 1971; Wood 1997). This material is rare in comparison with the aquatic turtle remains. Extant members of all three genera live in the lowland forests and savannas of northern South America (Wood 1997).

Crocodylians are very diverse and abundant in the lower Villavieja Formation and decrease in abundance higher in the stratigraphic sequence. The terrestrial predator *Langstonia huilensis* (Sebecidae) lacks close living relatives or analogues (Langston 1965; Langston and Gasparini 1997; Paolillo and Linares 2007). Sebecids possessed ziphodont, or finely serrated, bladed teeth and shearing bites that would have allowed these crocodiles to kill prey without needing to drown or shake it. With these traits and their size, sebecids were apex terrestrial predators that ranked among the largest of the Amazonian Neogene (Buffetaut and Hoffstetter 1977; Gasparini 1984; Busbey III 1986; Legasa, Buscalioni, and Gasparini 1993; Paolillo and Linares 2007; Riff et al. 2010).

Caimans are the most morphologically diverse group of crocodylians in the Honda Group and in the South American fossil record in general. They reached their maximum diversity dur-

ing the Miocene with a minimum of ten species in five genera (Langston 1965; Langston and Gasparini 1997; Bona, Riff, and Gasparini 2012; Bona et al. 2014). The La Venta fauna contains a remarkable diversity of caiman taxa, with four to five genera represented here alone (*Eocaiman*, *Purussaurus*, *Mourasuchus*, *Caiman*, and *Balanerodus*, but see discussion below) (Langston 1965; Bona 2014).

The La Ventan caimans include the first possible appearance of *Caiman latirostris* (Langston 1965; Gasparini 1981; Langston and Gasparini 1997; Aguilera, Riff, and Bocquentin-Villanueva 2006), which would represent the oldest known occurrence in the South American fossil record of an extant crocodilian species (Langston and Gasparini 1997; Fortier and Rincón 2013). While the generic assignment is well accepted, the specific assignment has been the subject of considerable debate (Langston 1965; Gasparini 1981; Langston and Gasparini 1997; Bona 2014). Despite this uncertainty, the La Ventan *Caiman* likely shared ecological characteristics with *C. latirostris* (Langston 1965). This species is an aquatic habitat generalist that occurs in a variety of heavily vegetated, wet, sub-tropical to tropical lowland habitats in the modern, including lagoons, rivers, marshes, lakes, and even artificial ponds (Yanosky 1990; Verdade and Piña 1998; Borteiro et al. 2006). It has cranial adaptations related to underwater fishing and durophagy (Bona and Desojo 2011). The fossil record suggests that these habitat preferences have been maintained over time as well. The species was widespread in the Pebas mega-wetland beginning no later than the late Miocene, but disappeared from regions that became drier, more seasonal, and higher in elevation during the uplift episodes that began in the middle to late Miocene (Bona et al. 2014).

The genus *Eocaiman* is one of the oldest lineages of caiman and dates to the Paleocene of Patagonia and Brazil (Simpson 1933; Brochu 1999; Brochu 2001; Brochu 2003; Brochu 2011;

Bona, Riff, and Gasparini 2012; Pinheiro et al. 2013). It was less specialized than either Cretaceous or post-Eocene crocodyliforms, which may have contributed to the survival of its lineage through the K-Pg extinction event (Kellner, Pinheiro, and Campos 2014). *Eocaiman* likely shared ecological and environmental requirements with the extant species *Caiman* (Krause and Piña 2012), but little evidence exists regarding their specific ecological preferences and requirements.

As with many of the crocodilian taxa from La Venta, *Purussaurus neivensis* lacks close living relatives and analogues. Other *Purussaurus* species are known from the Upper Miocene of Venezuela (*P. mirandai*, (Aguilera, Riff, and Bocquentin-Villanueva 2006) and Brasil (*P. brasiliensis*, (Barbosa Rodrigues 1892) in addition to La Venta. *P. brasiliensis* and *P. mirandai* were both the largest carnivores in their ecosystems, and their ability to take very large vertebrate prey from aquatic and riparian habitats made them the apex predators (Aguilera, Riff, and Bocquentin-Villanueva 2006; Sánchez-Villagra and Aguilera 2006; Riff and Aguilera 2008; Riff et al. 2010; Scheyer et al. 2013; Moreno-Bernal 2014; Aureliano et al. 2015). The ability of *Purussaurus* species to take such prey is supported by biomechanical studies demonstrating their impressive potential bite force and the ability of at least *P. neivensis* to use the ‘death roll’ characteristic of modern crocodilians that hunt large prey (Aureliano et al. 2015; Blanco, Jones, and Villamil 2015). The ecological preferences of *Balanerodus logimus* remain unknown (Langston and Gasparini 1997), but recent discoveries of *Purussaurus* jaws with teeth identical to those of *B. logimus* suggest that it may not be a distinct taxon (Scheyer and Moreno-Bernal 2010; Salas-Gismondi et al. 2015).

The Nettosuchidae, including *Mourasuchus* atopus of the La Venta fauna, represent the sister group to *Purussaurus* (Brochu 1999; Brochu 2003; Aguilera, Riff, and Bocquentin-

Villanueva 2006; Hastings et al. 2013). Because this species lacks close living relatives or analogues, its ecology is poorly understood. *Mourasuchus* most likely resided in calm water bodies such as ponds, where it may have been a filter feeder (Langston and Gasparini 1997; Langston Jr 2008) or a piscivore (Tineo et al. 2014). This hypothesis is based on its duck-billed snout, weak jaw, and tiny teeth, which would not have allowed *Mourasuchus* to take large prey. However, fossil material and biomechanical studies to distinguish between filter feeding and piscivory still are lacking (Riff et al. 2010; Bona, Degrange, and Fernández 2013). *M. atopus*, along with *Purussaurus neivensis*, occurs in coeval assemblages from the fluvial dominated lowland ecosystem of Fitzcarrald, Peru and the lowland disoxic marshes and swamps of Acre, Brasil (Salas-Gismondi et al. 2015).

One longirostrine taxa with unclear affinities, *Charactosuchus fieldsi*, is known from the Honda Group; close relationships with gavialoids can be clearly ruled out, as can affinities with most crocodylines and tomistomines (Langston 1965; Riff et al. 2010). *Charactosuchus fieldsi* has been compared to the modern species *Crocodylus intermedius*, which is a piscivore in deep, low energy rivers (Langston and Gasparini 1997). However, lack of material and phylogenetic information makes ecological interpretations difficult for this species.

Like *Purussaurus*, the gavial *Gryposuchus colombianus* was extremely large. The congeneric *Gryposuchus croizati* from the late Miocene Urumaco Formation was among the largest of any known crocodilians at an estimated 10.15 m in length (Riff and Aguilera 2008). Thus, while the elongated snout of *Gryposuchus* and other Miocene gharials indicates that these taxa were likely piscivores like their modern relatives (Langston 1965; Langston and Gasparini 1997; Riff and Aguilera 2008; Scheyer and Moreno-Bernal 2010), others have interpreted it as a top predator for its ecosystem (Scheyer et al. 2013).

The diversity of crocodilians in the lower Villavieja Formation parallels high diversity elsewhere in tropical South America throughout the early and middle Miocene (Moreno-Bernal 2014; Salas-Gismondi et al. 2015; Moreno-Bernal, Head, and Jaramillo 2016), when the Pebas mega-wetland ecosystem was at its maximum extent and included what is now the Magdalena Valley (Guerrero 1993; Guerrero 1997; Lundberg 1997; Lundberg et al. 1998; Hoorn et al. 2010; Moreno-Bernal, Head, and Jaramillo 2016). The similarity among crab, fish, lizard, and crocodilian taxa from Miocene localities in Colombia, Brasil, Venezuela, Bolivia, Peru, and Argentina provides strong support for the freshwater connections spanning this mega-wetland system (Riff et al. 2010; Bona, Riff, and Gasparini 2012; Bona and Carabajal 2013; Tineo et al. 2014).

Reptiles also appear to have played a more substantial role in terrestrial ecology than elsewhere in the world. While terrestrial predators in North America, Europe, Africa, and Asia were quite dominantly placental mammals, this role was filled by a combination of large snakes (Madtsoiidae), crocodiles, terror birds (Phorusrhacidae), and marsupials (see below) in South American ecosystems (Simpson 1950; Simpson 1980; Langston 1965; Patterson and Pascual 1968; Reig 1981; Gasparini 1984; Albino 1996; Langston and Gasparini 1997; Rosendo Pascual 2006; Riff et al. 2010; Prevosti and Soibelzon 2012; Prevosti, Forasiepi, and Zimicz 2013). This is likely related to the relatively low diversity of mammalian predators that is evident in South American faunas prior to the Great American Biotic Interchange (Marshall 1977; Croft 2001). Of these non-mammalian predators, only the crocodiles are known from the La Venta fauna.

2.4 Birds

Birds are notoriously underrepresented in the fossil record, and in this regard the fauna of La Venta is no exception. Highly fragmentary remains of only five taxa are known (Rasmussen

1997). Fortunately, four of the five are congeneric with extant species, which allows basic ecological interpretations even in the absence of more complete specimens (Rasmussen 1997; Kay and Madden 1997b).

On the basis of morphology, Rasmussen (1997) suggests that the extinct *Hoazinoides magdalenae* may have had similar locomotion to the living hoatzin (*Opisthocomus hoazin*). Although it is related to hoatzins along with turacos and cuculids, it is not a hoatzin (Rasmussen 1997). The hoatzin is a small, obligate arboreal folivore with foregut fermentation and a combination of clambering with poor flight that they use to access new growth (Grajal et al. 1989; Domínguez-Bello et al. 1994; Kornegay, Schilling, and Wilson 1994; Godoy-Vitorino et al. 2008; Tambussi and Degrange 2013). While it is unclear how closely related *O. hoazin* and *H. magdalenae* actually are, similarity in locomotion could possibly indicate similar behaviors and/or habitat preferences. The modern hoatzin is found in low trees and shrubs along the banks of forested streams, swamps, and oxbow lakes in the Orinoco and Amazon river basins (Grajal et al. 1989; Kay and Madden 1997b).

A jacamar (*Galbula hylochoreutes*, Galbulidae) is also known from the La Venta fauna (Rasmussen 1997). Because this genus has extant species, applications of closest living relative methods are somewhat more reliable. Extant *Galbula* species prefer humid lowland secondary forests and forest edges (Skutch 1963). All living jacamars are aerial insectivores that scan for prey from arboreal perches (Rasmussen 1997; Thiollay 2003).

Aramus paludigrus (Aramidae) also has an extant congener, *Aramus guarauna* (Rasmussen 1997). The postcranial remains of *A. paludigrus* closely resemble those of the extant limpkin and differ only in size, as it is 20% larger than the average for *A. guarauna* (Rasmussen 1997). Today, the limpkin lives in Neotropical wooded marshes, swamps, and mangrove forests (Blake

1977). They prey primarily on freshwater snails, which they find most often on local vegetation or marsh bottoms (Sick 2001; Tanaka, Souza, and Módena 2006).

A specimen of *Jaribu*, possibly conspecific with the extant *Jaribu mycteria*, was recovered by a local collector. *J. mycteria* are found in a variety of wetlands and grasslands today, and coastal wetlands are particularly important for their breeding (Frederick et al. 1997). Nests are built in trees 15-30 m off the ground, normally in seasonally flooded pine-savanna wetlands or riparian forests (Barnhill et al. 2005). In terms of diet, Jaribu specialize on marbled swamp eel (*Synbranchus marmoratus*) that they catch in low water, especially drying ponds, though they will also take snails (Alho 2008).

The final avian taxa known from La Venta is an anhinga (*Anhinga*, Anhingidae), possibly belonging to *A. grandis*, which is known from the late Miocene of Florida, late Pliocene of Nebraska, and probably from the late Miocene to Pliocene of the southern Amazon basin (Martin and Mengel 1975; Becker 1987; Rasmussen and Kay 1992; Rasmussen 1997; Noriega 2001; Alvarenga and Guilherme 2003). The diverse Mio-Pliocene South American, primarily Amazonian, fossil aningas include three to four species of *Anhinga* (Campbell Jr. 1996; Alvarenga and Guilherme 2003; Diederle 2015b) as well as species of three extinct genera of anhinga, *Macranhinga* (Noriega 1992; Noriega and Piña 2004; Diederle 2012), *Meganhinga* (Campbell Jr. 1996), and *Giganhinga* (Rinderknecht and Noriega 2002; Areta, Noriega, and Agnolin 2007). The Amazonian aningas are associated with large flooded areas surrounded by mosaics of forests and grasslands (Alvarenga and Guilherme 2003), much like the environments in which extant anhinga are found (Blake 1977). Extinct anhinga also likely had similar dietary niches to today as piscivorous divers, but with some variation in their approaches to fishing. Some of the larger species would have been able to actively pursue prey rather than stalking it, and would

have been able to dive deeper and for longer than extant anhingas (Noriega 2001; Diederle 2015a).

The avian fauna with close living relatives provide useful, “unambiguous” paleoenvironmental indicators (Rasmussen 1997). Because modern representatives of all four extant genera prefer tropical to subtropical, lowland, humid environments with available woods or forests, such habitats likely were reasonably well represented in the Colombian Miocene (Rasmussen 1997; Kay and Madden 1997b). In fact, the closest living relatives of the entire La Venta bird fauna today live sympatrically in lowland, forested Neotropical swamps (Blake 1977; Rasmussen 1997).

2.5 Marsupials

The La Venta fauna includes three opossum species in two genera, *Thylamys* and *Micoureus*, which are interpreted as arboreal and insectivorous and/or frugivorous based on their similarity with modern representatives (Goin 1997; Kay and Madden 1997b). The Palaeothentidae *Pithiculites* and Abderitidae *Hondathentes* were most likely arboreal and frugivorous or nectarivorous based on analogy with Australian phalangeroid marsupials (Kay and Madden 1997b) and morphological similarity to their arboreal, insectivorous and/or frugivorous relatives from the Santacrucian (Early Miocene) of Patagonia (Dumont and Bown 1997; Dumont, Strait, and Friscia 2000; Abello, Ortiz-Jaureguizar, and Candela 2012; Kay, Vizcaíno, and Bargo 2012).

One species, *Pachybiotherium minor*, represents the microbiotheres in the La Venta fauna. The sole extant species of microbiothere is an arboreal insectivore that lives in a variety of temperate forests and rainforests in Argentina (Marshall 1978); extinct microbiotheres are known mainly from Early Miocene (Colhuehuapian-Santacrucian) Patagonian forests and environmental

mosaics in temperate warm, humid climates (Goin et al. 2007; Goin, Abello, and Chornogubsky 2010; Madden et al. 2010; Abello, Ortiz-Jaureguizar, and Candela 2012; Kay, Vizcaíno, and Bargo 2012). The ecology of other microbiotheres is congruent with morphological analysis, and together this evidence suggests that *P. minor* was an arboreal frugivore-insectivore (Goin 1997; Kay and Madden 1997b).

At least four dominantly carnivorous species of Sparassodonta are also known from the La Venta fauna (*Hondadelphys fieldsi*, *Lycopsis longirostris*, *Dukecynus magnus*, and *Anachlysictis gracilis*). Based on cranial and dental morphology, *Lycopsis longirostris* and *Hondadelphys fieldsi* were most likely somewhat omnivorous, which in modern South American carnivores indicates seasonal variability in food supply (Goin 1997) and references therein). The Sparassodonts otherwise give relatively little information on environmental conditions.

2.6 Xenarthrans

The ecology of extinct xenarthrans is difficult to reconstruct for a variety of reasons. First, almost all xenarthrans lack dental enamel, which makes isotopic and microwear studies more difficult (Green 2009a; Green 2009b; MacFadden, DeSantis, et al. 2010; Green and Resar 2012; Haupt et al. 2013; Resar, Green, and McAfee 2013; Ciancio, Vieytes, and Carlini 2014; Green and Kalthoff 2015). Xenarthran dentition is homodont and/or severely reduced in most species, which precludes the use of relationships developed in other taxonomic groups in interpreting xenarthran paleobiological characteristics such as diet, habitat preference, and body mass (Fariña, Vizcaíno, and Bargo 1998; Bargo 2003). However, a collection of morphological, biomechanical, and phylogenetic studies over the last few decades have greatly improved our understanding of the biology and ecology of La Ventan xenarthrans and their close relatives.

Neotamandua is one of only three extinct genera that can be referred to Vermilingua (anteaters) unambiguously, along with the Santacrucian *Protamandua* and the Huayquerian *Palaeomyrmidon* (Hirschfeld 1976; Gaudin and Branham 1998; McDonald, Vizcaíno, and Bargo 2008). Although it was originally thought to be an ancestor to the modern genus *Tamandua*, more recent analyses have determined that *Neotamandua* is in fact closely related to *Myrmecophaga* (Engelmann 1985; Patterson et al. 1992; Gaudin and Branham 1998; McDonald, Vizcaíno, and Bargo 2008; Croft 2016). Like other vermilinguans, it was myrmecophagous, and morphometric analysis indicates that it was also scansorial (White 1997; Kay and Madden 1997b; Croft 2016).

Traditional morphometric analyses indicate that the La Venta fauna includes one scansorial (*Neonematherium flabellatum*, Scelidotheriinae) and three fully arboreal sloths (a small megalonychid, a small nothrothere, and a “large nothrothere cf. *Hapalops*”) (Kay and Madden 1997b; White 1997). However, subsequent biomechanical, ichnological, and taphonomic evidence indicates that at least one scelidotheriine and one mylodontine sloth were burrowers (Zárate et al. 1998; Bargo et al. 2000; Vizcaíno et al. 2001; Pujos et al. 2012; Genise and Farina 2012). When morphological assessment of locomotor categories (White 1993; White 1997) is combined with phylogenetic analysis (Gaudin 2004), the results suggest that climbing ability may be limited to the Megalonychidae and that burrowing was ubiquitous among mylodontines (Pujos et al. 2012), which would indicate a semifossorial rather than a scansorial habit for *N. flabellatum*. This semifossorial habit would also apply to the mylodontines *Pseudoprepotherium* and *Glossotheriopsis*. *Hapalops* was most likely scansorial to arboreal (J. L. White 1993; J. L. White 1997; Pujos et al. 2012), but recent phylogenetic analysis reveals that it was a megalonychid sloth and not a nothrothere (Gaudin 2004; Gaudin and McDonald 2008). The same

might also be true for the unidentified “small nothrothere,” but further taxonomic study is required to answer this question. Such locomotor diversity among ground sloths could explain the observation that La Venta sloths have combinations of values for different morphometric indices that are not observed in any modern xenarthrans (White 1997).

All three mylodonts (*Pseudopreotherium confusum*, *Neonematherium flabellatum*, and *Glossotheriopsis pascuali*) had a single transverse loph in their molariform teeth, which typically indicates that food was sliced rather than crushed. Furthermore, both *Pseudopreotherium confusum* and *Neonematherium flabellatum* had narrow, elongate premental snouts (McDonald 1997), which is associated with selective browsing in ungulates (Janis 1988; Janis and Ehrhardt 1988; Solounias, Teaford, and Walker 1988; Mendoza, Janis, and Palmqvist 2002; Mendoza and Palmqvist 2006a; Mendoza and Palmqvist 2008). However, Pujos et al. (2012) characterize the width of the snout as intermediate for *Pseudopreotherium*, suggesting a mixed diet consisting of both browse and graze.

In contrast, *Glossotheriopsis pascuali* exhibited an anteriorly flared muzzle (McDonald 1997), which is associated with grazing (Janis 1988; Janis and Ehrhardt 1988; Solounias, Teaford, and Walker 1988; Mendoza, Janis, and Palmqvist 2002; Mendoza and Palmqvist 2006a; Mendoza and Palmqvist 2008). Multiple lines of evidence indicate that later mylodonts in the *Glossotheriopsis* lineage were grazers, including flat occlusal surfaces that are useful for crushing and so are associated with grazing diets, and dung from the Late Pleistocene *Myiodon darwini* of the same lineage consisting entirely of Cyperaceae and Gramineae. Thus, McDonald (1997) suggests that *Glossotheriopsis pascuali* represents a transitional species between older, selectively browsing species and younger grazing species. Multiple such transitions within the Mylodontidae are also supported by phylogenetic analysis (Pujos et al. 2012). Overall, the diets

of the La Ventan mylodonts suggest an open woodland habitat (McDonald 1997). An interesting alternative hypothesis is that some mylodonts may have been partially myrmecophagous based on the size, morphology, and ichnology of caves attributed to mylodonts (Dondas, Isla, and Carballido 2009; Genise and Farina 2012).

Autoecological characteristics have also been proposed for the cingulates of La Venta. Today, dasypodine armadillos, which are represented in the La Venta fauna by *Nanoastegotherium prostaticum* (Astegotheriini) and *Anadasypus hondanus* (Dasypodini) (Carlini et al. 1997), prefer warm, humid forests and savannas (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999; Wetzel et al. 2007; McDonough and Loughry 2008; Meritt Jr. 2008; Abba and Cassini 2008; Cuéllar 2008; Abba et al. 2012). Paleontological evidence from Ecuador, Venezuela, and Argentina indicates that the Dasypodini have maintained this environmental preference since the Late Paleocene and that this preference was shared with the Astegotheriini and Stegotheriini (Rancy 1991; Rancy 1999; Ranzi 2000; Rincón, White, and McDonald 2008; Carlini et al. 2014; Castro et al. 2014; Soibelzon, Avilla, and Castro 2015). Extant dasypodine armadillos are semifossorial and insectivorous to insectivorous-omnivorous (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999; Vizcaino, Farina, and Mazzetta 1999; Wetzel et al. 2007; McDonough and Loughry 2008; Abba and Cassini 2008; Cuéllar 2008), and the extinct dasypodines appear to have shared these characteristics (Rancy 1991; Vizcaíno 1994; Rancy 1999; Vizcaíno 1997; Fariña and Vizcaíno 1997; Ranzi 2000; Vizcaíno et al. 2001; Vizcaíno, Fariña, Bargo, et al. 2004; Ascanio D. Rincón, White, and McDonald 2008; Castro et al. 2014). These characteristics most likely also apply to *Nanoastegotherium prostaticum* and *Anadasypus hondanus* (Carlini et al. 1997; Kay and Madden 1997b).

The La Ventan species *Pedrolypeutes praecursor* (Carlini et al. 1997), and the extant genus *Tolypeutes*, are the only taxa known from the Tolypeutine tribe Tolypeutini (Gaudin and Wible 2006; Wetzel et al. 2007). There has, however, been recent debate on the basis of molecular phylogeny about the status of the tribes Tolypeutini and its sister, Priodontini (Möller-Krull et al. 2007; Delsuc and Douzery 2008; Delsuc et al. 2012). *Tolypeutes* is the most cursorial of extant armadillo species and is relatively unique in that it does not burrow nor dig extensively, whereas other Tolypeutine genera- *Priodontes*, *Cabassous*, and possibly *Chlamyphorus*- are all highly fossorial (Fariña and Vizcaíno 1997; Vizcaino, Farina, and Mazzetta 1999; Vizcaíno and Milne 2002; Milne, Vizcaíno, and Fernicola 2009). Postcranial remains of *Pedrolypeutes* suggest that it was a more generalized armadillo perhaps more similar to the Euphractines (Carlini et al. 1997), which dig burrows but maintain relatively epigeal lifestyles (Vizcaino, Farina, and Mazzetta 1999; Koneval 2003; Milne, Vizcaíno, and Fernicola 2009). Such an interpretation is also consistent with recent phylogenetic studies, which indicate that basal Tolypeutines were likely generalized (Milne, Vizcaíno, and Fernicola 2009; Delsuc et al. 2012). Tolypeutine armadillos today live in a variety of habitats, including dry forests, ecotonal areas, and grasslands, with a range from xeric habitats to ones with over 1500 mm of rainfall per year (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999; Kay and Madden 1997b; Wetzel et al. 2007). All living members of Tolypeutinae are myrmecophagous (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999), suggesting that *Pedrolypeutes praecursor* most likely was as well (Carlini et al. 1997; Kay and Madden 1997b).

Neoglyptatelus is a unique cingulate with characteristics resembling both armadillos and glyptodonts, known not only from the La Venta fauna (*N. originalis*, (Carlini et al. 1997), but also from the middle to late Miocene of coastal Colombia and Uruguay (Vizcaíno, Milne, and

Bargo 2003; Carlos Villarroel and Clavijo 2005). Recent fossil discoveries and phylogenetic analyses have revealed that *Neoglyptatelus* and the closely related *Pachyarmatherium* are positioned as the sister group to the Dasypodinae or to the clade comprised of glyptodonts and pampatheres, and thus are not glyptodonts as originally believed (Porpino, Fernicola, and Bergqvist 2009; Oliveira, Porpino, and Silva 2013; Croft 2016). These new discoveries have substantially changed our understanding of the ecology of both armadillos, suggesting that they were insectivores and most likely myrmecophagous (Croft 2016), rather than grazers as was originally believed (Carlini et al. 1997; Kay and Madden 1997b).

Glyptodonts at La Venta include the species were originally identified as *Asterostemma* (Propalaehoplophorinae) species (Carlini et al. 1997; Kay and Madden 1997b). However, more recent comparative work determined that the La Venta glyptodonts are in fact basal members of Glyptodontinae and renamed them as *Boreostemma gigantea* and *Boreostemma acoste* (Carlini et al. 2008; Zurita et al. 2013). These recent revisions to our phylogenetic understanding of glyptodonts indicate that northern and southern glyptodonts have very different evolutionary histories and were likely isolated from each other in the Middle Miocene by the Pebas megawetland (Zurita, Scillato-Yané, et al. 2016).

Glyptodonts, including *Boreostemma*, have traditionally been viewed as grazers and thus as evidence of grasslands (Stirton 1953; Carlini et al. 1997; Fariña and Vizcaíno 2001; Rincón, White, and McDonald 2008). However, Kay and Madden (1997) suggested that given the lack of close living relatives or analogues, they may have been low-vegetation browsers instead. Recent ecomorphological studies indicate that in fact the early to middle Miocene (Santacrucian) propalaehoplophorines *Eucinepeltus*, *Propalaehoplophorus*, and *Cochlops* were all selective browsers in closed to moderately open habitats, and that mixed feeding glyptodonts arose in the

Late Miocene (Vizcaíno, Cassini, et al. 2011; Vizcaíno, Fernicola, and Bargo 2012; Kay, Vizcaíno, and Bargo 2012). Although specific ecomorphological studies would help to confirm this hypothesis, it is likely that the *Boreostemma* species of La Venta were also browsers.

The occurrence of *Scirrotherium hondaensis* at La Venta (Edmund and Theodor 1997) is the oldest known for any pampatheres (Góis et al. 2013). Pampatheres have long been considered to be herbivores, and more specifically grazers, which has been supported by recent studies of their dental and cranial morphology (Winge 1941; Edmund 1985; Vizcaíno, Iuliis, and Bargo 1998; Iuliis, Bargo, and Vizcaíno 2001; Vizcaíno, Bargo, and Cassini 2006; Scillato-Yané et al. 2005; Mead et al. 2007; Vizcaíno 2009; Scillato-Yané 2014). The dentition of *Scirrotherium* most closely resembles that of *Vassalia* (Edmund and Theodor 1997), the morphology of which is most consistent with grazing (Vizcaíno, Iuliis, and Bargo 1998). Congruent with this dietary hypothesis is the interpretation that pampatheres inhabited open (grasslands, savannas) to moderately open (scrubland) habitats (Carlini et al. 1997; Iuliis, Bargo, and Vizcaíno 2001; Rincón et al. 2014; Mitchell, Scanferla, et al. 2016). The wide geographic distribution of *Scirrotherium* that includes Colombia, Brazil, and Argentina (Edmund and Theodor 1997; Dozo et al. 2002; Góis et al. 2004; Cozzuol 2006; Dozo et al. 2010; Latrubesse et al. 2010; Góis et al. 2013) may indicate that it had somewhat broader ecological flexibility than some other pampatheres (Góis et al. 2013). An alternative ecological hypothesis states that pampatheres may have been at least partially insectivorous (Kay and Madden 1997b).

2.7 Rodents

Three species of Erethizontidae (porcupines) are known from La Venta, including two species of *Steiromys* as well as *Microsteiromys jacobsi* (Walton 1990; Walton 1997). All four

modern genera of erethizontids are arboreal (three genera) or scansorial (one genus). Biomechanical analysis of the postcranial skeletons of the Santacrucian species *Steiromys duplicatus* indicates that it was scansorial (Candela and Picasso 2008; Candela, Rasia, and Pérez 2012). Analysis of the cranial morphology indicates that *Steiromys* had stronger masticatory muscles, thick and deeply implanted incisors, and pentalophodont molars that provided an increased grinding area. All of these features suggest that *Steiromys* had a diet more like that of *Erethizon dorsatum* than those of living Neotropical porcupines, characterized by increased intake of abrasives and hard objects (Candela, Rasia, and Pérez 2012). Thus, while modern Neotropical porcupines are heavily folivorous, *Steiromys* was likely a generalist herbivore whose diet depended on local resource availability. *Microsteiromys* may have had a frugivorous-folivorous diet like its modern relatives (Walton 1997; Kay and Madden 1997b) or a generalist diet like *Steiromys*, but specific morphological and biomechanical studies have not yet tested between these hypotheses.

Octodontoid rodents are the most diverse clade of Hystricognath rodents (Patton 2015c). This clade includes the families Abrocomidae, Echymidae, Octodontidae, and under certain treatments, Ctenomyidae, though Ctenomyinae and Octodontinae are sometimes considered subfamilies of Octodontidae (Verzi, Olivares, and Morgan 2014). The phylogenetic affinities of *Acarechimys* cf. *A. minutissimus* have long been the subject of debate. *Acarechimys* and its closest relatives have been assigned to numerous positions in the Octodontoidea, including Echimyidae (Patterson and Wood 1982; Walton 1990; Vucetich and Verzi 1991; McKenna and Bell 1997; Walton 1997; Carvalho and Salles 2004), Octodontidae (Verzi, Olivares, and Morgan 2014), in Acaremyidae basal to Octodontidae + Echimyidae (Vucetich, Kramarz, and Candela 2010), or Octodontoidea incertae sedis (Candela 2016). Such uncertainty with regards to phylo-

genetic relationships makes ecological interpretation difficult in the absence of ecomorphological, isotope, or microwear studies pertaining specifically to *Acarechimys*.

Based on the recent phylogenetic analysis of Verzi et al. (2014), *Acarechimys* is positioned as stem Octodontinae. Modern octodontids live in mesic to arid open habitats and are fossorial to subterranean, as are rodents in their sister clade, Ctenomyidae/Ctenomyinae (Bidau 2015; Verzi, Díaz, and Barquez 2015). Early octodontids, including *Acarechimys*, were most likely also fossorial, but preferences for progressively open and more arid habitats evolved in response to climate changes from the Late Miocene onwards (Verzi, Olivares, and Morgan 2014). Thus, under this phylogenetic framework, *Acarechimys* was most likely a fossorial, granivorous rodent, preferring somewhat more humid and closed environmental conditions.

Alternatively, *Acarechimys* may have been an echimyid rodent. Two to three other species of spiny rats (Echimyidae) are also recognized in the La Venta fauna, including *Ricardomys longidens* and one or two additional indeterminate taxa (Walton 1990; Walton 1997). Modern echimyids are ecologically diverse, including fossorial, scansorial, arboreal, semiaquatic, and generalized terrestrial forms. They nearly all prefer forest habitats, most have tropical distributions, and the majority are arboreal or scansorial (Walton 1997; Kay and Madden 1997b; Emmons, Leite, and Patton 2015a; Emmons, Patton, and Leite 2015; Emmons, Leite, and Patton 2015b; Patton and Emmons 2015b; Patton 2015b). Thus, *Ricardomys*, and possibly *Acarechimys* if it is an echimyid, would have likely been scansorial granivores in forested regions (Walton 1997; Kay and Madden 1997b), although these hypotheses remain to be tested.

The La Venta fauna may contain as many as seven species of Dinomyidae, although the classification of this material has been highly disputed as well. The most widely supported opinion is that the La Venta taxa originally referred to “*Olenopsis*” actually belong to *Drytomomys*

aequatorialis (Fields 1957; Candela and Nasif 2006; Tejada-Lara et al. 2015), although other authors have disputed this assignment (Patterson and Wood 1982; Walton 1990; Walton 1997). Walton (1990, 1997) indicates that two species of different sizes exist, but Candela and Nasif (2006) refer all of the material from La Venta to *D. aequatorialis* pending further study. *D. aequatorialis* (=“*Olenopsis*”), *Scleromys*, and “*Scleromys*” all have been variably referred to Dasyproctidae rather than Dinomyidae (Mones 1981; Mones 1986; Kramarz 1998), probably because their generalized dentition makes taxonomic assignment difficult in the absence of a comprehensive phylogenetic analysis (Candela and Nasif 2006).

Dinomys, the only living dinomyid species, is an arboreal forest-dweller. Based on postcranial morphology of the dinomyids of La Venta, however, these species were intermediate in cursoriality between *Dinomys* and the extant, forest-dwelling dasyprocts *Dasyprocta* and *Myoprocta*. This generalized postcranial morphology suggests that the dinomyids of La Venta preferred relatively closed habitats (Walton 1997). Kay and Madden (1997) suggest a frugivorous-folivorous diet for all of the purported La Venta dinomyids based on analogy with extant species, which is also consistent with the frugivorous-folivorous diet suggested (Kay, Vizcaíno, and Bargo 2012) for the morphologically similar dasyproctid *Neoreomys australis* (Patterson and Wood 1982; Walton 1997).

The dasyprocts (Dasyproctidae) of La Venta include “*Neoreomys*” *huilensis* and two species of *Microscleromys* (Walton 1990; Walton 1997). The Honda Group dasyprocts are probably most closely related to the modern *Cuniculus* (Walton 1997). However, recent phylogenetic analyses indicate that *Cuniculus* may belong in a separate family, the Cuniculidae (Patton 2015a), and that *Neoreomys* is the sister formed by *Dasyprocta* and *Cuniculus* (Pérez 2010a; Pérez and Vucetich 2011; Pérez and Vucetich 2012; Pérez, Vucetich, and Deschamps 2014). Wal-

ton questions the assignment of “*N.*” *huilensis* to the Santacrucian genus, in which case the La Venta “*Neoreomys*” might belong in Cuniculidae as well, but no other generic assignment has been proposed yet and the La Venta species is very similar to Santacrucian *Neoreomys* (Walton 1997; Kramarz 2006; Townsend and Croft 2008b; Chick 2009). In terms of postcranial morphology, morphofunctional analysis indicates that the Santacrucian *N.* was more similar to the extant *Cuniculus* (= *Agouti*) *paca* than to *Dasyprocta*, suggesting that it was a capable runner and possibly swimmer, but was less cursorial than *Dasyprocta* (Walton 1997). All modern pacas, agoutis and agouchies (Cuniculidae, Dasyproctidae) live in tropical or sub-tropical forests and are frugivores and/or granivores (Patton 2015a; Patton and Emmons 2015a). Analogy with modern caviomorphs led Kay and Madden (1997b) to propose a granivorous diet for all dasyprocts of La Venta. Dental microwear analysis indicates that the Santacrucian *N. australis* of Patagonia also had a frugivorous-granivorous diet (Townsend and Croft 2008b).

As many as three species of caviids are also present in the Honda Group, including *Prodolichotis* and two species of a second unnamed genus (Walton 1990; Walton 1997). *P. pridiana* was originally assigned to Dolichotinae (Ameghino 1889; Rovereto 1914; Fields 1957; Vucetich 1980; Walton 1990; Walton 1997), but other analyses suggest that it belongs to Caviinae or is closely related to *Kerodon* of the Hydrochoerinae (Kraglievich 1932; Quintana 1998; Ubilla and Rinderknecht 2003). Most recently, one study (Madozzo-Jaén and Pérez 2017) suggested that *P. pridiana* species is basal to Caviidae and called for a comprehensive taxonomic and phylogenetic revision of the genus. Interestingly, although she places *P. pridiana* in Dolichotinae, Walton (1997) found its postcranial morphology more similar to that of the generalized *Cavia* (Caviinae) and basal caviid *Eocardia* than *Dolichotis* (Dolichotinae). Regardless of its affinities, this suggests that *Prodolichotis* likely was a generalized terrestrial rodent, unlike the

cursorial extant dolichotines that prefer open habitats (Walton 1997; Kay and Madden 1997b). All modern caviids with known diets are either grazers or generalized herbivores (Dunnum 2015), which is consistent with the interpreted grazer diet for both caviid genera at La Venta (Kay and Madden 1997b).

Overall, the rodent assemblage of the Honda Group is suggestive of a tropical, lowland ecosystem dominated by relatively closed (forested) habitats (Walton 1997; Kay and Madden 1997b). However, major taxonomic and phylogenetic studies are clearly needed to clarify the identities and affinities of many of the taxa found here. Furthermore, biomechanical, morpho-functional and microwear studies similar to those that have been applied to Patagonian rodents could vastly improve our knowledge of the ecology of the rodent assemblage of La Venta. Considering the minimal similarity between the rodent community composition of La Venta and that of southern South America (Walton 1990; Walton 1997), these studies are particularly necessary.

2.8 Bats

As for rodents, the autoecology of La Ventan bats has been inferred mainly on the basis of their closest living relatives. As always, the ecological preferences of taxa may change over time, and so this approach is stronger when supported by morphological, isotopic, or microwear studies to confirm that ecological preferences have not changed substantially. However, comparison with modern taxa is likely more appropriate in this case than for other groups as many of these bats belong to extant genera with specific ecologies.

Two genera of emballonurids are represented in the La Venta fauna. *Diclidurus* sp. indet. (Diclidurinae, Emballonuridae) belongs to an extant genus of aerial pursuit insectivores that primarily forages above forest canopies and water bodies. All modern species prefer moist, forest-

ed areas, particularly multistratal evergreen forests, for roosting and foraging, although some species may occasionally be found in humid human-modified areas as well (Eisenberg 1989; Czaplewski, Morgan, and McLeod 1997; Eisenberg and Redford 1999; Hood and Gardner 2007). A second genus remains unidentified, but does not belong to Diclidurinae (Czaplewski et al. 2003). This taxon was presumably an aerial insectivore as is typical of emballonurids; otherwise, very little is known about its ecology, as emballonurids use a wide range of habitats (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999; Hood and Gardner 2007).

Noctilio albiventris (Noctilionidae) is one of only two extant species in the family Noctilionidae (Gardner 2007a). It is predominantly an insectivore that feeds on aquatic insects near the surface of fresh water bodies, although it occasionally takes fish or fruit as well. It has a strong preference for streamside vegetation in lowland tropical forests (Eisenberg 1989; Redford and Eisenberg 1992; Czaplewski, Morgan, and McLeod 1997; Eisenberg and Redford 1999; Gardner 2007a).

Three genera of phyllostomine (Phyllostominae, Phyllostomidae) bats are known from La Venta (Czaplewski, Morgan, and McLeod 1997). *Tonatia*, sp. indet. belongs an extant genus whose members are foliage-gleaning insectivores and/or frugivores (Fleming, Hooper, and Wilson 1972; Eisenberg 1989; Redford and Eisenberg 1992; Williams, Willig, and Reid 1995; Eisenberg and Redford 1999; Williams and Genoways 2007). The morphology of an additional dentary, belonging either to *Tonatia* or *Lophostoma*, supports the hypothesis of insectivory-omnivory in the Miocene species as well (Czaplewski et al. 2003). *Tonatia* species have very high maneuverability in their flight because they usually live in mature, multistratal evergreen forests, although they have been found in other moist, typically forested habitats (Eisenberg

1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999; Williams and Genoways 2007).

Remains of *Notonycteris magdalensis* and *N. sucharadeus* show dental specializations for carnivory that resemble *Vampyrum spectrum* and *Chrotopterus aurit*, which represent two of the three other extant taxa in the tribe Vampyrini (Savage 1951; Czaplewski, Morgan, and McLeod 1997; Czaplewski et al. 2003; Dávalos et al. 2014; Cirranello et al. 2016). However, it is important to note that neither Miocene species is as specialized for carnivory as the modern phyllostomines (Czaplewski et al. 2003). The postcranial remains greatly resemble *Vampyrum* (Savage 1951; Czaplewski, Morgan, and McLeod 1997). Both modern species reside in forested habitats, particularly multistratal evergreen forests, and are strongly associated with moist areas (Navarro and Wilson 1982; Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999; Williams and Genoways 2007). Similarly, an unnamed genus of phyllostomine bears resemblance to *Chrotopterus* but has lower crowned dentition, suggesting that it was less specialized for carnivory and rather was an insectivore-carnivore (Czaplewski, Morgan, and McLeod 1997; Kay and Madden 1997b).

Palynephyllum antimaster (Glossophaginae, Phyllostomidae) is ecologically unique among the bats of La Venta. This species was likely nectarivorous, based on shared dental characteristics with other glossophagines, all of which are nectarivorous, and with other nectarivorous phyllostomids (Czaplewski, Morgan, and McLeod 1997; Czaplewski et al. 2003; Griffiths and Gardner 2007). Unfortunately, only two teeth have been described for this species, which limits further phylogenetic or ecological study (Czaplewski, Morgan, and McLeod 1997; Czaplewski et al. 2003). Modern species of Glossophaginae utilize Neotropical habitats at various elevations, ranging from multistratal evergreen forests to dry deciduous forests, and occa-

sionally including non-forested habitats (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999; Griffiths and Gardner 2007).

Four species in four genera represent the molossids at La Venta (Czaplewski, Morgan, and McLeod 1997; Czaplewski et al. 2003). *Mormopterus colombiensis* and *Potamops mascahehenes* are both extinct species that closely resemble extant members of their respective genera. An unidentified *Eumops* species has also been identified. Extant members of all three genera today are aerial pursuit insectivores that typically hunt over forest canopy or open water (Czaplewski, Morgan, and McLeod 1997; Eger 2007). Little is known ecologically about the unidentified molossid. *Kiotomops lopezi* was previously identified as a molossid from this fauna (Takai et al. 1991), but further investigation revealed that it is actually a marsupial (Czaplewski et al. 2003).

Two members of the extant genus *Thyroptera*, *T. robusta* and *Thyroptera* cf. *T. tricolor*, have also been discovered in the Honda Group (Czaplewski, Morgan, and McLeod 1997; Czaplewski et al. 2003). Today, *Thyroptera tricolor* is an aerial pursuit insectivore found in disturbed forest areas, including edges, tree falls, and successional areas (Czaplewski, Morgan, and McLeod 1997).

2.9 Primates

Platyrrhines (New World monkeys) are represented in the La Venta fauna by as many as twelve known species in eleven genera across all three modern families, making this by far the most diverse platyrrhine fossil assemblage known to date (Fleagle 2013). In fact, the primate species richness of the Monkey Beds alone (five subfamilies, six genera, six species) is comparable to many modern Neotropical communities. The platyrrhine community of La Venta is also

comparable in ecological diversity to modern communities, despite the relatively recent divergence and radiation of the major lineages during the Middle Miocene (Wheeler 2009).

Pitheciids in the La Venta fauna include representatives of two of the three pitheciid subfamilies. *Miocallicebus* belongs to Callicebinae, for which the only modern genus is *Callicebus* (Takai et al. 2001; Fleagle 2013). Due to lack of material, not much is known about this species (Kay, Meldrum, and Takai 2013). The fragmentary dental material, however, is very similar to *Callicebus*, differing mainly in its much larger size; *Miocallicebus* weighed an estimated 1.5 kg as opposed to 0.75-1 kg for *Callicebus* (Takai et al. 2001; Fleagle 2013; Kay, Meldrum, and Takai 2013). Extant callicebines mainly eat fruit, although members of various species groups supplement their diet with insects or foliage (Fleagle 2013), suggesting a frugivorous or frugivorous-omnivorous diet for *Miocallicebus* on the basis of phylogeny and shared dental traits.

Pitheciines (Pitheciinae, Pitheciidae) include *Cebupithecia sarmientoi* and *Nuciruptor rubricae* (Stirton 1949; Stirton 1951; Stirton and Savage 1951; Hershkovitz 1970; Meldrum and Kay 1990; Meldrum and Kay 1997b; Fleagle 2013; Kay, Meldrum, and Takai 2013). *Cebupithecia* and *Nuciruptor* would have been relatively small, at roughly 1.6-1.8 kg and 2.0 kg, respectively (Meldrum and Kay 1997b; Fleagle 2013). Based on their dentition, it is very likely both were frugivore-granivores, with specializations for consuming hard seeds. Although *Cebupithecia* is more specialized, both *C. sarmientoi* and *N. rubricae* show dental specializations for sclerocarpy (the process of extracting and consuming embedded seeds, *sensu* (Kinzey and Norconk 1990; Kinzey 1992), particularly in their incisor and canine morphology (Fleagle et al. 1997, Meldrum and Kay 1997b, Kay et al. 2013, Croft 2016).

Cebupithecia is known from a remarkably complete (70%) skeleton as well as additional postcranial material (Stirton 1949; Stirton 1951; Stirton and Savage 1951; Setoguchi et al. 1988;

Meldrum, Fleagle, and Kay 1990; Meldrum and Kay 1990; Meldrum and Kay 1997a), which has allowed extensive analysis of its locomotory capabilities. Analysis of the postcranial skeleton suggests that *C. sarmientoi* mainly used above-branch quadrupedal running and was adept at leaping and vertical clinging, but lacked specializations for suspensory behaviors and climbing that more characterize modern pitheciines (Fleagle and Meldrum 1988; Meldrum and Fleagle 1988; Ford 1990; Meldrum and Lemelin 1991; Meldrum and Kay 1997a; Hartwig and Meldrum 2002; Youlatos and Meldrum 2011). Based on tail morphology that is clearly non-prehensile, but intermediate in morphology between modern prehensile and non-prehensile tails in platyrrhines, *C. sarmientoi* may have used its tail to brace or help support its weight while suspended by its hindlimbs (Organ and Lemelin 2011).

The true taxonomic affinity of the remains of *Aotus dindensis* (Aotinae, Cebidae) has remained a highly contentious issue since it was originally described nearly three decades ago (Setoguchi and Rosenberger 1987). In preserved features, including an enlarged orbit, it is nearly identical to the extant *Aotus*, suggesting overall similarity in ecological traits (Setoguchi and Rosenberger 1987; Wright 1996). While some authors maintain that this species is in fact congeneric with extant *Aotus* species (Gebo et al. 1990; Rosenberger, Setoguchi, and Hartwig 1991; Kinzey 1997; Pérez et al. 2000; Hartwig and Meldrum 2002; Takai et al. 2009; Tejedor 2013; Tejedor and Muñoz-Saba 2013; Rosenberger 2014; Delgado, Galbany, and Pérez-Pérez 2016), others maintain that the remains actually belong to *Mohanamico hershkovitzi* (Kay 1990; Meldrum, Fleagle, and Kay 1990; Meldrum and Kay 1997a; Meldrum and Kay 1997b; Fleagle, Kay, and Anthony 1997; Kay et al. 2004; Fleagle 2013); however, an emerging consensus seems to have arisen that *A. dindensis* and *M. hershkovitzi* are not in fact synonymous (Kay 2015). Even the phylogenetic affinities of the modern *Aotus* are disputed, with some analyses placing it basal

to the Callitrichinae (Schrager 2007; Perelman et al. 2011; Springer et al. 2012), and others placing it basal to the Cebinae (Kay 2015).

Modern *Aotus* species are nocturnal and are dietary generalists, feeding on fruit, nectar, insects, and leaves. The dental anatomy of *Aotus dindensis* also indicates an omnivorous diet (Fleagle, Kay, and Anthony 1997), and the large orbit of *Aotus* indicates that it was also nocturnal (Setoguchi and Rosenberger 1987; Fleagle, Kay, and Anthony 1997; Takai et al. 2009). The nocturnality of *Aotus* likely evolved in response to interference competition from similarly sized diurnal monkeys and to greater predation threats during the day (Wright 1996; Burnham et al. 2013). The adaptation to a nocturnal lifestyle appears to have occurred through mosaic evolution based on sexual dimorphism of the canines, which is normally associated with diurnal social behaviors (Takai et al. 2009). Among platyrrhines, modern *Aotus* species are habitat generalists as they will use all forested habitats from the interior regions to the edges (Wright 1989; Wright 1994; Wright 1996). The limited postcranial specimens of *A. dindensis* indicate that its locomotion was similar to modern species, but that it leapt with greater frequency (Gebo et al. 1990).

As mentioned above, *Mohanamico hershkovitzi* has enough characteristics in common with *Aotus dindensis* that some authors argued for the synonymy of these two species, possibly suggesting close phylogenetic affinities between the taxa (Kay 2015). In spite of this similarity, many different phylogenetic positions have been suggested for *M. hershkovitzi*, including pitheciin (Luchterhand, Kay, and Madden 1986; Kay 1990), callitrichine (Rosenberger, Setoguchi, and Shigehara 1990; Rosenberger et al. 2009; Smaers and Vinicius 2009; Tejedor 2013; Kiesling et al. 2015; Delgado, Galbany, and Pérez-Pérez 2016), stem cebid (Schrager et al. 2014), or indeterminate affinities (Meldrum and Kay 1997b; Kay, Johnson, and Meldrum 1998; Horowitz 1999;

Takai et al. 2001; Fleagle 2013). Its dentition suggests a frugivorous or frugivorous-folivorous diet (Fleagle, Kay, and Anthony 1997; Kay and Madden 1997b; Fleagle 2013).

Several different species, all from the La Venta fauna, have been assigned to Callitrichinae (Cebidae). *Micodon kiotensis* was described as a fossil marmoset (Setoguchi and Rosenberger 1985; Rosenberger, Setoguchi, and Shigehara 1990). However, both its validity as a species and its affinity with callitrichines have been questioned on the basis of the limited material, the poor condition of the type, the greater similarity of the dental characters with pitheciins than with callitrichines, and the fact that the identification as a marmoset was based almost entirely on its small size (Kay and Meldrum 1997; Fleagle, Kay, and Anthony 1997; Fleagle 2013). Because of the poor quality and limited nature of the material and its unclear taxonomic status, little is known about the paleoecology of *Micodon*.

Patasola magdalena (Kay and Meldrum 1997) and *Lagonomico conclucatus* (Kay 1994) are both described as early callitrichines. However, allocating either of these species to Callitrichinae would have different implications for the early history of the subfamily, raising doubts about whether one or both taxa belong to other subfamilies (Fleagle 2013). *Patasola* was tiny, with estimates of body mass averaging 450-480 g (Kay and Meldrum 1997; Cooke, Rosenberger, and Turvey 2011). The molar shearing quotients and anterior dental morphology suggest that, like modern marmosets and tamarins, *Patasola* may have consumed vegetable gum and/or fruit (Kay and Meldrum 1997; Fleagle, Kay, and Anthony 1997). Insects may also have been important in its diet (Kay and Madden 1997b; Cooke 2011). The same approach indicates a frugivorous diet with leaves and/or gum for *Lagonomico* (Fleagle, Kay, and Anthony 1997; Kay and Madden 1997b). Estimates for the body mass of *Lagonomico* range from 0.595-1.2 kg (Kay 1994; Fleagle 2013).

Neosaimiri fieldsi and *Laventiana (Neosaimiri) annectens* represent the cebines (Cebinae, Cebidae) in the La Venta fauna (Stirton 1951; Meldrum, Fleagle, and Kay 1990; Takai 1994). *N. fieldsi* so closely resembles the extant *Saimiri* that multiple authors have argued that they should be considered the same genus (Hershkovitz 1970; Szalay and Delson 1979; Hartwig, Rosenberger, and Setoguchi 1990; Rosenberger, Setoguchi, and Hartwig 1991). Its postcranial morphology indicates that, much like *Saimiri* but perhaps with slightly lower agility, *N. fieldsi* was a quadrupedal runner and leaper (Meldrum, Fleagle, and Kay 1990; Meldrum and Kay 1997a; Nakatsukasa, Takai, and Setoguchi 1997; Fleagle 2013). Dental morphology indicates that *N. fieldsi* was a frugivore or frugivore-insectivore (Rosenberger 1992; Fleagle, Kay, and Anthony 1997; Kay and Madden 1997b; Wheeler 2009; Cooke 2011; Fleagle 2013).

Laventiana annectens (Rosenberger, Setoguchi, and Hartwig 1991) is sufficiently closely related to *Saimiri* and *Neosaimiri* that some authors have argued for its synonymy with *Neosaimiri* (Fleagle, Kay, and Anthony 1997; Kay and Meldrum 1997; Kay and Madden 1997b), or even for its synonymy with *N. fieldsi* (Takai 1994; Takai, Setoguchi, and Shigehara 2003). Dental morphology indicates a frugivorous or frugivorous-insectivorous diet for *L. annectens* as well, similar to *N. fieldsi* and extant *Saimiri* spp. (Fleagle, Kay, and Anthony 1997; Kay and Madden 1997b; Cooke 2011). Postcranial remains are not yet known from this species.

The third family of extant platyrrhines, Atelidae, is represented by two species in one genus (Alouattinae): *Stirtonia tatacoensis* and *S. victoriae* (Stirton 1951; Hershkovitz 1970; Kay et al. 1987). As with *Neosaimiri*, *Stirtonia* is so similar to its closest living relative, *Alouatta*, that synonymization of the two genera has been proposed (Tejedor 2008). Modern *Alouatta* species are folivorous-frugivorous and use a range from dry to wet forest habitats (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999), and likely provide a good model for the

ecology of *Stirtonia* (Rosenberger 1992). Dental morphology indicates that the diet of *Stirtonia* was in fact similar to *Alouatta*, although perhaps higher in fruit than extant species (Fleagle, Kay, and Anthony 1997; Kay and Madden 1997b; Cooke 2011).

The primate fauna of La Venta is exceptional in its taxonomic and ecological diversity and in its modernity compared with Santacrucian primates (Fleagle 2013). Both the dietary diversity and the large number of sympatric genera (including at least five genera in the Monkey Beds) indicate humid (1750 mm of rain per year or more) tropical forests, based on modern primate ecology (Fleagle, Kay, and Anthony 1997). At least three species of pitheciines are known, which suggests evergreen forest conditions because no living pitheciines are found in other forest types (Kay and Madden 1997b).

2.10 South American Native Ungulates

The Cenozoic record of South America contains a remarkable diversity of endemic ungulates, all of which are now extinct. The origins of these ungulates have been the subject of longstanding debate and study. The monophyly of a clade including all of the endemic South American ungulates, otherwise known as “South American native ungulates” or SANUs, has been the subject of much controversy (McKenna 1975; McKenna 1980; McKenna and Bell 1997; Bergqvist 1996; Muizon and Cifelli 2000). Various studies have suggested that such a clade might contain Litopterna, Astrapotheria, Notoungulata, Pyrotheria, Xenungulata, Didolodontidae (South American “condylarths”), and possibly even Xenarthrans (Cifelli 1983b; Cifelli 1983a; Cifelli et al. 1993; Billet et al. 2015). The placement of this clade within Eutheria has been the subject of equal debate. Proposals with varying levels of support and confidence include affinities for some or all SANUs with Afrotheria (Asher, Novacek, and Geisler 2003;

Shockey and Daza 2004; Asher and Lehmann 2008; Agnolin and Chimento 2011; Billet and Muizon 2013; O’Leary et al. 2013), Mioclaenidae (McKenna 1956; Muizon and Cifelli 2000; Gelfo 2007; Gelfo et al. 2009; Gelfo and Lorente 2010), a clade formed from Perissodactyla and Cetartiodactyla (O’Leary et al. 2013), and condylarth clades basal to crown Eutheria (Inés Horovitz 2004), although some of these proposals have received heavy criticism regarding incorrect interpretations of potential synapomorphies (Gheerbrant et al. 2001; Williamson and Carr 2007; Billet and Martin 2011; Gelfo and Lorente 2012; Kramarz and Bond 2014). However, two independent studies use proteomic methods to sequence type 1 collagen amino acids from Late Pleistocene litopterns (*Macrauchenia*) and toxodonts (*Toxodon*) and provide strong evidence that at least these members of Notoungulata and Litopterna form a monophyletic clade that represents the sister to crown Perissodactyla (Buckley 2015; Welker et al. 2015).

2.10.1 *2.10.1 Ungulates: Litopterns*

Litopterns were native South American ungulates that persisted from the Paleocene through the Late Pleistocene (Scherer, Pitana, and Ribeiro 2009). The status of Litopterna as a clade is uncertain and studies have yet to conclusively establish or refute the monophyly of the clade (Cifelli 1983b; Cifelli 1983a; Cifelli et al. 1993; McKenna and Bell 1997; Bergqvist 2005; Billet 2010; Billet et al. 2015). Litopterns are represented in the La Venta Fauna by six species (*Prothoaterium colombianus*, *Villarroelia totoyoi*, *Prolicaphrium sanalfonensis*, *Proterotheriidae* gen. et sp. indet., *Megadolodus molariformis*, *Theosodon* sp. indet.) in two families (*Proterotheriidae* and *Macraucheniidae*) (McKenna 1956; Cifelli and Diaz 1989; Cifelli and Guerrero 1997; Cifelli and Villarroel 1997).

While Proterotheriidae has traditionally been viewed as being comprised of open-habitat dwellers, the history of the family as a whole supports a preference for forests among the majority of species (Bond et al. 2001). This is consistent with the morphology of the proterotheriid species present in the La Venta fauna. Based on dental morphology and wear patterns in modern ungulates with different diets (Janis 1988; Cifelli and Diaz 1989; Mendoza and Palmqvist 2006a; Hummel et al. 2011), the extremely brachydont, bunodont, and thickly enameled dentition of *Megadolodus molariformis* is consistent only with an omnivorous diet likely including fruits, especially hard fruits (Cifelli and Guerrero 1997). Similarly, La Venta litopterns *Prothoatherium colombianus*, *Prolicaprium sanalfonensis*, and the unidentified proterotheriid most likely had omnivorous, frugivorous, or browsing diets (Cifelli and Guerrero 1997).

All four species have lower hypsodonty indices than are found in any extant ungulates in open environments, regardless of their diets, which is strongly indicative that the proterotheriids of La Venta resided in closed habitats. Furthermore, on the basis of traditional morphometric analysis of both dental and postcranial characteristics, and subsequent quantitative (principle components analysis) and qualitative comparison with extant ungulates, *Megadolodus molariformis* was an ungulate similar to extant suoids (pigs and peccaries) that preferred closed, probably heavily forested, habitats (Cifelli and Villarroel 1997). *Villarroelia totoyoi* had more lophodont, somewhat higher crowned cheek teeth than the other Colombian proterotheriids. On the basis of dental and postcranial morphology, *V. totoyoi* most likely was a mixed feeder in closed habitats, but did not rely primarily on grass (Cifelli and Guerrero 1997).

The only macraucheniid from the La Venta fauna is an unidentified *Theosodon* species (Cifelli and Villarroel 1997). *Theosodon* is widely known, including localities in the early to middle Miocene of Argentina (Tobaceo las Bayas Member: Collón-Cura Formation, Aisol For-

mation, Pinturas Formation, Cerro Bandera Formation), the early Miocene of Chile (Pampa Castillo, Chucal Formation), the middle Miocene of Bolivia (Yecua Formation), and the middle Miocene of Peru (Fitzcarrald Arch), in addition to the La Venta fauna of Colombia as discussed above (Bown and Larriestra 1990; Bondesio et al. 1980; M. E. Soria 1983; Marshall and Semper 1991; Flynn, Novacek, et al. 2002; Flynn, Croft, et al. 2002; Croft, Flynn, and Wyss 2004; Croft 2007; Kramarz and Bond 2005; Kramarz, Forasiepi, and Bond 2011; Tejada-Lara et al. 2015). Biomechanical and geometric morphometric studies of Santacrucian *Theosodon* suggest that it was an intermediate sized (46-210 kg) browser in closed habitats with little ability for handling tough food (Croft 2000; Cassini and Vizcaíno 2012; Cassini et al. 2012; Cassini 2013).

2.10.2 *Ungulates: Notoungulates*

Another clade of SANUs, the notoungulates, is highly abundant in the Honda Group, although it is not particularly high in diversity here. Notoungulata is subdivided into two monophyletic suborders, Toxodonta and Typotheria, as well as the basal groups consisting of Henricosborniidae and a clade made of *Notostylops* and Pyrotheria (Cifelli et al. 1993; McKenna and Bell 1997; Billet 2010; Billet 2011). Toxodonta is further subdivided into the monophyletic families of Toxodontidae, Leontiniidae, and Homalodotheriidae, and the probably polyphyletic families Isotemnidae and Notohippidae (Billet 2011). Toxodonta is represented in the La Venta fauna by *Pericotoxodon platignathus* (Toxodontinae, Toxodontidae) (Madden 1990; Madden 1997; Nasif, Musalem, and Cerdeño 2000) and *Huilatherium pluriplicatum* of the “tropical clade” of Leontiniidae (Villarroel and Guerrero Díaz 1985; Villarroel and Colwell Danis 1997; Villarroel 1997; Shockey et al. 2012).

Typotheria is divided into a basal bush consisting of Oldfieldthomasiidae and Archaeopithecidae, Interatheriidae and a clade formed by the three families Mesotheriidae, Hegetotheriidae, and the polyphyletic Archaeohyracidae (Billet 2011). In the Honda Group, there may be as many as three species of typotheres in the genus *Miocochilius* (Interatheriidae), but only *M. anamopodis* has been named (Stirton 1953; Kay and Madden 1997b).

2.10.2.1 Toxodontia

Pericotoxodon has been interpreted as a grazer on the basis of their distally broadened rostrum, extremely high crowned incisors, hypselodont (ever-growing) cheek teeth, and both enamel microstructure and molar morphology that provides resistance to mechanical failure (Maas 1997; Madden 1997). Sexual dimorphism in the shape and size of *Pericotoxodon* tusks may indicate polygynous herding (Madden 1997).

Morphology within toxodont lineages is highly conserved, and so studies of other toxodont ecology may be informative with regard to the La Venta toxodonts as well. Other Miocene toxodonts have been interpreted as C_3 grazers on the basis of isotopic evidence (MacFadden, Cerling, and Prado 1996). However, stable isotopic evidence from Pleistocene toxodonts suggests that at least later species were capable of filling niches ranging from C_3 browsing in closed canopy rainforests to specialized C_4 grazing in open grasslands, as well as a variety of intermediate niches (MacFadden and Shockey 1997; MacFadden 2005). Morphological studies confirm that Miocene toxodonts were capable of consuming tough food such as grass or bark; however, biomechanical and morphometric evidence fail to support specialized herbivory in Santacrucian toxodonts and rather suggest generalized herbivory (Cassini et al. 2011; Cassini et al. 2012; Cassini, Flores, and Vizcaíno 2012; Cassini and Vizcaíno 2012; Cassini, Vizcaíno, and Bargo 2012;

Cassini 2013). Thus, Miocene toxodonts may also have had a range of diets depending on their location and habitats, and so the ecological niche filled by the La Ventan *Pericotoxodon* requires site-specific methods.

Little work has been done regarding the ecology of leontiniids. Kay and Madden (1997) classify *Huilatherium platignathus* as a browser based on its relatively low hypsodonty index, and they also suggest a semiaquatic lifestyle. Leontiniids reached their greatest diversity in the Deseadan SALMA (Middle Oligocene to Early Miocene) (Ribeiro, López, and Bond 2010; Shockey et al. 2012). Deseadan leontiniids, including *Colpodon* of the tropical clade to which *Huilatherium* belongs, have been interpreted as browsers on soft substrates (Ribeiro, López, and Bond 2010).

2.10.2.2 Typotheria

Miocochilius was a small, probably cursorial interatheriid with an average estimated biomass of 5.8 kg (Stirton 1953; Kay and Madden 1997b; Wilson et al. 2012). The dentition supports adaptation to the consumption of considerable abrasives, with ever-growing cheek teeth, enamel microstructure for resisting heavy wear, and thick external cementum encasing the cheek teeth (Stirton 1953; Kay and Madden 1997b; Maas 1997). On this basis, it has traditionally been interpreted as an open habitat grazer (Stirton 1953; Kay and Madden 1997b). Interestingly, *Miocochilius* was also characterized by an anteriorly narrowed rostrum with incisors forming a selective food-cropping mechanism (Stirton 1953; Kay and Madden 1997b). These dental features are often associated with more selective browsing than with grazing. The body size of interatheriids is also puzzling when combined with their dentition, because modern small ungulates are selective browsers and not grazers (Cassini et al. 2012). The feeding biomechanics of intera-

theriids, including the closely related *Protypotherium* (Cifelli et al. 1993; Hitz, Flynn, and Wyss 2006; Billet 2011; B. Vera 2016), do not fall within those observed for specialized grazers or browsers in modern ungulates, suggesting generalized herbivory (Cassini and Vizcaíno 2012).

The morphology of limbs indicates that *Miocochilius* was a more cursorial interatheriid than its earlier relatives (Croft and Anderson 2008). In comparison with semi-digitigrade to digitigrade Santacrucian interatheriids such as paraxonic *Protypotherium* and paraxonic-mesaxonic *Interatherium*, *Miocochilius* was paraxonic and subunguligrade, indicating more cursorial motion than earlier genera (Stirton 1953; Kay and Madden 1997b; Elissamburu 2007; Croft and Anderson 2008). The locomotion of *Miocochilius* may have been similar to but somewhat less cursorial than that of *Tayassu*, a modern peccary (Stirton 1953). *Tayassu* typically prefers rainforests, but may be found in a broad range of habitats (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999).

A number of studies have focused on the ecology of Interatheriidae from Argentina. Santacrucian interatheriids possess many characteristics that are typical today of ungulates that are specialized grazers in open habitats. In particular, like the La Ventan interatheriid *Miocochilius anamapodus*, Santacrucian interatheriids have extremely high hypsodonty indices (Kohn et al. 2004; Reguero, Candela, and Cassini 2010; Cassini, Vizcaíno, and Bargo 2012). However, interatheriids morphologically resemble rodents, lagomorphs, or hyraxes more than modern ungulates in their overall morphology (Cifelli 1985; Croft and Weinstein 2008; Cassini et al. 2011; Giannini and García-López 2013; Cassini 2013), and on the basis of morphofunctional analysis of limb structure, *Interatherium* was likely a digger and *Protypotherium* was likely an occasional digger (Elissamburu 2004). Cassini, Vizcaíno, and Bargo (2012) suggest that hypsodonty may have been an adaptation in response to the abrasive grit ingested as a result of digging behaviors

in Santacrucian interatheriids and hegetotheriids, particularly because the volcanic particles that made up the soil at the time were so abrasive (see also (Madden 2015). This hypothesis has also been proposed as an explanation for the similar puzzling morphology of another family within Typotheria, the Mesotheriidae; mesotheriids possess highly hypsodont teeth, a narrow rostrum, and postcranial adaptations associated with digging for food (Shockey, Croft, and Anaya 2007).

However, this hypothesis cannot rule out the possibility of grazing among interatheriids (Cassini, Vizcaíno, and Bargo 2012), especially considering that adaptations for digging in *Protypotherium* may be phylogenetic relics from more fossorial relatives (Croft and Anderson 2008). Based on mesowear, *Federicoanaya* from the Deseadan fauna of Salla, Bolivia, which is also closely related to *Miocochilius* (Billet 2011), had a mixed diet, consisting partly of browse and partly of abrasive low graze (Croft and Weinstein 2008). A key consideration in the use of morphological approaches is that, as for toxodonts, hypsodonty allows a broadening of possible niches for taxa, but does not necessarily imply that a given species or that all members of a species necessarily are associated with open habitats and/or grazing diets at all points in time (Feranec 2003; Ozaki et al. 2007; Damuth and Janis 2005; Damuth and Janis 2011), as demonstrated by hypsodont Santacrucian notoungulates such as *Protypotherium* with wear patterns indicative of browsing diets (Townsend and Croft 2008a).

2.10.3 2.10.3 Ungulates: Astrapotheres

Astrapotheria consisted of intermediate to very large herbivorous ungulates endemic to South America, and have been proposed as the sister group of Notoungulata (Van Valen 1988; Billet 2010). Astrapotheres were present in northern South America from the Late Oligocene to the late middle or middle late Miocene (Goillot et al. 2011), and are represented in the La Venta

fauna by the uruguaytheriine species *Xenastrapotherium kraglievichi*, *Granastrapotherium snorki*, and *Hilarchotherium castanedaai* (Simpson 1940; Johnson and Madden 1997; Jaramillo 2010; Vallejo-Pareja et al. 2015). Body mass estimates suggest that *Xenastrapotherium* was 1238.7 ± 233.3 kg (mean of estimates $\pm$ SE), comparable to the African black rhinoceros (*Diceros bicornis*, 700-1400 kg), or 1325 kg using only the most reliable lower tooth row estimate for body mass (Johnson and Madden 1997; Vallejo-Pareja et al. 2015). The estimated body mass of *Hilarchotherium castanedaai* was quite similar at 1303 kg (Vallejo-Pareja et al. 2015). In comparison, body mass estimates are much higher for *Granastrapotherium snorki*. Johnson and Madden (1997) found a wide range of body mass estimates, with an average of 1374.7 ± 243.0 kg and some estimates as high as 3000 kg, Vallejo-Pareja et al. (2015) estimate a body mass of 3142 kg, and Croft (2016) estimates an intermediate range of 1800-2500 kg.

Various authors have suggested that astrapotheres may have been semiaquatic on the basis of their simple teeth, body shape, and/or retracted nares (Scott 1937; Lavocat 1958; Kay and Madden 1997b; Avilla and Vizcaíno 2005; Flynn et al. 2012; Kay, Vizcaíno, and Bargo 2012). Their frequent occurrence with fluvial sediments and/or aquatic faunas has also led to speculation regarding semiaquatic habits, and at the very least their distribution throughout South America suggests that they preferred relatively wet areas and more humid climates (Marshall, Salinas, and Suarez 1990; Houssaye, Fernandez, and Billet 2016; Croft 2016). However, a histology study that attempted to test this hypothesis found inconclusive results (Houssaye, Fernandez, and Billet 2016); they suggest that astrapotheres may have been similar to the Indian rhino, which is graviportal and swims often and well (Cassini et al. 2012). Additional approaches need to be applied to resolve this question.

X. kraglievichi has wear patterns on their upper tusks that could not have been caused by occlusion with other teeth. Thus, these wear patterns are evidence of rubbing against external objects (Johnson and Madden 1997). Based on morphological comparison with tapirs and elephants in the structure of the mandible and the dentition (Johnson and Madden 1997; Goillot et al. 2011; Kramarz, Forasiepi, and Bond 2011; Milewski and Dierenfeld 2013), astrapotheres most likely had prehensile proboscides that were, in the case of *Granastrapotherium snorki*, at least as enlarged as those of modern tapirs (*Tapirus*). Furthermore, tusk wear patterns at the tips are strongly reminiscent of modern proboscideans that use their trunks and tusks in opposition to each other to aid with leaf and branch stripping, which would require the proboscis to be at least 1m in length (Johnson and Madden 1997). Interestingly, Kay and Madden (1997) observe that destructive behaviors such as branch and bark stripping among modern megaherbivores, particularly tusked species, are responsible for maintaining edge habitats and clearings in modern Africa. Five La Venta megaherbivores (*Pseudopreopotherium*, *Pericotoxodon*, *Granastrapotherium*, *Hilarchotherium*, and *Xenastropotherium*) had tusks, and at least the two astrapotheres engaged in similar destructive activities. Thus, they suggest that the megaherbivores may have maintained edge habitats in the La Venta ecosystem in an analogous fashion.

The Astrapotheriinae from the southern part of the continent are the closest known fossil relatives of the Uruguatheriinae (Cifelli et al. 1993; McKenna and Bell 1997; Vallejo-Pareja et al. 2015), and so their more extensively studied ecology might provide some insight into that of northern astrapotheres. The two subfamilies are sister clades that diverged after an Oligocene episode of evolutionary turnover that reversed a number of previous trends in astrapotheriid evolution, including reduction in the size and number of the premolars, occlusal simplification, enlarged body size, and acquisition of hypsodonty (Kramarz and Bond 2009). Although large size

in modern ungulates tends to correlate with bulk feeders and a poor quality grass diet, Santacrucian astrapotheres were most likely selective browsers in closed habitats based on both traditional (*sensu* (Mendoza, Janis, and Palmqvist 2002; Mendoza, Janis, and Palmqvist 2005; Mendoza, Janis, and Palmqvist 2006; Mendoza and Palmqvist 2006a; Mendoza and Palmqvist 2006b; Mendoza and Palmqvist 2008) and geometric morphometric comparison of the mandible and cranium with modern ungulates (Cassini, Vizcaíno, and Bargo 2012; Cassini et al. 2012; Cassini 2013), morphometric analysis of the postcranium (Cassini et al. 2012), biomechanical analysis of masticatory abilities (Cassini and Vizcaíno 2012), tooth enamel structure (Rensberger and Pfretzschner 1992), and tooth enamel microwear (Townsend and Croft 2005). This suggests that northern astrapotheres, which lived in a generally more humid and forested habitat, were likely forest-dwelling browsers as well.

3. Summary of the La Venta Ecosystem

Several groups of mammals from the Honda Group beg for further study. The rodent fauna has many intriguing potential ecological and phylogenetic connections with those from other faunas, but major systematic revision and ecological study using microwear, stable isotopes, and biomechanics will be needed to illuminate the exact nature of these connections. New morphofunctional approaches that have been developed for xenarthrans could be applied to the taxa of La Venta to confirm or refute hypotheses based upon their southern relatives. Similarly, ecological studies of the SANUs of La Venta, including litopterns, toxodonts, typotheres, and astrapotheres, are needed to test hypotheses based on related taxa and to confirm their ecological roles at this specific location.

Overall, the geology, limited paleobotanical evidence, and faunal composition of the Honda Group suggest that the La Venta ecosystem was a lowland meandering river system. Until 1.8 Ma, the region was hydrologically continuous with the rest of the Amazon river basin as a part of the vast Pebas mega-wetland. A wide variety of indicators suggest that the climate was rather humid. The general consensus is that the La Venta system most likely represents an environmental mosaic of riparian, open grassland or woodland habitats, and forest habitats, although there is still some discussion as to which habitats were dominant and which were more minor. It is also unclear whether there were closed canopy multistratal rainforests anywhere in the region, or whether the forests were exclusively more open.

Chapter 4: Paleotemperature and seasonality reconstructions from stable isotope analyses in the Middle Miocene Honda Group, Colombia

1. INTRODUCTION

Paleoclimate reconstructions contribute to our understanding of the response of climate to disturbances in tectonics, ocean circulation, greenhouse gases, ecological changes, and other drivers. Such reconstructions are also used in combination with ecological data to understand the response of biological communities to changes in climate. Finally, reconstructions may be combined with and compared to climate models to test the validity of these models. These applications take on greater urgency given current anthropogenic contributions to climate change.

For all of these applications to be of the greatest use, paleoclimate reconstructions must be available from a wide range of localities, time intervals, and latitudes. However, paleoclimate data are not evenly distributed. In particular, tropical data, especially on land, are notoriously difficult to obtain. This is likely due in part to a sampling bias, with Europe and North America as the most thoroughly studied regions and many tropical regions having received comparatively little attention, and in part due to the thick soil and vegetation covering many modern tropical regions that makes any underlying fossils inaccessible. Regardless of the causes, this leaves a large gap in our knowledge of latitudinal and regional climate patterns.

1.1 The Study Area

1.1.1 Geology

The Honda group consists of two formations in the La Venta area (Guerrero 1997). The lower of these is the La Victoria formation, which consists of poorly cemented variegated mud-

stone alternating with gray pebbly volcanic litharenites in fining-upward sequences (Royo y Gómez 1942; Royo y Gómez 1945; Stirton 1953; Fields 1959; Wellman 1970; Guerrero 1993; Guerrero 1997). The La Victoria overlies the Saldaña Formation in an angular unconformity and is capped by the clast-supported Cerbatana Conglomerate Beds (Guerrero 1997).

The Villavieja Formation conformably overlies the La Victoria Formation and makes up the majority of both the thickness and duration of the Honda Group. The Baraya Member is the lower part of the Villavieja Formation and consists mainly of gray mudstone and sandstone. This is also the most fossiliferous part of the formation. The Cerro Colorado Member, or upper member, consists mainly of red mudstone and sandstone in thick horizons and is less fossiliferous.

With the exception of the Cerbatana Conglomerate Beds and the multistory sandstones that cap the Villavieja, the units of the Honda Group represent meandering river channel sandstones and floodplain mudstone paleosols. These were deposited in a low relief floodplain close to sea level by a meandering river system (Royo y Gómez 1942; Royo y Gómez 1945; Stirton 1953; Fields 1959; Wellman 1970; Guerrero 1993; Guerrero 1997; Kay and Madden 1997b). Predominant overbank sediments indicate that periodic flooding of the surrounding ecosystem was likely (Guerrero 1997; Kay and Madden 1997b). In contrast, the Cerbatana Conglomerate Beds are the only beds the Honda Group that represent deposition by braided rivers (Guerrero 1997; Flynn, Guerrero, and Swisher III 1997). The dates for the La Victoria and Villavieja Formations most likely are 13.5-12.9 and 12.9-11.6 Ma, respectively (Guerrero 1997; Flynn, Guerrero, and Swisher III 1997).

1.1.2 Paleontology

The La Venta Fauna of the Honda Group in Colombia represents an opportunity to provide invaluable low latitude, low elevation climate data and fill in a piece of this information gap. The Honda Group represents an ideal locality in part because of the outstanding geological and paleontological work done there in a number of expeditions led by INGEOMINAS (now El Servicio Geológico Colombiano) and Duke University (Madden, Savage, and Fields 1997).

Faunal evidence of the paleoclimate and environment of the Honda group comes from fish (Lundberg, Machado-Allison, and Kay 1986; Lundberg 1997), sirenians (Domning 1997), decapods (Rodríguez 1997), snakes and apodans (Hecht and LaDuke 1997), lizards (Sullivan and Estes 1997), crocodiles (Langston 1965; Langston and Gasparini 1997), turtles (Rivero-Blanco and Dixon 1979; Wood 1997), birds (Rasmussen 1997), marsupials (Goin 1997; Dumont and Bown 1997), xenarthrans (Hirschfeld 1976; McDonald 1997; White 1997; Carlini et al. 1997; Edmund and Theodor 1997; Kay and Madden 1997b), rodents (Walton 1997), litopterns (Cifelli and Diaz 1989; Cifelli and Guerrero 1997; Cifelli and Villarroel 1997), notoungulates (Maas 1997; Madden 1997; Villarroel 1997; Villarroel and Colwell Danis 1997), astrapotheres (Johnson and Madden 1997), bats (Czaplewski, Morgan, and McLeod 1997; Czaplewski et al. 2003), and primates (Meldrum and Kay 1990; Kay 1994; Kay and Meldrum 1997; Meldrum and Kay 1997a; Fleagle, Kay, and Anthony 1997; Wheeler 2009). This evidence consists of morphological adaptations, knowledge of modern analogue species and/or closest living relatives, a number of still-extant species, and dental enamel microstructure. This evidence was used to summarize the modes of locomotion, diets, and habitat preferences of the members of the La Venta fauna.

Kay and Madden (1997a) conclude, based on this evidence, that the Honda group represents an extensive wet evergreen forest with some habitat heterogeneity and seasonal flooding.

They suggest that the forest was the dominant ecosystem while grasslands represented habitat margins, including the areas in or along rivers, in tree-falls and other disturbed forest areas, and in interspersed meadows. These marginal grasslands would have supported the abundant but low diversity grazing herbivore populations. Kay and Madden further suggest that megaherbivores, especially the four tusked species of megaherbivores known from La Venta, may have helped maintain edge habitats that supported the grazers in a fashion analogous with modern day African elephants and other tusked herbivores.

1.1.3 Uplift of the Colombian Andes

The uplift of the Northern, or Colombian, Andes is tectonically distinct from the uplift of the Central Andes. The deformations of the Western and Central Cordilleras of the Northern Andes are associated with a Late Cretaceous-Paleocene collision between South America and a volcanic arc. The Eastern Cordillera, in contrast, is related to the collision of South America with the Panama-Choco island arc. This collision is also associated with the closure of the Central American Seaway and the formation of the Isthmus of Panama that connected North and South America during the Pliocene.

Based on sedimentological evidence, a rain shadow may have existed in central South America by as early as 15 Ma and certainly by 10 Ma, leading to a relatively continuous semi-arid to arid climate in the Central Andes until about 4 Ma (Hartley 2003). However, paleobotanical data indicate that the Northern and Central Andes may have been at no more than half of their present height by 10 Ma (Gregory-Wodzicki 2000). Thus, climate data from the Miocene of Colombia could help put additional constraints on Northern Andean uplift. Temporal changes in the stable isotope proxies for precipitation $\delta^{18}\text{O}$ throughout the Middle Miocene La Venta

Fauna of Colombia (13.5-11.5 Ma) (Guerrero 1993; Guerrero 1997; Flynn, Guerrero, and Swisher III 1997; Madden et al. 1997) may be particularly useful in this respect since the formation of the Eastern Cordillera resulted in a change in river drainage directions from eastward to westward at approximately 12.0 Ma due to the uplift of the Eastern Cordillera (Kay and Madden 1997b). Thus, precipitation patterns may also have changed, either due to changes in atmospheric circulation patterns or to changes in relief that affected the extent of Rayleigh distillation. Either way, these precipitation changes would be detectable using $\delta^{18}\text{O}$ records from tooth enamel.

These reconstructions are consistent with the geology of the Honda Group. In the La Victoria formation, with the exception of the Cerbatana Conglomerate, the direction of paleocurrents was to the east-southeast. Similarly, in the Baraya Member of the Villavieja Formation, the direction of paleocurrents was dominantly to the east, although significant currents were detected from north-northwest to south-southeast (Wellman 1970; Guerrero 1997). In the upper Cerro Colorado Member, flow was dominantly towards the west. This has been interpreted as an indicator of the uplift of the Eastern Cordillera of the Colombian Andes into a continuous range that provided complete closure of the eastern side of the basin and consequently resulted in a reversal of flow direction by 11.8 Ma. Uplift may have begun as early as 12.9 Ma, corresponding to the base of the Villavieja Formation (Guerrero 1997).

The overlying Nieva Formation (10.1-8.4 Ma) consists of braided stream conglomerates with paleocurrents directed towards the north to northeast and clasts indicative of source rock in both the Central Cordillera to the west and the Eastern Cordillera to the east, consistent with continued uplift to the east (Guerrero 1997).

The geological evidence corresponds with evidence from the evolution of fish. Biogeography and divergence between endemic fish in the Magdalena River Valley and Amazonia indi-

cates that the Magdalena River has been hydrologically distinct since the uplift of the Eastern Cordillera began, with no instances of post-uplift dispersal (Lundberg 1997; Lundberg et al. 1998; Lundberg 2005; Lundberg et al. 2010).

However, all of these lines of evidence relate to the Andes as a hydrological barrier. In an otherwise low elevation, low relief landscape, the Eastern Cordillera need only have generated distinct relief in order to alter the direction of flow of the meandering rivers of the Honda Group. Consequently, the height of the northern Andes during these intervals is unclear and may have continued to be quite low relative to their modern height. Paleobotanical evidence indicates that the Eastern Cordillera had attained no more than half of its modern elevation by 10 Ma and experienced rapid uplift between 5-2 Ma to attain its current height (Gregory-Wodzicki 2000).

1.2 Miocene climate

The Miocene was a time of major global and regional environmental changes that affected the Neotropics, but the exact form and extent of these effects is currently unverified. These changes included the onset of growth of the East Antarctic Ice Sheet and the associated changes in climate and the concurrent uplift of the Andes in South America. These changes affected climate in a variety of ways, which in turn led to major changes in ecosystem structure.

Globally, the most dramatic features of Middle Miocene climate change are related to the onset of growth of the East Antarctic Ice Sheet. From approximately 16-14.8 Ma, the ice sheet was unstable in size. Then, from 14.8-12.9 Ma, major growth of the East Antarctic Ice Sheet began, which is associated with a major global cooling trend and sea level fall during the same interval (Flower and Kennett 1994; Zachos et al. 2001; Shevenell, Kennett, and Lea 2004; Zachos, Dickens, and Zeebe 2008). Furthermore, the latitudinal temperature gradient was strengthened,

which led to mid-latitudes with increased continental aridification and seasonality (Böhme 2003; Fox 2000; Micheels et al. 2007). These changes have been linked to the expansion of grasslands during the Miocene, as will be discussed further below.

Most studies to date have focused primarily on marine records or on mid-latitude terrestrial records of climate. In the Middle Miocene of Colombia, original assessments of the faunal composition suggested that the climate may have been seasonally dry and may have consisted largely of open savannas based on the abundant but relatively species-poor presumed grazers (Stirton 1953). However, using the ecological composition of the La Venta Fauna along with statistically significant modern correlations between ecological composition of nonvolant mammals and climate, rainfall has been estimated at 1500-2000 mm/year (Kay and Madden 1997a; Kay and Madden 1997b). The ecological traits included proportion of species in intermediate body size classes, the proportion of fruit-eating herbivores, and the number of arboreal species, as well as 15 other characteristics of faunal composition, which suggested that the area was higher in rainfall and less seasonal than presumed by earlier studies (Kay and Madden 1997a). They conclude that the high proportion of browsers relative to grazers and the occurrence of specific taxa whose closest relatives require at least 1500-2000 mm/year of precipitation indicate that this estimate is reasonable.

This approach yields useful and interesting results, but it also raises a number of concerns, as Kay and Madden acknowledge (1997a, 1997b). First, these interpretations depend on faunal proxies calibrated in modern South American faunas. These include correlations between rainfall and faunal composition or habitat preferences of nearest living relatives. Furthermore, many of the proxies used in this study depend on dietary reconstructions based largely on dietary preferences of closest living relatives. However, there are many reasons why such calibrations

may have changed since the Middle Miocene. These differences include differences in the constituent mammalian groups between Miocene and modern faunas, different floral composition that could alter available niches, differences in competition and predation, recent disturbances of community compositions by humans, and sampling bias, as well as other factors such as the global climate change and changes in habitat or dietary preferences within clades since the Miocene. Thus, independent lines of evidence for the habitat reconstructions provided by Kay and Madden's faunal analysis could greatly strengthen the interpretations.

1.3 Reconstruction of terrestrial paleoclimate from stable isotopes

The oxygen isotope ratio of precipitation is recorded, albeit with some modulation, in the isotopic composition of tooth enamel. Enamel hydroxyapatite incorporates phosphate and carbonate ions whose oxygen isotope composition is equilibrated with blood water. The oxygen isotope composition of blood water in turn is a function of water sources in an environment, animal behavioral ecology, and physiology (Luz, Kolodny, and Horowitz 1984; Kohn 1996; Green 2016). Both paleotemperatures and paleoprecipitation $\delta^{18}\text{O}$ can be estimated using appropriately selected samples of paired fish teeth and large mammals, coupled with judiciously constraining uncertainties pertaining to landscape hydrology and mammalian physiology. These approaches and their uncertainties are described below.

1.3.1 Landscape variability in $\delta^{18}\text{O}$ of water

The oxygen isotope composition of surface waters and plants can vary considerably across a given landscape.

The standard approach to reporting light stable isotope compositions considers the ratio of heavy to light isotopes (e.g., of oxygen and carbon) in a material relative to a standard using

the formula $\delta = \left(\frac{R_{sample}}{R_{standard}} - 1 \right) \times 1000\text{‰}$, where R is the ratio of the heavy to light isotopes (e.g., O^{18}/O^{16}) in the sample or standard material. The resulting δ notation is $\delta^{18}O$ for the oxygen isotope ratio, and lower values indicate relative depletion in ^{18}O whereas higher values indicate relative enrichment in ^{18}O .

Oxygen isotopes fractionate during physical and chemical processes because chemical bonds with lighter isotopes of oxygen (^{16}O) are slightly weaker than those with heavier isotopes (^{18}O) (Gat 1996; Koch 1998). This leads to a range of thermodynamic equilibrium and kinetically driven offsets in isotopic compositions among different materials. In the hydrologic cycle, condensation of water vapor proceeds as a distillation process in which H_2O containing the heavy isotopes of O (and H) preferentially condense and rain out first, leaving air masses progressively more depleted in $H_2^{18}O$ as they move from their sources and dehydrate. The $\delta^{18}O$ of air masses and precipitation decreases due to cooling during movement from equatorial to polar regions, from coasts to inland environments, and from low to high elevations. (Epstein and Mayeda 1953; Dansgaard 1964; Gat 1996).

Once on the surface, precipitation stored in reservoirs such as ponds, streams and lakes can undergo further isotopic modification. Evaporation leaves behind water sources that are enriched in ^{18}O , which can cause surface water to have significantly different oxygen isotope compositions from that of the local precipitation (Dansgaard 1964; Gat 1996; Fricke 2007). Seasonal temperature changes also affect precipitation by changing ocean-air interactions and by changing rainout patterns. Plant uptake of water from soil does not fractionate water isotopes; however, water in leaf tissue tends to be highly enriched in $\delta^{18}O$ because this is where significant evaporation occurs. Groundwater progresses without fractionation as long as evaporation does not oc-

cur; if evaporation does occur during transport and storage of groundwater, then $\delta^{18}\text{O}$ enrichment occurs. Infiltration of meteoric water or mixing with other water sources may also affect the isotopic composition of groundwater (Gat 1996).

1.3.2 Isotopes in Bioapatite

Bioapatite $[(\text{Ca}_5(\text{PO}_4, \text{CO}_3)_3(\text{OH}, \text{CO}_3)]$ crystals make up the ‘hard parts’ of vertebrates, including bones, tooth dentine and enamel (Koch 1998; Cerling and Harris 1999; Passey et al. 2005). The oxygen isotope composition of bioapatite oxyanions depends on the isotopic composition of the water from which the bioapatite precipitates and on the temperature of precipitation. Bioapatite precipitates from body water and at the internal body temperature of the vertebrate. It is generally accepted that precipitation of bioapatite in vertebrates occurs with isotopic equilibrium or near equilibrium.

In the case of fish, body temperature is the same as the ambient environmental temperature because they do not thermoregulate either through physiology or through behavior. As with other aquatic animals, fish do not fractionate water isotopically, and so the isotopic composition of their body water is the same as that of the water body in which they lived.

The fact that fish teeth precipitate from body water that so closely represents ambient $\delta^{18}\text{O}$ and temperature makes fish tooth $\delta^{18}\text{O}$ an ideal proxy for paleoclimatic interpretation. However, either surface water $\delta^{18}\text{O}$ or mean annual temperature must be constrained in order to use fish tooth $\delta^{18}\text{O}$ to calculate the other variable. Several methods are available for this purpose. Some studies simply assume an *a priori* value for one or the other variable based on paleogeographic variables and/or regressions based on modern systems (Dettman and Lohmann 2000) or by assuming that the spatial relationship between $\delta^{18}\text{O}$ of precipitation and MAT has

remained constant over time (Ferguson, Gregory, and Constantine 1999; Nordt, Atchley, and Dworkin 2003; Dworkin, Nordt, and Atchley 2005). Models may also be used to estimate one of the variables. However, in the present study, we use a combination of fish and mammal tooth enamel $\delta^{18}\text{O}$ to estimate both variables simultaneously. This approach is discussed below.

As with the oxygen isotope composition of fish tooth bioapatite, the $\delta^{18}\text{O}$ of mammalian tooth enamel depends on both the temperature of precipitation and the composition of the body water from which the bioapatite precipitates. However, there are major physiological differences between terrestrial mammals and fish which affect both of these variables.

First, mammals are endothermic. This means that they maintain an essentially constant body temperature that is similar between different species of mammals. As a result, the temperature at which the bioapatite precipitates is the body temperature of the mammal in question and has nothing to do with climate. This is the theoretical reason that mammal and fish tooth $\delta^{18}\text{O}$ may be used together to determine both MAT and $\delta^{18}\text{O}$ of local surface waters; fish tooth $\delta^{18}\text{O}$ depends on both variables while mammal tooth $\delta^{18}\text{O}$ depends on a known body temperature and on $\delta^{18}\text{O}$ of surface water.

The second major difference is that considerable differences exist in $\delta^{18}\text{O}$ between local surface waters and mammalian body water. This is due in part to the mixing of several non-trivial sources of oxygen. For terrestrial mammals, food water, drinking water, and atmospheric oxygen may all contribute to the isotopic composition of oxygen in body water in varying proportions. Atmospheric oxygen has a $\delta^{18}\text{O}$ value of 23.5‰ that has been relatively constant across both time and space, and so does not account for differences among populations (Sowers et al. 1991). However, food water may have highly variable compositions depending on the diets of the animals. This is particularly problematic for climate reconstruction because some parts of

plants, especially leaves, may be evaporatively enriched in ^{18}O relative to local surface water by up to 10‰. For water independent or evaporation sensitive mammals, a majority or even all of their ingested water comes from their food, and so these animals may have highly enriched body water relative to surface water. On the other hand, for water-dependent or evaporation insensitive mammals, the majority of ingested water typically comes from drinking water. Thus, ingested water for evaporation insensitive mammals most closely resembles the water in which associated fish would have lived. Therefore, when using a combination of fish and mammal tooth $\delta^{18}\text{O}$ to calculate paleotemperature, it is preferable to use evaporation insensitive species (Levin et al. 2006).

Finally, mammals fractionate oxygen isotopes in body water through metabolic processes. The net fractionation is the result of the fractionation that occurs during a large number of processes in both the intake and output of oxygen. Types of intake are discussed in the above paragraph. Output includes exhaled gases, oral and nasal evaporative water loss, excrement, and sweating/cutaneous water vapor loss. Each process for input or output involves its own fractionation factor, which varies depending on both behavioral and physiological variables. The net fractionation between surface water and body water may be estimated either through the use of physiological models (Kohn 1996; Green 2016) or through empirical regressions between body water and surface water. These regressions may be species specific (Hoppe 2006) or may use a broad range of species (Amiot et al. 2004).

A main difference between the approaches is that the sources of uncertainty are made more explicit in physiological models. For example, relative humidity has a large effect on the amount of evaporative water loss and, consequently, on the overall fractionation of $\delta^{18}\text{O}$ between surface and body water. In physiological models (Kohn 1996), this is made explicit in the de-

pendence of the fractionation factor on relative humidity; in contrast, this factor simply accounts for some of the scatter in the model in empirical approaches.

1.3.3 Paleothermometry from combined fish and mammal tooth enamel $\delta^{18}\text{O}$

Stable isotope analyses of mammalian, reptilian, and fish tooth enamel, fish scales, and authigenic carbonates can provide quantitative proxies for mean annual temperature and precipitation, as well as seasonality in both variables. The following assumptions allow the calculation of both temperature and $\delta^{18}\text{O}$ of surface water (Fricke and Wing 2004): 1) oxygen isotope fractionation between drinking water and the bioapatite in tooth enamel is known from body temperature and/or calibrations of fractionations using modern mammals, 2) mineralization of bioapatite in ectothermic animals that do not behaviorally thermoregulate (e.g., fish) or of soil carbonates occurs at ambient temperatures, and 3) mammal and fish enamel or pedogenic carbonates from the same site both form from surface waters of the same isotopic composition. This approach will be applied to estimate mean annual temperature and $\delta^{18}\text{O}$ of local waters. The strength of this approach is that changes in temperature and in $\delta^{18}\text{O}_{\text{water}}$ can be differentiated.

1.3.4 Serial sampling of large mammal teeth: a record of seasonality

The degree of seasonality of precipitation has remained one of the most intriguing outstanding questions with regards to the Honda Group. Seasonality of precipitation varies in South America today largely because of the migration of the Inter-Tropical Convergence Zone (ITCZ), which in turn traces the migration of the solar insolation maximum (Zhou and Lau 1998; Vera et al. 2006; Bookhagen and Strecker 2010; Vonhof and Kaandorp 2010). The migration of the ITCZ is far more complex over South America than it is over the oceans, partly because of the heterogeneity in the thermal response of the continent and partly because of the effect that the

Andes have on atmospheric circulation and rainfall (Garreaud, Vuille, and Clement 2003; Vuille et al. 2003a; Vuille et al. 2003b; Vera et al. 2006; Bookhagen and Strecker 2008; Bookhagen and Strecker 2010; Vonnhof and Kaandorp 2010). Both the thermal response of different regions of the continent and the effect of the Andes on circulation were almost certainly different in the Middle Miocene due to the much lower height of the Andes and the differences in geography and vegetation. Global Circulation Models may help in determining likely precipitation patterns over different regions, but because the estimated height of the Andes during any given interval has very large error bars and because of uncertainties in paleogeographic reconstructions, additional constraints will be required to yield reliable results. Proxy data on seasonality from multiple contemporaneous localities could provide important constraints for these models and an important test for existing models.

In the case of the Honda Group in particular, the proxy data has been interpreted thus far in contradictory ways. Early interpretations in particular suggested that the region was dominated by grassland and had a long seasonal deficit on the basis of both fish and mammal faunal compositions (Stirton 1953; Bondesio and Pascual 1977). In particular, the presence of lungfish (*Lepidosiren*) and of ungulates with high-crowned cheek teeth suggested a seasonal water deficit to these authors. The presence of pedogenic carbonate nodules in several horizons is also typically associated with seasonality in precipitation. In contrast, Kay and Madden (1997b) found broad faunal evidence (see previous section) for a forest mosaic with a seasonal water deficit of less than three months, if it existed at all.

One approach for testing the extent of seasonality is to use serial sampling of megaherbivore tooth enamel. Seasonality has been identified by micro-sampling tooth enamel (Fricke and O'Neil 1996) and proboscidean tusks (Koch, Fisher, and Dettman 1989; Fox 2000). This ap-

proach works because teeth grow incrementally, with the oldest enamel at the highest point in the crown of the tooth and the youngest enamel at the junction between the enamel and root. Thus, serial samples of the enamel taken perpendicular to the axis of tooth growth may reveal changes in the animal's environment over the period during which the tooth grew. Depending on the species, this may represent anywhere from a few weeks in small or brachydont (low-crowned) teeth to roughly a year in larger, hypsodont (high-crowned) teeth. If the duration represented is long enough and the sampling resolution is fine enough, then seasonal variations in $\delta^{18}\text{O}$ may be revealed in these serial samples.

$\delta^{18}\text{O}$ of continental precipitation can vary significantly over the course of a year in seasonal climates, due to changes in air temperature, degree of rainout, and evaporation of falling raindrops (Gat 1996). Potentially seasonal evaporation of water in runoff, lakes and ponds, and soils, as well as transpiration of water by plants, can result in enrichment of ^{18}O relative to ^{16}O (Gat 1996). Thus, variation in $\delta^{18}\text{O}$ can reflect seasonal fluctuations in temperature and/or quantity of precipitation. Intra-annual variations in $\delta^{18}\text{O}$ relate predominantly to temperature variations at mid- and high-latitudes, while they relate mainly to variations in amount of precipitation in the tropics. In environments with a relatively low degree of seasonal variation (e.g. 1-2‰, Fricke and O'Neil 1996) the amplitude of variation of $\delta^{18}\text{O}$ over the length of the tooth tends to be very small, whereas for highly seasonal regions, the amplitude may be much larger (e.g. 4-6‰, Fricke and O'Neil 1996). Thus, isotopic analysis of serial samples of mammal teeth could provide vital evidence on the duration and the degree of seasonality in the Honda Group.

The closest isotopic serial sampled data, in temporal and spatial terms, comes from two teeth from the Middle Miocene (~17-15 Ma) of Panama (MacFadden and Higgins 2004). These data indicate that Panama's climate had very little seasonal variation compared with the modern

climate. The climate of lowland Colombia during the Middle Miocene may have been similarly equable. However, since this was likely the southern extent of a very narrow peninsula (Kirby and MacFadden 2005), it is possible that climate patterns in Panama during the Middle Miocene were more equable than those of the somewhat more continental area that is now the Magdalena Valley. Also, the temporal difference is at least 1.5 Myr between the Gaillard Cut fauna of Panama and the Honda Group of Colombia (Guerrero 1993; Guerrero 1997; Flynn, Guerrero, and Swisher III 1997; MacFadden, Kirby, et al. 2010), during which the East Antarctic Ice Sheet underwent considerable growth and the Northern Andes experienced at least some uplift. Thus, there are multiple possible reasons that the two serially sampled teeth from Panama may not be representative of the conditions in the Honda Group of Colombia.

1.3.5 Diagenesis

Arguably the biggest concern in using the isotopic composition of fossil materials for paleoclimate reconstruction is that of diagenetic alteration. Diagenesis is the post-depositional modification of fossil materials. There are two main ways in which diagenetic alteration of fossil isotopic compositions typically occurs. The first is early diagenesis. This often occurs within hundreds or thousands of years of death and is often microbially facilitated. The second variety is thermal diagenesis, which typically occurs after burial to significant depth and subsequent interaction with hot groundwater. The latter type of diagenesis is typically abiological.

Sampling methodology is important in avoiding material that is likely to be altered. First, mechanically removing and/or cleaning the surface of teeth prior to collecting sample enamel helps to avoid any authigenic minerals deposited on the surface of the tooth. Removal of the uppermost 0.5 mm of enamel is recommended based on spatial analysis of alteration in mammalian

enamel (Schoeninger et al. 2003). Authigenic minerals may also precipitate in cracks in the tooth enamel, so it is important to avoid sampling from any areas with cracks or veins (Michel, Ildefonse, and Morin 1996; Kohn, Schoeninger, and Barker 1999; Schoeninger et al. 2003).

Enamel has a much higher resistance to diagenetic alteration than either bone or dentine. This resistance is due to its low porosity, high crystallinity and low organic content, and large crystallite sizes that result in a much lower surface area to volume ratio (Elliott 2002). Thus, use of a small drill bit and a microscope while sampling enamel to ensure that all samples are pure enamel without any dentine substantially improves the odds of obtaining primary isotopic information. Diagenesis has not often been found to be a major problem in studies restricted to tooth enamel, particularly in Miocene and younger samples (Ayliffe, Lister, and Chivas 1992; Quade et al. 1992; Morgan, Kingston, and Marino 1994; Bocherens et al. 1995; Bocherens et al. 1996; Bryant, Froelich, et al. 1996; Bryant, Koch, et al. 1996; Cerling et al. 1997; Koch 1998; Sponheimer and Lee-Thorp 1999; Feranec and MacFadden 2000; Zazzo et al. 2000; Fox and Fisher 2001; Kohn and Cerling 2002; Lee-Thorp and Sponheimer 2003; Zazzo, Lécuyer, and Mariotti 2004; Zazzo et al. 2004; Sponheimer et al. 2006; Roche et al. 2010; Fricke, Henceroth, and Horner 2011; Thomas et al. 2011).

However, even with careful sampling of enamel, other approaches are required in order to test for diagenetic alteration of isotopic compositions in fossils. One approach compares the phosphate and carbonate fractions of homogenized subsamples of dental enamel. The oxygen-phosphorus bonds in phosphate are stronger than the oxygen-carbon bonds in carbonate, and so phosphate is more resistant to diagenetic alteration (Kohn and Cerling 2002), at least in inorganic settings. The phosphate component may have higher susceptibility in microbially-mediated diagenesis (Zazzo, Lécuyer, and Mariotti 2004; Zazzo et al. 2004). Regardless, the resistance of

phosphate and carbonate to diagenesis in any setting is far from equal, and thus alteration is expected to alter the relationship between $\delta^{18}\text{O}$ in carbonate and phosphate fractions of enamel, as has been observed in diagenetically altered bioapatite (Iacumin et al. 1996). Original enamel apatite exhibits a high correlation of $\delta^{18}\text{O}$ in phosphate and carbonate with a slope statistically equal to one (Shemesh, Kolodny, and Luz 1988; Iacumin et al. 1996; Zazzo, Lécuyer, and Mariotti 2004; Martin et al. 2008).

The offset between carbonate and phosphate $\delta^{18}\text{O}$ is somewhat taxonomically dependent, and varies by several per mil among extant mammal species. The equilibrium offset may vary due to taxonomic differences in average body temperature, circadian variations in body temperature, the pH at which enamel bioapatite precipitates, and differences in timing of precipitation of phosphate and structural carbonate in the enamel (Martin et al. 2008). The equilibrium offset between carbonate and phosphate $\delta^{18}\text{O}$ is 6.7-7.0‰ at the average mammalian body temperature of 37°C (Shemesh, Kolodny, and Luz 1988; Zheng 1996). Empirical studies in modern and well preserved fossil enamel have reported offsets of 9.1-9.5‰ in sharks (Vennemann et al. 2001; Kim et al. 2014), 8‰ in camarasaur (Eagle et al. 2011; Fricke, Henechroth, and Hoerner 2011), 8.3‰ (Bryant, Koch, et al. 1996), 8.5‰ (Iacumin et al. 1996), 5.2‰ (Fox and Fisher 2001), 9.5‰ (Zazzo et al. 2004), and 7.2-10.6‰ with a mean of 8.9‰ (Martin et al. 2008) in mammals. While the offsets vary considerably, the slope is statistically equal to one and the correlation is high in each case. Consequently, as long as the offset is within a reasonable range, the better test for diagenesis is assessment of the slope and strength of the correlation between carbonate and phosphate $\delta^{18}\text{O}$ than the absolute value of the carbonate-phosphate $\delta^{18}\text{O}$ offset.

Another method for diagenetic screening is comparison between the isotopic composition of tooth enamel and associated authigenic minerals (Kohn and Cerling 2002). In terrestrial sed-

iments, the isotopic composition of associated pedogenic carbonate nodules provides insight into the composition of ancient groundwater. If fossil tooth enamel had been isotopically altered by this groundwater, then the composition of the tooth enamel should be similar to the pedogenic nodules in the case of complete or nearly complete overprinting. In the case of partial isotopic overprinting, the $\delta^{18}\text{O}$ of tooth enamel would present as a trend with one end near the composition of the authigenic minerals. This approach has been used repeatedly to screen for diagenetic alteration of fossil tooth enamel (e.g., Fricke, Henceroth, and Hoerner 2011; Kim et al. 2014).

Diagenesis also may result in the homogenization of isotopic compositions of tooth enamel among different species. Thus, major isotopic differences among ecologically different sympatric species provide evidence that primary isotopic information remains. These differences are much more pronounced in fossils that post-date the spread of C_4 grasslands, because both $\delta^{13}\text{C}$ (Ericson, Sullivan, and Boaz 1981; M. H. O’Leary 1988; Farquhar, Ehleringer, and Hubick 1989; Macfadden and Cerling 1996; Koch 1998; Macfadden et al. 1999; MacFadden, Solounias, and Cerling 1999; Feranec and MacFadden 2000; Drucker et al. 2001) and $\delta^{18}\text{O}$ (Bocherens et al. 1996; Kohn 1996) vary by many per mil between C_3 and C_4 plants.

2. MATERIALS AND METHODS

All enamel samples were drilled under a microscope using Dremel diamond-tipped drill bits 1-2 mm in diameter. “Bulk” or time-averaged samples represent the entire duration of tooth formation in a single sample. For large herbivores, tooth enamel was drilled in a single strip from the cementum-enamel interface at the base of the tooth to the crown of the tooth. For smaller mammals, multiple tracks were required. Where possible, bulk samples for both phosphate and carbonate analysis were collected simultaneously and homogenized before dividing

them into separate aliquots for analysis. Serial samples were collected in numerous parallel tracks perpendicular to the vertical axis of the tooth. Samples of 3-5 mg of enamel powder were weighed into microcentrifuge tubes for carbonate analysis, whereas samples of 0.7-1.5 mg were weighed out for phosphate analysis.

All chemical reagents for this study were of ACS grade or higher. Solutions were made using deionized water (DI, 18.0 M Ω). For phosphate analysis, enamel samples were processed following the methodology outlined in Mine et al. (2016, see also Wenzel, Lécuyer, and Joachimski 2000; Dettman et al. 2001; Colman 2002; Wiedemann-Bidlack, Colman, and Fogel 2008; Mine 2015). Enamel was initially dissolved for 24 hours in 100 μ l 2M HNO₃ while on a shaker table. Samples were periodically resuspended to ensure complete dissolution. After 24 hours, 100 μ l 2M HF and 100 μ l 7.25M NH₄OH were added in order to precipitate CaF₂. After waiting for at least 20 minutes to ensure complete precipitation of CaF₂, the samples were pelleted for 5 minutes using a microcentrifuge. The supernatant was removed using glass pipets and transferred to new microcentrifuge tubes, and the residual pellets were rinsed twice with 50 μ l DI to ensure the complete transfer of dissolved bioapatite.

Phosphate was isolated from the dissolved bioapatite solution as Ag₃PO₄ using slow precipitation methodology (Colman 2002; Wiedemann-Bidlack, Colman, and Fogel 2008; Mine 2015; Mine et al. 2017). Precipitation occurred in polypropylene transfer pipet bulbs with the stems cut off. Solutions for the microprecipitations consisted of the sample solution (including the rinsed volumes), 0.75 mL Ag-Ammine solution (0.067M AgNO₃, 0.74M NH₄OH, and 0.35M NH₄NO₃), and 1.25 mL 1.25M NH₄NO₃. A pH of $\sim$ 10 was obtained by adding a 1:1 dilution of concentrated reagent NH₄OH with water dropwise to the precipitation solution. NH₄OH solutions were made fresh each day; Ag-ammine solutions were stored in opaque bottles. After thor-

oroughly mixing the precipitation solutions in the pipet bulbs with a pipet, the bulbs were heated at 50°C for 12-15 hours, or as needed to reduce the solution volume to 200-300 μl with a target of 250 μl . The precipitations resulted in gemmy, translucent, medium to dark yellow crystals.

The crystals were photographed and described following the precipitation. They were then rinsed 5 times in 2.0-2.5 mL DI to remove the residual nitrate and silver solution. The crystals were then dried in an oven at 50°C overnight. Once dry, Ag_3PO_4 crystals were weighed out into 250-500 μg aliquots in silver capsules for analysis. A fine camel hair brush and stainless steel microspatula were used in the weighing process to ensure that all crystals were removed from the pipet bulb and to gently break up any crystals or crystal agglomerations that weighed more than 500 μg . All crystals were analyzed for each precipitation.

To determine $\delta^{18}\text{O}_{\text{PO}_4}$ values, a Thermo Chemolysis Elemental Analyzer (TCEA) was used to achieve high temperature reduction of Ag_3PO_4 to CO (Kornexl et al. 1999; Vennemann et al. 2002) at 1450°C. The carrier gas then transported the sample CO through a Conflo IV open split to a Thermo Finnigan Delta V Plus mass spectrometer. Sample $\delta^{18}\text{O}$ was determined by comparison with the isotopic composition of house standards of silver phosphate that have been calibrated against YR-1, YR-2, YR-3, TU, Ambo Ele, ID Std, and Loth Hippo standards. These standards, in turn, have reported isotopic compositions determined by fluorination (Vennemann et al. 2002). A suite of two to three standards, each run in triplicate to quintuplicate, began and ended each run of analyses. After every ten samples, an additional set of triplicate standards was analyzed in order to track any drift in the measurements over time. Standard masses spanned the full range of those of the samples in order to detect any linearity effects.

For carbonate analysis, enamel samples were pretreated by soaking the powder in 150 μL buffered acetate solution ($\text{pH}\approx 4.5$) for 4 hours (Koch, Tuross, and Fogel 1997; Garvie-Lok, Var-

ney, and Katzenberg 2004). During this time, samples were placed on a shaker table and were further agitated manually every 1-2 hours. After 4 hours, samples were centrifuged for 3 minutes and supernatant was removed. Samples were then rinsed with ~2 ml of DI, agitated to resuspend the enamel, and centrifuged for 3 minutes to pellet the enamel; this rinsing process was completed 5 times. Enamel samples were then suspended in 100 μ l DI, transferred by pipet to 0.6 mL microcentrifuge tubes, pelleted in a centrifuge for 3 minutes, and dried down overnight in an oven at 50°C.

The dry pellets were then crushed with a stainless steel microspatula and weighed into Exetainer tubes for analysis. Samples below 2 mg were weighed into half sized Exetainer tubes to increase peak heights and thus improve the accuracy of measurements for small samples. Analyses were completed on a Delta V Plus outfitted with a GasBench II. Tubes were initially flushed with He for 5 minutes. 200 μ l 105% H₃PO₄ was injected into each sample after flushing completed. Acid digestion proceeded at °C for 36 hours. LSVEC, NBS-18, and NBS-19 standards were used for calibration of isotopic measurements. Unless otherwise stated, all isotopic measurements for $\delta^{13}\text{C}$ are reported relative to PDB and $\delta^{18}\text{O}$ measurements are reported relative to SMOW.

3. RESULTS AND DISCUSSION

3.1 Fossil enamel and pedogenic carbonate stable isotope compositions

The $\delta^{13}\text{C}_{\text{CO}_3}$, $\delta^{18}\text{O}_{\text{CO}_3}$, and $\delta^{18}\text{O}_{\text{PO}_4}$ measurements for bulk enamel composition are reported in Table 4.1 and those for serial samples of enamel are reported in Table 4.2. Measured $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ values of associated pedogenic carbonates are presented in Table 4.3. The carbonate data are presented graphically in Figure 4.1.

3.2 Evaluating the impact of diagenetic alteration

Before environmental and ecological interpretations of the data are possible, diagenetic overprinting must be ruled out. No single method can unequivocally demonstrate that primary isotopic information remains, but a combination of multiple methods may strengthen confidence in the fidelity of the isotopic record.

The first line of evidence supporting the isotopic fidelity of these fossils derives from comparison with concurrent authigenic carbonate. Because authigenic carbonates formed from the groundwater that would have diagenetically altered the isotopic composition of the fossils, altered tooth enamel carbonate would either a) overlap in isotopic composition with the pedogenic carbonates, or b) show a trend pointing towards the isotopic composition of the pedogenic carbonates, representing a mixing line between the pristine and completely altered end member compositions. However, there is no overlap between the pedogenic carbonates and the tooth enamel, nor is there a trend in the enamel towards the composition of the pedogenic carbonates (Figure 4.1). The absence of either of these patterns strongly suggests that primary isotopic compositions remain intact in these fossils.

We can pursue this with greater statistical rigor using a depth based multivariate Wilcoxon rank sum test, comparing the carbon and oxygen isotopic composition of all fossil enamel with that of pedogenic carbonate nodules. The Wilcoxon rank sum test was used because it is a nonparametric statistical analysis, meaning that it does not assume a normal distribution for the data. Rather than using multiple comparisons, a multivariate analysis is preferable, and the depth based multivariate Wilcoxon rank sum test has been shown to be finite-sample unbiased and distribution free (Jurečková and Kalina 2012).

Using this test, the difference between the enamel and pedogenic carbonate $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ is statistically significant ($p=5.375 \times 10^{-6}$, $W=577$, $n_{\text{pedogenic}}=12$, $n_{\text{enamel}}=52$). See Tables 4.4 and 4.5 for descriptive and comparative statistics, respectively. Alternatively, using separate univariate Mann-Whitney-Wilcoxon tests for $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ with a Bonferroni Correction for Multiple Comparisons yields similar results (Table 4.5).

Table 4.1: Stable isotope compositions of bulk (time-averaged) tooth enamel samples.

ID Number	Taxon	$\delta^{13}\text{C}$ (CO_3)	$\delta^{18}\text{O}$ (CO_3)	$\delta^{18}\text{O}$ (PO_4)
STRI 9075	"big mammal"	-11.85	27.80	21.07
STRI 9079	"mammal"	-12.35	27.47	21.14
STRI 9111	?Astrapothere	-12.35	24.63	17.16
STRI 8582	Astrapothere			22.61
STRI 8577	Astrapothere			23.64
STRI 8576	Astrapothere			19.57
STRI 8583	Astrapothere			18.25
STRI 9089	Astrapothere			21.38
STRI 9052	Astrapothere	-11.39	27.68	21.06
STRI 9111	Astrapothere	-11.65	24.60	17.54
STRI 9048	Astrapothere	-11.55	28.51	21.87
STRI 8661	Colossoma			17.56
STRI 9132-B	Colossoma			17.45
STRI 9150-E	Colossoma			17.14
STRI 9097-A	Colossoma			17.34
STRI 9132-C	Colossoma			16.04
STRI 9134-A	Colossoma			20.55
STRI 9150-A	Colossoma			18.34
STRI 9150-D	Colossoma			19.81
STRI 9097-B	Colossoma			18.66
STRI 9132-A	Colossoma			18.13
STRI 9134-B	Colossoma			15.93
STRI 9150-B	Colossoma			16.96
STRI 9150-C	Colossoma			19.13
STRI 8861	Colossoma			17.03
STRI 9095	Colossoma			16.98

Table 4.1: Stable isotope composition of bulk (time-averaged) samples, cont.

STRI 8861	?Colossoma			17.01
STRI 9097	Cynodontid			19.14
STRI 9099-B	Cynodontid			17.24
STRI 8579	?Huilatherium	-11.31	27.70	20.90
STRI 8656	Huilatherium	-9.75	28.66	21.42
STRI 9083	Huilatherium			21.80
STRI 8568	Huilatherium	-11.15	29.23	22.01
STRI 9109	Huilatherium	-11.10	25.89	20.18
STRI 9083	Huilatherium	-10.29	29.31	
STRI 9116	Huilatherium			20.18
STRI 9116	Huilatherium	-10.59	27.55	19.79
STRI 9116	Huilatherium			19.42
STRI 9116	Huilatherium			19.87
STRI 8657	Lung Fish			17.78
STRI 8658	Lung Fish			17.51
STRI 8659	Lung Fish			17.45
STRI 8660	Lung Fish			16.83
STRI 9107	?Marsupial	-16.72	24.44	
STRI 8563	Miocochilius	-10.39	26.80	
STRI 9106	Rodent	-8.57	32.57	24.95
STRI 9095	Rodent	-9.87	34.79	24.33
STRI 9104	Rodent	-11.18	30.22	21.21
STRI 9058	Rodent	-11.45	23.44	
STRI 9058	Rodent	-11.82	23.28	
STRI 9095	Rodent	-10.23	30.33	
STRI 9104	Rodent	-10.94	27.06	
STRI 9106	Rodent	-9.21	31.69	
STRI 8543	Rodent	-11.90	26.32	
STRI 8543	Rodent	-12.03	26.36	
STRI 8540	Rodent	-10.98	25.73	
STRI 9105	Rodent	-10.92	27.91	
STRI 9105	Rodent	-10.52	26.97	
STRI 9105	Rodent			20.52
STRI 9113	Toxodont			19.59
STRI 9114	Toxodont			20.01
STRI 8567	Toxodont	-13.71	27.41	18.91
STRI 8573	Toxodont	-10.19	27.14	19.86
STRI 8586	Toxodont	-12.09	28.19	19.32

Table 4.1: Stable isotope composition of bulk (time-averaged) samples, cont.

STRI 9059	Toxodont	-12.65	25.54	18.82
STRI 9077	Toxodont	-11.66	25.38	18.15
STRI 9114	Toxodont	-10.37	27.43	20.13
STRI 9115	Toxodont	-10.16	26.57	19.47
STRI 9103	Toxodont	-11.07	27.76	20.17
STRI 8572	Toxodont			20.02
STRI 9146	Toxodont	-11.93	27.49	
STRI 8580	Toxodont	-12.13	27.10	19.80
STRI 8572	Toxodont	-11.87	28.61	
STRI 9143	Toxodont	-11.89	26.37	
STRI 9146	Toxodont	-11.93	27.49	
STRI 8561	Toxodont	-11.59	27.40	
STRI 8583	Toxodont	-11.72	27.23	20.66
STRI 9126	Toxodont	-11.30	26.46	19.85
STRI 9128	Toxodont	-10.78	27.39	
STRI 9136	Toxodont	-10.70	29.43	
STRI 9137	Toxodont	-11.25	27.73	
STRI 9144	Toxodont	-10.97	27.98	
STRI 9145	Toxodont	-12.60	25.76	
STRI 9076	Toxodont	-12.64	26.30	19.07
STRI 9092	Toxodont			19.95

Table 4.2: Stable isotope compositions of serial samples of tooth enamel.

ID Number	Taxon	Position	$\delta^{13}\text{C}$ (CO ₃)	$\delta^{18}\text{O}$ (CO ₃)	$\delta^{18}\text{O}$ (PO ₄)
STRI 9089	Astrapothere	2	-10.94	28.76	
STRI 9089	Astrapothere	3	-10.99	28.16	
STRI 9089	Astrapothere	4	-11.04	28.47	
STRI 9089	Astrapothere	5	-11.20	28.67	
STRI 9089	Astrapothere	6	-11.07	27.81	
STRI 9089	Astrapothere	9	-11.42	27.86	
STRI 9089	Astrapothere	10	-11.27	27.42	
STRI 9111	Astrapothere	1	-12.50	24.82	
STRI 9111	Astrapothere	2	-12.47	24.47	
STRI 9111	Astrapothere	4	-12.31	24.27	
STRI 9111	Astrapothere	5	-11.98	24.09	
STRI 9111	Astrapothere	6	-12.01	24.68	
STRI 9111	Astrapothere	7	-12.34	24.48	
STRI 9111	Astrapothere	9	-12.63	24.45	
STRI 9111	Astrapothere	10	-12.45	24.27	
STRI 9111	Astrapothere	11	-12.51	24.25	
STRI 9111	Astrapothere	13	-12.12	24.16	
STRI 9111	Astrapothere	14	-12.34	24.18	
STRI 9111	Astrapothere	15	-12.45	24.09	
STRI 9111	Astrapothere	16	-12.30	24.54	
STRI 9111	Astrapothere	17	-12.42	25.09	
STRI 9111	Astrapothere	18	-12.39	25.46	
STRI 9111	Astrapothere	19	-12.26	25.37	
STRI 9111	Astrapothere	20	-12.33	25.18	
STRI 9111	Astrapothere	21	-11.93	25.35	
STRI 9111	Astrapothere	25	-11.94	24.70	
STRI 9111	Astrapothere	26	-12.06	25.48	
STRI 9109	Huilatherium	1	-11.05	28.17	
STRI 9109	Huilatherium	2	-11.15	28.25	
STRI 9109	Huilatherium	3	-11.12	28.27	
STRI 9109	Huilatherium	4	-11.00	28.94	
STRI 9109	Huilatherium	5	-11.31	28.12	
STRI 9109	Huilatherium	6	-11.13	28.63	
STRI 9109	Huilatherium	7	-11.29	28.35	
STRI 9109	Huilatherium	7	-11.29	28.35	
STRI 9109	Huilatherium	8	-11.18	27.66	
STRI 9109	Huilatherium	9	-11.22	27.94	
STRI 9109	Huilatherium	10	-11.12	27.54	
STRI 9109	Huilatherium	11	-11.31	27.68	

Table 4.2: Stable isotope compositions of serial samples of tooth enamel, cont.

STRI 9109	Huilatherium	12	-11.10	27.99	
STRI 9109	Huilatherium	13	-11.01	28.35	
STRI 9109	Huilatherium	14	-10.93	28.33	
STRI 9109	Huilatherium	15	-10.96	29.15	
STRI 9109	Huilatherium	16	-10.88	29.50	
STRI 9116	Huilatherium	1	-11.13	28.17	
STRI 9116	Huilatherium	2	-10.96	28.51	
STRI 9116	Huilatherium	3	-11.30	28.80	
STRI 9116	Huilatherium	4	-11.43	28.29	
STRI 9116	Huilatherium	4	-11.11	28.42	
STRI 9116	Huilatherium	4	-11.24	28.36	
STRI 9116	Huilatherium	5	-11.38	28.56	
STRI 9116	Huilatherium	6	-11.47	28.51	
STRI 9116	Huilatherium	6	-11.29	28.56	
STRI 9116	Huilatherium	6	-11.30	28.44	
STRI 9116	Huilatherium	7	-11.26	28.43	
STRI 9116	Huilatherium	7	-11.26	28.36	
STRI 9116	Huilatherium	7	-11.29	28.43	
STRI 9116	Huilatherium	8	-11.43	28.12	
STRI 9116	Huilatherium	9	-11.16	28.21	
STRI 9116	Huilatherium	10	-10.81	28.15	
STRI 9116	Huilatherium	11	-11.17	28.60	
STRI 9116	Huilatherium	12	-11.20	28.38	
STRI 9116	Huilatherium	13	-10.83	28.30	
STRI 9116	Huilatherium	14	-11.02	27.96	
STRI 9116	Huilatherium	16	-11.47	28.30	
STRI 9116	Huilatherium	1	-11.02	25.13	19.91
STRI 9116	Huilatherium	2			20.45
STRI 9116	Huilatherium	3	-11.17	27.43	20.54
STRI 9116	Huilatherium	4	-10.80	27.14	20.34
STRI 9116	Huilatherium	5	-10.55	26.83	20.57
STRI 9116	Huilatherium	6	-10.95	28.05	20.27
STRI 9116	Huilatherium	7			20.19
STRI 8580	Toxodont	2	-12.69	27.81	
STRI 8580	Toxodont	2	-12.66	28.32	
STRI 8580	Toxodont	3	-12.78	27.66	
STRI 8580	Toxodont	4	-12.48	27.89	
STRI 8580	Toxodont	5	-12.71	27.45	
STRI 8580	Toxodont	6	-12.71	27.29	
STRI 8580	Toxodont	7	-12.62	27.28	

Table 4.2: Stable isotope compositions of serial samples of tooth enamel, cont.

STRI 8580	Toxodont	8	-12.90	27.28
STRI 8580	Toxodont	9	-12.91	26.72
STRI 8580	Toxodont	10	-12.61	27.00
STRI 8580	Toxodont	11	-12.83	27.10
STRI 8580	Toxodont	13	-12.94	26.70
STRI 8580	Toxodont	14	-13.02	27.54
STRI 8580	Toxodont	15	-13.08	27.38
STRI 8580	Toxodont	17	-13.12	27.96
STRI 8580	Toxodont	23	-12.16	24.52
STRI 9143	Toxodont	5	-11.20	27.09
STRI 9143	Toxodont	7	-11.19	27.45
STRI 9143	Toxodont	9	-11.48	27.57
STRI 9143	Toxodont	10	-11.64	26.99
STRI 9143	Toxodont	12	-12.02	26.43
STRI 9143	Toxodont	13	-12.32	26.15
STRI 9143	Toxodont	14	-12.44	25.98
STRI 9143	Toxodont	15	-12.67	26.34
STRI 9143	Toxodont	16	-12.63	26.18
STRI 9143	Toxodont	19	-13.03	26.43

Table 4.3: Stable isotope compositions of pedogenic carbonates. The first number in “ID Number” indicates the nodule that was sampled and the second number refers to the position. All nodules were listed under STRI 9155.

ID Number	$\delta^{13}\text{C} (\text{CO}_3)$	$\delta^{18}\text{O} (\text{CO}_3)$
1_1	-9.97	22.22
1_2	-9.76	21.71
1_3	-9.93	21.99
2_1	-9.22	22.19
2_2	-9.27	21.61
2_3	-9.35	21.63
3_1	-9.42	22.05
3_2	-9.25	21.79
3_3	-9.26	22.01
4_1	-9.59	21.90
4_2	-9.53	21.66
4_3	-9.30	22.09

A second approach for screening for diagenesis is to compare the $\delta^{18}\text{O}$ of the carbonate and phosphate fractions of the same enamel. Time-averaged, or bulk, samples of dental enamel show a strong correlation in the modern record with a slope of essentially 1. Figure 4.2 shows that in the material from this study, the phosphate and carbonate are significantly correlated ($r^2=0.728$, $p=1.393 \times 10^{-10}$, $n=33$) with a slope statistically equal to 1 (1.033, Standard Error = 0.1134). The average carbonate-phosphate offset is 7.42‰, which lies within the standard range observed in modern mammals of $8 \pm 2\%$ (Iacumin et al. 1996; Vennemann et al. 2001; C. Martin et al. 2008; Fricke, Henechroth, and Hoerner 2011; Kim et al. 2014). The figure also shows that the trend in the current data compares well with those of other modern and fossil samples including both mammals and sharks. Unless both phosphate and carbonate oxygen, which have differing susceptibilities to diagenesis, were both altered completely at the same point in time in each fossil, this relationship should be altered.

Finally, differences in isotopic compositions among different taxonomic groups provide evidence that primary isotopic information has been preserved. Qualitatively, there are major differences between the isotopic compositions of the large mammals (toxodonts, astrapotheres, and *Huilatherium*) and those of the rodents. Furthermore, the rodents are far more variable than the large mammals, which is consistent with the idea that some of the rodents may have been much more evaporation sensitive than the large mammals. Evaporation sensitive (ES) mammals have higher $\delta^{18}\text{O}$ of body water than evaporation insensitive (EI) mammals, with the most pronounced ES-EI differences occurring in arid times or regions (Levin et al. 2006). That these ecologically significant differences are still evident in the data indicates that primary isotopic information is preserved.

Table 4.4: Descriptive statistics for tooth enamel and pedogenic carbonate $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ compositions. Only data from carbonate fractions were included. Abbreviations are as follows: Standard deviation: St. Dev., Minimum: Min., Maximum: Max.

	<i>n</i>	Median $\delta^{13}\text{C}$	Mean $\delta^{13}\text{C}$	Median $\delta^{18}\text{O}$	Mean $\delta^{18}\text{O}$	St. Dev. $\delta^{13}\text{C}$	St. Dev. $\delta^{18}\text{O}$	Range $\delta^{13}\text{C}$	Range $\delta^{18}\text{O}$	Min $\delta^{18}\text{O}$	Max $\delta^{18}\text{O}$	Min $\delta^{13}\text{C}$	Max $\delta^{13}\text{C}$
Enamel	52	-11.35	-11.39	27.41	27.51	1.25	2.16	-8.15	11.51	23.28	34.79	16.72	-8.57
Pedogenic	12	-9.39	-9.49	21.95	21.90	0.27	0.22	0.75	0.61	21.61	22.22	-9.97	-9.22

Table 4.5: Comparative statistics for tooth enamel and pedogenic carbonate $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ compositions. Only data from carbonate fractions were included.

	<i>p</i>	W	Significant
Multivariate Wilcoxon rank sum test	5.375×10^{-6}	577	Yes
Mann-Whitney-Wilcoxon: $\delta^{13}\text{C}$	$3.328 \times 10^{-6*}$	33	Yes
Mann-Whitney-Wilcoxon: $\delta^{18}\text{O}$	$1.683 \times 10^{-7*}$	624	Yes

* Includes Bonferroni Correction for Multiple Comparisons

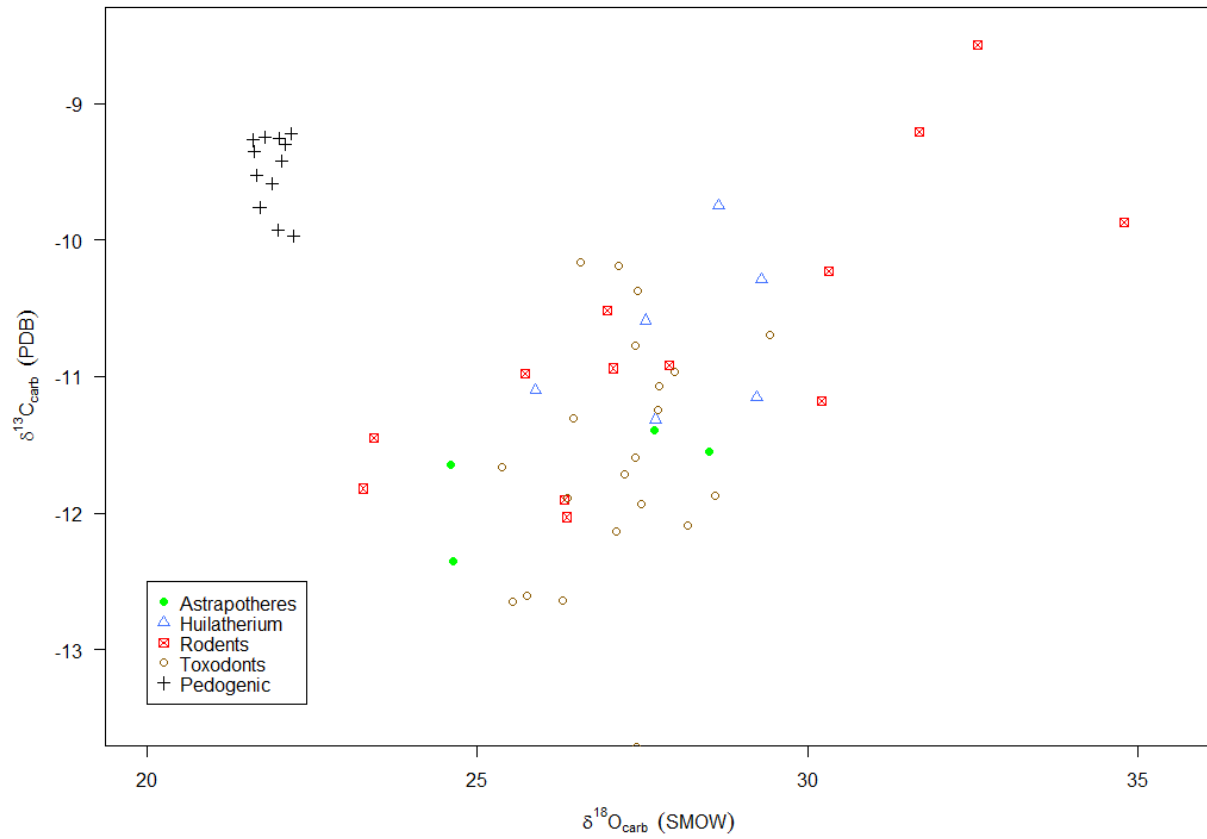


Figure 4.1: Stable carbon and oxygen isotope compositions of mammalian tooth enamel and associated pedogenic carbonate nodules. Note that there is no overlap between the pedogenic carbonates and any of the tooth enamel samples, nor is there a trend in mammalian isotope compositions toward that of the pedogenic nodules.

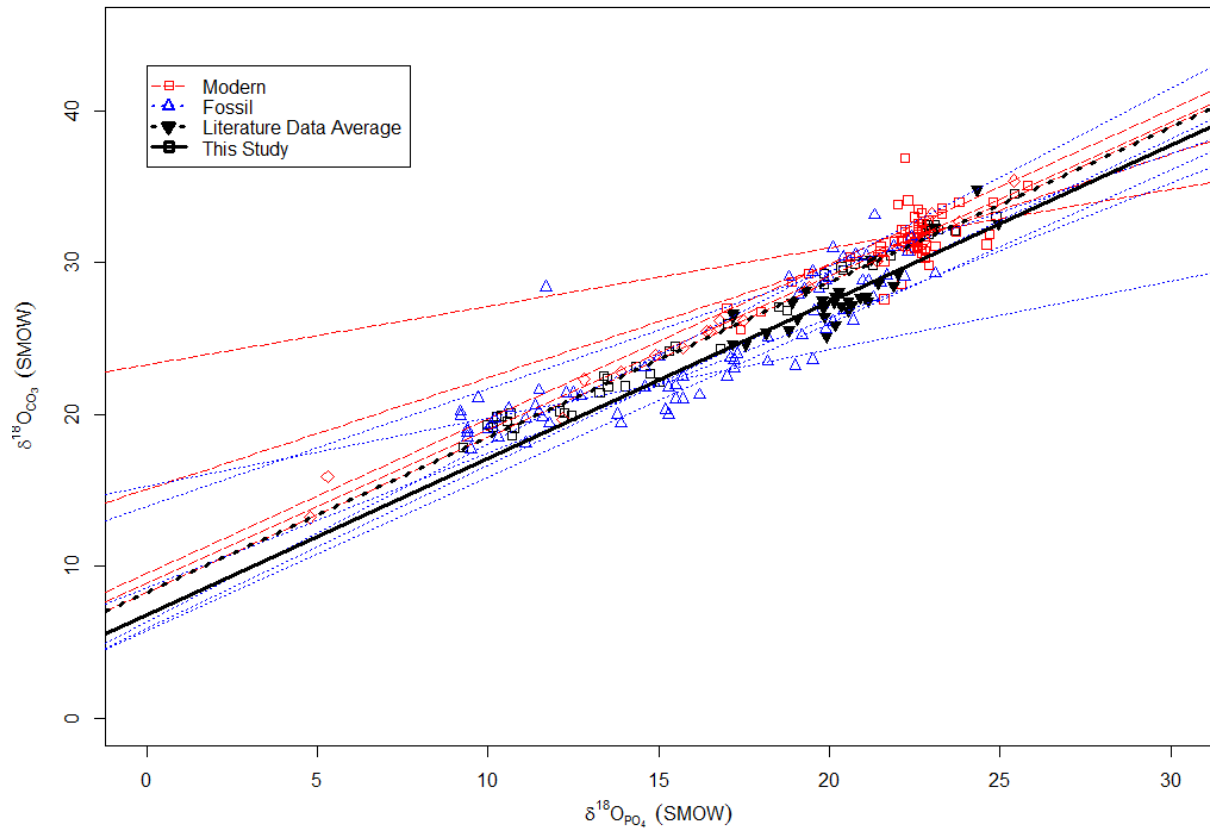


Figure 4.2: Correlation between $\delta^{18}\text{O}$ of phosphate and carbonate fractions of tooth enamel. Data was compiled from the literature (Bryant, Koch, et al. 1996; Iacumin et al. 1996; Lécuyer et al. 1998; Shahack-Gross, Tchernov, and Luz 1999; Vennemann et al. 2001; Antonio Longinelli, Iacumin, and Ramigni 2002; Zazzo et al. 2004; Martin et al. 2008; Fox and Fisher 2001; Eagle et al. 2011; Fricke, Henceroth, and Hoerner 2011; Kim et al. 2014). Each study is represented by a single line (dashed: modern, dotted: fossil) and the complete data set is represented by the solid dark line. The data from this study follow the composite data set and all but 2 of the individual study lines quite closely.

3.3 Terrestrial paleothermometry, general considerations

3.3.1 *Spatiotemporal variability and contemporaneity of fossil samples*

3.3.1.1 Spatial variations in $\delta^{18}\text{O}$ of surface waters

Various characteristics of the environment may alter the composition of local surface waters, such that local precipitation and surface waters do not have the same isotopic composition. River water does not necessarily have the same composition as local precipitation because it is a mixed composition of groundwater and precipitation, and thus is averaged over a large area and generally a long period of time (Kendall and Coplen 2001). However, in a survey of modern rivers in the United States, Kendall and Coplen found that the average discrepancy between river water and local precipitation in the United States was $0.5 \pm 1.3\%$. Based on this, along with other indicators of a robust relationship, they concluded that river water was a satisfactory proxy for rainwater. This relationship will be stronger in areas with higher rainfall, less evaporation, and, especially, with less relief (Kendall and Coplen 2001; Dutton et al. 2005). A strong relationship between $\delta^{18}\text{O}$ of precipitation and river water was also noted in Panama (Lachniet and Patterson 2006), which represents a humid, tropical climate that is more similar to the likely climate of Colombia in the Miocene. The Honda Group has been interpreted as a humid, high rainfall (Kay and Madden 1997a; Kay and Madden 1997b), low relief (Guerrero 1993; Guerrero 1997) environment; thus, it represents exactly the type of location with the strongest relationship between $\delta^{18}\text{O}$ of precipitation and river waters.

Even in the instance that $\delta^{18}\text{O}$ of river water was significantly offset from that of local precipitation, the estimate presented in this study for local temperatures would still be unbiased if in fact local mammals obtained most of their drinking water from the rivers. The fish sampled in

this study were riverine species and so the $\delta^{18}\text{O}$ of river water is the appropriate water to use for calculating the local temperatures. Thus, if the mammals were drinking primarily river water, then their drinking water would be the same water that the fish lived in and thus, there would not be any bias in the temperature calculation. However, there may have been heterogeneous water sources in the area. Thus, it is possible that mammals were drinking from water sources, such as lakes, with different isotopic compositions than the rivers in which the fish were living, and even the fish may have lived in water bodies with different temperatures and isotope compositions.

The three fish species included in this study are *Colossoma macropomum*, the cynodont *Hydrolycus*, and lungfish *Lepidosiren paradoxa*. The frugivore/granivore *Colossoma* inhabits shallow waters in lowland rivers where it spends roughly five months out of the year in the flooded forest (Lovshin 1995; Lundberg 1997). *Hydrolycus* is a large, open-river, pelagic piscivore. *Lepidosiren* is a water fish with specializations for aerial respiration, and is often found in anoxic and even temporary waters (Lundberg 1997).

Furthermore, the fish sampled for this study belonged to three taxa with different ecological preferences: *Colossoma macropomum*, lungfish *Lepidosiren paradoxa*, and the cynodontid *Hydrolycus*. All three taxa have living, morphologically conservative representatives, suggesting similarity in ecological preferences (Lundberg 1997; Lundberg 2005). Modern lungfish live primarily in shallow, still floodplain waters that are often anoxic and sometimes temporary. These waters are the most likely to be of a different temperature (warmer) than the main river channels and are also the most susceptible to evaporative enrichment of ^{18}O . *Colossoma* live predominantly in shallow water, including flooded forests, and facultatively breathe air in low oxygen conditions (Lovshin 1995; Val et al. 1998). Modern cynodontids, on the other hand, demonstrate a strong preference for clear water because they are visual predators (Melo, Lima,

and Silva 2009), and *Hydrolycus* fits this pattern as it is a large, open-river, pelagic piscivore (Lundberg 1997). The waters inhabited by cynodontids would thus be the least likely to exhibit evaporative enrichment and warmer temperatures.

The presence of a wide variety of fish with differing habitat preferences suggests that fish living in a variety of types of water bodies were sampled. The similarity between the oxygen isotope composition enameloid from these fish most likely indicates that river water was relatively isotopically homogeneous in the region. Such isotopic homogeneity would most likely result from a combination of predominantly flowing water with a humid climate that minimized evaporative enrichment.

Furthermore, two observations suggest that mammals likely obtained most of their drinking water from rivers. First, sedimentological and ecological evidence from the Honda Group is consistent with a fluvially dominated depositional setting, without documented evidence of large bodies of standing water such as lakes (Royo y Gómez 1942; Royo y Gómez 1945; Stirton 1953; Guerrero 1993; Guerrero 1997). The lack of lacustrine deposits indicates that the main water sources in the area were fluvial, and thus, probably more isotopically similar to each other and to the local precipitation than in an area with both lakes and rivers because standing water is much more susceptible to evaporative enrichment (Gat 1996; Hoppe, Stuska, and Amundson 2005).

Second, the low intraspecific variability in $\delta^{18}\text{O}$ among the large mammals, particularly in astrapotheres and *Huilatherium*, is not indicative of a region with high isotopic variability in the water supply. In an evaporative body of water, such as seasonal water holes or lakes, more seasonal variability in $\delta^{18}\text{O}$ of drinking water would be expected.

3.3.1.2 Time averaging and seasonal biases in fossil mammal teeth

In what represents a close parallel with the spatial assumptions, the combined mammal-fish tooth enamel approach to calculating mean annual temperature assumes that the fish and mammals were contemporaneous. Fluvial deposits, such as those in the Honda Group, may represent 10^2 - 10^4 years of time averaging, although they rarely represent less than 10^3 years (Behrensmeyer 1982). The extent of time-averaging depends largely on the sedimentation rate (Rogers 1993; Aslan and Behrensmeyer 1996), and channel lags may represent over 10^5 years of time averaging (Rogers 1993). 10^4 - 10^5 years is certainly long enough for changes to occur in both climate and local habitat that would change the $\delta^{18}\text{O}$ of local surface water.

The other temporal assumption is that, with enough samples, the collection of $\delta^{18}\text{O}$ measurements made from fish teeth and mammal teeth both represent average conditions over the course of a year. If $\delta^{18}\text{O}$ of surface water varies over the course of the year and growth of fish and/or mammal teeth occurs preferentially in a particular part of the year, then the temperature and (if mammal teeth record is seasonally biased) the reconstructed $\delta^{18}\text{O}$ of surface water will be biased as well. Hypsodont teeth often represent roughly a year of growth, whereas mesodont and brachydont teeth may represent less than a year of growth (Fricke, Clyde, and O'Neil 1998; Sharp and Cerling 1998). Brachydont teeth are represented by the astrapotheres (Cassini et al. 2012) and mesodont teeth by leontiniids (Shockey et al. 2012). Fossils of hypselodont, or eu-hypsodont, teeth may represent different durations depending on how much of the tooth remains unworn because they grow throughout the animals' lives. Hypselodont teeth are represented in this study by *Pericotoxodon platignathus* and indeterminate species of Toxodontidae in the Honda Group (Bond and Gelfo 2010; Shockey et al. 2012). Thus, if teeth grow more in certain times of the year or if brachydont teeth tend to grow at the same time of year in all animals due to syn-

chronized births and development, then only part of the year may be represented in the dental enamel. This would lead to a bias in the reconstructed $\delta^{18}\text{O}$ of surface water, which would ultimately also impact the temperature reconstruction.

It is not possible to know the extent to which the fossil localities in this study are time-averaged. However, there is relatively little variance in the isotopic compositions of teeth of the same species within the same locality. In fact, there is limited variance in $\delta^{18}\text{O}$ even between strata in the Villavieja Formation and across the La Victoria Formation to Villavieja Formation boundary. This suggests that, during this entire duration, climate was most likely relatively stable in the region. Consequently, time-averaging within localities is most likely not a major issue.

Without close living relatives of the mammal taxa examined in this study, the timing and duration of tooth generation is difficult to assess. However, the seasonal bias was most likely not strong, if it did exist. Serial sampling of brachyodont (astrapotheres), mesodont (*Huilatherium*), and hypselodont (*Pericotoxodon*) teeth did not reveal seasonal oscillations. Thus, sampling some teeth from the base to the crown may have represented less than a year whereas the same strategy applied to hypselodont toxodont teeth may have represented more than a year, but the overall effect would be small because the inter-seasonal variation is so small.

3.3.2 Phosphate-H₂O $\delta^{18}\text{O}$ thermometer

A recent revision of the phosphate-water fractionation relationship suggests that temperatures calculated using previous equations (Longinelli and Nuti 1973; Kolodny, Luz, and Navon 1983) might have been too low by 4-8°C (Puc  at et al. 2010). Recent experimental work on apatite biomineralization in sheep supports the Puc  at thermometer and confirms that the relationship continues up to at least 38°C (Green 2016).

One point of possible concern is that the Kohn (1996) physiological model includes an implicit use of the Kolodny et al. (1983) paleothermometer. However, the data used to fit the model were surface water and enamel phosphate $\delta^{18}\text{O}$ values. Thus, the use of the Kolodny thermometer may have resulted in errors in the equations relating the isotope composition of body water to that of dental enamel and surface waters, but should not affect the composite equation for the offset between enamel and surface water $\delta^{18}\text{O}$.

3.3.3 Estimating $\delta^{18}\text{O}$ and temperature of surface water

The physiological model used in this study to calculate the $\delta^{18}\text{O}$ of surface water is:

$$\delta^{18}\text{O}_m = 26.8 - 8.9h + 0.76\delta^{18}\text{O}_{sw},$$

where $\delta^{18}\text{O}_m$ is the oxygen isotope composition of mammalian tooth enamel phosphate, h is relative humidity, and $\delta^{18}\text{O}_{sw}$ is the oxygen isotope composition of surface water (Kohn 1996). This equation is based on data from a variety of mammalian herbivores in temperate climates. The fact that the current study focuses on tropical mammals may introduce additional error.

For the reasons discussed in section 3.3.2, this study uses the Puc  at (2010) thermometer:

$$T(^{\circ}\text{C}) = 118.7(\pm 4.9) - 4.22(\pm 0.20)(\delta^{18}\text{O}_f - \delta^{18}\text{O}_{sw}),$$

where $\delta^{18}\text{O}_f$ is the oxygen isotope composition of fish tooth enameloid phosphate and T is the temperature in degrees Celsius. These equations can be solved simultaneously to solve for temperature when the isotopic composition of co-occurring fish and mammal tooth enamel phosphate given reasonable estimates for relative humidity.

3.3.3.1 Environmental controls

The environment plays a major role in determining the relationship between ingested water and body water of local animals. In particular, relative humidity makes a large difference in an animal's fractionation of ingested water. Animals tend to lose more water to evaporation in arid environments and so their body water becomes more enriched in ^{18}O relative to ingested water. However, as discussed below, certain behaviors and physiologies may make an animal insensitive to changes in relative humidity. If these 'evaporation insensitive' species can be identified, they are the ideal ones to use for paleothermometry (Levin et al. 2006).

Modern day Panama has mean annual precipitation (1690 mm, $n = 28$, IAEA/WMO GNIP Database 2016) within the range of 1500-2000 mm/year estimated for the Honda Group based on faunal compositions (Kay and Madden 1997a). Relative humidity on Barro Colorado Island averages 90-95% in the forest understory and 80-85% in large clearings during the wet season, and averages 70-80% in the understory and 62-72% in clearings during the dry season (Windsor 1990). This results in annual averages of 77.5% midday relative humidity in clearings and 87.6% midday relative humidity in understory (average of monthly averages, see Appendix 2). Barro Colorado Island is a small island in the Panama Canal, and so might have somewhat higher relative humidity than more continuous stretches of tropical forest in the region. However, this suggests that a plausible range of relative humidity is 60-90%, depending on the season(s) of enamel precipitation and the microhabitat preferences of each species.

3.3.3.2 Influence of physiology and ecology

The theoretical basis for reconstructing surface water $\delta^{18}\text{O}$ of past environments is that the isotopic composition of body water of animals depends on that of their consumed water.

However, the fractionation factor between drinking water and body water may vary across taxa and across environments. In fact, the $\delta^{18}\text{O}$ of body water for different taxa in the same small area may differ by 5-7‰ based on physiology and ecology (Levin et al. 2006).

The physiology and autecology of any given species affect the relationship between the $\delta^{18}\text{O}$ of body water and that of local precipitation in several ways. First, because part of an animal's water intake comes from its food, the relationship between body water and local precipitation depends in part on diet. Different parts of plants have different isotopic compositions, with water in plant stems typically remaining close to the composition of local surface water while leaf water may be evaporatively enriched in ^{18}O by 10‰ (Flanagan and Ehleringer 1991; Kohn 1996). However, the variation introduced by food water will be less in this study than in many modern ecosystems. The offset between C_3 - C_4 plant water $\delta^{18}\text{O}$ can be as much as 10‰ (Kohn 1996), but the Honda Group is a pure C_3 ecosystem (see Chapter 5).

The contribution of food water to body water also relates directly to an animal's level of water dependency. Animals that are water dependent get the majority of their body water from drinking water, whereas water independent animals get most or all of their water needs from their food. For animals that obtain most of their water by drinking, the contribution of dietary water is essentially negligible (Kohn 1996). Many water dependent animals also have other physiological and behavioral characteristics that cause the isotopic composition of their body water to be even less sensitive to relative humidity. For example, large body size, skin that absorbs water, remaining near water sources, and wallowing are associated with many modern water dependent species (Levin et al. 2006). Larger animals tend to be more water dependent because they are less capable of conserving water (Bryant and Froelich 1995), though this relationship has significant scatter (Kohn 1996).

Other aspects of physiology may also affect the fractionation between the $\delta^{18}\text{O}$ of surface water and body water. For instance, animals that pant instead of sweating have a higher $\delta^{18}\text{O}$ of body water, assuming that all else is equal (Kohn 1996).

Because of all of the ecological and physiological factors that may affect the relationship between surface and body water, taxon-specific relationships are the most reliable choice for reconstruction of surface water (e.g., Luz, Kolodny, and Horowitz 1984; Luz and Kolodny 1985; Luz, Cormie, and Schwarcz 1990; Kohn 1996; Koch 1998; Hoppe 2006; Daux et al. 2008; Podlesak et al. 2008). However, in studies such as this where study taxa are extinct and have no close living relatives, this is clearly not possible. In these situations, a more generic, multi-taxon model must be used to reconstruct the isotopic composition of surface water, such as the Kohn (1996) model used in this paper. These models are based on data representing a wide range of taxa, giving an estimate of the variability in physiological variables across extant taxa.

The taxa used for paleotemperature reconstruction in this study likely were water dependent. La Ventan astrapotheres (*Xenastrapotherium kraglievichi*, *Granastrapotherium snorki*, *Hilarchotherium castanedaii*), toxodonts (*Pericotoxodon platignathus*), and leontiniids (*Huilatherium pluriplicatum*) were all quite large, with mass estimates of 1240-3150 kg, 800 kg, and 400 kg, respectively (Johnson and Madden 1997; Vallejo-Pareja et al. 2015; Croft 2016, see Chapter 6). Furthermore, *Huilatherium* was very likely semiaquatic (see Chapter 5). Astrapotheres have consistently been found in association with fluvial or lacustrine deposits (Marshall, Salinas, and Suarez 1990; Houssaye, Fernandez, and Billet 2016; Croft 2016), suggesting that they remained close to water whether or not they were semiaquatic. Consequently, the large mammals sampled in this study likely were minimally influenced by factors such as food water composition or high (relatively speaking) evaporative fractionation of body water.

3.4 La Venta paleotemperatures and surface water $\delta^{18}\text{O}$

The average composition of large mammalian tooth enamel phosphate is 20.13‰ (Table 4.6). Using the physiological model described above (Kohn 1996), this corresponds to an average $\delta^{18}\text{O}_{\text{sw}}$ of -2.42‰ at a 60% relative humidity to 1.09‰ at 90% relative humidity (Table 4.5). The high end of these estimates is likely too high, as precipitation with $\delta^{18}\text{O} > 0$ is uncommon. An alternative model, calculated by linear regression analysis of $\delta^{18}\text{O}_m$ and $\delta^{18}\text{O}_{\text{sw}}$ from a very wide range of extant mammals (using the data from Amiot et al. 2004) gives a value of $\delta^{18}\text{O}_{\text{sw}}$ of -4.67‰. For this study, this will be considered to be the range of possible surface water compositions.

The average $\delta^{18}\text{O}_f$ is 17.64‰ (Table 4.5). When this composition is combined with the range of estimates from Kohn's model, the range of temperatures is 34-48°C. The high end of these estimates is very high, and likely is not correct. When combined with the $\delta^{18}\text{O}_{\text{sw}}$ from the regression equation, this produces a temperature estimate of 25°C.

Table 4.6: $\delta^{18}\text{O}_{\text{sw}}$ and temperature reconstructions. Calculations were completed using Kohn (1996) and Amiot et al. (2004) models for mammalian fractionation of drinking water combined with Puecat (2010) phosphate $\delta^{18}\text{O}$ thermometer.

Using (1996):		Kohn		
$\delta^{18}\text{O}_m$	h (RH)	$\delta^{18}\text{O}_{\text{sw}}$	$\delta^{18}\text{O}_f$	Temp
19.62	0.6	-2.42	17.64	34
19.62	0.7	-1.25	17.64	39
19.62	0.8	-0.079	17.64	44
19.62	0.9	1.09	17.64	49
Using Amiot et al. (2004):		Using Puecat:		
$\delta^{18}\text{O}_m$	$\delta^{18}\text{O}_{\text{sw}}$	$\delta^{18}\text{O}_f$	Temp	
20.13	-4.67	17.64	25	

There are, of course, a number of plausible interpretations of these calculations. An obvious possibility is that the physiological model of Kohn is inappropriate for use in this study, either because of latitude (the model specifies temperate mammals), the physiological differences between extant mammals and notoungulates and astrapotheres, or both.

However, the fractionation models used in this study encompass a very wide range of taxa, which bracket Notoungulata (Buckley 2015; Welker et al. 2015) and thus, probably also bracket Astrapotheria (Van Valen 1988; Billet 2010). Thus, the fractionation was unlikely to be radically different from that seen in any extant mammals. If the physiological model is reasonably appropriate, then the alternative is that relative humidity was on the lower end of the estimate range (60-70%). Incidentally, lower relative humidity estimates also produce $\delta^{18}\text{O}_{\text{sw}}$ estimates that are more compatible with the Amiot regression, which might suggest that the precipitation estimates of Kay and Madden (1997a) are on the high side and that, while humid, the precipitation was somewhat less than that observed in modern Panama. This interpretation is also arguably more consistent with the presence of pedogenic nodules, as will be discussed in next section.

3.5 Seasonality

In serial sampling of teeth for all three large herbivores in this study, total variation is limited to 1-2‰. There is no clear evidence of cyclicity in any of the teeth. The lack of a clear annual cycle in any of the teeth is likely due to the small magnitude of total variation, such that differences between seasons would be indistinguishable from noise.

In what seems to be a contradiction, pedogenic carbonates are present from the Honda Group. Pedogenic carbonates are typically indicators of seasonal variation in precipitation and relatively dry climates, because their formation requires a wet season during which carbonate

leaching occurs in the upper soil and a dry season in which lower soil groundwater becomes supersaturated with respect to CaCO_3 and precipitates as nodules.

There are multiple possible explanations for this apparent discrepancy. The first is that, because of time-averaging, the carbonate nodules were formed at a different time than that during which the animals associated with the horizon lived. However, given that these nodules were found in the same horizon as many of the fossils in this study and that the climate seems to have been relatively stable over the entire stratigraphic section covered by this study, including multiple horizons spanning parts of two formations, it seems unlikely that the nodules represent a radically different climate than the one that existed during the time the mammals were living.

A second explanation for the discrepancy might be that large mammals are more highly mobile, and may have migrated seasonally to track environments that they found more suitable. Thus, by moving seasonally, they may have stayed in regions with higher precipitation year-round. However, this explanation is not favored because this would imply similar migratory behavior to maintain a very specific range of habitats in three families of large mammals in two orders, each of which had very different ecologies (See Chapter 3). Furthermore, migration would not explain the overall faunal composition that is indicative of high precipitation regimes.

Finally, it is possible that the seasonal variation in precipitation was enough to allow precipitation of CaCO_3 , probably at relatively deep levels in the soil, but was not enough to result in variations of greater than the ~2% variability seen in these teeth. While seasonal variability is represented in the serial sampling of teeth in highly seasonal climates, this variability is attenuated due to the residence time of water within animals' bodies and, more importantly, the duration of enamel precipitation. For mammals without hypselodont dentition, enamel mineralization

takes place in two sequential stages, which results in considerable time averaging of seasonal signals (Green 2016).

In modern day Panama, the winter dry season lasts three months and is characterized by precipitation up to $\sim 3.5\%$ higher than the average annual composition of precipitation. Similarly, June and October are characterized by precipitation 3-4% lower than the average annual composition of precipitation, but when the three month intervals centered on these months (e.g. May-July or Sept.-Nov., respectively) are calculated, the results differ from the average by only -1 to -2% (IAEA/WMO GNIP Database 2016). Variations on this order are difficult to differentiate as clear seasonal patterns because of the wide range of other factors that may affect $\delta^{18}\text{O}$ compositions of tooth enamel to this same degree. Thus, the lack of serial variability in the teeth of the large mammals may be simply due to the attenuation of seasonal signals in body water and the low magnitude of seasonal changes in $\delta^{18}\text{O}$ of precipitation.

Although tooth enamel $\delta^{18}\text{O}$ in mammalian tooth enamel would likely poorly record seasonal variations on the scale of those in the modern Panama Canal Zone, soil carbonates could exist in such a climate under the right conditions. On Barro Colorado Island, soils are largely dry by mid-way through the dry season, and the large quantities of calcium in the soil due to volcanics have been known to cause tufa precipitation in one of the catchments, despite the high precipitation and low soil pH (Baillie et al. 2007). Recent studies have indicated that vertisols (clay-rich, shrink-swell soils) are able to produce carbonate nodules in climates with precipitation in excess of 1400 mm/year (Nordt et al. 2006). Field and experimental work suggests that the depth of carbonate accumulation increases in more humid climates, but that higher precipitation in fact can lead to greatly increased rates of carbonate growth (Alexandrovskiy 2000; Gocke, Pustovoytov, and Kuzyakov 2012). The Honda Group is also characterized by abundant

volcaniclastics (and thus likely high calcium) and high clay content. Thus, the right conditions likely existed for carbonate nodule precipitation in a high precipitation environment with a dry season of only a few months.

It is worth noting here that the variability of the $\delta^{18}\text{O}$ in rodent tooth enamel is $\sim 10\%$. This compares more closely with the average isotopic variability that might be expected in a warm, tropical, monsoonal climate (e.g. modern Panama, average annual $\delta^{18}\text{O}$ variation 7.5%). This variability could also be due to taxonomic differences in evaporation sensitivity or diets of different parts of plants (leaves, stems, and fruits). However, one possible explanation is that because tooth mineralization in small mammals occurs over a much shorter duration, the variability in rodent bulk enamel samples represents the seasonal variability that is not represented in the large mammal serial samples.

4. Conclusions

While the uncertainty is clearly very high in the temperature calculations due to high model sensitivity to relative humidity and large differences between two physiological models, conclusions may still be drawn. Temperatures during the Middle Miocene of Colombia were quite high, with the lowest estimate at 25°C and the middle of the range estimates between $34\text{--}37^{\circ}\text{C}$. Both the $\delta^{18}\text{O}_{\text{sw}}$ and temperature reconstructions at the upper end of the range are improbable based on comparisons with modern data.

The sensitivity and uncertainty in the temperature analyses highlighted here should also be regarded as a cautionary tale in future paleotemperature studies. Many studies present a single temperature estimate without sensitivity analysis or exploration of parameter space. In order

to more realistically ascertain the range of possible climatic interpretations for a collection of isotopic data, assessment of the uncertainties is necessary.

Chapter 5: Stable Isotope Ecology of the Fauna and Ecosystem of La Venta, Colombia

1. INTRODUCTION

1.1 Paleoeological questions and clues from the fauna of La Venta, Colombia

The fauna from the Honda Group of La Venta, Colombia has great implications for understanding the evolution and ecology of South America's unique mammalian history. This fauna possesses by far the greatest vertebrate diversity of any known Neogene fauna within the Neotropics (Carrillo et al. 2015). Many of the first undisputed representatives of modern taxonomic groups also appear in the assemblages of the Honda Group (Flynn et al. 2012). The Honda Group dates to the Middle Miocene (13.5-11.6 Ma) and fills a temporal gap for which there were previously no South American faunas (Guerrero 1997; Flynn, Guerrero, and Swisher III 1997; Madden et al. 1997). Finally, the fauna of La Venta lived shortly before the onset of the Great American Biotic Interchange, or GABI. Although a recent discovery indicates that at least one overwater dispersal to Central America occurred prior to 20.9 Ma, the rest of the interchange began with ground sloths around 9-8.5 Ma (Bloch et al. 2016).

For all of these reasons, our understanding of the mammalian evolution in South America stands to benefit substantially from a more complete understanding of the fauna at La Venta. Research over the course of the last century has made major progress towards this goal (Kay and Madden 1997a; Kay and Madden 1997b; and references therein, see Chapter 2 for a thorough review). However, some questions remain regarding the vegetation composition and structure, as well as questions about the specific biology and ecology of individual mammal taxa. Tools

such as quantitative biomechanical, dental microwear, and stable isotope analyses have yet to be applied to this fauna. This study represents a first step in applying these new tools to the fauna of the Honda Group.

One question that has been discussed extensively with regards to the ecosystem of La Venta is that of vegetation structure. Stirton (1953) envisioned a grassland-dominated ecosystem with tree-lined streams and rivers. However, subsequent analyses have indicated that the mammalian community is more consistent with variable forest, woodland, and open environments (Kay and Madden 1997a; Kay and Madden 1997b; Flynn et al. 2012). The large number of tusked megaherbivores (five genera: *Pseudopreopotherium*, *Pericotoxodon*, *Granstrapotherium*, *Hilarcotherium*, and *Xenastropotherium*) may have helped to maintain ecotones with destructive behaviors such as tree- and branch-stripping, as elephants do in modern ecosystems (Kay and Madden 1997b).

On the other hand, certain taxa, such as the bats *Diclidurus* and representatives of Vampyrini (Eisenberg 1989; Czaplewski, Morgan, and McLeod 1997; Eisenberg and Redford 1999; Hood and Gardner 2007) and crown group pitheciins- represented at La Venta by *Cebu-pithecias* and *Nuciruptor* (Stirton 1949; Stirton 1951; Stirton and Savage 1951; Hershkovitz 1970; Meldrum and Kay 1990; Meldrum and Kay 1997b; Fleagle 2013; Kay, Meldrum, and Takai 2013), are strongly associated with closed canopy, multistratal evergreen forests in modern ecosystems. Others, such as the litopterns *Prothoatherium*, *Prolicaphrium*, and *Megadolodus*, have extremely brachydont dentition, suggestive of closed and probably densely forested habitats (Cifelli and Guerrero 1997; Cifelli and Villarroel 1997). Such faunal components are suggestive that, while it certainly would not have been the exclusive vegetation structure, some areas may

have had closed canopy, multistratal evergreen forests. However, this hypothesis has yet to be tested.

Another topic of ongoing discussion relates to possible semiaquatic habits in the mega-herbivores of La Venta and elsewhere in South America. Semiaquatic habits have been suggested repeatedly for various toxodontids (Cope 1897; Scott 1913; MacFadden and Shockey 1997; Cione et al. 2000). However, the Pleistocene toxodont *Toxodon* had a specialized locking knee mechanism using a greatly enlarged medial trochlear ridge that would have allowed them to stand and feed for long periods of time, which should not have been needed in an animal supported by water (Shockey 2001). Slightly enlarged MTRs first appear in early Miocene toxodontids such as *Adinotherium* and *Nesodon* and greatly enlarged MTRs first appear in the late Miocene *Hoffstetteria imperator*. However, the authors also point out that the modern river hippopotamus also has an enlarged MTR for unknown reasons, and suggest that isotope methods could be used to further test the hypothesis of semiaquatic habits in toxodontids.

Leontiniids, including the La Venta species *Huilatherium pluriplicatum*, are a relatively unstudied group in ecological terms. Kay and Madden (1997b) suggested that *Huilatherium platignathus* was a semiaquatic folivore. Ribeiro et al. (2010) interpreted the Deseadan leontiniids, including *Colpodon* of the “tropical clade” to which *Huilatherium* belongs, as browsers on soft substrates, but did not comment on their locomotion or use of substrate.

Finally, astrapotheres may have had semiaquatic habits. Various authors have suggested that astrapotheres may have been semiaquatic on both morphological grounds and because of their frequent association with fluvial sediments and aquatic faunas (Riggs 1935; Scott 1937; Lavocat 1958; Marshall, Salinas, and Suarez 1990; Kay and Madden 1997b; Avilla and Vizcaíno 2005; Flynn et al. 2012; Kay, Vizcaíno, and Bargo 2012; Houssaye, Fernandez, and Billet 2016;

Croft 2016). However, a histology study that attempted to test this hypothesis in *Parastrapotherium* using bone microstructure obtained somewhat inconclusive results (Houssaye, Fernandez, and Billet 2016). Consequently, they suggest that as previously was proposed for *Astrapotherium* (Cassini et al. 2012), astrapotheres may have been similar to the Indian rhino, which is graviportal but also swims very well.

1.2 Carbon isotopes in bioapatite

1.2.1 *Variation in carbon isotope ratios across the landscape*

The carbon that makes up plants originates from atmospheric CO₂ that is fixed during photosynthesis. However, despite this common origin, a variety of factors cause the fractionation of carbon isotopes during photosynthesis to vary among different environments and plant types. Fractionation occurs during photosynthesis because of kinetic isotope effects during biochemical reactions and because of the different rates of diffusion for ¹²C and ¹³C through stomata. The latter only exerts an important influence on the fractionation when CO₂ is limited (M. H. O’Leary 1988; Farquhar, Ehleringer, and Hubick 1989).

The largest cause of natural variation in $\delta^{13}\text{C}$ is the photosynthetic pathway(s) used by the local plants. Predominantly, this refers to the difference between C₃ (most trees, shrubs, and high altitude or high latitude grasses) and C₄ (mainly tropical, subtropical, and temperate grasses) pathways (O’Leary 1988; Farquhar, Ehleringer, and Hubick 1989). The CAM pathway is important for succulents and cacti, but does not represent a significant portion of photosynthesis outside of desert regions (Quade et al. 1989).

In addition to photosynthetic pathways, environmental conditions have an effect on isotopic discrimination during photosynthesis. Low irradiance levels lead to lower rates of photo-

synthesis, which in turn draws down intracellular partial pressure of CO₂ in leaves less than in higher irradiance conditions. Consequently, leaves which photosynthesize in low-light conditions do so with greater isotopic discrimination and so have lower $\delta^{13}\text{C}$ values. Water stress causes a decrease in leaf conductance and so a decrease in the partial pressure of CO₂, which results in less carbon fraction and thus, in photosynthate with higher $\delta^{13}\text{C}$ values than would be produced in more humid settings (Farquhar, Ehleringer, and Hubick 1989; Farquhar and Lloyd 1993; Heaton 1999; Arens, Jahren, and Amundson 2000; Fricke 2007).

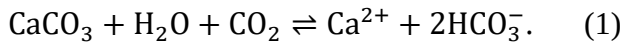
The canopy effect is the tendency of plants from the understory of closed canopy forests to have lower $\delta^{13}\text{C}$ values than plants from open environments. This is because dense canopies prevent thorough mixing of the air in the understory with the atmosphere, and so air at the level of the understory contains considerable CO₂ derived from soil respiration of organic matter. Because organic matter is ^{13}C depleted relative to the atmosphere, the recycled CO₂ produced by soil respiration also has low $\delta^{13}\text{C}$ values relative to the general atmosphere. The lower light levels received by the understory also contributes to low $\delta^{13}\text{C}$ values in understory growth (Broadmeadow and Griffiths 1993).

The net result of these influences on $\delta^{13}\text{C}$ values is that the same plants in wet, low light, cooler, and more densely forested environments will be lower than those of plants in dry, high irradiance, warm, and open environments. Furthermore, within a closed canopy forest, leaves and plants have lower $\delta^{13}\text{C}$ values the closer they grow to the ground because of increased use of respired CO₂ for photosynthesis, lower photosynthesis rates because of low irradiance levels, and reduced transport limitation due to higher ambient CO₂ concentrations from the soil gas efflux and higher humidity.

1.2.2 *Mineralized records of plant $\delta^{13}\text{C}$*

Because mineralized materials are more easily preserved in large quantities than plants over geologic timescales, it is important to understand the ways in which these materials reflect the isotopic composition of plants, and thus, of the environment in which they formed. Two of the most common mineralized elements for isotopic analysis of terrestrial paleoenvironments are pedogenic carbonates and mammalian tooth enamel.

Soil carbonates precipitate with soil carbon dioxide and dissolved carbonate species in groundwater according to the equilibrium reaction:



Thus, the isotopic composition of pedogenic carbonates depends on that of soil CO_2 . In extremely arid climates and above 30 cm depth, soil CO_2 is derived from combined sources- the atmosphere and soil respiration of organic matter. However, at greater depth in regions with greater than 350 mm of precipitation per year, soil CO_2 consists effectively of only soil-respired CO_2 (Cerling 1984; Cerling et al. 1989; Quade et al. 1989). Consequently, the isotopic composition of soil CO_2 and thus, of pedogenic carbonates, depends on that of the local vegetation that is the source of soil organic matter (Quade et al. 1989; Quade, Chivas, and McCulloch 1995). Soil-respired CO_2 is then further fractionated by greater soil diffusion rates of ^{12}C than ^{13}C , which leads to ^{13}C -enrichment of soil CO_2 relative to the composition of soil-respired CO_2 (Cerling 1984; Cerling et al. 1991; Cerling and Quade 1993). Ultimately, the net effect of these chemical and physical fractionations is a typical offset of ~14-16‰ between soil organic matter and pedogenic carbonates from the same soil (Cerling et al. 1989).

Similarly, the isotopic composition of mammalian tooth enamel relates directly to that of their diets. Mammals obtain carbon through their diets (DeNiro and Epstein 1978). Metabolized

food contributes to blood DIC (dissolved inorganic carbon), which in turn facilitates the precipitation of the bioapatite $[(Ca_5(PO_4, CO_3)_3(OH, CO_3)]$ that makes up bones, dentin, and tooth enamel (Koch 1998). Differences in digestive physiology result in variation in the fractionation between diet and blood DIC, resulting in total bioapatite-diet offsets of 9-11‰ in rodents and 12-14‰ in ungulates (Cerling and Harris 1999; Passey et al. 2005). Thus, the carbon isotope composition of herbivore bioapatite may be useful in determining interspecific dietary differences as well as the environments in which their food plants grew.

As discussed in Section 2.1, the isotopic composition of plants depends on both the photosynthetic pathway used and the environmental conditions in which the plants grow. Consequently, for any given ratio of $C_3:C_4$ plants in the diet of a mammalian herbivore, there is a range of possible $\delta^{13}C$ values representing the spectrum from closed canopy, wet evergreen forests to open deserts. If the approximate $C_3:C_4$ ratio of the diets is known, then the $\delta^{13}C$ compositions of mammalian tooth enamel can reveal the environmental conditions.

1.3 The origin of C_4 photosynthesis and pedogenic carbonates

Several lines of evidence suggest that the first C_4 grasses originally evolved in the Oligocene (Sage 2004; Strömberg 2005; Strömberg and McInerney 2011), associated with CO_2 starvation (Christin et al. 2008; Vicentini et al. 2008; Bouchenak-Khelladi and Hodkinson 2011) or with reductions in precipitation that caused transitions from tropical forests to tropical woodlands and savannahs (Edwards and Smith 2010). The C_4 pathway evolved independently 20 separate times beginning in the Oligocene, with many originations occurring much later (Edwards and Smith 2010).

C₄ plants initially represented a small portion of plant biomass until their later diversification. The reasons for this expansion have been the subject of much debate, and include CO₂ starvation (Ehleringer et al. 1991; Cerling 1997; Cerling, Harris, and MacFadden 1998), increasing frequency of fires (Keeley and Rundel 2003; Keeley and Rundel 2005), and changing plant-herbivore interactions due to either global cooling and increased seasonality (Fox and Koch 2003; Fox and Koch 2004) or coevolution of grasses and grazers (Retallack 2001; Retallack 2007). In order to best test these hypotheses, detailed information on when and where the increases in C₄ biomass occurred is required.

However, this question has itself been the topic of considerable debate. Many studies indicate that the spread of C₄ grasses occurred globally mainly between 8-5 Ma on at least four continents, including South America, North America, Africa and Asia (Quade et al. 1989; Quade et al. 1992; Cerling, Wang, and Quade 1993; Harrison et al. 1993; Morgan, Kingston, and Marino 1994; Quade and Cerling 1995; Quade et al. 1995; Cerling 1997; Latorre, Quade, and McIntosh 1997; Cerling, Harris, and MacFadden 1998; Barry et al. 2002; Behrensmeyer et al. 2007; Passey et al. 2009). In contrast, some evidence suggests that C₄ grasses made up a non-negligible portion of the biomass prior to 8 Ma in some regions. For instance, isotopic and phytolith proxies both indicate that the Great Plains region had up to 10-30% C₄ production by biomass starting in the early Miocene and continuing through the late middle to early late Miocene (12-8 Ma) (Fox and Koch 2003; Fox and Koch 2004; Strömberg and McInerney 2011; Fox et al. 2012). Fox et al. (2012) also point to evidence that suggests that the expansion of C₄ grasses was not as synchronous in other regions as it is often portrayed (e.g. Kleinert and Strecker 2001; Fan et al. 2007) and argue for analysis of the expansion on more regional scales. While some of the methods used in these studies have drawn criticism (Wynn 2007), agreement among multiple

independent lines of evidence regarding C₄ biomass in the Great Plains lends credence to these claims and so warrants further investigation.

In this context, pedogenic carbonate nodules in Colombia present an exciting opportunity for several reasons. C₄ grasses are believed to have originated in tropical lowlands, of which the Honda Group ecosystem was a prime example. Also, precipitation estimates for La Venta place the ecosystem in the transitional range between open and closed habitats that is associated with many of the C₄ origination events (Edwards and Smith 2010). Thus, the location and climate of the La Venta ecosystem match those in which C₄ plants most likely originated, and so may have contained a detectable proportion of C₄ biomass. Using $\delta^{13}\text{C}$ measurements of pedogenic carbonates and tooth enamel, along with the methods outlined in Fox and Koch (2003), it should be possible to approximate the C₄ content of the plant biomass of the Honda Group.

1.4 Semiaquatic and terrestrial habits in mammals

When used for multiple species from the same area, oxygen isotope analysis can help to differentiate between fully aquatic, semi-aquatic, and fully terrestrial habits. Aquatic and semiaquatic species differ from terrestrial species in that their drinking water generally comes from a single, relatively homogeneous source. Furthermore, when in water, these species are not subject to as high a rate of evaporative enrichment of body water H₂¹⁸O (Luz, Kolodny, and Horowitz 1984; Kohn 1996). Thus, semiaquatic and aquatic mammals have lower population level variability in $\delta^{18}\text{O}$ than terrestrial mammals (Clementz and Koch 2001; Clementz et al. 2006). Particularly in arid environments where evaporation is most intense, aquatic species also have significantly lower $\delta^{18}\text{O}$ than terrestrial taxa, as has been shown in hippo populations in East Africa (Cerling et al. 2008).

However, several issues may complicate the recognition of these patterns in the fossil record. If there is local variability in the isotopic composition of surface waters, for instance, between rivers that are relatively close to the composition of meteoric water and evaporatively ^{18}O enriched lakes, then animals drinking from such sources in different proportions would have corresponding differences in their body water $\delta^{18}\text{O}$ composition, which could confound the signal of semiaquatic habits. Furthermore, differences between species most likely exist in the proportion of their water intake that comes directly from drinking and what comes from the plants that make up their diet. Because plant water is also enriched in ^{18}O relative to local meteoric water, this again would result in different $\delta^{18}\text{O}$ compositions of water intake and thus, complicate the interpretation of $\delta^{18}\text{O}$ compositions in enamel. Finally, physiological factors that determine the fractionation between drinking water and body water vary amongst taxonomic groups, and this variation is unknown for species without close living relatives.

All of these issues on an ecological timescale may be compounded by taphonomic processes that result in time-averaging of assemblages. Attritional terrestrial fossil assemblages, such as would be found on floodplains in the Honda Formation, represent time-averaging on the order of $10\text{-}10^3$ years, and channel lag concentrations of fossils would represent $10^2\text{-}10^5$ years of accumulation (Behrensmeyer 1982; Behrensmeyer 1988; Rogers 1993; Aslan and Behrensmeyer 1996). Post-burial exhumation and reworking of lag concentrations would result in substantially higher timescales of time-averaging (Rogers and Kidwell 2000; Rogers and Brady 2010). Consequently, one might expect intertooth variability in $\delta^{18}\text{O}$ values to be a more reliable indicator of semiaquatic habits than comparisons between $\delta^{18}\text{O}$ values of extinct taxa.

1.5 Diagenesis

Before ecological interpretations of stable isotope ratios in fossil materials are possible, it is necessary to establish that the original isotopic compositions of the materials have been preserved. Diagenetic alteration is a major concern in all isotopic studies of fossil material because interpretations based on altered isotopic compositions would lead to erroneous conclusions. Sampling strategies, particularly focusing only on well preserved enamel, mechanically cleaning the surface of the enamel prior to collecting powder for analysis, and avoiding cracks, which provide additional surface area for alteration, and obvious areas of discoloration or reprecipitation, may greatly reduce the risk of diagenetic overprinting of primary isotope ratios.

2. METHODS

2.1 Sample collection

Tooth enamel was sampled using a Foredom TX slow speed drill (Bethel, CT, USA) fitted with 1-2 mm diameter Dremel diamond-tipped drill bits under microscopic magnification. Enamel surfaces were mechanically cleaned with the drill to remove dirt and authigenic minerals before sampling and any parts of the tooth showing obvious damage or reprecipitation were avoided. Only enamel was sampled.

Carbonate analysis requires 3-5 mg of powdered enamel for analysis and phosphate analysis requires 0.7-1.5 mg. Sampling sites in the enamel were selected by avoiding areas of discoloration or fractures. In order to collect time-averaged (“bulk”) samples, drilling ran from the enamel-cementum junction to the crown of the tooth. A single track was sufficient for large mammal teeth, but multiple tracks were required on larger teeth. For serial (intratooth) samples,

drilling was conducted in parallel tracks perpendicular to the vertical axes of the teeth. Whenever it was possible, enamel powder sufficient for both phosphate and carbonate analyses was collected simultaneously, homogenized, and then separated for analysis.

2.2 Phosphate Analysis

Sample processing for phosphate analysis followed the slow Ag_3PO_4 microprecipitation methodology of Mine et al. (2016), which was based on methods developed in previous studies (Wenzel, Lécuyer, and Joachimski 2000; Colman 2002; Wiedemann-Bidlack, Colman, and Fogel 2008; Mine 2015). Only ACS grade or higher chemical reagents were used for this study. All solutions were made from deionized water (DI, 18.0 M Ω). The first step was to dissolve enamel in 100 μl 2M HNO_3 on a shaker table for 24 hours. Periodically, the samples were resuspended to guarantee that they dissolved completely. Next, calcium was removed through the addition of 100 μl 2M HF and 100 μl 7.25M NH_4OH to cause CaF_2 to precipitate. The resulting solution was thoroughly mixed and then allowed to stand for at least 20 minutes to ensure complete precipitation, and then was pelleted using a microcentrifuge for 5 minutes. Glass Pasteur pipets were used to transfer the supernatant to clean microcentrifuge tubes. The residual solids were rinsed with 50 μl DI and then pelleted twice and the supernatant added to the samples to ensure that none of the phosphate from the dissolved bioapatite was lost.

The slow microprecipitation methodology (Wenzel, Lécuyer, and Joachimski 2000; Colman 2002; Wiedemann-Bidlack, Colman, and Fogel 2008; Mine 2015; Mine et al. 2016) was used to generate large Ag_3PO_4 crystals from the dissolved phosphate. Polypropylene transfer pipet bulbs with the stems cut off served as the precipitation vessels. The sample solutions, 0.75 mL Ag-Ammine solution (0.067M AgNO_3 , 0.74M NH_4OH , and 0.35M NH_4NO_3), and 1.25 mL

1.25M NH_4NO_3 were combined in the bulbs and mixed thoroughly with a pipet. A 1:1 dilution of concentrated reagent NH_4OH with water was added dropwise to raise the pH of the initial precipitation solution to about 10. Ag-ammine solutions were stored in opaque bottles and NH_4OH solutions were made fresh daily. In order to facilitate the precipitation, the bulbs were heated in a metal heating block at 50°C for 12-15 hours until the solution volume was reduced to 200-300 μL . At this point, crystals were gemmy, translucent, medium to dark yellow, and large. Crystals that did not match this description were dissolved and reprecipitated. All crystals were described and photographed under magnification before further processing occurred.

Crystals were rinsed 5 times using a Pasteur pipet and 3.0 mL DI to remove residual nitrate in the solution. The remaining supernatant was drawn off with a Pasteur pipet and the crystals were dried in an oven at 50°C . Once the crystals were dry, a fine camel hair brush and a stainless steel microspatula were used to remove any crystals that adhered to the pipet bulb and to break up any crystals or crystal agglomerations exceeding the maximum of 500 μg ; 250-500 μg of dry crystals were then weighed into silver foil capsules for subsequent isotopic analysis. All recoverable crystals from a precipitation were analyzed, resulting in 3-6 analyses for each precipitation.

A Thermo Chemolysis Elemental Analyzer (TCEA) reduced Ag_3PO_4 to CO at 1450°C in a glassy carbon reactor with a graphite crucible (Kornexl et al. 1999, Vennemann et al. 2002). The sample gas was then entrained in a He carrier gas, passing to a Conflo IV open split to a Thermo Delta V Plus mass spectrometer (Thermo, Bremen, Germany). Isotopic compositions of samples were calibrated against those of house standards; the isotopic composition of house standards has been determined by comparison with YR-1, YR-2, YR-3, TU, Ambo Ele, ID Std, and Loth Hippo standards, for which the composition has been measured using fluorination

(Vennemann et al. 2002). Run order consisted of a suite of two to three house standards in triplicate to quintuplicate at the beginning and end of the run, with sets of triplicate standard analyses after every ten samples. This allowed the detection of any drift in the measurements over time. Standard masses were also selected so that the peak areas spanned the full range of sample masses so that linearity effects could be identified and, if necessary, corrections could be made.

2.3 Carbonate Analysis

Pretreatment of enamel samples for carbonate analysis began by soaking the powder for four hours in 150 μ L buffered acetic acid solution with $\text{pH} \approx 4.5$ in 2ml polypropylene microcentrifuge tubes (Koch, Tuross, and Fogel 1997; Garvie-Lok, Varney, and Katzenberg 2004). During the acetic acid pretreatment, a shaker table kept the solutions mixed continuously and manual agitation of the samples ensured that they were fully resuspended every one to two hours. Next, the powder was pelleted in a centrifuge for three minutes so that the supernatant could be removed and discarded with minimal sample loss. The samples were then rinsed five times with approximately 2 mL of DI. For each rinse, the sample powder was agitated to fully resuspend the enamel powder in the clean DI, pelleted using the centrifuge for three minutes, and then separated from the supernatant using a glass pipet.

After rinsing was complete, the samples were fully suspended in 100 μ l DI so that they could be transferred by pipet to 0.6 mL microcentrifuge tubes, in which they were pelleted in the microcentrifuge for three minutes once again. The samples were then dried overnight in an oven at 50°C to remove adsorbed water.

Using a stainless steel microspatula, the dried enamel pellets were crushed, weighed, and transferred to Exetainer tubes. Small samples (≤ 2 mg) were transferred into half sized Exetainer

tubes for increased peak heights and accuracy; these samples were analyzed in a separate run against standards with comparable carbonate content also in half-sized Exetainer tubes. A Delta V Plus outfitted with a GasBench II was used to perform the analyses. Following 5 minutes of needle flushing with He, each tube received an injection of 200 μ l 105% H_3PO_4 . Acid digestion continued for 36 hours at 26°C. Isotopic compositions were determined by comparison with LSVEC ($\delta^{13}\text{C} = -46.6\text{‰}$ PDB), NBS-18 ($\delta^{13}\text{C} = -5.01\text{‰}$ PDB, $\delta^{18}\text{O} = 7.20\text{‰}$), and NBS-19 ($\delta^{13}\text{C} = 1.95\text{‰}$ PDB, $\delta^{18}\text{O} = 28.65\text{‰}$ VSMOW) standards.

3. RESULTS AND DISCUSSION

Table 4.1 presents the data for $\delta^{13}\text{C}_{\text{CO}_3}$, $\delta^{18}\text{O}_{\text{CO}_3}$, and $\delta^{18}\text{O}_{\text{PO}_4}$ of time-averaged, or bulk, enamel compositions. $\delta^{13}\text{C}_{\text{CO}_3}$, $\delta^{18}\text{O}_{\text{CO}_3}$, and $\delta^{18}\text{O}_{\text{PO}_4}$ of intra-tooth, or serial, enamel samples are reported in Table 4.2. Pedogenic carbonate $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ values are provided in Table 4.3. Figure 4.1 provides a graphical representation of carbonate $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$. Unless specified to the contrary, all $\delta^{13}\text{C}$ values are relative to PDB and all $\delta^{18}\text{O}$ values are relative to SMOW.

3.1 Diagenesis

Before ecological interpretations are possible, diagenetic alteration of isotopic compositions must be ruled out. The data used in this study have already been determined to represent primary isotopic compositions using two tests for diagenesis (Chapter 4, section 3.2). Regression analysis of both the carbonate and phosphate fractions of homogenized enamel samples shows the expected relationship for well-preserved enamel (Figure 4.2, Chapter 4), with a strong correlation ($r^2=0.728$), an average offset of 7.42‰, and a slope statistically equal to 1 (1.033, Standard Error = 0.1134). Furthermore, the isotopic composition of tooth enamel neither overlaps with, nor trends towards, that of co-occurring authigenic carbonates (Figure 4.1, Chapter 4).

The differences in isotopic composition between tooth enamel and authigenic minerals are statistically significant according to a depth based multivariate Wilcoxon rank sum test ($p=5.375 \times 10^{-6}$, $W=577$, $n_{\text{pedogenic}}=12$, $n_{\text{enamel}}=52$). The combination of these observations provides strong evidence that the primary isotopic compositions of the tooth enamel are preserved.

3.2 Pedogenic Carbonates

Pedogenic carbonate $\delta^{13}\text{C}$ may be used as a proxy for the proportion of C_4 in the plant biomass. For instance, evidence from paleosols suggests that C_4 plants may have been present in the Great Plains region during the Early to Middle Miocene (Fox and Koch 2003; Fox and Koch 2004), although this suggestion has drawn criticism (Wynn 2007).

The average $\delta^{13}\text{C}$ value for the sampled pedogenic carbonate nodules is -9.49‰ (PDB). Fox and Koch utilize a linear mixing model of Fox and Koch (2003) between pedogenic carbonate $\delta^{13}\text{C}$ of -10‰ beneath pure C_3 ecosystems and $\delta^{13}\text{C}$ of 4‰ beneath pure C_4 ecosystems. Using this model, the La Venta carbonate nodules would suggest that only 3.7% of the biomass was C_4 , and these values still fall well within the range of carbonate nodules formed in pure C_3 environments (Figure 5.1). Furthermore, the $\delta^{13}\text{C}$ of atmospheric CO_2 was about 0.5‰ higher during Laventan time than that of preindustrial CO_2 (-6‰) used by Fox and Koch, and so the average $\delta^{13}\text{C}$ of pedogenic carbonate should also have been approximately 0.5‰ higher. Thus, the La Venta carbonate nodules are almost exactly what would be expected for an average C_3 ecosystem during the Middle Miocene. Consequently, consistent with findings from other regions of South America in similar time intervals, there is no evidence for any detectable C_4 biomass in the La Venta ecosystem.

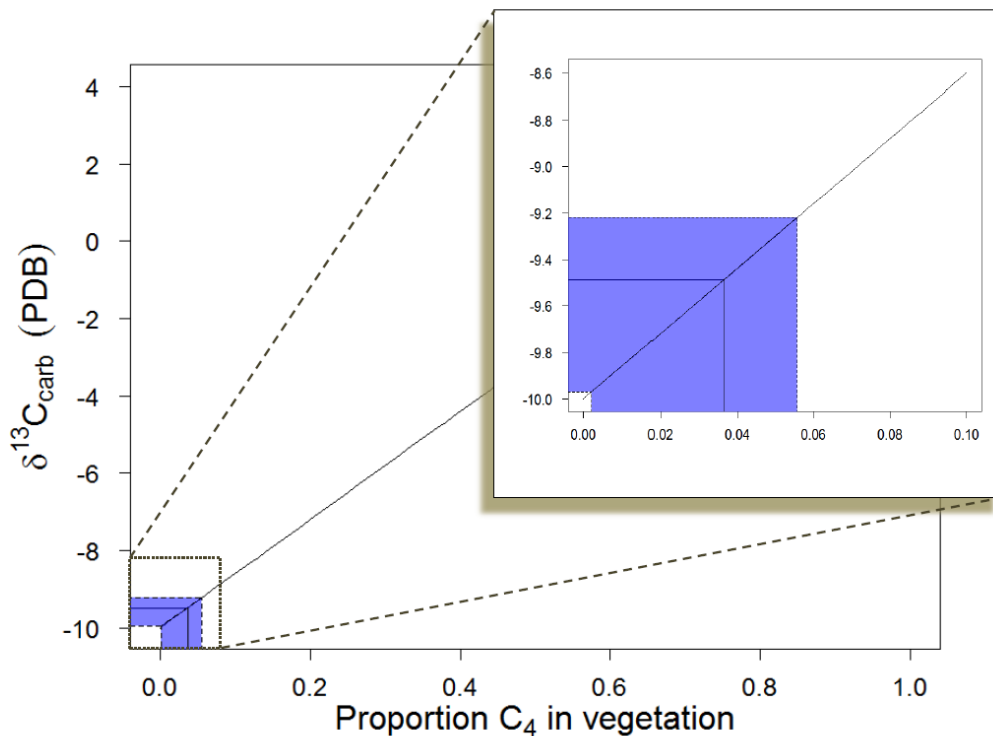


Figure 5.1: Proportion of C₄ vegetation as indicated by $\delta^{13}\text{C}$ of Honda Group pedogenic carbonates. The solid line represents a linear mixing model between pure C₃ vegetation at the left and pure C₄ vegetation at the right as calculated by Fox and Koch (2003). The shaded region indicates the range of $\delta^{13}\text{C}$ values for pedogenic carbonates at La Venta and the corresponding proportion of C₄ as indicated by the mixing model. All $\delta^{13}\text{C}$ values indicate less than 6% C₄, which is too low to distinguish from variability in pure C₃ ecosystems.

3.3 Rodent v. large mammal ecology and physiology

Because diagenetic alteration of the fossil tooth enamel is not responsible for the $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ values, ecological and environmental interpretation is possible. When comparing isotopic compositions between different taxa, clear patterns emerge. Most significantly, rodents display a different pattern than any of the larger mammals (*Huilatherium*, *Pericotodon*, or the

astrapotheres). First, the rodents display greater variability in both $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ values. At the low end of their ranges in both isotopic compositions, the rodents overlap with the larger mammals, but isotopic composition of rodents reaches higher values for both $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$. Further identification of the rodent taxa would be necessary to determine whether the isotopic variation systematically relates to taxonomic affinities.

A second important observation about the rodent isotopic compositions is that the oxygen and carbon isotopic values are significantly correlated ($r^2 = 0.625$, $p = 0.0013$). One possible explanation is that the variability reflects physiological, ecological, and/or behavioral differences among different species of rodents. For instance, it could represent a spectrum between rodents that prefer the cooler, wetter, more closed habitats at the low end of both the $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ ranges and in more open, drier, and warmer habitats at the higher end. Plants growing in cool, wet and closed environments would have lower $\delta^{13}\text{C}$, and lower rates of evaporation relative to precipitation in such environments would lead to lower $\delta^{18}\text{O}$ of the water. Such spatial variation could exist in the environmental mosaic that other authors have suggested for La Venta (Kay and Madden 1997a; Kay and Madden 1997b), and the rodent fauna of La Venta includes species whose closest living relatives prefer both open and closed habitats today (Walton 1990; Walton 1997).

Another possibility is that the covariation of $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ represents a spectrum between wetter and drier times in which the data were recorded. This could represent change in the climate over time, of course, but the absence of such covariation or of the same variability in large mammal isotopic compositions implies that all three large mammal species must have been missing in the area when the drier conditions were encountered. This is possible if the climate and ecosystem changes were sufficient to make the region unsuitable to the large mammals.

However, there is no stratigraphic evidence to suggest such temporal separation of the rodents and large mammals or ecological turnover (Guerrero 1997; Kay and Madden 1997b), and there are no significant differences in isotopic composition between strata that would suggest major climatic or environmental changes. Furthermore, toxodonts have been found from all latitudes and habitats in South America, sometimes spanning the range from closed canopy browsers to C₄ grassland grazers within individual species (Madden 1997; MacFadden 2005; Antoine et al. 2007; Kay, Vizcaíno, and Bargo 2012), so it seems unlikely that *Pericotoxodon* was so much less adaptable than the coexisting rodents whose living relatives have much narrower ecological tolerances (Walton 1997).

While modern precipitation in Colombia is heavily influenced by the presence of the Andes, sedimentology unambiguously indicates that the La Venta ecosystem was low in elevation and relief during the Middle Miocene (Royo y Gómez 1942; Royo y Gómez 1945; Stirton 1953; Fields 1959; Wellman 1970; Takai et al. 1992; Guerrero 1993; Villarroel et al. 1996; Guerrero 1997; Kay and Madden 1997b). The Canal Zone in Panama is low in elevation and relief, and shares features such as latitude and relationship to the Pacific Ocean and Gulf of Mexico with Middle Miocene northern Colombia, and so may provide a modern analogue for La Venta while holding as many variables as possible relatively constant. Panama experiences an average rainfall of 12.38 mm during February (n=24) and 20.32 mm during March (n=25), with relatively low precipitation compared to the rest of the year also experienced during January (57.17 mm, n=24). Consequently, $\delta^{18}\text{O}$ of precipitation in January ($-0.38 \pm 2.06\text{‰}$), February ($0.31 \pm 0.74\text{‰}$), and March ($-0.30 \pm 1.33\text{‰}$) is approximately 5‰ higher than the annual average ($-5.35 \pm 1.44\text{‰}$) (IAEA/WMO GNIP Database 2016).

The enamel of large mammals mineralizes over a longer period of time than that of small mammals, resulting in attenuation of seasonal signals when mineralization occurs throughout a period of changes in precipitation. The attenuation of seasonal signals is more problematic still when multiple layers of enamel are sampled (Passey and Cerling 2002; Passey et al. 2005; Wiedemann-Bidlack, Colman, and Fogel 2008; Zazzo et al. 2010; Zazzo et al. 2012). Half-times for body water in rodents, humans, and cows (~640 kg) have been shown to be similar, at 0.5-2 weeks, which results in time scales of 7-30 days for body water to reach equilibrium (Longinelli 1984; Luz, Kolodny, and Horowitz 1984; Woodford, Murphy, and Davis 1984; Podlesak et al. 2008; Abeni et al. 2015). This may cause further attenuation of temporal isotopic variations in water input (e.g., surface water isotopic compositions) even if only individual layers of enamel are sampled.

Because large mammal tooth enamel $\delta^{18}\text{O}$ is much more susceptible to attenuation, seasonal variations on the order observed in modern lowland Panama that only last for 2-3 months might be difficult to identify, even with serial sampling. The argument that attenuation is likely responsible for the lack of a seasonal signal is further supported by the observation that intra-tooth variability is significantly greater in *Pericotoxodon* molars, which were evergrowing and thus would have experienced much less remodeling during the enamel mineralization process. This demonstrates the utility of sampling a wide variety of taxa when seeking to reconstruct climatic conditions, particularly when determining the extent of seasonality is of interest.

3.4 Differentiating between semiaquatic and terrestrial habits in large endemic ungulates

Semiaquatic habits have been proposed for all three of the megaherbivores, including *Pericotoxodon*, *Huilatherium*, and the astrapotheres. As would be expected in a humid environment, we did not observe significant differences among the $\delta^{18}\text{O}$ composition of tooth enamel from different taxa. The most likely explanation is that the climate of La Venta was too humid for evaporative enrichment of ^{18}O in body water to be detected above the noise introduced by different and unknown physiologies, regional variations, and averaging of fossil assemblages over geologic time.

The average standard deviation for $\delta^{18}\text{O}$ variability within a given site in *Huilatherium* is 0.32‰, with a maximum standard deviation of 0.35‰ (Figure 5.2). Studies have found that aquatic and semiaquatic mammals typically have $\delta^{18}\text{O}$ variability between 0.3-0.5 ‰ (Clementz and Koch 2001; Clementz et al. 2006). Considering the likelihood that the specimens at any given locality likely represent a time-averaged assemblage over hundreds to tens of thousands of years (Rogers 1993; Aslan and Behrensmeyer 1996), such low variability is indicative of very isotopically homogeneous *Huilatherium* populations and of stable environments. This represents the first strong evidence for semiaquatic habits in *Huilatherium* or Leontiniidae in general.

In contrast, semiaquatic habits are not supported in this study for the toxodontids (Figure 5.2). The average standard deviation of $\delta^{18}\text{O}_{\text{CO}_3}$ or $\delta^{18}\text{O}_{\text{PO}_4}$ at any given site is 0.75‰, which is consistent with a fully terrestrial mammal (Clementz et al. 2006). Such a finding is consistent with recent biomechanical findings for the later toxodontids, *Toxodon* and *Hoffstetteria*, which indicate a specialized, passively locking knee that would allow standing for long periods of time. An alternative interpretation is that the variability is greater because of time averaging. Howev-

er, this explanation is considered to be the less parsimonious explanation for the data given 1) biomechanical evidence is consistent with terrestrial interpretations, 2) the lack of detectable isotopic changes over even the much larger stratigraphic ranges that are covered by the sampling sites, 3) the consistency in the isotopic composition of *Huilatherium* $\delta^{18}\text{O}$ from the same sites suggests that time averaging was minimal or that climate was very constant, and 4) intratooth variability is also much higher than in *Huilatherium* teeth.

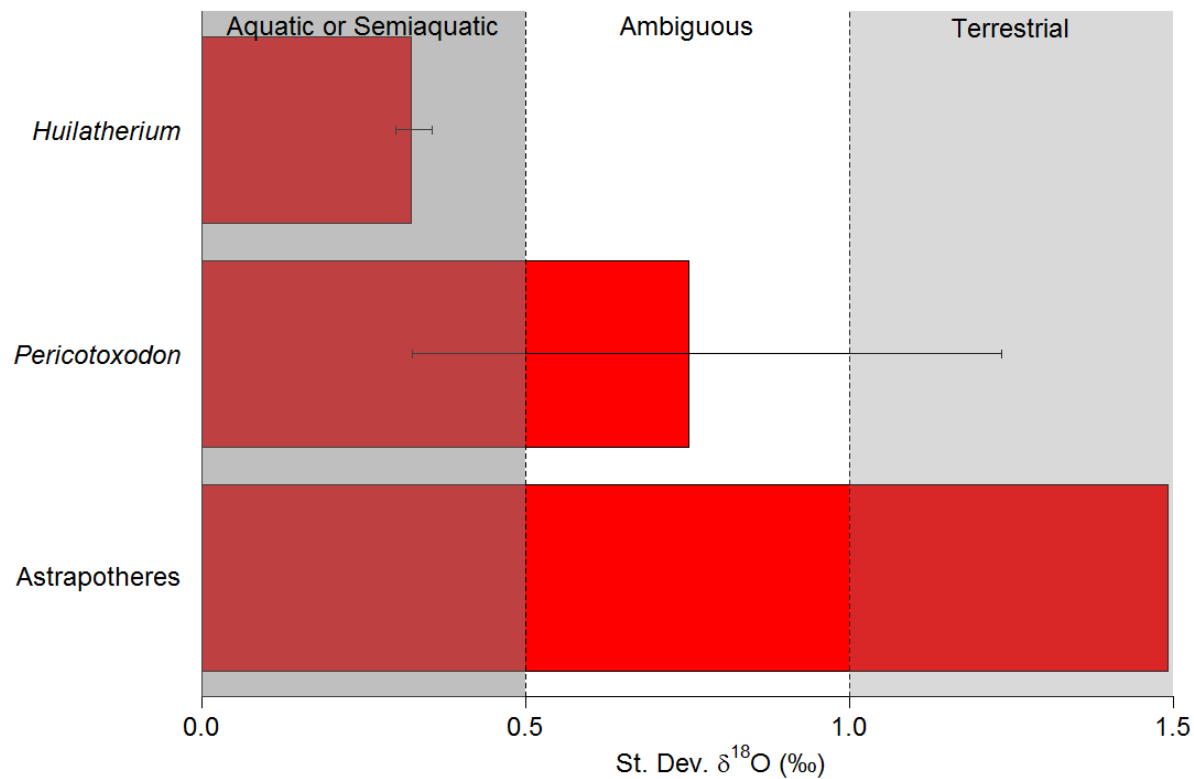


Figure 5.2: Semiaquatic v. terrestrial habits of La Venta megaherbivores. Individuals occurring at a given specific location and horizon for any taxon are treated as “populations.” Categories are defined using the standard deviation of $\delta^{18}\text{O}$ based on prior work in modern and fossil populations (Clementz and Koch 2001; Clementz et al. 2006). *Huilatherium* populations all fall well within the expected range for aquatic to semiaquatic taxa. On the other hand, astrapotheres (which lack greater taxonomic resolution in this sample) fall well into range typical of fully terrestrial taxa. The average standard deviation for *Pericotoxodon* samples is centered in the ambiguous range, with individual populations ranging from typical aquatic to typical terrestrial values.

The $\delta^{18}\text{O}$ of astrapothere tooth enamel is the most variable of any of the large mammalian taxa studied, with a standard deviation of 1.5‰ (Figure 5.2). There are two possible reasons for this. First, the obvious explanation is that astrapotheres may not have spent substantial amounts of time in the water. Studies have demonstrated that Santacrucian astrapotheres had the ability to support well more than their own weight on land (Cassini et al. 2012), and so this explanation is certainly reasonable.

A second possible explanation relates again to time averaging coupled with the possibility that astrapotheres had greater climatic tolerance and persisted through short-scale climate changes in which the other large mammals were not present. However, taphonomic and morphological evidence indicates that astrapotheres were more ecologically more selective than toxodonts in that they are nearly always associated with water bodies and seem to have been browsers in relatively closed habitats (Marshall, Salinas, and Suarez 1990; Rensberger and Pfretzschner 1992; Kay and Madden 1997b; Townsend and Croft 2005; Cassini et al. 2012; Cassini and Vizcaíno 2012; Cassini 2013; Houssaye, Fernandez, and Billet 2016). Given the greater ecological flexibility of toxodonts and the evidence for environmental stability described above, this explanation seems unlikely.

Third, unlike leontiniids and toxodontids for which only a single species has been described in the La Venta fauna, three species in three genera (*Granastapotherium snorki*, *Hilarcotherium castanedaii*, and *Xenastapotherium kraglievichi*) have been described (Johnson and Madden 1997; Jaramillo 2010; Vallejo-Pareja et al. 2015). The sizes of the astrapotheres also vary considerably, with an estimated body mass of 1200-1300 kg for *X. kraglievichi*, 1300 kg for *H. castanedaii*, and 1400-3000 kg for *G. snorki*. Such large differences in body mass could easily result in physiological variations in the fractionation between $\delta^{18}\text{O}$ of drinking water and body

water between species, which would in turn result in large standard deviations when all species are treated together. Furthermore, for there to be at least three species of large, closely related taxa coexisting in the fauna, there were likely differences in resource use that could have increased interspecific differences in the isotopic composition of ingested water. Unfortunately, because of the destructive nature of isotopic analysis, the samples analyzed were fragmentary and could not be identified at the generic or species level. Isotopic analyses of more complete material, for which at least generic level identification is possible, will be necessary to differentiate between these two explanations.

3.5 Implications for vegetation structure

One major question with regards to the La Venta ecosystem relates to the vegetation structure. The type of vegetation in an area is a critical component of the local habitat, and so an understanding of the basic floral community is necessary for interpreting ecological roles and preferences of any fossil species. However, because macroflora in the Honda Group is limited to a few pieces of preserved wood, such interpretations are difficult. Sedimentary and animal fossil evidence has led to differing conclusions. Thus, isotopic evidence has the potential to significantly improve our understanding of the entire La Venta ecosystem.

The first step in interpreting vegetation structure from tooth enamel $\delta^{13}\text{C}$ values is to adjust for changes in the $\delta^{13}\text{C}$ of atmospheric carbon dioxide. This can be done using the isotopic composition of planktonic or benthic foraminifera in the fossil record over time to reconstruct high resolution $\delta^{13}\text{C}$ curves for the atmosphere (Koch, Zachos, and Dettman 1995; Ekart et al. 1999; Pagani, Arthur, and Freeman 1999; Pagani, Freeman, and Arthur 1999; Passey et al. 2002; Passey et al. 2009). Benthic foraminifera record atmospheric $\delta^{13}\text{C}$ with higher fidelity and more

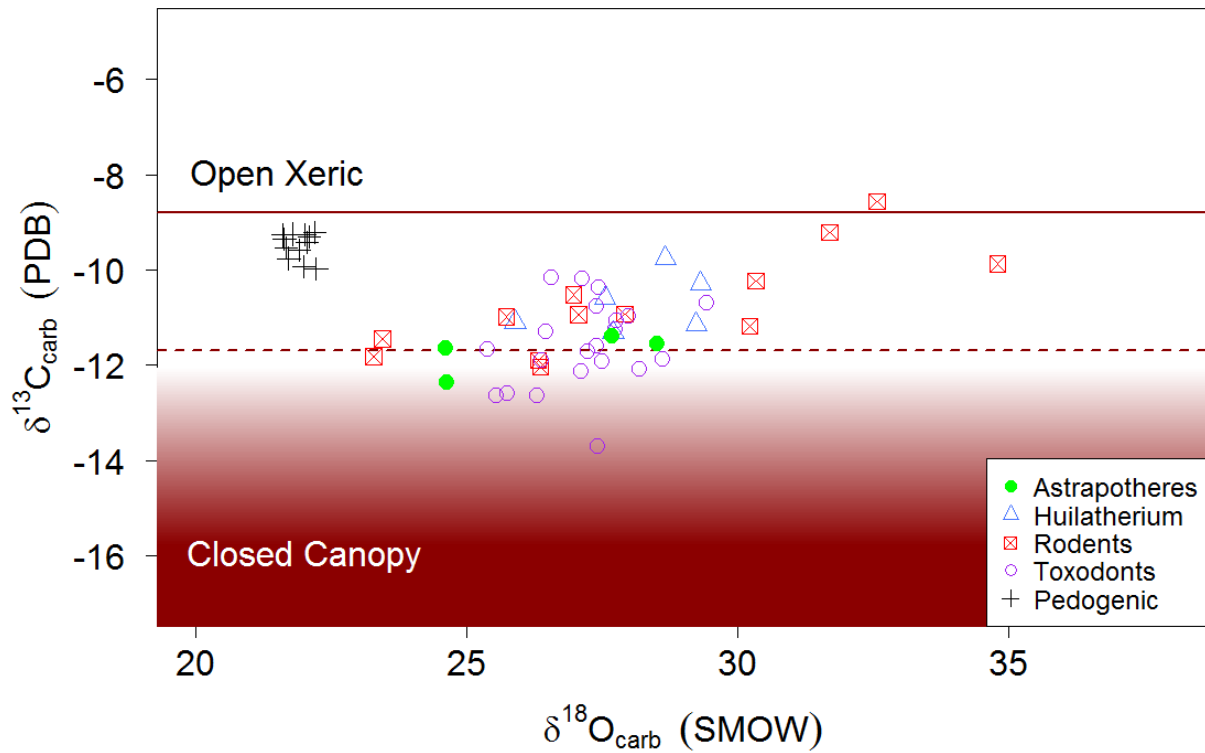


Figure 5.3: Implications of stable isotopes for La Venta vegetation structure. The isotope data overlay a diagram of typical interpretations of $\delta^{13}\text{C}$ values for pure C_3 ecosystems after adjusting for changes in atmospheric $\delta^{13}\text{C}$ over time. Shading indicates a range from $\delta^{13}\text{C}$ values that indisputably indicate closed canopy conditions (lower $\delta^{13}\text{C}$ values and solid shading) ranging to values that are sometimes, albeit controversially, interpreted as indicative of closed canopy habitats (progressively lighter background shading). The dotted line is the “average” $\delta^{13}\text{C}$ value for pure C_3 ecosystems, and the solid line differentiates xeric C_3 ecosystem $\delta^{13}\text{C}$ values.

quantifiable uncertainty than planktonic foraminifera based on comparison with measured $\delta^{13}\text{C}_{\text{CO}_2}$ from ice cores for the last 50k years (Tippie, Meyers, and Pagani 2010). Based on benthic foraminiferal records, the atmosphere during the formation of the Honda Group (13.5-11.6 Ma) had a $\delta^{13}\text{C}$ composition of $-5.95 \pm 0.35\text{‰}$. Using ϵ values based on modern data (Cerling and Harris 1999; Passey et al. 2002) and an average $\delta^{13}\text{C}$ for modern C_3 plants of -27‰ (Kohn 2010),

the expected $\delta^{13}\text{C}$ values of tooth enamel for La Venta mammals are approximately 1.6‰ higher than for modern C_3 herbivores.

Using the adjusted values for expected $\delta^{13}\text{C}$ of tooth enamel, it is possible to assess the environment in which the mammals of La Venta lived. Figure 5.3 overlays the tooth enamel isotopic data on the modeled environmental interpretations. Higher $\delta^{13}\text{C}$ values indicate more drought-stressed conditions, whereas values lower than the average indicate wet conditions and/or an increasing canopy effect. Based on metadata from modern studies, the high end $\delta^{13}\text{C}$ values of understory plants in closed canopy ecosystems are below -31.5‰ (Kohn 2010), and with an average atmospheric composition of -8‰, this equates to an $\epsilon_{\text{closed canopy} - \text{CO}_2}$ of -23.69. Based on the atmospheric composition of the Middle Miocene atmosphere and the $\epsilon_{\text{Enamel} - \text{Diet}}$, this translates to $\delta^{13}\text{C}$ of enamel less than -15.8‰. Our data indicate that, while the majority of samples have lower than average $\delta^{13}\text{C}$, only one of the samples is low enough to suggest a closed canopy forest, and this sample is an unidentifiable mammalian tooth fragment ($\delta^{13}\text{C} = -16.7\text{‰}$). This may represent one of the species that would be likely to associate exclusively with the densest areas of vegetation, but because of the fragmentary nature of the material, this hypothesis is untestable.

The large mammal (astrapothere, *Huilatherium*, and toxodont) values are not statistically lower than the expected mean $\delta^{13}\text{C}$ for average C_3 diets at the 95% confidence level (Wilcoxon signed rank test, $p=0.9461$). The $\delta^{13}\text{C}$ values are low enough to suggest that the La Venta ecosystem was likely wet and at least partially forested, but did not possess a full closed canopy rainforest. However, without a broader taxonomic sample, preferably including litopterns or other species that would most likely reside and forage in the most heavily forested regions most

or all of the time, it is impossible to completely rule out the possibility of closed canopy forests anywhere in the area.

As with the oxygen data, rodent $\delta^{13}\text{C}$ reaches higher values than those observed in any of the large mammal species. Because of the covariation of $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$, the most likely explanation is that the rodents record a time that is either not recorded or is too attenuated for recognition in the large mammal teeth. This time period would have been characterized by drier, and perhaps also warmer, conditions. However, based on the lack of a clear signal of seasonality in the large mammal serial samples, this period was no longer than 2-3 months.

The interpretations of climate and vegetation structure are consistent with each other. Based on faunal composition and interpreted ecological characteristics, Kay and Madden (1997a) estimated that the La Venta ecosystem probably received between 1500-2000 mm of precipitation per year. Savannas, woodlands, and rainforests all overlap as possible ecosystems in this range, in which differences between the ecosystems are determined largely by the extent to which precipitation is seasonal (Kay and Madden 1997a). Tropical forests tend to exist where the seasonality of precipitation is least pronounced, but even closed canopy forests experience short dry seasons, as exemplified by the lowland rainforest in the canal zone of modern Panama (IAEA/WMO GNIP Database 2016).

4. CONCLUSIONS

This study represents the first application of stable isotope methods to the La Venta fauna from the Middle Miocene of Colombia. The results are clearly inconsistent with diagenetic alteration, and thus ecological interpretations are possible. Despite reports of significant C_4 biomass in temperate North America during this interval, the isotopic composition of both tooth

enamel and pedogenic carbonates from the Honda Group are inconsistent with C₄ photosynthesis at a detectable level. Differences in the variability of $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ between large and small mammals highlights physiological differences in the attenuation of environmental signals and demonstrates the value of sampling enamel from mammals of multiple size classes when attempting ecological reconstructions. Variability in $\delta^{18}\text{O}$ is most parsimonious with an interpretation of terrestrial habits in toxodontids (*Pericotoxodon*), semiaquatic habits in leontiniids (*Huilatherium*), and is indeterminate for astrapotheres because of the lack of taxonomic resolution in our sample identifications. Finally, the $\delta^{13}\text{C}$ compositions of mammalian tooth enamel are consistent with a wet climate and possibly open forests, but do not yield evidence for significant areas of closed canopy rainforests.

Chapter 6: Body Mass in South American Mammals over the last 15 Million Years

1. INTRODUCTION

The last 15 Myr represents a particularly critical and interesting time in the evolution of South American mammals. During this time, South America was subject to global cooling and drying trends related to the growth of the East Antarctic Ice Sheet (Flower and Kennett 1994; Zachos et al. 2001; Shevenell, Kennett, and Lea 2004; Zachos, Dickens, and Zeebe 2008). These changes were associated with increased seasonality (Fox 2000; Böhme 2003; Micheels et al. 2007) and a large-scale expansion of grasslands at the expense of forests (Webb 1977; Janis 1989; Flower and Kennett 1994; Fox 2000; Janis 2008). The uplift of the Andes over this interval (Gregory-Wodzicki 2000; Hartley 2003) further altered both the abiotic and biotic landscape. Finally and perhaps most impressively, the Great American Biotic Interchange between North and South America, widely heralded as one of the greatest natural experiments in mammalian history, permanently altered the composition of the South American mammalian fauna. In order to more completely understand the consequences of any of these changes on the mammalian faunas, comprehensive paleobiological data on characteristics such as body mass are necessary.

Body mass is a characteristic which affects nearly every other aspect of the physiology, ecology, and evolutionary history for a given species. Quantitative relationships with body mass have been identified for multiple aspects of metabolism, temperature regulation, locomotion, ingestion, respiration, water balance, reproduction, growth, and production (McNab 1990). Body mass places biomechanical constraints upon the modes of locomotion and substrate use that are available to an animal species (Biewener 1989; Biewener 1990; Biewener 2000; Biewener 2005;

Spence 2009; Toledo 2016), which in turn defines the range of dietary options, breeding or nesting sites, and escape strategies that taxon may employ (Eisenberg 1981). Size also relates to diet and nutrition more directly in that it exercises control on physiological characters, such as mass-specific metabolic rate and residence time of food in the digestive system, and therefore constrains the diets available to animals in various size classes (Feldhamer et al. 2015). In at least some contexts, body mass is also associated with extinction risk, although explanations for this pattern vary (Alroy 2001; Johnson 2002; Barnosky et al. 2004; Cardillo et al. 2005; Johnson and Isaac 2009). Furthermore, many of the correlates of body mass cannot be measured directly for fossil species. Consequently, body mass estimation rates highly among the most important characteristics of fossil taxa for paleobiological reconstruction.

1.1 Overview of methods for mammalian body mass estimation

A number of approaches allow estimation of the body mass of fossil mammals. By far the most common technique is the use of allometric regressions. Most mammals scale allometrically in both ontogeny and evolution; that is, their shape changes along with their size. Allometric scaling is represented by power equations of the form:

$$Y = Y_0 M^b,$$

where Y is the dependent variable (body mass in this study), Y_0 is a normalization constant, M is the independent variable (morphological variables expressed as lengths in this study), and b is the scaling exponent. These functions are easier to work with when expressed using logarithms (including, as in for this study, natural logarithms):

$$\ln Y = b \ln M + \ln Y_0.$$

This feature allows the use of linear regression analysis of data for which both morphology (length) and body mass are known, with the scaling exponent b as the slope and $\ln Y_0$ as the intercept. Once the relationship has been established, typically among extant species that are functionally and phylogenetically close to the fossil species of interest, then the relationship may be used to predict body mass in extinct taxa.

Another approach assumes geometric similarity between two taxa. This approach assumes isometric scaling, wherein the shape remains the same as size increases. Thus, under isometric scaling, body mass increases proportionally to length cubed. While true isometric scaling is rare in biology and is typically confined to scaling across very narrow ranges of body mass, the errors caused by deviations from geometric similarity may be minimized when the species compared are reasonably similar in size and shape (Vizcaíno, Bargo, and Cassini 2006). This approach has the advantage that it may be applied to measurements shared by only two taxa without need for knowledge of the broader scaling relationship across the entire clade.

While geometric similarity and bivariate allometric regression analyses are the most common ways in which body mass has been estimated for the fossil mammals of South America, several other approaches have also been developed. These approaches are discussed in the context of the uncertainties associated with both approaches in the following section.

1.2 Uncertainty in body mass estimation

Body mass estimation in extinct mammals is laden with difficulties. Many of these problems relate to the incomplete nature of the fossil record. Using the most robust relationships between morphological variables and body mass is, of course, contingent on the preservation of the necessary elements, which is problematic given that many taxa are known only from isolated jaw

fragment or isolated teeth. This also limits the number of different relationships that can be applied and averaged to improve the estimate. In some cases, the only remains are elements that vary substantially in size depending on ecological characteristics such as diet and mode of locomotion, which therefore may yield misleading estimates when these characteristics vary substantially between the taxa used for the original relationship and the fossil taxon.

Another source of uncertainty results from the lack any close living relatives and/or morphological analogues for some fossil taxa. This is a major issue even in the Neogene record for South American mammals, in which entire orders (Litopterna, Astrapotheria, Notoungulata, Sparassodonta, Polydolopimorphia) are now extinct. Other taxa, such as xenarthrans, contain entire extinct families which are ecologically very distinct from their extant relatives and so have very different craniodental and postcranial proportions. While extant sloths are suspensory arboreal browsers, extinct “ground sloths” included semifossorial, graviportal, scansorial, arboreal, and semiaquatic habits with browsing, mixed feeding, and grazing diets (White 1993; White 1997; Bargo et al. 2000; Bargo 2001; Bargo, Iuliis, and Vizcaíno 2006; Bargo, Toledo, and Vizcaíno 2006; Bargo and Vizcaíno 2008; Vizcaíno et al. 2001; Pujos et al. 2012). Cingulates also had much greater taxonomic and ecological diversity in the past, including insectivorous, myrmecophagous, omnivorous, mesocarnivorous, browsing, mixed feeding, and grazing taxa with generalized terrestrial, semifossorial, fossorial, graviportal, and cursorial locomotion (Fariña 1985; Fariña 1995b; Vizcaíno and Bargo 1998; Vizcaíno, Iuliis, and Bargo 1998; Vizcaíno et al. 2001; Iuliis, Bargo, and Vizcaíno 2001; Bargo 2003; Abrantes, Avilla, and Vizcaíno 2005; Vizcaíno et al. 2006; Vizcaíno 2009; Carlini and Zurita 2010)

Furthermore, many taxa, including many of the xenarthrans discussed above, are far outside the range of masses observed in their extant relatives, and extrapolation of regressions from

much smaller taxa leads to large uncertainties. For instance, the rodent *Dinomys* (15 kg) is the only extant genus of Dinomyidae; in the past, however, Dinomyidae and its sister family Neopiblemidae included species ranging up to as much as 1000 kg, but these mass estimates are highly controversial because of the uncertainties cited here (Sánchez-Villagra, Aguilera, and Horovitz 2003; Rinderknecht and Blanco 2008; Blanco 2008; Hopkins 2008; Millien 2008; Millien and Bovy 2010; Blanco, Rinderknecht, and Lécuna 2012; Vucetich et al. 2015).

The accuracy of estimates yielded by geometric similarity also suffers when the taxa compared are of such different sizes because mammals tend to scale allometrically rather than isometrically (McMahon 1975; Alexander et al. 1979; Gingerich, Smith, and Rosenberg 1982; Gingerich 1990; Fortelius and Kappelman 1993; Vizcaíno, Bargo, and Cassini 2006), and the errors introduced by assuming geometric similarity increase greatly when comparing two mammals of very different mass. Furthermore, proportions in mammals typically scale differently across different ranges of body mass (Silva 1998), which adds further errors. Ecological differences exacerbate these problems, as they may be associated with systematic differences in functionally relevant morphological proportions.

Several approaches help to alleviate this uncertainty. For instance, in the case of xenarthrans, scale and computer models for more completely known taxa allow body mass reconstruction with fewer pitfalls than extrapolation of regressions and geometric similarity across such large differences in body mass (Fariña 1995b; Vizcaíno, Cassini, et al. 2011). These mass estimates then serve as a baseline for determining which allometric regressions are appropriate for a given clade (Fariña, Vizcaíno, and Bargo 1998; Bargo et al. 2000) or for comparisons with more poorly known taxa via geometric similarity (Croft 2000; Vizcaíno et al. 2006; Vizcaíno, Fernicola, and Bargo 2012; Vizcaíno et al. 2012). Other approaches, such as multivariate regression and

the use of centroid size based on geometric morphometrics, have also been shown to reduce the error in body mass estimation for South American mammals (Bargo, Toledo, and Vizcaíno 2012; Cassini, Vizcaíno, and Bargo 2012; Toledo et al. 2014).

2. METHODS

This study compiles body mass estimates for South American mammals in two ways. First, an extensive literature review was conducted in order to obtain body mass estimates for as many taxa as possible. For taxa with multiple body mass estimates in the literature, all estimates were averaged. For the remaining taxa, body mass was estimated by predictive regression equations and, in a relatively small number of cases, by assuming geometric similarity with a close living or fossil relative with a better established body mass. In several cases, body mass estimates were published or encountered in prior literature after a new mass had been calculated. In these cases, both the estimates from the literature and the current study are included (Appendix 3.9) to demonstrate the consistency of results here with those from other studies.

Body mass estimates are more reliable when they are obtained by averaging the estimates obtained using regressions of comparable quality (Scott 1990). Consequently, for each species, the final body mass estimate is calculated by averaging estimates using all regressions of comparable quality for which fossil material is available. For example, in ungulates, postcranial variables provide better estimates than those obtained from dental series lengths, which in turn provide better estimates than individual molar lengths. Thus, the body mass calculated here would be the average of postcranial estimates, or the average of estimates of molar row lengths if postcranial material is unavailable, or the average of individual molar estimates if neither postcranial nor molar row measurements are available.

2.1 Xenarthra: Tardigrada

When appropriate measurements were available, the bicondylar width of the femur (Croft 2000) was used to estimate body mass for sloths. Croft developed this equation using data from ursids, sloths, and the giant anteater because of the strong relationship between femoral dimensions and body mass in a wide range of living and extant taxa and because the femoral condyles are not extremely enlarged as in the femoral shafts, which results in overestimates of body mass (Croft 2000). However, this relationship likely still gives overestimates of body mass, as postcranial relationships tend to overestimate body mass in ground sloths.

Following Shockey and Anaya (2011), a regression relating body mass to total skull length in ungulates (Janis 1990) was also included in body mass calculations for sloths when appropriate measurements were available. These estimates are likely substantial underestimates of the total body mass for sloths (Shockey and Anaya 2011), but provide better estimates than are available from dental measurements because of the extremely reduced dentition of all xenarthrans.

Because many of the species for which body mass has not been calculated lack the necessary materials to estimate body mass using either of these methods, several other regressions were calculated following the logic of Croft (2000). Morphological data was compiled for extinct sloth species for which there are body mass estimates in the literature. Estimated body mass was then regressed against morphological variables that provide robust body mass estimates for other taxa, including lower and upper tooth row lengths, skull length, femur and humerus length and distal widths, tibia length, radius length, ulna length, astralagar length, and calcaneum length. The resulting relationships for tibia, radius, ulna, and upper tooth row lengths were considered insufficient for body mass estimation ($r^2 < 0.6$) and so were not used.

2.2 Xenarthra: Vermilingua and Cingulata

Body mass estimation in vermilinguans and cingulates is particularly challenging. Consequently, new body masses in this study were calculated using geometric similarity to close relatives for which there are published mass estimates. These calculations followed the classic equation (e.g. Candela, Cassini, and Nasif 2013) for geometric similarity:

$$M_u = \left(\frac{L_u}{L_k}\right)^3 \times M_k,$$

where M_u is the unknown body mass, M_k is the “known” (or in this case, previously estimated) body mass, L_u is the length of a morphological variable for the taxon with unknown body mass (e.g., femoral length), and L_k is the same length for the taxon of known or estimated mass.

2.3 Marsupials

Body size for marsupials was estimated exclusively from the lengths of individual teeth using the regressions calculated by Croft (2000) based on extant didelphids and caenolestids, and Gordon (2003) based on extant didelphids and dasyurids. Based on the discussion and r^2 values provided by the authors, there is no reason to favor any of the dental variables over others for mass estimation. However, following Janis (1990) and Croft (2000), only lengths were used because tooth widths and areas vary systematically with dietary preferences, whereas lengths are more dependent on body mass. Thus, the body masses for each species were calculated as the average of estimates using all available regressions for dental lengths from both studies.

2.4 Ungulates

For ungulates, postcranial measurements provide more reliable estimators of body mass than dental measurements (Damuth 1990; Janis 1990). Postcranial measurements should scale in a consistent way with body mass for animals with similar shape and locomotion because the

bones must be strong enough to bear the mass of the animal (Scott 1990). In particular, total head-body length correlates very strongly with body mass (Damuth 1990), although this variable is not available for any of the species discussed here. The other strongest predictors of body mass for ungulates are femur length, humerus length, and nonlength limb dimensions (Scott 1990). Consequently, any of these variables for which suitable measurements were available were used to calculate body mass.

For ungulate species lacking postcranial data, molar row lengths were the next most preferable data. While dental variables are generally less closely correlated with body mass than postcranial variables, molar row lengths provide more reliable estimates of body mass than do measurements of individual molar dimensions (Janis 1990). Molar row lengths are also rarely influenced by dietary differences, a fact which helps to avoid a major source of bias that affects calculations using some other dental variables.

Finally, for the majority of species analyzed in this study, only individual molar measurements were available. Estimates made on the basis of molar dimensions should be treated as tentative and should be verified using molar row lengths and/or postcranial measurements should suitable fossil material become available. However, major sources of bias may still be avoided by using regressions that are specific to the crown morphology and diet.

2.5 Rodents

Many studies have indicated that the length or area of the entire cheek tooth row provides a more robust estimate of body mass than regressions based on only one dental element, such as m1 or m2 (Hopkins 2008; Millien and Bovy 2010; Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015; Bertrand, Schillaci, and Silcox 2015). While limb bone

measurements are generally favored for many taxa because of their role in bearing the mass of the animal, the diversity of locomotion within rodents complicates the use of limb bone measurements for body mass estimates (Hopkins 2008; Millien 2008; Millien and Bovy 2010). Consequently, cheek tooth row lengths are the preferred variable for body mass estimation in this study.

However, for fossil species, measurements of tooth row lengths are often unavailable. For rodents, the sum of the molars and the premolar in species with a premolar is a good proxy for the length of the full toothrow, and the average difference is very small (0.41% for the lower tooth row and 1.11% for the upper tooth row). Consequently, the sum of the individual lengths of the cheek teeth may be used as a proxy for the length of the cheek tooth row if the latter measurement is unavailable (Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015).

In the case of some of the species, data are not available for any of the preferred characters for body mass estimation. In these cases, estimates were made on the basis of other available dental characters. Estimates were made using equations from the literature on the basis of m1, m2, M1, and M2 lengths for caviomorph rodents (Croft 2000), and m1 length and m1 width for all rodents (Millien and Bovy 2010).

For rodents larger than any extant rodent species, all methods of estimation present particular challenges for mass estimation. Extrapolation of regression equations to animals that fall outside the mass range of the animals on which the regression is based is one of the largest contributors to error in body mass estimation (Damuth and MacFadden 1990). This has resulted in a great deal of controversy with regards to the best approaches for estimating the body mass of very large rodent species (Sánchez-Villagra, Aguilera, and Horovitz 2003; Blanco 2008; Hop-

kins 2008; Millien 2008; Rinderknecht and Blanco 2008; Millien and Bovy 2010; Vucetich et al. 2015). However, the results of these studies suggest that tooth row length and tooth row area may be among the most reliable variables upon which body mass estimates can be made. Because length is less likely to change with age and tends to be more highly correlated with body mass, tooth row length is used for this study wherever available.

In addition, geometric similarity was used for body mass estimates in a relatively small number of rodents for which appropriate regressions were not available. The methodology for using geometric similarity is outlined in the section on Cingulata.

2.6 Primates

As for many other vertebrates, postcranial measurements provide more reliable estimates of body mass than dental measurements (Jungers 1990 and references therein). Consequently, estimates using postcranial variables following the equations of Ruff (1990) are considered preferable to dental variables for body mass estimation. When postcranial data is unavailable, the equations of Sears et al. (2008) allow estimates of body mass from dental dimensions.

2.7 Bats

Gunnell et al. (2009) report five bivariate regressions for use in calculating the body mass of extinct bat species. Of these measurements, humerus midshaft diameter is the most highly correlated with body mass ($r^2=0.869$). The r^2 values are slightly lower but comparable for p4 area ($r^2=0.857$), m1 area ($r^2=0.829$), and M1 area ($r^2=0.818$), and are considerably lower for humerus length ($r^2=0.711$). Consequently, other variables are preferred over humerus length for prediction of body mass in this study.

Relative to body mass, the cheek teeth of modern *Desmodus* species are very reduced while the canines are greatly enlarged compared with other bat species (Greenhall 1972); thus, dental variables are inappropriate for body mass estimation in extinct *Desmodus* species and were not used for this purpose. Because of the rarity of fossilized bats and thus the scarcity of morphometric data, only one variable was used to estimate body mass for each species.

3. RESULTS AND DISCUSSION

3.1 Xenarthrans: Tardigrada

3.1.1 *New bivariate regressions for body mass estimation in ground sloths*

This study presents eight new bivariate relationships between craniodental and postcranial morphological variables and body mass (Table 6.1, Figures 6.1-6.8). Body mass is calculated by the equation:

$$BM = e^{a\ln(L)+b} \times CF,$$

where *BM* is body mass (kg), *a* is the slope from the linear regression of natural log-transformed data, *b* is the intercept, *L* is the length measurement (mm), and *CF* is the correction factor. The correction factor is necessary because when the predicted body masses generated by least squares regression are retransformed back to arithmetic units, there is a positive skew in the distribution that results in underestimates of body mass. Consequently, following Freudenthal and Martín-Suárez (2013), a correction factor is applied after retransformation.

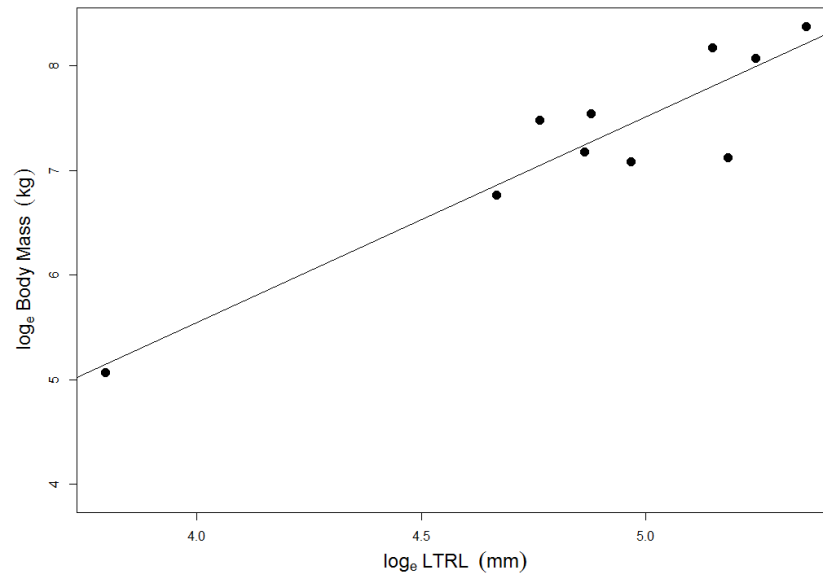


Figure 6.1: Regression of log-transformed body mass (kg) on log-transformed lower tooth row length (mm) in ground sloths. Body mass estimates and morphological measurements (Appendix 3.10) both derive from an extensive literature review.

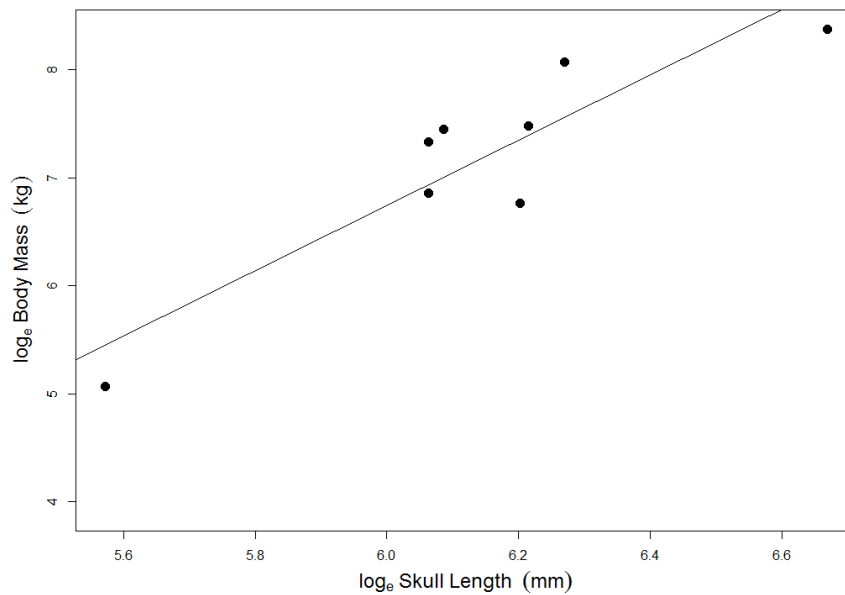


Figure 6.2: Regression of log-transformed body mass (kg) on log-transformed skull length (mm) in ground sloths. Body mass estimates and morphological measurements (Appendix 3.10) both derive from an extensive literature review.

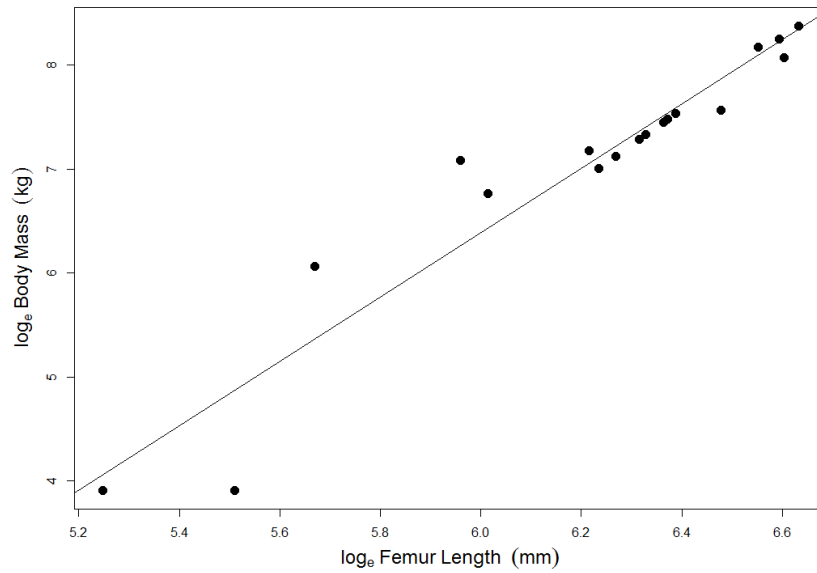


Figure 6.3: Regression of log-transformed body mass (kg) on log-transformed femur length (mm) in ground sloths. Body mass estimates and morphological measurements (Appendix 3.10) both derive from an extensive literature review.

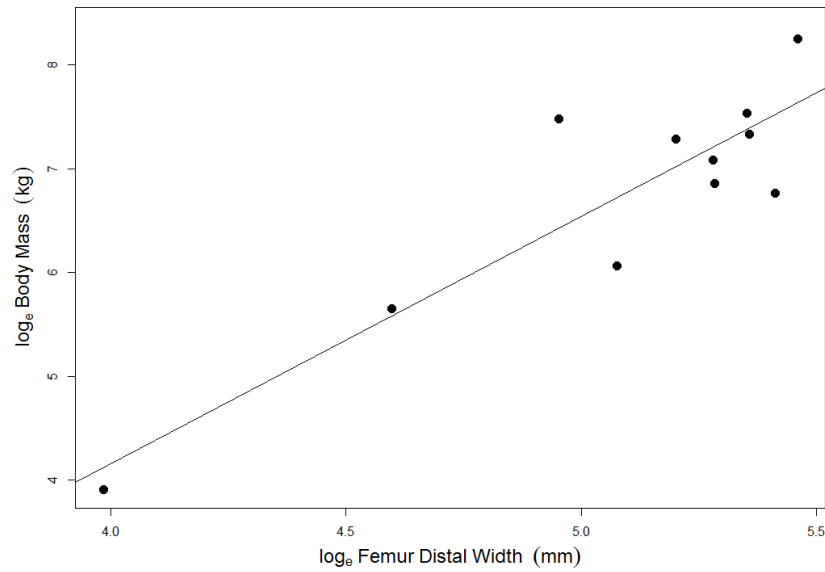


Figure 6.4: Regression of log-transformed body mass (kg) on log-transformed femur distal width (mm) in ground sloths. Body mass estimates and morphological measurements (Appendix 3.10) both derive from an extensive literature review.

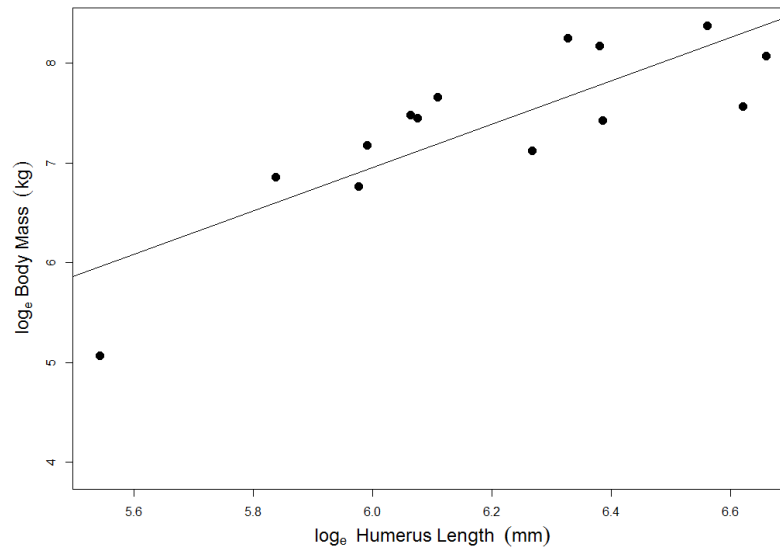


Figure 6.5: Regression of log-transformed body mass (kg) on log-transformed humerus length (mm) in ground sloths. Body mass estimates and morphological measurements (Appendix 3.10) both derive from an extensive literature review.

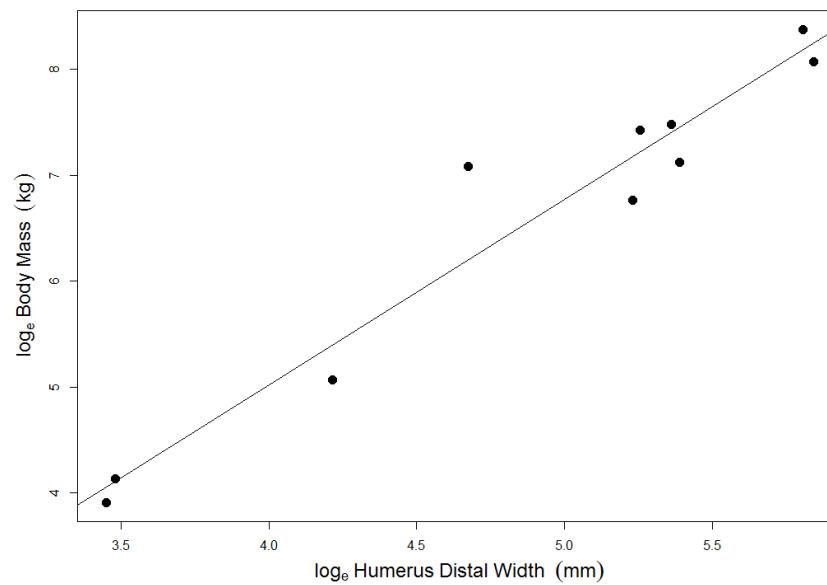


Figure 6.6: Regression of log-transformed body mass (kg) on log-transformed humerus distal width (mm) in ground sloths. Body mass estimates and morphological measurements (Appendix 3.10) both derive from an extensive literature review.

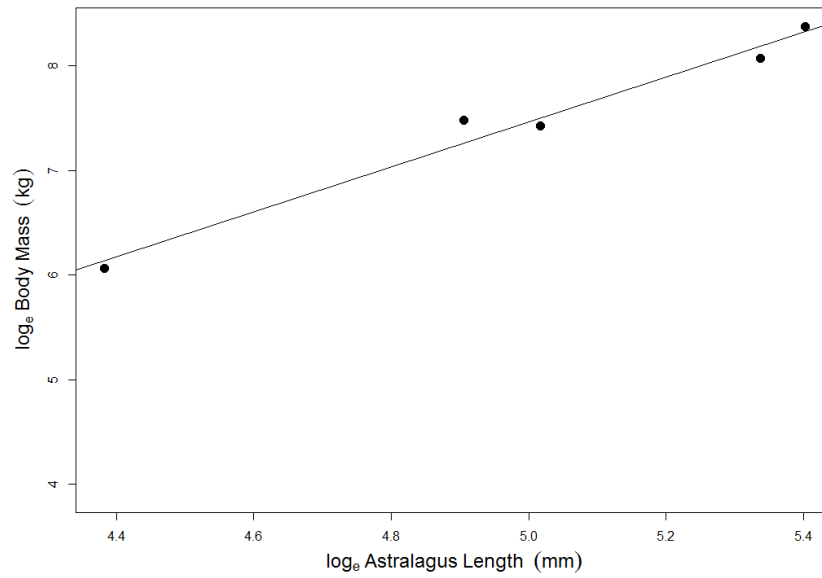


Figure 6.7: Regression of log-transformed body mass (kg) on log-transformed astralagus length (mm) in ground sloths. Body mass estimates and morphological measurements (Appendix 3.10) both derive from an extensive literature review.

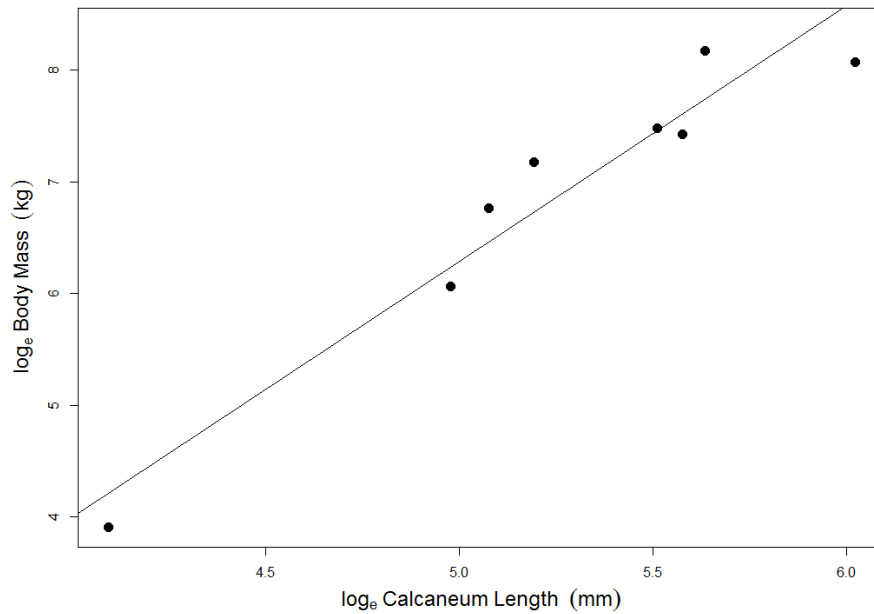


Figure 6.8: Regression of log-transformed body mass (kg) on log-transformed calcaneum length (mm) in ground sloths. Body mass estimates and morphological measurements (Appendix 3.10) both derive from an extensive literature review.

Table 6.1: New regressions for body mass estimation in extinct ground sloths. The following equations were developed by regressing the natural log of body mass estimates (kg) on the natural log of morphological measurements (mm). SEE is the standard error of the estimate, %SEE and %PE are the percent standard error of the estimate and the percent prediction error, calculated following (Van Valkenburgh 1990), and CF is the correction factor that is multiplied by the body mass estimate after conversion to kg following (Freudenthal and Martín-Suárez 2013). Note that the last four regressions are included for comparison, but were not used in this study, nor is their use recommended for other body mass estimates.

Measurement	Slope	Intercept	r^2	SEE	%SEE	%PE	CF
LMTR	1.9646	-2.3152	0.8565	0.3377	40.18	26.25	1.059
Skull length	3.0167	-11.358	0.8213	0.3990	49.03	37.04	1.083
Femur length	3.272	-13.329	0.9311	0.3649	44.04	25.76	1.069
Femur distal width	2.3822	-5.3718	0.7988	0.5037	65.48	45.03	1.135
Humerus length	2.1746	-6.0958	0.68	0.4554	57.68	40.63	1.109
Humerus distal width	1.7519	-1.9901	0.9434	0.3599	43.32	31.46	1.067
Astragalus length	2.1472	-3.2745	0.9758	0.1234	13.13	10.99	1.008
Calcaneum length	2.2889	-5.1583	0.9292	0.3432	40.95	31.18	1.061
UTRL	1.4871	0.2757	0.4794	0.7298	107.47	85.22	1.305
Tibia length	2.0341	-4.696	0.5806	0.6510	91.75	57.43	1.236
Radius length	1.3785	-1.0233	0.2772	0.7752	117.09	59.95	1.350
Ulna length	2.6748	-9.0442	0.5177	0.6561	92.73	53.38	1.240

Percent standard error of the estimate and percent prediction error are better indicators of the predictive ability of an equation than the correlation coefficient (Van Valkenburgh 1990). Thus, these measures, rather than r^2 , were primarily used to judge the quality of the regressions. Overall, the strength of the correlation and the prediction errors were comparable to those of the regressions used for many of the other groups in this study ($r^2 = 0.68$ to $r^2 = 0.9758$, %PE=10.99-45.03). Four additional regressions are presented for comparison, but were not used in this study and are not recommended for future use because r^2 is below 0.6 and percent prediction error is above 50% for these relationships.

It is important to bear in mind that unlike the other relationships used in this study, with the exception of one equation relating ground sloth mass to femur bicondylar width (Croft 2000),

these relationships are themselves based on body mass estimates. However, given the difficulties associated with body mass estimation in extinct ground sloths, the approach used here produces more accurate results than using bivariate regressions based solely on extant animals (Croft 2000). This is because the body mass estimates used to generate these equations have been produced using approaches that require more complete remains than are available for the sloths in this study, which precludes duplication of their estimation protocols.

There are a number of sources of error that likely resulted in the relative weakness of some of the relationships between morphometric variables analyzed here and body mass. Of course, the first source of error is that a certain amount of variation exists in the relationship between any such morphometric values and body mass. The relationships tend to be stronger when limited to taxa that are relatively closely related and that have similar mechanical requirements for the component under study; for example, postcranial variables are more strongly correlated to body mass within ungulates, for whom mode of locomotion is mainly cursorial, than among all mammals. However, “ground” sloths had tremendous diversity, with fossorial, terrestrial, scansorial, suspensory, and even aquatic modes of locomotion represented. Similarly, the group includes the full range of herbivorous diets from grazers to browsers, and dental formulas vary across the clade (e.g. Fariña, Vizcaíno, and Bargo 1998; Pujos, Iuliis, and Quispe 2011), which may systematically influence craniodental variables. Thus, the real variation may be greater within the true relationships than for other taxonomic groups.

In addition to the real variation in these relationships, the different methodologies (see Appendix 3.10 for details and references) that have been used to generate body mass estimates for extinct sloths likely introduce variation into the relationships calculated here. Some of the body mass estimates were obtained using relationships developed in extant xenarthrans. These

are the closest living relatives of the extinct xenarthrans, but the applicability of such regressions is limited because extinct xenarthrans reached much greater sizes and had a much wider range of ecological and biomechanical functions than their extant relatives. These regressions were based on a wide variety of craniodental and postcranial variables and included both bivariate and multivariate approaches. Other studies used relationships that were based on other taxa completely, such as ungulates, but which have been found to produce reasonable body estimates in at least some xenarthrans. Finally, some body masses have been estimated using geometric similarity between closely related extinct sloths.

The spread in relationships caused by differing body mass estimation procedures may have been exacerbated by small differences in the location and methods of taking the morphological measurements. These measurements were compiled from a large number of studies, many of which did not carefully diagram nor explain what was meant by the measurements in the paper. Consequently, the measurements used here may have represented slightly different dimensions for different species.

Moreover, the difficulties related to body mass estimation in xenarthrans result in systematic biases in the estimates. Consequently, estimates from the literature are likely underestimates when they are derived from dental or cranial features and are likely overestimates when they are derived from postcranial variables (Fariña, Vizcaíno, and Bargo 1998). The resulting spread in the estimates makes correlations very unlikely to be as strong as those that are developed based on actualistic studies. The best approach for compensating for this problem is to use the average estimate generated from as many different relationships as possible given the available material (Fariña, Vizcaíno, and Bargo 1998).

Comparison of the results of this study with those of Croft (2000) provides evidence that this variation in the relationship derives much more heavily from the artificial spread in body mass data and/or measurement data than from real variation in the relationship. Croft used data from a single author and study (Fariña, Vizcaíno, and Bargo 1998), and so body mass estimates and measurements were obtained using consistent methodologies. The resultant correlation coefficient was quite high ($r^2=0.94$). In contrast, the correlation coefficient for the relationship between body mass and distal femur width was much lower ($r^2=0.7988$). Consequently, it remains plausible that some of the weaker correlations between morphological variables and body mass result from combining both body mass estimates and morphological data from so many different sources.

This problem could be avoided by choosing to use data from only a single author. However, this study includes the results from all available sources in order to assess the precision of the body mass data collected from the literature. Despite the variation in approaches to estimating body mass, some of the variables still correlate very strongly with body mass and have low prediction errors. This also indicates that different methods, based on a variety of craniodental and postcranial elements, have produced consistent mass estimates. Such a finding lends increased confidence to the reliability of these estimates.

3.1.2 *Body mass estimates for extinct ground sloths*

Using the eight new regressions described above, body mass estimates were generated for 34 taxa (Table 6.2). As for the other taxa in this study, regressions were classified by their quality, and only the body mass estimates generated by the highest quality available for a given taxon

were averaged in the final estimate. However, all calculations are shown in Table S3.1 to allow comparisons of the results.

3.2 Xenarthra: Vermilingua and Cingulata

Body mass was only estimated for one additional vermilinguan, *Palaeomyrmidon* sp., by assuming geometric similarity with four species in three genera of living anteaters (Table S3.2).

Body mass for the three cingulate taxa in this study was estimated by assuming geometric similarity with *Neosclerocalyptus*. *Neosclerocalyptus* has an average estimated body mass of ~400 kg (Smith et al. 2003; Vizcaíno, Cassini, et al. 2011; Vizcaíno, Blanco, et al. 2011; Vizcaíno et al. 2012), which is similar to the masses estimated for the other three glyptodonts. Furthermore, glyptodonts have relatively conservative morphology and proportions (Croft 2000). Thus, the assumptions of geometric similarity likely do not bias these calculations substantially.

3.3 Marsupials

This study presents new body mass estimates for eight species of marsupials (Table 6.3). Marsupial body mass was estimated on the basis of the lengths of individual dental elements in this study. Although the correlations reported for the equations used are quite strong, the lengths of individual dental elements tend to be more variable than total dental or molar row lengths and some postcranial dimensions in a variety of taxa (Janis 1990; Croft 2000; Hopkins 2008; Freudenthal and Martín-Suárez 2013). However, for those species with published lengths of all upper and/or lower molars, averaging the mass estimates from all dental elements should provide a relatively similar result, as the sum of molar lengths generally is a good proxy for the length of the molar row (Damuth 1990; Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015). Also, as noted above, body mass estimates are more reliable when they are gener-

ated as the mean of estimates from relationships of comparable equality (Scott 1990), which strengthens the approach taken here further. Thus, while the mass estimates calculated for

Table 6.2: Body mass estimates for ground sloths. See the text and Table S3.1 for details on how these estimates were calculated.

Species	Body Mass (kg)
<i>Ahytherium aureum</i>	745
<i>Amphiocnus paranense</i>	187
<i>Australonyx aquae</i>	650
<i>Catonyx chiliensis</i> (= <i>Scelidotherium reyesi</i>)	1258
<i>Diabolotherium</i> (= <i>Nothropus</i>) <i>nordenskioldi</i>	105
<i>Eremotherium elenense</i>	1693
<i>Eremotherium sefvei</i>	527
<i>Hiskatherium saintandrei</i>	96.2
<i>Kiyumylodon lecuonai</i>	1106
<i>Lakukullus anatisrostratus</i>	326
<i>Lestobradys sprechmanni</i>	830
<i>Megalonychops primigenius</i>	2185
<i>Megathericulus patagonicus</i>	657
<i>Megatherium celendinense</i>	2654
<i>Megatherium medinae</i>	2010
<i>Megatherium sundti</i>	1945
<i>Megatherium urbinai</i>	1386
<i>Mesopotamocnus</i> (= <i>Ortotherium</i>) <i>brevirostrum</i>	381
<i>Octodontobradys</i> sp.	1113
<i>Octomylodon aversus</i>	1024
<i>Pliomegatherium</i> sp.	1721
<i>Pliomorphus mutilatus</i> , <i>P.</i> sp.	636
<i>Protomegalonyx chasicoensis</i>	208
<i>Protomegalonyx doellojuradoi</i>	1280
<i>Protomegalonyx praecursor</i>	393
<i>Protomegalonyx</i> sp.	502
<i>Sphenotherus zavaletianus</i> (= <i>S. paranensis</i>), <i>S.</i> sp.	888
<i>Thalassocnus antiquus</i>	158
<i>Thalassocnus littoralis</i>	168
<i>Thalassocnus natans</i>	181
<i>Thalassocnus yaucensis</i>	352
<i>Torcellia paranense</i>	559
<i>Urumacotherium</i> (= <i>Stenodon</i>) <i>campbelli</i>	293
<i>Xyophorus</i> sp.	142

Table 6.3: Body mass estimates for cingulates. See the text and Table S3.3 for details on how these estimates were calculated.

Species	Body Mass (kg)
<i>Boreostemma acostae</i>	229
<i>Eleutherocercus paranensis</i> , <i>E. sp.</i>	270
<i>Trachycalyptoides sp.</i>	183

Table 6.4: Body mass estimates for marsupials. See the text and Table S3.4 for details on how these estimates were calculated.

Species	Body Mass (kg)
<i>Argyrolagus palmeri</i>	0.056
<i>Lutreolina materdei</i>	0.666
<i>Microtragulus rusconii</i> , <i>M. sp.</i>	0.016
<i>Pliolestes tripotamicus</i>	0.129
<i>Pliolestes venetus</i>	0.052
<i>Sairadelphys tocantinensis</i>	0.024
<i>Thylamys pinei</i>	0.025
<i>Zygolestes tatei</i>	0.023

marsupials have some weaknesses, those species for which mass estimates are based on a greater number of elements and regressions should be considered relatively robust.

3.4 Ungulates

Ungulate body mass estimation for the 41 ungulates in this study (Table 6.5) was based largely on dental parameters because of the lack of other remains. Unfortunately, estimates generated using exclusively dental parameters have lower precision than those generated using postcranial remains because they are not involved in weight-bearing and because dietary differentiation exerts adaptive pressure on the size and shape of teeth (Damuth 1990; Janis 1990; Scott 1990).

Table 6.5: Body mass estimates for ungulates. See the text and Table S3.5 for details on how these estimates were calculated.

Species	Body Mass (kg)
<i>Alitoxodon</i> sp.	273
<i>Bounodus enigmaticus</i>	42.8
<i>Calchaquitherium mixtum</i>	1090
<i>Cullinia</i> sp.	104
<i>Dilobodon lutarius</i>	47.1
<i>Dinotoxodon paranensis</i>	1110
<i>Eoauchenia primitiva</i>	33.4
<i>Gyrinodon quassus</i> , G. sp.	1650
<i>Hypsitherium bolivianum</i>	29.0
<i>Lama castelnaudi</i>	147.2
<i>Lama intermedia</i>	112.3
<i>Miocochilius federicoi</i>	3.06
<i>Munizia paranensis</i>	37.5
<i>Neobrachytherium ameghinoi</i>	39.5
<i>Neobrachytherium</i> sp.	37.2
<i>Ocnerotherium</i> sp.	3949
<i>Oxydontherium piramydatus</i>	157
<i>Paedotherium minor</i>	1.06
<i>Paedotherium typicum</i>	1.32
<i>Palaeolama major</i>	292
<i>Palaeolama weddelli</i>	261
<i>Paranauchenia denticulata</i>	228
<i>Plesiotoxodon</i> sp.	1277
<i>Plesiotypotherium majus</i>	139
<i>Posnanskytherium desaguaderoi</i>	340
<i>Posnanskytherium inchasense</i>	545
<i>Posnanskytherium</i> sp.	435
<i>Proterotherium cervioides</i> , P. sp.	30.1
<i>Purperia cribatidens</i>	1336
<i>Scalabrinitherium bravardi</i> , S. rothii, S. sp.	297
<i>Surameryx acrensis</i>	28.0
<i>Sylvochoerus woodburnei</i>	56.4
<i>Tapirus greslebini</i>	247
<i>Tapirus mesopotamicus</i>	147
<i>Tapirus olivaresi</i>	323
<i>Trigodonops lopesi</i>	2468
<i>Villarroelia totoyoi</i>	43.9
<i>Waldochoerus bassleri</i>	23.7

Table 6.5: Body mass estimates for ungulates, cont.

<i>Xenastrapotherium aequatorialis</i>	1595
<i>Xenastrapotherium amazonense</i>	3445
<i>Xenorhinotherium bahiense</i> , <i>X. sp.</i>	1053

Body mass estimates based on dental elements have increased precision when ungulates are divided between selenodonts and non-selenodonts (Damuth 1990). Among dental variables, lower molar row length is the most consistent predictor of body mass across a wide range of herbivorous taxa and dietary classes (Janis 1990). In the absence of molar row lengths, the body mass of non-selenodonts may be estimated reasonably well using molar lengths. No significant differences in the mass-length relationship exist across different dietary categories within non-selenodonts (Damuth 1990; Fortelius 1990; Janis 1990). Non-selenodonts make up the majority of taxa for this study, and are represented by litopterns, notoungulates, astrapotheres, and tayasuids (Croft 2000). The body mass of selenodont browsers correlates well with m_{1-3} length ($r^2=0.95$) (Damuth 1990), which is fortunately available for the only selenodont species in the present study.

3.5 Rodents

New body mass estimates for 53 taxa of fossil rodents were calculated using a variety of craniodental parameters. While postcranial predictors are preferred for most taxonomic groups, the locomotor diversity of rodents makes these variables more complicated. Consequently, for this study, post-canine row length, or alternatively the sum of the lengths of post-canine elements as a proxy for row length (Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015), were preferred as predictive variables for body mass estimates.

Table 6.6: Body mass estimates for rodents. See the text and Table S3.6 for details on how these estimates were calculated.

Species	Body mass (kg)
<i>Alloiomys</i> sp.	4.5
<i>Arazamys castiglioni</i>	281
<i>Artigasia magna</i>	339
<i>Briaromys</i> sp.	22.6
<i>Cardiatherium chasicoense</i>	23.2
<i>Cardiatherium paranense</i>	30.4
<i>Cardiatherium patagonicum</i>	18.1
<i>Cardiatherium</i> sp.	23.1
<i>Cardiomya</i> sp.	26.7
<i>Caviodon</i> sp.	17.1
<i>Chasichimys</i> sp.	0.075
<i>Ctenomys cotocaensis</i>	2.22
<i>Ctenomys kraglievichi</i>	0.554
<i>Ctenomys praderii</i>	0.082
<i>Diaphoromys</i> sp.	209
<i>Eucelophorus</i> sp.	0.370
<i>Eumegamysops</i> sp.	192
<i>Eumysops formosus</i>	0.392
<i>Eumysops laeviplicatus</i>	0.421
<i>Eumysops</i> sp.	0.404
<i>Galileomys colloncurensis</i>	0.256
<i>Guimys unica</i> , G. sp.	0.804
<i>Holochilus primigenus</i>	0.116
<i>Hydrochoeropsis dasseni</i>	401
<i>Isostylomys</i> sp.	55.8
<i>Marisela</i> sp.	0.922
<i>Microcardiodon williensis</i>	1.621
<i>Neocavia depressidens</i> , N. lozanoi, N. sp.	0.417
<i>Neopiblema ambrosettianus</i>	101
<i>Neophanomys biplicatus</i>	0.083
<i>Neophanomys</i> sp.	0.088
<i>Neosteiromys tordillense</i>	6.93
<i>Orthomyctera</i> sp.	1.07
<i>Palaeocavia</i> sp.	1.08
<i>Palaeoctodon simplicidens</i>	0.233
<i>Paradoxomys</i> sp.	21.9
<i>Paramyocastor diligens</i>	2.55

Table 6.6: Body mass estimates for rodents, cont.

<i>Phoberomys bordasi</i>	154
<i>Phoberomys burmeisteri</i>	279
<i>Phoberomys pattersoni</i>	151
<i>Phugatherium cataclisticum</i> , <i>P. dichroplax</i> , <i>P. sp.</i>	451
<i>Pliodolichotis sp.</i>	34.9
<i>Praectenomys sp.</i>	0.325
<i>Protabrocoma sp.</i>	0.335
<i>Protacaremys denisae</i>	0.153
<i>Pseudoplataeomys formosus</i>	0.150
<i>Quebradahondomys potosiensis</i>	0.493
<i>Scapteromys herskovitzi</i>	0.102
<i>Simplimus sp.</i>	18.2
<i>Strophostephanos sp.</i>	0.010
<i>Tafimys powelli</i>	0.087
<i>Tetrastylus araucanus</i>	31.8
<i>Xenodontomys sp.</i>	0.288

Not surprisingly, body mass estimates for very large rodents (>100 kg) were quite variable. In keeping with other findings (Hopkins 2008; Millien and Bovy 2010), the body mass estimates calculated for *Phoberomys* spp. using dental dimensions were considerably lower than those calculated using cranial or postcranial elements. Because proportions clearly differed substantially from those of any living taxon, additional approaches such as those used for extinct xenarthran body mass may be required to determine the body masses of the extinct giant rodents more precisely. Consequently, the final estimates provided in this study were calculated by assuming geometric similarity to *Phoberomys pattersoni*, with a mass of 449 kg calculated by averaging all mass estimates in the published literature (Sánchez-Villagra, Aguilera, and Horovitz 2003; Hopkins 2008; Millien and Bovy 2010; Geiger et al. 2013; Vucetich et al. 2015).

3.6 Primates

The body mass of *Cartelles coimbrafilhoi* was estimated using femoral dimensions. The resultant mass estimate (37.0 kg) is somewhat higher than other studies have predicted based on dental dimensions (Rosenberger 2011; Halenar and Rosenberger 2013; Grayson 2016). Given that postcranial estimators tend to be better predictors of primate body mass (Jungers 1990), these estimates warrant reexamination.

However, postcranial data is only available for one of the three monkey species for which this study estimates body mass. Among craniodental variables, mandibular and lower dental variables outperform cranial and upper dental variables for body mass prediction in extant platyrrhines. Unfortunately, data is only available for M₂ dimensions for *Acrecebus fraileyi* and *Miocallicebus villaviejai*, and so these estimates should be viewed with caution. The observation that *A. fraileyi* is similar in size to *Lagothrix* (7-9.5 kg) suggests that the estimate obtained from dental variables (5.22 kg) is plausible, but might be too low. Based on the observation that *Miocallicebus* was much larger than the extant *Callicebus* (0.75-1.0 kg), the mass calculated here (1.85 kg) is reasonable.

Table 6.7: Body mass estimates for primates. See the text and Table S3.7 for details on how these estimates were calculated.

Species	Body Mass (kg)
<i>Acrecebus fraileyi</i>	5.22
<i>Cartelles coimbrafilhoi</i>	37.0
<i>Miocallicebus villaviejai</i>	1.85

3.7 Bats

Unfortunately, because of the preservational bias against microfossils, few specimens of extinct bats are known. This limits the number of measurements available for each species.

Consequently, the body mass of each species is estimated here by only one variable. In the case of *Notonycteris magdalenensis*, this is the variable with the lowest correlation coefficient for body mass estimation (humerus length). Furthermore, these measurements are typically drawn from the remains of one or two individuals and so may not be representative of the species average. Thus, these body mass estimates should be viewed as tentative at best.

Table 6.8: Body mass estimates for bats. See the text and Table S3.8 for details on how these estimates were calculated.

Species	Body Mass (kg)
<i>Desmodus draculae</i>	0.111
<i>Notonycteris magdalenensis</i>	0.067
<i>Notonycteris sucharadeus</i>	0.032
<i>Potamops mascahehenes</i>	0.064

4. CONCLUSIONS

This study makes three important contributions to studies of paleoecology requiring body mass estimates. First, the compilation of body mass estimates from the literature presented here is the most comprehensive to date for the last 15 million years of South American mammals. Second, eight new regressions, based on craniodental and postcranial measurements and body mass estimates, allow body mass estimates in more poorly known ground sloth taxa. Finally, using these regressions, other regressions from the literature, and geometric similarity, new body mass estimates were calculated for 146 taxa, most of which lack prior estimates. These contributions not only enable further studies of the evolution of body size in South American mammals, but provide the groundwork for more detailed studies of the diverse effects of changes such as cooling climates, the uplift of the Andes, and the Great American Biotic Interchange on South American faunas.

Chapter 7: Usurpers and insinulators: The role of competition in the dynamics of the Great American Biotic Interchange

1. Introduction

The dynamics of the Great American Biotic Interchange (GABI) have long fascinated paleontologists and evolutionary biologists. Mammalian biogeography suggests an imbalance between North and South American taxa: 53% of modern South American genera are descendants of late Pliocene to Pleistocene North American immigrants, whereas only four non-volant genera in temperate North America- specifically, *Didelphis*, *Dasypus*, *Erethizon*, and *Trichechus* (opossum, armadillo, porcupine, and manatee)- have South American affinities (Marshall 1981; Marshall et al. 1982; Webb 2006; Cione et al. 2015). This difference evidently arose primarily through diversification of North American immigrants upon their arrival in South America, because the number of dispersing genera was nearly symmetrical (Marshall et al. 1982; Webb 2006; Woodburne 2010, see Appendix 4.1).

Several explanations, either singly or in combination, have been proposed for this imbalance: (i) *Competitive displacement* of native South American herbivore and/or carnivore taxa by their ecological equivalents among North American immigrants (Simpson 1950; Simpson 1980; Patterson and Pascual 1968; Webb 1976; Webb 1978b; Webb 2006), possibly because repeated exchanges of mammalian taxa with Eurasia made North American taxa competitively superior to the long-isolated South American mammals (Vermeij 1991; Vermeij 2005; Leigh, O'Dea, and Vermeij 2014); (ii) *Intense predation* on native South American herbivores by carnivorous immigrants, leading to substantial reduction in ecological and taxonomic diversity (Vermeij 1991; Webb 2006; Leigh, O'Dea, and Vermeij 2014); (iii) *Passive ecological replacement*, with North

American immigrants filling roles left open by the prior extinction of native ecological equivalents (Patterson and Pascual 1968; Marshall 1981; Forasiepi, Martinelli, and Goin 2007; Prevosti, Tonni, and Bidegain 2009; Prevosti, Forasiepi, and Zimicz 2013); (iv) *Insinuation* of immigrants into ecological roles or adaptive zones that were not previously occupied by any native South American taxa (Patterson and Pascual 1968; Marshall and Hecht 1978; Marshall 1981; Marshall et al. 1982); and (v) *Growing adaptive zones*, which have been alluded to previously (Marshall et al. 1982; Burnham and Graham 1999), represent those portions of ecospace that accommodate increasing taxonomic diversity over time.

Attempts to differentiate among these hypotheses have mainly taken one of two approaches. Some studies have compared diversity, origination rates, and extinction rates in native faunas before and throughout the GABI to test for negative impacts of the immigrant arrivals (Marshall 1981; Webb 1991). Others have broadly compared the relative success of taxonomic groups that are considered ecologically similar to assess the plausibility of competition, predation, passive replacement, and insinuation (Webb 1976; Webb 1978b; Marshall and Hecht 1978; Webb 1985).

However, major advances in paleoecological reconstructions suggest a third possible approach: direct comparison of ecospace occupation *sensu* Bambach et al. (Bambach, Bush, and Erwin 2007) between native South American taxa and North American immigrants. For example, analyses of inferred diets and body masses suggest that North American carnivorans did not competitively displace the South American sparassodonts, but ecologically replaced extinct species (Prevosti, Forasiepi, and Zimicz 2013). Here, I use compiled data on body mass, mode of locomotion and substrate use, and diet for the taxa of South America from 15 Ma until the end of the Pleistocene (11.7 ka) to systematically test alternative hypotheses for the dynamics of the

Great American Biotic Interchange. I find that the vast majority of North American immigrants neither competitively excluded nor passively ecologically replaced South American native taxa; instead, immigrants overwhelmingly featured combinations of ecological traits distinct from contemporary and extinct South American taxa, and thus preferentially filled unoccupied adaptive zones (Figures 7.1 and 7.2).

2. Results and Discussion

Over the study interval (15 Ma and 11.7 ka), 504 South American native taxa occupied a total of 158 distinct ecological combinations and 150 North American immigrant taxa occupied a total of 66 ecological combinations. Of these, only 24 adaptive zones were occupied by both native and immigrant taxa, regardless of the time interval in which they lived. Overly fine partitioning of diets is not responsible for this functional separation of taxa; in addition to the primary dietary classification system designed for this study, all taxa were assigned to dietary categories using both Eisenberg's full macroniche protocol having sixteen distinct trophic categories (Eisenberg 1981, 248–51) and his consolidated trophic analysis with eight distinct categories (Eisenberg 1981, 224, see Appendix 4.4 for details). The coarser ecological framework indicated even less ecological overlap of any type, including fewer occurrences of passive replacement, overlap in growing adaptive zones, and possible competition. The decreases in ecological overlap were compensated for by a substantial increase in the already dominant proportion of North American immigrants that were insinulators, that is, taxa that occupied vacant adaptive zones (Appendix 4.4). Consequently, using the high-resolution scheme for all subsequent analyses is a conservative approach.

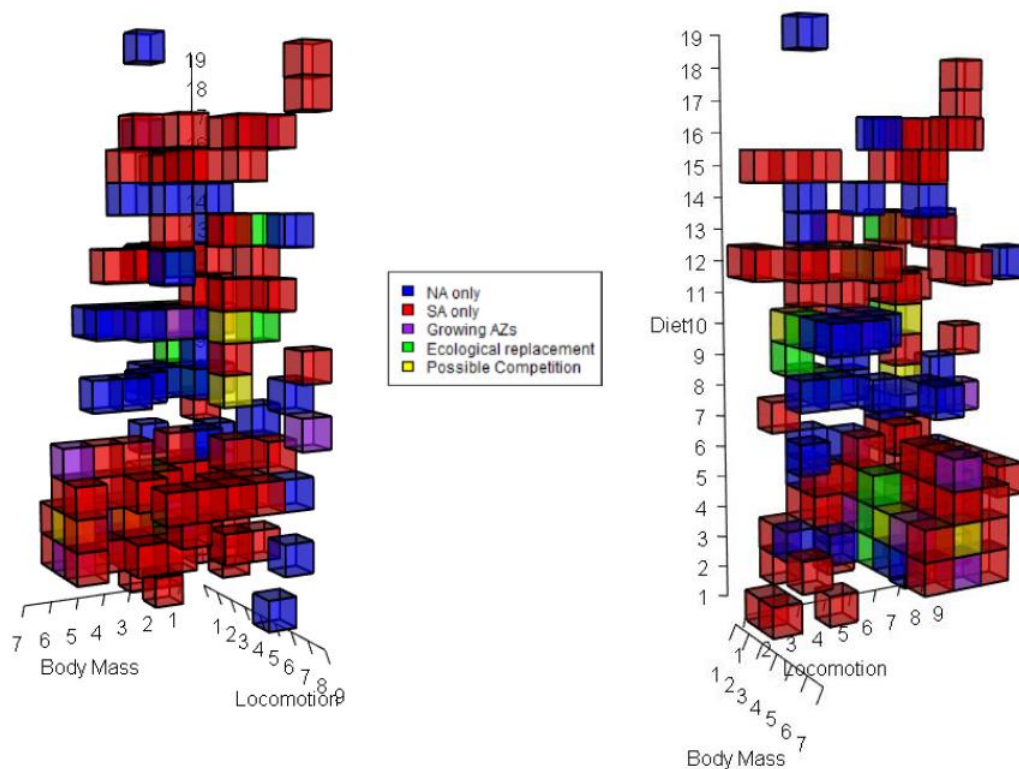


Figure 7.1: Ecospace occupation by North American immigrant and South American native taxa, shown in three dimensions defined by body mass, locomotion and substrate use, and trophic categories. See Appendix 4.2 for more information on the categories used. The vast majorities of North and South American taxa do not overlap with any relationship, but rather occupy completely distinct adaptive zones (blue and red, respectively). Growing adaptive zones (purple), in which both North and South American representatives are stable or increasing in taxonomic diversity, and passive ecological replacement (green) are proportionately much less common. Possible competition (yellow) is the rarest relationship. Because North American taxa were allowed to change their relationships to South American natives (e.g., a taxon that initially competitively replaced a South American equivalent might thereafter be classified as being in a growing adaptive zone if South American taxa later enter and diversify in the adaptive zone, or vice-versa), the relationships are coded on the basis of the first appearance of the taxa for graphical display. However, this protocol does not affect the overall patterns substantially (See Appendix 4.5).

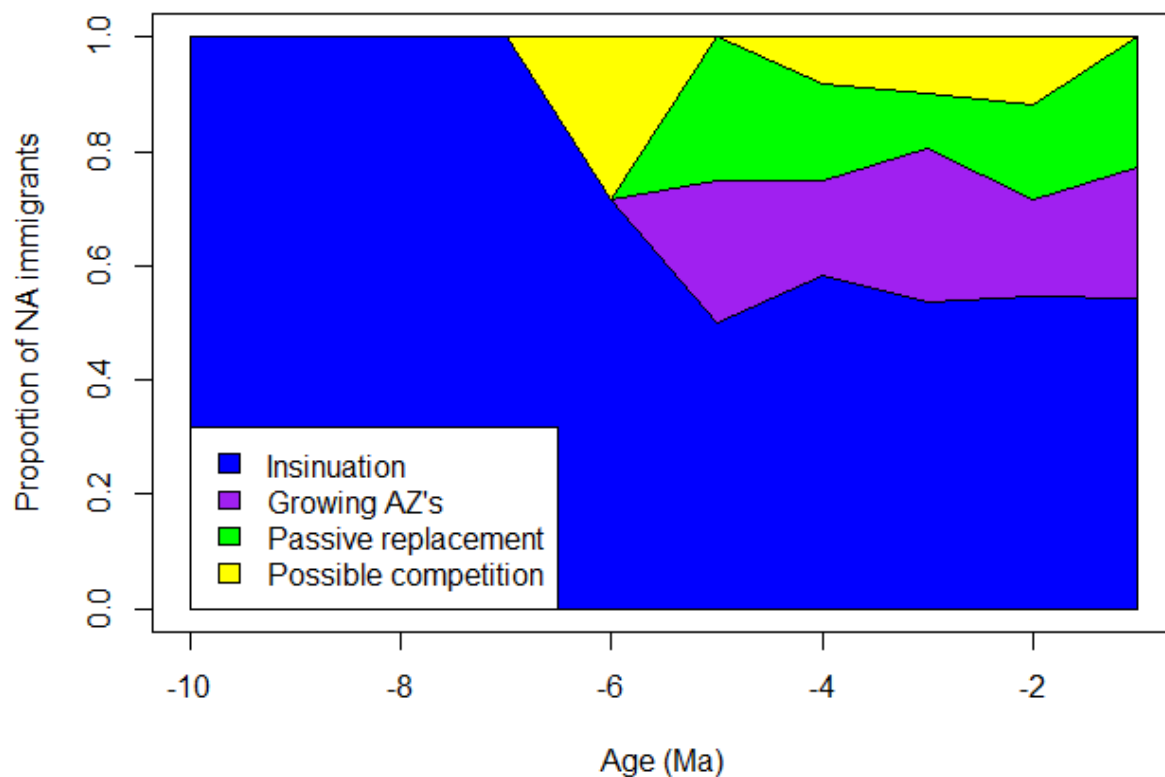


Figure 7.2: Relationships between North American immigrant taxa with respect to South American native taxa over time. Adaptive zones are defined using the primary dietary classification system; see Appendix 4.4 for a comparison with results using other classification systems. Insinuation (blue) is the dominant relationship throughout the GABI, growing adaptive zones (purple) and passive replacement (green) are relatively minor by comparison, and possible competition (yellow) is the least common relationship. See Appendix 4.6 for ecological classification of taxa.

To test whether the extent of overlap between North and South American taxa likely occurred by chance, 100,000 simulations placed two groups of 540 and 157 taxa (the numbers of native and immigrant taxa observed in the dataset) randomly across the 1197 possible ecological combinations (see Appendix 4.3 for code). The average number of overlapping adaptive zones between the two groups was 57.0, with none of the simulations producing 24 or fewer overlap-

ping adaptive zones such as observed in the actual dataset (Figure 7.3). This approach is conservative because many of the 1197 “possible” adaptive zones would in reality be highly unlikely or impossible due to physiological and evolutionary constraints. For example, both physiological models and fossil evidence suggest a maximum body mass for bats of 1.1-2.3 kg (Norberg and Norberg 2012). Thus, without evolution of a completely new body form, North American

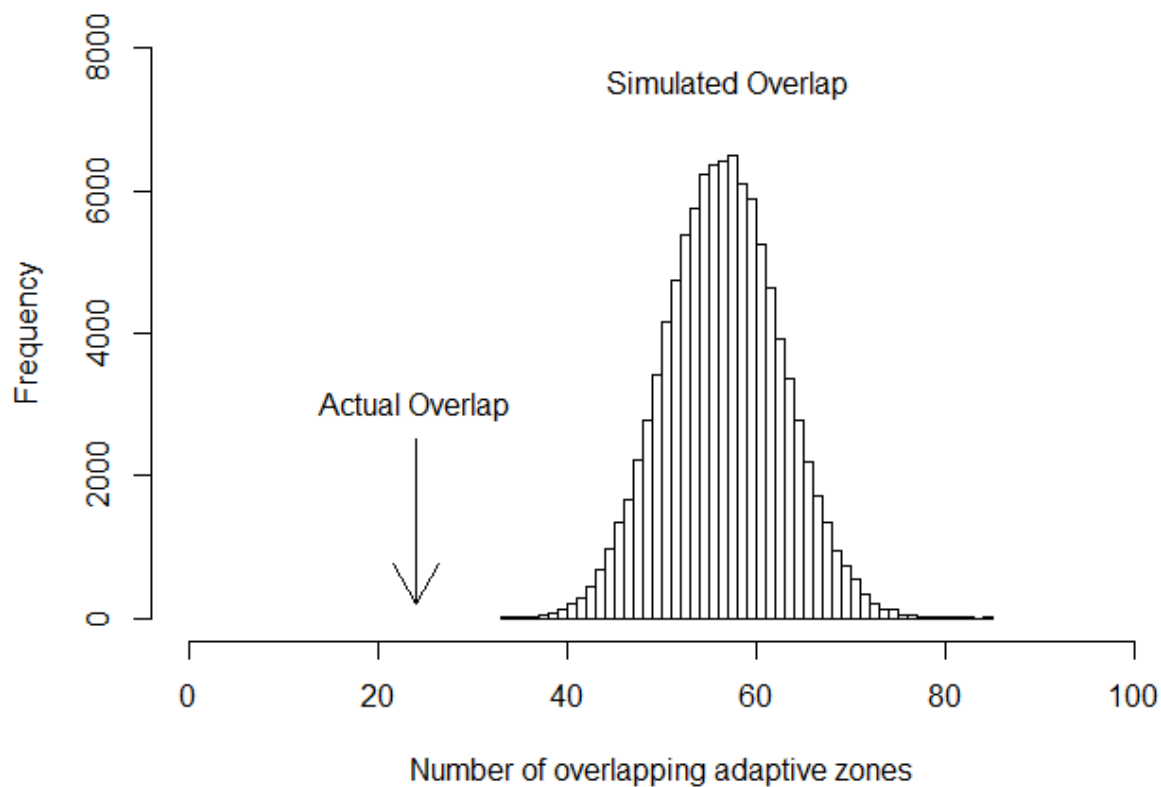


Figure 7.3: Comparison of real and simulated ecological overlap between North and South American mammals. The mean number of overlapping adaptive zones between North and South American mammals, given the number of taxa and the size of the potential ecospace available, is 57.0 shared adaptive zones. Out of 100,000 simulations, none produced as little ecological overlap as is actually observed, which strongly suggests that the observed patterns did not arise by random chance. Rather, North American mammals with similar traits to existing South American mammals were unable to successfully invade South America. Note that this graph includes overlapping taxa from any ages, and so indicates that North American taxa did not overlap substantially with extinct native taxa either.

immigrants would have been unable to fill any of the 133 ecospace combinations for volant mammals in larger body mass categories. With fewer possible adaptive zones, overlap by random chance should be even greater than estimated in these simulations.

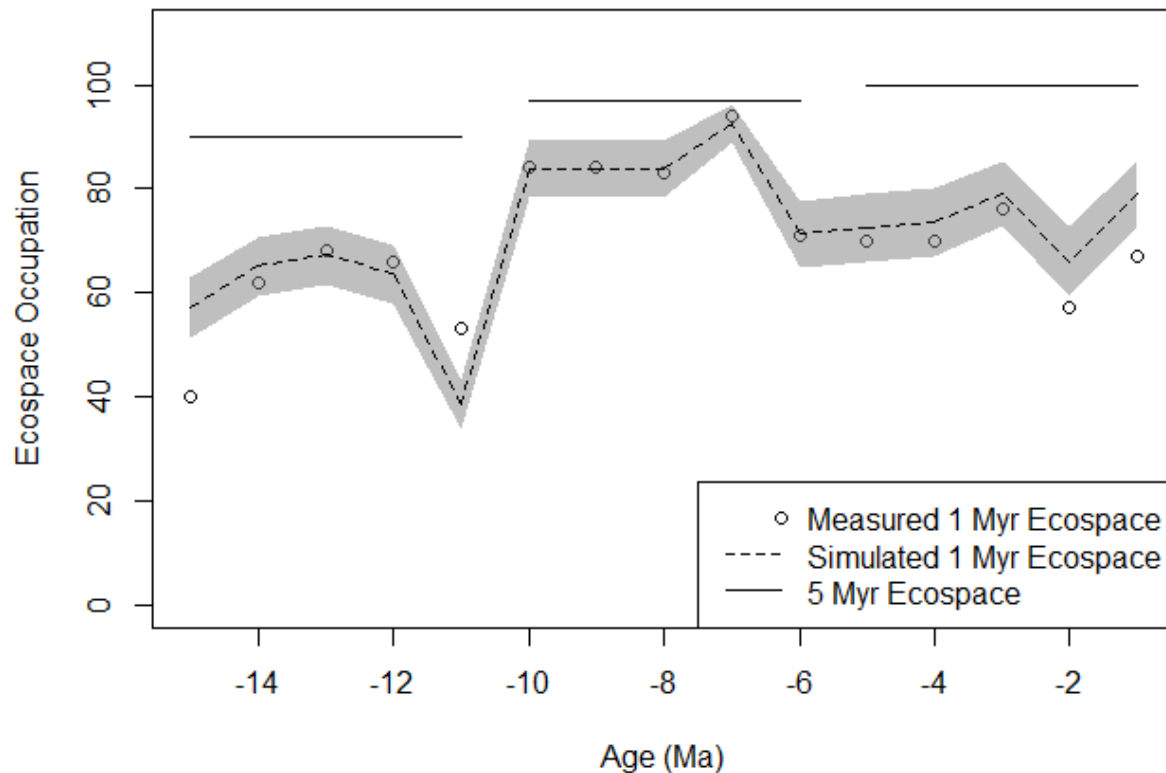


Figure 7.4: Simulations that subsampled taxa from 5-million-year bins compared with data at 1-million-year and 5-million-year resolution. In intervals for which the data (circles) is within the shaded region (± 2 standard deviation), the variation is likely due mostly or entirely to sampling effects, and the actual ecospace occupation (number of occupied adaptive zones) if completely sampled would be close to the corresponding 5-million-year ecospace occupation (solid line). For points that fall below the shaded region, some turnover on the 1-million-year timescale likely occurred, and the actual ecospace occupation was likely lower than the pooled ecospace occupation for the 5-million-year interval. The simulations closely track the data, indicating that the majority of variation in total ecospace occupation at the one million year resolution is due to sampling effects and so the 5-million year resolution may be more appropriate for assessing total ecospace occupation over time. At this scale, the total ecospace occupation is very stable over time. See Appendix 4.5 for additional details.

Another indicator of the impact of the North American immigrants on South American native taxa is the total ecological diversity of South American mammals over the course of the GABI. Although ecospace occupation- that is, the number of unique adaptive zones occupied by native taxa- suggests a moderate drop after the late Miocene when analyzed using one-million-year intervals, simulations demonstrate that this decrease is much more likely attributable to incomplete sampling (see Appendix 4.5 for details). When data are pooled into five-million-year bins, which the simulations indicate is more appropriate, ecospace occupation does not decrease significantly relative to prior intervals, and native taxa display remarkable stability in total ecological diversity over time (Figure 7.4). Such incomplete sampling has also been demonstrated for these faunas through rarefaction analysis (Carrillo et al. 2015).

Thus, the limited ecological overlap between taxa of North and South American affinities provides strong evidence that North American taxa preferentially filled unoccupied adaptive zones. This pattern of insinuation suggests not only that North American mammals did not competitively replace South American taxa, but that established populations of South American taxa likely competitively excluded North American taxa that otherwise might have dispersed. While a parallel ecological analysis of North America would be required to fully test this new hypothesis, the observation that only 11% of North American mammalian genera participated in the GABI (Marshall et al. 1982; Vermeij 1991) supports its plausibility. Furthermore, the lack of overlap between North American immigrants and South American taxa of any age suggests that ecological replacement, in which North American taxa filled adaptive zones left open by prior extinctions of native taxa, was also relatively rare in the GABI. Although there is considerable change in ecospace occupation by South American native taxa over the course of the last 15 mil-

lion years, the adaptive zones vacated by extinction or ecological shifts within clades remained vacant even with the influx of North American taxa.

The fact that vacated ecospace overall remained vacant after the invasion by North American taxa suggests that South American mammals with these characteristics were forced to adapt or go extinct in response to changing resources or environments rather than competition. Further support for this hypothesis comes from the fact that the total ecological diversity of South American mammals did not decline after large numbers of North American taxa began to immigrate (Figure 7.4). That new ecological combinations would become more favorable while others declined or disappeared is not surprising, given the large-scale environmental changes that occurred in South America through the Neogene (e.g., aridification, expansion of grasslands, and uplift of the Andes, Zachos, Dickens, and Zeebe 2008; Gregory-Wodzicki 2000; MacFadden 2006). However, the rarity of competitive replacement or even of passive ecological replacement is remarkable with major implications for the dynamics of the GABI and for biotic interchanges in general.

For example, the findings here challenge the hypothesis that repeated interchanges and invasions make a fauna more resistant to subsequent invasion because they allow replacement of competitively inferior taxa with superior taxa (Vermeij 1991; Leigh, O'Dea, and Vermeij 2014). Instead, the increased resistance to invasion that has been observed in both fossil and modern communities derives from the diversity of adaptive zones that are filled after faunal mixing. Prior studies demonstrate that the GABI increased the taxonomic diversity of South America (Vermeij 1991; Webb 2006), and this study supplements that finding with evidence that the ecological diversity increased substantially as well. Thus, future prospective invaders would find less vacant ecospace that could be easily invaded. This could also explain why South American

mammals did not disperse as deeply into North America nor diversify as extensively once there: repeated interchanges of North American and Eurasian taxa (Vermeij 1991; Leigh, O’Dea, and Vermeij 2014) may have resulted in more complete filling of available North American ecospace prior to the GABI.

This new interpretation is moreover consistent with the observation that faunas are typically far more susceptible to invasion when the invasion is preceded by substantial extinction (Vermeij 1991; Vermeij 2005), which vacates adaptive zones for invaders to occupy. If the GABI was typical of biotic interchanges in that invaders were mostly insinulators of open ecospace rather than competitors with incumbents, it could help to explain the observation that extinction within the recipient fauna is rare, even in highly imbalanced faunal exchanges (Fridley and Sax 2014; Sax et al. 2007).

Although incomplete sampling of the fossil record has a significant impact on the calculation of the total ecospace occupation in any given 1 Myr interval, the results here are robust with respect to sampling. For example, new discoveries of specimens that lengthen the known duration of South American taxa or that change the estimated dates of arrival for North American taxa are unlikely to substantially alter the patterns described here because there is such limited overlap between immigrant taxa and native taxa of *any* age. It thus seems highly unlikely that discoveries of native fossil taxa have been systematically biased in all ages against those that would eventually have ecological equivalents among the North American immigrants, given that known taxa of both North and South American affinities represent a wide range of body masses and would have occupied a broad range of habitats with varying preservation potentials. At least some of the ecological assignments upon which this study is based will likely require revision as methods for paleoecological reconstruction improve and are applied to more individual species

and genera. However, such revisions are unlikely to substantially alter the overall patterns described here, given that the patterns hold and are in fact stronger when fewer and broader ecological categories are used (Appendix 4.4).

The definition of competitive replacement was designed to be liberal, in that it would include all cases in which competition might have occurred, increasing the likelihood of recognition. Most importantly, because geographic range was not addressed, the taxa in “possible competition” categories may or may not have overlapped spatially. Other factors, such as circadian rhythms and habitat preferences, may further subdivide the adaptive zones as defined in this study. Thus, placing two species in the same category does not mean that they would necessarily be in direct competition even if they inhabited the same geographic region. The rarity of competitive replacement under such a liberal definition further supports the robustness of the conclusions here.

Overall, the results of this study strongly indicate that few, if any, North American immigrants competitively replaced native ecological equivalents in South America during the GABI. A relatively small proportion of immigrants passively replaced South American taxa, meaning that the South American taxa that had filled that ecospace were extinct before their arrival. Another small group of North American taxa were ecologically similar to contemporaneous South American taxa, but both of these sets of taxa stable to increased taxonomic diversity within their adaptive zones over time, likely in response to new ecological opportunities created by changing environments. In contrast, depending on the details of the classification system used, 60-85% of North American immigrants represented combinations of ecological traits that were novel for South America, that is not observed in native taxa at any point within the 15 Myr-long study interval. This finding indicates that the majority of North American immigrants were “insinuators”

that occupied previously empty ecospace within the South American ecosystems. Finally, the stability in the total ecospace occupation of South American native taxa over time, including throughout the GABI, indicates that North American predation may have resulted in defensive adaptations or behavior changes in some native herbivores (Zurita et al. 2010; Cione et al. 2015), but did not substantially diminish the ecological diversity of native South American mammals.

3. Methods

The taxonomic list for this study was generated by downloading all mammalian occurrences in South America identified to the genus or species level in the Paleobiology Database between 15 Ma and 11.7 Ka (Alroy et al. 2016). Where possible, the precision of temporal ranges for localities was improved using information on dating of specific stratigraphic units from the literature (Appendix 4.7). Taxa which have been synonymized or determined invalid were not included in the analysis (Appendix 4.8). Ecological data, including body mass, mode of locomotion and substrate use, and diet, were compiled from the literature (Appendices 3.9, 4.9, and 4.10) to allow ecological comparison between North American immigrants and South American natives. Each unique combination of body mass, locomotion and substrate use, and dietary categories was treated as a distinct “adaptive zone.”

North American immigrants were then classified as representatives of insinuation, in which immigrants occupied adaptive zones not previously occupied by native taxa, occupation of growing adaptive zones, in which the diversity of both North and South American taxa for a given adaptive zone increases over time, passive replacement, in which all South American taxa in the adaptive zone were extinct prior to the arrival of their North American counterparts, or possible competitive replacement. To be classified as “possible competitive replacement,” North

American taxa had to occupy the same adaptive zone as South American taxa, the South American taxa in that adaptive zone had to suffer a loss in diversity, and the gap, if any, between the last record of South American taxa and the first record of North American taxa had to be 1 Myr or less, to indicate a reasonable likelihood that native and immigrant taxa at least briefly overlapped. See Appendix 4.2 for further methodological details.

Chapter 8: Conclusions

Modern ecosystems face an unprecedented rate of change because of both human modification of abiotic environments and because of human-caused species introductions. To fully understand the consequences of these changes, studies must increasingly address the relationships between the abiotic environment, ecological interactions, and evolution.

For instance, the introduction of new taxa to a community may alter interspecific interactions such as competition and predation. Native taxa may respond to invasive species through character displacement, changes in behavior and resource use, defensive adaptations, or extinction. However, the relative importance of these different influences and the likelihood of different outcomes in specific scenarios remains the subject of debate. For the invaders, both the paleontological and modern records demonstrate that species differ in their abilities to invade and diversify in new habitats, and again, the reasons for these differences are intensely debated. Close investigation of the historical record of biotic invasions, interchanges, and adaptive radiations provides a critical opportunity to investigate the reasons behind the different success rates of both native and immigrant taxa and understand the ecological and evolutionary controls on these dynamics.

Modeling the morphological evolution of East African cichlids resulted in several key findings (Chapter 2):

1. Total diversity and disparity are misleading when analyzing multiple clades of different ages. Origination, extinction, and morphological change rates provide a better measure by which to compare clades of different ages in order to understand the processes involved in this remarkable adaptive radiation.

2. This study presents a new modeling framework that allows rate comparisons among clades of different ages in the absence of well-resolved phylogenies.
3. The tribe Cyprochromini very likely evolved with lower morphological change and turnover rates than the other clades. This was likely related to their low trophic diversity, but sorting out cause and effect will take additional study.

A thorough review of the fauna of La Venta (Chapter 3) updates the work of Kay et al. (1997) to lay the groundwork for further study, such as that presented in subsequent chapters. This review combines prior work on the La Venta fauna with more recent advancements, many of which have focused on Argentinian taxa, such as Santacrucian taxa. In particular, topics requiring further research are highlighted.

1. Because this fauna has received relatively little attention over the last twenty years, there is a need for paleoecological studies of these and other tropical taxa paralleling recent biomechanical, morphofunctional, stable isotope, and dental microwear analyses of Patagonian taxa.
2. Questions remain regarding the vegetation structure at La Venta. Specifically, it is clear that both forest and edge habitats were present, but it remains unclear if the ecosystem also included regions of closed canopy forest.
3. Various authors have suggested semiaquatic habits for toxodonts (*Pericotoxodon*), leontiniids (*Huilatherium*), and astrapotheres (*Granastrapotherium*, *Xenastrapotherium*, *Hilarchotherium*). However, these hypotheses remain largely untested, especially for leontiniids.

Stable isotope analysis allows quantitative reconstruction of past climates (Chapter 4). With regard to the climate of La Venta during the deposition of the Honda Group, analyses of phosphate $\delta^{18}\text{O}$ values in co-occurring fish and mammal teeth allow several inferences.

1. The minimum mean annual temperature estimate is 25°C. Middle range temperature estimates range from 34-37°C. The higher end of the temperature estimates are likely not reasonable. However, these temperature estimates demonstrate that the climate was quite warm, even at the lower end of the range of estimates.
2. If mean annual temperature did not exceed 40°C, then the $\delta^{18}\text{O}$ offsets between mammalian and fish tooth enamels are most consistent with somewhat lower relative humidity than is observed in modern Panama. This likely would also imply somewhat lower mean annual precipitation than the 1600 mm/year. This is consistent with reconstructions based on paleosol geochemistry (Anderson et al. 2016), but slightly lower than reconstructions based on faunal compositions (Kay and Madden 1997a).
3. Serial sampling of mammal teeth does not indicate a high degree of seasonality in precipitation.

Stable isotope analysis of the mammals from La Venta also provides insight into aspects of the ecology of ancient ecosystems (Chapter 5).

1. The $\delta^{13}\text{C}$ values of pedogenic carbonates from the Honda Group do not indicate any significant proportion of C_4 photosynthesis, despite the potential for such as indicated by hypotheses on the origin of C_4 and records of C_4 productivity in coeval temperate ecosystems.
2. Based on variability in population-level $\delta^{18}\text{O}$ values of *Huilatherium pluriplicatum* tooth enamel, this species was almost certainly semi-aquatic in habits. This is the

first strong evidence for the habits of any leontiniid. The oxygen isotope composition of tooth enamel is suggestive of terrestrial habits for *Pericotoxodon platignathus*.

Because of the lack of taxonomic resolution in the samples, the results are inconclusive with respect to the astrapotheres of La Venta.

3. Stable isotope values are consistent with wet environments and possibly open forests, but provide little to no evidence of closed canopy forests.

Body mass is of critical importance in many paleoecological studies, but is challenging for regions such as South America, where many taxa lack close living relatives and analogues (Chapter 6).

1. The compilation of body mass data presented here is the most comprehensive yet for fossil South American mammal taxa of the last 15 Myr.
2. Measurements and independent body mass estimates from the literature allow the calculation of eight new regressions that allow body mass estimates for extinct ground sloths.
3. Using a variety of techniques, I estimate body mass for 146 taxa for which estimates were previously unavailable.

The Great American Biotic Interchange (GABI), in which mammals and many other terrestrial taxa dispersed between North and South America, has long provided a fantastic natural experiment for the study of the ecological consequences of species invasions. Of particular interest is the imbalance in the success of the North and South American mammals that dispersed, for which a number of explanations have been proposed. Comparison of the ecological characteristics of immigrant and native South American taxa allows testing of these hypotheses (Chapter 7).

1. The majority of North American taxa were insinulators, meaning that they filled adaptive zones not occupied by any South American taxa in the last 15 Myr.
2. Cases in which North American taxa may have competitively excluded South American ecological counterparts are very rare; in fact, there is so little ecological overlap between immigrant and native taxa that South American taxa likely competitively excluded North American taxa that would otherwise have dispersed.
3. Passive ecological replacement, in which North American taxa filled adaptive zones left open by the prior extinction of native taxa, was also rare in the GABI; rather, those zones that were vacated by extinction typically remained open.
4. The findings presented here have critical implications for our broader understanding of species invasions and interchanges.

Appendix 1: Cichlids

1. Comparison of morphological databases

The data for endemic Lake Tanganyika cichlids for this study come from FishBase, and represent 80 species in four tribes (Froese and Pauly 2010). However, morphometric data are available for only one to two specimens per species. This could introduce bias if intraspecific variation were high relative to interspecific disparity, or if differences in age and gender introduced more variation between some species pairs than others. Thus, the morphometric data from FishBase were compared with the geometric morphometric data used by Chakrabarty (2005) for Lake Tanganyikan cichlids.

The Chakrabarty (2005) data set has an average of over 9 specimens per species for the four tribes analyzed in this study, with a range of 2 to 15 specimens per species, and has representatives of 36 species from the tribes Ectodini, Lamprologini, Tropheini, and Cyprichromini. Furthermore, the data is based on 18 landmarks, of which eight are exclusively post-cranial, eight are exclusively cranial, and two are on both the posterior part of the head and the anterior of the post-cranial body. Thus, this data includes more information on the cranium than the FishBase data, which is more variable in cichlids than the post-cranial body. Further, the Chakrabarty and FishBase data represent two different types of morphological data (geometric morphometric and traditional morphometric data, respectively). Thus, consistency with regard to the relative disparities of the tribes between the Chakrabarty and FishBase data would strongly suggest that differences in disparity among tribes are not due to sampling artifacts.

The first approach to ground-truth the FishBase data is to compare the disparity calculated for each of the tribes. The disparities calculated from the two datasets show a very strong cor-

relation ($r^2 = 0.933$, $p = 0.034$, Table S1.1.1, Figure S1.1A). A second regression analysis included the tribes Limnochromini and Perissodini, despite low sample sizes in both data sets, and again found a strong, significant correlation ($r^2 = 0.874$, $p = 0.006$, Table S1.1, Figure S1.1B). The disparity for the FishBase data was calculated as described in the main text. For the Chakrabarty data, the specimens were superimposed using a Generalized Least Squares (GLS) Procrustes superimposition in the program CoordGen6h (Webster and Sheets 2010). Disparity (variance) was then calculated as the sum of the squared Procrustes distances divided by the number of species minus one in the program DisparityBox6i (Webster and Sheets 2010). The strong correlation between the disparity calculated using the FishBase and Chakrabarty data suggests that the relative disparities of the different tribes are not artifacts of the sample size per species because of the consistency in results. Furthermore, using the Chakrabarty data set, the disparity of the tribe Cyprichromini is actually lower relative to both Ectodini and Tropheini, and is only slightly higher relative to Lamprologini, than it is using the FishBase data. Therefore, the results using the FishBase data are conservative with respect to the differences in rates between Cyprichromini and the other three tribes.

As a further comparison, the model results from the Min-Max simulations were compared with the Chakrabarty data set as well. In order to make the two comparable, the variance of Ectodini was defined as the value calculated from the FishBase data. The scaled variance of each of the other tribes was calculated as:

$$D_i = D_{E,FB} \frac{D_{i,C}}{D_{E,C}},$$

where D_i is the disparity of tribe i , $D_{E,FB}$ is the disparity of the tribe Ectodini as calculated from the FishBase Data, $D_{i,C}$ is the disparity of tribe i as calculated from the Chakrabarty data, and

Table S1.1.1: Disparity (D) and number of species (n) used in the regression analyses. The subscripts CH and FB stand for the Chakrabarty and FishBase databases, respectively.

	D_{CH}	D_{FB}	n_{CH}	n_{FB}
Ectodini	0.00467	174.18	10	19
Lamprologini	0.00338	164.44	17	44
Tropheini	0.00253	109.35	7	11
Cyprichromini	0.00071	33.39	2	6
Perissodini	0.00218	127.31	3	5
Limnochromini	0.00266	118.957	2	5

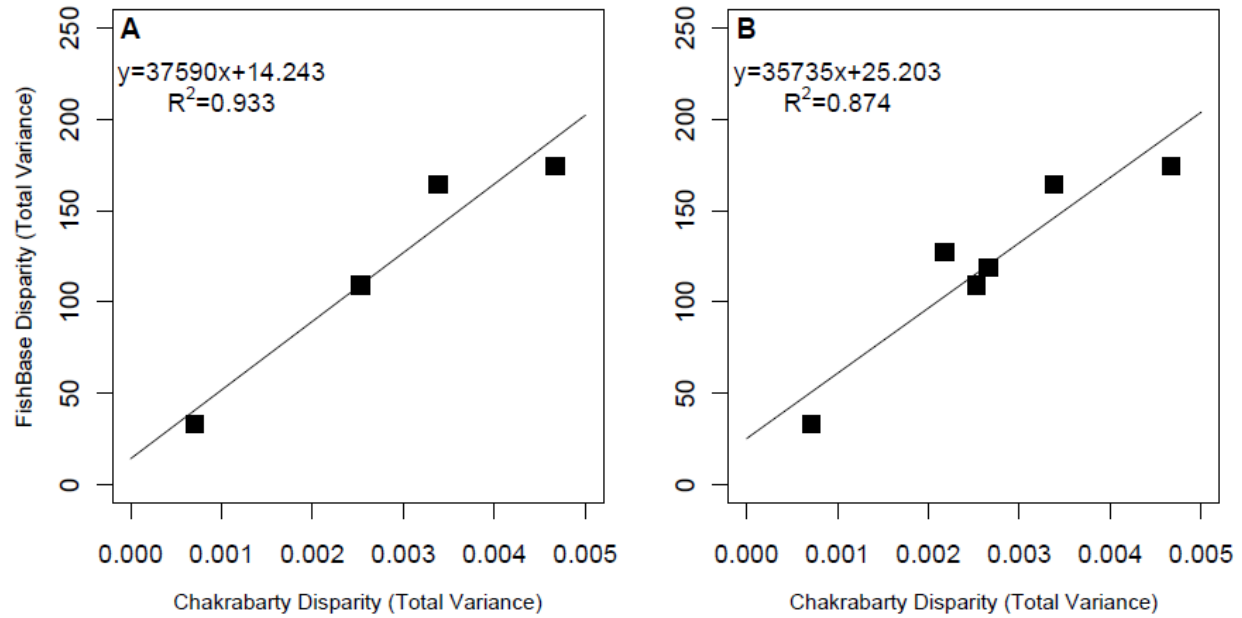


Figure S1.1: Comparison of disparity calculated from Chakrabarty and FishBase data sets.

Note that, while the absolute values for disparity differ because of the different types of data (geometric and traditional morphometric data), the correlation between the total variance calculated for each tribe using the two data sets is very strong. Given the differences between the types of data, number of species, and number of specimens per species in the two data sets, such a strong correlation indicates that the patterns identified using both data sets are not sampling artifacts, but rather, are real patterns of disparity among tribes of Tanganyikan cichlids.

$D_{E,C}$ is the disparity of Ectodini as calculated from the Chakrabarty data. Then, the standard errors for these values were calculated as:

$$SE_i = D_i \frac{SE_{i,C}}{D_{i,C}},$$

where SE_i is the standard error of tribe i and $SE_{i,C}$ is the standard error of tribe i using the Chakrabarty dataset. This scaling process was necessary because the simulations were run with parameter values based on the FishBase data, but since the current analysis aims only to identify rate differences and not to calculate absolute rates, the relative differences in disparity among the tribes are most important. The resulting scaled disparity and standard errors (Table S1.2) were then used as the observed or real disparity to which the simulation results were compared.

The results were very similar to the results obtained using the FishBase data (Table S1.3), and, in some cases, provide stronger support for rate differences between Cyprichromini and the other three tribes than the analyses presented in the main text. The AIC_C values for lower rates of morphological change in the Cyprichromini than the other three tribes range from 0.769-0.819, and those for lower turnover rates vary from 0.673-0.892. The overall consistency of results and the strength of support obtained from the Chakrabarty dataset represent compelling evidence that the disparity patterns described in this paper are not simply a sampling artifact.

The second approach is to compare intraspecific variability with interspecific disparity using the Chakrabarty database to assess the potential of the small sample sizes of the FishBase data to introduce additional uncertainty to the analyses. In almost all cases, the intraspecific variability was less than the interspecific disparity. However, the intraspecific variability was greater than interspecific disparity in three cases, including both species of Cyprichromini. Therefore, it is important to address the effects that intraspecific variability may have on the results of the analyses presented in this paper.

In order to assess the potential of intraspecific variability to influence the relative disparity of the tribes, the total disparity of the tribes was also calculated as the total variance of all specimens within each tribe by using the tribe, rather than the species, as the fundamental unit for analyses. Thus, rather than calculating the sum of Procrustes distances between species means and the overall mean, the disparity used the sum of the squared Procrustes distances between each specimen and the group mean for an entire tribe (Table S1.4). The results of the Min-Max simulation were then compared to the actual disparity of the tribes, using the percentage of the disparity of the Ectodini to scale the data (Table S1.4). Using this scaled data, the AIC_C values of rate differences among the tribes were calculated using the results of the MinMax model variation (Table S1.5). Lower rates of morphological change in Cyprichromini as compared to the other three tribes are supported with AIC_C values between 0.717-0.761, and lower turnover rates are supported with AIC_C values between 0.515-0.815. Importantly, these results are very similar to those presented in the main text and are well within the range of estimates from the other analyses. Because these results minimize the relative differences between Cyprichromini and the other three tribes, these represent a conservative estimate of the likelihood of rate differences between the tribes. Thus, the support for rate differences from this data set indicates that the patterns obtained in the main text are not sampling artifacts.

Table S1.1.2: Scaled variance and standard errors. The variance and standard error are calculated to be proportional to the variance and standard error calculated from the Chakrabarty data, but of magnitudes that are more comparable to the results calculated in the simulations. Because the approach used in this paper depends on the relative differences among clades, the data were scaled to the PC1-PC4 multidimensional variance of Ectodini.

	Scaled PC1-4 Variance	Scaled SE
Ectodini	152.15	4.89
Lamprologini	110.13	3.26
Tropheini	82.44	5.21
Cyprichromini	23.13	7.17

Table S1.1.3: Comparison of Chakrabarty data with simulation results. Note that the support for low rates in Cyprichromini is even stronger in some cases than using the FishBase data (Tables 2.3 and 2.4 in main text). Abbreviations are as in Table 2.3.

	Model	AICc	ΔAICc	Akaike wt.
<i>r</i>				
Ectodini-Cyprichromini	$r_E \leq r_C$	5.347	2.719	0.204
	$r_E > r_C$	2.628	0.000	0.796
Lamprologini-Cyprichromini	$r_L \leq r_C$	5.358	2.403	0.231
	$r_L > r_C$	2.955	0.000	0.769
Tropheini-Cyprichromini	$r_T \leq r_C$	4.206	3.026	0.181
	$r_T > r_C$	1.180	0.000	0.819
Ectodini-Lamprologini	$r_E \leq r_L$	6.479	0.043	0.495
	$r_E > r_L$	6.436	0.000	0.505
Lamprologini-Tropheini	$r_L \leq r_T$	4.719	0.000	0.596
	$r_L > r_T$	5.493	0.774	0.404
Ectodini-Tropheini	$r_E \leq r_T$	4.568	0.000	0.565
	$r_E > r_T$	5.087	0.519	0.435
<i>pq</i>				
Ectodini-Cyprichromini	$pq_E \leq pq_C$	28.424	1.446	0.327
	$pq_E > pq_C$	26.978	0.000	0.673
Lamprologini-Cyprichromini	$pq_L \leq pq_C$	34.783	4.213	0.108
	$pq_L > pq_C$	30.570	0.000	0.892
Tropheini-Cyprichromini	$pq_T \leq pq_C$	27.732	3.564	0.144
	$pq_T > pq_C$	24.168	0.000	0.856
Ectodini-Lamprologini	$pq_E \leq pq_L$	35.909	0.000	0.785
	$pq_E > pq_L$	38.504	2.594	0.215
Lamprologini-Tropheini	$pq_L \leq pq_T$	37.549	1.107	0.365
	$pq_L > pq_T$	36.442	0.000	0.635
Ectodini-Tropheini	$pq_E \leq pq_T$	29.596	0.000	0.721
	$pq_E > pq_T$	31.495	1.899	0.279

Table S1.1.4: Disparity using Procrustes distances between each specimen and the tribe mean and corresponding scaled variance and standard error.

	D_{CH}	Scaled Variance	Scaled SE
Ectodini	0.005715	152.15	12.58
Lamprologini	0.004763	126.82	5.39
Tropheini	0.003452	91.90	5.72
Cyprichromini	0.001256	33.43	3.44

Table S1.1.5: Rate comparisons using the Chakrabarty data. The scaled disparity from Table S1.4 were used as the observed disparity for each tribe, and then the likelihood of rate differences was calculated as described in the main text. Note that, even using the Procrustes distances between each specimen and the tribe mean rather than the Procrustes distances between species means and the tribe mean, the patterns are virtually the same as those described in the main text using the FishBase database. Therefore, these patterns are not likely to be sampling artifacts. Abbreviations are as in Table 2.3.

	Model	AICc	Δ AICc	Akaike wt.
<i>r</i>				
Ectodini-Cyprichromini	$r_E \leq r_C$	4.320	1.859	0.283
	$r_E > r_C$	2.461	0.000	0.717
Lamprologini-Cyprichromini	$r_L \leq r_C$	5.746	1.887	0.280
	$r_L > r_C$	3.859	0.000	0.720
Tropheini-Cyprichromini	$r_T \leq r_C$	5.253	2.320	0.239
	$r_T > r_C$	2.932	0.000	0.761
Ectodini-Lamprologini	$r_E \leq r_L$	3.723	-0.279	0.535
	$r_E > r_L$	4.001	0.000	0.465
Lamprologini-Tropheini	$r_L \leq r_T$	4.167	0.000	0.576
	$r_L > r_T$	4.777	0.609	0.424
Ectodini-Tropheini	$r_E \leq r_T$	2.733	0.000	0.584
	$r_E > r_T$	3.410	0.677	0.416
<i>pq</i>				
Ectodini-Cyprichromini	$pq_E \leq pq_C$	33.070	1.606	0.469
	$pq_E > pq_C$	31.463	0.000	0.531
Lamprologini-Cyprichromini	$pq_L \leq pq_C$	37.180	4.385	0.185
	$pq_L > pq_C$	32.796	0.000	0.815
Tropheini-Cyprichromini	$pq_T \leq pq_C$	30.709	3.652	0.212
	$pq_T > pq_C$	27.057	0.000	0.788
Ectodini-Lamprologini	$pq_E \leq pq_L$	39.820	0.000	0.813
	$pq_E > pq_L$	42.354	8.166	0.187
Lamprologini-Tropheini	$pq_L \leq pq_T$	39.152	1.118	0.349
	$pq_L > pq_T$	38.034	0.000	0.651
Ectodini-Tropheini	$pq_E \leq pq_T$	34.187	0.000	0.766
	$pq_E > pq_T$	35.964	1.776	0.234

2. Pairwise Min-Max Model Variation

The pairwise Min-Max model variation is the same as the Min-Max model described in the main text. However, in this version, the minimum and maximum species diversities are those of the pair of tribes in each individual analysis. Thus, a separate set of Min-Max

simulations was run for each tribe in each pairwise comparison. The results are very similar to those when the results are conditioned only on the range of species diversities for all four tribes, as is done with the Min-Max model throughout the main text (Table S2.1). Also, note that support for differences in rates between Cyprichromini and the other tribes is greater than using the other model variations in almost all cases, further supporting the conclusion that Cyprichromini has low evolutionary rates relative to the other tribes. These results provide further evidence that interpretations about rate differences among the Lake Tanganyikan cichlids are not sensitive to model conditioning.

Table S1.2: Rate comparisons for the Pairwise Min-Max Model. Note that the results are very similar to the Min-Max results presented in the main text, indicating that the more strict conditioning of the Pairwise Min-Max model does not significantly influence results. Abbreviations are as in Table 2.3.

	Model	AICc	ΔAICc	Akaike wt.
<i>r</i>				
Ectodini-Cyprichromini	$r_E \leq r_C$	1.040	1.632	0.307
	$r_E > r_C$	-0.592	0.000	0.693
Lamprologini-Cyprichromini	$r_L \leq r_C$	2.812	3.124	0.173
	$r_L > r_C$	-0.312	0.000	0.827
Tropheini-Cyprichromini	$r_T \leq r_C$	1.774	3.347	0.158
	$r_T > r_C$	-1.573	0.000	0.842
Ectodini-Lamprologini	$r_E \leq r_L$	-0.304	0.000	0.600
	$r_E > r_L$	0.507	0.811	0.400
Lamprologini-Tropheini	$r_L \leq r_T$	-0.978	0.000	0.600
	$r_L > r_T$	-0.164	0.814	0.400
Ectodini-Tropheini	$r_E \leq r_T$	-2.133	0.000	0.658
	$r_E > r_T$	-0.827	1.306	0.342
<i>pq</i>				
Ectodini-Cyprichromini	$pq_E \leq pq_C$	29.121	1.426	0.329
	$pq_E > pq_C$	27.695	0.000	0.671
Lamprologini-Cyprichromini	$pq_L \leq pq_C$	34.007	4.522	0.094
	$pq_L > pq_C$	29.485	0.000	0.906
Tropheini-Cyprichromini	$pq_T \leq pq_C$	28.257	4.075	0.115
	$pq_T > pq_C$	24.181	0.000	0.885
Ectodini-Lamprologini	$pq_E \leq pq_L$	33.433	0.000	0.822
	$pq_E > pq_L$	36.493	3.060	0.178
Lamprologini-Tropheini	$pq_L \leq pq_T$	32.034	1.476	0.323
	$pq_L > pq_T$	30.558	0.000	0.677
Ectodini-Tropheini	$pq_E \leq pq_T$	27.484	0.000	0.764
	$pq_E > pq_T$	29.833	2.348	0.236

3. Time-Dependent morphological evolution

The time-dependent model is identical to the speciation-dependent model except that morphological evolution occurs by continuous evolution (anagenesis) rather than at speciation events. Therefore, the initial morphology of any lineage is the same as that of its ancestor lineage at the time of branching. Then, in each subsequent time step, the morphology of all extant lineages changes by the product of $(r\lambda)^5$ and a random number drawn from a normal distribution with a mean of 0 and a standard deviation of 1, where r is the rate of morphological change and λ is the eigenvalue of the corresponding PC axis calculated from the empirical data. Thus, the time-dependent version of the model is the same as that described by Sidlauskas (2007). Support for differences in rates between Cyprichromini and the other three tribes is only marginally lower than that given by the speciation-based model, which indicates that the results are not significantly impacted by the assumption of speciation-dependent vs. time-dependent evolution.

Table S1.3: Time-dependent Min-Max Model rate comparisons. Note that the results are very similar to the speciation-dependent Min-Max model. Abbreviations are as in Table 2.3.

	Model	AICc	ΔAICc	Akaike wt.
<i>r</i>				
Ectodini-Cyprichromini	$r_E \leq r_C$	1.142	1.352	0.337
	$r_E > r_C$	-0.211	0.000	0.663
Lamprologini-Cyprichromini	$r_L \leq r_C$	4.314	1.716	0.298
	$r_L > r_C$	2.598	0.000	0.702
Tropheini-Cyprichromini	$r_T \leq r_C$	5.640	2.120	0.257
	$r_T > r_C$	3.520	0.000	0.743
Ectodini-Lamprologini	$r_E \leq r_L$	7.834	0.000	0.587
	$r_E > r_L$	8.534	0.700	0.413
Lamprologini-Tropheini	$r_L \leq r_T$	11.736	0.000	0.603
	$r_L > r_T$	12.572	0.836	0.397
Ectodini-Tropheini	$r_E \leq r_T$	8.691	0.000	0.641
	$r_E > r_T$	9.847	1.155	0.359
<i>pq</i>				
Ectodini-Cyprichromini	$pq_E \leq pq_C$	29.022	0.251	0.469
	$pq_E > pq_C$	28.771	0.000	0.531
Lamprologini-Cyprichromini	$pq_L \leq pq_C$	35.800	2.964	0.185
	$pq_L > pq_C$	32.836	0.000	0.815
Tropheini-Cyprichromini	$pq_T \leq pq_C$	32.334	2.623	0.212
	$pq_T > pq_C$	29.711	0.000	0.788
Ectodini-Lamprologini	$pq_E \leq pq_L$	41.616	0.000	0.813
	$pq_E > pq_L$	44.553	2.937	0.187
Lamprologini-Tropheini	$pq_L \leq pq_T$	44.095	1.243	0.349
	$pq_L > pq_T$	42.852	0.000	0.651
Ectodini-Tropheini	$pq_E \leq pq_T$	38.542	0.000	0.766
	$pq_E > pq_T$	40.915	2.373	0.234

4. Comparison of simulated variance to empirical total multivariate variance.

For this analysis, a success is defined as a trial in which the simulated variance is within one standard error of the total empirical variance. When total variance is used instead of the variance over the first four PC axes, the best supported model is always the same, but the degree of support for that model sometimes changes. Because the simulations only generated variance along the first 4 PC axes for computational reasons, the comparisons between simulated and empirical PC1-PC4 variance were used in the main text. However, the general consistency between the results yielded by both methods demonstrates that this decision does not significantly impact the results.

Table S1.4.1: Comparison of morphological change rates. Below are the results for the pairwise comparisons of morphological change rates among tribes. Labels and abbreviations are as for Table 2.3.

	Model	AICc	Δ AICc	Akaike wt.
Tropheini-Cyprichromini				
	No condition			
	$r_T > r_C$	6.127	0.000	0.681
	$r_T \leq r_C$	7.648	1.520	0.319
Extant	$r_T > r_C$	-1.054	0.000	0.703
	$r_T \leq r_C$	0.674	1.727	0.297
Min	$r_T > r_C$	-1.680	0.000	0.776
	$r_T \leq r_C$	0.808	2.488	0.224
Min-Max	$r_T > r_C$	-1.814	0.000	0.782
	$r_T \leq r_C$	0.741	2.555	0.218
Cyprichromini-Lamprologini				
	No condition			
	$r_L > r_C$	8.230	0.000	0.591
	$r_L \leq r_C$	8.963	0.733	0.409
Extant	$r_L > r_C$	0.444	0.000	0.619
	$r_L \leq r_C$	1.414	0.970	0.381
Min	$r_L > r_C$	0.023	0.000	0.700
	$r_L \leq r_C$	1.722	1.699	0.300
Min-Max	$r_L > r_C$	-0.480	0.000	0.761
	$r_L \leq r_C$	1.833	2.313	0.239

Table S1.4.1: Comparison of morphological change rates, cont.

Ectodini-Cyprichromini				
No condition	$r_E > r_C$	7.576	0.000	0.526
	$r_E \leq r_C$	7.787	0.211	0.474
Extant	$r_E > r_C$	-0.344	0.000	0.545
	$r_E \leq r_C$	0.021	0.365	0.455
Min	$r_E > r_C$	-0.679	0.000	0.622
	$r_E \leq r_C$	0.314	0.993	0.378
Min-Max	$r_E > r_C$	-1.711	0.000	0.740
	$r_E \leq r_C$	0.383	2.093	0.260
Ectodini-Lamprologini				
No condition	$r_E > r_L$	9.794	0.687	0.415
	$r_E \leq r_L$	9.107	0.000	0.585
Extant	$r_E > r_L$	1.432	0.777	0.404
	$r_E \leq r_L$	0.655	0.000	0.596
Min	$r_E > r_L$	1.077	0.792	0.402
	$r_E \leq r_L$	0.285	0.000	0.598
Min-Max	$r_E > r_L$	0.047	0.438	0.445
	$r_E \leq r_L$	-0.391	0.000	0.555
Ectodini-Tropheini				
No condition	$r_E > r_T$	8.458	1.449	0.326
	$r_E \leq r_T$	7.008	0.000	0.674
Extant	$r_E > r_T$	0.656	1.506	0.320
	$r_E \leq r_T$	-0.850	0.000	0.680
Min	$r_E > r_T$	-0.004	1.447	0.327
	$r_E \leq r_T$	-1.451	0.000	0.673
Min-Max	$r_E > r_T$	-1.092	0.682	0.416
	$r_E \leq r_T$	-1.774	0.000	0.584
Tropheini-Lamprologini				
No condition	$r_L > r_T$	9.066	1.025	0.375
	$r_L \leq r_T$	8.041	0.000	0.625
Extant	$r_L > r_T$	1.344	0.963	0.382
	$r_L \leq r_T$	0.381	0.000	0.618
Min	$r_L > r_T$	0.574	0.881	0.392
	$r_L \leq r_T$	-0.307	0.000	0.608
Min-Max	$r_L > r_T$	0.074	0.473	0.441
	$r_L \leq r_T$	-0.399	0.000	0.559

Table S1.4.2: Comparison of turnover rates. Below are the results for the pairwise comparisons of turnover rates among tribes. Labels and abbreviations are as for Table 2.3.

	Model	AICc	ΔAICc	Akaike wt.	
Tropheini-Cyprichromini	No Condition	$pq_T \leq pq_C$	34.575	2.997	0.183
		$pq_T > pq_C$	31.578	0.000	0.817
	Extant	$pq_T \leq pq_C$	27.062	2.826	0.196
		$pq_T > pq_C$	24.236	0.000	0.804
	Min	$pq_T \leq pq_C$	26.798	2.729	0.203
		$pq_T > pq_C$	24.069	0.000	0.797
	Min-Max	$pq_T \leq pq_C$	26.607	2.576	0.216
		$pq_T > pq_C$	24.031	0.000	0.784
	Cyprichromini-Lamprologini	No Condition	$pq_L \leq pq_C$	41.146	3.642
		$pq_L > pq_C$	37.504	0.000	0.861
Extant		$pq_L \leq pq_C$	32.677	3.049	0.179
		$pq_L > pq_C$	29.628	0.000	0.821
Min		$pq_L \leq pq_C$	32.810	3.157	0.171
		$pq_L > pq_C$	29.654	0.000	0.829
Min-Max		$pq_L \leq pq_C$	32.422	3.194	0.168
		$pq_L > pq_C$	29.228	0.000	0.832
Ectodini-Cyprichromini		No Condition	$pq_E \leq pq_C$	36.011	0.193
		$pq_E > pq_C$	35.817	0.000	0.524
	Extant	$pq_E \leq pq_C$	27.855	0.000	0.519
		$pq_E > pq_C$	28.007	0.152	0.481
	Min	$pq_E \leq pq_C$	27.919	0.000	0.513
		$pq_E > pq_C$	28.027	0.108	0.487
	Min-Max	$pq_E \leq pq_C$	27.701	0.228	0.471
		$pq_E > pq_C$	27.472	0.000	0.529
	Ectodini-Lamprologini	No Condition	$pq_E \leq pq_L$	42.198	0.000
		$pq_E > pq_L$	46.652	4.454	0.097
Extant		$pq_E \leq pq_L$	33.453	0.000	0.902
		$pq_E > pq_L$	37.883	4.430	0.098
Min		$pq_E \leq pq_L$	33.291	0.000	0.901
		$pq_E > pq_L$	37.710	4.419	0.099
Min-Max		$pq_E \leq pq_L$	32.637	0.000	0.874
		$pq_E > pq_L$	36.516	3.878	0.126

Table S1.4.2: Comparison of turnover rates, cont.

Ectodini-Tropheini				
No Condition	$pq_E \leq pq_T$	36.262	0.000	0.861
	$pq_E > pq_T$	39.916	3.654	0.139
Extant	$pq_E \leq pq_T$	28.063	0.000	0.882
	$pq_E > pq_T$	32.092	4.030	0.118
Min	$pq_E \leq pq_T$	27.697	0.000	0.870
	$pq_E > pq_T$	31.501	3.805	0.130
Min-Max	$pq_E \leq pq_T$	27.432	0.000	0.828
	$pq_E > pq_T$	30.569	3.136	0.172
Tropheini-Lamprologini				
No Condition	$pq_L \leq pq_T$	41.331	0.000	0.532
	$pq_L > pq_T$	41.584	0.253	0.468
Extant	$pq_L \leq pq_T$	32.478	0.000	0.547
	$pq_L > pq_T$	32.853	0.375	0.453
Min	$pq_L \leq pq_T$	32.400	0.000	0.532
	$pq_L > pq_T$	32.654	0.254	0.468
Min-Max	$pq_L \leq pq_T$	31.175	0.000	0.513
	$pq_L > pq_T$	31.283	0.108	0.487

5. Tests of the effects of sample size on variance.

In order to determine the effect of sample size on observed variance, the average total and PC1-PC4 variances of Lamprologini, Tropheini, and Ectodini were calculated from 1000 bootstrap iterations with replacement. When the number of species selected equals the sample size for that tribe, the variance represented is approximately 90-97% of the observed total variance or observed PC1-PC4 variance, and the percent variance represented by the selected species differs between total and PC1-PC4 variance by less than 0.3%. The analysis is then repeated, but instead only 6 species are selected with replacement in each iteration to emulate the effects of the small sample size for Cyprichromini. The results are nearly identical to those when the full sample size is used, with no systematic changes in variance and less than 1% decreases in the proportion of the variance represented in all cases. The consistency in variance, regardless of the number of samples selected, is expected because variance is not dependent on the number of species or the sample size, making it ideal for comparative morphology (Foote 1993, 1997, Ricklefs 2006a). Thus, sample size is not a major factor in the determining the differences in disparity among these tribes of cichlids.

Table S1.5: Effects of sample size on disparity. Bootstrap sub-sampling of data sets was used to determine the effects of smaller sample sizes on the estimated disparity of each of the three tribes with high disparity relative to Cyprichromini.

Full sample size	Ectodini	Tropheini	Lamprologini
Mean total variance	164.95	98.76	160.19
Mean PC1-PC4 variance	143.67	87.30	137.51
% Total variance represented	94.70	90.32	97.42
% PC variance represented	94.43	90.43	97.47
6 species			
Mean total variance	163.40	100.40	160.06
Mean PC1-PC4 variance	142.01	88.77	137.61
% Total variance represented	93.81	91.81	97.34
% PC variance represented	93.34	91.96	97.54

6. Same age analysis: A test of the relative importance of age and stochastic variation.

In order to determine whether the observed variance should be explained largely as differences in clade age or could be explained in terms of stochasticity alone, the third set of analyses treats all tribes as if they were the same age. Pairs of tribes for which rate differences are the preferred model when age is held constant, but which show no difference in rates when the simulations are run for the actual ages of each clade, are interpreted to have greater disparity due mainly to differences in age. The rationale is that if differences in disparity are sufficient to interpret rate differences given the same age, but this preference disappears when simulations use the actual ages of the clades, then the disparity patterns can be explained by similar processes with similar rates acting over different durations. On the other hand, if no rate differences are suggested even if the clades are treated as being the same age, then stochasticity alone can (but does not necessarily) account for the patterns of disparity. Table S4.1 provides the analysis results for this set of matrices.

The analyses in which all tribes are treated as having the same age indicate that differences in age probably have had some effect on morphological disparity. This set of analyses does not suggest differences in morphological change rates among pairs which did not previously have support for differences in rate differences; however, there is reasonably strong evidence for differences in turnover rates among Ectodini, Lamprologini, and Tropheini under this scenario. When the actual ages of these tribes are accounted for, there is not any strong evidence that higher disparity results from higher turnover rates, and thus, clade age is likely at least partially responsible for the differences in disparity among the clades. The correlation between age and disparity in East African cichlids (Figure 2.3a) further supports this argument.

Table S1.6.1: Same-age analysis: Comparison of rates of morphological change. Below are the results of the analyses for each of the r -value matrices generated when a success is defined as a value of the simulated variance that falls within one standard error of the PC1-PC4 total variance. For this set of analyses, however, the same set of simulations was used for all tribes. Labels and abbreviations are as for Table 2.3.

	Model	AICc	Δ AICc	Akaike wt.
Tropheini-Cyprichromini				
No condition	$r_T > r_C$	5.087	0.000	0.681
	$r_T \leq r_C$	6.607	1.520	0.319
Extant	$r_T > r_C$	-1.579	0.000	0.687
	$r_T \leq r_C$	-0.011	1.568	0.313
Min	$r_T > r_C$	-2.099	0.000	0.803
	$r_T \leq r_C$	0.716	2.814	0.197
Min-Max	$r_T > r_C$	-2.167	0.000	0.808
	$r_T \leq r_C$	0.708	2.875	0.192
Cyprichromini-Lamprologini				
No condition	$r_L > r_C$	6.729	0.000	0.724
	$r_L \leq r_C$	8.654	1.925	0.276
Extant	$r_L > r_C$	-0.161	0.000	0.736
	$r_L \leq r_C$	1.888	2.049	0.264
Min	$r_L > r_C$	-0.682	0.000	0.851
	$r_L \leq r_C$	2.800	3.482	0.149
Min-Max	$r_L > r_C$	-0.705	0.000	0.857
	$r_L \leq r_C$	2.880	3.585	0.143
Ectodini-Cyprichromini				
No condition	$r_E > r_C$	5.449	0.000	0.723
	$r_E \leq r_C$	7.370	1.921	0.277
Extant	$r_E > r_C$	-1.452	0.000	0.742
	$r_E \leq r_C$	0.656	2.108	0.258
Min	$r_E > r_C$	-2.004	0.000	0.855
	$r_E \leq r_C$	1.547	3.552	0.145
Min-Max	$r_E > r_C$	-2.025	0.000	0.861
	$r_E \leq r_C$	1.617	3.642	0.139

Table S1.6.1: Same-age analysis: Comparison of rates of morphological change, cont.

Ectodini-Lamprologini				
No condition	$r_E > r_L$	8.428	0.257	0.468
	$r_E \leq r_L$	8.171	0.000	0.532
Extant	$r_E > r_L$	-0.025	0.197	0.475
	$r_E \leq r_L$	-0.222	0.000	0.525
Min	$r_E > r_L$	-0.046	0.178	0.478
	$r_E \leq r_L$	-0.225	0.000	0.522
Min-Max	$r_E > r_L$	-0.025	0.197	0.475
	$r_E \leq r_L$	-0.222	0.000	0.525
Ectodini-Tropheini				
No condition	$r_E > r_T$	6.614	0.158	0.480
	$r_E \leq r_T$	6.456	0.000	0.520
Extant	$r_E > r_T$	-1.478	0.432	0.446
	$r_E \leq r_T$	-1.910	0.000	0.554
Min	$r_E > r_T$	-1.465	0.389	0.452
	$r_E \leq r_T$	-1.854	0.000	0.548
Min-Max	$r_E > r_T$	-1.478	0.432	0.446
	$r_E \leq r_T$	-1.910	0.000	0.554
Tropheini-Lamprologini				
No condition	$r_L > r_T$	8.428	0.257	0.468
	$r_L \leq r_T$	8.171	0.000	0.532
Extant	$r_L > r_T$	-0.025	0.197	0.475
	$r_L \leq r_T$	-0.222	0.000	0.525
Min	$r_L > r_T$	-0.046	0.178	0.478
	$r_L \leq r_T$	-0.225	0.000	0.522
Min-Max	$r_L > r_T$	-0.025	0.197	0.475
	$r_L \leq r_T$	-0.222	0.000	0.525

Table S1.6.2: Same-age analysis: Comparison of turnover rates. The results of the analyses for each of the pq -value matrices generated when a success is defined as a value of the simulated variance that falls within one standard error of the PC1-PC4 total variance are shown below. For this set of analyses, however, the same set of simulations was used for all tribes. Labels and abbreviations are as for Table 2.4.

	Model	AICc	Δ AICc	Akaike wt.
Tropheini-Cyprichromini				
No Condition	$pq_T \leq pq_C$	32.618	1.826	0.286
	$pq_T > pq_C$	30.792	0.000	0.714
Extant	$pq_T \leq pq_C$	25.370	1.636	0.306
	$pq_T > pq_C$	23.735	0.000	0.694
Min	$pq_T \leq pq_C$	25.451	1.545	0.316
	$pq_T > pq_C$	23.906	0.000	0.684
Min-Max	$pq_T \leq pq_C$	25.389	1.546	0.316
	$pq_T > pq_C$	23.843	0.000	0.684
Cyprichromini-Lamprologini				
No Condition	$pq_L \leq pq_C$	44.117	5.161	0.070
	$pq_L > pq_C$	38.956	0.000	0.930
Extant	$pq_L \leq pq_C$	35.979	4.514	0.095
	$pq_L > pq_C$	31.465	0.000	0.905
Min	$pq_L \leq pq_C$	36.244	4.566	0.093
	$pq_L > pq_C$	31.677	0.000	0.907
Min-Max	$pq_L \leq pq_C$	36.184	4.517	0.095
	$pq_L > pq_C$	31.667	0.000	0.905
Ectodini-Cyprichromini				
No Condition	$pq_E \leq pq_C$	36.807	3.584	0.143
	$pq_E > pq_C$	33.222	0.000	0.857
Extant	$pq_E \leq pq_C$	29.033	3.145	0.172
	$pq_E > pq_C$	25.888	0.000	0.828
Min	$pq_E \leq pq_C$	29.136	3.140	0.172
	$pq_E > pq_C$	25.996	0.000	0.828
Min-Max	$pq_E \leq pq_C$	29.105	3.114	0.174
	$pq_E > pq_C$	25.991	0.000	0.826
Ectodini-Lamprologini				
No Condition	$pq_E \leq pq_L$	44.070	0.000	0.783
	$pq_E > pq_L$	46.636	2.566	0.217
Extant	$pq_E \leq pq_L$	35.892	0.000	0.778
	$pq_E > pq_L$	38.395	2.503	0.222
Min	$pq_E \leq pq_L$	35.391	0.000	0.780
	$pq_E > pq_L$	37.920	2.529	0.220
Min-Max	$pq_E \leq pq_L$	35.398	0.000	0.781
	$pq_E > pq_L$	37.936	2.538	0.219

Table S1.6.2: Same-age analysis: Comparison of turnover rates, cont.

Ectodini-Tropheini				
No Condition	$pq_E \leq pq_T$	36.859	1.037	0.373
	$pq_E > pq_T$	35.822	0.000	0.627
Extant	$pq_E \leq pq_T$	28.967	0.824	0.398
	$pq_E > pq_T$	28.144	0.000	0.602
Min	$pq_E \leq pq_T$	28.475	0.951	0.383
	$pq_E > pq_T$	27.524	0.000	0.617
Min-Max	$pq_E \leq pq_T$	28.428	0.936	0.385
	$pq_E > pq_T$	27.491	0.000	0.615
Tropheini-Lamprologini				
No Condition	$pq_L \leq pq_T$	43.691	2.030	0.266
	$pq_L > pq_T$	41.661	0.000	0.734
Extant	$pq_L \leq pq_T$	35.444	1.711	0.298
	$pq_L > pq_T$	33.733	0.000	0.702
Min	$pq_L \leq pq_T$	34.982	1.908	0.278
	$pq_L > pq_T$	33.075	0.000	0.722
Min-Max	$pq_L \leq pq_T$	34.997	1.909	0.278
	$pq_L > pq_T$	33.089	0.000	0.722

7. Pure-birth results

The simulations in which the extinction rate was assumed to be zero produce results that are generally similar to those that assume that extinction rate is 90% of origination rate, particularly in morphological change rate comparisons. A low morphological change rate in Cyprichromini relative to the other three tribes is supported, and in some model variations, this support is even stronger than with the birth-death model. In no case is support substantially decreased, as the decrease in Akaike weights are always less than 0.014. As with the birth-death model, the results show no indication that the rate of morphological change differs among Ectodini, Lamprologini, and Tropheini.

Also consistent with the findings under the birth-death model is the finding that different turnover rates do not explain the higher variance of Ectodini relative to the other tribes or of Lamprologini relative to Tropheini, and that higher turnover rates in Tropheini relative to Cyprichromini most likely did contribute to differences in disparity. However, these simulations indicate that both Lamprologini and Ectodini are likely to have turnover rates which are equal or less than those of Cyprichromini. In the case of Lamprologini and Cyprichromini, equal rates are supported with Akaike weights of approximately 0.65, although equal rates make up a much lower proportion of the support in all other cases. Lower turnover rates in the more disparate tribe are strongly supported in all three comparisons among Ectodini, Lamprologini, and Tropheini. These results are somewhat inconsistent with the results of the birth-death model and with the strong correlation between age and disparity which indicates that similar rates among these three tribes are likely. Thus, while the value of ε has a limited affect on the interpretations of morphological change rate differences, it may have a slightly larger affect on interpretations of turnover rate differences, and a birth-death model may be more appropriate in studies of Lake

Tanganyika cichlids since high coupled origination and extinction rates have been previously suggested (Farias et al. 1999). However, these patterns are still qualitatively similar to the results of the birth-death model, and the general consistency further indicates that the results presented in this study are robust to two very different possible assumptions regarding extinction.

Table S1.7.1: Morphological change rate comparisons from a pure-birth model. As with the results in Tables 2.3 and 2.4, the simulated variance is compared with empirical PC1-PC4 variance in order to determine which trials are successes. Labels and abbreviations are as for Table 2.3.

	Model	AICc	Δ AICc	Akaike wt.
Ectodini-Cyprichromini				
Extant	$r_E \leq r_C$	-0.271	1.326	0.340
	$r_E > r_C$	-1.597	0.000	0.660
Min	$r_E \leq r_C$	-0.086	2.679	0.208
	$r_E > r_C$	-2.765	0.000	0.792
Min-Max	$r_E \leq r_C$	-0.029	2.730	0.203
	$r_E > r_C$	-2.759	0.000	0.797
Lamprologini-Cyprichromini				
Extant	$r_L \leq r_C$	1.929	1.665	0.303
	$r_L > r_C$	0.263	0.000	0.697
Min	$r_L \leq r_C$	1.932	3.110	0.174
	$r_L > r_C$	-1.178	0.000	0.826
Min-Max	$r_L \leq r_C$	1.983	3.140	0.172
	$r_L > r_C$	-1.157	0.000	0.828
Tropheini-Cyprichromini				
Extant	$r_T \leq r_C$	1.767	1.873	0.282
	$r_T > r_C$	-0.106	0.000	0.718
Min	$r_T \leq r_C$	0.797	3.284	0.162
	$r_T > r_C$	-2.487	0.000	0.838
Min-Max	$r_T \leq r_C$	0.846	3.321	0.160
	$r_T > r_C$	-2.475	0.000	0.840
Ectodini-Lamprologini				
Extant	$r_E \leq r_L$	3.124	0.000	0.562
	$r_E > r_L$	3.624	0.500	0.438
Min	$r_E \leq r_L$	0.414	0.000	0.555
	$r_E > r_L$	0.853	0.439	0.445
Min-Max	$r_E \leq r_L$	0.410	0.000	0.556
	$r_E > r_L$	0.862	0.452	0.444

Table S1.7.1: Morphological change rate comparisons from a pure-birth model, cont.

Lamprologini-Tropheini				
Extant	$r_L \leq r_T$	1.408	0.000	0.578
	$r_L > r_T$	2.036	0.628	0.422
Min	$r_L \leq r_T$	-0.064	0.000	0.580
	$r_L > r_T$	0.580	0.644	0.420
Min-Max	$r_L \leq r_T$	-0.060	0.000	0.578
	$r_L > r_T$	0.572	0.632	0.422
Ectodini-Tropheini				
Extant	$r_E \leq r_T$	1.009	0.000	0.604
	$r_E > r_T$	1.857	0.847	0.396
Min	$r_E \leq r_T$	-1.407	0.000	0.599
	$r_E > r_T$	-0.609	0.799	0.401
Min-Max	$r_E \leq r_T$	-1.415	0.000	0.598
	$r_E > r_T$	-0.619	0.796	0.402

Table S1.7.2: Turnover rate comparisons from a pure-birth model. As with the results in Tables 2.3 and 2.4, the simulated variance is compared with empirical PC1-PC4 variance in order to determine which trials are successes. Labels and abbreviations are as for Table 2.4.

	Model	AICc	ΔAICc	Akaike wt.
Ectodini-Cyprichromini				
Extant	$p_{q_E} \leq p_{q_C}$	30.165	-6.130	0.955
	$p_{q_E} > p_{q_C}$	36.294	0.000	0.045
Min	$p_{q_E} \leq p_{q_C}$	27.510	-5.734	0.946
	$p_{q_E} > p_{q_C}$	33.244	0.000	0.054
Min-Max	$p_{q_E} \leq p_{q_C}$	27.832	-3.373	0.844
	$p_{q_E} > p_{q_C}$	31.205	0.000	0.156
Lamprologini-Cyprichromini				
Extant	$p_{q_L} \leq p_{q_C}$	31.309	-2.863	0.807
	$p_{q_L} > p_{q_C}$	34.173	0.000	0.193
Min	$p_{q_L} \leq p_{q_C}$	28.575	-2.509	0.778
	$p_{q_L} > p_{q_C}$	31.083	0.000	0.222
Min-Max	$p_{q_L} \leq p_{q_C}$	28.758	-2.448	0.773
	$p_{q_L} > p_{q_C}$	31.205	0.000	0.227
Tropheini-Cyprichromini				
Extant	$p_{q_T} \leq p_{q_C}$	28.379	2.269	0.243
	$p_{q_T} > p_{q_C}$	26.110	0.000	0.757
Min	$p_{q_T} \leq p_{q_C}$	24.259	1.917	0.277
	$p_{q_T} > p_{q_C}$	22.342	0.000	0.723
Min-Max	$p_{q_T} \leq p_{q_C}$	24.455	1.907	0.278
	$p_{q_T} > p_{q_C}$	22.548	0.000	0.722
Ectodini-Lamprologini				
Extant	$p_{q_E} \leq p_{q_L}$	39.045	0.000	0.995
	$p_{q_E} > p_{q_L}$	49.702	10.657	0.005
Min	$p_{q_E} \leq p_{q_L}$	35.381	0.000	0.997
	$p_{q_E} > p_{q_L}$	46.708	11.327	0.003
Min-Max	$p_{q_E} \leq p_{q_L}$	35.530	0.000	0.997
	$p_{q_E} > p_{q_L}$	46.923	11.393	0.003
Lamprologini-Tropheini				
Extant	$p_{q_L} \leq p_{q_T}$	32.431	-7.630	0.978
	$p_{q_L} > p_{q_T}$	40.060	0.000	0.001
Min	$p_{q_L} \leq p_{q_T}$	29.605	-7.547	0.978
	$p_{q_L} > p_{q_T}$	37.152	0.000	0.001
Min-Max	$p_{q_L} \leq p_{q_T}$	29.653	-7.689	0.979
	$p_{q_L} > p_{q_T}$	37.342	0.000	0.001

Table S1.7.2: Turnover rate comparison from a pure-birth model, cont.

Ectodini-Tropheini				
Extant	$pq_E \leq pq_T$	33.709	0.000	0.999
	$pq_E > pq_T$	47.516	13.807	0.022
Min	$pq_E \leq pq_T$	28.996	0.000	0.999
	$pq_E > pq_T$	42.893	13.897	0.022
Min-Max	$pq_E \leq pq_T$	29.179	0.000	0.999
	$pq_E > pq_T$	43.096	13.916	0.021

8. Consistency of Model Variations

One approach to determining the extent of consistency in results among model variations is to regress the number of successes under each of the 200 parameter combinations that different models yield, where successes are defined as the number of trials in which the simulated variance is within one standard error of the empirical PC1-PC4 variance. Running the same model twice produces highly consistent results (Table S5.1).

Table S1.8: Values of r^2 for comparisons of model variations. These r^2 values are for the correlations between the number of successes (simulating a variance within 1SE of the empirical variance) for all pairwise comparisons of model variations used in this study for all four tribes. The data are divided into correlations calculated using successes when simulated variance is compared to empirical total variance and to empirical variance along PC1-PC4.

Tribe	None-Extant	None-Min	None-MinMax	Extant-Min	Extant-MinMax	Min-MinMax	Min-Min
Total Variance							
Ectodini	0.7881	0.845	0.0879	0.9524	0.0881	0.1099	0.9774
Lamprologini	0.5991	0.7132	0.365	0.8658	0.4655	0.4631	0.9384
Tropheini	0.6100	0.7992	0.8114	0.7888	0.8046	0.955	0.9689
Cyprichromini	0.7187	0.684	0.6613	0.8577	0.854	0.9721	0.9861
PC1-PC4 Variance							
Ectodini	0.8091	0.8602	0.1453	0.9611	0.1467	0.1596	0.9861
Lamprologini	0.6322	0.7231	0.4134	0.8591	0.4958	0.4713	0.9370
Tropheini	0.6091	0.8068	0.8123	0.7457	0.7688	0.9572	0.9686
Cyprichromini	0.7737	0.6787	0.6443	0.8522	0.8469	0.9805	0.9903

In general, different model variations are highly consistent with each other. The only model producing poor correlations ($r^2 < 0.5$) with the other three models was the Min-Max model, although this problem only arose with very long runs. This discrepancy between models occurs in the Ectodini and Lamprologini simulations. The models that are most consistently strongly correlated with each other (r^2 always greater than 0.74) are the Extant and Min versions.

All four models generally produce numbers of successes for each parameter combination that correlate well with each other. However, the Min-Max model simulations over larger numbers of time steps (those of Ectodini and Lamprologini) are poorly correlated with all other runs, with r^2 from 0.08-0.5, whether the simulated variance is compared with the total variance or with the PC1-PC4 variance.

This may indicate that long runs conditioned on a minimum number of species or on clade survival have a tendency to accumulate high species richness because only the upper part of the distribution of simulations is sampled. Magallon and Sanderson (2001) observed a similar phenomenon when comparing diversification rates calculated from clades with no extinction with those of clades evolving under relatively high rates of extinction. However, when conditioning on both the minimum and maximum number of species, as in the Min-Max model, the highly species-rich clades are also discarded. This could result in a relatively low proportion of the simulations being recorded, resulting in analysis of only a small subset of the successes under any given set of parameters when compared with the less restrictive models. This discrepancy would increase in simulations run over large numbers of time-steps, since a relatively small proportion of the clades generated over shorter durations would exceed the maximum species-richness, and so fewer simulations would be discarded.

For example, in the trials with the highest turnover rates, only 1012 of the 20,000 trials (5.06%) in the Min version of the Ectodini simulations would have met the conditions of the Min-Max version. Similarly, for the same parameter set in the Extant version of the model for Ectodini, only 1079 simulations (5.40%) would have been recorded in the Min-Max version of the model. In the No Condition model, only 96 of the 20,000 (0.48%) simulations with the highest origination and extinction rates would have fallen within the range required in the Min-Max

model. However, despite these differences in the proportion of simulations that were actually recorded and analyzed, the model variations do not yield systematic differences in interpretations and do not directly contradict each other unless the ΔAIC_c is less than about 0.3, in which case the difference in support is so minimal as to preclude interpretations in either direction. Also, note that because these are the results for the highest turnover rates, they represent the extreme case, and that under most parameter conditions, the discrepancies are not nearly so substantial. In general, the only differences between results of different model variations are in the degree of significance.

Appendix 2: Climate of La Venta

Table S2.1: Midday relative humidity data for Barro Colorado Island, Large clearing. Data from Windsor (1990).

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1986	1987	1988	1989	Average
Jan		79	78		76	76	71	72	67	73	79	75	68	67	72	73.3
Feb		71	72		70	70	76	73	70	68	80	70	70	70	64	71.1
Mar		64	66	67	69	71	68	71	63	64	76	67	62	66	66	67.1
Apr		75	76	67	70	72	71	77	78	64	79	70	78	66	65	72.0
May		78	64	73	79	79	75	83	78	72	80	72	81	85	73	76.6
Jun		82	75	75	84	78	84	90		78	86	77	84	76	81	80.8
Jul		80	65	85	81	80	86	88		85	81	84	85	88	81	82.2
Aug	82	85	66	85	86	81	86	88		81	82	81	92	84	82	82.9
Sep	79	88	68	80	81	80	84	83	88	83	74	79	92	82	77	81.2
Oct	75	87	70	85	88	76	85	86	80	83	81	79	81	85	82	81.5
Nov	81	79	76	89	84	82	85	84	79	84	81	86	82	87	84	82.9
Dec	71	76	69	81	85	81	83	81	74	85	86	72	79	80	79	78.8
Year																77.5

Table S2.2: Midday relative humidity data for Lutz catchment, 1m elevation, Barro Colorado Island (forest understory). Data from (Windsor 1990).

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	Average
Jan		90	86		84	88	83	83	77	80	89	84.4
Feb		83	81		79	81	82	84	81	78	89	82.0
Mar		75	80	76	79	80	77	79	81	77	89	79.3
Apr		83	76	77	76	78	72	84	87	73	88	79.4
May		90	84	79	86	89	81	91	86	82	90	85.8
Jun		93	93	92	95	89	91	95		86	93	91.9
Jul		90	65	97	93	89	91	95		92	89	89.0
Aug	92	92	92	97	98	90	95	97		90	88	93.1
Sep	94	94	92	96	95	92	93	92	93	93		93.4
Oct	88	93	70	96	97	93	94	96	85	93		90.5
Nov	92	90	94	96	94	90	95	97	87	95		93.0
Dec	83	86	88	93	93	89	91	91	84	91		88.9
Year												87.6

Appendix 3: Body Mass of South American Mammals

1. Sloth body mass calculations

Table S3.1 Sloth body mass calculations. The “Taxa” column provides the taxon or taxa to which the calculations are applied, while “Measurement Taxa” provides the specific taxon or taxa for which the measurements were made. Because measurements were obtained from the literature, “Measurement source” provides the references from which they were taken. The “Measure.” column indicates the particular measurement used in calculating body mass. “Equation taxa” provides the taxa that were used to calculate the regression between measurements and body mass. “Eq. source” provides the reference in which this regression was originally calculated. Note that when calculations are completed by assuming geometric similarity (as noted in the “Measurement” column), “Equation taxa” provides the taxon for which body mass is known (or estimated) for comparative purposes, and “Eq. source” provides the references for the body mass and measurements of that taxon. “Eq. quality” provides a relative assessment of the quality of each regression used for body mass calculation relative to the other available equations for sloths based on reported correlation coefficients, percent prediction errors and/or percent standard errors, and the original authors’ assessment of the reliability of the equation(s). Only calculations from the highest available level are averaged for the final body mass estimate for each taxon. Note that the final line for each taxon is bolded to indicate the summary line; taxa for which only one estimate is possible based on available data have only a single line which is also in bold.

Species	Measurement Taxa	Measurement source	Measurement	Measurement value (mm)	Equation Taxa	Eq. Source	Eq. Quality	Body Mass (kg)
<i>Ahytherium aureum</i>	<i>Ahytherium aureum</i>	(Cartelle, Iuliis, and Pujos 2008; Pujos, Iuliis, and Quispe 2011)	Distal Humerus Width	171	Extinct ground sloths	This study	Mid	1191
<i>Ahytherium aureum</i>	<i>Ahytherium aureum</i>	(Cartelle, Iuliis, and Pujos 2008; Pujos, Iuliis, and Quispe 2011)	Lower Tooth Row Length	90.3	Extinct ground sloths	This study	Mid	727

Table S3.1: Sloth body mass calculations, cont.

<i>Ahytherium aureum</i>	<i>Ahytherium aureum</i>	(Cartelle, Iuliis, and Pujos 2008; Pujos, Iuliis, and Quispe 2011)	Total Skull Length	300.5	Ungulates	(Janis 1990; Shockley and Anaya 2011)	Low	113
<i>Ahytherium aureum</i>	<i>Ahytherium aureum</i>	(Cartelle, Iuliis, and Pujos 2008; Pujos, Iuliis, and Quispe 2011)	Total Skull Length	300.5	Extinct ground sloths	This study	Low	377
<i>Ahytherium aureum</i>	<i>Ahytherium aureum</i>	(Cartelle, Iuliis, and Pujos 2008; Pujos, Iuliis, and Quispe 2011)	Astragalus Length	100	Extinct ground sloths	This study	High	745
<i>Ahytherium aureum</i>			Summary					745
<i>Amphiocnus paranense</i>	<i>Amphiocnus paranense</i>	(Measured from images in Brandoni 2008a)	Femur bicondylar width	100	Extinct ground sloths	(Croft 2000)	Mid	187
<i>Amphiocnus paranense</i>	<i>Amphiocnus paranense</i>	(Measured from images in Brandoni 2008a)	Femur Distal Width	100	Extinct ground sloths	This study	Low	307
<i>Amphiocnus paranense</i>			Summary					187
<i>Australonyx aquae</i>	<i>Australonyx aquae</i>	PBDB	Femur bicondylar width	150	Extinct ground sloths	(Croft 2000)	Mid	845
<i>Australonyx aquae</i>	<i>Australonyx aquae</i>	PBDB	Femur Distal Width	150	Extinct ground	This study	Low	805

Table S3.1: Sloth body mass calculations, cont.

241						sloths			
	<i>Australonyx aq-uae</i>	<i>Australonyx aq-uae</i>	PBDB	Femur length	374	Extinct ground sloths	This study	Mid	456
	<i>Australonyx aq-uae</i>					Summary			650
	<i>Catonyx chil-iensis</i> (= <i>Scelidotherium reyesi</i>)	<i>Catonyx chil-iensis</i> (= <i>Scelidotherium reyesi</i>)	(Pujos 2000)	Femur Length	465	Extinct ground sloths	This study	Mid	929
	<i>Catonyx chil-iensis</i> (= <i>Scelidotherium reyesi</i>)	<i>Catonyx chil-iensis</i> (= <i>Scelidotherium reyesi</i>)	(Pujos 2000)	Femur Distal Width	236	Extinct ground sloths	This study	Low	2370
	<i>Catonyx chil-iensis</i> (= <i>Scelidotherium reyesi</i>)	<i>Catonyx chil-iensis</i> (= <i>Scelidotherium reyesi</i>)	(Pujos 2000)	Lower Tooth Row Length	128	Extinct ground sloths	This study	Mid	1443
	<i>Catonyx chil-iensis</i> (= <i>Scelidotherium reyesi</i>)	<i>Catonyx chil-iensis</i> (= <i>Scelidotherium reyesi</i>)	(Pujos 2000)	Calcaneum Length				Mid	1403
	<i>Catonyx chil-iensis</i> (=<i>Scelidotherium reyesi</i>)					Summary			1258
	<i>Diabolotherium nordenskioldi</i> (= <i>Nothropus</i>)	<i>Diabolotherium nordenskioldi</i> (= <i>Nothropus</i>)	(Pujos et al. 2007)	Lower Tooth Row Length	43.2	Extinct ground sloths	This study	Mid	171

Table S3.1: Sloth body mass calculations, cont.

<i>Diabolotherium</i> (= <i>Nothropus</i>) <i>nordenskioldi</i>	<i>Diabolotherium</i> (= <i>Nothropus</i>) <i>nordenskioldi</i>	(Pujos et al. 2007)	Distal Humer- us Width	87	Extinct ground sloths	This study	Mid	365
<i>Diabolotherium</i> (= <i>Nothropus</i>) <i>nordenskioldi</i>	<i>Diabolotherium</i> (= <i>Nothropus</i>) <i>nordenskioldi</i>	(Pujos et al. 2007)	Calcaneum Length	77	Extinct ground sloths	This study	Mid	127
<i>Diabolotherium</i> (= <i>Nothropus</i>) <i>nordenskioldi</i>	<i>Diabolotherium</i> (= <i>Nothropus</i>) <i>nordenskioldi</i>	(Pujos et al. 2007)	Astragalus Length	40	Extinct ground sloths	This study	High	105
<i>Diabolotherium</i> (=<i>Nothropus</i>) <i>nordenskioldi</i>								105
<i>Eremotherium</i> <i>elenense</i>	<i>Eremotherium</i> <i>elenense</i>	(Tito 2008; Pujos et al. 2013)	Lower Tooth Row Length	113.3	Extinct ground sloths	This study	Mid	1072
<i>Eremotherium</i> <i>elenense</i>	<i>Eremotherium</i> <i>elenense</i>	(Tito 2008; Pujos et al. 2013)	Astragalus Length	146	Extinct ground sloths	This study	High	1693
<i>Eremotherium</i> <i>elenense</i>								1693
<i>Eremotherium</i> <i>sefvei</i>	<i>Eremotherium</i> <i>sefvei</i>	(Iuliis and St-André 1997)	Femur Length	391	Extinct ground sloths	This study	Mid	527
<i>Hiskatherium</i> <i>saintandrei</i>	<i>Hiskatherium</i> <i>saintandrei</i>	(Pujos, Iuliis, and Quispe 2011)	Lower Tooth Row Length	32.25	Extinct ground sloths	This study	Mid	96.2
<i>Kiyumylodon</i> <i>lecuonai</i>	<i>Kiyumylodon</i> <i>lecuonai</i>	(Rinderknecht, Perea, and McDonald)	Lower Tooth Row Length	111.8	Extinct ground	This study	Mid	1106

Table S3.1: Sloth body mass calculations, cont.

2007)					sloths			
<i>Lakukullus anatisrostratus</i>	<i>Lakukullus anatisrostratus</i>	(Pujos et al. 2014)	Lower Tooth Row Length	60	Extinct ground sloths	This study	Mid	326
<i>Lestobradys sprechmanni</i>	<i>Lestobradys sprechmanni</i>	(Rinderknecht et al. 2010, PBDB)	Lower Tooth Row Length	96.6	Extinct ground sloths	This study	Mid	830
<i>Megalonychops primigenius</i>	<i>Megalonychops primigenius</i>	(Perea 1998)	Humerus length (Calculated, not measured)	540	Extinct ground sloths	This study	Low	2185
<i>Megathericulus patagonicus</i>	<i>Megathericulus patagonicus</i>	(Brandoni and Carlini 2009; Iuliis, Brandoni, and Scillato-Yané 2008)	Distal Humerus Width	162	Extinct ground sloths	This study	Mid	1083
<i>Megathericulus patagonicus</i>	<i>Megathericulus patagonicus</i>	(Brandoni and Carlini 2009; Iuliis, Brandoni, and Scillato-Yané 2008)	Astragalus Length	94.66666667	Extinct ground sloths	This study	High	657
<i>Megathericulus patagonicus</i>			Summary					657
<i>Megatherium celendinense</i>	<i>Megatherium celendinense</i>	(Pujos 2006)	Distal Humerus Width	313	Extinct ground sloths	This study	Mid	2928
<i>Megatherium celendinense</i>	<i>Megatherium celendinense</i>	(Pujos 2006)	Astragalus Length	180	Extinct ground sloths	This study	High	2654
<i>Megatherium celendinense</i>			Summary					2654

Table S3.1: Sloth body mass calculations, cont.

<i>Megatherium medinae</i>	<i>Megatherium medinae</i>	(Iuliis, Ré, and Vizcaíno 2004)	Femur Length	623	Extinct ground sloths	This study	Mid	2420
<i>Megatherium medinae</i>	<i>Megatherium medinae</i>	(Iuliis, Ré, and Vizcaíno 2004)	Calcaneum Length	290	Extinct ground sloths	This study	Mid	1600
<i>Megatherium medinae</i>			Summary					2010
<i>Megatherium sundti</i>	<i>Megatherium sundti</i>	(Iuliis 1996; Iuliis 2006)	Lower Tooth Row Length	149	Extinct ground sloths	This study	Mid	1945
<i>Megatherium sundti</i>			Summary					1945
<i>Megatherium urbinai</i>	<i>Megatherium urbinai</i>	(Pujos and Salas 2004a)	Distal Humerus Width	202	Extinct ground sloths	This study	Mid	1594
<i>Megatherium urbinai</i>	<i>Megatherium urbinai</i>	(Pujos and Salas 2004a)	Calcaneum Length	257	Extinct ground sloths	This study	Mid	2003
<i>Megatherium urbinai</i>	<i>Megatherium urbinai</i>	(Pujos and Salas 2004a)	Astragalus Length	133	Extinct ground sloths	This study	High	1386
<i>Megatherium urbinai</i>	<i>Megatherium urbinai</i>	(Pujos and Salas 2004a)	Femur bicondylar width	230	Extinct ground sloths	(Croft 2000)	Mid	4151
<i>Megatherium urbinai</i>	<i>Megatherium urbinai</i>	(Pujos and Salas 2004a)	Femur Distal Width	230	Extinct ground sloths	This study	Low	2096

Table S3.1: Sloth body mass calculations, cont.

<i>Megatherium urbinai</i>	<i>Megatherium urbinai</i>	(Pujos and Salas 2004a)	Femur length	470	Extinct ground sloths	This study	Mid	962
<i>Megatherium urbinai</i>			Summary					1386
<i>Mesopotamocnus (=Ortotherium) brevirostrum</i>	<i>Ortotherium brevirostrum</i>	(Brandoni 2014a)	Lower Tooth Row Length	65	Extinct ground sloths	This study	Mid	381
<i>Octodontobradys sp.</i>	<i>Octodontobradys sp.</i>	(Santos, Rancy, and Ferigolo 1993; Villarreal 2000; Guilherme, Bock, and Porto 2011)	Lower Tooth Row Length	115.5	Extinct ground sloths	This study		1113
<i>Octomyodon aversus</i>	<i>Octomyodon aversus</i>	(Scillato-Yané 1977)	Lower Tooth Row Length	114	Extinct ground sloths	This study	Mid	1085
<i>Octomyodon aversus</i>	<i>Octomyodon aversus</i>	(Scillato-Yané 1977)	Total Skull Length	410	Ungulates	(Janis 1990; Shockey and Anaya 2011)	Low	284
<i>Octomyodon aversus</i>	<i>Octomyodon aversus</i>	(Scillato-Yané 1977)	Total Skull Length	410	Extinct ground sloths	This study	Mid	964
<i>Octomyodon aversus</i>			Summary					1024

Table S3.1: Sloth body mass calculations, cont.

<i>Pliomegatherium</i> sp.		(Brandoni 2006)	Lower Tooth Row Length	140	Extinct ground sloths	This study	1721	
<i>Pliomorphus mutilatus</i> , <i>P.</i> sp.	<i>Pliomorphus mutilatus</i>	(Ameghino 1885; Kraglievich 1923b; Brandoni 2009)	Femur bicondylar width	145	Extinct ground sloths	(Croft 2000)	Mid	744
<i>Pliomorphus mutilatus</i> , <i>P.</i> sp.	<i>Pliomorphus mutilatus</i>	(Ameghino 1885; Kraglievich 1923b; Brandoni 2009)	Femur Distal Width	145	Extinct ground sloths	This study	Low	743
<i>Pliomorphus mutilatus</i> , <i>P.</i> sp.	<i>Pliomorphus mutilatus</i>	(Ameghino 1885; Kraglievich 1923b; Brandoni 2009)	Femur length	391	Extinct ground sloths	This study	Mid	527
<i>Pliomorphus mutilatus</i>, <i>P.</i> sp.			Summary				636	
<i>Protomegalonyx chasicoensis</i>	<i>Protomegalonyx chasicoensis</i>	(Brandoni 2009)	Femur bicondylar width	106	Extinct ground sloths	(Croft 2000)	Mid	232
<i>Protomegalonyx chasicoensis</i>	<i>Protomegalonyx chasicoensis</i>	(Brandoni 2009)	Femur Distal Width	106	Extinct ground sloths	This study	Low	352
<i>Protomegalonyx chasicoensis</i>	<i>Protomegalonyx chasicoensis</i>	(Brandoni 2009)	Femur length	284	Extinct ground sloths	This study	Mid	185
<i>Protomegalonyx chasicoensis</i>			Summary				208	
<i>Protomegalonyx doellojuradoi</i>	<i>Protomegalonyx doellojuradoi</i>	(Brandoni 2009)	Femur bicondylar width	190	Extinct ground sloths	(Croft 2000)	Mid	2037

Table S3.1: Sloth body mass calculations, cont.

<i>Protomegalonyx doellojuradoi</i>	<i>Protomegalonyx doellojuradoi</i>	(Brandoni 2009)	Femur Distal Width	190	Extinct ground sloths	This study	Low	1414
<i>Protomegalonyx doellojuradoi</i>	<i>Protomegalonyx doellojuradoi</i>	(Brandoni 2009)	Femur length	390	Extinct ground sloths	This study	Mid	523
<i>Protomegalonyx doellojuradoi</i>			Summary					1280
<i>Protomegalonyx praecursor</i>	<i>Protomegalonyx praecursor</i>	(Brandoni 2009)	Femur bicondylar width	133	Extinct ground sloths	(Croft 2000)	Mid	540
<i>Protomegalonyx praecursor</i>	<i>Protomegalonyx praecursor</i>	(Brandoni 2009)	Femur Distal Width	133	Extinct ground sloths	This study	Low	605
<i>Protomegalonyx praecursor</i>	<i>Protomegalonyx praecursor</i>	(Brandoni 2009)	Femur length	310	Extinct ground sloths	This study	Mid	247
<i>Protomegalonyx praecursor</i>			Summary					393
<i>Protomegalonyx</i> sp.	Average of <i>P. chasicoensis</i> , <i>P. doellojuradoi</i> , <i>P. praecursor</i>	(Brandoni 2009)	Femur bicondylar width	143	Extinct ground sloths	(Croft 2000)	Mid	707
<i>Protomegalonyx</i> sp.	Average of <i>P. chasicoensis</i> , <i>P. doellojuradoi</i> , <i>P. praecursor</i>	(Brandoni 2009)	Femur Distal Width	143	Extinct ground sloths	This study	Low	719
<i>Protomegalonyx</i> sp.	Average of <i>P. chasicoensis</i> , <i>P.</i>	(Brandoni 2009)	Femur length	328	Extinct ground	This study	Mid	297

Table S3.1: Sloth body mass calculations, cont.

<i>doellojuradoi</i> , <i>P. praecursor</i>		sloths						
<i>Protomegalonyx</i> sp.		Summary						502
<i>Sphenotherus zavaletianus</i> (= <i>S. paranensis</i>), <i>S. sp.</i>	<i>Sphenotherus zavaletianus</i> (= <i>S. paranensis</i>), <i>S. sp.</i>	(Measured from images in Esteban 1999)	Lower Tooth Row Length	100	Extinct ground sloths	This study	Mid	888
<i>Thalassocnus antiquus</i>	<i>Thalassocnus antiquus</i>	(Muizon et al. 2003)	Lower Tooth Row Length	41.5	Extinct ground sloths	This study	Mid	158
<i>Thalassocnus littoralis</i>	<i>Thalassocnus littoralis</i>	(McDonald and Muizon 2002)	Lower Tooth Row Length	42.9	Extinct ground sloths	This study	Mid	168
<i>Thalassocnus natans</i>	<i>Thalassocnus natans</i>		Lower Tooth Row Length	44.5	Extinct ground sloths	This study	Mid	181
<i>Thalassocnus yaucensis</i>	<i>Thalassocnus yaucensis</i>	(Muizon et al. 2004)	Total Skull Length	293.7	Ungulates	(Janis 1990; Shockley and Anaya 2011)	Low	105
<i>Thalassocnus yaucensis</i>	<i>Thalassocnus yaucensis</i>	(Muizon et al. 2004)	Total Skull Length	293.7	Extinct ground sloths	This study	Mid	352
<i>Thalassocnus yaucensis</i>		Summary						352
<i>Torcellia</i>	<i>Torcellia</i>	(Brandoni 2009)	Femur bicon-	142.5	Extinct	(Croft	Mid	698

Table S3.1: Sloth body mass calculations, cont.

<i>paranense</i>	<i>paranense</i>		dylar width		ground sloths	2000)		
<i>Torcellia paranense</i>	<i>Torcellia paranense</i>	(Brandoni 2009)	Femur Distal Width	142.5	Extinct ground sloths	This study	Low	713
<i>Torcellia paranense</i>	<i>Torcellia paranense</i>	(Brandoni 2009)	Femur length	365	Extinct ground sloths	This study	Mid	421
<i>Torcellia paranense</i>			Summary					559
<i>Urumacotherium</i> (=Stenodon) campbelli	<i>Urumacotherium</i> (=Stenodon) campbelli	(Negri and Ferigolo 2004)	Lower Tooth Row Length	56.9	Extinct ground sloths	This study		293
<i>Xyophorus</i> sp.	<i>Xyophorus andinus</i> , <i>X. atlanticus</i> , " <i>X. bondesioi</i> ", " <i>X. cf. bondesioi</i> ", <i>X. crassissimus</i> , " <i>X.</i> " sp. " <i>X. villarroeli</i> "	(Brandoni 2014b)	Lower Tooth Row Length	39.3	Extinct ground sloths	This study		142

2. Vermilingua body mass calculations

Table S3.2: Vermilingua body mass calculations. All headings and abbreviations are as for Table S3.2: Sloth body mass calculations.

Species	Measurement Taxa	Measurement source	Measure.	Meas. value (mm)	Equation Taxa	Eq. Source	Eq. Qual.	Body Mass (kg)
<i>Palaeomyrmidon</i> sp.	<i>Paleomyrmidon</i> <i>incomptus</i>	(Rovereto 1914)	Geometric Similarity: Skull length	95	<i>Cyclopes didac- tylus</i>	(Reeve 1940; Wetzel 1985)	High	1.61
<i>Palaeomyrmidon</i> sp.	<i>Paleomyrmidon</i> <i>incomptus</i>	(Rovereto 1914)	Geometric Similarity: Skull length	95	<i>Tamandua tet- radactyla</i>	(Hayssen 2011)	High	1.71
<i>Palaeomyrmidon</i> sp.	<i>Paleomyrmidon</i> <i>incomptus</i>	(Rovereto 1914)	Geometric Similarity: Skull length	95	<i>Tamandua mex- icana</i>	(Navarrete and Orte- ga 2011)	High	1.79
<i>Palaeomyrmidon</i> sp.	<i>Paleomyrmidon</i> <i>incomptus</i>	(Rovereto 1914)	Geometric Similarity: Skull length	95	<i>Myrmecophaga tridactyla</i>	(Wetzel 1985; Gardner 2007b)	Mid	0.58
<i>Palaeomyrmidon</i> sp.			Average					1.70

3. Cingulata body mass calculations

Table S3.3 Cingulata body mass calculations. All headings and abbreviations are as for Table S3.1: Sloth body mass calculations.

Species	Measurement taxa	Measurement source	Measurement	Meas. value (mm)	Eq. Taxa	Eq. Source	Eq. Qual.	Body mass (kg)
<i>Boreostemma acostae</i>	<i>Boreostemma acostae</i>	(Zurita et al. 2013)	Geometric similarity: Skull length	195	<i>Neosclerocalyptus</i>	(Zurita, Carlini, and Scillato-Yané 2008)	Mid	229
<i>Eleutherocercus paranensis</i> , <i>E. sp.</i>	<i>E. antiquus</i>	(Zurita, Taglioretti, Reyes, et al. 2016)	Geometric similarity: Skull length	230.74	<i>Neosclerocalyptus</i>	(Zurita, Carlini, and Scillato-Yane 2008)	Mid	270
<i>Trachycalyptoides sp.</i>	<i>Trachycalyptoides achirensis</i>	(Saint-André 1996)	Geometric similarity: Lower tooth row length	172	<i>Neosclerocalyptus</i>	(Zurita, Carlini, and Scillato-Yane 2008)	Mid	331

4. Marsupial body mass calculations

Table S3.4: Marsupial body mass calculations. All headings and abbreviations are as for Table S3.1: Sloth body mass calculations.

Species	Measurement taxa	Measurement source	Measurement	Meas. value (mm)	Eq. Taxa	Eq. Source	Eq. Quality	Body mass (kg)
<i>Argyrolagus palmeri</i>	<i>Argyrolagus palmeri</i>	(Simpson 1970a; Simpson 1970b)	m1 Length	1.9	Marsupials (Didelphids, Caenolestids)	(Croft 2000)	Mid	0.044
<i>Argyrolagus palmeri</i>	<i>Argyrolagus palmeri</i>	(Simpson 1970a; Simpson 1970b)	m2 Length	2.1	Marsupials (Didelphids, Caenolestids)	(Croft 2000)	Mid	0.075
<i>Argyrolagus palmeri</i>	<i>Argyrolagus palmeri</i>	(Simpson 1970a; Simpson 1970b)	m1 Length	1.9	Marsupials (Didelphids, dasyurids)	(Gordon 2003)	Mid	0.059
<i>Argyrolagus palmeri</i>	<i>Argyrolagus palmeri</i>	(Simpson 1970a; Simpson 1970b)	m2 Length	2.1	Marsupials (Didelphids, dasyurids)	(Gordon 2003)	Mid	0.056
<i>Argyrolagus palmeri</i>	<i>Argyrolagus palmeri</i>	(Simpson 1970a; Simpson 1970b)	m3 Length	2.0	Marsupials (Didelphids, dasyurids)	(Gordon 2003)	Mid	0.046
<i>Argyrolagus palmeri</i>	<i>Argyrolagus palmeri</i>	(Simpson 1970a; Simpson 1970b)	m4 Length	2.0	Marsupials (Didelphids, dasyurids)	(Gordon 2003)	Mid	0.055
<i>Argyrolagus palmeri</i>			Summary					0.056
<i>Lutreolina maderdei</i>	<i>Lutreolina maderdei</i>	(Czaplewski 1996; Goin and de los Reyes 2011)	m1 Length	3.84	Marsupials (Didelphids, Caenolestids)	(Croft 2000)	Mid	0.726

Table S3.4: Marsupial body mass calculations, cont.

<i>Lutreolina maderdei</i>	<i>Lutreolina maderdei</i>	(Czaplewski 1996; Goin and de los Reyes 2011)	m1 Length	3.84	Marsupials (Didelphids, dasyurids)	(Gordon 2003)	Mid	0.606
<i>Lutreolina maderdei</i>		Summary						0.666
<i>Microtragulus rusconii</i> , M. sp.	<i>Microtragulus rusconii</i>	(Goin, Montalvo, and Visconti 2000)	m1 Length	1.37	Marsupials (Didelphids, Caenolestids)	(Croft 2000)	Mid	0.012
<i>Microtragulus rusconii</i> , M. sp.	<i>Microtragulus rusconii</i>	(Goin, Montalvo, and Visconti 2000)	m2 Length	1.32	Marsupials (Didelphids, caenolestids)	(Croft 2000)	Mid	0.015
<i>Microtragulus rusconii</i> , M. sp.	<i>Microtragulus rusconii</i>	(Goin, Montalvo, and Visconti 2000)	m1 Length	1.37	Marsupials (Didelphids, dasyurids)	(Gordon 2003)	Mid	0.020
<i>Microtragulus rusconii</i> , M. sp.	<i>Microtragulus rusconii</i>	(Goin, Montalvo, and Visconti 2000)	m2 Length	1.32	Marsupials (Didelphids, dasyurids)	(Gordon 2003)	Mid	0.012
<i>Microtragulus rusconii</i> , M. sp.	<i>Microtragulus rusconii</i>	(Goin, Montalvo, and Visconti 2000)	m3 Length	1.35	Marsupials (Didelphids, dasyurids)	(Gordon 2003)	Mid	0.013
<i>Microtragulus rusconii</i> , M. sp.	<i>Microtragulus rusconii</i>	(Goin, Montalvo, and Visconti 2000)	m4 Length	1.13	Marsupials (Didelphids, dasyurids)	(Gordon 2003)	Mid	0.009

Table S3.4: Marsupial body mass calculations, cont.

<i>Microtragulus rusconii</i> , M. sp.	<i>Microtragulus rusconii</i>	(Goin, Montalvo, and Visconti 2000)	M1 Length	1.46	Marsupials (Didelphids, Caenolestids)	(Croft 2000)	Mid	0.015
<i>Microtragulus rusconii</i> , M. sp.	<i>Microtragulus rusconii</i>	(Goin, Montalvo, and Visconti 2000)	M2 Length	1.49	Marsupials (Didelphids, Caenolestids)	(Croft 2000)	Mid	0.020
<i>Microtragulus rusconii</i> , M. sp.	<i>Microtragulus rusconii</i>	(Goin, Montalvo, and Visconti 2000)	M1 Length	1.46	Marsupials (Didelphids, dasyurids)	(Gordon 2003)	Mid	0.021
<i>Microtragulus rusconii</i> , M. sp.	<i>Microtragulus rusconii</i>	(Goin, Montalvo, and Visconti 2000)	M2 Length	1.49	Marsupials (Didelphids, dasyurids)	(Gordon 2003)	Mid	0.021
<i>Microtragulus rusconii</i> , M. sp.	<i>Microtragulus rusconii</i>	(Goin, Montalvo, and Visconti 2000)	M3 Length	1.24	Marsupials (Didelphids, dasyurids)	(Gordon 2003)	Mid	0.014
<i>Microtragulus rusconii</i>, M. sp.			Summary					0.016
<i>Pliolestes tripotamicus</i>	<i>Pliolestes tripotamicus</i>	(Reig 1955; Goin, Pardiñas, and Lezcano 1994; PBDB)	m1 Length	2.66	Marsupials (Didelphids, Caenolestids)	(Croft 2000)	Mid	0.168
<i>Pliolestes tripotamicus</i>	<i>Pliolestes tripotamicus</i>	(Reig 1955; Goin, Pardiñas, and Lezcano	m1 Length	2.66	Marsupials (Didelphids, dasyurids)	(Gordon 2003)	Mid	0.179

Table S3.4: Marsupial body mass calculations, cont.

		1994; PBDB)						
<i>Pliolestes tripotamicus</i>	<i>Pliolestes tripotamicus</i>	(Reig 1955; Goin, Pardiñas, and Lezcano 1994; PBDB)	M1 Length	2.21	Marsupials (Didelphids, Caenolestids)	(Croft 2000)	Mid	0.087
<i>Pliolestes tripotamicus</i>	<i>Pliolestes tripotamicus</i>	(Reig 1955; Goin, Pardiñas, and Lezcano 1994; PBDB)	M1 Length	2.21	Marsupials (Didelphids, dasyurids)	(Gordon 2003)	Mid	0.083
<i>Pliolestes tripotamicus</i>			Summary					0.129
<i>Pliolestes venetus</i>	<i>Pliolestes venetus</i>	(Goin, Montalvo, and Visconti 2000)	m1 Length	1.91	Marsupials (Didelphids, Caenolestids)	(Croft 2000)	Mid	0.045
<i>Pliolestes venetus</i>	<i>Pliolestes venetus</i>	(Goin, Montalvo, and Visconti 2000)	m1 Length	1.91	Marsupials (Didelphids, dasyurids)	(Gordon 2003)	Mid	0.060
<i>Pliolestes venetus</i>			Summary					0.052
<i>Sairadelphys to-cantinensis</i>	<i>Sairadelphys to-cantinensis</i>	PBDB	m1 Length	1.68	Marsupials (Didelphids, Caenolestids)	(Croft 2000)	Mid	0.027
<i>Sairadelphys to-cantinensis</i>	<i>Sairadelphys to-cantinensis</i>	PBDB	m1 Length	1.68	Marsupials (Didelphids, dasyurids)	(Gordon 2003)	Mid	0.039
<i>Sairadelphys to-cantinensis</i>	<i>Sairadelphys to-cantinensis</i>	PBDB	M2 Length	1.38	Marsupials (Didelphids, Caenolestids)	(Croft 2000)	Mid	0.015

Table S3.4: Marsupial body mass calculations, cont.

<i>Sairadelphys to-</i> <i>cantinensis</i>	<i>Sairadelphys to-</i> <i>cantinensis</i>	PBDB	M2 Length	1.38	Marsupials (Didel- phids, dasyurids)	(Gordon 2003)	Mid	0.016
<i>Sairadelphys to-</i> <i>cantinensis</i>	<i>Sairadelphys to-</i> <i>cantinensis</i>	PBDB	M3 Length	1.42	Marsupials (Didel- phids, dasyurids)	(Gordon 2003)	Mid	0.021
<i>Sairadelphys to-</i> <i>cantinensis</i>			Summary					0.024
<i>Thylamys pinei</i>	<i>Thylamys pinei</i>	(Goin, Mon- talvo, and Visconti 2000; PBDB)	m1 Length	1.58	Marsupials (Didel- phids, Caenoles- tids)	(Croft 2000)	Mid	0.021
<i>Thylamys pinei</i>	<i>Thylamys pinei</i>	(Goin, Mon- talvo, and Visconti 2000; PBDB)	m2 Length	1.57	Marsupials (Didel- phids, Caenoles- tids)	(Croft 2000)	Mid	0.028
<i>Thylamys pinei</i>	<i>Thylamys pinei</i>	(Goin, Mon- talvo, and Visconti 2000; PBDB)	m1 Length	1.58	Marsupials (Didel- phids, dasyurids)	(Gordon 2003)	Mid	0.032
<i>Thylamys pinei</i>	<i>Thylamys pinei</i>	(Goin, Mon- talvo, and Visconti 2000; PBDB)	m2 Length	1.57	Marsupials (Didel- phids, dasyurids)	(Gordon 2003)	Mid	0.021
<i>Thylamys pinei</i>			Summary					0.025
<i>Zygolestes tatei</i>	<i>Zygolestes tatei</i>	PBDB	m1 Length	1.53	Marsupials (Didel- phids, Caenoles- tids)	(Croft 2000)	Mid	0.019
<i>Zygolestes tatei</i>	<i>Zygolestes tatei</i>	PBDB	m2 Length	1.53	Marsupials (Didel- phids, Caenoles- tids)	(Croft 2000)	Mid	0.025
<i>Zygolestes tatei</i>	<i>Zygolestes tatei</i>	PBDB	m1 Length	1.53	Marsupials (Didel-	(Gordon	Mid	0.029

Table S3.4: Marsupial body mass calculations, cont.

					phids, dasyurids)	2003)		
<i>Zygolestes tatei</i>	<i>Zygolestes tatei</i>	PBDB	m2 Length	1.53	Marsupials (Didel- phids, dasyurids)	(Gordon 2003)	Mid	0.019
<i>Zygolestes tatei</i>			Summary					0.023

5. Ungulate body mass calculations

Table S3.5: Ungulate body mass calculations. All headings and abbreviations are as for Table S3.1: Sloth body mass calculations.

Species	Measurement taxa	Measure. source	Measurement	Meas. value (mm)	Eq. Taxa	Eq. Source	Eq. Qual.	Body mass (kg)
<i>Alitoxodon</i> sp.	<i>Alitoxodon vetustus</i>	(Rovereto 1914)	m1 Length	27	Non-selenodont ungulates	(Damuth 1990)	Mid	378
<i>Alitoxodon</i> sp.	<i>Alitoxodon vetustus</i>	(Rovereto 1914)	m2 Length	26.5	Non-selenodont ungulates	(Damuth 1990)	Mid	225
<i>Alitoxodon</i> sp.	<i>Alitoxodon vetustus</i>	(Rovereto 1914)	m1-m3 Length	77.5 (27+26.5+24)	Non-selenodont ungulates	(Damuth 1990)	Mid	216
<i>Alitoxodon</i> sp.			Summary					273
<i>Bounodus enigmaticus</i>	<i>Bounodus enigmaticus</i>	(Measured from images in Carlini, Gelfo, and Sánchez 2006)	M1 Length	13.57142857	Non-selenodont ungulates	(Damuth 1990)	Mid	42.9
<i>Bounodus enigmaticus</i>	<i>Bounodus enigmaticus</i>	(Measured from images in Carlini, Gelfo, and Sánchez 2006)	M2 Length	15.71428571	Non-selenodont ungulates	(Damuth 1990)	Mid	42.8
<i>Bounodus enigmaticus</i>			Summary					42.8
<i>Calchaquitherium mixtum</i>	<i>Calchaquitherium mixtum</i>	(Nasif, Musalem, and	m1 Length	41	Non-selenodont ungulates	(Damuth 1990)	Mid	1421

Table S3.5: Ungulate body mass calculations, cont.

		Cerdeño 2000)						
<i>Calchaquitherium mixtum</i>	<i>Calchaquitherium mixtum</i>	(Nasif, Mu- salem, and Cerdeño 2000)	m2 Length	39.5	Non-selenodont ungulates	(Damuth 1990)	Mid	738
<i>Calchaquitherium mixtum</i>	<i>Calchaquitherium mixtum</i>	(Nasif, Mu- salem, and Cerdeño 2000)	m1-m3 Length	133.1 (41+39.5+ 52.6)	Non-selenodont ungulates	(Damuth 1990)	Mid	1112
<i>Calchaquitherium mixtum</i>			Summary					1090
<i>Cullinia</i> sp.	<i>Cullinia</i>	(Schmidt and Ferrero 2014)	M1 Length	17.71	Non-selenodont ungulates	(Damuth 1990)	Mid	98.2
<i>Cullinia</i> sp.	<i>Cullinia</i>	(Schmidt and Ferrero 2014)	m2 Length	20.9	Non-selenodont ungulates	(Damuth 1990)	Mid	111
<i>Cullinia</i> sp.			Summary					104
<i>Dilobodon luta- rius</i>		(Ameghino 1886)	m1 Length	14	Non-selenodont ungulates	(Damuth 1990)	Mid	47.1
<i>Dinotoxodon paranensis</i>	<i>Toxodon (=Dinotoxodon) paranensis</i>	(Schmidt 2013)	m1 Length	32.01	Non-selenodont ungulates	(Damuth 1990)	Mid	648
<i>Dinotoxodon paranensis</i>	<i>Toxodon (=Dinotoxodon) paranensis</i>	(Schmidt 2013)	m2 Length	37.85	Non-selenodont ungulates	(Damuth 1990)	Mid	650
<i>Dinotoxodon paranensis</i>	<i>Toxodon (=Dinotoxodon) paranensis</i>	(Schmidt 2013)	m1-m3 Length	124.03 (32.01+ 37.85+	Non-selenodont ungulates	(Damuth 1990)	Mid	898

Table S3.5: Ungulate body mass calculations, cont.

54.17)								
<i>Dinotoxodon paranensis</i>	<i>Toxodon</i> (= <i>Dinotoxodon</i>) <i>paranensis</i>	(Schmidt 2013)	M1 Length	41.63	Non-selenodont ungulates	(Damuth 1990)	Mid	1401
<i>Dinotoxodon paranensis</i>	<i>Toxodon</i> (= <i>Dinotoxodon</i>) <i>paranensis</i>	(Schmidt 2013)	M2 Length	52.36	Non-selenodont ungulates	(Damuth 1990)	Mid	1507
<i>Dinotoxodon paranensis</i>	<i>Toxodon</i> (= <i>Dinotoxodon</i>) <i>paranensis</i>	(Schmidt 2013)	M1-M3 Length	151.4 (41.63+ 52.36+ 57.41)	Non-selenodont ungulates	(Damuth 1990)	Mid	1554
<i>Dinotoxodon paranensis</i>			Summary					1110
<i>Eoauchenia</i> sp.	<i>Eoauchenia primitiva</i>	(Schmidt 2013)	Distal Humerus Width	30.25	Ungulates	(Scott 1990)		33.4
<i>Gyrinodon quasus</i> , G. sp.	<i>Gyrinodon quasus</i>	(Paula Couto 1982; PBDB)	m1 Length	39.5	Non-selenodont ungulates	(Damuth 1990)	Mid	1262
<i>Gyrinodon quasus</i> , G. sp.	<i>Gyrinodon quasus</i>	(Paula Couto 1982; PBDB)	m2 Length	40.5	Non-selenodont ungulates	(Damuth 1990)	Mid	795
<i>Gyrinodon quasus</i> , G. sp.	<i>Gyrinodon quasus</i>	(Paula Couto 1982; PBDB)	m1-m3 Length	142 (39.5+40.5+62)	Non-selenodont ungulates	(Damuth 1990)	Mid	1353
<i>Gyrinodon quasus</i> , G. sp.	<i>Gyrinodon quasus</i>	(Paula Couto 1982; PBDB)	M1 Length	51	Non-selenodont ungulates	(Damuth 1990)	Mid	2634
<i>Gyrinodon quasus</i> , G. sp.	<i>Gyrinodon quasus</i>	(Paula Couto 1982; PBDB)	M2 Length	55	Non-selenodont ungulates	(Damuth 1990)	Mid	1744

Table S3.5: Ungulate body mass calculations, cont.

		PBDB)						
<i>Gyrinodon quas-</i> <i>sus</i> , <i>G. sp.</i>	<i>Gyrinodon quas-</i> <i>sus</i>	(Paula Couto 1982; PBDB)	M1-M3 Length	168 (51+55+6 2)	Non-selenodont ungulates	(Damuth 1990)	Mid	2112
<i>Gyrinodon quas-</i> <i>sus</i>, <i>G. sp.</i>			Summary					1650
<i>Hypsitherium bo-</i> <i>livianum</i>	<i>Hypsitherium bo-</i> <i>livianum</i>	(Anaya and MacFadden 1995)	m1 Length	11.6	Non-selenodont ungulates	(Damuth 1990)	Mid	26.0
<i>Hypsitherium bo-</i> <i>livianum</i>	<i>Hypsitherium bo-</i> <i>livianum</i>	(Anaya and MacFadden 1995)	m2 Length	12.7	Non-selenodont ungulates	(Damuth 1990)	Mid	25.1
<i>Hypsitherium bo-</i> <i>livianum</i>	<i>Hypsitherium bo-</i> <i>livianum</i>	(Anaya and MacFadden 1995)	M1 Length	12.4	Non-selenodont ungulates	(Damuth 1990)	Mid	32.4
<i>Hypsitherium bo-</i> <i>livianum</i>	<i>Hypsitherium bo-</i> <i>livianum</i>	(Anaya and MacFadden 1995)	M2 Length	14.5	Non-selenodont ungulates	(Damuth 1990)	Mid	33.7
<i>Hypsitherium bo-</i> <i>livianum</i>	<i>Hypsitherium bo-</i> <i>livianum</i>	(Anaya and MacFadden 1995)	M1-M3 Length	38.7 (12.4+14. 5+11.8)	Non-selenodont ungulates	(Damuth 1990)	Mid	27.8
<i>Hypsitherium</i> <i>bolivianum</i>			Summary					29.0
<i>Lama castelnaudi</i>	<i>Lama</i> <i>castelnaudi</i>	(Scherer 2009)	m2 Length	23	Non-selenodont ungulates	(Damuth 1990)	Mid	147
<i>Miocochilius fed-</i> <i>ericoi</i>	<i>Miocochilius fed-</i> <i>ericoi</i>	PBDB	M1 Length	6	Non-selenodont ungulates	(Damuth 1990)	Mid	3.39
<i>Miocochilius fed-</i> <i>ericoi</i>	<i>Miocochilius fed-</i> <i>ericoi</i>	PBDB	M2 Length	6.1	Non-selenodont ungulates	(Damuth 1990)	Mid	2.60

Table S3.5: Ungulate body mass calculations, cont.

<i>Miocochilius fed- ericoi</i>	<i>Miocochilius fed- ericoi</i>	PBDB	M1-M3 Length	18.6 (6 + 6.1+6.5)	Non-selenodont ungulates	(Damuth 1990)	Mid	3.20
<i>Miocochilius fed- ericoi</i>	<i>Miocochilius federicoi</i>	PBDB	Summary					3.06
<i>Munizia paranensis</i>		(Kraglievich 1931a)	M1 Length	13	Non-selenodont ungulates	(Damuth 1990)	Mid	37.5
<i>Neobrachytheri- um ameghinoi</i>	<i>Neobrachytheri- um ameghinoi</i>	(Soria 2001)	m1 Length	13.3	Non-selenodont ungulates	(Damuth 1990)	Mid	40.1
<i>Neobrachytheri- um ameghinoi</i>	<i>Neobrachytheri- um ameghinoi</i>	(Soria 2001)	m2 Length	14.8	Non-selenodont ungulates	(Damuth 1990)	Mid	39.6
<i>Neobrachytheri- um ameghinoi</i>	<i>Neobrachytheri- um ameghinoi</i>	(Soria 2001)	m1-m3 Length	44 (13.3 + 14.8 + 15.9)	Non-selenodont ungulates	(Damuth 1990)	Mid	38.9
<i>Neobrachytheri- um ameghinoi</i>			Summary					39.5
<i>Neobrachytheri- um sp.</i>	Average of <i>N. ameghinoi</i> , <i>N. intermedius</i> , <i>N. morenoi</i> , <i>N. ullu- mense</i>	(Soria 2001)	m1 Length	13.3	Non-selenodont ungulates	(Damuth 1990)	Mid	40.1
<i>Neobrachytheri- um sp.</i>	Average of <i>N. ameghinoi</i> , <i>N. intermedius</i> , <i>N. morenoi</i> , <i>N. ullu- mense</i>	(Soria 2001)	m2 Length	14.8	Non-selenodont ungulates	(Damuth 1990)	Mid	39.6
<i>Neobrachytheri- um sp.</i>	Average of <i>N. ameghinoi</i> , <i>N. intermedius</i> , <i>N. morenoi</i> , <i>N. ullu- mense</i>	(Soria 2001)	m1-m3 Length	44 (13.3 + 14.8 + 15.9)	Non-selenodont ungulates	(Damuth 1990)	Mid	38.3

Table S3.5: Ungulate body mass calculations, cont.

<i>Neobrachytherium</i> sp.	Average of <i>N. ameghinoi</i> , <i>N. intermedius</i> , <i>N. morenoi</i> , <i>N. ullumense</i>	(Soria 2001)	M1 Length	13	Non-selenodont ungulates	(Damuth 1990)	Mid	37.5
<i>Neobrachytherium</i> sp.	Average of <i>N. ameghinoi</i> , <i>N. intermedius</i> , <i>N. morenoi</i> , <i>N. ullumense</i>	(Soria 2001)	M2 Length	14.5	Non-selenodont ungulates	(Damuth 1990)	Mid	33.7
<i>Neobrachytherium</i> sp.	Average of <i>N. ameghinoi</i> , <i>N. intermedius</i> , <i>N. morenoi</i> , <i>N. ullumense</i>	(Soria 2001)	M1-M3 Length	41.5 (13+14.5+14)	Non-selenodont ungulates	(Damuth 1990)	Mid	34.1
<i>Neobrachytherium</i> sp.	Summary							37.2
<i>Ocnerotherium</i> sp.	<i>Ocnerotherium intermedium</i>	(Pascual 1954)	M1 Length	63	Non-selenodont ungulates	(Damuth 1990)	Mid	5081
<i>Ocnerotherium</i> sp.	<i>Ocnerotherium intermedium</i>	(Pascual 1954)	M2 Length	67	Non-selenodont ungulates	(Damuth 1990)	Mid	3127
<i>Ocnerotherium</i> sp.	<i>Ocnerotherium intermedium</i>	(Pascual 1954)	M1-M3 Length	18.6 (6+6.1+6.5)	Non-selenodont ungulates	(Damuth 1990)	Mid	3637
<i>Ocnerotherium</i> sp.	<i>Ocnerotherium intermedium</i>	(Pascual 1954)	Upper Post-canine Row Length	247	Non-selenodont ungulates	(Damuth 1990)	Mid	1094
<i>Ocnerotherium</i> sp.	Summary							3949
<i>Oxydontherium</i>	<i>Oxydontherium</i>	(Schmidt and	m1 Length	20.21	Non-selenodont	(Damuth	Mid	151

Table S3.5: Ungulate body mass calculations, cont.

<i>piramydatus</i>		Ferrero (2014)			ungulates	1990)		
<i>Oxydontherium piramydatus</i>	<i>Oxydontherium</i>	(Schmidt and Ferrero 2014)	m2 Length	23.47	Non-selenodont ungulates	(Damuth 1990)	Mid	156
<i>Oxydontherium piramydatus</i>	<i>Oxydontherium</i>	(Schmidt and Ferrero 2014)	M1 Length	22.23	Non-selenodont ungulates	(Damuth 1990)	Mid	199
<i>Oxydontherium piramydatus</i>	<i>Oxydontherium</i>	(Schmidt and Ferrero 2014)	M2 Length	24.08	Non-selenodont ungulates	(Damuth 1990)	Mid	151
<i>Oxydontherium piramydatus</i>	<i>Oxydontherium</i>	(Schmidt and Ferrero 2014)	M1-M3 Length	65.22 (22.23+24.08+18.91)	Non-selenodont ungulates	(Damuth 1990)	Mid	130
<i>Oxydontherium piramydatus</i>			Summary					157
<i>Paedotherium minor</i>	<i>Paedotherium minor</i>	PBDB	m1 Length	4.11	Non-selenodont ungulates	(Damuth 1990)	Mid	0.968
<i>Paedotherium minor</i>	<i>Paedotherium minor</i>	PBDB	m2 Length	4.13	Non-selenodont ungulates	(Damuth 1990)	Mid	0.882
<i>Paedotherium minor</i>	<i>Paedotherium minor</i>	PBDB	m1-m3 Length	13.9 (4.11+4.13+5.66)	Non-selenodont ungulates	(Damuth 1990)	Mid	1.18
<i>Paedotherium minor</i>	<i>Paedotherium minor</i>	PBDB	M1 Length	4.46	Non-selenodont ungulates	(Damuth 1990)	Mid	1.35
<i>Paedotherium minor</i>	<i>Paedotherium minor</i>	PBDB	M2 Length	4.19	Non-selenodont ungulates	(Damuth 1990)	Mid	0.855
<i>Paedotherium minor</i>	<i>Paedotherium minor</i>	PBDB	M1-M3 Length	13.07 (4.46+4.13+4.48)	Non-selenodont ungulates	(Damuth 1990)	Mid	1.13

Table S3.5: Ungulate body mass calculations, cont.

9+4.42)								
<i>Paedotherium minor</i>		Summary						1.06
<i>Paedotherium typicum</i>	<i>Paedotherium typicum</i>	PBDB	m1 Length	4.26	Non-selenodont ungulates	(Damuth 1990)	Mid	1.08
<i>Paedotherium typicum</i>	<i>Paedotherium typicum</i>	PBDB	m2 Length	4.37	Non-selenodont ungulates	(Damuth 1990)	Mid	1.04
<i>Paedotherium typicum</i>	<i>Paedotherium typicum</i>	PBDB	m1-m3 Length	14.63 (4.26+4.37+6)	Non-selenodont ungulates	(Damuth 1990)	Mid	1.38
<i>Paedotherium typicum</i>	<i>Paedotherium typicum</i>	PBDB	M1 Length	4.81	Non-selenodont ungulates	(Damuth 1990)	Mid	1.70
<i>Paedotherium typicum</i>	<i>Paedotherium typicum</i>	PBDB	M2 Length	4.67	Non-selenodont ungulates	(Damuth 1990)	Mid	1.18
<i>Paedotherium typicum</i>	<i>Paedotherium typicum</i>	PBDB	M1-M3 Length	14.54 (4.81+4.67+5.06)	Non-selenodont ungulates	(Damuth 1990)	Mid	1.55
<i>Paedotherium typicum</i>		Summary						1.32
<i>Palaeolama major</i>	<i>Palaeolama major</i>	(Scherer 2009)	Femur Length	412	Ungulates	(Scott 1990)	Low	12437
<i>Palaeolama major</i>	<i>Palaeolama major</i>	(Scherer 2009)	Humerus Length	321.6	Ungulates	(Scott 1990)	High	405
<i>Palaeolama major</i>	<i>Palaeolama major</i>	(Scherer 2009)	Distal Humerus Width	64.9	Ungulates	(Scott 1990)	High	239
<i>Palaeolama major</i>	<i>Palaeolama major</i>	(Scherer 2009)	Tibia Proximal Width	82.6	Ungulates	(Scott 1990)	High	231
<i>Palaeolama major</i>		Summary						292

Table S3.5: Ungulate body mass calculations, cont.

<i>Palaeolama weddelli</i>	<i>Palaeolama weddelli</i>	(Scherer 2009)	Femur Length	385	Ungulates	(Scott 1990)	Low	10365
<i>Palaeolama weddelli</i>	<i>Palaeolama weddelli</i>	(Scherer 2009)	Humerus Length	302.8	Ungulates	(Scott 1990)	High	330
<i>Palaeolama weddelli</i>	<i>Palaeolama weddelli</i>	(Scherer 2009)	Distal Humerus Width	60.3	Ungulates	(Scott 1990)	High	198
<i>Palaeolama weddelli</i>	<i>Palaeolama weddelli</i>	(Scherer 2009)	Tibia Proximal Width	85.5	Ungulates	(Scott 1990)	High	255
<i>Palaeolama weddelli</i>			Summary					261
<i>Paranauchenia denticulata</i>	<i>Paranauchenia denticulata</i>	(Schmidt and Ferrero 2014)	m2 Length	29.8	Non-selenodont ungulates	(Damuth 1990)	Mid	319
<i>Paranauchenia denticulata</i>	<i>Paranauchenia denticulata</i>	(Schmidt and Ferrero 2014)	M1 Length	24.8	Non-selenodont ungulates	(Damuth 1990)	Mid	280
<i>Paranauchenia denticulata</i>	<i>Paranauchenia denticulata</i>	(Schmidt and Ferrero 2014)	M2 Length	23.7	Non-selenodont ungulates	(Damuth 1990)	Mid	144
<i>Paranauchenia denticulata</i>	<i>Paranauchenia denticulata</i>	(Schmidt and Ferrero 2014)	M1-M3 Length	71.3 (24.8+23.7+22.8)	Non-selenodont ungulates	(Damuth 1990)	Mid	169
<i>Paranauchenia denticulata</i>			Summary					228
<i>Paratrigodon</i> sp.	<i>Paratrigodon euquii</i>	(Schmidt 2013)	M1 Length	59.25	Non-selenodont ungulates	(Damuth 1990)	Mid	4198
<i>Paratrigodon</i> sp.	<i>Paratrigodon euquii</i>	(Schmidt 2013)	M2 Length	59.5	Non-selenodont ungulates	(Damuth 1990)	Mid	2201
<i>Paratrigodon</i> sp.	<i>Paratrigodon euquii</i>	(Schmidt 2013)	M1-M3 Length	14.54 (4.81+4.6)	Non-selenodont ungulates	(Damuth 1990)	Mid	3266

Table S3.5: Ungulate body mass calculations, cont.

7+5.06)							
Paratrigodon sp.		Summary					3221
Plesiotoxodon sp.		(Paula Couto 1982)	M2 Length	49.5	Non-selenodont ungulates	(Damuth 1990)	Mid 1277
<i>Plesiotypotherium majus</i>	<i>Plesiotypotherium majus</i>	(Townsend and Croft 2010)	M1 Length	20.8	Non-selenodont ungulates	(Damuth 1990)	Mid 162
<i>Plesiotypotherium majus</i>	<i>Plesiotypotherium majus</i>	(Townsend and Croft 2010)	M2 Length	21.8	Non-selenodont ungulates	(Damuth 1990)	Mid 113
<i>Plesiotypotherium majus</i>	<i>Plesiotypotherium majus</i>	(Townsend and Croft 2010)	M1-M3 Length	67.2 (20.8+21.8+24.6)	Non-selenodont ungulates	(Damuth 1990)	Mid 141
Plesiotypotherium majus		Summary					139
<i>Posnanskytherium desaguaderoi</i>	<i>Posnanskytherium desaguaderoi</i>	(Anaya and MacFadden 1995)	m1 Length	23.4	Non-selenodont ungulates	(Damuth 1990)	Mid 240
<i>Posnanskytherium desaguaderoi</i>	<i>Posnanskytherium desaguaderoi</i>	(Anaya and MacFadden 1995)	m2 Length	24.7	Non-selenodont ungulates	(Damuth 1990)	Mid 182
<i>Posnanskytherium desaguaderoi</i>	<i>Posnanskytherium desaguaderoi</i>	(Anaya and MacFadden 1995)	m1-m3 Length	80.8 (23.4+24.7+32.7)	Non-selenodont ungulates	(Damuth 1990)	Mid 245
<i>Posnanskytherium desaguaderoi</i>	<i>Posnanskytherium desaguaderoi</i>	(Anaya and MacFadden 1995)	M1 Length	30.7	Non-selenodont ungulates	(Damuth 1990)	Mid 543
<i>Posnanskytherium desaguaderoi</i>	<i>Posnanskytherium desaguaderoi</i>	(Anaya and MacFadden 1995)	M2 Length	33	Non-selenodont ungulates	(Damuth 1990)	Mid 384

Table S3.5: Ungulate body mass calculations, cont.

		1995)						
<i>Posnanskytherium desaguaderoi</i>	<i>Posnanskytherium desaguaderoi</i>	(Anaya and MacFadden 1995)	M1-M3 Length	99.2 (30.7+33+35.5)	Non-selenodont ungulates	(Damuth 1990)	Mid	446
<i>Posnanskytherium desaguaderoi</i>			Summary					
<i>Posnanskytherium inchasense</i>	<i>Posnanskytherium inchasense</i>	(Anaya and MacFadden 1995)	m1 Length	26.7	Non-selenodont ungulates	(Damuth 1990)	Mid	365
<i>Posnanskytherium inchasense</i>	<i>Posnanskytherium inchasense</i>	(Anaya and MacFadden 1995)	m2 Length	27.4	Non-selenodont ungulates	(Damuth 1990)	Mid	248
<i>Posnanskytherium inchasense</i>	<i>Posnanskytherium inchasense</i>	(Anaya and MacFadden 1995)	m1-m3 Length	91.8 (26.7+27.4+37.7)	Non-selenodont ungulates	(Damuth 1990)	Mid	361
<i>Posnanskytherium inchasense</i>	<i>Posnanskytherium inchasense</i>	(Anaya and MacFadden 1995)	M1 Length	34.6	Non-selenodont ungulates	(Damuth 1990)	Mid	788
<i>Posnanskytherium inchasense</i>	<i>Posnanskytherium inchasense</i>	(Anaya and MacFadden 1995)	M2 Length	41.8	Non-selenodont ungulates	(Damuth 1990)	Mid	774
<i>Posnanskytherium inchasense</i>	<i>Posnanskytherium inchasense</i>	(Anaya and MacFadden 1995)	M1-M3 Length	117.4 (34.6+41.8+41)	Non-selenodont ungulates	(Damuth 1990)	Mid	734
<i>Posnanskytherium inchasense</i>			Summary					
<i>Posnanskytherium sp.</i>	Average of <i>P. desaguaderoi</i> and <i>P. inchasense</i>	(Anaya and MacFadden 1995)	m1 Length	25.1	Non-selenodont ungulates	(Damuth 1990)	Mid	300
<i>Posnanskytherium</i>	Average of <i>P.</i>	(Anaya and	m2 Length	26.1	Non-selenodont	(Damuth	Mid	215

Table S3.5: Ungulate body mass calculations, cont.

um sp.	<i>desaguaderoi</i> and <i>P. inchasense</i>	MacFadden 1995)			ungulates	1990)		
<i>Posnanskytheri- um</i> sp.	Average of <i>P.</i> <i>desaguaderoi</i> and <i>P. inchasense</i>	(Anaya and MacFadden 1995)	m1-m3 Length	86.4 (25.1+26. 1+35.2)	Non-selenodont ungulates	(Damuth 1990)	Mid	300
<i>Posnanskytheri- um</i> sp.	Average of <i>P.</i> <i>desaguaderoi</i> and <i>P. inchasense</i>	(Anaya and MacFadden 1995)	M1 Length	32.7	Non-selenodont ungulates	(Damuth 1990)	Mid	661
<i>Posnanskytheri- um</i> sp.	Average of <i>P.</i> <i>desaguaderoi</i> and <i>P. inchasense</i>	(Anaya and MacFadden 1995)	M2 Length	37.4	Non-selenodont ungulates	(Damuth 1990)	Mid	557
<i>Posnanskytheri- um</i> sp.	Average of <i>P.</i> <i>desaguaderoi</i> and <i>P. inchasense</i>	(Anaya and MacFadden 1995)	M1-M3 Length	108.4 (32.7+37. 4+38.3)	Non-selenodont ungulates	(Damuth 1990)	Mid	580
<i>Posnanskytheri- um</i> sp.			Summary					435
<i>Proterotherium cervoides</i> , <i>P.</i> sp.	<i>Proterotherium cervoides</i>	(Soria 2001)	M1 Length	11.8	Non-selenodont ungulates	(Damuth 1990)	Mid	27.8
<i>Proterotherium cervoides</i> , <i>P.</i> sp.	<i>Proterotherium cervoides</i>	(Soria 2001)	M2 Length	14.3	Non-selenodont ungulates	(Damuth 1990)	Mid	32.3
<i>Proterotherium cervoides</i>, <i>P.</i> sp.			Summary					30.1
<i>Purperia criba- tidens</i>	<i>Purperia criba- tidens</i>		M1 Length	41	Non-selenodont ungulates	(Damuth 1990)	Mid	1336
<i>Scalabrinitherium bravardi</i> , <i>S.</i> <i>rothii</i> , <i>S.</i> sp.	<i>Scalabrinitherium</i>	(Schmidt and Ferrero 2014)	m1 Length	25.03	Non-selenodont ungulates	(Damuth 1990)	Mid	297
<i>Scalabrinitherium bravardi</i> , <i>S.</i> <i>rothii</i> , <i>S.</i> sp.	<i>Scalabrinitherium</i>	(Schmidt and Ferrero 2014)	m2 Length	29.57	Non-selenodont ungulates	(Damuth 1990)	Mid	311

Table S3.5: Ungulate body mass calculations, cont.

<i>Scalabrinitherium bravardi</i> , <i>S. rothii</i> , <i>S. sp.</i>	<i>Scalabrinitherium</i>	(Schmidt and Ferrero 2014)	M1 Length	27.24	Non-selenodont ungulates	(Damuth 1990)	Mid	375
<i>Scalabrinitherium bravardi</i> , <i>S. rothii</i> , <i>S. sp.</i>	<i>Scalabrinitherium</i>	(Schmidt and Ferrero 2014)	M2 Length	28.71	Non-selenodont ungulates	(Damuth 1990)	Mid	255
<i>Scalabrinitherium bravardi</i> , <i>S. rothii</i> , <i>S. sp.</i>	<i>Scalabrinitherium</i>	(Schmidt and Ferrero 2014)	M1-M3 Length	80.99 (27.24+28.71+25.04)	Non-selenodont ungulates	(Damuth 1990)	Mid	245
<i>Scalabrinitherium bravardi</i>, <i>S. rothii</i>, <i>S. sp.</i>			Summary					297
<i>Surameryx acensis</i>	<i>Surameryx acensis</i>	(Prothero et al. 2014)	m1 Length	10.7	Selenodont browsers	(Damuth 1990)	Mid	26.6
<i>Surameryx acensis</i>	<i>Surameryx acensis</i>	(Prothero et al. 2014)	m2 Length	12.1	Selenodont browsers	(Damuth 1990)	Mid	25.8
<i>Surameryx acensis</i>	<i>Surameryx acensis</i>	(Prothero et al. 2014)	m1-m3 Length (measured, not sum)	86.4 (25.1+26.1+35.2)	Selenodont browsers	(Damuth 1990)	Mid	31.5
<i>Surameryx acensis</i>	<i>Surameryx acensis</i>	(Prothero et al. 2014)	m1-m3 Length	86.4 (25.1+26.1+35.2)	Selenodont browsers	(Damuth 1990)	Mid	33.3
<i>Surameryx acensis</i>			Summary					28.0
<i>Sylvochoerus woodburnei</i>	<i>Sylvochoerus woodburnei</i>	(Frailey and Campbell 2012; PBDB)	m1 Length	14.9	Non-selenodont ungulates	(Damuth 1990)	Mid	57.4

Table S3.5: Ungulate body mass calculations, cont.

<i>Sylvochoerus woodburnei</i>	<i>Sylvochoerus woodburnei</i>	(Frailey and Campbell 2012; PBDB)	m2 Length	17.2	Non-selenodont ungulates	(Damuth 1990)	Mid	61.9
<i>Sylvochoerus woodburnei</i>	<i>Sylvochoerus woodburnei</i>	(Frailey and Campbell 2012; PBDB)	m1-m3 Length	54.2 (14.9+17.2+22.1)	Non-selenodont ungulates	(Damuth 1990)	Mid	73.1
<i>Sylvochoerus woodburnei</i>	<i>Sylvochoerus woodburnei</i>	(Frailey and Campbell 2012; PBDB)	M1 Length	14.2	Non-selenodont ungulates	(Damuth 1990)	Mid	49.4
<i>Sylvochoerus woodburnei</i>	<i>Sylvochoerus woodburnei</i>	(Frailey and Campbell 2012; PBDB)	M2 Length	16.1	Non-selenodont ungulates	(Damuth 1990)	Mid	45.9
<i>Sylvochoerus woodburnei</i>	<i>Sylvochoerus woodburnei</i>	(Frailey and Campbell 2012; PBDB)	M1-M3 Length	47.5 (14.2+16.1+17.2)	Non-selenodont ungulates	(Damuth 1990)	Mid	50.8
<i>Sylvochoerus woodburnei</i>			Summary					56.4
<i>Tapirus greslebini</i>	<i>Tapirus greslebi-ni</i>	(Holanda and Ferrero 2012)	M1 Length	25.5	Non-selenodont ungulates	(Damuth 1990)	Mid	305
<i>Tapirus greslebini</i>	<i>Tapirus greslebi-ni</i>	(Holanda and Ferrero 2012)	M2 Length	26	Non-selenodont ungulates	(Damuth 1990)	Mid	190
<i>Tapirus greslebi-ni</i>			Summary					247

Table S3.5: Ungulate body mass calculations, cont.

<i>Tapirus mesopotamicus</i>	<i>Tapirus mesopotamicus</i>	(Holanda and Ferrero 2012)	M1 Length	20.2	Non-selenodont ungulates	(Damuth 1990)	Mid	148
<i>Tapirus mesopotamicus</i>	<i>Tapirus mesopotamicus</i>	(Holanda and Ferrero 2012)	M2 Length	23.74	Non-selenodont ungulates	(Damuth 1990)	Mid	145
<i>Tapirus mesopotamicus</i>	<i>Tapirus mesopotamicus</i>	(Holanda and Ferrero 2012)	M1-M3 Length	67.2 (20.8+21.8+24.6)	Non-selenodont ungulates	(Damuth 1990)	Mid	148
<i>Tapirus mesopotamicus</i>			Summary					147
<i>Tapirus olivaresi</i>	<i>Tapirus olivaresi</i>	(Holanda and Ferrero 2012)	m1 Length	26.6	Non-selenodont ungulates	(Damuth 1990)	Mid	360
<i>Tapirus olivaresi</i>	<i>Tapirus olivaresi</i>	(Holanda and Ferrero 2012)	m2 Length	29.5	Non-selenodont ungulates	(Damuth 1990)	Mid	309
<i>Tapirus olivaresi</i>	<i>Tapirus olivaresi</i>	(Holanda and Ferrero 2012)	m1-m3 Length	86.4 (25.1+26.1+35.2)	Non-selenodont ungulates	(Damuth 1990)	Mid	300
<i>Tapirus olivaresi</i>			Summary					323
<i>Trigodonops lopesi</i>	<i>Trigodonops lopesi</i>	(Paula Couto 1982)	m1 Length	48.8	Non-selenodont ungulate	(Damuth 1990)		2468
<i>Villarroelia totoyoi</i>	<i>Villarroelia totoyoi</i>	(Cifelli and Guerrero 1997)	m1 Length	13.825	Non-selenodont ungulates	(Damuth 1990)	Mid	45.3
<i>Villarroelia totoyoi</i>	<i>Villarroelia totoyoi</i>	(Cifelli and Guerrero 1997)	m2 Length	14.933333 33	Non-selenodont ungulates	(Damuth 1990)	Mid	40.6

Table S3.5: Ungulate body mass calculations, cont.

<i>Villarroelia totoyoi</i>	<i>Villarroelia totoyoi</i>	(Cifelli and Guerrero 1997)	M1 Length	14.3	Non-selenodont ungulates	(Damuth 1990)	Mid	50.5
<i>Villarroelia totoyoi</i>	<i>Villarroelia totoyoi</i>	(Cifelli and Guerrero 1997)	M2 Length	15.275	Non-selenodont ungulates	(Damuth 1990)	Mid	39.3
<i>Villarroelia totoyoi</i>			Summary					43.9
<i>Waldochoerus bassleri</i>	<i>Waldochoerus bassleri</i>	(Frailey and Campbell 2012)	m1 Length	11.8	Non-selenodont ungulates	(Damuth 1990)	Mid	27.4
<i>Waldochoerus bassleri</i>	<i>Waldochoerus bassleri</i>	(Frailey and Campbell 2012)	m2 Length	13.1	Non-selenodont ungulates	(Damuth 1990)	Mid	27.5
<i>Waldochoerus bassleri</i>	<i>Waldochoerus bassleri</i>	(Frailey and Campbell 2012)	m1-m3 Length	42.5 (11.8+13.1+17.6)	Non-selenodont ungulates	(Damuth 1990)	Mid	35.0
<i>Waldochoerus bassleri</i>	<i>Waldochoerus bassleri</i>	(Frailey and Campbell 2012)	M1 Length	11	Non-selenodont ungulates	(Damuth 1990)	Mid	22.3
<i>Waldochoerus bassleri</i>	<i>Waldochoerus bassleri</i>	(Frailey and Campbell 2012)	M2 Length	9.8	Non-selenodont ungulates	(Damuth 1990)	Mid	10.6
<i>Waldochoerus bassleri</i>	<i>Waldochoerus bassleri</i>	(Frailey and Campbell 2012)	M1-M3 Length	34.4 (11+9.8+3.6)	Non-selenodont ungulates	(Damuth 1990)	Mid	19.6
<i>Waldochoerus bassleri</i>			Summary					23.7
<i>Xenastrapotherium aequatorialis</i>	<i>Xenastrapotherium aequatorialis</i>	PBDB	m1 Length	39	Non-selenodont ungulates	(Damuth 1990)	Mid	1212

Table S3.5: Ungulate body mass calculations, cont.

<i>Xenastrapotherium aequatorialis</i>	<i>Xenastrapotherium aequatorialis</i>	PBDB	m2 Length	55	Non-selenodont ungulates	(Damuth 1990)	Mid	1978
<i>Xenastrapotherium aequatorialis</i>								1595
<i>Xenastrapotherium amazonense</i>	<i>Xenastrapotherium amazonense</i>	PBDB	M3 Length	83	Non-selenodont ungulates	(Damuth 1990)	Mid	3445
<i>Xenorhinotherium bahiense</i> , X. sp.	<i>Xenorhinotherium</i>	(Schmidt and Ferrero 2014)	m1 Length	36	Non-selenodont ungulates	(Damuth 1990)	Mid	941
<i>Xenorhinotherium bahiense</i> , X. sp.	<i>Xenorhinotherium</i>	(Schmidt and Ferrero 2014)	m2 Length	44.5	Non-selenodont ungulates	(Damuth 1990)	Mid	1052
<i>Xenorhinotherium bahiense</i> , X. sp.	<i>Xenorhinotherium</i>	(Schmidt and Ferrero 2014)	M1 Length	41	Non-selenodont ungulates	(Damuth 1990)	Mid	1336
<i>Xenorhinotherium bahiense</i> , X. sp.	<i>Xenorhinotherium</i>	(Schmidt and Ferrero 2014)	M2 Length	46.3	Non-selenodont ungulates	(Damuth 1990)	Mid	1047
<i>Xenorhinotherium bahiense</i> , X. sp.	<i>Xenorhinotherium</i>	(Schmidt and Ferrero 2014)	M1-M3 Length	34.4 (11+9.8+13.6)	Non-selenodont ungulates	(Damuth 1990)	Mid	889
<i>Xenorhinotherium bahiense</i>, X. sp.								1053

6. Rodent body mass calculations

Table S3.6: Rodent body mass calculations. All headings and abbreviations are as for Table S3.1: Sloth body mass calculations.

Species	Measure- ment taxa	Meas. source	Measure.	Meas. value (mm)	Eq. Taxa	Eq. Source	Eq. Qual.	Body mass (kg)
<i>Alloiomys</i> sp.	<i>Alloiomys pattersoni</i>	(Vucetich 1979)	Skull length	103.1	All rodents	(Bertrand, Schillaci, and Silcox 2015)	High	5.3
<i>Alloiomys</i> sp.	<i>Alloiomys pattersoni</i>	(Vucetich 1979)	Skull length	103.1	Hystriocogna- thi	(Rinderknecht and Blan- co 2008)	High	3.1
<i>Alloiomys</i> sp.	<i>Alloiomys pattersoni</i>	(Vucetich 1979)	P4-M3	25.7	All rodents	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	5.0
<i>Alloiomys</i> sp.			Summary					4.5
<i>Arazamys castiglioni</i>	<i>Arazamys castiglioni</i>	(Rin- derknecht, Enrique, and Ubilla 2011)	URsum P4-M3	97.5 (22.9+ 23.1+25+ 26.5)	All rodents	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	197
<i>Arazamys castiglioni</i>	<i>Arazamys castiglioni</i>	(Rin- derknecht, Enrique, and Ubilla 2011)	M1 Length	23.1	Caviomorphs	(Croft 2000)	Mid	355
<i>Arazamys castiglioni</i>	<i>Arazamys castiglioni</i>	(Rin- derknecht, Enrique, and Ubilla 2011)	M2 Length	25	Caviomorphs	(Croft 2000)	Mid	291
<i>Arazamys castiglioni</i>			Summary					281
<i>Artigasias magna</i>	<i>Artigasias magna</i>	PBDB	m1 Length	19.6	All rodents	(Millien and Bovy 2010)	Mid	153

Table S3.6: Rodent body mass calculations, cont.

<i>Artigas magna</i>	<i>Artigas magna</i>	PBDB	m1 width	22.4	All rodents	(Millien and Bovy 2010)	Low	437
<i>Artigas magna</i>	<i>Artigas magna</i>	PBDB	m1 Length	19.6	Caviomorphs	(Croft 2000)	Mid	385
<i>Artigas magna</i>	<i>Artigas magna</i>	PBDB	m2 Length	24	Caviomorphs	(Croft 2000)	Mid	480
<i>Artigas magna</i>			Summary					339
<i>Briaromys</i> sp.	<i>Briaromys tronessar- tianus</i>	(Ameghino 1889)	m1 Length	9	All rodents	(Millien and Bovy 2010)	Mid	16.0
<i>Briaromys</i> sp.	<i>Briaromys tronessar- tianus</i>	(Ameghino 1889)	m1 Length	9	Caviomorphs	(Croft 2000)	Mid	28.2
<i>Briaromys</i> sp.	<i>Briaromys tronessar- tianus</i>	(Ameghino 1889)	m2 Length	9	Caviomorphs	(Croft 2000)	Mid	23.5
<i>Briaromys</i> sp.			Summary					22.6
<i>Cardiatherium chasicoense</i>	<i>Cardiatheri- um chasicoense</i>	(Deschamps et al. 2007)	LRsum p4-m3	46.78 (11.6+10. 19+10.29 +14.7)	Hystrico- morpha	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	23.6
<i>Cardiatherium chasicoense</i>	<i>Cardiatheri- um chasicoense</i>	(Deschamps et al. 2007)	URsum P4-M3	43.47 (8.32+8.6 4*2+17.8 7)	Hystrico- morpha	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	22.9
<i>Cardiatherium chasicoense</i>	<i>Cardiatheri- um chasicoense</i>	(Deschamps et al. 2007)	LRsum p4-m3	46.78 (11.6+10. 19+10.29 +14.7)	All rodents	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	25.2

Table S3.6: Rodent body mass calculations, cont.

<i>Cardiatherium chasicoense</i>	<i>Cardiatherium chasicoense</i>	(Deschamps et al. 2007)	URsum P4-M3	43.47 (8.32+8.64*2+17.87)	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	21.3
<i>Cardiatherium chasicoense</i>			Summary					23.2
<i>Cardiatherium paranense</i>	<i>Cardiatherium paranense</i>	(Vucetich et al. 2012)	URsum P4-M3	48.78 (9.18+8.2+7.3+24.1)	Hystrico-morpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	31.6
<i>Cardiatherium paranense</i>	<i>Cardiatherium paranense</i>	(Vucetich et al. 2012)	URsum P4-M3	48.78 (9.18+8.2+7.3+24.1)	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	29.3
<i>Cardiatherium paranense</i>			Summary					30.4
<i>Cardiatherium patagonicum</i>	<i>Cardiatherium patagonicum</i>	(Vucetich, Deschamps, et al. 2005)	URsum P4-M3	40.42 (7.8+6.41*2+19.8)	Hystrico-morpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	18.7
<i>Cardiatherium patagonicum</i>	<i>Cardiatherium patagonicum</i>	(Vucetich, Deschamps, et al. 2005)	URsum P4-M3	40.42 (7.8+6.41*2+19.8)	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	17.4
<i>Cardiatherium patagonicum</i>			Summary					18.1

Table S3.6: Rodent body mass calculations, cont.

<i>Cardiatherium</i> sp.	Average of <i>C. paranense</i> , <i>C. aff. orientalis</i> , <i>C. chasicoense</i> , <i>C. patagonicum</i>	(Vucetich, Deschamps, et al. 2005; Deschamps et al. 2007; Vucetich et al. 2012)	LRsum p4-m3	46.8 (10.7+10.3+11.1+14.7)	Hystrico- morpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	23.6
<i>Cardiatherium</i> sp.	Average of <i>C. paranense</i> , <i>C. aff. orientalis</i> , <i>C. chasicoense</i> , <i>C. patagonicum</i>	(Vucetich, Deschamps, et al. 2005; Deschamps et al. 2007; Vucetich et al. 2012)	URsum P4-M3	43.2 (8.3+7.4+7.2+19.9)	Hystrico- morpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	22.5
<i>Cardiatherium</i> sp.	Average of <i>C. paranense</i> , <i>C. aff. orientalis</i> , <i>C. chasicoense</i> , <i>C. patagonicum</i>	(Vucetich, Deschamps, et al. 2005; Deschamps et al. 2007; Vucetich et al. 2012)	LRsum p4-m3	46.8 (10.7+10.3+11.1+14.7)	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	25.2

Table S3.6: Rodent body mass calculations, cont.

<i>Cardiatherium</i> sp.	Average of <i>C. paranense</i> , <i>C. aff. orientalis</i> , <i>C. chasicoense</i> , <i>C. patagonicum</i>	(Vucetich, Deschamps, et al. 2005; Deschamps et al. 2007; Vucetich et al. 2012)	URsum P4-M3	43.2 (8.3+7.4 +7.2+19.9)	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	20.9
<i>Cardiatherium</i> sp.			Summary					23.1
<i>Cardiomya</i> sp.	<i>Cardiomya cavinus</i> , <i>C. sp.</i>	(Ameghino 1885; Pérez, Vucetich, and Deschamps 2014)	m1 Length	10	All rodents	(Millien and Bovy 2010)	Mid	21.7
<i>Cardiomya</i> sp.	<i>Cardiomya cavinus</i> , <i>C. sp.</i>	(Ameghino 1885; Pérez, Vucetich, and Deschamps 2014)	m1 width	5	All rodents	(Millien and Bovy 2010)	Low	3.7
<i>Cardiomya</i> sp.	<i>Cardiomya cavinus</i> , <i>C. sp.</i>	(Ameghino 1885; Pérez, Vucetich, and Deschamps 2014)	m1 Length	10	Caviomorphs	(Croft 2000)	Mid	40.2

Table S3.6: Rodent body mass calculations, cont.

<i>Cardiomy</i> sp.	<i>Cardiomy</i> <i>cavinus</i> , <i>C.</i> sp.	(Ameghino 1885; Pérez, Vucetich, and Des- champs 2014)	m2 Length	8.3	Caviomorphs	(Croft 2000)	Mid	18.3
<i>Cardiomy</i> sp.			Summary					26.7
<i>Caviodon</i> sp.	<i>Caviodon</i> <i>cuyano</i>	(Vucetich et al. 2011)	LRsum p4-m3	40.98 (12.3+ 8.25+ 8.59+ 11.84)	Hystri- morpha	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	16.6
<i>Caviodon</i> sp.	<i>Caviodon</i> <i>cuyano</i>	(Vucetich et al. 2011)	LRsum p4-m3	40.98 (12.3+ 8.25+ 8.59+ 11.84)	All rodents	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	17.5
<i>Caviodon</i> sp.			Summary					17.1
<i>Chasichimys</i> sp.	<i>Chasichimys</i> sp. nov.	(Chick 2009)	m1 Length	1.8	All rodents	(Millien and Bovy 2010)	Mid	0.150
<i>Chasichimys</i> sp.	<i>Chasichimys</i> sp. nov.	(Chick 2009)	m1 width	1.6	All rodents	(Millien and Bovy 2010)	Low	0.100
<i>Chasichimys</i> sp.	<i>Chasichimys</i> sp. nov.	(Chick 2009)	m1 Length	1.8	Caviomorphs	(Croft 2000)	Mid	0.127
<i>Chasichimys</i> sp.	<i>Chasichimys</i> sp. nov.	(Chick 2009)	m2 Length	1.8	Caviomorphs	(Croft 2000)	Mid	0.167

Table S3.6: Rodent body mass calculations, cont.

<i>Chasichimys</i> sp.	<i>Chasichimys</i> sp. nov.	(Chick 2009)	LRsum dp4-m3	5.3 (1.9+1.8 +1.8+1.7)	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.067
<i>Chasichimys</i> sp.	<i>Chasichimys</i> sp. nov.	(Chick 2009)	LRsum dp4-m3	5.3 (1.9+1.8 +1.8+1.7)	Hystrico-morpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.073
<i>Chasichimys</i> sp.	<i>Chasichimys</i> sp. nov.	(Chick 2009)	Lower cheek tooth row length: Non-Muroidea <500 g	5.9	Non-Muroidea <500g	(Hopkins 2008)	High	0.070
<i>Chasichimys</i> sp.	<i>Chasichimys</i> sp. nov.	(Chick 2009)	dp4-m3	5.9	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.090
<i>Chasichimys</i> sp.	<i>Chasichimys</i> sp. nov.	(Chick 2009)	M1 Length	1.6	Caviomorphs	(Croft 2000)	Mid	0.093
<i>Chasichimys</i> sp.	<i>Chasichimys</i> sp. nov.	(Chick 2009)	M2 Length	2.0	Caviomorphs	(Croft 2000)	Mid	0.208
<i>Chasichimys</i> sp.			Summary					0.075
<i>Ctenomys co-tocaensis</i>	<i>Ctenomys cotocaensis</i>	(Azurduy 2005)	Geo. Sim.: In-cisor width	8.1 (C. conoveri: 6.6)	<i>Ctenomys conoveri</i>	(Azurduy 2005)	Mid	2.22

Table S3.6: Rodent body mass calculations, cont.

<i>Ctenomys kraglievichi</i>	<i>Ctenomys kraglievichi</i>	(Azurduy 2005)	Geometric similarity: Incisor width	5.1 (C. conoveri: 6.6)	<i>Ctenomys conoveri</i>	(Azurduy 2005)	Mid	0.554
<i>Ctenomys praderii</i>	<i>Ctenomys praderii</i>	(Azurduy 2005)	Geometric similarity: Incisor width	2.7 (C. conoveri: 6.6)	<i>Ctenomys conoveri</i>	(Azurduy 2005)	Mid	0.082
<i>Diaphoromys</i> sp.	<i>Diaphoromys gamayensis</i>	(Kraglievich 1931b)	m1 Length	17.2	All rodents	(Millien and Bovy 2010)	Mid	105
<i>Diaphoromys</i> sp.	<i>Diaphoromys gamayensis</i>	(Kraglievich 1931b)	m1 width	16	All rodents	(Millien and Bovy 2010)	Low	150
<i>Diaphoromys</i> sp.	<i>Diaphoromys gamayensis</i>	(Kraglievich 1931b)	m1 Length	17.2	Caviomorphs	(Croft 2000)	Mid	249
<i>Diaphoromys</i> sp.	<i>Diaphoromys gamayensis</i>	(Kraglievich 1931b)	m2 Length	20	Caviomorphs	(Croft 2000)	Mid	274
<i>Diaphoromys</i> sp.			Summary					209
<i>Eucelophorus</i> sp.	Average of <i>E. chapadmalensis</i> and <i>E. zaratei</i>	(Reig and Quintana 1992)	Skull length	57.75	All rodents	(Bertrand, Schillaci, and Silcox 2015)	High	0.537

Table S3.6: Rodent body mass calculations, cont.

<i>Eucelophorus</i> sp.	Average of <i>E. chapadmalensis</i> and <i>E. zaratei</i>	(Reig and Quintana 1992)	Skull length	57.75	Hystriocognathi	(Rinderknecht and Blanco 2008)	High	0.394
<i>Eucelophorus</i> sp.	Average of <i>E. chapadmalensis</i> and <i>E. zaratei</i>	(Reig and Quintana 1992)	dp4-m3	10.11	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.388
<i>Eucelophorus</i> sp.	Average of <i>E. chapadmalensis</i> and <i>E. zaratei</i>	(Reig and Quintana 1992)	DP4-M3	10.54	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.428
<i>Eucelophorus</i> sp.	Average of <i>E. chapadmalensis</i> and <i>E. zaratei</i>	(Reig and Quintana 1992)	Lower cheek tooth row length	10.11	Non-Muroidea <500 g	(Hopkins 2008)	High	0.258
<i>Eucelophorus</i> sp.	Average of <i>E. chapadmalensis</i> and <i>E. zaratei</i>	(Reig and Quintana 1992)	Upper cheek tooth row length	10.54	All rodents	(Bertrand, Schillaci, and Silcox 2015)	High	0.394
<i>Eucelophorus</i> sp.	Average of <i>E. chapadmalensis</i> and <i>E. zaratei</i>	(Reig and Quintana 1992)	Upper cheek tooth row area	20.34 (10.54*1.93)	All rodents	(Bertrand, Schillaci, and Silcox 2015)	High	0.187
<i>Eucelophorus</i> sp.			Summary					0.370
<i>Eumegamysops</i> sp.	<i>Eumegamysops praependens</i>	(Alvarez 1958)	URsum P4-M3	96.5 (22.5+23+25+26)	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	192

Table S3.6: Rodent body mass calculations, cont.

<i>Eumysops formosus</i>	<i>Eumysops formosus</i>	(Olivares, Verzi, and Vucetich 2012)	dp4-m3	11.97	Hystrico-morpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.634
<i>Eumysops formosus</i>	<i>Eumysops formosus</i>	(Olivares, Verzi, and Vucetich 2012)	DP4-M3	9.32	Hystrico-morpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.313
<i>Eumysops formosus</i>	<i>Eumysops formosus</i>	(Olivares, Verzi, and Vucetich 2012)	dp4-m3	11.97	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.615
<i>Eumysops formosus</i>	<i>Eumysops formosus</i>	(Olivares, Verzi, and Vucetich 2012)	DP4-M3	9.32	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.305
<i>Eumysops formosus</i>	<i>Eumysops formosus</i>	(Olivares, Verzi, and Vucetich 2012)	Lower cheek tooth row length	11.97	Non-Muroidea <500 g	(Hopkins 2008)	High	0.214
<i>Eumysops formosus</i>	<i>Eumysops formosus</i>	(Olivares, Verzi, and Vucetich 2012)	Upper cheek tooth row length	9.32	All rodents	(Bertrand, Schillaci, and Silcox 2015)	High	0.269
<i>Eumysops formosus</i>			Summary					0.392
<i>Eumysops laeviplicatus</i>	<i>Eumysops laeviplicatus</i>	(Olivares, Verzi, and Vucetich 2012)	dp4-m3	11.26	Hystrico-morpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.539

Table S3.6: Rodent body mass calculations, cont.

<i>Eumysops laeviplicatus</i>	<i>Eumysops laeviplicatus</i>	(Olivares, Verzi, and Vucetich 2012)	DP4-M3	10.335	Hystrico-morpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.418
<i>Eumysops laeviplicatus</i>	<i>Eumysops laeviplicatus</i>	(Olivares, Verzi, and Vucetich 2012)	dp4-m3	11.26	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.520
<i>Eumysops laeviplicatus</i>	<i>Eumysops laeviplicatus</i>	(Olivares, Verzi, and Vucetich 2012)	DP4-M3	10.335	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.406
<i>Eumysops laeviplicatus</i>	<i>Eumysops laeviplicatus</i>	(Olivares, Verzi, and Vucetich 2012)	Lower cheek tooth row length	11.26	Non-Muroidea <500 g	(Hopkins 2008)	High	0.271
<i>Eumysops laeviplicatus</i>	<i>Eumysops laeviplicatus</i>	(Olivares, Verzi, and Vucetich 2012)	Upper cheek tooth row length	10.335	All rodents	(Bertrand, Schillaci, and Silcox 2015)	High	0.371
<i>Eumysops laeviplicatus</i>			Summary					0.421
<i>Eumysops</i> sp.	<i>Eumysops formosus</i> , <i>E. laeviplicatus</i>	(Olivares, Verzi, and Vucetich 2012)	dp4-m3	11.61	Hystrico-morpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.584
<i>Eumysops</i> sp.	<i>Eumysops formosus</i> , <i>E. laeviplicatus</i>	(Olivares, Verzi, and Vucetich 2012)	DP4-M3	9.83	Hystrico-morpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.363

Table S3.6: Rodent body mass calculations, cont.

<i>Eumysops</i> sp.	<i>Eumysops formosus</i> , <i>E. laeviplicatus</i>	(Olivares, Verzi, and Vucetich 2012)	dp4-m3	11.26	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.566
<i>Eumysops</i> sp.	<i>Eumysops formosus</i> , <i>E. laeviplicatus</i>	(Olivares, Verzi, and Vucetich 2012)	DP4-M3	10.335	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.353
<i>Eumysops</i> sp.	<i>Eumysops formosus</i> , <i>E. laeviplicatus</i>	(Olivares, Verzi, and Vucetich 2012)	Lower cheek tooth row length	11.26	Non-Muroidea <500 g	(Hopkins 2008)	High	0.242
<i>Eumysops</i> sp.	<i>Eumysops formosus</i> , <i>E. laeviplicatus</i>	(Olivares, Verzi, and Vucetich 2012)	Upper cheek tooth row length	10.335	All rodents	(Bertrand, Schillaci, and Silcox 2015)	High	0.318
<i>Eumysops</i> sp.			Summary					0.404
<i>Galileomys colloncurens</i>	<i>Galileomys colloncurens</i>	(Vucetich and Kramarz 2003; PBDB)	m1 Length	2.15	All rodents	(Millien and Bovy 2010)	Mid	0.250
<i>Galileomys colloncurens</i>	<i>Galileomys colloncurens</i>	(Vucetich and Kramarz 2003; PBDB)	m1 width	1.53	All rodents	(Millien and Bovy 2010)	Low	0.087
<i>Galileomys colloncurens</i>	<i>Galileomys colloncurens</i>	(Vucetich and Kramarz 2003; PBDB)	m1 Length	2.15	Caviomorphs	(Croft 2000)	Mid	0.231

Table S3.6: Rodent body mass calculations, cont.

<i>Galileomys colloncurens</i>	<i>Galileomys colloncurens</i>	(Vucetich and Kramarz 2003; PBDB)	m2 Length	2.15	Caviomorphs	(Croft 2000)	Mid	0.288
<i>Galileomys colloncurens</i>			Summary					0.256
<i>Guiomys unica</i> , G. sp.	<i>Guiomys unica</i>	(Pérez 2010a; Croft, Chick, and Anaya 2011)	LRsum p4-m3	13.6 (3.1+3.6 +4+2.9)	Hystricomorpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.889
<i>Guiomys unica</i> , G. sp.	<i>Guiomys unica</i>	(Pérez 2010a; Croft, Chick, and Anaya 2011)	URsum P4-M3	12.7 (2.9+3.5 +3.5+3.6)	Hystricomorpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.742
<i>Guiomys unica</i> , G. sp.	<i>Guiomys unica</i>	(Pérez 2010a; Croft, Chick, and Anaya 2011)	LRsum p4-m3	13.6 (3.1+3.6 +4+2.9)	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.870
<i>Guiomys unica</i> , G. sp.	<i>Guiomys unica</i>	(Pérez 2010a; Croft, Chick, and Anaya 2011)	URsum P4-M3	12.7 (2.9+3.5 +3.5+3.6)	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.716
<i>Guiomys unica</i>, G. sp.			Summary					0.804
<i>Holochilus primigenus</i>	<i>Holochilus primigenus</i>	PBDB	LRsum m1-m3	6.95 (2.89+2.0 4+2.02)	Cricetidae	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.124
<i>Holochilus primigenus</i>	<i>Holochilus primigenus</i>	PBDB	URsum M1-M3	6.29 (2.67+1.9 7+1.65)	Cricetidae	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.098

Table S3.6: Rodent body mass calculations, cont.

<i>Holochilus primigenus</i>	<i>Holochilus primigenus</i>	PBDB	LRsum m1-m3	6.95 (2.89+2.04+2.02)	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.140
<i>Holochilus primigenus</i>	<i>Holochilus primigenus</i>	PBDB	URsum M1-M3	6.29 (2.67+1.97+1.65)	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.103
<i>Holochilus primigenus</i>			Summary					0.116
<i>Hydrochoeropsis dasseni</i>	<i>Hydrochoeropsis dasseni</i>	(Kraglievich 1930)	Skull length	340	All rodents	(Bertrand, Schillaci, and Silcox 2015)	High	592
<i>Hydrochoeropsis dasseni</i>	<i>Hydrochoeropsis dasseni</i>	(Kraglievich 1930)	Skull length	340	Hystriognathi	Rinderknecht and Blanco 2008	High	209
<i>Hydrochoeropsis dasseni</i>			Summary					401
<i>Isostylomys</i> sp.	Averaged measurements from <i>I. intermedius</i> , <i>I. laurillardi</i> , <i>I. ameghinoi</i> , <i>I. laevis</i> , <i>I. magnus</i>	(Mones and Castiglioni 1979)	LRsum p4-m3	63.65 (17.17+14.93+14.2+17.35)	Hystriomorpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	53.4

Table S3.6: Rodent body mass calculations, cont.

<i>Isostylomys</i> sp.	Averaged measurements from <i>I intermedius</i> , <i>I. laurillardi</i> , <i>I. ameghinoi</i> , <i>I. laevis</i> , <i>I. magnus</i>	(Mones and Castiglioni 1979)	LRsum p4-m3	63.65 (17.17+14.93+14.2+17.35)	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	58.2
<i>Isostylomys</i> sp.			Summary					55.8
<i>Marisela</i> sp.	<i>Marisela gregoriana</i>	(Vucetich et al. 2010)	M1 Length	3.36	Caviomorphs	(Croft 2000)	Mid	0.921
<i>Marisela</i> sp.	<i>Marisela gregoriana</i>	(Vucetich et al. 2010)	M2 Length	3.36	Caviomorphs	(Croft 2000)	Mid	0.922
<i>Marisela</i> sp.			Summary					0.922
<i>Microcardiodon williensis</i>	<i>Microcardiodon williensis</i>	(Pérez and Vucetich 2011)	LRsum p4-m3	17.07 (2.86+4.03+4.84+5.34)	Hystrico-morpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	1.63
<i>Microcardiodon williensis</i>	<i>Microcardiodon williensis</i>	(Pérez and Vucetich 2011)	LRsum p4-m3	17.07 (2.86+4.03+4.84+5.34)	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	1.62
<i>Microcardiodon williensis</i>			Summary					1.62
<i>Neocavia depressidens</i> , <i>N. lozanoi</i> , <i>N. sp.</i>	<i>Neocavia lozanoi</i>	(Kraglievich 1932)	P4-M3	11	Hystrico-morpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.437

Table S3.6: Rodent body mass calculations, cont.

<i>Neocavia depressidens</i> , <i>N. lozanoi</i> , <i>N. sp.</i>	<i>Neocavia lozanoi</i>	(Kraglievich 1932)	P4-M3	11	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.424
<i>Neocavia depressidens</i> , <i>N. lozanoi</i> , <i>N. sp.</i>	<i>Neocavia lozanoi</i>	(Kraglievich 1932)	Upper cheek tooth row length	11	All rodents	(Bertrand, Schillaci, and Silcox 2015)	High	0.390
<i>Neocavia depressidens</i>, <i>N. lozanoi</i>, <i>N. sp.</i>			Summary					0.417
<i>Neoepiblema ambrosettianus</i>	<i>Neoepiblema ambrosettianus</i>	(Negri and Ferigolo 1999; PBDB)	Skull length	276.3	All rodents	(Bertrand, Schillaci, and Silcox 2015)	High	261
<i>Neoepiblema ambrosettianus</i>	<i>Neoepiblema ambrosettianus</i>	(Negri and Ferigolo 1999; PBDB)	Skull length	276.3	Hystriocognathi	(Rinderknecht and Blanco 2008)	High	100
<i>Neoepiblema ambrosettianus</i>	<i>Neoepiblema ambrosettianus</i>	(Negri and Ferigolo 1999; PBDB)	p4-m3	59	Hystricomorpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	43.7
<i>Neoepiblema ambrosettianus</i>	<i>Neoepiblema ambrosettianus</i>	(Negri and Ferigolo 1999; PBDB)	P4-M3	70.5	Hystricomorpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	88.3
<i>Neoepiblema ambrosettianus</i>	<i>Neoepiblema ambrosettianus</i>	(Negri and Ferigolo 1999; PBDB)	Lower cheek tooth row length	59	Non-Muroidea <500 g	(Hopkins 2008)	High	42.2

Table S3.6: Rodent body mass calculations, cont.

<i>Neopiblema ambrosettianus</i>	<i>Neopiblema ambrosettianus</i>	(Negri and Ferigolo 1999; PBDB)	p4-m3	59	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	47.3
<i>Neopiblema ambrosettianus</i>	<i>Neopiblema ambrosettianus</i>	(Negri and Ferigolo 1999; PBDB)	P4-M3	70.5	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	80.8
<i>Neopiblema ambrosettianus</i>	<i>Neopiblema ambrosettianus</i>	(Negri and Ferigolo 1999; PBDB)	Upper cheek tooth row length	70.5	All rodents	(Bertrand, Schillaci, and Silcox 2015)	High	144
<i>Neopiblema ambrosettianus</i>	<i>Neopiblema ambrosettianus</i>	(Negri and Ferigolo 1999; PBDB)	Upper cheek tooth row area	979.95 (70.5*13.9)	All rodents	(Bertrand, Schillaci, and Silcox 2015)	High	97.2
Neopiblema ambrosettianus			Summary					101
<i>Neophanomys biplicatus</i>	<i>Neophanomys biplicatus</i>	(Verzi, Vieytes, and Montalvo 2011)	LRsum dp4-m3	5.66 (1.54+1.52+1.56+1.04)	Hystricomorpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.087
<i>Neophanomys biplicatus</i>	<i>Neophanomys biplicatus</i>	(Verzi, Vieytes, and Montalvo 2011)	LRsum dp4-m3	5.66 (1.54+1.52+1.56+1.04)	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.080
<i>Neophanomys biplicatus</i>			Summary					0.083

Table S3.6: Rodent body mass calculations, cont.

<i>Neophanomys</i> sp.	Average of specimens from <i>N.</i> <i>biplicatus</i> , <i>N.</i> <i>pristinus</i> , and <i>N. re-</i> <i>cens</i>	(Verzi, Vieytes, and Montalvo 2011)	LRsum dp4-m3	5.77 (1.59+1.5 1+1.49+1 .18)	Hystrico- morpha	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.091
<i>Neophanomys</i> sp.	Average of specimens from <i>N.</i> <i>biplicatus</i> , <i>N.</i> <i>pristinus</i> , and <i>N. re-</i> <i>cens</i>	(Verzi, Vieytes, and Montalvo 2011)	LRsum dp4-m3	5.77 (1.59+1.5 1+1.49+1 .18)	All rodents	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.084
<i>Neophanomys</i> sp.			Summary					0.088
<i>Neosteiromys</i> <i>tordillense</i>	<i>Ne-</i> <i>osteiromys</i> <i>tordillense</i>	(Vucetich, Mazzoni, and Pardiñas 1993; PBDB)	M1 Length	6.40	Caviomorphs	(Croft 2000)	Mid	6.74
<i>Neosteiromys</i> <i>tordillense</i>	<i>Ne-</i> <i>osteiromys</i> <i>tordillense</i>	(Vucetich, Mazzoni, and Pardiñas 1993; PBDB)	M2 Length	6.40	Caviomorphs	(Croft 2000)	Mid	5.85

Table S3.6: Rodent body mass calculations, cont.

<i>Neosteiromys tordillense</i>	<i>Ne-osteiomys tordillense</i>	(Vucetich, Mazzoni, and Pardiñas 1993; PBDB)	m1 Length	6.3	All rodents	(Millien and Bovy 2010)	Mid	5.67
<i>Neosteiromys tordillense</i>	<i>Ne-osteiomys tordillense</i>	(Vucetich, Mazzoni, and Pardiñas 1993; PBDB)	m1 Length	6.3	Caviomorphs	(Croft 2000)	Mid	8.52
<i>Neosteiromys tordillense</i>	<i>Ne-osteiomys tordillense</i>	(Vucetich, Mazzoni, and Pardiñas 1993; PBDB)	m2 Length	6.3	Caviomorphs	(Croft 2000)	Mid	7.85
<i>Neosteiromys tordillense</i>			Summary					6.93
<i>Orthomyctera</i> sp.	<i>Orthomyctera rigens</i>	(Chick 2009)	Upper cheek tooth row length	15	All rodents	(Bertrand, Schillaci, and Silcox 2015)	High	1.18
<i>Orthomyctera</i> sp.	<i>Orthomyctera rigens</i>	(Chick 2009)	Upper cheek tooth row area	45 (15*3)	All rodents	(Bertrand, Schillaci, and Silcox 2015)	High	0.674
<i>Orthomyctera</i> sp.	<i>Orthomyctera rigens</i>	(Chick 2009)	p4-m3	15	Hystriomorphs	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	1.15

Table S3.6: Rodent body mass calculations, cont.

<i>Orthomyctera</i> sp.	<i>Orthomycte- ra rigens</i>	(Chick 2009)	P4-M3	15	All rodents	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	1.13
<i>Orthomyctera</i> sp.	<i>Orthomycte- ra rigens</i>	(Chick 2009)	p4-m3	15	All rodents	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	1.14
<i>Orthomyctera</i> sp.	<i>Orthomycte- ra rigens</i>	(Chick 2009)	P4-M3	15	All rodents	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	1.13
<i>Orthomyctera</i> sp.			Summary					1.07
<i>Palaeocavia</i> sp.	<i>Palaeo- cavia? maw- ka</i>	(Madozzo- Jaén and Pé- rez 2017)	Upper cheek tooth row length	15	All rodents	(Bertrand, Schillaci, and Silcox 2015)	High	1.12
<i>Palaeocavia</i> sp.	<i>Palaeo- cavia? maw- ka</i>	(Madozzo- Jaén and Pé- rez 2017)	p4-m3	14.55	Hystri- cormorpha	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	1.06
<i>Palaeocavia</i> sp.	<i>Palaeo- cavia? maw- ka</i>	(Madozzo- Jaén and Pé- rez 2017)	P4-M3	15	All rodents	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	1.08
<i>Palaeocavia</i> sp.	<i>Palaeo- cavia? maw- ka</i>	(Madozzo- Jaén and Pé- rez 2017)	p4-m3	14.55	All rodents	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	1.05
<i>Palaeocavia</i> sp.	<i>Palaeo- cavia? maw- ka</i>	(Madozzo- Jaén and Pé- rez 2017)	P4-M3	15	All rodents	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	1.08
<i>Palaeocavia</i> sp.			Summary					1.08

Table S3.6: Rodent body mass calculations, cont.

<i>Palaeoctodon simplicidens</i>	<i>Palaeoctodon simplicidens</i>	PBDB	LRsum p4-m3	8.3 (2.1+2.2 +2+2)	Hystrico- morpha	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.240
<i>Palaeoctodon simplicidens</i>	<i>Palaeoctodon simplicidens</i>	PBDB	LRsum p4-m3	8.3 (2.1+2.2 +2+2)	All rodents	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.227
<i>Palaeoctodon simplicidens</i>			Summary					0.233
<i>Paramyocastor diligens</i>	<i>Paramyocastor diligens</i>	(Verzi, Des- champs, and Vucetich 2002)	dp4-m3	21.54	Hystrico- morpha	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	3.01
<i>Paramyocastor diligens</i>	<i>Paramyocastor diligens</i>	(Verzi, Des- champs, and Vucetich 2002)	dp4-m3	11.26	All rodents	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	3.04
<i>Paramyocastor diligens</i>	<i>Paramyocastor diligens</i>	(Verzi, Des- champs, and Vucetich 2002)	URsum P4-M3	12.7 (2.9+3.5 +3.5+3.6)	Hystrico- morpha	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	2.12
<i>Paramyocastor diligens</i>	<i>Paramyocastor diligens</i>	(Verzi, Des- champs, and Vucetich 2002)	URsum P4-M3	12.7 (2.9+3.5 +3.5+3.6)	All rodents	(Freudenthal and Martín- Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	2.03
<i>Paramyocastor diligens</i>			Summary					2.55
<i>Phoberomys bordasi</i>	<i>Phoberomys bordasi</i>	(Carrillo and Sánchez- Villagra 2015)	m1 Length	16.50	All rodents	(Millien and Bovy 2010)	Low	92.7

Table S3.6: Rodent body mass calculations, cont.

<i>Phoberomys bordasi</i>	<i>Phoberomys bordasi</i>	(Carrillo and Sánchez-Villagra 2015)	m1 width	15.7	All rodents	(Millien and Bovy 2010)	Low	141
<i>Phoberomys bordasi</i>	<i>Phoberomys bordasi</i>	(Carrillo and Sánchez-Villagra 2015)	m1 Length	16.50	Caviomorphs	(Croft 2000)	Low	216
<i>Phoberomys bordasi</i>	<i>Phoberomys bordasi</i>	(Carrillo and Sánchez-Villagra 2015)	p4 length	16.40	Marmotini	(Goodwin and Bullock 2012)	Low	111
<i>Phoberomys bordasi</i>	<i>Phoberomys bordasi</i>	(Carrillo and Sánchez-Villagra 2015)	Geometric similarity: p4 length	16.40	<i>Phoberomys pattersoni</i>	(Carrillo and Sánchez-Villagra 2015)	Mid	80.2
<i>Phoberomys bordasi</i>	<i>Phoberomys bordasi</i>	(Carrillo and Sánchez-Villagra 2015)	Geometric similarity: m1 length	16.50	<i>Phoberomys pattersoni</i>	(Carrillo and Sánchez-Villagra 2015)	Mid	139
<i>Phoberomys bordasi</i>			Summary					110
<i>Phoberomys burmeisteri</i>	<i>Phoberomys burmeisteri</i>	(Carrillo and Sánchez-Villagra 2015)	LRsum p4-m3	115.8 (32.3+23.8+25.3+34.4)	Hystrico-morpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	Low	262
<i>Phoberomys burmeisteri</i>	<i>Phoberomys burmeisteri</i>	(Carrillo and Sánchez-Villagra 2015)	LRsum p4-m3	115.8 (32.3+23.8+25.3+34.4)	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	Low	297

Table S3.6: Rodent body mass calculations, cont.

<i>Phoberomys burmeisteri</i>	<i>Phoberomys burmeisteri</i>	(Carrillo and Sánchez-Villagra 2015)	LRsum p4-m3	115.8 (32.3+23.8+25.3+34.4)	<i>Phoberomys pattersoni</i>	(Carrillo and Sánchez-Villagra 2015)	Mid	548
<i>Phoberomys burmeisteri</i>			Summary					548
<i>Phoberomys insolita</i>	<i>Phoberomys insolita</i>	(Carrillo and Sánchez-Villagra 2015)	P4-M2	20.17	<i>Phoberomys burmeisteri</i>	(Carrillo and Sánchez-Villagra 2015)	Mid	485
<i>Phoberomys pattersoni</i>	<i>Phoberomys pattersoni</i>	(Carrillo and Sánchez-Villagra 2015)	LRsum p4-m3	108.39 (29.13+24.37+25.35+29.54)	Hystrico-morpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	Low	219
<i>Phoberomys pattersoni</i>	<i>Phoberomys pattersoni</i>	(Carrillo and Sánchez-Villagra 2015)	URsum P4-M3	108.39 (29.13+24.37+25.35+29.54)	Hystrico-morpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	Low	70.6
<i>Phoberomys pattersoni</i>	<i>Phoberomys pattersoni</i>	(Carrillo and Sánchez-Villagra 2015)	LRsum p4-m3	108.39 (29.13+24.37+25.35+29.54)	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	Low	248
<i>Phoberomys pattersoni</i>	<i>Phoberomys pattersoni</i>	(Carrillo and Sánchez-Villagra 2015)	URsum P4-M3	108.39 (29.13+24.37+25.35+29.54)	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	Low	64.8

Table S3.6: Rodent body mass calculations, cont.

<i>Phoberomys pattersoni</i>			Summary					151
<i>Phoberomys praecursor</i>	<i>Phoberomys praecursor</i>	(Carrillo and Sánchez-Villagra 2015)	p4 length	28.7	<i>Phoberomys pattersoni</i>	(Carrillo and Sánchez-Villagra 2015)	Mid	429
<i>Phugatherium cataclisticum</i> , <i>P. dichroplax</i> , <i>P. sp.</i>	<i>P. dichroplax</i>	PBDB	m1 Length	23	All rodents	(Millien and Bovy 2010)	Mid	243
<i>Phugatherium cataclisticum</i> , <i>P. dichroplax</i> , <i>P. sp.</i>	<i>P. dichroplax</i>	PBDB	m1 width	12	All rodents	(Millien and Bovy 2010)	Low	476
<i>Phugatherium cataclisticum</i> , <i>P. dichroplax</i> , <i>P. sp.</i>	<i>P. dichroplax</i>	PBDB	m1 Length	23	Caviomorphs	(Croft 2000)	Mid	659
<i>Phugatherium cataclisticum</i>, <i>P. dichroplax</i>, <i>P. sp.</i>			Summary					451
<i>Pliodolichotis sp.</i>	<i>Pliodolichotis ortuzari</i>	(Kraglievich 1927)	Geometric similarity: M3 Length	11	<i>Eodolichotis elachys</i>	(Walton 1990; Walton 1997)	Mid	34.9
<i>Praectenomys sp.</i>	<i>Praectenomys rhombidens</i>	(Quintana 1994)	dp4-m3	10.27	Hystricomorpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.422

Table S3.6: Rodent body mass calculations, cont.

<i>Praectenomys</i> sp.	<i>Praectenomys rhombidens</i>	(Quintana 1994)	DP4-M3	8.46	Hystrico-morpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.239
<i>Praectenomys</i> sp.	<i>Praectenomys rhombidens</i>	(Quintana 1994)	dp4-m3	10.27	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.405
<i>Praectenomys</i> sp.	<i>Praectenomys rhombidens</i>	(Quintana 1994)	DP4-M3	8.46	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.234
<i>Praectenomys</i> sp.			Summary					0.325
<i>Protabrocoma</i> sp.	<i>Protabrocoma paranensis</i>	(Kraglievich 1927)	LRsum p4-m3	9.5 (2+2.5*3)	Hystrico-morpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.343
<i>Protabrocoma</i> sp.	<i>Protabrocoma paranensis</i>	(Kraglievich 1927)	LRsum p4-m3	9.5 (2+2.5*3)	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.328
<i>Protabrocoma</i> sp.			Summary					0.335
<i>Protacaremys</i> <i>denisae</i>	<i>Protacaremys denisae</i>	PBDB	LRsum p4-m3	7.1 (2.15+1.8+1+2.15)	Hystrico-morpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.158
<i>Protacaremys</i> <i>denisae</i>	<i>Protacaremys denisae</i>	PBDB	LRsum p4-m3	7.1 (2.15+1.8+1+2.15)	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.148
<i>Protacaremys</i> <i>denisae</i>			Summary					0.153

Table S3.6: Rodent body mass calculations, cont.

<i>Pseudoplataeomys formosus</i>	<i>Pseudoplataeomys formosus</i> (=P. scindens, see Lucas Kraglievich 1934)	(Ameghino 1889)	m1 Length	2.0	All rodents	(Millien and Bovy 2010)	Mid	0.203
<i>Pseudoplataeomys formosus</i>	<i>Pseudoplataeomys formosus</i> (=P. scindens, see Lucas Kraglievich 1934)	(Ameghino 1889)	m1 width	1.5	All rodents	(Millien and Bovy 2010)	Low	0.081
<i>Pseudoplataeomys formosus</i>	<i>Pseudoplataeomys formosus</i> (=P. scindens, see Lucas Kraglievich 1934)	(Ameghino 1889)	m1 Length	2.0	Caviomorphs	(Croft 2000)	Mid	0.181
<i>Pseudoplataeomys formosus</i>	<i>Pseudoplataeomys formosus</i> (=P. scindens, see Lucas Kraglievich 1934)	(Ameghino 1889)	m2 Length	2.0	Caviomorphs	(Croft 2000)	Mid	0.230

Table S3.6: Rodent body mass calculations, cont.

<i>Pseudoplateomys formosus</i>	<i>Pseudoplateomys formosus</i> (=P. scindens, see Lucas Kraglievich 1934)	(Ameghino 1889)	M1 Length	1.4	Caviomorphs	(Croft 2000)	Mid	0.062
<i>Pseudoplateomys formosus</i>	<i>Pseudoplateomys formosus</i> (=P. scindens, see Lucas Kraglievich 1934)	(Ameghino 1889)	M2 Length	1.4	Caviomorphs	(Croft 2000)	Mid	0.075
<i>Pseudoplateomys formosus</i>			Summary					0.150
<i>Quebradahondomys potosiensis</i>	<i>Quebradahondomys potosiensis</i>	(Croft, Chick, and Anaya 2011)	m1 Length	2.4	All rodents	(Millien and Bovy 2010)	Mid	0.345
<i>Quebradahondomys potosiensis</i>	<i>Quebradahondomys potosiensis</i>	(Croft, Chick, and Anaya 2011)	m1 width	2.1	All rodents	(Millien and Bovy 2010)	Low	0.237
<i>Quebradahondomys potosiensis</i>	<i>Quebradahondomys potosiensis</i>	(Croft, Chick, and Anaya 2011)	m1 Length	2.4	Caviomorphs	(Croft 2000)	Mid	0.334
<i>Quebradahondomys potosiensis</i>	<i>Quebradahondomys potosiensis</i>	(Croft, Chick, and Anaya 2011)	m2 Length	3.0	Caviomorphs	(Croft 2000)	Mid	0.801

Table S3.6: Rodent body mass calculations, cont.

<i>Quebradachondomys potosiensis</i>			Summary					0.493
<i>Scapteromys herskovitzi</i>	<i>Scapteromys herskovitzi</i>	(Reig 1994)	LRsum m1-m3	6.5900	Cricetidae	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.109
<i>Scapteromys herskovitzi</i>	<i>Scapteromys herskovitzi</i>	(Reig 1994)	URsum M1-M3	6.02 (2.82+1.74+1.46)	Cricetidae	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.089
<i>Scapteromys herskovitzi</i>	<i>Scapteromys herskovitzi</i>	(Reig 1994)	LRsum m1-m3	6.5900	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.121
<i>Scapteromys herskovitzi</i>	<i>Scapteromys herskovitzi</i>	(Reig 1994)	URsum M1-M3	6.02 (2.82+1.74+1.46)	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.091
<i>Scapteromys herskovitzi</i>			Summary					
<i>Simplimus</i> sp.	<i>Simplimus</i> sp.	(Vucetich 1984)	m1 Length	8.4	All rodents	(Millien and Bovy 2010)	Mid	13.1
<i>Simplimus</i> sp.	<i>Simplimus</i> sp.	(Vucetich 1984)	m1 width	7.75	All rodents	(Millien and Bovy 2010)	Low	15.0
<i>Simplimus</i> sp.	<i>Simplimus</i> sp.	(Vucetich 1984)	m1 Length	8.4	Caviomorphs	(Croft 2000)	Mid	22.4
<i>Simplimus</i> sp.	<i>Simplimus</i> sp.	(Vucetich 1984)	m2 Length	8.4	Caviomorphs	(Croft 2000)	Mid	19.0
<i>Simplimus</i> sp.			Summary					18.2
<i>Strophostephanos</i> sp.	<i>Strophostephanos jheringi</i>	(Ameghino 1891)	Geometric similarity: M1	2.73	<i>Mus musculus</i>	(Gingerich 1974; Speakman and McQueenie 1996)	Mid	0.014

Table S3.6: Rodent body mass calculations, cont.

<i>Strophostephanos</i> sp.	<i>Strophostephanos jheringi</i>	(Ameghino 1891)	Geometric similarity: M2	2.73	<i>Mus musculus</i>	(Gingerich 1974; Speakman and McQueenie 1996)	Mid	0.006
<i>Strophostephanos</i> sp.			Summary					0.010
<i>Tafimys powelli</i>	<i>Tafimys powelli</i>	PBDB	m1-m3	6.16	Cricetidae	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.092
<i>Tafimys powelli</i>	<i>Tafimys powelli</i>	PBDB	M1-M3	5.7	Cricetidae	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.078
<i>Tafimys powelli</i>	<i>Tafimys powelli</i>	PBDB	m1-m3	6.16	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.101
<i>Tafimys powelli</i>	<i>Tafimys powelli</i>	PBDB	URsum M1-M3	5.7	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.079
<i>Tafimys powelli</i>			Summary					0.087
<i>Tetrastylus araucanus</i>	<i>Tetrastylus araucanus</i>	(Ameghino 1904)	M1 Length	11	Caviomorphs	(Croft 2000)	Mid	35.9
<i>Tetrastylus araucanus</i>	<i>Tetrastylus araucanus</i>	(Ameghino 1904)	M2 Length	11	Caviomorphs	(Croft 2000)	Mid	27.6
<i>Tetrastylus araucanus</i>			Summary					31.8
<i>Xenodontomys</i> sp.	<i>Xenodontomys ellipticus</i>	(Kraglievich 1927; Verzi, Montalvo, and Vucetich 1991)	p4-m3	8.98	Hystricomorpha	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.296

Table S3.6: Rodent body mass calculations, cont.

<i>Xenodontomys</i> sp.	<i>Xenodontomys ellipticus</i>	(Kraglievich 1927; Verzi, Montalvo, and Vucetich 1991)	p4-m3	8.98	All rodents	(Freudenthal and Martín-Suárez 2013; Freudenthal and Martín-Suárez 2015)	High	0.281
<i>Xenodontomys</i> sp.			Summary					0.288

7. Primate body mass calculations

Table S3.7: Primate body mass calculations. All headings and abbreviations are as for Table S3.1: Sloth body mass calculations.

Species	Measurement taxa	Measurement source	Measure.	Measure. value (mm)	Eq. Taxa	Eq. Source	Eq. Qual.	Body mass (kg)
<i>Acrecebus fraileyi</i>	<i>Acrecebus fraileyi</i>	(Kay and Frailey 1993; Kay and Cozzuol 2006)	M2 length	7.75	Primates	(Sears et al. 2008)	Mid	4.76
<i>Acrecebus fraileyi</i>	<i>Acrecebus fraileyi</i>	(Kay and Frailey 1993; Kay and Cozzuol 2006)	M2 area	74.7875 (7.75*9.65)	Primates	(Sears et al. 2008)	Mid	5.68
<i>Acrecebus fraileyi</i>			Summary					5.22
<i>Cartelles coim-brafilhoi</i>	<i>Cartelles coim-brafilhoi</i>	(Halenar and Rosenberger 2013)	Femur length	237	Nonhuman primates	(Ruff 1990)	High	36.0
<i>Cartelles coim-brafilhoi</i>	<i>Cartelles coim-brafilhoi</i>	(Halenar and Rosenberger 2013)	Femur midshaft width	20.4	Nonhuman primates	(Ruff 1990)	High	38.0
<i>Cartelles coim-brafilhoi</i>								37.0
<i>Miocallicebus villaviejai</i>	<i>Miocallicebus villaviejai</i>	(Takai et al. 2001; PBDB)	M2 length	4.41	Primates	(Sears et al. 2008)	Mid	1.85
<i>Miocallicebus villaviejai</i>	<i>Miocallicebus villaviejai</i>	(Takai et al. 2001; PBDB)	M2 area	23.1525 (4.41*5.25)	Primates	(Sears et al. 2008)	Mid	1.85
<i>Miocallicebus villaviejai</i>			Summary					1.85

8. Bat body mass calculations

Table S3.8: Bat body mass calculations. All headings and abbreviations are as for Table S3.1: Sloth body mass calculations.

Species	Measurement source	Measurement	Measurement value (mm)	Eq. Taxa	Eq. Source	Eq. Quality	Body Mass
<i>Desmodus draculae</i>	(Ray, Linares, and Morgan 1988; Trajano and De Vivo 1991)	Humerus midshaft width	3.3	Chiroptera	(Gunnell et al. 2009)	High	0.111
<i>Desmodus draculae</i>	(Ray, Linares, and Morgan 1988; Trajano and De Vivo 1991)	Humerus Length	51	Chiroptera	(Gunnell et al. 2009)	Low	0.079949
<i>Desmodus draculae</i>	Summary			Chiroptera			0.111
<i>Notonycteris magdalenensis</i>	PBDB	Humerus Length	47.6	Chiroptera	(Gunnell et al. 2009)	Low	0.067
<i>Notonycteris sucharadeus</i>	PBDB	m1 area	4.15 (2.5x1.66)	Chiroptera	(Gunnell et al. 2009)	Mid	0.032
<i>Potamops mascahehenes</i>	(Czaplewski, Morgan, and McLeod 1997, 1997)	M1 Area	13.21 (3.27*4.04)	Chiroptera	(Gunnell et al. 2009)	Mid	0.064

9. Compilation of Neogene mammal body mass estimates

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka. Species provides the taxa or taxon with occurrences in the PBDB in South America from within the specified date range. The body mass estimate is provided in kg. In the case that the body mass estimate was derived as the average of two or more estimates, the range of estimates is provided in the “Body mass range” column. Observations or comments on the size of the taxon are given in the “Observations” column. The “Method/Basis” column provides the approach that was used to calculate body mass estimates. When allometric equations for only one or two measurements (e.g., molar lengths or molar row lengths) were used, the specific measurements are stated. When a larger number of allometric equations were used, the type of equation is provided instead (e.g. craniodental allometric equations). “Taxa studied” gives the taxon or taxa on which measurements were actually made. This is typically the same as the taxon in the “Species” column, but sometimes is a different species of the same genus depending on the availability of known material for different species. “Body mass category” provides one of seven body mass categories to which the taxon/taxa belong(s). Based on qualitative comparisons (normally given under “Observations”), this is sometimes possible even when a quantitative estimate is not. Finally, “Estimate source” provides the reference in which the body mass was calculated. Other sources which have cited and/or used the same estimate are also provided to illustrate general agreement or acceptance of given body mass estimates.

Species	Body Mass Estimate	Body Mass Range	Observations	Method/Basis	Taxa studied	Body Mass Category	Estimate source
<i>Abderites meridionalis</i>	0.2914			Molar length and width	<i>Abderites meridionalis</i>	<0.5	PBDB
<i>Abderites meridionalis</i>	0.248			Molar area	<i>Abderites meridionalis</i>	<0.5	(Dumont, Strait, and Friscia 2000a)
<i>Abderites meridionalis</i>	0.270			Average	<i>Abderites meridionalis</i>	<0.5	This study
<i>Abrothrix illuteus</i>	0.048			Literature review: extant spp.	<i>Abrothrix illuteus</i>	<0.5	(Freudenthal and Martín-Suárez 2013)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Acarechimys</i> sp.	0.12	0.09-0.15	Visual comparison with modern species	<i>A. cf. A. minutissimus</i>	<0.5	(Walton 1997)
<i>Acrecebus fraileyi</i>	8.25	Size of <i>Lagothrix</i> (7-9.5 kg)		<i>Acrecebus fraileyi</i>		(Halenar and Rosenberger 2013)
<i>Acrecebus fraileyi</i>	5.22	4.8-5.7	Molar length and area	<i>Acrecebus fraileyi</i>	0.5-8	This study
<i>Acrecebus fraileyi</i>	6.7		Average	<i>Acrecebus fraileyi</i>	0.5-8	This study
<i>Acrocyon</i> sp.	27.5	26.3-28.7	Molar length, Molar row length	<i>Acrocyon riggsi</i> , <i>A. sectorius</i>	8-44	(Wroe, Argot, and Dickman 2004; Ercoli and Prevosti 2011; Ercoli, Prevosti, and Forasiepi 2014)
<i>Acrocyon</i> sp.	11.49		Dental allometric equations	<i>Acrocyon sectorius</i>	8-44	(Kay, Vizcaíno, and Bargo 2012; Prevosti et al. 2012)
<i>Acrocyon</i> sp.	16.625	16.26 - 16.99	Molar length, width, area	<i>Acrocyon sectorius</i>	8-44	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Acrocyon</i> sp.	18.5		Average		8-44	This study
<i>Actenomys priscus</i>	1.3		Humerus	<i>Actenomys</i>	0.5-8	(Fernández,

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

		length			Vassallo, and Zárata 2000)
<i>Actenomys</i> sp.	1.3	Humerus length	<i>Actenomys</i>	0.5-8	(Fernández, Vassallo, and Zárata 2000)
<i>Acyon myctoderos</i>	12.03	Molar length, width, area	<i>Acyon myctoderos</i>	8-44	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Acyon tricuspidatus</i>	4.3	Dental allometric equations	<i>Acyon tricuspidatus</i>	0.5-8	(Prevosti et al. 2012)
<i>Acyon tricuspidatus</i>	5.29	Molar length, width, area	<i>Acyon tricuspidatus</i>	0.5-8	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Acyon tricuspidatus</i>	8	Molar length, Molar row length	<i>Acyon tricuspidatus</i>	0.5-8	(Wroe, Argot, and Dickman 2004; Ercoli, Prevosti, and Forasiepi 2014)
<i>Acyon tricuspidatus</i>	5.9	Average		0.5-8	This study
<i>Adinotherium robustum</i>	24.3	Molar length	<i>Adinotherium robustum</i>	1-44	(Croft 2000)
<i>Adinotherium robustum</i>	82.06	Craniomandibular geometric morphometrics	<i>Adinotherium robustum</i>	44-100	(Cassini, Vizcaíno, and Bargo 2012)
<i>Adinotherium robustum</i>	126.24	Craniodental allometric equations	<i>Adinotherium robustum</i>	100-500	(Cassini et al. 2012)
<i>Adinotherium robustum</i>	77.5	Average		44-100	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Adinotherium</i> sp.	29.035	24.3-33.8	Molar length	<i>Adinotherium ovinum</i> , <i>A. robustum</i>	8-44	(Croft 2000)
<i>Adinotherium</i> sp.	121.26		Craniodental allometric equations	<i>Adinotherium</i> sp.	100-500	(Vizcaíno et al. 2010; Vizcaíno et al. 2012)
<i>Adinotherium</i> sp.	70.23	58.40-82.06	Cranio-mandibular geometric morphometrics	<i>Adinotherium ovinum</i> , <i>A. robustum</i>	44-100	(Cassini, Vizcaíno, and Bargo 2012)
<i>Adinotherium</i> sp.	113.265	100.29 - 126.24	Craniodental allometric equations	<i>Adinotherium ovinum</i> , <i>A. robustum</i>	100-500	(Cassini et al. 2012; Kay, Vizcaíno, and Bargo 2012)
<i>Adinotherium</i> sp.	119.45	86.31-150.85	Dental and postcranial allometric equations	<i>Adinotherium</i>	100-500	(Andrea Elisamburu 2012)
<i>Adinotherium</i> sp.	90.6		Average		44-100	This study
<i>Aenigmys diamantensis</i>		Similar in size to <i>Dasyprocta</i> (4.5 kg)		<i>Aenigmys diamantensis</i>	0.5-8	(Vucetich, Vieytes, et al. 2005)
<i>Agalmaceros blicki</i>	60		Literature review	<i>Agalmaceros</i>	44-100	(Smith et al. 2003)
<i>Ahytherium aureum</i>		Smaller than <i>Megistonyx</i> (<776 kg at most)		<i>Ahytherium aureum</i>		(McDonald, Rincón, and Gaudin 2013)
<i>Ahytherium aureum</i>	300		Literature review	<i>Ahytherium</i>	100-500	(Grayson 2016)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Ahytherium aureum</i>	745		Postcranial allometric equations	<i>Ahytherium aureum</i>	500-1000	This study
<i>Ahytherium aureum</i>	523		Average		500-1000	This study
<i>Akodon azarae</i>	0.0185		Postcranial allometric equations	<i>Akodon azarae</i>	<0.5	PBDB
<i>Akodon azarae</i>	0.0275	0.01 - 0.045	Literature review: extant spp.	<i>Akodon azarae</i>	<0.5	(Freudenthal and Martín-Suárez 2013)
<i>Akodon azarae</i>	0.023		Average		<0.5	This study
<i>Akodon</i> sp.	0.036	0.01 - 0.07	Literature review: extant spp.	<i>Akodon</i>, 36 spp.	<0.5	(Freudenthal and Martín-Suárez 2013)
<i>Alitoxodon</i> sp.	273		Molar lengths	<i>Alitoxodon vetustus</i>	100-500	This study
<i>Alloiomys</i> sp.		Similar to <i>Neoreomys</i> (4-6.7 kg)		<i>Alloiomys</i>		(Chick 2009)
<i>Alloiomys</i> sp.	4.5		Skull length, Tooth row length	<i>Alloiomys pattersoni</i>	0.5-8	This study
<i>Alloiomys</i> sp.	4.5		Average		0.5-8	This study
<i>Alouatta mauroi</i>	6.45	6.3-6.6	Literature review: extant spp.	<i>Alouatta</i>	0.5-8	(Allen and Kay 2012)
<i>Amphiocnus paranense</i>	187		Postcranial allometric equations	<i>Amphiocnus paranense</i>	100-500	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Anadasypus aequatorianus</i> , <i>A. hondanus</i> , <i>A. sp.</i>		<5 kg	Similar in size to <i>Dasyus novemcinctus</i>	<i>Anadasypus</i>	0.5-8	(Carlini et al. 1997)
<i>Anadasypus aequatorianus</i> , <i>A. hondanus</i> , <i>A. sp.</i>	3.3		Based on Carlini et al. 1997	<i>Anadasypus hondanus</i>	0.5-8	(Croft 2000)
<i>Anadasypus aequatorianus</i>, <i>A. hondanus</i>, <i>A. sp.</i>	3.3		Average		0.5-8	This study
<i>Andinomys edax</i> , <i>A. sp.</i>	0.0705	0.05 - 0.91	Literature review: extant spp.	<i>Andinomys edax</i>	<0.5	(Freudenthal and Martín-Suárez 2013)
<i>Andinomys edax</i> , <i>A. sp.</i>	0.058		Literature review: extant spp.	<i>Andinomys edax</i>	<0.5	(Eisenberg and Redford 1999)
<i>Andinomys edax</i>, <i>A. sp.</i>	0.064		Average	<i>Andinomys edax</i>		This study
<i>Antifer crassus</i>, <i>A. niemeyeri</i>, <i>A. sp.</i>	120		Living Analogue ("CLA")	<i>Antifer</i>	100-500	(Vizcaíno et al. 2012)
<i>Arazamys castiglioni</i>	382.615	309.4-455.83	Geometric similarity	<i>Arazamys castiglioni</i>	100-500	(Vucetich et al. 2015)
<i>Arazamys castiglioni</i>	281		Molar length, Molar row length	<i>Arazamys castiglioni</i>	100-500	This study
<i>Arazamys castiglioni</i>		100-500	Unspecified	<i>Arazamys</i>	100-500	Rinderknecht pers. comm.
<i>Arazamys castiglioni</i>	332		Average	<i>Arazamys castiglioni</i>	100-500	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Arctodictis munizi</i>		Consistently larger cranial and dental measurements than <i>A. sinclairi</i> (39.9 kg)	Craniodental allometric equations	<i>Arctodictis munizi</i>	8-44	(Ercoli and Prevosti 2011)
<i>Arctodictis munizi</i>	50		Unspecified	<i>Arctodictis munizi</i>	44-100	(Kay, Vizcaíno, and Bargo 2012)
<i>Arctodictis munizi</i>		>37 kg	Dental allometric equations	<i>Arctodictis munizi</i>		(Prevosti et al. 2012)
<i>Arctodictis munizi</i>	37		Craniodental allometric equations	<i>Arctodictis munizi</i>	8-44	(Vizcaíno et al. 2010)
<i>Arctodictis munizi</i>	43.04		Molar length, width, area	<i>Arctodictis munizi</i>	8-44	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Arctodictis munizi</i>	51.6		Molar length, Molar row length	<i>Arctodictis munizi</i>	44-100	(Wroe, Argot, and Dickman 2004; Ercoli, Prevosti, and Forasiepi 2014)
<i>Arctodictis munizi</i>	45.41		Average		44-100	This study
<i>Arctodictus</i> sp.	39.9		Humerus and ulna allometric equations	<i>Arctodictis sinclairi</i>	8-44	(Ercoli and Prevosti 2011)
<i>Arctodictus</i> sp.	50		Unspecified	<i>Arctodictis munizi</i>	44-100	(Kay, Vizcaíno, and Bargo 2012)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Arctodictus</i> sp.		>37 kg	Dental allometric equations	<i>Arctodictis munizi</i>		(Prevosti et al. 2012)
<i>Arctodictus</i> sp.	37		Craniodental allometric equations	<i>Arctodictis munizi</i>	8-44	(Vizcaíno et al. 2010)
<i>Arctodictus</i> sp.	30.69	18.34 - 43.04	Molar length, width, area	<i>Arctodictis munizi</i> , <i>A. sinclairi</i>	8-44	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Arctodictus</i> sp.	51.6		Molar length, Molar row length	<i>Arctodictis munizi</i>	44-100	(Wroe, Argot, and Dickman 2004; Ercoli, Prevosti, and Forasiepi 2014)
<i>Arctodictus</i> sp.	41.838		Average		8-44	This study
<i>Arctodus</i> sp.	500		(Fariña 1995a in Fariña 1996 without detailed methods)	<i>Arctodus bonariensis</i>	500-1000	(Fariña 1995a in Fariña 1996 without detailed methods)
<i>Arctodus</i> sp.	308	probably an underestimate	Craniodental allometric equations	<i>Arctodus</i> sp.	100-500	(Fariña, Vizcaíno, and Bargo 1998)
<i>Arctodus</i> sp.	540	302-720	Literature review	<i>Arctodus bonariensis</i> , <i>A. pristinus</i> , <i>A. simus</i>	500-1000	(Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Arctodus</i> sp.	1000		Long bone allometric equations	<i>Arctodus simus</i>	500-1000	(Figueirido et al. 2010)
<i>Arctodus</i> sp.	587		Average			This study
	600		Molar length, width, area	<i>Arctotherium brasiliense</i>	500-1000	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Arctotherium brasiliense</i> , <i>Arctotherium</i> sp.	510	250 - 900	Molar length, width, area	<i>Arctotherium angustidens</i> , <i>A. bonariense</i> , <i>A. tarijense</i> , <i>A. vetustum</i> , <i>A. wingei</i>	500-1000	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Arctotherium brasiliense</i> , <i>Arctotherium</i> sp.	364		Femur length	<i>Arctotherium</i>	100-500	(Prevosti and Martin 2013)
<i>Arctotherium brasiliense</i> , <i>Arctotherium</i> sp.	235		Craniodental and postcranial allometric equations	<i>Arctotherium angustidens</i> , <i>A. bonariense</i> , <i>A. tarijense</i> , <i>A. vetustum</i> , <i>A. wingei</i>	100-500	(Soibelzon and Tarantini 2009; Fariña et al. 2014)
<i>Arctotherium brasiliense</i>, <i>Arctotherium</i> sp.	370		Average		100-500	This study
<i>Arctotherium tarijense</i>	500		Molar length, width, area	<i>Arctotherium tarijense</i>	100-500	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Arctotherium tarijense</i>	231.1		Cranial allometric equations	<i>Arctotherium tarijense</i>		(Arnaudo et al. 2016)
<i>Arctotherium tarijense</i>	365.55		Average		100-500	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Arctotherium wingei</i>	250	Molar length, width, area	<i>Arctotherium wingei</i>	100-500	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Arctotherium wingei</i>	150	Craniodental and postcranial allometric equations	<i>Arctotherium wingei</i>	100-500	(Soibelzon and Tarantini 2009; Soibelzon and Prevosti 2013)
<i>Arctotherium wingei</i>	200	Average		100-500	This study
<i>Argyrolagus palmeri</i>	0.056	Molar length	<i>Argyrolagus palmeri</i>	<0.5	This study
<i>Artigasias magna</i>	500-1000	Unspecified	<i>Artigasias</i>	500-1000	Rinderknecht pers. comm.
<i>Artigasias magna</i>	339	Molar length	<i>Artigasias magna</i>	100-500	This study
<i>Artigasias magna</i>	339	Average		100-500	This study
<i>Aspidocalyptus</i> sp.		About 25% smaller than <i>Palaehoplophoroides rothi</i>	<i>Aspidocalyptus</i>		(Scillato-Yané and Carlini 1998)
<i>Asterostemma</i> sp.	78.13	Geometric similarity	cf. <i>Asterostemma</i>	44-100	(Vizcaíno, Fernicola, and Bargo 2012)
<i>Astrapotherium</i> sp.	504	Molar length	<i>Astrapotherium magnum</i>	500-1000	(Croft 2000)
<i>Astrapotherium</i> sp.	1021.63	"Regression"	<i>Astrapotherium</i>	>1000	(Vizcaíno et al. 2012)
<i>Astrapotherium</i> sp.	921.32	Unspecified	<i>Astrapotherium magnum</i>	500-1000	(Kay, Vizcaíno, and Bargo

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

2012)					
<i>Astrapotherium</i> sp.	2198	1060-3594	Molar row length	<i>Astrapotherium?</i> <i>runderarium</i> , <i>A. magnum</i> , <i>A. giganteum</i>	>1000 (Vallejo-Pareja et al. 2015)
<i>Astrapotherium</i> sp.	1161		Average		>1000 This study
<i>Auliscomys</i> sp.	0.0485	0.033 - 0.077	Literature review: extant spp.	<i>Auliscomys boliviensis</i> , <i>A. pictus</i> , <i>A. sublimis</i>	<0.5 (Freudenthal and Martín-Suárez 2013)
<i>Australonyx aquae</i>	650		Femur allometric equations	<i>Australonyx aquae</i>	500-1000 This study
<i>Australonyx aquae</i>	300		Comparison with <i>Megalonyx</i>	<i>Australonyx</i>	100-500 (Grayson 2016)
<i>Australonyx aquae</i>	475		Average		100-500 This study
<i>Blastocerus</i> sp.	96.25	80-150	Literature review: extant spp.	<i>Blastocerus dichotomus</i>	44-100 (Silva and Downing 1995)
<i>Blastocerus</i> sp.	130	120-140	Museum records, craniodental and postcranial allometric equations	<i>Blastocerus dichotomus</i>	100-500 (Vizcaíno, Bargo, and Cassini 2006)
<i>Blastocerus</i> sp.	113.125		Average		44-100 This study
<i>Bolivartherium cordensis</i> , <i>B. urumaquensis</i>	1719		Femur length	<i>Bolivartherium urumaquensis</i>	>1000 (Rincón et al. 2015)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Bolomys</i> sp.	0.035		Literature re-view: extant spp.	<i>Bolomys lasiurus</i>	<0.5	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Bolomys</i> sp.	0.036		Literature re-view: extant spp.	<i>Bolomys amoenus</i> , <i>B. lactens</i> , <i>B. lasiurus</i> , <i>B. len-guarum</i>	<0.5	(Silva and Downing 1995)
<i>Bolomys</i> sp.	0.036		Average		<0.5	This study
<i>Boreostemma acos-tae</i> , <i>B. pliocena</i> , <i>B. sp.</i> , <i>B. venezolensis</i>	75	50-100	about the size of modern Giant Armadillo (<i>Priodontes maxi-mus</i>): 50-60 kg	Comparison with extant taxa	<i>Boreostemma acos-tae</i>	44-100 (Carlini et al. 1997)
<i>Boreostemma acos-tae</i> , <i>B. pliocena</i> , <i>B. sp.</i> , <i>B. venezolensis</i>	90			Geometric simi-larity	<i>Boreostemma acos-tae</i>	44-100 (Croft 2000)
<i>Boreostemma acos-tae</i> , <i>B. pliocena</i> , <i>B. sp.</i> , <i>B. venezolensis</i>	195			Geometric simi-larity	<i>Boreostemma acos-tae</i>	100-500 This study
<i>Boreostemma acos-tae</i>, <i>B. pliocena</i>, <i>B. sp.</i>, <i>B. venezolensis</i>	120			Average	44-100	This study
<i>Borhyaena tuberata</i>	36.4			Unspecified	<i>Borhyaena tuberata</i>	8-44 (Kay, Vizcaíno, and Bargo 2012)
<i>Borhyaena tuberata</i>	28.47			Molar length, width, area	<i>Borhyaena tuberata</i>	8-44 (Prevosti, Forasiepi, and

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

					Zimicz 2013)
					(Ercoli and Prevosti 2011; Ercoli, Prevosti, and Forasiepi 2014)
<i>Borhyaena tuberata</i>	36.42		Ulna and tibia allometric equations	<i>Borhyaena tuberata</i>	8-44
<i>Borhyaena tuberata</i>	33.8		Average		8-44 This study
<i>Borhyaenidium altiplanicus</i>	1.16		Molar length, width, area	<i>Borhyaenidium altiplanicus</i>	0.5-8 (Prevosti, Forasiepi, and Zimicz 2013)
<i>Borhyaenidium musteloides</i>	1.56		Molar length, width, area	<i>Borhyaenidium musteloides</i>	0.5-8 (Prevosti, Forasiepi, and Zimicz 2013)
<i>Borhyaenidium riggsi</i>	1.98		Molar length, width, area	<i>Borhyaenidium riggsi</i>	0.5-8 (Prevosti, Forasiepi, and Zimicz 2013)
<i>Borhyaenidium</i> sp.	1.57	1.16-1.98	Molar length, width, area	<i>Borhyaenidium altiplanicus</i>, <i>B. musteloides</i>, <i>B. riggsi</i>	0.5-8 (Prevosti, Forasiepi, and Zimicz 2013)
<i>Bounodus enigmaticus</i>	42.8		Molar length	<i>Bounodus enigmaticus</i>	8-44 This study
<i>Brachytherium cuspidatum</i> , <i>B. sp.</i>	8.84		Molar lengths	<i>Brachytherium cuspidatum</i> (=Licaphrium floweri)	8-44 (Croft 2000)
<i>Brachytherium cuspidatum</i> , <i>B. sp.</i>	15		Modern analogue	<i>Brachytherium</i> sp.	8-44 (Vizcaíno, Fariña, Zárate, et al. 2004)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Brachytherium cuspidatum</i> , <i>B. sp.</i>	11.9		Average	8-44	This study
<i>Briaromys sp.</i>	22.6		Molar lengths	<i>Briaromys tronesartianus</i> 8-44	This study
<i>Cabassous sp.</i>	4.05	2-6.4	Literature review: extant spp.	<i>Cabassous centralis</i> , <i>C. tatouay</i> 0.5-8	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Calchaquitherium mixtum</i>	1090		Molar length, Molar row length	<i>Calchaquitherium mixtum</i> >1000	This study
<i>Calomys callosus</i>	0.037		Unspecified	<i>Calomys callosus</i> <0.5	(Croft 2000)
<i>Calomys callosus</i>	0.0345	0.015-0.054	Literature review: extant spp.	<i>Calomys callosus</i> <0.5	(Freudenthal and Martín-Suárez 2013)
<i>Calomys callosus</i>	0.036		Average	<0.5	This study
<i>Calomys sp.</i>	0.026	0.009-0.06	Live measurements	<i>Calomys callosus</i> , <i>C. tener</i> <0.5	(Mares, Ernest, and Gettinger 1986)
<i>Calomys sp.</i>	0.021	0.013-0.031	Literature review: extant spp.	<i>Calomys callosus</i> , <i>C. laucha</i> , <i>C. musculinus</i> <0.5	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Calomys sp.</i>	0.028	0.0106-0.0495	Literature review: extant spp.	<i>Calomys</i> , 11 spp. <0.5	(Freudenthal and Martín-Suárez 2013)
<i>Calomys sp.</i>	0.025		Average	<0.5	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Canis dirus</i>	51		Molar length, width, area	<i>Canis dirus</i>	44-100	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Canis dirus</i>	50		Literature review	<i>Canis dirus</i>	44-100	(Smith et al. 2003)
<i>Canis dirus</i>	50.5		Average	<i>Canis dirus</i>	44-100	This study
<i>Canis sp.</i>	10.9	8.2-13.6	Literature review: extant spp.	<i>Canis avus</i>	8-44	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Canis sp.</i>	51		Molar length, width, area	<i>Canis dirus</i>	44-100	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Canis sp.</i>	31.0		Average		8-44	This study
<i>Cardiatherium chasicoense</i>	12.9		Geometric similarity	<i>Cardiatherium chasicoense</i>	8-44	(Vucetich et al. 2015)
<i>Cardiatherium chasicoense</i>	23.2		Molar row length	<i>Cardiatherium chasicoense</i>	8-44	This study
<i>Cardiatherium chasicoense</i>	18.0		Average		8-44	This study
<i>Cardiatherium paranense</i>	29.6		Geometric similarity	<i>Cardiatherium paranense</i>	8-44	(Vucetich et al. 2015)
<i>Cardiatherium paranense</i>	23.2		Molar row length	<i>Cardiatherium paranense</i>	8-44	This study
<i>Cardiatherium paranense</i>	30.4		Average		8-44	This study
<i>Cardiatherium patagonicum</i>	18.1		Molar row length	<i>Cardiatherium patagonicum</i>	8-44	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Cardiatherium</i> sp.	44.3		Geometric similarity	<i>Cardiatherium chasicoense</i> , <i>C. isselii</i> , <i>C. paranense</i>	44-100	(Vucetich et al. 2015)
<i>Cardiatherium</i> sp.	23.1		Molar row length	<i>Cardiatherium chasicoense</i> , <i>C. paranense</i> , <i>C. patagonicum</i>	8-44	This study
<i>Cardiatherium</i> sp.	33.7		Average		8-44	This study
<i>Cardiomya</i> sp.	11.75	7.5 - 16	Based on observation: Similar to <i>Dolichotis patagonica</i>	<i>Cardiomya cavinus</i>	8-44	(Ameghino 1885)
<i>Cardiomya</i> sp.	11.6166	4.2-19.97	Geometric similarity	<i>Cardiomya</i> sp. nov.	8-44	(Vucetich et al. 2015)
<i>Cardiomya</i> sp.	26.7		Molar length	<i>Cardiomya cavinus</i>	8-44	This study
<i>Cardiomya</i> sp.	16.7		Average		8-44	This study
<i>Cartelles coimbra-filhoi</i>	22	20-24	Based on observation: Similar to <i>Protopithecus brasiliensis</i>	<i>Cartelles coimbra-filhoi</i>	8-44	(Rosenberger 2011; Halenar and Rosenberger 2013)
<i>Cartelles coimbra-filhoi</i>	27		Literature review	<i>Cartelles</i>	8-44	(Grayson 2016)
<i>Cartelles coimbra-filhoi</i>	37		Femur allometric equations	<i>Cartelles coimbra-filhoi</i>	8-44	This study
<i>Cartelles coimbra-filhoi</i>	28.7		Average		8-44	This study
<i>Carterodon</i> sp.	0.13	0.06 - 0.2	Literature review: extant spp.	<i>Carterodon sulcidens</i>	<0.5	(Freudenthal and Martín-Suárez 2013)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Carterodon</i> sp.	0.144	0.092-0.195	Literature review: extant spp.	<i>Carterodon sulci-dens</i>	<0.5	(Patton, Pardiñas, and D'Elía 2015)
<i>Carterodon</i> sp.	0.137		Average		<0.5	This study
<i>Catagonus</i> sp., <i>C. stenocephalus</i>	34.7	34.6-34.8	Literature review: extant spp.	<i>Catagonus wagneri</i>	8-44	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Catagonus</i> sp., <i>C. stenocephalus</i>	50		Modern analogue	<i>Catagonus</i>	44-100	(Vizcaíno et al. 2012)
<i>Catagonus</i> sp., <i>C. stenocephalus</i>	35		Unspecified	<i>Catagonus</i>	8-44	(Fariña et al. 2014)
<i>Catagonus</i> sp., <i>C. stenocephalus</i>	42.5		Average		8-44	This study
<i>Catonyx chiliensis</i> (= <i>Scelidotherium reyesi</i>)		About 30% smaller than <i>C. tarijensis</i> (or about 1200 kg based on estimates for <i>C. tarijensis</i>)		<i>Catonyx chiliensis</i>	>1000	(Pujos 2000)
<i>Catonyx chiliensis</i> (= <i>Scelidotherium reyesi</i>)	1258		Postcranial allometric equations	<i>Catonyx chiliensis</i>	>1000	This study
<i>Catonyx chiliensis</i> (= <i>Scelidotherium reyesi</i>)	1258		Average		>1000	This study
<i>Catonyx cuvieri</i>	1547	1000 - 2093	Femur allometric equations	<i>Catonyx</i> (= <i>Scelidodon</i>) sp., <i>C. tarijensis</i>	>1000	(Croft 2000; Smith et al. 2003; Raj

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

					Pant, Goswami, and Finarelli 2014)
<i>Catonyx cuvieri</i>	500		Unspecified	<i>Catonyx cuvieri</i>	500-1000 (Ximenes 2008)
<i>Catonyx cuvieri</i>	1023		Average		>1000 This study
<i>Catonyx tarijensis</i>	2093		Femur allometric equations	<i>Catonyx</i> (= <i>Scelidodon</i>) <i>tarijensis</i>	>1000 (Croft 2000; Smith et al. 2003; Raj Pant, Goswami, and Finarelli 2014)
<i>Catonyx tarijensis</i>	1449	991 - 2625	Postcranial multiple regression	<i>Catonyx tarijensis</i>	>1000 (De Esteban-Trivigno, Mendoza, and De Renzi 2008)
<i>Catonyx tarijensis</i>	1771		Average		>1000 This study
<i>Cavia</i> sp.	0.35		Unspecified	<i>Cavia</i> cf. <i>C. porcellus</i>	0.5-8 (Croft 2000)
<i>Cavia</i> sp.	0.454	0.206-1.01	Museum records, craniodental and postcranial allometric equations	<i>Cavia aperea</i>	0.5-8 (Vizcaíno, Bargo, and Cassini 2006)
<i>Cavia</i> sp.	0.845	0.25 - 1.5	Literature review: extant spp.	<i>Cavia aperea</i> , <i>C. fulgida</i> , <i>C. porcellus</i> , <i>C. tschudii</i> , <i>C. magna</i>	0.5-8 (Freudenthal and Martín-Suárez 2013)
<i>Cavia</i> sp.	1		Unspecified	<i>Cavia</i>	0.5-8 (Fariña et al. 2014)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Cavia</i> sp.	0.662		Average		0.5-8	This study
<i>Caviodon multiplicatus</i> , <i>C. sp.</i>	37.427	13-61.62	Geometric similarity	<i>Caviodon cuyano</i>	8-44	(Vucetich et al. 2015)
<i>Caviodon multiplicatus</i> , <i>C. sp.</i>	17.1		Molar row length	<i>Caviodon cuyano</i>	8-44	This study
<i>Caviodon multiplicatus</i>, <i>C. sp.</i>	27.263		Average		8-44	This study
<i>Cebupithecia sarmientoi</i>	2.2		Literature review	<i>Cebupithecia sarmientoi</i>	0.5-8	(Croft 2000)
<i>Cebupithecia sarmientoi</i>	1.792		Molar area	<i>Cebupithecia sarmientoi</i>	0.5-8	(Meldrum and Kay 1997a)
<i>Cebupithecia sarmientoi</i>	2.0		Average		0.5-8	This study
<i>Cerdocyon thous</i>	5.7		Molar length, width, area	<i>Cerdocyon thous</i>	0.5-8	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Chaetophractus</i> sp.	1.604	0.814-3.65	Literature review: extant spp.	<i>Chaetophractus vellosus</i> , <i>C. villosus</i>	0.5-8	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Chaetophractus</i> sp.	1.4	0.8-2	Comparison with extant <i>Chaetophractus</i> spp.	<i>Chaetophractus tarijensis</i> , <i>C. villosus</i>	0.5-8	(Croft 2000)
<i>Chaetophractus</i> sp.	3.7		Geometric similarity	<i>Chaetophractus villosus</i>	0.5-8	(Tambusso and Fariña 2015)
<i>Chaetophractus</i> sp.	2.6		Average		0.5-8	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Chaetophractus villosus</i>	2.370	1.0-3.65	Literature review: extant spp.	<i>Chaetophractus villosus</i>	0.5-8	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Chaetophractus villosus</i>	2	2	Unspecified	<i>Chaetophractus villosus</i>	0.5-8	(Croft 2000)
<i>Chaetophractus villosus</i>	4.14	3.46 - 4.53	Museum records, craniodental and postcranial allometric equations	<i>Chaetophractus villosus</i>	0.5-8	(Vizcaíno et al. 2006)
<i>Chaetophractus villosus</i>	3.7		Geometric similarity	<i>Chaetophractus villosus</i>	0.5-8	(Tambusso and Fariña 2015)
<i>Chaetophractus villosus</i>	3.1		Average		0.5-8	This study
<i>Chapalmalania</i> sp.		>100	Modern analogue	<i>Chapalmalania ortognatha</i>		(Vizcaíno, Fariña, Zárate, et al. 2004)
<i>Chapalmalania</i> sp.	22.5		Molar length, width, area	<i>Chapalmalania altaefrontis</i> , <i>C. ortognatha</i>	8-44	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Chapalmalania</i> sp.		>30 kg	Unspecified	<i>Chapalmalania</i>		(Mitchell, Bray, et al. 2016)
<i>Chapalmalania</i> sp.	22.5		Average		8-44	This study
<i>Charitoceros</i> sp.	32.4		Molar length	<i>Charitoceros</i> sp.	8-44	(Croft 2000)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Charitoceros</i> sp.	60		Literature re-view	<i>Charitoceros</i> sp.	44-100	(Smith et al. 2003)
<i>Charitoceros</i> sp.	46.2		Average		44-100	This study
<i>Chasichimys</i> sp.	0.075		Molar row length	<i>Chasichimys</i> sp. nov. Chick 2009	<0.5	This study
<i>Chasicostylus castroi</i>	6.74		Molar length, width, area	<i>Chasicostylus castroi</i>	0.5-8	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Chasicotatus ameghinoi</i> , <i>C. sp.</i> , <i>C. spinozai</i>		much smaller than <i>Ringueletia simpsoni</i> (40 kg)		<i>Chasicotatus</i>	0.5-8	(Cenizo, Soibelzon, and Saffer 2015)
<i>Chasicotatus ameghinoi</i> , <i>C. sp.</i> , <i>C. spinozai</i>		similar in size to <i>Zaedyus</i> (1 kg) and smaller or equal to <i>Doellettus</i>		<i>Chasicotatus ameghinoi</i> , <i>C. peiranoi</i>	0.5-8	(Esteban and Nasif 1996)
<i>Chasicotatus ameghinoi</i>, <i>C. sp.</i>, <i>C. spinozai</i>			Summary		0.5-8	This study
<i>Chironectes minimus</i>, <i>C. sp.</i>	0.3867		Literature re-view	<i>Chironectes minimus</i>	<0.5	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Chlamydotherium</i> sp.	1500		Unspecified	<i>Chlamydotherium</i> sp.	>1000	(Croft 2000)
<i>Chorobates</i> sp., <i>C. villosissimus</i>		Slightly smaller than/similar to <i>Chaetophractus villosus</i> (4.14 kg)		<i>Chorobates rescens</i>, <i>C. villosissimus</i>	0.5-8	(Scillato-Yané et al. 1995; Carlini and Scillato-Yane

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

						1996)
<i>Chrotopterus auri-</i> <i>tus</i>	0.06225	0.0602 3- 0.0647 2	Literature re- view: extant spp.	<i>Chrotopterus auri-</i> <i>tus</i>	<0.5	(Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)
<i>Chrysocyon brachy-</i> <i>urus, C. sp.</i>	23.75	23.3- 24.2	Molar length, width, area	<i>Chrysocyon brachy-</i> <i>urus</i>	8-44	(Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)
<i>Chrysocyon brachy-</i> <i>urus, C. sp.</i>	25		Molar length, width, area	<i>Chrysocyon brachy-</i> <i>urus</i>	8-44	(Prevosti, Fo- rasiepi, and Zimicz 2013)
<i>Chrysocyon brachy-</i> <i>urus, C. sp.</i>	25		Average		8-44	This study
<i>Cladosictis pata-</i> <i>gonica</i>	5.64	4.68 - 6.60	Molar length, width, area	<i>Cladosictis pata-</i> <i>gonica</i>	0.5-8	(Ercoli and Prevosti 2011; Prevosti, Forasiepi, and Zimicz 2013; Ercoli, Prevos- ti, and Forasiepi 2014)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Cladosictis patagonica</i>	6.6		Unspecified	<i>Cladosictis patagonica</i>	0.5-8	(Kay, Vizcaíno, and Bargo 2012)
<i>Cladosictis patagonica</i>	5.64		Note that Kay et al. estimate is one of estimates in Ercoli and Prevosti studies, so not averaged again here	Average	0.5-8	This study
<i>Clyomys</i> sp.	0.115	0.021 - 0.209	Literature review: extant spp.	<i>Clyomys bishopi</i> , <i>C. laticeps</i>	<0.5	(Freudenthal and Martín-Suárez 2013)
<i>Clyomys</i> sp.	0.246	0.158-0.334	Literature review: extant spp.	<i>Clyomys laticeps</i>	<0.5	(Patton, Pardiñas, and D'Elía 2015)
<i>Clyomys</i> sp.	0.181		Average		<0.5	This study
<i>Cochlops muricatus</i>	80		Geometric similarity	<i>Cochlops</i>	44-100	(Vizcaíno et al. 2012)
<i>Cochlops muricatus</i>	82.99	79.27-86.71	Geometric similarity	<i>Cochlops muricatus</i>	44-100	(Vizcaíno, Fernicola, and Bargo 2012; Kay, Vizcaíno, and Bargo 2012)
<i>Cochlops muricatus</i>	81.5		Average		44-100	This study
<i>Coendou prehensilis</i> , <i>C. sp.</i>	4.9		Literature review: extant spp.	<i>Coendou prehensilis</i>	0.5-8	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Red-

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

					ford 1999)
<i>Coendou prehensilis</i> , C. sp.	6	4-8	Comparison with extant spp. of <i>Coendou</i>	<i>Coendou magnus</i> , C. sp.	0.5-8 (Croft 2000)
<i>Coendou prehensilis</i> , C. sp.	3.35	0.9 - 5.8	Literature re- view: extant spp.	<i>Coendou bicolor</i> , <i>C.</i> <i>nycthemera</i> , <i>C. pre-</i> <i>hensilis</i> , <i>C. roth-</i> <i>schildi</i>	0.5-8 (Freudenthal and Martín- Suárez 2013)
<i>Coendou prehensilis</i> , C. sp.	2.95		Unspecified	<i>Coendou</i>	0.5-8 (Fariña et al. 2014)
<i>Coendou prehen-</i> <i>silis</i>, C. sp.	4.3		Average		0.5-8 This study
<i>Conepatus semistri-</i> <i>tus</i>		up to 4 kg	Literature re- view: extant spp.	<i>Conepatus semistri-</i> <i>atus</i>	0.5-8 (Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)
<i>Conepatus semistri-</i> <i>tus</i>	3.4		Literature re- view: extant spp.	<i>Conepatus semistri-</i> <i>atus</i>	0.5-8 (Andersson 2003)
<i>Conepatus semistri-</i> <i>atus</i>	3.4		Average		0.5-8 This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Conepatus</i> sp., <i>C. suffocans</i>	2.925	1.5-4	Literature review: extant spp.	<i>Conepatus chinga</i> , <i>C. rex</i> , <i>C. semistriatus</i>	0.5-8	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Conepatus</i> sp., <i>C. suffocans</i>	2.688	1.92 - 4.0	Molar length, width, area	<i>Conepatus chinga</i> , <i>C. humboldtii</i> , <i>C. mercedensis</i> , <i>C. semistriatus</i> , <i>C. talarae</i>	0.5-8	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Conepatus</i> sp., <i>C. suffocans</i>	2.8065		Average		0.5-8	This study
<i>Cryptotis</i> sp.	0.0125	0.009-0.0159	Literature review: extant spp.	<i>Cryptotis peruvien-sis</i> , <i>C. montivaga</i> , <i>C. thomasi</i>	<0.5	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Ctenomys cotocaensis</i>	2.218		Geometric similarity	<i>Ctenomys cotocaensis</i>	0.5-8	This study
<i>Ctenomys cotocaensis</i>		>1.2	<i>C. cotocaensis</i> is larger than <i>C. conoveri</i> (1.2 kg)	<i>Ctenomys cotocaensis</i>	0.5-8	(Azurduy 2005)
<i>Ctenomys cotocaensis</i>	2.218		Average		0.5-8	This study
<i>Ctenomys kraglievichi</i>	0.554		Geometric similarity	<i>Ctenomys kraglievichi</i>	0.5-8	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Ctenomys kraglievichi</i>	0.718-1.2	<i>C. kraglievichi</i> is bigger than <i>C. subassentiens</i> (0.718 kg) and smaller than <i>C. conoveri</i> (1.2 kg)	<i>Ctenomys kraglievichi</i>	0.5-8	(Azurduy 2005)
<i>Ctenomys kraglievichi</i>	0.554	Average		0.5-8	This study
<i>Ctenomys magellanicus</i>	0.2585	0.246-0.271	Literature review: extant spp.	<i>Ctenomys magellanicus</i>	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Ctenomys magellanicus</i>	0.22		Unspecified	<i>Ctenomys magellanicus</i>	<0.5 (Croft 2000)
<i>Ctenomys magellanicus</i>	0.239	Average		<0.5	This study
<i>Ctenomys praderii</i>	0.082	Geometric similarity		<i>Ctenomys praderii</i>	<0.5 This study
<i>Ctenomys</i> sp.	0.497	0.22-0.718	Molar length	<i>Ctenomys brachyrhinus</i> , <i>C. lujanensis</i> , <i>C. magellanicus</i> , <i>C. subassentiens</i>	<0.5 (Croft 2000)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Ctenomys</i> sp.	0.147	0.102-0.225	Museum records, craniodental and postcranial allometric equations	<i>Ctenomys azarae</i> , <i>C. maulinus</i> , <i>C. talarum</i>	<0.5	(Vizcaíno, Bargo, and Cassini 2006)
<i>Ctenomys</i> sp.	0.273	0.07 - 1.2	Literature review: extant spp.	<i>Ctenomys</i> , 44 spp.	<0.5	(Freudenthal and Martín-Suárez 2013)
<i>Ctenomys</i> sp.	0.30566	7	Average		<0.5	This study
<i>Ctenomys subassentiens</i>	0.718		Molar length	<i>Ctenomys subassentiens</i>	0.5-8	(Croft 2000)
<i>Cullinia</i> sp.	104		Molar length	<i>Cullinia</i>	100-500	This study
<i>Cuniculus paca</i>	8.8135	3.627 - 14	Literature review: extant spp.	<i>Cuniculus paca</i>	8-44	(Freudenthal and Martín-Suárez 2013)
<i>Cuniculus</i> sp.	8.532	3.627 - 14	Literature review: extant spp.	<i>Cuniculus paca</i> , <i>C. taczanowskii</i>	8-44	(Freudenthal and Martín-Suárez 2013)
<i>Cuvieronius hyodon</i>	4551		Molar length	<i>Cuvieronius hyodon</i>	>1000	(Croft 2000)
<i>Cuvieronius hyodon</i>	4197.59		Literature review	<i>Cuvieronius hyodon</i>	>1000	(Brook and Bowman 2004; Raia, Carotenuto, and Meiri 2010)
<i>Cuvieronius hyodon</i>	4374		Average		>1000	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Cuvieronius</i> sp., <i>C. tropicus</i>	5000		Literature review	<i>Cuvieronius</i> sp.	>1000	(Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Cyonasua argentina</i>	6.38		Molar length, width, area	<i>Cyonasua argentina</i>	0.5-8	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Cyonasua groeberi</i>	6.38		Molar length, width, area	<i>Cyonasua groeberi</i>	0.5-8	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Cyonasua pascuali</i>	5.69		Molar length, width, area	<i>Cyonasua pascuali</i>	0.5-8	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Cyonasua pascuali</i>	5		Unspecified	<i>Cyonasua pascuali</i>	0.5-8	(Soibelzon and Prevosti 2013)
<i>Cyonasua pascuali</i>	5.345		Average		0.5-8	This study
<i>Cyonasua</i> sp.	6.15	5.69 - 6.38	Molar length, width, area	<i>Cyonasua argentina</i> , <i>C. brevirostris</i> , <i>C. clausa</i> , <i>C. groeberi</i> , <i>C. lutaria</i> , <i>C. meranii</i> , <i>C. pascuali</i>	0.5-8	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Dasyprocta</i> sp.	3.25	0.6 - 5.9	Literature review: extant spp.	<i>Dasyprocta</i> , 10 spp.	0.5-8	(Freudenthal and Martín-Suárez 2013)
<i>Dasyprocta</i> sp.	3.5	3-4	Literature review: extant spp.	<i>Dasyprocta azarae</i> , <i>D. punctata</i>	0.5-8	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Red-

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

					ford 1999)	
<i>Dasyprocta</i> sp.	3.375	Average			0.5-8	This study
<i>Dasypus hybridus</i>	1.5	Literature re- view: extant spp.			<i>Dasypus hybridus</i>	0.5-8 (Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)
<i>Dasypus neogaeus</i>	2.575	1.5-4.1	Based on: inter- mediate between <i>D. hybridus</i> (1.5 kg) and <i>D. no- vemcinctus</i> (3.2- 4.1 kg)		<i>Dasypus neogaeus</i>	0.5-8 (Ameghino 1891)
<i>Dasypus neogaeus</i>	3.6	1.09- 10.5	Literature re- view: extant spp.		<i>Dasypus hybridus</i> , <i>D. kappleri</i> , <i>D. no- vemcinctus</i> , <i>D. pi- losus</i> , <i>D. sep- temcinctus</i>	0.5-8 (Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)
<i>Dasypus neogaeus</i>	5.5	Unspecified		<i>Dasypus</i>	0.5-8	(Fariña et al. 2014)
<i>Dasypus neogaeus</i>	3.8807	Average			0.5-8	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Dasypus sabanicola</i> , <i>D. sp.</i> , <i>D. villosus</i>	3.6	1.09- 10.5	Literature re- view: extant spp.	<i>Dasypus hybridus</i> , <i>D. kappleri</i> , <i>D. no- vemcinctus</i> , <i>D. pi- losus</i> , <i>D. sep- temcinctus</i>	0.5-8	(Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)
<i>Dasypus sabanicola</i> , <i>D. sp.</i> , <i>D. villosus</i>	5.5		Unspecified	<i>Dasypus</i>	0.5-8	(Fariña et al. 2014)
<i>Dasypus sabanicola</i>, <i>D. sp.</i>, <i>D. villosus</i>	4.5		Average		0.5-8	This study
<i>Desmodus draculae</i>		Tooth size 25% larger than <i>D. ro- tundus</i>		<i>Desmodus draculae</i>	<0.5	(Pardiñas and Tonni 2000)
<i>Desmodus draculae</i>	0.111		Humerus al- lometric equa- tions	<i>Desmodus draculae</i>	<0.5	This study
<i>Desmodus draculae</i>	0.111		Average		<0.5	This study
<i>Desmodus rotundus</i>	0.0325	0.025- 0.040	Literature re- view: extant spp.	<i>Desmodus rotundus</i>	<0.5	(Greenhall, Joermann, and Schmidt 1983)
<i>Diabolotherium</i> (=Nothropus) <i>nor- denskioldi</i>		Similar size to <i>Pa- rocnus browni</i> (69 kg)		<i>Diabolotherium</i> <i>nordenskioldi</i>	44-100	(Pujos et al. 2007)
<i>Diabolotherium</i> (=Nothropus) <i>nor- denskioldi</i>	84		Literature re- view	<i>Diabolotherium</i>	44-100	(Grayson 2016)
<i>Diabolotherium</i> (=Nothropus) <i>nor- denskioldi</i>	105		Postcranial al- lometric equa- tions	<i>Diabolotherium</i> <i>nordenskioldi</i>	100- 500	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Diabolotherium</i> (=<i>Nothropus</i>) <i>nor-</i> <i>denskioldi</i>		94.5	Average		44-100	This study
<i>Diadiaphorus ever-</i> <i>sus</i> (= <i>Coelosoma</i> <i>eversa</i>), <i>D. sp.</i>	26.5	21.5- 26.5	Molar length	<i>Diadiaphorus ro-</i> <i>bustus, D. majascu-</i> <i>lus</i> (= <i>D. sp.</i>)	44-100	(Croft 2000)
<i>Diadiaphorus ever-</i> <i>sus</i> (= <i>Coelosoma</i> <i>eversa</i>), <i>D. sp.</i>	70.25		Regression ("RE")	<i>Diadiaphorus</i>	44-100	(Vizcaíno et al. 2012)
<i>Diadiaphorus ever-</i> <i>sus</i> (= <i>Coelosoma</i> <i>eversa</i>), <i>D. sp.</i>		48.375	Average		44-100	This study
<i>Diadiaphorus ma-</i> <i>jusculus</i>	24	21.5- 26.5	Molar length	<i>Diadiaphorus ma-</i> <i>jusculus</i>	8-44	(Croft 2000)
<i>Diadiaphorus ma-</i> <i>jusculus</i>	190		Cited in Vil- lafañe et al. 2006 without methodological details, original source unavail- able	<i>Diadiaphorus ma-</i> <i>jusculus</i>	100- 500	(Villafañe 2005; Vil- lafañe, Ortiz- Jaureguizar, and Bond 2006)
<i>Diadiaphorus ma-</i> <i>jusculus</i>	70.25		Craniodental allometric equa- tions	<i>Diadiaphorus ma-</i> <i>jusculus</i>	44-100	(Vizcaíno et al. 2010)
<i>Diadiaphorus ma-</i> <i>jusculus</i>	51.785	47.49- 56.08	Craniomandibu- lar geometric morphometrics	<i>Diadiaphorus ma-</i> <i>jusculus</i>	44-100	(Cassini, Viz- caíno, and Bargo 2012)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Diadiaphorus majusculus</i>	82.05		Craniodental allometric equations	<i>Diadiaphorus majusculus</i>	44-100	(Cassini et al. 2012; Kay, Vizcaíno, and Bargo 2012)
<i>Diadiaphorus majusculus</i>	83.617		Average		44-100	This study
<i>Dicolpomys fossor</i>	0.144		Literature review	<i>Dicolpomys sp.</i>	<0.5	(Lyons, Smith, and Brown 2004)
<i>Didelphis solimoesensis</i>	0.403	0.275-0.531	Comparison with <i>Caluromys</i> (0.275 kg) and <i>Philander</i> (0.531 kg)	<i>Didelphis solimoesensis</i>	<0.5	(Cozzuol et al. 2006)
<i>Didelphis solimoesensis</i>	0.4		Dental allometric equations	<i>Didelphis solimoesensis</i>	<0.5	(Zimicz 2014)
<i>Didelphis solimoesensis</i>	0.402		Average		<0.5	This study
<i>Didelphis sp.</i>	1.58	0.75-2.45	Literature review	<i>Didelphis albiventris</i> , <i>D. marsupialis</i>	0.5-8	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Doedicurus sp.</i>	1400		Scale models	<i>Doedicurus clavicaudatus</i>	>1000	(Fariña 1995b)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Doedicurus</i> sp.	1468		Craniodental and postcranial allometric equations	<i>Doedicurus clavicaudatus</i>	>1000	(Fariña, Vizcaíno, and Bargo 1998; Croft 2000; Smith et al. 2003; Raia, Carotenuto, and Meiri 2010; Vizcaíno et al. 2012)
<i>Doedicurus</i> sp.	1410.247	1215.54 - 1547.20	Geometric similarity	<i>Doedicurus clavicaudatus</i> , <i>D.</i> sp.	>1000	(Vizcaíno, Cassini, et al. 2011; Vizcaíno et al. 2011)
<i>Doedicurus</i> sp.	1410	1060 - 1760	Scale and computer models	<i>Doedicurus clavicaudatus</i>	>1000	(Vizcaíno, Blanco, et al. 2011)
<i>Doedicurus</i> sp.	1041		Unspecified	<i>Doedicurus</i>	>1000	(Fariña et al. 2014)
<i>Doedicurus</i> sp.	1229		Craniodental and postcranial allometric equations	<i>Doedicurus clavicaudatus</i>	>1000	(Tambusso and Fariña 2015)
<i>Doedicurus</i> sp.	1326		Average		>1000	This study
<i>Doellotatus chapadmalensis</i> , <i>D. inornatus</i> , <i>D.</i> sp.		Similar to or a little larger than <i>Chasicotatus</i> (<i>C. ameghinoi</i>)		<i>Doellotatus</i>	0.5-8	(Esteban and Nasif 1996)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Doellotatus chapadmalensis</i> , <i>D. inornatus</i> , <i>D. sp.</i>	<10 kg		<i>Doellotatus</i>	0.5-8	(Vizcaíno, Farriña, Zárate, et al. 2004)
<i>Doellotatus chapadmalensis</i>, <i>D. inornatus</i>, <i>D. sp.</i>	1-10		Summary	0.5-8	This study
<i>Dolicavia minuscula</i>, <i>D. sp.</i>	0.53452		Body length	0.5-8	(Dozo 1997)
<i>Dolichotis patagonum</i>	7.5		Unspecified	0.5-8	(Croft 2000)
<i>Dolichotis patagonum</i>	9.625	7.693-11.319	Museum records, craniodental and postcranial allometric equations	8-44	(Vizcaíno, Bargo, and Cassini 2006)
<i>Dolichotis patagonum</i>	11.85	7.7 - 16	Literature review: extant spp.	8-44	(Freudenthal and Martín-Suárez 2013)
<i>Dolichotis patagonum</i>	9.658333		Average	8-44	This study
<i>Dolichotis sp.</i>	7.5		Unspecified	0.5-8	(Croft 2000)
<i>Dolichotis sp.</i>	5.659	1.693-11.319	Museum records, craniodental and postcranial	0.5-8	(Vizcaíno, Bargo, and Cassini 2006)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

			nial allometric equations			
<i>Dolichotis</i> sp.	6.996	1.6 - 16	Literature re- view: extant spp.	<i>Dolichotis salinico- la, D. patagonum</i>	0.5-8	(Freudenthal and Martín- Suárez 2013)
<i>Dolichotis</i> sp.	12.5		Unspecified	<i>Dolichotis</i>	8-44	(Fariña et al. 2014)
<i>Dolichotis</i> sp.	4.7	1.8-8	Literature re- view: extant spp.	<i>Dolichotis salinico- la, D. patagonum</i>	0.5-8	(Patton, Pardi- ñas, and D'Elía 2015)
<i>Dolichotis</i> sp.	7.476		Average		0.5-8	This study
<i>Drytomomys aequa- torialis, D. sp.</i>	18.5	8-25 kg, 12- 25 adult	Larger than <i>Di- nomys branickii</i> (10-15 kg) and similar to small <i>Castor canadi- ensis</i> (12-25 kg)	<i>Drytomomys aequa- torialis</i>	8-44	(Walton 1997)
<i>Drytomomys aequa- torialis, D. sp.</i>		8-44	Unspecified	<i>Drytomomys</i>	8-44	Rinderknecht pers. comm.
<i>Drytomomys aequa- torialis, D. sp.</i>	18.5		Average		8-44	This study
<i>Dusicyon avus</i>	14.65		Molar length, width, area	<i>Dusicyon avus</i>	8-44	(Prevosti, Fo- rasiepi, and Zimicz 2013)
<i>Dusicyon culpaeus</i>	7.28		Molar length, width, area	<i>Dusicyon culpaeus</i>	0.5-8	(Prevosti, Fo- rasiepi, and Zimicz 2013)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Dusicyon sechurae</i>	3.6		Molar length, width, area	<i>Dusicyon sechurae</i>	0.5-8	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Dusicyon sp.</i>	5.35	3.97-8.05	Literature review: extant spp.	<i>Dusicyon avus</i>	0.5-8	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Dusicyon sp.</i>	8.51	3.6-14.65	Molar length, width, area	<i>Dusicyon avus</i> , <i>D. culpaeus</i> , <i>D. sechurae</i>	0.5-8	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Dusicyon sp.</i>	6.93		Average		0.5-8	This study
<i>Echimys sp.</i>	0.516	0.194 - 0.89	Literature review: extant spp.	<i>Echimys chrysurus</i> , <i>E. semivillosus</i> , <i>E. saturnus</i>	0.5-8	(Freudenthal and Martín-Suárez 2013)
<i>Echimys sp.</i>	0.369	0.25-0.5	Literature review: extant spp.	<i>Echimys blainvillei</i> , <i>E. lamarum</i> , <i>E. sp.</i>	<0.5	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Echimys sp.</i>	0.443		Average		<0.5	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Eionaletherium tanycnemius</i>	1098		Larger than <i>Pseudopreotherium confusum</i> or <i>P. venezuelanum</i> , but smaller than <i>Mirandabradys</i> , <i>Urumacotherium garciai</i> , or <i>Bolivatherium urumaquensis</i>	Femur length	<i>Eionaletherium tanycnemius</i>	>1000	(Rincón et al. 2015)
<i>Eira barbara</i>	4.23			Molar length, width, area	<i>Eira barbara</i>	0.5-8	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Eira barbara</i>	3.9			Literature review: extant spp.	<i>Eira barbara</i>	0.5-8	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Eira barbara</i>	4.1			Average		0.5-8	This study
<i>Eleutherocercus paranensis</i> , <i>E. sp.</i>	270			Geometric similarity	<i>Eleutherocercus antiquus</i>	100-500	This study
<i>Eligmodontia typus</i>	0.01975	0.0125 - 0.027		Literature review: extant spp.	<i>Eligmodontia typus</i>	<0.5	(Freudenthal and Martín-Suárez 2013)
<i>Eligmodontia typus</i>	0.021	0.0206 - 0.0214		Literature review: extant spp.	<i>Eligmodontia typus</i>	<0.5	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Eligmodontia typus</i>	0.020		Average	<i>Eligmodontia typus</i>	<0.5	This study
<i>Eoauchenia</i> sp.			Similar to "Epi-therium" (70-82 kg; Vizcaíno et al. 2012, Cassini et al. 2012)		44-100	(Schmidt 2013)
<i>Eoauchenia</i> sp.	33.4		Humerus allometric equations	<i>Eoauchenia primitiva</i>	8-44	This study
<i>Eoauchenia</i> sp.	33.4		Average		8-44	This study
<i>Eodolichotis elachys</i>			"Cavia-sized"	<i>Eodolichotis elachys</i>	0.5-8	(Walton 1990)
<i>Eodolichotis elachys</i>	1.1	0.8-1.3	Visual comparison with modern species	<i>Eodolichotis elachys</i>	0.5-8	(Walton 1997)
<i>Eodolichotis elachys</i>	1.1		Average		0.5-8	This study
<i>Eodolichotis maddenii</i>			"Cavia-sized"	<i>Eodolichotis maddenii</i>	0.5-8	(Walton 1990)
<i>Eodolichotis maddenii</i>	1.5	1-2	Visual comparison with modern species	<i>Eodolichotis maddenii</i>	0.5-8	(Walton 1997)
<i>Eodolichotis maddenii</i>	1.5		Average		0.5-8	This study
<i>Eodolichotis</i> sp.			Larger than <i>E. elachys</i> and <i>E. maddenii</i> (<i>Prodolichotis</i> sized: 2-3.5 kg)	<i>Eodolichotis</i> sp.	0.5-8	(Walton 1990)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Eosclerocalyptus planus</i> , <i>E. sp.</i>	185.73		Mean Geometric Similarity	<i>Eosclerocalyptus lilloi</i>	100-500	(Vizcaíno, Cassini, et al. 2011)
<i>Epecuenia sp.</i>			Similar size to <i>Neobrachytherium morenoi</i>	<i>Epecuenia thoatherioides</i>	8-44	(M. F. Soria 2001)
<i>Epieurycerus truncus</i>	120		Living Analogue ("CLA")	<i>Epieurycerus</i>	100-500	(Vizcaíno et al. 2012)
<i>Eptesicus fuscus</i>		≤ 0.026	Literature review: extant spp.	<i>Eptesicus fuscus</i>	<0.5	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Eptesicus sp.</i>	0.0123	0.0056 -0.026	Literature review: extant spp.	<i>Eptesicus brasiliensis</i> , <i>E. diminutus</i> , <i>E. furinalis</i> , <i>E. fuscus</i>	<0.5	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Equus andium</i>	220		Femur allometric equations	<i>Equus andium</i>	100-500	(Alberdi, Prado, and Ortiz-Jaureguizar 1995; Smith et al. 2003)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Equus caballus</i>	350		Museum records, craniodental and postcranial allometric equations	<i>Equus caballus</i>	100-500	(Vizcaíno, Bargo, and Cassini 2006)
<i>Equus curvidens</i>	300		Literature review	<i>Equus curvidens</i>	100-500	(Croft 2000)
<i>Equus insulatus</i>	350.72		Femur allometric equations	<i>Equus insulatus</i>	100-500	(Alberdi, Prado, and Ortiz-Jaureguizar 1995; Smith et al. 2003)
<i>Equus insulatus</i>	101.6		Molar length	<i>Equus insulatus</i>	100-500	(Croft 2000)
<i>Equus insulatus</i>	226.16		Average	<i>Equus insulatus</i>	100-500	This study
<i>Equus santaeelenae</i>	350.72		Femur allometric equations	<i>Equus santaeelenae</i>	100-500	Alberdi et al. 1995
<i>Equus</i> sp.	308	250-420	Museum records, craniodental and postcranial allometric equations	<i>Equus africanus</i> , <i>E. burchellii</i> , <i>E. caballus</i> , <i>E. grevyi</i> , <i>E. kiang</i> , <i>E. quagga</i> , <i>E. zebra</i>	100-500	(Vizcaíno, Bargo, and Cassini 2006)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Equus</i> sp.	379	Cited in Vizcaíno et al. 2012 without methodological details, original source unavailable	<i>Equus</i>	100-500	(Alberdi and Prado 2004; Vizcaíno et al. 2012)
<i>Equus</i> sp.	250	Unspecified	<i>Equus</i>	100-500	(Fariña et al. 2014)
<i>Equus</i> sp.	312	Average	<i>Equus</i>	100-500	This study
<i>Eremotherium elenense</i>		About half the size of <i>E. laurillardi</i>	<i>Eremotherium elenense</i>	>1000	(Pujos and Salas 2004b)
<i>Eremotherium elenense</i>	1693	Astralagar length	<i>Eremotherium elenense</i>	>1000	This study
<i>Eremotherium elenense</i>	1693	Average		>1000	This study
<i>Eremotherium laurillardi</i>	4500	Cited in Barbosa et al. 2014 without methodological details	<i>Eremotherium laurillardi</i>	>1000	(Cartelle 2000)
<i>Eremotherium laurillardi</i>	800	Literature review	<i>Eremotherium laurillardi</i>	500-1000	(Smith et al. 2003; Lyons, Smith, and Brown 2004; Raia, Carotenuto, and Meri 2010)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Eremotherium laurillardi</i>	3555		Femur length	<i>Eremotherium laurillardi</i>	>1000	(McDonald 2005; Raj Pant, Goswami, and Finarelli 2014)
<i>Eremotherium laurillardi</i>	3900		Unspecified	<i>Eremotherium laurillardi</i>	>1000	(McDonald 2012)
<i>Eremotherium laurillardi</i>	3188.75		Average		>1000	This study
<i>Eremotherium sefvei</i>	977	Same size as <i>Megatherium altiplanicum</i> (977 kg)		<i>Eremotherium sefvei</i>	500-1000	(Saint-André and Iuliis 2001)
<i>Eremotherium sefvei</i>	527		Femur allometric equations	<i>Eremotherium sefvei</i>	500-1000	This study
<i>Eremotherium sefvei</i>	752		Average		500-1000	This study
<i>Eremotherium</i> sp.	2931	2584.4 - 3555.1	Literature review	<i>Eremotherium eomigrans</i> , <i>E. laurillardi</i> , <i>E. rusconii</i>	>1000	(Raj Pant, Goswami, and Finarelli 2014)
<i>Eremotherium</i> sp.	2709	1923 - 3495	Femur length	<i>Eremotherium eomigrans</i> , <i>E. sp.</i>	>1000	(Rincón et al. 2015)
<i>Eremotherium</i> sp.	2820		Average		>1000	This study
<i>Erethizon</i> sp.	10.8	3.5 - 18	Literature review: extant spp.	<i>Erethizon dorsatum</i>	8-44	(Freudenthal and Martín-Suárez 2013)
<i>Eucelophorus</i> sp.	0.37		Skull length and molar row length	<i>Eucelophorus chapadmalensis</i> . <i>E. zaratei</i>	<0.5	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Eucholoeops ingens</i>	39.7		Similarity to <i>Hapalops longiceps</i>	<i>Eucholoeops ingens</i>	8-44	(Croft 2000)
<i>Eucholoeops ingens</i>	80		Humerus allometric equations	<i>Eucholoeops</i>	44-100	(Bargo, Vizcaíno, and Kay 2009; Vizcaíno et al. 2012)
<i>Eucholoeops ingens</i>	76.88	63.07 - 90.7	Postcranial multiple regression	<i>Eucholoeops ingens</i>	44-100	(Bargo, Toledo, and Vizcaíno 2012; Kay, Vizcaíno, and Bargo 2012)
<i>Eucholoeops ingens</i>	53		Postcranial multiple regression	<i>Eucholoeops ingens</i>	44-100	(Toledo et al. 2014)
<i>Eucholoeops ingens</i>	62.4		Average		44-100	This study
<i>Eulamaops sp.</i>	150		(Fariña 1995a; in Fariña 1996 without detailed methods)	<i>Eulamaops paralellus</i>	100-500	(Fariña 1995a; Fariña 1996; Croft 2000; Smith et al. 2003)
<i>Eumegamys sp.</i>	125	109.37 - 139.7	Geometric similarity	<i>Eumegamys paranensis</i>	100-500	(Candela, Cassini, and Nasif 2013)
<i>Eumegamys sp.</i>	224	170-278.6	Geometric similarity	<i>Eumegamys paranensis</i>	100-500	(Vucetich et al. 2015)
<i>Eumegamys sp.</i>	174		Average			This study
<i>Eumegamysops sp.</i>	377.85	286-469.7	Geometric similarity	<i>Eumegamysops praependens</i>	100-500	(Vucetich et al. 2015)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Eumegamysops</i> sp.	192		Molar row length	<i>Eumegamysops</i> sp.	100-500	This study
<i>Eumegamysops</i> sp.	284.925		Average		100-500	This study
<i>Eumops</i> sp.	0.0187	0.011-0.0325	Literature review: extant spp.	<i>Eumops auripendulus</i> , <i>E. bonariensis</i> , <i>E. glaucinus</i>	<0.5	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Eumysops formosus</i>	0.392		Molar row length	<i>Eumysops formosus</i>	<0.5	This study
<i>Eumysops laeviplicatus</i>	0.421		Molar row length	<i>Eumysops laeviplicatus</i>	<0.5	This study
<i>Eumysops parodii</i> , <i>E. sp.</i>	0.469	0.467-0.471	Molar row length	<i>Eumysops formosus</i> , <i>E. laeviplicatus</i>	<0.5	This study
<i>Eumysops parodii</i> , <i>E. sp.</i>		Slightly smaller than <i>Marisela gregoriana</i> (0.9 kg)		<i>Eumysops parodii</i>		(Vucetich et al. 2010)
<i>Eumysops parodii</i> , <i>E. sp.</i>	0.404		Average		<0.5	This study
<i>Euphractus patagonicus</i>	3.72		Postcranial allometric equations	<i>Euphractus</i> (= <i>Stenotatus</i>) <i>patagonicus</i>	0.5-8	(Vizcaíno et al. 2006)
<i>Euphractus sexcinctus</i>	5.0		Unspecified	<i>Euphractus sexcinctus</i>	0.5-8	(Croft 2000)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Euphractus sexcinctus</i>	4.315	3-6.5	Literature review: extant spp.	<i>Euphractus sexcinctus</i>	0.5-8	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Euphractus sexcinctus</i>	4.7		Average		0.5-8	This study
<i>Euphractus</i> sp.	4.2		Average	<i>Euphractus patagonicus</i>, <i>E. sexcinctus</i>	0.5-8	This study
<i>Euryzygomatomys</i> sp.	0.188		Literature review: extant spp.	<i>Euryzygomatomys spinosus</i>	<0.5	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Euryzygomatomys</i> sp.	0.1875	0.165 - 0.210	Literature review: extant spp.	<i>Euryzygomatomys spinosus</i>	<0.5	(Freudenthal and Martín-Suárez 2013)
<i>Euryzygomatomys</i> sp.	0.188		Average		<0.5	This study
<i>Eutatus seguini</i>	50	Similar to <i>Priodontes maximus</i> (~50 kg)		<i>Eutatus seguini</i>	44-100	(Vizcaíno and Bargo 1998; Vizcaíno et al. 2001)
<i>Eutatus seguini</i>	49.9		Postcranial allometric equations	<i>Eutatus seguini</i>	44-100	(Vizcaíno, Milne, and Bargo 2003)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Eutatus seguini</i>	56.37	50.19-65.72	Craniodental and postcranial allometric equations	<i>Eutatus seguini</i>	44-100	(Vizcaíno et al. 2006)
<i>Eutatus seguini</i>	52.09		Average		44-100	This study
<i>Eutatus</i> sp.	50.5	1-100	Unspecified	<i>Eutatus</i>		(Lessa and Farina 1996)
<i>Eutatus</i> sp.	50		Literature review	<i>Eutatus</i>	50 kg	(Vizcaíno, Fernicola, and Bargo 2012)
<i>Eutatus</i> sp.	200		Unspecified	<i>Eutatus</i>		(Fariña et al. 2014)
<i>Eutatus</i> sp.	50		Unspecified	<i>Eutatus</i>		(Vizcaíno and Bargo 2014)
<i>Eutatus</i> sp.	87.6		Average		44-100	This study
<i>Felis platensis</i> , <i>F.</i> sp.	3.8	2.2-8.8	Literature review: extant spp.	<i>Felis colocolo</i> , <i>F. geoffroyi</i> , <i>F. jacobi-ta</i> , <i>F. pardalis</i> , <i>F. tigrina</i> , <i>F. wiedii</i>	0.5-8	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Felis platensis</i> , <i>F.</i> sp.		<10	Unspecified	<i>Felis platensis</i>	0.5-8	(Di Giacomo 2012)
<i>Felis platensis</i>, <i>F.</i> sp.	3.8		Average		0.5-8	This study
<i>Galea musteloides</i>	0.226		Literature review: extant spp.	<i>Galea musteloides</i>	<0.5	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Red-

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

ford 1999)					
<i>Galea musteloides</i>	0.23		Unspecified	<i>Galea musteloides</i>	<0.5 (Croft 2000)
<i>Galea musteloides</i>	0.39	0.18 - 0.6	Literature review: extant spp.	<i>Galea musteloides</i>	<0.5 (Freudenthal and Martín-Suárez 2013)
<i>Galea musteloides</i>	0.282		Average	<0.5	This study
<i>Galea</i> sp.	0.421	0.15 - 0.672	Literature review: extant spp.	<i>Galea flavidens</i> , <i>G. musteloides</i> , <i>G. spixii</i>	<0.5 (Freudenthal and Martín-Suárez 2013)
<i>Galea</i> sp.	0.45		Unspecified	<i>Galea</i>	<0.5 (Fariña et al. 2014)
<i>Galea</i> sp.	0.4355		Average	<0.5	This study
<i>Galea spixii</i>	0.499	0.326 - 0.672	Literature review: extant spp.	<i>Galea spixii</i>	<0.5 (Freudenthal and Martín-Suárez 2013)
<i>Galictis</i> sp.	2.4	1.6 - 3.2	Literature review: extant spp.	<i>Galictis cuja</i> , <i>G. vittata</i>	0.5-8 (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Galictis</i> sp.	2.12	1.9 - 2.34	Molar length, width, area	<i>Galictis cuja</i> , <i>G. henningi</i> , <i>G. sorgentini</i> , <i>G. vittata</i>	0.5-8 (Prevosti, Forasiepi, and Zimicz 2013)
<i>Galictis</i> sp.	2.26		Average	0.5-8	This study
<i>Galileomys colloncurensis</i>	0.256		Molar length	<i>Galileomys colloncurensis</i>	<0.5 This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Glossotheriopsis pascuali</i>	24.518		Femur bicondylar width	<i>Glossotheriopsis pascuali</i>	8-44	(Croft 2000)
<i>Glossotherium chapadmalense</i>	310.54		Femur allometric equations	<i>Glossotherium chapadmalense</i>	100-500	(McDonald 2005; Raj Pant, Goswami, and Finarelli 2014)
<i>Glossotherium giganteum</i>		>1000	Unspecified	<i>Glossotherium (=Ocnotherium) giganteum</i>	>1000	(Araújo-Júnior 2012)
<i>Glossotherium giganteum</i>	1344		Literature review	<i>Glossotherium</i>	>1000	(Vizcaíno et al. 2012)Vizcaíno et al. 2012
<i>Glossotherium giganteum</i>	1344		Average		>1000	This study
<i>Glossotherium robustum</i>	1216		Craniodental and postcranial allometric equations	<i>Glossotherium robustum</i>	>1000	(Fariña, Vizcaíno, and Bargo 1998; Croft 2000)
<i>Glossotherium robustum</i>	1471	1200-1718	Scale models, computer models, allometric equations	<i>Glossotherium robustum</i>	>1000	(Bargo et al. 2000)
<i>Glossotherium robustum</i>	1063	750 - 1376	Craniodental allometric equations	<i>Glossotherium robustum</i>	>1000	(Christiansen and Fariña 2003)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Glossotherium robustum</i>	1693		Literature review	<i>Glossotherium robustum</i>	>1000	(Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Glossotherium robustum</i>	1182		Literature review	<i>Glossotherium robustum</i>	>1000	(Raj Pant, Goswami, and Finarelli 2014)
<i>Glossotherium robustum</i>	1325		Average		>1000	This study
<i>Glossotherium</i> sp., <i>G. tropicorum</i>	1344		Literature review	<i>Glossotherium</i>	>1000	(Vizcaíno et al. 2012)
<i>Glossotherium</i> sp., <i>G. tropicorum</i>	1302		Unspecified	<i>Glossotherium</i>	>1000	(Fariña et al. 2014)
<i>Glossotherium</i> sp., <i>G. tropicorum</i>	1323		Average		>1000	This study
<i>Glyptodon clavipes</i>	2000		Postcranial allometric equations	<i>Glyptodon clavipes</i>	>1000	(Fariña 1995a; Croft 2000; Vizcaíno et al. 2012)
<i>Glyptodon clavipes</i>	1995		Literature review	<i>Glyptodon clavipes</i>	>1000	(Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Glyptodon clavipes</i>	1730	1460 - 2000	Computer and scale models	<i>Glyptodon clavipes</i>	>1000	(Vizcaíno, Blanco, et al. 2011)
<i>Glyptodon clavipes</i>	1908		Average		>1000	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Glyptodon elongatus</i> , G. sp.	1400	800 - 2000	Geometric similarity	<i>Glyptodon clavipes</i> , <i>G. perforatus</i> , <i>G. reticulatus</i> , <i>G. rudimentarius</i>	>1000	(Croft 2000)
<i>Glyptodon elongatus</i> , G. sp.	1264		Mean of averages for species in this study	<i>Glyptodon clavipes</i> , <i>G. munizi</i> , <i>G. reticulatus</i>	>1000	This study
<i>Glyptodon elongatus</i>, G. sp.	1332		Average		>1000	This study
<i>Glyptodon munizi</i>	1150		Geometric similarity	<i>Glyptodon munizi</i>	>1000	(Vizcaíno, Cassini, et al. 2011)
<i>Glyptodon reticulatus</i>	862		Postcranial allometric equations	<i>Glyptodon reticulatus</i>	500-1000	(Fariña, Vizcaíno, and Bargo 1998; Croft 2000; Vizcaíno et al. 2012)
<i>Glyptodon reticulatus</i>	871		Literature review	<i>Glyptodon reticulatus</i>	500-1000	(Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Glyptodon reticulatus</i>	819		Geometric similarity	<i>Glyptodon reticulatus</i>	500-1000	(Vizcaíno, Cassini, et al. 2011)
<i>Glyptodon reticulatus</i>	380.5	350-411	Computer and scale models	<i>Glyptodon reticulatus</i>	100-500	(Vizcaíno, Blanco, et al. 2011)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Glyptodon reticulatus</i>	733		Average		500-1000	This study
<i>Glyptotherium cylindricum</i>	1096		Literature review	<i>Glyptotherium floridanum</i> , <i>G. mexicanum</i>	>1000	(Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Gracilinanus</i> sp.	0.023	0.0149 -0.031	Literature review: extant spp.	<i>Gracilinanus agilis</i> , <i>G. dryas</i> , <i>G. microtarsus</i>	<0.5	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Granastrapotherium snorki</i>	1374.7		Craniodental allometric equations	<i>Granastrapotherium snorki</i>	>1000	(Johnson and Madden 1997)
<i>Granastrapotherium snorki</i>	732		Molar length	<i>Granastrapotherium snorki</i>	500-1000	(Croft 2000)
<i>Granastrapotherium snorki</i>	3142		Molar row length	<i>Granastrapotherium snorki</i>	>1000	(Vallejo-Pareja et al. 2015)
<i>Granastrapotherium snorki</i>	1749.6		Average		>1000	This study
<i>Guiomys</i> sp., <i>G. unica</i>	1.25	1-1.5	Unspecified	<i>Guiomys unica</i>	0.5-8	(Croft 2016)
<i>Guiomys</i> sp., <i>G. unica</i>	0.804		Molar row length	<i>Guiomys unica</i>	0.5-8	This study
<i>Guiomys</i> sp., <i>G. unica</i>	1.03		Average		0.5-8	This study
<i>Gyrinodon quassus</i> , <i>G. sp.</i>	1650		Molar length	<i>Gyrinodon quassus</i>	>1000	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Hapalops angustipalatus</i>	26.41		Postcranial multiple regression	<i>Hapalops angustipalatus</i>	8-44	(Bargo, Toledo, and Vizcaíno 2012)
<i>Hapalops angustipalatus</i>	35		Femur allometric equations	<i>Hapalops angustipalatus</i>	8-44	(Rincón et al. 2015)
<i>Hapalops angustipalatus</i>	30.705		Average		8-44	This study
<i>Hapalops</i> sp.	19.154	9.526-27.818	Femur allometric equations	<i>Hapalops gracilidens</i> , <i>H. indifferens</i>	8-44	(Croft 2000)
<i>Hapalops</i> sp.	41.32	10.96 - 85.17	Postcranial multiple regression	<i>Hapalops angustipalatus</i> , <i>H. elongates</i> , <i>H. longiceps</i> , <i>H. platycephalus</i> , <i>H. ponderosus</i> , <i>h. rectangularis</i> , <i>H. sp.</i>	8-44	(Bargo, Toledo, and Vizcaíno 2012; Kay, Vizcaíno, and Bargo 2012)
<i>Hapalops</i> sp.	70.0		Literature	<i>Hapalops</i>	8-44	(Vizcaíno et al. 2012)
<i>Hapalops</i> sp.	24.3	9.5 - 42.8	Literature review	<i>Hapalops elongatus</i> , <i>H. gracilidens</i> , <i>H. indifferens</i> , <i>H. longiceps</i> , <i>H. platycephalus</i> , <i>H. sp.</i>	8-44	(Raj Pant, Goswami, and Finarelli 2014)
<i>Hapalops</i> sp.	31	15-51	Femur allometric equations	<i>Hapalops angustipalatus</i> , <i>H. longiceps</i> , <i>H. platycephalus</i> , <i>H. reutimeyeri</i>	8-44	(Rincón et al. 2015)
<i>Hapalops</i> sp.	37.1547		Average		8-44	This study
	3					

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Haplomastodon chimborazi</i>	6000		Literature review	<i>Haplomastodon chimborazi</i>	>1000	(Smith et al. 2003; Grayson 2016)
<i>Haplomastodon</i> sp.	6000		Literature review	<i>Haplomastodon chimborazi</i>	>1000	(Smith et al. 2003; Grayson 2016)
<i>Haplomastodon waringi</i>	6000		Literature review	<i>Haplomastodon chimborazi</i>	>1000	(Smith et al. 2003; Grayson 2016)
<i>Hegetotherium mirabile</i> , <i>H.</i> sp.	2.19		Molar length	<i>Hegetotherium mirabile</i>	0.5-8	(Croft 2000; Reguero, Candela, and Cassini 2010)
<i>Hegetotherium mirabile</i> , <i>H.</i> sp.	4.67		Cranio-mandibular geometric morphometrics	<i>Hegetotherium mirabile</i>	0.5-8	(Cassini, Vizcaíno, and Bargo 2012)
<i>Hegetotherium mirabile</i> , <i>H.</i> sp.	9.69	8.85 - 11.75	Craniodental and postcranial allometric equations	<i>Hegetotherium</i>		(Elissamburu 2012)
<i>Hegetotherium mirabile</i> , <i>H.</i> sp.	7.71		Postcranial allometric equations	<i>Hegetotherium mirabile</i>	0.5-8	(Cassini et al. 2012; Kay, Vizcaíno, and Bargo 2012)
<i>Hegetotherium mirabile</i> , <i>H.</i> sp.	6.1		Average		0.5-8	This study
<i>Hemiauchenia paradoxa</i>	1000		(Fariña 1995a in Fariña 1996 without detailed methods)	<i>Hemiauchenia paradoxa</i>	500-1000	(Fariña 1995a; Fariña 1996; Croft 2000; Smith et al. 2003; Raia,

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

					Carotenuto, and Meiri 2010)
					(Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Hemiauchenia</i> sp.	555	110-1000	Literature review	<i>Hemiauchenia macrocephala</i> , <i>H. paradoxo</i>	
<i>Hemiauchenia</i> sp.	400		Geometric similarity	<i>Hemiauchenia</i>	100-500 (Vizcaíno et al. 2012)
<i>Hemiauchenia</i> sp.	191.5		Unspecified	<i>Hemiauchenia</i>	100-500 (Fariña et al. 2014)
<i>Hemiauchenia</i> sp.	382.166		Average		100-500 This study
<i>Hemihegetotherium</i> sp., <i>H. trilobus</i>	7.20433	3.9 - 13.681 kg	Molar length	<i>Hemihegetotherium achataleptum</i> , <i>H. sp. nov.</i> , <i>H. torresi</i>	(Reguero, Candela, and Cassini 2010)
<i>Hemihegetotherium</i> sp., <i>H. trilobus</i>	13.14	10.22 - 21.73	Craniodental and postcranial allometric equations	<i>Hemihegetotherium</i>	8-44 (Elissamburu 2012)
<i>Hemihegetotherium</i> sp., <i>H. trilobus</i>	10.1721		Average		8-44 This study
<i>Herpailurus</i> sp.	2.6		Literature review: extant spp.	<i>Felis (Herpailurus) yagouaroundi</i>	8-44 (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Red-

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

ford 1999)					
<i>Herpailurus</i> sp.	6.75	4.5-9	Literature review: extant spp.	<i>Felis (Herpailurus) yagouaroundi</i>	8-44 (Nowak 1999)
<i>Herpailurus</i> sp.	5.2		Molar length, width, area	<i>Herpailurus</i>	8-44 (Prevosti, Forasiepi, and Zimicz 2013)
<i>Herpailurus</i> sp.	50.4		Unspecified	<i>Herpailurus</i>	44-100 (Fariña et al. 2014)
<i>Herpailurus</i> sp.	16.2		Average		8-44 This study
<i>Heteromys</i> sp.	0.068	0.019 - 0.268	Literature review: extant spp.	<i>Heteromys anomalus, H. australis, H. desmarestianus, H. gaumeri, H. nelsoni, H. oasicus, H. oresterus, H. teleus</i>	<0.5 (Freudenthal and Martín-Suárez 2013)
<i>Hilarcotherium castanedaii</i>	1303	1187-1607	Craniodental and postcranial allometric equations	<i>Hilarcotherium castanedaii</i>	>1000 (Vallejo-Pareja et al. 2015)
<i>Hippidion</i> (=Onohippidium) <i>devillei</i>	255.69		Femur allometric equations	<i>Hippidion</i> (=Onohippidium) <i>devillei</i>	100-500 (Alberdi, Prado, and Ortiz-Jaureguizar 1995)
<i>Hippidion</i> (=Onohippidium) <i>devillei</i>	309		Literature review	<i>Hippidion</i> (=Onohippidium) <i>devillei</i>	100-500 (Smith et al. 2003; Raia, Carotenuto,

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

				and Meiri 2010)
<i>Hippidion</i> (=<i>Onohippidium</i>) <i>devillei</i>	282	Average	100- 500	This study
<i>Hippidion principale</i>	460.35	Femur allometric equations	<i>Hippidion principale</i> 100-500	(Alberdi, Prado, and Ortiz-Jaureguizar 1995)
<i>Hippidion principale</i>	511	Craniodental and postcranial allometric equations	<i>Hippidion principale</i> 500-1000	(Fariña, Vizcaíno, and Bargo 1998; Croft 2000; Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Hippidion principale</i>	485.675	Average	100- 500	
<i>Hippidion saldiasi</i>	265.6	Femur allometric equations	<i>Hippidion saldiasi</i> 100-500	(Alberdi, Prado, and Ortiz-Jaureguizar 1995; Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Hippidion</i> sp.	327.21	255.69 - 460.35	Femur allometric equations	<i>Hippidion devillei</i> , <i>H. principale</i> , <i>H. saldiasi</i>	100-500	(Alberdi, Prado, and Ortiz-Jaureguizar 1995; Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Hippidion</i> sp.	460		Literature review	<i>Hippidion</i>	100-500	(Vizcaíno et al. 2012)
<i>Hippidion</i> sp.	476		Unspecified	<i>Hippidion</i>	100-500	(Fariña et al. 2014)
<i>Hippidion</i> sp.	421		Average		100-500	This study
<i>Hippocamelus</i> sp.	19.2		Molar length	<i>Hippocamelus</i>	8-44	(Croft 2000)
<i>Hippocamelus</i> sp.	67.5	65-70	Craniodental and postcranial allometric equations	<i>Hippocamelus bisulcus</i>	44-100	(Vizcaíno, Bargo, and Cassini 2006)
<i>Hippocamelus</i> sp.	62.5		Literature review	<i>Hippocamelus bisulcus</i>	44-100	(De Esteban-Trivigno, Mendoza, and De Renzi 2008)
<i>Hippocamelus</i> sp.	49.7		Average		44-100	This study
<i>Hiskatherium saintandrei</i>		Small megatherioid, comparable to <i>Schismotherium fractum</i> (44 kg, Toledo et al. 2014)		<i>Hiskatherium saintandrei</i>	44-100	(Pujos, Iuliis, and Quispe 2011)Pujos et al. 2011

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Hiskatherium saintandrei</i>	96.2		Molar row length	<i>Hiskatherium saintandrei</i>	44-100	This study
<i>Hiskatherium saintandrei</i>	96.2		Average		44-100	This study
<i>Holmesina occidentalis</i>	200		Literature review	<i>Holmesina occidentalis</i>	100-500	(Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Holmesina occidentalis</i>	177		Craniodental and postcranial allometric equations	<i>Holmesina occidentalis</i>	100-500	(Vizcaíno et al. 2006)
<i>Holmesina occidentalis</i>	189		Average		100-500	This study
<i>Holmesina paulacoutoi</i>		Very similar in body mass to <i>H. occidentalis</i>		<i>Holmesina paulacoutoi</i>	100-500	(Iuliis, Bargo, and Vizcaíno 2001)
<i>Holmesina paulacoutoi</i>	125		Literature review	<i>Holmesina paulacoutoi</i>	100-500	(Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Holmesina paulacoutoi</i>	125		Average		100-500	This study
<i>Holmesina sp.</i>	192	125-250	Literature review	<i>Holmesina occidentalis</i> , <i>H. paulacoutoi</i> , <i>H. septentrionalis</i>	100-500	(Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Holochilus brasiliensis</i> , H. sp.	0.1925	0.059 - 0.326	Literature review: extant spp.	<i>Holochilus brasiliensis</i>	<0.5	(Freudenthal and Martín-Suárez 2013)
<i>Holochilus brasiliensis</i> , H. sp.	0.35		Unspecified	<i>Holochilus</i>	<0.5	(Fariña et al. 2014)
<i>Holochilus brasiliensis</i>, H. sp.	0.27125		Average		<0.5	This study
<i>Holochilus primigenus</i>	0.61		Molar length	<i>Holochilus primigenus</i>	0.5-8	(Croft 2000)
<i>Holochilus primigenus</i>	0.116		Molar row length	<i>Holochilus primigenus</i>	<0.5	This study
<i>Holochilus primigenus</i>	0.363		Average		<0.5	This study
<i>Homalodotherium</i> sp.	300		Molar length	<i>Homalodotherium cunninghami</i>	100-500	(Croft 2000)
<i>Homalodotherium</i> sp.	350		Craniodental allometric equations	<i>Homalodotherium</i>	100-500	(Cassini et al. 2011)
<i>Homalodotherium</i> sp.	1171.6	881-1330	Craniodental and postcranial allometric equations	<i>Homalodotherium</i>	>1000	(Elissamburu 2012)
<i>Homalodotherium</i> sp.	405.08		Craniodental allometric equations	<i>Homalodotherium cunninghami</i>	100-500	(Cassini et al. 2012; Kay, Vizcaíno, and Bargo 2012)
<i>Homalodotherium</i> sp.	340		"Regression"	<i>Homalodotherium</i>	100-500	(Vizcaíno et al. 2012)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Homalodotherium</i> sp.	407.5	≤315-500	Slightly smaller than <i>Chasicotherium</i>	Unspecified	<i>Homalodotherium</i> , <i>Chasicotherium</i>	100-500	(Croft 2016)
<i>Homalodotherium</i> sp.	496			Average		100-500	This study
<i>Homotherium venezuelensis</i>	190			Molar length, width, area	<i>Homotherium</i> sp. nov.	100-500	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Homunculus patagonicus</i>	1.86			Molar allometric equations	<i>Homunculus patagonicus</i>	0.5-8	(Coleman, Kay, and Colbert 2010)
<i>Homunculus patagonicus</i>	2.7			Craniodental and postcranial allometric equations	<i>Homunculus patagonicus</i>	0.5-8	(Kay et al. 2012)
<i>Homunculus patagonicus</i>	2.28			Average		0.5-8	This study
<i>Homunculus</i> sp.	3.35			Craniodental and postcranial allometric equations	<i>Homunculus patagonicus</i>, <i>H. sp. nov.</i>		(Kay et al. 2012)
<i>Hondadelphys fieldsi</i>	3.72			Molar length, width, area	<i>Hondadelphys fieldsi</i>	0.5-8	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Hondalagus altiplanensis</i>	0.1			Similarity in size to <i>Monodelphis domestica</i>	<i>Hondalagus altiplanensis</i>	<0.5	(Sánchez-Villagra, Kay, and Anaya-Daza 2000)
<i>Hondalagus altiplanensis</i>	0.035	0.02-0.05		Unspecified	<i>Hondalagus altiplanensis</i>	<0.5	(Croft 2016)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Hondalagus alti-planensis</i>	0.068		Average		<0.5	This study
<i>Hoplophorus euphractus</i> , <i>H. sp.</i> , <i>H. verus</i>	1000		Unspecified	<i>Hoplophorus</i> aff. <i>H. euphractus</i>	500-1000	(Croft 2000)
<i>Hoplophorus euphractus</i> , <i>H. sp.</i> , <i>H. verus</i>	280		Literature review	<i>Hoplophorus</i>	500-1000	(Smith et al. 2003; Grayson 2016)
<i>Hoplophorus euphractus</i>, <i>H. sp.</i>, <i>H. verus</i>	640		Average		500-1000	This study
<i>Huilatherium pluripicatum</i>	500	>500	Unspecified	<i>Huilatherium pluripicatum</i>		(Kay and Madden 1997b)
<i>Huilatherium pluripicatum</i>	315		Molar length	<i>Huilatherium pluripicatum</i>	100-500	(Croft 2000)
<i>Huilatherium pluripicatum</i>	407.5		Average		100-500	This study
<i>Hydrochoeropsis dasseni</i> , <i>H. sp.</i>		>200	Unspecified	<i>Hydrochoeropsis dasseni</i>	100-500	(Vucetich and Deschamps 2015)
<i>Hydrochoeropsis dasseni</i> , <i>H. sp.</i>	93.68		Geometric similarity	<i>Hydrochoeropsis dasseni</i>	44-100	(Vucetich et al. 2015)
<i>Hydrochoeropsis dasseni</i> , <i>H. sp.</i>	401		Skull length and molar row length	<i>Hydrochoeropsis dasseni</i>	100-500	This study
<i>Hydrochoeropsis dasseni</i>, <i>H. sp.</i>	366		Average		100-500	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Hydrochoerus bal-</i> <i>lesterensis, H. sp.</i>	49.3	20 - 91	Literature re- view: extant spp.	<i>Hydrochoerus hy-</i> <i>drochaeris, H. isth-</i> <i>mius</i>	44-100	(Freudenthal and Martín- Suárez 2013)
<i>Hydrochoerus bal-</i> <i>lesterensis, H. sp.</i>	53		Unspecified	<i>Hydrochoerus</i>	44-100	(Fariña et al. 2014)
<i>Hydrochoerus bal-</i> <i>lesterensis, H. sp.</i>	51.2		Average		44-100	This study
<i>Hydrochoerus hy-</i> <i>drochaeris</i>	63		Literature re- view: extant spp.	<i>Hydrochoerus hy-</i> <i>drochaeris</i>	44-100	(Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)
<i>Hydrochoerus hy-</i> <i>drochaeris</i>	49.3	48.5- 50.074	Museum rec- ords, cranioden- tal and postcra- nial allometric equations	<i>Hydrochoerus hy-</i> <i>drochaeris</i>	44-100	(Vizcaíno, Bargo, and Cassini 2006)
<i>Hydrochoerus hy-</i> <i>drochaeris</i>	55.5	20 - 91	Literature re- view: extant spp.	<i>Hydrochoerus hy-</i> <i>drochaeris</i>	44-100	(Freudenthal and Martín- Suárez 2013)
<i>Hydrochoerus hy-</i> <i>drochaeris</i>	55.9		Average		44-100	This study
<i>Hyperdidelphys pat-</i> <i>tersoni</i>	0.4444	Size of <i>Philander</i> <i>opossum</i> (0.4444 kg)		<i>Hyperdidelphys pat-</i> <i>tersoni</i>	<0.5	(Goin and Pardiñas 1996)
<i>Hyperdidelphys pat-</i> <i>tersoni</i>	1.16		Dental allome- tric equations	<i>Hyperdidelphys pat-</i> <i>tersoni</i>	0.5-8	(Zimicz 2014)
<i>Hyperdidelphys pat-</i> <i>tersoni</i>	0.802		Summary		0.5-8	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Hyperdidelphys</i> sp.	1.0022	Size of <i>Philander opossum</i> (0.4444 kg) to <i>Didelphis albiventris</i> (1.56 kg)		<i>Hyperdidelphys inexpecta</i> , <i>H. parvula</i> , <i>H. pattersoni</i> , <i>H. dimartinoi</i>	0.5-8	(Goin and Pardiñas 1996)
<i>Hyperdidelphys</i> sp.	1.3	0.98 - 2.07	Dental allometric equations	<i>Hyperdidelphys inexpecta</i> , <i>H. parvula</i> , <i>H. pattersoni</i> , <i>H. dimartinoi</i>	0.5-8	(Zimicz 2014)
<i>Hyperdidelphys</i> sp.	1.2		Average		0.5-8	This study
<i>Hypsitherium bolivianum</i>	29		Molar length	<i>Hypsitherium bolivianum</i>	8-44	This study
<i>Interatherium</i> sp.	0.426	0.399 - 0.453	Molar length	<i>Interatherium robustum</i> , <i>I. sp.</i>	0.5-8	(Croft 2000)
<i>Interatherium</i> sp.	3.5		Craniodental allometric equations	<i>Interatherium robustum</i>	0.5-8	(Vizcaíno et al. 2010)
<i>Interatherium</i> sp.	3.33	1.74 - 4.40	Craniodental and postcranial allometric equations	<i>Interatherium</i>	0.5-8	(Elissamburu 2012)
<i>Interatherium</i> sp.	1.48	1.33-1.81	Craniomandibular geometric morphometrics	<i>Interatherium excavatum</i> , <i>I. extensum</i> , <i>I. robustum</i>	0.5-8	(Cassini, Vizcaíno, and Bargo 2012)
<i>Interatherium</i> sp.	2.38		Craniodental allometric equations	<i>Interatherium robustum</i>	0.5-8	(Cassini et al. 2012; Kay, Vizcaíno, and

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

Bargo 2012)						
<i>Interatherium</i> sp.	2.2			Average	0.5-8	This study
<i>Isostylomys</i> sp.	87.3	70.56-104		Geometric similarity	<i>Isostylomys laurillardi</i>	100-500 (Vucetich et al. 2015)
<i>Isostylomys</i> sp.		100-500		Unspecified	<i>Isostylomys</i>	100-500 Rinderknecht pers. comm.
<i>Isostylomys</i> sp.	55.8			Molar row length	<i>Isostylomys</i> (=Eumegamys) <i>ameghinoi</i> , <i>I. intermedius</i> , <i>I. laevis</i> , <i>I. laurillardi</i> , <i>I. magnus</i>	44-100 This study
<i>Isostylomys</i> sp.	71.5			Average		44-100 This study
<i>Josephoartigasiá monesi</i>	857	356.4-1534.83	Calculated as mean of estimates in the paper, although author prefers lowest estimate (as low as 350 kg)	Craniodental allometric equations	<i>Josephoartigasiá monesi</i>	500-1000 (Millien 2008)
<i>Josephoartigasiá monesi</i>	1000			Craniodental allometric equations	<i>Josephoartigasiá monesi</i>	500-1000 (Rinderknecht and Blanco 2008; Blanco 2008; Blanco, Rinderknecht, and Lecuona 2012)
<i>Josephoartigasiá monesi</i>	770.205	622.78 -		Geometric similarity	<i>Josephoartigasiá monesi</i>	500-1000 (Vucetich et al. 2015)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

917.63					
<i>Josephoartigasiá monesi</i>	929		Average	500-1000	This study
<i>Kerodon sp.</i>	0.945	0.7-1.04	Literature review: extant spp.	<i>Kerodon acrobata</i> , <i>K. rupestris</i>	0.5-8 (Patton, Pardiñas, and D'Elía 2015)
<i>Kiyumylodon lecuonai</i>		Slightly smaller than <i>Glossotherium robustum</i>		<i>Kiyumylodon lecuonai</i>	(Rinderknecht, Perea, and Mcdonald 2007)
<i>Kiyumylodon lecuonai</i>	1106		Molar row length	<i>Kiyumylodon lecuonai</i>	>1000 This study
<i>Kiyumylodon lecuonai</i>	1106		Average	>1000	This study
<i>Kraglievichia paranense</i> , <i>K. sp.</i>	45		Literature review	<i>Kraglievichia paranense</i>	44-100 (Brook and Bowman 2004)
<i>Kraglievichia paranense</i> , <i>K. sp.</i>		Possibly congeneric with <i>Pampatherium</i> (200 kg)		<i>Kraglievichia</i>	100-500 (Wolf, Kalthoff, and Sander 2012)
<i>Kraglievichia paranense</i> , <i>K. sp.</i>	45		Average	44-100	This study
<i>Kunsia sp.</i>	0.142	0.116 - 0.168	Literature review: extant spp.	<i>Kunsia fronto</i> , <i>K. tomentosus</i>	<0.5 (Freudenthal and Martín-Suárez 2013)
<i>Kunsia sp.</i>	0.4475	0.241-0.654	Literature review: extant spp.	<i>Kunsia tomentosus</i>	<0.5 (Patton, Pardiñas, and D'Elía 2015)
<i>Kunsia sp.</i>	0.295		Average	<0.5	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Lagidium</i> sp.	1.4	0.75-2.1	Literature review: extant spp.	<i>Lagidium peruanum</i> , <i>L. viscacia</i>	0.5-8	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Lagidium</i> sp.	2.154	0.9 - 3.845	Literature review: extant spp.	<i>Lagidium peruanum</i> , <i>L. viscacia</i> , <i>L. wolffsohni</i>	0.5-8	(Freudenthal and Martín-Suárez 2013)
<i>Lagidium</i> sp.	1.24	1.2-1.6	Literature review: extant spp.	<i>Lagidium</i>	0.5-8	(Patton, Pardiñas, and D'Elía 2015)
<i>Lagidium</i> sp.	1.598		Average		0.5-8	This study
<i>Lagonimico conclucatus</i>	1		Molar length and area	<i>Lagonimico conclucatus</i>	0.5-8	(Fleagle et al. 1997)
<i>Lagostomus maximus</i>	6.3		Unspecified	<i>Lagostomus maximus</i>	0.5-8	(Croft 2000)
<i>Lagostomus maximus</i>	4.7075	4.111-5.14	Museum records, craniodental and postcranial allometric equations	<i>Lagostomus maximus</i>	0.5-8	(Vizcaíno, Bargo, and Cassini 2006)
<i>Lagostomus maximus</i>	5	2-8	Literature review: extant spp.	<i>Lagostomus maximus</i>	0.5-8	(Freudenthal and Martín-Suárez 2013)
<i>Lagostomus maximus</i>	5.3		Average		0.5-8	This study
<i>Lagostomus</i> sp.	4.875		Unspecified	<i>Lagostomus</i>	0.5-8	(Fariña et al. 2014)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Lakukullus anatis-rostratus</i>	217.5	134-301	Similar in size to <i>Thalassocnus</i> (134-301 kg)	<i>Lakukullus anatis-rostratus</i>	100-500	(Pujos et al. 2014)
<i>Lakukullus anatis-rostratus</i>	326		Molar row length	<i>Lakukullus anatis-rostratus</i>	100-500	This study
<i>Lakukullus anatis-rostratus</i>	272		Average		100-500	This study
<i>Lama castelnaudi</i>	147		Molar length	<i>Lama castelnaudi</i>	100-500	This study
<i>Lama gracilis</i>	57.34	50.36-64.32	Humerus allometric equations	<i>Lama gracilis</i>	44-100	(Cajal, Tonni, and Tartarini 2010)
<i>Lama guanicoe</i>	110		Museum records, craniodental and postcranial allometric equations	<i>Lama guanicoe</i>	100-500	(Vizcaíno, Bargo, and Cassini 2006)
<i>Lama guanicoe</i>	100	80-120	Unspecified	<i>Lama guanicoe</i>	100-500	(Cajal, Tonni, and Tartarini 2010)
<i>Lama guanicoe</i>	105		Average		100-500	This study
<i>Lama</i> sp.	120		Comparison with living relative/analogue ("CLA")	<i>Lama</i>	100-500	(Vizcaíno et al. 2012)
<i>Lama</i> sp.	100		Unspecified	<i>Lama</i>	100-500	(Fariña et al. 2014)
<i>Lama</i> sp.	110		Average		100-500	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Leopardus braccatus</i>	3.3	2.9-3.7	Literature review: extant spp.	<i>Leopardus braccatus</i>	0.5-8	(Barstow and Leslie 2012)
<i>Leopardus pardalis</i>	7.9	7-8.8	Literature review: extant spp.	<i>Leopardus pardalis</i>	0.5-8	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Leopardus pardalis</i>	10.08		Molar length, width, area	<i>Leopardus pardalis</i>	8-44	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Leopardus pardalis</i>	9.0		Average		8-44	This study
<i>Leopardus</i> sp.	5.016	2.2 - 10.08	Molar length, width, area	<i>Leopardus colocolo, L. geoffroyi, L. jacobita, L. guigna, L. pardalis, L. tigrinus, L. wiedii</i>	0.5-8	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Leopardus tigrinus</i>	3		Molar length, width, area	<i>Leopardus tigrinus</i>	0.5-8	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Leopardus voro-huensis</i>	3.77		Molar length, width, area	" <i>Felis</i> " (= <i>Leopardus</i>) <i>voro-huensis</i>	0.5-8	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Lestobradys sprechmanni</i>		Smaller than <i>Lestodon armatus</i>		<i>Lestobradys sprechmanni</i>		Rinderknecht et al. 2010
<i>Lestobradys sprechmanni</i>	830		Molar row length	<i>Lestobradys sprechmanni</i>	500-1000	This study
<i>Lestobradys sprechmanni</i>	830		Average		500-1000	This study
<i>Lestodelphys halli</i>	0.076		Literature re-	<i>Lestodelphys halli</i>	<0.5	(Eisenberg

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

L. sp.		view: extant spp.		1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	
		Craniodental and postcranial allometric equations		(Fariña, Vizcaíno, and Bargo 1998; Croft 2000; Smith et al. 2003; Raia, Carotenuto, and Meiri 2010; Vizcaíno et al. 2012)	
<i>Lestodon armatus</i>	3397		<i>Lestodon armatus</i>	>1000	
		Scale models, computer models, allometric equations		(Bargo et al. 2000)	
<i>Lestodon armatus</i>	3925	3750-4100	<i>Lestodon armatus</i>	>1000	
		Postcranial multiple regression		(De Esteban-Trivigno, Mendoza, and De Renzi 2008)	
<i>Lestodon armatus</i>	3550.7		<i>Lestodon armatus</i>	>1000	
		Craniodental and postcranial allometric equations		(Vizcaíno, Bargo, and Cassini 2006; Raj Pant, Goswami, and Finarelli 2014)	
<i>Lestodon armatus</i>	3302		<i>Lestodon armatus</i>	>1000	
<i>Lestodon armatus</i>	3544	Average		>1000	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Lestodon</i> sp.	2566	1300 - 3397	Literature review	<i>Lestodon armatus, L. gaudryi, L. trigonidens</i>	>1000	(Croft 2000)
<i>Lestodon</i> sp.	2590		Unspecified	<i>Lestodon</i>	>1000	(Fariña et al. 2014)
<i>Lestodon</i> sp.	2578		Average		>1000	This study
<i>Lomaphorops coral-linus</i>	250		Literature review	<i>Lomaphorops</i>	100-500	(Grayson 2016)
		0.0061				(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Lonchophylla</i> sp.	0.01	0.0142	Literature review	<i>Lonchophylla</i>	<0.5	
						(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Lontra longicaudis</i>	5.8		Literature review: extant spp.	<i>Lontra longicaudis</i>	0.5-8	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Lontra longicaudis</i>	10.33		Molar length, width, area	<i>Lontra longicaudis</i>	8-44	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Lontra longicaudis</i>	8.07		Average		0.5-8	This study
		0.0303				(Dechmann, Kalko, and Kerth 2004)
<i>Lophostoma silvicolum</i>	0.0307	4-0.0310	Live capture	<i>Lophostoma silvicolum</i>	<0.5	
		6				
<i>Luantus</i> sp.	0.59	0.441 - 0.739	Craniodental and postcranial allometric	<i>Luantus initialis, L. minor, L. propheticus, L. toldensis</i>	0.5-8	(Pérez 2010a)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

equations					
<i>Lundomys</i> sp.	0.239		Literature re-view: extant spp.	<i>Lundomys molitor</i>	<0.5 (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Lundomys</i> sp.	0.2385	0.227 - 0.250	Literature re-view: extant spp.	<i>Lundomys molitor</i>	<0.5 (Freudenthal and Martín-Suárez 2013)
<i>Lundomys</i> sp.	0.37		Unspecified	<i>Lundomys</i>	<0.5 (Fariña et al. 2014)
<i>Lundomys</i> sp.	0.2825		Average		<0.5 This study
<i>Lutreolina crassicaudata</i>	0.537	0.432 - 1.1	Literature re-view: extant spp.	<i>Lutreolina crassicaudata</i>	0.5-8 (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Lutreolina crassicaudata</i>	0.37		Unspecified	<i>Lutreolina crassicaudata</i>	<0.5 (Croft 2000)
<i>Lutreolina crassicaudata</i>	0.4535		Average		<0.5 This study
<i>Lutreolina materdei</i>		Larger than <i>L. crassicaudata</i>		<i>Lutreolina materdei</i>	0.5-8 (Goin and de los Reyes 2011)
<i>Lutreolina materdei</i>	0.666		Molar length	<i>Lutreolina materdei</i>	0.5-8 This study
<i>Lutreolina materdei</i>	0.666		Average		0.5-8 This study
<i>Lutreolina</i> sp.	0.560		Average	<i>Lutreolina crassicaudata</i>, <i>L. materdei</i>	0.5-8 This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Lycopsis longirostris</i>	17.800	Femur allometric equations	<i>Lycopsis longirostris</i>	(Argot 2004a)
<i>Lycopsis longirostris</i>	29.77	Ulna allometric equations	<i>Lycopsis longirostris</i> 8-44	(Ercoli and Prevosti 2011; Prevosti et al. 2012)
<i>Lycopsis longirostris</i>	42.51	Molar length, width, area	<i>Lycopsis longirostris</i> 8-44	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Lycopsis longirostris</i>	44	Molar area	<i>Lycopsis longirostris</i> 8-44	(Suarez et al. 2016)
<i>Lycopsis longirostris</i>	33.5	Average	8-44	This study
<i>Lycopsis viverensis</i>	10.9	Molar length, width, area	<i>Lycopsis viverensis</i> 8-44	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Lycopsis viverensis</i>	18	Molar area	<i>Lycopsis viverensis</i> 8-44	(Suarez et al. 2016)
<i>Lycopsis viverensis</i>	14.45	Average	8-44	This study
<i>Lyncodon</i> sp.	0.23	Molar length, width, area	<i>Lyncodon bosei</i> , <i>L. patagonicus</i> <0.5	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Macrauchenia patachonica</i>	988	Craniodental and postcranial allometric equations	<i>Macrauchenia patachonica</i> 500-1000	(Fariña, Vizcaíno, and Bargo 1998; Croft 2000; Smith et al. 2003; Vizcaíno et al. 2012)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Macrauchenia</i> sp.	988		Literature re-view	<i>Macrauchenia</i>	500-1000	(Vizcaíno et al. 2012)
<i>Macrauchenia</i> sp.	909		Unspecified	<i>Macrauchenia</i>	500-1000	(Fariña et al. 2014)
<i>Macrauchenia</i> sp.	948.5		Average		500-1000	This study
<i>Macraucheniopsis</i> sp.	1200		Geometric similarity	<i>Macraucheniopsis</i>	>1000	(Vizcaíno et al. 2012)
<i>Macrochorobates chapadmalensis</i>		Larger than <i>Euphractus sexcinctus</i> (3.95-6.5 kg), no larger than <i>Chaetophractus villosus</i> (1.32-3.65 kg)		<i>Macrochorobates chapadmalensis</i>	0.5-8	(Scillato-Yané et al. 1995; Cenizo, Soibelzon, and Saffer 2015)
<i>Macrochorobates scalabrinii</i>		A little larger than <i>M. chapadmalensis</i>		<i>Macrochorobates scalabrinii</i>	0.5-8	(Contreras et al. 2013)
<i>Macro euphractus retusus</i> , <i>M. sp.</i>		>100	Comparison with living analogue	<i>Macro euphractus retusus</i> , <i>M. outesi</i>		(Vizcaíno, Fariña, Zárate, et al. 2004)
<i>Macro euphractus retusus</i> , <i>M. sp.</i>		One of the largest dasypodids		<i>Macro euphractus retusus</i>		(Vizcaíno 2009)
<i>Macro euphractus retusus</i> , <i>M. sp.</i>	95	90-100	Unspecified	<i>Macro euphractus outesi</i>	44-100	(Croft 2016)
<i>Macro euphractus retusus</i>, <i>M. sp.</i>	95		Summary		44-100	This study
<i>Mammut</i> sp.	5761		Humerus and femur allometric equations	<i>Mammut americanum</i>	>1000	(Lambert and Holling 1998)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Mammut</i> sp.	4524	Literature re- view	<i>Mammut american- um</i>	>1000	(Smith et al. 2003)
<i>Mammut</i> sp.	5142.5	Average		>1000	This study
<i>Marisela</i> sp.	0.922	Molar length	<i>Marisela grego- riana</i>	0.5-8	This study
<i>Marmosa contrerasi</i>	0.0327	Molar length and width	<i>Marmosa contre- rasi</i>	<0.5	PBDB
		Literature re- view: extant spp.	<i>Marmosa murina</i>	<0.5	(Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)
<i>Marmosa</i> sp.	0.026				
<i>Maruchito trilofo- donte</i>	0.758	Molar length and width	<i>Maruchito trilofo- donte</i>	0.5-8	PBDB
		Literature re- view: extant spp.			(Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)
<i>Mazama americana</i>	28.9		<i>Mazama americana</i>	8-44	
		Literature re- view: extant spp.			(Vizcaíno, Bargo, and Cassini 2006)
<i>Mazama americana</i>	30		<i>Mazama americana</i>	8-44	
<i>Mazama americana</i>	29.45	Average		8-44	This study
		Literature re- view: extant spp.	<i>Mazama americana</i> , <i>M. chunyi</i> , <i>M. goua- zoupira</i> , <i>M. nana</i> , <i>M. rufina</i>	8-44	(Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)
<i>Mazama</i> sp.	16.88	8.2 - 28.9			

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Mazama</i> sp.	22.12	15.05-30.2	Museum records, craniodental and postcranial allometric equations	<i>Mazama americana</i> , <i>M. gouazoupira</i> , <i>M. nana</i>	8-44	(Vizcaíno, Bargo, and Cassini 2006)
<i>Mazama</i> sp.	19.5		Average		8-44	This study
<i>Megadolodus molariformis</i>	70	60-80	Dental and postcranial allometric equations	<i>Megadolodus molariformis</i>	44-100	(Cifelli and Villarroel 1997)
<i>Megadolodus molariformis</i>	12.1		Molar length	<i>Megadolodus molariformis</i>	8-44	(Croft 2000)
<i>Megadolodus molariformis</i>	50	40-60	Unspecified	<i>Megadolodus molariformis</i>	44-100	(Croft 2016)
<i>Megadolodus molariformis</i>	44.0		Average		44-100	This study
<i>Megalonychops primigenius</i>		Comparable in size to <i>Megatherium</i> (~3950 kg)		<i>Megalonychops primigenius</i>	>1000	(Cione et al. 2000)
<i>Megalonychops primigenius</i>	2185		Humerus length	<i>Megalonychops primigenius</i>	>1000	This study
<i>Megalonychops primigenius</i>	2185		Average		>1000	This study
<i>Megastus</i> sp.		Larger than <i>Neoreomys</i>		<i>Megastus</i>	0.5-8	(Chick 2009)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

		Slightly smaller than <i>Eomegatherium andinum</i> and <i>Anisodontherium halmyronomum</i> , considerably smaller than <i>Megatheriops rec-tidens</i> and <i>Pyramiodontherium bergi</i>		<i>Megathericulus pat-agonicus</i>	(Pujos et al. 2013)
<i>Megathericulus pat-agonicus</i> , <i>M. sp.</i>	657	Postcranial al-lometric equa-tions	<i>Megathericulus pat-agonicus</i>	500-1000	This study
<i>Megathericulus pat-agonicus</i>, <i>M. sp.</i>	657	Average		500-1000	This study
<i>Megatherium alti-planicum</i>	977	Literature re-view	<i>Megatherium alti-planicum</i>	500-1000	(Raj Pant, Goswami, and Finarelli 2014)
<i>Megatherium alti-planicum</i>	1400	1000-1800	Literature re-view	<i>Megatherium alti-planicum</i>	>1000 (Encina 2015)
<i>Megatherium alti-planicum</i>	1189	Average		>1000	
<i>Megatherium ameri-canum</i>	3800	Scale model	<i>Megatherium ameri-canum</i>	>1000	(Casinos 1996)
<i>Megatherium ameri-canum</i>	3950	Craniodental and postcranial allometric equa-tions	<i>Megatherium ameri-canum</i>	>1000	(Fariña, Viz-caíno, and Bargo 1998; Croft 2000; Vizcaíno et al.

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

					2012)
<i>Megatherium americanum</i>	3950	Geometric model	<i>Megatherium americanum</i>	>1000	(Blanco and Czerwonogora 2003)
<i>Megatherium americanum</i>	6300	Literature review	<i>Megatherium americanum</i>	>1000	(Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Megatherium americanum</i>	4054	Femur allometric equations	<i>Megatherium americanum</i>	>1000	(Iuliis, Ré, and Vizcaíno 2004)
<i>Megatherium americanum</i>	3807.5	Literature review	<i>Megatherium americanum</i>	>1000	(Raj Pant, Goswami, and Finarelli 2014)
<i>Megatherium americanum</i>	4389	Femur allometric equations	<i>Megatherium americanum</i>	>1000	(Rincón et al. 2015)
<i>Megatherium americanum</i>	4322	Average		>1000	This study
<i>Megatherium celendinense</i>		Equivalent size to <i>M. americanum</i> , <i>Eremotherium laurillardi</i> , <i>E. eomigrans</i>	<i>Megatherium celendinense</i>	>1000	(Pujos 2006)
<i>Megatherium celendinense</i>	2767	Postcranial allometric equations	<i>Megatherium celendinense</i>	>1000	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Megatherium celendinense</i>	2767		Average	>1000	This study
<i>Megatherium medinae</i>		Larger than <i>M. altiplanicum</i> (~1200 kg), smaller than <i>M. americanum</i> (~4300 kg)		<i>Megatherium medinae</i>	(Saint-André and Iuliis 2001)
<i>Megatherium medinae</i>	2010		Postcranial allometric equations	<i>Megatherium medinae</i>	This study
<i>Megatherium medinae</i>	2010		Average	>1000	This study
<i>Megatherium</i> sp.	4584		Unspecified	<i>Megatherium</i>	(Fariña et al. 2014)
<i>Megatherium</i> sp.	2500		Literature review	<i>Megatherium altiplanicum</i> , <i>M. americanum</i> , <i>M. sp.</i>	(Raj Pant, Goswami, and Finarelli 2014)
<i>Megatherium</i> sp.	3542		Average	>1000	This study
<i>Megatherium sundti</i>		Similar size to <i>M. medinae</i> and <i>M. tarijense</i>		<i>Megatherium sundti</i>	(Pujos and Salas 2004a)
<i>Megatherium sundti</i>	1945		Molar row length	<i>Megatherium sundti</i>	This study
<i>Megatherium sundti</i>	1945		Average	>1000	This study
<i>Megatherium tarijense</i>	1239		Femur allometric equations	<i>Megatherium tarijense</i>	(Rincón et al. 2015)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Megatherium urbinai</i>		5% larger than <i>M. altiplanicus</i> , smaller than <i>M. tarijense</i> , <i>M. sundti</i> , <i>M. medinae</i> , <i>M. americanum</i>	<i>Megatherium urbinai</i>	>1000	(Pujos and Salas 2004a)
<i>Megatherium urbinai</i>	1386		Postcranial allometric equations	<i>Megatherium urbinai</i>	>1000 This study
<i>Megatherium urbinai</i>	1386		Average	>1000	This study
<i>Megistonyx oreobios</i>		Similar in size to <i>Megalonyx</i> (596-776 kg, McDonald 2005, Fields 2009)	<i>Megistonyx oreobios</i>	500-1000	(McDonald 2005; Fields 2009b; McDonald, Rincón, and Gaudin 2013)
<i>Megistonyx oreobios</i>	272		Literature review	100-500	(Grayson 2016)
<i>Megistonyx oreobios</i>	272		Average	100-500	
<i>Mesopotamocnus (=Ortotherium) brevirostrum</i>	381		Molar row length	100-500	This study
<i>Mesoprocta hypsodus</i>		Similar in size to <i>Neoreomys australis</i>	<i>Mesoprocta hypsodus</i>	0.5-8	(Croft, Chick, and Anaya 2011)
<i>Mesotherium</i> sp.	64.546	55.656 - 73.436	Molar length	<i>Mesotherium cristatum</i> , <i>M. maendrum</i>	44-100 (Reguero, Candela, and Cassini 2010)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

		115.18	Dental and postcranial allometric equations		100-500	(Elissamburu 2012)
<i>Mesotherium</i> sp.	138.03	-		<i>Mesotherium</i>		
<i>Mesotherium</i> sp.	60		Geometric similarity	<i>Mesotherium</i>	44-100	(Vizcaíno et al. 2012)
<i>Mesotherium</i> sp.	87.5		Average		44-100	This study
<i>Micoureus laventiscus</i>	0.09		Literature review: extant spp.	<i>Micoureus laventiscus</i>	<0.5	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Micoureus laventiscus</i>	0.05		Unspecified	<i>Micoureus laventiscus</i>	<0.5	(Croft 2000)
<i>Micoureus laventiscus</i>	0.07		Average		<0.5	This study
<i>Microbiotherium tehuelchum</i>	0.061		Molar area	<i>Microbiotherium tehuelchum</i>	<0.5	(Abello, Ortiz-Jaureguizar, and Candela 2012; Kay, Vizcaíno, and Bargo 2012)
<i>Microcardiodon williensis</i>		Very similar mandible size to <i>Eocardia robusta</i> (<i>Eocardia fissa</i> 2.83 kg, <i>E. montana</i> & <i>E. fissa</i> 1.4-2.84 kg)		<i>Microcardiodon williensis</i>	0.5-8	(Pérez and Vucetich 2011)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Microcardiodon williensis</i>	1.62		Molar row length	<i>Microcardiodon williensis</i>	0.5-8	This study
<i>Microcardiodon williensis</i>	1.62		Average		0.5-8	This study
<i>Microcavia aua</i>	0.35	0.2-0.5	Literature review: extant spp.	<i>Microcavia aua</i>	<0.5	(Patton, Pardiñas, and D'Elía 2015)
<i>Microcavia australis</i>	0.24		Unspecified	<i>Microcavia australis</i>	<0.5	(Croft 2000)
<i>Microcavia australis</i>	0.3095	0.119 - 0.5	Literature review: extant spp.	<i>Microcavia australis</i>	<0.5	(Freudenthal and Martín-Suárez 2013)
<i>Microcavia australis</i>	0.27475		Average		<0.5	This study
<i>Microcavia</i> sp.	0.562	0.24 - 0.884	Molar length	<i>Microcavia australis</i> , <i>M. robusta</i>	0.5-8	(Croft 2000)
<i>Microcavia</i> sp.	0.2615	0.08 - 0.5	Literature review: extant spp.	<i>Microcavia australis</i> , <i>M. niata</i> , <i>M. shiptoni</i>	<0.5	(Freudenthal and Martín-Suárez 2013)
<i>Microcavia</i> sp.	0.35		Unspecified	<i>Microcavia</i>	<0.5	(Fariña et al. 2014)
<i>Microcavia</i> sp.	0.35	0.2-0.5	Literature review: extant spp.	<i>Microcavia</i>	<0.5	(Patton, Pardiñas, and D'Elía 2015)
<i>Microcavia</i> sp.	0.381		Average		<0.5	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Micronycteris</i> sp.	0.007	0.005-0.015	Literature review: extant spp.	<i>Micronycteris brachyotis</i> , <i>M. daviesi</i> , <i>M. megalotis</i> , <i>M. minuta</i> , <i>M. nicefori</i> , <i>M. sanborni</i> , <i>M. schmidtorum</i> , <i>M. sylvestris</i>	<0.5	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Microscleromys cribriphilus</i>	0.1		Unspecified	<i>Microscleromys cribriphilus</i>	<0.5	(Walton 1997)
<i>Microscleromys paradoxalis</i>	0.2		Unspecified	<i>Microscleromys paradoxalis</i>	<0.5	(Walton 1997; Croft 2000)
<i>Microsteiromys jacobsi</i> , <i>M. sp.</i>	0.25	0.2-0.3	Visual comparison with <i>Neotoma cinerea</i> and <i>Mesomys hispidus</i>	<i>Microsteiromys jacobsi</i>	<0.5	(Walton 1997; Croft 2000)
<i>Microtragulus rusconii</i> , <i>M. sp.</i>			Compares well in size to <i>Hondalagus altiplanensis</i> (0.02-0.1 kg)	<i>Microtragulus rusconii</i>	<0.5	(Villarroel and Marshall 1988)
<i>Microtragulus rusconii</i> , <i>M. sp.</i>	0.016		Molar length	<i>Microtragulus rusconii</i>	<0.5	This study
<i>Microtragulus rusconii</i> , <i>M. sp.</i>	0.016		Average		<0.5	This study
<i>Microtypotherium choquecotense</i>	12.927		Molar length	<i>Microtypotherium choquecotense</i>	8-44	(Reguero, Candela, and Cassini 2010)
<i>Miocallicebus vilaviejai</i>		>1	Much larger than <i>Callicebus</i> (0.75-1	<i>Miocallicebus vilaviejai</i>	0.5-8	(Takai et al. 2001)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

kg)					
<i>Miocallicebus vil-laviejai</i>	1.85		Molar length, area	<i>Miocallicebus vil-laviejai</i>	0.5-8 This study
<i>Miocallicebus vil-laviejai</i>	1.85		Average	0.5-8	This study
<i>Miocochilius anomopodus</i> , M. sp.	1.953		Molar length	<i>Miocochilius anomopodus</i>	0.5-8 (Croft 2000)
<i>Miocochilius anomopodus</i> , M. sp.	2.393		Molar length	<i>Miocochilius anomopodus</i>	0.5-8 (Reguero, Candela, and Cassini 2010)
<i>Miocochilius anomopodus</i> , M. sp.	12	11-13	Unspecified	<i>Miocochilius anomopodus</i>	16285 (Croft 2016)
<i>Miocochilius anomopodus</i> , M. sp.	20.66	15.57 - 23.94	Craniodental and postcranial allometric equations	<i>Miocochilius</i>	8-44 (Elissamburu 2012)
<i>Miocochilius anomopodus</i>, M. sp.	9.3		Average	<i>Miocochilius anomopodus</i>	8-44 This study
<i>Miocochilius federicoi</i>	20.66	15.57 - 23.94	Craniodental and postcranial allometric equations	<i>Miocochilius</i>	8-44 (Elissamburu 2012)
<i>Miocochilius federicoi</i>	3.06		Molar length	<i>Miocochilius federicoi</i>	0.5-8 This study
<i>Miocochilius federicoi</i>	11.86		Average	8-44	This study
<i>Mirandabradys sorcorrensis</i>	1521		Femur allometric equations	<i>Mirandabradys sorcorrensis</i>	>1000 (Rincón et al. 2015)
<i>Mirandabradys</i>	1868		Femur allome-	<i>Mirandabradys</i>	>1000 (Rincón et al.

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>urumaquensis</i>			tric equations	<i>urumaquensis</i>	2015)
<i>Mirandabradys zambasi</i>	1462.5	1297 - 1628	Femur allometric equations	<i>Mirandabradys zambasi</i>	(Rincón et al. 2015)
<i>Mixotoxodon larensis</i> , <i>M. sp.</i>	1000		Literature review: extant spp.	<i>Mixotoxodon</i>	(Smith et al. 2003)
<i>Mixotoxodon larensis</i> , <i>M. sp.</i>	3797.06	2880.6 - 4713.6	Craniodental and postcranial allometric equations	<i>Mixotoxodon</i>	(Elissamburu 2012)
<i>Mixotoxodon larensis</i> , <i>M. sp.</i>	2399		Average		>1000
<i>Monodelphis domestica</i>	0.0714	0.058-0.095	Literature review: extant spp.	<i>Monodelphis domestica</i>	(Macrini 2004)
<i>Morenelaphus brachyceros</i> , <i>M. sp.</i>	50		Literature review	<i>Morenelaphus lujanensis</i> , <i>M. azpeitlanus</i>	(Fariña 1995, Croft 2000, MOM 4.1)
<i>Morenelaphus brachyceros</i> , <i>M. sp.</i>	50		Unspecified	<i>Morenelaphus</i>	(Fariña et al. 2014)
<i>Morenelaphus brachyceros</i> , <i>M. sp.</i>	50		Average		44-100 This study
<i>Mormoops</i> sp.	0.0166	0.0164 3 - 0.0167 7	Literature review: extant spp.	<i>Mormoops megalophylla</i>	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

		Double the size of <i>Protypotherium</i> <i>antiquum</i> (2.8-6.7 kg)				(Kraglievich 1931a)
<i>Munizia paranensis</i>				<i>Munizia paranensis</i>		
<i>Munizia paranensis</i>	37.5		Molar length	<i>Munizia paranensis</i>	8-44	This study
<i>Munizia paranensis</i>	37.5		Average		8-44	This study
<i>Myiodon</i> sp.	1000		Literature re- view	<i>Myiodon listai</i>	>1000	(Smith et al. 2003; Raia, Carotenuto, and Meiri 2010; Fariña et al. 2014)
<i>Myiodon</i> sp.	1986		Craniodental allometric equa- tions	<i>Myiodon darwinii</i>	>1000	(Christiansen and Fariña 2003; Vizcaí- no et al. 2012)
<i>Myiodon</i> sp.	1396.5	1000 - 1793	Literature re- view	<i>Myiodon darwinii</i> , <i>M. listai</i>	>1000	(Raj Pant, Goswami, and Finarelli 2014)
<i>Myiodon</i> sp.	1461		Average		>1000	This study
<i>Myiodonopsis ibseni</i>		"quite similar to <i>Myiodon darwini</i> "		<i>Myiodonopsis ibseni</i>	>1000	(Cartelle 2000)
<i>Myiodonopsis ibseni</i>	1000		Literature re- view	<i>Myiodonopsis</i>	>1000	(Grayson 2016)
<i>Myiodonopsis ibseni</i>	1000		Average		>1000	This study
<i>Myocastor coypus</i> , <i>M. perditus</i> , <i>M. sp.</i>	4.9		Literature re- view: extant spp.	<i>Myocastor coypus</i>	0.5-8	(Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Myocastor coypus</i> , <i>M. perditus</i> , <i>M. sp.</i>	8		Unspecified	<i>Myocastor perditus</i> (= <i>M. coypus</i>), <i>M.</i> <i>priscus</i>	0.5-8	(Croft 2000)
<i>Myocastor coypus</i> , <i>M. perditus</i> , <i>M. sp.</i>	7	2-12	Literature re- view: extant spp.	<i>Myocastor coypus</i>	0.5-8	(Freudenthal and Martín- Suárez 2013)
<i>Myocastor coypus</i> , <i>M. perditus</i> , <i>M. sp.</i>	7.5		Unspecified	<i>Myocastor</i>	0.5-8	(Fariña et al. 2014)
<i>Myocastor coypus</i>, <i>M. perditus</i>, <i>M. sp.</i>	6.85		Average		0.5-8	This study
<i>Myrmecophaga tri-</i> <i>dactyla</i>	33.7		Live capture	<i>Myrmecophaga tri-</i> <i>dactyla</i>	8-44	(Medri and Mourão 2005)
<i>Nanoastegotherium</i> <i>prostatum</i>		<2	Unspecified	<i>Nanoastegotherium</i> <i>prostatum</i>		(Carlini et al. 1997)
<i>Nanoastegotherium</i> <i>prostatum</i>	1.5		Literature re- view	<i>Nanoastegotherium</i> <i>prostatum</i>	0.5-8	(Croft 2000)
<i>Nanoastegotherium</i> <i>prostatum</i>	1.5		Average			
						(Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)
<i>Nasua sp.</i>	4.05	3.2-4.9	Literature re- view: extant spp.	<i>Nasua nasua</i>	0.5-8	
<i>Necromys lactens</i>	0.0345	0.033 - 0.036	Literature re- view: extant spp.	<i>Necromys lactens</i>	<0.5	(Freudenthal and Martín- Suárez 2013)
<i>Necromys sp.</i>	0.04056 1	0.019 - 0.42	Literature re- view: extant spp.	<i>Necromys</i> , 9 spp.	<0.5	(Freudenthal and Martín- Suárez 2013)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Nectomys squamipes</i>	0.2325	0.045 - 0.42	Literature review: extant spp.	<i>Nectomys squamipes</i>	<0.5	(Freudenthal and Martín-Suárez 2013)
<i>Neobrachytherium ameghinoi</i>		Genus similar in size to <i>Tetramerorhinus mixtum</i> (19.33-65.58 kg), smaller than <i>Epi-therium laternarium</i>		<i>Neobrachytherium</i>		(Soria 2001)
<i>Neobrachytherium ameghinoi</i>	39.5		Molar length	<i>Neobrachytherium ameghinoi</i>	8-44	This study
<i>Neobrachytherium ameghinoi</i>	39.5		Average		8-44	This study
<i>Neobrachytherium</i> sp.		Genus similar in size to <i>Tetramerorhinus mixtum</i> (19.33-65.58 kg), smaller than <i>Epi-therium laternarium</i>		<i>Neobrachytherium</i>		(Soria 2001)
<i>Neobrachytherium</i> sp.	35	25-45	Unspecified	<i>Neobrachytherium ullumense</i>	8-44	(Croft 2016)
<i>Neobrachytherium</i> sp.	37.2		Molar length	<i>Neobrachytherium ameghinoi</i> , <i>N. intermedius</i> , <i>N. morenoi</i> , <i>N. ullumense</i>	8-44	This study
<i>Neobrachytherium</i> sp.	36.1		Average		8-44	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Neocavia depressidens</i> , <i>N. sp.</i>			Similar to <i>Microcavia</i> and <i>Palaeocavia</i>	<i>Neocavia lozanoi</i>	<0.5	(Kraglievich 1932)
<i>Neocavia depressidens</i> , <i>N. sp.</i>	0.417		Molar row length	<i>Neocavia lozanoi</i>	<0.5	This study
<i>Neocavia depressidens</i>, <i>N. sp.</i>	0.417		Average		<0.5	This study
<i>Nechoerus sirasakae</i> , <i>N. sp.</i>	150		Literature review	<i>Nechoerus sulcidens</i> , <i>N. tarijensis</i>	100-500	(Fariña 1995a in Croft 2000)
<i>Nechoerus sirasakae</i> , <i>N. sp.</i>	93.33	60-150	Literature review	<i>Nechoerus pinckneyi</i> , <i>N. sulcidens</i>	44-100	(Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Nechoerus sirasakae</i> , <i>N. sp.</i>	110		Geometric similarity	<i>Nechoerus</i>	100-500	(Vizcaíno et al. 2012)
<i>Nechoerus sirasakae</i> , <i>N. sp.</i>	63		Unspecified	<i>Nechoerus</i>	44-100	(Fariña et al. 2014)
<i>Nechoerus sirasakae</i> , <i>N. sp.</i>	234.5	226-243	Craniodontal allometric equations	<i>Nechoerus</i> cf. <i>N. aesopi</i>	100-500	(Ghizzoni 2014)
<i>Nechoerus sirasakae</i> , <i>N. sp.</i>	190		Geometric similarity	<i>Nechoerus</i>	100-500	(Vucetich et al. 2015)
<i>Nechoerus sirasakae</i>, <i>N. sp.</i>	140		Average		100-500	This study
<i>Neopiblema ambrosettianus</i>	103.8	86-151	Craniodontal allometric equations	<i>Neopiblema ambrosettianus</i>	100-500	(Kerber, Negri, Ferigolo, et al. 2017)
<i>Neopiblema ambrosettianus</i>	101		Skull and molar row length	<i>Neopiblema ambrosettianus</i>	100-500	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Neoepiblema am-brosettianus</i>	102		Average		100-500	This study
<i>Neoepiblema horridula</i>	30	21-39	Craniodental allometric equations	<i>Neoepiblema horridula</i>	8-44	(Kerber, Negri, Ferigolo, et al. 2017)
<i>Neoepiblema</i> sp.	66.9		Craniodental allometric equations	<i>Neoepiblema am-brosettianus</i> , <i>N. horridula</i>	44-100	(Kerber, Negri, Ferigolo, et al. 2017)
<i>Neoglyptatelus originalis</i> , <i>N. sp.</i>	12		Literature review	<i>Neoglyptatelus originalis</i>	8-44	(Croft 2000)
<i>Neoglyptatelus sincelejanus</i>		Slightly smaller than <i>N. originalis</i> (12 kg)		<i>Neoglyptatelus sincelejanus</i>	8-44	(Villarroel and Clavijo 2005)
<i>Neohapalops rothi</i>		Slightly larger than <i>Anal-cimorphus</i> (160 kg)		<i>Neohapalops rothi</i>	100-500	(Kraglievich 1923a)
<i>Neolicaphrium recens</i>	40		Literature review, comparison with living analogues	<i>Neolicaphrium</i>	8-44	(Vizcaíno, Fariña, Zárate, et al. 2004)
<i>Neolicaphrium recens</i>	32.5		Unspecified	<i>Neolicaphrium</i>	8-44	(Fariña et al. 2014)
<i>Neolicaphrium recens</i>	36		Average		8-44	This study
<i>Neonematherium</i> sp.	35.3		Femur allometric equations	<i>Neonematherium flabellatum</i>	8-44	(Croft 2000)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Neophanomys bipliocatus</i>	0.083		Molar row length	<i>Neophanomys biplicatus</i>	<0.5	This study
<i>Neophanomys</i> sp.	0.086		Molar row length	<i>Neophanomys biplicatus</i> , <i>N. sp.</i>	<0.5	This study
<i>Neoreomys huilensis</i>	4.0	3.7 - 4.2	Comparison with <i>Dasyprocta punctata</i>	<i>Neoreomys huilensis</i>	0.5-8	(Walton 1997; Croft 2000)
<i>Neoreomys</i> sp.	3.7	3.2 - 4.2	Comparison with <i>Dasyprocta punctata</i>	<i>Neoreomys huilensis</i>	0.5-8	(Walton 1997; Croft 2000)
<i>Neoreomys</i> sp.	7.52		Postcranial allometric equations	<i>Neoreomys australis</i>	0.5-8	(Candela, Raia, and Pérez 2012)
<i>Neoreomys</i> sp.	7.12		Unspecified	<i>Neoreomys australis</i>	0.5-8	(Kay, Vizcaíno, and Bargo 2012)
<i>Neoreomys</i> sp.	8.42		Geometric similarity	<i>Neoreomys australis</i>	8-44	(Vucetich et al. 2015)
<i>Neoreomys</i> sp.	6.7		Average		0.5-8	This study
<i>Neosaimiri fieldsi</i>	0.84		Dental allometric equations	<i>Neosaimiri fieldsi</i>	0.5-8	(Meldrum and Kay 1997a; Croft 2000)
<i>Neosclerocalyptus heusseri</i> , <i>N. sp.</i>	200		Literature review	<i>Neosclerocalyptus</i> spp.	100-500	(Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Neosclerocalyptus heusseri</i> , N. sp.	290	260 - 320	Scale and computer models	<i>Neosclerocalyptus ornatus</i>	100-500	(Vizcaíno, Blanco, et al. 2011)
<i>Neosclerocalyptus heusseri</i> , N. sp.	509.932	384 - 598	Geometric similarity	<i>Neosclerocalyptus ornatus</i> , N. <i>paskoensis</i> , N. sp.	500-1000	(Vizcaíno, Cassini, et al. 2011)
<i>Neosclerocalyptus heusseri</i> , N. sp.	598		Literature review	<i>Neosclerocalyptus</i>	500-1000	(Vizcaíno et al. 2012)
<i>Neosclerocalyptus heusseri</i>, N. sp.	399		Average		100-500	
<i>Neosteiromys</i> sp.	18.16		Postcranial allometric equations	<i>Neosteiromys pattoni</i>	8-44	(Candela and Picasso 2008)
<i>Neosteiromys tordilense</i>		Similar in size to <i>Steiromys</i> (2-16 kg, ave. 7 kg)		<i>Neosteiromys tordilense</i>		(Vucetich, Mazzoni, and Pardiñas 1993)
<i>Neosteiromys tordilense</i>	6.93		Molar length	<i>Neosteiromys tordilense</i>	0.5-8	This study
<i>Neosteiromys tordilense</i>	6.93		Average		0.5-8	This study
<i>Neotamandua australis</i>		Similar in size to <i>Tamandua</i> (3.2 - 7 kg) but more robust (width of proximal humerus 50% greater)		<i>Neotamandua australis</i>	0.5-8	(Scillato-Yané and Carlini 1998)
<i>Neotamandua borealis</i>	4.5		Comparison with <i>Tamandua</i>	<i>Neotamandua borealis</i>	0.5-8	(Croft 2000)
<i>Neotamandua borealis</i>	15	10-20	Unspecified	<i>Neotamandua borealis</i>	8-44	(Croft 2016)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Neotamandua borealis</i>	9.8		Average		8-44	This study
<i>Neotamandua conspicua</i>		Slightly larger cranium than <i>Tamandua</i> (3.2 - 7 kg)		<i>Neotamandua conspicua</i>	0.5-8	(Hirschfeld 1976)
<i>Neothoracophorus</i> sp.	950	800-1100	Literature review	<i>Neothoracophorus depressus</i> , <i>N. elevatus</i>	500-1000	(Croft 2000), (Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Neothoracophorus</i> sp.	600		"CF"	<i>Neothoracophorus</i>	500-1000	(Vizcaíno et al. 2012)
<i>Neothoracophorus</i> sp.	775		Average		500-1000	This study
<i>Neotomys ebriosus</i>	0.0635	0.058 - 0.069	Literature review: extant spp.	<i>Neotomys ebriosus</i>	<0.5	(Freudenthal and Martín-Suárez 2013)
<i>Nesodon imbricatus</i>	293.881		Molar length	<i>Nesodon imbricatus</i>	100-500	(Croft 2000)
<i>Nesodon imbricatus</i>	374.96	320.25 - 429.67	Craniomandibular geometric morphometrics	<i>Nesodon imbricatus</i>	100-500	(Cassini, Vizcaíno, and Bargo 2012)
<i>Nesodon imbricatus</i>	637.51	630.17 - 644.85	Craniodental allometric equations	<i>Nesodon imbricatus</i>	500-1000	(Cassini et al. 2012; Kay, Vizcaíno, and Bargo 2012)
<i>Nesodon imbricatus</i>	435		Average		100-500	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Nesodon</i> sp.	243.121 5		Molar length	<i>Nesodon imbricatus</i> , <i>N. sp.</i>	100- 500	(Croft 2000)
<i>Nesodon</i> sp.	587.9	554.83 - 669.27	Craniodental and postcranial allometric equa- tions	<i>Nesodon</i>	500- 1000	(Elissamburu 2012)
<i>Nesodon</i> sp.	554.61		Craniodental allometric equa- tions	<i>Nesodon</i>	500- 1000	(Vizcaíno et al. 2010; Viz- caíno et al. 2012)
<i>Nesodon</i> sp.	462		Average		100- 500	This study
<i>Neuryurus gigan- teus</i> , <i>N. sp.</i>		Comparable to <i>Panochthus</i> (1061 kg)		<i>Neuryurus rudis</i>	>1000	(Esteban Soi- belzon et al. 2010)
<i>Neuryurus gigan- teus</i> , <i>N. sp.</i>	311.1		Craniodental and postcranial allometric equa- tions	<i>Neuryurus sp.</i>	100- 500	(Vizcaíno, Bargo, and Cassini 2006; Vizcaíno, Cas- sini, et al. 2011)
<i>Neuryurus gigan- teus</i> , <i>N. sp.</i>	1000		Unspecified	<i>Neuryurus</i>	500- 1000	(Fariña et al. 2014)
<i>Neuryurus gigan- teus</i>, <i>N. sp.</i>	656		Average		500- 1000	This study
<i>Noctilio lacrimaelu- naris</i>	0.04367 5	0.023- .067	Literature re- view: extant spp.	<i>Noctilio albiventris</i> , <i>N. leporinus</i>	<0.5	

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Nothropus</i> sp.	125.969		Femur allometric equations	<i>Nothropus tarijensis</i>	100-500	(Croft 2000)
<i>Nothropus</i> sp.	100		Literature review	<i>Nothropus</i> sp.	100-500	(Smith et al. 2003; Raia, Carotenuto, and Meiri 2010; Raj Pant, Goswami, and Finarelli 2014)
<i>Nothropus</i> sp.	112.985		Average		100-500	This study
<i>Nothrotherium ma-</i> <i>quinense</i>	≤50		Unspecified	<i>Nothrotherium ma-</i> <i>quinense</i>	44-100	(Ximenes 2008)
<i>Nothrotherium</i> sp.	151		Literature review	<i>Nothrotherium</i> sp.	100-500	(Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Nothrotherium</i> sp.	50	≤50	Unspecified	<i>Nothrotherium ma-</i> <i>quinense</i>	44-100	(Ximenes 2008)
<i>Nothrotherium</i> sp.	83		Literature review	<i>Nothrotherium</i> sp.	44-100	(Raj Pant, Goswami, and Finarelli 2014)
<i>Nothrotherium</i> sp.	169.5	69 - 270	Femur allometric equations	<i>Nothrotherium</i> sp.	100-500	(Rincón et al. 2015)
<i>Nothrotherium</i> sp.	113		Average		100-500	This study
<i>Notictis ortizi</i>	0.89		Molar length,	<i>Notictis ortizi</i>	0.5-8	(Prevosti, Fo-

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

		width, area		rasiepi, and Zimicz 2013)
<i>Notiomastodon</i> sp.	7580	Literature re- view	<i>Notiomastodon</i> sp.	>1000 (Croft 2000)
<i>Notiomastodon</i> sp.	6193	Literature re- view	<i>Notiomastodon</i> sp.	>1000 (Smith et al. 2003; Raia, Carotenuto, and Meiri 2010; Grayson 2016)
<i>Notiomastodon</i> sp.	6887	Average	>1000	This study
<i>Notocynus hermosi-</i> <i>cus</i>	1.77	Molar length, width, area	<i>Notocynus hermo-</i> <i>sicus</i>	0.5-8 (Prevosti, Forasiepi, and Zimicz 2013)
<i>Notonycteris magda-</i> <i>lenensis</i>		A little larger than <i>Chrotopterus</i> (0.075-0.096 kg) and much smaller than <i>Vampyrum</i> (0.166 kg)	<i>Notonycteris mag-</i> <i>dalenensis</i>	<0.5 (Czaplewski et al. 2003)
<i>Notonycteris magda-</i> <i>lenensis</i>	0.067	Postcranial al- lometric equa- tions	<i>Notonycteris mag-</i> <i>dalenensis</i>	<0.5 This study
<i>Notonycteris mag-</i> <i>dalenensis</i>	0.067	Average	<0.5	This study
<i>Notonycteris sucha-</i> <i>radeus</i>		Measurements about 71-84% of those in <i>N. mag-</i> <i>dalenensis</i>	<i>Notonycteris sucha-</i> <i>radeus</i>	<0.5 (Czaplewski et al. 2003)
<i>Notonycteris sucha-</i> <i>radeus</i>	0.032	Molar area	<i>Notonycteris sucha-</i> <i>radeus</i>	<0.5 This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Notonycteris sucha- radeus</i>	0.032		Average	<0.5	This study
<i>Nuciruptor rubricae</i>	2.044		Molar area	<i>Nuciruptor rubri- cae</i>	0.5-8 (Meldrum and Kay 1997b)
<i>Nunezia caro- loameghinoi</i>		Smaller than <i>Myrmecophaga tridactyla</i> (33.7 kg)		<i>Nunezia caro- loameghinoi</i>	8-44 (Scillato-Yané et al. 1995)
<i>Ocnerotherium</i> sp.		Similar in size to <i>Mixotoxodon lar- ensis</i> (1000- 3797.06 kg)		<i>Ocnerotherium in- termedium</i>	>1000 (Bond, Mad- den, and Car- lini 2006)
<i>Ocnerotherium</i> sp.	3949		Dental allome- tric equations	<i>Ocnerotherium</i> sp.	>1000 This study
<i>Ocnerotherium</i> sp.	3949		Average	>1000	This study
<i>Octodontobradys</i> sp.		About the size of <i>Pseudoprepother- ium</i> (826-1025 kg), larger than <i>Orophodon</i> and smaller than <i>Oc- tomyledon</i>		<i>Octodontobradys puruensis</i>	500- 1000 (Santos, Ran- cy, and Ferigo- lo 1993)
<i>Octodontobradys</i> sp.	1113		Molar row length	<i>Octodontobradys</i> sp.	>1000 This study
<i>Octodontobradys</i> sp.	1113		Average	>1000	This study
<i>Octomyledon aver- sus</i>		Approximately the size of <i>Glos- sotherium ro- bustum</i>		<i>Octomyledon aver- sus</i>	>1000 (Scillato-Yané 1977)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Octomyodon aver-</i> <i>sus</i>	1024		Molar row length	<i>Octomyodon aver-</i> <i>sus</i>	>1000	This study
<i>Octomyodon aver-</i> <i>sus</i>	1024		Average		>1000	This study
<i>Odocoileus sp.</i>	80	50-120	Literature re- view: extant spp.	<i>Odocoileus virgini-</i> <i>anus</i>	44-100	(Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)
<i>Oligoryzomys fla-</i> <i>vescens</i>	0.032		Literature re- view: extant spp.	<i>Oligoryzomys fla-</i> <i>vescens</i>	<0.5	(Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)
<i>Oligoryzomys fla-</i> <i>vescens</i>	0.0235	0.015 - 0.032	Literature re- view: extant spp.	<i>Oligoryzomys fla-</i> <i>vescens</i>	<0.5	(Freudenthal and Martín- Suárez 2013)
<i>Oligoryzomys fla-</i> <i>vescens</i>	0.028		Average		<0.5	This study
<i>Oligoryzomys longi-</i> <i>caudatus</i>	0.0255	0.013 - 0.038	Literature re- view: extant spp.	<i>Oligoryzomys lon-</i> <i>gicaudatus</i>	<0.5	(Freudenthal and Martín- Suárez 2013)
<i>Oligoryzomys sp.</i>	0.02596 4	0.007 - 0.08	Literature re- view: extant spp.	<i>Oligoryzomys</i> , 13 spp.	<0.5	(Freudenthal and Martín- Suárez 2013)
<i>Orthomyctera sp.</i>		Smaller than Doli- chotinae		<i>Orthomyctera andi-</i> <i>na</i> , <i>O. rigens</i>	0.5-8	(Martín Ubilla and Rin- derknecht 2003)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Orthomyctera</i> sp.	1.07		Molar row length	<i>Orthomyctera rigens</i>	0.5-8	This study
<i>Orthomyctera</i> sp.	1.07		Average		0.5-8	This study
<i>Ortotherium lat-curvatum</i>		Slightly smaller than <i>Mesopotamocnus brevirostrum</i>		<i>Ortotherium lat-curvatum</i>	100-500	(Brandoni 2010)
<i>Oxymycterus</i> sp.	0.07012 5	0.025 - 0.2	Literature review: extant spp.	<i>Oxymycterus</i> , 13 spp.	<0.5	(Freudenthal and Martín-Suárez 2013)
<i>Oxymycterus wayku</i>	0.0618	0.0445 – 0.0765	Live capture	<i>Oxymycterus wayku</i>	<0.5	(Jayat et al. 2008)
<i>Oxydontherium piramydatus</i> , <i>O. sp.</i> , <i>O. zeballozi</i>	157		Molar length	<i>Oxydontherium</i> sp.	100-500	This study
<i>Ozotoceros bezoarticus</i> , <i>O. sp.</i>		≤35	Literature review: extant spp.	<i>Ozotoceros bezoarticus</i>		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Ozotoceros bezoarticus</i> , <i>O. sp.</i>	37.5	35-40	Museum records, craniodental and postcranial allometric equations	<i>Ozotoceros bezoarticus</i>	8-44	(Vizcaíno, Bargo, and Cassini 2006)
<i>Ozotoceros bezoarticus</i> , <i>O. sp.</i>	32.5		Unspecified	<i>Ozotoceros</i>	8-44	(Fariña et al. 2014)
<i>Ozotoceros bezoarticus</i>, <i>O. sp.</i>	35		Average		8-44	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Pachyarmatherium brasiliense</i> , <i>P. tenebris</i>	9.63		Small size comparable to <i>Dasypus bellus</i> in size (1.58-17.68 kg, McDonald 2005)	<i>Pachyarmatherium leiseyi</i>	8-44	(Downing and White 1995; McDonald 2005; Valerio and Laurito 2011)
<i>Pachyrukhos</i> sp.	2.8		Craniodental allometric equations	<i>Pachyrukhos</i>	0.5-8	(Cassini et al. 2011)
<i>Pachyrukhos</i> sp.	1.56		Craniomandibular geometric morphometrics	<i>Pachyrukhos moyani</i>	0.5-8	(Cassini, Vizcaíno, and Bargo 2012)
<i>Pachyrukhos</i> sp.	1.77	1.45 - 2.44	Craniodental and postcranial allometric equations	<i>Pachyrukhos</i>	0.5-8	(Elissamburu 2012)
<i>Pachyrukhos</i> sp.	2.0		Average		0.5-8	This study
<i>Paedotherium bonaerense</i>	0.34		Molar length	<i>Paedotherium bonaerense</i>	<0.5	(Reguero, Candela, and Cassini 2010)
<i>Paedotherium bonaerense</i>	2.03	1.56 - 2.48	Craniodental and postcranial allometric equations	<i>Paedotherium bonaerense</i>	0.5-8	(Elissamburu 2012)
<i>Paedotherium bonaerense</i>	1.2		Average		0.5-8	This study
<i>Paedotherium minor</i>	1.06		Molar length	<i>Paedotherium minor</i>	0.5-8	This study
<i>Paedotherium</i> sp.	1.326		Body length	<i>Paedotherium insignis</i>	0.5-8	(Dozo 1997)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Paedotherium</i> sp.	1.925	1.49 - 2.48	Craniodental and postcranial allometric equations	<i>Paedotherium bonaerense</i> , <i>P. typicum</i>	0.5-8	(Elissamburu 2012)
<i>Paedotherium</i> sp.	1.16		Molar length	<i>Paedotherium minor</i> , <i>P. typicum</i>	0.5-8	This study
<i>Paedotherium</i> sp.	1.47033		Average		0.5-8	This study
<i>Paedotherium typicum</i>	1.82		Craniodental and postcranial allometric equations	<i>Paedotherium typicum</i>	0.5-8	(Elissamburu 2012)
<i>Paedotherium typicum</i>	1.32		Molar length	<i>Paedotherium typicum</i>	0.5-8	This study
<i>Paedotherium typicum</i>	1.57		Average		0.5-8	This study
<i>Palaehoplophorus antiquus</i>		Similar size to <i>Palaehoplophoroides rothi</i> , larger than <i>Propalaehoplophorinae</i> of Santa Cruz		<i>Palaehoplophorus antiquus</i>		(Ameghino 1889; Scillato-Yané and Carlini 1998; González 2010)
<i>Palaeocavia</i> sp.		Small size, similar size to large <i>Cavia</i> species (<i>C. aperea</i> , 0.637 kg)		<i>Palaeocavia? mawka</i>		(Verzi and Quintana 2005; Madoz-zo-Jaén and Pérez 2017)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Palaeocavia</i> sp.	1.1		Molar row length	<i>Palaeocavia?</i> maw-ka	0.5-8	This study
<i>Palaeocavia</i> sp.	1.1		Average		0.5-8	This study
<i>Palaeoctodon simplicidens</i>	0.233		Molar row length	<i>Palaeoctodon simplicidens</i>	<0.5	This study
<i>Palaeolama major</i>	292	Excluded femur-highly unrealistic value (12,400 kg)	Postcranial allometric equations	<i>Palaeolama major</i>	100-500	This study
<i>Palaeolama</i> sp.	540		Literature review	<i>Palaeolama mirifica</i> , <i>P. sp.</i>	500-1000	(Smith et al. 2003)
<i>Palaeolama</i> sp.	79		Literature review	<i>Palaeolama mirifica</i>	100-500	(Raia, Carotenuto, and Meri 2010)
<i>Palaeolama</i> sp.	300		Literature review	<i>Palaeolama</i>	100-500	(Grayson 2016)
<i>Palaeolama</i> sp.	276.5		Postcranial allometric equations	<i>Palaeolama major</i> , <i>P. weddelli</i>	100-500	This study
<i>Palaeolama</i> sp.	299		Average		100-500	This study
<i>Palaeolama weddelli</i>	112.8		Molar length	<i>Palaeolama weddelli</i>	100-500	(Croft 2000)
<i>Palaeolama weddelli</i>	261	Excluded femur-highly unrealistic value (10,400 kg)	Postcranial allometric equations	<i>Palaeolama weddelli</i>	100-500	This study
<i>Palaeolama weddelli</i>	187		Average		100-500	This study
<i>Palaeomyrmidon</i> sp.		Closely related to <i>Cyclopes</i> (~0.25 kg)		<i>Palaeomyrmidon</i>		(McDonald, Vizcaíno, and Bargo 2008)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Palaeomyrmidon</i> sp.	1.7		Geometric similarity	<i>Palaeomyrmidon incomptus</i>	0.5-8	This study
<i>Palaeomyrmidon</i> sp.	1.7		Average		0.5-8	This study
<i>Paleuphractus</i> sp.		Smaller than <i>Proeuphractus limpidus</i> (1.32-4.14 kg, based on <i>Chaetophractus villosus</i>)		<i>Paleuphractus argentinus</i>	0.5-8	(Perea and Scillato-Yané 1995)
<i>Pampatherium humboldtii</i>	150		Literature review	<i>Pampatherium humboldtii</i>	100-500	(Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Pampatherium</i> sp.	200		Fariña 1995 cited in other sources without methodological details, Original source unavailable	<i>Pampatherium</i> sp.	100-500	(Fariña 1995a; Croft 2000; Vizcaíno et al. 2012; Fariña et al. 2014)
<i>Pampatherium</i> sp.	175	150 - 200	Literature review	<i>Pampatherium humboldtii</i> , <i>P. typum</i>	100-500	(Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Pampatherium</i> sp.	187.5		Average		100-500	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

					(Fariña 1995a; Croft 2000; Smith et al. 2003; Raia, Carotenuto, and Meiri 2010; Vizcaíno et al. 2012)
<i>Pampatherium typum</i>	200	Literature review	<i>Pampatherium typum</i>	100-500	
<i>Panochthus greslebini</i>	1061	Postcranial allometric equations	<i>Panochthus tuberculatus</i>	>1000	(Fariña, Vizcaíno, and Bargo 1998; Croft 2000; Vizcaíno et al. 2012)
<i>Panochthus greslebini</i>		Similar mass to <i>P. tuberculatus</i>	<i>Panochthus greslebini</i>	>1000	(Di Giacomo 2012)
<i>Panochthus greslebini</i>	1061	Average		>1000	This study
<i>Panochthus intermedius</i>	1157.4	Geometric similarity	<i>Panochthus intermedius</i>	>1000	(Vizcaíno, Cassini, et al. 2011)
<i>Panochthus</i> sp.	1100	Literature review	<i>Panochthus tuberculatus</i>	>1000	(Fariña 1996)
<i>Panochthus</i> sp.	1061	Craniodental and postcranial allometric equations	<i>Panochthus tuberculatus</i>	>1000	(Fariña, Vizcaíno, and Bargo 1998; Croft 2000; Smith et al. 2003; Raia, Carotenuto, and Meiri 2010; Vizcaíno et al. 2012)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

					no et al. 2012)
<i>Panochthus</i> sp.	1185		Scale and computer models	<i>Panochthus tuberculatus</i>	>1000 (Vizcaíno, Blanco, et al. 2011)
<i>Panochthus</i> sp.	1106.67 7	1061- 1157.4 0	Geometric similarity	<i>Panochthus intermedius</i> , <i>P. sp.</i> , <i>P. tuberculatus</i>	>1000 (Vizcaíno, Cassini, et al. 2011)
<i>Panochthus</i> sp.	795		Unspecified	<i>Panochthus</i>	500-1000 (Fariña et al. 2014)
<i>Panochthus</i> sp.	1453		Craniodental allometric equations	<i>Panochthus tuberculatus</i>	>1000 (Tambusso and Fariña 2015)
<i>Panochthus</i> sp.	1117		Average		>1000 This study
<i>Panochthus tuberculatus</i>	1061		Craniodental and postcranial allometric equations	<i>Panochthus tuberculatus</i>	>1000 (Fariña, Vizcaíno, and Bargo 1998; Croft 2000; Smith et al. 2003; Raia, Carotenuto, and Meiri 2010; Vizcaíno et al. 2012)
<i>Panochthus tuberculatus</i>	1100		Literature review	<i>Panochthus tuberculatus</i>	>1000 (Fariña 1996)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Panochthus tuberculatus</i>	1061		Craniodental and postcranial allometric equations	<i>Panochthus tuberculatus</i>	>1000	(Fariña, Vizcaíno, and Bargo 1998; Croft 2000; Smith et al. 2003; Raia, Carotenuto, and Meiri 2010; Vizcaíno et al. 2012)
<i>Panochthus tuberculatus</i>	1185		Scale and computer models	<i>Panochthus tuberculatus</i>	>1000	(Vizcaíno, Blanco, et al. 2011)
<i>Panochthus tuberculatus</i>	1453		Craniodental allometric equations	<i>Panochthus tuberculatus</i>	>1000	(Tambusso and Fariña 2015)
<i>Panochthus tuberculatus</i>	1200		Average		>1000	This study
<i>Panthera onca</i>	90	61-119	Literature review: extant spp.	<i>Panthera onca</i>	44-100	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Panthera onca</i>	62		Literature review: extant spp.	<i>Panthera onca</i>	44-100	(Lambert and Holling 1998)
<i>Panthera onca</i>	71.2		Molar length, width, area	<i>Panthera onca</i>	44-100	(Prevosti, Forasiepi, and Zimicz 2013)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Panthera onca</i>	190	132-248	Literature review	<i>Panthera onca</i>	100-500	(Van Valkenburgh 1990; Prevosti and Martin 2013)
<i>Panthera onca</i>	103.3		Average		100-500	This study
<i>Panthera</i> sp.	109		Unspecified	<i>Panthera</i>	100-500	(Fariña et al. 2014)
		Euphractini indet. described as similar in size to <i>Proeuphractus</i> , <i>Euphractus</i> (3-6.5 kg), Chorobates (4.14 kg), <i>Paraeuphractus</i>				
<i>Paraeuphractus</i> sp.				<i>Paraeuphractus</i>	0.5-8	(Perea 1993)
<i>Paraglyptodon</i> sp.	800		"CF"	<i>Paraglyptodon</i>	500-1000	(Vizcaíno et al. 2012)
<i>Paramyocastor diligens</i>		Smaller than <i>Myocastor coypus</i> (4.9 kg)		<i>Paramyocastor diligens</i>	0.5-8	(Kerber et al. 2014)
<i>Paramyocastor diligens</i>	2.55		Molar row length	<i>Paramyocastor diligens</i>	0.5-8	This study
<i>Paramyocastor diligens</i>	2.55		Average		0.5-8	This study
		Larger than <i>Eucholoeops</i> (62 kg), similar to <i>Ortotherium</i> (320 kg), smaller than <i>Pliomorphus</i> (572 kg)				
<i>Paranabradys vucetichae</i>				<i>Paranabradys vucetichae</i>	100-500	(Scillato-Yané 1980)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

kg) and <i>Pliome-</i> <i>tanastes</i>					
		Size range overlaps with <i>Theosodon</i> (44-113.09 kg), <i>Oxyodontotherium</i> (164 kg), overlaps with but is smaller on average than <i>Scalabrinitherium</i> (309 kg)			
<i>Paranauchenia denticulata</i>			<i>Paranauchenia denticulata</i>	100-500	(Schmidt and Ferrero 2014)
<i>Paranauchenia denticulata</i>	228	Molar length	<i>Paranauchenia denticulata</i>	100-500	This study
<i>Paranauchenia denticulata</i>	228	Average		100-500	This study
<i>Parapropalaehoplophorus septentrionalis</i>		Similar in size to <i>Eucinepeltus</i> (115 kg, (Croft 2000))	<i>Parapropalaehoplophorus septentrionalis</i>	100-500	(Croft, Flynn, and Wyss 2007)
<i>Paratrigodon</i> sp.		Larger than <i>Dinotoxodon</i> , smaller premolars than <i>Haplomastodon wildei</i>	<i>Paratrigodon euguii</i>	>1000	(Schmidt 2013)
<i>Paratrigodon</i> sp.	3221	Molar length, Molar row length	<i>Paratrigodon euguii</i>	>1000	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Paratrigodon</i> sp.	3221		Average	>1000	This study
			Molar length, width, area		(Prevosti, Forasiepi, and Zimicz 2013)
<i>Patagosmilus goini</i>	16.07			8-44	
<i>Patasola magdalenae</i>	0.48		Molar area	<0.5	(Kay and Meldrum 1997)
			Literature review: extant spp.		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Pecari (=Tayassu) tajacu</i>	19.55	19.4-19.7		8-44	
<i>Pediolagus salinicola</i>	2		Postcranial allometric equations	0.5-8	(Candela, Rasia, and Pérez 2012)
<i>Pedrolypeutes praecursor</i>		<4	Unspecified	0.5-8	(Carlini et al. 1997)
<i>Pedrolypeutes praecursor</i>	2		Literature review	0.5-8	(Croft 2000)
<i>Pedrolypeutes praecursor</i>	2		Average	0.5-8	This study
			Postcranial allometric equations		(Vizcaíno et al. 2006; Vizcaíno, Fernicola, and Bargo 2012)
<i>Peltephilus pumilus</i> , <i>P. sp.</i>	9.645	8.22-11.07		8-44	
<i>Peltephilus pumilus</i> , <i>P. sp.</i>	11		Unspecified	8-44	(Kay, Vizcaíno, and Bargo 2012)
<i>Peltephilus pumilus</i> , <i>P. sp.</i>	10.3		Average	8-44	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Pericotoxodon platignathus</i>	798			Craniodental and postcranial allometric equations	<i>Pericotoxodon platignathus</i>	500-1000	(Madden 1997)
<i>Philander entrerianus</i>	0.42	0.240-0.600	Intermediate size among living <i>Philander</i> spp.	Unspecified	Extant <i>Philander</i> spp.	<0.5	(Goin, Noriega, and de los Reyes 2013)
<i>Phlyctaenopyga</i> sp.			Larger than <i>Neosclerocalyptus</i> (598 kg) but smaller than <i>Panochthus</i> (1035 kg)		<i>Phlyctaenopyga</i>	500-1000	(Zamorano et al. 2011; Zamorano 2012)
<i>Phoberomys bordasi</i>	110			Geometric similarity	<i>Phoberomys bordasi</i>	100-500	This study
<i>Phoberomys burmeisteri</i>	680.5	550–811		Geometric similarity	<i>Phoberomys burmeisteri</i>	500-1000	(Vucetich et al. 2015)
<i>Phoberomys burmeisteri</i>	548			Geometric similarity	<i>Phoberomys burmeisteri</i>	500-1000	This study
<i>Phoberomys burmeisteri</i>	614			Average		500-1000	This study
<i>Phoberomys insolita</i>			Larger than <i>P. minima</i> , smaller than <i>P. pattersoni</i>		<i>Phoberomys insolita</i>	100-500	(Carrillo and Sánchez-Villagra 2015)
<i>Phoberomys insolita</i>	485			Geometric similarity	<i>Phoberomys insolita</i>	100-500	This study
<i>Phoberomys insolita</i>	485			Average		100-500	This study
<i>Phoberomys lozanoi</i>			Larger than <i>P. minima</i> , smaller than <i>P. pattersoni</i>		<i>Phoberomys lozanoi</i>	100-500	(Carrillo and Sánchez-Villagra 2015)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

			Larger than <i>Ne- oepiblema</i> (max size >100 kg) but smallest of <i>Phoberomys</i> sp.		<i>Phoberomys mini- ma</i>	100- 500	(Carrillo and Sánchez- Villagra 2015)
<i>Phoberomys minima</i>							
<i>Phoberomys patter- soni</i>	588.5	436- 741	Craniodental allometric equa- tions	<i>Phoberomys patter- soni</i>	500- 1000	(Sánchez- Villagra, Aguilera, and Horovitz 2003; Geiger et al. 2013)	
<i>Phoberomys patter- soni</i>	234	164– 334	Molar row length	<i>Phoberomys patter- soni</i>	100- 500	(Hopkins 2008)	
<i>Phoberomys patter- soni</i>	425	220- 774	220-280 kg pre- ferred range, total range 221-774)	Craniodental allometric equa- tions	<i>Phoberomys patter- soni</i>	100- 500	(Millien and Bovy 2010)
<i>Phoberomys patter- soni</i>	549	444– 654	Geometric simi- larity	<i>Phoberomys patter- soni</i>	500- 1000	(Vucetich et al. 2015)	
<i>Phoberomys patter- soni</i>	449		Average		100- 500	This study	
<i>Phoberomys prae- cursor</i>			Larger than P. minima, smaller than P. pattersoni	<i>Phoberomys prae- cursor</i>	100- 500	(Carrillo and Sánchez- Villagra 2015)	
<i>Phoberomys prae- cursor</i>	429		Geometric simi- larity	<i>Phoberomys prae- cursor</i>	100- 500	This study	
<i>Phoberomys prae- cursor</i>	429		Average		100- 500	This study	

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Phoberomys</i> sp.	417	All species between 100-500 kg except <i>P. burmeisteri</i>	Average	<i>Phoberomys bordasi</i> , <i>P. bumeisteri</i> , <i>P. insolita</i> , <i>P. patersoni</i> , <i>P. praecursor</i>	100-500	This study
<i>Phugatherium cataclisticum</i>	238.9		Geometric similarity	<i>Phugatherium cataclisticum</i>	100-500	(Vucetich et al. 2015)
<i>Phugatherium novum</i>	115		Geometric similarity	<i>Phugatherium novum</i>	100-500	(Vucetich et al. 2015)
<i>Phugatherium</i> sp.	200		Geometric similarity	<i>Chapalmatherium</i> (= <i>Phugatherium</i>)	100-500	(Vizcaíno et al. 2012)
<i>Phugatherium</i> sp.	177		Geometric similarity	<i>Phugatherium cataclisticum</i> , <i>P. novum</i>	100-500	(Vucetich et al. 2015)
<i>Phugatherium</i> sp.	188		Average		100-500	This study
		0.0205				(Ferro, José Martínez, and Barquez 2010)
<i>Phyllotis anitae</i>	0.0265	0.0375	Live capture	<i>Phyllotis anitae</i>	<0.5	
		0.012 - 0.116	Literature review: extant spp.	<i>Phyllotis</i> , 13 spp.	<0.5	(Freudenthal and Martín-Suárez 2013)
<i>Pisanodon</i> sp.		Comparable to <i>Andinotoxodon</i> , <i>Neotrigodon utoquineae</i> , <i>Gyrinodon quasius</i> (1600 kg), <i>Trigodonops lopesi</i> (~2500 kg) and <i>Abothrodon</i>		<i>Pisanodon</i>	>1000	(Madden 1990)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

		<i>pricei</i>			
		Similarity to or synonymy with <i>Aconaemys</i> (0.133-0.134 kg, Schulte-Hostedde 2008; 0.1189 kg, Patton, Pardiñas, and D'Elía 2015)			(Reig 1986; Reig 1989; Reig and Quintana 1991)
<i>Pithanotomys columbaris</i> , <i>P. macer</i> , <i>P. sp.</i>			<i>Pithanotomys</i>	<0.5	
<i>Plaina intermedia</i> , <i>Plaina sp.</i>	45	Synonymous or very similar to <i>Kraglievichia</i>	<i>Plaina</i>	8-44	(McKenna and Bell 1997)
<i>Plaina intermedia</i> , <i>Plaina sp.</i>	35	Synonymous or very similar to <i>Vassalia</i>	<i>Plaina</i>	8-44	(Iuliis and Edmund 2002)
<i>Plaina intermedia</i> , <i>Plaina sp.</i>	40			8-44	This study
<i>Planops sp.</i>	300	Geometric similarity	<i>Planops</i>	100-500	(Vizcaíno et al. 2012)
<i>Planops sp.</i>	62.4	Literature review	<i>Planops sp.</i>	44-100	(Raj Pant, Goswami, and Finarelli 2014)
<i>Planops sp.</i>	181	Average		100-500	
<i>Platygonus narinoensis</i> , <i>P. sp.</i>	21	Molar length	<i>Platygonus sten-ocephalus</i>	8-44	(Croft 2000)
<i>Platygonus narinoensis</i> , <i>P. sp.</i>	80	Literature review	<i>Platygonus compressus</i> , <i>P. spp.</i>	44-100	(Smith et al. 2003; Raia, Carotenuto, and Meiri

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

					2010)
<i>Platygonus narinoensis</i> , <i>P. sp.</i>	100	> 100	Modern analogue	<i>Platygonus scagliai</i>	(Vizcaíno, Fariña, Zárate, et al. 2004)
<i>Platygonus narinoensis</i> , <i>P. sp.</i>	50		Comparison with living relative/analogue ("CLA")	<i>Platygonus</i>	44-100 (Vizcaíno et al. 2012)
<i>Platygonus narinoensis</i>, <i>P. sp.</i>	62.8		Average	44-100	This study
<i>Plaxhaplous</i> sp.	1300		(Fariña 1995a; in Fariña 1996 without detailed methods)	<i>Plaxhaplous canaliculatus</i>	>1000 Fariña 1995, Fariña 1996, (Croft 2000); (Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Plaxhaplous</i> sp.	1100		"CF"	<i>Plaxhaplous</i>	>1000 (Vizcaíno et al. 2012)
<i>Plaxhaplous</i> sp.	1200		Average	>1000	This study
<i>Plesiomegatherium</i> sp.	3000		Geometric similarity	<i>Plesiomegatherium</i>	>1000 (Vizcaíno et al. 2012)
<i>Plesiotoxodon</i> sp.	1277		Molar length	<i>Plesiotoxodon amazonensis</i>	>1000 This study
<i>Plesiotypotherium achirense</i>	20.359		Molar length	<i>Plesiotypotherium achirense</i>	8-44 (M. A. Reguero, Candela, and Casini 2010)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Plesiotypotherium majus</i>	139	Molar length	<i>Plesiotypotherium majus</i>	100-500	This study
<i>Plesiotypotherium</i> sp.	20.359	Molar length	<i>Plesiotypotherium achirensense</i>	8-44	(Reguero, Candela, and Cassini 2010)
<i>Plesiotypotherium</i> sp.	137	Molar length	<i>Plesiotypotherium majus</i>	100-500	This study
<i>Plesiotypotherium</i> sp.	78.7	Average of <i>P. achirensense</i> and <i>P. majus</i>		44-100	This study
<i>Pliodasypus vergelianus</i>		Same size as <i>Propraopus sulcatus</i> (50 kg) and larger end of <i>Dasypus bellus</i> (1.58-17.68 kg, McDonald 2005)	<i>Pliodasypus vergelianus</i>	44-100	(Castro et al. 2014)
<i>Pliodolichotis</i> sp.	34.9	Geometric similarity	<i>Pliodolichotis ortuzari</i>	8-44	This study
<i>Pliolestes tripotamicus</i>	0.129	Molar length	<i>Pliolestes tripotamicus</i>	<0.5	This study
<i>Pliolestes venetus</i>	0.052	Molar length	<i>Pliolestes venetus</i>	<0.5	This study
<i>Pliomegatherium lelongi</i>	2417	Dental dimensions	<i>Pliomegatherium lelongi</i>	>1000	(Amson, Carrillo, and Jaramillo 2016)
<i>Pliomegatherium lelongi</i>	1721	Molar row length	<i>Pliomegatherium lelongi</i>	>1000	This study
<i>Pliomegatherium lelongi</i>	2069	Average		>1000	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Pliomorphus mutilatus</i> , <i>P. robustus</i> , <i>P. sp.</i>	636		Postcranial allometric equations	<i>Pliomorphus mutilatus</i>	500-1000	This study
<i>Plohophorus araucanus</i> , <i>P. cuneiformis</i> , <i>P. figuratus</i> , <i>P. paranensis</i> , <i>P. sp.</i>	263		Museum records, craniodental and postcranial allometric equations	<i>Plohophorus</i>	100-500	(Vizcaíno, Bargo, and Cassini 2006; Vizcaíno et al. 2012)
<i>Posnanskytherium desaguaderoi</i>	340		Molar length	<i>Posnanskytherium desaguaderoi</i>	100-500	This study
<i>Posnanskytherium inchasense</i>	545		Molar length	<i>Posnanskytherium inchasense</i>	500-1000	This study
<i>Posnanskytherium sp.</i>	435		Molar length, Molar row length	<i>Posnanskytherium desaguaderoi</i> , <i>P. inchasense</i>	100-500	This study
<i>Potamarchus murinus</i>	15.9	12.9-18.99	Geometric similarity	<i>Potamarchus murinus</i>	8-44	
<i>Potamarchus murinus</i>	14.17		Molar row length	<i>Potamarchus murinus</i>	8-44	(Kerber, Negri, Ferigolo, et al. 2017)
<i>Potamarchus murinus</i>			Unspecified	<i>Potamarchus</i>	8-44 kg	Rinderknecht pers. comm.
<i>Potamarchus murinus</i>	15.1		Average		8-44	This study
<i>Potamarchus sp.</i>	15.9	12.9-18.99	Geometric similarity	<i>Potamarchus murinus</i>	8-44	
<i>Potamarchus sp.</i>	9.715	4.26-14	Molar row length	<i>Potamarchus adami</i> , <i>P. murinus</i>	8-44	(Kerber, Negri, Ferigolo, et al. 2017)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Potamarchus</i> sp.		Unspecified	<i>Potamarchus</i>	8-44 kg	Rinderknecht pers. comm.
<i>Potamarchus</i> sp.	12.8	Average		8-44	This study
<i>Potamops mascahenes</i>		Similar size to <i>Philisis shingis</i> (which has body mass similar to <i>Vampyravus orientalis</i> , 0.120 kg)	<i>Potamops mascahenes</i>	<0.5	(Czaplewski, Morgan, and McLeod 1997)
<i>Potamops mascahenes</i>	0.064	Molar area	<i>Potamops mascahenes</i>	<0.5	This study
<i>Potamops mascahenes</i>	0.064	Average		<0.5	This study
<i>Praectenomys</i> sp.		Similar size to <i>Ctenomys talarum</i> (0.554 kg - 0.718 kg)	<i>Praectenomys rhombidens</i>	0.5-8	(Quintana 1994)
<i>Praectenomys</i> sp.	0.325	Molar row length	<i>Praectenomys rhombidens</i>	<0.5	This study
<i>Praectenomys</i> sp.	0.325	Average		<0.5	This study
<i>Prepotherium</i> sp.	525	Geometric similarity	<i>Prepotherium</i>	500-1000	(Vizcaíno et al. 2012)
<i>Prepotherium</i> sp.	169	Postcranial allometric equations	<i>Prepotherium potens</i>	100-500	(Rincón et al. 2015)
<i>Prepotherium</i> sp.	160	120-200 Postcranial multiple regression	<i>Prepotherium</i>	100-500	(Toledo et al. 2014; Toledo 2016)
<i>Prepotherium</i> sp.	285	Average		100-500	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Procyon cancrivorus</i>	9		Molar length, width, area	<i>Procyon cancrivorus</i>	8-44	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Prodolichotis guerreroi</i> , <i>P. pridiani</i> , <i>P. sp.</i>	2.75	2-3.5	Visual comparison with modern species	<i>Prodolichotis guerreroi</i> , <i>P. pridiani</i> , <i>P. sp.</i>	0.5-8	(Walton 1997)
<i>Proechimys sp.</i>	0.322	0.012 - 1	Literature review: extant spp.	<i>Proechimys</i> , 22 spp.	<0.5	(Freudenthal and Martín-Suárez 2013)
<i>Proeremotherium eljebe</i>			A little smaller than the species of <i>Pyramiodontherium</i> (1990 kg) and <i>Megatherium lundii</i> , <i>M. medinae</i> , <i>M. tarijense</i> and <i>M. urbinai</i> (1200-1800 kg); larger than most species of <i>Megatheriulus</i> (758 kg), <i>Eomegatherium</i> , <i>Pliomegatherium</i> (1955 kg), <i>Promegatherium</i> and <i>Eremotherium sefvei</i> (743 kg); similar in size to <i>Anisodontherium</i>	<i>Proeremotherium eljebe</i>	>1000	(Carlini, Scillato-Yané, and Sánchez 2006)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

(=Plesiomegatherium) halmyronomum				
Proeuphractus limpidus	Size similar to Chaetophractus villosus (3.1 kg)	Proeuphractus limpidus	0.5-8	(Perea and Scillato-Yané 1995)
Proeuphractus sp.	Euphractini indet. described as similar in size to Proeuphractus, Euphractus (3-6.5 kg), Chorobates (4.14 kg), Parae-	Proeuphractus	0.5-8	(Perea 1993)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>uphractus</i>					
<i>Proeutatus</i> sp.	12.4		Unspecified	<i>Proeutatus oenophorus</i>	8-44 (Croft 2000)
<i>Proeutatus</i> sp.	15.28		Postcranial allometric equations	<i>Proeutatus lagena</i> , <i>P. oenophorus</i> , <i>P. robustus</i> , <i>P. sp.</i>	8-44 (Vizcaíno et al. 2006)
<i>Proeutatus</i> sp.	15		Unspecified	<i>Proeutatus oenophorus</i>	8-44 (Kay, Vizcaíno, and Bargo 2012)
<i>Proeutatus</i> sp.	14.115	7.58 - 20.65	Postcranial allometric equations	<i>Proeutatus lagena</i> , <i>P. oenophorus</i> , <i>P. robustus</i> , <i>P. sp.</i>	8-44 (Vizcaíno, Fernicola, and Bargo 2012)
<i>Proeutatus</i> sp.	14.2		Average		8-44 This study
<i>Prolagostomus</i> sp.	2.6		Molar length	<i>Prolagostomus oblicuidens</i>	0.5-8 (Croft 2000)
<i>Prolicaphrium sanalfonensis</i>	4.7		Molar length	<i>Prolicaphrium sanalfonensis</i>	0.5-8 (Croft 2000)
<i>Promacrauchenia antiqua</i>, <i>P. sp.</i>	400		Geometric similarity	<i>Promacrauchenia</i>	100-500 (Vizcaíno et al. 2012)
<i>Pronothrotherium figueirasi</i>, <i>P. mirabilis</i>	75	50-100	Unspecified	<i>Pronothrotherium typicum</i>	44-100 (Croft 2016)
<i>Propalaehoplophorus australis</i>	80		Postcranial multiple regression	<i>Propalaehoplophorus australis</i>	44-100 (De Esteban-Trivigno, Mendoza, and De Renzi 2008)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Propalaeohoplophorus australis</i>	81.645	67-93.48	Postcranial multiple regression	<i>Propalaeohoplophorus australis</i>	44-100	(Vizcaíno, Fernicola, and Bargo 2012; Kay, Vizcaíno, and Bargo 2012)
<i>Propalaeohoplophorus australis</i>	80.8225		Average		44-100	This study
<i>Propalaeohoplophorus</i> sp.	78.0383	3	Postcranial multiple regression, Geometric similarity	<i>Propalaeohoplophorus australis</i> , <i>P. incisivus</i> , <i>P. sp.</i>	44-100	(Vizcaíno, Blanco, et al. 2011; Vizcaíno, Fernicola, and Bargo 2012)
<i>Propalaeohoplophorus</i> sp.	73.4		Literature review	<i>Propalaeohoplophorus</i>	44-100	(Vizcaíno et al. 2012)
<i>Propalaeohoplophorus</i> sp.	75.7		Average		44-100	This study
<i>Propithecium neuquenensis</i>	1.538		Molar area	<i>Propithecium neuquenensis</i>	0.5-8	(Kay, Johnson, and Meldrum 1998)
<i>Propraopus</i> sp., <i>P. sulcatus</i>	45		Literature review	<i>Propraopus grandis</i>	44-100	(Fariña, Vizcaíno, and Blanco 1997)
<i>Propraopus</i> sp., <i>P. sulcatus</i>	50		Geometric similarity	<i>Propraopus grandis</i>	44-100	(Fariña and Vizcaíno 1997; Croft 2000; Vizcaíno et al. 2001)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Propraopus</i> sp., <i>P. sulcatus</i>	200	Unspecified	<i>Propraopus</i>	100-500	(Fariña et al. 2014)
<i>Propraopus</i> sp., <i>P. sulcatus</i>	98.3	Average		44-100	
<i>Proscelidodon patrius</i>, <i>P. sp.</i>	430	Geometric similarity	<i>Proscelidodon</i>	100-500	(Vizcaíno et al. 2012)
<i>Protabrocoma</i> sp.	0.335	Molar row length	<i>Protabrocoma paranensis</i>	<0.5	This study
<i>Protacaremys denisiae</i>		Smaller than <i>Prospaniomys</i> , larger than <i>Acarechimys</i>	<i>Protacaremys denisiae</i>	<0.5	(Verzi, Olivares, and Morgan 2017)
<i>Protacaremys denisiae</i>	0.153	Molar row length	<i>Protacaremys denisiae</i>	<0.5	This study
<i>Protacaremys denisiae</i>	0.153	Average		<0.5	This study
<i>Protamandua rothi</i>		Intermediate between <i>Cyclopes</i> and <i>Tamandua</i>	<i>Protamandua rothi</i>	0.5-8	(Hirschfeld 1976; Bargo, Toledo, and Vizcaíno 2012)
<i>Protamandua rothi</i>	4.5	4-5	Postcranial multiple regression	<i>Protamandua rothi</i>	0.5-8
<i>Protamandua rothi</i>	4.5	Average		0.5-8	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Proterotherium cer- vioides</i> , <i>P. sp.</i>			Slightly smaller than <i>Thoatherium minusculum</i> (6.25- 24.2 kg), smaller than <i>Licaphrium</i> (8.8 kg)	<i>Proterotherium cer- vioides</i>		(Soria 2001)
<i>Proterotherium cer- vioides</i> , <i>P. sp.</i>	30.1		Molar length	<i>Proterotherium cer- vioides</i>	8-44	This study
<i>Proterotherium cer- vioides</i>, <i>P. sp.</i>	30.1		Average		8-44	This study
<i>Prothoatherium sp.</i>	1		Molar length	<i>Prothoatherium colombianus</i>	0.5-8	(Croft 2000)
<i>Prothylacynus pata- gonicus</i>	20.64		Molar length, width, area	<i>Prothylacynus pat- agonicus</i>	8-44	(Prevosti, Fo- rasiepi, and Zimicz 2013)
<i>Protocyon orcesi</i>	25		Literature re- view	<i>Protocyon orcesi</i>	8-44	(Smith et al. 2003)
<i>Protocyon sp.</i>	26.67	25 - 30	Molar length, width, area	<i>Protocyon scagli- rum</i>, <i>P. troglodytes</i>, <i>P. tarijensis</i>	8-44	(Prevosti, Fo- rasiepi, and Zimicz 2013)
<i>Protocyon tarijensis</i>	30		Molar length, width, area	<i>Protocyon tarijensis</i>	8-44	(Prevosti, Fo- rasiepi, and Zimicz 2013)
<i>Protocyon troglo- dytes</i>	16	Underestimate, 20-25 kg more accurate	Molar length, width, area	<i>Protocyon troglo- dytes</i>	8-44	(Smith et al. 2003; Prevosti, Zurita, and Carlini 2005; Soibelzon and Prevosti 2013)
<i>Protomegalonyx chasicensis</i>	150		Unspecified	<i>Protomegalonyx chasicensis</i>	100- 500	(Croft 2016)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Protomegalonyx chasicoensis</i>	208		Postcranial allometric equations	<i>Protomegalonyx chasicoensis</i>	100-500	This study
<i>Protomegalonyx chasicoensis</i>	179		Average		100-500	This study
<i>Protomegalonyx doellojuradoi</i>	1280		Postcranial allometric equations	<i>Protomegalonyx doellojuradoi</i>	>1000	This study
<i>Protomegalonyx praecursor</i>	393		Postcranial allometric equations	<i>Protomegalonyx praecursor</i>	100-500	This study
<i>Protomegalonyx</i> sp.	502		Postcranial allometric equations	<i>Protomegalonyx chasicoensis</i> , <i>P. doellojuradoi</i> , <i>P. praecursor</i>	500-1000	This study
<i>Protopithecus brasiliensis</i>	20		Postcranial allometric equations	<i>Protopithecus brasiliensis</i>	8-44	(Halenar 2011b; Rosenberger 2011)
<i>Protypotherium antiquum</i> , <i>P. sp.</i>	1.566	0.906 - 2.817	Molar length	<i>Protypotherium australe</i> , <i>P. praerutilum</i>	0.5-8	(Croft 2000)
<i>Protypotherium antiquum</i> , <i>P. sp.</i>	2.793	1.84-3.82	Craniomandibular geometric morphometrics	<i>Protypotherium australe</i> , <i>P. attenuatum</i> , <i>P. praerutilum</i>	0.5-8	(Cassini, Vizcaíno, and Bargo 2012)
<i>Protypotherium antiquum</i> , <i>P. sp.</i>	5.35	3.80-7.73	Postcranial allometric equations	<i>Protypotherium australe</i> , <i>P. attenuatum</i> , <i>P. praerutilum</i>	0.5-8	(Cassini et al. 2012; Kay, Vizcaíno, and Bargo 2012)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Protypotherium antiquum</i> , <i>P. sp.</i>	6.74	5.42 - 9.22	Craniodental and postcranial allometric equations	<i>Protypotherium</i>	0.5-8	(Elissamburu 2012)
<i>Protypotherium antiquum</i>, <i>P. sp.</i>	4.1		Average		0.5-8	This study
<i>Protypotherium australe</i>	2.817		Molar length	<i>Protypotherium australe</i>	0.5-8	(Croft 2000; Reguero, Candela, and Cassini 2010)
<i>Protypotherium australe</i>	3.725	3.63-3.82	Craniomandibular geometric morphometrics	<i>Protypotherium australe</i>	0.5-8	(Cassini, Vizcaíno, and Bargo 2012)
<i>Protypotherium australe</i>	7.73		Postcranial allometric equations	<i>Protypotherium australe</i>	0.5-8	(Cassini et al. 2012; Kay, Vizcaíno, and Bargo 2012)
<i>Protypotherium australe</i>	4.8		Average		0.5-8	This study
<i>Prozaedyus proximus</i>	1.3	0.75-1.86	Postcranial allometric equations	<i>Prozaedyus exilis</i> , <i>P. sp.</i>	0.5-8	(Vizcaíno, Fernicola, and Bargo 2012)
<i>Prozaedyus proximus</i>	1		Unspecified	<i>Prozaedyus proximus</i>	0.5-8	(Kay, Vizcaíno, and Bargo 2012)
<i>Prozaedyus proximus</i>	1.2		Average		0.5-8	This study
<i>Prozaedyus sp.</i>	1		Similarity to <i>Zaedyus</i>	<i>Prozaedyus exilis</i>	0.5-8	(Croft 2000)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Prozaedyus</i> sp.	1.12		Postcranial allometric equations	<i>Prozaedyus exilis</i> , <i>P. sp.</i>		(Vizcaíno et al. 2006)
<i>Prozaedyus</i> sp.	1.3	0.75-1.86	Postcranial allometric equations	<i>Prozaedyus exilis</i> , <i>P. sp.</i>	0.5-8	(Vizcaíno, Fernicola, and Bargo 2012)
<i>Prozaedyus</i> sp.	1.1		Average		0.5-8	This study
<i>Pseudalopex gymnocercus</i>	4.98		Molar length, width, area	<i>Lycalopex</i> (= <i>Pseudalopex</i>) <i>gymnocercus</i>	0.5-8	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Pseudolycopsis cabrerai</i>	14.44		Molar length, width, area	<i>Pseudolycopsis cabrerai</i>	8-44	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Pseudoplateomys formosus</i>	0.15		Molar length	<i>Pseudoplateomys formosus</i>	<0.5	This study
<i>Pseudoplohophorus absolutus</i>	209		Craniodental and postcranial allometric equations	<i>Pseudoplohophorus absolutus</i>	100-500	(Tambusso and Fariña 2015)
<i>Pseudopreopotherium confusum</i>	1025		Femur allometric equations	<i>Pseudopreopotherium confusum</i>	>1000	(Croft 2000)
<i>Pseudopreopotherium confusum</i>	875	824-915	Femur allometric equations	<i>Pseudopreopotherium confusum</i>	500-1000	(Rincón et al. 2015; Rincón et al. 2016)
<i>Pseudopreopotherium confusum</i>	950		Average		500-1000	This study
<i>Pseudopreopotherium</i> sp.	714		Femur allometric equations	<i>Pseudopreopotherium confusum</i> , <i>P. venezuelanum</i>	500-1000	(Rincón et al. 2015; Rincón et al. 2016)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Pseudopreotherium venezuelanum</i>	553		Femur allometric equations	<i>Pseudopreotherium venezuelanum</i>	500-1000	(Rincón et al. 2015; Rincón et al. 2016)
		Known from single lower molar only, unknown if m1 m2 or m3, so only assigned to category based on range of estimates				
<i>Pseudosigmomys</i> sp.	9.9-16.7		Dental allometric equations	<i>Pseudosigmomys</i> sp.	8-44	This study
<i>Pseudotypotherium</i> sp.	80		Comparison with living analogue	<i>Pseudotypotherium</i> sp.	44-100	(Vizcaíno, Fariña, Zárate, et al. 2004)
<i>Pseudotypotherium</i> sp.	38.014		Molar length	<i>Pseudotypotherium hystatum</i>	8-44	(Reguero, Candela, and Cassini 2010)
<i>Pseudotypotherium</i> sp.	59.0		Average		44-100	This study
						(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Pteronotus</i> sp.	0.01421 7	0.0093 - 0.0204	Literature review: extant spp.	<i>Pteronotus davyi</i> , <i>P. gymnotus</i> , <i>P. parnellii</i>	<0.5	
<i>Pteronura brasiliensis</i>	26		Molar length, width, area	<i>Pteronura brasiliensis</i>	8-44	(Prevosti, Forasiepi, and Zimicz 2013)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Puma concolor</i> , <i>P.</i> sp.	37	23.6- 50.4	Literature re- view: extant spp.	<i>Puma concolor</i>	8-44	(Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)
<i>Puma concolor</i> , <i>P.</i> sp.	52.53		Molar length, width, area	<i>Puma concolor</i>	44-100	(Prevosti, Fo- rasiepi, and Zimicz 2013)
<i>Puma concolor</i> , <i>P.</i> sp.	145.27		Dental and postcranial al- lometric equa- tions	<i>Puma concolor</i>	100- 500	(Prevosti and Martin 2013)
<i>Puma concolor</i> , <i>P.</i> sp.	50.4		Unspecified	<i>Puma</i>	44-100	(Fariña et al. 2014)
<i>Puma concolor</i>	71.3		Average		44-100	This study
<i>Puma yagouaroundi</i>	2.6		Literature re- view: extant spp.	<i>Puma (=Felis, =Herpailurus) ya- gouaroundi</i>	0.5-8	(Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)
<i>Purperia cribatidens</i>	1336	Based on single M1(?)	Molar length	<i>Purperia criba- tidens</i>	>1000	This study
<i>Pyramiodontherium scillatoyanei</i>	2500		Humerus al- lometric equa- tions	<i>Pyramiodontherium scillatoyanei</i>	>1000	(Iuliis, Ré, and Vizcaíno 2004)
<i>Pyramiodontherium scillatoyanei</i>	844		Femur allome- tric equations	<i>Pyramiodontherium scillatoyanei</i>	500- 1000	(Ascanio D. Rincón et al. 2015)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Pyramiodontherium scillatoyanei</i>	1672		Average	>1000	This study
<i>Pyramiodontherium</i> sp.	2500		Humerus allometric equations	<i>Pyramiodontherium scillatoyanei</i> >1000	(Iuliis, Ré, and Vizcaíno 2004; Raj Pant, Goswami, and Finarelli 2014)
<i>Pyramiodontherium</i> sp.	1233	844 - 1719	Femur allometric equations	<i>Pyramiodontherium bergi</i> , <i>P. brevirostrum</i> , <i>P. scillatoyanei</i> >1000	(Rincón et al. 2015)
<i>Pyramiodontherium</i> sp.	1866.5		Average	>1000	This study
<i>Quebradahondomys potosiensis</i>	0.493		Molar length	<i>Quebradahondomys potosiensis</i> 0.5-8	This study
<i>Ranculus scabrinianus</i> , <i>R. sp.</i>		About the size of <i>Mylodon</i> (1000-2000 kg)		<i>Ranculus scabrinianus</i> >1000	(Ameghino 1891)
<i>Reithrodon auritus</i> , <i>R. sp.</i>	0.08015	0.0786 - 0.0817	Literature review: extant spp.	<i>R. physodes</i> , includes <i>R. auritus</i> <0.5	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Reithrodon auritus</i> , <i>R. sp.</i>	0.086		Unspecified	<i>Reithrodon auritus</i> <0.5	(Croft 2000)(Croft 2000; Fariña et al. 2014)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Reithrodon auritus</i> , <i>R. sp.</i>	0.068	(0.02 - 0.116	Literature re- view: extant spp.	<i>Reithrodon auritus</i>	<0.5	(Freudenthal and Martín- Suárez 2013)
<i>Reithrodon auritus</i>, <i>R. sp.</i>	0.078		Average		<0.5	This study
<i>Rhogeessa sp.</i>	0.00375	0.0035 -0.004	Literature re- view: extant spp.	<i>Rhogeessa tumida</i>	<0.5	(Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)
<i>Ricardomys lon- gidens</i>	0.2	0.15- 0.25	Visual compar- ison with mod- ern species	<i>Ricardomys lon- gidens</i>	<0.5	(Walton 1997)
<i>Ringueletia sp.</i>	40 kg		Comparison with living an- alogue	<i>Ringueletia simp- soni</i>	8-44	(Vizcaíno, Fa- riña, Zárate, et al. 2004)
<i>Sairadelphys tocan- inensis</i>	0.027	≤0.040	Slightly larger than <i>Hyladelphys</i> (0.0079 - 0.018 kg), very small didelphid	Molar length and width	<i>Sairadelphys tocan- inensis</i>	<0.5 (Oliveira et al. 2011)
<i>Sairadelphys tocan- inensis</i>	0.024			Molar length	<i>Sairadelphys tocan- inensis</i>	<0.5 This study
<i>Sairadelphys tocan- inensis</i>	0.0255		Average		<0.5	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Scalabrinitherium bravardi</i> , S. sp.		Size range overlaps with <i>Theosodon</i> (44-113.09 kg), <i>Oxyodontotherium</i> (164 kg), overlaps with but is larger on average than <i>Paranauchenia</i> (248 kg)	<i>Scalabrinitherium</i>	100-500	(Schmidt and Ferrero 2014)
<i>Scalabrinitherium bravardi</i> , S. sp.	297	Molar length	<i>Scalabrinitherium bravardi</i>	100-500	This study
<i>Scalabrinitherium bravardi</i>, S. sp.	297	Average		100-500	This study
<i>Scapteromys hershkovitzi</i>		Slightly smaller than <i>S. tumidus</i>	<i>Scapteromys hershkovitzi</i>	<0.5	(Reig 1994)
<i>Scapteromys hershkovitzi</i>	0.102	Molar row length	<i>Scapteromys hershkovitzi</i>	<0.5	This study
<i>Scapteromys hershkovitzi</i>	0.102	Average		<0.5	This study
<i>Scapteromys tumidus</i>	0.146	Literature review: extant spp.	<i>Scapteromys tumidus</i>	<0.5	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Scapteromys tumidus</i>	0.1425	0.09 - 0.195 Literature review: extant spp.	<i>Scapteromys tumidus</i>	<0.5	(Freudenthal and Martín-Suárez 2013)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Scapteromys tumidus</i>	0.144		Average		<0.5	
<i>Scelidotheridium</i> sp.	430		Geometric similarity	<i>Scelidotheridium</i>	100-500	(Vizcaíno et al. 2012)
<i>Scelidotherium leptcephalum</i>	1057		Postcranial allometric equations	<i>Scelidotherium leptcephalum</i>	>1000	(Fariña, Vizcaíno, and Bargo 1998; Vizcaíno et al. 2012)
<i>Scelidotherium leptcephalum</i>	840	830-850	Scale and computer models	<i>Scelidotherium</i>	500-1000	(Bargo et al. 2000)
<i>Scelidotherium leptcephalum</i>	1119		Literature review	<i>Scelidotherium leptcephalum</i>	>1000	(Croft 2000; Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Scelidotherium leptcephalum</i>	594		Postcranial multiple regression	<i>Scelidotherium leptcephalum</i>	500-1000	(De Esteban-Trivigno, Mendoza, and De Renzi 2008)
<i>Scelidotherium leptcephalum</i>	710		Postcranial allometric equations	<i>Scelidotherium leptcephalum</i>	500-1000	(Rincón et al. 2015; Rincón et al. 2016)
<i>Scelidotherium leptcephalum</i>	864		Average		500-1000	This study
<i>Scelidotherium</i> sp.	1057		Literature review	<i>Scelidotherium</i>	>1000	(Vizcaíno et al. 2012)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Scelidotherium</i> sp.	826		Unspecified	<i>Scelidotherium</i>	500-1000	(Fariña et al. 2014)
<i>Scelidotherium</i> sp.	942		Average		500-1000	
<i>Sciamys petisensis</i> , <i>S. sp.</i>	0.055	0.01-0.1	Unspecified	<i>Sciamys</i> sp.	<0.5	(Kay, Vizcaíno, and Bargo 2012)
<i>Scirrotherium carinatum</i>			Similar in size to <i>S. hondaensis</i>	<i>Scirrotherium carinatum</i>	8-44	(Góis et al. 2013)
<i>Scirrotherium hondaensis</i> , <i>S. sp.</i>		<40	Unspecified	<i>Scirrotherium hondaensis</i>	8-44	(Carlini et al. 1997)
<i>Scirrotherium hondaensis</i> , <i>S. sp.</i>	35		Literature review	<i>Scirrotherium hondaensis</i>	8-44	(Croft 2000)
<i>Scirrotherium hondaensis</i> , <i>S. sp.</i>	35		Average		8-44	This study
<i>Sclerocalyptus ornatus</i>	280		Scale models	<i>Sclerocalyptus ornatus</i>	100-500	(Fariña 1995b; Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Scleromys colombianus</i>	3	2.5-3.5	Visual comparison with modern species	<i>Scleromys colombianus</i>	0.5-8	(Walton 1997; Croft 2000)
<i>Scleromys schurmanni</i>	1.5	1-2	Visual comparison with modern species	<i>Scleromys schurmanni</i>	0.5-8	(Walton 1997; Croft 2000)
<i>Scleromys</i> sp.	2.5	2-3	Visual comparison with modern species	<i>Scleromys</i> sp.	0.5-8	(Croft 2000)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Sigmodon hispidus</i>	0.171	0.042 - 0.3	Literature review: extant spp.	<i>Sigmodon hispidus</i>	<0.5	(Freudenthal and Martín-Suárez 2013)
<i>Sigmodon</i> sp.	0.12637 5	0.02 - 0.3	Literature review: extant spp.	<i>Sigmodon</i> , 10 spp.	<0.5	(Freudenthal and Martín-Suárez 2013)
<i>Simplimus</i> sp.		Similar to <i>Potamarchus</i> (21 kg)		<i>Simplimus</i>	8-44	(Kerber, Negri, Ribeiro, Vucetich, et al. 2016)
<i>Simplimus</i> sp.			Unspecified	<i>Simplimus</i>	8-44	Rinderknecht pers. comm.
<i>Simplimus</i> sp.	18.2		Molar length	<i>Simplimus indivisus</i>	8-44	This study
<i>Simplimus</i> sp.	18.2		Average		8-44	This study
<i>Sipalocyon gracilis</i>	2.11		Unspecified	<i>Sipalocyon gracilis</i>	0.5-8	(Kay, Vizcaíno, and Bargo 2012; Ercoli, Prevosti, and Forasiepi 2014)
<i>Sipalocyon gracilis</i>	1.96		Molar length, width, area	<i>Sipalocyon gracilis</i>	0.5-8	(Ercoli and Prevosti 2011; Prevosti, Forasiepi, and Zimicz 2013)
<i>Sipalocyon gracilis</i>	2.0		Average		0.5-8	This study
<i>Sipalocyon</i> sp.	1.57	0.93 - 1.96	Molar length, width, area	<i>Sipalocyon externa</i> , <i>S. gracilis</i> , <i>S. obus-ta</i>	0.5-8	(Prevosti, Forasiepi, and Zimicz 2013)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Smilodon fatalis</i>	352		Postcranial allometric equations	<i>Smilodon fatalis</i>	100-500	(Anyonge 1993)
<i>Smilodon fatalis</i>	164		Craniodental and postcranial allometric equations	<i>Smilodon fatalis</i>	100-500	(Lambert and Holling 1998)
<i>Smilodon fatalis</i>	417	400-433	Literature review	<i>Smilodon fatalis</i>	100-500	(Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Smilodon fatalis</i>	220	160-280 kg	Postcranial allometric equations	<i>Smilodon fatalis</i>	100-500	(Christiansen and Harris 2005; Prevosti, Forasiepi, and Zimicz 2013)
<i>Smilodon fatalis</i>	288		Average		100-500	This study
<i>Smilodon gracilis</i>	77.5	55-100	Postcranial allometric equations	<i>Smilodon gracilis</i>	44-100	(Christiansen and Harris 2005)
<i>Smilodon populator</i>	442		Literature review	<i>Smilodon populator</i>	100-500	(Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Smilodon populator</i>	310	220-360	Postcranial allometric equations	<i>Smilodon populator</i>	100-500	(Christiansen and Harris 2005)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Smilodon populator</i>	290		Molar length, width, area	<i>Smilodon populator</i>	100- 500	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Smilodon populator</i>	347		Average		100- 500	This study
<i>Smilodon</i> sp.	403	289- 517	Craniodental and postcranial allometric equations	<i>Smilodon</i>	100- 500	(Prevosti and Martin 2013)
<i>Smilodon</i> sp.	304		Unspecified	<i>Smilodon</i>	100- 500	(Fariña et al. 2014)
<i>Smilodon</i> sp.	354		Average		100- 500	This study
<i>Solimoea acrensis</i>	5.4		Molar area	<i>Solimoea acrensis</i>	0.5-8	(Kay and Cozzuol 2006)
<i>Sparassocynus heterotopicus</i>	0.32		Dental allometric equations	<i>Sparassocynus heterotopicus</i>	<0.5	(Zimicz 2014)
<i>Sparassocynus</i> sp.	0.35	0.32- 0.37	Dental allometric equations	<i>Sparassocynus bahiai</i>, <i>S. derivatus</i>, <i>S. heterotopicus</i>	<0.5	(Zimicz 2014)
<i>Speothos</i> sp.	9		Literature review: extant spp.	<i>Speothos pacivorus</i>	8-44	(Smith et al. 2003)
<i>Speothos</i> sp.	3.19		Postcranial allometric equations	<i>Speothos venaticus</i>	0.5-8	PBDB
<i>Speothos</i> sp.	6.1		Average		0.5-8	This study
<i>Sphenotherus paranensis</i>, <i>S. sp.</i>	888		Molar row length	<i>Sphenotherus paranensis</i>	500- 1000	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Stegomastodon platensis</i> , <i>S. sp.</i>	7580		Craniodental and postcranial allometric equations	<i>Stegomastodon superbus</i>	>1000	(Fariña, Vizcaíno, and Bargo 1998; Croft 2000; Smith et al. 2003; Raia, Carotenuto, and Meiri 2010; Vizcaíno et al. 2012; Grayson 2016)
<i>Steiromys</i> sp.	2.2	0.9-4	Visual comparison with modern species	<i>Steiromys</i> sp.	0.5-8	(Walton 1997; Croft 2000)
<i>Steiromys</i> sp.	12.07	5.72 - 16.27	Postcranial allometric equations	<i>Steiromys duplicatus</i>	8-44	(Candela and Picasso 2008)
<i>Steiromys</i> sp.		<10 to 14.17	Unspecified	<i>Steiromys detentus</i> , <i>S. duplicatus</i>	8-44	(Kay, Vizcaíno, and Bargo 2012)
<i>Steiromys</i> sp.	7.1		Average		0.5-8	This study
<i>Stenotatus</i> sp.	3.79	3.67-3.91	Postcranial allometric equations	<i>Stenotatus</i>	0.5-8	(Vizcaíno et al. 2006; Kay, Vizcaíno, and Bargo 2012; Vizcaíno, Fernicola, and Bargo 2012)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Stenotephanos plicidens</i>	625.57	583.66 - 667.47	Dental and postcranial allometric equations	<i>Xotodon</i> (= <i>Stenotephanos</i>)	500-1000	(Elissamburu 2012)
<i>Stenotephanos plicidens</i>	300		Geometric similarity	<i>Xotodon</i> (= <i>Stenotephanos</i>)	100-500	(Vizcaíno et al. 2012)
<i>Stenotephanos plicidens</i>	463		Average		100-500	This study
<i>Stichomys</i> sp.	0.492		Molar length	<i>Stichomys regularis</i>	<0.5	(Croft 2000; Candela, Rasia, and Pérez 2012)
<i>Stirtonia tatacoensis</i>	5.8		Literature review	<i>Stirtonia tatacoensis</i>	0.5-8	(Soligo 2006)
<i>Stirtonia tatacoensis</i>	7		Similarity to <i>Alouatta</i>	<i>Stirtonia tatacoensis</i>	0.5-8	(Croft 2000)
<i>Stirtonia tatacoensis</i>	6.4		Average		0.5-8	This study
<i>Stirtonia victoriae</i>	10		Literature review	<i>Stirtonia victoriae</i>	8-44	(Soligo 2006)
<i>Strophostephanos</i> sp.		"size of a small mouse," "very small"		<i>Strophostephanos jheringi</i>	<0.5	(Ameghino 1891; Candela 2005; Nasif 2014)
<i>Strophostephanos</i> sp.	0.01		Geometric similarity	<i>Strophostephanos jheringii</i>	<0.5	This study
<i>Strophostephanos</i> sp.	0.01		Average		<0.5	This study
<i>Stylocynus paranensis</i>	26.83		Molar length, width, area	<i>Stylocynus paranensis</i>	8-44	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Surameryx acrensis</i>	31		Molar row	<i>Surameryx acrensis</i>	8-44	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

length					
<i>Sylvilagus floridanus</i>	1.2		Live capture	<i>Sylvilagus floridanus</i>	0.5-8 (Chapman, Hockman, and Ojeda C. 1980)
<i>Sylvilagus sp.</i>	1.142	0.4 - 2.3	Literature review: extant spp.	<i>Sylvilagus sp.</i>	0.5-8 (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Sylvochoerus woodburnei</i>			Similar size to <i>Tayassu pecari</i> (~32 kg)	<i>Sylvochoerus woodburnei</i>	8-44 (Frailey and Campbell 2012)
<i>Sylvochoerus woodburnei</i>	56.4		Molar length	<i>Sylvochoerus woodburnei</i>	44-100 This study
<i>Sylvochoerus woodburnei</i>	56.4		Average		44-100
<i>Tadarida brasiliensis</i>	0.012	0.011-0.012	Literature review: extant spp.	<i>Tadarida brasiliensis</i>	<0.5 (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Tafimys powelli</i>			Size "similar to <i>Phyllotis darwini</i> or <i>Loxodontomys micropus</i> " (0.04172-0.07507 kg Lima et al. 1997 and 0.0576 kg Teta et	<i>Tafimys powelli</i>	<0.5 (Ortiz, Pardiñas, and Stepan 2000)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

			al. 2009, respectively)			
<i>Tafimys powelli</i>	0.027		Based on mass of house mouse	<i>Tafimys</i>	<0.5	(Grayson 2016)
<i>Tafimys powelli</i>	0.050	0.03-0.07	Unspecified	<i>Tafimys powelli</i>	<0.5	Ortiz pers. comm.
<i>Tafimys powelli</i>	0.087		Molar row length	<i>Tafimys powelli</i>	<0.5	This study
<i>Tafimys powelli</i>	0.055		Average		<0.5	This study
<i>Tapirus greslebini</i>		Larger than <i>T. terrestris</i> (243 kg), similar to <i>T. haysii</i> (which is slightly larger than <i>T. indicus</i> , 296 kg MOM 4.1, similar to <i>T. bairdii</i> 299 kg MOM 4.1)		<i>Tapirus greslebini</i>	100-500	(Holanda and Ferrero 2012)
<i>Tapirus greslebini</i>	247		Molar length	<i>Tapirus greslebini</i>	100-500	This study
<i>Tapirus greslebini</i>	247		Average		100-500	This study
<i>Tapirus mesopotamicus</i>		Similar in size to <i>T. terrestris</i> (243 kg)		<i>Tapirus mesopotamicus</i>	100-500	(Holanda and Ferrero 2012)
<i>Tapirus mesopotamicus</i>	147		Molar length	<i>Tapirus mesopotamicus</i>	100-500	This study
<i>Tapirus mesopotamicus</i>	147		Average		100-500	This study
<i>Tapirus olivaresi</i>		Larger than <i>T. terrestris</i> (243 kg),		<i>Tapirus olivaresi</i>	100-500	(Holanda and Ferrero 2012)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

		similar to <i>T. haysii</i> (which is slightly larger than <i>T. in-</i> <i>dicus</i> , 296 kg MOM 4.1, similar to <i>T. bairdii</i> 299 kg MOM 4.1)			
<i>Tapirus olivaresi</i>	323		Molar length	<i>Tapirus olivaresi</i>	100- 500 This study
<i>Tapirus olivaresi</i>	323		Average		100- 500 This study
<i>Tapirus</i> sp.	240.662 5	209.8- 291.1	Museum rec- ords, cranioden- tal and postcra- nial allometric equations	<i>Tapirus bairdii</i> , <i>T.</i> <i>indicus</i> , <i>T.</i> <i>pinchaque</i> , <i>T. ter-</i> <i>restris</i>	100- 500 (Vizcaíno, Bargo, and Cassini 2006)
<i>Tapirus</i> sp.	250		Unspecified	<i>Tapirus</i>	100- 500 (Fariña et al. 2014)
<i>Tapirus</i> sp.	239		Molar length	<i>Tapirus greslebini</i> , <i>T. mesopotamicus</i> , <i>T. olivaresi</i>	100- 500 This study
<i>Tapirus</i> sp.	245		Average		100- 500 This study
<i>Tapirus terrestris</i>	243.35	238.9- 247.8	Museum rec- ords, cranio- dental and postcranial al- lometric equa- tions	<i>Tapirus terrestris</i>	100- 500 (Vizcaíno, Bargo, and Cassini 2006)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Tayassu pecari</i> , T. sp.	33.5		Literature re-view: extant spp.	<i>Tayassu pecari</i>	8-44	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Tayassu pecari</i> , T. sp.	30		Unspecified	<i>Tayassu pecari</i>	8-44	(Croft 2000)
<i>Tayassu pecari</i>, T. sp.	31.75		Average		8-44	This study
<i>Telicomys amazonensis</i>	600		Geometric similarity	<i>Telicomys</i>	500-1000	(Vizcaíno et al. 2012)
<i>Tetramerorhinus cingulatum</i> (=T. fortis)	82.76		Cited in (G. H. Cassini, Vizcaíno, and Bargo 2012) without methodological details	<i>Tetramerorhinus cingulatum</i>	44-100	(Villafañe 2005)
<i>Tetramerorhinus cingulatum</i> (=T. fortis)	27.08		Craniomandibular geometric morphometrics	<i>Tetramerorhinus cingulatum</i>	8-44	(Cassini, Vizcaíno, and Bargo 2012)
<i>Tetramerorhinus cingulatum</i> (=T. fortis)	41.71		Craniodental allometric equations	<i>Tetramerorhinus cingulatum</i>	8-44	(Cassini et al. 2012; Kay, Vizcaíno, and Bargo 2012)
<i>Tetramerorhinus cingulatum</i> (=T. fortis)	50.51667		Average		44-100	This study
<i>Tetramerorhinus</i> sp.	74.17	65.58-82.76	Cited in (G. H. Cassini, Vizcaí-	<i>Tetramerorhinus cingulatum</i> , T. mix-	44-100	(Villafañe 2005)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

			no, and Bargo 2012) without methodological details	<i>tum</i>		
<i>Tetramerorhinus</i> sp.	23.205	19.33- 27.08	Craniomandibular geometric morphometrics	<i>Tetramerorhinus cingulatum</i> , <i>T. mixtum</i>	8-44	(Cassini, Vizcaíno, and Bargo 2012)
<i>Tetramerorhinus</i> sp.	32.5	26.29- 41.71	Craniodental allometric equations	<i>Tetramerorhinus cingulatum</i> , <i>T. lucarius</i> , <i>T. mixtum</i>	8-44	(Cassini et al. 2012; Kay, Vizcaíno, and Bargo 2012)
<i>Tetramerorhinus</i> sp.	43.3		Average		8-44	This study
<i>Tetrastylus araucanus</i> , <i>T. sp.</i>		Larger than <i>Neopiblemus</i> and smaller than <i>Phoberomys</i> , <i>Telicomys</i>		<i>Tetrastylus</i>		(Horovitz et al. 2006; Kerber, Negri, Ribeiro, Nasif, et al. 2017)
<i>Tetrastylus araucanus</i> , <i>T. sp.</i>			Unspecified	<i>Tetrastylus</i>	100-500	Rinderknecht pers. comm.
<i>Tetrastylus araucanus</i> , <i>T. sp.</i>	31.8		Molar length	<i>Tetrastylus araucanus</i>	8-44	This study
<i>Tetrastylus araucanus</i>, <i>T. sp.</i>	31.8		Average			This study
<i>Thalassocnus antiquus</i>		Slightly smaller (~10%) than <i>T. natans</i>		<i>Thalassocnus antiquus</i>	100-500	(Muizon et al. 2003)
<i>Thalassocnus antiquus</i>	158		Molar row length	<i>Thalassocnus antiquus</i>	100-500	This study
<i>Thalassocnus antiquus</i>	158		Average		100-500	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Thalassocnus carolomartini</i>			Similar size to <i>T. yaucensis</i> , ~3% larger than <i>T. littoralis</i>	<i>Thalassocnus carolomartini</i>	100-500	(Muizon et al. 2003)
<i>Thalassocnus littoralis</i>			~12% larger than <i>T. natans</i>	<i>Thalassocnus littoralis</i>	100-500	(McDonald and Muizon 2002)
<i>Thalassocnus littoralis</i>	168		Molar row length	<i>Thalassocnus littoralis</i>	100-500	This study
<i>Thalassocnus littoralis</i>	168		Average		100-500	This study
<i>Thalassocnus natans</i>	203.2	134-301	Postcranial multiple regression	<i>Thalassocnus natans</i>	100-500	(Esteban-Trivigno, Mendoza, and Renzi 2008)
<i>Thalassocnus natans</i>	152		Postcranial allometric equations	<i>Thalassocnus natans</i>	100-500	(Rincón et al. 2015)
<i>Thalassocnus natans</i>	181		Molar row length	<i>Thalassocnus natans</i>	100-500	This study
<i>Thalassocnus natans</i>	179		Average		100-500	This study
<i>Thalassocnus</i> sp.	215		Molar row length	<i>Thalassocnus antiquus</i> , <i>T. carolomartini</i> , <i>T. littoralis</i> , <i>T. natans</i> , <i>T. yaucensis</i>	100-500	This study
<i>Thalassocnus yaucensis</i>			Similar in size to <i>T. carolomartini</i>	<i>Thalassocnus yaucensis</i>	100-500	(Muizon et al. 2004)
<i>Thalassocnus yaucensis</i>	352		Molar row length	<i>Thalassocnus yaucensis</i>	100-500	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Thalassocnus yaucensis</i>	352		Average		100-500	This study
<i>Theosodon</i> sp.	45	44 - 46	Molar length	<i>Theosodon lydekkeri</i> , <i>T. sp.</i>	44-100	(Croft 2000)
<i>Theosodon</i> sp.	113.09		Craniomandibular geometric morphometrics	<i>Theosodon garrettorum</i>	100-500	(Cassini, Vizcaíno, and Bargo 2012)
<i>Theosodon</i> sp.	136.84	121.55 - 158.04	Craniodental allometric equations	<i>Theosodon garrettorum</i> , <i>T. gracilis</i> , <i>T. lydekkeri</i>	100-500	(Cassini et al. 2012; Kay, Vizcaíno, and Bargo 2012)
<i>Theosodon</i> sp.	95.61		Regression	<i>Theosodon</i>	44-100	(Vizcaíno et al. 2012)
<i>Theosodon</i> sp.	97.6		Average		44-100	This study
<i>Theriodictis</i> sp.	27		Literature review	<i>Theriodictis platenensis</i> , <i>T. tarijensis</i>	8-44	(Smith et al. 2003)
<i>Theriodictis</i> sp.	36		Molar length, width, area	<i>Theriodictis platenensis</i>	8-44	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Theriodictis</i> sp.	31.5		Average		8-44	This study
<i>Thrichomys</i> sp.	0.308	0.2 - 0.5	Literature review: extant spp.	<i>Thrichomys pachyurus</i>, <i>T. apereoides</i>	<0.5	(Freudenthal and Martín-Suárez 2013)
<i>Thylacosmilus atrox</i> , <i>T. sp.</i>	117.36		Postcranial allometric equations	<i>Thylacosmilus atrox</i>	44-100	(Ercoli and Prevosti 2011)
<i>Thylacosmilus atrox</i> , <i>T. sp.</i>	30.2		Molar length, width, area	<i>Thylacosmilus atrox</i>	8-44	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Thylacosmilus atrox</i>, <i>T. sp.</i>	73.8		Average		44-100	This study

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Thylamys minutus</i>	0.016		Molar length	<i>Thylamys minutus</i>	<0.5	(Croft 2000)
<i>Thylamys pinei</i>	0.025		Molar length	<i>Thylamys pinei</i>	<0.5	This study
						(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Thylamys</i> sp.	0.03373 3	0.0183 -0.054	Literature review: extant spp.	<i>Thylamys elegans</i> , <i>T. macrura</i> , <i>T. pussilla</i>		
<i>Thylamys</i> sp.	0.0385	0.016 - 0.053	Molar length	<i>Thylamys colombianus</i> , <i>T. minutus</i>	<0.5	(Croft 2000)
<i>Thylatheridium dolgopola</i>		Smaller than <i>Sparassocynus bahiai</i> or <i>S. derivatus</i> (<i>Sparassocynus</i> ~0.35 kg) and slightly larger than <i>Thylatheridium cristatum</i> (0.20 kg)		<i>Thylatheridium dolgopola</i>	<0.5	(Forasiepi, Goin, and Martinelli 2009)
<i>Thylatheridium dolgopola</i>	0.262		Dental allometric equations	<i>Thylatheridium dolgopola</i>	<0.5	(Zimicz 2014)
<i>Thylatheridium dolgopola</i>	0.262		Average		<0.5	This study
<i>Thylatheridium hudsoni</i>	0.147		Dental allometric equations	<i>Thylatheridium hudsoni</i>	<0.5	(Zimicz 2014)
<i>Thylatheridium</i> sp.	0.2045	0.147- 0.202	Dental allometric equations	<i>Thylatheridium cristatum</i> , <i>T. hudsoni</i> , <i>T. pascuali</i>	<0.5	(Zimicz 2014)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Thylophorops chapalmalensis</i>	3.322		Dental allometric equations	<i>Thylophorops chapalmalensis</i>	0.5-8	(Zimicz 2014)
<i>Thylophorops chapalmalensis</i>	3.4	3.1-3.7	Literature review	<i>Thylophorops chapalmalensis</i>	0.5-8	(Cenizo, Soibelzon, and Saffer 2015)
<i>Thylophorops chapalmalensis</i>	3.361		Average		0.5-8	This study
<i>Tolypeutes</i> sp., <i>T. tricinctus</i>	1.295	1-1.59	Literature review: extant spp.	<i>Tolypeutes</i>	0.5-8	(Nowak 1999)
<i>Torcellia paranense</i>	559		Postcranial allometric equations	<i>Torcellia paranense</i>	500-1000	This study
<i>Toxodon bilobidens</i>	1100		Literature review	<i>Toxodon bilobidens</i>	>1000	(Smith et al. 2003)
<i>Toxodon paranensis</i>	1110		Molar length	<i>Toxodon</i> (=Dinotoxodon) <i>paranensis</i>	>1000	This study
<i>Toxodon platensis</i> , <i>T. sp.</i>	1642		Craniodental and postcranial allometric equations	<i>Toxodon platensis</i>	>1000	(Fariña, Vizcaíno, and Bargo 1998; Croft 2000; Smith et al. 2003; Vizcaíno et al. 2012)
<i>Toxodon</i> sp.	1790.8	1354.7 - 2095.7	Craniodental and postcranial allometric equations	<i>Toxodon</i>	>1000	(Elissamburu 2012)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Toxodon</i> sp.	1415		Unspecified	<i>Toxodon</i>	>1000	(Fariña et al. 2014)
<i>Toxodon</i> sp.	1615.93		Average		>1000	This study
	3		Literature re-view: extant spp.	<i>Trachops cirrhosus</i>	<0.5	(Cramer, Willig, and Jones 2001)
<i>Trachops cirrhosus</i>	0.033		Geometric similarity	<i>Trachycalyptoides achirensis</i>	100-500	This study
<i>Trachycalyptoides</i> sp.	331		"CF"	<i>Trachycalyptus</i>	500-1000	(Vizcaíno et al. 2012)
<i>Trachycalyptus cingulatus</i> , <i>T.</i> sp.	600		Dental allometric equations	<i>Trachytypotherium</i> (= <i>Eutypotherium</i>) <i>lehmannitschei</i>	8-44	(Reguero, Candela, and Cassini 2010)
<i>Trachytypotherium</i> sp.	19.551		Dental allometric equations	<i>Tremacyllus impressus</i>	0.5-8	(Reguero, Candela, and Cassini 2010)
<i>Tremacyllus impressus</i> , <i>T.</i> sp.	0.224		Craniodental and postcranial allometric equations	<i>Tremacyllus</i>	0.5-8	(Elissamburu 2012)
<i>Tremacyllus impressus</i> , <i>T.</i> sp.	1.19	0.94 - 1.49				
<i>Tremacyllus impressus</i> , <i>T.</i> sp.	0.707		Average		0.5-8	This study
			Craniodental and postcranial allometric equations	<i>Trigodon</i>	>1000	(Elissamburu 2012)
<i>Trigodon gaudryi</i> , <i>T.</i> sp.	1809	1427.3 - 2386.3				
<i>Typotheriopsis</i> sp.	23.244		Dental allometric equations	<i>Typotheriopsis silveyrai</i>	100-500	(Reguero, Candela, and Cassini 2010)
<i>Typotheriopsis</i> sp.	189.44	168.28	Craniodental	<i>Typotheriopsis</i>	100-	(Elissamburu

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

	- 232.5	and postcranial allometric equations	500	2012)
<i>Typotheriopsis</i> sp.	106	Average	100-500	This study
<i>Typotherium cristatum</i>	73.436	Dental allometric equations	<i>Typotherium</i> (= <i>Mesotherium</i>) <i>cristatum</i>	(Reguero, Candela, and Cassini 2010)
<i>Urocyon cinereoargenteus</i>	4.6	Literature review	<i>Urocyon cinereoargenteus</i>	(Lambert and Holling 1998)
<i>Urocyon cinereoargenteus</i>	3.65	Molar length, width, area	<i>Urocyon cinereoargenteus</i>	(Prevosti, Forasiepi, and Zimicz 2013)
<i>Urocyon cinereoargenteus</i>	4.125	Average	0.5-8	This study
<i>Urotherium interundatum</i> , U. sp.	326	Geometric similarity	<i>Urotherium antiquum</i>	(Vizcaíno, Cassini, et al. 2011)
<i>Urotherium interundatum</i> , U. sp.	600	"CF"	<i>Urotherium</i>	(Vizcaíno et al. 2012)
<i>Urotherium interundatum</i> , U. sp.	463	Average	100-500	This study
<i>Urumacotherium</i> (= <i>Stenodon</i>) <i>campbelli</i>	293	Molar row length	<i>Urumacotherium</i> (= <i>Stenodon</i>) <i>campbelli</i>	This study
<i>Urumacotherium</i> sp.	2108	Femur allometric equations	<i>Urumacotherium garciai</i>	(Rincón et al. 2015; Rincón et al. 2016)
<i>Urumaquia robusta</i>	1025	Femur allometric equations	<i>Urumaquia robusta</i>	(Rincón et al. 2015)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Valgipes bucklandi</i>	200		Literature re-view	<i>Valgipes</i>	100-500	(Smith et al. 2003; Raia, Carotenuto, and Meiri 2010)
<i>Valgipes bucklandi</i>	400		Literature re-view	<i>Valgipes</i>	100-500	(Grayson 2016)
<i>Valgipes bucklandi</i>	300		Average		100-500	This study
<i>Vassallia</i> sp.		Comparable to/ slightly smaller than <i>Scirrotherium hondaensis</i> (35 kg)		<i>Vassalia minuta</i>	8-44	(Edmund and Theodor 1997)
<i>Vetelia</i> sp.		Partial synonymy with <i>Peltephilus strepens</i> (11 kg)		<i>Vetelia puncta</i>		(González 2010)
<i>Vetelia</i> sp.		Much larger than <i>Euphractus sexcinctus</i> (3.95-6.5 kg) but smaller than <i>Macro-euphractus retusus</i> (95 kg) and much smaller than <i>Holmesina</i>		<i>Vetelia puncta</i>		(Vizcaíno, Iuliis, and Bargo 1998; L. R. González 2010)
<i>Vetelia</i> sp.		6.5< Mass< 95	Summary			
<i>Vicugna vicugna</i>	50	45-55	Literature re-view: extant	<i>Vicugna vicugna</i>	44-100	(Eisenberg 1989; Redford

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

		spp.			and Eisenberg 1992; Eisenberg and Redford 1999)
<i>Vicugna vicugna</i>	47.5	Literature review: extant spp.	<i>Vicugna vicugna</i>	44-100	(Silva and Downing 1995; Smith et al. 2003)
<i>Vicugna vicugna</i>	45	Literature review: extant spp.	<i>Vicugna vicugna</i>	44-100	(Christiansen 2002)
<i>Vicugna vicugna</i>	47.5	Average		44-100	This study
<i>Villarroelia totoyoi</i>		About the size of <i>Licaphrium mesopotamiense</i> (8.8-15 kg)	<i>Villarroelia totoyoi</i>	8-44	(Cifelli and Guerrero 1997)
<i>Villarroelia totoyoi</i>	43.9	Molar length	<i>Villarroelia totoyoi</i>	8-44	This study
<i>Villarroelia totoyoi</i>	43.9	Average		8-44	This study
<i>Waldochoerus bassleri</i>	23.7	Molar length	<i>Waldochoerus bassleri</i>	8-44	This study
<i>Windhausenien</i> sp.	700	Literature review	<i>Windhausenien</i>	500-1000	(Smith et al. 2003)
<i>Xenastrapotherium aequatorialis</i>	1595	Molar length	<i>Xenastrapotherium aequatorialis</i>	>1000	This study
<i>Xenastrapotherium amazonense</i>	3445	Molar length	<i>Xenastrapotherium amazonense</i>	>1000	This study
<i>Xenastrapotherium kraglievichi</i>	1238.7	Craniodental and postcranial allometric equations	<i>Xenastrapotherium kraglievichi</i>	>1000	(Johnson and Madden 1997)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Xenastrapotherium kraglievichi</i>	260	Dental allometric equations	<i>Xenastrapotherium kraglievichi</i>	>1000	(Croft 2000)
<i>Xenastrapotherium kraglievichi</i>	1325	Postcranial allometric equations	<i>Xenastrapotherium kraglievichi</i>	>1000	(Vallejo-Pareja et al. 2015)
<i>Xenastrapotherium kraglievichi</i>	941	Average		>1000	This study
<i>Xenastrapotherium</i> sp.	1994	Mean of species averages		>1000	This study
<i>Xenodontomys</i> sp.	0.288	Molar row length	<i>Xenodontomys ellipticus</i>	<0.5	This study
<i>Xenorhinotherium bahiense</i> , X. sp.		Similar body mass to <i>Macrauchenia patagonica</i> (400-988 kg)	<i>Xenorhinotherium bahiense</i>	500-1000	(Araújo-Júnior, Porpino, and Bergqvist 2013)
<i>Xenorhinotherium bahiense</i> , X. sp.	1094	Molar length	<i>Xenorhinotherium bahiense</i>	>1000	This study
<i>Xenorhinotherium bahiense</i>, X. sp.	1094	Average		>1000	This study
<i>Xiphuroides</i> sp.		Larger than <i>Prodaedicurus</i> but smaller than <i>Daedicurus clavicaudatus</i>	<i>Xiphuroides uquiensis</i>		(Castellanos 1927)
<i>Xyophorus</i> sp.		Smaller than <i>Thalassocnus nantans</i> (154 kg), <i>Lakukullus</i>	<i>Xyophorus villarroeli</i>		(Pujos et al. 2014)

Table S3.9: Compilation of mammalian body mass estimates for South American mammals, 15 Ma to 11.7 ka, cont.

<i>Xyophorus</i> sp.	142	Molar row length	<i>Xyophorus andinus</i> , <i>X. atlanticus</i> , "X." <i>bondesioi</i> , "X." cf. <i>bondesioi</i> , X. <i>crassissimus</i> , "X." sp. "X." <i>villarroeli</i>	100- 500	This study
<i>Xyophorus</i> sp.	142	Average		100- 500	This study
<i>Zaedyus pichiy</i> , Z. sp.	1	Literature re- view: extant spp.	<i>Zaedyus pichiy</i>	0.5-8	(Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)
<i>Zygolestes paranen- sis</i>		Smaller than <i>Z. tatei</i>	<i>Zygolestes paranensis</i>	<0.5	(Goin, Mon- talvo, and Vis- conti 2000)
<i>Zygolestes tatei</i>		Smaller than <i>Thylamys</i> (0.016 - 0.053 kg), <i>Thylatheridium</i> (0.147-0.202 kg)	<i>Zygolestes tatei</i>	<0.5	(Goin, Mon- talvo, and Vis- conti 2000)
<i>Zygolestes tatei</i>	0.023	Molar length	<i>Zygolestes tatei</i>	<0.5	This study
<i>Zygolestes tatei</i>	0.023	Average		<0.5	This study

10. Calculation of regressions for determination of ground sloth body mass

Table S3.10: Data for calculation of regressions for determination of ground sloth body mass. The following measurements were used to calculate eight new regressions for use in body mass estimation for extinct ground sloths. Taxa were only included if one or more measurements of the morphological variables used were available for the same species as at least one published body mass estimate. When only genus level information was available, the data were not included unless the mass estimate was derived from specimens with available measurements so that it could be certain that the mass estimate and morphological measurements were for the same species. “Ave. Mass” denotes the average body mass estimate for the species. Abbreviations for morphological measurements are Lower Tooth Row Length: LTRL; Skull Length: Skull L; Femur Length: Femur L; Femur Distal Width: Femur L; Humerus Length: Hum. L; Humerus Distal Width: Hum. Dist. W; Astralagus Length: Astr. L; Calcaneus Length: Calc. L; Upper Tooth Row Length: UTRL; Tibia Length: Tibia L; Radius Length: Radius L; Ulna Length: Ulna L. All measurements are in mm.

Species	Ave. Mass	LTRL	Skull L	Femur L	Femur dist. W	Hum. L	Hum. Dist. W	Astr. L	Calc. L	UTRL	Tibia L	Radius L	Ulna L
<i>Bolivatherium urumaquensis</i>	1719		440	580		435							
<i>Catonyx tarijensis</i>	1771	117.2	500	585	141.5	430	213	135	247.5		340	315	445
<i>Eionaletherium tancnemius</i>	1098			510							442		
<i>Eremotherium eomigrans</i>	1923			651		750.3					528	642.7	626
<i>Eremotherium laurillardi</i>	3189	189.4	528.5	737		780	344.7	208	412	214	555	700	716
<i>Eucholoeops ingens</i>	62.4						32.453						
<i>Glossotherium robustum</i>	1307	129.3		500		400			180		220	260	360
<i>Hapalops angustipalatus</i>	50.015			190	53.724		31.453		60.0		140		
<i>Lestodon armatus</i>	3544	172		700		590			280	97	340	360	460
<i>Lestodon trigonidens</i>	3832			730	235	560					370		470
<i>Megatherium altiplanicum</i>	1189	143.6		387.5	196.5		107.2					395	
<i>Megatherium americanum</i>	4322	211.9	787.4	759		706.9	332.6	221.9			620		634.8
<i>Megatherium tarijense</i>	1239	178		528		527	219				408		

Table S3.10: Data for calculation of regressions for determination of ground sloth body mass, cont.

<i>Mirandabradys socorrensis</i>	1521	430	560	212									290
<i>Mirandabradys urumaquensis</i>	1868			594	211								
<i>Mirandabradys zabasi</i>	1462.5			553	181.5								
<i>Myiodon darwini</i>	1889.5	131.3											
<i>Nothrotherium maquinense</i>	50			247									
<i>Prepootherium</i> sp.	285				99.187							68.6	
<i>Proscelidodon patrius</i>	430			290	160			80	145				205
<i>Pseudoprepootherium confusum</i>	950		430		197	343							289
<i>Pyramiodontherium scillatoyanei</i>	1672					593	191.5	151	264				472
<i>Scelidotherium leptcephalum</i>	864	106.3	494	409.3	224.25	394	187		160	103	277	301.25	378
<i>Thalassocnus natans</i>	159	44.5	262.9			255.4	67.6						284.8
<i>Urumacotherium garciai</i>	2108					450							310
<i>Urumaquia robusta</i>	1025												440

Appendix 4: GABI

1. Overview of the Great American Biotic Interchange

1.1 Chronology of the Great American Biotic Interchange

The interchange has typically been separated into an early phase of ‘herald’ taxa that dispersed over the Bolivar Trough prior to the existence of a complete land connection in the Panamanian isthmus, and the ‘legion’ taxa that dispersed once the land bridge was complete (Simpson 1950; Webb 1976; Simpson 1980; Marshall 1981; Webb 1985; Webb 2006). The discovery of *Panamacebus*, a crown cebid, in Panama provides evidence of the first confirmed dispersal of the interchange between 25-22 Ma (Bloch et al. 2016). The next known dispersals, also from South to North America, were megalonychid and mylodontid sloths, which dispersed between 8-9 Ma (Hirschfeld and Webb 1968; Hirschfeld 1981; Marshall 1985; Webb 1985; Webb 1989; McDonald 2002; Goin et al. 2012; Laurito and Valerio 2012; Valerio and Laurito 2014). Over the course of the entire interchange, thirteen xenarthrans, three rodents, and one marsupial dispersed to temperate North America (Goin et al. 2012).

The first undisputed terrestrial mammal immigrant to South America were procyonids ancestral to *Cyonasua* and *Chapalmalania* in the late Miocene, ~ 7.3-9 Ma (Woodburne 2010; Prevosti and Soibelzon 2012; Prevosti, Forasiepi, and Zimicz 2013; Forasiepi et al. 2014; Cione et al. 2015). A gomphothere (*Amahuacatherium*), a tapirid, two peccaries (*Sylvochoerus woodburnei* and *Waldochoerus bassleri*), and a dromomerycine (*Surameryx acrensis*) from the Acre region of the Amazon have been dated to between 10.3-9.5 Ma (Campbell, Frailey, and Romero-Pittman 2009; Campbell Jr. et al. 2010; Frailey and Campbell 2012; Prothero et al. 2014; Cione

et al. 2015), although the age of the section and the identity of the gomphothere have been subject to intense debate (Alberdi, Prado, and Salas 2004; Lucas, Yuan, and Min 2013; Mothé, Avilla, and Cozzuol 2013; Leigh, O’Dea, and Vermeij 2014; Mothé and Avilla 2015). Other early immigrants to South America included sigmodontine rodents and additional procyonids by 6 Ma (Forasiepi, Martinelli, and Goin 2007; Prevosti and Pardiñas 2009; Goin et al. 2012; Cione et al. 2015; Verzi and Montalvo 2008). Finally, the first undisputed tayassuid (*Platygonus*) appears in the Chapadmalalan, ~4-3 Ma (Prevosti, Gasparini, and Bond 2006; Gasparini, Ubilla, and Tonni 2013; Cione et al. 2015), and a camelid (*Lama*) in the early Marplatan, ~3.3-2.8 Ma, represents the final immigrant prior to the main phase of the GABI (Tonni et al. 1992; Cione and Tonni 1995; Cione et al. 2007; Woodburne 2010; Cione et al. 2015).

Along with geological and marine faunal evidence, the early migrants have led some authors to propose that a land connection existed at least temporarily as early as the 10 Ma (Campbell Jr. et al. 2010; Goin et al. 2012; Stone 2013; Prothero et al. 2014), although this interpretation is still highly controversial (Coates and Obando 1996; Cody et al. 2010; Coates and Stallard 2013; Cione et al. 2015). Proponents of an early land bridge argue that dispersal of temperate and open habitat taxa would have been precluded by the tropical rainforests that dominated the isthmus until Plio-Pleistocene glaciations. Whether because of the absence of a complete land connection or of dispersal routes with suitable habitats in South America, the “legions” of the GABI did not disperse until ~2.6 Ma (Webb 1985; Webb 1991; Tonni et al. 1992; Cione and Tonni 1995; Webb 2006; Cione et al. 2007; Woodburne 2010; Cione et al. 2015).

The main duration of the GABI can be further subdivided into four phases, GABI 1 through GABI 4 (Woodburne 2010). In South America, GABI 1 is characterized by the arrival of *Galictis* (Mustelidae), *Dusicyon* (Canidae), *Hippidion* and *Onohippidium* (Equiidae), and a

gomphothere (Gomphotheriidae) around 2.6 Ma (López, Reguero, and Lizuain 2001; Cione et al. 2007; Woodburne 2010; Cione et al. 2015). The dispersal pulse of GABI 2, at about 1.8 Ma, brought *Arctotherium* (Ursidae), *Felis*, *Puma*, *Panthera*, and *Smilodon* (Felidae), *Catagonus* (Tayassuidae), *Palaeolama* and *Hemiauchenia* (Camelidae), *Epiuryceros* and *Antifer* (Cervidae), *Tapirus* (Tapiridae), and *Stegomastodon* and *Cuvieronius* (Gomphotheridae) to South America (Tonni et al. 1992; Cione and Tonni 1995; Cione et al. 2005; MacFadden 2000; Soibelzon, Tonni, and Bond 2005; Cione et al. 2007; Woodburne 2010; Prevosti and Soibelzon 2012; Gasparini, Ubilla, and Tonni 2013; Cione et al. 2015). In GABI 3, a third major dispersal pulse at about 1.0-0.7 Ma, *Herpailurus* (Felidae), *Paraceros* (Cervidae), *Pecari* (Tayassuidae) appear in South America for the first time (Cione et al. 2005; Prevosti 2006; Cione et al. 2007; Gasparini, Ubilla, and Tonni 2013; Cione et al. 2015).

Finally, at and after 0.125 Ma, GABI 4 brought *Nasua* (Procyonidae), *Lontra* (= *Lutra*, Mustelidae), *Canis* (Canidae), *Leopardus* (Felidae), *Sylvilagus* (Leporidae), *Urocyon* (Canidae), and *Equus* (Equidae), along with *Glyptotherium* (Glyptodontidae), to South America (Tonni et al. 1985; Cione and Tonni 1995; Cione et al. 2005; Prevosti 2006; Prevosti and Rincón 2007; Carlini et al. 2008; Cione et al. 2015). *Glyptotherium* was a genus of glyptodont that originated in North America from South American immigrants and subsequently dispersed back to South America. Some authors consider GABI 4 to continue today (Cione et al. 2015).

1.2 Participants in the GABI

This section provides a brief overview of the taxonomy and major ecological characteristics of the major groups that took part in the GABI. Many of these groups are covered in more

detail in Chapter 2. For the ecology of individual genera and species and relevant references, see Tables S3.9, S4.6, S4.9, and S4.10.

During the time interval assessed by the current study, two families comprised the order Litopterna: small to medium sized Proterotheriidae and the large to very large Macraucheniidae (Cifelli 1985). Because of similarities in adaptations for cursorial locomotion, proterotheres and sometimes macraucheniids were interpreted as ecological equivalents of horses, and thus, as open-habitat grazers by a number of early studies, but recent work has revealed a different interpretation. Both macraucheniids and proterotheres preferred closed to moderately open habitats and browsing or omnivorous-frugivorous diets, although some of the latest forms were also adapted for mixed herbivory (Webb 1978a; Cifelli and Guerrero 1997; Cifelli and Villarroel 1997; Shockey 1999; Bond 1999; Bond et al. 2001; Carlini, Gelfo, and Sánchez 2006; Villafañe, Ortiz-Jaureguizar, and Bond 2006; Krapovickas et al. 2009; Ubilla et al. 2009; Cassini et al. 2012; Croft 2016).

Notoungulates were by far the most morphologically and taxonomically diverse of the endemic South American ungulates. For the time period studied in this paper, notoungulates consisted of the families Toxodontidae, Leontiniidae, and Homalodotheriidae in Toxodontia and Interatheriidae, Mesotheriidae, and Hegetotheriidae in Typotheria (Cifelli 1985; McKenna and Bell 1997; Gabbert 2004; Billet 2011). Toxodontids, leontiniids, and haplodontheres were ecologically diverse intermediate to very large herbivores with ambulatory to graviportal and semiaquatic forms, capable of living in a variety of habitats with a wide range of diets (Shockey 2001; MacFadden 2005; Elissamburu 2007; Townsend and Croft 2008a; Bond and Gelfo 2010; Kay, Vizcaíno, and Bargo 2012; Cassini 2013; Chapter 4). Interatheres, mesotheres, and hegetotheres were small to medium sized herbivores with varied diets and semifossorial, fossorial, cursorial,

and saltatory habits (Stirton 1953; Kay and Madden 1997b; Bond 1999; Elissamburu 2004; Elissamburu 2007; Candela, Noriega, and Reguero 2007; Reguero, Dozo, and Cerdeño 2007; Croft and Anderson 2008; Cassini et al. 2011; Cassini and Vizcaíno 2012; Kay, Vizcaíno, and Bargo 2012; McCoy and Norris 2012; Cassini 2013; Reguero et al. 2015; Croft 2016).

Astrapotheres were large to very large selective browsers that likely preferred relatively closed habitats (Cifelli 1985; Rensberger and Pfretzschner 1992; Townsend and Croft 2005; Cassini and Vizcaíno 2012; Cassini et al. 2012; Cassini, Vizcaíno, and Bargo 2012; Cassini 2013). They probably used their trunks and large tusks for destructive activities such as leaf and branch-stripping that would have helped to maintain edge habitats in a way to modern proboscideans (Johnson and Madden 1997; Kay and Madden 1997b). Semi-aquatic habits have been suggested for astrapotheres (Scott 1937; Lavocat 1958; Marshall, Salinas, and Suarez 1990; Kay and Madden 1997b; Avilla and Vizcaíno 2005; Flynn et al. 2012; Kay, Vizcaíno, and Bargo 2012; Houssaye, Fernandez, and Billet 2016; Croft 2016), although paleoecological studies using a variety of proxies have failed to either confirm or reject this hypothesis (Cassini et al. 2012; Houssaye, Fernandez, and Billet 2016; Chapter 4).

The metatherian didelphimorphs, represented for this interval by Borhyaenidae, Didelphidae, Hathliacynidae, Hondadelphidae, Sparassocynidae, and Thylacosmilidae, have utilized a very wide range of ecologies over the course of the Neogene. Estimated body masses range from under 20 g to over 50 kg (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999; Croft 2000; Kay, Vizcaíno, and Bargo 2012; Ercoli, Prevosti, and Álvarez 2012; Prevosti, Forasiepi, and Zimicz 2013; Chapter 5). Life modes include arboreal, scansorial, cursorial, ambulatory, generalized terrestrial, semifossorial, fossorial, and semiaquatic forms (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999; Argot 2004b; Argot

2004a; Gardner 2007b; Abello, Ortiz-Jaureguizar, and Candela 2012; Ercoli, Prevosti, and Álvarez 2012; Kay, Vizcaíno, and Bargo 2012; Prevosti, Forasiepi, and Zimicz 2013; Croft 2016). Hypercarnivorous, mesocarnivorous, omnivorous, insectivorous, and even frugivorous diets add to the ecological diversity of the didelphimorphs (Reig and Simpson 1972; Eisenberg 1989; Redford and Eisenberg 1992; Goin et al. 1995; Goin and Pardiñas 1996; Goin 1997; Eisenberg and Redford 1999; Cozzuol et al. 2006; Martins et al. 2006; Gardner 2007b; Forasiepi, Goin, and Martinelli 2009; Goswami, Milne, and Wroe 2011; Oliveira et al. 2011; Prevosti, Forasiepi, and Zimicz 2013; Engelman and Croft 2014).

The other metatherians in this interval include polydolopimorphs of the family Argyrolagidae and paucituberculatans of the family Caenolestidae. Argyrolagids were small, bipedal, ricochetel, mostly granivorous desert marsupials, analogous to desert rodents such as jerboas (Dipodidae) and kangaroo rats (*Dipodomys*, Heteromyidae) (Simpson 1970b; Mares 1985; Mares 1993; Sánchez-Villagra and Kay 1997; Sánchez-Villagra, Kay, and Anaya-Daza 2000; Carlini, Pascual, and Goin 2007; García-López and Babot 2015; Croft 2016). Extant caenolestids and extinct caenolestoids (Paleothentidae) are small saltatorial insectivore-frugivores (Kay and Madden 1997b; Gardner 2007b; Abello, Ortiz-Jaureguizar, and Candela 2012), suggesting that extinct caenolestids probably were as well.

Xenarthrans are perhaps the most distinctive element of native South American faunas. While their diversity is greatly reduced today, extinct xenarthrans included five families of sloths large to very large armored pampatheres and glyptodonts, and a greater diversity of armadillos, in addition to ancestors of the extant suspensory sloths and anteaters. Xenarthra is divided into Pilosa, including sloths and anteaters, and Cingulata, including armadillos, glyptodonts, and pampatheres (Engelmann 1985; Gaudin and McDonald 2008; Delsuc and Douzery 2008). Sloths

included arboreal, scansorial, graviportal, semifossorial, and semiaquatic forms, with diets ranging from browsing, mixed feeding, and grazing, including sea-grass “grazing” (Pujos et al. 2012; Bargo 2001; Bargo and Vizcaíno 2008; Bargo et al. 2000; Bargo, Toledo, and Vizcaíno 2006; Bargo, Iuliis, and Vizcaíno 2006; Vizcaíno et al. 2001; White 1993; White 1997). Some sloths may also have been somewhat insectivorous or frugivorous (Dondas, Isla, and Carballido 2009; Fariña et al. 2014; Resar 2012; Resar, Green, and McAfee 2013). As in extant Vermilinguans, extinct anteaters were strictly myrmecophagous and ranged from ambulatory to arboreal forms (McDonald, Vizcaíno, and Bargo 2008).

Cingulates were also highly diverse in the past. Armadillos have included generalized terrestrial, semifossorial, and fossorial forms with insectivorous, myrmecophagous, omnivorous, mesocarnivorous, and browsing forms (Vizcaíno and Bargo 1998; Vizcaíno, Iuliis, and Bargo 1998; Bargo 2003; Vizcaíno et al. 2006; Vizcaíno 2009). Glyptodonts were mainly graviportal and ranged from browsing diets in middle Miocene forms to grazing in Plio-Pleistocene taxa (Fariña 1985; Fariña 1995b; Vizcaíno et al. 2001; Croft 2016). Pampatheres were also mainly grazers (Iuliis, Bargo, and Vizcaíno 2001; Carlini and Zurita 2010), but unlike other xenarthrans, pampatheres were not only able to burrow but also appear to have been adapted for fast locomotion (Abrantes, Avilla, and Vizcaíno 2005; Rincón, White, and McDonald 2008). Xenarthran body masses cover more than three orders of magnitude, from roughly one to several thousand kilograms (see Chapter 5).

Platyrrhines, or New World monkeys, have the distinction of being the first group with a documented dispersal between North and South America around 25-22 Ma (Bloch et al. 2016). They have a variety of diets, including frugivorous, granivorous, folivorous, omnivorous, and insectivorous regimens (Kay et al. 1987; Hartwig and Cartelle 1996; Fleagle, Kay, and Anthony

1997; Kay and Meldrum 1997; Meldrum and Kay 1997b; Meldrum and Kay 1997a; Kay and Cozzuol 2006; Wheeler 2009; Cooke 2011; Rosenberger 2011; Halenar 2012). All extant platyrrhines are arboreal (Ferrari 2009), and postcranial remains for fossil platyrrhines are consistent with arboreal habits as well (Meldrum and Kay 1997a; Kay, Johnson, and Meldrum 1998; Tejedor and Rosenberger 2008; Halenar 2011a; Rosenberger 2011; Kay et al. 2012).

Caviomorphs constitute the South American native rodents. The fossil record for the past 15 million years includes representatives of Abrocomidae (chinchilla rats), Acaremyidae (an extinct family with controversial affinities and composition), Caviidae (cavies, maras, and capybaras), Chinchilidae (chinchillas and viscachas), Ctenomyidae (tuco-tucos), Cuniculidae (pacas), Dasyproctidae (agoutis), Dinomyidae (pacaranas and their diverse extinct relatives), Echimyidae (spiny rats), “Eocardiidae” (stem caviid radiation), Erethizontidae (New World porcupines), Myocastoridae (nutrias), Neoepiblemidae (close relatives of dinomyids including very large forms), Octodontidae (a diverse family including degus, viscacha rats, and allies), although some of the subfamilies of these clades have been variably elevated to familial rank. Caviomorph rodents include a wide range of ecologies, with diets including grazers, browsers, mixed feeders, frugivores, granivores, insectivores, generalized herbivores, and various combinations therein. The range in caviomorph body masses is phenomenal, from <0.5 kg to extinct giant forms with some body mass estimates over 1000 kg (Sánchez-Villagra, Aguilera, and Horovitz 2003; Rinderknecht and Blanco 2008; Blanco 2008; Millien 2008; Millien and Bovy 2010; Blanco, Rinderknecht, and Lecuona 2012; Patton, Pardiñas, and D’Elía 2015). They also make a wide range of uses of substrates, with arboreal, scansorial, cursorial, generalized terrestrial, graviportal, semifossorial, fossorial, and semiaquatic representatives (Nowak 1999; Elissamburu and Vizcaíno

2004; Samuels and Van Valkenburgh 2008; Elissamburu and Santis 2011; Blanco, Rinderknecht, and Lecuona 2012; Patton, Pardiñas, and D'Elía 2015).

Muroid rodents, particularly sigmodontine rodents (Cricetidae), are by far the most speciose immigrants to South America (Patton et al. 2015). These mice and rats include generalized terrestrial, semifossorial, scansorial, and semiaquatic forms (Steppan 1996; Pardiñas, D'Elía, and Teta 2008; Carrizo et al. 2014; Machado et al. 2014), with diets including grass, roots, insects, leaves, and seeds (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999; Patton 2015c; Ortiz and Pardiñas 2001; Ortiz, Jayat, and Pardiñas 2011; Alhajeri 2014). However, muroid rodents have much less variability in size than caviomorph rodents, with the body mass of all taxa under 0.5 kg.

Although soricids participated in the GABI, they are represented in the South America both in the modern and in the fossil record only by species in the genus *Cryptotis* (Gardner 2007b). These small shrews are semifossorial invertivores (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999). In South America today, they are found above 1200 m of elevation in wet, tropical parts of South America (Gardner 2007b).

Similarly, excluding recent introductions by humans, lagomorphs are represented only by the leporid genus *Sylvilagus* in both the fossil record and modern faunas. As with all rabbits, these species are curso-saltatorial (Chapman and Flux 1990). They can be found in a wide range of habitats throughout the Americas (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999; Nowak 1999). Their diets vary considerably between regions and habitats, and so they are considered to be generalist herbivores (Chapman, Hockman, and Ojeda C. 1980).

Artiodactyls are represented in South America by camelids, cervids, tayassuids, and a dromomerycid. These taxa are typically medium to large herbivores. Cervids mostly are brows-

ers to mixed feeders, without any true grazing forms (Janis 2008; Merino and Rossi 2010). Similarly, dromomerycids were mostly browsers and mixed feeders with few grazers (Semperebon, Janis, and Solounias 2004). Camelids were somewhat more trophically diverse, with a range from specialized browsers to specialized grazers as well as intermediate or generalized diets (Dompiere and Churcher 1996; Macfadden and Cerling 1996; MacFadden 1997; Feranec 2003; Marcolino et al. 2012; Scherer 2013; Yann 2014; Yann and DeSantis 2014). Finally, tayassuids include a variety of browsers, frugivores, and omnivore-frugivores (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999; Ranzi 2000; Frailey and Campbell 2012) that add considerably to artiodactyl dietary diversity. Artiodactyls have had specializations for cursoriality since the earliest known fossils (Rose 1996) and are still mainly cursorial forms, although some South American artiodactyls would perhaps be better classified as sub-cursorial (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999; Clifford 2010).

Perissodactyl immigrants to South America include the equids *Equus* and *Hippidion* and tapirids, all of the genus *Tapirus*. Tapirs are large, semiaquatic frugivore-browsers that still live in the Neotropics today (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999). New World equids went extinct at the end of the Pleistocene, but like their extant relatives, they were large cursorial grazers and mixed feeders (MacFadden 2000; Fariña, Blanco, and Christiansen 2005; García, Martínez Carretero, and Dacar 2008).

South American proboscideans mostly (or entirely) consist of gomphotheres. Gomphotheres were generalist herbivores, capable of a range of diets depending on availability (MacFadden and Shockey 1997; Prado et al. 2003; Prado et al. 2005; Sánchez, Prado, and Alberdi 2004; Campbell Jr. et al. 2010; Asevedo et al. 2012; Domingo, Prado, and Alberdi 2012). Proboscideans, including gomphotheres, are very large and graviportal (Janis et al. 1998). The single occur-

rence in Guyana of *Mammut*, a mastodon, is highly contested and frequently ignored altogether. Furthermore, the systematics of South American proboscideans is highly controversial, with different authors promoting different phylogenetic relationships, synonymies, and taxonomic combinations (Prado et al. 2005; Arroyo-Cabrales et al. 2007; Prado and Alberdi 2008; Campbell, Frailey, and Romero-Pittman 2009; Ferretti 2010; Cozzuol, Mothé, and Avilla 2012; Mothé et al. 2012; Mothé, Avilla, and Cozzuol 2013; Lucas, Yuan, and Min 2013; Mothé and Avilla 2015). Consequently, *Cuvieronius*, *Haplomastodon*, *Notiomastodon*, and *Stegomastodon* have all been included in this analysis, despite probable synonymies, because of the current seeming lack of consensus. However, because of the similarity of these taxa in terms of body mass, diet, and locomotion that makes the systematics of this clade so difficult, the systematic confusion should not have a major influence on the results of this analysis.

Carnivora includes some of the earliest of the South American immigrants, from the family Procyonidae, along with later dispersers that included additional procyonids (raccoons, coatis, kinkajous, and allies), canids (primarily foxes), felids (cats), mustelids (weasels, grisons, and otters), and ursids (bears). Modes of locomotion include semifossorial, generalized terrestrial, cursorial, scansorial, arboreal, and semiaquatic habits. Carnivorans have hypercarnivorous, mesocarnivorous, omnivorous, and piscivorous diets (Prevosti and Palmqvist 2001; Prevosti and Vizcaíno 2006; Prevosti, Turazzini, and Amelia Chemisquy 2010; Ercoli, Prevosti, and Álvarez 2012; Prevosti and Martin 2013; Prevosti and Schubert 2013; Prevosti, Forasiepi, and Zimicz 2013; Ercoli et al. 2016). They range from small, with some weasles under 0.25 kg, to very large, with the largest extinct bears weighing up to 900 kg (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999; Prevosti, Forasiepi, and Zimicz 2013).

Because of their poor fossil record and the assumption that flight would facilitate dispersal in the absence of a land-bridge, bats are generally overlooked in discussions of the Great American Biotic Interchange. However, bats typically either do not migrate or migrate for shorter distances than birds, and it is unusual for bats to cross oceanic barriers. Molecular divergence times and the fossil record both indicate that bats should be considered as part of the GABI fauna. The Noctilionidae, Phyllostomidae, and Thyropteridae are known only from South America prior to the GABI, and clear evidence supporting Interchange dispersals to North America exists for *Desmodus* (Phyllostomatidae), *Tadarida* (Molossidae), *Eumops* (Molossidae), *Macrotus* (Phyllostomatidae), *Choeronycteris* (Phyllostomatidae), and *Leptonycteris* (Phyllostomatidae) (Czaplewski, Morgan, and McLeod 1997; Czaplewski et al. 2003; Czaplewski, Morgan, and Naeher 2003; Morgan 2005; Czaplewski, Morgan, and McLeod 2008; Morgan 2008). Biogeographical and molecular studies suggest that *Eptesicus* (Vespertilionidae) also originated in South America and dispersed to North America by the Late Miocene (Gunnell and Simmons 2005; Lim 2009). Bats with originally North American affinities also appeared in South America during the Interchange, including representatives of Mormoopidae and *Rhogeessa* (Vespertilionidae) (Czaplewski, Morgan, and Naeher 2003; Dávalos 2006; Lim 2009).

Although it is helpful to have a basic understanding of the mammals involved in the GABI, such broad strokes as have been provided here can only suggest possible ecological relationships between native and immigrant taxa. In the absence of more detailed and specific ecological information on each taxa, it is impossible to test the hypotheses about the reasons for the current distribution of taxa across the Americas. Consequently, a systematic comparison of the specific ecologies of the taxa involved is critically important in understanding the details of the dynamics of the GABI.

2. Methodological details

Body mass categories for small to medium mammals followed established conventions, with categories for small to medium mammals defined by the ranges <0.5 kg, 0.5-8 kg, and 8-44 kg (Legendre 1986; Barnosky and Shabel 2005; Stegner and Holmes 2013). 44 kg is the minimum body mass commonly used in the definition of megafauna (Martin 1984; Jablonski 1991; Martin and Steadman 1999; Barnosky et al. 2004; Koch and Barnosky 2006; Sodhi, Brook, and Bradshaw 2009; Corlett 2010; Barnosky, Carrasco, and Graham 2011; Stuart and Lister 2012; Corlett 2013; Sandom et al. 2014), often specifically reference to North and South American pre-Holocene ecosystems (Barnosky 2008; Hansen and Galetti 2009; Yule et al. 2009; Faith 2011; Vizcaíno et al. 2012; Dantas, Dutra, et al. 2013; Stegner and Holmes 2013; Villavicencio et al. 2016). Body mass categories above 44 kg were the same as those used for Vizcaíno et al. (2012) in their study of body mass in large South American herbivores: 44-100 kg, 100-500 kg, 500-1000 kg, and >1000 kg. Body mass data are from Table S3.9. Body mass categories are indicated in later data tables by a short-hand number, as are categories of mode of locomotion and substrate use; these numbers and the corresponding categories are given in Table S4.6.

Locomotion categories were based on those in other ecological studies that classified the locomotion of a range of taxa (Eisenberg 1981; Kay and Madden 1997b; Carrano 1999; Elissamburu and Vizcaíno 2004; Hutchinson et al. 2006; Polly 2007; Elissamburu and Santis 2011; Ercoli, Prevosti, and Álvarez 2012; Kay, Vizcaíno, and Bargo 2012; Samuels, Meachen, and Sakai 2013; Carrizo et al. 2014). Categories used in this analysis include fossorial, semifossorial, scansorial, arboreal, cursorial and curso-saltatorial, generalized terrestrial, ambulatory or graviportal, semiaquatic, and volant locomotion. As has been extensively discussed in the literature,

gradations between these categories are continuous, and so classification relies on modal activities.

Fossorial (or subterranean) taxa spend most or all of their time underground, likely forage at least partially on underground foods such as soil invertebrates, roots, and tubers, and have highly specialized morphology to support their subterranean lifestyles. Semifossorial taxa spend considerable time above ground, but also have adaptations related to burrowing and/or digging regularly for food. Similarly, both scansorial and arboreal taxa climb well, but scansorial taxa spend considerable time on the ground whereas arboreal taxa spend little or no time terrestrially.

Terrestrial taxa are generally divided into two to four categories based primarily on how specialized they are for running. Because this represents a continuous spectrum, the number of categories and the boundaries differ among studies and authors, but every effort for consistency was made using the following definitions. Generalized terrestrial taxa are capable of a range of modes of locomotion and uses of substrate, perhaps including some combination of running, leaping, climbing, swimming, digging, and object manipulation, but lack adaptations related to any particular substrate use and do not rely consistently on any one activity. Cursorial and cursorio-saltatorial taxa are adapted for speed. They use rapid locomotion to escape danger and/or catch prey, and can achieve greater speeds and/or maintain these speeds for longer than generalized taxa. Ambulatory or graviportal taxa run with lower frequency and have lower maximum speeds than other terrestrial animals, and they tend to rely on defenses related to fighting, such as large size, armor, and weapons, rather than fleeing to avoid predation.

Semiaquatic taxa are those that regularly swim for purposes such as foraging, escape from predation, and travel. Marine mammals not included in this analysis included members of Cetacea (whales, dolphins, and porpoises), Phocidae (earless or true seals), Otariidae (eared

seals), and Sirenia (manatees and dugongs). These taxa were not included because their dispersal prior to the completion of the land bridge would have been relatively unrestricted and because marine mammals use different resources and interact with a different collection of organisms than the rest of the taxa in this analysis. Among mammals, volant, or flying, taxa include only members of Chiroptera.

Three different approaches to the classification of diet were used. All three produced very similar results. The primary classification system as discussed in the main text consists of nineteen trophic categories. The other two classification systems are based on Eisenberg (1981), with sixteen and eight trophic categories. Table S4.2.2 provides the specific categories for each system. The details of the results are discussed at length separately in Appendix 4.4.

For every interval in which it occurred, each North American taxon was classified as representatives of insinuation, passive replacement, growing adaptive zones, or possible competition. An insinuator is a taxon with no overlap with extant or prior South American taxa. Note that all of these taxa except for four had no overlap with South American taxa of any age, and four early North American immigrants in the genus *Cyonasua*, all from the same adaptive zone, were classified as insinuators for the interval 9-4 Ma because the only South American representative of their adaptive zone evolved ~5 Myr after their arrival. However, once South American ecological equivalents had evolved, *Cyonasua* species were classified under growing adaptive zones (see below).

Passive ecological replacement indicates that the immigrant taxa filled a niche that had previously been occupied by South American taxa, but that a gap of at least 1 Myr existed between the disappearance of the last South American representative and the arrival of the first North American representative of the same adaptive zone. Note that, in terms of processes act-

ing on the immigrant taxa, there would have been no difference between insinuation and passive replacement, but that differentiating these categories allowed for more refined analyses in other regards. Growing adaptive zones indicates that the taxonomic diversity of both North and South American immigrants is stable to increasing, and at least one is increasing. Cases of possible competition were identified as situations in which North American taxa filled an adaptive zone occupied by South American taxa within 1 Myr of their arrival, and South American taxonomic diversity declined in an interval for which they shared their adaptive zone with immigrant taxa.

Note that categories are assigned separately for each time interval in which a taxon occurs. Thus, some taxa may be classified differently over the course of their duration in South America. For example, an immigrant species whose arrival initially is associated with a decline in native taxa diversity in the same adaptive zone will be classified as possible competition, but if additional native taxa evolve and diversity increases during a subsequent interval, it will be classified then as belonging to a “growing adaptive zone.” Another specific example is that of the *Cyonasua* immigrants provided above.

Table S4.2.1: Numeric codes for body mass and mode of locomotion categories. See Table S4.6.1 for the ecological classification of the taxa analyzed in this study.

Category number	Body mass range (kg)	Mode of locomotion
1	<0.5	Arboreal
2	0.5-8	Scansorial
3	8-44	Generalized terrestrial
4	44-100	Cursorial and cursorsaltatorial
5	100-500	Ambulatory and graviportal
6	500-1000	Semifossorial
7	>1000	Fossorial/subterranean
8		Semiaquatic/aquatic
9		Volant

Table S4.2.2: Trophic categories. This table lists the trophic categories that are used under the three different dietary classification systems. See Table S4.10 for the dietary classification of each taxon under the different systems and Appendix 4.4 for a comparison of the results using the different approaches.

Cat. #	Primary trophic categories this study	Eisenberg macroniche	Simplified Eisenberg
1	Frugivore (including fruit and gum)	Piscivore and squid-eater	Carnivore
2	Granivore	Carnivore	Piscivore
3	Folivore	Nectarivore	Myrmecophage
4	Mixed browser/grazer	Gumivore	Insectivore/omnivore or insectivore/frugivore
5	Grazer	Crustacivore and Clam-eater	Frugivore/carnivore or frugivore/omnivore
6	Generalist herbivore	Mymecophage	Frugivore/granivore
7	Insectivores and Invertivores	Aerial insectivore	Frugivore/browser
8	Omnivore	Foliage-gleaning insectivore	Browser/grazer
9	Mesocarnivore	Insectivore/Omnivore	
10	Hypercarnivore (including piscivores)	Frugivore/Omnivore	
11	Frugivore-granivore or granivore-frugivore	Frugivore/Granivore	
12	Folivore-frugivore or folivore-granivore	Frugivore/Herbivore	
13	Omnivore-insectivore and insectivore-frugivore, insectivore-granivore	Herbivore/Browser	
14	Omnivore-herbivore, including Omnivore-granivore, omnivore-frugivore, Omnivore-browser	Herbivore/Grazer	
15	Myrmecophage	Planktonivore	
16	Radicivores and grazer-radicivores	Sanguivore	
17	Sangrivores		
18	Nectarivore		
19	Scavenger or scavenger-omnivore		

3. Code for simulations of ecological overlap

Simulations were used to demonstrate that there is greater separation between the eco-space occupation of North and South American taxa than would likely arise by random chance alone. Because the number of taxa and ecospace occupation for any given interval was too low for such an analysis, the total number of representatives of each group- immigrant and native taxa- was used, with overlap defined as any adaptive zone that had at least one North American and one South American occupant, regardless of when this occupation occurred. Thus, “overlap” includes North American taxa that occupied growing adaptive zones, passively replaced earlier South American taxa, or competitively displaced ecological counterparts.

```
##Enter parameter values for simulation. n is the total number of adaptive zones,
##NAmspecies: number of North American species, Samspecies: number of South American
species
##realoverlap: total number of adaptive zones that have both North and South American taxa,
## including possible competition, passive ecological replacement, and growing adaptive zones
n=1197
NAmspecies=157
Samspecies=540
realoverlap=24

## at the end, “more” is the number of simulations that produced more than real overlap
##overlapV is a vector for the number of overlapping adaptive zones in each simulation
more=0
overlapV<-vector()
## 100,000 simulations:
for (i in 1:100000)
{
  NAm<-sample(1:n,NAmspecies,replace=T)
  SAm<-sample(1:n,Samspecies,replace=T)
  overlap=0
  for (z in 1:NAmspecies) {if (NAm[z] %in% SAm) overlap<-overlap+1}
  if (overlap>realoverlap) more<-more+1
  overlapV[i]<-overlap
}
```

4. Alternative Trophic Classification Systems

In order to verify that the results were not merely an artifact of the decisions regarding trophic classifications, three different trophic analyses were used. The first was developed from the data by creating new categories for each distinct diet represented in the full database. However, such an approach when applied to the fossil record could result in biases, because the diets of some mammals are easier to reconstruct in detail than others; for instance, xenarthran diets are particularly challenging to reconstruct because of their simplified dental morphology, the lack of ecologically similar relatives for many extinct taxa, and the lack of tooth enamel that makes both isotopic and dental microwear analyses more challenging. Furthermore, because any ecological grouping of taxa requires arbitrary divisions within continuous dietary spectrums, the amount of overlap- or lack there-of- in any given ecological analysis is somewhat dependent on the classification system used.

Consequently, the most effective way to determine the sensitivity of the results to the particulars of the classification system is to apply multiple systems and compare the results. For this study, Eisenberg's 16 trophic categories from his classic macroniche analysis (pp. 248-251, 1981) were used as a second system, and a simplified version (p. 224) with only eight trophic categories was used as a third system. Appendix 4.2 provides the details of the dietary categories used, and Table S4.6 lists the categories assigned to each taxon under all three classification schemes.

As shown in Tables S4.4.1, S4.4.2, and S4.4.3, the results of all three analyses were very similar. In fact, contrary to expectations, there were fewer instances that met the criteria for possible competition in both classification schemes based on Eisenberg's categories (1981), despite the lower number of trophic categories relative to the original system. Usage of Eisenberg's

macroniche categories indicated a total of three possible instances of competitive replacement, with a loss of three South American taxa in two adaptive zones. Even the most coarse classification system only suggested a maximum total loss of eight South American taxa in three adaptive zones as a result of competition.

Note that the numbers of overlapping taxa and overlapping adaptive zones are similar between all three classification systems, and that the differences between the positions of the distributions vary much more as a result of the total calculated size of the possible ecospace than because of differences in the degree of overlap. However, all three classification systems include adaptive zones that are improbable to impossible to occupy, and thus, all three systems are conservative measures of the statistical significance of the results. Given that not a single simulation, using any of the trophic classification systems, produced as little overlap as is seen in reality, it is highly unlikely the observed patterns are the result random chance.

Table S4.4.1 Percentages of North American immigrants with different relationships to South American native taxa in 1 Myr time intervals using this study's primary classification system for trophic categories. See Table S4.2.2 for details on the dietary categories. The total number of North American immigrant taxa for any given interval is indicated by *n*. Note that this number differs from the total number of species because some taxa span multiple intervals. The total percentage for each category represents the sum of occurrences in that category out of all occurrences in all time intervals, whereas the average is computed by averaging the percent of taxa in each category over the ten time intervals without regard to the different numbers of taxa in each time interval. The data in this table is displayed graphically in Figure 7.3 in the main text.

Age (Ma)	Insinuation	Growing adaptive zones	Ecological replacement	Possible competition	<i>n</i>
0-1	54.39	22.81	22.81	0.00	57
1-2	54.76	16.67	16.67	11.90	42
2-3	53.66	26.83	9.76	9.76	41
3-4	58.33	16.67	16.67	8.33	12
4-5	50.00	25.00	25.00	0.00	8
5-6	71.43	0.00	0.00	28.57	7
6-7	100.00	0.00	0.00	0.00	7
7-8	100.00	0.00	0.00	0.00	4
8-9	100.00	0.00	0.00	0.00	4
9-10	100.00	0.00	0.00	0.00	4
Total	59.68	18.82	15.05	6.45	186
Average	74.26	10.80	9.09	5.86	18.6

Table S4.4.2: Percentages of North American immigrants with different relationships to South American native taxa in 1 Myr time intervals using the coarse version of Eisenberg's classification system for trophic categories. Labels are as for Table S4.4.1. This data is displayed graphically in Figure S4.4.1 below.

Age (Ma)	Insinuation	Growing adaptive zones	Ecological replacement	Possible competition	<i>n</i>
0-1	81.82	11.36	6.82	0.00	44
1-2	88.57	0.00	2.86	8.57	35
2-3	88.57	8.57	2.86	0.00	35
3-4	90.91	9.09	0.00	0.00	11
4-5	87.50	12.50	0.00	0.00	8
5-6	85.71	14.29	0.00	0.00	7
6-7	75.00	25.00	0.00	0.00	8
7-8	80.00	20.00	0.00	0.00	5
8-9	80.00	20.00	0.00	0.00	5
9-10	75.00	25.00	0.00	0.00	4
Total	85.19	9.88	3.09	1.85	162
Average	83.31	14.58	1.25	0.86	16.2

Table S4.4.3: Percentages of North American immigrants with different relationships to South American native taxa in 1 Myr time intervals using the trophic categories from Eisenberg's 1981 macroniche analysis. Labels are as for Table S4.4.1. This data is displayed graphically in Figure S4.4.2 below.

Age (Ma)	Insinuation	Growing adaptive zones	Ecological replacement	Possible competition	<i>n</i>
0-1	79.17	10.42	10.42	0.00	48
1-2	84.21	5.26	7.89	2.63	38
2-3	84.21	5.26	7.89	2.63	38
3-4	91.67	8.33	0.00	0.00	12
4-5	87.50	12.50	0.00	0.00	8
5-6	85.71	0.00	0.00	14.29	7
6-7	71.43	28.57	0.00	0.00	8
7-8	50.00	50.00	0.00	0.00	5
8-9	50.00	50.00	0.00	0.00	5
9-10	50.00	50.00	0.00	0.00	4
Total	80.59	11.18	6.47	1.76	173
Average	73.39	22.03	2.62	1.95	17.3

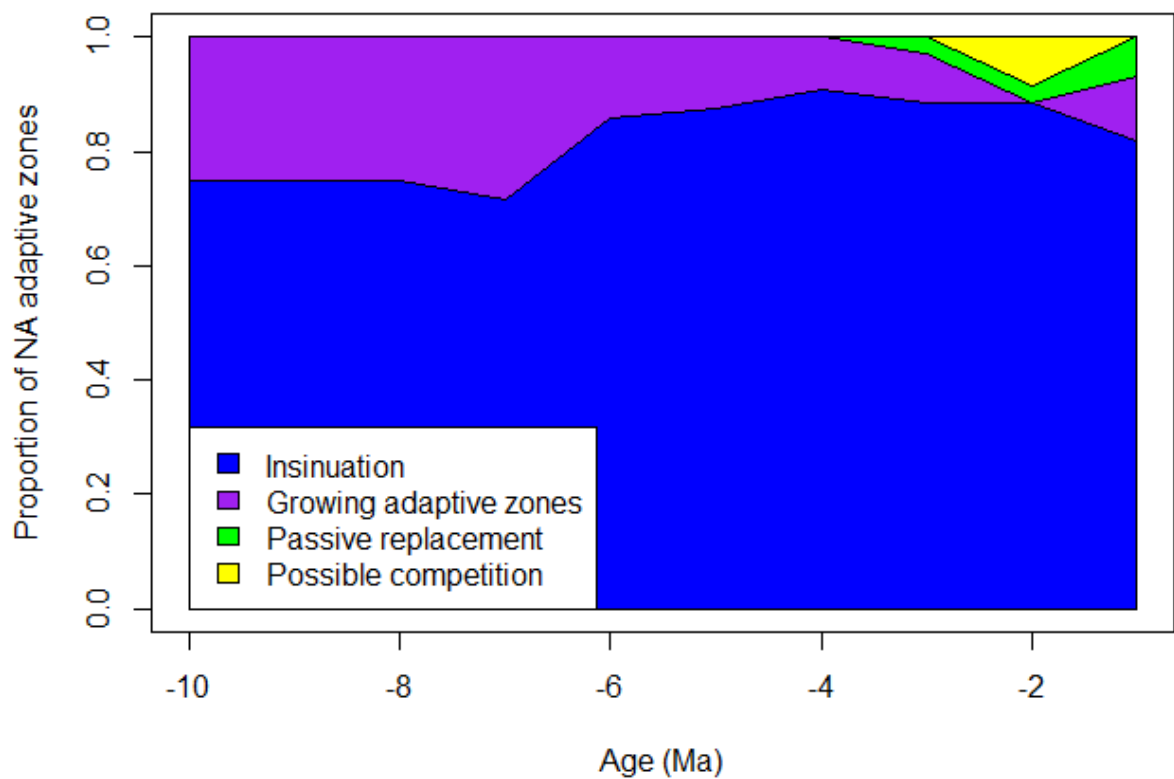


Figure S4.4.1: Proportion of adaptive zones for North American immigrant taxa with each relationship relative to South American native taxa over time, using the coarse version of Eisenberg's macroniche trophic categories. Labels are as for Figure 7.3 in the main text. Data is given in Table S4.4.1 above.

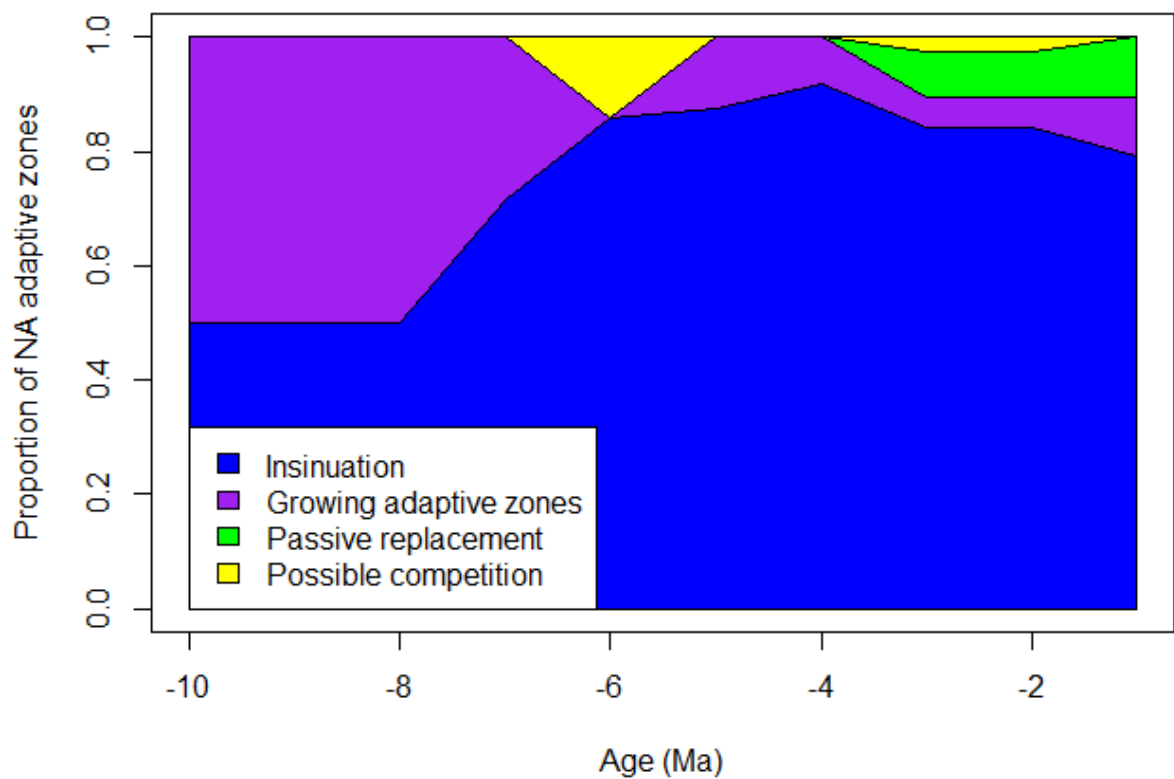


Figure 4.4.2: Proportion of adaptive zones for North American immigrant taxa with each relationship relative to South American native taxa over time, using Eisenberg's macroniche trophic categories. Labels are as for Figure 7.3 in the main text. Data is given in Table S4.4.2 above.

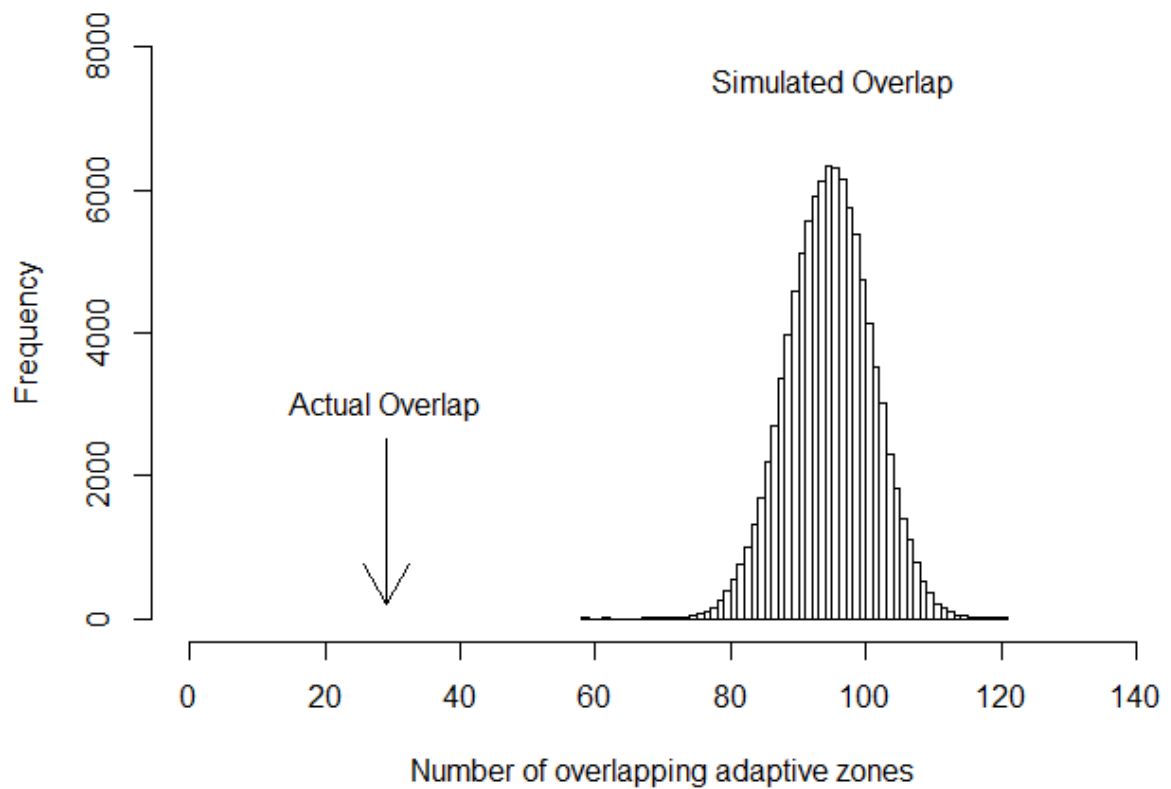


Figure 4.4.3: Comparison of simulated and actual overlap between North American immigrant and South American native taxa using the coarse version of Eisenberg's 1981 macroniche tropic categories. None of the 100,000 simulations produced as little ecological overlap as is actually observed, which supports the interpretation that these differences did not arise by random chance.

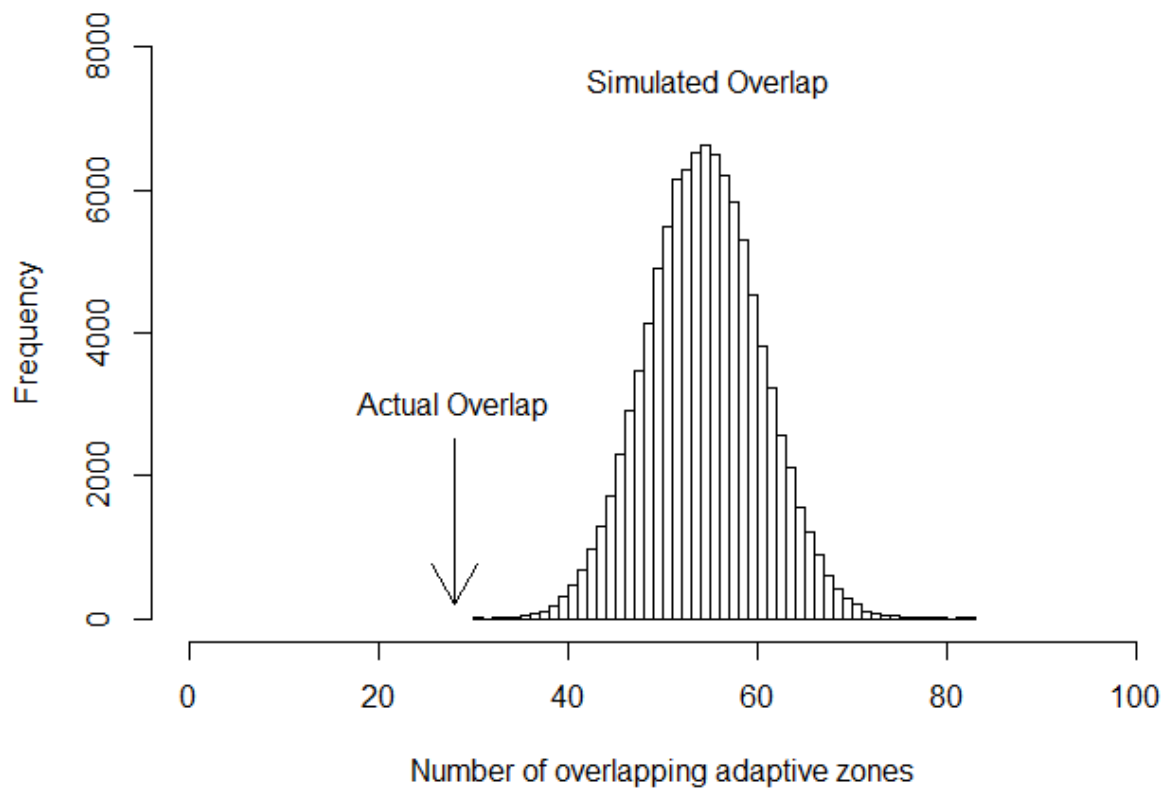


Figure S4.4.4: Comparison of simulated and actual overlap between North American immigrant and South American native taxa using Eisenberg's original 1981 macroniche trophic categories. None of the 100,000 simulations produced as little ecological overlap as is actually observed, which supports the interpretation that these differences did not arise by random chance.

5. Analysis of Ecological Turnover and Ecospace Occupation

In order to understand the ecological trends of native South American mammals before or throughout the GABI, the total ecospace occupation, calculated as the total number of unique adaptive zones, of native taxa was calculated for each one million year interval. This total was further broken down for each interval between “new” ecospace, or adaptive zones unoccupied in the preceding interval, and “old” ecospace, which had been previously occupied by native taxa. The results of this analysis are shown in Figure S4.4.5.

The results indicate substantial fluctuations over time. Furthermore, this analysis suggests that ecological diversity was highest during the late Miocene and declined somewhat during the Plio-Pleistocene. However, pooling data from several million years results in much higher total occupied ecospace estimates for the middle Miocene and Plio-Pleistocene, but only negligible increases for the late Miocene. Combined with the much higher number of species sampled in each interval of the late Miocene, this suggests that the pattern might be due to sampling biases rather than real changes in ecological diversity.

In order to test whether the patterns in total ecospace occupation and ecospace turnover are real or are due to sampling, simulations that conducted random subsampling were used (see code below). All species and their ecological characteristics for five-million-year intervals were analytically pooled. In each run of the simulation, a random subset of these species was selected for each one-million-year time interval. The number of species that were sampled was the same as the actual number of species known for that time interval. The simulation then tabulates and stores the ecospace occupation for each one million year interval. After 10,000, the average results from the simulations were compared with the observed data.

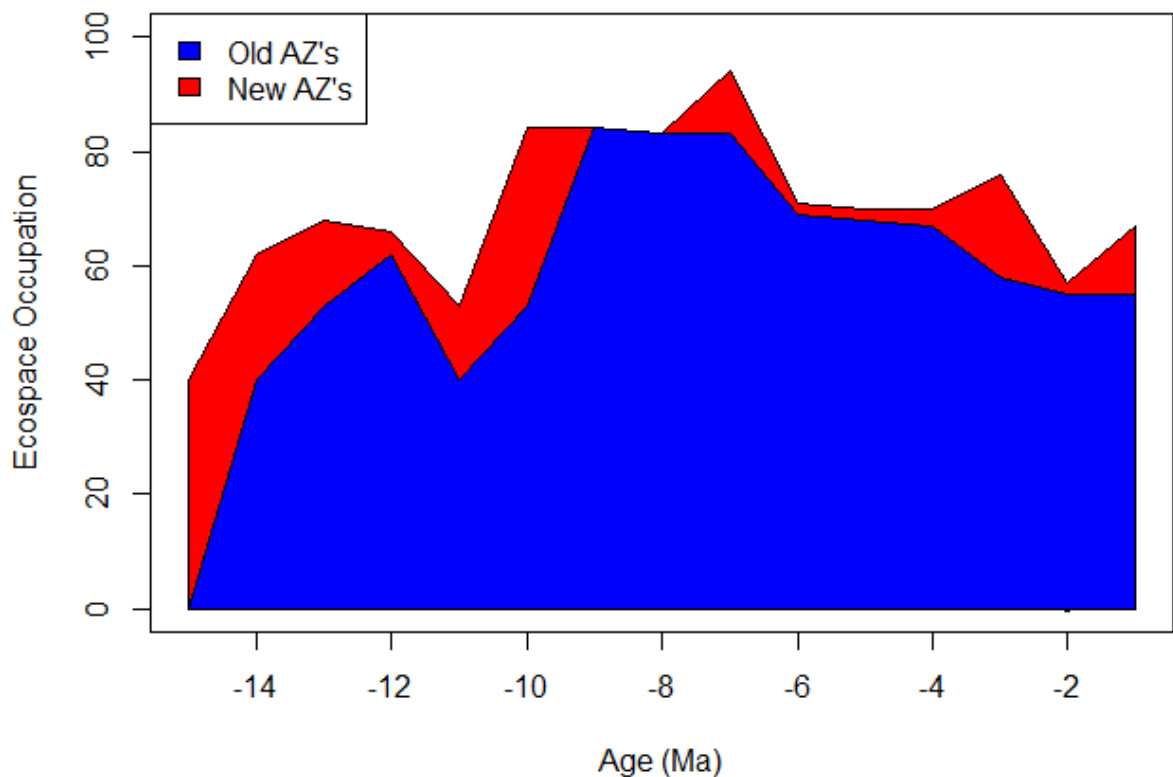


Figure S4.5: Ecospace occupation (total # occupied adaptive zones) and ecological turnover in South American mammals over time. This graph displays the changes in ecospace occupation over time. Red indicates adaptive zones that were unoccupied by native South American taxa in the preceding one million years, and blue indicates adaptive zones that were occupied in the previous interval. The ages indicate the one million year intervals beginning at the given date (e.g., “-14” indicates the interval between 14-13 Ma). Excluding the first interval because all adaptive zones are “new” with no previous interval for comparison, the largest periods of turnover are between 14-12 Ma, 10-9 Ma, with increased proportions of new adaptive zones also occurring between 7-6 Ma, 3-2 Ma, and 1 Ma – 11.7 Ka.

As shown in Figure 7.4 in the main text, the simulated data tracks very closely with observed data. The ecospace occupation for the intervals 2-1 Ma and 1-0.0117 Ma are slightly lower than expected based purely on random subsampling. This does suggest that the ecospace distribution for the last two million years was slightly different than for the preceding three mil-

lion years, most likely due to a reduction in total ecospace occupation. However, the observed data differs from the average simulated ecospace occupation by 14.0-15.5%, and is only 4.5-8.4% lower than the expected range, based on subsampling of the five million year pooled sample. Thus, while some reduction in ecological diversity likely occurred, an 8-15% reduction still leaves the end-Pleistocene native fauna within the range observed for previous time intervals. Thus, there is little evidence that the GABI or any other Plio-Pleistocene events led to a substantial loss of ecological diversity among native South American taxa.

Overall, the simulated and observed data track very closely. Such an observation indicates that the apparent rises and falls over time in total ecospace occupation are very likely an artifact of inadequate sampling at the one-million-year resolution. This result is not surprising, given that a recent study found by way of rarefaction analysis that Neotropical faunas of the Neogene remain severely undersampled (Carrillo et al. 2015). These results indicate that, if more completely sampled, the total ecospace occupation for each one-million-year interval would be more similar to the corresponding five-million-year total ecospace. Thus, the five-million-year total ecospace occupation likely provides more accurate insight into the overall trends in South American ecological diversity over time. With five-million-year intervals, South American ecological diversity appears quite stable. This pattern is not consistent with a large loss of ecological diversity resulting from the influx of North American mammals.

Code for simulations:

```
##This code has to be run 3 times: once for each 5 million year interval.
## Initialize simulations, Diversity is a vector of the number of species for each 1 Myr interval
##SA_t3 is a matrix of the possible adaptive zones represented by numeric codes as outlined in
      ##Appendix 4.2, with the first 3 columns representing the ecological variables
      ##and the fourth column providing the number of taxa occurring in that adaptive zone
Diversity<-c(143,146,166,121,167)
FilledNiches<-vector()
intervalniches<-vector()
nunique<-vector(length=5)
EcospaceMatrix<-matrix(nrow=1000,ncol=5)
##EcospaceMatrix is where the results are stored. Each row represents a different run of the
      ##simulations, and each column is a different time interval. Thus, the average of each
      ##column is the expected ecospace occupation based on random subsampling alone.

for (i in 1:length(SA_t3[,1])) {if (SA_t3[i,4]>0) for (z in 1:SA_t3[i,4]) FilledNiches<-
append(FilledNiches,i)}

for (i in 1:1000)
{
  for (u in 1:5)
  {
    intervalniches<-sample(FilledNiches, size = Diversity[u], replace = FALSE)
    uniqueV<-vector()
    for (q in 1:length(intervalniches))
    {
      niche<-intervalniches[q]
      if (q==1) uniqueV[1]<-niche
      inunique=0
      for (a in 1:length(uniqueV))
      {
        if (uniqueV[a]==niche) inunique=1
      }
      if (inunique==0) uniqueV<-append(uniqueV,niche)
    }

    nunique[u]<-length(uniqueV)
  }
  EcospaceMatrix[i,]<-nunique
}
```

6. Ecological categories for all taxa

Table S4.6: Ecological classification of South American taxa, 15 Ma-11.7 ka. Interpretations of numeric codes for body mass and locomotion (here abbreviated “Loc”) categories are given in Table S4.2.1, and for diet are given in Table S4.2.2. Diet 1 corresponds to the primary dietary classification system used in this study, Diet 2 corresponds to Eisenberg’s macroniche trophic categories, and Diet 3 refers to the simplified version of Eisenberg’s trophic categories (see Appendices 4.2 and 4.4). NAm stands for North American affinity, and SA stands for South American affinity. This was defined based on distribution of each taxon’s pre-GABI ancestors, not its immediate parent taxon. In other words, descendants of North American taxa are still classified with North American affinities, even if the individual taxon originated in South America. Likewise, taxa descendent from originally South American ancestors are given South American affinities, even if the particular species or genus originated in Central or North America. Also note that several taxa are outside the temporal range of this study, and so are not included in the final analyses. However, they are included here because the time ranges given on the PBDB were broad enough that they were downloaded in the original data set, and they are included with their temporal ranges here to clarify the reasons for which they were excluded from the ecological analyses.

Taxa	Body Mass	Loc	Diet 1	Diet 2	Diet 3	Min Age	Max Age	NAm /SA
<i>Abderites meridionalis</i>	1	2	1	11	4	16.3	17.5	SA
<i>Abrothrix illuteus</i>	1	3	13	9	4	0.0117	0.126	NAm
<i>Acantharodeia</i> sp.		6	8	9	4	5.333	9	SA
<i>Acarechimys</i> sp.	1	6	2	11	6	11.3	16	SA
<i>Acrecebus fraileyi</i>	2	1	1	10	5	6.5	10	SA
<i>Acrocyon</i> sp.	3	2	10	2	1	13.8	15.5	SA
<i>Actenomys priscus</i>	2	7	5	14	8	3.6	9	SA
<i>Actenomys</i> sp.	2	7	5	14	8	3	6.8	SA
<i>Acyon myctoderos</i>	2	2	10	2	1	12.7	13	SA
<i>Acyon tricuspidatus</i>	2	2	10	2	1	16.3	17.5	SA
<i>Adinotherium robustum</i>	4	5	6	14	8	16.3	17.5	SA
<i>Adinotherium</i> sp.	4	5	6	14	8	6.8	17.5	SA
<i>Aenigmys diamantensis</i>	2					0.0117	2.588	SA
<i>Agalmaceros blicki</i>	4	4	4	13	8	0.0117	2.588	NAm
<i>Ahytherium aureum</i>	5	5	3	13	8	0	2.588	SA
<i>Akodon azarae</i>	1	3	14	10	4	0.0117	0.781	NAm
<i>Akodon</i> sp.	1	3	14	10	5	0	2.588	NAm
<i>Alitoxodon</i> sp.	5	5	6	14	8	3.6	5.3	SA
<i>Alloimys</i> sp.	2	4	11	11	6	13.8	15.5	SA
<i>Alouatta mauroi</i>	2	1	12	12	7	0	0.126	SA
<i>Amphiocnus paranense</i>	5	2	3	13	8	6.8	9	SA
<i>Anadasypus aequatorianus</i>	2	6	13	9	4	9	11.8	SA
<i>Anadasypus hondanus</i>	2	6	13	9	4	13.5	12.9	SA
<i>Anadasypus</i> sp.	2	6	13	9	4	6.5	10	SA

Table S4.6: Ecological classification of South American taxa, 15 Ma - 11.7ka, cont.

<i>Andinomys edax</i>	1	3	6	14	8	0.0117	0.126	NAm
<i>Andinomys</i> sp.	1	3	6	14	8	0.781	2.588	NAm
<i>Antifer crassus</i>	5	4	4	13	8	2.588	3.6	NAm
<i>Antifer niemeyeri</i>	5	4	4	13	8	0	0.126	NAm
<i>Antifer</i> sp.	5	4	4	13	8	0.0117	2.588	NAm
<i>Arazamys castiglioni</i>	5	4				6.8	9	SA
<i>Arctodictis munizi</i>	4	5	10	2	1	16.3	17.5	SA
<i>Arctodus</i> sp.	6	5	8	10	5	0.781	2.588	NAm
<i>Arctotherium brasiliense</i>	6	5	8	10	5	0	2.588	NAm
<i>Arctotherium</i> sp.	5	5	8	10	5	0	1.2	NAm
<i>Arctotherium tarijense</i>	5	5	8	10	5	0.781	1.2	NAm
<i>Arctotherium wingei</i>	5	5	14	10	5	0	1.2	NAm
<i>Argyrolagus palmeri</i>	1	4	2	11	6	4	6.8	SA
<i>Artigasias magna</i>	5	4	4	13	8	3	4	SA
<i>Aspidocalyptus</i> sp.		5	4	14	8	6.8	9	SA
<i>Asterostemma</i> sp.	4	5	3	13	8	6.5	10	SA
<i>Astrapotherium</i> sp.	7	5	3	13	8	11.8	17.5	SA
<i>Auliscomys</i> sp.	1	3	6	14	8	4	6.8	NAm
<i>Australonyx aquae</i>	5	5	3	13	8	0.0117	0.781	SA
<i>Berthawyeria</i> sp.		5	4	14	8	6.8	9	SA
<i>Blastocerus</i> sp.	4	4	4	13	8	0.0117	2.588	NAm
<i>Bolivartherium codorensis</i>	7	6	5	14	8	3.6	5.3	SA
<i>Bolivartherium urumaquensis</i>	7	6	5	14	8	6.8	13.8	SA
<i>Bolomys</i> sp.	1	6	13	9	4	0	2.588	NAm
<i>Boreostemma acostae</i>	4	5	5	14	8	12.9	13.5	SA
<i>Boreostemma pliocena</i>	4	5	5	14	8	4	6.8	SA
<i>Boreostemma</i> sp.	4	5	5	14	8	2.588	13.8	SA
<i>Boreostemma venezolensis</i>	4	5	5	14	8	16.3	17.5	SA
<i>Borhyaena tuberata</i>	3	4	10	2	1	16.3	17.5	SA
<i>Borhyaenidium altiplanicus</i>	2	2	10	2	1	6.8	9	SA
<i>Borhyaenidium musteloides</i>	2	2	10	2	1	6.8	9	SA
<i>Borhyaenidium riggsi</i>	2	2	10	2	1	4	6.8	SA
<i>Borhyaenidium</i> sp.	2	2	10	2	1	6.8	9	SA
<i>Bounodus enigmaticus</i>	3	4	8	10	5	6.8	9	SA
<i>Briaromys</i> sp.	3					6.8	9	SA
<i>Cabassous</i> sp.	2	7	15	6	3	0	2.588	SA
<i>Calchaquitherium mixtum</i>	7	5	6	14	8	6.8	9	SA
<i>Calomys callosus</i>	1	3	14	9	4	0.012	0.781	NAm
<i>Calomys</i> sp.	1	3	14	9	4	0	2.588	NAm
<i>Canis dirus</i>	4	4	10	2	1	0.0117	2.588	NAm

Table S4.6: Ecological classification of South American taxa, 15 Ma - 11.7ka, cont.

<i>Canis</i> sp.	3	4	10	2	1	0.0117	2.588	NAm
<i>Cardiatherium chasicoense</i>	3	8	5	14	8	6.8	10	SA
<i>Cardiatherium paranense</i>	3	8	5	14	8	6.8	9	SA
<i>Cardiatherium patagonicum</i>	3	8	5	14	8	6.8	9	SA
<i>Cardiatherium</i> sp.	3	8	5	14	8	2.588	12	SA
<i>Cardiomya</i> sp.	3	4			8	2.588	12	SA
<i>Cartelles coimbrafilhoi</i>	3	1	1	11	7	0.010276	0.35989	SA
<i>Carterodon</i> sp.	1	6	3	13	8	0	2.588	SA
<i>Catagonus</i> sp.	3	4	14	10	5	0	2.588	NAm
<i>Catagonus stenocephalus</i>	3	4	14	10	5	0.781	1.2	NAm
<i>Catonyx chiliensis</i> (= <i>Scelidotherium reyesi</i>)	7	6	3	13	7	0	2.588	SA
<i>Catonyx cuvieri</i>	7	6	3	13	7	0	2.588	SA
<i>Catonyx tarijensis</i>	7	6	3	13	7	0.0117	6.8	SA
<i>Cavia</i> sp.	2	3	5	14	8	0	2.588	SA
<i>Caviodon multiplicatus</i>	3	4			8	3	4	SA
<i>Caviodon</i> sp.	3	4			8	2.588	9	SA
<i>Cebupithecia sarmientoi</i>	2	1	11	11	6	11.6	13.8	SA
<i>Cerdocyon thous</i>	2	3	8	10	5	0	0.126	NAm
<i>Chaetophractus</i> sp.	2	6	13	9	4	0.781	9	SA
<i>Chaetophractus villosus</i>	2	6	13	9	4	0.0117	3	SA
<i>Chapalmalania</i> sp.	3	2	19	10	5	2.588	6.8	NAm
<i>Charitoceros</i> sp.	4	4	3	13	8	0.781	2.588	NAm
<i>Chasichimys</i> sp.	1	3	4	14	8	9	10	SA
<i>Chasicostylus castroi</i>	2	2	10	2	1	5	12	SA
<i>Chasicotatus ameghinoi</i>	2	6	3	13	8	5	12	SA
<i>Chasicotatus</i> sp.	2	6	3	13	8	5.333	9	SA
<i>Chasicotatus spinozai</i>	2	6	3	13	8	6.8	9	SA
<i>Chironectes minimus</i>	1	8	20	1	2	0	2.588	SA
<i>Chironectes</i> sp.	1	8	20	1	2	6.8	11.62	SA
<i>Chlamydothorium</i> sp.	7	5	5	14	8	0.126	2.588	SA
<i>Chorobates</i> sp.	2	6	8	9	4	3	9	SA
<i>Chorobates villosissimus</i>	2	6	8	9	4	3.6	9	SA
<i>Chrotopterus auritus</i>	1	9	9	9	5	0	2.588	SA
<i>Chrysocyon brachyurus</i>	3	3	8	10	5	0	2.588	NAm
<i>Chrysocyon</i> sp.	3	3	8	10	5	0	2.588	NAm
<i>Cladosictis patagonica</i>	2	2	10	2	1	16.3	17.5	SA
<i>Clyomys</i> sp.	1	6	12	12	7	0	9	SA
<i>Cochlops muricatus</i>	4	5	3	13	8	16.3	17.5	SA

Table S4.6: Ecological classification of South American taxa, 15 Ma - 11.7ka, cont.

<i>Diadiaphorus eversus</i> (=Coelosoma eversa)	4	4	3	13	8	6.8	9	SA
<i>Coendou prehensilis</i>	2	1	1	12	7	0	0.126	SA
<i>Coendou</i> sp.	2	1	1	12	7	0.0117	2.588	SA
<i>Conepatus semistriatus</i>	2	6	8	10	5	0	0.126	NAm
<i>Conepatus</i> sp.	2	6	8	10	5	0.0117	0.781	NAm
<i>Conepatus suffocans</i>	2	6	8	10	5	0.781	2.588	NAm
<i>Contrerascynus</i> <i>borhyaenoides</i>		2	10	2	1	9	10	SA
<i>Cranithlastus xibiensis</i>		5	4	14	8	6.8	9	SA
<i>Cryptotis</i> sp.	1	6	7	9	4	0.0117	0.781	NAm
<i>Ctenomys cotocaensis</i>	2	7	16	14	8	0.781	1.2	SA
<i>Ctenomys kraglievichi</i>	2	7	16	14	8	0.126	0.781	SA
<i>Ctenomys magellanicus</i>	1	7	16	14	8	0.0117	0.781	SA
<i>Ctenomys praderii</i>	1	7	16	14	8	0.0117	2.588	SA
<i>Ctenomys</i> sp.	1	7	16	14	8	0	4	SA
<i>Ctenomys subassentiens</i>	2	7	16	14	8	0.781	2.588	SA
<i>Cullinia</i> sp.	5	4	4	13	8	6.5	10	SA
<i>Cuniculus paca</i>	3	3	12	12	7	0.126	0.781	SA
<i>Cuniculus</i> sp.	3	3	1	12	7	0.0117	0.126	SA
<i>Cuvieronius hyodon</i>	7	5	4	13	8	0.0117	2.588	NAm
<i>Cuvieronius</i> sp.	7	5	4	13	8	0	2.588	NAm
<i>Cuvieronius tropicus</i>	7	5	4	13	8	0.0117	5.333	NAm
<i>Cyonasua argentina</i>	2	2	8	10	5	6.8	9	NAm
<i>Cyonasua groeberi</i>	2	2	8	10	5	4	9	NAm
<i>Cyonasua pascuali</i>	2	2	8	10	5	6.8	9	NAm
<i>Cyonasua</i> sp.	2	2	8	10	5	2.588	9	NAm
<i>Dasyprocta</i> sp.	2	4	11	11	6	0.0117	2.588	SA
<i>Dasypus hybridus</i>	2	6	13	9	4	0.0117	0.126	SA
<i>Dasypus neogaeus</i>	2	6	13	9	4	6.8	9	SA
<i>Dasypus sabanicola</i>	2	6	13	9	4	0.0117	0.126	SA
<i>Dasypus</i> sp.	2	6	13	9	4	0	2.588	SA
<i>Dasypus villosus</i>	2	6	13	9	4	0.781	1.2	SA
<i>Desmodus draculae</i>	1	9	17	16	1	0	2.588	SA
<i>Desmodus rotundus</i>	1	9	17	16	1	0	0.126	SA
<i>Diadiaphorus majusculus</i>	4	4	3	13	7	16.3	17.5	SA
<i>Diadiaphorus</i> sp.	4	4	3	13	7	3.6	15.5	SA
<i>Dicolpomys fossor</i>	1	7	11	11	6	0	2.588	SA
<i>Didelphis solimoensis</i>	1	2	1	11	6	6.5	10	SA
<i>Didelphis</i> sp.	2	2	8	10	5	0.0117	4	SA
<i>Dilobodon lutarius</i>		5	6	14	8	6.8	9	SA

Table S4.6: Ecological classification of South American taxa, 15 Ma - 11.7ka, cont.

<i>Doedicurus</i> sp.	7	5	5	14	8	0	3	SA
<i>Doellomys</i> sp.		3				6.8	9	SA
<i>Doellotatus chapadmalensis</i>	2	6	3	13	8	3	9	SA
<i>Doellotatus inornatus</i>	2	6	3	13	8	3.6	9	SA
<i>Doellotatus</i> sp.	2	6	3	13	8	4	9	SA
<i>Dolicavia minuscula</i>	2	3	4	14	8	3	4	SA
<i>Dolicavia</i> sp.	2	3	4	14	8	3.6	9	SA
<i>Dolichotis patagonum</i>	3	4	4	14	8	0.012	0.781	SA
<i>Dolichotis</i> sp.	2	4	4	14	8	0.0117	2.588	SA
<i>Drytomomys aequatorialis</i>	3	4				11.6	13.8	SA
<i>Drytomomys</i> sp.	3	4				6.8	16	SA
<i>Dusicyon avus</i>	3	4	10	2	1	0.0117	0.781	NAm
<i>Dusicyon culpaeus</i>	2	4	9	10	5	0.0117	2.588	NAm
<i>Dusicyon sechurae</i>	2	4	8	10	5	0.0117	0.781	NAm
<i>Dusicyon</i> sp.	2	4	10	2	1	0.0117	2.588	NAm
<i>Echimys</i> sp.	1	1	12	12	7	0.0117	0.126	SA
<i>Eionaletherium tanycnemius</i>	7	6	5	14	8	6.8	9	SA
<i>Eira barbara</i>	2	2	9	10	5	0	0.126	NAm
<i>Eleutherocercus paranensis</i>	5	5	5	14	8	6.8	9	SA
<i>Eleutherocercus</i> sp.	5	5	5	14	8	4	6.8	SA
<i>Eligmodontia typus</i>	1	6	2	11	6	0.012	0.781	NAm
<i>Eoauchenia</i> sp.	3	4	4	13	8	3.6	9	SA
<i>Eodolichotis elachys</i>	2	3	4	14	8	11.6	13.5	SA
<i>Eodolichotis maddenii</i>	2	3	4	14	8	12.9	13.5	SA
<i>Eodolichotis</i> sp.	2	3	4	14	8	11.6	12.9	SA
<i>Eosclerocalyptus planus</i>	5	5	4	14	8	3	9	SA
<i>Eosclerocalyptus</i> sp.	5	5	4	14	8	3	9	SA
<i>Epecuenia</i> sp.	3	4	3	13	7	6.8	9	SA
<i>Epieurycerus truncus</i>	5	4	3	13	8	0.126	0.781	NAm
<i>Eptesicus fuscus</i>	1	9	7	9	4	0.0117	0.126	SA
<i>Eptesicus</i> sp.	1	9	7	9	4	0	0.126	SA
<i>Equus andium</i>	5	4	4	14	8	0.0117	2.588	NAm
<i>Equus caballus</i>	5	4	5	14	8	0	2.588	NAm
<i>Equus insulatus</i>	5	4	4	14	8	0.0117	2.588	NAm
<i>Equus santaeelenae</i>	5	4	5	14	8	0.0117	2.588	NAm
<i>Equus</i> sp.	5	4	5	14	8	0	2.588	NAm
<i>Eremotherium elenense</i>	7	5	4	13	8	0.0117	0.781	SA

Table S4.6: Ecological classification of South American taxa, 15 Ma - 11.7ka, cont.

<i>Eremotherium laurillardi</i>	7	5	3	13	8	0	3.6	SA
<i>Eremotherium sefvei</i>	6	5	3	13	8	0.0117	0.126	SA
<i>Eremotherium</i> sp.	7	5	3	13	8	0	2.588	SA
<i>Erethizon</i> sp.	3	2	6	14	8	1.2	3	NAm
<i>Eucelophorus</i> sp.	1	7	16	14	8	3	6.8	SA
<i>Eucholoeops ingens</i>	4	2	3	13	8	16.3	17.5	SA
<i>Eumegamys</i> sp.	5	5	5	14	8	2.588	10	SA
<i>Eumegamysops</i> sp.	5	5	5	14	8	6.8	9	SA
<i>Eumops</i> sp.	1	9	7	9	5	11.6	12.9	SA
<i>Eumysops formosus</i>	1	6	11	11	6	4	6.8	SA
<i>Eumysops laeviplicatus</i>	1	6	11	11	6	4	6.8	SA
<i>Eumysops parodii</i>	1	6	11	11	6	6.8	9	SA
<i>Eumysops</i> sp.	1	6	11	11	6	0.0117	10	SA
<i>Euphractus patagonicus</i>	2	6	8	9	4	16.3	17.5	SA
<i>Euphractus sexcinctus</i>	2	6	8	9	4	0	2.588	SA
<i>Euphractus</i> sp.	2	6	8	9	4	0.0117	0.126	SA
<i>Euryzygomatomys</i> sp.	1	6	6	14	8	0.781	2.588	SA
<i>Eutatus seguini</i>	4	6	3	13	8	0.0117	1.2	SA
<i>Eutatus</i> sp.	4	6	3	13	8	0.781	1.2	SA
<i>Felis platensis</i>	2	2	10	2	1	0.0117	2.588	NAm
<i>Felis</i> sp.	2	2	10	2	1	0.0117	2.588	NAm
<i>Galea musteloides</i>	1	3	4	14	8	0.0117	0.126	SA
<i>Galea</i> sp.	1	3	4	14	8	0.0117	4	SA
<i>Galea spixii</i>	1	3	4	14	8	0	2.588	SA
<i>Galictis</i> sp.	2	6	10	2	1	0.0117	2.588	NAm
<i>Galileomys colloncurensis</i>	1					13.8	15.5	SA
<i>Glossotheriopsis pascuali</i>	3	6	4	14	8	13.8	15.5	SA
<i>Glossotherium chapadmalense</i>	5	6	5	14	8	3	6.8	SA
<i>Glossotherium giganteum</i>	7	6	5	14	8	0.0117	2.588	SA
<i>Glossotherium robustum</i>	7	6	5	14	8	0.0117	2.588	SA
<i>Glossotherium</i> sp.	7	6	5	14	8	0	2.6	SA
<i>Glossotherium tropicorum</i>	7	6	5	14	8	0.0117	0.781	SA
<i>Glyptodon clavipes</i>	7	5	5	14	8	0	2.588	SA
<i>Glyptodon elongatus</i>	7	5	5	14	8	0.0117	0.126	SA
<i>Glyptodon munizi</i>	7	5	5	14	8	0.8	1.2	SA
<i>Glyptodon reticulatus</i>	6	5	5	14	8	0	2.588	SA
<i>Glyptodon</i> sp.	7	5	5	14	8	0	3.6	SA
<i>Glyptotherium cylindricum</i>	7	5	5	14	8	0.0117	0.126	SA
<i>Gracilinanus</i> sp.	1	2	13	9	5	0	2.588	SA
<i>Granastropotherium snorki</i>	6	5	3	13	8	11.6	13.8	SA

Table S4.6: Ecological classification of South American taxa, 15 Ma - 11.7ka, cont.

<i>Guiomys</i> sp.	2	3	4	14	8	13	15.6	SA
<i>Guiomys unica</i>	2	3	4	14	8	11.6	15.97	SA
<i>Gyrinodon quassus</i>	7	5	6	14	8	2.588	5.333	SA
<i>Gyrinodon</i> sp.	7	5	6	14	8	6.5	10	SA
<i>Hapalops angustipalatus</i>	3	2	3	13	8	12.7	13	SA
<i>Hapalops</i> sp.	3	2	3	13	8	6.5	10	SA
<i>Haplomastodon chimborazi</i>	7	5	6	14	8	0.0117	2.588	NAm
<i>Haplomastodon</i> sp.	7	5	6	14	8	0.0117	2.588	NAm
<i>Haplomastodon waringi</i>	7	5	6	14	8	0.0117	2.588	NAm
<i>Haplostropha</i> sp.						6.8	9	SA
<i>Hegetotherium mirabile</i>	2	6	6	14	8	16.3	17.5	SA
<i>Hegetotherium</i> sp.	2	6	6	14	8	13.8	15.5	SA
<i>Hemiauchenia paradoxa</i>	6	4	4	13	8	0.0117	2.588	NAm
<i>Hemiauchenia</i> sp.	5	4	4	13	8	0.0117	2.588	NAm
<i>Hemihegetotherium</i> sp.	3	4	6	14	8	3	11.608	SA
<i>Hemihegetotherium trilobus</i>	3	4	6	14	8	12.7	13	SA
<i>Herpailurus</i> sp.	3	2	10	2	1	0.126	0.781	NAm
<i>Heteromys</i> sp.	1	7	1	11	6	0.0117	0.126	NAm
<i>Hilarchotherium castanedaii</i>	7	5	3	13	8	12.9	13.5	SA
<i>Hippidion principale</i>	5	4	4	14	8	0.126	2.588	NAm
<i>Hippidion saldiasi</i>	5	4	4	14	8	0.0117	2.5	NAm
<i>Hippidion</i> sp.	5	4	4	14	8	0	5.333	NAm
<i>Hippocamelus</i> sp.	4	4	3	13	8	0.0117	2.588	NAm
<i>Hiskatherium saintandrei</i>	3	5	12	12	7	12.7	13	SA
<i>Hoffstetterius imperator</i>		5	6	14	8	6.8	9	SA
<i>Holmesina occidentalis</i>	5	4	5	14	8	0.0117	1	SA
<i>Holmesina paulacoutoi</i>	5	4	5	14	8	0	0.781	SA
<i>Holmesina</i> sp.	5	4	5	14	8	0.0117	3.6	SA
<i>Holochilus brasiliensis</i>	1	8	5	14	8	0	2.588	NAm
<i>Holochilus primigenus</i>	1	8	5	14	8	0.781	1.2	NAm
<i>Holochilus</i> sp.	1	8	5	14	8	0.0117	0.781	NAm
<i>Holozaedyus laevisculptus</i>		6	8	9	4	4	6.8	SA
<i>Homalodotherium</i> sp.		5	3	13	8	16.3	17.5	SA
<i>Homotherium venezuelensis</i>	5	3	10	2	1	0.126	2.588	NAm
<i>Homunculus patagonicus</i>	2	1	12	12	7	16.3	17.5	SA
<i>Homunculus</i> sp.	2	1	12	12	7	12.9	13.5	SA
<i>Hondadelphys fieldsi</i>	2	2	7	10	5	11.6	12.9	SA
<i>Hondalagus altiplanensis</i>	1	4	2	11	6	11.6	15.97	SA
<i>Hoplophorus euphractus</i>	6	5	5	14	8	0.0117	0.126	SA

Table S4.6: Ecological classification of South American taxa, 15 Ma - 11.7ka, cont.

<i>Hoplophorus</i> sp.	6	5	5	14	8	0	9	SA
<i>Hoplophorus verus</i>	6	5	5	14	8	6.8	9	SA
<i>Huilatherium pluripicatum</i>	5	8	3	13	8	11.6	13.8	SA
<i>Hydrochoeropsis dasseni</i>	5	8	5	14	8	1.2	3	SA
<i>Hydrochoeropsis</i> sp.	5	8	5	14	8	2.588	3.6	SA
<i>Hydrochoerus ballesterensis</i>	4	8	5	14	8	2.588	3.6	SA
<i>Hydrochoerus hydrochaeris</i>	4	8	5	14	8	0	1.2	SA
<i>Hydrochoerus</i> sp.	4	8	5	14	8	0.0117	2.588	SA
<i>Hyperdidelphys pattersoni</i>	2	2	9	10	5	6.8	9	SA
<i>Hyperdidelphys</i> sp.	2	2	9	10	5	4	6.8	SA
<i>Hypsitherium bolivianum</i>	3	7	5	14	8	3	6.8	SA
<i>Interatherium</i> sp.	2	6	5	14	8	13.8	17.5	SA
<i>Isostylomys</i> sp.	4	4	4	14	8	6.8	9	SA
<i>Josephoartigasiá monesi</i>	6	5	3	13	8	0.8	6.8	SA
<i>Kerodon</i> sp.	2	2	3	13	8	0.0117	0.126	NAm
<i>Kiyumylodon lecuonai</i>	7	6	5	14	8	6.8	9	SA
<i>Kraglievichia paranense</i>	4	4	5	14	8	6.8	9	SA
<i>Kraglievichia</i> sp.	4	4	5	14	8	5	12	SA
<i>Kunsia</i> sp.	1	6	16	14	8	0	2.588	NAm
<i>Lagidium</i> sp.	2	4	5	14	8	0.0117	0.781	SA
<i>Lagonimico conclucatus</i>	2	1	1	4	7	12.9	13.5	SA
<i>Lagostomus maximus</i>	2	6	5	14	8	0.0117	0.781	SA
<i>Lagostomus</i> sp.	2	6	5	14	8	0.0117	9	SA
<i>Lakukullus anatisrostratus</i>	5	5	3	13	8	11.8	13.8	SA
<i>Lama castelnaudi</i>	5	4	4	14	8	0.781	1.2	NAm
<i>Lama gracilis</i>	4	4	4	14	8	0.0117	2.5	NAm
<i>Lama guanicoe</i>	5	4	4	14	8	0	1.2	NAm
<i>Lama</i> sp.	5	4	4	14	8	0	2.588	NAm
<i>Leopardus braccatus</i>	2	2	10	2	1	0	2.588	NAm
<i>Leopardus pardalis</i>	3	2	10	2	1	0	0.126	NAm
<i>Leopardus</i> sp.	2	2	10	2	1	0	0.126	NAm
<i>Leopardus tigrinus</i>	2	2	10	2	1	0	0.126	NAm
<i>Leopardus vorohuensis</i>	2	2	10	2	1	1.2	3	NAm
<i>Lestobradys sprechmanni</i>	6	5	3	14	8	6.8	9	SA
<i>Lestodelphys halli</i>	1	3	10	2	1	0.0117	0.781	SA
<i>Lestodelphys</i> sp.	1	3	10	2	1	0.0117	0.781	SA
<i>Lestodon armatus</i>	7	6	5	14	8	0	9	SA
<i>Lestodon</i> sp.	7	6	5	14	8	0.0117	6.8	SA

Table S4.6: Ecological classification of South American taxa, 15 Ma - 11.7ka, cont.

<i>Lonchophylla</i> sp.	1	9	18	3	10	0	0.126	SA
<i>Lontra longicaudis</i>	2	8	20	1	2	0	0.126	NAAm
<i>Lophostoma silvicolum</i>	1	9	7	9	4	0.0117	0.126	SA
<i>Luantus</i> sp.	2	4	4	14	8	11.8	17.5	SA
<i>Lundomys</i> sp.	1	8	3	14	8	0.126	0.781	NAAm
<i>Lutreolina crassicaudata</i>	1	3	8	10	5	0.781	4	SA
<i>Lutreolina materdei</i>	2	3	8	10	5	6.5	10	SA
<i>Lutreolina</i> sp.	1	3	8	10	5	0.781	9	SA
<i>Lycopsis longirostris</i>	3	3	10	2	1	11.6	12.9	SA
<i>Lycopsis viverensis</i>	3	3	10	2	1	9	10	SA
<i>Lyncodon</i> sp.	1	6	10	2	1	0.012	0.781	NAAm
<i>Macrauchenia patachonica</i>	6	4	4	13	8	0.0117	2.588	SA
<i>Macrauchenia</i> sp.	6	4	4	13	8	0	9	SA
<i>Macraucheniaopsis</i> sp.	7	4	4	13	8	0.126	0.781	SA
<i>Macrochorobates chapadmalensis</i>	2	6	8	9	4	3	6.8	SA
<i>Macrochorobates scalabrinii</i>	2	6	8	9	4	5.333	10	SA
<i>Macroeuphractus retusus</i>		6	9	9	4	3	9	SA
<i>Macroeuphractus</i> sp.		6	9	9	4	3.6	9	SA
<i>Mammut</i> sp.	7	5	3	13	8	0.0117	2.588	NAAm
<i>Marisela</i> sp.	2					2.588	3.6	SA
<i>Marmosa contrerasi</i>	1	2	13	9	4	4	6.8	SA
<i>Marmosa</i> sp.	1	2	13	9	4	0	13.8	SA
<i>Maruchito trilofodonte</i>	2	1	12	12	7	13.8	15.5	SA
<i>Mazama americana</i>	3	4	12	12	7	0.0117	2.588	NAAm
<i>Mazama</i> sp.	3	4	12	12	7	0	2.588	NAAm
<i>Megabradys darwini</i>		6	5	14	8	5.333	11.608	SA
<i>Megadolodus molariformis</i>	3	3	14	10	5	11.8	13.8	SA
<i>Megalonychops primigenius</i>	7	5	3	13	8	6.8	9	SA
<i>Megastus</i> sp.	2	4	4	13	8	13.8	15.5	SA
<i>Megathericulus patagonicus</i>	6	5	3	13	8	10	11.8	SA
<i>Megathericulus</i> sp.	6	5	3	13	8	11.6	13.8	SA
<i>Megatherium altiplanicum</i>	7	5	3	13	8	3.6	5.333	SA
<i>Megatherium americanum</i>	7	5	3	13	8	0.0117	2.588	SA
<i>Megatherium celendinense</i>	7	5	3	13	8	0.0117	0.781	SA
<i>Megatherium medinae</i>	7	5	3	13	8	0.0117	2.588	SA

Table S4.6: Ecological classification of South American taxa, 15 Ma - 11.7ka, cont.

<i>Megatherium</i> sp.	7	5	3	13	8	0	5	SA
<i>Megatherium sundti</i>	7	5	3	13	8	0.0117	2.588	SA
<i>Megatherium tarijense</i>	7	5	3	13	8	0.0117	0.781	SA
<i>Megatherium urbinai</i>	7	5	3	13	8	0.0117	2.588	SA
<i>Megistonyx oreobios</i>	5	5	3	13	8	0.017385	0.126	SA
<i>Mesoprocta hypsodus</i>	2	4	11	11	6	12.7	13	SA
<i>Mesotherium</i> sp.	4	7	16	14	8	0.0117	2.588	SA
<i>Micoureus laventicus</i>	1	1	7	9	4	11.6	15.6	SA
<i>Microbiotherium tehuelchum</i>	1	1	7	9	4	16.3	17.5	SA
<i>Microcardiodon williensis</i>	2	3	5	14	8	11.608	15.97	SA
<i>Microcavia aua</i>	1	3	12	12	7	0.0117	0.126	SA
<i>Microcavia australis</i>	1	3	12	12	7	0.0117	0.781	SA
<i>Microcavia</i> sp.	1	3	12	12	7	0.0117	5.333	SA
<i>Micronycteris</i> sp.	1	9	7	8	4	0.0117	0.126	SA
<i>Microscleromys cribriphilus</i>	1	4	11	11	6	11.6	12.9	SA
<i>Microscleromys paradoxalis</i>	1	4	11	11	6	11.6	12.9	SA
<i>Microsteiromys jacobsi</i>	1	1	11	11	6	11.6	12.9	SA
<i>Microsteiromys</i> sp.	1	1	11	11	6	13	15.6	SA
<i>Microtragulus rusconii</i>	1	4	2	11	6	6.8	9	SA
<i>Microtragulus</i> sp.	1	4	2	11	6	0.0117	6.8	SA
<i>Microtypotherium choquecotense</i>	3	7	16	14	8	5.333	16	SA
<i>Miocallicebus villaviejai</i>	2	1	12	12	7	12.9	13.5	SA
<i>Miocochilius anomopodus</i>	2	4	5	14	8	11.6	13.8	SA
<i>Miocochilius federicoi</i>	2	4	5	14	8	12.7	13	SA
<i>Miocochilius</i> sp.	3	4	5	14	8	11.8	13.8	SA
<i>Mirandabradys socorrensis</i>	7	6	4	14	8	11.608	15.97	SA
<i>Mirandabradys urumaquensis</i>	7	6	4	14	8	6.8	13.8	SA
<i>Mirandabradys zabasi</i>	7	6	4	14	8	2.588	5.333	SA
<i>Mixotoxodon larensis</i>	7	5	6	14	8	0.0117	2.588	SA
<i>Mixotoxodon</i> sp.	7	5	6	14	8	0.0117	2.588	SA
<i>Monodelphis domestica</i>	1	2	7	9	4	0	2.588	SA
<i>Morenelaphus brachyceros</i>	4	4	4	13	8	0.0117	2.588	NAm
<i>Morenelaphus</i> sp.	4	4	4	13	8	0.0117	0.781	NAm
<i>Mormoops</i> sp.	1	9	7	7	4	0	0.126	NAm
<i>Munizia paranensis</i>	3	4	5	14	8	6.8	9	SA

Table S4.6: Ecological classification of South American taxa, 15 Ma - 11.7ka, cont.

<i>Mylodon</i> sp.	7	6	5	14	8	0	2.588	SA
<i>Mylodonopsis ibseni</i>	7	6	3	13	8	0	2.588	SA
<i>Myocastor coypus</i>	2	8	5	14	8	0	9	SA
<i>Myocastor perditus</i>	2	8	5	14	8	0.781	2.588	SA
<i>Myocastor</i> sp.	2	8	5	14	8	0.0117	9	SA
<i>Myrmecophaga tridactyla</i>	3	6	15	6	3	0	0.126	SA
<i>Nanoastegotherium prostaticum</i>	2	6	15	6	3	11.6	12.9	SA
<i>Nasua</i> sp.	2	2	8	10	5	0.781	2.588	NAm
<i>Necromys lactens</i>	1	3	13	9	4	0.0117	0.126	NAm
<i>Necromys</i> sp.	1	3	13	9	4	4	6.8	NAm
<i>Nectomys squamipes</i>	1	8	8	9	4	0.781	2.588	NAm
<i>Neobrachytherium ameghinoi</i>	3	4	3	13	8	6.8	9	SA
<i>Neobrachytherium</i> sp.	3	4	3	13	8	5.333	9	SA
<i>Neocavia depressidens</i>	1	3	4	14	8	2.588	5.333	SA
<i>Neocavia</i> sp.	1	3	4	14	8	4	9	SA
<i>Neochoerus sirasakae</i>	5	8	5	14	8	0.0117	0.781	SA
<i>Neochoerus</i> sp.	5	8	5	14	8	0.0117	2.588	SA
<i>Neoepiblema ambrosettianus</i>	5	8	5	14	8	6.5	10	SA
<i>Neoepiblema horridula</i>	3	8	5	14	8	6.5	10	SA
<i>Neoepiblema</i> sp.	4	8	5	14	8	2.588	16	SA
<i>Neoglyptatelus originalis</i>	3	5	15	6	3	11.6	13.8	SA
<i>Neoglyptatelus sincelejanus</i>	3	5	15	6	3	2.588	5.333	SA
<i>Neoglyptatelus</i> sp.	3	5	15	6	3	6.5	16	SA
<i>Neohapalops rothi</i>	5	5	3	13	8	6.8	10	SA
<i>Neolicaphrium recens</i>	3	4	4	13	8	0.0117	2.588	SA
<i>Neonematherium</i> sp.	3	6	3	13	8	11.8	13.8	SA
<i>Neophanomys biplicatus</i>	1	2	2	11	6	3	9	SA
<i>Neophanomys</i> sp.	1	2	2	11	6	4	6.8	SA
<i>Neoreomys huilensis</i>	2	4	11	11	6	11.6	12.9	SA
<i>Neoreomys</i> sp.	2	4	11	11	6	13.8	15.5	SA
<i>Neosaimiri fieldsi</i>	2	1	13	9	4	11.8	13.8	SA
<i>Neosclerocalyptus heusseri</i>	6	5	5	14	8	0.0117	0.781	SA
<i>Neosclerocalyptus</i> sp.	5	5	5	14	8	0	5.333	SA
<i>Neosteiromys</i> sp.	3	2	12	12	7	4	9	SA
<i>Neosteiromys tordillense</i>	2	2	12	12	7	13.8	15.5	SA
<i>Neotamandua australis</i>	2	2	15	6	3	13.8	15.5	SA
<i>Neotamandua borealis</i>	3	2	15	6	3	11.8	13.8	SA

Table S4.6: Ecological classification of South American taxa, 15 Ma - 11.7ka, cont.

<i>Neotamandua conspicua</i>	2	2	15	6	3	3	6.8	SA
<i>Neothoracophorus</i> sp.	6	5	5	14	8	0.0117	15.5	SA
<i>Neotomys ebriosus</i>	1	8				0.0117	0.126	NAm
<i>Nesodon imbricatus</i>	6	5	6	14	8	16.3	17.5	SA
<i>Nesodon</i> sp.	5	5	6	14	8	16.3	17.5	SA
<i>Neuryurus giganteus</i>	6	5	5	14	8	3.6	5.333	SA
<i>Neuryurus</i> sp.	6	5	5	14	8	0	3.6	SA
<i>Noctilio lacrimaelunaris</i>	1	9	7	9	4	6.5	10	SA
<i>Nothropus nordenskioldi</i>	5	1	3	13	8	0.0117	0.781	SA
<i>Nothropus</i> sp.	5	5	3	13	8	0.781	2.588	SA
<i>Nothrotherium maquinense</i>	4	5	3	13	8	0	2.588	SA
<i>Nothrotherium</i> sp.	5	5	3	13	8	0	2.588	SA
<i>Notictis ortizi</i>	2	2	10	2	1	6.8	11.62	SA
<i>Notiomastodon</i> sp.	7	5	6	14	8	0.781	2.588	NAm
<i>Notocynus hermosicus</i>	2	2	10	2	1	4	6.8	SA
<i>Notonycteris magdalenensis</i>	1	9	10	2	1	11.6	13.8	SA
<i>Notonycteris sucharadeus</i>	1	9	10	2	1	11.6	12.9	SA
<i>Nuciraptor rubricae</i>	2	1	11	11	6	11.6	12.9	SA
<i>Nunezia caroloameghinoi</i>	3	6	15	6	3	4	6.8	SA
<i>Ocnerotherium</i> sp.	7	5	6	14	8	6.8	9	SA
<i>Octodontobradys</i> sp.	6	5	5	14	8	6.5	16	SA
<i>Octomylodon aversus</i>	6	6	3	13	8	6.8	9	SA
<i>Odocoileus</i> sp.	4	4	3	13	8	0.0117	0.781	NAm
<i>Oligoryzomys flavescens</i>	1	2	13	9	4	0.0117	0.126	NAm
<i>Oligoryzomys longicaudatus</i>	1	2	12	10	6	0.0117	0.126	NAm
<i>Oligoryzomys</i> sp.	1	2	13	9	4	0	2.588	NAm
<i>Orthomyctera</i> sp.	2	4	4	14	8	3	12.704	SA
<i>Ortotherium brevirostrum</i>	5	5	3	13	8	6.8	9	SA
<i>Ortotherium laticurvatum</i>	5	5	3	13	8	6.8	9	SA
<i>Oxymycterus</i> sp.	1	6	7	9	4	0.126	2.588	NAm
<i>Oxymycterus wayku</i>	1	6	7	9	4	0.0117	0.126	NAm
<i>Oxydontherium piramydatus</i>	5	4	4	13	8	6.8	9	SA
<i>Oxydontherium</i> sp.	5	4	4	13	8	2.588	3.6	SA
<i>Oxydontherium zeballozi</i>	5	4	4	13	8	3	9	SA
<i>Ozotoceros bezoarticus</i>	3	4	4	14	8	0.0117	0.781	NAm
<i>Ozotoceros</i> sp.	3	4	4	14	8	0	2.588	NAm
<i>Pachyarmatherium brasiliense</i>	5	5	15	6	3	0	0.126	SA

Table S4.6: Ecological classification of South American taxa, 15 Ma - 11.7ka, cont.

<i>Pachyarmatherium tenebris</i>	5	5	15	6	3	0.0117	2.588	SA
<i>Pachyrukhos</i> sp.	2	4	16	14	8	13.8	15.5	SA
<i>Paedotherium bonaerense</i>	2	6	16	14	8	3	9	SA
<i>Paedotherium minor</i>	2	6	16	14	8	5	17.5	SA
<i>Paedotherium</i> sp.	2	6	16	14	8	0.0117	9	SA
<i>Paedotherium typicum</i>	2	6	16	14	8	1.07	6.8	SA
<i>Palaeohoplophorus antiquus</i>		5	4	14	8	6.8	9	SA
<i>Palaeocavia</i> sp.	2	3	4	14	8	3	9	SA
<i>Palaeoctodon simplicidens</i>	1					6.8	9	SA
<i>Palaeolama major</i>	5	4	3	13	8	0	2.588	NAm
<i>Palaeolama</i> sp.	5	4	3	13	8	0.0117	3.6	NAm
<i>Palaeolama weddelli</i>	5	4	3	13	8	0.0117	2.588	NAm
<i>Palaeomyrmidon</i> sp.	2	1	15	6	3	3	6.8	SA
<i>Paleuphractus</i> sp.	2	6	8	9	4	3.6	9	SA
<i>Pampatherium humboldtii</i>	5	4	5	14	8	0.0117	2.588	SA
<i>Pampatherium</i> sp.	5	4	5	14	8	0	2.588	SA
<i>Pampatherium typum</i>	5	4	5	14	8	0.0117	0.781	SA
<i>Panochthus greslebini</i>	7	5	5	14	8	0	0.126	SA
<i>Panochthus intermedius</i>	7	5	5	14	8	0.0117	2.588	SA
<i>Panochthus</i> sp.	7	5	5	14	8	0.0117	3.6	SA
<i>Panochthus tuberculatus</i>	7	5	5	14	8	0.0117	2.588	SA
<i>Panthera onca</i>	5	2	10	2	1	0	2.588	NAm
<i>Panthera</i> sp.	5	2	10	2	1	0.0117	0.781	NAm
<i>Paraeuphractus</i> sp.	2	6	8	9	4	3	6.8	SA
<i>Paraglyptodon</i> sp.	6	5	5	14	8	1.2	10	SA
<i>Paramyocastor diligens</i>	2	6	11	11	6	1.07	6.8	SA
<i>Paranabradys vucetichae</i>	5	5	3	13	8	5.333	11.608	SA
<i>Paranauchenia denticulata</i>	5	4	4	13	8	6.8	9	SA
<i>Parapropalaehoplophorus septentrionalis</i>	5	5	3	13	8	11.8	13.8	SA
<i>Paratrigodon</i> sp.	7	5	3	14	8	6.5	13	SA
<i>Patagosmilus goini</i>	3	3	10	2	1	13.8	15.5	SA
<i>Patasola magdalenae</i>	1	1	13	4	4	12.9	13.5	SA
<i>Pecari (=Tayassu) tajacu</i>	2	4	4	14	8	0.012	0.781	NAm
<i>Pediolagus salinicola</i>	2	3	15	6	3	11.608	15.97	SA
<i>Pedrolypeutes praecursor</i>	3	7	19	10	5	16.3	17.5	SA
<i>Peltephilus pumilus</i>	3	7	19	10	5	13.8	15.5	SA
<i>Peltephilus</i> sp.	6	5	6	14	8	11.6	13.8	SA
<i>Pericotoxodon platignathus</i>	1	1	8	10	4	6.8	9	SA
<i>Philander entrerianus</i>	6	5	5	14	8	3	6.8	SA

Table S4.6: Ecological classification of South American taxa, 15 Ma - 11.7ka, cont.

<i>Phlyctaenopyga</i> sp.	5	8	5	14	8	5.333	11.608	SA
<i>Phoberomys bordasi</i>	6	8	5	14	8	6.5	10	SA
<i>Phoberomys burmeisteri</i>	5	8	5	14	8	6.8	9	SA
<i>Phoberomys insolita</i>	5	8	5	14	8	6.8	9	SA
<i>Phoberomys lozanoi</i>	5	8	5	14	8	6.5	10	SA
<i>Phoberomys minima</i>	5	8	5	14	8	6.8	9	SA
<i>Phoberomys pattersoni</i>	5	8	5	14	8	6.8	9	SA
<i>Phoberomys praecursor</i>	5	8	5	14	8	2.588	9	SA
<i>Phoberomys</i> sp.						4	9	SA
<i>Phtoramys homogenidens</i>						6.8	9	SA
<i>Phtoramys</i> sp.	5	8	5	14	8	4	11.62	SA
<i>Phugatherium cataclisticum</i>	5	8	5	14	8	4	6.8	SA
<i>Phugatherium novum</i>	5	8	5	14	8	3	9	SA
<i>Phugatherium</i> sp.	1	3	8	9	4	0.0117	0.126	SA
<i>Phyllotis anitae</i>	1	3	8	9	4	0	2.588	NAm
<i>Phyllotis</i> sp.	7	5	6	14	8	5	12	NAm
<i>Pisanodon</i> sp.	1	7	6	14	8	3	6.8	SA
<i>Pithanotomys columnaris</i>	1	7	6	14	8	4	9	SA
<i>Pithanotomys macer</i>	1	7	6	14	8	0.0117	9	SA
<i>Pithanotomys</i> sp.	3	4	5	14	8	3	6.8	SA
<i>Plaina intermedia</i>	3	4	5	14	8	3	6.8	SA
<i>Plaina</i> sp.	5	5	3	13	8	6.5	10	SA
<i>Planops</i> sp.	4	4	8	10	5	1.2	3.6	SA
<i>Platygonus narinoensis</i>	4	4	8	10	5	0.0117	5.333	NAm
<i>Platygonus</i> sp.	7	5	5	14	8	0.8	2.6	NAm
<i>Plaxhaplous</i> sp.	7	5	3	13	8	3	9	SA
<i>Plesiomegatherium</i> sp.	7	5	6	14	8	6.5	10	SA
<i>Plesiotoxodon</i> sp.	3	7	16	14	8	5.3	12.704	SA
<i>Plesiotypotherium achirens</i>	5	7	16	14	8	6.844	12.704	SA
<i>Plesiotypotherium majus</i>	4	7	16	14	8	6.844	15.5	SA
<i>Plesiotypotherium</i> sp.	4	6	13	9	4	2.588	3.6	SA
<i>Pliodasypus vergelianus</i>	2	4	4	14	8	6.8	9	SA
<i>Pliodolichotis</i> sp.	1	4	13	9	4	4	6.8	SA
<i>Pliolestes tripotamicus</i>	1	4	13	9	4	6.8	9	SA
<i>Pliolestes venetus</i>	7	5	3	13	8	6.8	9	SA
<i>Pliomegatherium lelongi</i>	7	5	3	13	8	3	4	SA
<i>Pliomegatherium</i> sp.	6	5	3	13	8	6.8	9	SA
<i>Pliomorphus mutilatus</i>	6	5	3	13	8	6.8	9	SA
<i>Pliomorphus robustus</i>	6	5	3	13	8	5.333	11.608	SA
<i>Pliomorphus</i> sp.	5	5	5	14	8	6.8	9	SA

Table S4.6: Ecological classification of South American taxa, 15 Ma - 11.7ka, cont.

<i>Plohophorus araucanus</i>	5	5	5	14	8	3.6	5.3	SA
<i>Plohophorus cuneiformis</i>	5	5	5	14	8	4	11.608	SA
<i>Plohophorus figuratus</i>	5	5	5	14	8	6.8	9	SA
<i>Plohophorus paranensis</i>	5	5	5	14	8	3	10	SA
<i>Plohophorus</i> sp.	5	5	6	14	8	3	6.8	SA
<i>Posnanskytherium desaguadero</i>	6	5	6	14	8	3	6.8	SA
<i>Posnanskytherium inchasense</i>	5	5	6	14	8	3	6.8	SA
<i>Posnanskytherium</i> sp.	3	4				6.5	13.8	SA
<i>Potamarchus murinus</i>	3	4				5.333	16	SA
<i>Potamarchus</i> sp.	1	9	7	9	4	12.9	13.5	SA
<i>Potamops mascahehenes</i>	1	7	16	14	8	4	5	SA
<i>Praectenomys</i> sp.	5	5	3	13	8	13.8	15.5	SA
<i>Prepothierium</i> sp.	3	2	8	10	5	0	0.126	SA
<i>Procyon cancrivorus</i>		5	5	14	8	2.588	6.8	NAm
<i>Prodaedicurus</i> sp.	2	3	4	14	8	11.6	13.8	SA
<i>Prodolichotis guerreroi</i>	2	3	4	14	8	11.6	13.8	SA
<i>Prodolichotis pridiani</i>	2	3	4	14	8	3	9	SA
<i>Prodolichotis</i> sp.	1	6	11	11	6	0	2.588	SA
<i>Proechimys</i> sp.	7	5	3	13	8	2.588	5.3	SA
<i>Proeremotherium eljebe</i>	2	6	8	9	4	5.333	9	SA
<i>Proeuphractus limpidus</i>	2	6	8	9	4	5	12	SA
<i>Proeuphractus</i> sp.	3	6	19	10	5	13.8	17.5	SA
<i>Proeutatus</i> sp.	2	6	4	14	8	11.6	15.97	SA
<i>Prolagostomus</i> sp.	2	4	3	13	8	11.6	12.9	SA
<i>Prolicaphrium sanalfonensis</i>	5	4	4	13	8	3	9	SA
<i>Promacrauchenia antiqua</i>	5	4	4	13	8	0.781	9	SA
<i>Promacrauchenia</i> sp.		6	5	14	8	6.8	9	SA
<i>Promylodon paranensis</i>	4	5	3	13	8	0.781	5.333	SA
<i>Pronothrotherium figueirasi</i>	4	5	3	13	88	0.781	9	SA
<i>Pronothrotherium mirabilis</i>	4	5	3	13	8	16.3	17.5	SA
<i>Propalaehoplophorus australis</i>	4	5	3	13	8	13.8	15.5	SA
<i>Propalaehoplophorus</i> sp.	2	1	11	11	6	13.8	15.5	SA
<i>Propithecina neuquenensis</i>	4	6	13	9	4	0	2.588	SA
<i>Propraopus</i> sp.	4	6	13	9	4	0.0117	2.588	SA
<i>Propraopus sulcatus</i>	5	6	3	13	8	0.781	9	SA
<i>Proscelidodon patrius</i>	5	6	3	13	8	3.6	9	SA

Table S4.6: Ecological classification of South American taxa, 15 Ma - 11.7ka, cont.

<i>Proscelidodon</i> sp.	1	2	3	13	8	3.6	9	SA
<i>Protabrocoma</i> sp.	1	6	2	11	6	13.8	15.5	SA
<i>Protacaremys denisae</i>	2	2	15	6	3	16.3	17.5	SA
<i>Protamandua rothi</i>	3	4	3	13	8	6.8	9	SA
<i>Proterotherium cervioides</i>	3	4	3	13	8	6.5	10	SA
<i>Proterotherium</i> sp.	2	4	12	12	7	11.6	12.9	SA
<i>Prothoatherium</i> sp.	3	2	10	2	1	16.3	17.5	SA
<i>Prothylacynus patagonicus</i>	3	4	10	2	1	0.0117	0.781	SA
<i>Protocyon orcesi</i>	3	4	10	2	1	0.0117	2.588	SA
<i>Protocyon</i> sp.	3	4	10	2	1	0.781	1.2	SA
<i>Protocyon tarijensis</i>	3	4	10	2	1	0	2.588	SA
<i>Protocyon troglodytes</i>		5	4	14	8	6.8	9	SA
<i>Protoglyptodon primiformis</i>	5	5	3	13	8	5	12	SA
<i>Protomegalonyx chasicoensis</i>	7	5	3	13	8	6.8	9	SA
<i>Protomegalonyx doellojuradoi</i>	5	5	3	13	8	6.8	9	SA
<i>Protomegalonyx praecursor</i>	5	5	3	13	8	6.5	10	SA
<i>Protomegalonyx</i> sp.	3	1	1	11	6	0	2.588	SA
<i>Protopithecus brasiliensis</i>	2	3	5	14	8	6.8	9	SA
<i>Protypotherium antiquum</i>	2	3	5	14	8	16.3	17.5	SA
<i>Protypotherium australe</i>	2	3	5	14	8	5.333	17.5	SA
<i>Protypotherium</i> sp.	2	6	19	10	5	16.3	17.5	SA
<i>Prozaedyus proximus</i>	2	6	19	10	5	12	16	SA
<i>Prozaedyus</i> sp.	2	4	9	10	5	0.012	2.588	SA
<i>Pseudalopex gymnocercus</i>	3	2	10	2	1	5	12	NAm
<i>Pseudolycopsis cabrerai</i>	1	4	3	13	8	4	6.8	SA
<i>Pseudoplateomys formosus</i>	5	5	5	14	8	6.8	9	SA
<i>Pseudoplohophorus absolutus</i>	6	6	4	14	8	11.6	13.8	SA
<i>Pseudoprepottherium confusum</i>	6	6	4	14	8	6.5	10	SA
<i>Pseudoprepottherium</i> sp.	6	6	4	14	8	6.5	10	SA
<i>Pseudoprepottherium venezuelanum</i>	3	4			8	6.8	9	SA
<i>Pseudosigmomys</i> sp.	4	7	4	14	8	3.6	9	SA
<i>Pseudotypotherium</i> sp.	1	9	7	9	4	0	0.126	SA
<i>Pteronotus</i> sp.	3	8	20	1	2	0	2.588	NAm
<i>Pteronura brasiliensis</i>	4	2	10	2	1	0	2.588	NAm

Table S4.6: Ecological classification of South American taxa, 15 Ma - 11.7ka, cont.

<i>Puma concolor</i>	4	2	10	2	1	0.0117	0.781	NAm
<i>Puma</i> sp.	2	2	10	2	1	0	0.126	NAm
<i>Puma yagouaroundi</i>	7	8	3	13	8	6.5	10	NAm
<i>Purperia cribatidens</i>	7	5	3	13	8	3.6	5.333	SA
<i>Pyramiodontherium scillatoyanei</i>	7	5	3	13	8	1.2	9	SA
<i>Pyramiodontherium</i> sp.	2					12.7	13	SA
<i>Quebradahondomys potosiensis</i>	7	6	3	13	8	6.8	9	SA
<i>Ranculcus scalabrinianus</i>	7	6	3	13	8	6.5	10	SA
<i>Ranculcus</i> sp.	1	3	16	14	8	0.0117	0.781	SA
<i>Reithrodon auritus</i>	1	3	16	14	8	0.0117	0.781	NAm
<i>Reithrodon</i> sp.	1	9	7	7	4	0.0117	0.126	NAm
<i>Rhogeessa</i> sp.	1	2	2	11	6	11.6	12.9	NAm
<i>Ricardomys longidens</i>	3	6	3	13	8	6.8	9	SA
<i>Ringueletia</i> sp.	1	2	13	9	4	0.0117	2.588	SA
<i>Sairadelphys tocantinensis</i>	5	4	4	13	8	6.8	9	SA
<i>Scalabrinitherium bravardi</i>	5	4	4	13	8	7.246	11.62	SA
<i>Scalabrinitherium</i> sp.	1	6	13	9	4	3	4	SA
<i>Scapteromys herskovitzi</i>	1	8	13	9	4	0	2.588	NAm
<i>Scapteromys tumidus</i>	5	6	12	13	7	3	4	NAm
<i>Scelidotheridium</i> sp.	6	6	12	12	7	0.0117	2.588	SA
<i>Scelidotherium leptocephalum</i>	6	6	12	12	7	0	6.8	SA
<i>Scelidotherium</i> sp.	1	6	13	10	4	11.608	15.97	SA
<i>Sciamys petisensis</i>	1	6	13	10	4	6.8	9	SA
<i>Sciamys</i> sp.	3	4	5	14	8	6.5	10	SA
<i>Scirrotherium carinatum</i>	3	4	5	14	8	11.8	13.8	SA
<i>Scirrotherium hondaensis</i>	3	4	5	14	8	11.3	16	SA
<i>Scirrotherium</i> sp.	5	5	5	14	8	0.0117	2.588	SA
<i>Sclerocalyptus ornatus</i>	2	3	12	12	7	6.5	13.8	SA
<i>Scleromys colombianus</i>	2	3	12	12	7	11.6	13.8	SA
<i>Scleromys schurmanni</i>	2	3	12	12	7	11.8	15.7	SA
<i>Scleromys</i> sp.	1	3	5	14	8	0.0117	0.126	SA
<i>Sigmodon hispidus</i>	1	3	5	14	8	0.0117	0.781	NAm
<i>Sigmodon</i> sp.	3	4				6.5	16	NAm
<i>Simplimus</i> sp.	2	2	10	2	1	16.3	17.5	SA
<i>Sipalocyon gracilis</i>	2	2	10	2	1	13	15.6	SA
<i>Sipalocyon</i> sp.	5	3	10	2	1	0.0117	0.126	SA
<i>Smilodon fatalis</i>	4	3	10	2	1	0.126	2.588	NAm
<i>Smilodon gracilis</i>	5	3	10	2	1	0	1.2	NAm
<i>Smilodon populator</i>	5	3	10	2	1	0.0117	2.588	NAm

Table S4.6: Ecological classification of South American taxa, 15 Ma - 11.7ka, cont.

<i>Smilodon</i> sp.	2	1	12	12	7	6.5	10	NAm
<i>Solimoa acensis</i>	1	6	10	2	1	4	5	SA
<i>Sparassocynus heterotopicus</i>	2	6	10	2	1	4	6.8	SA
<i>Sparassocynus</i> sp.	2	6	10	2	1	0.0117	2.588	SA
<i>Speothos</i> sp.	7	6	5	14	8	6.8	9	NAm
<i>Sphenotherus paranensis</i>	7	6	5	14	8	3	6.8	SA
<i>Sphenotherus</i> sp.	7	5	6	14	8	0.0117	2.588	SA
<i>Stegomastodon platensis</i>	7	5	6	14	8	0.0117	2.588	NAm
<i>Stegomastodon</i> sp.	2	2	6	14	8	11.3	16	NAm
<i>Steiromys</i> sp.	5	6	5	14	8	6.5	10	SA
<i>Stenotatus</i> sp.	2	6	19	9	4	13.8	17.5	SA
<i>Stenotephanos plicidens</i>	5	5	6	14	8	3	9	SA
<i>Stichomys</i> sp.	1					13.8	15.5	SA
<i>Stirtonia</i> sp.	2	1	3	13	8	6.5	10	SA
<i>Stirtonia tatacoensis</i>	2	1	3	13	8	11.8	13.8	SA
<i>Stirtonia victoriae</i>	3	1	3	13	8	12.9	13.5	SA
<i>Stromaphorus</i> sp.		5	4	14	8	3	9	SA
<i>Strophostephanos</i> sp.	1	3				6.8	9	SA
<i>Stylocynus paranensis</i>	3		8	10	5	6.8	11.62	SA
<i>Surameryx acensis</i>	3	3	3	13	8	6.8	9	NAm
<i>Sylvilagus floridanus</i>	2	4	6	14	8	0.0117	0.781	NAm
<i>Sylvilagus</i> sp.	2	4	6	14	8	0	2.588	NAm
<i>Sylvochoerus woodburnei</i>	4	4	16	10	5	6.8	9	NAm
<i>Tadarida brasiliensis</i>	1	9	7	9	4	0	0.126	SA
<i>Tafimys powelli</i>	1	3	5	14	8	0.0117	0.126	NAm
<i>Tapirus (Tapirulum) greslebini</i>	5	8	12	12	7	2.588	3.6	NAm
<i>Tapirus mesopotamicus</i>	5	8	12	12	7	0	0.8	NAm
<i>Tapirus olivaresi</i>	5	8	12	12	7	0.0117	0.126	NAm
<i>Tapirus</i> sp.	5	8	12	12	7	0	2.588	NAm
<i>Tapirus terrestris</i>	5	8	12	12	7	0	2.588	NAm
<i>Tayassu pecari</i>	3	4	12	12	7	0.0117	0.781	NAm
<i>Tayassu</i> sp.	3	4	12	12	7	0	2.588	NAm
<i>Telicomys amazonensis</i>	3	4	12	12	7	0	0.781	SA
<i>Tetramerorhinus cingulatum</i> (= <i>T. fortis</i>)	6	4				6.5	10	SA
<i>Tetramerorhinus</i> sp.	4	4	3	13	8	16.3	17.5	SA
<i>Tetrastylus araucanus</i>	4	4	3	13	8	11.6	13.8	SA
<i>Tetrastylus</i> sp.	3	4	12	12	7	6.8	9	SA
<i>Thalassocnus antiquus</i>	4	4	12	12	7	3	12	SA

Table S4.6: Ecological classification of South American taxa, 15 Ma - 11.7ka, cont.

<i>Thalassocnus carolomartini</i>	5	8	5	14	8	7	8.8	SA
<i>Thalassocnus littoralis</i>	5	8	5	14	8	5.333	7.246	SA
<i>Thalassocnus natans</i>	5	8	5	14	8	5.333	7.246	SA
<i>Thalassocnus</i> sp.	5	8	5	14	8	4.5	11.62	SA
<i>Thalassocnus yaucensis</i>	5	8	5	14	8	5.33	7.246	SA
<i>Theosodon</i> sp.	5	8	5	14	8	3.6	5.75	SA
<i>Theriodictis</i> sp.	4	4	3	13	8	7.9	17.5	NAm
<i>Thrichomys</i> sp.	3	4	10	2	1	0.0117	2.588	SA
<i>Thylacosmilus atrox</i>	1	3	11	12	6	0	2.588	SA
<i>Thylacosmilus</i> sp.	4	3	10	2	1	6.8	9	SA
<i>Thylamys minutus</i>	4	3	10	2	1	3	6.8	SA
<i>Thylamys pinei</i>	1	2	13	9	4	11.8	13.8	SA
<i>Thylamys</i> sp.	1	2	13	9	4	6.8	10	SA
<i>Thylatheridium hudsoni</i>	1	2	13	9	4	0	9	SA
<i>Thylatheridium</i> sp.	1	3	10	2	1	6.8	9	SA
<i>Thylophorops chapalmalensis</i>	1	3	10	2	1	4	9	SA
<i>Tolypeutes</i> sp.	2	6	9	10	5	3	6.8	SA
<i>Tolypeutes tricinctus</i>	2	3	15	6	3	0	1.2	SA
<i>Torcellia paranense</i>	2	3	15	6	3	0	0.126	SA
<i>Toxodon bilobidens</i>	6	5	3	13	8	6.8	9	SA
<i>Toxodon paranensis</i>	7	5	6	14	8	0.012	0.781	SA
<i>Toxodon platensis</i>	7	5	6	14	8	6.8	11.62	SA
<i>Toxodon</i> sp.	7	5	6	14	8	0	2.588	SA
<i>Trachops cirrhosus</i>	7	5	6	14	8	0	6.8	SA
<i>Trachycalyptoides</i> sp.	1	9	9	9	5	0.0117	0.126	SA
<i>Trachytypotherium</i> sp.	5	5	4	14	8	6.8	9	SA
<i>Tremacyllus impressus</i>	3	7	16	14	8	6.8	9	SA
<i>Tremacyllus</i> sp.	2	6	16	14	8	3	9	SA
<i>Trigodon gaudryi</i>	2	6	6	14	8	0.0117	9	SA
<i>Trigodon</i> sp.	7	5	6	14	8	4	6.8	SA
<i>Typotheriopsis</i> sp.	7	5	6	14	8	6.5	10	SA
<i>Typotherium cristatum</i>	5	6	16	14	8	3	12	SA
<i>Urocyon cinereoargenteus</i>	4	7	16	14	8	0.781	1.2	NAm
<i>Urotherium interundatum</i>	2	2	8	10	5	0.0117	0.126	SA
<i>Urotherium</i> sp.	5	5	4	14	8	6.8	9	SA
<i>Urumacotherium (=Stenodon) campbelli</i>	5	5	4	14	8	1.2	5.333	SA
<i>Urumacotherium</i> sp.	7	6	5	14	8	6.5	13.8	SA
<i>Urumaquia robusta</i>	7	5	4	13	8	6.8	13.8	SA
<i>Valgipes bucklandi</i>	5	6	3	13	8	0.0117	2.588	SA

Table S4.6: Ecological classification of South American taxa, 15 Ma - 11.7ka, cont.

<i>Vassallia</i> sp.	3	4	5	14	8	6.8	23	SA
<i>Vetelia</i> sp.		6	8	9	4	5	12	SA
<i>Vicugna vicugna</i>	4	4	5	14	8	0.0117	0.781	NAm
<i>Villarroelia totoyoi</i>	3	4	4	13	8	5	12	SA
<i>Waldochoerus bassleri</i>	3	4	14	10	5	6.8	9	NAm
<i>Windhausenina</i> sp.	6	4	4	13	8	0.0117	3	SA
<i>Xenastrapotherium aequatorialis</i>	7	5	3	13	8	20	23	SA
<i>Xenastrapotherium amazonense</i>	7	5	3	13	8	6.5	10	SA
<i>Xenastrapotherium kraglievichi</i>	6	5	3	13	8	11.6	13.8	SA
<i>Xenastrapotherium</i> sp.	7	5	3	13	8	6.5	13.8	SA
<i>Xenodontomys</i> sp.	1	6	5	14	8	6.8	9	SA
<i>Xenorhinotherium bahiense</i>	7	4	3	13	8	0	0.126	SA
<i>Xenorhinotherium</i> sp.	7	4	3	13	8	0	2.588	SA
<i>Xiphuroides</i> sp.		5	5	14	8	1.2	3	SA
<i>Xyophorus</i> sp.	4	5	3	13	8	3.6	9	SA
<i>Zaedyus pichiy</i>	2	6	8	9	5	0.0117	0.781	SA
<i>Zaedyus</i> sp.	2	6	8	9	5	0.0117	9	SA
<i>Zygolestes paranensis</i>	1	2	7	9	4	6.8	9	SA
<i>Zygolestes tatei</i>	1	2	7	9	4	6.8	9	SA

7. Modified ages for locations

Table S4.7: Modified location data. This table contains locations with modified age ranges. The first column provides the PBDB ID number for the location. The following columns, Group (Sedimentary Group), Formation, Member, Early Interval, and Late Interval, are all provided by the PBDB and are included here for reference. Where applicable, the column “Modified Interval” provides the updated interval or range of intervals from the literature. Some references provided absolute dates instead of SALMAs or epochs, in which case this field is left blank. References provide the literature sources for the modified ages, and fields “Min Age” and “Max Age” provide the modified age range.

Loc. #	Group	Formation	Member	Early Interval	Late Interval	Modified Interval	References	Min Age	Max Age
12970	Honda	Villavieja	Baraya Volcanic	Late Miocene		Laventan	(Guerrero 1997)	11.6	12.9
12971		Villavieja	Baraya Volcanic	Miocene		Laventan	(Guerrero 1997)	11.6	12.9
12972		Villavieja	Baraya Volcanic	Miocene		Laventan	(Guerrero 1997)	11.6	12.9
12973		La Victoria		Miocene		Laventan	(Guerrero 1997)	13.5	12.9
12974		La Victoria		Miocene		Laventan	(Guerrero 1997)	13.5	12.9
12975		La Victoria		Miocene		Laventan	(Guerrero 1997)	13.5	12.9
28611		Collon Cura		Middle Miocene		Colloncuran	(Madden et al. 1997; Kay, Johnson, and Meldrum 1998)	13.8	15.5

Table S4.7: Modified ages for locations, cont.

45485	Pisco		Tortonian		(Ehret et al. 2012)	7	8.8
55596	Salicas		Late Miocene		(Brandoni et al. 2012)	5.333	9
55599	Parana		Serravallian		(Cozzuol 2006)	9.5	11
55602	Solimoes		Tortonian	late Chasicoan-Huayquerian	(Hernández et al. 2005)	6.5	10
57966	Angostura		Late Miocene		(Cantalamessa et al. 2007)	9.1	12.4
57989	Solimoes		Miocene	Miocene	(Hernández et al. 2005)	6.5	10
58455	Villavieja		Laventan		(Guerrero 1997)	11.6	12.9
59053	Puerto Madryn	lower	Tortonian		(Dozo et al. 2010)	6.8	9
61292	Saldungaray		Late Miocene		(Quattrocchio et al. 2008)	6.8	9
61298	Saldungaray		Late Miocene		(Quattrocchio et al. 2008)	6.8	9
61299	Saldungaray		Late Miocene		(Quattrocchio et al. 2008)	6.8	9
61300	Saldungaray		Late Miocene		(Quattrocchio et al. 2008)	6.8	9
61304	Saldungaray		Late Miocene	Early Pliocene	(Quattrocchio et al. 2008)	6.8	9
61306	Saldungaray		Early		(Quattrocchio	6.8	9

Table S4.7: Modified ages for locations, cont.

			Pliocene		et al. 2008)		
63762	Mariño	Middle	Middle Miocene		(Irigoyen, Buchan, and Brown 2000)	12.2	15.7
67383	Solimoës	upper	Tortonian	late Chasicoan-Huayquerian	(Hernández et al. 2005)	6.5	10
67384	Solimoës	upper	Tortonian	late Chasicoan-Huayquerian	(Hernández et al. 2005)	6.5	10
67385	Solimoës		Tortonian	late Chasicoan-Huayquerian	(Hernández et al. 2005)	6.5	10
67386	Solimões		Tortonian	late Chasicoan-Huayquerian	(Hernández et al. 2005)	6.5	10
68402	Nazareno		Middle Miocene	Colloncuran	(Croft, Flynn, and Wyss 2004)	13.8	15.5
68503	Quehua		Middle Miocene	Late Miocene	(MacFadden, Anaya, and Swisher 1995)	6.844	12.704
68623	Yecua		Middle Miocene		(Uba, Strecker, and Schmitt 2007)	7.9	12.5
68789	Petaca		Late Miocene		(Uba, Strecker, and Schmitt 2007)	9	23
68792	Muyu Huasi		Late Miocene	Huayquerian	(Chick 2009)	6.8	9

Table S4.7: Modified ages for locations, cont.

79180	Arroyo Chasicó		Late Miocene	Chasicoan-Huayquerian	(Cione et al. 2005; Verzi, Montalvo, and Deschamps 2008)	6.8	10	
79347	Camacho	San Pedro	Late Miocene	Huayquerian	(Perea and Martínez 2004)	6.8	9	
79508	Río Quinto		Late Miocene	Chapadmalalan	(Prado et al. 1998)	3	4	
79631	Punta Gorda	Alvear	Late Pliocene		(Walther and Mena 2013)	1.07	2.59	
95373	Pisco		Middle Miocene		(Ehret et al. 2012)	7.5	11.6	
96800	Pisco		Serravallian		(Ehret et al. 2012)	9.5	11.6	
101985	Puerto Madryn		Late Miocene	Huayquerian	(Dozo et al. 2010)	6.8	9	
107668	Parana		Serravallian	Tortonian	(Cozzuol 2006)	9.5	11	
113413	Buenos Aires		Middle Pleistocene		PBDB Notes	0.1	0.4	
113415	Camacho		Late Miocene	Huayquerian	(Perea and Martínez 2004)	6.8	9	
114697	Sincelejo		Pliocene		(Alfaro and Holz 2014)	2.588	5.333	
115776	Puerto Madryn	lower levels	Tortonian	Huayquerian	(Dozo et al. 2010)	6.8	9	
122031	Puerto		Middle	Late	Huayquerian	(Dozo et al.	6.8	9

Table S4.7: Modified ages for locations, cont.

		Madryn		Miocene	Miocene	2010)		
122079		Puerto Madryn		Middle Miocene	Late Miocene	(Dozo et al. 2010)	6.8	9
128628		Parana	upper	Tortonian		(Cozzuol 2006)	9.5	11
133692	Honda	Villavieja		Laventan		(Guerrero 1997)	11.6	12.9
134808		Solimoes		late Chasicoan	Huayquerian	(Hernández et al. 2005)	6.5	10
134868		Solimoes	Acre Conglomerate s	late Chasicoan	Huayquerian	(Hernández et al. 2005)	6.5	10
135348	Honda	Villavieja		Laventan		(Guerrero 1997)	11.6	12.9
135373	Honda	Villavieja		Laventan		(Guerrero 1997)	11.6	12.9
136233	Honda	Villavieja		Laventan		(Guerrero 1997)	11.6	12.9
136714		Solimoes		late Chasicoan	Huayquerian	(Hernández et al. 2005)	6.5	10
136716		Solimoes		late Chasicoan	Huayquerian	(Hernández et al. 2005)	6.5	10
136717		Solimoes		late Chasicoan	Huayquerian	(Hernández et al. 2005)	6.5	10
137876		Madre de Dios	Acre Conglomerate	Late Miocene		(Gaffney, Wood, and Campbell 1998)	6.8	9
137877		Madre de	Acre	Late Miocene		(Gaffney,	6.8	9

Table S4.7: Modified ages for locations, cont.

	Dios	Conglomerate			Wood, and Campbell 1998)		
137878	Madre de Dios	Acre Conglomerate	Late Miocene	Huayquerian	(Gaffney, Wood, and Campbell 1998)	6.8	9
137879	Madre de Dios	Acre Conglomerate	Late Miocene	Huayquerian	(Gaffney, Wood, and Campbell 1998)	6.8	9
137880	Madre de Dios	Acre Conglomerate	Late Miocene	Huayquerian	(Gaffney, Wood, and Campbell 1998)	6.8	9
137881	Madre de Dios	Acre Conglomerate	Late Miocene	Huayquerian	(Gaffney, Wood, and Campbell 1998)	6.8	9
137882	Madre de Dios	Acre Conglomerate	Late Miocene	Huayquerian	(Gaffney, Wood, and Campbell 1998)	6.8	9
137883	Madre de Dios	Acre Conglomerate	Late Miocene	Huayquerian	(Gaffney, Wood, and Campbell 1998)	6.8	9
137884	Madre de Dios	Acre Conglomerate	Late Miocene	Huayquerian	(Gaffney, Wood, and Campbell 1998)	6.8	9

Table S4.7: Modified ages for locations, cont.

						1998)		
						(Perea and Martínez 2004)	6.8	9
140028		Camacho	San Pedro	Late Miocene	Huayquerian			
140051	Honda	Villavieja		Laventan	Laventan	(Guerrero 1997)	11.6	12.9
140179	Honda	Villavieja		Laventan	Laventan	(Guerrero 1997)	11.6	12.9
140181	Honda	Villavieja		Laventan	Laventan	(Guerrero 1997)	11.6	12.9
140183	Honda	Villavieja		Laventan	Laventan	(Guerrero 1997)	11.6	12.9
141256	Honda	Villavieja	Cerro Colorado	Laventan	Laventan	(Guerrero 1997)	11.6	12.9
141257	Honda	Villavieja	Baraya	Laventan	Laventan	(Guerrero 1997)	11.6	12.9
141508		Parana		Late Miocene		(Cozzuol 2006)	9.5	11
141513		Parana		Late Miocene		(Cozzuol 2006)	9.5	11
142428	Honda	Villavieja	Baraya	Laventan	Laventan	(Guerrero 1997)	11.6	12.9
143489	Honda	Villavieja	Colorado	Laventan	Laventan	(Guerrero 1997)	11.6	12.9
143787	Honda	Villavieja		Laventan	Laventan	(Guerrero 1997)	11.6	12.9
143788	Honda	Villavieja		Laventan	Laventan	(Guerrero 1997)	11.6	12.9
143789	Honda	Villavieja		Laventan	Laventan	(Guerrero	11.6	12.9

Table S4.7: Modified ages for locations, cont.

						1997)		
144513		Yahuarango		Middle Miocene		(Antoine et al. 2013)	13	15.6
144675		Biblian		Miocene		(Lavenu, Noblet, and Winter 1995)	20	23
144707		Chiu-Chiu		Late Pleistocene		(May et al. 2005)	0.5	2.5
144708		Chiu Chiu		Pleistocene		(May et al. 2005)	0.5	2.5
144711		Chiu-Chiu		Pleistocene		(May et al. 2005)	0.5	2.5
144712		Chiu-Chiu		Late Pleistocene		(May et al. 2005)	0.5	2.5
145175	Honda	Villavieja		Laventan	Laventan	(Guerrero 1997)	11.6	12.9
145194	Honda	Villavieja	Baraya Volcanic	Laventan	Laventan	(Guerrero 1997)	11.6	12.9
145234	Honda	Villavieja		Laventan	Laventan	(Guerrero 1997)	11.6	12.9
145512		Sincelejo	Morrocoyal	Pliocene		(Alfaro and Holz 2014)	2.588	5.333
145614	Honda	Villavieja	Baraya	Laventan	Laventan	(Guerrero 1997)	11.6	12.9
145617	Honda	Villavieja		Laventan	Laventan	(Guerrero 1997)	11.6	12.9
145813		Rio Negro		Late Miocene	Early Pliocene	(Zinsmeister et al. 1981; Farinati and	7.246	11.608

Table S4.7: Modified ages for locations, cont.

					Zavala 2002)		
146404	Socorro	Superior	Middle Miocene	Laventan	(Goillot et al. 2011)	11.8	13.8
146405	Socorro	Superior	Middle Miocene	Laventan	(Goillot et al. 2011)	11.8	13.8
146406	Socorro	Superior	Middle Miocene	Laventan	(Goillot et al. 2011)	11.8	13.8
146407	Urumaco	Inferior	Middle Miocene	Laventan	(Linares 2004)	11.8	13.8
146416	Urumaco	Medio	Late Miocene	Chasicoan	(Linares 2004)	9	10
146421	Urumaco	Medio	Late Miocene	Chasicoan	(Linares 2004)	9	10
146422	Urumaco	Medio	Late Miocene	Chasicoan	(Linares 2004)	9	10
146423	Urumaco	Medio	Late Miocene	Chasicoan	(Linares 2004)	9	10
146424	Urumaco	Medio	Late Miocene	Chasicoan	(Linares 2004)	9	10
146425	Urumaco	Medio	Late Miocene	Chasicoan	(Linares 2004)	9	10
146426	Urumaco	Medio	Late Miocene	Chasicoan	(Linares 2004)	9	10
146427	Urumaco	Medio	Late Miocene	Chasicoan	(Linares 2004)	9	10
146428	Urumaco	Superior	Late Miocene	Huayquerian	(Linares 2004)	6.8	9
146429	Urumaco	Superior	Late Miocene	Huayquerian	(Linares 2004)	6.8	9

Table S4.7: Modified ages for locations, cont.

146430	Urumaco	Superior	Late Miocene	Huayquerian	(Linares 2004)	6.8	9
146431	Urumaco	Superior	Late Miocene	Huayquerian	(Linares 2004)	6.8	9
146432	Urumaco	Superior	Late Miocene	Huayquerian	(Linares 2004)	6.8	9
146433	Urumaco	Superior	Late Miocene	Huayquerian	(Linares 2004)	6.8	9
146446	Urumaco	Superior	Late Miocene	Huayquerian	(Linares 2004)	6.8	9
146447	Urumaco	Superior	Late Miocene	Huayquerian	(Linares 2004)	6.8	9
146448	Urumaco	Superior	Late Miocene	Huayquerian	(Linares 2004)	6.8	9
146449	Urumaco	Superior	Late Miocene	Huayquerian	(Linares 2004)	6.8	9
146450	Urumaco	Superior	Late Miocene	Huayquerian	(Linares 2004)	6.8	9
146451	Urumaco	Superior	Late Miocene	Huayquerian	(Linares 2004)	6.8	9
146452	Urumaco	Superior	Late Miocene	Huayquerian	(Linares 2004)	6.8	9
146527	La Victoria		Laventan	Laventan	(Guerrero 1997)	12.9	13.5
146855	Puerto Madryn		Tortonian	Huayquerian	(Dozo et al. 2010)	6.8	9
151506	Salicas		Late Miocene		(Brandoni et al. 2012)	5.333	9
152068	Saldungaray		Late Miocene	Huayquerian	(Quattrocchio	6.8	9

Table S4.7: Modified ages for locations, cont.

					et al. 2008)		
152069	Saldungaray		Huayquerian	Huayquerian	(Quattrocchio et al. 2008)	6.8	9
156532	Madre de Dios	Acre conglomerate	Late Miocene	Huayquerian	(Gaffney, Wood, and Campbell 1998)	6.8	9
166501	Letrero		Late Miocene	Mayoan-Chasicoan	(Carlini et al. 2014)	9	11.8
168397	Arroyo Chasicó	Las Barrancas	Late Miocene	Chasicoan-Huayquerian	(Cione et al. 2005)	6.8	10

8. Taxa omitted from analysis

Table S4.8: Taxa omitted from analysis. This table lists the taxa which were not included in any stage of the ecological analyses because they have been determined by systematic experts to be junior synonyms of other taxa in the database or invalid or questionable taxa. Taxa which were determined to be junior synonyms for which the senior synonym was not in the data downloaded from the PBDB were left in the ecological analysis, but their names were updated to that of the senior synonym. As note previously, marine mammals (Cetacea, Phocidae, Otariidae, Sirenia) were not included in this analysis because their dispersal prior to the completion of the land bridge would have been relatively unrestricted and because marine mammals use different resources and interact with a different collection of organisms than the rest of the taxa in this analysis. Only taxa identified to the genus or species level were included in this analysis.

Species	Species # (PBDB)	Reason	Notes	References
<i>Abothrodon pricei</i>	205602	<i>Nomen dubium</i>		(Elissamburu 2007)
<i>Amahuacatherium peruvium</i>	267503	Invalid genus and species		(Lucas, Yuan, and Min 2013)
<i>Argyromanis</i> sp.	318385	<i>Incertae familiae, Nomen dubium</i>	Questionable species: only known from one left astragalus, affinities unclear	(McDonald, Vizcaíno, and Bargo 2008; Bargo, Toledo, and Vizcaíno 2012)
<i>Brachytherium cuspidatum</i>	246253	<i>Nomen dubium</i>	<i>Nomen dubium</i> , Partial junior synonym: <i>Neobrachytherium ameghinoi</i>	(Soria 2001)
<i>Brachytherium</i> sp.	43470	<i>Nomen dubium</i>	<i>Nomen dubium</i> , Partial junior synonym: <i>Neobrachytherium ameghinoi</i>	(Soria 2001)
<i>Canis proplatensis</i>	264379	Invalid species		Prevosti pers. comm.
<i>Carlesia</i> sp.	278320	Junior synonym	Junior synonym for <i>Eumegamys</i>	Candela 2005
<i>Chasicobradys intermedius</i>	263006	Junior synonym	Probably junior synonym of <i>Neohapalops rothi</i>	(Brandoni 2009)
<i>Chlamyphractus pressulus</i>	278343	<i>Nomen dubium</i>		(Scillato-Yané et al. 2013)

Table S4.8: Taxa omitted from analysis, cont.

<i>Colpostemma</i> sp.	42090	Junior synonym	Junior synonym of <i>Myocastor coypus</i>	(Candela and Noriega 2004; Candela 2005)
<i>Comaphorus concisus</i>	247966	<i>Nomen dubium</i>		(Scillato-Yané et al. 2013)
<i>Contracavia</i> sp.	131378	Junior synonym	Junior synonym of <i>Cardiatherium</i> sp.	Vucetich, Deschamps, and Pérez 2013
<i>Coscinocercus</i> sp.	188880	Junior synonym	Junior synonym of <i>Pseudoplohophorus</i>	(Perea and Martínez 2004)
<i>Diadiaphorus paranensis</i>	278305	Junior synonym	Junior synonym of <i>Brachytherium cuspidatum</i>	(Schmidt 2015)
<i>Diaphoromys</i> sp.	42092	Junior synonym	Junior synonym of <i>Eumegamys</i> (GBIF)	(GBIF 2016)
<i>Dicotyles major</i>	264343	Junior synonym	Junior synonym of <i>Tayassu</i> sp.	(MacFadden and Shockey 1997)
<i>Dinotoxodon paranensis</i>	278300	Junior synonym	Junior synonym of <i>Toxodon paranensis</i>	(Mercerat 1895 in Santos 2012)
<i>Elassotherium</i> sp.	43631	Junior synonym	Junior synonym of <i>Proscelidodon</i>	(Miño-Boilini and Carlini 2009)
<i>Eomegatherium nanum</i>	278349	<i>Nomen dubium</i>	Questionable validity	(Iuliis 1995; Iuliis, Brandoni, and Scillato-Yané 2008)
<i>Epipatriarchus</i> sp.	43414	<i>Nomen dubium</i>		(Elissamburu 2007)
<i>Equus curvidens</i>	247768	Junior synonym	Junior synonym to <i>Equus neogeus</i>	(Prado and Alberdi 1994)
<i>Equus martinei</i>	247638	Junior synonym	Junior synonym of <i>Equus insulatus</i>	(Prado and Alberdi 1994)
<i>Equus santaeelenae</i>	117393	Duplicate entry		
<i>Eulamaops</i> sp.	42524	<i>Incertae familiae</i>	Incertae sedis: may be cervid and not camelid, poorly known	(Scherer 2013; Alcázar Orosco 2014)
<i>Eutomodus elautus</i>	240078	<i>Nomen dubium</i>		(Elissamburu 2007)
<i>Glossotherium emmersoni</i>	263051	Junior synonym	Junior synonym of <i>G. robustum</i>	(Encina 2015)
<i>Gyriabrus royo</i>	135712	Invalid species		Rinderknecht pers. comm.

Table S4.8: Taxa omitted from analysis, cont.

<i>Gyriabrus</i> sp.	42094	Invalid genus		Rinderknecht pers. comm.
<i>Haplodontherium</i> sp.	240028	<i>Nomen dubium</i>		(Elissamburu 2007)
<i>Haplomastodon</i> (<i>Aleamastodon</i>) <i>guayasensis</i>	247636	Junior synonym	Junior synonym: <i>Notiomastodon</i> (= <i>Stegomastodon</i>), or at least for <i>H. chimborazi</i>	(Ferretti 2010)
<i>Kiotomops lopezi</i>	266938	Invalid description	Invalid description: Not a bat	(Czaplewski et al. 2003)
<i>Lama glama</i>	104242	Junior synonym	Junior synonym of <i>Lama guanicoe</i> , domestic derivative	(González et al. 2006)
<i>Lama intermedia</i>	264370	Junior synonym	Junior synonym of <i>Lama glama</i>	(Scherer 2009)
<i>Lama mesolithica</i>	264371	Junior synonym	Junior synonym of <i>Lama guanicoe</i>	(González et al. 2006)
<i>Lestodon urumaquensis</i>	271776	Junior synonym	Junior synonym of <i>Leston armatus</i>	(Czerwonogora and Fariña 2013)
<i>Licaphrium mesopotamiense</i>	278306	Junior synonym	Junior synonym of <i>Brachytherium cuspidatum</i>	Schmidt 2015
<i>Lomaphorops corallinus</i>	282541	<i>Nomen dubium</i>		(Zurita, Taglioretti, Reyes, et al. 2016)
<i>Macrauchenia ullomensis</i>	84193	Junior synonym	Junior synonym of <i>M. patachonica</i>	(Guérin and Faure 2004; Encina 2015)
<i>Mesenodon</i> sp.	279977	<i>Nomen dubium</i>		(Elissamburu 2007)
<i>Mesotoxodon</i> sp.	279978	<i>Nomen dubium</i>		(Elissamburu 2007)
<i>Metopotoxus</i> sp.	43580	Junior synonym	Junior synonym of <i>Cochlops</i>	(Vizcaíno, Fernicola, and Bargo 2012)
<i>Micodon kiotensis</i>	260161	<i>Nomen dubium</i>	Known from one poor upper molar fragment which may actually belong to <i>Neosaimiri fieldsi</i>	(Fleagle, Kay, and Anthony 1997; Kay and Meldrum 1997)
<i>Minitoxodon</i> sp.	279979	<i>Nomen dubium</i>		(Elissamburu 2007)

Table S4.8: Taxa omitted from analysis, cont.

<i>Neotoxodon</i> sp.	279976	<i>Nomen dubium</i>		(Elissamburu 2007)
<i>Neotrigodon utoquineae</i>	205604	<i>Nomen dubium</i>		(Elissamburu 2007)
<i>Ocnopus gracilis</i>	261415	Junior synonym	Junior synonym of <i>Valgipes</i>	(Cartelle, Iuliis, and Ferreira 2009; Iuliis, Pujos, and Cartelle 2009)
<i>Olenopsis</i> sp.	42087	Junior synonym	Junior synonym of <i>Drytomomys</i>	(Candela and Nasif 2006)
<i>Onohippidium bolivianum</i>	84191	Junior synonym	Junior synonym of <i>O. devillei</i>	(Alberdi and Prado 1993)
<i>Onohippidium</i> sp.	43014	Junior synonym	Junior synonym: <i>Hippidion</i>	(Alberdi and Prado 1993; Alberdi and Prado 1998; Orlando et al. 2009; Santos Avilla, Bernardes, and Mothé 2015)
<i>Orthoarthrus mixtus</i>	318388	<i>Incertae familiae, Nomen dubium</i>	Questionable species, highly questionable affinities (<i>Vermilingua</i> ?)	(McDonald, Vizcaíno, and Bargo 2008; Bargo, Toledo, and Vizcaíno 2012)
<i>Ortotherium robustum</i>	278473	<i>Nomen vanum</i>		(Brandoni 2010)
<i>Pachynodon modicus</i>	278296	<i>Nomen dubium</i>		(Elissamburu 2007)
<i>Palaeolama aequatorialis</i>	247641	Junior synonym	Junior synonym of <i>P. major</i>	(Scherer 2009)
<i>Palaeolama crassa</i>	247642	Junior synonym	Junior synonym to <i>P. weddelli</i>	(Scherer 2009)
<i>Palaeolama crequii</i>	264367	Junior synonym	Junior synonym of <i>Lama castelnaudi</i>	(Scherer 2009)
<i>Palaeolama reissi</i>	247640	Junior synonym	Junior synonym to <i>P. weddelli</i>	(Scherer 2009)
<i>Palaeotoxodon paranensis</i>	278297	<i>Nomen dubium</i>		(Elissamburu 2007)
<i>Palaeotoxodon protoburmeisteri</i>	278299	Junior synonym	Junior synonym of <i>Pisanodon</i>	(Tonni et al. 1992; Bond, Madden, and Carlini 2006; Croft 2007)

Table S4.8: Taxa omitted from analysis, cont.

<i>Palaeotoxodon</i> sp.	43400	Junior synonym	Junior synonym of <i>Pisanodon</i>	(Madden 1990; Tonni et al. 1992; Nasif, Musalem, and Cerdeño 2000; Croft 2007; Santos 2008)
<i>Palaeotoxodon virgatus</i>	278298	Junior synonym	Junior synonym of <i>Pisanodon</i>	(Tonni et al. 1992; Croft 2007; Santos 2008; Schmidt 2013)
<i>Pampatherium paulacoutoi</i>	273796	Junior synonym	Moved to <i>Holmesina</i> (<i>H. paulacoutoi</i> is already in the database with a different ID #)	(Cartelle Guerra, Câmara, and Prado 1985)
<i>Paradidelphys</i> sp.	39980	Junior synonym	Junior synonym: <i>P. nodosa</i> is junior synonym of <i>Thylophorops perplana</i> and <i>P. parvula</i> is included in <i>Didelphys biforata</i>	(Marshall 1977; Goin and Pardiñas 1996)
<i>Paradoxomys</i> sp.	246141	<i>Nomen dubium</i>		(Candela 2005)
<i>Paraglyptodon paranensis</i>	291892	<i>Nomen dubium</i>		(Scillato-Yané et al. 2013)
<i>Parahipparion saldiasi</i>	311191	Junior synonym	Junior synonym of <i>Hippidion saldiasi</i>	(Alberdi and Prado 1993)
<i>Parahoplophorus paranensis</i>	278345	<i>Nomen dubium</i>		(Scillato-Yané et al. 2013)
<i>Parahyaenodon argentinus</i>	270813	Junior synonym	Junior synonym of <i>Cyonasua</i>	(Forasiepi, Martinelli, and Goin 2007; Prevosti pers. comm.)
<i>Paranamys</i> sp.	278327	Junior synonym	Junior synonym of <i>Drytomomys</i>	(Candela and Nasif 2006)
<i>Parapanochthus</i> sp.	188888	Junior synonym	Only species has been returned to <i>Panochthus</i>	(Porpino et al. 2014)
<i>Parodimys</i> sp.	122366	Junior synonym	Probably juvenile of other cardiomyine genera	(Vucetich et al. 2010)
<i>Pascualia laeviplicata</i>	281442	Junior synonym	Possible junior synonym of <i>Galea</i>	(Ubilla and Rinderknecht 2014)

Table S4.8: Taxa omitted from analysis, cont.

<i>Pentastylomys</i> sp.	278330	<i>Nomen dubium</i>	Poorly known, possible synonyms	(Kretzoi and Vörös 1989; Candela 2005; Rinderknecht et al. 2010; Kerber et al. 2014)
<i>Perumys gyulavarii</i>	271961	Junior synonym	Probably junior synonym of <i>Phoberomys</i>	(Kerber, Negri, Ribeiro, Vucetich, et al. 2016)
<i>Plohophorops</i> sp.	97127	Junior synonym	Junior synonym: genus created for <i>Plohophorus araucanus</i>	(Zamorano and Scillato-Yané 2011)
<i>Prolestodon antiquus</i>	278481	Junior synonym	Junior synonym of <i>Leston armatus</i>	(Esteban 1996; Czerwonogora and Fariña 2013)
<i>Prolestodon paranensis</i>	278480	Junior synonym	Junior synonym of <i>Leston armatus</i>	(Esteban 1996; Czerwonogora and Fariña 2013)
<i>Promegatherium parvulum</i>	278353	<i>Nomen dubium</i>	"Equivocal status"	(Iuliis 1996; Iuliis, Ré, and Vizcaíno 2004; Brandoni and Scillato-Yané 2007)
<i>Promegatherium smaltatus</i>	246263	<i>Nomen dubium</i>	"Equivocal status"	(Iuliis 1996; Iuliis, Ré, and Vizcaíno 2004; Brandoni and Scillato-Yané 2007)
<i>Propediolagus</i> sp.	42123	Junior synonym	Junior synonym to <i>Microcavia</i> and <i>Dolicavia</i>	(Quintana 1996; Quintana 1997)
<i>Propraopus magnus</i>	247621	Junior synonym	Junior synonym of <i>Propraopus sulcatus</i>	(Rincón et al. 2009)
<i>Proterotherium americanum</i>	247755	<i>Nomen nudum</i>		(Soria 2001; Schmidt and Cerdeño 2014)
<i>Proterotherium gradatum</i>	278304	Junior synonym	Junior synonym of <i>Brachytherium cuspidatum</i>	(Soria 2001; Schmidt 2011; Schmidt 2013; Schmidt 2015)
<i>Protomegamys</i> sp.	278331	Junior synonym	Junior synonym for <i>Eumegamys</i> or at best nomen dubium	(McKenna and Bell 1997; Candela 2005; Rinderknecht 2011)
<i>Pseudoeuryurus lelongianus</i>	278347	<i>Nomen dubium</i>		(Scillato-Yané et al. 2013)

Table S4.8: Taxa omitted from analysis, cont.

<i>Pseudohegetotherium</i> sp.	43448	Junior synonym	Junior synonym for <i>Hemihegetotherium torresi</i>	(Cerdeño and Montalvo 2002)
<i>Pseudomacrauchenia</i> sp.	297009	Junior synonym	Junior synonym: <i>Promacrauchenia</i>	(Schmidt 2013)
<i>Rhodanodolichotis antepridiana</i>	265614	Junior synonym	Junior synonym of <i>Prodolichotis pridiana</i> (type and other <i>Rhodanodolichotis</i> specimens reidentified as <i>P. pridiana</i>)	(Walton 1997)
<i>Rhodanodolichotis</i> sp.	265613	Junior synonym	Junior synonym: <i>Prodolichotis pridiana</i> (type and other <i>Rhodanodolichotis</i> specimens reidentified as <i>P. pridiana</i>)	(Walton 1997)
<i>Rhodanodolichotis vucetichae</i>	266025	Junior synonym	Junior synonym of <i>Prodolichotis pridiana</i> (type and other <i>Rhodanodolichotis</i> specimens reidentified as <i>P. pridiana</i>)	(Walton 1997)
<i>Rhynchotherium andium</i>	269159	Junior synonym	Junior synonym of <i>Cuvieronius hyodon</i>	(Prado et al. 2003; Prado et al. 2005; Lucas 2008; Lucas 2009; Lucas et al. 2011)
<i>Scalabrinitherium rothii</i>	246239	Junior synonym	Junior synonym of <i>Scalabrinitherium bravardi</i>	(Schmidt 2013)
<i>Scelidodon chiliense</i>	84186	Junior synonym	Junior synonym of <i>Catonyx chiliense</i>	(McDonald and Perea 2002; Corona, Perea, and McDonald 2013)
<i>Scelidodon</i> sp.	43645	Junior synonym	Junior synonym of <i>Catonyx</i>	(McDonald and Perea 2002; Corona, Perea, and McDonald 2013)
<i>Scelidootherium cuvieri</i>	261419	Junior synonym	Junior synonym to <i>Catonyx cuvieri</i>	(Corona, Perea, and McDonald 2013)
<i>Scelidootherium patrium</i>	248049	Junior synonym	Junior synonym of <i>Proscelidodon patrius</i>	(Brandoni 2008b)

Table S4.8: Taxa omitted from analysis, cont.

<i>Scelidotherium tarijense</i>	264373	Junior synonym	Junior synonym of <i>Catonyx tarijensis</i>	(Miño-Boilini and Zurita 2015)
<i>Smilodon riggii</i>	270462	Invalid species	Not a valid species	(Prevosti and Pomi 2007)
<i>Strabosodon acuticavus</i>	278484	<i>Nomen dubium</i>	No diagnostic characters and poorly known	(Brandoni 2013)
<i>Strabosodon obtusicavus</i>	278485	<i>Nomen dubium</i>	No diagnostic characters and poorly known	(Brandoni 2013)
<i>Toxodon gezi</i>	117320	Junior synonym	Junior synonym of <i>T. platensis</i>	(Bond 1999; Miño-Boilini, Cerdeño, and Bond 2006; Zurita et al. 2007; Guérin and Faure 2013)
<i>Toxodontherium compressum</i>	240027	<i>Nomen dubium</i>		(Elissamburu 2007)
<i>Toxodontherium</i> sp.	240026	<i>Nomen dubium</i>		(Elissamburu 2007)
<i>Trachycalyptus cingulatus</i>	278341	<i>Nomen nudum</i>	Genus recognized as <i>Nomen nudum</i> by Ameghino 1908, Zurita et al. 2016 agree that most species non-valid and that genus lacks diagnostic characters	(Zurita, Taglioretti, De Los Reyes, et al. 2016)
<i>Trachycalyptus</i> sp.	43592	<i>Nomen nudum</i>	Genus recognized as <i>Nomen nudum</i> by Ameghino 1908, Zurita et al. 2016 agree that most species non-valid and that genus lacks diagnostic characters	(Zurita, Taglioretti, De Los Reyes, et al. 2016)
<i>Trigodonops lopesi</i>	205600	<i>Nomen dubium</i>		(Elissamburu 2007)
<i>Trigodonops</i> sp.	205599	<i>Nomen dubium</i>		(Elissamburu 2007)
<i>Xotodon doellojuradi</i>	278292	Junior synonym	Junior synonym of <i>Stenotephanos plicidens</i>	(Schmidt 2013)
<i>Xotodon foricurvatus</i>	240064	Junior synonym	Junior synonym of <i>Stenotephanos plicidens</i>	(Schmidt 2013)
<i>Xotodon</i> sp.	43407	Junior synonym	Junior synonym of <i>Stenotephanos</i>	(Schmidt 2013)

9. Diets of South American fossil taxa

Table S4.9: Dietary data for South American fossil taxa. This table was compiled from an extensive literature search. The column, “Taxa, this study,” indicates the specific taxon for which at least one occurrence was downloaded from the PBDB. Note that this is different from the other taxonomic columns, “Taxa studied” and “Author taxa.” These columns, respectively, indicate for each study which taxa were directly studied, and if the author indicated that the results might be applicable to additional taxa. The “Relationship” column (abbreviated “Rel.”) indicates the relationship between the taxa in the PBDB occurrences and the taxa studied in each reference. The “Diet” column provides the diet given by each reference, and where available, the “Diet Details” column provides additional information. Finally, “Source” column gives the reference and the “Methods” column (abbreviated “Met.”) describes the methods used by that study. Abbreviations are listed below for the diet, relationship, and method columns. For taxa with only one relevant dietary study, the single study is in bold to indicate that this was the diet used in the analyses for the current study. If more than one study was available, then all references are listed on individual lines and are followed by a bolded summary line indicating the dietary classification used in this study. In cases where different studies gave different diets, a variety of factors were considered before assigning the diet for this study, including the methods used and taxonomic resolution of each study, and the number of authors, studies, or methods that agree on any given diet. Abbreviations: Diet: Frugivore: Fr, Omnivore: Om, Granivore: Gn, Hypercarnivore: HC, Mesocarnivore: MC, Grazer: Gz, Mixed Feeder: MF, Folivore: Fl, Radicivore (root eater): Rz, Generalized herbivore: GH, Formicivore: Fm, Scavenger: Sc, Piscivore: Ps, Gumivore: Gm, Nectarivore: Nc, Sanguivore: Sn, Insectivore: In, Om-H: Omnivore-herbivore, Herbivore (unknown specialization): Herb. Relationship: Same taxa as studied in reference: Tax, Another species from the Same Subgenus/Genus/Tribe/Subfamily/Family/Superfamily: SSG/SG/ST /SSF/SF/SSpF, Taxa for this study is within a higher level clade that was studied as a unit in the reference- Within Subgenus/Genus/Tribe/Subfamily/Family: WSG/WG/WSF/WF, Sister genus of the taxa studied in the reference: SisG, Phylogenetic bracketing by the taxa in the reference(s): PB, Within a higher level clade to which the author suggested their interpretations also apply: AGp, Ecological Similarity to the taxa in the reference: ES, Morphological Similarity to the taxa in the reference: MS, See “Diet Details” for an explanation: See. Methods: Dental Morphology: DM, Literature Review: LR, Literature review of extant taxa only: LR-e, Unspecified: Un, Ecological Similarity: ES, Morphological Similarity: MS, Morphological Comparison to a Fossil Relative: MC:FR, Closest Living Relative: CLR, Phylogenetic Bracketing: PB, Cranial Morphology: CM, Craniodental morphology: CDM, Mandibular Morphology: MM, Dental and Mandibular Morphology: DMM, Cranial and Mandibular Morphology: CMM, Cranial Geometric Morphometrics: CGM, Cranial Ontogeny: CO, Postcranial Morphology: PCM, Postcranial Geometric Morphometrics: PCGM, Biomechanics: BM, Dental Microwear: DMc, Dental Mesowear: DMs, Enamel Microstructure: EM, Stable Isotopes: SI, Habitat: Hb, Regional Faunal Composition: RFC, Modern Analogue: MA, Fecal Analysis (modern): FA, Coprolite Analysis (fossil): CA, Field Observations: FO, Dental Wear patterns: DW, Laboratory experiments with living animals: Lab, Myology: My, Stomach Contents: SC, Taphonomy: Tph, Ichnology: Ich, Vegetation Analysis: VA, Tooth Calculus Analysis of microfossils: TCA, Trapping of live animals: Tp.

Table S4.9: Dietary data for South American fossil taxa, cont.

Taxa, this study	Diet	Diet Details	Source	Rel.	Taxa Studied	Author Taxa	Met.
<i>Abderites meridionalis</i>	Fr		(Dumont, Strait, and Friscia 2000b)	Tax	<i>Abderites meridionalis</i>	<i>Abderites meridionalis</i>	DM, Mass
<i>Abrothrix illuteus</i>	Om-In		(Patton, Pardiñas, and D'Elía 2015)	SG	<i>Abrothrix andina</i> , <i>A. jelskii</i> , <i>A. longipilis</i> , <i>A. olivacea</i> , <i>A. sanborni</i>	<i>Abrothrix andina</i> , <i>A. jelskii</i> , <i>A. longipilis</i> , <i>A. olivacea</i> , <i>A. sanborni</i>	LR-E
<i>Acantharoidea sp.</i>	Om	Variety of plant types (roots, tubers, nuts) and variety of animal matter (ants, carrion, birds, mice)	(Vizcaíno 2009)	ST	<i>Prozaedyus</i> , <i>Zaedyus</i> , <i>Macro-euphractus</i> , <i>Euphractus</i> , other extant Euphractini	Euphractini	LR, CDM
<i>Acarechimys sp.</i>	Gn		(Kay and Madden 1997b)	Tax	<i>Acarechimys</i>	<i>Acarechimys</i>	Un
<i>Acrecebus fraileyi</i>	Fr-Om	This study, based on: <i>Cebus</i> is frugivore-omnivore (Fleagle 2013), and <i>Cebus</i> and <i>Acrecebus</i> are sister genera (Kay and Coz-zuol 2006; Kay 2015)	(Fleagle 2013; Kay and Coz-zuol 2006; Kay 2015)	SisG	<i>Cebus</i>	<i>Cebus</i>	LR-E
<i>Acrecebus fraileyi</i>	Fr		(Fleagle 2013)	Tax	<i>Acrecebus fraileyi</i>	<i>Acrecebus fraileyi</i>	Un
<i>Acrecebus fraileyi</i>	Fr-Om			Sum			
<i>Acrocyon sp.</i>	HC		(Kay, Vizcaíno,	Tax	<i>Acrocyon sec-</i>	<i>Acrocyon sec-</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

			and Bargo 2012)		torius	torius	
<i>Acrocyon</i> sp.	HC		(Prevosti, Forasiepi, and Zimicz 2013)	SG	<i>Acrocyon riggsi</i> , <i>A. sectorius</i>	<i>Acrocyon riggsi</i> , <i>A. sectorius</i>	DM
<i>Acrocyon</i> sp.	HC			Sum			
<i>Actenomys priscus</i>, <i>A. sp.</i>	Gz	Fossorial with similarities to <i>Ctenomys</i> but not yet subterranean (Verzi 2008; Fernández, Vassallo, and Zárate 2000); <i>Ctenomys</i> spp. are grazers or radicivores, many with a preference for above-ground vegetation (Comparatore, Cid, and Busch 1995; Rosi et al. 2009; Albanese et al. 2010; Patton, Pardiñas, and D’Elía 2015)	(Fernández, Vassallo, and Zárate 2000; Verzi 2008; Comparatore, Cid, and Busch 1995; Rosi et al. 2009; Albanese et al. 2010; Patton, Pardiñas, and D’Elía 2015)	SG	<i>Actenomys</i> spp.		MS, ES, CLR
<i>Acyon myctoderos</i>, <i>A. tricuspidatus</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Acyon myctoderos</i>, <i>Acyon tricuspidatus</i>	<i>Acyon myctoderos</i>, <i>Acyon tricuspidatus</i>	DM
<i>Adinotherium robustum</i> , <i>A. sp.</i>	Fl		(Townsend and Croft 2008a)	SG	<i>Adinotherium ovinum</i>	<i>Adinotherium ovinum</i>	DMc
<i>Adinotherium robustum</i> , <i>A. sp.</i>	Gz or MF		(Cassini et al. 2011)	SF	<i>Nesodon</i>	<i>Nesodon</i>	CMM
<i>Adinotherium robustum</i> , <i>A. sp.</i>	GH		(Cassini and Vizcaíno 2012)	SG	<i>Adinotherium ovinum</i>	<i>Adinotherium ovinum</i>	BM
<i>Adinotherium</i>	GH		(Cassini, Viz-	SG	<i>Adinotherium</i>	<i>Adinotherium</i>	CM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>robustum</i> , A. sp.			caíno, and Bar- go 2012)		<i>ovinum</i>	<i>ovinum</i>	
<i>Adinotherium robustum</i> , A. sp.	Gz		(Cassini et al. 2012)	SG	<i>Adinotherium ovinum</i>	<i>Adinotherium ovinum</i>	CDM
<i>Adinotherium robustum</i> , A. sp.	GH		(Cassini, Flores, and Vizcaíno 2012)	SG, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CO, CM
<i>Adinotherium robustum</i> , A. sp.	Gz		(Kay, Vizcaíno, and Bargo 2012)	SG	<i>Adinotherium ovinum</i>	<i>Adinotherium ovinum</i>	LR
<i>Adinotherium robustum</i> , A. sp.	GH	Diet dependent on availability: Browse to graze	(Cassini 2013)	WG	<i>Adinotherium</i>	<i>Adinotherium</i>	CGM
<i>Adinotherium robustum</i>, A. sp.	GH			Sum		Toxodontidae	
<i>Agalmoceros blicki</i>	Fl or MF	"[South American] cervids... never evolved true grazing forms, although the marsh deer (<i>Blastocerus dichotomus</i>) is a fresh grass grazer."	(Janis 2008)	AGp	South American cervids	South American cervids	LR
<i>Agalmoceros blicki</i>	MF		(Merino and Rossi 2010)	AGp	Open habitat South American cervids	Open habitat South American cervids	LR
<i>Agalmoceros blicki</i>	MF			Sum			
<i>Ahytherium aureum</i>	Fl		(Pujos et al. 2012)	WF	Megalo-nychidae	Megalo-nychidae	PB
<i>Akodon azarae</i>	Om-	Invertebrates, leaves, fruits,	(Patton,	Tax	<i>Akodon aza-</i>	<i>Akodon aza-</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

	H	seeds, green vegetation	Pardiñas, and D'Elía 2015)		rae	rae	
<i>Akodon</i> sp.	Om-H or Om-In	Various proportions of plant material and insects in diet within and among spp.	(Patton, Pardiñas, and D'Elía 2015)	SG	<i>Akodon affinis</i> , <i>A. azarae</i> , <i>A. cursor</i> , <i>A. dolores</i> , <i>A. josemariarguedasi</i> , <i>A. montensis</i> , <i>A. paranaensis</i> , <i>A. subfuscus</i> , <i>A. torques</i>	<i>Akodon affinis</i> , <i>A. azarae</i> , <i>A. cursor</i> , <i>A. dolores</i> , <i>A. josemariarguedasi</i> , <i>A. montensis</i> , <i>A. paranaensis</i> , <i>A. subfuscus</i> , <i>A. torques</i>	LR-E
<i>Alitoxodon</i> sp.	GH	Diet varies from C ₃ browser in closed canopy to open grassland C ₄ grazer	(MacFadden 2005)	SF, PB	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	SI
<i>Alitoxodon</i> sp.	Fl		(Townsend and Croft 2008a)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	DMc
<i>Alitoxodon</i> sp.	Gz or MF		(Cassini et al. 2011)	SF, PB	<i>Nesodon</i>	<i>Nesodon</i>	CMM
<i>Alitoxodon</i> sp.	GH		(Cassini, Vizcaíno, and Bar-go 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	CM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Alitoxodon</i> sp.	Gz		(Cassini et al. 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	CDM
<i>Alitoxodon</i> sp.	GH		(Cassini, Flores, and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CO, CM
<i>Alitoxodon</i> sp.	GH		(Cassini and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	BM
<i>Alitoxodon</i> sp.	Gz		(Kay, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	LR
<i>Alitoxodon</i> sp.	GH	Diet dependent on availability: Browse to graze	(Cassini 2013)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CGM
<i>Alitoxodon</i> sp.	GH			Sum		Toxodontidae	
<i>Alloiomys</i> sp.	Gn-Fr	Extant dasyproctids eat and cache fruit and seeds; <i>Dasyprocta azarae</i> : Palm seeds, <i>Dasyprocta fuliginosa</i> : Seeds and nuts; <i>Dasyprocta leporina</i> : frugivore-granivore; <i>Dasyprocta prymnolopha</i> : "seed predator";	(Patton, Pardiñas, and D'Elía 2015)	SF, CL, R	<i>Dasyprocta</i> and <i>Myoprocta</i>	<i>Dasyprocta</i> and <i>Myoprocta</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Dasyprocta punctata</i> : "seed predator"; <i>Dasyprocta variegata</i> : Brazil nuts and palm seeds; <i>Myoprocta acouchy</i> : Fruit and seeds over 99% of diet; <i>Myoprocta pratti</i> : Frugivore-granivore							
<i>Alouatta mau-roi</i>	Fl-Fr		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SG	<i>Alouatta</i> , including <i>A. belzebul</i> , <i>A. fusca</i> , <i>A. palliata</i> , <i>A. sara</i>	<i>Alouatta</i> , including <i>A. belzebul</i> , <i>A. fusca</i> , <i>A. palliata</i> , <i>A. sara</i>	LR-E
<i>Amphiocnus paranense</i>	Fl		(Pujos et al. 2012)	WF	Megalo-nychidae	Megalo-nychidae	PB
<i>Anadasypus aequatorianus</i> , <i>A. hondanus</i> , <i>A. sp.</i>	Om-In		(Carlini et al. 1997)	SG	<i>Anadasypus hondanus</i>	<i>Anadasypus hondanus</i>	Un
<i>Andinomys edax</i> , <i>A. sp.</i>	GH	Green plants	(Alhajeri 2014)	Tax, SG	<i>Andinomys edax</i>	<i>Andinomys edax</i>	LR-E
<i>Antifer crassus</i> , <i>A. niemeyeri</i> , <i>A. sp.</i>	Fl	Middle-sized cervids (such as <i>Morenelaphus</i> and <i>Charitoceros</i>) have the most folivorous diets	(Menégaz and Ortiz Jauregui-zar 1995)	WG	<i>Morenelaphus</i> , <i>Epieurycerus</i> , <i>Paraceros</i> , <i>Antifer</i>	<i>Morenelaphus</i> , <i>Epieurycerus</i> , <i>Paraceros</i> , <i>Antifer</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Antifer crassus</i> , <i>A. niemeyeri</i> , <i>A.</i> <i>sp.</i>	MF	Translating and paraphrasing: Although they have been previ- ously interpreted as browsers in forests (Menégaz & Ortiz Jau- reguizar 1995), <i>Antifer</i> seems to be associated with arid to semi- arid climates similar to the Pam- pean region today.	(M. Alcaraz and Zurita 2004)	WG	<i>Antifer</i>	<i>Antifer</i>	Hb
<i>Antifer crassus</i> , <i>A. niemeyeri</i> , <i>A.</i> <i>sp.</i>	Fl or MF	"[South American] cervids... never evolved true grazing forms, although the marsh deer (<i>Blasto- cerus dichotomous</i>) is a fresh grass grazer."	(Janis 2008)	AGp	South Ameri- can cervids	South Ameri- can cervids	LR
<i>Antifer crassus</i> , <i>A. niemeyeri</i> , <i>A.</i> <i>sp.</i>	MF	This study, based on: Open, semi- arid habitat (Zurita et al. 2009)	(Zurita et al. 2009)	WG	<i>Morenela- phus, Antifer</i>	<i>Morenela- phus, Antifer</i>	RFC
<i>Antifer crassus</i> , <i>A. niemeyeri</i> , <i>A.</i> <i>sp.</i>	MF		(Merino and Rossi 2010)	AGp	Open habitat South Ameri- can cervids	Open habitat South Ameri- can cervids	LR
<i>Antifer crassus</i>, <i>A. niemeyeri</i>, <i>A.</i> <i>sp.</i>	MF			Sum			
<i>Arctodictis mu- nizi</i> , <i>A. sp.</i>	HC		(Kay, Vizcaíno, and Bargo 2012)	Tax, SG	<i>Arctodictis munizi</i>	<i>Arctodictis munizi</i>	Un
<i>Arctodictis mu- nizi</i> , <i>A. sp.</i>	HC		(Prevosti, Fora- siepi, and Zimicz 2013)	Tax, SG	<i>Arctodictis munizi</i>	<i>Arctodictis munizi</i>	DM
<i>Arctodictis mu- nizi</i> , <i>A. sp.</i>	HC			Sum			

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Arctodus</i> sp.	Om-H		(Emslie and Czaplewski 1985)	SG	<i>Arctodus simus</i>	<i>Arctodus simus</i>	CLR
<i>Arctodus</i> sp.	HC		(Bocherens et al. 1995)	SG	<i>Arctodus simus</i>	<i>Arctodus simus</i>	SI
<i>Arctodus</i> sp.	Sc			SG	<i>Arctodus simus</i>	<i>Arctodus simus</i>	SI
<i>Arctodus</i> sp.	HC		(Barnes et al. 2002)	SG	<i>Arctodus simus</i>	<i>Arctodus simus</i>	SI
<i>Arctodus</i> sp.	Om		(Sorkin 2006)	SG	<i>Arctodus simus</i>	<i>Arctodus simus</i>	CM, PCM, SI
<i>Arctodus</i> sp.	HC		(Fox-Dobbs, Leonard, and Koch 2008)	SG	<i>Arctodus simus</i>	<i>Arctodus simus</i>	SI
<i>Arctodus</i> sp.	Om	Variable based on availability	(Figueirido et al. 2010)	SG	<i>Arctodus simus</i>	<i>Arctodus simus</i>	CDM, PCM
<i>Arctodus</i> sp.	Om			Sum			
<i>Arctotherium brasiliense</i>, <i>A. sp.</i>	Om	All are omnivores	(Prevosti, Forasiepi, and Zimicz 2013)	SG	<i>Arctotherium angustidens</i>, <i>A. wingei</i>, <i>A. vetustum</i>, <i>A. tarijense</i>, <i>A. bonariense</i>	<i>Arctotherium angustidens</i>, <i>A. wingei</i>, <i>A. vetustum</i>, <i>A. tarijense</i>, <i>A. bonariense</i>	DM
<i>Arctotherium tarijense</i>	Om		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>A. tarijense</i>	<i>A. tarijense</i>	DM
<i>Arctotherium wingei</i>	Om-H	Mostly herbivorous	(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>A. wingei</i>	<i>A. wingei</i>	DM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Argyrolagus palmeri</i>	Gn-In	High proportion of seeds, with some insects	(Simpson 1970b)	SG, PB	Argyrolagidae (<i>Argyrolagus</i> and <i>Microtragulus</i>)	Argyrolagidae	MA
<i>Argyrolagus palmeri</i>	Gn		(Mares 1985)	WF	Argyrolagidae	Argyrolagidae	Un
<i>Argyrolagus palmeri</i>	Gn		(Mares 1993)	WF	Argyrolagidae	Argyrolagidae	MA
<i>Argyrolagus palmeri</i>	Gn	Size alone implies granivory or insectivory, crowns too high for pure insectivory: abrasives from seeds on the ground and dust in open, semiarid environments	(Sánchez-Villagra and Kay 1997)	SF	<i>Proargyrolagus</i>	<i>Proargyrolagus</i>	DM, Mass
<i>Argyrolagus palmeri</i>	Gn	Highly abrasive diet, "perhaps including a large proportion of grasses" or abrasive because of open habitats	(Sánchez-Villagra, Kay, and Anaya-Daza 2000)	SF	<i>Hondalagus altiplanensis</i>	<i>Hondalagus altiplanensis</i>	LR
<i>Argyrolagus palmeri</i>	Gn		(Carlini, Pascual, and Goin 2007)	SF	<i>Anargyrolagus</i>	Argyrolagidae	MA
<i>Argyrolagus palmeri</i>	Gn		(García-López and Babot 2015)	WF	Argyrolagidae	Argyrolagidae	MA
<i>Argyrolagus palmeri</i>	Gn	"Feeding mainly on seeds in more open areas"	(Croft 2016)	SF	<i>Hondalagus altiplanensis</i>	<i>Hondalagus altiplanensis</i>	Un
<i>Argyrolagus palmeri</i>	Gn			Sum		Argyrolagidae	
<i>Artigasias magna</i>	MF		Rinderknecht pers. comm.	WG	<i>Artigasias</i>	<i>Artigasias</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Aspidocalyptus</i> sp.	MF	This study, based on: Similar temporal trends in multiple lineages of glyptodonts: Intermediate between Miocene browsers and Pleistocene grazers	(Vizcaíno, Cassini, et al. 2011)	See	<i>Hoplophrac-tus, Eosclero-calyptus, Urotherium</i>	<i>Hoplophrac-tus, Eosclero-calyptus, Urotherium</i>	CDM
<i>Asterostemma</i> sp.	Fl	Highly selective to selective feeders in relatively closed to moderately open habitats	(Vizcaíno, Cassini, et al. 2011)	SSF	<i>Eucinepeltus, Propalaeophorus, Cochlops</i>	<i>Eucinepeltus, Propalaeophorus, Cochlops</i>	CDM
<i>Astrapotherium</i> sp.	Fl		(Rensberger and Pfretzschner 1992)	Tax	<i>Astrapotheri-um</i>	<i>Astrapotheri-um</i>	EM
<i>Astrapotherium</i> sp.	Fl		(Townsend and Croft 2005)	Tax	<i>Astrapotheri-um</i>	<i>Astrapotheri-um</i>	DMc
<i>Astrapotherium</i> sp.	Fl		(Cassini, Vizcaíno, and Bargo 2012)	Tax	<i>Astrapotheri-um</i>	<i>Astrapotheri-um</i>	CM
<i>Astrapotherium</i> sp.	Fl		(Cassini et al. 2012)	Tax	<i>Astrapotheri-um</i>	<i>Astrapotheri-um</i>	CDM
<i>Astrapotherium</i> sp.	MF		(Kay, Vizcaíno, and Bargo 2012)	Tax	<i>Astrapotheri-um</i>	<i>Astrapotheri-um</i>	Un
<i>Astrapotherium</i> sp.	Fl		(Cassini 2013)	Tax	<i>Astrapotheri-um</i>	<i>Astrapotheri-um</i>	CGM
<i>Astrapotherium</i> sp.	Fl			Sum			
<i>Auliscomys</i> sp.	GH	Forbs, lichens, other vegetation	(Patton, Pardiñas, and D'Elía 2015)	SG	<i>Auliscomys boliviensis, A. pictus, A. sublimus</i>	<i>Auliscomys boliviensis, A. pictus, A. sublimus</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Australonyx aquae</i>	Fl		(Pujos et al. 2012)	WF	Megalo- nychidae	Megalo- nychidae	PB
<i>Berroia</i> sp.	GH	Diet varies from C ₃ browser in closed canopy to open grassland C ₄ grazer	(MacFadden 2005)	SF, PB	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	SI
<i>Berroia</i> sp.	Fl		(Townsend and Croft 2008a)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	DMc
<i>Berroia</i> sp.	Gz or MF		(Cassini et al. 2011)	SF, PB	<i>Nesodon</i>	<i>Nesodon</i>	CMM
<i>Berroia</i> sp.	GH		(Cassini, Vizcaíno, and Bar-go 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	CM
<i>Berroia</i> sp.	Gz		(Cassini et al. 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	CDM
<i>Berroia</i> sp.	GH		(Cassini, Flores, and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CO, CM
<i>Berroia</i> sp.	GH		(Cassini and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and	Nesodontines (<i>Adinotherium ovinum</i> and	BM

Table S4.9: Dietary data for South American fossil taxa, cont.

					<i>Nesodon imbricatus</i>)	<i>Nesodon imbricatus</i>)	
<i>Berroia</i> sp.	Gz		(Kay, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	LR
<i>Berroia</i> sp.	GH	Diet dependent on availability: Browse to graze	(Candela, Cassini, and Nasif 2013)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CGM
<i>Berroia</i> sp.	GH			Sum		Toxodontidae	
<i>Berthawyeria</i> sp.	MF	Relationship: Similar temporal trends in multiple lineages of glyptodonts; Diet: Intermediate between Miocene browsers and Pleistocene grazers	(Vizcaíno, Cassini, et al. 2011)	See	<i>Hoplophractus</i>, <i>Eosclerocalyptus</i>, <i>Urotherium</i>	<i>Hoplophractus</i>, <i>Eosclerocalyptus</i>, <i>Urotherium</i>	CDM
<i>Blastocerus</i> sp.	MF	"Grazer-browser specialist": shoots of shrubs and broad-leaved aquatic macrophytes	(Tomas and Salis 2000)	SG	<i>Blastocerus dichotomus</i>	<i>Blastocerus dichotomus</i>	FA
<i>Blastocerus</i> sp.	MF to Gz	Fresh grass grazer	(Janis 2008)	SG	<i>Blastocerus dichotomus</i>	<i>Blastocerus dichotomus</i>	LR
<i>Blastocerus</i> sp.	MF		(Merino and Rossi 2010)	AGp	Open habitat South American cervids	Open habitat South American cervids	LR
<i>Blastocerus</i> sp.	MF			Sum			
<i>Bolivartherium codorensis</i>, <i>B. urumaquensis</i>	Gz		(Pujos et al. 2012)	WF	Mylodontidae	Mylodontidae	PB

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Bolomys</i> sp.	In-Gn	Seeds (majority of diet), invertebrates/ insects	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SG	<i>Bolomys lasiurus</i>		LR-E
<i>Bolomys</i> sp.	Om-In	Seeds, insects/ invertebrates, green vegetation	(Patton, Pardiñas, and D'Elía 2015)	SG	<i>Necomys</i> (= <i>Bolomys</i>) <i>amoenus</i> , <i>N. lasiurus</i> , <i>N. obscurus</i>	<i>Necomys amoenus</i> , <i>N. lasiurus</i> , <i>N. obscurus</i>	LR-E
<i>Bolomys</i> sp.	Om-In			Sum			
<i>Boreostemma acostae</i> , <i>B. pliocena</i> , <i>B. sp.</i> , <i>B. venezolensis</i>	Gz		(Fariña 1985)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CMM
<i>Boreostemma acostae</i> , <i>B. pliocena</i> , <i>B. sp.</i> , <i>B. venezolensis</i>	Gz		(Pérez, Scillato-Yané, and Vizcaino 2000)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CM
<i>Boreostemma acostae</i> , <i>B. pliocena</i> , <i>B. sp.</i> , <i>B. venezolensis</i>	Gz		(Fariña and Vizcaino 2001)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CMDM
<i>Boreostemma acostae</i> , <i>B. pliocena</i> , <i>B. sp.</i> , <i>B. venezolensis</i>	Gz	<i>Panochthus</i> and <i>Sclerocalyptus</i> : grazers in cold, semiarid, open environments	(Zurita, Scillato-Yané, and Carlini 2005)	AGp	<i>Panochthus</i> and <i>Sclerocalyptus</i>	Plio-Pleistocene Glyptodontidae	LR
<i>Boreostemma</i>	Gz		(Ascanio D.	AGp	<i>Glyptodon</i>	Plio-	LR

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>acostae</i> , <i>B. pliocena</i> , <i>B. sp.</i> , <i>B. venezolensis</i>			Rincón, White, and Mcdonald 2008)			Pleistocene Glyptodontidae	
<i>Boreostemma acostae</i> , <i>B. pliocena</i> , <i>B. sp.</i> , <i>B. venezolensis</i>	Gz	Relationship: Plio-Pleistocene glyptodonts shared dental morphology and diet based on authors above; Diet: Bulk feeders in moderately open to open habitats	(Vizcaíno, Casini, et al. 2011)	PB	<i>Doedicurus</i> , <i>Panochthus</i> , <i>Neuryurus</i> , <i>Neosclerocalyptus</i>	<i>Doedicurus</i> , <i>Panochthus</i> , <i>Neuryurus</i> , <i>Neosclerocalyptus</i>	CDM
<i>Boreostemma acostae</i>, <i>B. pliocena</i>, <i>B. sp.</i>, <i>B. venezolensis</i>	Gz			Sum		Plio-Pleistocene Glyptodontidae	
<i>Borhyaena tuberata</i>	HC		(Kay, Vizcaíno, and Bargo 2012)	Tax	<i>Borhyaena tuberata</i>	<i>Borhyaena tuberata</i>	Un
<i>Borhyaena tuberata</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Borhyaena tuberata</i>	<i>Borhyaena tuberata</i>	DM
<i>Borhyaena tuberata</i>	HC			Sum			
<i>Borhyaenidium altiplanicus</i> , <i>B. musteloides</i> , <i>B. riggsi</i> , <i>B. sp.</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Borhyaenidium altiplanicus</i> , <i>B. musteloides</i> , <i>B. riggsi</i>	<i>Borhyaenidium altiplanicus</i> , <i>B. musteloides</i> , <i>B. riggsi</i>	DM
<i>Bounodus enigmaticus</i>	Om	Bunodont, thick enamel: consistent with diet of fruit with thick rinds, breaking shells of crustaceans and mollusks, omnivory	(Carlini, Gelfo, and Sánchez 2006)	Tax	<i>Bounodus enigmaticus</i>	<i>Bounodus enigmaticus</i>	DM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Cabassous</i> sp.	Fm		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SG	<i>Cabassous</i> , including <i>C. centralis</i> , <i>C. chasicoensis</i> , <i>C. tatouay</i> , <i>C. uncinatus</i>	<i>Cabassous</i>	LR-E
<i>Calchaquitherium mixtum</i>	GH	Diet varies from C ₃ browser in closed canopy to open grassland C ₄ grazer	(MacFadden 2005)	SF, PB	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	SI
<i>Calchaquitherium mixtum</i>	Fl		(Townsend and Croft 2008a)	SF, PB	Nesodontines (Adinotherium ovinum and Nesodon imbricatus)	Nesodontines (Adinotherium ovinum and Nesodon imbricatus)	DMc
<i>Calchaquitherium mixtum</i>	Gz or MF		(Cassini et al. 2011)	SF, PB	<i>Nesodon</i>	<i>Nesodon</i>	CMM
<i>Calchaquitherium mixtum</i>	GH		(Cassini, Vizcaíno, and Bar-go 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	CM
<i>Calchaquitherium mixtum</i>	Gz		(Cassini et al. 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	CDM
<i>Calchaquitherium mixtum</i>	GH		(Cassini, Flores, and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon im-</i>	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon im-</i>	CO, CM

Table S4.9: Dietary data for South American fossil taxa, cont.

					<i>bricatus</i>)	<i>bricatus</i>)	
<i>Calchaquitherium mixtum</i>	GH		(Cassini and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	BM
<i>Calchaquitherium mixtum</i>	Gz		(Kay, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	LR
<i>Calchaquitherium mixtum</i>	GH	Diet dependent on availability: Browse to graze	(Cassini 2013)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CGM
<i>Calchaquitherium mixtum</i>	GH			Sum		Toxodontidae	
<i>Calomys callosus</i>	Gn-In		(Mares, Ernest, and Gettinger 1986)	Tax	<i>Calomys callosus</i>	<i>Calomys callosus</i>	FO
<i>Calomys</i> sp.	Gn-Om	Granivore-insectivore or granivore-omnivore	(Mares, Ernest, and Gettinger 1986)	SG	<i>Calomys callosus</i> , <i>C. tener</i>	<i>Calomys callosus</i> , <i>C. tener</i>	FO
<i>Calomys</i> sp.	Gn-Om	"Mostly granivorous"	(Patton, Pardiñas, and D'Elía 2015)	Tax	<i>Calomys</i>	<i>Calomys</i>	LR-E
<i>Calomys</i> sp.	Gn-Om			Sum			

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Caluromys (Philander) entrerianus</i>	Om	All three extant species of <i>Caluromys</i> : Fruits, flowers, insects, small vertebrates	(Gardner 2007b)	SG	<i>Caluromys derbianus</i> , <i>C. lanatus</i> , <i>C. philander</i>	<i>Caluromys derbianus</i> , <i>C. lanatus</i> , <i>C. philander</i>	LR-E
<i>Canis dirus</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Canis dirus</i>	<i>Canis dirus</i>	DM
<i>Canis</i> sp.	HC		(Prevosti, Forasiepi, and Zimicz 2013)	SG	<i>Canis dirus</i>	<i>Canis dirus</i>	DM
<i>Canis</i> sp.	Om		(Prevosti, Forasiepi, and Zimicz 2013)	SG	<i>Canis familiaris</i>	<i>Canis familiaris</i>	DM
<i>Canis</i> sp.	HC		(Soibelzon and Prevosti 2013)	Tax	<i>Canis</i>	<i>Canis</i>	Un
<i>Canis</i> sp.	HC			Sum			
<i>Cardiatherium chasicoense</i> , <i>C. paranense</i> , <i>C. patagonicum</i> , <i>C. sp.</i>	Gz		(Webb 2006)	WF	Hydrochoeridae	Hydrochoeridae	Un
<i>Cardiatherium chasicoense</i> , <i>C. paranense</i> , <i>C. patagonicum</i> , <i>C. sp.</i>	MF		(MacFadden and Shockey 1997)	SF	<i>Nechoerus tarijensis</i>	<i>Nechoerus tarijensis</i>	SI
<i>Cardiatherium chasicoense</i> , <i>C. paranense</i> , <i>C. patagonicum</i> , <i>C. sp.</i>	Gz	This study, based on stable isotope data (MacFadden and Shockey 1997): Aquatic plants, including most aquatic grasses,	(Bowes et al. 2002)	SF	<i>Nechoerus tarijensis</i>	<i>Nechoerus tarijensis</i>	SI

Table S4.9: Dietary data for South American fossil taxa, cont.

548	sp.		are C ₃ , with a few examples that will use C ₃ -C ₄ intermediate or C ₄ under particular conditions (Bowes et al. 2002) so a diet of terrestrial and aquatic grasses would likely appear by stable isotope analysis to be "mixed feeding"					
	<i>Cardiatherium chasicoense</i> , <i>C. paranense</i> , <i>C. patagonicum</i> , <i>C. sp.</i>	Gz	<i>Hydrochoerus</i> : Grasses, sedges, and aquatic plants	(Patton, Pardiñas, and D'Elía 2015)	SF, CLR	<i>Hydrochoerus hydrochaeris</i>	<i>Hydrochoerus hydrochaeris</i>	LR-E
	<i>Cardiatherium chasicoense</i> , <i>C. paranense</i> , <i>C. patagonicum</i> , <i>C. sp.</i>	Gz	Grasses and aquatic plants	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SF, CLR	<i>Hydrochoerus hydrochaeris</i>	<i>Hydrochoerus hydrochaeris</i>	LR-E
	<i>Cardiatherium chasicoense</i> , <i>C. paranense</i> , <i>C. patagonicum</i> , <i>C. sp.</i>	Gz	This study, based on: Similarity of <i>Cardiatherium</i> to extant capybaras in terms of size, herding, and semiaquatic habits (Vucetich, Deschamps, et al. 2005; Vucetich, Deschamps, and Pérez 2013; Vucetich et al. 2014; Vucetich et al. 2015)	(Vucetich, Deschamps, et al. 2005; Vucetich, Deschamps, and Pérez 2013; Vucetich et al. 2014; Vucetich et al. 2015)	ES	<i>Phugatherium</i> , <i>Cardiatherium</i>		MA & CLR

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Cardiatherium chasicoense</i> , <i>C. paranense</i> , <i>C. patagonicum</i> , <i>C. sp.</i>	Gz			Sum		Capybaras	
<i>Cardiomyx</i> sp.	Fl to Gz	<i>Kerodon</i> browser, <i>Hydrochoerus</i> grazer	(Patton, Pardiñas, and D'Elia 2015)	SSF	<i>Kerodon</i> and <i>Hydrochoerus</i>	<i>Kerodon</i> and <i>Hydrochoerus</i>	LR-E
<i>Cartelles coimbrafilhoi</i>	Fr		(Halenar and Rosenberger 2013)	Tax	<i>Cartelles coimbrafilhoi</i>	<i>Cartelles coimbrafilhoi</i>	Un
<i>Carterodon</i> sp.	Fl		(Marinho-Filho, Rodrigues, and Juarez 2002)	SG	<i>Carterodon sulcidens</i>	<i>Carterodon sulcidens</i>	Un
<i>Catagonus</i> sp., <i>Catagonus stenocephalus</i>	Om-Fl	Cacti and bromeliads, some invertebrates and vertebrates	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SG	<i>Catagonus wagneri</i>	<i>Catagonus wagneri</i>	LR-E
<i>Catonyx chilensis</i> (= <i>Scelidotherium reyesi</i>), <i>Catonyx cuvieri</i> , <i>Catonyx tarijensis</i>	Fl		(Pujos et al. 2012)	WG	<i>Catonyx</i>	<i>Catonyx</i>	MM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Catonyx chil- iensis</i> (= <i>Scelidothieriu m reyesi</i>), <i>Cat- onyx cuvieri</i> , <i>Catonyx tarijen- sis</i>	Fl	Narrow muzzle, cone-shaped pre- hensile lip for selecting individual plants or plant parts: Selective feeder	(Bargo, Toledo, and Vizcaíno 2006)	SSF	<i>Scelidothieri- um</i>	<i>Scelidothieri- um</i>	CMM
<i>Catonyx chil- iensis</i> (= <i>Scelidothieriu m reyesi</i>), <i>Cat- onyx cuvieri</i> , <i>Catonyx tarijen- sis</i>	MF	$\delta^{13}\text{C}$ of -8.7‰	(França et al. 2015)	Tax, SG	<i>Catonyx</i> (= <i>Scelidodon</i>)	<i>Catonyx</i> (= <i>Scelidodon</i>)	SI
<i>Catonyx chil- iensis</i> (= <i>Scelidothieriu m reyesi</i>), <i>Cat- onyx cuvieri</i> , <i>Catonyx tarijen- sis</i>	Fl	$\delta^{13}\text{C}$ of -10.17‰	(Pereira, Dan- tas, and Ferreira 2013)	SSF	<i>Valgipes</i>	<i>Valgipes</i>	SI
<i>Catonyx chil- iensis</i> (=<i>Scelidothieriu m reyesi</i>), <i>Cat- onyx cuvieri</i>, <i>Catonyx tari- jensis</i>	Fl	Sum					
<i>Cavia</i> sp.	Gz	Primarily grazer, but also eats grass inflorescences	(Eisenberg 1989; Redford	SG	<i>Cavia aperea</i>	<i>Cavia aperea</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

			and Eisenberg 1992; Eisenberg and Redford 1999)				
<i>Cavia</i> sp.	Gz	Primarily grazer, but also eats grass inflorescences	(Townsend and Croft 2008b)	Tax	<i>Cavia</i>	<i>Cavia</i>	LR-E
<i>Cavia</i> sp.	Gz	Primarily grazer, but also eats grass inflorescences	(Patton, Pardi- ñas, and D'Elía 2015)	SG	<i>Cavia aperea</i> , <i>C. intermedia</i>	<i>Cavia aperea</i> , <i>C. intermedia</i>	LR-E
<i>Cavia</i> sp.	Gz			Sum			
<i>Caviodon mul- tiplicatus</i>, <i>Cavi- odon</i> sp.	Fl to Gz	Kerodon browser, Hydrocho- erus grazer	(Patton, Pardiñas, and D'Elía 2015)	SSF	Kerodon and Hydrocho- erus	Kerodon and Hydrocho- erus	LR-E
<i>Cebupithecina sarmientoi</i>	Fr- Gn		(Meldrum and Kay 1997a)	Tax	<i>Cebupithecina sarmientoi</i>	<i>Cebupithecina sarmientoi</i>	DM
<i>Cebupithecina sarmientoi</i>	Fr-Fl		(Kay and Mad- den 1997b)	Tax	<i>Cebupithecina sarmientoi</i>	<i>Cebupithecina sarmientoi</i>	DM
<i>Cebupithecina sarmientoi</i>	Fr- Gn		(Fleagle, Kay, and Anthony 1997)	Tax	<i>Cebupithecina sarmientoi</i>	<i>Cebupithecina sarmientoi</i>	DM
<i>Cebupithecina sarmientoi</i>	Fr- Gn		(Fleagle 2013)	Tax	<i>Cebupithecina sarmientoi</i>	<i>Cebupithecina sarmientoi</i>	DM
<i>Cebupithecina sarmientoi</i>	Fr- Gn			Sum			
<i>Cerdocyon thous</i>	Om		(Prevosti, Fo- rasiepi, and Zimicz 2013)	Tax	<i>Cerdocyon thous</i>	<i>Cerdocyon thous</i>	DM
<i>Chaetophractus sp.</i> , <i>Chae-</i>	Om- In		(Eisenberg 1989; Redford	Tax, SG	<i>Chaetophrac- tus villosus</i>	<i>Chaetophrac- tus villosus</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>tophractus villosus</i>			and Eisenberg 1992; Eisenberg and Redford 1999)				
<i>Chapalmalania</i> sp.	Sc-Om		(Prevosti, Forasiepi, and Zimicz 2013)	SG	<i>Chapalmalania altaefrontis</i> , <i>C. ortognatha</i>	<i>Chapalmalania altaefrontis</i> , <i>C. ortognatha</i>	DM
<i>Charitoceros</i> sp.	Fl or MF	"[South American] cervids... never evolved true grazing forms, although the marsh deer (<i>Blastocercus dichotomus</i>) is a fresh grass grazer."	(Janis 2008)	AGp	South American cervids	South American cervids	LR
<i>Charitoceros</i> sp.	MF		(Merino and Rossi 2010)	AGp	Open habitat South American cervids	Open habitat South American cervids	LR
<i>Charitoceros</i> sp.	Fl		(Zurita et al. 2009)	SF	Cervidae cf. <i>Morenelaphus</i> , <i>Antifer</i>	Cervidae cf. <i>Morenelaphus</i> , <i>Antifer</i>	LR
<i>Charitoceros</i> sp.	Gz or MF	"more abrasive diet"	(Pêgo 2014)	SF	<i>Morenelaphus</i> sp.	<i>Morenelaphus</i> sp.	DM
<i>Charitoceros</i> sp.	Fl		(Alcaraz 2010)	SF	<i>Morenelaphus</i> , <i>Epieurycerus</i> , <i>Paraceros</i>	<i>Morenelaphus</i> , <i>Epieurycerus</i> , <i>Paraceros</i>	LR
<i>Charitoceros</i> sp.	Fl	Relationship: Similar size to <i>Morenelaphus</i> ; Diet: Middle-sized cervids (such as <i>Morenelaphus</i> and <i>Charitoceros</i>) have the	(Menégaz and Ortiz Jaureguizar 1995)	See	<i>Morenelaphus</i> , <i>Epieurycerus</i> , <i>Paraceros</i> ,	<i>Morenelaphus</i> , <i>Epieurycerus</i> , <i>Paraceros</i> ,	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

most folivorous diets				<i>Antifer</i>		<i>Antifer</i>	
<i>Charitoceros</i> sp.	Fl			Sum			
<i>Chasichimys</i> sp.	MF	This study, based on: Relationship: Direct ancestor to <i>Actenomys</i> ; Diet: Ecological and morphological intermediate between <i>Octodon</i> and <i>Ctenomys</i> (M. E. Fernández, Vassallo, and Zárate 2000); <i>Octodon</i> spp. are generalized herbivores (grasses, leaves, roots, bark, seeds, fruits) above ground and <i>Ctenomys</i> spp. are mixed feeders to grazers or radicivores, many with a preference for above-ground vegetation (Comparatore, Cid, and Busch 1995; Rosi et al. 2009; Albanese et al. 2010; Patton, Pardiñas, and D’Elía 2015)	(Fernández, Vassallo, and Zárate 2000; Comparatore, Cid, and Busch 1995; Rosi et al. 2009; Albanese et al. 2010; Patton, Pardiñas, and D’Elía 2015)	See	<i>Actenomys</i> spp.		MS, ES, CLR
<i>Chasicostylus castroi</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Chasicostylus castroi</i>	<i>Chasicostylus castroi</i>	DM
<i>Chasicotatus ameghinoi</i> , <i>C.</i> sp., <i>C. spinozai</i>	Fl	<i>Eutatus</i> and <i>Proeutatus</i> more specialized for herbivory	(Vizcaíno and Bargo 1998)	ST	<i>Eutatus</i> , <i>Proeutatus</i> , <i>Doelotatus</i> , <i>Ringueletia</i>	<i>Eutatus</i> , <i>Proeutatus</i> , <i>Doelotatus</i> , <i>Ringueletia</i>	CDM
<i>Chasicotatus ameghinoi</i> , <i>C.</i> sp., <i>C. spinozai</i>	Fl	"Eutatines (up to 50 kg) are mainly browsers"	(Vizcaíno, Iuliis, and Bargo 1998)	WT	Eutatini	Eutatini	CDM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Chasicotatus ameghinoi</i> , <i>C. sp.</i> , <i>C. spinozai</i>	Fl			Sum			
<i>Chironectes minimus</i> , <i>C. sp.</i>	MC-Ps	Small fish, crabs, crustaceans, insects, frogs	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax	<i>Chironectes minimus</i>	<i>Chironectes minimus</i>	LR-E
<i>Chlamydotherium</i> sp.	Gz		(Fariña 1985)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CMM
<i>Chlamydotherium</i> sp.	Gz		(Pérez, Scillato-Yané, and Vizcaino 2000)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CM
<i>Chlamydotherium</i> sp.	Gz		(Fariña and Vizcaíno 2001)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CMDM
<i>Chlamydotherium</i> sp.	Gz	<i>Panochthus</i> and <i>Sclerocalyptus</i> : grazers in cold, semiarid, open environments	(Zurita, Scillato-Yané, and Carlini 2005)	AGp	<i>Panochthus</i> and <i>Sclerocalyptus</i>	Plio-Pleistocene Glyptodontidae	LR
<i>Chlamydotherium</i> sp.	Gz		(Rincón, White, and McDonald 2008)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	LR
<i>Chlamydotherium</i> sp.	Gz	Relationship: Plio-Pleistocene	(Vizcaíno, Cas-	See	<i>Doedicurus</i> ,	<i>Doedicurus</i> ,	CDM

Table S4.9: Dietary data for South American fossil taxa, cont.

um sp.		glyptodonts shared dental morphology and diet based on authors above; Diet: Bulk feeders in moderately open to open habitats	sini, et al. 2011)		<i>Panochthus, Neuryurus, Neosclerocalyptus</i>	<i>Panochthus, Neuryurus, Neosclerocalyptus</i>	
<i>Chlamydotherrium</i> sp.	Gz			Sum		Plio-Pleistocene Glyptodontidae	
<i>Chorobates</i> sp., <i>C. villosissimus</i>	Om	Variety of plant types (roots, tubers, nuts) and variety of animal matter (ants, carrion, birds, mice)	(Vizcaíno 2009)	ST	<i>Prozaedyus, Zaedyus, Macro-euphractus, Euphractus, other extant Euphractini</i>	Euphractini	LR, CDM
<i>Chrotopterus auritus</i>	MC	Insects, fruit, vertebrates	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax	<i>Chrotopterus auritus</i>	<i>Chrotopterus auritus</i>	LR-E
<i>Chrotopterus auritus</i>	MC	Birds, mammals, insects, fruit	(Gardner 2007b)	Tax	<i>Chrotopterus auritus</i>	<i>Chrotopterus auritus</i>	LR-E
<i>Chrotopterus auritus</i>	MC			Sum			
<i>Chrysocyon brachyurus</i> , <i>C. sp.</i>	Om		(Prevosti et al. 2015)	Tax, SG	<i>Chrysocyon brachyurus</i>	<i>Chrysocyon brachyurus</i>	LR-E
<i>Chrysocyon brachyurus</i> , <i>C. sp.</i>	Om	Birds, mammals especially armadillos, lots of fruit	(Motta-Junior et al. 1996)	Tax, SG	<i>Chrysocyon brachyurus</i>	<i>Chrysocyon brachyurus</i>	FA

Table S4.9: Dietary data for South American fossil taxa, cont.

sp.							
<i>Chrysocyon brachyurus</i> , <i>C.</i> sp.	Om	Birds, mammals especially rodents, invertebrates especially beetles, lots of fruit	(Aragona and Setz 2001)	Tax, SG	<i>Chrysocyon brachyurus</i>	<i>Chrysocyon brachyurus</i>	FA
<i>Chrysocyon brachyurus</i> , <i>C.</i> sp.	Om	58% plant, 26% mammal (mostly rodents), 11.3% bird, 3.1% reptile, 1.6% insect	(Jácomo, Silveira, and Diniz-Filho 2004)	Tax, SG	<i>Chrysocyon brachyurus</i>	<i>Chrysocyon brachyurus</i>	FA
<i>Chrysocyon brachyurus</i> , <i>C.</i> sp.	Om	Slightly over half of diet is plant, especially fruit, the rest is animal, especially small mammals	(Bueno and Motta-Junior 2004)	Tax, SG	<i>Chrysocyon brachyurus</i>	<i>Chrysocyon brachyurus</i>	FA
<i>Chrysocyon brachyurus</i> , <i>C.</i> sp.	Om	39.5% fruit, 13.0% grains, foliage, stems, 3.7% insects, 43.8% small vertebrates	(Motta-Junior and Martins 2002)	Tax, SG	<i>Chrysocyon brachyurus</i>	<i>Chrysocyon brachyurus</i>	FA
<i>Chrysocyon brachyurus</i>, <i>C.</i> sp.	Om			Sum			
<i>Cladosictis patagonica</i>	HC	Vertebrate prey	(Kay, Vizcaíno, and Bargo 2012)	Tax	<i>Cladosictis patagonica</i>	<i>Cladosictis patagonica</i>	Un
<i>Cladosictis patagonica</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Cladosictis patagonica</i>	<i>Cladosictis patagonica</i>	DM
<i>Cladosictis patagonica</i>	HC			Sum			
<i>Clyomys</i> sp.	Gn	Palm nuts/seeds and leaves make up bulk of its diet	(Bueno et al. 2004)	SG	<i>Clyomys bishopi</i>	<i>Clyomys bishopi</i>	Un
<i>Clyomys</i> sp.	Gn	Palm nuts/seeds and leaves make up bulk of its diet	(Patton, Pardiñas, and D'Elía 2015)	SG	<i>Clyomys laticeps</i>	<i>Clyomys laticeps</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Clyomys</i> sp.	Gn- Fl	Palm nuts/seeds and leaves and grasses make up bulk of its diet: Monocot specialist	(Vieira 2003)	SG	<i>Clyomys bishopi</i>	<i>Clyomys bishopi</i>	FA
<i>Clyomys</i> sp.	Gn- Fl			Sum			
<i>Cochlops mu- ricatus</i>	Fl or MF	Somewhat selective herbivore in moderately open habitats	(Vizcaíno, Cas- sini, et al. 2011)	Tax	<i>Cochlops mu- ricatus</i>	<i>Cochlops mu- ricatus</i>	CDM
<i>Cochlops mu- ricatus</i>	Fl		(Kay, Vizcaíno, and Bargo 2012)	Tax	<i>Cochlops mu- ricatus</i>	<i>Cochlops mu- ricatus</i>	Un
<i>Cochlops mu- ricatus</i>	Fl			Sum			
<i>Coendou pre- hensilis</i> , <i>C. sp.</i>	Fr- Fl	Buds, bark (sometimes), fruits, unripe seeds	(Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)	Tax, SG	<i>Coendou pre- hensilis</i>	<i>Coendou prehensilis</i>	LR-E
<i>Conepatus sem- istriatus</i> , <i>C. sp.</i> , <i>C. suffocans</i>	Om		(Prevosti, Fo- rasiepi, and Zimicz 2013)	Tax, SG	<i>Conepatus semistriatus</i>	<i>Conepatus semistriatus</i>	DM
<i>Contrerascynus borhyaenoides</i>	HC	This study, based on diets of other hathliacinines: 19 spp. in 12 genera studied in Hath- lyacininae are hypercarnivores, 3 spp. in 1 genus (<i>Patene</i> spp.) are omnivores (Prevosti, Forasiepi, and Zimicz 2013)	(Prevosti, Fo- rasiepi, and Zimicz 2013)	SSF	<i>Acyon myctoderos</i> , <i>A. tricuspidat- us</i> , <i>Borhyaen- nidium alti- planicus</i> , <i>B. musteloides</i> , <i>B. riggsi</i> , <i>Chasicostylus</i>	<i>Acyon myctoderos</i> , <i>A. tricuspidat- us</i> , <i>Borhyaen- nidium alti- planicus</i> , <i>B. musteloides</i> , <i>B. riggsi</i> , <i>Chasicostylus</i>	DM

Table S4.9: Dietary data for South American fossil taxa, cont.

					<i>castroi</i> , <i>Cladosictis</i> <i>centralis</i> , <i>C.</i> <i>patagonica</i> , <i>Notictis ortizi</i> , <i>Notocynus</i> <i>hermosicus</i> , <i>Notogale mi-</i> <i>tis</i> , <i>Patene</i> <i>campelli</i> , <i>P.</i> <i>coluapiensis</i> , <i>P. simpsoni</i> , <i>Perathereutes</i> <i>pungens</i> , <i>Procladosictis</i> <i>pungens</i> , <i>Pseudonotic-</i> <i>tis chubuten-</i> <i>sis</i> , <i>P. pusil-</i> <i>lus</i> , <i>Sallacyon</i> <i>hoffstetteri</i> , <i>Sipalocyon</i> <i>externa</i> , <i>S.</i> <i>gracilis</i> , <i>S.</i> <i>obusta</i>	<i>castroi</i> , <i>Cladosictis</i> <i>centralis</i> , <i>C.</i> <i>patagonica</i> , <i>Notictis ortizi</i> , <i>Notocynus</i> <i>hermosicus</i> , <i>Notogale mi-</i> <i>tis</i> , <i>Patene</i> <i>campelli</i> , <i>P.</i> <i>coluapiensis</i> , <i>P. simpsoni</i> , <i>Perathereutes</i> <i>pungens</i> , <i>Procladosictis</i> <i>pungens</i> , <i>Pseudonotic-</i> <i>tis chubuten-</i> <i>sis</i> , <i>P. pusil-</i> <i>lus</i> , <i>Sallacyon</i> <i>hoffstetteri</i> , <i>Sipalocyon</i> <i>externa</i> , <i>S.</i> <i>gracilis</i> , <i>S.</i> <i>obusta</i>	
<i>Cranithlastus xibiensis</i>	MF	Relationship: Within late Miocene Hoplophorinae; Late Miocene Hoplophorinae intermediate between middle Miocene browsers and Plio-Pleistocene	(Vizcaíno, Cassini, et al. 2011)	See	<i>Hoplophrac-</i> <i>tus</i> , <i>Eosclero-</i> <i>calyptus</i> , <i>Urotherium</i>	<i>Hoplophrac-</i> <i>tus</i> , <i>Eosclero-</i> <i>calyptus</i> , <i>Urotherium</i>	CDM

Table S4.9: Dietary data for South American fossil taxa, cont.

grazers							
<i>Cryptotis</i> sp.	In	<i>Cryptotis meridensis</i> : Invertebrates dominate the diet and include earthworms (most abundant prey), centipedes, pill bugs, snails, spiders, insects. Other prey includes lizards, rodent nestlings, eggs and chicks of ground-nesting birds. <i>Cryptotis montivaga</i> : beetles, spiders, caterpillars, arthropod larvae	(Gardner 2007b)	SG	<i>Cryptotis meridensis</i> , <i>C. montivaga</i>	<i>Cryptotis meridensis</i> , <i>C. montivaga</i>	LR-E
<i>Cryptotis</i> sp.	In	Forages in leaf litter	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax	<i>Cryptotis</i>	<i>Cryptotis</i>	LR-E
<i>Cryptotis</i> sp.	In	Sum					
<i>Ctenomys coto-caensis</i> , <i>C. kraglievichi</i> , <i>C. praderii</i> , <i>C. sp.</i> , <i>C. subassentiens</i>	Gz-Rz	Genus: diet of roots and grasses	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	WG	<i>Ctenomys</i>	<i>Ctenomys</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Ctenomys coto- caensis</i> , <i>C. kra- glievichi</i> , <i>C. praderii</i> , <i>C. sp.</i> , <i>C. subassentiens</i>	Gz- Rz	<i>C. boliviensis</i> : roots and tubers, <i>C. flamarioni</i> : grasses and sedges, <i>C. fulvus</i> : diet includes Larrea (shrub) leaves, <i>C. magellanicus</i> : roots of grasses and shrubs, <i>C. mendocinus</i> : above ground grass- es and shrubs, <i>C. nattereri</i> : diet includes grasses, <i>C. optimus</i> : bulbs and grass roots, <i>C. pear- soni</i> : herbivorous generalist pre- ferring grasses, <i>C. roigi</i> : roots and basal grass stems, <i>C. saltarius</i> : creosote and other shrubs, <i>C. so- ciabilis</i> : main food item is grass	(Patton, Pardi- ñas, and D'Elía 2015)	SG	<i>Ctenomys bo- liviensis</i> , <i>C. flamarioni</i> , <i>C. fulvus</i> , <i>C. ma- gellanicus</i> , <i>C. mendocinus</i> , <i>C. natterri</i> , <i>C. optimus</i> , <i>C. personi</i> , <i>C. roigi</i> , <i>C. sal- tarius</i> , <i>C. so- ciabilis</i>	<i>Ctenomys bo- liviensis</i> , <i>C. flamarioni</i> , <i>C. fulvus</i> , <i>C. ma- gellanicus</i> , <i>C. mendocinus</i> , <i>C. natterri</i> , <i>C. optimus</i> , <i>C. personi</i> , <i>C. roigi</i> , <i>C. sal- tarius</i> , <i>C. so- ciabilis</i>	LR-E
<i>Ctenomys coto- caensis</i> , <i>C. kra- glievichi</i> , <i>C. praderii</i> , <i>C. sp.</i> , <i>C. subassentiens</i>	Gz- GH	Generalist herbivore with strong preference for above ground parts of grasses	(Martino, Zenu- to, and Busch 2007)	SG	<i>Ctenomys talarum</i>	<i>Ctenomys talarum</i>	LR-E
<i>Ctenomys coto- caensis</i>, <i>C. kra- glievichi</i>, <i>C. praderii</i>, <i>C. sp.</i>, <i>C. subassen- tiens</i>	Gz- Rz	Sum					
<i>Ctenomys mag- ellanicus</i>	Rz	Roots of grasses and shrubs	(Patton, Pardiñas, and D'Elía 2015)	Tax	<i>Ctenomys magellanicus</i>	<i>Ctenomys magellanicus</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Cullinia</i> sp.	MF	This study, based on: More hypsodont (protohypsodont) than earlier macraucheniids, probably preferred open environments (Bond et al. 1995)	(Bond et al. 1995)	SSF	<i>Promacrauchenia antiqua</i> , <i>P. kraglievichi</i> , <i>P. chapalmalense</i> , <i>Windhausen</i> , <i>Macraucheniopsis ensenadensis</i> , <i>Macrauchenia patachonica</i> , <i>Pseudomacrauchenia</i> , <i>Xenorhinotherium bahiense</i>	DM
<i>Cullinia</i> sp.	MF	Mixed feeding consistent with macraucheniid skeletal and dental morphology	(Bond 1999)	SSF	<i>Promacrauchenia antiqua</i> , <i>P. kraglievichi</i> , <i>P. chapalmalense</i> , <i>Windhausen</i> , <i>Macraucheniopsis ensenadensis</i> , <i>Macrauchenia</i>	" <i>Macrauchenia</i> and macraucheniids in general" DM, PCM

Table S4.9: Dietary data for South American fossil taxa, cont.

						<i>patachonica</i> , <i>Pseudo-</i> <i>macrauchen-</i> <i>nia</i> , <i>Xenorhi-</i> <i>notherium ba-</i> <i>hiense</i>	
<i>Cullinia</i> sp.	MF		(MacFadden and Shockey 1997)	SSF	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i>	DM, SI
<i>Cullinia</i> sp.	MF		(MacFadden 2000)	SSF	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i>	CDM, SI
<i>Cullinia</i> sp.	MF	$\delta^{13}\text{C}$ consistent with mixed feeding in most (5) cases, browsing in 2 cases	(Domingo, Prado, and Alberdi 2012)	SSF	<i>Macrauchenia patachonica</i> , <i>Macrauchen-</i> <i>opsis?</i>	<i>Macrauchenia patachonica</i> , <i>Macrauchen-</i> <i>opsis?</i>	SI
<i>Cullinia</i> sp.		<i>Cullinia</i> is in Macraucheniinae, Macraucheniinae is monophyletic	(Schmidt and Ferrero 2014)	WF	Macraucheniidae		PB
<i>Cullinia</i> sp.	MF to Fl		(Varela 2014)	SSF	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i>	BM
<i>Cullinia</i> sp.	MF	$\delta^{13}\text{C}$ consistent with mixed feeding	(França et al. 2015)	SSF	<i>Macrauchenia</i>	<i>Macrauchenia</i>	LR, SI
<i>Cullinia</i> sp.	MF			Sum			
<i>Cuniculus paca</i> , <i>C. sp.</i>	Fr-Fl	Opportunistic- mainly frugivores, but also eat leaves, buds, flowers, seeds	(Patton, Pardiñas, and D'Elía 2015)	Tax, SG	<i>Cuniculus paca</i>	<i>Cuniculus paca</i>	LR-E
<i>Cuniculus paca</i> , <i>C. sp.</i>	Fr-Fl	Fruits, nuts, seeds, herbaceous vegetation	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg	Tax, SG	<i>Cuniculus paca</i>	<i>Cuniculus paca</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

			and Redford 1999)				
<i>Cuniculus pa- ca, C. sp.</i>	Fr- Fl			Sum			
<i>Cuvieronius hyodon, C. sp., C. tropicus</i>	Gz		(MacFadden and Shockey 1997)	Tax, SG	<i>Cuvieronius hyodon</i>	<i>Cuvieronius hyodon</i>	SI
<i>Cuvieronius hyodon, C. sp., C. tropicus</i>	MF		(Prado et al. 2005)	Tax, SG	<i>Cuvieronius hyodon</i>	<i>Cuvieronius hyodon</i>	SI
<i>Cuvieronius hyodon, C. sp., C. tropicus</i>	MF to Fl		(Sánchez, Pra- do, and Alberdi 2004)	Tax, SG	<i>Cuvieronius hyodon</i>	<i>Cuvieronius hyodon</i>	SI
<i>Cuvieronius hyodon, C. sp., C. tropicus</i>	MF			Sum			
<i>Cyonasua ar- gentina, C. groeberi, C. pascuali, C. sp.</i>	Om	All omnivores	(Prevosti, Fo- rasiepi, and Zimicz 2013)	Tax, SG	<i>Cyonasua ar- gentina, C. groeberi, C. pascuali</i>	<i>Cyonasua argentina, C. groeberi, C. pascuali</i>	DM
<i>Dasyprocta sp.</i>	Fr- Gn		(Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)	Tax	<i>Dasyprocta</i>	<i>Dasyprocta</i>	LR-E
<i>Dasypus hy- bridus</i>	Om- In	One stomach: mostly ants and termites, also other insects and invertebrates and a small ro- dent	(Eisenberg 1989; Redford and Eisenberg 1992; Eisen-	Tax	<i>Dasypus hy- bridus</i>	<i>Dasypus hy- bridus</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

			berg and Redford 1999)				
<i>Dasypus neogaeus</i> , <i>D. saba-nicola</i> , <i>D. sp.</i> , <i>D. villosus</i>	Om-In		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SG	<i>Dasypus hybridus</i> , <i>D. kappleri</i> , <i>D. novemcinctus</i>	<i>Dasypus hybridus</i> , <i>D. kappleri</i> , <i>D. novemcinctus</i>	LR-E
<i>Desmodus draculae</i>	Sn	Possibly preferred extinct megafauna	(Trajano and De Vivo 1991)	Tax	<i>Desmodus draculae</i>	<i>Desmodus draculae</i>	CLR
<i>Desmodus rotundus</i>	Sn		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax	<i>Desmodus rotundus</i>	<i>Desmodus rotundus</i>	LR-E
<i>Diabolotherium</i> (=Nothropus) <i>nordenskioldi</i>	Fl		(Pujos et al. 2012)	Tax	<i>Diabolotherium</i> (=Nothropus) <i>nordenskioldi</i>	<i>Diabolotherium</i> (=Nothropus) <i>nordenskioldi</i>	MM
<i>Diadiaphorus eversus</i> (=Coelosoma <i>eversa</i>)	Fl		(Cassini et al. 2012)	SG	<i>Diadiaphorus majusculus</i>	All Santacrucian proterotheriids	CDM
<i>Diadiaphorus majusculus</i> , <i>D. sp.</i>	Fl		(Cassini et al. 2012)	Tax, SG	<i>Diadiaphorus majusculus</i>	All Santacrucian proterotheriids	CDM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Dicolpomys fossor</i>	Fr-Gn	Relationship: Broad dietary similarity across entire subfamily Eumysopinae; <i>Clyomys</i>: Granivore, <i>Euryzygomatomys spinosus</i>: "herbivore", <i>Hoplomys</i>: Frugivore-granivore, <i>Lonchothrix</i>: frugivore?, <i>Proechimys</i>: Frugivore-granivore, <i>Thrichomys</i>: Frugivore-insectivore and Frugivore-browser, <i>Trinomys</i>: Frugivore-granivore	(Patton, Pardiñas, and D'Elía 2015)	SSF, See	<i>Clyomys</i> , <i>Euryzygomatomys</i> , <i>Hoplomys</i> , <i>Lonchothrix</i> , <i>Proechimys</i> , <i>Thrichomys</i> , <i>Trinomys</i>	<i>Clyomys</i> , <i>Euryzygomatomys</i> , <i>Hoplomys</i> , <i>Lonchothrix</i> , <i>Proechimys</i> , <i>Thrichomys</i> , <i>Trinomys</i>	LR-E
<i>Didelphis solimoensis</i>	Fr	More strictly frugivorous than others in genus	(Mario Alberto Cozzuol 2006)	Tax	<i>Didelphis solimoensis</i>	<i>Didelphis solimoensis</i>	DM
<i>Didelphis</i> sp.	Om	Opportunistic: vertebrates, invertebrates, leaves, fruits	(Gardner 2007b)	SG	<i>Didelphis marsupialis</i>	<i>Didelphis marsupialis</i>	LR-E
<i>Didelphis</i> sp.	Om	<i>Didelphis marsupialis</i> : Insects, frogs, birds, small mammals, earthworms, fruits, other plants, <i>D. albiventris</i> : invertebrates in 100% of scat samples, fruit in 76%, small vertebrates 58%, gum reported	(Mario Alberto Cozzuol 2006)	SG	<i>Didelphis albiventris</i> , <i>D. marsupialis</i>	<i>Didelphis albiventris</i> , <i>D. marsupialis</i>	LR-E
<i>Didelphis</i> sp.	Om	Sum					
<i>Dilobodon lutaris</i>	GH	Diet varies from C ₃ browser in closed canopy to open grassland C ₄ grazer	(MacFadden 2005)	SF, PB	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	SI

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Dilobodon lutaris</i>	Fl		(Townsend and Croft 2008a)	SF, PB	Nesodontines (Adinotherium ovinum and Nesodon imbricatus)	Nesodontines (Adinotherium ovinum and Nesodon imbricatus)	DMc
<i>Dilobodon lutaris</i>	Gz or MF		(Cassini et al. 2011)	SF, PB	<i>Nesodon</i>	<i>Nesodon</i>	CMM
<i>Dilobodon lutaris</i>	GH		(Cassini, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (Adinotherium and Nesodon)	Nesodontines	CM
<i>Dilobodon lutaris</i>	Gz		(Cassini et al. 2012)	SF, PB	Nesodontines (Adinotherium and Nesodon)	Nesodontines	CDM
<i>Dilobodon lutaris</i>	GH			SF, PB	Nesodontines (Adinotherium ovinum and Nesodon imbricatus)	Nesodontines (Adinotherium ovinum and Nesodon imbricatus)	CO, CM
<i>Dilobodon lutaris</i>	GH		(Cassini and Vizcaíno 2012)	SF, PB	Nesodontines (Adinotherium ovinum and Nesodon imbricatus)	Nesodontines (Adinotherium ovinum and Nesodon imbricatus)	BM
<i>Dilobodon lutaris</i>	Gz		(Kay, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (Adinotherium and Nesodon)	Nesodontines	LR
<i>Dilobodon lutaris</i>	GH	Diet dependent on availability: Browse to graze	(Cassini 2013)	SF, PB	Nesodontines (Adinotherium ovinum and	Nesodontines (Adinotherium ovinum and	CGM

Table S4.9: Dietary data for South American fossil taxa, cont.

					<i>Nesodon imbricatus</i>)	<i>Nesodon imbricatus</i>)	
<i>Dilobodon luta-</i>	GH			Sum		Toxodonti-	
<i>rius</i>						dae	
<i>Doedicurus</i> sp.	Gz	Bulk feeder in open environments	(Vizcaíno, Casini, et al. 2011)	Tax	<i>Doedicurus</i>	<i>Doedicurus</i>	CMDM
<i>Doellotatus chapad-</i>	Fl	Not as specialized for herbivory as <i>Eutatus</i> and <i>Proeutatus</i> , but eutatines are "mostly browsers" and <i>Doellotatus</i> has some herbivorous specializations	(Vizcaíno and Bargo 1998)	WG	<i>Doellotatus</i>	<i>Doellotatus</i>	CMM
<i>malensis, D. inornatus, D. sp.</i>							
<i>Doellotatus chapad-</i>	Fl	Not as specialized for herbivory as <i>Eutatus</i> and <i>Proeutatus</i> , but eutatines are "mostly browsers" and <i>Doellotatus</i> has some herbivorous specializations	(Vizcaíno, Iulis, and Bargo 1998)	WG	<i>Doellotatus</i>	<i>Doellotatus</i>	CMM
<i>malensis, D. inornatus, D. sp.</i>							
<i>Doellotatus chapad-</i>	Fl			Sum			
<i>malensis, D. inornatus, D. sp.</i>							
<i>Dolicavia miniscula, D. sp.</i>	MF	<i>Cavia</i> : Mostly grazers but also eat grass inflorescences, <i>Galea</i> : "herbivores", <i>Microcavia australis</i> : generalist herbivores (leaves, grasses, seeds, flowers, berries)	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SSF	<i>Cavia, Galea, Microcavia</i>	<i>Cavia, Galea, Microcavia</i>	LR-E
<i>Dolicavia miniscula, D. sp.</i>	Gz	<i>Cavia</i> : grazers	(Townsend and Croft 2008b)	SSF	<i>Cavia</i>	<i>Cavia</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

sp.							
<i>Dolicavia miniscula</i> , D. sp.	Gz	Open habitat grazers	(Cassini 2013)	SSF	<i>Procavia</i>	<i>Procavia</i>	Un
<i>Dolicavia miniscula</i> , D. sp.	MF	<i>Cavia</i> : Mainly grazers but also eat grass inflorescences, <i>Galea</i> : "herbivores", <i>Microcavia australis</i> : Mixed feeder to browser (leaves, shoots, flowers, fruits, bark), <i>Microcavia niata</i> : Mixed feeders (herbaceous plants, grasses, aquatic plants)	(Patton, Pardiñas, and D'Elía 2015)	SSF	<i>Cavia</i> , <i>Galea</i> , <i>Microcavia</i>	<i>Cavia</i> , <i>Galea</i> , <i>Microcavia</i>	LR-E
<i>Dolicavia miniscula</i> , D. sp.	MF	<i>Galea</i> : grasses and shrubs though less C ₄ than previously thought, <i>Microcavia</i> : mostly shrubs	(Fernández et al. 2016)	SSF	<i>Galea leuco-blephara</i> , <i>Microcavia australis</i>	<i>Galea leuco-blephara</i> , <i>Microcavia australis</i>	SI
<i>Dolicavia miniscula</i>, D. sp.	MF			Sum			
<i>Dolichotis patagonum</i> , D. sp.	MF	About half shrubs, the rest grasses and forbs	(Bonino et al. 1997)	Tax, SG	<i>Dolichotis patagonum</i>	<i>Dolichotis patagonum</i>	FA
<i>Dolichotis patagonum</i> , D. sp.	Gz	Selective grazing	(Reguero, Dozo, and Cerdeño 2007)	Tax, SG	<i>Dolichotis</i>	<i>Dolichotis</i>	Un
<i>Dolichotis patagonum</i> , D. sp.	Gz to MF	Grasses dominant, then shrubs, rare forbs; Only selective in drought when it prefers shrubs and forbs	(Puig et al. 2010)	Tax, SG	<i>Dolichotis patagonum</i>	<i>Dolichotis patagonum</i>	FA
<i>Dolichotis patagonum</i> , D. sp.	Gz to	Green vegetation (prefers grasses) and fruits	(Patton, Pardiñas, and D'Elía	Tax, SG	<i>Dolichotis patagonum</i>	<i>Dolichotis patagonum</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

	MF		2015)				
<i>Dolichotis patagonum</i>, <i>D. sp.</i>	MF			Sum			
<i>Dusicyon avus</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Dusicyon avus</i>	<i>Dusicyon avus</i>	DM
<i>Lycalopex</i> (=Dusicyon) <i>culpaeus</i> , L. <i>sechurae</i>	MC	Rabbits and rodents	(Prevosti, Forasiepi, and Zimicz 2013)	Tax, SG	<i>Lycalopex</i> (=Dusicyon) <i>culpaeus</i>	<i>Lycalopex</i> (=Dusicyon) <i>culpaeus</i>	DM
<i>Lycalopex</i> (=Dusicyon) <i>culpaeus</i> , L. <i>sechurae</i>	Om		(Prevosti, Forasiepi, and Zimicz 2013)	Tax, SG	<i>Lycalopex</i> (=Dusicyon) <i>culpaeus</i>	<i>Lycalopex</i> (=Dusicyon) <i>culpaeus</i>	DM
<i>Lycalopex</i> (=Dusicyon) <i>culpaeus</i>, L. <i>sechurae</i>	MC			Sum			
<i>Dusicyon sp.</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	SG	<i>Dusicyon avus</i>	<i>Dusicyon avus</i>	DM
<i>Echimys sp.</i>	Fr-FI	"Fruit and probably leaves"	(Patton, Pardiñas, and D'Elía 2015)	SG	<i>Echimys chrysurus</i>	<i>Echimys chrysurus</i>	LR-E
<i>Eionaletherium tanycnemius</i>	Gz	This study, based on phylogenetic distribution of grazing in Mylodontidae with grazing across <i>Glossotherium</i> and <i>Paramylodon</i> (Pujos et al. 2012) and the phylogenetic position of	(Pujos et al. 2012; Rincón et al. 2015)	PB, see	<i>Eionaletherium tanycnemius</i>		PB

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Eionaletherium</i> - nested between <i>Glossotherium</i> and <i>Paramylodon</i> (Rincón et al. 2015)							
<i>Eira barbara</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Eira barbara</i>	<i>Eira barbara</i>	DM
<i>Eira barbara</i>	Om	68% of scat contains fruit, 58% arthropods, 58% small vertebrates	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax	<i>Eira barbara</i>	<i>Eira barbara</i>	LR-E
<i>Eira barbara</i>	Om	Opportunistic omnivore- fruits, carrion, small vertebrates, insects, honey	(Presley 2000)	Tax	<i>Eira barbara</i>	<i>Eira barbara</i>	LR-E
<i>Eira barbara</i>	MC			Sum			
<i>Eleutherocercus paranensis</i> , <i>E.</i> sp.	Gz		(Fariña 1985)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CMM
<i>Eleutherocercus paranensis</i> , <i>E.</i> sp.	Gz		(L. M. Pérez, Scillato-Yané, and Vizcaino 2000)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CM
<i>Eleutherocercus paranensis</i> , <i>E.</i> sp.	Gz		(Fariña and Vizcaino 2001)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CMDM
<i>Eleutherocercus paranensis</i> , <i>E.</i>	Gz	<i>Panochthus</i> and <i>Sclerocalyptus</i> : grazers in cold, semiarid, open	(A. Zurita, Scillato-Yané, and	AGp	<i>Panochthus</i> and <i>Sclero-</i>	Plio-Pleistocene	LR

Table S4.9: Dietary data for South American fossil taxa, cont.

sp.	environments		Carlini 2005)		<i>calyptus</i>	Glyptodonti- dae	
<i>Eleutherocercus paranensis</i> , <i>E.</i> sp.	Gz		(Ascanio D. Rincón, White, and McDonald 2008)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodonti- dae	LR
<i>Eleutherocercus paranensis</i> , <i>E.</i> sp.	Gz	Relationship: Plio-Pleistocene glyptodonts shared dental morphology and diet based on authors above; Diet: Bulk feeders in moderately open to open habitats	(Vizcaíno, Casini, et al. 2011)	PB	<i>Doedicurus</i> , <i>Panochthus</i> , <i>Neuryurus</i> , <i>Neosclerocalyptus</i>	<i>Doedicurus</i> , <i>Panochthus</i> , <i>Neuryurus</i> , <i>Neosclerocalyptus</i>	CDM
<i>Eleutherocercus paranensis</i>, <i>E.</i> sp.	Gz			Sum		Plio-Pleistocene Glyptodonti- dae	
<i>Eligmodontia typus</i>	Gr		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax	<i>Eligmodontia typus</i>	<i>Eligmodontia typus</i>	LR-E
<i>Eoauchenia</i> sp.	MF	Mesodont teeth and cement may indicate increase in abrasives in diet	(Bond 1999)	Tax	<i>Eoauchenia</i>	<i>Eoauchenia</i>	DM
<i>Eoauchenia</i> sp.	MF	This study, based on dental differences from other proterotheriids; Differs from most other proterotheriids in cementum layer and in protohypsodont dentition-suggestive of a more abrasive diet	(Bond et al. 2001)	Tax	<i>Eoauchenia</i>		DM

Table S4.9: Dietary data for South American fossil taxa, cont.

and/or more open environment (Bond et al. 2001)							
<i>Eoauchenia</i> sp.	MF			Tax	<i>Eoauchenia</i>		
<i>Eodolichotis elachys</i> , <i>E. maddeni</i> , <i>E. sp.</i>	Gz		(Walton 1990)	Tax	<i>Eodolichotis elachys</i> , <i>E. maddeni</i> , <i>E. sp.</i> , <i>Prodolichotis pridianna</i>	<i>Eodolichotis elachys</i> , <i>E. maddeni</i> , <i>E. sp.</i> , <i>Prodolichotis pridianna</i>	DM
<i>Eodolichotis elachys</i> , <i>E. maddeni</i> , <i>E. sp.</i>	Gz		(Kay and Madden 1997b)	Tax, SG	<i>Eodolichotis elachys</i> , <i>E. maddeni</i> , <i>Prodolichotis pridianna</i>	<i>Eodolichotis elachys</i> , <i>E. maddeni</i> , <i>Prodolichotis pridianna</i>	Un
<i>Eodolichotis elachys</i> , <i>E. maddeni</i> , <i>E. sp.</i>	Gz to MF	Green vegetation (prefers grasses) and fruits	(Patton, Pardiñas, and D'Elía 2015)	SSF	<i>Dolichotis patagonum</i>	<i>Dolichotis patagonum</i>	LR-E
<i>Eodolichotis elachys</i> , <i>E. maddeni</i> , <i>E. sp.</i>	MF	About half shrubs, the rest grasses and forbs	(Bonino et al. 1997)	SSF	<i>Dolichotis patagonum</i>	<i>Dolichotis patagonum</i>	FA
<i>Eodolichotis elachys</i> , <i>E. maddeni</i> , <i>E. sp.</i>	Gz to MF	Grasses dominant, then shrubs, rare forbs; Only selective in drought when it prefers shrubs and forbs	(Puig et al. 2010)	SSF	<i>Dolichotis patagonum</i>	<i>Dolichotis patagonum</i>	FA
<i>Eodolichotis elachys</i> , <i>E. maddeni</i> , <i>E. sp.</i>	MF	Depend heavily on grasses but mixed diet overall		Sum			
<i>Eosclerocalyp-tus planus</i> , <i>E. sp.</i>	MF	Relationship: Similar temporal trends in multiple lineages of glyptodonts: Intermediate be-	(Vizcaíno, Cassini, et al. 2011)	Tax	<i>Hoplophrac-tus</i> , <i>Eosclero-calyptus</i> ,	<i>Hoplophrac-tus</i> , <i>Eosclero-calyptus</i> ,	CDM

Table S4.9: Dietary data for South American fossil taxa, cont.

tween Miocene browsers and Pleistocene grazers					<i>Urotherium</i>	<i>Urotherium</i>	
<i>Epecuenia</i> sp.	Fl		(Croft 2016)	PB	<i>Thoatherium minusculum</i> and <i>Neobrachytherium ullumense</i>	<i>Thoatherium minusculum</i> and <i>Neobrachytherium ullumense</i>	Un
<i>Epecuenia</i> sp.	Fl	This study, based on diet of <i>Neobrachytherium</i> (Croft 2016) and possible synonymy of <i>Epecuenia</i> and <i>Neobrachytherium</i> (Soria 2001)	(Soria 2001; Croft 2016)	See	<i>Epecuenia</i>		MS
<i>Epecuenia</i> sp.	Fl			Sum			
<i>Epieurycerus truncus</i>	Fl		(Menégaz and Ortiz Jau-reguizar 1995)	Tax	<i>Epieurycerus truncus</i>	<i>Epieurycerus truncus</i>	Un
<i>Eptesicus fuscus</i> , <i>E. sp.</i>	In	Beetles predominant, seldom eat moths	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax	<i>Eptesicus fuscus</i>	<i>Eptesicus fuscus</i>	LR-E
<i>Equus andium</i> , <i>E. insulatus</i>	MF		(Prado et al. 2011)	Tax	<i>Equus andium</i> , <i>E. insulatus</i>	<i>Equus andium</i> , <i>E. insulatus</i>	SI
<i>Equus andium</i> , <i>E. insulatus</i>	Gz		(Bernardes et al. 2013)	WS G	<i>Equus</i> (<i>Amerhippus</i>)	<i>Equus</i> (<i>Amerhippus</i>)	CMDM
<i>Equus andium</i> , <i>E. insulatus</i>	MF			Sum			

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Equus caballus</i> , <i>E. santaeelenae</i> , <i>E. sp.</i>	Gz		(Prado et al. 2011)	Tax, WS G	<i>Equus san- taeelenae</i>	<i>Equus san- taeelenae</i>	SI
<i>Equus caballus</i> , <i>E. santaeelenae</i> , <i>E. sp.</i>	Gz		(Bernardes et al. 2013)	WS G	<i>Equus</i> (<i>Amerhippus</i>)	<i>Equus</i> (<i>Amerhippus</i>)	CMDM
<i>Equus caballus</i>, <i>E. san- taeelenae</i>, <i>E.</i> <i>sp.</i>	Gz			Sum			
<i>Eremotherium</i> <i>elenense</i>	Fl or Fl-Fr		(Bargo 2001)	SF	<i>Megatherium</i> <i>americanum</i>	<i>Megatherium</i> <i>americanum</i>	DM, BM
<i>Eremotherium</i> <i>elenense</i>	Fl		(Carretero, Gar- cía, and Dacar 2004)	SF	<i>Megatherium</i> <i>americanum</i>	<i>Megatherium</i> <i>americanum</i>	CA
<i>Eremotherium</i> <i>elenense</i>	MF	"more of a grazer than a browser contrary to ... <i>E. laurillardi</i> "	(Pujos and Salas 2004a)	Tax	<i>Eremotherium</i> <i>elenense</i>	<i>Eremotherium</i> <i>elenense</i>	Un
<i>Eremotherium</i> <i>elenense</i>	Fl		(de Fátima Ros- setti et al. 2004)	SG	<i>Eremotherium</i> <i>laurillardi</i>	<i>Eremotherium</i> <i>laurillardi</i>	SI
<i>Eremotherium</i> <i>elenense</i>	Fl orFl- Fr	Soft to moderate food; Cutting, not crushing or grinding; Diet may have included fruits	(Vizcaíno, Bar- go, and Cassini 2006)	SF	<i>Megatherium</i> <i>americanum</i>	<i>Megatherium</i> <i>americanum</i>	DM
<i>Eremotherium</i> <i>elenense</i>	Fl or Fl-Fr		(Bargo, Toledo, and Vizcaíno 2006)	SF	<i>Megatherium</i> <i>americanum</i>	<i>Megatherium</i> <i>americanum</i>	DM, BM
<i>Eremotherium</i> <i>elenense</i>	Fl	Coprolites and morphology agree: Folivory most likely	(McDonald and Iuliis 2008)	SF	<i>Megatherium</i> <i>americanum</i>	<i>Megatherium</i> <i>americanum</i>	LR

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Eremotherium elenense</i>	Fl	Food reduction mainly by shearing or cutting	(Bargo, Vizcaíno, and Kay 2009)	SF	<i>Eucholoeops</i>	<i>Eucholoeops</i> and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, and megatheriids)	DW, CMDM
<i>Eremotherium elenense</i>	Fr-Fl	Selective tough object feeder	(Pujos, Iuliis, and Quispe 2011)	SF	<i>Hiskatherium saintandrei</i>	<i>Hiskatherium saintandrei</i>	MC:FR
<i>Eremotherium elenense</i>	Fl	Food reduction mainly by shearing or cutting	(Bargo, Toledo, and Vizcaíno 2012)	SF	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Peleciodon</i> , <i>Prepootherium</i> , <i>Planops</i>	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Peleciodon</i> , <i>Prepootherium</i> , <i>Planops</i> , and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, and megatheriids)	DW, CMDM
<i>Eremotherium elenense</i>	Fl		(Kay, Vizcaíno, and Bargo 2012)	SF	<i>Eucholoeops ingens</i>	<i>Eucholoeops ingens</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Eremotherium elenense</i>	Fl		(Pujos et al. 2012)	WF	Megatheriidae	Megatheriidae	PB, CMDM
<i>Eremotherium elenense</i>	Fl	Low to moderate toughness	(Green and Kalthoff 2015)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DMc
<i>Eremotherium elenense</i>	MF	"more of a grazer than a browser contrary to ... <i>E. laurillardi</i>"		Sum			
<i>Eremotherium laurillardi</i> , <i>E. sefvei</i> , <i>E. sp.</i>	Fl or Fl-Fr		(Bargo 2001)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
<i>Eremotherium laurillardi</i> , <i>E. sefvei</i> , <i>E. sp.</i>	Fl		(Carretero, García, and Dacar 2004)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	CA
<i>Eremotherium laurillardi</i> , <i>E. sefvei</i> , <i>E. sp.</i>	MF	"more of a grazer than a browser contrary to ... <i>E. laurillardi</i> "	(Pujos and Salas 2004a)	SG	<i>Eremotherium elenense</i>	<i>Eremotherium elenense</i>	Un
<i>Eremotherium laurillardi</i> , <i>E. sefvei</i> , <i>E. sp.</i>	Fl		(Fátima Rossetti et al. 2004)	Tax, SG	<i>Eremotherium laurillardi</i>	<i>Eremotherium laurillardi</i>	SI
<i>Eremotherium laurillardi</i> , <i>E. sefvei</i> , <i>E. sp.</i>	Fl or Fl-Fr		(Bargo, Toledo, and Vizcaíno 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
<i>Eremotherium laurillardi</i> , <i>E. sefvei</i> , <i>E. sp.</i>	Fl or Fl-Fr	Soft to moderate food; Cutting, not crushing or grinding; Diet may have included fruits	(Vizcaíno, Bargo, and Cassini 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM
<i>Eremotherium laurillardi</i> , <i>E. sefvei</i> , <i>E. sp.</i>	Fl	Coprolites and morphology agree: Folivory most likely	(McDonald and Iuliis 2008)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	LR
<i>Eremotherium</i>	Fl	Food reduction mainly by shear-	(Bargo, Vizcaí-	SF	<i>Eucholoeops</i>	<i>Eucholoeops</i>	DW,

Table S4.9: Dietary data for South American fossil taxa, cont.

			<i>laurillardi</i> , <i>E. sefvei</i> , <i>E. sp.</i>	ing or cutting	no, and Kay 2009)		and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, and megatheriids)	CMDM
	<i>Eremotherium laurillardi</i> , <i>E. sefvei</i> , <i>E. sp.</i>	Fr-Fl	Selective tough object feeder	(Pujos, Iuliis, and Quispe 2011)	SF	<i>Hiskatherium saintandrei</i>	<i>Hiskatherium saintandrei</i>	MC:FR
577	<i>Eremotherium laurillardi</i> , <i>E. sefvei</i> , <i>E. sp.</i>	Fl	Food reduction mainly by shearing or cutting	(Bargo, Toledo, and Vizcaíno 2012)	SF	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Pelecycodon</i> , <i>Prepootherium</i> , <i>Planops</i>	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Pelecycodon</i> , <i>Prepootherium</i> , <i>Planops</i> , and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, and megatheriids)	DW, CMDM
	<i>Eremotherium laurillardi</i> , <i>E. sefvei</i> , <i>E. sp.</i>	Fl		(Kay, Vizcaíno, and Bargo 2012)	SF	<i>Eucholoeops ingens</i>	<i>Eucholoeops ingens</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Eremotherium laurillardi</i> , <i>E. sefvei</i> , <i>E. sp.</i>	Fl		(Pujos et al. 2012)	WF	Megatheriidae	Megatheriidae	PB, CMDM
<i>Eremotherium laurillardi</i> , <i>E. sefvei</i> , <i>E. sp.</i>	Fl	Low to moderate toughness	(Green and Kalthoff 2015)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DMc
<i>Eremotherium laurillardi</i>, <i>E. sefvei</i>, <i>E. sp.</i>	Fl			Sum			
<i>Erethizon sp.</i>	GH	"Facultative specialist herbivore" - can specialize on difficult and narrow diet when food resources are rare, but are dietary generalists when resources are more abundant	(Coltrane 2012)	Tax	<i>Erethizon dorsatum</i>	<i>Erethizon dorsatum</i>	LR-E
<i>Eucelophorus sp.</i>	Rz or Gz-Rz	This study, based on modern analogue: Ecologically similar to, but more specialized for subterranean life than, <i>Ctenomys</i> (Reig and Quintana 1992), <i>Ctenomys</i> spp. are radicivores or grazer-radicivores: <i>C. boliviensis</i> : roots and tubers, <i>C. flamarioni</i> : grasses and sedges, <i>C. fulvus</i> : diet includes <i>Larrea</i> (shrub) leaves, <i>C. magellanicus</i> : roots of grasses and shrubs, <i>C. mendocinus</i> : above ground grasses and shrubs, <i>C. nattereri</i> : diet includes grasses, <i>C. opti-</i>	(Reig and Quintana 1992)	SG	<i>Eucelophorus chapadmalaensis</i> , <i>E. zaratei</i>		MA

Table S4.9: Dietary data for South American fossil taxa, cont.

			<i>mus</i> : bulbs and grass roots, <i>C. pearsoni</i> : herbivorous generalist preferring grasses, <i>C. roigi</i> : roots and basal grass stems, <i>C. saltarius</i> : creosote and other shrubs, <i>C. sociabilis</i> : main food item is grass (Patton, Pardiñas, and D’Elía 2015)				
<i>Eucholoeops ingens</i>	Fl or Fl-Fr		(Bargo 2001)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
<i>Eucholoeops ingens</i>	Fl or Fl-Fr		(Bargo, Toledo, and Vizcaíno 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
<i>Eucholoeops ingens</i>	Fl		(Carretero, García, and Dacar 2004)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	CA
<i>Eucholoeops ingens</i>	MF		(Pujos and Salas 2004a)	SF	<i>Eremotherium elenense</i>	<i>Eremotherium elenense</i>	Un
<i>Eucholoeops ingens</i>	Fl		(Fátima Rossetti et al. 2004)	SF	<i>Eremotherium laurillardi</i>	<i>Eremotherium laurillardi</i>	SI
<i>Eucholoeops ingens</i>	Fl or Fl-Fr	Soft to moderate food; Cutting, not crushing or grinding; Diet may have included fruits	(Vizcaíno, Bargo, and Cassini 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM
<i>Eucholoeops ingens</i>	Fl	Coprolites and morphology agree: Folivory most likely	(McDonald and Iuliis 2008)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	LR
<i>Eucholoeops ingens</i>	Fl	Food reduction mainly by shearing or cutting	(Bargo, Vizcaíno, and Kay 2009)	WG	<i>Eucholoeops</i>	<i>Eucholoeops</i> and "nearly all other Miocene mega-	DW, CMDM

Table S4.9: Dietary data for South American fossil taxa, cont.

						therioids" (including basal megatherioids, megalonychids, and megatheriids)	
<i>Eucholoeops ingens</i>	Fr-Fl	Selective tough object feeder	(Pujos, Iuliis, and Quispe 2011)	SF	<i>Hiskatherium saintandrei</i>	<i>Hiskatherium saintandrei</i>	MC:FR
<i>Eucholoeops ingens</i>	Fl	Food reduction mainly by shearing or cutting	(Bargo, Toledo, and Vizcaíno 2012)	WG	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Pelecycodon</i> , <i>Prepootherium</i> , <i>Planops</i>	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Pelecycodon</i> , <i>Prepootherium</i> , <i>Planops</i> , and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, and megatheriids)	DW, CMDM
<i>Eucholoeops ingens</i>	Fl		(Kay, Vizcaíno, and Bargo 2012)	WG	<i>Eucholoeops ingens</i>	<i>Eucholoeops ingens</i>	Un
<i>Eucholoeops ingens</i>	Fl		(Pujos et al. 2012)	WF	Megatheriidae	Megatheriidae	PB, CMDM
<i>Eucholoeops ingens</i>	Fl	Low to moderate toughness	(Pujos et al. 2012)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DMc

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Eucholoeops ingens</i>	Fl	Sum					
<i>Eumegamys</i> sp.	MF to Gz	Diet close to ground, stems, leaves, scrubs, twigs, roots	(Candela, Cas-sini, and Nasif 2013)	SG	<i>Eumegamys paranensis</i>	<i>Eumegamys paranensis</i>	DM
<i>Eumegamys</i> sp.	Gz		(Vucetich and Deschamps 2015)	WS F	Eumegamysi-nae	Eumegamysi-nae	DM
<i>Eumegamys</i> sp.	Gz	Sum					
<i>Eumegamysops</i> sp.	MF to Gz	Diet close to ground, stems, leaves, scrubs, twigs, roots	(Candela, Cas-sini, and Nasif 2013)	SSF	<i>Eumegamys paranensis</i>	<i>Eumegamys paranensis</i>	DM
<i>Eumegamysops</i> sp.	Gz		(Vucetich and Deschamps 2015)	WS F	Eumegamysi-nae	Eumegamysi-nae	DM
<i>Eumegamysops</i> sp.	Gz	Sum					
<i>Eumops</i> sp.	In	Aerial insectivores: open-air and over-water foraging	(Czaplewski, Morgan, and McLeod 1997)	Tax	<i>Eumops</i>	<i>Eumops</i>	LR-E
<i>Eumysops for-mosus</i>, <i>Eumysops laeviplicatus</i>, <i>Eumysops parodii</i>, <i>Eumysops</i> sp.	Fr-Gn	Relationship: Broad dietary similarity across entire subfam-ily Eumysopinae; <i>Clyomys</i>: Granivore, <i>Euryzygomatomys spinosus</i>: "herbivore", <i>Hop-lomys</i>: Frugivore-granivore, <i>Lonchothrix</i>: frugivore?, <i>Proe-chimys</i>: Frugivore-granivore, <i>Thrichomys</i>: Frugivore-insectivore and Frugivore-	(Patton, Pardiñas, and D'Elia 2015)	See	<i>Clyomys</i>, <i>Euryzygomato-mys</i>, <i>Hop-lomys</i>, <i>Lonchothrix</i>, <i>Proechimys</i>, <i>Thrichomys</i>, <i>Trinomys</i>	<i>Clyomys</i>, <i>Euryzygomato-mys</i>, <i>Hop-lomys</i>, <i>Lonchothrix</i>, <i>Proechimys</i>, <i>Thrichomys</i>, <i>Trinomys</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

browser, <i>Trinomys</i>: Frugivore-granivore							
<i>Euphractus patagonicus</i> , <i>E. sexcinctus</i> , <i>Euphractus</i> sp.	Om	"Carnivore-omnivore," Can eat very hard food items	(Vizcaíno and Bargo 1998)	WG	<i>Euphractus</i>	<i>Euphractus</i>	LR-E
<i>Euphractus patagonicus</i> , <i>E. sexcinctus</i> , <i>Euphractus</i> sp.	Om	Carrion, small vertebrates, insects, bromeliad fruits, tubers, palm nuts; plants may make up substantial portion of diet	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax, SG	<i>Euphractus sexinctus</i>	<i>Euphractus sexinctus</i>	LR-E
<i>Euphractus patagonicus</i>, <i>E. sexcinctus</i>, <i>Euphractus</i> sp.	Om	Sum					
<i>Euryzygomatomys</i> sp.	GH	Will feed on bark when resources are scarce	(Gonçalves et al. 2007)	SG	<i>Euryzygomatomys spinosus</i>	<i>Euryzygomatomys spinosus</i>	FO, Lab
<i>Eutatus seguini</i> , <i>E. sp.</i>	Fl	<i>Eutatus</i> and <i>Proeutatus</i> more specialized for herbivory	(Vizcaíno and Bargo 1998)	WG	<i>Eutatus</i> , <i>Proeutatus</i> , <i>Doelotatus</i> , <i>Ringueletia</i>	<i>Eutatus</i> , <i>Proeutatus</i> , <i>Doelotatus</i> , <i>Ringueletia</i>	CDM
<i>Eutatus seguini</i> , <i>E. sp.</i>	Fl	"Eutatines (up to 50 kg) are mainly browsers"	(Vizcaíno, Iuliis, and Bargo 1998)	WT	Eutatini	Eutatini	CDM
<i>Eutatus seguini</i> , <i>E. sp.</i>	Fl		(Vizcaíno, Fariña, Bargo, et al. 2004)	WG	<i>Eutatus</i>	<i>Eutatus</i>	CDM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Eutatus seguini</i> , <i>E. sp.</i>	Fl	$\delta^{13}\text{C}$ consistent with browsing in woodland habitat	(Domingo, Pra- do, and Alberdi 2012)	Tax, SG	<i>Eutatus se- guini</i>	<i>Eutatus se- guini</i>	SI
<i>Eutatus se- guini</i>, <i>E. sp.</i>	Fl			Sum			
<i>Felis platensis</i>, <i>F. sp.</i>	HC	Rodents and other small verte- brates (shrews, birds, fish, iguanas)	(Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)	SG	<i>Felis</i> (=<i>Oncifelis</i>) <i>colocolo</i>, <i>Fe- lis</i> (=<i>Oncifelis</i>) <i>geoffroyi</i>, <i>Fe- lis</i> (=<i>Oreailurus</i>) <i>jacobita</i>, <i>Felis</i> (=<i>Leopardus</i>) <i>pardalis</i>, <i>Felis</i> (=<i>Leopardus</i>) <i>tigrina</i>, <i>Felis</i> (=<i>Leopardus</i>) <i>wiedii</i>, <i>Felis</i> (=<i>Herpailuru</i> s) <i>ya- gouaroundi</i>	<i>Felis</i> (=<i>Oncifelis</i>) <i>colocolo</i>, <i>Fe- lis</i> (=<i>Oncifelis</i>) <i>geoffroyi</i>, <i>Fe- lis</i> (=<i>Oreailurus</i>) <i>jacobita</i>, <i>Felis</i> (=<i>Leopardus</i>) <i>pardalis</i>, <i>Fe- lis</i> (=<i>Leopardus</i>) <i>tigrina</i>, <i>Felis</i> (=<i>Leopardus</i>) <i>wiedii</i>, <i>Felis</i> (=<i>Herpailuru</i> s) <i>ya- gouaroundi</i>	LR-E
<i>Galea mus- teloides</i>, <i>G. sp.</i>, <i>G. spixii</i>	MF	Grasses and shrubs though less C_4 than previously thought	(Fernández et al. 2016)	SG	<i>Galea leuco- blephara</i>	<i>Galea leuco- blephara</i>	SI
<i>Galictis sp.</i>	HC		(Prevosti, Fo- rasiepi, and Zimicz 2013)	SG	<i>Galictis cuja</i>	<i>Galictis cuja</i>	DM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Glossotheriopsis pascuali</i>	MF	Transitional form between browsers and grazers: flared snout like grazers but lacks crushing teeth	(McDonald 1997)	Tax	<i>Glossotheriopsis pascuali</i>	<i>Glossotheriopsis pascuali</i>	CMDM
<i>Glossotheriopsis pascuali</i>	Fl		(Kay and Mad-den 1997b)	Tax	<i>Glossotheriopsis pascuali</i>	<i>Glossotheriopsis pascuali</i>	Un
<i>Glossotheriopsis pascuali</i>	MF	This study, based on: Broader snout than <i>Pseudopreoptherium</i> (McDonald 1997), which is classified as a mixed feeder (Pujos et al. 2012)	(Cerdeño et al. 2012)	Tax	<i>Glossotheriopsis pascuali</i>	<i>Glossotheriopsis pascuali</i>	CMDM
<i>Glossotheriopsis pascuali</i>	MF			Sum			
<i>Glossotherium chapadmalense</i> , <i>G. giganteum</i> , <i>G. robustum</i> , <i>G.</i> <i>sp.</i> , <i>G. tropicorum</i>	Gz		(Pujos et al. 2012)	WG	<i>Glossotherium</i>	<i>Glossotherium</i>	CMDM
<i>Glossotherium chapadmalense</i> , <i>G. giganteum</i> , <i>G. robustum</i> , <i>G.</i> <i>sp.</i> , <i>G. tropicorum</i>	Gz	Based on morphological similarity to <i>G. robustum</i>	(Dantas, Missagia, et al. 2013)	SG	<i>Glossotherium lettsomi</i>	<i>Glossotherium lettsomi</i>	CMDM
<i>Glossotherium chapadmalense</i> , <i>G. giganteum</i> , <i>G. robustum</i> , <i>G.</i> <i>sp.</i> , <i>G. tropicorum</i>	Gz	Bulk feeders that used their lips and tongue to pull out grass and herbs	(Bargo, Iuliis, and Vizcaíno 2006)	Tax, SG	<i>Glossotherium robustum</i>	<i>Glossotherium robustum</i>	CMDM

Table S4.9: Dietary data for South American fossil taxa, cont.

um							
<i>Glossotherium chapadmalense</i> , <i>G. giganteum</i> , <i>G. robustum</i> , <i>G.</i> <i>sp.</i> , <i>G. tropicorum</i>	Gz	Bulk feeders in cold, open, arid C ₃ environments	(Czerwonogora, Fariña, and Tonni 2011)	Tax, SG	<i>Glossotherium</i> <i>robustum</i>	<i>Glossotheri-</i> <i>um robustum</i>	SI
<i>Glossotherium</i> <i>chapadmalense</i>, <i>G. giganteum</i>, <i>G. robustum</i>, <i>G.</i> <i>sp.</i>, <i>G. tropi-</i> <i>corum</i>	Gz	Sum					
<i>Glyptodon clav-</i> <i>ipes</i> , <i>G. elon-</i> <i>gatus</i> , <i>G. mu-</i> <i>nizi</i> , <i>G. reticula-</i> <i>tus</i> , <i>G. sp.</i>	Gz		(Fariña 1985)	WG	<i>Glyptodon</i>	Plio- Pleistocene Glyptodonti- dae	CMM
<i>Glyptodon clav-</i> <i>ipes</i> , <i>G. elon-</i> <i>gatus</i> , <i>G. mu-</i> <i>nizi</i> , <i>G. reticula-</i> <i>tus</i> , <i>G.</i>	Gz		(L. M. Pérez, Scillato-Yané, and Vizcaino 2000)	WG	<i>Glyptodon</i>	Plio- Pleistocene Glyptodonti- dae	CM
<i>Glyptodon clav-</i> <i>ipes</i> , <i>G. elon-</i> <i>gatus</i> , <i>G. mu-</i> <i>nizi</i> , <i>G. reticula-</i> <i>tus</i> , <i>G.</i>	Gz		(Fariña and Vizcaino 2001)	WG	<i>Glyptodon</i>	Plio- Pleistocene Glyptodonti- dae	CMDM
<i>Glyptodon clav-</i> <i>ipes</i> , <i>G. elon-</i>	Gz		(Pomi 2008)	WG	<i>Glyptodon</i>	<i>Glyptodon</i>	LR

Table S4.9: Dietary data for South American fossil taxa, cont.

586	<i>gatus</i> , <i>G. munizi</i> , <i>G. reticulatus</i> , <i>G.</i>							
	<i>Glyptodon clavipes</i> , <i>G. elongatus</i> , <i>G. munizi</i> , <i>G. reticulatus</i> , <i>G.</i>	Gz		(Ascanio D. Rincón, White, and McDonald 2008)	WG	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	LR
	<i>Glyptodon clavipes</i> , <i>G. elongatus</i> , <i>G. munizi</i> , <i>G. reticulatus</i> , <i>G.</i>	Fl	Reversion to more selective feeding like middle Miocene glyptodonts, alternatively: different feeding behavior or specialized physiology	(Vizcaíno, Casini, et al. 2011)	WG	<i>Glyptodon</i>	<i>Glyptodon</i>	CMDM
	<i>Glyptodon clavipes</i> , <i>G. elongatus</i> , <i>G. munizi</i> , <i>G. reticulatus</i> , <i>G.</i>	Gz to MF	Flexible diets and habitats	(Domingo, Prado, and Alberdi 2012)	WG	<i>Glyptodon</i>	<i>Glyptodon</i>	SI
	<i>Glyptodon clavipes</i> , <i>G. elongatus</i> , <i>G. munizi</i> , <i>G. reticulatus</i> , <i>G.</i>	Gz to MF	Diet varies from mixed feeder to grazer	(França et al. 2015)	WG	<i>Glyptodon</i>	<i>Glyptodon</i>	SI
	<i>Glyptodon clavipes</i>, <i>G. elongatus</i>, <i>G. munizi</i>, <i>G. reticulatus</i>, <i>G.</i>	Gz	Sum					
	<i>Glyptotherium cylindricum</i>	Gz to	Mixed, but mainly grasses	(Pérez-Crespo et al. 2012)	WG	<i>Glyptotherium</i>	<i>Glyptotherium</i>	SI

Table S4.9: Dietary data for South American fossil taxa, cont.

MF							
<i>Gracilinanus</i> sp.	In-Fr	Opportunistic forager feeding mainly on insects": Proportion of insects depended on availability	(Martins et al. 2006)	SG	<i>Gracilinanus microtarsus</i>	<i>Gracilinanus microtarsus</i>	FA
<i>Granastrapotherium snorki</i>	Fl	Similar cheek tooth mechanics to rhinocerotoids	(Rensberger and Pfretzschner 1992)	Tax	<i>Parastrapotherium</i> , <i>Astrapotherium</i> , <i>Granastrapotherium snorki</i>	<i>Astrapotheres</i>	EM
<i>Granastrapotherium snorki</i>	Fl		(Kay and Madden 1997b)	Tax	<i>Granastrapotherium snorki</i>	<i>Granastrapotherium snorki</i>	Un
<i>Granastrapotherium snorki</i>	Fl		(Townsend and Croft 2005)	SF	<i>Astrapotherium</i>	<i>Astrapotherium</i>	DMc
<i>Granastrapotherium snorki</i>	Fl	Less muscle mass for chewing, proportionally short cheek tooth row	(Cassini and Vizcaíno 2012)	SF	<i>Astrapotherium</i>	<i>Astrapotherium</i>	CM
<i>Granastrapotherium snorki</i>	Fl		(Cassini, Vizcaíno, and Bargo 2012)	SF	<i>Astrapotherium</i>	<i>Astrapotherium</i>	CDM
<i>Granastrapotherium snorki</i>	Fl		(Cassini et al. 2012)	SF	<i>Astrapotherium</i>	<i>Astrapotherium</i>	CM
<i>Granastrapotherium snorki</i>	MF		(Kay, Vizcaíno, and Bargo 2012)	SF	<i>Astrapotherium</i>	<i>Astrapotherium</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Granastra-</i> <i>potherium snor-</i> <i>ki</i>	Fl		(Cassini 2013)	SF	<i>Astrapotheri-</i> <i>um</i>	<i>Astrapotheri-</i> <i>um</i>	CGM
<i>Granastra-</i> <i>potherium snor-</i> <i>ki</i>	Fl	"feeding on relatively soft leaves near the edges of rivers and lakes"	(Croft 2016)	Tax	<i>Granastra-</i> <i>potherium</i> <i>snorki</i>	<i>Granastra-</i> <i>potherium</i> <i>snorki</i>	Un
<i>Granastra-</i> <i>potherium</i> <i>snorki</i>	Fl			Sum			
<i>Guiomys</i> sp., <i>G. unica</i>	MF	Relationship: Within paraphyletic "Eocardiidae" (Pérez 2010a; Pérez and Pol 2012; Pérez, Vucetich, and Deschamps 2014); Diet: Wide diet, including abrasive foods like grasses by modern analogy with <i>Dolichotis patagonum</i> and <i>D. salinicola</i> (Candela, Rasia, and Pérez 2012)	(Candela, Rasia, and Pérez 2012)	SF, See	<i>Eocardia montana</i> , <i>E. fissa</i>	<i>Eocardia montana</i> , <i>E. fissa</i>	DM, MA
<i>Guiomys</i> sp., <i>G. unica</i>	Gz	Relationship: Both in "Eocardiidae"	(Kay, Vizcaíno, and Bargo 2012)	SF, See	<i>Eocardia montana</i> , <i>E. fissa</i>	<i>Eocardia montana</i> , <i>E. fissa</i>	Un
<i>Guiomys</i> sp., <i>G. unica</i>	MF	"feeding on leaves of low-growing plants," "probably fed in more open areas of Quebrada Honda"	(Croft 2016)	Tax, SG	<i>Guiomys unica</i>	<i>Guiomys unica</i>	Un
<i>Guiomys</i> sp., <i>G. unica</i>	MF			Sum			
<i>Gyrinodon quassus</i> , <i>G. sp.</i>	GH	Diet varies from C ₃ browser in closed canopy to open grassland C ₄ grazer	(MacFadden 2005)	SF, PB	<i>Toxodon</i> (Toxodontinae) and <i>Mix-</i>	<i>Toxodon</i> (Toxodontinae) and <i>Mix-</i>	SI

Table S4.9: Dietary data for South American fossil taxa, cont.

				<i>otoxodon</i> (Haplodonthe- riinae)	<i>otoxodon</i> (Haplodonthe- riinae)	
<i>Gyrinodon</i> <i>quassus</i> , G. sp.	Fl	(Townsend and Croft 2008a)	SF, PB	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon im-</i> <i>bricatus</i>)	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon im-</i> <i>bricatus</i>)	DMc
<i>Gyrinodon</i> <i>quassus</i> , G. sp.	Gz or MF	(Cassini et al. 2011)	SF, PB	<i>Nesodon</i>	<i>Nesodon</i>	CMM
<i>Gyrinodon</i> <i>quassus</i> , G. sp.	GH	(Cassini and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	BM
<i>Gyrinodon</i> <i>quassus</i> , G. sp.	GH	(Cassini, Viz- caíno, and Bar- go 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	CM
<i>Gyrinodon</i> <i>quassus</i> , G. sp.	Gz	(Cassini et al. 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon im-</i> <i>bricatus</i>)	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon im-</i> <i>bricatus</i>)	CDM
<i>Gyrinodon</i> <i>quassus</i> , G. sp.	GH	(Cassini, Flores, and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon im-</i> <i>bricatus</i>)	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon im-</i> <i>bricatus</i>)	CO, CM
<i>Gyrinodon</i> <i>quassus</i> , G. sp.	Gz	(Kay, Vizcaíno, and Bargo	SF, PB	Nesodontines (<i>Adinotherium</i>	Nesodontines	LR

Table S4.9: Dietary data for South American fossil taxa, cont.

			2012)		and <i>Nesodon</i>)		
<i>Gyrinodon quassus</i> , <i>G. sp.</i>	GH	Diet dependent on availability: Browse to graze	(Cassini 2013)	SF, PB	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon im- bricatus</i>)	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon im- bricatus</i>)	CGM
<i>Gyrinodon quassus</i>, <i>G. sp.</i>	GH			Sum		Toxodonti- dae	
<i>Hapalops angustipalatus</i> , <i>H. sp.</i>	Fl or Fl-Fr		(Bargo 2001)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
<i>Hapalops angustipalatus</i> , <i>H. sp.</i>	Fl		(Carretero, García, and Dacar 2004)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	CA
<i>Hapalops angustipalatus</i> , <i>H. sp.</i>	MF		(Pujos and Salas 2004a)	SF	<i>Eremotherium elenense</i>	<i>Eremotherium elenense</i>	Un
<i>Hapalops angustipalatus</i> , <i>H. sp.</i>	Fl		(Fátima Rossetti et al. 2004)	SF	<i>Eremotherium laurillardi</i>	<i>Eremotherium laurillardi</i>	SI
<i>Hapalops angustipalatus</i> , <i>H. sp.</i>	Fl or Fl-Fr		(Bargo, Toledo, and Vizcaíno 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
<i>Hapalops angustipalatus</i> , <i>H. sp.</i>	Fl or Fl-Fr	Soft to moderate food; Cutting, not crushing or grinding; Diet may have included fruits	(Vizcaíno, Bargo, and Cassini 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM
<i>Hapalops angustipalatus</i> , <i>H. sp.</i>	Fl	Coprolites and morphology agree: Folivory most likely	(McDonald and Iuliis 2008)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	LR

Table S4.9: Dietary data for South American fossil taxa, cont.

591	<i>Hapalops angustipalatus</i> , <i>H.</i> sp.	Fl	Food reduction mainly by shearing or cutting	(Bargo, Vizcaíno, and Kay 2009)	SF	<i>Eucholoeops</i>	<i>Eucholoeops</i> and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, and megatheriids)	DW, CMDM
	<i>Hapalops angustipalatus</i> , <i>H.</i> sp.	Fr-Fl	Selective tough object feeder	(Pujos, Iuliis, and Quispe 2011)	SF	<i>Hiskatherium saintandrei</i>	<i>Hiskatherium saintandrei</i>	MC:FR
	<i>Hapalops angustipalatus</i> , <i>H.</i> sp.	Fl	Food reduction mainly by shearing or cutting	(Bargo, Toledo, and Vizcaíno 2012)	WG	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Peleciodon</i> , <i>Prepootherium</i> , <i>Planops</i>	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Peleciodon</i> , <i>Prepootherium</i> , <i>Planops</i> , and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, and megatheriids)	DW, CMDM
	<i>Hapalops angustipalatus</i> , <i>H.</i> sp.	Fl		(Kay, Vizcaíno, and Bargo 2012)	SF	<i>Eucholoeops ingens</i>	<i>Eucholoeops ingens</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Hapalops an-gustipalatus</i> , <i>H.</i> sp.	Fl		(Pujos et al. 2012)	WF	Megatheriidae	Megatheriidae	PB, CMDM
<i>Hapalops an-gustipalatus</i> , <i>H.</i> sp.	Fl	Low to moderate toughness	(Green and Kalthoff 2015)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DMc
<i>Hapalops an-gustipalatus</i>, <i>H.</i> sp.	Fl			Sum			
<i>Haplomastodon chimborazi</i> , <i>H.</i> sp., <i>H. waringi</i>	Fl	Browser in closed canopy forest	(Fátima Rossetti et al. 2004)	Tax, SG	<i>Haplomastodon waringi</i>	<i>Haplomastodon waringi</i>	SI
<i>Haplomastodon chimborazi</i> , <i>H.</i> sp., <i>H. waringi</i>	GH	Grazer to browser depending on site: <i>S. waringi</i> : grazing to browse-heavy mixed feeding, <i>S. platensis</i> : browsing to mixed feeding	(Sánchez, Prado, and Alberdi 2004)	Tax, SG	<i>Stegomastodon</i> (= <i>Haplomastodon</i>) <i>warengi</i> , <i>Haplomastodon chimborazi</i> (= <i>Stegomastodon platensis</i> , = <i>Notiomastodon platensis</i>)	<i>Stegomastodon</i> (= <i>Haplomastodon</i>) <i>warengi</i> , <i>Haplomastodon chimborazi</i> (= <i>Stegomastodon platensis</i> , = <i>Notiomastodon platensis</i>)	SI
<i>Haplomastodon chimborazi</i> , <i>H.</i> sp., <i>H. waringi</i>	GH	Diet depends on availability and can contain low quality food from woody plants and C ₃ grasses	(Asevedo et al. 2012)	Tax, SG	<i>Notiomastodon platensis</i> (= <i>Stegomastodon platensis</i> , = <i>Haplomastodon chimborazi</i>)	<i>Notiomastodon platensis</i> (= <i>Stegomastodon platensis</i> , = <i>Haplomastodon chimborazi</i>)	DMc, TCA
<i>Haplomastodon chimborazi</i> , <i>H.</i>	GH	Diet depends on availability and can contain low quality food from	(Avilla et al. 2013)	Tax, SG	<i>Notiomastodon platensis</i>	<i>Notiomastodon platensis</i>	LR

Table S4.9: Dietary data for South American fossil taxa, cont.

593	sp., <i>H. waringi</i>		woody plants and C ₃ grasses			(=Stegomastodon platensis, =Haplomastodon chimborazi)	(=Stegomastodon platensis, =Haplomastodon chimborazi)	
	<i>Haplomastodon chimborazi</i>, <i>H. sp.</i>, <i>H. waringi</i>	GH			Sum			
	<i>Hegetotherium mirabile</i> , <i>H. sp.</i>	Gz	Selective grazing, convergent on <i>Dolichotis patagonum</i>	(M. A. Reguero, Dozo, and Cerdeño 2007)	WF	<i>Medistylus</i> , <i>Prosotherium</i> , <i>Propachyrucos</i>	<i>Medistylus</i> , <i>Prosotherium</i> , <i>Propachyrucos</i>	Cranial, DM
	<i>Hegetotherium mirabile</i> , <i>H. sp.</i>	Gz, GH	For typotheres, particularly <i>Hegetotherium</i> , hypsodonty may be associated with digging habit and not diet	(Guillermo H. Cassini et al. 2011)	WG	<i>Hegetotherium</i> , <i>Pachyrukhos</i>	<i>Hegetotherium</i> , <i>Pachyrukhos</i>	CMM
	<i>Hegetotherium mirabile</i> , <i>H. sp.</i>	Herb	Typical biomechanical configuration for a specialized herbivore	(Guillermo H. Cassini and Vizcaíno 2012)	WF	<i>Pachyrukhos</i>	<i>Pachyrukhos</i>	BM
	<i>Hegetotherium mirabile</i> , <i>H. sp.</i>	Gz, GH	<i>Hegetotherium</i> : Exaggerated features related to open habitats, but not necessarily grazing (unlike <i>Pachyrukhos</i> and <i>Interatherium</i>)	(Guillermo H. Cassini, Vizcaíno, and Bargo 2012)	Tax, SG	<i>Hegetotherium mirabile</i> , <i>Pachyrukhos moyani</i>	<i>Hegetotherium mirabile</i> , <i>Pachyrukhos moyani</i>	CMM
	<i>Hegetotherium mirabile</i> , <i>H. sp.</i>	Gz		(Kay, Vizcaíno, and Bargo 2012)	Tax, SG	<i>Hegetotherium mirabile</i>	<i>Hegetotherium mirabile</i>	Un
	<i>Hegetotherium mirabile</i> , <i>H. sp.</i>	In	"Mammalian woodpeckers" feeding on insects and grub in fallen trees, logs	(McCoy and Norris 2012)	Tax, SG	<i>Hegetotherium mirabile</i>	<i>Hegetotherium mirabile</i>	CMDM
	<i>Hegetotherium</i>	GH	Leaves or grasses depending on	(Candela, Cas-	WG	<i>Hegetotheri-</i>	<i>Hegetotheri-</i>	CGM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>mirabile</i> , <i>H.</i> sp.		availability	sini, and Nasif 2013)	<i>um</i>	<i>um</i>		
<i>Hegetotherium mirabile</i>, <i>H.</i> sp.	GH			Sum			
<i>Hemiauchenia paradoxa</i> , <i>H.</i> sp.	Fl		(Dompierre and Churcher 1996)	SG	<i>Hemiauchenia macrocephala</i> , <i>Palaeolama weddelli</i> , <i>Alforjas</i> sp. and <i>Hemiauchenia ?vera</i>	<i>Hemiauchenia macrocephala</i> , <i>Palaeolama weddelli</i> , <i>Alforjas</i> sp. and <i>Hemiauchenia ?vera</i>	MM
<i>Hemiauchenia paradoxa</i> , <i>H.</i> sp.	MF to Fl	Hypsodont intermediate feeder with a preference for browse	(Feranec 2003)	SG	<i>Hemiauchenia vera</i> , <i>H. blancoensis</i> , <i>H. seymourensis</i> , <i>H. macrocephala</i>	<i>Hemiauchenia</i>	SI
<i>Hemiauchenia paradoxa</i> , <i>H.</i> sp.		Hypsodont intermediate feeder	(Scherer 2013)	WG	<i>Hemiauchenia</i>	<i>Hemiauchenia</i>	LR
<i>Hemiauchenia paradoxa</i> , <i>H.</i> sp.	Fl to MF	Facultative grazers	(Macfadden and Cerling 1996)	WG	<i>Hemiauchenia</i>	<i>Hemiauchenia</i>	SI
<i>Hemiauchenia paradoxa</i> , <i>H.</i> sp.	Fl to MF	Facultative grazers	(MacFadden 1997)	WG	<i>Hemiauchenia</i>	<i>Hemiauchenia</i>	LR
<i>Hemiauchenia paradoxa</i> , <i>H.</i> sp.	Fl to MF	Dietary generalist (browse to mixed feeding depending on availability)	(Yann 2014)	WG	<i>Hemiauchenia</i>	<i>Hemiauchenia</i>	SI

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Hemiauchenia paradoxa</i> , <i>H.</i> sp.	Fl to MF	Dietary generalist (browse to mixed feeding depending on availability)	(Yann and De-Santis 2014)	SG	<i>Hemiauchenia macrocephala</i>	<i>Hemiauchenia macrocephala</i>	SI
<i>Hemiauchenia paradoxa</i>, <i>H.</i> sp.	MF	Mixed, but preference for browse		Sum			
<i>Hemihegetotherium</i> sp., <i>H. trilobus</i>	GH	"feeding on leaves of low-growing plants, perhaps in both open and more forested areas" (mesowear patterns indicate browsing but hypsodonty indicates grazing)	(Croft 2016)	Tax	<i>Hemihegetotherium trilobus</i>	<i>Hemihegetotherium trilobus</i>	DM
<i>Herpailurus</i> sp.	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Herpailurus</i>	<i>Herpailurus</i>	DM
<i>Hesperocynus</i> (= <i>Thylatheridium</i>) <i>dolgopolae</i>	HC		(Forasiepi, Goin, and Martinnelli 2009)	Tax	<i>Hesperocynus</i> (= <i>Thylatheridium</i>) <i>dolgopolae</i>	<i>Thylatheridium dolgopolae</i>	CDM
<i>Hilarcotherium castanedaii</i>	Fl	Similar cheek tooth mechanics to rhinocerotoids	(Rensberger and Pfretzschner 1992)	SSF	<i>Parastrapotherium</i> , <i>Astrapotherium</i> , <i>Granastrapotherium snorki</i>	<i>Astrapotheres</i>	EM
<i>Hilarcotherium castanedaii</i>	Fl		(Kay and Madden 1997b)	SSF	<i>Granastrapotherium snorki</i>	<i>Granastrapotherium snorki</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Hilarcotherium castanedaii</i>	Fl		(Townsend and Croft 2005)	SF	<i>Astrapotherium</i>	<i>Astrapotherium</i>	DMc
<i>Hilarcotherium castanedaii</i>	Fl	Less muscle mass for chewing, proportionally short cheek tooth row	(Cassini and Vizcaíno 2012)	SF	<i>Astrapotherium</i>	<i>Astrapotherium</i>	CM
<i>Hilarcotherium castanedaii</i>	Fl		(Cassini, Vizcaíno, and Bargo 2012)	SF	<i>Astrapotherium</i>	<i>Astrapotherium</i>	CDM
<i>Hilarcotherium castanedaii</i>	Fl		(Cassini et al. 2012)	SF	<i>Astrapotherium</i>	<i>Astrapotherium</i>	CM
<i>Hilarcotherium castanedaii</i>	MF		(Kay, Vizcaíno, and Bargo 2012)	SF	<i>Astrapotherium</i>	<i>Astrapotherium</i>	Un
<i>Hilarcotherium castanedaii</i>	Fl		(Cassini 2013)	SF	<i>Astrapotherium</i>	<i>Astrapotherium</i>	CGM
<i>Hilarcotherium castanedaii</i>	Fl	"feeding on relatively soft leaves near the edges of rivers and lakes"	(Croft 2016)	SSF	<i>Granastrapotherium snorki</i>	<i>Granastrapotherium snorki</i>	Un
<i>Hilarcotherium castanedaii</i>	Fl		Sum				
<i>Hippidion</i> (=Onohippidium) devillei, <i>H. principale</i> , <i>H. saldiasii</i> , <i>H. sp.</i>	MF		(MacFadden 2000)	Tax, SG	<i>Hippidion principale</i> , <i>Hippidion</i> (=Onohippidium) devillei	<i>Hippidion principale</i> , <i>Hippidion</i> (=Onohippidium) devillei	SI
<i>Hippidion</i> (=Onohippidium) devillei, <i>H. principale</i> , <i>H.</i>	MF	Mixed feeder at both of two sites, but relative proportions of grasses vs. woody plants depend on environment	(García, Martínez Carretero, and Dacar 2008)	WG	<i>Hippidion</i>	<i>Hippidion</i>	CA

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>saldiasi</i> , <i>H. sp.</i>							
<i>Hippidion</i> (= <i>Onohippidium</i>) <i>devillei</i> , <i>H.</i> <i>principale</i> , <i>H.</i> <i>saldiasi</i> , <i>H. sp.</i>	MF		(Bernardes et al. 2013)	WG	<i>Hippidion</i> (and <i>Onohippidium</i>)	<i>Hippidion</i> (and <i>Onohippidium</i>)	CMDM, LR
<i>Hippidion</i> (=<i>Onohippidium</i>) <i>devillei</i>, <i>H.</i> <i>principale</i>, <i>H.</i> <i>saldiasi</i>, <i>H. sp.</i>	MF			Sum		Hippidion	
<i>Hippocamelus</i> sp.	Fl	Diet dominated by shrubs and trees (Annual mean: Grasses 9.2%, Herbs 9.3%, Shrubs 58.6%, Trees 19.5%)	(Galende, Ramilo, and Beati 2005)	SG	<i>Hippocamelus bisulcus</i>	<i>Hippocamelus bisulcus</i>	FA
<i>Hippocamelus</i> sp.	MF	In rainy season, grasses 57% of fragments	(Gazzolo 2006)	SG	<i>Hippocamelus antisensis</i>	<i>Hippocamelus antisensis</i>	FA
<i>Hippocamelus</i> sp.	Fl	Diet dominated by shrubs	(Vila, Borrelli, and Martínez 2009)	SG	<i>Hippocamelus bisulcus</i>	<i>Hippocamelus bisulcus</i>	FA
<i>Hippocamelus</i> sp.	Fl	Understory browser, feeding predominantly in open areas within the forest	(Barberena et al. 2011)	SG	<i>Hippocamelus bisulcus</i>	<i>Hippocamelus bisulcus</i>	SI
<i>Hippocamelus</i> sp.	Fl			Sum			
<i>Hiskatherium</i> <i>saintandrei</i>	Fl or Fl-Fr		(Bargo 2001)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
<i>Hiskatherium</i> <i>saintandrei</i>	Fl		(Carretero, García, and Dacar 2004)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	CA

Table S4.9: Dietary data for South American fossil taxa, cont.

598	<i>Hiskatherium saintandrei</i>	MF		(Pujos and Salas 2004a)	SF	<i>Eremotherium elenense</i>	<i>Eremotherium elenense</i>	Un
	<i>Hiskatherium saintandrei</i>	Fl		(Fátima Rossetti et al. 2004)	SF	<i>Eremotherium laurillardi</i>	<i>Eremotherium laurillardi</i>	SI
	<i>Hiskatherium saintandrei</i>	Fl or Fl-Fr		(Bargo, Iuliis, and Vizcaíno 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
	<i>Hiskatherium saintandrei</i>	Fl or Fl-Fr	Soft to moderate food; Cutting, not crushing or grinding; Diet may have included fruits	(Vizcaíno, Bargo, and Cassini 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM
	<i>Hiskatherium saintandrei</i>	Fl	Coprolites and morphology agree: Folivory most likely	(McDonald and Iuliis 2008)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	LR
	<i>Hiskatherium saintandrei</i>	Fl	Food reduction mainly by shearing or cutting	(Bargo, Vizcaíno, and Kay 2009)	AGp	<i>Eucholoeops</i>	<i>Eucholoeops</i> and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, and megatheriids)	DW, CMDM
	<i>Hiskatherium saintandrei</i>	Fl	Food reduction mainly by shearing or cutting	(Bargo, Toledo, and Vizcaíno 2012)	AGp	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Peleciodon</i> , <i>Prepootherium</i> , <i>Planops</i>	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Peleciodon</i> , <i>Prepootherium</i> , <i>Planops</i> , and "nearly all other Miocene	DW, CMDM

Table S4.9: Dietary data for South American fossil taxa, cont.

						megatherioids" (including basal megatherioids, megalonychids, and megatheriids)	
	<i>Hiskatherium saintandrei</i>	Fl		(Kay, Vizcaíno, and Bargo 2012)	SF	<i>Eucholoeops ingens</i>	<i>Eucholoeops ingens</i> Un
	<i>Hiskatherium saintandrei</i>	Fr-Fl	Selective tough object feeder	(Pujos, Iuliis, and Quispe 2011)	Tax	<i>Hiskatherium saintandrei</i>	<i>Hiskatherium saintandrei</i> MC:FR
	<i>Hiskatherium saintandrei</i>	Fl		(Pujos et al. 2012)	WF	Megatheriidae	Megatheriidae PB, CMDM
	<i>Hiskatherium saintandrei</i>	Fl	Low to moderate toughness	(Green and Kalthoff 2015)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i> DMc
	<i>Hiskatherium saintandrei</i>	Fr-Fl			Sum		
	<i>Hoffstetterius imperator</i>	GH	Diet varies from C ₃ browser in closed canopy to open grassland C ₄ grazer	(MacFadden 2005)	SF, PB	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae) SI
	<i>Hoffstetterius imperator</i>	Fl		(Townsend and Croft 2008a)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>) DMc

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Hoffstetteriaus</i> <i>imperator</i>	Gz or MF		(Cassini et al. 2011)	SF, PB	<i>Nesodon</i>	<i>Nesodon</i>	CMM
<i>Hoffstetteriaus</i> <i>imperator</i>	GH		(Cassini and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	BM
<i>Hoffstetteriaus</i> <i>imperator</i>	GH		(Cassini, Viz- caíno, and Bar- go 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	CM
<i>Hoffstetteriaus</i> <i>imperator</i>	Gz		(Cassini et al. 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon im-</i> <i>bricatus</i>)	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon im-</i> <i>bricatus</i>)	CDM
<i>Hoffstetteriaus</i> <i>imperator</i>	GH		(Cassini, Flores, and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon im-</i> <i>bricatus</i>)	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon im-</i> <i>bricatus</i>)	CO, CM
<i>Hoffstetteriaus</i> <i>imperator</i>	Gz		(Kay, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	LR
<i>Hoffstetteriaus</i> <i>imperator</i>	GH	Diet dependent on availability: Browse to graze	(Cassini 2013)	SF, PB	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon im-</i> <i>bricatus</i>)	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon im-</i> <i>bricatus</i>)	CGM
<i>Hoffstetteriaus</i> <i>imperator</i>	GH			Sum		Toxodonti- dae	
<i>Holmesina oc-</i>	Gz	<i>Holmesina</i> less efficient at grind-	(Vizcaíno, Iuli-	Tax,	<i>Holmesina</i>	<i>Holmesina</i>	CMDM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>occidentalis</i> , <i>H. paulacoutoi</i> , <i>H. sp.</i>		ing than <i>Vassallia</i>	is, and Bargo 1998)	SG	<i>occidentalis</i>	<i>occidentalis</i>	
<i>Holmesina occidentalis</i> , <i>H. paulacoutoi</i> , <i>H. sp.</i>	Gz	Least coarse vegetation out of <i>Holmesina</i> and <i>Pampatherium</i> spp., but still a capable grinder	(Iuliis, Bargo, and Vizcaíno 2001)	Tax, SG	<i>Holmesina occidentalis</i>	<i>Holmesina occidentalis</i>	BM
<i>Holmesina occidentalis</i> , <i>H. paulacoutoi</i> , <i>H. sp.</i>	Gz	Very high OSA (Occlusal Surface Area), typical of grazers (also may have to do with digestive tract needing greater oral food processing)	(Vizcaíno, Bargo, and Cassini 2006)	Tax, SG	<i>Holmesina occidentalis</i> , <i>Holmesina paulacoutoi</i>	<i>Holmesina occidentalis</i>	DM
<i>Holmesina occidentalis</i> , <i>H. paulacoutoi</i> , <i>H. sp.</i>	Gz	Differences between <i>Holmesina</i> and <i>Pampatherium</i> species relate to environments (more humid v. semi-arid) rather than diet	(Carlini and Zurita 2010)	WG	<i>Holmesina</i> and <i>Pampatherium</i>	<i>Holmesina</i> and <i>Pampatherium</i>	LR
<i>Holmesina occidentalis</i>, <i>H. paulacoutoi</i>, <i>H. sp.</i>	Gz	Sum					
<i>Holochilus brasiliensis</i> , <i>H. sp.</i>	MF to Gz	<i>H. brasiliensis</i> : feeds on "more tender parts of aquatic, riparian, and domestic plants" and can cause serious damage in sugarcane and rice fields, <i>H. chacarius</i> : feeds on plant stems and seeds, may eat snails	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax, SG	<i>Holochilus brasiliensis</i>	<i>Holochilus brasiliensis</i>	LR-E
<i>Holochilus brasiliensis</i> , <i>H. sp.</i>	Gz	"Fibrous diet"	(Steppan 1996)	WG	<i>Holochilus</i>	<i>Holochilus</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Holochilus brasiliensis</i> , <i>H.</i> sp.	Gz	Over 90% of diet grasses (84.3%) and sedges (6%), 5.8% invertebrates, 1.7% dicots, 2.2% unidentifiable	(Barreto and García-Rangel 2005)	SG	<i>Holochilus sciureus</i>	<i>Holochilus sciureus</i>	LR-E
<i>Holochilus brasiliensis</i> , <i>H.</i> sp.	Gz	Diet "include[s] abrasives and fibrous items" (referring not only to <i>H. sciureus</i> but <i>Holochilus</i> spp. in general)	(Nascimento 2014)	WG	<i>Holochilus</i>	<i>Holochilus</i>	Un
<i>Holochilus brasiliensis</i> , <i>H.</i> sp.	Gz	<i>Holochilus</i> : multiple adaptations for herbivory; <i>H. chacarius</i> : strictly herbivorous and damages rice, banana, sugarcane, other crops; <i>H. sciureus</i> : feeds mainly on savanna grass leaves and seeds and is a sugarcane pest; <i>H. venezuelae</i> : mostly grasses with small amounts of sedges, dicots, and invertebrates	(Patton, Pardiñas, and D'Elía 2015)	SG	<i>Holochilus</i> , including <i>H. chacarius</i> , <i>H. sciureus</i> , <i>H. venezuelae</i>	<i>Holochilus</i> , including <i>H. chacarius</i> , <i>H. sciureus</i> , <i>H. venezuelae</i>	LR-E
<i>Holochilus brasiliensis</i> , <i>H.</i> sp.	Gz	Sum					
<i>Holozaedyus laevisculptus</i>	Om	Variety of plant types (roots, tubers, nuts) and variety of animal matter (ants, carrion, birds, mice)	(Vizcaíno 2009)	AGp	<i>Prozaedyus</i> , <i>Zaedyus</i> , <i>Macro-euphractus</i> , <i>Euphractus</i> , other extant Euphractini	Euphractini	LR, CDM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Homalodotherium</i> sp.	Fl		(Kay, Vizcaíno, and Bargo 2012)	SG	<i>Homalodotherium cunninghami</i>	<i>Homalodotherium cunninghami</i>	Un
<i>Homalodotherium</i> sp.	Fl	High browsers, standing on their hind legs and using their long clawed arm to pull branches within reach of their prehensile upper lip	(Croft 2016)	Tax	<i>Chasicotherium</i> and <i>Homalodotherium</i>	<i>Chasicotherium</i> and <i>Homalodotherium</i>	Un
<i>Homalodotherium</i> sp.	Fl			Sum			
<i>Homotherium venezuelensis</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	SG	<i>Homotherium</i> sp. nov.	<i>Homotherium</i> sp. nov.	DM
<i>Homunculus patagonicus</i> , <i>H.</i> sp.	Fr	Adapted to harvest fruits with tough rinds	(Tejedor and Rosenberger 2008)	Tax, SG	<i>Homunculus patagonicus</i>	<i>Homunculus patagonicus</i>	DM
<i>Homunculus patagonicus</i> , <i>H.</i> sp.	Fr-Fl	Fruit with leaves	(Kay et al. 2012)	Tax, SG	<i>Homunculus patagonicus</i>	<i>Homunculus patagonicus</i>	DM
<i>Homunculus patagonicus</i> , <i>H.</i> sp.	Fr-Fl	Fruit with leaves	(Fleagle 2013)	Tax, SG	<i>Homunculus patagonicus</i>	<i>Homunculus patagonicus</i>	LR
<i>Homunculus patagonicus</i>, <i>H.</i> sp.	Fr-Fl			Sum			
<i>Hondadelphys fieldsi</i>	Om	Large talonids and protocones	(Goin 1997)	Tax	<i>Hondadelphys fieldsi</i>	<i>Hondadelphys fieldsi</i>	DM
<i>Hondadelphys fieldsi</i>	In-Fr	"Insects with fruit"	(Kay and Madden 1997b)	Tax	<i>Hondadelphys fieldsi</i>	<i>Hondadelphys fieldsi</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Hondadelphys fieldsi</i>	Om		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Hondadelphys fieldsi</i>	<i>Hondadelphys fieldsi</i>	DM
<i>Hondadelphys fieldsi</i>	Om			Sum			
<i>Hondalagus altiplanensis</i>	Gn-In	High proportion of seeds, with some insects	(Simpson 1970b)	WF	Argyrolagidae (<i>Argyrolagus</i> and <i>Microtragulus</i>)	Argyrolagidae	MA
<i>Hondalagus altiplanensis</i>	Gn	High proportion of seeds in diet: convergent with granivorous extant desert rodents	(Mares 1985)	WF	Argyrolagidae	Argyrolagidae	MA
<i>Hondalagus altiplanensis</i>	Gn	High proportion of seeds in diet: convergent with granivorous extant desert rodents	(Mares 1993)	WF	Argyrolagidae	Argyrolagidae	MA
<i>Hondalagus altiplanensis</i>	Gn	Size alone implies granivory or insectivory, crowns too high for pure insectivory: abrasives from seeds on the ground and dust in open, semiarid environments	(Sánchez-Villagra and Kay 1997)	SF	<i>Proargyrolagus</i>	<i>Proargyrolagus</i>	DM, Mass
<i>Hondalagus altiplanensis</i>	Gn	Highly abrasive diet, "perhaps including a large proportion of grasses" or abrasive because of open habitats	(Sánchez-Villagra, Kay, and Anaya-Daza 2000)	Tax	<i>Hondalagus altiplanensis</i>	<i>Hondalagus altiplanensis</i>	LR
<i>Hondalagus altiplanensis</i>	Gn	Convergent with extant granivorous, desert-dwelling rodents	(Carlini, Pascual, and Goin 2007)	SF	<i>Argyrolagus</i> , <i>Anargyrolagus</i>	<i>Argyrolagus</i> , <i>Anargyrolagus</i>	LR
<i>Hondalagus altiplanensis</i>	Gn	Convergent with extant granivorous, desert-dwelling rodents	(García-López and Babot 2015)	WF	Argyrolagidae	Argyrolagidae	LR

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Hondalagus al- tiplanensis</i>	Gn	"Feeding mainly on seeds in more open areas"	(Croft 2016)	Tax	<i>Hondalagus altiplanensis</i>	<i>Hondalagus altiplanensis</i>	Un
<i>Hondalagus altiplanensis</i>	Gn			Sum			
<i>Hoplophorus euphractus</i> , <i>H. sp.</i> , <i>H. verus</i>	Gz		(Mário André Trinidade Dantas and Cozzuol 2016)	Tax, SG	<i>Hoplophorus euphractus</i>	<i>Hoplophorus euphractus</i>	LR
<i>Huilatherium pluripicatum</i>	Fl		(Kay and Madden 1997b)	Tax	<i>Huilatherium pluripicatum</i>	<i>Huilatherium pluripicatum</i>	Un
<i>Hydrochoerop- sis dasseni</i> , <i>H. sp.</i>	Gz		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SSF	<i>Hydrochoeris hydrochaeris</i>	<i>Hydrochoerus hydrochaeris</i>	LR-E
<i>Hydrochoerop- sis dasseni</i> , <i>H. sp.</i>	Gz	Grasses, sedges, aquatic plants	(Patton, Pardi- ñas, and D'Elía 2015)	SSF	<i>Hydrochoeris hydrochaeris</i>	<i>Hydrochoerus hydrochaeris</i>	LR-E
<i>Hydrochoerop- sis dasseni</i>, <i>H. sp.</i>	Gz			Sum			
<i>Hydrochoerus hydrochaeris</i>	Gz		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax	<i>Hydrochoeris hydrochaeris</i>	<i>Hydrochoerus hydrochaeris</i>	LR-E
<i>Hydrochoerus</i>	Gz	Grasses, sedges, aquatic plants	(Patton, Pardi-	Tax	<i>Hydrochoeris</i>	<i>Hydrochoerus</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>hydrochaeris</i>			ñas, and D'Elía 2015)		<i>hydrochaeris</i>	<i>hydrochaeris</i>	
<i>Hydrochoerus hydrochaeris</i>	Gz			Sum			
<i>Hydrochoerus ballesterensis</i> , <i>Hydrochoerus</i> sp.	Gz		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SG	<i>Hydrochoerus hydrochaeris</i>	<i>Hydrochoerus hydrochaeris</i>	LR-E
<i>Hydrochoerus ballesterensis</i> , <i>Hydrochoerus</i> sp.	Gz	Grasses, sedges, aquatic plants	(Patton, Pardiñas, and D'Elía 2015)	SG	<i>Hydrochoerus hydrochaeris</i>	<i>Hydrochoerus hydrochaeris</i>	LR-E
<i>Hydrochoerus ballesterensis</i>, <i>Hydrochoerus</i> sp.	Gz			Sum			
<i>Hyperdidelphys pattersoni</i>, <i>H.</i> sp.	MC	More carnivorous than <i>Didelphys</i> (omnivore); <i>Hyperdidelphys pattersoni</i> has the fewest characters corresponding to increased carnivory of the 4 spp. in the genus	(Goin and Pardiñas 1996)	Tax, SG	<i>Hyperdidelphys pattersoni</i>, <i>H. inexpectata</i>, <i>H. dimartinoi</i>, <i>H. parvula</i>	<i>Hyperdidelphys</i>	CMDM
<i>Hypsitherium bolivianum</i>	Gz		(Anaya and MacFadden 1995)	Tax	<i>Hypsitherium bolivianum</i>	<i>Hypsitherium bolivianum</i>	Hypse-lodonty

Table S4.9: Dietary data for South American fossil taxa, cont.

607	<i>Interatherium</i> sp.	Gz	Characteristics of extant grazers, and far from mixed feeders/generalized herbivores or browsers: "wide muzzle, an extremely wide and deep mandibular angle, and a long paraoccipital process;" Some of these characteristics may be associated with digging in open habitats than with grazing	(Guillermo H. Cassini et al. 2011)	Tax	<i>Interatherium</i> , <i>Protypotherium</i>	<i>Interatherium</i> , <i>Protypotherium</i>	CMDM
	<i>Interatherium</i> sp.	Gz	Characteristics of extant grazers, and far from mixed feeders/generalized herbivores or browsers: "wide muzzle, an extremely wide and deep mandibular angle, and a long paraoccipital process"	(Guillermo H. Cassini et al. 2012)	SG	<i>Interatherium robustum</i> , <i>Protypotherium attenuatum</i> , <i>P. australe</i> , <i>P. prae-rutilum</i>	<i>Interatherium robustum</i> , <i>Protypotherium attenuatum</i> , <i>P. australe</i> , <i>P. prae-rutilum</i>	CMDM
	<i>Interatherium</i> sp.	Gz	Consistent with grazing, may also have fed on hard objects	(Guillermo H. Cassini and Vizcaíno 2012)	Tax	<i>Interatherium</i> , <i>Protypotherium</i>	<i>Interatherium</i> , <i>Protypotherium</i>	BM
	<i>Interatherium</i> sp.	Gz	Similar to <i>Procavia</i> (Open habitat grazers)	(Candela, Cassini, and Nasif 2013)	Tax	<i>Interatherium</i> , <i>Protypotherium</i>	<i>Interatherium</i> , <i>Protypotherium</i>	CGM
	<i>Interatherium</i> sp.	Fl	Not a grazer or hard object feeder	(K. E. B. Townsend and Croft 2008a)	SF	<i>Protypotherium</i>	<i>Protypotherium</i>	DMc
	<i>Interatherium</i> sp.	Gz	Sum					
	<i>Isostylomys</i> sp.	MF		Rinderknecht pers. comm.	Tax	<i>Isostylomys</i>	<i>Isostylomys</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Josephoartigasiá monesi</i>	Fl	Fed primarily on soft plants	(Blanco, Rinderknecht, and Lecuona 2012)	Tax	<i>Josephoartigasiá monesi</i>	<i>Josephoartigasiá monesi</i>	DM
<i>Kerodon</i> sp.	Fl	Leaves of scrubby plants	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SG	<i>Kerodon rupestris</i>	<i>Kerodon rupestris</i>	LR-E
<i>Kerodon</i> sp.	Fl	<i>K. acrobata</i> : Cactaceae, manioc, leaves of local vegetation; <i>K. rupestris</i> : Majority of diet from treetop foraging	(Patton, Pardiñas, and D'Elía 2015)	SG	<i>Kerodon acrobata</i> , <i>K. rupestris</i>	<i>Kerodon acrobata</i> , <i>K. rupestris</i>	LR-E
<i>Kerodon</i> sp.	Fl	Sum					
<i>Kiyumylodon lecuonai</i>	Gz	This study, based on: Morphology resembles other grazers (<i>Lestodon</i> , <i>Glossotherium</i> , <i>Mylo-don</i>) (Rinderknecht, Perea, and Mcdonald 2007)	(Rinderknecht, Perea, and Mcdonald 2007)	Tax	<i>Kiyumylodon lecuonai</i>	<i>Kiyumylodon lecuonai</i>	
<i>Kiyumylodon lecuonai</i>	Gz	This study, based on: Most mylodontids are grazers (Pujos et al. 2012)	(Pujos et al. 2012)	WF	Myodontidae	Myodontidae	PB
<i>Kiyumylodon lecuonai</i>	Gz	Sum					
<i>Kraglievichia paranense</i> , <i>K. sp.</i>	Gz	This study, based on: Close relationship of <i>Kraglievichia</i> and <i>Holmesina</i> (Scillato-Yané et al. 2005) and <i>Holmesina</i> was a grazer (Vizcaíno, Iuliis, and Bargo 1998; Iuliis, Bargo, and Vizcaíno	(Vizcaíno, Iuliis, and Bargo 1998; Vizcaíno, Bargo, and Cas-sini 2006; Iuliis, Bargo, and Viz-	WG	<i>Kraglievichia</i> , <i>Holmesina</i>	<i>Holmesina</i>	CDM

Table S4.9: Dietary data for South American fossil taxa, cont.

		2001; Vizcaíno, Bargo, and Cassini 2006)	caíno 2001; Scillato-Yané et al. 2005)				
<i>Kunsia</i> sp.	Gz-Rz	Roots and grasses while burrowing	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SG	<i>Kunsia tomentosus</i>	<i>Kunsia tomentosus</i>	LR-E
<i>Kunsia</i> sp.	Rz-In	Roots, with invertebrates	(Patton, Pardiñas, and D'Elía 2015)	SG	<i>Kunsia tomentosus</i>	<i>Kunsia tomentosus</i>	LR-E
<i>Kunsia</i> sp.	Gz-Rz			Sum			
<i>Lagidium</i> sp.	Fl?	Fresh cacti, other vegetation	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SG	<i>Lagidium viscaria</i>	<i>Lagidium viscaria</i>	LR-E
<i>Lagidium</i> sp.	Gz to MF	"Variety of grasses, shrubs, and herbs, but select heavily for grasses"	(Walker et al. 2000)	SG	<i>Lagidium viscaria</i>	<i>Lagidium viscaria</i>	LR-E
<i>Lagidium</i> sp.	Gz	Dominated by grasses (89%)	(K. E. B. Townsend and Croft 2008b)	Tax	<i>Lagidium</i>	<i>Lagidium</i>	LR-E
<i>Lagidium</i> sp.	GH	Fresh, green leaves, flowers, fruits, stems, and bark; varies considerably between regions	(Patton, Pardiñas, and D'Elía 2015)	SG	<i>Lagidium viscaria</i>	<i>Lagidium viscaria</i>	LR-E
<i>Lagidium</i> sp.	Gz			Sum			

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Lagonimico conclucatus</i>	Fr	Mixed gum and fruit eating	(Fleagle, Kay, and Anthony 1997)	Tax	<i>Lagonimico conclucatus</i>	<i>Lagonimico conclucatus</i>	DM
<i>Lagonimico conclucatus</i>	Fr-Fl	Fruit with leaves	(Kay and Mad-den 1997b)	Tax	<i>Lagonimico conclucatus</i>	<i>Lagonimico conclucatus</i>	DM
<i>Lagonimico conclucatus</i>	Fr	Fruit and gum	(Kay 1994)	Tax	<i>Lagonimico conclucatus</i>	<i>Lagonimico conclucatus</i>	DM
<i>Lagonimico conclucatus</i>	Fr	Fruit and gum		Sum			
<i>Lagostomus maximus</i> , L. sp.	Gz	"Strictly grazers"	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax, SG	<i>Lagostomus maximus</i>	<i>Lagostomus maximus</i>	LR-E
<i>Lagostomus maximus</i> , L. sp.	Gz to MF	Selective grazing, will eat forbs and shrubs as well as grasses in scrubland	(Patton, Pardiñas, and D'Elía 2015)	Tax, SG	<i>Lagostomus maximus</i>	<i>Lagostomus maximus</i>	LR-E
<i>Lagostomus maximus</i>, L. sp.	Gz			Sum			
<i>Lakukullus anatisrostratus</i>	Fl	Food reduction mainly by shearing or cutting	(Bargo, Vizcaíno, and Kay 2009)	AGp	<i>Eucholoeops</i>	<i>Eucholoeops</i> and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, nothrotheres,	DW, CMDM

Table S4.9: Dietary data for South American fossil taxa, cont.

						and mega-theriids)	
<i>Lakukullus anatisrostratus</i>	Fl	Food reduction mainly by shearing or cutting	(Bargo, Toledo, and Vizcaíno 2012)	AGp	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Pelecycodon</i> , <i>Prepootherium</i> , <i>Planops</i>	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Pelecycodon</i> , <i>Prepootherium</i> , <i>Planops</i> , and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, nothrotheres, and megatheriids)	DW, CMDM
<i>Lakukullus anatisrostratus</i>	Fl		(Pujos et al. 2012)	WF	Nothrotheriidae	Nothrotheriidae	PB
<i>Lakukullus anatisrostratus</i>	Fl	Indiscriminant leaf eater	(Pujos et al. 2014)	Tax	<i>Lakukullus anatisrostratus</i>	<i>Lakukullus anatisrostratus</i>	DMM
<i>Lakukullus anatisrostratus</i>	Fl			Sum			
<i>Lama castelnaudi</i> , <i>L. guanicoe</i> , <i>L. sp.</i>	MF	Graze 61.5%, browse 15.4%	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford	Tax, SG	<i>Lama guanicoe</i>	<i>Lama guanicoe</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

			1999)				
<i>Lama castelnaudi</i> , <i>L. guanicoe</i> , <i>L. sp.</i>	MF	<i>Lama guanicoe</i> : Mixed feeder	(Dompierre and Churcher 1996)	Tax, SG	<i>Lama guanicoe</i>	<i>Lama guanicoe</i>	MM
<i>Lama castelnaudi</i>, <i>L. guanicoe</i>, <i>L. sp.</i>	MF			Sum			
<i>Leopardus colocolo</i> (<i>L. braccatus</i>)	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Leopardus colocolo</i>	<i>Leopardus colocolo</i>	DM
<i>Leopardus pardalis</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Leopardus pardalis</i>	<i>Leopardus pardalis</i>	DM
<i>Leopardus sp.</i> , <i>L. vorohuensis</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	SG	<i>Leopardus colocolo</i> , <i>L. geoffroyi</i> , <i>L. jacobita</i> , <i>L. guigna</i> , <i>L. pardalis</i> , <i>L. tigrinus</i> , <i>L. wiedii</i>	<i>Leopardus colocolo</i> , <i>L. geoffroyi</i> , <i>L. jacobita</i> , <i>L. guigna</i> , <i>L. pardalis</i> , <i>L. tigrinus</i> , <i>L. wiedii</i>	DM
<i>Leopardus tigrinus</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Leopardus tigrinus</i>	<i>Leopardus tigrinus</i>	DM
<i>Lestobradys sprechmanni</i>	Gz	This study, based on grazing in Mylodontinae with the exception of Thinobadistes and Pseudoprepottherium (Pujos et al. 2012) and similarities between Lestobradys and Lestodon that suggest close	(Rinderknecht et al. 2010; Pujos et al. 2012)	Tax	<i>Lestobradys sprechmanni</i>	<i>Lestobradys sprechmanni</i>	PB

Table S4.9: Dietary data for South American fossil taxa, cont.

		phylogenetic affinity (Rinderknecht et al. 2010)					
<i>Lestodelphys halli</i> , L. sp.	HC	Strongly carnivorous, eating everything, including bones and fur	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax, SG	<i>Lestodelphys halli</i>	<i>Lestodelphys halli</i>	LR-E
<i>Lestodelphys halli</i> , L. sp.	HC	Carnivores, eating everything, including bones and fur	(Gardner 2007b)	Tax, SG	<i>Lestodelphys halli</i>	<i>Lestodelphys halli</i>	LR-E
<i>Lestodelphys halli</i>, L. sp.	HC			Sum			
<i>Lestodon armatus</i> , L. sp.	Gz	Wide muzzle, square nonprehensile lip	(Bargo, Toledo, and Vizcaíno 2006)	Tax, SG	<i>Lestodon armatus</i>	<i>Lestodon armatus</i>	CMM
<i>Lestodon armatus</i> , L. sp.	Gz	Wide muzzle, square nonprehensile lip	(Bargo and Vizcaíno 2008)	Tax, SG	<i>Lestodon armatus</i>	<i>Lestodon armatus</i>	CMM, BM'
<i>Lestodon armatus</i> , L. sp.	Gz		(Czerwonogora, Fariña, and Tonni 2011)	WG	<i>Lestodon</i>	<i>Lestodon</i>	SI
<i>Lestodon armatus</i> , L. sp.	Gz		(Pujos et al. 2012)	WG	<i>Lestodon</i>	<i>Lestodon</i>	MM
<i>Lestodon armatus</i>, L. sp.	Gz			Sum			
<i>Lonchophylla</i> sp.	Nc	Nectar and pollen, but also will eat insects and fruit	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford	Tax	<i>Lonchophylla</i>	<i>Lonchophylla</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

			1999)				
<i>Lonchophylla</i> sp.	Nc-In	<i>L. bokermanni</i> : pollen, nectar, insects; <i>L. concava</i> : pollen, nectar, insects; <i>L. dekeyseri</i> : nectar in dry season and more fruits and insects in rainy season; <i>L. mordax</i> : insects, nectar, pollen, fruit; <i>L. robusta</i> : insects and "plant material"; <i>L. thomasi</i> : pollen, nectar, insects	(Gardner 2007b)	SG	<i>Lonchophylla bokermanni</i> , <i>L. concava</i> , <i>L. dekeyseri</i> , <i>L. mordax</i> , <i>L. robusta</i> , <i>L. thomasi</i>	<i>Lonchophylla bokermanni</i> , <i>L. concava</i> , <i>L. dekeyseri</i> , <i>L. mordax</i> , <i>L. robusta</i> , <i>L. thomasi</i>	LR-E
<i>Lonchophylla</i> sp.	Nc-In	Sum					
<i>Lontra longicaudis</i>	Ps	With a very similar diet, the related genus <i>Lutra</i> is one of the examples given for Eisenberg's piscivore category (pp.248-249)	(Eisenberg 1981)	Tax	<i>Lontra longicaudis</i>	<i>Lontra longicaudis</i>	LR-E
<i>Lontra longicaudis</i>	Ps	Fish, mollusks, crustaceans	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax	<i>Lontra longicaudis</i>	<i>Lontra longicaudis</i>	LR-E
<i>Lontra longicaudis</i>	Om		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Lontra longicaudis</i>	<i>Lontra longicaudis</i>	DM
<i>Lontra longicaudis</i>	Ps	Sum					
<i>Lophostoma silviculum</i>	In	Gleaning insectivores	(Dechmann, Kalko, and	Tax	<i>Lophostoma silviculum</i>	<i>Lophostoma silviculum</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

Kerth 2004)							
<i>Luantus</i> sp.	MF	Relationship: Within paraphyletic "Eocardiidae" based on position basal to euhypsodont Caviioidea (Pérez 2010a; Pérez and Pol 2012; Pérez, Vucetich, and Deschamps 2014); Diet: likely mixed feeding even after euhypsodonty in the same clade (<i>Eocardia</i>) (Candela, Rasia, and Pérez 2012)	(Pérez 2010a; Pérez and Pol 2012; Pérez, Vucetich, and Deschamps 2014; Candela, Rasia, and Pérez 2012)	SF, See	<i>Eocardia montana</i> , <i>E. fissa</i>	<i>Eocardia montana</i> , <i>E. fissa</i>	DM, MA
<i>Luantus</i> sp.	Gz	Relationship: Within paraphyletic "Eocardiidae"	(Kay, Vizcaíno, and Bargo 2012)	SF, See	<i>Eocardia montana</i> , <i>E. fissa</i>	<i>Eocardia montana</i> , <i>E. fissa</i>	Un
<i>Luantus</i> sp.	MF	Relationship: Within paraphyletic "Eocardiidae"; Diet: "feeding on leaves of low-growing plants," "probably fed in more open areas of Quebrada Honda"	(Croft 2016)	SF, See	<i>Guiomys unica</i>	<i>Guiomys unica</i>	Un
<i>Luantus</i> sp.	MF	Sum					
<i>Lundomys</i> sp.	Herb	95% plant material	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SG	<i>Lundomys molitor</i>	<i>Lundomys molitor</i>	LR-E
<i>Lundomys</i> sp.	Gz	This study, based on: Ecologically and morphologically similar to <i>Holochilus</i> (U. F. J. Pardiñas and Teta 2011); "Fibrous diet" (Steppan 1996)	(U. F. J. Pardiñas and Teta 2011; Steppan 1996)	SisG, MS, ES	<i>Holochilus</i>	<i>Holochilus</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Lundomys</i> sp.	MF to Gz	This study, based on: Ecologically and morphologically similar to <i>Holochilus</i> (Pardiñas and Teta 2011); <i>H. brasiliensis</i> : feeds on "more tender parts of aquatic, riparian, and domestic plants" and can cause serious damage in sugarcane and rice fields, <i>H. chalcarius</i> : feeds on plant stems and seeds, may eat snails (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	(Pardiñas and Teta 2011; Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SisG , MS, ES	<i>Holochilus brasiliensis</i>	<i>Holochilus brasiliensis</i>	LR-E
<i>Lundomys</i> sp.	Gz	This study, based on: Ecologically and morphologically similar to <i>Holochilus</i> (Pardiñas and Teta 2011); Over 90% of diet grasses (84.3%) and sedges (6%), 5.8% invertebrates, 1.7% dicots, 2.2% unidentifiable (Barreto and García-Rangel 2005)	(Pardiñas and Teta 2011; Barreto and García-Rangel 2005)	SisG , MS, ES	<i>Holochilus sciureus</i>	<i>Holochilus sciureus</i>	LR-E
<i>Lundomys</i> sp.	Gz	This study, based on: Ecologically and morphologically similar to <i>Holochilus</i> (Pardiñas and Teta 2011); Diet "include[s] abrasives and fibrous items" (referring not only to <i>H. sciureus</i> but <i>Holochilus</i> spp. in general) (Brandão et al. 2015)	(Brandão et al. 2015; U. F. J. Pardiñas and Teta 2011)	SisG , MS, ES	<i>Holochilus</i>	<i>Holochilus</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Lundomys</i> sp.	Gz	This study, based on: Ecologically and morphologically similar to <i>Holochilus</i> (Pardiñas and Teta 2011); <i>Holochilus</i> has multiple adaptations for herbivory; <i>H. chacarius</i> : strictly herbivorous and damages rice, banana, sugarcane, other crops; <i>H. sciureus</i> : feeds mainly on savanna grass leaves and seeds and is a sugarcane pest; <i>H. venezuelae</i> : mostly grasses with small amounts of sedges, dicots, and invertebrates (Patton, Pardiñas, and D'Elía 2015)	(Pardiñas and Teta 2011; Patton, Pardiñas, and D'Elía 2015)	SisG , MS, ES	<i>Holochilus</i> , including <i>H. chacarius</i> , <i>H. sciureus</i> , <i>H. venezuelae</i>	<i>Holochilus</i> , including <i>H. chacarius</i> , <i>H. sciureus</i> , <i>H. venezuelae</i>	LR-E
<i>Lundomys</i> sp..	Herb	Herbivore	(Patton, Pardiñas, and D'Elía 2015)	SG	<i>Lundomys molitor</i>	<i>Lundomys molitor</i>	LR-E
<i>Lundomys</i> sp.	Gz	Sum					
<i>Lutreolina crassicaudata</i> , <i>L. materdei</i> , <i>L. sp.</i>	Om	Fish, small vertebrates, insects and other invertebrates, fruit, seeds	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax, SG	<i>Lutreolina crassicaudata</i>	<i>Lutreolina crassicaudata</i>	LR-E
<i>Lutreolina crassicaudata</i> , <i>L. materdei</i> , <i>L. sp.</i>	Om	100% of feces contained animal, with 54% containing crabs and 46% contained beetles; 85% contained fruits	(Cáceres, Ghizoni-Jr, and Graipel 2002)	Tax, SG	<i>Lutreolina crassicaudata</i>	<i>Lutreolina crassicaudata</i>	Tp, FA

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Lutreolina crassicaudata</i>, <i>L. materdei</i>, <i>L.</i> <i>sp.</i>	Om			Sum			
<i>Lycopsis longirostrus</i> , <i>L.</i> <i>viverensis</i>	HC		(Kay et al. 2012)	SG	<i>Lycopsis torresi</i>	<i>Lycopsis torresi</i>	Un
<i>Lycopsis longirostrus</i> , <i>L.</i> <i>viverensis</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax, SG	<i>Lycopsis longirostrus</i>	<i>Lycopsis longirostrus</i>	DM
<i>Lycopsis longirostrus</i>, <i>L.</i> <i>viverensis</i>	HC			Sum			
<i>Lyncodon</i> sp.	HC		(Prevosti, Forasiepi, and Zimicz 2013)	SG	<i>Lyncodon patagonicus</i>	<i>Lyncodon patagonicus</i>	DM
<i>Macrauchenia patachonica</i> , <i>M.</i> <i>sp.</i>	MF	This study, based on: More hypsodont (protohypsodont) than earlier macraucheniids, probably preferred open environments (Bond et al. 1995)	(Bond et al. 1995)	Tax, SG	<i>Promacrauchenia antiqua</i> , <i>P. kraglievichi</i> , <i>P. chapalmalense</i> , <i>Windhausenina</i> , <i>Macrauchenia opsis ensenadensis</i> , <i>Macrauchenia patachonica</i> , <i>Pseudo-</i>		DM

Table S4.9: Dietary data for South American fossil taxa, cont.

						<i>macrauchenia, Xenorhinotherium bahiense</i>	
	<i>Macrauchenia patachonica, M. sp.</i>	MF		(MacFadden and Shockey 1997)	Tax, SG	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i> DM, SI
	<i>Macrauchenia patachonica, M. sp.</i>	MF		(MacFadden 2000)	Tax, SG	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i> CDM, SI
	<i>Macrauchenia patachonica, M. sp.</i>	MF	$\delta^{13}\text{C}$ consistent with mixed feeding in most (5) cases, browsing in 2 cases	(Domingo, Prado, and Alberdi 2012)	Tax, SG	<i>Macrauchenia patachonica, Macrauchenio-opsis?</i>	<i>Macrauchenia patachonica, Macrauchenio-opsis?</i> SI
	<i>Macrauchenia patachonica, M. sp.</i>	MF to Fl		(Varela 2014)	Tax, SG	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i> BM
	<i>Macrauchenia patachonica, M. sp.</i>	MF	$\delta^{13}\text{C}$ consistent with mixed feeding	(França et al. 2015)	WG	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i> LR, SI
	<i>Macrauchenia patachonica, M. sp.</i>	MF	Both C ₄ grasses and other low-growing plants and leaves of trees and shrubs	(Croft 2016)	Tax, SG	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i> Un
	<i>Macrauchenia patachonica, M. sp.</i>	MF			Sum		

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Macraucheniopsis</i> sp.	MF	This study, based on: More hypsodont (protohypsodont) than earlier macraucheniids, probably preferred open environments (Bond et al. 1995)	(Bond et al. 1995)	SSF	<i>Promacrauchenia antiqua</i> , <i>P. kraglievichi</i> , <i>P. chapalmalense</i> , <i>Windhausen</i> , <i>Macraucheniopsis enenadensis</i> , <i>Macrauchenia patachonica</i> , <i>Pseudomacrauchenia</i> , <i>Xenorhinotherium bahiense</i>	DM
<i>Macraucheniopsis</i> sp.	MF		(MacFadden and Shockey 1997)	SSF	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i> DM, SI
<i>Macraucheniopsis</i> sp.	MF		(MacFadden 2000)	SSF	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i> CDM, SI
<i>Macraucheniopsis</i> sp.	MF	$\delta^{13}\text{C}$ consistent with mixed feeding in most (5) cases, browsing in 2 cases	(Domingo, Prado, and Alberdi 2012)	Tax	<i>Macrauchenia patachonica</i> , <i>Macraucheniopsis?</i>	<i>Macrauchenia patachonica</i> , <i>Macraucheniopsis?</i> SI
<i>Macraucheniopsis</i> sp.		<i>Macraucheniopsis</i> is in Macraucheniinae, Macraucheniinae is monophyletic	(Schmidt and Ferrero 2014)	WF	Macraucheniidae	PB

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Macrauchenia-opsis</i> sp.	MF to Fl		(Varela 2014)	SSF	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i>	BM
<i>Macrauchenia-opsis</i> sp.	MF	$\delta^{13}\text{C}$ consistent with mixed feeding	(França et al. 2015)	SSF	<i>Macrauchenia</i>	<i>Macrauchenia</i>	LR, SI
<i>Macrauchenia-opsis</i> sp.	MF	Both C ₄ grasses and other low-growing plants and leaves of trees and shrubs	(Croft 2016)	SSF	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i>	Un
<i>Macrauchenia-opsis</i> sp.	MF			Sum			
<i>Macrochorobates chapadmalensis</i> , <i>M. scalabrinii</i>	Om	Variety of plant types (roots, tubers, nuts) and variety of animal matter (ants, carrion, birds, mice)	(Vizcaíno 2009)	ST	<i>Prozaedyus</i> , <i>Zaedyus</i> , <i>Macro-euphractus</i> , <i>Euphractus</i> , other extant Euphractini	Euphractini	LR, CDM
<i>Macro-euphractus retusus</i> , <i>M.</i> sp.	MC	Up to hare sized vertebrate prey	(Vizcaíno and Iuliis 2003)	SG	<i>Macro-euphractus outesi</i>	<i>Macro-euphractus outesi</i>	LR, CDM
<i>Macro-euphractus retusus</i> , <i>M.</i> sp.	MC	Up to hare sized vertebrate prey	(Vizcaíno 2009)	WG	<i>Macro-euphractus</i>	<i>Macro-euphractus</i>	LR, CDM
<i>Macro-euphractus retusus</i> , <i>M.</i> sp.	MC	Preyed on small vertebrates, but also ate insects and probably plant matter	(Croft 2016)	SG	<i>Macro-euphractus outesi</i>	<i>Macro-euphractus outesi</i>	Un
<i>Macro-euphractus retusus</i>, <i>M.</i> sp.	MC			Sum			
<i>Mammut</i> sp.	Fl	Shrubs, herbs	(Arroyo-Cabrales et al.	Tax	<i>Mammut</i>	<i>Mammut</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

			2007)				
<i>Mammut</i> sp.	Fl	C ₃ browser	(Yann 2014)	Tax	<i>Mammut</i>	<i>Mammut</i>	SI
<i>Mammut</i> sp.	Fl	Primarily C ₃ diet at all sites, even when more generalist taxa shifted from browsing to mixed feeding	(Yann and De-Santis 2014)	Tax	<i>Mammut</i>	<i>Mammut</i>	SI
<i>Mammut</i> sp.	Fl			Sum			
<i>Marmosa contrerasi</i>, <i>M. sp.</i>	In-Fr	All spp. depend heavily on insects/invertebrates and most also eat fruit	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	WG	<i>Marmosa</i>	<i>Marmosa</i>	LR-E
<i>Maruchito trilofodonte</i>	Fr-Fl	This study, based on: Very similar dentition to <i>Spaniomys</i>, but more hypsodont (Vucetich, Mazzoni, and Pardiñas 1993); <i>Spaniomys</i> was frugivore-folivore (Kay et al. 2012)	(Vucetich, Mazzoni, and Pardiñas 1993; Kay et al. 2012)	Tax	<i>Maruchito trilofodonte</i>		DM
<i>Mazama americana</i>	Fr-Fl	Prefers fruit, eats leaves when fruit is scarce; fungi is an important component of diet	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax	<i>Mazama americana</i>	<i>Mazama americana</i>	LR-E
<i>Mazama</i> sp.	Fr-Fl	Prefers fruit, also eats leaves, buds, flowers, twigs, roots, and sometimes graze	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Red-	SG	<i>Mazama americana</i>, <i>M. gouazoubira</i>	<i>Mazama americana</i>, <i>M. gouazoubira</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

ford 1999)							
<i>Megabradys darwini</i>	Gz	This study, based on: <i>Megabradys</i> , <i>Ranculus</i> , <i>Promylodon</i> , and <i>Prolestodon</i> have a higher mandibular body (Carlini, Scillato-Yané, and Sánchez 2006), which is associated with grazing in other species (Bargo, Toledo, and Vizcaíno 2006)	(Carlini, Scillato-Yané, and Sánchez 2006; Bargo, Toledo, and Vizcaíno 2006)	WG	<i>Megabradys</i> , <i>Ranculus</i> , <i>Promylodon</i> , <i>Prolestodon</i>		MM
<i>Megabradys darwini</i>	Gz	This study, based on: Most mylodontines are grazers; Nested between <i>Glossotherium</i> and <i>Lestodon</i> (D. Perea 1992) which are both grazers (Pujos et al. 2012)	(D. Perea 1992; Pujos et al. 2012)	WS F, PB	Mylodontinae	Mylodontinae	PB
<i>Megabradys darwini</i>	Gz	Sum					
<i>Megadolodus molariformis</i>	Om-Fr	Likely an omnivorous, suoid-like diet	(Cifelli and Villarreal 1997)	Tax	<i>Megadolodus molariformis</i>	<i>Megadolodus molariformis</i>	DM
<i>Megadolodus molariformis</i>	Om-Fr	Suoid-like niche (omnivorous) likely, browsing also possible	(Cifelli and Guerrero 1997)	Tax	<i>Megadolodus molariformis</i>	<i>Megadolodus molariformis</i>	DM
<i>Megadolodus molariformis</i>	Fr-Fl		(Kay and Madden 1997b)	Tax	<i>Megadolodus molariformis</i>	<i>Megadolodus molariformis</i>	Un
<i>Megadolodus molariformis</i>	Om-Fr	Similar diets: Omnivorous with fruits with strong, thick rinds	(Carlini, Gelfo, and Sánchez 2006)	Tax	<i>Bounodus enigmaticus</i> , <i>Megadolodus molariformis</i>	<i>Bounodus enigmaticus</i> , <i>Megadolodus molariformis</i>	DM
<i>Megadolodus molariformis</i>	Om-Fr	Sum					

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Megalonychops primigenius</i>	Fl		(Pujos et al. 2012)	WF	Megalonychidae	Megalonychidae	PB
<i>Megastus</i> sp.	MF	This study, based on: Relationship: Within paraphyletic "Eocardiidae" position basal to euhypsodont Caviioidea (Pérez 2010a; Pérez and Pol 2012; Pérez, Vucetich, and Deschamps 2014); Diet: and likely mixed feeding even after euhypsodonty in the same clade (<i>Eocardia</i>) (Candela, Rasia, and Pérez 2012)	(Pérez 2010a; Pérez and Pol 2012; Pérez, Vucetich, and Deschamps 2014; Candela, Rasia, and Pérez 2012)	See	<i>Eocardia montana</i> , <i>E. fissa</i>	<i>Eocardia montana</i> , <i>E. fissa</i>	DM, MA
<i>Megastus</i> sp.	Gz	Relationship: Within paraphyletic "Eocardiidae"	(Kay et al. 2012)	See	<i>Eocardia montana</i> , <i>E. fissa</i>	<i>Eocardia montana</i> , <i>E. fissa</i>	Un
<i>Megastus</i> sp.	MF	Relationship: Within paraphyletic "Eocardiidae"; Diet: "feeding on leaves of low-growing plants," "probably fed in more open areas of Quebrada Honda"	(Croft 2016)	See	<i>Guiomys unica</i>	<i>Guiomys unica</i>	Un
<i>Megastus</i> sp.	MF			Sum			
<i>Megathericulus patagonicus</i> , <i>M.</i> sp.	Fl or Fl-Fr		(Bargo 2001)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
<i>Megathericulus patagonicus</i> , <i>M.</i> sp.	Fl		(Carretero, García, and Dacar 2004)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	CA
<i>Megathericulus patagonicus</i> , <i>M.</i> sp.	MF		(Pujos and Salas 2004a)	SF	<i>Eremotherium elenense</i>	<i>Eremotherium elenense</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Megathericulus patagonicus</i> , <i>M.</i> sp.	Fl		(Fátima Rossetti et al. 2004)	SF	<i>Eremotherium laurillardi</i>	<i>Eremotherium laurillardi</i>	SI
<i>Megathericulus patagonicus</i> , <i>M.</i> sp.	Fl or Fl-Fr		(Bargo, Toledo, and Vizcaíno 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
<i>Megathericulus patagonicus</i> , <i>M.</i> sp.	Fl or Fl-Fr	Soft to moderate food; Cutting, not crushing or grinding; Diet may have included fruits	(Vizcaíno, Bargo, and Cassini 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM
<i>Megathericulus patagonicus</i> , <i>M.</i> sp.	Fl	Coprolites and morphology agree: Folivory most likely	(McDonald and Iuliis 2008)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	LR
<i>Megathericulus patagonicus</i> , <i>M.</i> sp.	Fl	Food reduction mainly by shearing or cutting	(Bargo, Vizcaíno, and Kay 2009)	SF	<i>Eucholoeops</i>	<i>Eucholoeops</i> and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, and megatheriids)	DW, CMDM
<i>Megathericulus patagonicus</i> , <i>M.</i> sp.	Fr-Fl	Selective tough object feeder	(Pujos, Iuliis, and Quispe 2011)	SF	<i>Hiskatherium saintandrei</i>	<i>Hiskatherium saintandrei</i>	MC:FR
<i>Megathericulus patagonicus</i> , <i>M.</i> sp.	Fl	Food reduction mainly by shearing or cutting	(Bargo, Toledo, and Vizcaíno 2012)	SF	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Peleciodon</i> , <i>Prepothorium</i> , <i>Planops</i>	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Peleciodon</i> , <i>Prepothorium</i> , <i>Planops</i> , and	DW, CMDM

Table S4.9: Dietary data for South American fossil taxa, cont.

						"nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, and megatheriids)	
<i>Megathericulus patagonicus</i> , <i>M.</i> sp.	Fl		(Kay, Vizcaíno, and Bargo 2012)	SF	<i>Eucholoeops ingens</i>	<i>Eucholoeops ingens</i>	Un
<i>Megathericulus patagonicus</i> , <i>M.</i> sp.	Fl		(Pujos et al. 2012)	WF	Megatheriidae	Megatheriidae	PB, CMDM
<i>Megathericulus patagonicus</i> , <i>M.</i> sp.	Fl	Low to moderate toughness	(Green and Kalthoff 2015)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DMc
<i>Megathericulus patagonicus</i>, <i>M.</i> sp.	Fl			Sum			
<i>Megatherium altiplanicum</i> , <i>M. americanum</i> , <i>M. celendinense</i> , <i>M. medinae</i> , <i>M. sp.</i> , <i>M. sundti</i> , <i>M. tarijense</i> , <i>M. urbinai</i>	Om to HC	Carnivory? Scavenging?	(Fariña and Blanco 1996)	Tax, SG	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	PCM

Table S4.9: Dietary data for South American fossil taxa, cont.

627	<i>Megatherium altiplanicum</i> , <i>M. americanum</i> , <i>M. celendinense</i> , <i>M. medinae</i> , <i>M. sp.</i> , <i>M. sundti</i> , <i>M. tarijense</i> , <i>M. urbinai</i>	Fl or Fl-Fr		(Bargo 2001)	Tax, SG	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
	<i>Megatherium altiplanicum</i> , <i>M. americanum</i> , <i>M. celendinense</i> , <i>M. medinae</i> , <i>M. sp.</i> , <i>M. sundti</i> , <i>M. tarijense</i> , <i>M. urbinai</i>	Fl		(Carretero, García, and Dacar 2004)	Tax, SG	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	CA
	<i>Megatherium altiplanicum</i> , <i>M. americanum</i> , <i>M. celendinense</i> , <i>M. medinae</i> , <i>M. sp.</i> , <i>M. sundti</i> , <i>M. tarijense</i> , <i>M. urbinai</i>	Fl or Fl-Fr	<i>M. americanum</i> : Narrowest muzzle of those studied (also studied: <i>Glossotherium robustum</i> , <i>Lestodon armatus</i> , <i>Mylodon darwini</i> , <i>Scelidotherium leptcephalum</i>): most selective	(Bargo, Toledo, and Vizcaíno 2006)	Tax, SG	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
	<i>Megatherium altiplanicum</i> , <i>M. americanum</i> , <i>M. celendinense</i> , <i>M. medinae</i> , <i>M. sp.</i> , <i>M. sundti</i> ,	Fl or Fl-Fr	Soft to moderate food; Cutting, not crushing or grinding; Diet may have included fruits	(Vizcaíno, Bargo, and Cassini 2006)	Tax, SG	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM

Table S4.9: Dietary data for South American fossil taxa, cont.

628	<i>M. tarijense</i> , <i>M. urbinai</i>						
	<i>Megatherium altiplanicum</i> , <i>M. americanum</i> , <i>M. celendinense</i> , <i>M. medinae</i> , <i>M. sp.</i> , <i>M. sundti</i> , <i>M. tarijense</i> , <i>M. urbinai</i>	Fl	Coprolites and morphology agree: Folivory most likely	(McDonald and Iuliis 2008)	Tax, SG	<i>Megatherium americanum</i>	<i>Megatherium americanum</i> LR
	<i>Megatherium altiplanicum</i> , <i>M. americanum</i> , <i>M. celendinense</i> , <i>M. medinae</i> , <i>M. sp.</i> , <i>M. sundti</i> , <i>M. tarijense</i> , <i>M. urbinai</i>	Fl	Low to moderate toughness	(Green and Kalthoff 2015)	Tax, SG	<i>Megatherium americanum</i>	<i>Megatherium americanum</i> DMc
	<i>Megatherium altiplanicum</i>, <i>M. americanum</i>, <i>M. celendinense</i>, <i>M. medinae</i>, <i>M. sp.</i>, <i>M. sundti</i>, <i>M. tarijense</i>, <i>M. urbinai</i>	Fl	Sum				
	<i>Megistonyx oreobios</i>	Fl		(Pujos et al. 2012)	WF	Megalo-nychidae	Megalo-nychidae PB

Table S4.9: Dietary data for South American fossil taxa, cont.

Mesopo- tamocnus (=Ortotherium) brevirostrum	Fl		(Pujos et al. 2012)	WF	Megalo- nychidae	Megalo- nychidae	PB
<i>Mesoprocta hypsodus</i>	Fr- Gn	Frugivore? Modern dasyproctids are, but <i>Mesoprocta</i> is more hypsodont ($HI \geq 3.6$ in <i>Mesoprocta</i> vs. < 1.6 for modern dasyproctids)	(Croft, Chick, and Anaya 2011)	Tax	<i>Mesoprocta hypsodus</i>	<i>Mesoprocta hypsodus</i>	CLR
<i>Mesotherium</i> sp.	Gz- Rz	Roots/tubers, grasses; <i>Mesotherium</i> was a digger	(Shockey, Croft, and Anaya 2007)	Tax	<i>Mesotherium</i>	<i>Mesotherium</i>	DM, PCM
<i>Micoureus laventicus</i>	In		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SG	<i>Micoureus demerarae</i>	<i>Micoureus demerarae</i>	LR-E
<i>Microbiotheri- um tehuelchum</i>	In		(Abello, Ortiz-Jaureguizar, and Candela 2012)	Tax	<i>Microbiother- ium te- huelchum</i>	<i>Microbiother- ium te- huelchum</i>	DM
<i>Microbiotheri- um tehuelchum</i>	In-Fr		(Kay, Vizcaíno, and Bargo 2012)	Tax	<i>Microbiother- ium te- huelchum</i>	<i>Microbiother- ium te- huelchum</i>	Un
<i>Microbiotheri- um tehuelchum</i>	In			Sum			

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Microcardiodon williensis</i>	MF	Relationship: Within paraphyletic "Eocardiidae"; Diet: Wide diet, including abrasive foods like grasses by modern analogy with <i>Dolichotis patagonum</i> and <i>D. salinicola</i>	(Candela, Rasia, and Pérez 2012)	SF, See	<i>Eocardia montana, E. fissa</i>	<i>Eocardia montana, E. fissa</i>	DM, MA
<i>Microcardiodon williensis</i>	Gz	Both in "Eocardiidae"	(Kay, Vizcaíno, and Bargo 2012)	SF, See	<i>Eocardia montana, E. fissa</i>	<i>Eocardia montana, E. fissa</i>	Un
<i>Microcardiodon williensis</i>	MF	Relationship: Nested between <i>Guiomys unica</i> and <i>Eocardia robusta</i> in phylogeny (María E. Pérez, Vucetich, and Deschamps 2014); Diet: "feeding on leaves of low-growing plants," "probably fed in more open areas of Quebrada Honda" (Croft 2016)		SF, See	<i>Guiomys unica</i>	<i>Guiomys unica</i>	Un
<i>Microcardiodon williensis</i>	MF	Sum					
<i>Microcavia aua, M. australis, M. sp.</i>	Fl-Fr	Leaves, grasses, seeds, flowers, berries	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax, SG	<i>Microcavia australis</i>	<i>Microcavia australis</i>	LR-E
<i>Microcavia aua, M. australis, M. sp.</i>	Fl-Fr	<i>M. australis</i> : Mixed feeder to browser (leaves, shoots, flowers, fruits, bark), <i>M. niata</i> : Mixed feeders (herbaceous plants, grasses, aquatic plants)	(Patton, Pardiñas, and D'Elía 2015)	Tax, SG	<i>Microcavia australis, M. niata</i>	<i>Microcavia australis, M. niata</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Microcavia</i> <i>aia</i> , <i>M. australis</i> , <i>M. sp.</i>	Fl-Fr				Sum			
<i>Micronycteris</i> sp.	In	Foliage-gleaning insectivores, but will occasionally take fruit	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax	<i>Micronycteris</i>	<i>Micronycteris</i>	LR-E	
<i>Microscleromys cribriphilus</i> , <i>M. paradoxalis</i> , <i>M. sp.</i>	Fr	Analogy with <i>Dasyprocta</i> , <i>Myoprocta</i> , <i>Cuniculus</i>	(Walton 1997)	Tax, SG	<i>Microscleromys cribriphilus</i>	<i>Microscleromys cribriphilus</i>	MA	
<i>Microscleromys cribriphilus</i> , <i>M. paradoxalis</i> , <i>M. sp.</i>	Gn		(Kay and Madden 1997b)	Tax, SG	<i>Microscleromys cribriphilus</i>	<i>Microscleromys cribriphilus</i>	Un	
<i>Microscleromys cribriphilus</i> , <i>M. paradoxalis</i> , <i>M. sp.</i>	Gn-Fr	Extant dasyproctids eat and cache fruit and seeds; <i>Dasyprocta azarae</i> : Palm seeds, <i>D. fuliginosa</i> : Seeds and nuts; <i>D. leporina</i> : frugivore-granivore; <i>D. prymnolopha</i> : "seed predator"; <i>D. punctata</i> : "seed predator"; <i>D. variegata</i> : Brazil nuts and palm seeds; <i>Myoprocta acouchy</i> : Fruit and seeds over 99% of diet; <i>M. pratti</i> : Frugivore-granivore	(Patton, Pardiñas, and D'Elía 2015)	SF	<i>Dasyprocta</i> and <i>Myoprocta</i>	<i>Dasyprocta</i> and <i>Myoprocta</i>	LR-E	
<i>Microscleromys cribriphilus</i> , <i>M. sp.</i>	Fr-Gn				Sum			

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>paradoxalis</i>, <i>M.</i> sp.							
<i>Microscleromys jacobsi</i>	Fr	Analogy with <i>Dasyprocta</i> , <i>Myoprocta</i> , <i>Cuniculus</i>	(Walton 1997)	Tax	<i>Microscleromys jacobsi</i>	<i>Microscleromys jacobsi</i>	MA
<i>Microscleromys jacobsi</i>	Fr-Fl		(Kay and Madden 1997b)	Tax	<i>Microscleromys jacobsi</i>	<i>Microscleromys jacobsi</i>	Un
<i>Microscleromys jacobsi</i>	Gn-Fr	Extant dasyproctids eat and cache fruit and seeds; <i>Dasyprocta azarae</i> : Palm seeds, <i>D. fuliginosa</i> : Seeds and nuts; <i>D. leporina</i> : frugivore-granivore; <i>D. prymnolopha</i> : "seed predator"; <i>D. punctata</i> : "seed predator"; <i>D. variegata</i> : Brazil nuts and palm seeds; <i>Myoprocta acouchy</i> : Fruit and seeds over 99% of diet; <i>M. pratti</i> : Frugivore-granivore	(Patton, Pardiñas, and D'Elía 2015)	SF	<i>Dasyprocta</i> and <i>Myoprocta</i>	<i>Dasyprocta</i> and <i>Myoprocta</i>	LR-E
<i>Microscleromys jacobsi</i>	Fr-Gn	Sum					
<i>Microtragulus rusconii</i> , <i>M.</i> sp.	Gn-In	High proportion of seeds, with some insects	(Simpson 1970b)	WG	Argyrolagidae (<i>Argyrolagus</i> and <i>Microtragulus</i>)	Argyrolagidae	MA
<i>Microtragulus rusconii</i> , <i>M.</i> sp.	Gn		(Mares 1985)	WF	Argyrolagidae	Argyrolagidae	Un
<i>Microtragulus rusconii</i> , <i>M.</i> sp.	Gn		(Mares 1993)	SF	<i>Argyrolagus</i>	<i>Argyrolagus</i>	MA

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Microtragulus rusconii</i> , <i>M. sp.</i>	Gn	Size alone implies granivory or insectivory, crowns too high for pure insectivory: abrasives from seeds on the ground and dust in open, semiarid environments	(Sánchez-Villagra and Kay 1997)	SF	<i>Proargyrolagus</i>	<i>Proargyrolagus</i>	DM, Mass
<i>Microtragulus rusconii</i> , <i>M. sp.</i>	Gn	Highly abrasive diet, "perhaps including a large proportion of grasses" or abrasive because of open habitats	(Sánchez-Villagra, Kay, and Anaya-Daza 2000)	SF	<i>Hondalagus altiplanensis</i>	<i>Hondalagus altiplanensis</i>	LR
<i>Microtragulus rusconii</i> , <i>M. sp.</i>	Gn		(Carlini, Pascual, and Goin 2007)	SF	<i>Anargyrolagus</i>	Argyrolagidae	MA
<i>Microtragulus rusconii</i> , <i>M. sp.</i>	Gn		(García-López and Babot 2015)	WF	Argyrolagidae	Argyrolagidae	MA
<i>Microtragulus rusconii</i> , <i>M. sp.</i>	Gn	"Feeding mainly on seeds in more open areas"	(Croft 2016)	SF	<i>Hondalagus altiplanensis</i>	<i>Hondalagus altiplanensis</i>	Un
<i>Microtragulus rusconii</i>, <i>M. sp.</i>	Gn			Sum		Argyrolagidae	
<i>Microtypotherium choquecostense</i>	Gz-Rz	Roots/tubers, grasses; Mesotheriids were diggers	(Shockey, Croft, and Anaya 2007)	WF, PB	<i>Mesotherium</i>, <i>Plesiotypotherium</i>, <i>Trachytherus</i>	Mesotheriidae	DM, PCM
<i>Miocallicebus villaviejai</i>	Fr-Fl	This study, based on: Dentition much larger, but otherwise very similar, to extant <i>Callicebus</i> (Takai et al. 2001) and <i>Callicebus</i> diet is frugivorous to frugivorous-folivorous (Fleagle 2013)	(Takai et al. 2001; Fleagle 2013)	CLR	<i>Miocallicebus</i>		CLR, MC:FR

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Miocochilius anomopodus</i> , <i>M. federicoi</i> , <i>M. sp.</i>	Gz		(Kay and Mad-den 1997b)	Tax, SG	<i>Miocochilius anomopodus</i>	<i>Miocochilius anomopodus</i>	Un
<i>Miocochilius anomopodus</i> , <i>M. federicoi</i> , <i>M. sp.</i>	Fl	Not a grazer or hard object feeder	(Townsend and Croft 2008a)	SF	<i>Protypotherium</i>	<i>Protypotherium</i>	DMc
<i>Miocochilius anomopodus</i> , <i>M. federicoi</i> , <i>M. sp.</i>	Gz	Characteristics of extant grazers, and far from mixed feed-ers/generalized herbivores or browsers: "wide muzzle, an ex-tremely wide and deep mandibu-lar angle, and a long paraoccipital process;" Some of these charac-teristics may be associated with digging in open habitats than with grazing	(Cassini et al. 2011)	SF	<i>Interatherium</i> , <i>Protypotherium</i>	<i>Interatherium</i> , <i>Protypotherium</i>	CMDM
<i>Miocochilius anomopodus</i> , <i>M. federicoi</i> , <i>M. sp.</i>	Gz	Consistent with grazing, may also have fed on hard objects	(Cassini and Vizcaíno 2012)	SF	<i>Interatherium</i> , <i>Protypotherium</i>	<i>Interatherium</i> , <i>Protypotherium</i>	BM
<i>Miocochilius anomopodus</i> , <i>M. federicoi</i> , <i>M. sp.</i>	Gz	Characteristics of extant grazers, and far from mixed feed-ers/generalized herbivores or browsers: "wide muzzle, an ex-tremely wide and deep mandibu-lar angle, and a long paraoccipital process"	(Cassini et al. 2012)	SF	<i>Interatherium robustum</i> , <i>Protypotherium attenuatum</i> , <i>P. australe</i> , <i>P. prae-rutilum</i>	<i>Interatherium robustum</i> , <i>Protypotherium attenuatum</i> , <i>P. australe</i> , <i>P. prae-rutilum</i>	CMDM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Miocochilius anomopodus</i> , <i>M. federicoi</i> , <i>M. sp.</i>	Gz	Similar to <i>Procavia</i> (Open habitat grazers)	(Cassini 2013)	SF	<i>Interatherium</i> , <i>Protypotherium</i>	<i>Interatherium</i> , <i>Protypotherium</i>	CGM
<i>Miocochilius anomopodus</i> , <i>M. federicoi</i> , <i>M. sp.</i>	Gz	"Probably fed on low-growing, abrasive vegetation in more open areas"	(Croft 2016)	Tax, SG	<i>Miocochilius anomopodus</i>	<i>Miocochilius anomopodus</i>	Un
<i>Miocochilius anomopodus</i>, <i>M. federicoi</i>, <i>M. sp.</i>	Gz	Sum					
<i>Mirandabradys socorrensis</i> , <i>M. urumaquensis</i> , <i>M. zabasi</i>	MF	This study, based on: Phylogenetic placement (Closely related to, but more derived than, <i>Pseudopreotherium</i>) (Carlini, Scillato-Yané, and Sánchez 2006), browsing (McDonald 1997) to mixed feeding (Pujos et al. 2012) in <i>Pseudopreotherium</i> and general trend in mylodonts towards grazing over time (Pujos et al. 2012)	(Carlini, Scillato-Yané, and Sánchez 2006; McDonald 1997; Pujos et al. 2012)	Tax	<i>Mirandabradys socorrensis</i> , <i>M. urumaquensis</i> , <i>M. zabasi</i>		PB
<i>Mixotoxodon larensis</i> , <i>M. sp.</i>	GH	Diet varies from C ₃ browser in closed canopy to open grassland C ₄ grazer	(MacFadden 2005)	SF, PB	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	SI

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Mixotoxodon larensis</i> , <i>M. sp.</i>	Fl	(Townsend and Croft 2008a)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	DMc
<i>Mixotoxodon larensis</i> , <i>M. sp.</i>	Gz or MF	(Cassini et al. 2011)	SF, PB	<i>Nesodon</i>	<i>Nesodon</i>	CMM
<i>Mixotoxodon larensis</i> , <i>M. sp.</i>	GH	(Cassini and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	BM
<i>Mixotoxodon larensis</i> , <i>M. sp.</i>	GH	(Cassini, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	CM
<i>Mixotoxodon larensis</i> , <i>M. sp.</i>	Gz	(Cassini et al. 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CDM
<i>Mixotoxodon larensis</i> , <i>M. sp.</i>	GH	(Guillermo H. Cassini, Flores, and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CO, CM
<i>Mixotoxodon larensis</i> , <i>M. sp.</i>	Gz	(Kay, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	LR

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Mixotoxodon larensis</i> , M. sp.	GH	Diet dependent on availability: Browse to graze	(Cassini 2013)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CGM
<i>Mixotoxodon larensis</i>, M. sp.	GH			Sum		Toxodontidae	
<i>Monodelphis domestica</i>	In	Feeds primarily on invertebrates	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax	<i>Monodelphis domestica</i>	<i>Monodelphis domestica</i>	LR-E
<i>Morenelaphus brachyceros</i> , M. sp.	Fl	Middle-sized cervids (such as <i>Morenelaphus</i> and <i>Charitoceros</i>) have the most folivorous diets	(Menégaz and Ortiz Jaureguizar 1995)	WG	<i>Morenelaphus</i> , <i>Epieurycerus</i> , <i>Paraceros</i> , <i>Antifer</i>	<i>Morenelaphus</i> , <i>Epieurycerus</i> , <i>Paraceros</i> , <i>Antifer</i>	Un
<i>Morenelaphus brachyceros</i> , M. sp.	MF	Relationship: Closely related and overlapping in habitats; Diet: Translating and paraphrasing: Although they have been previously interpreted as browsers in forests (Menégaz & Ortiz Jaureguizar 1995), <i>Antifer</i> seems to be associated with arid to semi-arid climates similar to the Pampean region today.	(M. Alcaraz and Zurita 2004)	See	<i>Antifer</i>	<i>Antifer</i>	ES, MC:FR

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Morenelaphus brachyceros</i> , <i>M.</i> sp.	Fl or MF	"[South American] cervids... never evolved true grazing forms, although the marsh deer (<i>Blastocerus dichotomus</i>) is a fresh grass grazer."	(Janis 2008)	AGp	South American cervids	South American cervids	LR
<i>Morenelaphus brachyceros</i> , <i>M.</i> sp.	MF	This study, based on: Open, semi-arid habitat (Alfredo Eduardo Zurita et al. 2009)	(Alfredo Eduardo Zurita et al. 2009)	WG	<i>Morenelaphus</i> , <i>Antifer</i>	<i>Morenelaphus</i> , <i>Antifer</i>	RFC
<i>Morenelaphus brachyceros</i> , <i>M.</i> sp.	Fl	Region is overall open, but associated with forested areas so must have been forest patches	(M. A. Alcaraz 2010)	WG	<i>Morenelaphus</i>	<i>Morenelaphus</i>	LR
<i>Morenelaphus brachyceros</i> , <i>M.</i> sp.	MF		(Merino and Rossi 2010)	AGp	Open habitat South American cervids	Open habitat South American cervids	LR
<i>Morenelaphus brachyceros</i> , <i>M.</i> sp.	MF	More abrasive diet	(Pêgo 2014)	WG	<i>Morenelaphus</i>	<i>Morenelaphus</i>	DM
<i>Morenelaphus brachyceros</i>, <i>M.</i> sp.	MF			Sum			
<i>Mormoops</i> sp.	In	Feeds mainly on moths	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SG	<i>Mormoops megalophylla</i>	<i>Mormoops megalophylla</i>	LR-E
<i>Munizia paranensis</i>	Gz		(Kay and Maden 1997b)	SF	<i>Miocochilius anomopodus</i>	<i>Miocochilius anomopodus</i>	Un
<i>Munizia paranensis</i>	MF	Semi-open woodland community (Late Oligocene)	(Croft and Weinstein	SF	<i>Federicoa-naya sallaen-</i>	<i>Federicoa-naya sallaen-</i>	DMS

Table S4.9: Dietary data for South American fossil taxa, cont.

			2008)		sis	sis	
<i>Munizia paranensis</i>	Fl	Not a grazer or hard object feeder	(Townsend and Croft 2008a)	SF	<i>Protypotherium</i>	<i>Protypotherium</i>	DMc
<i>Munizia paranensis</i>	Gz	Basal interatheriid	(Billet, Blondel, and de Muizon 2009)	SF	<i>Federicoa-naya sallaensis</i>	<i>Federicoa-naya sallaensis</i>	DMc
<i>Munizia paranensis</i>	Gz	Characteristics of extant grazers, and far from mixed feeders/generalized herbivores or browsers: "wide muzzle, an extremely wide and deep mandibular angle, and a long paraoccipital process;" Some of these characteristics may be associated with digging in open habitats than with grazing	(Cassini et al. 2011)	SF	<i>Interatherium</i> , <i>Protypotherium</i>	<i>Interatherium</i> , <i>Protypotherium</i>	CMDM
<i>Munizia paranensis</i>	Gz	Consistent with grazing, may also have fed on hard objects	(Cassini and Vizcaíno 2012)	SF	<i>Interatherium</i> , <i>Protypotherium</i>	<i>Interatherium</i> , <i>Protypotherium</i>	BM
<i>Munizia paranensis</i>	Gz	Characteristics of extant grazers, and far from mixed feeders/generalized herbivores or browsers: "wide muzzle, an extremely wide and deep mandibular angle, and a long paraoccipital process"	(Cassini et al. 2012)	SF	<i>Interatherium robustum</i> , <i>Protypotherium attenuatum</i> , <i>P. australe</i> , <i>P. prae-rutilum</i>	<i>Interatherium robustum</i> , <i>Protypotherium attenuatum</i> , <i>P. australe</i> , <i>P. prae-rutilum</i>	CMDM
<i>Munizia paranensis</i>	Gz	Similar to <i>Procavia</i> (Open habitat grazers)	(Cassini 2013)	SF	<i>Interatherium</i> , <i>Protypotherium</i>	<i>Interatherium</i> , <i>Protypotherium</i>	CGM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Munizia paranensis</i>	Gz	"Probably fed on low-growing, abrasive vegetation in more open areas"	(Croft 2016)	SF	<i>Miocochilius anomopodus</i>	<i>Miocochilius anomopodus</i>	Un
<i>Munizia paranensis</i>	Gz			Sum			
<i>Myiodon</i> sp.	Gz	Grasses and sedges (cool, wet sedge-grassland spp.)	(Moore 1978)	SG	<i>Myiodon darwinii</i>	<i>Myiodon darwinii</i>	CA
<i>Myiodon</i> sp.	Gz		(McDonald and Iuliis 2008)	SG	<i>Myiodon darwinii</i>	<i>Myiodon darwinii</i>	LR
<i>Myiodon</i> sp.	Gz	Muzzle still broad enough to be a grazer	(Pujos et al. 2012)	Tax	<i>Myiodon</i>	<i>Myiodon</i>	MM
<i>Myiodon</i> sp.	MF or Fl	More narrow muzzled, with a cone-shaped, prehensile upper lip	(Bargo, Iuliis, and Vizcaíno 2006)	SG	<i>Myiodon darwinii</i>	<i>Myiodon darwinii</i>	CMM
<i>Myiodon</i> sp.	MF or Fl	More narrow muzzled, with a cone-shaped, prehensile upper lip	(Bargo and Vizcaíno 2008)	SG	<i>Myiodon darwinii</i>	<i>Myiodon darwinii</i>	CMM
<i>Myiodon</i> sp.	MF or Fl	Narrower muzzle than ancestor: reversion to more selective feeding	(Vizcaíno 2009)	SG	<i>Myiodon darwinii</i>	<i>Myiodon darwinii</i>	LR
<i>Myiodon</i> sp.	Gz	Possibly a somewhat more selective grazer than previous mylodontids		Sum			
<i>Myiodonopsis ibseni</i>	Fl		(Dantas, Misagia, et al. 2013)	Tax	<i>Myiodonopsis ibseni</i>	<i>Myiodonopsis ibseni</i>	CDM, SI
<i>Myocastor coypus</i> , <i>M. perditus</i> , <i>M.</i> sp.	Gz	Aquatic vegetation	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg	Tax, SG	<i>Myocastor coypus</i>	<i>Myocastor coypus</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

			and Redford 1999)				
<i>Myocastor coypus</i> , <i>M. perditus</i> , <i>M. sp.</i>	Gz	Aquatic monocots (40-60%)>terrestrial monocots (30-35%)>dicots (0-15%)	(Borgnia, Galante, and Casini 2000)	Tax, SG	<i>Myocastor coypus</i>	<i>Myocastor coypus</i>	FA
<i>Myocastor coypus</i> , <i>M. perditus</i> , <i>M. sp.</i>	Gz	Aquatic monocots make up majority of diet	(Guichón et al. 2003)	Tax, SG	<i>Myocastor coypus</i>	<i>Myocastor coypus</i>	FO, VA, FA
<i>Myocastor coypus</i> , <i>M. perditus</i> , <i>M. sp.</i>	Fr-Fl	Fruits and leaves	(Townsend and Croft 2008b)	Tax, SG	<i>Myocastor coypus</i>	<i>Myocastor coypus</i>	DMc
<i>Myocastor coypus</i> , <i>M. perditus</i> , <i>M. sp.</i>	Gz-MF	Grains, roots, rhizomes, stems and leaves of aquatic plants, mussels and snails	(Patton, Pardiñas, and D'Elía 2015)	Tax, SG	<i>Myocastor coypus</i>	<i>Myocastor coypus</i>	LR-E
<i>Myocastor coypus</i>, <i>M. perditus</i>, <i>M. sp.</i>	Gz			Sum			
<i>Myrmecophaga (=Nunezia) caroloameghinoi</i>	Fm		(McDonald, Vizcaíno, and Bargo 2008)	Tax	<i>Myrmecophaga (=Nunezia) caroloameghinoi</i>	<i>Myrmecophaga (=Nunezia) caroloameghinoi</i>	PB, CLR, CM
<i>Myrmecophaga tridactyla</i>	Fm		(McDonald, Vizcaíno, and Bargo 2008)	Tax	<i>Myrmecophaga tridactyla</i>	<i>Myrmecophaga tridactyla</i>	LR-E
<i>Nanoastegotherium prostaticum</i>	In		(Carlini et al. 1997)	Tax	<i>Nanoastegotherium prostaticum</i>	<i>Nanoastegotherium prostaticum</i>	Un
<i>Nanoastegotherium prostaticum</i>	Fm		(Kay and Maden 1997b)	Tax	<i>Nanoastegotherium prostaticum</i>	<i>Nanoastegotherium prostaticum</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>tum</i>					<i>tatum</i>	<i>tatum</i>	
<i>Nanoastegotherium prostatum</i>	Fm			Sum			
<i>Nasua</i> sp.	Om	Fruit, invertebrates, opportunistic vertebrate predation	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SG	<i>Nasua nasua</i>	<i>Nasua nasua</i>	LR-E
<i>Necromys lactens</i>, <i>N. sp.</i>	Om-In	<i>N. amoenus</i>: Mostly insectivorous but varies locally; <i>N. lasiurus</i>: Arthropods, seeds, green vegetation, <i>N. obscurus</i>: Omnivorous, with arthropods such as beetles and crickets as well as plant material	(Patton, Pardiñas, and D'Elía 2015)	Tax, SG	<i>Necromys amoenus</i>, <i>N. lasiurus</i>, <i>N. obscurus</i>	<i>Necromys amoenus</i>, <i>N. lasiurus</i>, <i>N. obscurus</i>	LR-E
<i>Nectomys squamipes</i>	Om	Fungi, invertebrates, leaves, fruit, small vertebrates	(Patton, Pardiñas, and D'Elía 2015)	Tax	<i>Nectomys squamipes</i>	<i>Nectomys squamipes</i>	LR-E
<i>Neobrachytherium ameghinoi</i>, <i>N. sp.</i>	Fl	Leaves, twigs, buds	(Croft 2016)	SG	<i>Neobrachytherium ullumense</i>	<i>Neobrachytherium ullumense</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Neocavia depressidens</i> , N. sp.	MF	<i>Cavia</i> : Mainly grazers but also eat grass inflorescences, <i>Galea</i> : "herbivores", <i>Microcavia australis</i> : Mixed feeder to browser (leaves, shoots, flowers, fruits, bark), <i>Microcavia niata</i> : Mixed feeders (herbaceous plants, grasses, aquatic plants)	(Patton, Pardiñas, and D'Elía 2015)	SSF	<i>Cavia</i> , <i>Galea</i> , <i>Microcavia</i>	<i>Cavia</i> , <i>Galea</i> , <i>Microcavia</i>	LR-E
<i>Neocavia depressidens</i> , N. sp.	MF	<i>Cavia</i> : Mostly grazers but also eat grass inflorescences, <i>Galea</i> : "herbivores", <i>Microcavia australis</i> : generalist herbivores (leaves, grasses, seeds, flowers, berries)	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SSF	<i>Cavia</i> , <i>Galea</i> , <i>Microcavia</i>	<i>Cavia</i> , <i>Galea</i> , <i>Microcavia</i>	LR-E
<i>Neocavia depressidens</i> , N. sp.	Gz	<i>Cavia</i> : grazers	(Townsend and Croft 2008b)	SSF	<i>Cavia</i>	<i>Cavia</i>	LR-E
<i>Neocavia depressidens</i> , N. sp.	Gz	Open habitat grazers	(Cassini 2013)	SSF	<i>Procavia</i>	<i>Procavia</i>	Un
<i>Neocavia depressidens</i> , N. sp.	MF	<i>Galea</i> : grasses and shrubs though less C ₄ than previously thought, <i>Microcavia</i> : mostly shrubs	(Fernández et al. 2016)	SSF	<i>Galea leuco-blephara</i> , <i>Microcavia australis</i>	<i>Galea leuco-blephara</i> , <i>Microcavia australis</i>	SI
<i>Neocavia depressidens</i>, N. sp.	MF	Sum					
<i>Neochoerus sirasakae</i> , N. sp.	Gz	Grasses and aquatic plants	(Eisenberg 1989; Redford and Eisenberg	CLR	<i>Hydrochoerus</i>	<i>Hydrochoerus hydrochaeris</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

			1992; Eisenberg and Redford 1999)				
<i>Nechoerus si-rasakae</i> , <i>N. sp.</i>	MF	Diet likely similar to extant capybaras	(MacFadden and Shockey 1997)	SG	<i>Nechoerus tarijensis</i>	<i>Nechoerus tarijensis</i>	SI
<i>Nechoerus si-rasakae</i> , <i>N. sp.</i>	Gz	This study, based on stable isotope data (MacFadden and Shockey 1997): Aquatic plants, including most aquatic grasses, are C ₃ , with a few examples that will use C ₃ -C ₄ intermediate or C ₄ under particular conditions (Bowes et al. 2002): a diet of terrestrial and aquatic grasses would likely appear by stable isotope analysis to be "mixed feeding"	(MacFadden and Shockey 1997; Bowes et al. 2002)	SG	<i>Nechoerus tarijensis</i>	<i>Nechoerus tarijensis</i>	SI
<i>Nechoerus si-rasakae</i> , <i>N. sp.</i>	Gz	This study, based on: Similarity of <i>Cardiatherium</i> to extant capybaras in terms of size, herding, and semiaquatic habits (Vucetich, Deschamps, et al. 2005; Vucetich, Deschamps, and Pérez 2013; Vucetich et al. 2014; Vucetich et al. 2015)	(Vucetich, Deschamps, et al. 2005; Vucetich, Deschamps, and Pérez 2013; Vucetich et al. 2014; Vucetich et al. 2015)	PB	<i>Phugatherium</i> , <i>Cardiatherium</i>		MA & CLR
<i>Nechoerus si-rasakae</i> , <i>N. sp.</i>	Gz		(Webb 2006)	WF	Hydrochoeridae	Hydrochoeridae	Un
<i>Nechoerus si-rasakae</i> , <i>N. sp.</i>	Gz	<i>Hydrochoerus</i> : Grasses, sedges, and aquatic plants	(Patton, Pardiñas, and D'Elía 2015)	CLR	<i>Hydrochoerus hydrochaeris</i>	<i>Hydrochoerus hydrochaeris</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Nechoerus sirasakae</i> , <i>N.</i> sp.	Gz	This study, based on: <i>Nechoerus</i> very closely related to extant <i>Hydrochoerus</i> (Vucetich and Deschamps 2015)	(Vucetich and Deschamps 2015)	CLR	<i>Hydrochoerus</i>		MA & CLR
<i>Nechoerus sirasakae</i>, <i>N.</i> sp.	Gz			Sum		Capybaras	
<i>Neopiblema ambrosettianus</i> , <i>N. horridula</i> , <i>N.</i> sp.	Gz	Abrasive diet, probably including seagrasses	(Sánchez-Villagra, Aguilera, and Horovitz 2003)	SF	<i>Phoberomys pattersoni</i>	<i>Phoberomys pattersoni</i>	Hb, RFC, DMM
<i>Neopiblema ambrosettianus</i> , <i>N. horridula</i> , <i>N.</i> sp.	Gz	Abrasive diet, includes seagrasses	(Horovitz et al. 2010)	SF	<i>Phoberomys pattersoni</i>	<i>Phoberomys pattersoni</i>	DM
<i>Neopiblema ambrosettianus</i> , <i>N. horridula</i> , <i>N.</i> sp.	Gz	Abrasive diet, includes seagrasses; may have used forelimbs for food manipulation	(Geiger et al. 2013)	SF	<i>Phoberomys pattersoni</i>	<i>Phoberomys pattersoni</i>	DM, PCM
<i>Neopiblema ambrosettianus</i>, <i>N. horridula</i>, <i>N.</i> sp.	Gz			Sum		Neopiblemidae	
<i>Neoglyptatelus originalis</i> , <i>N. sincelejanus</i> , <i>N.</i> sp.	Gz		(Kay and Maden 1997b)	Tax, SG	<i>Neoglyptatelus originalis</i>	<i>Neoglyptatelus originalis</i>	Un
<i>Neoglyptatelus originalis</i> , <i>N. sincelejanus</i> , <i>N.</i>	Fm		(Croft 2016)	Tax, SG	<i>Neoglyptatelus originalis</i>	<i>Neoglyptatelus originalis</i>	MM

Table S4.9: Dietary data for South American fossil taxa, cont.

sp.							
<i>Neoglyptatelus originalis</i>, <i>N. sincelejanus</i>, <i>N. sp.</i>	Fm			Sum			
<i>Neohapalops rothi</i>	Fl		(Pujos et al. 2012)	WF	Nothrotheriidae	Nothrotheriidae	PB
<i>Neolicaphrium recens</i>	MF	Based on mesodonty and presence of some cement: "survived in marginal environments of the Pampasia adapted to a 'mixed' diet, not entirely browser"	(Bond 1999)	Tax	<i>Neolicaphrium recens</i>	<i>Neolicaphrium recens</i>	DM
<i>Neolicaphrium recens</i>	MF	"the increase in the crown height was probably due to the incorporation of more abrasive elements (grasses and grit) (Janis, 1988) in its diet."	(Bond et al. 2001)	Tax	<i>Neolicaphrium recens</i>	<i>Neolicaphrium recens</i>	DM
<i>Neolicaphrium recens</i>	MF			Sum			
<i>Neonematherium</i> sp.	Fl	Selective browser	(McDonald 1997)	SG	<i>Neonematherium flabellatum</i>	<i>Neonematherium flabellatum</i>	MM
<i>Neonematherium</i> sp.	Fl		(Kay and Mad-den 1997b)	SG	<i>Neonematherium flabellatum</i>	<i>Neonematherium flabellatum</i>	Un
<i>Neonematherium</i> sp.	Fl		(Pujos et al. 2012)	WS F	Scelidothetriinae	Scelidothetriinae	PB
<i>Neonematherium</i> sp.	Fl			Sum			

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Neophanomys biplicatus</i> , <i>N. sp.</i>	Gn	This study, based on: <i>Neophanomys</i> is the sister genus or is congeneric with <i>Acarechimys</i> (Verzi, Vieytes, and Montalvo 2011; Verzi, Olivares, and Morgan 2014), and based on: <i>Acarechimys</i> was granivorous (Kay and Madden 1997b)	(Kay and Madden 1997b; Verzi, Vieytes, and Montalvo 2011; Verzi, Olivares, and Morgan 2014)	SG	<i>Neophanomys</i>		Un
<i>Neoreomys huilensis</i>	Gn		(Kay and Madden 1997b)	Tax	<i>Neoreomys huilensis</i>	<i>Neoreomys huilensis</i>	Un
<i>Neoreomys huilensis</i>	Fr	Analogy with <i>Dasyprocta</i> , <i>Myoprocta</i> , <i>Cuniculus</i>	(Walton 1997)	Tax	<i>Neoreomys huilensis</i>	<i>Neoreomys huilensis</i>	MA
<i>Neoreomys huilensis</i>	Fr-Gn	Dental similarities between <i>Neoreomys</i> and living relatives (<i>Dasyprocta</i> and <i>Myoprocta</i>) suggest similar diet and habitat	(Kramarz and Bellosi 2005)	SG	<i>Neoreomys australis</i> , <i>N. sp. nov.</i>	<i>Neoreomys australis</i> , <i>N. sp. nov.</i>	DM
<i>Neoreomys huilensis</i>	Fr-Gn	Results somewhat complicated because of environmental signals	(Townsend and Croft 2008b)	SG	<i>Neoreomys australis</i>	<i>Neoreomys australis</i>	DMc
<i>Neoreomys huilensis</i>	Fr-Fl	Fruit with leaves	(Kay, Vizcaíno, and Bargo 2012)	SG	<i>Neoreomys australis</i>	<i>Neoreomys australis</i>	Un
<i>Neoreomys huilensis</i>	Fr-Gn			Sum			
<i>Neosaimiri fieldsi</i>	Fr-In	<i>Neosaimiri</i> is very closely related to <i>Saimiri</i> ; may be the direct ancestor or even congeneric	(Rosenberger 1992)	Tax	<i>Neosaimiri fieldsi</i>	<i>Neosaimiri fieldsi</i>	CLR
<i>Neosaimiri fieldsi</i>	Fr-Gn	Fruit and seeds	(Fleagle, Kay, and Anthony 1997)	Tax	<i>Neosaimiri fieldsi</i>	<i>Neosaimiri fieldsi</i>	DM
<i>Neosaimiri</i>	Fr-In		(Kay and Mad-	Tax	<i>Neosaimiri</i>	<i>Neosaimiri</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>fieldsi</i>			den 1997b)		<i>fieldsi</i>	<i>fieldsi</i>	
<i>Neosaimiri fieldsi</i>	Fr-In		(Meldrum and Kay 1997a)	Tax	<i>Neosaimiri fieldsi</i>	<i>Neosaimiri fieldsi</i>	DM
<i>Neosaimiri fieldsi</i>	Fr-In		(Cooke 2011)	Tax	<i>Neosaimiri fieldsi</i>	<i>Neosaimiri fieldsi</i>	DGM
<i>Neosaimiri fieldsi</i>	Fr-In		(Fleagle 2013)	Tax	<i>Neosaimiri fieldsi</i>	<i>Neosaimiri fieldsi</i>	LR
<i>Neosaimiri fieldsi</i>	Fr-In			Sum			
<i>Neosclerocalyp- tus heusseri</i> , <i>N.</i> <i>sp.</i>	Gz	Bulk feeders in moderately open to open habitats	(Vizcaíno, Cas- sini, et al. 2011)	SG	<i>Neosclero- calyptus</i>	<i>Neosclero- calyptus</i>	DMM
<i>Neosclerocalyp- tus heusseri</i> , <i>N.</i> <i>sp.</i>	MF		(Domingo, Pra- do, and Alberdi 2012)	SG	<i>Neosclero- calyptus</i>	<i>Neosclero- calyptus</i>	SI
<i>Neosclerocalyp- tus heusseri</i> , <i>N.</i> <i>sp.</i>	MF		(França et al. 2015)	SG	<i>Neosclero- calyptus</i>	<i>Neosclero- calyptus</i>	SI
<i>Neosclerocalyp- tus heusseri</i> , <i>N.</i> <i>sp.</i>	Gz	This study, based on reinterpreta- tion of stable isotope data (Do- mingo, Prado, and Alberdi 2012; França et al. 2015): Although in- terpreting stable isotope data from a single sample in dentine is risky for multiple reasons, -5.3‰ very likely represents pure grazing in a habitat with mixed C ₄ and C ₃ grasses (37°S, Late Pleistocene); for the same region in their data, <i>Equus</i> , which they interpret as	(Domingo, Pra- do, and Alberdi 2012; França et al. 2015)	SG	<i>Neosclero- calyptus</i>	<i>Neosclero- calyptus</i>	SI

Table S4.9: Dietary data for South American fossil taxa, cont.

		pure grazing on a mix of C ₃ and C ₄ grasses, has an average of -7.9‰, and <i>Toxodon</i> , which they also interpret as pure grazing on a mix of C ₃ and C ₄ grasses, has an average of -5.8‰.					
<i>Neosclerocalyp- tus heusseri</i> , <i>N.</i> <i>sp.</i>	Gz			Sum			
<i>Neosteiromys</i> <i>sp.</i> , <i>N. tordil- lense</i>	Fr- Fl	This study, based on: Similar dentition in <i>Steiromys</i> , <i>Ne- osteiromys</i> , <i>Coendou</i> , and other Neotropical erethizontids not in this analysis (Vucetich and Ver- zi 1994); <i>Steiromys</i> , <i>Mi- crosteiromys</i> , and <i>Coendou</i> spp. were/are frugivore-folivores (Walton 1997; Kay and Mad- den 1997b; Kay, Vizcaíno, and Bargo 2012; Patton, Pardiñas, and D'Elía 2015)	(Vucetich and Verzi 1994; Walton 1997; Kay and Mad- den 1997b; Kay, Vizcaíno, and Bargo 2012; Patton, Pardiñas, and D'Elía 2015)	WF	<i>Mi- crosteiromys</i> <i>jacobsi</i> , <i>Steiromys</i> sp. nov. 1, <i>S. sp.</i> nov. 2, <i>S. du- plicatus</i> , <i>S.</i> <i>detentus</i> , <i>Co- endou</i>	<i>Mi- crosteiromys</i> <i>jacobsi</i> , <i>Steiromys</i> sp. nov. 1, <i>S. sp.</i> nov. 2, <i>S. du- plicatus</i> , <i>S.</i> <i>detentus</i> , <i>Co- endou</i>	PB
<i>Neotamandua</i> <i>australis</i> , <i>N.</i> <i>borealis</i> , <i>N.</i> <i>conspicua</i>	Fm		(Kay and Madden 1997b)	Tax, SG	<i>Neotamandua</i> <i>borealis</i>	<i>Neotamandua</i> <i>borealis</i>	Un
<i>Neothoracopho- rus</i> sp.	Gz		(Fariña 1985)	AGp	<i>Glyptodon</i>	Plio- Pleistocene Glyptodonti- dae	CMM
<i>Neothoracopho-</i>	Gz		(L. M. Pérez,	AGp	<i>Glyptodon</i>	Plio-	CM

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<i>rus</i> sp.			Scillato-Yané, and Vizcaino 2000)			Pleistocene Glyptodontidae	
<i>Neothoracophorus</i> sp.	Gz		(Fariña and Vizcaíno 2001)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CMDM
<i>Neothoracophorus</i> sp.	Gz	<i>Panochthus</i> and <i>Sclerocalyptus</i> : grazers in cold, semiarid, open environments	(Zurita, Scillato-Yané, and Carlini 2005)	AGp	<i>Panochthus</i> and <i>Sclerocalyptus</i>	Plio-Pleistocene Glyptodontidae	LR
<i>Neothoracophorus</i> sp.	Gz		(Rincón, White, and Mcdonald 2008)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	LR
<i>Neothoracophorus</i> sp.	Gz	Relationship: Plio-Pleistocene glyptodonts shared dental morphology and diet based on authors above; Diet: Bulk feeders in moderately open to open habitats	(Vizcaíno, Casini, et al. 2011)	See	<i>Doedicurus</i> , <i>Panochthus</i> , <i>Neuryurus</i> , <i>Neosclerocalyptus</i>	<i>Doedicurus</i> , <i>Panochthus</i> , <i>Neuryurus</i> , <i>Neosclerocalyptus</i>	CDM
<i>Neothoracophorus</i> sp.	Gz			Sum		Plio-Pleistocene Glyptodontidae	
<i>Nesodon imbricatus</i> , <i>N.</i> sp.	GH	Diet varies from C ₃ browser in closed canopy to open grassland C ₄ grazer	(MacFadden 2005)	PB	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	SI

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Nesodon imbricatus</i> , <i>N. sp.</i>	Fl		(Townsend and Croft 2008a)	Tax, SG	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	DMc
<i>Nesodon imbricatus</i> , <i>N. sp.</i>	Gz or MF		(Cassini et al. 2011)	WG	<i>Nesodon</i>	<i>Nesodon</i>	CMM
<i>Nesodon imbricatus</i> , <i>N. sp.</i>	GH		(Cassini and Vizcaíno 2012)	Tax, SG	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	BM
<i>Nesodon imbricatus</i> , <i>N. sp.</i>	GH		(Cassini, Vizcaíno, and Bargo 2012)	WG	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	CM
<i>Nesodon imbricatus</i> , <i>N. sp.</i>	Gz		(Cassini et al. 2012)	WG	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CDM
<i>Nesodon imbricatus</i> , <i>N. sp.</i>	GH		(Cassini, Flores, and Vizcaíno 2012)	Tax, SG	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CO, CM
<i>Nesodon imbricatus</i> , <i>N. sp.</i>	Gz		(Kay, Vizcaíno, and Bargo 2012)	WG	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	LR
<i>Nesodon imbricatus</i> , <i>N. sp.</i>	GH	Diet dependent on availability: Browse to graze	(Cassini 2013)	Tax, SG	Nesodontines (<i>Adinotherium ovinum</i> and	Nesodontines (<i>Adinotherium ovinum</i> and	CGM

Table S4.9: Dietary data for South American fossil taxa, cont.

					<i>Nesodon imbricatus</i>)	<i>Nesodon imbricatus</i>)	
<i>Nesodon imbricatus</i> , <i>N. sp.</i>	GH			Sum		Toxodontidae	
<i>Neuryurus giganteus</i> , <i>N. sp.</i>	Gz	Bulk feeders in moderately open to open habitats	(Vizcaíno, Casini, et al. 2011)	WG	<i>Neuryurus</i>	<i>Neuryurus</i>	DMM
<i>Noctilio lacrimaelunaris</i>	In	This study, based on information: <i>N. albiventris</i> feeds primarily on aquatic insects (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999); <i>N. leporinus</i> feeds on small fish, but is much larger than <i>N. albiventris</i> , which in turn is much larger than <i>N. lacrimaelunaris</i> (Czaplewski 1996)	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999; Czaplewski 1996)	SG	<i>Noctilio albiventris</i>	<i>Noctilio albiventris</i>	CLR, Mass
<i>Nothropus sp.</i>	Fl		(Pujos et al. 2012)	WF	Megalonychidae	Megalonychidae	PB
<i>Nothrotherium maquinense</i> , <i>N. sp.</i>	Fl		(Pujos et al. 2012)	WG	<i>Nothrotherium</i>	<i>Nothrotherium</i>	MM
<i>Notictis ortizi</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Notictis ortizi</i>	<i>Notictis ortizi</i>	DM
<i>Notiomastodon sp.</i>	Fl	Browser in closed canopy forest	(Fátima Rossetti et al. 2004)	WF	<i>Haplomastodon waringi</i>	<i>Haplomastodon waringi</i>	SI
<i>Notiomastodon sp.</i>	GH	Grazer to browser depending on site: <i>S. waringi</i> : grazing to	(Sánchez, Prado, and Alberdi	SG	<i>Stegomastodon</i>	<i>Stegomastodon</i>	SI

Table S4.9: Dietary data for South American fossil taxa, cont.

		browse-heavy mixed feeding, <i>S. platensis</i> : browsing to mixed feeding	2004)		(=Haplomastodon) waringi, Haplomastodon chimborazi (=Stegomastodon platensis, =Notiomastodon platensis)	(=Haplomastodon) waringi, Haplomastodon chimborazi (=Stegomastodon platensis, =Notiomastodon platensis)	
Notiomastodon sp.	GH	Diet depends on availability and can contain low quality food from woody plants and C ₃ grasses	(Asevedo et al. 2012)	SG	Notiomastodon platensis (=Stegomastodon platensis, =Haplomastodon chimborazi)	Notiomastodon platensis (=Stegomastodon platensis, =Haplomastodon chimborazi)	DMc, TCA
Notiomastodon sp.	GH	Diet depends on availability and can contain low quality food from woody plants and C ₃ grasses	(L. dos S. Avilla et al. 2013)	SG	Notiomastodon platensis (=Stegomastodon platensis, =Haplomastodon chimborazi)	Notiomastodon platensis (=Stegomastodon platensis, =Haplomastodon chimborazi)	LR
Notiomastodon sp.	MF		(França et al. 2015)	SG	Notiomastodon	Notiomastodon	SI
Notiomastodon sp.	GH			Sum			
Notocynus hermosicus	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	Notocynus hermosicus	Notocynus hermosicus	

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Notonycteris magdalenensis</i> , <i>N. sucharadeus</i>	HC	Similar to <i>Vampyrum</i> and <i>Chrotopterus</i> , both of which feed primarily on small vertebrates (occasionally taking insects or fruit)	(Czaplewski, Morgan, and McLeod 1997)	Tax, SG	<i>Notonycteris magdalenensis</i>	<i>Notonycteris magdalenensis</i>	MA
<i>Nuciruptor rubricae</i>	Gn-Fr		(Meldrum and Kay 1997b)	Tax	<i>Nuciruptor rubricae</i>	<i>Nuciruptor rubricae</i>	DM
<i>Ocnerotherium</i> sp.	GH	Diet varies from C ₃ browser in closed canopy to open grassland C ₄ grazer	(MacFadden 2005)	SF, PB	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	SI
<i>Ocnerotherium</i> sp.	Fl		(Townsend and Croft 2008a)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	DMc
<i>Ocnerotherium</i> sp.	Gz or MF		(Cassini et al. 2011)	SF, PB	<i>Nesodon</i>	<i>Nesodon</i>	CMM
<i>Ocnerotherium</i> sp.	GH		(Cassini and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	BM
<i>Ocnerotherium</i> sp.	GH		(Cassini, Vizcaíno, and Bar-go 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	CM
<i>Ocnerotherium</i> sp.	Gz		(Cassini et al. 2012)	SF, PB	Nesodontines (<i>Adinotherium</i>	Nesodontines (<i>Adinotherium</i>	CDM

Table S4.9: Dietary data for South American fossil taxa, cont.

GSS						<i>ovinum</i> and <i>Nesodon im- bricatus</i>)	<i>ovinum</i> and <i>Nesodon im- bricatus</i>)	
	<i>Ocnerotherium</i> sp.	GH		(Cassini, Flores, and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon im- bricatus</i>)	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon im- bricatus</i>)	CO, CM
	<i>Ocnerotherium</i> sp.	Gz		(Kay, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	LR
	<i>Ocnerotherium</i> sp.	GH	Diet dependent on availability: Browse to graze	(Cassini 2013)	SF, PB	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon im- bricatus</i>)	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon im- bricatus</i>)	CGM
	<i>Ocnerotherium</i> sp.	GH			Sum		Toxodonti- dae	
	<i>Octodontobradys</i> sp.	Gz	Mobile mandible, well- developed masseter muscles for processing grass	(Guilherme, Bocquentin, and Porto 2011)	SG	<i>Octodonto- bradys</i> sp., <i>O.</i> <i>puruensis</i>	<i>Octodonto- bradys</i> sp., <i>O.</i> <i>puruensis</i>	CMM
	<i>Octomylodon</i> <i>aversus</i>	Fl		(Pujos et al. 2012)	WG	<i>Octomylodon</i>	<i>Octomylodon</i>	MM
	<i>Odocoileus</i> sp.	Fl		(Eisenberg 1989; Redford and Eisenberg 1992; Eisen- berg and Red- ford 1999)	SG	<i>Odocoileus</i> <i>virginianus</i>	<i>Odocoileus</i> <i>virginianus</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Oligoryzomys flavescens</i>	Gn	Population outbreaks during bamboo masting (ratada), stomachs contain plant material supplemented by invertebrate material	(Patton, Pardiñas, and D'Elía 2015)	Tax	<i>Oligoryzomys flavescens</i>	<i>Oligoryzomys flavescens</i>	LR-E
<i>Oligoryzomys flavescens</i>	Om	Stomachs contain plant material supplemented by invertebrate material	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax	<i>Oligoryzomys flavescens</i>	<i>Oligoryzomys flavescens</i>	LR-E
<i>Oligoryzomys flavescens</i>	Gn-In	Sum					
<i>Oligoryzomys longicaudatus</i>	Gn-Fl	Strongly granivorous in dry season and combination of flowers, pollen, and foliage in wet season, insects very minor in diet; Outbreaks during bamboo masting	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax	<i>Oligoryzomys longicaudatus</i>	<i>Oligoryzomys longicaudatus</i>	LR-E
<i>Oligoryzomys longicaudatus</i>	Gn	Outbreaks associated with bamboo masting (seeding)	(Patton, Pardiñas, and D'Elía 2015)	Tax	<i>Oligoryzomys longicaudatus</i>	<i>Oligoryzomys longicaudatus</i>	LR-E
<i>Oligoryzomys longicaudatus</i>	Gn-Fl	Sum					
<i>Oligoryzomys</i> sp.	Gn-In	<i>O. delticola</i> : primarily herbivorous, but eats some insects; <i>O. flavescens</i> : Herbivore-insectivore (see above); <i>O. longicaudatus</i> : Granivorous-folivorous (see above); <i>O. nigripes</i> : Granivore-	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SG	<i>Oligoryzomys delticola</i> , <i>O. flavescens</i> , <i>O. longicaudatus</i> , <i>O. nigripes</i>	<i>Oligoryzomys delticola</i> , <i>O. flavescens</i> , <i>O. longicaudatus</i> , <i>O. nigripes</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

insectivore (Leaves, grass seeds, fungal hyphae, insects)							
<i>Oligoryzomys</i> sp.	Gn-Fl	<i>O. arenalis</i> : insectivorous-granivorous; <i>O. flavescens</i> : Granivore-insectivore (see above); <i>O. longicaudatus</i> : Granivorous-folivorous (see above); <i>O. nigripes</i> : Granivorous (grass seeds)	(Patton, Pardiñas, and D'Elía 2015)	SG	<i>Oligoryzomys arenalis</i> , <i>O. flavescens</i> , <i>O. longicaudatus</i> , <i>O. nigripes</i>	<i>Oligoryzomys arenalis</i> , <i>O. flavescens</i> , <i>O. longicaudatus</i> , <i>O. nigripes</i>	LR-E
<i>Oligoryzomys</i> sp.	Gn-In	Sum					
<i>Orthomyctera</i> sp.	MF	<i>Cavia</i> : Mostly grazers but also eat grass inflorescences, <i>Galea</i> : "herbivores", <i>Microcavia australis</i> : generalist herbivores (leaves, grasses, seeds, flowers, berries)	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	WS F	<i>Cavia</i> , <i>Galea</i> , <i>Microcavia</i>	<i>Cavia</i> , <i>Galea</i> , <i>Microcavia</i>	LR-E
<i>Orthomyctera</i> sp.	Gz	<i>Cavia</i> : grazers	(Townsend and Croft 2008b)	WS F	<i>Cavia</i>	<i>Cavia</i>	LR-E
<i>Orthomyctera</i> sp.	Gz	Open habitat grazers	(Cassini 2013)	WS F	<i>Procavia</i>	<i>Procavia</i>	Un
<i>Orthomyctera</i> sp.	MF	<i>Cavia</i> : Mainly grazers but also eat grass inflorescences, <i>Galea</i> : "herbivores", <i>Microcavia australis</i> : Mixed feeder to browser (leaves, shoots, flowers, fruits,	(Patton, Pardiñas, and D'Elía 2015)	WS F	<i>Cavia</i> , <i>Galea</i> , <i>Microcavia</i>	<i>Cavia</i> , <i>Galea</i> , <i>Microcavia</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

		bark), <i>Microcavia niata</i> : Mixed feeders (herbaceous plants, grasses, aquatic plants)					
<i>Orthomyctera</i> sp.	MF	<i>Galea</i> : grasses and shrubs though less C ₄ than previously thought, <i>Microcavia</i> : mostly shrubs	(Fernández et al. 2016)	WS F	<i>Galea leuco-blephara</i> , <i>Microcavia australis</i>	<i>Galea leuco-blephara</i> , <i>Microcavia australis</i>	SI
<i>Orthomyctera</i> sp.	MF			Sum			
<i>Ortotherium laticurvatum</i>	FI		(Pujos et al. 2012)	WF	Megalo-nychidae	Megalo-nychidae	PB
<i>Oxymycterus</i> sp., <i>O. wayku</i>	In	Genus is "highly insectivorous": <i>O. nasutus</i> : insectivorous; <i>O. paramensis</i> : also eats grasses and seeds, <i>O. rufus</i> : primarily invertivore (soil invertebrates) with only 15-20% plant mass "as are other species of the genus"	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SG	<i>Oxymycterus nasutus</i> , <i>O. paramensis</i> , <i>O. rufus</i>	<i>Oxymycterus</i>	LR-E
<i>Oxydontherium piramydatus</i> , <i>O. sp.</i> , <i>O. zeballozi</i>	MF	This study, based on: More hypsodont (protohypsodont) than earlier macraucheniids, probably preferred open environments (Bond et al. 1995)	(Bond et al. 1995)	SSF	<i>Promacrauchenia antiqua</i> , <i>P. kraglievichi</i> , <i>P. chapalmalense</i> , <i>Windhausenina</i> , <i>Macrauchenia oopsis ense-</i>		DM

Table S4.9: Dietary data for South American fossil taxa, cont.

659						<i>nadensis</i> , <i>Macrauchenia</i> <i>patachonica</i> , <i>Pseudo-</i> <i>macrauche-</i> <i>nia</i> , <i>Xenorhi-</i> <i>notherium ba-</i> <i>hiense</i>	
	<i>Oxydontherium</i> <i>piramy-</i> <i>datum</i> , <i>O. sp.</i> , <i>O.</i> <i>zeballozi</i>	MF		(MacFadden and Shockey 1997)	SSF	<i>Macrauchenia</i> <i>patachonica</i>	<i>Macrauchenia</i> <i>patachonica</i> DM, SI
	<i>Oxydontherium</i> <i>piramy-</i> <i>datum</i> , <i>O. sp.</i> , <i>O.</i> <i>zeballozi</i>	MF		(MacFadden 2000)	SSF	<i>Macrauchenia</i> <i>patachonica</i>	<i>Macrauchenia</i> <i>patachonica</i> CDM, SI
	<i>Oxydontherium</i> <i>piramy-</i> <i>datum</i> , <i>O. sp.</i> , <i>O.</i> <i>zeballozi</i>	MF	$\delta^{13}\text{C}$ consistent with mixed feed- ing in most (5) cases, browsing in 2 cases	(Domingo, Pra- do, and Alberdi 2012)	SSF	<i>Macrauchenia</i> <i>patachonica</i> , <i>Macraucheni-</i> <i>opsis?</i>	<i>Macrauchenia</i> <i>patachonica</i> , <i>Macraucheni-</i> <i>opsis?</i> SI
	<i>Oxydontherium</i> <i>piramy-</i> <i>datum</i> , <i>O. sp.</i> , <i>O.</i> <i>zeballozi</i>		<i>Oxydontherium</i> is in <i>Macraucheniinae</i> , <i>Macrauche-</i> <i>niinae</i> is monophyletic	(Schmidt and Ferrero 2014)	SSF	<i>Macrauche-</i> <i>niidae</i>	PB
	<i>Oxydontherium</i> <i>piramy-</i> <i>datum</i> , <i>O. sp.</i> , <i>O.</i> <i>zeballozi</i>	MF to Fl		(Varela 2014)	SSF	<i>Macrauchenia</i> <i>patachonica</i>	<i>Macrauchenia</i> <i>patachonica</i> BM
	<i>Oxydontherium</i> <i>piramy-</i> <i>datum</i>	MF	$\delta^{13}\text{C}$ consistent with mixed feed- ing	(França et al. 2015)	SSF	<i>Macrauchenia</i>	<i>Macrauchenia</i> LR, SI

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>datus</i> , <i>O. sp.</i> , <i>O. zeballozi</i>							
<i>Oxydontherium piramy-</i>	MF			Sum			
<i>datus</i>, <i>O. sp.</i>, <i>O. zeballozi</i>							
<i>Ozotoceros bezoarticus</i>, <i>O. sp.</i>	MF	Grasses seasonally important, but selects heavily for herbs, browsing secondary importance	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax, SG	<i>Ozotoceros bezoarticus</i>	<i>Ozotoceros bezoarticus</i>	LR-E
<i>Pachyarmatherium brasiliense</i>, <i>P. tenebris</i>	Fm		(Croft 2016)	WG	<i>Pachyarmatherium</i>	<i>Pachyarmatherium</i>	CMM
<i>Pachyrukhos</i> sp.	Gz	Selective grazing, convergent on <i>Dolichotis patagonum</i>	(Reguero, Dozo, and Cerdeño 2007)	SF	<i>Medistylus</i> , <i>Prosotherium</i> , <i>Propachyru-</i> <i>cos</i>	<i>Medistylus</i> , <i>Prosotherium</i> , <i>Propachyru-</i> <i>cos</i>	CDM
<i>Pachyrukhos</i> sp.	Gz or Gz- Rz	For typotheres, particularly <i>Hegetotherium</i> , hypsodonty may be associated with digging habit and not diet	(Cassini et al. 2011)	Tax	<i>Hegetotherium</i> , <i>Pachyrukhos</i>	<i>Hegetotherium</i> , <i>Pachyrukhos</i>	CMM
<i>Pachyrukhos</i> sp.	Herb	Typical biomechanical configuration for a specialized herbivore	(Cassini and Vizcaíno 2012)	WG	<i>Pachyrukhos</i>	<i>Pachyrukhos</i>	BM
<i>Pachyrukhos</i> sp.	Gz	<i>Hegetotherium</i> : Exaggerated features related to open habitats and grazing	(Cassini, Vizcaíno, and Bargo 2012)	SG	<i>Hegetotherium mirabile</i> , <i>Pachyrukhos moyani</i>	<i>Hegetotherium mirabile</i> , <i>Pachyrukhos moyani</i>	CMM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Pachyrukhos</i> sp.	Gz		(Kay, Vizcaíno, and Bargo 2012)	SF	<i>Hegetotherium mirabile</i>	<i>Hegetotherium mirabile</i>	Un
<i>Pachyrukhos</i> sp.	In	"Mammalian woodpeckers" feeding on insects and grub in fallen trees, logs	(McCoy and Norris 2012)	SF	<i>Hegetotherium mirabile</i>	<i>Hegetotherium mirabile</i>	CMDM
<i>Pachyrukhos</i> sp.	GH	Leaves or grasses depending on availability	(Cassini 2013)	SF	<i>Hegetotherium</i>	<i>Hegetotherium</i>	CGM
<i>Pachyrukhos</i> sp.	Gz-Rz			Sum			
<i>Paedotherium bonaerense</i> , <i>P. minor</i> , <i>P. sp.</i> , <i>P. typicum</i>	Gz	"dietary specialization for highly abrasive food with hard substrate (dust and ash)."	(Candela, Noriega, and Reguero 2007)	Tax, SG	<i>Paedotherium typicum</i>	<i>Paedotherium typicum</i>	CMDM
<i>Paedotherium bonaerense</i> , <i>P. minor</i> , <i>P. sp.</i> , <i>P. typicum</i>	Gz-Rz	This study, based on: <i>Paedotherium</i> was fossorial (Elissamburu 2004) and mesotheres (also not ungulates) likely have such high hypsodonty (like <i>Paedotherium</i>) because of diet of roots (Shockey, Croft, and Anaya 2007) and tubers covered in grit	(Elissamburu 2004; Shockey, Croft, and Anaya 2007)	WG	<i>Paedotherium</i>		MC:FR
<i>Paedotherium bonaerense</i> , <i>P. minor</i> , <i>P. sp.</i> , <i>P. typicum</i>	MF	Hypsodonty may have resulted from high grit intake rather than exclusive grazing, but had diet low to ground and covered in grit	(Reguero et al. 2015)	Tax, SG	<i>Paedotherium bonaerense</i> , <i>P. kakai</i> , <i>P. minor</i> , <i>P. typicum</i>	<i>Paedotherium bonaerense</i> , <i>P. kakai</i> , <i>P. minor</i> , <i>P. typicum</i>	DM, size
<i>Paedotherium bonaerense</i> , <i>P. minor</i> , <i>P. sp.</i> , <i>P. typicum</i>	Gz	Fed "on low vegetation, perhaps in both open and forested habitats"	(Croft 2016)	Tax, SG	<i>Paedotherium typicum</i>	<i>Paedotherium typicum</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>typicum</i>							
<i>Paedotherium bonaerense</i>, <i>P. minor</i>, <i>P. sp.</i>, <i>P. typicum</i>	Gz-Rz			Sum			
<i>Palaehoplophorus antiquus</i>	MF	Relationship: Similar temporal trends in multiple lineages of glyptodonts: Intermediate between Miocene browsers and Pleistocene grazers	(Vizcaíno, Cassini, et al. 2011)	See	<i>Hoplophrac-tus</i>, <i>Eosclero-calyptus</i>, <i>Urotherium</i>	<i>Hoplophrac-tus</i>, <i>Eosclero-calyptus</i>, <i>Urotherium</i>	CDM
<i>Palaeocavia</i> sp.	MF	<i>Cavia</i> : Mostly grazers but also eat grass inflorescences, <i>Galea</i> : "herbivores", <i>Microcavia australis</i> : generalist herbivores (leaves, grasses, seeds, flowers, berries)	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SSF	<i>Cavia</i> , <i>Galea</i> , <i>Microcavia</i>	<i>Cavia</i> , <i>Galea</i> , <i>Microcavia</i>	LR-E
<i>Palaeocavia</i> sp.	Gz	<i>Cavia</i> : grazers	(Townsend and Croft 2008b)	SSF	<i>Cavia</i>	<i>Cavia</i>	LR-E
<i>Palaeocavia</i> sp.	Gz	Open habitat grazers	(Cassini 2013)	SSF	<i>Procavia</i>	<i>Procavia</i>	Un
<i>Palaeocavia</i> sp.	MF	<i>Cavia</i> : Mainly grazers but also eat grass inflorescences, <i>Galea</i> : "herbivores", <i>Microcavia australis</i> : Mixed feeder to browser (leaves, shoots, flowers, fruits, bark), <i>Microcavia niata</i> : Mixed feeders (herbaceous plants, grasses, aquatic plants)	(Patton, Pardiñas, and D'Elía 2015)	SSF	<i>Cavia</i> , <i>Galea</i> , <i>Microcavia</i>	<i>Cavia</i> , <i>Galea</i> , <i>Microcavia</i>	LR-E
<i>Palaeocavia</i> sp.	MF	<i>Galea</i> : grasses and shrubs though less C ₄ than previously thought,	(Fernández et al. 2016)	SSF	<i>Galea leuco-blephara</i> , <i>Mi-</i>	<i>Galea leuco-blephara</i> , <i>Mi-</i>	SI

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Microcavia</i> : mostly shrubs				<i>crocavia aus-</i> <i>tralis</i>	<i>crocavia aus-</i> <i>tralis</i>	
<i>Palaeocavia</i> sp.	MF		Sum			
<i>Palaeolama ma-</i> <i>jor</i> , <i>P. sp.</i> , <i>P.</i> <i>weddelli</i>	Fl	(Dompierre and Churcher 1996)	Tax, SG	<i>Palaeolama</i> <i>weddelli</i> , <i>Hemiauchenia</i> <i>macrocephala</i> , Alforjas sp. and <i>Hemi-</i> <i>auchenia</i> ?vera	<i>Palaeolama</i> <i>weddelli</i> , <i>Hemiauchenia</i> <i>macrocephala</i> , Alforjas sp. and <i>Hemi-</i> <i>auchenia</i> ?vera	MM
<i>Palaeolama ma-</i> <i>jor</i> , <i>P. sp.</i> , <i>P.</i> <i>weddelli</i>	Fl	(Macfadden and Cerling 1996)	WG	<i>Palaeolama</i> , <i>Hemiauchenia</i>	<i>Palaeolama</i> , <i>Hemiauchenia</i>	SI
<i>Palaeolama ma-</i> <i>jor</i> , <i>P. sp.</i> , <i>P.</i> <i>weddelli</i>	Fl	(MacFadden 1997)	WG	<i>Palaeolama</i> , <i>Hemiauchenia</i>	<i>Palaeolama</i> , <i>Hemiauchenia</i>	LR
<i>Palaeolama ma-</i> <i>jor</i> , <i>P. sp.</i> , <i>P.</i> <i>weddelli</i>	Fl	(Marcolino et al. 2012)	Tax, SG	<i>Palaeolama</i> <i>major</i>	<i>Palaeolama</i> <i>major</i>	CA
<i>Palaeolama ma-</i> <i>jor</i> , <i>P. sp.</i> , <i>P.</i> <i>weddelli</i>	Fl	(Scherer 2013)	WG	<i>Palaeolama</i> , <i>Hemiauchenia</i>	<i>Palaeolama</i> , <i>Hemiauchenia</i>	LR
<i>Palaeolama ma-</i> <i>jor</i> , <i>P. sp.</i> , <i>P.</i> <i>weddelli</i>	Fl	Specialist on browse (Yann 2014)	WG	<i>Palaeolama</i> , <i>Hemiauchenia</i>	<i>Palaeolama</i> , <i>Hemiauchenia</i>	SI
<i>Palaeolama ma-</i> <i>jor</i> , <i>P. sp.</i> , <i>P.</i> <i>weddelli</i>	Fl	Specialist on browse (Yann and De- Santis 2014)	SG	<i>Palaeolama</i> <i>mirifica</i> , <i>Hem-</i> <i>iauchenia</i> <i>macrocephala</i>	<i>Palaeolama</i> <i>mirifica</i> , <i>Hemiauchenia</i> <i>macrocephala</i>	SI

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Palaeolama major</i> , <i>P. sp.</i> , <i>P. weddelli</i>	Fl			Sum			
<i>Palaeomyrmidon</i> sp.	Fm		(McDonald, Vizcaíno, and Bargo 2008)	Tax	<i>Palaeomyrmidon</i>	<i>Palaeomyrmidon</i>	PB, CLR, CM
<i>Paleuphractus</i> sp.	Om	Omnivore-carnivore clade of armadillos	(Vizcaíno 2009)	WT	Euphractini	Euphractini	LR
<i>Pampatherium humboldtii</i>	Gz	Intermediate between <i>Holmesina occidentalis</i> and <i>Pampatherium typum</i> in terms of coarseness of diet; Very capable grinder	(Iuliis, Bargo, and Vizcaíno 2001)	Tax	<i>Pampatherium humboldtii</i>	<i>Pampatherium humboldtii</i>	BM
<i>Pampatherium humboldtii</i>	Gz	Differences between <i>Holmesina</i> and <i>Pampatherium</i> species relate to environments (more humid v. semi-arid) rather than diet	(Carlini and Zurita 2010)	WG	<i>Holmesina</i> and <i>Pampatherium</i>	<i>Holmesina</i> and <i>Pampatherium</i>	LR
<i>Pampatherium humboldtii</i>	Gz			Sum			
<i>Pampatherium</i> sp.	Gz	Very capable grinders	(Iuliis, Bargo, and Vizcaíno 2001)	SG	<i>Pampatherium humboldtii</i> , <i>P. typum</i>	<i>Pampatherium humboldtii</i> , <i>P. typum</i>	BM
<i>Pampatherium</i> sp.	Gz	Differences between <i>Holmesina</i> and <i>Pampatherium</i> species relate to environments (more humid v. semi-arid) rather than diet	(Carlini and Zurita 2010)	WG	<i>Holmesina</i> and <i>Pampatherium</i>	<i>Holmesina</i> and <i>Pampatherium</i>	LR
<i>Pampatherium</i> sp.	Gz			Sum			

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Pampatherium typum</i>	Gz	Most coarse diet out of all <i>Holmesina</i> and <i>Pampatherium</i> spp.	(Iuliis, Bargo, and Vizcaíno 2001)	Tax	<i>Pampatherium typum</i>	<i>Pampatherium typum</i>	BM
<i>Pampatherium typum</i>	Gz	Differences between <i>Holmesina</i> and <i>Pampatherium</i> species relate to environments (more humid v. semi-arid) rather than diet	(Carlini and Zurita 2010)	WG	<i>Holmesina</i> and <i>Pampatherium</i>	<i>Holmesina</i> and <i>Pampatherium</i>	LR
<i>Pampatherium typum</i>	Gz	Sum					
<i>Panochthus greslebini</i> , <i>P. intermedius</i> , <i>P. sp.</i> , <i>P. tuberculatus</i>	Gz		(Fariña 1985)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CMM
<i>Panochthus greslebini</i> , <i>P. intermedius</i> , <i>P. sp.</i> , <i>P. tuberculatus</i>	Gz		(Pérez, Scillato-Yané, and Vizcaino 2000)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CM
<i>Panochthus greslebini</i> , <i>P. intermedius</i> , <i>P. sp.</i> , <i>P. tuberculatus</i>	Gz		(Fariña and Vizcaíno 2001)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CMDM
<i>Panochthus greslebini</i> , <i>P. intermedius</i> , <i>P. sp.</i> , <i>P. tuberculatus</i>	Gz	<i>Panochthus</i> and <i>Sclerocalyptus</i> : grazers in cold, semiarid, open environments	(Zurita, Scillato-Yané, and Carlini 2005)	WG	<i>Panochthus</i> and <i>Sclerocalyptus</i>	Plio-Pleistocene Glyptodontidae	LR

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Panochthus greslebini</i> , <i>P. intermedius</i> , <i>P. sp.</i> , <i>P. tuberculatus</i>	Gz		(Rincón, White, and McDonald 2008)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	LR
<i>Panochthus greslebini</i> , <i>P. intermedius</i> , <i>P. sp.</i> , <i>P. tuberculatus</i>	Gz	Bulk feeders in open environments	(Vizcaíno, Cassini, et al. 2011)	WG	<i>Panochthus</i>	<i>Panochthus</i>	DMM
<i>Panochthus greslebini</i>, <i>P. intermedius</i>, <i>P. sp.</i>, <i>P. tuberculatus</i>	Gz			Sum			
<i>Panthera onca</i> , <i>P. sp.</i>	HC	Could prey on large mammals and juvenile megamammals	(Prevosti and Vizcaíno 2006)	Tax, SG	<i>Panthera onca</i>	<i>Panthera onca</i>	CDM, PCM
<i>Panthera onca</i> , <i>P. sp.</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax, SG	<i>Panthera onca</i>	<i>Panthera onca</i>	DM
<i>Panthera onca</i> , <i>P. sp.</i>	HC	Gnawed bones of <i>Mylodon</i> , <i>Hippidion</i> and camelids; Stable isotopes: Ate large proportions of <i>Hippidion</i> and <i>Lama gracilis</i>	(Prevosti and Martin 2013)	Tax, SG	<i>Panthera onca</i>	<i>Panthera onca</i>	CDM, PCM, SI, Tph
<i>Panthera onca</i>, <i>P. sp.</i>	HC			Sum			
<i>Paraeuphractus sp.</i>	Om	Omnivore-carnivore clade of armadillos	(Vizcaíno 2009)	WT	Euphractini	Euphractini	LR
<i>Paraeuphractus</i>	Gz		(Fariña 1985)	AGp	<i>Glyptodon</i>	Plio-	CMM

Table S4.9: Dietary data for South American fossil taxa, cont.

sp.						Pleistocene Glyptodontidae	
<i>Paraeuphractus</i> sp.	Gz		(Pérez, Scillato-Yané, and Vizcaino 2000)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CM
<i>Paraeuphractus</i> sp.	Gz		(Fariña and Vizcaíno 2001)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CMDM
<i>Paraeuphractus</i> sp.	Gz	<i>Panochthus</i> and <i>Sclerocalyptus</i> : grazers in cold, semiarid, open environments	(Pomi 2008)	AGp	<i>Panochthus</i> and <i>Sclerocalyptus</i>	Plio-Pleistocene Glyptodontidae	LR
<i>Paraeuphractus</i> sp.	Gz		(Rincón, White, and Mcdonald 2008)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	LR
<i>Paraeuphractus</i> sp.	Gz	Relationship: Plio-Pleistocene glyptodonts shared dental morphology and diet based on authors above; Diet: Bulk feeders in moderately open to open habitats	(Vizcaíno 2009)	AGp	<i>Doedicurus</i> , <i>Panochthus</i> , <i>Neuryurus</i> , <i>Neosclerocalyptus</i>	<i>Doedicurus</i> , <i>Panochthus</i> , <i>Neuryurus</i> , <i>Neosclerocalyptus</i>	DMM
<i>Paraeuphractus</i> sp.	Gz			Sum		Plio-Pleistocene Glyptodontidae	

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Paramyocastor diligens</i>	Fr-Gn	This study, based on: Relationship: Ecologically more similar to Eumysopinae than extant <i>Myocastor</i> , and probably is in a clade with <i>Thrichomys</i> , <i>Hoplomys</i> , and <i>Proechimys</i> (Galewski et al. 2005; Candela, Noriega, and Reguero 2007); Diet: <i>Hoplomys</i> : Frugivore-granivore, <i>Proechimys</i> : Frugivore-granivore, <i>Thrichomys</i> : Frugivore-insectivore and Frugivore-browser, also <i>Clyomys</i> : Granivore, <i>Euryzygomatomys spinosus</i> : "herbivore", <i>Lonchothrix</i> : frugivore?, <i>Trinomys</i> : Frugivore-granivore (Patton, Pardiñas, and D'Elía 2015)	(Galewski et al. 2005; Candela, Noriega, and Reguero 2007; Patton, Pardiñas, and D'Elía 2015)	See	<i>Clyomys</i> , <i>Euryzygomatomys</i> , <i>Hoplomys</i> , <i>Lonchothrix</i> , <i>Proechimys</i> , <i>Thrichomys</i> , <i>Trinomys</i>	<i>Clyomys</i> , <i>Euryzygomatomys</i> , <i>Hoplomys</i> , <i>Lonchothrix</i> , <i>Proechimys</i> , <i>Thrichomys</i> , <i>Trinomys</i>	LR
<i>Paranabradys vucetichae</i>	Fl		(Pujos et al. 2012)	WF	Megalo-nychidae	Megalo-nychidae	PB
<i>Paranauchenia denticulata</i>	MF	This study, based on: More hypsodont (protohypsodont) than earlier macraucheniiids, probably preferred open environments (Bond et al. 1995)	(Bond et al. 1995)	SSF	<i>Promacrauchenia antiqua</i> , <i>P. kraglievichi</i> , <i>P. chapalmalense</i> , <i>Windhausenina</i> , <i>Macrauchenia</i>	<i>Promacrauchenia antiqua</i> , <i>P. kraglievichi</i> , <i>P. chapalmalense</i> , <i>Windhausenina</i> , <i>Macrauchenia</i>	DM

Table S4.9: Dietary data for South American fossil taxa, cont.

					<i>opsis ense-nadensis, Macrauchenia patachonica, Pseudo-macrauchenia, Xenorhinotherium bahiense</i>	<i>opsis ense-nadensis, Macrauchenia patachonica, Pseudo-macrauchenia, Xenorhinotherium bahiense</i>	
<i>Paranauchenia denticulata</i>	MF	Mixed feeding consistent with macraucheniid skeletal and dental morphology	(Bond 1999)	SSF	<i>Promacrauchenia antiqua, P. kraglievichi, P. chapalmalense, Windhausenian, Macrauchenio-opsis ense-nadensis, Macrauchenia patachonica, Pseudo-macrauchenia, Xenorhinotherium bahiense</i>	" <i>Macrauchenia</i> and macrauchenids in general"	DM, PCM
<i>Paranauchenia denticulata</i>	MF		(MacFadden and Shockey 1997)	SSF	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i>	DM, SI

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Paranauchenia denticulata</i>	MF		(MacFadden 2000)	SSF	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i>	CDM, SI
<i>Paranauchenia denticulata</i>	MF	$\delta^{13}\text{C}$ consistent with mixed feeding in most (5) cases, browsing in 2 cases	(Domingo, Prado, and Alberdi 2012)	SSF	<i>Macrauchenia patachonica</i> , <i>Macrauchenio-opsis?</i>	<i>Macrauchenia patachonica</i> , <i>Macrauchenio-opsis?</i>	SI
<i>Paranauchenia denticulata</i>		<i>Paranauchenia</i> is in Macraucheniinae, Macraucheniinae is monophyletic (Schmidt and Ferrero 2014)	(Schmidt and Ferrero 2014)	WF	Macraucheniidae		PB
<i>Paranauchenia denticulata</i>	MF to Fl		(Varela 2014)	SSF	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i>	BM
<i>Paranauchenia denticulata</i>	MF	$\delta^{13}\text{C}$ consistent with mixed feeding	(França et al. 2015)	SSF	<i>Macrauchenia</i>	<i>Macrauchenia</i>	LR, SI
<i>Paranauchenia denticulata</i>	MF	Both C ₄ grasses and other low-growing plants and leaves of trees and shrubs	(Croft 2016)	SSF	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i>	Un
<i>Paranauchenia denticulata</i>	MF			Sum			
<i>Parapropalaehopliphorus septentrionalis</i>	Fl	This study, based on: Relationship: Basal to Propalaehopliphorinae (Croft, Flynn, and Wyss 2007); Diet: Other propalaehopliphorines are highly selective to selective feeders in relatively closed to moderately open habitats (Vizcaíno, Cassini, et al. 2011)	(Croft, Flynn, and Wyss 2007; Vizcaíno, Cassini, et al. 2011)	See	<i>Eucinepeltus, Propalaehopliphorus, Cochlops</i>	<i>Eucinepeltus, Propalaehopliphorus, Cochlops</i>	CDM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Paratrigodon</i> sp.	GH	Diet varies from C ₃ browser in closed canopy to open grassland C ₄ grazer	(MacFadden 2005)	SF, PB	<i>Toxodon</i> (Toxodonti- nae) and <i>Mix- otoxodon</i> (Haplodonthe- riinae)	<i>Toxodon</i> (Toxodonti- nae) and <i>Mix- otoxodon</i> (Haplodonthe- riinae)	SI
<i>Paratrigodon</i> sp.	Fl		(Townsend and Croft 2008a)	SF, PB	<i>Toxodon</i> (Toxodonti- nae) and <i>Mix- otoxodon</i> (Haplodonthe- riinae)	<i>Toxodon</i> (Toxodonti- nae) and <i>Mix- otoxodon</i> (Haplodonthe- riinae)	DMc
<i>Paratrigodon</i> sp.	Gz or MF		(Cassini et al. 2011)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon im- bricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon im- bricatus</i>)	CMM
<i>Paratrigodon</i> sp.	GH		(Cassini and Vizcaíno 2012)	SF, PB	<i>Nesodon</i>	<i>Nesodon</i>	BM
<i>Paratrigodon</i> sp.	GH		(Cassini, Viz- caíno, and Bar- go 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	CM
<i>Paratrigodon</i> sp.	Gz		(Cassini et al. 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	CDM
<i>Paratrigodon</i> sp.	GH		(Cassini, Flores, and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon im- bricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon im- bricatus</i>)	CO, CM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Paratrigodon</i> sp.	Gz		(Kay, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	LR
<i>Paratrigodon</i> sp.	GH	Diet dependent on availability: Browse to graze	(Cassini 2013)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	CGM
<i>Paratrigodon</i> sp.	GH			Sum		Toxodontidae	
<i>Patagosmilus goini</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Patagosmilus goini</i>	<i>Patagosmilus goini</i>	DM
<i>Patasola magdalenae</i>	Fr		(Fleagle, Kay, and Anthony 1997)	Tax	<i>Patasola magdalenae</i>	<i>Patasola magdalenae</i>	DM
<i>Patasola magdalenae</i>	In-Fr	Insects with fruits	(Kay and Madden 1997b)	Tax	<i>Patasola magdalenae</i>	<i>Patasola magdalenae</i>	Un
<i>Patasola magdalenae</i>	Fr-Gm	Gum or fruit eater	(Kay and Meldrum 1997)	Tax	<i>Patasola magdalenae</i>	<i>Patasola magdalenae</i>	DM
<i>Patasola magdalenae</i>	Fr-In			Sum			
<i>Dolichotis (Pediolagus) salinicola</i>	MF	About half shrubs, the rest grasses and forbs	(Bonino et al. 1997)	SG	<i>Dolichotis patagonum</i>	<i>Dolichotis patagonum</i>	FA
<i>Dolichotis (Pediolagus) salinicola</i>	Gz to MF	Grasses dominant, then shrubs, rare forbs; Only selective in drought when it prefers shrubs and forbs	(Puig et al. 2010)	SG	<i>Dolichotis patagonum</i>	<i>Dolichotis patagonum</i>	FA

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Dolichotis (Pediolagus) salinicola</i>	Gz to MF	Green vegetation (prefers grasses over forbs and shrubs) and fruits	(Patton, Pardiñas, and D'Elía 2015)	SG	<i>Dolichotis patagonum</i>	<i>Dolichotis patagonum</i>	LR-E
<i>Dolichotis (Pediolagus) salinicola</i>	MF			Sum			
<i>Pedrolypeutes praecursor</i>	In		(Carlini et al. 1997)	Tax	<i>Pedrolypeutes praecursor</i>	<i>Pedrolypeutes praecursor</i>	Un
<i>Pedrolypeutes praecursor</i>	Fm		(Kay and Madden 1997b)	Tax	<i>Pedrolypeutes praecursor</i>	<i>Pedrolypeutes praecursor</i>	Un
<i>Pedrolypeutes praecursor</i>	Fm			Sum			
<i>Peltephilus pumilus</i> , <i>P. sp.</i>	Rz-Sc	Unlike previous hypotheses, could not have been efficient hunter, but masticatory musculature, horns, and postcranial anatomy all consistent with digging for roots/tubers	(Fariña and Vizcaíno 1997)	WG	<i>Peltephilus</i>	<i>Peltephilus</i>	CMDM
<i>Peltephilus pumilus</i> , <i>P. sp.</i>	Rz		(Bargo 2003)	WG	<i>Peltephilus</i>	<i>Peltephilus</i>	LR
<i>Peltephilus pumilus</i> , <i>P. sp.</i>	Rz-Sc		(Vizcaíno 2009)	WG	Peltephines	Peltephines	CMDM
<i>Peltephilus pumilus</i> , <i>P. sp.</i>	Rz-Sc	Scavenging and tubers	(Kay, Vizcaíno, and Bargo 2012)	Tax, SG	<i>Peltephilus pumilus</i>	<i>Peltephilus pumilus</i>	Un
<i>Peltephilus pumilus</i>, <i>P. sp.</i>	Rz-Sc	Scavenging and tubers		Sum			
<i>Pericotoxodon platignathus</i>	GH	Diet varies from C ₃ browser in closed canopy to open grassland C ₄ grazer	(MacFadden 2005)	SF, PB	<i>Toxodon</i> (Toxodontinae) and <i>Mix-</i>	<i>Toxodon</i> (Toxodontinae) and <i>Mix-</i>	SI

Table S4.9: Dietary data for South American fossil taxa, cont.

				<i>otoxodon</i> (Haplodonthe- riinae)	<i>otoxodon</i> (Haplodonthe- riinae)	
<i>Pericotoxodon platignathus</i>	Fl	(Townsend and Croft 2008a)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	DMc
<i>Pericotoxodon platignathus</i>	Gz or MF	(Cassini et al. 2011)	SF, PB	<i>Nesodon</i>	<i>Nesodon</i>	CMM
<i>Pericotoxodon platignathus</i>	GH	(Cassini and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	BM
<i>Pericotoxodon platignathus</i>	GH	(Cassini, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	CM
<i>Pericotoxodon platignathus</i>	Gz	(Guillermo H. Cassini et al. 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CDM
<i>Pericotoxodon platignathus</i>	GH	(Cassini, Flores, and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CO, CM
<i>Pericotoxodon platignathus</i>	Gz	(Kay, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	LR

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Pericotoxodon platignathus</i>	GH	Diet dependent on availability: Browse to graze	(Cassini 2013)	SF, PB	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon im-</i> <i>bricatus</i>)	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon im-</i> <i>bricatus</i>)	CGM
<i>Pericotoxodon platignathus</i>	GH			Sum		Toxodonti- dae	
<i>Phlyctaenopyga</i> sp.	Gz		(Fariña 1985)	AGp	<i>Glyptodon</i>	Plio- Pleistocene Glyptodonti- dae	CMM
<i>Phlyctaenopyga</i> sp.	Gz		(Pérez, Scillato- Yané, and Viz- caino 2000)	AGp	<i>Glyptodon</i>	Plio- Pleistocene Glyptodonti- dae	CM
<i>Phlyctaenopyga</i> sp.	Gz		(Fariña and Vizcaíno 2001)	AGp	<i>Glyptodon</i>	Plio- Pleistocene Glyptodonti- dae	CMDM
<i>Phlyctaenopyga</i> sp.	Gz	<i>Panochthus</i> and <i>Sclerocalyptus</i> : grazers in cold, semiarid, open environments	(Zurita, Scilla- to-Yané, and Carlini 2005)	AGp	<i>Panochthus</i> and <i>Sclero-</i> <i>calyptus</i>	Plio- Pleistocene Glyptodonti- dae	LR
<i>Phlyctaenopyga</i> sp.	Gz		(Rincón, White, and McDonald 2008)	AGp	<i>Glyptodon</i>	Plio- Pleistocene Glyptodonti- dae	LR
<i>Phlyctaenopyga</i> sp.	Gz	Relationship: Plio-Pleistocene glyptodonts shared dental mor- phology and diet based on authors	(Vizcaíno, Cas- sini, et al. 2011)	See	<i>Doedicurus</i> , <i>Panochthus</i> , <i>Neuryurus</i> ,	<i>Doedicurus</i> , <i>Panochthus</i> , <i>Neuryurus</i> ,	CDM

Table S4.9: Dietary data for South American fossil taxa, cont.

		above; Diet: Bulk feeders in moderately open to open habitats				<i>Neosclerocalyptus</i>	<i>Neosclerocalyptus</i>	
<i>Phlyctaenopyga</i> sp.	Gz			Sum			Plio-Pleistocene Glyptodontidae	
<i>Phoberomys bordasi</i> , <i>P. burmeisteri</i> , <i>P. insolita</i> , <i>P. lozanoi</i> , <i>P. minima</i> , <i>P. pattersoni</i> , <i>P. praecursor</i> , <i>P. sp.</i>	Gz	Abrasive diet, probably including seagrasses	(Sánchez-Villagra, Aguilera, and Horovitz 2003)	Tax, SG	<i>Phoberomys pattersoni</i>	<i>Phoberomys pattersoni</i>	Hb, RFC, DMM	
<i>Phoberomys bordasi</i> , <i>P. burmeisteri</i> , <i>P. insolita</i> , <i>P. lozanoi</i> , <i>P. minima</i> , <i>P. pattersoni</i> , <i>P. praecursor</i> , <i>P. sp.</i>	Gz	Abrasive diet, includes seagrasses	(Horovitz et al. 2010)	Tax, SG	<i>Phoberomys pattersoni</i>	<i>Phoberomys pattersoni</i>	DM	
<i>Phoberomys bordasi</i> , <i>P. burmeisteri</i> , <i>P. insolita</i> , <i>P. lozanoi</i> , <i>P. minima</i> , <i>P. pattersoni</i> , <i>P. praecursor</i> , <i>P. sp.</i>	Gz	Abrasive diet, includes seagrasses; may have used forelimbs for food manipulation	(Geiger et al. 2013)	Tax, SG	<i>Phoberomys pattersoni</i>	<i>Phoberomys pattersoni</i>	DM, PCM	

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Phoberomys bordasi</i> , <i>P. burmeisteri</i> , <i>P. insolita</i> , <i>P. lozanoi</i> , <i>P. minima</i> , <i>P. pattersoni</i> , <i>P. praecursor</i> , <i>P. sp.</i>	Gz			Sum			
<i>Phugatherium cataclisticum</i> , <i>P. novum</i> , <i>P. sp.</i>	Gz	Grasses and aquatic plants	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	CLR	<i>Hydrochoerus</i>	<i>Hydrochoerus hydrochaeris</i>	LR-E
<i>Phugatherium cataclisticum</i> , <i>P. novum</i> , <i>P. sp.</i>	MF		(MacFadden and Shockey 1997)	SF	<i>Nechoerus tarijensis</i>	<i>Nechoerus tarijensis</i>	SI
<i>Phugatherium cataclisticum</i> , <i>P. novum</i> , <i>P. sp.</i>	Gz	This study, based on stable isotope data (MacFadden and Shockey 1997): Aquatic plants, including most aquatic grasses, are C ₃ , with a few examples that will use C ₃ - C ₄ intermediate or C ₄ under particular conditions (Bowes et al. 2002) so a diet of terrestrial and aquatic grasses would likely appear by stable isotope analysis to be "mixed feeding"	(MacFadden and Shockey 1997; Bowes et al. 2002)	SF	<i>Nechoerus tarijensis</i>	<i>Nechoerus tarijensis</i>	SI
<i>Phugatherium</i>	Gz	This study, based on: Similarity	(Vucetich, Des-	WG	<i>Phugatheri-</i>		MA &

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>cataclisticum</i> , <i>P. novum</i> , <i>P. sp.</i>		to extant capybaras in terms of size, herding, and semiaquatic habits (Vucetich, Deschamps, et al. 2005; Vucetich, Deschamps, and Pérez 2013; Vucetich et al. 2014; Vucetich et al. 2015)	champs, et al. 2005; Vucetich, Deschamps, and Pérez 2013; Vucetich et al. 2014; Vucetich et al. 2015)		<i>um</i> , <i>Cardia-therium</i>		CLR
<i>Phugatherium cataclisticum</i> , <i>P. novum</i> , <i>P. sp.</i>	Gz		(Webb 2006)	WF	Hydro-choeridae	Hydro-choeridae	Un
<i>Phugatherium cataclisticum</i> , <i>P. novum</i> , <i>P. sp.</i>	Gz	Grasses, sedges, and aquatic plants	(Patton, Pardiñas, and D’Elía 2015)	CLR	<i>Hydrochoerus hydrochaeris</i>	<i>Hydrochoerus hydrochaeris</i>	LR-E
<i>Phugatherium cataclisticum</i> , <i>P. novum</i> , <i>P. sp.</i>	Gz			Sum		Capybaras	
<i>Phyllotis anitae</i> , <i>P. sp.</i>	Om	<i>P. amicus</i> : Broadly omnivorous- Leafy vegetation about half of diet (typical of genus), but more insects and less seed than most spp.; <i>P andium</i> : More leafy vegetation and less seed than most spp.- 43% grass, 31% forbs, 4% seeds, 22% insects; <i>P. limatus</i> : Insects and forbs, with very little seed or grass; <i>P. osilae</i> : omnivorous, relies most on grass and seeds; <i>P. xanthopygus</i> : Omnivorous	(Patton, Pardiñas, and D’Elía 2015)	WG	<i>P. amicus</i> , <i>P. andium</i> , <i>P. limatus</i> , <i>P. osilae</i> , <i>P. xanthopygus</i>	<i>P. amicus</i> , <i>P. andium</i> , <i>P. limatus</i> , <i>P. osilae</i> , <i>P. xanthopygus</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Pisanodon</i> sp.	GH	Diet varies from C ₃ browser in closed canopy to open grassland C ₄ grazer	(MacFadden 2005)	SF, PB	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	SI
<i>Pisanodon</i> sp.	Fl		(Townsend and Croft 2008a)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	DMc
<i>Pisanodon</i> sp.	Gz or MF		(Cassini et al. 2011)	SF, PB	<i>Nesodon</i>	<i>Nesodon</i>	CMM
<i>Pisanodon</i> sp.	GH		(Cassini and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	BM
<i>Pisanodon</i> sp.	GH		(Cassini, Vizcaíno, and Bar-go 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	CM
<i>Pisanodon</i> sp.	Gz		(Cassini et al. 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CDM
<i>Pisanodon</i> sp.	GH		(Cassini, Flores, and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CO, CM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Pisanodon</i> sp.	Gz		(Kay, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	LR
<i>Pisanodon</i> sp.	GH	Diet dependent on availability: Browse to graze	(Cassini 2013)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CGM
<i>Pisanodon</i> sp.	GH			Sum		Toxodontidae	
<i>Pithanotomys columnaris</i> , <i>P. macer</i> , <i>P. sp.</i>	GH	Relationship: Either very closely related to or synonymous with <i>Aconaemys</i> (Reig 1986; Reig 1989), Diet: <i>Aconaemys fuscus</i> : pinenuts, roots, bulbs; <i>A. porteri</i> : Leaves, sprouts, small bamboo branches, other vegetation; <i>A. sagei</i> : Green vegetable matter only (Patton, Pardiñas, and D'Elía 2015)	(Reig 1986; Reig 1989; Patton, Pardiñas, and D'Elía 2015)	See	<i>Aconaemys fuscus</i> , <i>A. porteri</i> , <i>A. sagei</i>	<i>Aconaemys fuscus</i> , <i>A. porteri</i> , <i>A. sagei</i>	LR-E
<i>Plaina intermedia</i> , <i>P. sp.</i>	Gz	This study, based on: <i>S. hondaensis</i> is most similar to <i>Vassallia</i> (Edmund and Theodor 1997), which is highly efficient at grinding (Vizcaíno, Iuliis, and Bargo 1998)	(Edmund and Theodor 1997; Vizcaíno, Iuliis, and Bargo 1998)	SF	<i>Scirrotherium hondaensis</i>		MC:FR
<i>Plaina intermedia</i> , <i>P. sp.</i>	In-Fr	"Insects with fruit"	(Kay and Madden 1997b)	SF	<i>Scirrotherium hondaensis</i>	<i>Scirrotherium hondaensis</i>	Un
<i>Plaina intermedia</i> , <i>P. sp.</i>	Gz	<i>Holmesina</i> less efficient at grinding than <i>Vassallia</i>	(Vizcaíno, Iuliis, and Bargo	SF	<i>Holmesina occidentalis</i> ,	<i>Holmesina</i> , <i>Vassallia</i>	CMDM

Table S4.9: Dietary data for South American fossil taxa, cont.

			1998)		<i>Vassallia maxima</i>		
<i>Plaina intermedia</i> , <i>P. sp.</i>	Gz	Very capable grinders	(Iuliis, Bargo, and Vizcaíno 2001)	SF	<i>Holmesina occidentalis</i> , <i>H. paulacoutoi</i> , <i>Pam-patherium humboldtii</i> , <i>P. typum</i>	<i>Holmesina occidentalis</i> , <i>H. paulacoutoi</i> , <i>Pam-patherium humboldtii</i> , <i>P. typum</i>	BM
<i>Plaina intermedia</i> , <i>P. sp.</i>	Gz	Very high OSA (Occlusal Surface Area), typical of grazers (also may have to do with digestive tract needing greater oral food processing)	(Vizcaíno, Bargo, and Cassini 2006)	SF	<i>Holmesina occidentalis</i>	<i>Holmesina occidentalis</i>	DM
<i>Plaina intermedia</i> , <i>P. sp.</i>	Gz		(Mead et al. 2007)	WF	Pam-patheriidae	Pam-patheriidae	LR
<i>Plaina intermedia</i> , <i>P. sp.</i>	Gz		(Vizcaíno 2009)	WF	Pam-patheriidae	Pam-patheriidae	CMDM
<i>Plaina intermedia</i> , <i>P. sp.</i>	Gz	Differences between <i>Holmesina</i> and <i>Pam-patherium</i> species relate to environments (more humid v. semi-arid) rather than diet	(Carlini and Zurita 2010)	SF	<i>Holmesina</i> and <i>Pam-patherium</i>	<i>Holmesina</i> and <i>Pam-patherium</i>	LR
<i>Plaina intermedia</i>, <i>P. sp.</i>	Gz			Sum			
<i>Planops</i> sp.	Fl or Fl-Fr		(Bargo 2001)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
<i>Planops</i> sp.	Fl		(Carretero, García, and Dacar 2004)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	CA

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Planops</i> sp.	MF		(Pujos and Salas 2004a)	SF	<i>Eremotherium elenense</i>	<i>Eremotherium elenense</i>	Un
<i>Planops</i> sp.	Fl		(Fátima Rossetti et al. 2004)	SF	<i>Eremotherium laurillardi</i>	<i>Eremotherium laurillardi</i>	SI
<i>Planops</i> sp.	Fl or Fl-Fr		(Bargo, Toledo, and Vizcaíno 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
<i>Planops</i> sp.	Fl or Fl-Fr	Soft to moderate food; Cutting, not crushing or grinding; Diet may have included fruits	(Vizcaíno, Bargo, and Cassini 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM
<i>Planops</i> sp.	Fl	Coprolites and morphology agree: Folivory most likely	(McDonald and Iuliis 2008)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	LR
<i>Planops</i> sp.	Fl	Food reduction mainly by shearing or cutting	(Bargo, Vizcaíno, and Kay 2009)	AGp	<i>Eucholoeops</i>	<i>Eucholoeops</i> and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, and megatheriids)	DW, CMDM
<i>Planops</i> sp.	Fr-Fl	Selective tough object feeder	(Pujos, Iuliis, and Quispe 2011)	SF	<i>Hiskatherium saintandrei</i>	<i>Hiskatherium saintandrei</i>	MC:FR
<i>Planops</i> sp.	Fl	Food reduction mainly by shearing or cutting	(Bargo, Toledo, and Vizcaíno 2012)	Tax	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Peleciodon</i> , <i>Prepothorium</i> ,	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Peleciodon</i> , <i>Prepothorium</i> ,	DW, CMDM

Table S4.9: Dietary data for South American fossil taxa, cont.

					<i>Planops</i>	<i>Planops</i> , and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, and megatheriids)	
<i>Planops</i> sp.	Fl		(Kay, Vizcaíno, and Bargo 2012)	SF	<i>Eucholoeops ingens</i>	<i>Eucholoeops ingens</i>	Un
<i>Planops</i> sp.	Fl		(Pujos et al. 2012)	WF	Megatheriidae	Megatheriidae	PB, CMDM
<i>Planops</i> sp.	Fl	Low to moderate toughness	(Green and Kalthoff 2015)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DMc
<i>Planops</i> sp.	Fl			Sum			
<i>Platygonus narinoensis</i> , <i>P.</i> sp.	MF	Mixed feeding with significant grazing component	(Macfadden and Cerling 1996)	WG	<i>Platygonus</i>	<i>Platygonus</i>	SI
<i>Platygonus narinoensis</i> , <i>P.</i> sp.	MF		(Feranec and MacFadden 2000)	WG	<i>Platygonus</i>	<i>Platygonus</i>	SI
<i>Platygonus narinoensis</i> , <i>P.</i> sp.	Om	Closest to omnivores including invertebrates in diet	(Schmidt 2008)	SG	<i>Platygonus compressus</i>	<i>Platygonus compressus</i>	DMc
<i>Platygonus narinoensis</i> , <i>P.</i> sp.	MF		(DeSantis, Feranec, and MacFadden 2009)	SG	<i>Platygonus vetus</i>	<i>Platygonus vetus</i>	SI

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Platygonus narinoensis</i> , <i>P. sp.</i>	Fl, MF, Om	Diet varies between regions and over time	(Yann 2014)	SG	<i>Platygonus compressus</i> , <i>P. Cumberlandensis</i> , <i>P. vetus</i>	<i>Platygonus compressus</i> , <i>P. Cumberlandensis</i> , <i>P. vetus</i>	LR, SI
<i>Platygonus narinoensis</i> , <i>P. sp.</i>	Fl to MF	Changed from browse to mixed feeding when browse became more limited	(Yann and DeSantis 2014)	SG	<i>Platygonus compressus</i> , <i>P. Cumberlandensis</i> , <i>P. vetus</i>	<i>Platygonus compressus</i> , <i>P. Cumberlandensis</i> , <i>P. vetus</i>	SI
<i>Platygonus narinoensis</i> , <i>P. sp.</i>	Fl to MF		(Wilson 2016)	SG	<i>Platygonus compressus</i>	<i>Platygonus compressus</i>	SI
<i>Platygonus narinoensis</i>, <i>P. sp.</i>	Om	Capable of browsing, mixed feeding, omnivory		Sum			
<i>Plaxhaplous</i> sp.	Gz		(Fariña 1985)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CMM
<i>Plaxhaplous</i> sp.	Gz		(Pérez, Scillato-Yané, and Vizcaino 2000)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CM
<i>Plaxhaplous</i> sp.	Gz		(Fariña and Vizcaino 2001)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CMDM
<i>Plaxhaplous</i> sp.	Gz	<i>Panochthus</i> and <i>Sclerocalyptus</i> : grazers in cold, semiarid, open environments	(Zurita, Scillato-Yané, and Carlini 2005)	AGp	<i>Panochthus</i> and <i>Sclerocalyptus</i>	Plio-Pleistocene Glyptodontidae	LR

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Plaxhaplous</i> sp.	Gz		(Rincón, White, and McDonald 2008)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	LR
<i>Plaxhaplous</i> sp.	Gz	Relationship: Plio-Pleistocene glyptodonts shared dental morphology and diet based on authors above; Diet: Bulk feeders in moderately open to open habitats	(Vizcaíno, Cassini, et al. 2011)	See	<i>Doedicurus</i> , <i>Panochthus</i> , <i>Neuryurus</i> , <i>Neosclerocalyptus</i>	<i>Doedicurus</i> , <i>Panochthus</i> , <i>Neuryurus</i> , <i>Neosclerocalyptus</i>	CDM
<i>Plaxhaplous</i> sp.	Gz			Sum		Plio-Pleistocene Glyptodontidae	
<i>Plesiomegatherium</i> sp.	Fl or Fl-Fr		(Bargo 2001)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
<i>Plesiomegatherium</i> sp.	Fl		(Carretero, García, and Dacar 2004)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	CA
<i>Plesiomegatherium</i> sp.	MF		(Pujos and Salas 2004a)	SF	<i>Eremotherium elenense</i>	<i>Eremotherium elenense</i>	Un
<i>Plesiomegatherium</i> sp.	Fl		(Fátima Rossetti et al. 2004)	SF	<i>Eremotherium laurillardi</i>	<i>Eremotherium laurillardi</i>	SI
<i>Plesiomegatherium</i> sp.	Fl or Fl-Fr		(Bargo, Toledo, and Vizcaíno 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
<i>Plesiomegatherium</i> sp.	Fl or Fl-Fr	Soft to moderate food; Cutting, not crushing or grinding; Diet may have included fruits	(Vizcaíno, Bargo, and Cassini 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Plesiomegatherium</i> sp.	Fl	Coprolites and morphology agree: Folivory most likely	(McDonald, Vizcaíno, and Bargo 2008)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	LR
<i>Plesiomegatherium</i> sp.	Fl	Food reduction mainly by shearing or cutting	(Bargo, Vizcaíno, and Kay 2009)	SF	<i>Eucholoeops</i>	<i>Eucholoeops</i> and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, and megatheriids)	DW, CMDM
<i>Plesiomegatherium</i> sp.	Fr-Fl	Selective tough object feeder	(Pujos, Iuliis, and Quispe 2011)	SF	<i>Hiskatherium saintandrei</i>	<i>Hiskatherium saintandrei</i>	MC:FR
<i>Plesiomegatherium</i> sp.	Fl	Food reduction mainly by shearing or cutting	(Bargo, Toledo, and Vizcaíno 2012)	SF	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Peleciodon</i> , <i>Prepootherium</i> , <i>Planops</i>	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Peleciodon</i> , <i>Prepootherium</i> , <i>Planops</i> , and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, and megatheriids)	DW, CMDM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Plesiomegatherium</i> sp.	Fl		(Kay, Vizcaíno, and Bargo 2012)	SF	<i>Eucholoeops ingens</i>	<i>Eucholoeops ingens</i>	Un
<i>Plesiomegatherium</i> sp.	Fl		(Pujos et al. 2012)	WF	Megatheriidae	Megatheriidae	PB, CMDM
<i>Plesiomegatherium</i> sp.	Fl	Low to moderate toughness	(Green and Kalthoff 2015)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DMc
<i>Plesiomegatherium</i> sp.	Fl			Sum			
<i>Plesiotoxodon</i> sp.	GH	Diet varies from C ₃ browser in closed canopy to open grassland C ₄ grazer	(MacFadden 2005)	SF, PB	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	SI
<i>Plesiotoxodon</i> sp.	Fl		(Townsend and Croft 2008a)	SF, PB	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	DMc
<i>Plesiotoxodon</i> sp.	Gz or MF		(Cassini et al. 2011)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CMM
<i>Plesiotoxodon</i> sp.	GH		(Cassini and Vizcaíno 2012)	SF, PB	<i>Nesodon</i>	<i>Nesodon</i>	BM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Plesiotoxodon</i> sp.	GH		(Cassini, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	CM
<i>Plesiotoxodon</i> sp.	Gz		(Cassini et al. 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	CDM
<i>Plesiotoxodon</i> sp.	GH		(Cassini, Flores, and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CO, CM
<i>Plesiotoxodon</i> sp.	Gz		(Kay, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	LR
<i>Plesiotoxodon</i> sp.	GH	Diet dependent on availability: Browse to graze	(Cassini 2013)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	CGM
<i>Plesiotoxodon</i> sp.	GH			Sum		Toxodontidae	
<i>Plesiotypotherium achirensense</i>, <i>P. majus</i>, <i>P. sp.</i>	Gz-Rz	Roots/tubers, grasses; Mesotherium was a digger	(Shockey, Croft, and Anaya 2007)	WG, PB	<i>Plesiotypotherium</i>	<i>Plesiotypotherium</i>, <i>Mesotheriidae</i>	DM, PCM
<i>Pliodasypus vergelianus</i>	Om-In		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford	ST	<i>Dasypus hybridus</i> , <i>D. kappleri</i> , <i>D. novemcinctus</i>	<i>Dasypus hybridus</i> , <i>D. kappleri</i> , <i>D. novemcinctus</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

			1999)				
<i>Pliodasypus vergelianus</i>	Om-In		(Carlini et al. 1997)	ST	<i>Anadasypus hondanus</i>	<i>Anadasypus hondanus</i>	Un
<i>Pliodasypus vergelianus</i>	Om-In	Dasypodini: ecological generalists, omnivores to insectivores	(Ranzi 2000)	ST	<i>Dasypus novemcinctus</i> , <i>D. kappleri</i> , <i>Propraopus</i>		Un
<i>Pliodasypus vergelianus</i>	Om-In		(Gardner 2007b)	ST	<i>Dasypus hybridus</i> , <i>D. kappleri</i> , <i>D. novemcinctus</i>	<i>Dasypus hybridus</i> , <i>D. kappleri</i> , <i>D. novemcinctus</i>	LR-E
<i>Pliodasypus vergelianus</i>	Om		(Rincón, White, and McDonald 2008)	ST	<i>Dasypus</i> , <i>Propraopus</i>	<i>Dasypus</i> , <i>Propraopus</i>	LR
<i>Pliodasypus vergelianus</i>	Om-In			Sum			
<i>Pliodolichotis</i> sp.	Gz		(Walton 1990)	SSF	<i>Eodolichotis elachys</i> , <i>E. maddeni</i>	<i>Eodolichotis elachys</i> , <i>E. maddeni</i>	DM
<i>Pliodolichotis</i> sp.	MF	About half shrubs, the rest grasses and forbs	(Bonino et al. 1997)	SSF	<i>Dolichotis patagonum</i>	<i>Dolichotis patagonum</i>	FA
<i>Pliodolichotis</i> sp.	Gz		(Kay and Madden 1997b)	SSF	<i>Eodolichotis elachys</i> , <i>E. maddeni</i> , <i>Prodolichotis pridiana</i>	<i>Eodolichotis elachys</i> , <i>E. maddeni</i> , <i>Prodolichotis pridiana</i>	Un
<i>Pliodolichotis</i> sp.	Gz to MF	Grasses dominant, then shrubs, rare forbs; Only selective in drought when it prefers shrubs and forbs	(Puig et al. 2010)	SSF	<i>Dolichotis patagonum</i>	<i>Dolichotis patagonum</i>	FA

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Pliodolichotis</i> sp.	Gz to MF	Green vegetation (prefers grasses) and fruits	(Patton, Pardiñas, and D'Elía 2015)	SSF	<i>Dolichotis patagonum</i>	<i>Dolichotis patagonum</i>	LR-E
<i>Pliodolichotis</i> sp.	MF	Depend heavily on grasses but mixed diet overall		Sum			
<i>Pliolestes tripotamicus</i> , <i>P. venetus</i>	In-Fr		(Kay and Madden 1997b)	SSp F, PB	<i>Hondathentes cazador</i>	<i>Hondathentes cazador</i>	
<i>Pliolestes tripotamicus</i> , <i>P. venetus</i>	In-Om or In-Fr	<i>Caenolestes caniventer</i> : insectivore-frugivore; <i>Lestoros inca</i> : insectivore(-omnivore?); <i>Rhyncholestes raphanurus</i> : invertebrates, vegetation, fungi	(Gardner 2007b)	SF	<i>Caenolestes caniventer</i> , <i>Lestoros inca</i> , <i>Rhyncholestes raphanurus</i>	<i>Caenolestes caniventer</i> , <i>Lestoros inca</i> , <i>Rhyncholestes raphanurus</i>	LR-E
<i>Pliolestes tripotamicus</i> , <i>P. venetus</i>	In-Fr		(Abello, Ortiz-Jaureguizar, and Candela 2012)	SSp F, PB	<i>Stilotherium dissimile</i>	<i>Stilotherium dissimile</i>	DM
<i>Pliolestes tripotamicus</i>, <i>P. venetus</i>	In-Om or In-Fr	All spp. with known or inferred diets from both the Middle Miocene and extant Caenolestidae are insectivore-frugivores/ insectivore-omnivores		Sum			
<i>Pliomegatherium lelongi</i> , <i>P. sp.</i>	Fl or Fl-Fr		(Bargo 2001)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
<i>Pliomegatherium lelongi</i> , <i>P. sp.</i>	Fl		(Carretero, García, and Dacar 2004)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	CA
<i>Pliomegatheri-</i>	MF		(Pujos and	SF	<i>Eremotherium</i>	<i>Eremotherium</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>um lelongi</i> , <i>P.</i> sp.			Salas 2004a)		<i>elenense</i>	<i>elenense</i>	
<i>Pliomegatheri- um lelongi</i> , <i>P.</i> sp.	Fl		(Fátima Rossetti et al. 2004)	SF	<i>Eremotherium laurillardi</i>	<i>Eremotherium laurillardi</i>	SI
<i>Pliomegatheri- um lelongi</i> , <i>P.</i> sp.	Fl or Fl-Fr		(Bargo, Toledo, and Vizcaíno 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
<i>Pliomegatheri- um lelongi</i> , <i>P.</i> sp.	Fl or Fl-Fr	Soft to moderate food; Cutting, not crushing or grinding; Diet may have included fruits	(Vizcaíno, Bar- go, and Cassini 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM
<i>Pliomegatheri- um lelongi</i> , <i>P.</i> sp.	Fl	Coprolites and morphology agree: Folivory most likely	(McDonald and Iuliis 2008)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	LR
<i>Pliomegatheri- um lelongi</i> , <i>P.</i> sp.	Fl	Food reduction mainly by shear- ing or cutting	(Bargo, Vizcaí- no, and Kay 2009)	SF	<i>Eucholoeops</i>	<i>Eucholoeops</i> and "nearly all other Mio- cene mega- therioids" (in- cluding basal megatheri- oids, megalo- nychids, and megatheriids)	DW, CMDM
<i>Pliomegatheri- um lelongi</i> , <i>P.</i> sp.	Fr-Fl	Selective tough object feeder	(Pujos, Iuliis, and Quispe 2011)	SF	<i>Hiskatherium saintandrei</i>	<i>Hiskatherium saintandrei</i>	MC:FR

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Pliomegatherium lelongi</i> , <i>P.</i> sp.	Fl	Food reduction mainly by shearing or cutting	(Bargo, Toledo, and Vizcaíno 2012)	SF	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Peleciodon</i> , <i>Prepothorium</i> , <i>Planops</i>	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Peleciodon</i> , <i>Prepothorium</i> , <i>Planops</i> , and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, and megatheriids)	DW, CMDM
<i>Pliomegatherium lelongi</i> , <i>P.</i> sp.	Fl		(Kay, Vizcaíno, and Bargo 2012)	SF	<i>Eucholoeops ingens</i>	<i>Eucholoeops ingens</i>	Un
<i>Pliomegatherium lelongi</i> , <i>P.</i> sp.	Fl		(Pujos et al. 2012)	WF	Megatheriidae	Megatheriidae	PB, CMDM
<i>Pliomegatherium lelongi</i> , <i>P.</i> sp.	Fl	Low to moderate toughness	(Green and Kalthoff 2015)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DMc
<i>Pliomegatherium lelongi</i>, <i>P.</i> sp.	Fl			Sum			
<i>Pliomorphus mutilatus</i>, <i>P. robustus</i>, <i>P.</i> sp.	Fl		(Pujos et al. 2012)	WF	Megalonychidae	Megalonychidae	PB
<i>Plohophorus</i>	Gz		(Fariña 1985)	AGp	<i>Glyptodon</i>	Plio-	CMM

Table S4.9: Dietary data for South American fossil taxa, cont.

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<i>araucanus</i> , <i>P.</i> <i>cuneiformis</i> , <i>P.</i> <i>figuratus</i> , <i>P.</i> <i>paranensis</i> , <i>P.</i> sp.						Pleistocene Glyptodonti- dae	
<i>Plohophorus</i> <i>araucanus</i> , <i>P.</i> <i>cuneiformis</i> , <i>P.</i> <i>figuratus</i> , <i>P.</i> <i>paranensis</i> , <i>P.</i> sp.	Gz		(Pérez, Scillato- Yané, and Viz- caino 2000)	AGp	<i>Glyptodon</i>	Plio- Pleistocene Glyptodonti- dae	CM
<i>Plohophorus</i> <i>araucanus</i> , <i>P.</i> <i>cuneiformis</i> , <i>P.</i> <i>figuratus</i> , <i>P.</i> <i>paranensis</i> , <i>P.</i> sp.	Gz		(Fariña and Vizcaíno 2001)	AGp	<i>Glyptodon</i>	Plio- Pleistocene Glyptodonti- dae	CMDM
<i>Plohophorus</i> <i>araucanus</i> , <i>P.</i> <i>cuneiformis</i> , <i>P.</i> <i>figuratus</i> , <i>P.</i> <i>paranensis</i> , <i>P.</i> sp.	Gz	<i>Panochthus</i> and <i>Sclerocalyptus</i> : grazers in cold, semiarid, open environments	(A. Zurita, Scil- lato-Yané, and Carlini 2005)	AGp	<i>Panochthus</i> and <i>Sclero- calyptus</i>	Plio- Pleistocene Glyptodonti- dae	LR
<i>Plohophorus</i> <i>araucanus</i> , <i>P.</i> <i>cuneiformis</i> , <i>P.</i> <i>figuratus</i> , <i>P.</i> <i>paranensis</i> , <i>P.</i> sp.	Gz		(Rincón, White, and Mcdonald 2008)	AGp	<i>Glyptodon</i>	Plio- Pleistocene Glyptodonti- dae	LR
<i>Plohophorus</i>	Gz	Relationship: Plio-Pleistocene	(Vizcaíno, Cas-	See	<i>Doedicurus</i> ,	<i>Doedicurus</i> ,	CDM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>araucanus</i> , <i>P.</i> <i>cuneiformis</i> , <i>P.</i> <i>figuratus</i> , <i>P.</i> <i>paranensis</i> , <i>P.</i> sp.		glyptodonts shared dental morphology and diet based on authors above; Diet: Bulk feeders in moderately open to open habitats	sini, et al. 2011)		<i>Panochthus</i> , <i>Neuryurus</i> , <i>Neosclerocalyptus</i>	<i>Panochthus</i> , <i>Neuryurus</i> , <i>Neosclerocalyptus</i>	
<i>Plohophorus</i> <i>araucanus</i>, <i>P.</i> <i>cuneiformis</i>, <i>P.</i> <i>figuratus</i>, <i>P.</i> <i>paranensis</i>, <i>P.</i> sp.	Gz			Sum		Plio-Pleistocene Glyptodontidae	
<i>Posnanskytherium de-saguaderoi</i> , <i>P.</i> <i>inchasense</i> , <i>P.</i> sp.	GH	Diet varies from C ₃ browser in closed canopy to open grassland C ₄ grazer	(MacFadden 2005)	SF, PB	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	SI
<i>Posnanskytherium de-saguaderoi</i> , <i>P.</i> <i>inchasense</i> , <i>P.</i> sp.	Fl		(Townsend and Croft 2008a)	SF, PB	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon imbricatus</i>)	DMc
<i>Posnanskytherium de-saguaderoi</i> , <i>P.</i> <i>inchasense</i> , <i>P.</i> sp.	Gz or MF		(Cassini et al. 2011)	SF, PB	<i>Nesodon</i>	<i>Nesodon</i>	CMM
<i>Posnanskytherium de-saguaderoi</i> , <i>P.</i>	GH		(Cassini and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	BM

Table S4.9: Dietary data for South American fossil taxa, cont.

695	<i>inchasense</i> , <i>P.</i> sp.						
	<i>Posnanskytherium de-saguaderoi</i> , <i>P. inchasense</i> , <i>P.</i> sp.	GH		(Cassini, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines CM
	<i>Posnanskytherium de-saguaderoi</i> , <i>P. inchasense</i> , <i>P.</i> sp.	Gz		(Cassini et al. 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon imbricatus</i>) CDM
	<i>Posnanskytherium de-saguaderoi</i> , <i>P. inchasense</i> , <i>P.</i> sp.	GH		(Cassini, Flores, and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon imbricatus</i>) CO, CM
	<i>Posnanskytherium de-saguaderoi</i> , <i>P. inchasense</i> , <i>P.</i> sp.	Gz		(Kay, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines LR
	<i>Posnanskytherium de-saguaderoi</i> , <i>P. inchasense</i> , <i>P.</i> sp.	GH	Diet dependent on availability: Browse to graze	(Cassini 2013)	SF, PB	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium</i> <i>ovinum</i> and <i>Nesodon imbricatus</i>) CGM
	<i>Posnanskytherium de-</i>	GH			Sum		Toxodontidae

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>saguaderoi</i> , <i>P. inchasense</i> , <i>P. sp.</i>							
<i>Potamops mascahehenes</i>	In	Aerial pursuit insectivore	(Czaplewski, Morgan, and McLeod 1997)	Tax	<i>Potamops mascahehenes</i>	<i>Potamops mascahehenes</i>	Un
<i>Praectenomys sp.</i>	Gz-Rz	This study, based on modern analogue: Ecologically similar and closely related to <i>Ctenomys</i> (Reig 1989); <i>Ctenomys</i> spp. are radicivores or grazer-radicivores: <i>C. boliviensis</i> : roots and tubers, <i>C. flamarioni</i> : grasses and sedges, <i>C. fulvus</i> : diet includes <i>Larrea</i> (shrub) leaves, <i>C. magellanicus</i> : roots of grasses and shrubs, <i>C. mendo-cinus</i> : above ground grasses and shrubs, <i>C. nattereri</i> : diet includes grasses, <i>C. optimus</i> : bulbs and grass roots, <i>C. pearsoni</i> : herbivorous generalist preferring grasses, <i>C. roigi</i> : roots and basal grass stems, <i>C. saltarius</i> : creosote and other shrubs, <i>C. sociabilis</i> : main food item is grass (Patton, Pardiñas, and D'Elía 2015)	(Reig 1989; Patton, Pardiñas, and D'Elía 2015)	SSF	<i>Ctenomys boliviensis</i> , <i>C. flamarioni</i> , <i>C. fulvus</i> , <i>C. magellanicus</i> , <i>C. mendo-cinus</i> , <i>C. nattereri</i> , <i>C. optimus</i> , <i>C. pearsoni</i> , <i>C. roigi</i> , <i>C. saltarius</i> , <i>C. sociabilis</i>	<i>Ctenomys boliviensis</i> , <i>C. flamarioni</i> , <i>C. fulvus</i> , <i>C. magellanicus</i> , <i>C. mendo-cinus</i> , <i>C. nattereri</i> , <i>C. optimus</i> , <i>C. pearsoni</i> , <i>C. roigi</i> , <i>C. saltarius</i> , <i>C. sociabilis</i>	LR-E
<i>Prepothorium sp.</i>	Fl or Fl-Fr		(Bargo 2001)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Prepotherium</i> sp.	Fl		(Carretero, García, and Dacar 2004)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	CA
<i>Prepotherium</i> sp.	MF		(Pujos and Salas 2004a)	SF	<i>Eremotherium elenense</i>	<i>Eremotherium elenense</i>	Un
<i>Prepotherium</i> sp.	Fl		(de Fátima Rossetti et al. 2004)	SF	<i>Eremotherium laurillardi</i>	<i>Eremotherium laurillardi</i>	SI
<i>Prepotherium</i> sp.	Fl or Fl-Fr		(Bargo, Toledo, and Vizcaíno 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
<i>Prepotherium</i> sp.	Fl or Fl-Fr	Soft to moderate food; Cutting, not crushing or grinding; Diet may have included fruits	(Vizcaíno, Bargo, and Cassini 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM
<i>Prepotherium</i> sp.	Fl	Coprolites and morphology agree: Folivory most likely	(McDonald and Iuliis 2008, 200)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	LR
<i>Prepotherium</i> sp.	Fl	Food reduction mainly by shearing or cutting	(Bargo, Vizcaíno, and Kay 2009)	AGp	<i>Eucholoeops</i>	<i>Eucholoeops</i> and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, and megatheriids)	DW, CMDM
<i>Prepotherium</i> sp.	Fr-Fl	Selective tough object feeder	(Pujos, Iuliis, and Quispe 2011)	SF	<i>Hiskatherium saintandrei</i>	<i>Hiskatherium saintandrei</i>	MC:FR

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Prepothorium</i> sp.	Fl	Food reduction mainly by shearing or cutting	(Bargo, Toledo, and Vizcaíno 2012)	Tax	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Peleciodon</i> , <i>Prepothorium</i> , <i>Planops</i>	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Peleciodon</i> , <i>Prepothorium</i> , <i>Planops</i> , and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, and megatheriids)	DW, CMDM
<i>Prepothorium</i> sp.	Fl		(Pujos et al. 2012)	WF	Megatheriidae	Megatheriidae	PB, CMDM
<i>Prepothorium</i> sp.	Fl	Low to moderate toughness	(Green and Kalthoff 2015)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DMc
<i>Prepothorium</i> sp.	Fl		(Toledo 2016)	Tax	<i>Hapalops</i> , <i>Peleciodon</i> , <i>Schismotherium</i> , <i>Analcimorphus</i> , <i>Eucholoeops</i> , <i>Prepothorium</i>	<i>Hapalops</i> , <i>Peleciodon</i> , <i>Schismotherium</i> , <i>Analcimorphus</i> , <i>Eucholoeops</i> , <i>Prepothorium</i>	PCM, LR
<i>Prepothorium</i> sp.	Fl			Sum			
<i>Procyon cancrivorus</i>	Om		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Procyon cancrivorus</i>	<i>Procyon cancrivorus</i>	DM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Prodaedicurus</i> sp.	Gz		(Fariña 1985)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CMM
<i>Prodaedicurus</i> sp.	Gz		(L. M. Pérez, Scillato-Yané, and Vizcaino 2000)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CM
<i>Prodaedicurus</i> sp.	Gz		(Fariña and Vizcaíno 2001)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CMDM
<i>Prodaedicurus</i> sp.	Gz	<i>Panochthus</i> and <i>Sclerocalyptus</i> : grazers in cold, semiarid, open environments	(A. Zurita, Scillato-Yané, and Carlini 2005)	AGp	<i>Panochthus</i> and <i>Sclerocalyptus</i>	Plio-Pleistocene Glyptodontidae	LR
<i>Prodaedicurus</i> sp.	Gz		(Ascanio D. Rincón, White, and McDonald 2008)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	LR
<i>Prodaedicurus</i> sp.	Gz	Relationship: Plio-Pleistocene glyptodonts shared dental morphology and diet based on authors above; Diet: Bulk feeders in moderately open to open habitats	(Vizcaíno, Cassini, et al. 2011)	See	<i>Doedicurus</i> , <i>Panochthus</i> , <i>Neuryurus</i> , <i>Neosclerocalyptus</i>	<i>Doedicurus</i> , <i>Panochthus</i> , <i>Neuryurus</i> , <i>Neosclerocalyptus</i>	CDM
<i>Prodaedicurus</i> sp.	Gz			Sum		Plio-Pleistocene Glyptodontidae	
<i>Prodolichotis</i>	Gz		(Walton 1990)	SSF	<i>Eodolichotis</i>	<i>Eodolichotis</i>	DM

Table S4.9: Dietary data for South American fossil taxa, cont.

700	<i>guerreroi</i> , <i>P. pridiana</i> , <i>P. sp.</i>					<i>elachys</i> , <i>E. maddeni</i>	<i>elachys</i> , <i>E. maddeni</i>	
	<i>Prodolichotis guerreroi</i> , <i>P. pridiana</i> , <i>P. sp.</i>	MF	About half shrubs, the rest grasses and forbs	(Kay and Madden 1997b)	SSF	<i>Dolichotis patagonum</i>	<i>Dolichotis patagonum</i>	FA
	<i>Prodolichotis guerreroi</i> , <i>P. pridiana</i> , <i>P. sp.</i>	Gz		(Patton, Pardiñas, and D'Elía 2015)	Tax, SG	<i>Prodolichotis pridiana</i> , <i>Eodolichotis elachys</i> , <i>E. maddeni</i>	<i>Prodolichotis pridiana</i> , <i>Eodolichotis elachys</i> , <i>E. maddeni</i>	Un
	<i>Prodolichotis guerreroi</i> , <i>P. pridiana</i> , <i>P. sp.</i>	Gz to MF	Grasses dominant, then shrubs, rare forbs; Only selective in drought when it prefers shrubs and forbs	(Bonino et al. 1997)	SSF	<i>Dolichotis patagonum</i>	<i>Dolichotis patagonum</i>	FA
	<i>Prodolichotis guerreroi</i> , <i>P. pridiana</i> , <i>P. sp.</i>	Gz to MF	Green vegetation (prefers grasses) and fruits	(Puig et al. 2010)	SSF	<i>Dolichotis patagonum</i>	<i>Dolichotis patagonum</i>	LR-E
	<i>Prodolichotis guerreroi</i>, <i>P. pridiana</i>, <i>P. sp.</i>	MF	Depend heavily on grasses but mixed diet overall		Sum			
	<i>Proechimys</i> sp.	Fr-Gn	Fungi, fruits, seeds	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax	<i>Proechimys</i>	<i>Proechimys</i>	

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Proechimys</i> sp.	Fr-Gn	Frugivore-granivores: <i>P. steeri</i> : sporocarps of fungi; <i>P. guyannensis</i> : seed predators, <i>P. brevicaudata</i> : yucca and plantains, <i>P. semispinosus</i> : seed predators	(Patton, Pardiñas, and D'Elía 2015)	SG	<i>P. steeri</i> , <i>P. guyannensis</i> : <i>P. brevicaudata</i> , <i>P. semispinosus</i>	<i>P. steeri</i> , <i>P. guyannensis</i> : <i>P. brevicaudata</i> , <i>P. semispinosus</i>	LR-E
<i>Proechimys</i> sp.	Fr-Gn	Sum					
<i>Proeremotherium eljebe</i>	Fl or Fl-Fr		(Bargo 2001)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
<i>Proeremotherium eljebe</i>	Fl		(Carretero, García, and Dacar 2004)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	CA
<i>Proeremotherium eljebe</i>	MF		(Pujos and Salas 2004a)	SF	<i>Eremotherium elenense</i>	<i>Eremotherium elenense</i>	Un
<i>Proeremotherium eljebe</i>	Fl		(Fátima Rossetti et al. 2004)	SF	<i>Eremotherium laurillardi</i>	<i>Eremotherium laurillardi</i>	SI
<i>Proeremotherium eljebe</i>	Fl or Fl-Fr		(Bargo, Toledo, and Vizcaíno 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
<i>Proeremotherium eljebe</i>	Fl or Fl-Fr	Soft to moderate food; Cutting, not crushing or grinding; Diet may have included fruits	(Vizcaíno, Bargo, and Cassini 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM
<i>Proeremotherium eljebe</i>	Fl	Coprolites and morphology agree: Folivory most likely	(McDonald and Iuliis 2008)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	LR
<i>Proeremotherium eljebe</i>	Fl	Food reduction mainly by shearing or cutting	(Bargo, Vizcaíno, and Kay 2009)	SF	<i>Eucholoeops</i>	<i>Eucholoeops</i> and "nearly all other Miocene mega-	DW, CMDM

Table S4.9: Dietary data for South American fossil taxa, cont.

						therioids" (including basal megatherioids, megalonychids, and megatheriids)	
<i>Proeremotherium eljebe</i>	Fr-Fl	Selective tough object feeder	(Pujos, Iuliis, and Quispe 2011)	SF	<i>Hiskatherium saintandrei</i>	<i>Hiskatherium saintandrei</i>	MC:FR
<i>Proeremotherium eljebe</i>	Fl	Food reduction mainly by shearing or cutting	(Bargo, Toledo, and Vizcaíno 2012)	SF	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Pelecycodon</i> , <i>Prepothierium</i> , <i>Planops</i>	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Pelecycodon</i> , <i>Prepothierium</i> , <i>Planops</i> , and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, and megatheriids)	DW, CMDM
<i>Proeremotherium eljebe</i>	Fl		(Kay, Vizcaíno, and Bargo 2012)	SF	<i>Eucholoeops ingens</i>	<i>Eucholoeops ingens</i>	Un
<i>Proeremotherium eljebe</i>	Fl		(Pujos et al. 2012)	WF	Megatheriidae	Megatheriidae	PB, CMDM
<i>Proeremotherium eljebe</i>	Fl	Low to moderate toughness	(Green and Kalthoff 2015)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DMc

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Proeremotherium eljebe</i>	Fl				Sum		
<i>Proeuphractus limpidus</i>, <i>P. sp.</i>	Om	Variety of plant types (roots, tubers, nuts) and variety of animal matter (ants, carrion, birds, mice)	(Vizcaíno 2009)	WT	<i>Prozaedyus</i>, <i>Zaedyus</i>, <i>Macro-euphractus</i>, <i>Euphractus</i>, other extant <i>Euphractini</i>	<i>Euphractini</i>	LR, CDM
<i>Proeutatus sp.</i>	Fl	<i>Eutatus</i> and <i>Proeutatus</i> more specialized for herbivory	(Vizcaíno and Bargo 1998)	Tax	<i>Eutatus</i> , <i>Proeutatus</i> , <i>Doelotatus</i> , <i>Ringueletia</i>	<i>Eutatus</i> , <i>Proeutatus</i> , <i>Doelotatus</i> , <i>Ringueletia</i>	CDM
<i>Proeutatus sp.</i>	Sc-Fl	Scavenging and browsing	(Kay, Vizcaíno, and Bargo 2012)	SG	<i>Proeutatus oenophorus</i>	<i>Proeutatus oenophorus</i>	
<i>Proeutatus sp.</i>	Sc-Fl				Sum		
<i>Prolagostomus sp.</i>	Fl?	Relationship: Closely related to <i>Lagidium</i> ; Diet: Fresh cacti, other vegetation	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SF, See	<i>Lagidium viscacia</i>	<i>Lagidium viscacia</i>	LR-E
<i>Prolagostomus sp.</i>	Gz	Relationship: Closely related to <i>Lagostoma</i> ; Diet: "Strictly grazers"	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SF, See	<i>Lagostomus maximus</i>	<i>Lagostomus maximus</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

704	<i>Prolagostomus</i> sp.	Gz to MF	Relationship: Closely related to <i>Lagidium</i> ; Diet: "Variety of grasses, shrubs, and herbs, but select heavily for grasses"	(Walker et al. 2000)	SF, See	<i>Lagidium vis-cacia</i>	<i>Lagidium vis-cacia</i>	LR-E
	<i>Prolagostomus</i> sp.	Gz	Dominated by grasses (89%)	(Townsend and Croft 2008b)	SF, See	<i>Lagidium</i>	<i>Lagidium</i>	LR-E
	<i>Prolagostomus</i> sp.	GH	Relationship: Closely related to <i>Lagidium</i> ; Diet: Fresh, green leaves, flowers, fruits, stems, and bark; varies considerably between regions	(Patton, Pardiñas, and D'Elía 2015)	SF, See	<i>Lagidium vis-cacia</i>	<i>Lagidium vis-cacia</i>	LR-E
	<i>Prolagostomus</i> sp.	Gz to MF	Relationship: Closely related to <i>Lagostoma</i> ; Diet: Selective grazing, will eat forbs and shrubs as well as grasses in scrubland	(Patton, Pardiñas, and D'Elía 2015)	SF, See	<i>Lagostomus maximus</i>	<i>Lagostomus maximus</i>	LR-E
	<i>Prolagostomus</i> sp.	MF to Gz	Fed on "grasses and low vegetation"	(Croft 2016)	Tax	<i>Prolagostomus</i> sp.	<i>Prolagostomus</i> sp.	Un
	<i>Prolagostomus</i> sp.	MF	Sum					
	<i>Prolicaphrium sanalfonensis</i>	Fl or Fl-Fr	Omnivorous, frugivorous, or browsing	(Cifelli and Guerrero 1997)	Tax	<i>Prolicaphrium sanalfonensis</i>	<i>Prolicaphrium sanalfonensis</i>	DM
	<i>Prolicaphrium sanalfonensis</i>	Fl		(Kay and Madden 1997b)	Tax	<i>Prolicaphrium sanalfonensis</i>	<i>Prolicaphrium sanalfonensis</i>	Un
	<i>Prolicaphrium sanalfonensis</i>	Fl	Sum					
	<i>Promacrauche-</i>	MF	This study, based on: More hyp-	(Bond et al.	Tax,	<i>Proma-</i>		DM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>nia antiqua</i> , <i>P.</i> sp.		sodont (protohypsodont) than earlier macraucheniids, probably preferred open environments (Bond et al. 1995)	1995)	SG	<i>crauchenia antiqua</i> , <i>P. kraglievichi</i> , <i>P. chapalmalense</i> , <i>Windhausen</i> , <i>Macrauchenio</i> <i>opsis en</i> <i>nadensis</i> , <i>Macrauchenia patachonica</i> , <i>Pseudo</i> <i>macrauche</i> <i>nia</i> , <i>Xenorhi</i> <i>notherium ba</i> <i>hiense</i>		
<i>Promacrauchenia antiqua</i> , <i>P.</i> sp.	MF	Mixed feeding consistent with macraucheniid skeletal and dental morphology	(Bond 1999)	Tax, SG	<i>Proma</i> <i>crauchenia antiqua</i> , <i>P. kraglievichi</i> , <i>P. chapalmalense</i> , <i>Windhausen</i> , <i>Macrauchenio</i> <i>opsis en</i> <i>nadensis</i> , <i>Macrauchenia patachonica</i> ,	" <i>Macrauchenia</i> and macraucheniids in general"	DM, PCM

Table S4.9: Dietary data for South American fossil taxa, cont.

						<i>Pseudo-macrauchenia</i> , <i>Xenorhinotherium bahiense</i>	
	<i>Promacrauchenia antiqua</i> , <i>P.</i> sp.	MF		(MacFadden and Shockey 1997)	SSF	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i> DM, SI
	<i>Promacrauchenia antiqua</i> , <i>P.</i> sp.	MF		(MacFadden 2000)	SSF	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i> CDM, SI
706	<i>Promacrauchenia antiqua</i> , <i>P.</i> sp.	MF	$\delta^{13}\text{C}$ consistent with mixed feeding in most (5) cases, browsing in 2 cases	(Domingo, Prado, and Alberdi 2012)	SSF	<i>Macrauchenia patachonica</i> , <i>Macrauchenio-opsis?</i>	<i>Macrauchenia patachonica</i> , <i>Macrauchenio-opsis?</i> SI
	<i>Promacrauchenia antiqua</i> , <i>P.</i> sp.		<i>Promacrauchenia</i> is in Macraucheninae, Macraucheninae is monophyletic	(Schmidt and Ferrero 2014)	WF	Macrauchenidae	PB
	<i>Promacrauchenia antiqua</i> , <i>P.</i> sp.	MF to Fl		(Varela 2014)	SSF	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i> BM
	<i>Promacrauchenia antiqua</i> , <i>P.</i> sp.	MF	$\delta^{13}\text{C}$ consistent with mixed feeding	(França et al. 2015)	SSF	<i>Macrauchenia</i>	<i>Macrauchenia</i> LR, SI
	<i>Promacrauchenia antiqua</i>, <i>P.</i> sp.	MF			Sum		
	<i>Promylodon paranensis</i>	Gz	This study, based on: <i>Megabradys</i> , <i>Ranculus</i> , <i>Promylodon</i> , and <i>Prolestodon</i> have a higher man-	(Carlini, Scillato-Yané, and Sánchez 2006)	WG	<i>Megabradys</i> , <i>Ranculus</i> , <i>Promylodon</i> ,	MM

Table S4.9: Dietary data for South American fossil taxa, cont.

		dibular body (Carlini, Scillato-Yané, and Sánchez 2006), which is associated with grazing in other taxa (Bargo, Toledo, and Vizcaíno 2006)			<i>Prolestodon</i>		
<i>Promylodon paranensis</i>	Gz	This study, based on: Nested between <i>Glossotherium</i> and <i>Lestodon</i> (D. Perea 1992) which are both grazers (Pujos et al. 2012)	(Perea 1992; Pujos et al. 2012)	WF	Myodontinae	Myodontinae	PB
<i>Promylodon paranensis</i>	Gz			Sum			
<i>Pronothrotherium figueirasi</i>, <i>P. mirabilis</i>	Fl		(Pujos et al. 2012)	WG	<i>Pronothrotherium</i>	<i>Pronothrotherium</i>	MM
<i>Propalaeolophorus australis</i> , <i>P. sp.</i>	Fl	Highly selective herbivore in moderately open habitats	(Vizcaíno, Casini, et al. 2011)	WG	<i>Propalaeolophorus</i>	<i>Propalaeolophorus</i>	CDM
<i>Propalaeolophorus australis</i> , <i>P. sp.</i>	Fl		(Kay and Madden 1997b)	Tax, SG	<i>Propalaeolophorus australis</i>	<i>Propalaeolophorus australis</i>	Un
<i>Propalaeolophorus australis</i>, <i>P. sp.</i>	Fl			Sum			
<i>Propithecina neuquenensis</i>	Gn-Fr	Consistent with fruit, seeds, and gum: Most likely, seeds were a significant portion of diet given similarities to extant pithiciin seed-eaters, fruit also likely	(Kay, Johnson, and Meldrum 1998)	Tax	<i>Propithecina neuquenensis</i>	<i>Propithecina neuquenensis</i>	DM
<i>Propraopus sp.</i> , <i>P. sulcatus</i>	Om		(Ranzi 2000)	WG	<i>Propraopus</i>	<i>Propraopus</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Propraopus</i> sp., <i>P. sulcatus</i>	Om- In		(Rincón, White, and Mcdonald 2008)	WG	<i>Propraopus</i>	<i>Propraopus</i>	LR
<i>Propraopus</i> sp., <i>P. sulcatus</i>	Om- In			Sum			
<i>Proscelidodon</i> <i>patrius</i>, <i>P. sp.</i>	Fl		(Pujos et al. 2012)	WS F	Scelidothe- riinae	Scelidothe- riinae	PB
<i>Protabrocoma</i> sp.	MF to Fl	<i>Abrocoma cinera</i> : shrubs most important, bunch grass second; <i>A.</i> <i>schistacea</i> : Selective feeding, predominantly on shrub <i>Larrea</i> , <i>A. uspallata</i> : ~90% 3 specific shrubs (<i>Larrea</i> , <i>Lycium</i> , <i>Schinus</i>), <i>Cuscomys ashaninka</i> : fruit and unidentified plant material	(Patton, Pardi- ñas, and D'Elía 2015)	SF	<i>Abrocoma ci- nera</i> , <i>A. schis- tacea</i> , <i>A. us- pallata</i> , <i>Cus- comys asha- ninka</i>	<i>Abrocoma</i> <i>cinera</i> , <i>A.</i> <i>schistacea</i> , <i>A.</i> <i>uspallata</i> , <i>Cuscomys as- haninka</i>	LR-E
<i>Protabrocoma</i> sp.	Fl	"Confirm [prior] designations... of... <i>Abrocoma bennetti</i> as... fo- livores." Both grasses and shrubs in winter and spring months, but 91% shrubs in dry summer and fall months	(Meserve, Mar- tin, and Rodri- guez M. 1983)	SF	<i>Abrocoma</i> <i>bennetti</i>	<i>Abrocoma</i> <i>bennetti</i>	
<i>Protabrocoma</i> sp.	Fl	Shrubs, forbs, seeds, and grasses; in one region, diet consisted of 51.9% foliage of a single shrub (<i>Chenopodium</i>) and 22.8% shrub connective tissue	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SF	<i>Abrocoma</i> <i>bennetti</i>	<i>Abrocoma</i> <i>bennetti</i>	LR-E
<i>Protabrocoma</i> sp.	Fl	Shoots and leaves in densest part of woodland	(Tarifa et al. 2009)	SF	<i>Abrocoma</i>	<i>Abrocoma</i>	FO

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Protabrocoma</i> sp.	Fl	No grasses in winter or summer diet, only shrubs and flowering plants	(Cortés et al. 2002)	SF	<i>Abrocoma cinerea</i>	<i>Abrocoma cinerea</i>	FA
<i>Protabrocoma</i> sp.	Fl	<i>A. schistacea</i> : Over 80% of diet is <i>Larrea</i> , making the species a creosotebush dietary specialist, <i>A. uspallata</i> : 30% <i>Larrea</i> , 34.2% <i>Lycium</i> and 24% <i>Schinus</i> (all shrubs)	(Taraborelli et al. 2011)	SF	<i>Abrocoma schistacea</i> , <i>A. uspallata</i>	<i>Abrocoma schistacea</i> , <i>A. uspallata</i>	FA
<i>Protabrocoma</i> sp.	Fl	Creosotebush dietary specialist	(Taraborelli et al. 2015)	SF	<i>Abrocoma schistacea</i>	<i>Abrocoma schistacea</i>	LR-E
<i>Protabrocoma</i> sp.	Fl	Sum					
<i>Protacaremys denisae</i>	Gn	This study, based on: Closely related to <i>Acarechimys</i> (Arnal and Vucetich 2015) and <i>Acarechimys minutissimus</i> is granivorous (Kay and Madden 1997b)	(Arnal and Vucetich 2015; Kay and Madden 1997b)	SG	<i>Protacaremys prior</i>, <i>Acarechimys minutus</i>, and 'Acaremys' <i>preminutus</i>	<i>Protacaremys prior</i>, <i>Acarechimys minutus</i>, and 'Acaremys' <i>preminutus</i>	Un
<i>Protamandua rothi</i>	Fm		(McDonald, Vizcaíno, and Bargo 2008)	Tax	<i>Protamandua rothi</i>	<i>Protamandua rothi</i>	CM, PCM
<i>Protamandua rothi</i>	Fm		(Bargo, Toledo, and Vizcaíno 2012)	Tax	<i>Protamandua rothi</i>	<i>Protamandua rothi</i>	CMM
<i>Protamandua rothi</i>	Fm		(Kay, Vizcaíno, and Bargo 2012)	Tax	<i>Protamandua rothi</i>	<i>Protamandua rothi</i>	Un
<i>Protamandua rothi</i>	Fm	Sum					

Table S4.9: Dietary data for South American fossil taxa, cont.

710	<i>Proterotherium cervioides</i> , <i>P.</i> sp.	Fl or Fl-Fr	<i>Prolicaphrium sanalfonsensis</i> : Folivore, <i>Prothoatherium colombianus</i> : Frugivore-folivore, <i>Villarroelia totoyoi</i> : Folivore, <i>Megadolodus molariformis</i> : Frugivore-folivore	(Kay and Madden 1997b)	SG	<i>Prolicaphrium sanalfonsensis</i> , <i>Prothoatherium colombianus</i> , <i>Villarroelia totoyoi</i> , <i>Megadolodus molariformis</i>	<i>Prolicaphrium sanalfonsensis</i> , <i>Prothoatherium colombianus</i> , <i>Villarroelia totoyoi</i> , <i>Megadolodus molariformis</i>	Un
	<i>Proterotherium cervioides</i> , <i>P.</i> sp.	Fl		(Guillermo H. Cassini, Vizcaíno, and Bargo 2012)	SF	<i>Diadiaphorus majusculus</i>	All Santacrucian proterotheriids	CDM
	<i>Proterotherium cervioides</i> , <i>P.</i> sp.	Fl		(Guillermo H. Cassini et al. 2012)	SF	<i>Thoatherium</i> , <i>Anisolophus</i> , <i>Tetramerorhinus</i>	<i>Thoatherium</i> , <i>Anisolophus</i> , <i>Tetramerorhinus</i>	CMDM
	<i>Proterotherium cervioides</i> , <i>P.</i> sp.	Fl		(Kay, Vizcaíno, and Bargo 2012)	SF	<i>Thoatherium</i> , <i>Diadiaphorus</i> , <i>Tetramerorhinus</i>	<i>Thoatherium</i> , <i>Diadiaphorus</i> , <i>Tetramerorhinus</i>	Un
	<i>Proterotherium cervioides</i> , <i>P.</i> sp.	Fl		(Croft 2016)	SF	<i>Thoatherium minusculum</i> , <i>Neobrachytherium ullumense</i>	<i>Thoatherium minusculum</i> , <i>Neobrachytherium ullumense</i>	Un
	<i>Proterotherium cervioides</i>, <i>P.</i> sp.	Fl	Sum					
	<i>Prothoatherium</i>	Fl or	Consistent with browsing or fru-	(Cifelli and Di-	SG	<i>Prothoatheri-</i>	<i>Prothoatheri-</i>	DM,

Table S4.9: Dietary data for South American fossil taxa, cont.

sp.	Fr-Gn	givory-granivory	az 1989)		<i>um colombi-anus</i>	<i>um colombi-anus</i>	MA
<i>Prothoatherium</i> sp.	Fl, Fr, or Om	Consistent with omnivorous, frugivorous, or browsing diets	(Cifelli and Guerrero 1997)	SG	<i>Prothoatherium colombi-anus</i> , <i>Prolicaphrium sanalfonsensis</i> , <i>Villarroelia totoyoi</i> , <i>Megadolodus molariformis</i>	<i>Prothoatherium colombi-anus</i> , <i>Prolicaphrium sanalfonsensis</i> , <i>Villarroelia totoyoi</i> , <i>Megadolodus molariformis</i>	DM, MA
<i>Prothoatherium</i> sp.	Fl-Fr	<i>Prothoatherium colombianus</i> : Frugivore-folivore	(Kay and Madden 1997b)	SG	<i>Prothoatherium colombi-anus</i> , <i>Prolicaphrium sanalfonsensis</i> , <i>Villarroelia totoyoi</i> , <i>Megadolodus molariformis</i>	<i>Prolicaphrium sanalfonsensis</i> , <i>Prothoatherium colombianus</i> , <i>Villarroelia totoyoi</i> , <i>Megadolodus molariformis</i>	Un
<i>Prothoatherium</i> sp.	Fl-Fr	Sum					
<i>Prothylacynus patagonicus</i>	HC		(Kay, Vizcaíno, and Bargo 2012)	Tax	<i>Prothylacynus patagonicus</i>	<i>Prothylacynus patagonicus</i>	Un
<i>Prothylacynus patagonicus</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Prothylacynus patagonicus</i>	<i>Prothylacynus patagonicus</i>	DM
<i>Prothylacynus patagonicus</i>	HC	Sum					

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Protocyon orcesi</i> , <i>P. sp.</i>	HC	Diet included <i>Equus neogeus</i> , <i>Hippidion principale</i> , <i>Stegomastodon platensis</i> , <i>Toxodon</i> , <i>Megatherium americanum</i>	(Prevosti and Schubert 2013)	SG	<i>Protocyon troglodytes</i>	<i>Protocyon troglodytes</i>	SI
<i>Protocyon orcesi</i> , <i>P. sp.</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	SG	<i>Protocyon scagliorum</i> , <i>P. troglodytes</i> , <i>P. tarijensis</i>	<i>Protocyon scagliorum</i> , <i>P. troglodytes</i> , <i>P. tarijensis</i>	DM
<i>Protocyon orcesi</i>, <i>P. sp.</i>	HC	Sum					
<i>Protocyon tarijensis</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Protocyon tarijensis</i>	<i>Protocyon tarijensis</i>	DM
<i>Protocyon troglodytes</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Protocyon troglodytes</i>	<i>Protocyon troglodytes</i>	DM
<i>Protocyon troglodytes</i>	HC	Diet included <i>Equus neogeus</i> , <i>Hippidion principale</i> , <i>Stegomastodon platensis</i> , <i>Toxodon</i> , <i>Megatherium americanum</i>	(Prevosti and Schubert 2013)	Tax	<i>Protocyon troglodytes</i>	<i>Protocyon troglodytes</i>	SI
<i>Protocyon troglodytes</i>	HC	Sum					
<i>Protoglyptodon primiformis</i>	MF	Relationship: Similar temporal trends in multiple lineages of glyptodonts: Intermediate between Miocene browsers and Pleistocene grazers	(Vizcaíno, Casini, et al. 2011)	See	<i>Hoplophractus</i>, <i>Eosclerocalyptus</i>, <i>Urotherium</i>	<i>Hoplophractus</i>, <i>Eosclerocalyptus</i>, <i>Urotherium</i>	CDM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Protomegalonyx chasicensis</i>, <i>P. doellojuradoi</i>, <i>P. praecursor</i>, <i>P. sp.</i>	Fl		(Croft 2016)	Tax, SG	<i>Protomegalonyx chasicensis</i>	<i>Protomegalonyx chasicensis</i>	Un
<i>Protopithecus brasiliensis</i>		Lacks specializations for folivory	(Hartwig and Cartelle 1996)	Tax	<i>Protopithecus brasiliensis</i>	<i>Protopithecus brasiliensis</i>	DM
<i>Protopithecus brasiliensis</i>	Fr		(Halenar 2012)	Tax	<i>Protopithecus brasiliensis</i>	<i>Protopithecus brasiliensis</i>	LR
<i>Protopithecus brasiliensis</i>	Fr			Sum			
<i>Protypotherium antiquum</i> , <i>P. australe</i> , <i>P. sp.</i>	MF	Semi-open woodland community (Late Oligocene)	(Croft and Weinstein 2008)	SF	<i>Federicoa-naya sallaensis</i>	<i>Federicoa-naya sallaensis</i>	DMS
<i>Protypotherium antiquum</i> , <i>P. australe</i> , <i>P. sp.</i>	Fl	Not a grazer or hard object feeder	(Townsend and Croft 2008a)	WG	<i>Protypotherium</i>	<i>Protypotherium</i>	DMc
<i>Protypotherium antiquum</i> , <i>P. australe</i> , <i>P. sp.</i>	Gz	Basal interatheriid	(Billet, Blondel, and de Muizon 2009)	SF	<i>Federicoa-naya sallaensis</i>	<i>Federicoa-naya sallaensis</i>	DMc
<i>Protypotherium antiquum</i> , <i>P. australe</i> , <i>P. sp.</i>	Gz	Consistent with grazing, may also have fed on hard objects	(Cassini and Vizcaíno 2012)	WG	<i>Interatherium</i> , <i>Protypotherium</i>	<i>Interatherium</i> , <i>Protypotherium</i>	BM
<i>Protypotherium antiquum</i> , <i>P. australe</i> , <i>P. sp.</i>	Gz	Characteristics of extant grazers, and far from mixed feeders/generalized herbivores or browsers: "wide muzzle, an extremely wide and deep mandibular angle, and a long paraoccipital	(Cassini et al. 2011)	WG	<i>Interatherium</i> , <i>Protypotherium</i>	<i>Interatherium</i> , <i>Protypotherium</i>	CMDM

Table S4.9: Dietary data for South American fossil taxa, cont.

		process;" Some of these characteristics may be associated with digging in open habitats than with grazing					
<i>Protypotherium antiquum</i> , <i>P. australe</i> , <i>P. sp.</i>	Gz	Characteristics of extant grazers, and far from mixed feeders/generalized herbivores or browsers: "wide muzzle, an extremely wide and deep mandibular angle, and a long paraoccipital process"	(Cassini et al. 2012)	Tax, SG	<i>Interatherium robustum</i> , <i>Protypotherium attenuatum</i> , <i>P. australe</i> , <i>P. prae-rutilum</i>	<i>Interatherium robustum</i> , <i>Protypotherium attenuatum</i> , <i>P. australe</i> , <i>P. prae-rutilum</i>	CMDM
<i>Protypotherium antiquum</i> , <i>P. australe</i> , <i>P. sp.</i>	Gz		(Kay, Vizcaíno, and Bargo 2012)	Tax, SG	<i>Protypotherium australe</i>	<i>Protypotherium australe</i>	Un
<i>Protypotherium antiquum</i> , <i>P. australe</i> , <i>P. sp.</i>	Gz	Similar to <i>Procavia</i> (Open habitat grazers)	(Cassini 2013)	WG	<i>Protypotherium</i>	<i>Protypotherium</i>	CGM
<i>Protypotherium antiquum</i>, <i>P. australe</i>, <i>P. sp.</i>	Gz			Sum			
<i>Prozaedyus proximus</i> , <i>P. sp.</i>	Om	Variety of plant types (roots, tubers, nuts) and variety of animal matter (ants, carrion, birds, mice)	(Vizcaíno 2009)	WG	<i>Prozaedyus</i> , <i>Zaedyus</i> , <i>Macro-euphractus</i> , <i>Euphractus</i> , other extant Euphractini	Euphractini	LR, CDM
<i>Prozaedyus proximus</i> , <i>P. sp.</i>	Sc-In		(Kay, Vizcaíno, and Bargo 2012)	Tax, SG	<i>Prozaedyus proximus</i>	<i>Prozaedyus proximus</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Prozaedyus proximus</i> , <i>P. sp.</i>	Sc-Om			Sum			
<i>Lycalopex (Pseudalopex) gymnocercus</i>	MC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Lycalopex gymnocercus</i>	<i>Lycalopex gymnocercus</i>	DM
<i>Pseudolycopsis cabrerai</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Pseudolycopsis cabrerai</i>	<i>Pseudolycopsis cabrerai</i>	DM
<i>Pseudoplateomys formosus</i>	Fl	This study, based on: <i>Pseudoplateomys</i> is sister to <i>Octodontomys</i> (Verzi, Olivares, and Morgan 2014) (although controversial (Candela 2016)); <i>Octodontomys gliroides</i> (monotypic) feeds on cactus fruits, acacia sheaths, shrub leaves and bark (Patton, Pardiñas, and D'Elía 2015)	(Verzi, Olivares, and Morgan 2014; Patton, Pardiñas, and D'Elía 2015; Candela 2016)	SG	<i>Pseudoplateomys innominatus</i>		CLR
<i>Pseudoplohophorus absolutus</i>	Gz	Rejects resource limitation as a possible reason for small brain size because grazing diet would provide abundant resources	(Tambusso and Fariña 2015)	Tax	<i>Pseudoplohophorus absolutus</i>	<i>Pseudoplohophorus absolutus</i>	CM
<i>Pseudoprethorium confusum</i> , <i>P. sp.</i> , <i>P. venezuelanum</i>	Fl	Elongate and narrow mandible suggests selective browsing	(McDonald 1997)	Tax, SG	<i>Pseudoprethorium confusum</i>	<i>Pseudoprethorium confusum</i>	MM
<i>Pseudoprethorium confusum</i> , <i>P. sp.</i> , <i>P.</i>	Fl		(Kay and Meldrum 1997)	Tax, SG	<i>Pseudoprethorium confusum</i>	<i>Pseudoprethorium confusum</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>venezuelanum</i>							
<i>Pseudopre-potherium confusum</i> , <i>P. sp.</i> , <i>P. venezuelanum</i>	MF	Based on mandibular width, but falls in the range classified as mixed feeders by Pujos (based on distributed values across all sloths)	(Pujos et al. 2012)	WG	<i>Pseudopre-potherium</i>	<i>Pseudopre-potherium</i>	MM
<i>Pseudopre-potherium confusum</i>, <i>P. sp.</i>, <i>P. venezuelanum</i>	MF	Sum					
<i>Pseudotypotherium</i> sp.	MF	This study, based on $\delta^{13}\text{C}$ values (-4.2, -9.9, -11.2, -9.2‰) (MacFadden, Cerling, and Prado 1996): Mixed feeder	(MacFadden, Cerling, and Prado 1996)	Tax	<i>Pseudoty-potherium</i> sp.	<i>Pseudoty-potherium</i> sp.	SI
<i>Pteronotus</i> sp.	In	Aerial pursuit insectivore	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SG	<i>Pteronotus parnellii</i>	<i>Pteronotus parnellii</i>	LR-E
<i>Pteronotus</i> sp.	In	Aerial pursuit insectivore	(Herd 1983)	SG	<i>Pteronotus parnellii</i>	<i>Pteronotus parnellii</i>	LR-E
<i>Pteronotus</i> sp.	In	Aerial pursuit insectivore	(Adams 1989)	SG	<i>Pteronotus davyi</i>	<i>Pteronotus davyi</i>	LR-E
<i>Pteronotus</i> sp.	In	Sum					
<i>Pteronura brasiliensis</i>	Ps (HC)	Fish majority of diet; in all studies but one in 1980 (which seems to have been studying otters outside their home ranges) inverte-	(Carter and Rosas 1997)	Tax	<i>Pteronura brasiliensis</i>	<i>Pteronura brasiliensis</i>	Direct observation, FA

Table S4.9: Dietary data for South American fossil taxa, cont.

		brates, mammal, amphibian, reptile, and bird remains were rare					
<i>Pteronura brasiliensis</i>	Ps (HC)	Almost exclusively fish, out of 254 samples, only 1 had monkey fur and 1 had sloth fur; no other non-fish remains	(Cabral et al. 2010)	Tax	<i>Pteronura brasiliensis</i>	<i>Pteronura brasiliensis</i>	FA
<i>Pteronura brasiliensis</i>	Om		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Pteronura brasiliensis</i>	<i>Pteronura brasiliensis</i>	DM
<i>Pteronura brasiliensis</i>	Ps (HC)			Sum			
<i>Puma concolor</i> , <i>P. sp.</i>	HC	Small to medium size mammals, with considerable regional variation in body mass and prey size	(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Puma concolor</i>	<i>Puma concolor</i>	CDM, PCM
<i>Puma concolor</i> , <i>P. sp.</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Puma concolor</i>	<i>Puma concolor</i>	DM
<i>Puma concolor</i> , <i>P. sp.</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Puma concolor</i>	<i>Puma concolor</i>	CDM, PCM, FO
<i>Puma concolor</i>, <i>P. sp.</i>	HC			Sum			
<i>Puma yagouaroundi</i>	HC	Small mammals and other vertebrates	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax	<i>Puma yagouaroundi</i>	<i>Puma yagouaroundi</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Purperia cribatidens</i>	Fl		(Kay and Madden 1997b)	SF	<i>Huilatherium pluripicatum</i>	<i>Huilatherium pluripicatum</i>	Un
<i>Purperia cribatidens</i>	Fl		(Croft 1999)	WF	Leontiniidae	Leontiniidae	LR
<i>Purperia cribatidens</i>	Fl	Late Oligocene to Early Miocene leontiniids	(Ribeiro, López, and Bond 2010)	SF	<i>Scarrittia canquelensis</i> , <i>S. barranquensis</i> , <i>Henricofilholia lustrata</i> , <i>H. vucetichia</i> , <i>Colpodon distinctus</i> , <i>C. propinquus</i> , <i>Leontinia garzoni</i> , <i>Ancylocoelus minor</i> , <i>A. frequens</i>	<i>Scarrittia canquelensis</i> , <i>S. barranquensis</i> , <i>Henricofilholia lustrata</i> , <i>H. vucetichia</i> , <i>Colpodon distinctus</i> , <i>C. propinquus</i> , <i>Leontinia garzoni</i> , <i>Ancylocoelus minor</i> , <i>A. frequens</i>	DM
<i>Purperia cribatidens</i>	Fl			Sum			
<i>Pyramiodontherium scillatoyanei</i> , <i>P. sp.</i>	Fl or Fl-Fr		(Bargo 2001)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
<i>Pyramiodontherium scillatoyanei</i> , <i>P. sp.</i>	Fl		(Carretero, García, and Dacar 2004)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	CA
<i>Pyramiodontherium scilla-</i>	MF		(Pujos and Salas 2004a)	SF	<i>Eremotherium elenense</i>	<i>Eremotherium elenense</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

toyanei, P. sp.							
Pyramiodontherium scillatoyanei, P. sp.	Fl		(de Fátima Rossetti et al. 2004)	SF	Eremotherium laurillardi	Eremotherium laurillardi	SI
Pyramiodontherium scillatoyanei, P. sp.	Fl or Fl-Fr		(Bargo, Toledo, and Vizcaíno 2006)	SF	Megatherium americanum	Megatherium americanum	DM, BM
Pyramiodontherium scillatoyanei, P. sp.	Fl or Fl-Fr	Soft to moderate food; Cutting, not crushing or grinding; Diet may have included fruits	(Vizcaíno, Bargo, and Cassini 2006)	SF	Megatherium americanum	Megatherium americanum	DM
Pyramiodontherium scillatoyanei, P. sp.	Fl	Coprolites and morphology agree: Folivory most likely	(McDonald and Iuliis 2008)	SF	Megatherium americanum	Megatherium americanum	LR
Pyramiodontherium scillatoyanei, P. sp.	Fl	Food reduction mainly by shearing or cutting	(Bargo, Vizcaíno, and Kay 2009)	SF	Eucholoeops	Eucholoeops and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, and megatheriids)	DW, CMDM
Pyramiodontherium scillatoyanei, P. sp.	Fr-Fl	Selective tough object feeder	(Pujos, Iuliis, and Quispe 2011)	SF	Hiskatherium saintandrei	Hiskatherium saintandrei	MC:FR
Pyramiodontherium scillatoyanei, P. sp.	Fl	Food reduction mainly by shearing or cutting	(Bargo, Toledo, and Vizcaíno 2012)	SF	Eucholoeops, Hapalops, Pelecyodon,	Eucholoeops, Hapalops, Pelecyodon,	DW, CMDM

Table S4.9: Dietary data for South American fossil taxa, cont.

720						<i>Prepothorium, Planops</i>	<i>Prepothorium, Planops, and "nearly all other Miocene megatherioids" (including basal megatherioids, megalo-nychids, and megatheriids)</i>	
	<i>Pyramiodon-therium scilla-toyanei, P. sp.</i>	Fl		(Kay, Vizcaíno, and Bargo 2012)	SF	<i>Eucholoeops ingens</i>	<i>Eucholoeops ingens</i>	Un
	<i>Pyramiodon-therium scilla-toyanei, P. sp.</i>	Fl		(Pujos et al. 2012)	WF	Megatheriidae	Megatheriidae	PB, CMDM
	<i>Pyramiodon-therium scilla-toyanei, P. sp.</i>	Fl	Low to moderate toughness	(Green and Kalthoff 2015)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DMc
	<i>Pyramiodon-therium scilla-toyanei, P. sp.</i>	Fl			Sum			
	<i>Ranculcus scabrinianus, R. sp.</i>	Fl	This study, based on: Mandibular body higher, symphysis much wider than in earlier mylodontids (Carlini, Scillato-Yané, and Sánchez 2006), both features associated with grazing (Bargo, Toledo, and Vizcaíno 2006)	(Carlini, Scillato-Yané, and Sánchez 2006; Bargo, Toledo, and Vizcaíno 2006)	WG	<i>Ranculcus</i>	<i>Ranculcus</i>	MM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Ranculus scalabrinianus</i> , <i>R. sp.</i>	Fl	This study, based on: <i>Ranculus</i> is nested between <i>Glossotherium</i> and <i>Lestodon</i> (D. Perea 1992), which are both grazers (Pujos et al. 2012)	(D. Perea 1992; Pujos et al. 2012)	WG	<i>Ranculus</i>	<i>Ranculus</i>	PB
<i>Ranculus scalabrinianus</i> , <i>R. sp.</i>	Fl	Sum					
<i>Reigomys</i> (= <i>Holochilus</i>) <i>primigenus</i>	Gz	This study, based on: Sister genus to <i>Holochilus</i> (Steppan 1996; Machado et al. 2014), which is a grazer (Steppan 1996; Barreto and García-Rangel 2005; Brandão et al. 2015; Patton, Pardiñas, and D'Elía 2015)	(Steppan 1996; Machado et al. 2014; Nascimento 2014; Patton, Pardiñas, and D'Elía 2015; Barreto and García-Rangel 2005)	SisG	<i>Holochilus</i> , <i>Reigomys</i> , <i>Pseudoryzomys</i> , <i>Lundomys</i>		CLR
<i>Reithrodon auritus</i> , <i>R. sp.</i>	Gz-Rz	Diet mostly grass, also contains roots of other plants	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax, SG	<i>Reithrodon auritus</i>	<i>Reithrodon auritus</i>	LR-E
<i>Reithrodon auritus</i> , <i>R. sp.</i>	Gz-Rz	<i>R. auritus</i> : grazer, <i>R. typicus</i> : grazer-radicivore	(Patton, Pardiñas, and D'Elía 2015)	Tax, SG	<i>Reithrodon auritus</i> , <i>R. typicus</i>	<i>Reithrodon auritus</i> , <i>R. typicus</i>	LR-E
<i>Reithrodon auritus</i> , <i>R. sp.</i>	Gz-Rz	Sum					
<i>Rhogeessa sp.</i>	In	Aerial pursuit insectivore	(Eisenberg 1989; Redford	SG	<i>Rhogeessa tumida</i>	<i>Rhogeessa tumida</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

			and Eisenberg 1992; Eisen- berg and Red- ford 1999)			
<i>Ricardomys longidens</i>	Gn		(Kay and Madden 1997b)	Tax	<i>Ricardomys longidens</i>	<i>Ricardomys longidens</i> Un
<i>Ringueletia</i> sp.	Fl	Intermediate between <i>Stenota- tus</i> and <i>Eutatus</i> in terms of spe- cialization for herbivory	(Vizcaíno and Bargo 1998)	Tax	<i>Ringueletia</i>	<i>Ringueletia</i> CMDM
<i>Sairadelphys tocantinensis</i>	In- Fr		(Oliveira et al. 2011)	Tax	<i>Sairadelphys tocantinensis</i>	<i>Sairadelphys tocantinensis</i> DM
<i>Scalabrinitheri- um bravardi</i> , <i>S.</i> sp.	MF	This study, based on: More hyp- sodont (protohypsodont) than ear- lier macraucheniids, probably preferred open environments (Bond et al. 1995)	(Bond et al. 1995)	SSF	<i>Proma- crauchenia antiqua</i> , <i>P. kraglievichi</i> , <i>P. chapalma- lense</i> , <i>Windhause- nia</i> , <i>Macraucheni- opsis ense- nadensis</i> , <i>Macrauchenia patachonica</i> , <i>Pseudo- macrauche- nia</i> , <i>Xenorhi- notherium ba-</i>	DM

Table S4.9: Dietary data for South American fossil taxa, cont.

					<i>hiense</i>		
<i>Scalabrinitherium bravardi</i> , S. sp.	MF		(MacFadden and Shockey 1997)	SSF	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i>	DM, SI
<i>Scalabrinitherium bravardi</i> , S. sp.	MF	Mixed feeding consistent with macraucheniid skeletal and dental morphology	(Bond 1999)	SSF	<i>Promacrauchenia antiqua</i> , <i>P. kraglievichi</i> , <i>P. chapalmalense</i> , <i>Windhausenina</i> , <i>Macrauchenioptosis ensenadensis</i> , <i>Macrauchenia patachonica</i> , <i>Pseudomacrauchenia</i> , <i>Xenorhinotherium bahiense</i>	" <i>Macrauchenia</i> and macrauchenids in general"	DM, PCM
<i>Scalabrinitherium bravardi</i> , S. sp.	MF		(MacFadden 2000)	SSF	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i>	CDM, SI
<i>Scalabrinitherium bravardi</i> , S. sp.	MF	$\delta^{13}\text{C}$ consistent with mixed feeding in most (5) cases, browsing in 2 cases	(Domingo, Prado, and Alberdi 2012)	SSF	<i>Macrauchenia patachonica</i> , <i>Macrauchenioptosis?</i>	<i>Macrauchenia patachonica</i> , <i>Macrauchenioptosis?</i>	SI
<i>Scalabrinitherium</i>		<i>Scalabrinitherium</i> is in	(Schmidt and	WF	Macrauche-		PB

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>um bravardi</i> , S. sp.		Macraucheniinae, Macraucheniinae is monophyletic	Ferrero 2014)	niidae			
<i>Scalabrinitherium bravardi</i> , S. sp.	MF to Fl		(Varela 2014)	SSF	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i>	BM
<i>Scalabrinitherium bravardi</i> , S. sp.	MF	$\delta^{13}\text{C}$ consistent with mixed feeding	(França et al. 2015)	SSF	<i>Macrauchenia</i>	<i>Macrauchenia</i>	LR, SI
<i>Scalabrinitherium bravardi</i>, S. sp.	MF			Sum			
" <i>Scapteromys</i> " <i>hershkovitzi</i>	Om-In	This study, based on: Relationship: Probably is closer to or belongs to <i>Kunsia</i> and/or <i>Gyldenstolpia</i> (Pardiñas, D'Elía, and Teta 2008; Pardiñas 2013; Bezerra and Pardiñas 2016); <i>G. planaltensis</i> : digs for food (Pardiñas, D'Elía, and Teta 2008); <i>K. tomentosus</i> : roots of grasses and arthropods (Bezerra and Pardiñas 2016); <i>Scapteromys aquaticus</i> : feeds preferentially on invertebrates (especially oligochaetes); <i>S. tumidus</i> : heavily insectivorous (~85%), prefers beetles, and digs to obtain food (Patton, Pardiñas, and D'Elía 2015)	(Pardiñas, D'Elía, and Teta 2008; Pardiñas 2013; Bezerra and Pardiñas 2016; Patton, Pardiñas, and D'Elía 2015)	See	<i>Scapteromys herskovitzi</i>	<i>Scapteromys herskovitzi</i>	PB

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Scapteromys tumidus</i>	Om-In	Heavily insectivorous (~85%), prefers beetles, and digs to obtain food	(Patton, Pardiñas, and D'Elia 2015)	Tax	<i>Scapteromys tumidus</i>	<i>Scapteromys tumidus</i>	LR-E
<i>Scelidotherium leptocephalum</i> , S. sp.	Fl		(Pujos et al. 2012)	WS F	<i>Scelidotheriinae</i>	<i>Scelidotheriinae</i>	PB
<i>Scelidotherium leptocephalum</i> , S. sp.	Fl	Narrow muzzle, cone-shaped prehensile lip for selecting individual plants or plant parts: Selective feeder	(Bargo, Toledo, and Vizcaíno 2006)	WG	<i>Scelidotherium</i>	<i>Scelidotherium</i>	CMM
<i>Scelidotherium leptocephalum</i> , S. sp.	Om-Fr		(Esteban-Trivigno 2011)	WG	<i>Scelidotherium</i>	<i>Scelidotherium</i>	MM
<i>Scelidotherium leptocephalum</i> , S. sp.	Fl		(Pujos et al. 2012)	WG	<i>Scelidotherium</i>	<i>Scelidotherium</i>	MM
<i>Scelidotherium leptocephalum</i> , S. sp.	MF	$\delta^{13}\text{C}$ of -6.00‰	(França et al. 2015)	WG	<i>Scelidotherium</i>	<i>Scelidotherium</i>	SI
<i>Scelidotherium leptocephalum</i> , S. sp.	Fl			Sum			
<i>Sciamys petisensis</i> , S. sp.	Fr-In	"Fruit with invertebrates"	(Kay, Vizcaíno, and Bargo 2012)	SG	<i>Sciamys</i> sp.	<i>Sciamys</i> sp.	Un
<i>Scirrotherium carinatum</i> , S. <i>hondaensis</i> , S. sp.	Gz	This study, based on: <i>S. hondaensis</i> is most similar to <i>Vassallia</i> (Edmund and Theodor 1997), which is highly efficient at grinding (Vizcaíno, Iuliis, and Bargo	(Edmund and Theodor 1997; Vizcaíno, Iuliis, and Bargo 1998)	Tax, SG	<i>Scirrotherium hondaensis</i>		MC:FR

Table S4.9: Dietary data for South American fossil taxa, cont.

1998)							
<i>Scirrotherium carinatum</i> , <i>S. hondaensis</i> , <i>S. sp.</i>	In-Fr	"Insects with fruit"	(Kay and Mad-den 1997b)	Tax, SG	<i>Scirrotherium hondaensis</i>	<i>Scirrotherium hondaensis</i>	Un
<i>Scirrotherium carinatum</i> , <i>S. hondaensis</i> , <i>S. sp.</i>	Gz	Relationship: Morphological similarity to <i>Vassallia</i> ; Diet: <i>Holmesina</i> less efficient at grinding than <i>Vassallia</i>	(Vizcaíno, Iuliis, and Bargo 1998)	MS, See	<i>Holmesina occidentalis</i> , <i>Vassallia maxima</i>	<i>Holmesina</i> , <i>Vassallia</i>	CMDM
<i>Scirrotherium carinatum</i> , <i>S. hondaensis</i> , <i>S. sp.</i>	Gz	Very capable grinders	(Iuliis, Bargo, and Vizcaíno 2001)	SF	<i>Holmesina occidentalis</i> , <i>H. paulacoutoi</i> , <i>Pam-patherium humboldtii</i> , <i>P. typum</i>	<i>Holmesina occidentalis</i> , <i>H. paulacoutoi</i> , <i>Pam-patherium humboldtii</i> , <i>P. typum</i>	BM
<i>Scirrotherium carinatum</i> , <i>S. hondaensis</i> , <i>S. sp.</i>	Gz	Very high OSA (Occlusal Surface Area), typical of grazers (also may have to do with digestive tract needing greater oral food processing)	(Vizcaíno, Bargo, and Cassini 2006)	SF	<i>Holmesina occidentalis</i>	<i>Holmesina occidentalis</i>	DM
<i>Scirrotherium carinatum</i> , <i>S. hondaensis</i> , <i>S. sp.</i>	Gz		(Mead et al. 2007)	WF	Pam-patheriidae	Pam-patheriidae	LR
<i>Scirrotherium carinatum</i> , <i>S. hondaensis</i> , <i>S. sp.</i>	Gz		(Vizcaíno 2009)	WF	Pam-patheriidae	Pam-patheriidae	CMDM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Scirrotherium carinatum</i> , <i>S. hondaensis</i> , <i>S. sp.</i>	Gz	Differences between <i>Holmesina</i> and <i>Pampatherium</i> species relate to environments (more humid v. semi-arid) rather than diet	(Carlini and Zurita 2010)	SF	<i>Holmesina</i> and <i>Pampatherium</i>	<i>Holmesina</i> and <i>Pampatherium</i>	LR
<i>Scirrotherium carinatum</i>, <i>S. hondaensis</i>, <i>S. sp.</i>	Gz	Sum					
<i>Sclerocalyptus ornatus</i>	Gz		(Fariña 1985)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CMM
<i>Sclerocalyptus ornatus</i>	Gz		(Pérez, Scillato-Yané, and Vizcaino 2000)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CM
<i>Sclerocalyptus ornatus</i>	Gz		(Fariña and Vizcaíno 2001)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CMDM
<i>Sclerocalyptus ornatus</i>	Gz	<i>Panochthus</i> and <i>Sclerocalyptus</i> : grazers in cold, semiarid, open environments	(Zurita, Scillato-Yané, and Carlini 2005)	AGp	<i>Panochthus</i> and <i>Sclerocalyptus</i>	Plio-Pleistocene Glyptodontidae	LR
<i>Sclerocalyptus ornatus</i>	Gz		(Rincón, White, and McDonald 2008)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	LR

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Sclerocalyptus ornatus</i>	Gz	Relationship: Plio-Pleistocene glyptodonts shared dental morphology and diet based on authors above; Diet: Bulk feeders in moderately open to open habitats	(Vizcaíno, Casini, et al. 2011)	See	<i>Doedicurus, Panochthus, Neuryurus, Neosclerocalyptus</i>	<i>Doedicurus, Panochthus, Neuryurus, Neosclerocalyptus</i>	CDM
<i>Sclerocalyptus ornatus</i>	MF		(Domingo, Prado, and Alberdi 2012)	WG	<i>Sclerocalyptus, Neosclerocalyptus</i>	<i>Sclerocalyptus, Neosclerocalyptus</i>	SI
<i>Sclerocalyptus ornatus</i>	MF		(França et al. 2015)	WG	<i>Sclerocalyptus, Neosclerocalyptus</i>	<i>Sclerocalyptus, Neosclerocalyptus</i>	SI
<i>Sclerocalyptus ornatus</i>	MF or Gz	This study, based on: Reinterpretation of stable isotope data (Domingo, Prado, and Alberdi 2012; França et al. 2015): Although interpreting stable isotope data from a single sample in dentine is risky for multiple reasons, -5.3‰ (<i>Neosclerocalyptus</i>) very likely represents pure grazing in a habitat with mixed C ₄ and C ₃ grasses (37°S, Late Pleistocene); for the same region in their data, <i>Equus</i> , which they interpret as pure grazing on a mix of C ₃ and C ₄ grasses, has an average of -7.9‰, and <i>Toxodon</i> , which they also inter-	(Domingo, Prado, and Alberdi 2012; França et al. 2015)	WG	<i>Sclerocalyptus, Neosclerocalyptus</i>	<i>Sclerocalyptus, Neosclerocalyptus</i>	SI

Table S4.9: Dietary data for South American fossil taxa, cont.

		pret as pure grazing on a mix of C ₃ and C ₄ grasses, has an average of -5.8‰. Can't rule out grazing on grounds of single <i>Sclerocalyp-tus</i> sample either (-7‰)					
<i>Sclerocalyp-tus ornatus</i>	Gz			Sum			
<i>Scleromys colombianus</i> , <i>S. schurmanni</i> , <i>S. sp.</i>	Fr-Fl	(Kay and Madden 1997b)	Tax	<i>Scleromys colombianus</i> , <i>S. schurmanni</i> , <i>S. cf. S. colombianus</i> , <i>S. cf. S. schurmanni</i>	<i>Scleromys colombianus</i> , <i>S. schurmanni</i> , <i>S. cf. S. colombianus</i> , <i>S. cf. S. schurmanni</i>	Un	
<i>Sigmodon hispidus</i> , <i>S. sp.</i>	Gz	<i>S. alstoni</i> : strongly prefers grass, but eats large quantities of grain as well; <i>S. hirsutus</i> : green tissues of grasses and herbaceous dicots	(Patton, Pardiñas, and D'Elia 2015)	Tax, SG	<i>Sigmodon alstoni</i> , <i>S. hirsutus</i>	<i>Sigmodon alstoni</i> , <i>S. hirsutus</i>	LR-E
<i>Sipalocyon gracilis</i> , <i>S. sp.</i>	HC		(Kay, Vizcaíno, and Bargo 2012)	Tax, SG	<i>Sipalocyon gracilis</i>	<i>Sipalocyon gracilis</i>	Un
<i>Sipalocyon gracilis</i> , <i>S. sp.</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	Tax, SG	<i>Sipalocyon gracilis</i>	<i>Sipalocyon gracilis</i>	DM
<i>Sipalocyon gracilis</i>, <i>S. sp.</i>	HC			Sum			
<i>Smilodon fatalis</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013;	Tax	<i>Smilodon fatalis</i>	<i>Smilodon fatalis</i>	DM

Table S4.9: Dietary data for South American fossil taxa, cont.

			Prevosti and Martin 2013)				
<i>Smilodon fatalis</i>	HC	Probably focused on larger prey like <i>Mylodon</i> and <i>Macrauchenia</i>	(Prevosti and Martin 2013)	WG	<i>Smilodon</i>	<i>Smilodon</i>	CDM, PCM, Tph
<i>Smilodon fatalis</i>	HC			Sum			
<i>Smilodon gracilis</i> , <i>S. sp.</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013; Prevosti and Martin 2013)	SG	<i>Smilodon fatalis</i> , <i>S. populator</i>	<i>Smilodon fatalis</i> , <i>S. populator</i>	DM
<i>Smilodon gracilis</i> , <i>S. sp.</i>	HC	Probably focused on larger prey like <i>Mylodon</i> and <i>Macrauchenia</i>	(Prevosti and Martin 2013)	WG	<i>Smilodon</i>	<i>Smilodon</i>	CDM, PCM, SI, Tph
<i>Smilodon gracilis</i>, <i>S. sp.</i>	HC			Sum			
<i>Smilodon populator</i>	HC	By comparison with North American <i>Smilodon</i> spp., could hunt prey between 1000-2000 kg	(Prevosti and Vizcaíno 2006)	Tax	<i>Smilodon populator</i>	<i>Smilodon populator</i>	MC:FR
<i>Smilodon populator</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013; Prevosti and Martin 2013)	Tax	<i>Smilodon populator</i>	<i>Smilodon populator</i>	DM
<i>Smilodon populator</i>	HC	Probably focused on larger prey like <i>Mylodon</i> and <i>Macrauchenia</i>	(Prevosti and Martin 2013)	WG	<i>Smilodon</i>	<i>Smilodon</i>	CDM, PCM, SI, Tph
<i>Smilodon popu-</i>	HC			Sum			

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>lator</i>							
<i>Solimoea acensis</i>	Fr-Fl	Primarily fruit, some leaves: similar to spider monkey	(Kay and Cozzuol 2006)	Tax	<i>Solimoea acensis</i>	<i>Solimoea acensis</i>	DM, MAs
<i>Solimoea acensis</i>	Fr		(Halenar 2012)	Tax	<i>Solimoea acensis</i>	<i>Solimoea acensis</i>	LR
<i>Solimoea acensis</i>	Fr-Fl			Sum			
<i>Sparassocynus heterotopicus</i>, <i>S. sp.</i>	HC		(Reig and Simpson 1972)	WG	<i>Sparassocynus</i>	<i>Sparassocynus</i>	CMDM
<i>Speothos sp.</i>	HC		(Prevosti, Forasiepi, and Zimicz 2013)	SG	<i>Speothos venaticus</i>, <i>S. pacivorus</i>	<i>Speothos venaticus</i>, <i>S. pacivorus</i>	DM
<i>Sphenotherus paranensis</i>, <i>S. sp.</i>	Gz	This study, based on: <i>Sphenotherus</i> is most closely related to <i>Mylodon</i>, then to <i>Pleurolestodon</i> (Perea 1992), both of which are grazers (Pujos et al. 2012)	(Perea 1992; Pujos et al. 2012)	SG	<i>Sphenotherus</i>	<i>Sphenotherus</i>	PB
<i>Stegomastodon platensis</i> , <i>S. sp.</i>	GH	Grazer to browser depending on site: <i>S. waringi</i> : grazing to browse-heavy mixed feeding, <i>S. platensis</i> : browsing to mixed feeding	(Sánchez, Prado, and Alberdi 2004)	Tax, SG	<i>Stegomastodon</i> (= <i>Haplomastodon</i>) <i>waringi</i> , <i>Stegomastodon platensis</i> (= <i>Haplomastodon chimborazi</i> , = <i>Notiomastodon platensis</i>)	<i>Stegomastodon</i> (= <i>Haplomastodon</i>) <i>waringi</i> , <i>Stegomastodon platensis</i> (= <i>Haplomastodon chimborazi</i> , = <i>Notiomastodon platensis</i>)	SI

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Stegomastodon platensis</i> , S. sp.	GH	Diet depends on availability and can contain low quality food from woody plants and C ₃ grasses	(Asevedo et al. 2012)	Tax, SG	<i>Stegomastodon platensis</i> (=Notiomastodon platensis, =Haplomastodon chimborazi)	<i>Stegomastodon platensis</i> (=Notiomastodon platensis, =Haplomastodon chimborazi)	DMc, TCA
<i>Stegomastodon platensis</i> , S. sp.	GH	Diet depends on availability and can contain low quality food from woody plants and C ₃ grasses	(Avilla et al. 2013)	Tax, SG	<i>Stegomastodon platensis</i> (=Notiomastodon platensis, =Haplomastodon chimborazi)	<i>Stegomastodon platensis</i> (=Notiomastodon platensis, =Haplomastodon chimborazi)	LR
<i>Stegomastodon platensis</i>, S. sp.	GH	Sum					
<i>Steiromys</i> sp.	GH	Larger muscle mass, more grinding capability than extant Neotropical porcupines, more similar to <i>Erethizon dorsatum</i> that consumes bark, seeds, and leaves including conifer needles	(Candela, Rasia, and Pérez 2012)	SG	<i>Steiromys duplicatus</i>	<i>Steiromys duplicatus</i>	CDM
<i>Steiromys</i> sp.	Fl		(Kay, Vizcaíno, and Bargo 2012)	SG	<i>Steiromys duplicatus</i>	<i>Steiromys duplicatus</i>	Un
<i>Steiromys</i> sp.	GH	Sum					
<i>Urumacotherium</i> (=Stenodon) campbelli, U. sp.	Gz	This study, based on: <i>U. garciai</i> : "Shovel-shaped lingual gutter" and <i>U. campbelli</i> : "Bulbous palate" (Negri and Ferigolo 2004); broad snout corresponds with grazer diet in Mylodontiidae	(Bargo, Toledo, and Vizcaíno 2006; Pujos et al. 2012; Negri and Ferigolo 2004)	Tax, SG	<i>Urumacotherium campbelli</i> , <i>U. garciai</i>		CMM

Table S4.9: Dietary data for South American fossil taxa, cont.

		(Bargo, Toledo, and Vizcaíno 2006; Pujos et al. 2012)					
<i>Urumacotherium</i> (= <i>Stenodon</i>) <i>campbelli</i> , U. sp.	Gz	This study, based on: Most mylodontids, other than Scelidotheriinae, are grazers (Pujos et al. 2012)	(Pujos et al. 2012)	WF	Mylodontidae	Mylodontidae	PB
<i>Urumacotherium</i> (= <i>Stenodon</i>) <i>campbelli</i>, U. sp.	Gz			Sum			
<i>Stenotatus</i> sp.	Sc-In		(Vizcaíno and Bargo 1998)	SG	<i>Stenotatus patagonicus</i>	<i>Stenotatus patagonicus</i>	CDM
<i>Stenotephanos plicidens</i>	GH	Diet varies from C ₃ browser in closed canopy to open grassland C ₄ grazer	(MacFadden 2005)	SF, PB	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	SI
<i>Stenotephanos plicidens</i>	Fl		(Townsend and Croft 2008a)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	DMc
<i>Stenotephanos plicidens</i>	Gz or MF		(Cassini et al. 2011)	SF, PB	<i>Nesodon</i>	<i>Nesodon</i>	CMM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Stenotephanos plicidens</i>	GH		(Cassini and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	BM
<i>Stenotephanos plicidens</i>	GH		(Cassini, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	CM
<i>Stenotephanos plicidens</i>	Gz		(Cassini et al. 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CDM
<i>Stenotephanos plicidens</i>	GH		(Cassini, Flores, and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CO, CM
<i>Stenotephanos plicidens</i>	Gz		(Kay, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	LR
<i>Stenotephanos plicidens</i>	GH	Diet dependent on availability: Browse to graze	(Cassini 2013)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CGM
<i>Stenotephanos plicidens</i>	GH			Sum		Toxodontidae	
<i>Stirtonia</i> sp., <i>S. tatacoensis</i> , <i>S. victoriae</i>	Fl		(Fleagle, Kay, and Anthony 1997)	Tax, SG	<i>Stirtonia tatacoensis</i> , <i>S. victoriae</i>	<i>Stirtonia tatacoensis</i> , <i>S. victoriae</i>	DM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Stirtonia</i> sp., <i>S. tatacoensis</i> , <i>S. victoriae</i>	Fl		(Kay and Madden 1997b)	SG	<i>Stirtonia tatacoensis</i> , <i>S. victoriae</i>	<i>Stirtonia tatacoensis</i> , <i>S. victoriae</i>	Un
<i>Stirtonia</i> sp., <i>S. tatacoensis</i> , <i>S. victoriae</i>	Fl		(Halenar 2012)	SG	<i>Stirtonia tatacoensis</i> , <i>S. victoriae</i>	<i>Stirtonia tatacoensis</i> , <i>S. victoriae</i>	LR
<i>Stirtonia</i> sp., <i>S. tatacoensis</i>, <i>S. victoriae</i>	Fl			Sum			
<i>Stromaphorus</i> sp.	MF	Relationship: Similar temporal trends in multiple lineages of glyptodonts: Intermediate between Miocene browsers and Pleistocene grazers	(Vizcaíno, Cassini, et al. 2011)	See	<i>Hoplophractus</i> , <i>Eosclerocalyptus</i> , <i>Urotherium</i>	<i>Hoplophractus</i> , <i>Eosclerocalyptus</i> , <i>Urotherium</i>	CDM
<i>Stromaphorus</i> sp.	MF	This study, based on: Mixed feeding in <i>Hoplophractus</i> , <i>Eosclerocalyptus</i> , <i>Pseudoplohophorus</i> (Vizcaíno, Cassini, et al. 2011); and <i>Stromaphorus</i> , <i>Hoplophractus</i> , <i>Eosclerocalyptus</i> , <i>Pseudoplohophorus</i> closely related to each other (Fernicola, Vizcaíno, and Fariña 2008; Porpino, Fernicola, and Bergqvist 2010; Fernicola and Porpino 2012)	(Vizcaíno, Cassini, et al. 2011; Porpino, Fernicola, and Bergqvist 2010; Fernicola and Porpino 2012; Fernicola, Vizcaíno, and Fariña 2008)	Tax	<i>Stromaphorus</i> , <i>Hoplophractus</i> , <i>Eosclerocalyptus</i> , <i>Pseudoplohophorus</i>		CDM
<i>Stromaphorus</i> sp.	MF			Sum			

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Stylocynus paranensis</i>	Om	Omnivorous and "possibly bear-like in feeding habits" based on "enormous protocones and broad, basined talonids"	(Marshall 1978)	Tax	<i>Stylocynus paranensis</i>	<i>Stylocynus paranensis</i>	DM
<i>Stylocynus paranensis</i>	Om		(Prevosti, Forasiepi, and Zimicz 2013)	Tax	<i>Stylocynus paranensis</i>	<i>Stylocynus paranensis</i>	DM
<i>Stylocynus paranensis</i>	Om			Sum			
<i>Surameryx acensis</i>	Fl or MF	This study, based on: brachydont to mesodont cheek teeth in Dromomerycinae (Janis 2000)	(Janis 2000)	WS F	Dromomerycinae		DM
<i>Surameryx acensis</i>	Fl or MF	Relationship: Almost all spp. in Dromomerycinae are browsers, including all more basal/ earlier spp.	(Semprebon, Janis, and Solounias 2004)	SSF. See	Dromomerycinae: Drepanomeryx (2 spp.), Dromomeryx (2 spp.), Rakomerx (1 sp.), Barbouromeryx sp., Bouromeryx pawniensis, Procranioceras (1 sp.), Cranioceras (2 spp.), Pediomeryx (2 spp.)	Dromomerycinae: Drepanomeryx (2 spp.), Dromomeryx (2 spp.), Rakomerx (1 sp.), Barbouromeryx sp., Bouromeryx pawniensis, Procranioceras (1 sp.), Cranioceras (2 spp.), Pediomeryx (2 spp.)	DMc, DMs

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Surameryx acrensis</i>	Fl	This study, based on: Relationship: Brachydont cheek teeth, most resembles <i>Barbouromeryx</i> , also resembles <i>Bouromeryx</i> , most closely related to these and other early/basal Dromomerycines (Prothero et al. 2014); Diet: All taxa mentioned above are browsers (Semprebon, Janis, and Solounias 2004)	(Semprebon, Janis, and Solounias 2004; Prothero et al. 2014)	See	<i>Surameryx acrensis</i>		DM, DMc, DMs
<i>Surameryx acrensis</i>	Fl	Sum					
<i>Sylvilagus floridanus</i> , <i>Sylvilagus</i> sp.	GH	Diet ranges from browsing to grazing regionally and seasonally	(Chapman, Hockman, and Ojeda C. 1980)	Tax, SG	<i>Sylvilagus floridanus</i>	<i>Sylvilagus floridanus</i>	LR-E
<i>Sylvilagus floridanus</i> , <i>Sylvilagus</i> sp.	GH	Diet ranges from browsing to grazing	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax, SG	<i>Sylvilagus floridanus</i>	<i>Sylvilagus floridanus</i>	LR-E
<i>Sylvilagus floridanus</i>, <i>Sylvilagus</i> sp.	GH	Sum					
<i>Sylvochoerus woodburnei</i>	Om-Fr	Closely allied with <i>Tayassu pecari</i> ; Dug with snouts in leaf litter for food, including fallen fruits and nuts	(Frailey and Campbell 2012)	Tax	<i>Sylvochoerus woodburnei</i>	<i>Sylvochoerus woodburnei</i>	CM, PCM, CLR
<i>Tadarida brasiliensis</i>	In	Aerial pursuit insectivore-~90% of diet moths	(Wilkins 1989)	Tax	<i>Tadarida brasiliensis</i>	<i>Tadarida brasiliensis</i>	LR-E

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Tafimys powelli</i>	Gz	Associated with grazing on abrasive vegetation	(Ortiz, Pardiñas, and Steppan 2000)	Tax	<i>Tafimys powelli</i>	<i>Tafimys powelli</i>	DM
<i>Tafimys powelli</i>	Gz	Associated with grazing on abrasive vegetation	(Ortiz and Pardiñas 2001)	Tax	<i>Tafimys powelli</i>	<i>Tafimys powelli</i>	DM
<i>Tafimys powelli</i>	Gz	Associated with grazing on abrasive vegetation	(Ortiz, Jayat, and Pardiñas 2011)	Tax	<i>Tafimys powelli</i>	<i>Tafimys powelli</i>	DM
<i>Tafimys powelli</i>	Gz		(Grayson 2016)	Tax	<i>Tafimys powelli</i>	<i>Tafimys powelli</i>	LR
<i>Tafimys powelli</i>	Gz		Ortiz pers. comm.	Tax	<i>Tafimys powelli</i>	<i>Tafimys powelli</i>	Un
<i>Tafimys powelli</i>	Gz			Sum			
<i>Tapirus greslebini</i> , <i>T. mesopotamicus</i> , <i>T. olivaresi</i> , <i>T. sp. T. terrestris</i>	Fl-Fr	<i>T. bairdii</i> : Selective feeders, eat a variety of leaves and fruits; <i>T. pinchaque</i> : Selective browsers; <i>T. terrestris</i> : Selective browsers and frugivores	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax, SG	<i>T. bairdii</i> , <i>T. pinchaque</i> , <i>T. terrestris</i>	<i>T. bairdii</i> , <i>T. pinchaque</i> , <i>T. terrestris</i>	LR-E
<i>Tapirus greslebini</i> , <i>T. mesopotamicus</i> , <i>T. olivaresi</i> , <i>T. sp. T. terrestris</i>	Fr-Fl	"Frugivore-herbivore"	(Ranzi 2000)	Tax, SG	<i>T. terrestris</i>	<i>T. terrestris</i>	Un
<i>Tapirus greslebini</i>, <i>T. mesopotamicus</i>, <i>T. olivaresi</i>, <i>T. sp. T. terrestris</i>	Fr-Fl			Sum			

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Tayassu pecari</i> , <i>T. sp.</i>	Fl-Fr	Fruits and seeds 61% volume, 97% occurrence; vegetative plant parts 39% volume, 97% occurrence, invertebrates, larvae, and vertebrate parts trace % volume, 82% occurrence	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax, SG	<i>Tayassu pecari</i>	<i>Tayassu pecari</i>	LR-E
<i>Tayassu pecari</i> , <i>T. sp.</i>	Fr-Fl	"Frugivore-herbivore"	(Ranzi 2000)	Tax, SG	<i>Tayassu pecari</i>	<i>Tayassu pecari</i>	Un
<i>Tayassu pecari</i>, <i>T. sp.</i>	Fl-Fr	Sum					
<i>Pecari</i> (= <i>Tayassu</i>) <i>tajacu</i>	Fl-Fr	Fruits, seeds, tubers, green grass, shoots, cactus fruit and stems, bromeliad and agave growing points	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax	<i>Pecari</i> (= <i>Tayassu</i>) <i>tajacu</i>	<i>Pecari</i> (= <i>Tayassu</i>) <i>tajacu</i>	LR-E
<i>Pecari</i> (= <i>Tayassu</i>) <i>tajacu</i>	Fr-Fl	"Frugivore-herbivore"	(Ranzi 2000)	Tax	<i>Pecari</i> (= <i>Tayassu</i>) <i>tajacu</i>	<i>Pecari</i> (= <i>Tayassu</i>) <i>tajacu</i>	Un
<i>Pecari</i> (=<i>Tayassu</i>) <i>tajacu</i>	Fl-Fr	Sum					
<i>Tetramerorhinus cingulatum</i> (= <i>T. fortis</i>), <i>T. sp.</i>	Fl		(Cassini and Vizcaíno 2012)	SG	<i>Tetramerorhinus mixtum</i>	<i>Tetramerorhinus mixtum</i>	BM
<i>Tetramerorhinus cingulatum</i> (= <i>T. fortis</i>), <i>T. sp.</i>	Fl		(Cassini et al. 2012)	SG	<i>Tetramerorhinus mixtum</i>	<i>Tetramerorhinus mixtum</i>	CMDM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Tetramerorhinus cingulatum</i> (= <i>T. fortis</i>), <i>T.</i> sp.	Fl		(Kay, Vizcaíno, and Bargo 2012)	SG	<i>Tetramerorhinum mixtum</i>	<i>Tetramerorhinum mixtum</i>	Un
<i>Tetramerorhinus cingulatum</i> (= <i>T. fortis</i>), <i>T.</i> sp.	Fl		(Cassini 2013)	SG	<i>Tetramerorhinum mixtum</i>	<i>Tetramerorhinum mixtum</i>	CGM
<i>Tetramerorhinus cingulatum</i> (= <i>T. fortis</i>), <i>T.</i> sp.	Fl			Sum			
<i>Tetrastylus araucanus</i> , <i>T.</i> sp.	Fr-Fl	This study, based on: Extreme dental similarity to <i>Dinomys</i> , may be congeneric (White and Alberico 1992)	(White and Alberico 1992)	SG	<i>Dinomys branickii</i> , <i>Tetrastylus atropheatus</i>		CLR, DM
<i>Thalassocnus antiquus</i>	Gz	Similar to <i>T. natans</i> but slightly older and slightly more primitive	(Muizon et al. 2003)	Tax	<i>Thalassocnus antiquus</i>	<i>Thalassocnus antiquus</i>	
<i>Thalassocnus antiquus</i>	Fl		(Pujos et al. 2012)	WG	<i>Thalassocnus</i>	<i>Thalassocnus</i>	MM
<i>Thalassocnus antiquus</i>	Om-Fr		(Esteban-Trivigno 2011)	WG	<i>Thalassocnus</i>	<i>Thalassocnus</i>	MM
<i>Thalassocnus antiquus</i>	Gz			Sum			

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Thalassocnus carolomartini</i>	Gz	More specialized for marine 'grazing' than <i>T. natans</i> , specifically in broadening of the spout and development of strong lips, increased amount of crushing vegetation (associated with 'grazing') than other nothrotheres	(Muizon et al. 2004)	Tax	<i>Thalassocnus carolomartini</i>	<i>Thalassocnus carolomartini</i>	
<i>Thalassocnus carolomartini</i>	Fl		(Pujos et al. 2012)	WG	<i>Thalassocnus</i>	<i>Thalassocnus</i>	MM
<i>Thalassocnus carolomartini</i>	Om-Fr		(Esteban-Trivigno 2011)	WG	<i>Thalassocnus</i>	<i>Thalassocnus</i>	MM
<i>Thalassocnus carolomartini</i>	Gz			Sum			
<i>Thalassocnus littoralis</i>	Gz	More specialized for marine 'grazing' than <i>T. natans</i> , specifically in broadening of the spout and development of strong lips, increased amount of crushing vegetation (associated with 'grazing') than other nothrotheres	(McDonald and Muizon 2002)	Tax	<i>Thalassocnus littoralis</i>	<i>Thalassocnus littoralis</i>	
<i>Thalassocnus littoralis</i>	Fl		(Pujos et al. 2012)	WG	<i>Thalassocnus</i>	<i>Thalassocnus</i>	MM
<i>Thalassocnus littoralis</i>	Om-Fr		(Esteban-Trivigno 2011)	WG	<i>Thalassocnus</i>	<i>Thalassocnus</i>	MM
<i>Thalassocnus littoralis</i>	Gz			Sum			
<i>Thalassocnus natans</i>	Gz	Transition from browsing to "grazing on marine vegetation", specifically seagrasses	(McDonald and Muizon 2002)	Tax	<i>Thalassocnus natans</i>	<i>Thalassocnus natans</i>	
<i>Thalassocnus</i>	Fl		(Pujos et al.	WG	<i>Thalassocnus</i>	<i>Thalassocnus</i>	MM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>natans</i>			2012)				
<i>Thalassocnus natans</i>	Om-Fr		(Esteban-Trivigno 2011)	WG	<i>Thalassocnus</i>	<i>Thalassocnus</i>	MM
<i>Thalassocnus natans</i>	Gz			Sum			
<i>Thalassocnus</i> sp.	Gz	Semi-aquatic to aquatic in order to feed on seagrasses or seaweed because Peruvian coast was a desert	(Muizon et al. 2004)	SG	<i>Thalassocnus antiquus</i> , <i>T. natans</i> , <i>T. carolomartini</i> , <i>T. yaucensis</i>	<i>Thalassocnus</i> sp.	
<i>Thalassocnus</i> sp.	Fl		(Pujos et al. 2012)	WG	<i>Thalassocnus</i>	<i>Thalassocnus</i>	MM
<i>Thalassocnus</i> sp.	Om-Fr		(Esteban-Trivigno 2011)	WG	<i>Thalassocnus</i>	<i>Thalassocnus</i>	MM
<i>Thalassocnus</i> sp.	Gz			Sum			
<i>Thalassocnus yaucensis</i>	Gz	More specialized for marine 'grazing' than <i>T. natans</i> , specifically in broadening of the spout and development of strong lips	(Muizon et al. 2004)	Tax	<i>Thalassocnus yaucensis</i>	<i>Thalassocnus yaucensis</i>	
<i>Thalassocnus yaucensis</i>	Fl		(Pujos et al. 2012)	WG	<i>Thalassocnus</i>	<i>Thalassocnus</i>	MM
<i>Thalassocnus yaucensis</i>	Om-Fr		(Esteban-Trivigno 2011)	WG	<i>Thalassocnus</i>	<i>Thalassocnus</i>	MM
<i>Thalassocnus yaucensis</i>	Gz			Sum			
<i>Theosodon</i> sp.	Fl	Softer items than even proterotheriids	(Cassini and Vizcaíno 2012)	WG	<i>Theosodon</i>	<i>Theosodon</i>	BM
<i>Theosodon</i> sp.	Fl	<i>Theosodon garrettorum</i> largest	(Cassini et al.	SG	<i>Theosodon</i>	<i>Theosodon</i>	CMDM

Table S4.9: Dietary data for South American fossil taxa, cont.

		and in mixed feeder space, <i>T. gracilis</i> and <i>T. lydekkeri</i> browsers	2012)		<i>garrettorum</i> , <i>T. gracilis</i> , <i>T. lydekkeri</i>	<i>garrettorum</i> , <i>T. gracilis</i> , <i>T. lydekkeri</i>	
<i>Theosodon</i> sp.	Fl		(Kay, Vizcaíno, and Bargo 2012)	SG	<i>Theosodon gracilis</i> , <i>T. lydekkeri</i>	<i>Theosodon gracilis</i> , <i>T. lydekkeri</i>	Un
<i>Theosodon</i> sp.	Fl		(Cassini 2013)	WG	<i>Theosodon</i>	<i>Theosodon</i>	CGM
<i>Theosodon</i> sp.	Fl			Sum			
<i>Theriodictis</i> sp.	HC		(Prevosti and Palmqvist 2001)	Tax	<i>Theriodictis</i>	<i>Theriodictis</i>	CDM
<i>Theriodictis</i> sp.	HC		(Prevosti, Forasiepi, and Zimicz 2013)	SG	<i>Theriodictis platensis</i>	<i>Theriodictis platensis</i>	DM
<i>Theriodictis</i> sp.	HC			Sum			
<i>Thrichomys</i> sp.	Fr-Gn	<i>T. apereoides</i> : seeds, fruits, insects; <i>T. laurentius</i> : frugivore-folivore; <i>T. pachyurus</i> : frugivore-granivore	(Patton, Pardiñas, and D'Elia 2015)	SG	<i>T. apereoides</i> , <i>T. laurentius</i> , <i>T. pachyurus</i>	<i>T. apereoides</i> , <i>T. laurentius</i> , <i>T. pachyurus</i>	LR-E
<i>Thylacosmilus atrox</i>, <i>T. sp.</i>	HC			Tax, SG	<i>Thylacosmilus atrox</i>	<i>Thylacosmilus atrox</i>	DM
<i>Thylamys minutus</i> , <i>T. pinei</i> , <i>T. sp.</i>	Om-In	<i>T. elegans</i> : arthropods up to 90% of diet, also eat fruit, small vertebrates, probably carrion; <i>T. velutinus</i> : omnivorous, with 75% of diet animal and 44% arthropods	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SG	<i>T. elegans</i> , <i>T. velutinus</i>	<i>T. elegans</i> , <i>T. velutinus</i>	LR-E
<i>Thylamys minutus</i> , <i>T. pinei</i> , <i>T. sp.</i>	In-Fr		(Kay and Madden 1997b)	SG	<i>T. elegans</i> , <i>T. velutinus</i>	<i>T. elegans</i> , <i>T. velutinus</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Thylamys minutus</i> , <i>T. pinei</i> , <i>T. sp.</i>	In-Fr			Sum			
<i>Thylatheridium hudsoni</i> , <i>T. sp.</i>	HC		(Forasiepi, Goin, and Martinnelli 2009)	Tax	<i>Thylatheridium hudsoni</i>	<i>Thylatheridium hudsoni</i>	CDM
<i>Thylophorops chapalmalensis</i>	MC	"Omnivorous diet trending towards carnivory"	(Goin et al. 2009)	Tax	<i>T. chapalmalensis</i>	<i>T. chapalmalensis</i>	DM
<i>Tolypeutes sp.</i> , <i>T. tricinctus</i>	Fm	Myrmecophagous with some soft invertebrates and fruit	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	SG	<i>Tolypeutes matacus</i>	<i>Tolypeutes matacus</i>	LR-E
<i>Torcellia paranense</i>	Fl		(Pujos et al. 2012)	WG	Megalonychiidae	Megalonychiidae	PB
<i>Toxodon bibidens</i> , <i>T. paranensis</i> , <i>T. platensis</i> , <i>T. sp.</i>	GH	Diet varies from C ₃ browser in closed canopy to open grassland C ₄ grazer	(MacFadden 2005)	WG	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodonteriinae)	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodonteriinae)	SI
<i>Toxodon bibidens</i> , <i>T. paranensis</i> , <i>T. platensis</i> , <i>T. sp.</i>	Fl		(Townsend and Croft 2008a)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	DMc
<i>Toxodon bibidens</i> , <i>T. paranensis</i> , <i>T. sp.</i>	Gz or MF		(Cassini et al. 2011)	SF, PB	<i>Nesodon</i>	<i>Nesodon</i>	CMM

Table S4.9: Dietary data for South American fossil taxa, cont.

745	<i>platensis</i> , <i>T. sp.</i>						
	<i>Toxodon bi-lobidens</i> , <i>T. paranensis</i> , <i>T. platensis</i> , <i>T. sp.</i>	GH		(Cassini and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines BM
	<i>Toxodon bi-lobidens</i> , <i>T. paranensis</i> , <i>T. platensis</i> , <i>T. sp.</i>	GH		(Cassini, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines CM
	<i>Toxodon bi-lobidens</i> , <i>T. paranensis</i> , <i>T. platensis</i> , <i>T. sp.</i>	Gz		(Cassini et al. 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>) CDM
	<i>Toxodon bi-lobidens</i> , <i>T. paranensis</i> , <i>T. platensis</i> , <i>T. sp.</i>	GH		(Cassini, Flores, and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>) CO, CM
	<i>Toxodon bi-lobidens</i> , <i>T. paranensis</i> , <i>T. platensis</i> , <i>T. sp.</i>	Gz		(Kay, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines LR
	<i>Toxodon bi-lobidens</i> , <i>T. paranensis</i> , <i>T. platensis</i> , <i>T. sp.</i>	GH	Diet dependent on availability: Browse to graze	(Cassini 2013)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>) CGM
<i>Toxodon bi-lobidens</i>, <i>T.</i>		GH			Sum		

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>paranensis</i> , <i>T. platensis</i> , <i>T. sp.</i>							
<i>Trachops cirrhosus</i>	MC	Insects and small vertebrates	(Gardner 2007b)	Tax	<i>Trachops cirrhosus</i>	<i>Trachops cirrhosus</i>	LR-E
<i>Trachycalyptoides</i> sp.	MF	Relationship: Similar temporal trends in multiple lineages of glyptodonts: Intermediate between Miocene browsers and Pleistocene grazers	(Vizcaíno, Casini, et al. 2011)	See	<i>Hoplophrac-tus</i> , <i>Eosclerocalyptus</i> , <i>Urotherium</i>	<i>Hoplophrac-tus</i> , <i>Eosclerocalyptus</i> , <i>Urotherium</i>	CDM
<i>Trachytypotherium</i> sp.	Gz-Rz	Roots/tubers, grasses; Mesotheriids were diggers	(Shockey, Croft, and Anaya 2007)	WF, PB	<i>Mesotherium</i> , <i>Plesiotypotherium</i> , <i>Trachytherus</i>	<i>Mesotheriidae</i>	Dental, PCM
<i>Tremacyllus impressus</i> , <i>T. sp.</i>	Gz-Rz	This study, based on: Morphology is consistent with that of other grazer-radicivores in Pachyrukhinae and Interatheriidae: RMW (Relative Muzzle Width)=1.40 (<i>Hegetotherium mirabile</i> : 1.40, <i>Medistylus dorsatus</i> : 1.40, <i>Prosotherium garzoni</i> : 1.70, <i>Pachyrukhos moyanoi</i> : 1.41, <i>Paedotherium bonaerense</i> : 1.56) and HI (Hypsodonty Index) 3.23 (<i>Prohegetotherium sculptum</i> : 2.23, <i>Hegetotherium mirabile</i> : 2.42, <i>Prosotherium garzoni</i> : 2.41, <i>Medistylus dorsatus</i> : 2.72, <i>Pachyrukhos moyanoi</i> : 3.52, <i>Pae-</i>	(Reguero, Dozo, and Cerdeño 2007)	Tax, SG	<i>Tremacyllus impressus</i> , <i>Prohegetotherium sculptum</i> , <i>Hegetotherium mirabile</i> , <i>Prosotherium garzoni</i> , <i>Medistylus dorsatus</i> , <i>Pachyrukhos moyanoi</i> , <i>Paedotherium bonaerense</i>		DMM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Adinotherium bonaerense</i>: 4.06) (Reguero, Dozo, and Cerdeño 2007)							
<i>Trigodon gaudryi</i> , T. sp.	GH	Diet varies from C ₃ browser in closed canopy to open grassland C ₄ grazer	(MacFadden 2005)	SF, PB	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	<i>Toxodon</i> (Toxodontinae) and <i>Mixotoxodon</i> (Haplodontheriinae)	SI
<i>Trigodon gaudryi</i> , T. sp.	Fl		(Townsend and Croft 2008a)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	DMc
<i>Trigodon gaudryi</i> , T. sp.	Gz or MF		(Cassini et al. 2011)	SF, PB	<i>Nesodon</i>	<i>Nesodon</i>	CMM
<i>Trigodon gaudryi</i> , T. sp.	GH		(Cassini and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	BM
<i>Trigodon gaudryi</i> , T. sp.	GH		(Cassini, Vizcaíno, and Bar-go 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	CM
<i>Trigodon gaudryi</i> , T. sp.	Gz		(Cassini et al. 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CDM

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Trigodon gaudryi</i> , <i>T. sp.</i>	GH		(Cassini, Flores, and Vizcaíno 2012)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CO, CM
<i>Trigodon gaudryi</i> , <i>T. sp.</i>	Gz		(Kay, Vizcaíno, and Bargo 2012)	SF, PB	Nesodontines (<i>Adinotherium</i> and <i>Nesodon</i>)	Nesodontines	LR
<i>Trigodon gaudryi</i> , <i>T. sp.</i>	GH	Diet dependent on availability: Browse to graze	(Cassini 2013)	SF, PB	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	Nesodontines (<i>Adinotherium ovinum</i> and <i>Nesodon imbricatus</i>)	CGM
<i>Trigodon gaudryi</i>, <i>T. sp.</i>	GH			Sum			
<i>Typotheriopsis</i> sp.	Gz-Rz	Roots/tubers, grasses; Mesotheriids were diggers	(Shockey, Croft, and Anaya 2007)	WF, PB	<i>Mesotherium</i> , <i>Plesiotypotherium</i> , <i>Trachytherus</i>	Mesotheriidae	Dental, postCM
<i>Typotheriopsis</i> sp.	Gz-Rz	Fed on "low vegetation and perhaps roots and tubers"	(Croft 2016)	SG	<i>Typotheriopsis chasicensis</i>	<i>Typotheriopsis chasicensis</i>	Un
<i>Typotheriopsis</i> sp.	Gz-Rz			Sum			
<i>Typotherium cristatum</i>	Gz-Rz	Roots/tubers, grasses; Mesotheriids were diggers	(Shockey, Croft, and Anaya 2007)	WF, PB	<i>Mesotherium</i> , <i>Plesiotypotherium</i> , <i>Trachytherus</i>	Mesotheriidae	DM, PCM
<i>Urocyon cinereoargenteus</i>	Om		(Prevosti, Forasiepi, and	Tax	<i>Urocyon cinereoargen-</i>	<i>Urocyon cinereoargen-</i>	DM

Table S4.9: Dietary data for South American fossil taxa, cont.

			Zimicz 2013)		teus	teus	
<i>Urotherium interundatum</i> , U. sp.	MF	Relationship: Similar temporal trends in multiple lineages of glyptodonts: Intermediate between Miocene browsers and Pleistocene grazers	(Vizcaíno, Cassini, et al. 2011)	See	<i>Hoplophrac-tus, Eosclero-calyptus, Urotherium</i>	<i>Hoplophrac-tus, Eosclero-calyptus, Urotherium</i>	CDM
<i>Urumaquia robusta</i>	Fl or Fl-Fr		(Bargo 2001)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
<i>Urumaquia robusta</i>	Fl		(Carretero, García, and Dacar 2004)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	CA
<i>Urumaquia robusta</i>	MF	"more of a grazer than a browser contrary to ... <i>E. laurillardi</i> "	(Pujos and Salas 2004a)	SF	<i>Eremotherium elenense</i>	<i>Eremotherium elenense</i>	Un
<i>Urumaquia robusta</i>	Fl		(Fátima Rossetti et al. 2004)	SF	<i>Eremotherium laurillardi</i>	<i>Eremotherium laurillardi</i>	SI
<i>Urumaquia robusta</i>	Fl or Fl-Fr		(Bargo, Toledo, and Vizcaíno 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM, BM
<i>Urumaquia robusta</i>	Fl or Fl-Fr	Soft to moderate food; Cutting, not crushing or grinding; Diet may have included fruits	(Vizcaíno, Bargo, and Cassini 2006)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DM
<i>Urumaquia robusta</i>	Fl	Coprolites and morphology agree: Folivory most likely	(McDonald and Iuliis 2008)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	LR
<i>Urumaquia robusta</i>	Fl	Food reduction mainly by shearing or cutting	(Bargo, Vizcaíno, and Kay 2009)	SF	<i>Eucholoeops</i>	<i>Eucholoeops</i> and "nearly all other Miocene megatherioids" (including basal	DW, CMDM

Table S4.9: Dietary data for South American fossil taxa, cont.

						megatherioids, megalonychids, and megatheriids)	
<i>Urumaquia robusta</i>	Fr-Fl	Selective tough object feeder	(Pujos, Iuliis, and Quispe 2011)	SF	<i>Hiskatherium saintandrei</i>	<i>Hiskatherium saintandrei</i>	MC:FR
<i>Urumaquia robusta</i>	Fl	Food reduction mainly by shearing or cutting	(Bargo, Toledo, and Vizcaíno 2012)	SF	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Peleciodon</i> , <i>Prepootherium</i> , <i>Planops</i>	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Peleciodon</i> , <i>Prepootherium</i> , <i>Planops</i> , and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, and megatheriids)	DW, CMDM
<i>Urumaquia robusta</i>	Fl		(Kay, Vizcaíno, and Bargo 2012)	SF	<i>Eucholoeops ingens</i>	<i>Eucholoeops ingens</i>	Un
<i>Urumaquia robusta</i>	Fl		(Pujos et al. 2012)	WF	Megatheriidae	Megatheriidae	PB, CMDM
<i>Urumaquia robusta</i>	Fl	Low to moderate toughness	(Green and Kalthoff 2015)	SF	<i>Megatherium americanum</i>	<i>Megatherium americanum</i>	DMc

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Urumaquia robusta</i>	MF	"more of a grazer than a browser contrary to ... <i>E. laurillardi</i>"		Sum			
<i>Valgipes bucklandi</i>	Fl		(Pujos et al. 2012)	WS F	Scelidothe- riinae	Scelidothe- riinae	PB
<i>Valgipes bucklandi</i>	Fl		(Pereira, Dantas, and Ferreira 2013)	Tax	<i>Valgipes bucklandi</i>	<i>Valgipes bucklandi</i>	SI
<i>Valgipes bucklandi</i>	Fl			Sum			
<i>Vassallia</i> sp.	Gz	<i>Vassallia</i> even more efficient at grinding than <i>Holmesina</i>	(Vizcaíno, Iuliis, and Bargo 1998)	SG	<i>Vassallia maxima</i>	<i>Vassallia maxima</i>	CMDM
<i>Vassallia</i> sp.	Gz	Very capable grinders	(Iuliis, Bargo, and Vizcaíno 2001)	SF	<i>Holmesina occidentalis</i> , <i>H. paulacoutoi</i> , <i>Pam- patherium humboldtii</i> , <i>P. typum</i>	<i>Holmesina occidentalis</i> , <i>H. paulacoutoi</i> , <i>Pam- patherium humboldtii</i> , <i>P. typum</i>	BM
<i>Vassallia</i> sp.	Gz	Very high OSA (Occlusal Surface Area), typical of grazers (also may have to do with digestive tract needing greater oral food processing)	(Vizcaíno, Bargo, and Cassini 2006)	SF	<i>Holmesina occidentalis</i>	<i>Holmesina occidentalis</i>	DM
<i>Vassallia</i> sp.	Gz	Differences between <i>Holmesina</i> and <i>Pampatherium</i> species relate to environments (more humid v. semi-arid) rather than diet	(Carlini and Zurita 2010)	SF	<i>Holmesina</i> and <i>Pam- patherium</i>	<i>Holmesina</i> and <i>Pam- patherium</i>	LR

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Vassallia</i> sp.	Gz			Sum			
<i>Vetelia</i> sp.	Om	Variety of plant types (roots, tubers, nuts) and variety of animal matter (ants, carrion, birds, mice)	(Vizcaíno 2009)	WT	<i>Prozaedyus</i> , <i>Zaedyus</i> , <i>Macro-euphractus</i> , <i>Euphractus</i> , other extant <i>Euphractini</i>	<i>Euphractini</i>	LR, CDM
<i>Vicugna vicugna</i>	Gz		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax	<i>Vicugna vicugna</i>	<i>Vicugna vicugna</i>	LR-E
<i>Villarroelia totoyoi</i>	MF		(Cifelli and Guerrero 1997)	Tax	<i>Villarroelia totoyoi</i>	<i>Villarroelia totoyoi</i>	DM
<i>Waldochoerus bassleri</i>	Om-Fr	Closely allied with <i>Pecari tajacu</i> ; Dug with snouts in leaf litter for food, including fallen fruits and nuts	(Frailey and Campbell 2012)	Tax	<i>Waldochoerus bassleri</i>	<i>Waldochoerus bassleri</i>	CM, PCM, CLR
<i>Windhausenina</i> sp.	MF	This study, based on: More hypsodont (protohypsodont) than earlier macraucheniids, probably preferred open environments (Bond et al. 1995)	(Bond et al. 1995)	Tax	<i>Promacrauchenina antiqua</i> , <i>P. kraglievichi</i> , <i>P. chapalmalense</i> , <i>Windhausenina</i> , <i>Macrauchenia</i>		DM

Table S4.9: Dietary data for South American fossil taxa, cont.

						<i>opsis ensenadensis</i> , <i>Macrauchenia patachonica</i> , <i>Pseudo-macrauchenia</i> , <i>Xenorhinotherium bahiense</i>	
753	<i>Windhauseniasp.</i>	MF	Mixed feeding consistent with macraucheniid skeletal and dental morphology	(Bond 1999)	Tax	<i>Promacrauchenia antiqua</i> , <i>P. kraglievichi</i> , <i>P. chapalmalense</i> , <i>Windhauseniasp.</i> , <i>Macraucheniaopsis ensenadensis</i> , <i>Macrauchenia patachonica</i> , <i>Pseudo-macrauchenia</i> , <i>Xenorhinotherium bahiense</i>	" <i>Macrauchenia</i> and macrauchenids in general" DM, PCM
	<i>Windhauseniasp.</i>	MF		(MacFadden and Shockey 1997)	SSF	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i> DM, SI

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Windhausen</i> sp.	MF		(MacFadden 2000)	SSF	<i>Macrauchenia</i> <i>patachonica</i>	<i>Macrauchenia</i> <i>patachonica</i>	CDM, SI
<i>Windhausen</i> sp.	MF	$\delta^{13}\text{C}$ consistent with mixed feed- ing in most (5) cases, browsing in 2 cases	(Domingo, Pra- do, and Alberdi 2012)	SSF	<i>Macrauchenia</i> <i>patachonica</i> , <i>Macraucheni-</i> <i>opsis?</i>	<i>Macrauchenia</i> <i>patachonica</i> , <i>Macraucheni-</i> <i>opsis?</i>	SI
<i>Windhausen</i> sp.		<i>Windhausen</i> is in Macrauche- niinae, Macraucheniinae is mon- ophyletic (Schmidt and Ferrero 2014)	(Schmidt and Ferrero 2014)	WF	Macrauche- niidae		PB
<i>Windhausen</i> sp.	MF to Fl		(Varela 2014)	SSF	<i>Macrauchenia</i> <i>patachonica</i>	<i>Macrauchenia</i> <i>patachonica</i>	BM
<i>Windhausen</i> sp.	MF	$\delta^{13}\text{C}$ consistent with mixed feed- ing	(França et al. 2015)	SSF	<i>Macrauchenia</i>	<i>Macrauchenia</i>	LR, SI
<i>Windhausen</i> sp.	MF			Sum			
<i>Xenastrapother-</i> <i>ium aequatori-</i> <i>alis, X. ama-</i> <i>zonense, X. kra-</i> <i>glievichi, X. sp.</i>	Fl	Relationship: Studied taxa in- clude <i>G. snorki</i> from the "Tropi- cal Clade"; Diet: Similar cheek tooth mechanics to rhinocerotoids	(Rensberger and Pfretzschner 1992)	SF, See	<i>Parastra-</i> <i>pothorium</i> , <i>Astrapotheri-</i> <i>um, Granas-</i> <i>trapotherium</i> <i>snorki</i>	<i>Astrapotheres</i>	EM
<i>Xenastrapother-</i> <i>ium aequatori-</i> <i>alis, X. ama-</i> <i>zonense, X. kra-</i> <i>glievichi, X. sp.</i>	Fl		(Kay and Mad- den 1997b)	Tax, SG	<i>Xenastra-</i> <i>pothorium</i> <i>kraglievichi</i>	<i>Xenastra-</i> <i>pothorium</i> <i>kraglievichi</i>	Un
<i>Xenastrapother-</i> <i>ium aequatori-</i> <i>alis, X. ama-</i>	Fl		(Townsend and Croft 2008a)	SF	<i>Astrapotheri-</i> <i>um</i>	<i>Astrapotheri-</i> <i>um</i>	DMc

Table S4.9: Dietary data for South American fossil taxa, cont.

zonense, <i>X. kra-</i> <i>glievichi</i> , <i>X. sp.</i>							
<i>Xenastrapother-</i> <i>ium aequatori-</i> <i>alis</i> , <i>X. ama-</i> <i>zonense</i> , <i>X. kra-</i> <i>glievichi</i> , <i>X. sp.</i>	Fl	Less muscle mass for chewing, proportionally short cheek tooth row		SF	<i>Astrapotheri-</i> <i>um</i>	<i>Astrapotheri-</i> <i>um</i>	CM
<i>Xenastrapother-</i> <i>ium aequatori-</i> <i>alis</i> , <i>X. ama-</i> <i>zonense</i> , <i>X. kra-</i> <i>glievichi</i> , <i>X. sp.</i>	Fl		(Cassini, Viz- caíno, and Bar- go 2012)	SF	<i>Astrapotheri-</i> <i>um</i>	<i>Astrapotheri-</i> <i>um</i>	CM
<i>Xenastrapother-</i> <i>ium aequatori-</i> <i>alis</i> , <i>X. ama-</i> <i>zonense</i> , <i>X. kra-</i> <i>glievichi</i> , <i>X. sp.</i>	Fl		(Cassini et al. 2012)	SF	<i>Astrapotheri-</i> <i>um</i>	<i>Astrapotheri-</i> <i>um</i>	CDM
<i>Xenastrapother-</i> <i>ium aequatori-</i> <i>alis</i> , <i>X. ama-</i> <i>zonense</i> , <i>X. kra-</i> <i>glievichi</i> , <i>X. sp.</i>	Fl		(Cassini 2013)	SF	<i>Astrapotheri-</i> <i>um</i>	<i>Astrapotheri-</i> <i>um</i>	CGM
<i>Xenastrapother-</i> <i>ium aequatori-</i> <i>alis</i> , <i>X. ama-</i> <i>zonense</i> , <i>X. kra-</i> <i>glievichi</i> , <i>X. sp.</i>	MF		(Kay, Vizcaíno, and Bargo 2012)	SF	<i>Astrapotheri-</i> <i>um</i>	<i>Astrapotheri-</i> <i>um</i>	Un
<i>Xenastrapother-</i> <i>ium aequatori-</i> <i>alis</i> , <i>X. ama-</i>	Fl	Relationship: <i>G. snorki</i> is also from the "Tropical Clade"; Diet: "feeding on relatively soft leaves	(Croft 2016)	SF, See	<i>Granastra-</i> <i>pothorium</i> <i>snorki</i>	<i>Granastra-</i> <i>pothorium</i> <i>snorki</i>	Un

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>zonense</i> , <i>X. kraglievichi</i> , <i>X. sp.</i>		near the edges of rivers and lakes"					
<i>Xenastrapotherium aequatorialis</i>, <i>X. amazonense</i>, <i>X. kraglievichi</i>, <i>X. sp.</i>	Fl			Sum			
<i>Xenodontomys sp.</i>	Gz	This study, based on: Fossorial with similarities to <i>Ctenomys</i> but not yet subterranean (Fernández, Vassallo, and Zárate 2000; Verzi 2008); Diet: <i>Ctenomys</i> spp. are grazers or radicivores, many with a preference for above-ground vegetation (Comparatore, Cid, and Busch 1995; Rosi et al. 2009; Albanese et al. 2010; Patton, Pardiñas, and D'Elía 2015)	(Fernández, Vassallo, and Zárate 2000; Verzi 2008; Comparatore, Cid, and Busch 1995; Rosi et al. 2009; Albanese et al. 2010; Patton, Pardiñas, and D'Elía 2015)	Tax	<i>Xenodontomys</i>		MS, ES, CLR
<i>Xenorhinotherium bahiense</i> , <i>X. sp.</i>	Fl		(Lobo 2015)	Tax	<i>Xenorhinotherium bahiense</i>	<i>Xenorhinotherium bahiense</i>	DM, DGM
<i>Xiphuroides sp.</i>	Gz		(Fariña 1985)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CMM
<i>Xiphuroides sp.</i>	Gz		(Pérez, Scillatoyané, and Vizcaino 2000)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodonti-	CM

Table S4.9: Dietary data for South American fossil taxa, cont.

						dae	
<i>Xiphuroides</i> sp.	Gz		(Fariña and Vizcaíno 2001)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	CMDM
<i>Xiphuroides</i> sp.	Gz	<i>Panochthus</i> and <i>Sclerocalyptus</i> : grazers in cold, semiarid, open environments	(Zurita, Scillato-Yané, and Carlini 2005)	AGp	<i>Panochthus</i> and <i>Sclerocalyptus</i>	Plio-Pleistocene Glyptodontidae	LR
<i>Xiphuroides</i> sp.	Gz		(Rincón, White, and McDonald 2008)	AGp	<i>Glyptodon</i>	Plio-Pleistocene Glyptodontidae	LR
<i>Xiphuroides</i> sp.	Gz	Relationship: Plio-Pleistocene glyptodonts shared dental morphology and diet based on authors above; Diet: Bulk feeders in moderately open to open habitats	(Vizcaíno, Cassini, et al. 2011)	See	<i>Doedicurus</i> , <i>Panochthus</i> , <i>Neuryurus</i> , <i>Neosclerocalyptus</i>	<i>Doedicurus</i> , <i>Panochthus</i> , <i>Neuryurus</i> , <i>Neosclerocalyptus</i>	CDM
<i>Xiphuroides</i> sp.	Gz			Sum		Plio-Pleistocene Glyptodontidae	
<i>Xyophorus</i> sp.	Fl	Food reduction mainly by shearing or cutting	(Bargo, Vizcaíno, and Kay 2009)	AGp	<i>Eucholoeops</i>	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Peleciodon</i> , <i>Prepottherium</i> , <i>Planops</i> , and "nearly all other Miocene megatheri-	DW, CMDM

Table S4.9: Dietary data for South American fossil taxa, cont.

						oids" (including basal megatherioids, megalonychids, nothrotheres, and megatheriids)	
<i>Xyophorus</i> sp.	Fl	Food reduction mainly by shearing or cutting	(Bargo, Toledo, and Vizcaíno 2012)	AGp	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Pelecyodon</i> , <i>Prepootherium</i> , <i>Planops</i>	<i>Eucholoeops</i> , <i>Hapalops</i> , <i>Pelecyodon</i> , <i>Prepootherium</i> , <i>Planops</i> , and "nearly all other Miocene megatherioids" (including basal megatherioids, megalonychids, nothrotheres, and megatheriids)	DW, CMDM
<i>Xyophorus</i> sp.	Fl		(Pujos et al. 2012)	WF	Nothrotheriidae	Nothrotheriidae	PB
<i>Xyophorus</i> sp.	Fl	Indiscriminant leaf eater	(Pujos et al. 2014)	SF	<i>Lakukullus anatisrostratus</i>	<i>Lakukullus anatisrostratus</i>	DMM
<i>Xyophorus</i> sp.	Fl			Sum			

Table S4.9: Dietary data for South American fossil taxa, cont.

<i>Zaedyus pichiy</i> , <i>Z. sp.</i>	Om		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	Tax, SG	<i>Zaedyus pichiy</i>	<i>Zaedyus pichiy</i>	LR-E
<i>Zaedyus pichiy</i> , <i>Z. sp.</i>	Om	Carnivore-omnivore clade but the least carnivorous armadillo of the group	(Superina 2007)	Tax, SG	<i>Zaedyus pichiy</i>	<i>Zaedyus pichiy</i>	SC
<i>Zaedyus pichiy</i>, <i>Z. sp.</i>	Om			Sum			
<i>Zygolestes paranensis</i>	In	More specialized than <i>Z. tatei</i>	(Goin, Montalvo, and Visconti 2000)	Tax	<i>Zygolestes paranensis</i>	<i>Zygolestes paranensis</i>	DM
<i>Zygolestes tatei</i>	In		(Goin, Montalvo, and Visconti 2000)	Tax	<i>Zygolestes tatei</i>	<i>Zygolestes tatei</i>	DM

10. Locomotion and substrate use of South American fossil taxa

Table S4.10: Locomotion and substrate usage data for South American fossil taxa. This is a compilation from an extensive literature search of available data on diets for South American fossil taxa. Column labels, table structure, and abbreviations are as for Table S4.9.1 for dietary data. Additional abbreviations for mode of locomotion and substrate use are as follows: Arboreal: A, Scansorial: S, Generalized Terrestrial: GT, Cursorial: C, Ambulatory/Graviportal: Am, Semifossorial: SF, Fossorial/Subterranean: F, Semiaquatic: Aq, Volant: V, Curso-saltatorial: CS, Ricochetel Saltatorial: RS, Terrestrial (details not specified in this study): T.

Taxa, this study	Rel.	Taxa studied	Taxa to which author applies Loc.	Loc.	Details	Source	Met.
<i>Abderites meridionalis</i>	WF	Abderitidae	Abderitidae	S		(Jaureguizar 2003)	LR, MA
<i>Abrothrix illuteus</i>	WG	<i>Abrothrix</i>	<i>Abrothrix</i>	GT	"ambulatory": "species that usually use the ground to move about and do not have specializations that limit any particular activity"	(Carrizo et al. 2014)	FO, LR-E
<i>Acantharodeia</i> sp.	WF	Dasypodidae	Dasypodidae	SF		(Superina, Pagnutti, and Abba 2014)	Un
<i>Acarechimys</i> sp.	SG	<i>Acarechimys</i> cf. <i>A. minutissimus</i>	<i>Acarechimys</i> cf. <i>A. minutissimus</i>	S		(Kay and Madden 1997b)	Un
<i>Acarechimys</i> sp.	WG	<i>Acarechimys</i>	<i>Acarechimys</i>	SF		(Verzi, Olivares, and Morgan 2014)	PB
<i>Acarechimys</i> sp.	Sum			SF			
<i>Acrecebus fraileyi</i>	WI O	Platyrrhini	Platyrrhini	A		(Ferrari 2009)	Un
<i>Acrocyon</i> sp.	SG	<i>Acrocyon sectorius</i>	<i>Acrocyon sectorius</i>	S		(Kay, Vizcaíno, and Bargo 2012)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Actenomys priscus</i> , <i>A. sp.</i>	WG	<i>Actenomys</i>	<i>Actenomys</i>	F	Morphology related to tooth-digging, but not as specialized as in subterranean <i>Ctenomys</i> and <i>Eucelophorus</i>	(Verzi 2008)	CDM
<i>Actenomys priscus</i> , <i>A. sp.</i>	WG	<i>Actenomys</i>	<i>Actenomys</i>	F		(Verzi, Olivares, and Morgan 2014)	PB
<i>Actenomys priscus</i> , <i>A. sp.</i>	SG	<i>Actenomys priscus</i>	<i>Actenomys priscus</i>	F	Fossil remains found in their burrows	(Cenizo, Soibelzon, and Saffer 2015)	Tph
<i>Actenomys priscus</i>, <i>A. sp.</i>	Sum			F			
<i>Acyon myctoderos</i> , <i>A. tricuspidatus</i>	SF	<i>Prothylacynus patagonica</i> , <i>Cladosictis patagonica</i> , <i>Sipalocyon gracilis</i> , <i>Pseudonotictis pusillus</i>	"most hathlyacynids"	S	All hathlyacynids for which sufficient postcranial remains are known were classified as scansorial	(Prevosti et al. 2012)	PCGM
<i>Acyon myctoderos</i> , <i>A. tricuspidatus</i>	SF	<i>Cladosictis patagonica</i> , <i>Sipalocyon gracilis</i> , <i>Perathereutes pungens</i>	<i>Cladosictis patagonica</i> , <i>Sipalocyon gracilis</i> , <i>Perathereutes pungens</i>	S	Postcranial remains not known for <i>P. pungens</i>	(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Acyon myctoderos</i>, <i>A. tricuspidatus</i>	Sum			S			
<i>Adinotherium</i>	WG	<i>Toxodon</i> ,	<i>Toxodon</i> ,	Not	Specialized knee joints	(Shockey 2001)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>robustum</i> , A. sp.		<i>Adinotherium</i> , <i>Hoffstetterius</i> <i>imperator</i>	<i>Adinotherium</i> , <i>Hoffstetterius</i> <i>imperator</i>	Aq	with passive locks would allow them to stand for long periods of time and would be unneeded in the water		
<i>Adinotherium robustum</i> , A. sp.	WG	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	Am or GT	Part of a trend throughout evolution of Toxodontidae towards reduced cursoriality	(Elissamburu 2007)	PCM
<i>Adinotherium robustum</i> , A. sp.	SG	<i>Adinotherium</i> <i>ovinum</i>	<i>Adinotherium</i> <i>ovinum</i>	Am		(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Adinotherium robustum</i>, A. sp.	Sum		Toxodontidae	Am			
<i>Agalmaceros blicki</i>	WF	Cervidae	Cervidae	C	Cursorial (open habitats) or Cursorial-saltatorial (closed habitats)	(Curran 2012)	PCGM
<i>Ahytherium aureum</i>	Tax	<i>Ahytherium aureum</i>		Am	This study, terrestrial locomotion inferred based on body mass of 300-600 kg (Table S3.9) and unlikelihood of climbing in animals >150-200 kg (Toledo et al. 2014)	(Toledo et al. 2014)	MAs
<i>Akodon azarae</i> , A. sp.	SG	<i>Akodon molinae</i>	<i>Akodon molinae</i>	GT	No specialization in locomotion so relies on	(Taraborelli, Corbalán, and Giannoni 2003)	Lab

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

					vegetation cover to escape predation		
<i>Akodon azarae</i> , <i>A. sp.</i>	WG	<i>Akodon</i>	<i>Akodon</i>	GT	"ambulatory": "species that usually use the ground to move about and do not have specializations that limit any particular activity"	(Carrizo et al. 2014)	FO, LR-E
<i>Akodon azarae</i>, <i>A. sp.</i>	Sum			GT			
<i>Alitoxodon</i> sp.	SF, PB	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius</i> <i>imperator</i>	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius</i> <i>imperator</i>	Not Aq	Specialized knee joints with passive locks would allow them to stand for long periods of time and would be unneeded in the water	(Shockey 2001)	PCM
<i>Alitoxodon</i> sp.	SF, PB	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	Am or GT	Part of a trend throughout evolution of Toxodontidae towards reduced cursoriality	(Elissamburu 2007)	PCM
<i>Alitoxodon</i> sp.	SF, PB	<i>Adinotherium</i> <i>ovinum</i>	<i>Adinotherium</i> <i>ovinum</i>	Am		(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Alitoxodon</i> sp.	Sum		Toxodontidae	Am			
<i>Alloiomys</i> sp.	SF	<i>Dasyprocta</i>	<i>Dasyprocta</i>	C		(Elissamburu 2004)	Un
<i>Alloiomys</i> sp.	SF	<i>Dasyprocta</i>	<i>Dasyprocta</i>	C		(Elissamburu and Vizcaíno 2004)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Alloiomys</i> sp.	SF	<i>Dasyprocta azarae</i> , <i>D. leporina</i> , <i>D. punctata</i> , <i>Myoprocta acouchy</i>	<i>Dasyprocta azarae</i> , <i>D. leporina</i> , <i>D. punctata</i> , <i>Myoprocta acouchy</i>	C	(Weisbecker and Schmid 2007)	LR-E
<i>Alloiomys</i> sp.	SF	<i>Neoprocta australis</i>	<i>Neoprocta australis</i>	C	Similar features to <i>Cuniculus paca</i> , suggesting good running and possibly swimming abilities	PCM
<i>Alloiomys</i> sp.	SF	<i>Neoprocta australis</i>	<i>Neoprocta australis</i>	C	(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Alloiomys</i> sp.	WF	Dasyproctidae	Dasyproctidae	C	Adapted for speed	LR-E
<i>Alloiomys</i> sp.	Sum			C	(Patton, Pardiñas, and D'Elía 2015)	
<i>Alouatta mau-roi</i>	WG	<i>Alouatta</i>	<i>Alouatta</i>	A	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Amphiocnus paranense</i>	SF	<i>Acratocnus odontrigonus</i> , <i>A. sp.</i> , <i>Choloepus didactylus</i> , <i>C. hoffmanni</i> , <i>Eucholoeops sp.</i> , <i>Hapalops sp.</i> , <i>Megalonyx jeffersonii</i> , <i>Neocnus comes</i> ,	<i>Acratocnus odontrigonus</i> , <i>A. sp.</i> , <i>Choloepus didactylus</i> , <i>C. hoffmanni</i> , <i>Eucholoeops sp.</i> , <i>Hapalops sp.</i> , <i>Megalonyx jeffersonii</i> , <i>Neocnus comes</i> ,	S	All scansorial except <i>Megalonyx</i> : terrestrial and <i>Choloepus</i> : arboreal (Categories: Terrestrial, Scansorial, Arboreal)	PCGM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>Parocnus serus, Pelecyodon arcuatus</i>	<i>Parocnus serus, Pelecyodon arcuatus</i>				
<i>Amphiocnus paranense</i>	WF	Megalonychidae	Megalonychidae	S	This study, based on: Most megalonychids are scansorial or arboreal(Pujos et al. 2012); <i>Amphiocnus</i> is on the large end of what could reasonably be scansorial (Toledo et al. 2014)	(Pujos et al. 2012; Toledo et al. 2014)	PB, Mass
<i>Amphiocnus paranense</i>	Sum			S			
<i>Anadasypus aequatorianus, A. hondanus, A. sp.</i>	Tax, SG	<i>Anadasypus hondanus</i>	<i>Anadasypus hondanus</i>	SF		(Kay and Madden 1997b)	Un
<i>Andinomys edax, A. sp.</i>	Tax, SG	<i>Andinomys edax</i>	<i>Andinomys edax</i>	GT	Terrestrial nesting	(Alhajeri 2014)	Un
<i>Andinomys edax, A. sp.</i>	Tax, SG	<i>Andinomys</i>	<i>Andinomys</i>	GT	"ambulatory": "species that usually use the ground to move about and do not have specializations that limit any particular activity"	(Carrizo et al. 2014)	FO, LR-E
<i>Andinomys edax, A. sp.</i>	Sum			GT			
<i>Antifer crassus, A. niemeyeri, A. sp.</i>	WF	Cervidae	Cervidae	C	Cursorial (open habitats) or Cursorial (closed habitats)	(Curran 2012)	PCGM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

tats)						
<i>Arazamys castiglioni</i>	WG	<i>Arazamys</i>	<i>Arazamys</i>	C		Rinderknecht pers. comm.
<i>Arctodictis munizi</i> , <i>A. sp.</i>	Tax, SG	<i>Arctodictis munizi</i>	<i>Arctodictis munizi</i>	Am		(Kay, Vizcaíno, and Bargo 2012)
<i>Arctodus</i> sp.	WF	Ursidae	Ursidae	Am		(Jenkins and Camazine 1977)
<i>Arctodus</i> sp.	SG	<i>Arctodus simus</i>	<i>Arctodus simus</i>	GT	Better adapted to fast locomotion than extant ursids	(Per Christiansen 1999)
<i>Arctodus</i> sp.	SG	<i>Arctodus simus</i>	<i>Arctodus simus</i>	Am	Highly efficient at pacing gait over long distances, but not a good runner	(Matheus 2003)
<i>Arctodus</i> sp.	WF	Ursidae	Ursidae	GT	Smaller bears often scansorial, larger bears generalized terrestrial	(Samuels, Meachen, and Sakai 2013)
<i>Arctodus</i> sp.	Sum			Am		
<i>Arctotherium brasiliense</i> , <i>A. sp.</i> , <i>A. tarijense</i> , <i>A. wingei</i>	WF	Ursidae	Ursidae	Am		(Jenkins and Camazine 1977)
<i>Argyrolagus palmeri</i>	WG	Argyrolagidae (<i>Argyrolagus</i> and <i>Microtragulus</i>)	Argyrolagidae	RS		(Simpson 1970b)
<i>Argyrolagus palmeri</i>	WF	Argyrolagidae	Argyrolagidae	RS		(Mares 1985)
<i>Argyrolagus palmeri</i>	WF	Argyrolagidae	Argyrolagidae	RS		(Mares 1993)

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Argyrolagus palmeri</i>	SF	<i>Proargyrolagus</i>	<i>Proargyrolagus</i>	RS		(Sánchez-Villagra and Kay 1997)	Mass, DM
<i>Argyrolagus palmeri</i>	SG	<i>Argyrolagus scagliai</i>	<i>Argyrolagus scagliai</i>	RS		(Straccia 1999)	PCM
<i>Argyrolagus palmeri</i>	SF	<i>Hondalagus altiplanensis</i>	<i>Hondalagus altiplanensis</i>	RS		(Sánchez-Villagra, Kay, and Anaya-Daza 2000)	LR
<i>Argyrolagus palmeri</i>	SF	<i>Anargyrolagus</i>	<i>Argyrolagidae</i>	RS		(Carlini, Pascual, and Goin 2007)	MA
<i>Argyrolagus palmeri</i>	WF	<i>Argyrolagidae</i>	<i>Argyrolagidae</i>	RS		(García-López and Babot 2015)	MA
<i>Argyrolagus palmeri</i>	SF	<i>Hondalagus altiplanensis</i>	<i>Hondalagus altiplanensis</i>	RS		(Croft 2016)	Un
<i>Argyrolagus palmeri</i>	Sum		<i>Argyrolagidae</i>	RS			
<i>Artigasía magna</i>	WG	<i>Artigasía</i>	<i>Artigasía</i>	C		Rinderknecht pers. comm.	Un
<i>Aspidocalyptus</i> sp.	SF	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Aspidocalyptus</i> sp.	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Aspidocalyptus</i> sp.	SF	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003)	PCM
<i>Aspidocalyptus</i> sp.	SF, PB	<i>Parapropalaeh oplophorus</i> , <i>Glyptodon</i> ,	<i>Parapropalaeh oplophorus</i> , <i>Glyptodon</i> , <i>Pa-</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal,	(Croft 2016)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>nochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>		<i>Parapropalaehoplopho-</i> <i>rus</i> : terrestrial and slow- moving		
<i>Aspidocalyptus</i> sp.	Sum		Glyptodonti- dae	Am			
<i>Asterostemma</i> sp.	SF	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glypto- dontidae	Am	Large glyptodonts "Ca- pable of only a slow run"	(Fariña 1995b)	PCM
<i>Asterostemma</i> sp.	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Asterostemma</i> sp.	SF	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glypto- dontidae	Am	Long bone morphology not congruent with run- ning or galloping	(Bargo 2003)	PCM
<i>Asterostemma</i> sp.	SF, PB	<i>Parapropalaeh</i> <i>oplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaeh</i> <i>oplophorus</i> , <i>Glyptodon</i> , <i>Pa</i> - <i>nochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaehoplopho-</i> <i>rus</i> : terrestrial and slow- moving	(Croft 2016)	Un
<i>Asterostemma</i> sp.	Sum		Glyptodonti- dae	Am			
<i>Astrapotherium</i> sp.	Tax	<i>Astrapotheri-</i> <i>um</i>	<i>Astrapotherium</i>	Aq		(Riggs 1935)	Tph
<i>Astrapotherium</i> sp.	Tax	<i>Astrapotheri-</i> <i>um</i> , <i>Parastra-</i> <i>pothorium</i>	<i>Astrapotherium</i> , <i>Parastrapother-</i> <i>ium</i>	Aq	"Short and weak" limbs; Often found in or near ancient river channels	(Scott 1937)	PCM, Tph
<i>Astrapotherium</i> sp.	SG	<i>Astrapotheri-</i> <i>um magnum</i>	<i>Astrapotherium</i> <i>magnum</i>	Aq		(Avilla and Vizcaíno 2005)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

769	<i>Astrapotherium</i> sp.	SF	<i>Granastrapotherium snorki</i> , <i>Xenastrapotherium kraglievichi</i>	<i>Granastrapotherium snorki</i> , <i>Xenastrapotherium kraglievichi</i>	Aq	(Kay and Madden 1997b)	Un
	<i>Astrapotherium</i> sp.	Tax	<i>Astrapotherium</i>	<i>Astrapotherium</i>	GT	Likely could swim and run	(Cassini et al. 2012) PCM
	<i>Astrapotherium</i> sp.	SG	<i>Astrapotherium magnum</i>	<i>Astrapotherium magnum</i>	Aq	(Flynn et al. 2012)	PCM, Tph
	<i>Astrapotherium</i> sp.	SG	<i>Astrapotherium magnum</i>	<i>Astrapotherium magnum</i>	Am	(Kay, Vizcaíno, and Bar-go 2012)	Un
	<i>Astrapotherium</i> sp.	WF	Astrapotheres, especially Uruguaytheriinae	Astrapotheres, especially Uruguaytheriinae	Aq	(Catena et al. 2016)	LR
	<i>Astrapotherium</i> sp.	SF	<i>Granastrapotherium snorki</i>	<i>Granastrapotherium snorki</i>	Aq	(Croft 2016)	Tph
	<i>Astrapotherium</i> sp.	SF	<i>Parastrapotherium</i>	<i>Parastrapotherium</i>	Am or Aq	(Houssaye, Fernandez, and Billet 2016)	BH
	<i>Astrapotherium</i> sp.	SF	<i>Granastapotherium</i> and/or <i>Xenastrapotherium</i>	<i>Granastapotherium</i> and/or <i>Xenastrapotherium</i>	Am	Inconsistent with semi-aquatic habits	Chpater 5 SI
	<i>Astrapotherium</i> sp.	Sum			Am		

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Auliscomys</i> sp.	Tax	<i>Auliscomys</i>	<i>Auliscomys</i>	GT	"ambulatory": "species that usually use the ground to move about and do not have specializations that limit any particular activity"	(Carrizo et al. 2014)	FO, LR-E
<i>Australonyx aquae</i>	Tax	<i>Australonyx aquae</i>	<i>Australonyx aquae</i>	Am	"Arboreal habits unlikely"	(Iuliis, Pujos, and Cartelle 2009)	PCM
<i>Berroia</i> sp.	SF, PB	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetteria</i> <i>imperator</i>	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetteria</i> <i>imperator</i>	Not Aq	Specialized knee joints with passive locks would allow them to stand for long periods of time and would be unneeded in the water	(Shockey 2001)	PCM
<i>Berroia</i> sp.	SF, PB	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	Am or GT	Part of a trend throughout evolution of Toxodontidae towards reduced cursoriality	(Elissamburu 2007)	PCM
<i>Berroia</i> sp.	SF, PB	<i>Adinotherium</i> <i>ovinum</i>	<i>Adinotherium</i> <i>ovinum</i>	Am		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Berroia</i> sp.	Sum		Toxodontidae	Am			
<i>Berthawyleeria</i> sp.	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Berthawyleeria</i> sp.	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Berthawyeria</i> sp.	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glypto- dontidae	Am	Long bone morphology not congruent with run- ning or galloping	(Bargo 2003)	PCM
<i>Berthawyeria</i> sp.	SF, PB	<i>Parapropalaeh oplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaeh oplophorus</i> , <i>Glyptodon</i> , <i>Pa- nochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaehoplopho- rus</i> : terrestrial and slow- moving	(Croft 2016)	Un
<i>Berthawyeria</i> sp.	Sum		Glyptodonti- dae	Am			
<i>Blastocerus</i> sp.	WF	Cervidae	Cervidae	C	Cursorial (open habi- tats) or Curso- saltatorial (closed habi- tats)	(Curran 2012)	PCG M
<i>Bolivartherium codorensis</i> , <i>B. urumaquensis</i>	SF	<i>Scelidotheri- um</i> , <i>Glos- sotherium</i>	<i>Scelidothorium</i> , <i>Glossotherium</i>	SF	Size of burrows con- sistent with mylodont builders, Claw marks in- side burrows match mylodont hand, "anatom- ical, allometric, and bio- mechanical analysis of sloths limbs" suggests mylodonts could dig well	(Vizcaíno et al. 2001)	PM, BM, Ich, Mass
<i>Bolivartherium codorensis</i> , <i>B. urumaquensis</i>	SF	<i>Scelidotheri- um</i> , <i>Scelidodon</i>	<i>Scelidothorium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social in- sects as food	(Dondas, Isla, and Carbal- lido 2009)	Ich
<i>Bolivartherium codorensis</i> , <i>B.</i>	SF	<i>Scelidotheri- um</i> , <i>Scelidodon</i>	<i>Scelidothorium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social in-	(Genise and Farina 2012)	Ich

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>urumaquensis</i>					sects as food		
<i>Bolivartherium codorensis</i> , <i>B. urumaquensis</i>	WF	<i>Scelidotherium</i> , <i>Glossotherium</i>	Mylodontidae	SF	.	(Pujos et al. 2012)	PB
<i>Bolivartherium codorensis</i> , <i>B. urumaquensis</i>	SF	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Bolivartherium codorensis</i> , <i>B. urumaquensis</i>	WF	Large-size mylodont	Large-size mylodont	SF		(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph
<i>Bolivartherium codorensis</i>, <i>B. urumaquensis</i>	Sum		Mylodontidae	SF			
<i>Bolomys sp.</i>	SG	<i>Bolomys lasiurus</i>	<i>Bolomys lasiurus</i>	T		(Moura 2003)	Un
<i>Bolomys sp.</i>	Tax	<i>Bolomys</i>	<i>Bolomys</i>	SF		(Granzinolli and Motta-Junior 2006)	Un
<i>Bolomys sp.</i>	Sum			SF			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Boreostemma acostae</i> , <i>B. pliocena</i> , <i>B. sp.</i> , <i>B. venezolensis</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Boreostemma acostae</i> , <i>B. pliocena</i> , <i>B. sp.</i> , <i>B. venezolensis</i>	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Boreostemma acostae</i> , <i>B. pliocena</i> , <i>B. sp.</i> , <i>B. venezolensis</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003)	PCM
<i>Boreostemma acostae</i> , <i>B. pliocena</i> , <i>B. sp.</i> , <i>B. venezolensis</i>	SF, PB	<i>Parapropalaehoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaehoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaehoplophorus</i> : terrestrial and slow-moving	(Croft 2016)	Un
<i>Boreostemma acostae</i>, <i>B. pliocena</i>, <i>B. sp.</i>, <i>B. venezolensis</i>	Sum		Glyptodontidae	Am			
<i>Borhyaena tuberata</i>	Tax	<i>Borhyaena tuberata</i>	<i>Borhyaena tuberata</i>	C	"Incipiently cursorial"	(Argot 2004b)	PCM
<i>Borhyaena tuberata</i>	Tax	<i>Borhyaena tuberata</i>	<i>Borhyaena tuberata</i>	C	"Some degree of cursoriality"	(Ercoli, Prevosti, and Álvarez 2012)	PCM
<i>Borhyaena tuberata</i>	Tax	<i>Borhyaena tuberata</i>	<i>Borhyaena tuberata</i>	C	"Some degree of cursoriality"	(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Borhyaena tuberata</i>	Sum			C			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Borhyaenidium altiplanicus</i> , <i>B. musteloides</i> , <i>B. riggsi</i> , <i>B. sp.</i>	SF	<i>Prothylacynus patagonica</i> , <i>Cladosictis patagonica</i> , <i>Sipalocyon gracilis</i> , <i>Pseudonotictis pusillus</i>	"most hathlyacynids"	S	All hathlyacynids for which sufficient postcranial remains are known were classified as scansorial	(Prevosti et al. 2012)	PCGM
<i>Borhyaenidium altiplanicus</i> , <i>B. musteloides</i> , <i>B. riggsi</i> , <i>B. sp.</i>	SF	<i>Cladosictis patagonica</i> , <i>Sipalocyon gracilis</i> , <i>Perathereutes pungens</i>	<i>Cladosictis patagonica</i> , <i>Sipalocyon gracilis</i> , <i>Perathereutes pungens</i>	S	Postcranial remains not known for <i>P. pungens</i>	(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Borhyaenidium altiplanicus</i>, <i>B. musteloides</i>, <i>B. riggsi</i>, <i>B. sp.</i>	Sum			S			
<i>Bounodus enigmaticus</i>	SF	<i>Brachytherium</i> , <i>Diplasiotherium</i> , <i>Eoauchenia</i>	Late proterotheriids	C	Nearly monodactyl	(Webb 1978a)	PCM
<i>Bounodus enigmaticus</i>	SF	cf. <i>Licaphrium</i> (=Proterotherium)	cf. <i>Licaphrium</i> (=Proterotherium)	C	Late Oligocene	(Shockey 1999)	PCM
<i>Bounodus enigmaticus</i>	WF	Proterotheriidae	Proterotheriidae	C	Early trend towards monodactyly	(Villafañe, Ortiz-Jaureguizar, and Bond 2006)	PCM
<i>Bounodus enigmaticus</i>	WF	Proterotheriidae	Proterotheriidae	C		(Ubilla et al. 2009)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Bounodus enigmaticus</i>	AGp	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	Proterotheriidae	C		(Cassini et al. 2012)	PCM
<i>Bounodus enigmaticus</i>	SF	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	C		(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Bounodus enigmaticus</i>	SF	<i>Neobrachytherium ullumense</i>	<i>Neobrachytherium ullumense</i>	C		(Croft 2016, 201)	PCM
<i>Bounodus enigmaticus</i>	Sum		Proterotheriidae	C			
<i>Cabassous</i> sp.	SG	<i>C. centralis</i>, <i>C. tatouay</i>	<i>C. centralis</i>, <i>C. tatouay</i>	F	<i>C. centralis</i> "strongly fossorial," <i>C. tatouay</i> also "highly fossorial"	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Calchaquitherium mixtum</i>	SF, PB	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius imperator</i>	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius imperator</i>	Not Aq	Specialized knee joints with passive locks would allow them to stand for long periods of time and would be unneeded in the water	(Shockey 2001)	PCM
<i>Calchaquitherium mixtum</i>	SF, PB	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> ,	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> ,	Am or GT	Part of a trend throughout evolution of Toxodontidae towards reduced cur-	(Elissamburu 2007)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>Adinotherium</i> , <i>Proadinotherium</i>	<i>Adinotherium</i> , <i>Proadinotherium</i>		sociality		
<i>Calchaquitherium mixtum</i>	SF, PB	<i>Adinotherium</i> <i>ovinum</i>	<i>Adinotherium</i> <i>ovinum</i>	Am		(Kay, Vizcaíno, and Bar- go 2012)	Un
<i>Calchaquitherium mixtum</i>	Sum		Toxodontidae	Am			
<i>Calomys callosus</i> , <i>C. sp.</i>	Tax, SG	<i>Calomys callosus</i> , <i>C. tener</i>	<i>Calomys callosus</i> , <i>C. tener</i>	GT	"Terrestrial" (options: Terrestrial, Cursorial, Scansorial, Arboreal, Semi-aquatic)	(Mares, Ernest, and Get- tinger 1986)	FO, LR-E
<i>Calomys callosus</i> , <i>C. sp.</i>	Tax, SG	<i>Calomys callosus</i>	<i>Calomys callosus</i>	GT	"ambulatory": "species that usually use the ground to move about and do not have speciali- zations that limit any par- ticular activity"	(Carrizo et al. 2014)	FO, LR-E
<i>Calomys callosus</i>, <i>C. sp.</i>	Sum			GT			
<i>Canis dirus</i> , <i>C. sp.</i>	Tax, SG	<i>Canis dirus</i> , <i>C. armbrusteri</i>	<i>Canis dirus</i> , <i>C. armbrusteri</i>	C	Discriminant analysis of functional indices	(Samuels, Meachen, and Sakai 2013)	PCM
<i>Canis dirus</i> , <i>C. sp.</i>	Tax, SG	<i>Canis</i>	<i>Canis</i>	C		(Soibelzon and Prevosti 2013)	LR
<i>Canis dirus</i>, <i>C. sp.</i>	Sum			C			
<i>Cardiatherium chasicoense</i> , <i>C. paranense</i> , <i>C. patagonicum</i> , <i>C.</i>	Tax, SG	<i>C. chasicoensis</i> , <i>C. orientalis</i> , <i>C. paranense</i> , <i>C.</i>	<i>C. chasicoensis</i> , <i>C. orientalis</i> , <i>C. paranense</i> , <i>C. patagonicum</i>	Aq	All found in deposits that formed in or near water, such as swamps, lakes, rivers	(Deschamps et al. 2007)	Tph

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

sp.		<i>patagonicum</i>					
<i>Cardiatherium chasicoense</i> , <i>C. paranense</i> , <i>C. patagonicum</i> , <i>C. sp.</i>	Tax, SG	<i>Cardiatherium sp.</i>	<i>Cardiatherium sp.</i>	Aq	Extant capybaras are semi-aquatic; fossil capybaras have all been found in "water-related settings"	(Vucetich et al. 2010)	CLR, Tph
<i>Cardiatherium chasicoense</i> , <i>C. paranense</i> , <i>C. patagonicum</i> , <i>C. sp.</i>	Tax, SG	<i>Cardiatherium</i>	<i>Cardiatherium</i>	Aq	Semi-aquatic, social habits, large body size and novel dental morphology evolved roughly simultaneously (first evident in <i>Cardiatherium</i> spp.)	(Pérez, Scillato-Yané, and Vizcaíno 2014)	CLR, Tph, CDM
<i>Cardiatherium chasicoense</i> , <i>C. paranense</i> , <i>C. patagonicum</i> , <i>C. sp.</i>	Tax, SG	<i>Cardiatherium</i>	<i>Cardiatherium</i>	Aq	Semi-aquatic, social habits, large body size and novel dental morphology evolved roughly simultaneously (first evident in <i>Cardiatherium</i> spp.)	(Vucetich et al. 2015)	LR
<i>Cardiatherium chasicoense</i> , <i>C. paranense</i> , <i>C. patagonicum</i> , <i>C. sp.</i>	Sum			Aq			
<i>Cardiomyys</i> sp.	WS F	Hydrochoeridae and specifically <i>Cardiomyinae</i>	<i>Cardiomyinae</i>	C	This study, based on: <i>Cardiomyinae</i> is within <i>Hydrochoeriidae</i> (Pérez 2010a; Pérez 2010b; Vucetich, Deschamps, and Pérez 2013; Vucetich et al. 2015); <i>Cardi-</i>	(Pérez 2010a; Pérez 2010b; Vucetich, Deschamps, and Pérez 2013; Vucetich et al. 2015; Morgan and Álvarez 2013; Pérez, Scillato-Yané, and Vizcaíno	PB, LR

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

778						omyines did not yet have semi-aquatic habits but are most closely allied with capybaras (Pérez, Scillato-Yané, and Vizcaíno 2014): Cursorial (if they weren't also semi-aquatic) (Morgan and Álvarez 2013)	2014)	
	<i>Cartelles coimbrafilhoi</i>	Tax	<i>Cartelles coimbrafilhoi</i>	<i>Cartelles coimbrafilhoi</i>	A	Included suspension and climbing	(Halenar and Rosenberger 2013)	PCM
	<i>Carterodon</i> sp.	SG	<i>Carterodon sulcidens</i>	<i>Carterodon sulcidens</i>	SF		(Patton, Pardiñas, and D'Elía 2015)	LR-E
	<i>Catagonus</i> sp., <i>Catagonus stenocephalus</i>	SG	<i>Catagonus wagneri</i>	<i>Catagonus</i>	C	Morphological features related to cursorial (and diurnal, open and dry habitat) are also present in fossil spp. of the genus	(Menégaz and Ortiz Jaureguizar 1995)	Un
	<i>Catagonus</i> sp., <i>Catagonus stenocephalus</i>	WG	<i>Catagonus</i>	<i>Catagonus</i>	C		(Gasparini, Kerber, and Oliveira 2009)	CM, PCM
	<i>Catagonus</i> sp., <i>Catagonus stenocephalus</i>	WG	<i>Catagonus</i>	<i>Catagonus</i>	C		(Avilla et al. 2013)	CM, PCM
	<i>Catagonus</i> sp., <i>Catagonus stenocephalus</i>	Sum			C			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

779	<i>Catonyx chil- iensis</i> (= <i>Scelidother- ium reyesi</i>), <i>C.</i> <i>cuvieri</i> , <i>C. tari- jensis</i>	See	Scelidotheri- um, Glos- sotherium	Scelidotherium, Glossotherium	SF	Relationship: Closely related to <i>Scelidotherium</i> ; Diet: Size of burrows consistent with mylodont builders, Claw marks in- side burrows match mylodont hand, "anatom- ical, allometric, and bio- mechanical analysis of sloths limbs" suggests mylodonts could dig well	(Vizcaíno et al. 2001)	PM, BM, Ich, Mass
	<i>Catonyx chil- iensis</i> (= <i>Scelidother- ium reyesi</i>), <i>C.</i> <i>cuvieri</i> , <i>C. tari- jensis</i>	SSF	Scelidotheri- um, Sceli- dodon	Scelidotherium, Scelidodon	SF	May be associated with searching for social in- sects as food	(Dondas, Isla, and Carbal- lido 2009)	Ich
	<i>Catonyx chil- iensis</i> (= <i>Scelidother- ium reyesi</i>), <i>C.</i> <i>cuvieri</i> , <i>C. tari- jensis</i>	SSF	Scelidotheri- um, Sceli- dodon	Scelidotherium, Scelidodon	SF	May be associated with searching for social in- sects as food	(Genise and Farina 2012)	Ich
	<i>Catonyx chil- iensis</i> (= <i>Scelidother- ium reyesi</i>), <i>C.</i> <i>cuvieri</i> , <i>C. tari- jensis</i>	WF, PB	Scelidotheri- um, Glos- sotherium	Mylodontidae	SF	.	(Pujos et al. 2012)	PB
	<i>Catonyx chil-</i>	SSF	<i>Catonyx tari-</i>	<i>Catonyx tari-</i>	T	Categories: Terrestrial,	(Grass 2014)	PCGM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

780	<i>iensis</i> (= <i>Scelidotherium reyesi</i>), <i>C. cuvieri</i> , <i>C. tarijensis</i>		<i>jensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>	<i>jensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>	Scansorial, Arboreal		
	<i>Catonyx chilensis</i> (= <i>Scelidotherium reyesi</i>), <i>C. cuvieri</i> , <i>C. tarijensis</i>	AGp	Large-size mylodont	Large-size mylodont	SF	(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph
	<i>Catonyx chilensis</i> (= <i>Scelidotherium reyesi</i>), <i>C. cuvieri</i> , <i>C. tarijensis</i>	Sum		Mylodontidae	SF		
	<i>Cavia</i> sp.	Tax	<i>Cavia</i>	<i>Cavia</i>	GT	Generally does not burrow but takes shelter in available cover, terrestrial	(Nowak 1999) LR-E
	<i>Cavia</i> sp.	Tax	<i>Cavia</i>	<i>Cavia</i>	GT		(Elissamburu and Vizcaí- Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Cavia</i> sp.	Tax	<i>Cavia</i>	<i>Cavia</i>	GT	no 2004)	(Elissamburu and Santis 2011)	LR-E
<i>Cavia</i> sp.	Sum			GT			
<i>Caviodon multiplicatus</i> , <i>C. sp.</i>	WS F	Hydrochoeridae and specifically Cardiomyinae	Cardiomyinae	C	Cardiomyinae is within Hydrochoeriidae (Pérez 2010a; Pérez 2010b; Vucetich, Deschamps, and Pérez 2013; Vucetich et al. 2015); Cardiomyines did not yet have semi-aquatic habits but are most closely allied with capybaras (Pérez, Scillato-Yané, and Vizcaino 2014) which are cursorial (if they weren't also semi-aquatic) (Morgan and Álvarez 2013)	(Pérez 2010a; Pérez 2010b; Vucetich, Deschamps, and Pérez 2013; Vucetich et al. 2015; Pérez, Scillato-Yané, and Vizcaino 2014; Morgan and Álvarez 2013)	PB, LR
<i>Cebupithecia sarmientoi</i>	Tax	<i>Cebupithecia sarmientoi</i>	<i>Cebupithecia sarmientoi</i>	A	Arboreal quadrupedal leaper	(Meldrum and Kay 1997a)	PCM
<i>Cerdocyon thous</i>	Tax	<i>Cerdocyon thous</i>	<i>Cerdocyon thous</i>	GT		(Samuels, Meachen, and Sakai 2013)	LR-E
<i>Chaetophractus</i> sp., <i>Chaetophractus villosus</i>	Tax, SG	<i>Chaetophractus villosus</i>	<i>Chaetophractus villosus</i>	SF	Study of burrow morphology in extant <i>Chaetophractus villosus</i>	(Abba, Sauthier, and Vizcaino 2005)	FO

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Chapalmalania</i> sp.	ST, PB	Procyonini (<i>Bassariscus</i> , <i>Nasua</i> , <i>Procyon</i>)		S	This study based on: Phylogenetic nesting of <i>Cyonasua</i> and <i>Chapalmalania</i> between <i>Bassariscus</i> and (<i>Nasua</i> + <i>Procyon</i>) (Koepfli et al. 2007) and on scansorial habit of all extant procyonines (Baskin 2003)	(Baskin 2003; Koepfli et al. 2007)	PB
<i>Charitoceros</i> sp.	WF	Cervidae	Cervidae	C	Cursorial (open habitats) or Cursorial (closed habitats)	(Curran 2012)	PCGM
<i>Chasichimys</i> sp.	Tax	<i>Chasichimys</i>	<i>Chasichimys</i>	GT	Not yet semifossorial, generalized ancestors to specialized fossorial-subterranean Ctenomyidae later, very similar to generalized Eumysopinae	(Verzi 2002)	DCM
<i>Chasicostylus castroi</i>	SF	<i>Prothylacynus patagonica</i> , <i>Cladosictis patagonica</i> , <i>Sipalocyon gracilis</i> , <i>Pseudonotictis pusillus</i>	"most hathlyacynids"	S	All hathlyacynids for which sufficient postcranial remains are known were classified as scansorial	(Prevosti et al. 2012)	PCGM
<i>Chasicostylus</i>	SF	<i>Cladosictis</i>	<i>Cladosictis pat-</i>	S	Postcranial remains not	(Kay, Vizcaíno, and Bar-	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>castroi</i>		<i>patagonica</i> , <i>Sipalocyon</i> <i>gracilis</i> , <i>Pera-</i> <i>thereutes</i> <i>pungens</i>	<i>agonica</i> , <i>Sipal-</i> <i>ocyon gracilis</i> , <i>Perathereutes</i> <i>pungens</i>		known for <i>P. pungens</i>	go 2012)	
Chasicostylus	Sum			S			
<i>castroi</i>							
<i>Chasicotatus</i> <i>ameghinoi</i> , <i>C.</i> <i>sp.</i> , <i>C. spinozai</i>	ST	<i>Proeutatus</i>	<i>Proeutatus</i>	SF	No Santacrucian armadillos reached, "the degree of curoriality of <i>Tolypeutes matacus</i> , the fossoriality of <i>Priodontes maximus</i> , or the subterranean habits of <i>Chlamyphorus truncatus</i> ."	(Vizcaíno, Fernicola, and Bargo 2012)	PCM
<i>Chasicotatus</i> <i>ameghinoi</i> , <i>C.</i> <i>sp.</i> , <i>C. spinozai</i>	ST	<i>Proeutatus</i>	<i>Proeutatus</i>	SF	No Santacrucian armadillos reached, "the degree of curoriality of <i>Tolypeutes matacus</i> , the fossoriality of <i>Priodontes maximus</i> , or the subterranean habits of <i>Chlamyphorus truncatus</i> ."	(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Chasicotatus</i> <i>ameghinoi</i> , <i>C.</i> <i>sp.</i> , <i>C. spinozai</i>	ST	<i>Eutatus seguini</i>	<i>Eutatus seguini</i>	SF	Less fossorial specialization than <i>Priodontes</i>	(Vizcaíno, Milne, and Bargo 2003)	PCM
<i>Chasicotatus</i> <i>ameghinoi</i> , <i>C.</i> <i>sp.</i> , <i>C. spinozai</i>	ST	<i>Eutatus</i> , <i>Ringueletia</i> <i>simpsoni</i>	<i>Eutatus</i> , <i>Ringueletia</i> <i>simpsoni</i>	SF	Built burrows	(Cenizo, Soibelzon, and Saffer 2015)	Ich

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Chasicotatus ameghinoi</i> , <i>C. sp.</i> , <i>C. spinozai</i>	Sum		Eutatini	SF			
<i>Chironectes minimus</i> , <i>C. sp.</i>	Tax, SG	<i>Chironectes minimus</i>	<i>Chironectes minimus</i>	Aq		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Chlamydotherium</i> sp.	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Chlamydotherium</i> sp.	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Chlamydotherium</i> sp.	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003)	PCM
<i>Chlamydotherium</i> sp.	SF, PB	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaeohoplophorus</i> : terrestrial and slow-moving	(Croft 2016)	Un
<i>Chlamydotherium</i> sp.	Sum		Glyptodontidae	Am			
<i>Chorobates</i> sp., <i>C. villosissimus</i>	ST	<i>Euphractus</i> , <i>Chaetophractus</i> , <i>Zaedyus</i>	<i>Euphractus</i> , <i>Chaetophractus</i> , <i>Zaedyus</i>	SF		(Vizcaíno and Milne 2002)	LR-E
<i>Chorobates</i> sp.,	ST	<i>Prozaedyus</i>	<i>Prozaedyus</i> ex-	SF		(Vizcaíno, Fernicola, and	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>C. villosissimus</i>		<i>exilis</i> , <i>P. sp.</i>	<i>ilis</i> , <i>P. sp.</i>			Bargo 2012)	
<i>Chorobates</i> sp., <i>C. villosissimus</i>	ST	<i>Prozaedyus</i> <i>proximus</i>	<i>Prozaedyus</i> <i>proximus</i>	SF		(Kay, Vizcaíno, and Bar- go 2012)	Un
<i>Chorobates</i> sp., <i>C. villosissimus</i>	ST	<i>Macro-</i> <i>euphractus</i> <i>outesi</i>	<i>Macroeuphrac-</i> <i>tus outesi</i>	SF		(Croft 2016)	Un
<i>Chorobates</i> sp., <i>C. villosissimus</i>	Sum		Euphractini	SF			
<i>Chrotopterus</i> <i>auritus</i>	WO	Chiroptera	Chiroptera	V		(Paleobiology Database)	Un
<i>Chrysocyon</i> <i>brachyurus</i>, <i>C.</i> <i>sp.</i>	Tax, SG	<i>Chrysocyon</i> <i>brachyurus</i>	<i>Chrysocyon</i> <i>brachyurus</i>	GT		(Samuels, Meachen, and Sakai 2013)	LR-E
<i>Cladosictis pat-</i> <i>agonica</i>	Tax	<i>Cladosictis</i> <i>patagonica</i>	<i>Cladosictis pat-</i> <i>agonica</i>	S	Likely scansorial	(Argot 2004b)	PCM
<i>Cladosictis pat-</i> <i>agonica</i>	Tax	<i>Cladosictis</i> <i>patagonica</i>	<i>Cladosictis pat-</i> <i>agonica</i>	S		(Ercoli, Prevosti, and Ál- varez 2012)	PCGM
<i>Cladosictis pat-</i> <i>agonica</i>	Tax	<i>Cladosictis</i> <i>patagonica</i>	<i>Cladosictis pat-</i> <i>agonica</i>	S		(Kay, Vizcaíno, and Bar- go 2012)	Un
<i>Cladosictis pat-</i> <i>agonica</i>	Sum			S			
<i>Clyomys</i> sp.	SG	<i>Clyomys lati-</i> <i>ceps</i>	<i>Clyomys lati-</i> <i>ceps</i>	SF	Burrows common	(Patton, Pardiñas, and D'Elía 2015)	LR-E
<i>Cochlops mu-</i> <i>ricatus</i>	Tax	<i>Cochlops mu-</i> <i>ricatus</i>	<i>Cochlops mu-</i> <i>ricatus</i>	Am		(Kay, Vizcaíno, and Bar- go 2012)	Un
<i>Coendou pre-</i> <i>hensilis</i> , <i>C. sp.</i>	Tax, SG	<i>Coendou pre-</i> <i>hensilis</i>	<i>Coendou pre-</i> <i>hensilis</i>	A		(Eisenberg 1989; Redford and Eisenberg 1992; Ei- senberg and Redford 1999)	LR-E

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Coendou prehensilis</i> , <i>C. sp.</i>	WG	<i>Coendou</i>	<i>Coendou</i>	A		(Nowak 1999)	LR-E
<i>Coendou prehensilis</i>, <i>C. sp.</i>	Sum			A			
<i>Conepatus semistriatus</i> , <i>C. sp.</i> , <i>C. suffocans</i>	SG	<i>C. chinga</i>	<i>C. chinga</i>	SF	Will build its own burrow	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Conepatus semistriatus</i> , <i>C. sp.</i> , <i>C. suffocans</i>	SG	<i>C. leuconotus</i>	<i>C. leuconotus</i>	SF		(Samuels, Meachen, and Sakai 2013)	LR-E
<i>Conepatus semistriatus</i>, <i>C. sp.</i>, <i>C. suffocans</i>	Sum			SF			
<i>Contrerascynus borhyaenoides</i>	SF	<i>Prothylacynus patagonica</i> , <i>Cladosictis patagonica</i> , <i>Sipalocyon gracilis</i> , <i>Pseudonotictis pusillus</i>	"most hathlyacynids"	S	All hathlyacynids for which sufficient postcranial remains are known were classified as scansorial	(Prevosti et al. 2012)	PCGM
<i>Contrerascynus borhyaenoides</i>	SF	<i>Cladosictis patagonica</i> , <i>Sipalocyon gracilis</i> , <i>Peratheres pungen</i>	<i>Cladosictis patagonica</i> , <i>Sipalocyon gracilis</i> , <i>Peratheres pungen</i>	S	Postcranial remains not known for <i>P. pungen</i>	(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Contrerascynus borhyaenoides</i>	Sum			S			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Cranithlastus xibiensis</i>	AGp	<i>Glyptodon, Panochthus, Doedicurus, Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Cranithlastus xibiensis</i>	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Cranithlastus xibiensis</i>	AGp	<i>Glyptodon, Panochthus, Doedicurus, Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003)	PCM
<i>Cranithlastus xibiensis</i>	SF	<i>Parapropalaehoplophorus, Glyptodon, Panochthus, Doedicurus, Sclerocalyptus</i>	<i>Parapropalaehoplophorus, Glyptodon, Panochthus, Doedicurus, Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus, Glyptodon</i>) graviportal, <i>Parapropalaehoplophorus</i> : terrestrial and slow-moving	(Croft 2016)	Un
<i>Cranithlastus xibiensis</i>	Sum		Glyptodontidae	Am			
<i>Cryptotis</i> sp.	Tax	<i>Cryptotis</i>	<i>Cryptotis</i>	SF	Will build its own burrow	(Nowak 1999)	LR-E
<i>Ctenomys coto-caensis, C. kra-glievichi, C. magellanicus, C. praderii, C. sp., C. subas-sentiens</i>	WG	<i>Ctenomys</i>	<i>Ctenomys</i>	F		(Verzi 2002)	CDM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Ctenomys coto-</i> <i>caensis</i> , <i>C. kra-</i> <i>glievichi</i> , <i>C.</i> <i>magellanicus</i> , <i>C. praderii</i> , <i>C.</i> <i>sp.</i> , <i>C. subas-</i> <i>sentiens</i>	SG	<i>Ctenomys</i> <i>chapalma-</i> <i>lensis</i> , <i>C. aus-</i> <i>tralis</i> , <i>C. talar-</i> <i>um</i>	<i>Ctenomys</i>	F	(Vieytes, Morgan, and Verzi 2007)	EM
<i>Ctenomys coto-</i> <i>caensis</i> , <i>C. kra-</i> <i>glievichi</i> , <i>C.</i> <i>magellanicus</i> , <i>C. praderii</i> , <i>C.</i> <i>sp.</i> , <i>C. subas-</i> <i>sentiens</i>	WG	<i>Ctenomys</i>	<i>Ctenomys</i>	F	(Verzi, Olivares, and Morgan 2014)	LR
<i>Ctenomys coto-</i> <i>caensis</i>, <i>C. kra-</i> <i>glievichi</i>, <i>C.</i> <i>magellanicus</i>, <i>C. praderii</i>, <i>C.</i> <i>sp.</i>, <i>C. subas-</i> <i>sentiens</i>	Sum			F		
<i>Cullinia</i> sp.	AGp	<i>Proma-</i> <i>crauchenia</i> <i>antigua</i> , <i>P.</i> <i>kraglievichi</i> , <i>P.</i> <i>chapad-</i> <i>malense</i> , <i>Windhausen</i> <i>delacroixi</i> , <i>Pseudo-</i>	Macrauche- niidae	C	(Bond et al. 1995)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

			<i>macrauchenia yepesi</i> , <i>Macrauchenia</i> <i>opsis ensenadensis</i> , <i>M.</i> <i>cf. M. ensenadensis</i> , <i>Macrauchenia</i> <i>patachonica</i> , <i>Xenorhinotherium bahiense</i>				
<i>Cullinia</i> sp.	SF	? <i>Coniopternium</i> <i>um</i>	? <i>Coniopternium</i>	C	Locking knee would also allow standing for long periods of time	(Shockey 1999)	PCM
<i>Cullinia</i> sp.	SF	<i>Coniopternium</i>	<i>Coniopternium</i>	C	Locking knee would also allow standing for long periods of time	(Shockey and Anaya 2008)	PCM
<i>Cullinia</i> sp.	SF	<i>Theosodon gracilis</i> , <i>T. lydekkeri</i>	<i>Theosodon gracilis</i> , <i>T. lydekkeri</i>	C		(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Cullinia</i> sp.	WF	<i>Macrauchenia</i> <i>niidae</i>	<i>Macrauchenia</i> <i>niidae</i>	C		(Schmidt and Ferrero 2014)	LR
<i>Cullinia</i> sp.	SF	<i>Theosodon lallemanti</i> , <i>Macrauchenia</i> <i>patachonica</i>	<i>Theosodon lallemanti</i> , <i>Macrauchenia</i> <i>patachonica</i>	C		(Croft 2016)	Un
<i>Cullinia</i> sp.	Sum		<i>Macrauchenia</i> <i>niidae</i>	C			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Cuniculus paca</i> , <i>C. sp.</i>	Tax, SG	<i>Cuniculus pa-</i> <i>ca</i>	<i>Cuniculus paca</i>	GT	Mostly use armadillo burrows	(Patton, Pardiñas, and D'Elía 2015)	LR-E
<i>Cuniculus paca</i> , <i>C. sp.</i>	Tax, SG	<i>Cuniculus pa-</i> <i>ca</i>	<i>Cuniculus paca</i>	GT	Can swim, can dig occa- sionally, not generally specialized for any loco- motion	(Elissamburu and Santis 2011)	LR-E
<i>Cuniculus pa-</i> <i>ca, C. sp.</i>	Sum			GT			
<i>Cuvieronius</i> <i>hyodon, C. sp.,</i> <i>C. tropicus</i>	WO	Proboscidea	Proboscidea	Am		(Janis et al. 1998)	Un
<i>Cyonasua ar-</i> <i>gentina, C.</i> <i>groeberi, C.</i> <i>pascuali, C. sp.</i>	PB	Procyonini (<i>Bassariscus</i>, <i>Nasua, Procy-</i> <i>on</i>)		S	This study, based on: phylogenetic nesting of <i>Cyonasua</i> and <i>Chapalmalania</i> between <i>Bassariscus</i> and (<i>Nasua</i> + <i>Procyon</i>) (Koepfli et al. 2007) and on scanso- rial habit of all extant procyonines (Baskin 2003)	(Koepfli et al. 2007; Baskin 2003)	PB
<i>Dasyprocta sp.</i>	Tax	<i>Dasyprocta sp.</i>	<i>Dasyprocta sp.</i>	C		(Elissamburu and Vizcaí- no 2004)	Un
<i>Dasyprocta sp.</i>	SG	<i>Dasyprocta</i> <i>azarae</i>	<i>Dasyprocta</i> <i>azarae</i>	C		(García-Esponda and Candela 2010)	LR-E
<i>Dasyprocta sp.</i>	Sum			C			
<i>Dasypus hybri-</i> <i>dus, D. neo-</i> <i>gaeus, D. saba-</i>	Tax, SG	<i>Dasypus hy-</i> <i>bridus, D. no-</i> <i>vemcinctus, D.</i>	<i>Dasypus</i> , and <i>Dasypodinae</i>	SF		(Vizcaino, Farina, and Mazzetta 1999)	LR, PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>nicola</i> , <i>D. sp.</i> , <i>D. villosus</i>		<i>kappleri</i>					
<i>Dasypus hybri-</i> <i>dus</i> , <i>D. neo-</i> <i>gaeus</i> , <i>D. saba-</i> <i>nicola</i> , <i>D. sp.</i> , <i>D. villosus</i>	WG	<i>Dasypus</i>	<i>Dasypus</i>	SF		(Koneval 2003)	LR, PCM
<i>Dasypus hybri-</i> <i>dus</i>, <i>D. neo-</i> <i>gaeus</i>, <i>D. saba-</i> <i>nicola</i>, <i>D. sp.</i>, <i>D. villosus</i>	Sum			SF			
<i>Desmodus</i> <i>draculae</i>	WO	Chiroptera	Chiroptera	V		(Paleobiology Database)	Un
<i>Desmodus ro-</i> <i>tundus</i>	WO	Chiroptera	Chiroptera	V		(Paleobiology Database)	Un
<i>Diabolotherium</i> (=Nothropus) <i>nordenskioldi</i>	Tax	<i>Diabolotheri-</i> <i>um</i> (=Nothropus) <i>nordenskioldi</i>	<i>Diabolotherium</i> (=Nothropus) <i>nordenskioldi</i>	A		(Pujos et al. 2007)	PCM
<i>Diadiaphorus</i> <i>eversus</i> (=Coelosoma <i>eversa</i>)	AGp	<i>Brachytheri-</i> <i>um</i> , <i>Diplasio-</i> <i>therium</i> , <i>Eoa-</i> <i>chenia</i>	Late proterothe- riids	C	Nearly monodactyl	(Webb 1978a)	PCM
<i>Diadiaphorus</i> <i>eversus</i> (=Coelosoma <i>eversa</i>)	SF	cf. <i>Licaphrium</i> (=Proterotheri- <i>um</i>)	cf. <i>Licaphrium</i> (=Proterotheriu- <i>m</i>)	C	Late Oligocene	(Shockey 1999)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Diadiaphorus eversus</i> (= <i>Coelosoma eversa</i>)	WF	Proterotheriidae	Proterotheriidae	C	Early trend towards monodactyly	(Villafañe, Ortiz-Jaureguizar, and Bond 2006)	PCM
<i>Diadiaphorus eversus</i> (= <i>Coelosoma eversa</i>)	WF	Proterotheriidae	Proterotheriidae	C		(Martin Ubilla et al. 2009)	Un
<i>Diadiaphorus eversus</i> (= <i>Coelosoma eversa</i>)	AGp	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	Proterotheriidae	C		(Guillermo H. Cassini et al. 2012)	PCM
<i>Diadiaphorus eversus</i> (= <i>Coelosoma eversa</i>)	SF	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	C		(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Diadiaphorus eversus</i> (= <i>Coelosoma eversa</i>)	SF	<i>Neobrachytherium ullumense</i>	<i>Neobrachytherium ullumense</i>	C		(Croft 2016)	PCM
<i>Diadiaphorus eversus</i> (=<i>Coelosoma eversa</i>)	Sum		Proterotheriidae	C			
<i>Diadiaphorus majusculus</i> , <i>D.</i>	AGp	<i>Brachytherium</i> , <i>Diplasio-</i>	Late proterotheriids	C	Nearly monodactyl	(Webb 1978a)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

sp.		<i>therium, Eoauchenia</i>					
<i>Diadiaphorus majusculus, D. sp.</i>	SF	cf. <i>Licaphrium</i> (=Proterotherium)	cf. <i>Licaphrium</i> (=Proterotherium)	C	Late Oligocene	(Shockey 1999)	PCM
<i>Diadiaphorus majusculus, D. sp.</i>	WF	Proterotheriidae	Proterotheriidae	C	Early trend towards monodactyly	(Villafañe, Ortiz-Jaureguizar, and Bond 2006)	PCM
<i>Diadiaphorus majusculus, D. sp.</i>	WF	Proterotheriidae	Proterotheriidae	C		(Ubilla et al. 2009)	Un
<i>Diadiaphorus majusculus, D. sp.</i>	AGp	<i>Diadiaphorus majusculus, Tetramerorhinus mixtum, Thoatherium minusculum</i>	Proterotheriidae	C		(Cassini et al. 2012)	PCM
<i>Diadiaphorus majusculus, D. sp.</i>	SF	<i>Diadiaphorus majusculus, Tetramerorhinus mixtum, Thoatherium minusculum</i>	<i>Diadiaphorus majusculus, Tetramerorhinus mixtum, Thoatherium minusculum</i>	C		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Diadiaphorus majusculus, D. sp.</i>	SF	<i>Neobrachytherium ullumense</i>	<i>Neobrachytherium ullumense</i>	C		(Croft 2016)	PCM
<i>Diadiaphorus majusculus, D. sp.</i>	Sum		Proterotheriidae	C			
<i>Dicolpomys</i>	Tax	<i>Dicolpomys</i>	<i>Dicolpomys</i>	F		(Hadler et al. 2008)	CDM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>fossor</i>		<i>fossor</i>	<i>fossor</i>				
<i>Dicolpomys fossor</i>	Tax	<i>Dicolpomys fossor</i>	<i>Dicolpomys fossor</i>	F		(Morgan and Verzi 2011)	LR
<i>Dicolpomys fossor</i>	Tax	<i>Dicolpomys fossor</i>	<i>Dicolpomys fossor</i>	F		(Verzi, Olivares, and Morgan 2014)	CDM, PB
<i>Dicolpomys fossor</i>	Sum			F			
<i>Didelphis solimoensis</i>, <i>D. sp.</i>	Tax, SG	<i>Didelphis solimoensis</i>	<i>Didelphis solimoensis</i>	S	May have been more arboreal than extant spp. of <i>Didelphis</i>	(Cozzuol 2006)	CLRs, DM
<i>Dilobodon lutaris</i>	SF, PB	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius imperator</i>	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius imperator</i>	Not Aq	Specialized knee joints with passive locks would allow them to stand for long periods of time and would be unneeded in the water	(Shockey 2001)	PCM
<i>Dilobodon lutaris</i>	SF, PB	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	Am or GT	Part of a trend throughout evolution of Toxodontidae towards reduced cursoriality	(Elissamburu 2007)	PCM
<i>Dilobodon lutaris</i>	SF, PB	<i>Adinotherium ovinum</i>	<i>Adinotherium ovinum</i>	Am		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Dilobodon lutaris</i>	Sum		Toxodontidae	Am			
<i>Doedicurus sp.</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> ,	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Sclerocalyptus</i>							
<i>Doedicurus</i> sp.	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Doedicurus</i> sp.	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glypto- dontidae	Am	Long bone morphology not congruent with run- ning or galloping	(Bargo 2003)	PCM
<i>Doedicurus</i> sp.	SF, PB	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaeohoplophorus</i> : terrestrial and slow-moving	(Croft 2016)	Un
<i>Doedicurus</i> sp.	Sum	Glyptodontidae		Am			
<i>Doellotatus chapadmalensis</i> , <i>D. inornatus</i> , <i>D. sp.</i>	ST	<i>Eutatus seguini</i>	<i>Eutatus seguini</i>	SF	Less fossorial specialization than <i>Priodontes</i>	(Vizcaíno, Milne, and Bargo 2003)	PCM
<i>Doellotatus chapadmalensis</i> , <i>D. inornatus</i> , <i>D. sp.</i>	ST	<i>Proeutatus</i>	<i>Proeutatus</i>	SF	No Santacrucian armadillos reached, "the degree of curoriality of <i>Tolypeutes matacus</i> , the fossoriality of <i>Priodontes maximus</i> , or the subterranean habits of <i>Chlamyphorus truncatus</i> ."	(Vizcaíno, Fernicola, and Bargo 2012)	PCM
<i>Doellotatus chapadmalensis</i> , <i>D. sp.</i>	ST	<i>Proeutatus</i>	<i>Proeutatus</i>	SF	No Santacrucian armadillos reached, "the degree of curoriality of <i>Tolypeu-</i>	(Kay, Vizcaíno, and Bargo 2012)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>inornatus</i> , <i>D.</i> sp.					<i>tes matacus</i> , the fossori- ality of <i>Priodontes max- imus</i> , or the subterranean habits of <i>Chlamyphorus truncatus</i> ."		
<i>Doellotatus</i> <i>chapad- malensis</i> , <i>D.</i> <i>inornatus</i> , <i>D.</i> sp.	ST	<i>Eutatus</i> , <i>Ringueletia simpsoni</i>	<i>Ringueletia simpsoni</i>	SF	Built burrows	(Cenizo, Soibelzon, and Saffer 2015)	Ich
<i>Doellotatus</i> <i>chapad- malensis</i>, <i>D.</i> <i>inornatus</i>, <i>D.</i> sp.	Sum		Eutatini	SF			
<i>Dolicavia mi- nuscula</i> , <i>D.</i> sp.	SSF	<i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	<i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	GT	<i>Microcavia</i> : occasionally digs, occasionally climbs, mostly terrestrial; <i>Galea</i> : primarily terrestrial, dig occasionally; <i>Cavia</i> : gen- eralized terrestrial	(Nowak 1999)	LR-E
<i>Dolicavia mi- nuscula</i> , <i>D.</i> sp.	SSF	<i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	<i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	GT	<i>Microcavia</i> : occasionally digs; <i>Galea</i> : dig occa- sionally; <i>Cavia</i> : general- ized terrestrial	(Elissamburu and Vizcaí- no 2004)	Un
<i>Dolicavia mi- nuscula</i> , <i>D.</i> sp.	PB	<i>Eocardia</i> , <i>Pro- dolichotis</i> , <i>Mi- crocavia</i> , <i>Ga- lea</i> , <i>Cavia</i>	<i>Dolicavia</i> , by phylogenetic bracketing	GT	This study, based on: <i>Eo- cardia</i> and <i>Prodolichotis</i> were similar in postcra- nial morphology and rel-	(Walton 1997; Nowak 1999; Pérez 2010a; Can- dela, Rasia, and Pérez 2012)	PB

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

					atively generalized (Walton 1997); <i>Eocardia fissa</i> was cursorial but less so than <i>Dolichotis/Pediolagus</i> (Candela, Rasia, and Pérez 2012); <i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i> are generalized terrestrial (Nowak 1999), and <i>Dolicavia</i> is phylogenetically bracketed by these taxa (Pérez 2010a)		
<i>Dolicavia minuscula</i> , <i>D. sp.</i>	SSF	<i>Microcavia australis</i> , <i>M. criolloensis</i>	<i>Microcavia australis</i> , <i>M. criolloensis</i>	SF	<i>M. criolloensis</i> may possess additional adaptations for digging beyond what extant <i>M. australis</i> has	(Ubilla 2008)	PCM
<i>Dolicavia minuscula</i> , <i>D. sp.</i>	SSF	<i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	<i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	SF to GT	<i>Microcavia</i> : Digger, <i>Cavia</i> : Generalized terrestrial ("Ambulatory"), <i>Galea</i> : Generalized terrestrial ("Ambulatory")	(Morgan and Álvarez 2013)	LR-E
<i>Dolicavia minuscula</i> , <i>D. sp.</i>	Sum			GT			
<i>Dolicavia minuscula</i> , <i>D. sp.</i>	WG	<i>Dolichotis</i>	<i>Dolichotis</i>	C		(Elissamburu and Vizcaíno 2004)	Un
<i>Dolicavia minuscula</i> , <i>D. sp.</i>	WG	<i>Dolichotis</i>	<i>Dolichotis</i>	C		(Elissamburu and Santis 2011)	LR-E
<i>Dolicavia mi-</i>	Tax,	<i>Dolichotis pat-</i>	<i>Dolichotis pat-</i>	C		(Patton, Pardiñas, and	LR-E

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>nuscula</i> , <i>D. sp.</i>	SG	<i>agonum</i>	<i>agonum</i>			D'Elia 2015)	
<i>Dolicavia minuscula</i>, <i>D. sp.</i>	Sum			C			
<i>Drytomomys aequatorialis</i>, <i>D. sp.</i>	Tax, SG	<i>Drytomomys aequatorialis</i>	<i>Drytomomys aequatorialis</i>	C		(Walton 1997)	PCM, MA
<i>Dusicyon avus</i>, <i>D. sp.</i>	PB	<i>Dusicyon australis</i>, <i>Pseudalopex vetulus</i>, <i>P. griseus</i>, <i>P. sechurae</i>, <i>P. culpaeus</i>, <i>P. gymnocercus</i>	<i>Lycalopex/Pseudalopex</i>	C	This study, based on: Cursorial locomotion in <i>Lycalopex/ Pseudalopex</i> (Samuels, Meachen, and Sakai 2013; Álvarez, Ercoli, and Prevosti 2013); <i>Dusicyon australis</i> forms a monophyletic clade with <i>Pseudalopex vetulus</i>, <i>P. griseus</i>, <i>P. sechurae</i>, <i>P. culpaeus</i>, <i>P. gymnocercus</i> (Zrzavý and Říčanová 2004)	(Álvarez, Ercoli, and Prevosti 2013; Samuels, Meachen, and Sakai 2013; Zrzavý and Říčanová 2004)	PB, LR
<i>Echimys sp.</i>	Tax	<i>Echimys</i>	<i>Echimys</i>	A		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

799	<i>Eionaletherium tanycnemius</i>	SF	<i>Scelidotherium, Glossotherium</i>	<i>Scelidotherium, Glossotherium</i>	SF	Size of burrows consistent with mylodont builders, Claw marks inside burrows match mylodont hand, "anatomical, allometric, and biomechanical analysis of sloths limbs" suggests mylodonts could dig well	(Vizcaíno et al. 2001)	PM, BM, Ich, Mass
	<i>Eionaletherium tanycnemius</i>	SF	<i>Scelidotherium, Scelidodon</i>	<i>Scelidotherium, Scelidodon</i>	SF	May be associated with searching for social insects as food	(Dondas, Isla, and Carbalido 2009)	Ich
	<i>Eionaletherium tanycnemius</i>	SF	<i>Scelidotherium, Scelidodon</i>	<i>Scelidotherium, Scelidodon</i>	SF	May be associated with searching for social insects as food	(Genise and Farina 2012)	Ich
	<i>Eionaletherium tanycnemius</i>	AGp	<i>Scelidotherium, Glossotherium</i>	Mylodontidae	SF	.	(Pujos et al. 2012)	PB
	<i>Eionaletherium tanycnemius</i>	SF	<i>Catonyx tarijensis, Glossotherium robustum, G. sp., Lestodon armatus, L. sp., Lestobradys sprechmanni, Paramylodon harlani, P. sp., Scelidotherium carlesi, S. lep-</i>	<i>Catonyx tarijensis, Glossotherium robustum, G. sp., Lestodon armatus, L. sp., Lestobradys sprechmanni, Paramylodon harlani, P. sp., Scelidotherium carlesi, S. lep-</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>tocephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>	<i>tocephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>				
<i>Eionaletherium tanycnemius</i>	AGp	Large-size mylodont	Large-size mylodont	SF		(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph
<i>Eionaletherium tanycnemius</i>	Sum	Mylodontidae	Mylodontidae	SF			
<i>Eira barbara</i>	Tax	<i>Eira barbara</i>	<i>Eira barbara</i>	S	"Excellent climbers... often seen high in trees."	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Eleutherocercus paranensis</i> , <i>E. sp.</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Eleutherocercus paranensis</i> , <i>E. sp.</i>	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Eleutherocercus paranensis</i> , <i>E. sp.</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003)	PCM
<i>Eleutherocercus paranensis</i> , <i>E. sp.</i>	SF, PB	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaeohoplophorus</i> : terrestrial and slow-moving	(Croft 2016)	Un
<i>Eleutherocercus paranensis</i> ,	Sum		Glyptodontidae	Am			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>E. sp.</i>							
<i>Eligmodontia typus</i>	Tax	<i>Eligmodontia typus</i>	<i>Eligmodontia typus</i>	SF	"Nests and retreats underground"	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Eoauchenia</i> sp.	Tax	<i>Brachytherium</i> , <i>Diplasiotherium</i> , <i>Eoauchenia</i>	Late proterotheriids	C	Nearly monodactyl	(Webb 1978a)	PCM
<i>Eoauchenia</i> sp.	SF	cf. <i>Licaphrium</i> (=Proterotherium)	cf. <i>Licaphrium</i> (=Proterotherium)	C	Late Oligocene	(Shockey 1999)	PCM
<i>Eoauchenia</i> sp.	WF	Proterotheriidae	Proterotheriidae	C	Early trend towards monodactyly	(Villafañe, Ortiz-Jaureguizar, and Bond 2006)	PCM
<i>Eoauchenia</i> sp.	WF	Proterotheriidae	Proterotheriidae	C		(Ubilla et al. 2009)	Un
<i>Eoauchenia</i> sp.	WF	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	Proterotheriidae	C		(Cassini et al. 2012)	PCM
<i>Eoauchenia</i> sp.	SF	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	C		(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Eoauchenia</i> sp.	SF	<i>Ne-</i>	<i>Neobrachyther-</i>	C		(Croft 2016)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>obrachytheri- um ullumense</i>	<i>ium ullumense</i>				
<i>Eoauchenia</i> sp.	Sum		Proterothe- riidae	C			
<i>Eodolichotis elachys</i>, <i>E. maddeni</i>, <i>E. sp.</i>	Tax	<i>Eodolichotis elachys</i>, <i>E. maddeni</i>, <i>E. sp.</i>	<i>Eodolichotis elachys</i>, <i>E. maddeni</i>, <i>E. sp.</i>	GT	La Venta dolichotines have more in common with generalized <i>Cavia</i> than <i>Dolichotis</i>	(Walton 1997)	PCM
<i>Eosclerocalyp- tus planus</i> , <i>E. sp.</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glypto- dontidae	Am	Large glyptodonts "Ca- pable of only a slow run"	(Fariña 1995b)	PCM
<i>Eosclerocalyp- tus planus</i> , <i>E. sp.</i>	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Eosclerocalyp- tus planus</i> , <i>E. sp.</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glypto- dontidae	Am	Long bone morphology not congruent with run- ning or galloping	(Bargo 2003)	PCM
<i>Eosclerocalyp- tus planus</i> , <i>E. sp.</i>	SF, PB	<i>Parapropalae- hoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalae- hoplophorus</i> , <i>Glyptodon</i> , <i>Pa- nochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaeohoplopho- rus</i> : terrestrial and slow- moving	(Croft 2016)	Un
<i>Eosclerocalyp- tus planus</i>, <i>E. sp.</i>	Sum		Glyptodonti- dae	Am			
<i>Epecuenia</i> sp.	AGp	<i>Brachytheri- um</i> , <i>Diplasio-</i>	Late proterothe- riids	C	Nearly monodactyl	(Webb 1978a)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>therium, Eoau-</i> <i>chenia</i>					
<i>Epecuenia</i> sp.	SF	cf. <i>Licaphrium</i> (= <i>Proterother-</i> <i>ium</i>)	cf. <i>Licaphrium</i> (= <i>Proterother-</i> <i>ium</i>)	C	Late Oligocene	(Shockey 1999)	PCM
<i>Epecuenia</i> sp.	WF	Proterothe- riidae	Proterotheriidae	C	Early trend towards mondactyly	(Villafañe, Ortiz- Jaureguizar, and Bond 2006)	PCM
<i>Epecuenia</i> sp.	WF	Proterothe- riidae	Proterotheriidae	C		(Martin Ubilla et al. 2009)	Un
<i>Epecuenia</i> sp.	WF	<i>Diadiaphorus</i> <i>majusculus</i> , <i>Tetramerorhi-</i> <i>nus mixtum</i> , <i>Thoatherium</i> <i>minusculum</i>	Proterotheriidae	C		(Guillermo H. Cassini et al. 2012)	PCM
<i>Epecuenia</i> sp.	SF	<i>Diadiaphorus</i> <i>majusculus</i> , <i>Tetramerorhi-</i> <i>nus mixtum</i> , <i>Thoatherium</i> <i>minusculum</i>	<i>Diadiaphorus</i> <i>majusculus</i> , <i>Te-</i> <i>tramerorhinus</i> <i>mixtum</i> , <i>Thoatherium</i> <i>minusculum</i>	C		(Kay, Vizcaíno, and Bar- go 2012)	Un
<i>Epecuenia</i> sp.	SF	<i>Ne-</i> <i>obrachytheri-</i> <i>um ullaense</i>	<i>Neobrachyther-</i> <i>ium ullaense</i>	C		(Croft 2016)	PCM
<i>Epecuenia</i> sp.	Sum		Proterothe- riidae	C			
<i>Epieurycerus</i> <i>truncus</i>	WF	Cervidae	Cervidae	C	Cursorial (open habi- tats) or Curso- saltatorial (closed habi-	(Curran 2012)	PCG M

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

					tats)		
<i>Eptesicus fuscus</i> , <i>E. sp.</i>	WO	Chiroptera	Chiroptera	V		(Paleobiology Database)	Un
<i>Equus andium</i> , <i>E. caballus</i> , <i>E. insulatus</i> , <i>E. santaeelenae</i> , <i>E. sp.</i>	WG	Equus	Equus	C		(Gellman, Bertram, and Hermanson 2002)	Un
<i>Eremotherium elenense</i> , <i>E. laurillardi</i> , <i>E. sefvei</i> , <i>E. sp.</i>	SF	<i>Mesocnus</i> (Megalonychidae), <i>Megalocnus</i> (Megalonychidae), <i>Prepothierium</i> (Megatheriidae)	<i>Mesocnus</i> , <i>Megalocnus</i> , <i>Prepothierium</i>	Am	Morphology very different from cursorial animals, consistent with arboreal or ambulatory habits	(White 1993)	PCM
<i>Eremotherium elenense</i> , <i>E. laurillardi</i> , <i>E. sefvei</i> , <i>E. sp.</i>	WF	<i>Megatherium</i>	<i>Megatherium</i>	GT	Could have run	(Fariña and Vizcaíno 1999)	BM
<i>Eremotherium elenense</i> , <i>E. laurillardi</i> , <i>E. sefvei</i> , <i>E. sp.</i>	AGp	"Extinct sloths"	"Extinct sloths"	Am	Unlikely that they could have outrun predators; likely fought rather than ran	(McDonald 2012)	PCM
<i>Eremotherium elenense</i> , <i>E. laurillardi</i> , <i>E. sefvei</i> , <i>E. sp.</i>	WF	Megatheriidae	Megatheriidae	T	Neither climbers nor diggers	(Pujos et al. 2012)	PB
<i>Eremotherium elenense</i> , <i>E. sp.</i>	SF	<i>Megatherium lundii</i> , <i>M. sp.</i> ,	<i>Megatherium lundii</i> , <i>M. sp.</i> ,	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>laurillardi</i> , <i>E. sefvei</i> , <i>E. sp.</i>		<i>M. tarijense</i>	<i>M. tarijense</i>				
<i>Eremotherium elenense</i> , <i>E. laurillardi</i> , <i>E. sefvei</i> , <i>E. sp.</i>	SF	<i>Pyramiodontherium</i>	<i>Pyramiodontherium</i>	Am	"Slow walking gait only"	(Melchor et al. 2015)	Un
<i>Eremotherium elenense</i> , <i>E. laurillardi</i> , <i>E. sefvei</i> , <i>E. sp.</i>	SF	Santacrucian sloths, including representatives of Megatheriidae, Megalonychidae, and Mylodontidae	Santacrucian sloths, including representatives of Megatheriidae, Megalonychidae, and Mylodontidae	Am	"Not well-suited for fast locomotion"	(Toledo 2016)	PCM
<i>Eremotherium elenense</i>, <i>E. laurillardi</i>, <i>E. sefvei</i>, <i>E. sp.</i>	Sum			Am			
<i>Erethizon sp.</i>	Tax	<i>Erethizon</i>	<i>Erethizon</i>	S	"Primarily terrestrial but frequently [climbs trees]"	(Nowak 1999)	LR-E
<i>Eucelophorus sp.</i>	Tax	<i>Eucelophorus</i>	<i>Eucelophorus</i>	F		(Reig and Quintana 1992)	CDM
<i>Eucelophorus sp.</i>	Tax	<i>Eucelophorus</i>	<i>Eucelophorus</i>	F	Most specialized tooth-digger known	(Verzi 2002)	CDM
<i>Eucelophorus sp.</i>	Sum			F			
<i>Eucholoeops ingens</i>	WG	<i>Eucholoeops</i>	<i>Eucholoeops</i>	S		(White 1993)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Eucholoeops ingens</i>	WG	<i>Eucholoeops</i>	<i>Eucholoeops</i>	S or Am		(White 1997)	PCM
<i>Eucholoeops ingens</i>	Tax	<i>Eucholoeops ingens</i>	<i>Eucholoeops ingens</i>	S		(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Eucholoeops ingens</i>	WG	<i>Eucholoeops</i>	<i>Eucholoeops</i>	S		(Pujos et al. 2012)	LR
<i>Eucholoeops ingens</i>	SG	<i>Acratocnus odontrigonus</i> , <i>A. sp.</i> , <i>Choloepus didactylus</i> , <i>C. hoffmanni</i> , <i>Eucholoeops sp.</i> , <i>Hapalops sp.</i> , <i>Megalonyx jeffersonii</i> , <i>Neocnus comes</i> , <i>Parocnus serus</i> , <i>Peleciodon arcuatus</i>	<i>Acratocnus odontrigonus</i> , <i>A. sp.</i> , <i>Choloepus didactylus</i> , <i>C. hoffmanni</i> , <i>Eucholoeops sp.</i> , <i>Hapalops sp.</i> , <i>Megalonyx jeffersonii</i> , <i>Neocnus comes</i> , <i>Parocnus serus</i> , <i>Peleciodon arcuatus</i>	S	All scansorial except <i>Megalonyx</i> : terrestrial and <i>Choloepus</i> : arboreal (Categories: Terrestrial, Scansorial, Arboreal)	(Grass 2014)	PCGM
<i>Eucholoeops ingens</i>	WG	<i>Eucholoeops</i>	<i>Eucholoeops</i>	A		(Toledo 2016)	
<i>Eucholoeops ingens</i>	Sum			S			
<i>Eumegamys sp.</i>	WS F	<i>Josephoartigasia monesi</i>	Most rodents, including <i>Eumegamynae</i>	Am	"not well-suited for fast running," too large to hide so probably used teeth as defensive weapon	(Blanco, Rinderknecht, and Lecuona 2012)	Un
<i>Eumegamysops</i>	WS	<i>Josephoar-</i>	Most rodents,	Am	"not well-suited for fast	(Blanco, Rinderknecht,	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

sp.	F	<i>tigasia monesi</i>	including Eumegamysi- nae	running," too large to hide so probably used teeth as defensive weapon	and Lecuona 2012)	
<i>Eumops</i> sp.	WO	Chiroptera	Chiroptera	V	(Paleobiology Database)	Un
<i>Eumysops for- mosus</i> , <i>E.</i> <i>laeviplicatus</i> , <i>E.</i> <i>parodii</i> , <i>E.</i> sp.	WG	<i>Eumysops</i>	<i>Eumysops</i>	SF	Gregarious and built their own burrow systems	(Beilinson and Taglioretti 2013) Ich
<i>Eumysops for- mosus</i> , <i>E.</i> <i>laeviplicatus</i> , <i>E.</i> <i>parodii</i> , <i>E.</i> sp.	WG	<i>Eumysops</i>	<i>Eumysops</i>	T		(Verzi, Olivares, and Morgan 2014) PB
<i>Eumysops for- mosus</i> , <i>E.</i> <i>laeviplicatus</i> , <i>E.</i> <i>parodii</i> , <i>E.</i> sp.	WG	<i>Eumysops</i>	<i>Eumysops</i>	SF	Gregarious and built their own burrow systems	(Cenizo, Soibelzon, and Saffer 2015) Ich
<i>Eumysops for- mosus</i>, <i>E.</i> <i>laeviplicatus</i>, <i>E.</i> <i>parodii</i>, <i>E.</i> sp.	Sum			SF		
<i>Euphractus pat- agonicus</i> , <i>E.</i> <i>sexcinctus</i> , <i>E.</i> sp.	Tax, SG	<i>Euphractus</i> <i>sexcinctus</i>	<i>Euphractus sex- cinctus</i>	SF		(Eisenberg 1989; Redford and Eisenberg 1992; Ei- senberg and Redford 1999) LR-E
<i>Euphractus pat- agonicus</i> , <i>E.</i> <i>sexcinctus</i> , <i>E.</i> sp.	WG	<i>Euphractus</i> , <i>Chaetophrac- tus</i> , <i>Zaedyus</i>	<i>Euphractus</i> , <i>Chaetophrac- tus</i> , <i>Zaedyus</i>	SF		(Vizcaíno and Milne 2002) LR-E
<i>Euphractus</i>	Sum			SF		

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>patagonicus</i> , <i>E. sexcinctus</i> , <i>E. sp.</i>							
<i>Euryzygoma-</i> <i>tomys sp.</i>	SG	<i>Euryzygoma-</i> <i>tomys spinosus</i>	<i>Euryzygoma-</i> <i>tomys spinosus</i>	SF		(Patton, Pardiñas, and D'Elía 2015)	LR-E
<i>Eutatus se-</i> <i>guini</i> , <i>E. sp.</i>	Tax, SG	<i>Eutatus se-</i> <i>guini</i>	<i>Eutatus seguini</i>	SF	Less fossorial speciali- zation than <i>Priodontes</i>	(Vizcaíno, Milne, and Bargo 2003)	PCM
<i>Felis platensis</i> , <i>F. sp</i>	SG	<i>Felis</i> (=Oncifelis) <i>colocolo</i> , <i>Felis</i> (=Oncifelis) <i>geoffroyi</i> , <i>Felis</i> (=Oreailurus) <i>jacobita</i> , <i>Felis</i> (=Leopardus) <i>pardalis</i> , <i>Felis</i> (=Leopardus) <i>tigrina</i> , <i>Felis</i> (=Leopardus) <i>wiedii</i> , <i>Felis</i> (=Herpailurus) <i>yagouaroundi</i>	<i>Felis</i> (=Oncifelis) <i>colocolo</i> , <i>Felis</i> (=Oncifelis) <i>geoffroyi</i> , <i>Felis</i> (=Oreailurus) <i>jacobita</i> , <i>Felis</i> (=Leopardus) <i>pardalis</i> , <i>Felis</i> (=Leopardus) <i>tigrina</i> , <i>Felis</i> (=Leopardus) <i>wiedii</i> , <i>Felis</i> (=Herpailurus) <i>yagouaroundi</i>	S	<i>F. colocolo</i> : arboreal, <i>F. pardalis</i> : mostly hunts on ground but scansorial; <i>F. tigrina</i> : scansorial; <i>F. wiedii</i> : mostly arboreal; <i>F. yagouaroundi</i> : scansorial	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Felis platensis</i> , <i>F. sp</i>	SG	<i>Felis colocolo</i> , <i>Felis geoffroyi</i> , <i>Felis pardalis</i> , <i>Felis yagoua-</i> <i>roundi</i>	<i>Felis colocolo</i> , <i>Felis geoffroyi</i> , <i>Felis pardalis</i> , <i>Felis yagoua-</i> <i>roundi</i>	S	<i>F. colocolo</i> : scansorial, <i>F. geoffroyi</i> : Scansorial; <i>F. pardalis</i> : mostly terrestrial but climbs, jumps, and swims well; <i>F. yagouaroundi</i> : scansorial	(Nowak 1999)	LR-E
<i>Felis platensis</i> ,	Sum			S			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

F. sp							
<i>Galea musteloides</i> , <i>G. sp.</i> , <i>G. spixii</i>	WG	<i>Galea</i>	<i>Galea</i>	GT	Primarily terrestrial, dig occasionally	(Nowak 1999)	LR-E
<i>Galea musteloides</i> , <i>G. sp.</i> , <i>G. spixii</i>	WG	<i>Galea</i>	<i>Galea</i>	GT	Dig occasionally	(Elissamburu and Vizcaíno 2004)	Un
<i>Galea musteloides</i> , <i>G. sp.</i> , <i>G. spixii</i>	Tax, SG	<i>Galea musteloides</i>	<i>Galea musteloides</i>	SF to GT	<i>G. musteloides</i> : Will either build a burrow or use an abandoned burrow; <i>G. spixii</i> : Generally nest in crevices, under rocks, under low vegetation	(Patton, Pardiñas, and D'Elía 2015)	LR-E
<i>Galea musteloides</i> , <i>G. sp.</i> , <i>G. spixii</i>	Sum			GT			
<i>Galictis sp.</i>	SG	<i>Galictis cuja</i>	<i>Galictis cuja</i>	SF	Adaptations for moving through burrows in search of rodents	(Ercoli et al. 2016)	My, PCM
<i>Glossotheriopsis pascuali</i>	SF	<i>Scelidotherium</i> , <i>Glossotherium</i>	<i>Scelidotherium</i> , <i>Glossotherium</i>	SF	Size of burrows consistent with mylodont builders, Claw marks inside burrows match mylodont hand, "anatomical, allometric, and biomechanical analysis of sloths limbs" suggests mylodonts could dig well	(Vizcaíno et al. 2001)	PM, BM, Ich, Mass

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Glossotheriopsis pascuali</i>	SF	<i>Scelidotherium</i> , <i>Scelidodon</i>	<i>Scelidotherium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Dondas, Isla, and Carbalido 2009)	Ich
<i>Glossotheriopsis pascuali</i>	SF	<i>Scelidotherium</i> , <i>Scelidodon</i>	<i>Scelidotherium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Genise and Farina 2012)	Ich
<i>Glossotheriopsis pascuali</i>	WF	<i>Scelidotherium</i> , <i>Glossotherium</i>	Mylodontidae	SF	.	(Pujos et al. 2012)	PB
<i>Glossotheriopsis pascuali</i>	SF	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Glossotheriopsis pascuali</i>	AGp	Large-size mylodont	Large-size mylodont	SF		(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph
<i>Glossotheriopsis pascuali</i>	Sum		Mylodontidae	SF			
<i>Glossotherium chapadmalense</i> , <i>G. giganteum</i> ,	WG	<i>Scelidotherium</i> , <i>Glossotherium</i>	<i>Scelidotherium</i> , <i>Glossotherium</i>	SF	Size of burrows consistent with mylodont builders, Claw marks in-	(Vizcaíno et al. 2001)	PM, BM, Ich,

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>G. robustum</i> , <i>G. sp.</i> , <i>G. tropicorum</i>					side burrows match mylodont hand, "anatomical, allometric, and biomechanical analysis of sloths limbs" suggests mylodonts could dig well	Mass	
<i>Glossotherium chapadmalense</i> , <i>G. giganteum</i> , <i>G. robustum</i> , <i>G. sp.</i> , <i>G. tropicorum</i>	SF	<i>Scelidothierium</i> , <i>Scelidodon</i>	<i>Scelidothierium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Dondas, Isla, and Carbalido 2009)	Ich
<i>Glossotherium chapadmalense</i> , <i>G. giganteum</i> , <i>G. robustum</i> , <i>G. sp.</i> , <i>G. tropicorum</i>	SF	<i>Scelidothierium</i> , <i>Scelidodon</i>	<i>Scelidothierium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Genise and Farina 2012)	Ich
<i>Glossotherium chapadmalense</i> , <i>G. giganteum</i> , <i>G. robustum</i> , <i>G. sp.</i> , <i>G. tropicorum</i>	WG	<i>Scelidothierium</i> , <i>Glossotherium</i>	<i>Scelidothierium</i> , <i>Glossotherium</i>	SF	.	(Pujos et al. 2012)	PB
<i>Glossotherium chapadmalense</i> , <i>G. giganteum</i> , <i>G. robustum</i> , <i>G. sp.</i> , <i>G. tropicorum</i>	Tax, SG	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> ,	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> ,	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>	<i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>				
<i>Glossotherium chapadmalense</i> , <i>G. giganteum</i> , <i>G. robustum</i> , <i>G. sp.</i> , <i>G. tropicorum</i>	AGp	Large-size mylodont	Large-size mylodont	SF		(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph
<i>Glossotherium chapadmalense</i>, <i>G. giganteum</i>, <i>G. robustum</i>, <i>G. sp.</i>, <i>G. tropicorum</i>	Sum			SF			
<i>Glyptodon clavipes</i> , <i>G. elongatus</i> , <i>G. munizi</i> , <i>G. reticulatus</i> , <i>G. sp.</i>	WG	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Glyptodon clavipes</i> , <i>G. elongatus</i> , <i>G. munizi</i> , <i>G. reticulatus</i> , <i>G. sp.</i>	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Glyptodon clavipes</i> , <i>G. elongatus</i> , <i>G. munizi</i> , <i>G. reticulatus</i> , <i>G. sp.</i>	WG	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003)	PCM
<i>Glyptodon clavipes</i> , <i>G. elongatus</i> , <i>G. munizi</i> , <i>G. reticulatus</i> , <i>G. sp.</i>	WG	<i>Parapropalaehoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaehoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaehoplophorus</i> : terrestrial and slow-moving	(Croft 2016)	Un
<i>Glyptodon clavipes</i>, <i>G. elongatus</i>, <i>G. munizi</i>, <i>G. reticulatus</i>, <i>G. sp.</i>	Sum		Glyptodontidae	Am			
<i>Glyptotherium cylindricum</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Glyptotherium cylindricum</i>	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Glyptotherium cylindricum</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003)	PCM
<i>Glyptotherium cylindricum</i>	PB	<i>Parapropalaehoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaehoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaehoplophorus</i> : terrestrial and slow-moving	(Croft 2016)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Doedicurus</i> , <i>Sclerocalyptus</i>		<i>rus</i> : terrestrial and slow-moving		
<i>Glyptotherium cylindricum</i>	Sum		Glyptodontidae	Am			
<i>Gracilinanus</i> sp.	SG	<i>G. agilis</i> , <i>G. dryas</i> , <i>G. microtarsus</i>	<i>G. agilis</i> , <i>G. dryas</i> , <i>G. microtarsus</i>	S	<i>G. agilis</i> : Scansorial; <i>G. dryas</i> : Forages both arboreally and terrestrially (Scansorial); <i>G. microtarsus</i> : Probably scansorial or arboreal	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Granastrapotherium snorki</i>	SF	<i>Astrapotherium</i>	<i>Astrapotherium</i>	Aq		(Riggs 1935)	Tph
<i>Granastrapotherium snorki</i>	SF	<i>Astrapotherium</i> , <i>Parastrapotherium</i>	<i>Astrapotherium</i> , <i>Parastrapotherium</i>	Aq	"Short and weak" limbs; Often found in or near ancient river channels	(Scott 1937)	PCM, Tph
<i>Granastrapotherium snorki</i>	SF	<i>Astrapotherium magnum</i>	<i>Astrapotherium magnum</i>	Aq		(Avilla and Vizcaíno 2005)	PCM
<i>Granastrapotherium snorki</i>	Tax	<i>Granastrapotherium snorki</i> , <i>Xenastrapotherium kraglievichi</i>	<i>Granastrapotherium snorki</i> , <i>Xenastrapotherium kraglievichi</i>	Aq		(Kay and Madden 1997b)	Un
<i>Granastrapotherium snorki</i>	SF	<i>Astrapotherium</i>	<i>Astrapotherium</i>	GT	Likely could swim and run	(Cassini et al. 2012)	PCM
<i>Granastrapotherium snorki</i>	SF	<i>Astrapotherium magnum</i>	<i>Astrapotherium magnum</i>	Aq		(Flynn et al. 2012)	PCM, Tph

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Granastrapotherium snorki</i>	SF	<i>Astrapotherium magnum</i>	<i>Astrapotherium magnum</i>	Am		(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Granastrapotherium snorki</i>	AGp	Astrapotheres, especially Uruguaytheriinae	Astrapotheres, especially Uruguaytheriinae	Aq		(Catena et al. 2016)	LR
<i>Granastrapotherium snorki</i>	Tax	<i>Granastrapotherium snorki</i>	<i>Granastrapotherium snorki</i>	Aq		(Croft 2016)	Tph
<i>Granastrapotherium snorki</i>	SF	<i>Parastrapotherium</i>	<i>Parastrapotherium</i>	Am or Aq		(Houssaye, Fernandez, and Billet 2016)	BH
<i>Granastrapotherium snorki</i>	WG	<i>Granastapotherium</i> and/or <i>Xenastapotherium</i>	<i>Granastapotherium</i> and/or <i>Xenastapotherium</i>	Am	Inconsistent with semi-aquatic habits	Chapter 5	SI
<i>Granastrapotherium snorki</i>	Sum			Am			
<i>Guiomys</i> sp., <i>G. unica</i>	PB	<i>Eocardia</i>, <i>Prodolichotis pridiana</i>	<i>Guiomys unica</i>, by phylogenetic bracketing	GT	This study, based on: <i>Eocardia</i> and <i>Prodolichotis pridiana</i> were generalized terrestrial (Walton 1997), <i>Eocardia fissa</i> was somewhat cursorial but more generalized than <i>Dolichotis</i> (Candela, Rasia, and Pérez 2012);	(Pérez 2010a; Candela, Rasia, and Pérez 2012; Walton 1997)	PB

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

					<i>Guimys unica</i> is closely phylogenetically bracketed by <i>Eocardia</i> and <i>Prodolichotis pridiani</i> (Pérez 2010a)		
<i>Gyrinodon quassus</i> , G. sp.	SF, PB	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius imperator</i>	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius imperator</i>	Not Aq	Specialized knee joints with passive locks would allow them to stand for long periods of time and would be unneeded in the water	(Shockey 2001)	PCM
<i>Gyrinodon quassus</i> , G. sp.	SF, PB	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	Am or GT	Part of a trend throughout evolution of Toxodontidae towards reduced cursoriality	(Elissamburu 2007)	PCM
<i>Gyrinodon quassus</i> , G. sp.	SF, PB	<i>Adinotherium ovinum</i>	<i>Adinotherium ovinum</i>	Am		(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Gyrinodon quassus</i>, G. sp.	Sum		Toxodontidae	Am			
<i>Hapalops angustipalatus</i> , H. sp.	WG	<i>Hapalops</i>	<i>Eucholoeops</i>	S		(White 1993)	PCM
<i>Hapalops angustipalatus</i> , H. sp.	WG	<i>Hapalops</i>	<i>Eucholoeops</i>	S		(J. L. White 1997)	PCM
<i>Hapalops angustipalatus</i> , H. sp.	WG	<i>Hapalops</i>	<i>Eucholoeops ingens</i>	S		(Kay, Vizcaíno, and Bar-go 2012)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Hapalops angustipalatus</i> , <i>H.</i> sp.	WG	<i>Hapalops</i>	<i>Eucholoeops</i>	S		(Pujos et al. 2012)	LR
<i>Hapalops angustipalatus</i> , <i>H.</i> sp.	WG	<i>Hapalops</i>	<i>Eucholoeops</i>	A		(Toledo 2016)	
<i>Hapalops angustipalatus</i>, <i>H.</i> sp.	Sum			S			
<i>Haplomastodon chimborazi</i>, <i>H.</i> sp., <i>H. waringi</i>	WO	Proboscidea	Proboscidea	Am		(Janis et al. 1998)	Un
<i>Hegetotherium mirabile</i> , <i>H.</i> sp.	Tax, SG	<i>Hegetotherium mirabile</i>	<i>Hegetotherium mirabile</i>	SF	Frequent diggers	(Elissamburu 2004)	PCM
<i>Hegetotherium mirabile</i> , <i>H.</i> sp.	Tax, SG	<i>Hegetotherium mirabile</i>	<i>Hegetotherium mirabile</i>	SF	For typotheres, particularly <i>Hegetotherium</i> , hypsodonty may be associated with digging habit and not diet	(Cassini et al. 2011)	CMM
<i>Hegetotherium mirabile</i> , <i>H.</i> sp.	See	<i>Interatherium</i>	<i>Interatherium</i>	SF	Relationship: Closely related to and similar level of fossoriality to <i>Interatherium</i> (Elissamburu 2004); Locomotion: <i>Interatherium</i> was "more similar to a mustelid and was probably more fossorial (certainly not cursorial)" (Croft and Anderson 2008)	(Croft and Anderson 2008; Elissamburu 2004)	PCM, LR

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Hegetotherium mirabile</i> , <i>H. sp.</i>	WG	<i>Hegetotherium</i> , <i>Interatherium</i>	<i>Hegetotherium</i> , <i>Interatherium</i>	SF	Intermediate between occasionally digging and digging caviomorphs: Better digger than most Santacrucian typotheres, but not as good as many extant caviomorphs	(Cassini, Vizcaíno, and Bargo 2012)	PCM
<i>Hegetotherium mirabile</i> , <i>H. sp.</i>	Tax, SG	<i>Hegetotherium mirabile</i>	<i>Hegetotherium mirabile</i>	C		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Hegetotherium mirabile</i>, <i>H. sp.</i>	Sum			SF			
<i>Hemiauchenia paradoxa</i> , <i>H. sp.</i>	WG	<i>Hemiauchenia</i>	<i>Hemiauchenia</i>	C	Better adapted to fast locomotion than extant llamas or <i>Palaeolama</i>	(Webb 1974)	PCM
<i>Hemiauchenia paradoxa</i> , <i>H. sp.</i>	WG	<i>Hemiauchenia</i>	<i>Hemiauchenia</i>	C	Better adapted to fast locomotion than extant llamas or <i>Palaeolama</i>	(Scherer 2013)	PCM
<i>Hemiauchenia paradoxa</i>, <i>H. sp.</i>	Sum			C			
<i>Hemihegetotherium sp.</i>, <i>H. trilobus</i>	Tax, SG	<i>Hemihegetotherium trilobus</i>	<i>Hemihegetotherium trilobus</i>	C	Likely was a "quick and agile runner that was also capable of digging and/or swimming"	(Croft 2016)	PCM
<i>Herpailurus sp.</i>	SG	<i>Felis</i> (= <i>Herpailurus</i>) <i>yagouaroundi</i>	<i>Felis</i> (= <i>Herpailurus</i>) <i>yagouaroundi</i>	S		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Herpailurus sp.</i>	SG	<i>Felis</i> (= <i>Herpailurus</i>)	<i>Felis</i> (= <i>Herpailurus</i>)	S		(Nowak 1999)	LR-E

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>yagouaroundi</i>	<i>yagouaroundi</i>				
<i>Herpailurus</i> sp.	Sum			S			
<i>Hesperocynus</i> (= <i>Thylatheridium</i>) <i>dolgopola</i>	SF	<i>Sparassocynus derivatus</i>	<i>Sparassocynus derivatus</i>	SF	Specifies that details are unknown, but that based on analogy with dasyurid marsupials of Australia, likely dug burrows and may have searched for prey underground as well	(Croft 2016)	MA
<i>Heteromys</i> sp.	Tax	<i>Heteromys</i>	<i>Heteromys</i>	F	Construct elaborate burrow systems, forage on surface and carry food back to burrows in cheek pouches	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Hilarcotherium castanedaii</i>	SF	<i>Astrapotherium</i>	<i>Astrapotherium</i>	Aq		(Riggs 1935)	Tph
<i>Hilarcotherium castanedaii</i>	SF	<i>Astrapotherium</i> , <i>Parastrapotherium</i>	<i>Astrapotherium</i> , <i>Parastrapotherium</i>	Aq	"Short and weak" limbs; Often found in or near ancient river channels	(Scott 1937)	PCM, Tph
<i>Hilarcotherium castanedaii</i>	SF	<i>Astrapotherium magnum</i>	<i>Astrapotherium magnum</i>	Aq		(Avilla and Vizcaíno 2005)	PCM
<i>Hilarcotherium castanedaii</i>	SF	<i>Granastrapotherium snorki</i> , <i>Xenastrapotherium kraglievichi</i>	<i>Granastrapotherium snorki</i> , <i>Xenastrapotherium kraglievichi</i>	Aq		(Kay and Madden 1997b)	Un
<i>Hilarcotherium castanedaii</i>	SF	<i>Astrapotherium</i>	<i>Astrapotherium</i>	GT	Likely could swim and run	(Cassini et al. 2012)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Hilarcotherium castanedaii</i>	SF	<i>Astrapotherium magnum</i>	<i>Astrapotherium magnum</i>	Aq		(Flynn et al. 2012)	PCM, Tph
<i>Hilarcotherium castanedaii</i>	SF	<i>Astrapotherium magnum</i>	<i>Astrapotherium magnum</i>	Am		(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Hilarcotherium castanedaii</i>	AGp	Astrapotheres, especially Uruguaytheriinae	Astrapotheres, especially Uruguaytheriinae	Aq		(Catena et al. 2016)	LR
<i>Hilarcotherium castanedaii</i>	SF	<i>Granastrapotherium snorki</i>	<i>Granastrapotherium snorki</i>	Aq		(Croft 2016)	Tph
<i>Hilarcotherium castanedaii</i>	SF	<i>Parastrapotherium</i>	<i>Parastrapotherium</i>	Am or Aq		(Houssaye, Fernandez, and Billet 2016)	BH
<i>Hilarcotherium castanedaii</i>	SF	Granastapotherium and/or Xenastapotherium	Granastapotherium and/or Xenastapotherium	Am	Inconsistent with semi-aquatic habits	Chapter 5	SI
<i>Hilarcotherium castanedaii</i>	Sum			Am			
<i>Hippidion</i> (=Onohippidium) <i>devillei</i>	Tax	<i>Hippidion</i> (=Onohippidium) <i>devillei</i>	<i>Hippidion</i> (=Onohippidium) <i>devillei</i>	C		(Croft 2016)	Un
<i>Hippidion</i> <i>principale</i> , <i>H. saldiasi</i> , <i>H. sp.</i>	Tax, SG	<i>Hippidion</i> <i>principale</i>	<i>Hippidion</i> <i>principale</i>	C		(Fariña, Blanco, and Christiansen 2005)	PCM
<i>Hippocamelus</i> <i>sp.</i>	SG	<i>Hippocamelus bisulcus</i>	<i>Hippocamelus bisulcus</i>	C		(Vizcaino, Farina, and Mazzetta 1999)	Un
<i>Hiskatherium saintandrei</i>	AGp	"Extinct sloths"	"Extinct sloths"	Am	Unlikely that they could have outrun predators;	(McDonald 2012)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

					likely fought rather than ran		
<i>Hiskatherium saintandrei</i>	SF	Nothrotheriidae	Nothrotheriidae	T	Neither climbers nor diggers	(Pujos et al. 2012)	PB
<i>Hiskatherium saintandrei</i>	SF	Nothrotheriops shastensis, N. sp.	Nothrotheriops shastensis, N. sp.	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Hiskatherium saintandrei</i>	AGp	Santacrucian sloths, including representatives of (Mega-theriidae + Nothrotheriidae), Megalonychidae, and Mylodontidae	Santacrucian sloths, including representatives of (Mega-theriidae + Nothrotheriidae), Megalonychidae, and Mylodontidae	Am	"Not well-suited for fast locomotion"	(Toledo 2016)	PCM
<i>Hiskatherium saintandrei</i>	Sum			Am			
<i>Hoffstetteriaus imperator</i>	SF, PB	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetteriaus imperator</i>	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetteriaus imperator</i>	Not Aq	Specialized knee joints with passive locks would allow them to stand for long periods of time and would be unneeded in the water	(Shockey 2001)	PCM
<i>Hoffstetteriaus imperator</i>	SF, PB	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	Am or GT	Part of a trend throughout evolution of Toxodontidae towards reduced cursoriality	(Elissamburu 2007)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Hoffstetterius imperator</i>	SF, PB	<i>Adinotherium ovinum</i>	<i>Adinotherium ovinum</i>	Am		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Hoffstetterius imperator</i>	Sum		Toxodontidae	Am			
<i>Holmesina occidentalis</i> , <i>H. paulacoutoi</i> , <i>H. sp.</i>	SF	<i>Pampatherium humboldtii</i>	<i>Pampatherium humboldtii</i>	C	Adapted for fast movements, also may have been able to burrow	(Abrantes, Avilla, and Vizcaíno 2005)	PCM
<i>Holmesina occidentalis</i> , <i>H. paulacoutoi</i> , <i>H. sp.</i>	SF	<i>Pampatherium humboldtii</i>	<i>Pampatherium humboldtii</i>	C	Adapted for fast movements	(Rincón, White, and McDonald 2008)	PCM
<i>Holmesina occidentalis</i>, <i>H. paulacoutoi</i>, <i>H. sp.</i>	Sum			C			
<i>Holochilus brasiliensis</i>, <i>H. sp.</i>	WG	<i>Holochilus</i>	<i>Holochilus</i>	Aq		(Patton, Pardiñas, and D'Elía 2015)	LR-E
<i>Holozaedyus laevisculptus</i>	ST	<i>Euphractus</i> , <i>Chaetophractus</i> , <i>Zaedyus</i>	<i>Euphractus</i> , <i>Chaetophractus</i> , <i>Zaedyus</i>	SF		(Vizcaíno and Milne 2002)	LR-E
<i>Holozaedyus laevisculptus</i>	ST	<i>Prozaedyus exilis</i> , <i>P. sp.</i>	<i>Prozaedyus exilis</i> , <i>P. sp.</i>	SF		(Vizcaíno, Fernicola, and Bargo 2012)	PCM
<i>Holozaedyus laevisculptus</i>	ST	<i>Prozaedyus proximus</i>	<i>Prozaedyus proximus</i>	SF		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Holozaedyus laevisculptus</i>	ST	<i>Macro-euphractus outesi</i>	<i>Macro-euphractus outesi</i>	SF		(Croft 2016)	Un
<i>Holozaedyus</i>	Sum		Euphractini	SF			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>laevisculptus</i>							
<i>Homalodotherium</i> sp.	SG	<i>Homalodotherium</i>	<i>Homalodotherium</i>	Am		(Elissamburu 2007)	PCM
<i>Homalodotherium</i> sp.	SG	<i>Homalodotherium cunninghami</i>	<i>Homalodotherium cunninghami</i>	Am		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Homalodotherium</i> sp.	Sum			Am			
<i>Homotherium venezuelensis</i>	SG	<i>Homotherium ischyryus</i>, <i>H. serum</i>	<i>Homotherium ischyryus</i>, <i>H. serum</i>	GT	<i>H. ischyryus</i> was more cursorial than <i>H. serum</i>, but still less cursorial than canids and no more cursorial than extant lions	(Samuels, Meachen, and Sakai 2013)	PCM
<i>Homunculus patagonicus</i> , <i>H.</i> sp.	Tax, SG	<i>Homunculus patagonicus</i>	<i>Homunculus patagonicus</i>	A	Arboreal, quadrupedal and not leaping	(Tejedor and Rosenberger 2008)	PCM
<i>Homunculus patagonicus</i> , <i>H.</i> sp.	Tax, SG	<i>Homunculus patagonicus</i>	<i>Homunculus patagonicus</i>	A		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Homunculus patagonicus</i>, <i>H.</i> sp.	Sum			A			
<i>Hondadelphys fieldsi</i>	WF, See	<i>Sipalocyon</i> , <i>Cladosictis</i> , <i>Hondadelphys fieldsi</i>	<i>Sipalocyon</i> , <i>Cladosictis</i> , <i>Hondadelphys fieldsi</i>	S	Intermediate in size between <i>Sipalocyon</i> and <i>Cladosictis</i> and dentally similar: May have filled similar ecological niche	(Argot 2004b)	DM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Hondadelphys fieldsi</i>	WF	<i>Prothylacynus patagonica</i> , <i>Cladosictis patagonica</i> , <i>Sipalocyon gracilis</i> , <i>Pseudonotictis pusillus</i>	"most hathlyacynids"	S	All hathlyacynids for which sufficient postcranial remains are known were classified as scansorial	(Prevosti et al. 2012)	PCGM
<i>Hondadelphys fieldsi</i>	WF	<i>Cladosictis patagonica</i> , <i>Sipalocyon gracilis</i> , <i>Perathereutes pungens</i>	<i>Cladosictis patagonica</i> , <i>Sipalocyon gracilis</i> , <i>Perathereutes pungens</i>	S	Postcranial remains not known for <i>P. pungens</i>	(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Hondadelphys fieldsi</i>	Sum			S			
<i>Hondalagus altiplanensis</i>	WF	Argyrolagidae (<i>Argyrolagus</i> and <i>Microtragulus</i>)	Argyrolagidae	RS		(Simpson 1970b)	PCM, MA
<i>Hondalagus altiplanensis</i>	WF	Argyrolagidae	Argyrolagidae	RS		(Mares 1985)	Un
<i>Hondalagus altiplanensis</i>	WF	Argyrolagidae	Argyrolagidae	RS		(Mares 1993)	MA
<i>Hondalagus altiplanensis</i>	SF	<i>Proargyrolagus</i>	<i>Proargyrolagus</i>	RS		(Sánchez-Villagra and Kay 1997)	Mass, DM
<i>Hondalagus altiplanensis</i>	SF	<i>Argyrolagus scagliai</i>	<i>Argyrolagus scagliai</i>	RS		(Straccia 1999)	PCM
<i>Hondalagus altiplanensis</i>	Tax	<i>Hondalagus altiplanensis</i>	<i>Hondalagus altiplanensis</i>	RS		(Sánchez-Villagra, Kay, and Anaya-Daza 2000)	LR

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Hondalagus altiplanensis</i>	SF	<i>Anargyrolagus</i>	Argyrolagidae	RS		(Carlini, Pascual, and Go-in 2007)	MA
<i>Hondalagus altiplanensis</i>	WF	Argyrolagidae	Argyrolagidae	RS		(García-López and Babot 2015)	MA
<i>Hondalagus altiplanensis</i>	Tax	<i>Hondalagus altiplanensis</i>	<i>Hondalagus altiplanensis</i>	RS		(Croft 2016)	Un
<i>Hondalagus altiplanensis</i>	Sum		Argyrolagidae	RS			
<i>Hoplophorus euphractus</i> , <i>H. sp.</i> , <i>H. verus</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Hoplophorus euphractus</i> , <i>H. sp.</i> , <i>H. verus</i>	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Hoplophorus euphractus</i> , <i>H. sp.</i> , <i>H. verus</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003)	PCM
<i>Hoplophorus euphractus</i> , <i>H. sp.</i> , <i>H. verus</i>	SF, PB	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaeohoplophorus</i> : terrestrial and slow-moving	(Croft 2016)	Un
<i>Hoplophorus euphractus</i> , <i>H. sp.</i> , <i>H. verus</i>	Sum		Glyptodontidae	Am			
<i>Huilatherium pluripicatum</i>	Tax	<i>Huilatherium pluripicatum</i>	<i>Huilatherium pluripicatum</i>	Aq		(Kay and Madden 1997b)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Huilatherium pluripicatum</i>	Tax	<i>Huilatherium pluripicatum</i>	<i>Huilatherium pluripicatum</i>	Aq		Chapter 5	SI
<i>Huilatherium pluripicatum</i>	Sum			Aq			
<i>Hydrochoeropsis dasseni</i> , H. sp.	Tax, SG	<i>Hydrochoeropsis dasseni</i>	<i>Hydrochoeropsis dasseni</i>	Aq		(Reguero and Candela 2008)	CLR
<i>Hydrochoeropsis dasseni</i> , H. sp.	PB	<i>C. chasicoensis</i> , <i>C. orientalis</i> , <i>C. paranense</i> , <i>C. patagonicum</i>	<i>C. chasicoensis</i> , <i>C. orientalis</i> , <i>C. paranense</i> , <i>C. patagonicum</i>	Aq	All found in deposits that formed in or near water, such as swamps, lakes, rivers	(Deschamps et al. 2007)	Tph
<i>Hydrochoeropsis dasseni</i> , H. sp.	PB	<i>Cardiatherium</i> sp.	<i>Cardiatherium</i> sp.	Aq	Extant capybaras are semi-aquatic; fossil capybaras have all been found in "water-related settings"	(Vucetich et al. 2010)	CLR, Tph
<i>Hydrochoeropsis dasseni</i> , H. sp.	PB	Derived forms of Hydrochoeridae, beginning with <i>Cardiatherium</i> (includes <i>Hydrochoeropsis</i>)	Derived forms of Hydrochoeridae, beginning with <i>Cardiatherium</i> (includes <i>Hydrochoeropsis</i>)	Aq	Semi-aquatic, social habits, large body size and novel dental morphology evolved roughly simultaneously (first evident in <i>Cardiatherium</i> spp.)	(Pérez, Scillato-Yané, and Vizcaíno 2014)	CLR, Tph, CDM
<i>Hydrochoeropsis dasseni</i> , H. sp.	PB	Derived forms of Hydrochoeridae, beginning with <i>Cardiatherium</i>	Derived forms of Hydrochoeridae, beginning with <i>Cardiatherium</i>	Aq	Semi-aquatic, social habits, large body size and novel dental morphology evolved roughly simultaneously (first evident in	(Vucetich et al. 2015)	LR

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		(includes <i>Hydrochoeropsis</i>)	(includes <i>Hydrochoeropsis</i>)	<i>Cardiatherium</i> spp.)			
<i>Hydrochoeropsis dasseni</i>, <i>H. sp.</i>	Sum			Aq			
<i>Hydrochoerus ballesterensis</i> , <i>H. hydrochaeris</i> , <i>H. sp.</i>	Tax, SG	<i>Hydrochoerus hydrochaeris</i> , <i>H. isthmus</i>	<i>Hydrochoerus hydrochaeris</i> , <i>H. isthmus</i>	Aq		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Hydrochoerus ballesterensis</i> , <i>H. hydrochaeris</i> , <i>H. sp.</i>	PB	<i>Hydrochoeropsis dasseni</i>	<i>Hydrochoeropsis dasseni</i>	Aq		(Reguero and Candela 2008)	CLR
<i>Hydrochoerus ballesterensis</i> , <i>H. hydrochaeris</i> , <i>H. sp.</i>	PB	<i>C. chasicensis</i> , <i>C. orientalis</i> , <i>C. paranense</i> , <i>C. patagonicum</i>	<i>C. chasicensis</i> , <i>C. orientalis</i> , <i>C. paranense</i> , <i>C. patagonicum</i>	Aq	All found in deposits that formed in or near water, such as swamps, lakes, rivers	(Deschamps et al. 2007)	Tph
<i>Hydrochoerus ballesterensis</i> , <i>H. hydrochaeris</i> , <i>H. sp.</i>	PB	<i>Cardiatherium</i> sp.	<i>Cardiatherium</i> sp.	Aq	Extant capybaras are semi-aquatic; fossil capybaras have all been found in "water-related settings"	(Vucetich et al. 2010)	CLR, Tph
<i>Hydrochoerus ballesterensis</i> , <i>H. hydrochaeris</i> , <i>H. sp.</i>	PB	Derived forms of <i>Hydrochoeridae</i> , beginning with <i>Cardiatherium</i> (includes <i>Hydrochoeropsis</i>)	Derived forms of <i>Hydrochoeridae</i> , beginning with <i>Cardiatherium</i> (includes <i>Hydrochoeropsis</i>)	Aq	Semi-aquatic, social habits, large body size and novel dental morphology evolved roughly simultaneously (first evident in <i>Cardiatherium</i> spp.)	(Pérez, Scillato-Yané, and Vizcaíno 2014)	CLR, Tph, CDM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Hydrochoerus ballesterensis</i> , <i>H. hydrochaeris</i> , <i>H. sp.</i>	PB	Derived forms of Hydrochoeridae, beginning with <i>Cardiatherium</i> (includes <i>Hydrochoeropsis</i>)	Derived forms of Hydrochoeridae, beginning with <i>Cardiatherium</i> (includes <i>Hydrochoeropsis</i>)	Aq	Semi-aquatic, social habits, large body size and novel dental morphology evolved roughly simultaneously (first evident in <i>Cardiatherium</i> spp.)	(Vucetich et al. 2015)	LR
<i>Hydrochoerus ballesterensis</i> , <i>H. hydrochaeris</i> , <i>H. sp.</i>	Sum			Aq			
<i>Hyperdidelphys pattersoni</i> , <i>H. sp.</i>	SisG	<i>Lutreolina</i> , <i>Hyperdidelphis</i>	<i>Lutreolina</i> , <i>Hyperdidelphis</i>	S	This study, based on: <i>Lutreolina</i> climbs well (scansorial) (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999), and <i>Lutreolina</i> is the sister group to <i>Hyperdidelphis</i> (Goin and Pardiñas 1996)	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999; Goin and Pardiñas 1996)	LR-E
<i>Hypsitherium bolivianum</i>	WF	<i>Mesotherium cristatum</i> , <i>Plesiotypotherium achirensense</i> , <i>Trachytherus spegazzinianus</i>	Mesotheriidae	F		(Shockey, Croft, and Anaya 2007)	PCM, PB
<i>Interatherium sp.</i>	Tax	<i>Interatherium</i>	<i>Interatherium</i>	SF	Frequent diggers	(Elissamburu 2004)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Interatherium</i> sp.	Tax	<i>Interatherium</i>	<i>Interatherium</i>	SF	For rodent-like ty- pothères, including <i>In- teratherium</i> , hypsodonty may be associated with digging habit and not diet	(Cassini et al. 2011)	CMM
<i>Interatherium</i> sp.	Tax	<i>Interatherium</i>	<i>Interatherium</i>	SF	<i>Interatherium</i> was "more similar to a mustelid and was probably more fos- sorial (certainly not cur- sorial)"	(Croft and Anderson 2008)	PCM, LR
<i>Interatherium</i> sp.	Tax	<i>Hegetotheri- um, Interather- ium</i>	<i>Hegetotherium, Interatherium</i>	SF	Intermediate between occasionally digging and digging caviomorphs: Better digger than most Santacrucian typothères, but not as good as many extant caviomorphs	(Cassini, Vizcaíno, and Bargo 2012)	PCM
<i>Interatherium</i> sp.	SG	<i>Interatherium robustum</i>	<i>Interatherium robustum</i>	C		(Kay, Vizcaíno, and Bar- go 2012)	Un
<i>Interatherium</i> sp.	Sum			SF			
<i>Isostylomys</i> sp.	Tax	<i>Isostylomys</i>	<i>Isostylomys</i>	C		Rinderknecht pers. comm.	Un
<i>Josephoar- tigasiá monesi</i>	Tax	<i>Josephoar- tigasiá monesi</i>	<i>Josephoar- tigasiá monesi</i>	Am	"not well-suited for fast running," too large to hide so probably used teeth as defensive weapon	(Blanco, Rinderknecht, and Lecuona 2012)	Un
<i>Kerodon</i> sp.	SG	<i>Kerodon acro- bata, K.</i>	<i>Kerodon acro- bata, K.</i>	S	<i>K. acrobata</i> : Can climb and jump from branch	(Patton, Pardiñas, and D'Elía 2015)	LR-E

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>rupestris</i>	<i>rupestris</i>		to branch within tallest bushes; <i>K. rupestris</i> : adept climbers that forage in bushes and trees		
<i>Kiyumylodon lecuonai</i>	SF	<i>Scelidothierium</i> , <i>Glossotherium</i>	<i>Scelidothierium</i> , <i>Glossotherium</i>	SF	Size of burrows consistent with mylodont builders, Claw marks inside burrows match mylodont hand, "anatomical, allometric, and biomechanical analysis of sloths limbs" suggests mylodonts could dig well	(Vizcaíno et al. 2001)	PM, BM, Ich, Mass
<i>Kiyumylodon lecuonai</i>	SF	<i>Scelidothierium</i> , <i>Scelidodon</i>	<i>Scelidothierium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Dondas, Isla, and Carbalido 2009)	Ich
<i>Kiyumylodon lecuonai</i>	SF	<i>Scelidothierium</i> , <i>Scelidodon</i>	<i>Scelidothierium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Genise and Farina 2012)	Ich
<i>Kiyumylodon lecuonai</i>	WF	<i>Scelidothierium</i> , <i>Glossotherium</i>	Mylodontidae	SF	.	(Pujos et al. 2012)	PB
<i>Kiyumylodon lecuonai</i>	SF	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> ,	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> ,	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>	<i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>				
<i>Kiyumylodon lecuonai</i>	AGp	Large-size mylodont	Large-size mylodont	SF		(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph
<i>Kiyumylodon lecuonai</i>	Sum		Mylodontidae	SF			
<i>Kraglievichia paranense</i> , <i>K. sp.</i>	SF	<i>Pampatherium humboldtii</i>	<i>Pampatherium humboldtii</i>	C	Adapted for fast movements, also may have been able to burrow	(Abrantes, Avilla, and Vizcaíno 2005)	PCM
<i>Kraglievichia paranense</i> , <i>K. sp.</i>	SF	<i>Pampatherium humboldtii</i>	<i>Pampatherium humboldtii</i>	C	Adapted for fast movements	(Rincón, White, and Mcdonald 2008)	PCM
<i>Kraglievichia paranense</i>, <i>K. sp.</i>	Sum			C			
<i>Kunsia sp.</i>	SG	<i>Kunsia tomentosus</i>	<i>Kunsia tomentosus</i>	SF	"Strongly adapted for burrowing"	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Kunsia sp.</i>	SG	<i>Kunsia tomentosus</i>	<i>Kunsia tomentosus</i>	SF		(Patton, Pardiñas, and D'Elía 2015)	LR-E
<i>Kunsia sp.</i>	Sum			SF			
<i>Lagidium sp.</i>	Tax	<i>Lagidium</i>	<i>Lagidium</i>	C	Curso-saltatorial	(Elissamburu 2004)	LR-E
<i>Lagonimico conclucatus</i>	WIO	Platyrrhini	Platyrrhini	A		(Ferrari 2009)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Lagostomus maximus</i> , <i>L. sp.</i>	Tax, SG	<i>Lagostomus maximus</i>	<i>Lagostomus maximus</i>	SF	Build extensive burrow systems	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Lakukullus anatisrostratus</i>	AGp	"Extinct sloths"	"Extinct sloths"	Am	Unlikely that they could have outrun predators; likely fought rather than ran	(McDonald 2012)	PCM
<i>Lakukullus anatisrostratus</i>	WF	Nothrotheriidae	Nothrotheriidae	T	Neither climbers nor diggers	(Pujos et al. 2012)	PB
<i>Lakukullus anatisrostratus</i>	SF	<i>Nothrotheriops shastensis</i> , <i>N. sp.</i>	<i>Nothrotheriops shastensis</i> , <i>N. sp.</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Lakukullus anatisrostratus</i>	SF	Santacrucian sloths, including representatives of (Mega-theriidae + Nothrotheriidae), Megalonychidae, and Mylodontidae	Santacrucian sloths, including representatives of (Mega-theriidae + Nothrotheriidae), Megalonychidae, and Mylodontidae	Am	"Not well-suited for fast locomotion"	(Toledo 2016)	PCM
<i>Lakukullus anatisrostratus</i>	Sum			Am			
<i>Lama castelnaudi</i> , <i>L. gracilis</i> , <i>L. guanicoe</i> , <i>L. sp.</i>	WG	<i>Lama</i>	<i>Lama</i>	C	<i>Lama guanicoe</i> can run at up to 56 km/hr	(Nowak 1999)	LR-E
<i>Leopardus colocolo</i> (includes	Tax, SG	<i>Leopardus</i> (=Felis,	<i>Leopardus</i> (=Felis,	S to A	<i>F. colocolo</i> : arboreal, <i>F. pardalis</i> : mostly hunts on	(Eisenberg 1989; Redford and Eisenberg 1992; Ei-	LR-E

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>L. braccatus</i>), <i>L. pardalis</i> , <i>L.</i> sp., <i>L. tigrinus</i> , <i>L. vorohuensis</i>		= <i>Oncifelis</i>) <i>colocolo</i> , <i>par-</i> <i>dalis</i> , <i>Leopar-</i> <i>dus</i> (=Felis) <i>tigrinus</i>	= <i>Oncifelis</i>) <i>co-</i> <i>locolo</i> , <i>pardalis</i> , <i>Leopardus</i> (=Felis) <i>tigrinus</i>		ground but scansorial; <i>F.</i> <i>trigrina</i> : scansorial; <i>F.</i> <i>wiedii</i> : mostly arboreal; <i>F. yagouaroundi</i> : scanso- rial	senberg and Redford 1999)	
<i>Leopardus col-</i> <i>ocolo</i> (includes <i>L. braccatus</i>), <i>L. pardalis</i> , <i>L.</i> sp., <i>L. tigrinus</i> , <i>L. vorohuensis</i>	Tax, SG	<i>Felis colocolo</i> , <i>Felis pardalis</i>	<i>Felis colocolo</i> , <i>Felis pardalis</i>	S	<i>L. colocolo</i> : scansorial; <i>L. pardalis</i> : mostly ter- restrial but climbs, jumps, and swims well	(Nowak 1999)	LR-E
<i>Leopardus col-</i> <i>ocolo</i> (includes <i>L. braccatus</i>), <i>L. pardalis</i>, <i>L.</i> sp., <i>L. tigrinus</i>, <i>L. vorohuensis</i>	Sum			S			
<i>Lestobradys</i> <i>sprechmanni</i>	SF	<i>Scelidotheri-</i> <i>um</i> , <i>Glos-</i> <i>sotherium</i>	<i>Scelidothorium</i> , <i>Glossotherium</i>	SF	Size of burrows con- sistent with mylodont builders, Claw marks in- side burrows match mylodont hand, "anatom- ical, allometric, and bio- mechanical analysis of sloths limbs" suggests mylodonts could dig well	(Vizcaíno et al. 2001)	PM, BM, Ich, Mass
<i>Lestobradys</i> <i>sprechmanni</i>	SF	<i>Scelidotheri-</i> <i>um</i> , <i>Scelidodon</i>	<i>Scelidothorium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social in- sects as food	(Dondas, Isla, and Carbal- lido 2009)	Ich
<i>Lestobradys</i>	SF	<i>Scelidotheri-</i>	<i>Scelidothorium</i> ,	SF	May be associated with	(Genise and Farina 2012)	Ich

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>sprechmanni</i>		<i>um, Scelidodon</i>	<i>Scelidodon</i>		searching for social insects as food		
<i>Lestobradys sprechmanni</i>	WF	<i>Scelidothierium, Glossotherium</i>	Mylodontidae	SF		(Pujos et al. 2012)	PB
<i>Lestobradys sprechmanni</i>	SF	<i>Catonyx tarijensis, Glossotherium robustum, G. sp., Lestodon armatus, L. sp., Lestobradys sprechmanni, Paramylodon harlani, P. sp., Scelidothierium carlesi, S. leptcephalum, S. bravardi, S. sp.</i>	<i>Catonyx tarijensis, Glossotherium robustum, G. sp., Lestodon armatus, L. sp., Lestobradys sprechmanni, Paramylodon harlani, P. sp., Scelidothierium carlesi, S. leptcephalum, S. bravardi, S. sp.</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Lestobradys sprechmanni</i>	AGp	Large-size mylodont	Large-size mylodont	SF		(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph
<i>Lestobradys sprechmanni</i>	Sum		Mylodontidae	SF			
<i>Lestodelphys halli, L. sp.</i>	Tax, SG	<i>Lestodelphys halli</i>	<i>Lestodelphys halli</i>	GT	"Highly terrestrial species" in a group that "move at a slow pace, regardless of the substrate" but capable of fleeing with half-bound gait	(Goin et al. 2016)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Lestodon armatus</i> , <i>L. sp.</i>	SF	<i>Scelidotherium</i> , <i>Glossotherium</i>	<i>Scelidotherium</i> , <i>Glossotherium</i>	SF	Size of burrows consistent with mylodont builders, Claw marks inside burrows match mylodont hand, "anatomical, allometric, and biomechanical analysis of sloths limbs" suggests mylodonts could dig well	(Vizcaíno et al. 2001)	PM, BM, Ich, Mass
<i>Lestodon armatus</i> , <i>L. sp.</i>	SF	<i>Scelidotherium</i> , <i>Scelidodon</i>	<i>Scelidotherium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Dondas, Isla, and Carbalido 2009)	Ich
<i>Lestodon armatus</i> , <i>L. sp.</i>	SF	<i>Scelidotherium</i> , <i>Scelidodon</i>	<i>Scelidotherium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Genise and Farina 2012)	Ich
<i>Lestodon armatus</i> , <i>L. sp.</i>	WF	<i>Scelidotherium</i> , <i>Glossotherium</i>	Mylodontidae	SF	.	(Pujos et al. 2012)	PB
<i>Lestodon armatus</i> , <i>L. sp.</i>	SF	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. lep-</i>	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. lep-</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>tocephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>	<i>tocephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>				
<i>Lestodon armatus</i> , <i>L. sp.</i>	AGp	Large-size mylodont	Large-size mylodont	SF		(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph
<i>Lestodon armatus</i>, <i>L. sp.</i>	Sum		Mylodontidae	SF			
<i>Lomaphorops corallinus</i>	SF	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Lomaphorops corallinus</i>	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Lomaphorops corallinus</i>	SF	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003)	PCM
<i>Lomaphorops corallinus</i>	SF, PB	<i>Parapropalaehoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaehoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaehoplophorus</i> : terrestrial and slow-moving	(Croft 2016)	Un
<i>Lomaphorops corallinus</i>	Sum		Glyptodontidae	Am			
<i>Lonchophylla sp.</i>	WO	Chiroptera	Chiroptera	V		(Paleobiology Database)	Un
<i>Lontra longicaudis</i>	Tax	<i>Lontra longicaudis</i>	<i>Lontra longicaudis</i>	Aq		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Lophostoma silviculum</i>	WO	Chiroptera	Chiroptera	V	(Paleobiology Database)		Un
<i>Luantus</i> sp.	See	<i>Eocardia</i>	<i>Eocardia</i>	GT	Relationship: Both within basal "Eocardiidae"; Locomotion: Similar to <i>Cavia</i>	(Walton 1997)	PCM
<i>Luantus</i> sp.	See	<i>Eocardia fissa</i>	<i>Eocardia fissa</i>	C	Relationship: Both within basal "Eocardiidae"; Locomotion: Similar to <i>Pediolagus</i> and <i>Dolichotis</i> but less specialized for cursorial locomotion: somewhat intermediate between <i>Cavia</i> and <i>Pediolagus/Dolichotis</i> , but closer to the latter	(Candela, Rasia, and Pérez 2012)	PCM
<i>Luantus</i> sp.	See	<i>Eocardia fissa</i> , <i>E. montana</i>	<i>Eocardia fissa</i> , <i>E. montana</i>	C	Relationship: Both within basal "Eocardiidae"	(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Luantus</i> sp.	Sum			C			
<i>Lundomys</i> sp.	Tax	<i>Lundomys</i>	<i>Lundomys</i>	Aq		(Steppan 1996)	Un
<i>Lundomys</i> sp.	Tax	<i>Holochilus</i> , <i>Pseudoryzomys</i> , and <i>Lundomys</i>	<i>Holochilus</i> , <i>Pseudoryzomys</i> , and <i>Lundomys</i>	Aq		(Machado et al. 2014)	Un
<i>Lundomys</i> sp.	Tax	<i>Lundomys</i>	<i>Lundomys</i>	Aq		(Patton, Pardiñas, and D'Elía 2015)	LR-E
<i>Lundomys</i> sp.	Sum			Aq			
<i>Lutreolina crassicaudata</i>	Tax, SG	<i>Lutreolina crassicaudata</i>	<i>Lutreolina crassicaudata</i>	S	"Climbs well"	(Eisenberg 1989; Redford and Eisenberg	LR-E

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>L. materdei</i>, <i>L. sp.</i>					1992; Eisenberg and Redford 1999)		
<i>Lycalopex</i> (= <i>Dusicyon</i> , <i>Pseudalopex</i>) <i>culpaeus</i> , <i>L.</i> (= <i>Dusicyon</i> , <i>Pseudalopex</i>) <i>sechurae</i>	SG	<i>Lycalopex</i> <i>gymnocerus</i> , <i>L.</i> sp.	<i>Lycalopex gym-</i> <i>nocerus</i> , <i>L. sp.</i>	C		(Samuels, Meachen, and Sakai 2013)	LR-E
<i>Lycalopex</i> (= <i>Dusicyon</i> , <i>Pseudalopex</i>) <i>culpaeus</i> , <i>L.</i> (= <i>Dusicyon</i> , <i>Pseudalopex</i>) <i>sechurae</i>	SG	<i>Lycalopex cul-</i> <i>paeus</i> , <i>L. gym-</i> <i>nocerus</i>	<i>Lycalopex cul-</i> <i>paeus</i> , <i>L. gym-</i> <i>nocerus</i>	C		(Álvarez, Ercoli, and Prevosti 2013)	LR-E
<i>Lycalopex</i> (=<i>Dusicyon</i>, <i>Pseudalopex</i>) <i>culpaeus</i>, <i>L.</i> (=<i>Dusicyon</i>, <i>Pseudalopex</i>) <i>sechurae</i>	Sum			C			
<i>Lycopsis longi-</i> <i>rostrus</i> , <i>L.</i> <i>viverensis</i>	Tax, SG	<i>Lycopsis longi-</i> <i>rostrus</i>	<i>Lycopsis longi-</i> <i>rostrus</i>	GT to S	Mainly terrestrial, some climbing possible, no in- dication of incipient cur- soriality, food capture and manipulation with forelimbs	(Argot 2004b)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

839	<i>Lycopsis longirostrus</i> , <i>L. viverensis</i>	Tax, SG	<i>Lycopsis longirostrus</i>	<i>Lycopsis longirostrus</i>	GT	Terrestrial, no indication of incipient cursoriality, food capture and manipulation with forelimbs	(Argot 2004a)	PCM
	<i>Lycopsis longirostrus</i> , <i>L. viverensis</i>	Tax, SG	<i>Lycopsis longirostrus</i>	<i>Lycopsis longirostrus</i>	GT to S	"Primarily terrestrial and secondarily scansorial," may have climbed "occasionally"	(Ercoli, Prevosti, and Álvarez 2012)	PCM
	<i>Lycopsis longirostrus</i> , <i>L. viverensis</i>	Sum			GT			
	<i>Lyncodon</i> sp.	SG	<i>Lyncodon patagonicus</i>	<i>Lyncodon patagonicus</i>	SF	Preys on fossorial rodents, long tubular body (Very little known about this species)	(Prevosti, Teta, and Pardiñas 2009)	PCM
	<i>Macrauchenia patachonica</i> , <i>M.</i> sp.	Tax, SG	<i>Promacrauchenia antiqua</i> , <i>P. kraglievichi</i> , <i>P. chapadmalense</i> , <i>Windhausenina delacroixi</i> , <i>Pseudomacrauchenia yepesi</i> , <i>Macrauchenia opsis ensenadensis</i> , <i>M.</i> cf. <i>M. ensen-</i>	<i>Macrauchenia</i> niidae	C		(Bond et al. 1995)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

			<i>nadensis</i> , <i>Macrauchenia</i> <i>patachonica</i> , <i>Xenorhinother-</i> <i>ium bahiense</i>				
	<i>Macrauchenia</i> <i>patachonica</i> , <i>M.</i> <i>sp.</i>	SF	? <i>Coniopterni-</i> <i>um</i>	? <i>Coniopternium</i>	C	Locking knee would also allow standing for long periods of time	(Shockey 1999) PCM
	<i>Macrauchenia</i> <i>patachonica</i> , <i>M.</i> <i>sp.</i>	Tax, SG	<i>Macrauchenia</i> <i>patachonica</i>	<i>Macrauchenia</i> <i>patachonica</i>	C	Specialized particularly for swerving	(Fariña, Blanco, and Christiansen 2005) PCM
840	<i>Macrauchenia</i> <i>patachonica</i> , <i>M.</i> <i>sp.</i>	SF	<i>Coniopternium</i>	<i>Coniopternium</i>	C	Locking knee would also allow standing for long periods of time	(Shockey and Anaya 2008) PCM
	<i>Macrauchenia</i> <i>patachonica</i> , <i>M.</i> <i>sp.</i>	SF	<i>Theosodon</i> <i>gracilis</i> , <i>T.</i> <i>lydekkeri</i>	<i>Theosodon gra-</i> <i>cilis</i> , <i>T. lydek-</i> <i>keri</i>	C		(Kay, Vizcaíno, and Bar- go 2012) Un
	<i>Macrauchenia</i> <i>patachonica</i> , <i>M.</i> <i>sp.</i>	WF	<i>Macrauche-</i> <i>niidae</i>	<i>Macrauche-</i> <i>niidae</i>	C		(Schmidt and Ferrero 2014) LR
	<i>Macrauchenia</i> <i>patachonica</i> , <i>M.</i> <i>sp.</i>	Tax, SG	<i>Theosodon lal-</i> <i>lemanti</i> , <i>Macrauchenia</i> <i>patachonica</i>	<i>Theosodon lal-</i> <i>lemanti</i> , <i>Macrauchenia</i> <i>patachonica</i>	C		(Croft 2016) Un
	<i>Macrauchenia</i> <i>patachonica</i>, <i>M. sp.</i>	Sum			C		
	<i>Macraucheni-</i> <i>opsis sp.</i>	SG	<i>Proma-</i> <i>crauchenia</i> <i>antigua</i> , <i>P.</i>	<i>Macrauche-</i> <i>niidae</i>	C		(Bond et al. 1995) Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

841		<i>kraglievichi</i> , <i>P. chapadmalense</i> , <i>Windhausenia delacroixi</i> , <i>Pseudo-macrauchenia yepesi</i> , <i>Macrauchenia opsis ensenadensis</i> , <i>M.</i> <i>cf. M. ensenadensis</i> , <i>Macrauchenia patachonica</i> , <i>Xenorhinotherium bahiense</i>						
	<i>Macrauchenia opsis</i> sp.	SF	?Coniopternium	?Coniopternium	C	Locking knee would also allow standing for long periods of time	(Shockey 1999)	PCM
	<i>Macrauchenia opsis</i> sp.	SF	<i>Macrauchenia patachonica</i>	<i>Macrauchenia patachonica</i>	C	Specialized particularly for swerving	(Fariña, Blanco, and Christiansen 2005)	PCM
	<i>Macrauchenia opsis</i> sp.	SF	<i>Coniopternium</i>	<i>Coniopternium</i>	C	Locking knee would also allow standing for long periods of time	(Shockey and Anaya 2008)	PCM
	<i>Macrauchenia opsis</i> sp.	SF	<i>Theosodon gracilis</i> , <i>T. lydekkeri</i>	<i>Theosodon gracilis</i> , <i>T. lydekkeri</i>	C		(Kay, Vizcaíno, and Bar-go 2012)	Un
	<i>Macrauchenia opsis</i> sp.	WF	Macrauchenidae	Macrauchenidae	C		(Schmidt and Ferrero 2014)	LR

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Macrauchenio-opsis</i> sp.	SF	<i>Theosodon lallemanti</i> , <i>Macrauchenia patachonica</i>	<i>Theosodon lallemanti</i> , <i>Macrauchenia patachonica</i>	C	(Croft 2016)	Un
<i>Macrauchenio-opsis</i> sp.	Sum			C		
<i>Macrochorobates chapadmalensis</i> , <i>M. scalabrinii</i>	ST	<i>Euphractus</i> , <i>Chaetophractus</i> , <i>Zaedyus</i>	<i>Euphractus</i> , <i>Chaetophractus</i> , <i>Zaedyus</i>	SF	(Vizcaíno and Milne 2002)	LR-E
<i>Macrochorobates chapadmalensis</i> , <i>M. scalabrinii</i>	ST	<i>Prozaedyus exilis</i> , <i>P. sp.</i>	<i>Prozaedyus exilis</i> , <i>P. sp.</i>	SF	(Vizcaíno, Fernicola, and Bargo 2012)	PCM
<i>Macrochorobates chapadmalensis</i> , <i>M. scalabrinii</i>	ST	<i>Prozaedyus proximus</i>	<i>Prozaedyus proximus</i>	SF	(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Macrochorobates chapadmalensis</i> , <i>M. scalabrinii</i>	ST	<i>Macro-euphractus outesi</i>	<i>Macroeuphractus outesi</i>	SF	(Croft 2016)	Un
<i>Macrochorobates chapadmalensis</i>, <i>M. scalabrinii</i>	Sum		Euphractini	SF		
<i>Macroeuphractus retusus</i> , <i>M. sp.</i>	ST	<i>Euphractus</i> , <i>Chaetophractus</i> , <i>Zaedyus</i>	<i>Euphractus</i> , <i>Chaetophractus</i> , <i>Zaedyus</i>	SF	(Vizcaíno and Milne 2002)	LR-E
<i>Macroeuphractus</i>	ST	<i>Prozaedyus</i>	<i>Prozaedyus ex-</i>	SF	(Vizcaíno, Fernicola, and	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>tus retusus</i> , <i>M.</i> sp.		<i>exilis</i> , <i>P.</i> sp.	<i>ilis</i> , <i>P.</i> sp.			Bargo 2012)	
<i>Macroeuphrac-</i> <i>tus retusus</i> , <i>M.</i> sp.	ST	<i>Prozaedyus</i> <i>proximus</i>	<i>Prozaedyus</i> <i>proximus</i>	SF		(Kay, Vizcaíno, and Bar- go 2012)	Un
<i>Macroeuphrac-</i> <i>tus retusus</i> , <i>M.</i> sp.	ST	Macroeuphrac- tus outesi	Macroeuphrac- tus outesi	SF		(Croft 2016)	Un
<i>Macroeuphrac-</i> <i>tus retusus</i>, <i>M.</i> sp.	Sum		Euphractini	SF			
<i>Mammut</i> sp.	WO	Proboscidea	Proboscidea	Am		(Janis et al. 1998)	Un
<i>Marmosa con-</i> <i>trerasi</i> , <i>M.</i> sp.	SG	<i>Marmosa</i> <i>murina</i> , <i>M.</i> <i>robinsoni</i>	<i>Marmosa</i> <i>murina</i> , <i>M.</i> <i>robinsoni</i>	S	<i>M. murina</i> : "arboreal" and frequently trapped on the ground (scanso- rial), <i>M. robinsoni</i> : for- ages both on the ground and in trees and vines	(Eisenberg 1989; Red- ford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Maruchito trilo-</i> <i>fodonte</i>	WG	<i>Maruchito</i>	<i>Maruchito</i>	A		(Verzi, Olivares, and Morgan 2014)	PB
<i>Maruchito trilo-</i> <i>fodonte</i>	See	<i>Callistomys</i> , <i>Spaniomys</i>	<i>Callistomys</i> , <i>Spaniomys</i>	A	This study, based on: Re- lationship: Same lineage as <i>Spaniomys</i> and <i>Callis-</i> <i>tomys</i> (Vucetich, Kra- marz, and Candela 2010); Locomotion: <i>Spaniomys</i> is arboreal (Kay, Vizcaí- no, and Bargo 2012); <i>Callistomys</i> is arboreal (Patton, Pardiñas, and	(Vucetich, Kramarz, and Candela 2010; Kay, Viz- caíno, and Bargo 2012; Patton, Pardiñas, and D'Elía 2015)	CLR, MC:F R

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

D'Elía 2015)							
Maruchito trilofodonte	Sum	A					
<i>Mazama americana</i> , <i>M. sp.</i>	Tax, SG	<i>Mazama americana</i>	<i>Mazama americana</i>	C	Cursorial, also swims well	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Megabradys darwini</i>	SF	<i>Scelidotherium</i> , <i>Glossotherium</i>	<i>Scelidotherium</i> , <i>Glossotherium</i>	SF	Size of burrows consistent with mylodont builders, Claw marks inside burrows match mylodont hand, "anatomical, allometric, and biomechanical analysis of sloths limbs" suggests mylodonts could dig well	(Vizcaíno et al. 2001)	PM, BM, Ich, Mass
<i>Megabradys darwini</i>	Sf	<i>Scelidotherium</i> , <i>Scelidodon</i>	<i>Scelidotherium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Dondas, Isla, and Carbalido 2009)	Ich
<i>Megabradys darwini</i>	SF	<i>Scelidotherium</i> , <i>Scelidodon</i>	<i>Scelidotherium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Genise and Farina 2012)	Ich
<i>Megabradys darwini</i>	WF	<i>Scelidotherium</i> , <i>Glossotherium</i>	Mylodontidae	SF	.	(Pujos et al. 2012)	PB
<i>Megabradys darwini</i>	SF	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon ar-</i>	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon ar-</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>matus</i> , <i>L. sp.</i> , <i>Lestobradys</i> <i>sprechmanni</i> , <i>Paramylodon</i> <i>harlani</i> , <i>P. sp.</i> , <i>Scelidotherium</i> <i>carlesi</i> , <i>S. lep-</i> <i>tocephalum</i> , <i>S.</i> <i>bravardi</i> , <i>S. sp.</i>	<i>matus</i> , <i>L. sp.</i> , <i>Lestobradys</i> <i>sprechmanni</i> , <i>Paramylodon</i> <i>harlani</i> , <i>P. sp.</i> , <i>Scelidotherium</i> <i>carlesi</i> , <i>S. lep-</i> <i>tocephalum</i> , <i>S.</i> <i>bravardi</i> , <i>S. sp.</i>				
	<i>Megabradys darwini</i>	AGp	Large-size mylodont	Large-size mylodont	SF	(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph
	<i>Megabradys darwini</i>	Sum		Mylodontidae	SF		
	<i>Megadolodus molariformis</i>	Tax	<i>Megadolodus molariformis</i>	<i>Megadolodus molariformis</i>	GT	Morphologically distinct from other proterotheriids, Specialized for terrestrial locomotion but not cursorially specialized	(Cifelli and Villarroel 1997) PCM
	<i>Megalonychops primigenius</i>	SF	<i>Acratocnus odontrigonus</i> , <i>A. sp.</i> , <i>Choloepus didactylus</i> , <i>C. hoffmanni</i> , <i>Eucholoeops sp.</i> , <i>Hapalops sp.</i> , <i>Megalonyx jeffersonii</i> , <i>Neocnus comes</i> ,	<i>Acratocnus odontrigonus</i> , <i>A. sp.</i> , <i>Choloepus didactylus</i> , <i>C. hoffmanni</i> , <i>Eucholoeops sp.</i> , <i>Hapalops sp.</i> , <i>Megalonyx jeffersonii</i> , <i>Neocnus comes</i> ,	Am or S	All scansorial except <i>Megalonyx</i> : terrestrial and <i>Choloepus</i> : arboreal (Categories: Terrestrial, Scansorial, Arboreal)	(Grass 2014) PCGM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>Parocnus serus, Pelecyodon arcuatus</i>	<i>Parocnus serus, Pelecyodon arcuatus</i>				
<i>Megalonychops primigenius</i>	WF	Megalonychidae	Megalonychidae	Am	This study, based on: Most megalonychids are scansorial or arboreal but some are ambulatory (Pujos et al. 2012); <i>Megalonychops</i> is comparable in size to <i>Megatherium</i> (Cione et al. 2000) (~3950 kg); Around 150-200 kg is on the large end of what could reasonably be scansorial (Toledo et al. 2014)	(Pujos et al. 2012; Toledo et al. 2014; Cione et al. 2000)	PB, Mass
<i>Megalonychops primigenius</i>	Sum			Am			
<i>Megastus</i> sp.	SF	<i>Dasyprocta</i>	<i>Dasyprocta</i>	C		(Elissamburu 2004)	Un
<i>Megastus</i> sp.	SF	<i>Dasyprocta</i>	<i>Dasyprocta</i>	C		(Elissamburu and Vizcaino 2004)	PCM
<i>Megastus</i> sp.	SF	<i>Dasyprocta azarae</i> , <i>D. leporina</i> , <i>D. punctata</i> , <i>Myoprocta acouchy</i>	<i>Dasyprocta azarae</i> , <i>D. leporina</i> , <i>D. punctata</i> , <i>Myoprocta acouchy</i>	C		(Weisbecker and Schmid 2007)	LR-E
<i>Megastus</i> sp.	SF	<i>Neoprocta australis</i>	<i>Neoprocta australis</i>	C	Similar features to <i>Cuniculus paca</i> , suggesting good running and possi-	(Candela, Rasia, and Pérez 2012)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

					bly swimming abilities		
<i>Megastus</i> sp.	SF	<i>Neoprocta australis</i>	<i>Neoprocta australis</i>	C		(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Megastus</i> sp.	WF	Dasyproctidae	Dasyproctidae	C	Adapted for speed	(Patton, Pardiñas, and D'Elía 2015)	LR-E
<i>Megastus</i> sp.	Sum			C			
<i>Megathericulus patagonicus</i> , <i>M.</i> sp.	SF	<i>Mesocnus</i> (Megalonychidae), <i>Megalocnus</i> (Megalonychidae), <i>Prepothierium</i> (Megatheriidae)	<i>Mesocnus</i> , <i>Megalocnus</i> , <i>Prepothierium</i>	Am	Morphology very different from cursorial animals, consistent with arboreal or ambulatory habits	(White 1993)	PCM
<i>Megathericulus patagonicus</i> , <i>M.</i> sp.	SF	<i>Megatherium</i>	<i>Megatherium</i>	GT	Could have run	(Fariña and Vizcaíno 1999)	BM
<i>Megathericulus patagonicus</i> , <i>M.</i> sp.	AGp	"Extinct sloths"	"Extinct sloths"	Am	Unlikely that they could have outrun predators; likely fought rather than ran	(McDonald 2012)	PCM
<i>Megathericulus patagonicus</i> , <i>M.</i> sp.	WF	Megatheriidae	Megatheriidae	T	Neither climbers nor diggers	(Pujos et al. 2012)	PB
<i>Megathericulus patagonicus</i> , <i>M.</i> sp.	SF	<i>Megatherium lundii</i> , <i>M.</i> sp., <i>M. tarijense</i>	<i>Megatherium lundii</i> , <i>M.</i> sp., <i>M. tarijense</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Megathericulus patagonicus</i> , <i>M.</i> sp.	SF	<i>Pyramiodontherium</i>	<i>Pyramiodontherium</i>	Am	"Slow walking gait only"	(Melchor et al. 2015)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Megathericulus patagonicus</i> , <i>M.</i> sp.	SF	Santacrucian sloths, including representatives of Megatheriidae, Megalonychidae, and Mylodontidae	Santacrucian sloths, including representatives of Megatheriidae, Megalonychidae, and Mylodontidae	Am	"Not well-suited for fast locomotion"	(Toledo 2016)	PCM
<i>Megathericulus patagonicus</i>, <i>M.</i> sp.	Sum				Am		
<i>Megatherium altiplanicum</i> , <i>M. americanum</i> , <i>M. celendinense</i> , <i>M. medinae</i> , <i>M.</i> sp., <i>M. sundti</i> , <i>M. tarijense</i> , <i>M. urbinai</i>	SF	<i>Mesocnus</i> (Megalonychidae), <i>Megalocnus</i> (Megalonychidae), <i>Prepootherium</i> (Megatheriidae)	<i>Mesocnus</i> , <i>Megalocnus</i> , <i>Prepootherium</i>	Am	Morphology very different from cursorial animals, consistent with arboreal or ambulatory habits	(J. L. White 1993)	PCM
<i>Megatherium altiplanicum</i> , <i>M. americanum</i> , <i>M. celendinense</i> , <i>M. medinae</i> , <i>M.</i> sp., <i>M. sundti</i> , <i>M. tarijense</i> , <i>M. urbinai</i>	WG	<i>Megatherium</i>	<i>Megatherium</i>	GT	Could have run	(Fariña and Vizcaíno 1999)	BM
<i>Megatherium altiplanicum</i> , <i>M. americanum</i> , <i>M.</i>	AGp	"Extinct sloths"	"Extinct sloths"	Am	Unlikely that they could have outrun predators; likely fought rather than	(McDonald 2012)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

849	<i>celendinense</i> , <i>M. medinae</i> , <i>M.</i> <i>sp.</i> , <i>M. sundti</i> , <i>M. tarijense</i> , <i>M.</i> <i>urbinai</i>				ran		
	<i>Megatherium</i> <i>altiplanicum</i> , <i>M.</i> <i>americanum</i> , <i>M.</i> <i>celendinense</i> , <i>M. medinae</i> , <i>M.</i> <i>sp.</i> , <i>M. sundti</i> , <i>M. tarijense</i> , <i>M.</i> <i>urbinai</i>	WF	Megatheriidae	Megatheriidae	T	Neither climbers nor dig- gers	(Pujos et al. 2012) PB
	<i>Megatherium</i> <i>altiplanicum</i> , <i>M.</i> <i>americanum</i> , <i>M.</i> <i>celendinense</i> , <i>M. medinae</i> , <i>M.</i> <i>sp.</i> , <i>M. sundti</i> , <i>M. tarijense</i> , <i>M.</i> <i>urbinai</i>	Tax, SG	<i>Megatherium</i> <i>lundi</i> , <i>M. sp.</i> , <i>M. tarijense</i>	<i>Megatherium</i> <i>lundi</i> , <i>M. sp.</i> , <i>M. tarijense</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014) PCGM
	<i>Megatherium</i> <i>altiplanicum</i> , <i>M.</i> <i>americanum</i> , <i>M.</i> <i>celendinense</i> , <i>M. medinae</i> , <i>M.</i> <i>sp.</i> , <i>M. sundti</i> , <i>M. tarijense</i> , <i>M.</i> <i>urbinai</i>	SF	<i>Pyramiodon-</i> <i>therium</i>	<i>Pyramiodon-</i> <i>therium</i>	Am	"Slow walking gait only"	(Melchor et al. 2015) Un
	<i>Megatherium</i>	SF	Santacrucian	Santacrucian	Am	"Not well-suited for fast	(Toledo 2016) PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>altiplanicum</i> , <i>M. americanum</i> , <i>M. celendinense</i> , <i>M. medinae</i> , <i>M. sp.</i> , <i>M. sundti</i> , <i>M. tarijense</i> , <i>M. urbinai</i>		sloths, including representatives of Megatheriidae, Megalonychidae, and Mylodontidae	sloths, including representatives of Megatheriidae, Megalonychidae, and Mylodontidae		locomotion"		
<i>Megatherium altiplanicum</i>, <i>M. americanum</i>, <i>M. celendinense</i>, <i>M. medinae</i>, <i>M. sp.</i>, <i>M. sundti</i>, <i>M. tarijense</i>, <i>M. urbinai</i>	Sum			Am			
<i>Megistonyx oreobios</i>	SF	<i>Acratocnus odontrigonus</i> , <i>A. sp.</i> , <i>Choloepus didactylus</i> , <i>C. hoffmanni</i> , <i>Eucholoeps sp.</i> , <i>Hapalops sp.</i> , <i>Megalonyx jeffersonii</i> , <i>Neocnus comes</i> , <i>Parocnus serus</i> , <i>Peleciodon arcuatus</i>	<i>Acratocnus odontrigonus</i> , <i>A. sp.</i> , <i>Choloepus didactylus</i> , <i>C. hoffmanni</i> , <i>Eucholoeps sp.</i> , <i>Hapalops sp.</i> , <i>Megalonyx jeffersonii</i> , <i>Neocnus comes</i> , <i>Parocnus serus</i> , <i>Peleciodon arcuatus</i>	Am	All scansorial except <i>Megalonyx</i> (similar in size to <i>Megistonyx</i>): terrestrial and <i>Choloepus</i> : arboreal (Categories: Terrestrial, Scansorial, Arboreal)	(Grass 2014)	PCGM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Megistonyx oreobios</i>	WF	Megalonychi- dae	Megalonychi- dae	Am	This study, based on: Most megalonychids are scansorial or arboreal, but some including <i>Meg- alonyx</i> are ambulatory (Pujos et al. 2012); <i>Me- gistonyx</i> is comparable in size to <i>Megalonx</i> (Coro- na, Perea, and McDonald 2013); <i>Megalonyx</i> is ~578 kg (McDonald 2005; Fields 2009a); around 150-200 kg is on the large end of what could reasonably be scansorial (Toledo et al. 2014)	(McDonald 2005; Fields 2009a; Pujos et al. 2012; McDonald, Rincón, and Gaudin 2013; Toledo et al. 2014)	PB, Mass
<i>Megistonyx oreobios</i>	Sum			Am			
<i>Mesopo- tamocnus</i> (=Ortotherium) <i>brevirostrum</i>	SF	<i>Acratocnus</i> <i>odontrigonus</i> , <i>A. sp.</i> , <i>Choloepus di- dactylus</i> , <i>C.</i> <i>hoffmanni</i> , <i>Eu- choloeps sp.</i> , <i>Hapalops sp.</i> , <i>Megalonyx jef- ersonii</i> , <i>Ne- ocnus comes</i> ,	<i>Acratocnus</i> <i>odontrigonus</i> , <i>A. sp.</i> , <i>Choloepus di- dactylus</i> , <i>C.</i> <i>hoffmanni</i> , <i>Eu- choloeps sp.</i> , <i>Hapalops sp.</i> , <i>Megalonyx jef- ersonii</i> , <i>Ne- ocnus comes</i> ,	Am	All scansorial except <i>Megalonyx</i> : terrestrial and <i>Choloepus</i> : arboreal (Categories: Terrestrial, Scansorial, Arboreal)	(Grass 2014)	PCGM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>Parocnus serus</i> , <i>Peleciodon arcuatus</i>	<i>Parocnus serus</i> , <i>Peleciodon arcuatus</i>				
<i>Mesopotamocnus</i> (=Ortotherium) <i>brevirostrum</i>	WF	Megalonychidae	Megalonychidae	Am	This study, based on: Most megalonychids are scansorial or arboreal but some are ambulatory (Pujos et al. 2012); <i>Ortotherium</i> is over 300 kg (Table S3.9); Around 150-200 kg is on the large end of what could reasonably be scansorial (Toledo et al. 2014)	(Pujos et al. 2012; Toledo et al. 2014)	PB, Mass
<i>Mesopotamocnus</i> (=Ortotherium) <i>brevirostrum</i>	Sum			Am			
<i>Mesoprocta hypsodus</i>	SF	<i>Dasyprocta</i>	<i>Dasyprocta</i>	C		(Elissamburu 2004)	Un
<i>Mesoprocta hypsodus</i>	SF	<i>Dasyprocta</i>	<i>Dasyprocta</i>	C		(Elissamburu and Vizcaíno 2004)	PCM
<i>Mesoprocta hypsodus</i>	SF	<i>Dasyprocta azarae</i> , <i>D. leporina</i> , <i>D. punctata</i> , <i>Myoprocta acouchy</i>	<i>Dasyprocta azarae</i> , <i>D. leporina</i> , <i>D. punctata</i> , <i>Myoprocta acouchy</i>	C		(Weisbecker and Schmid 2007)	LR-E
<i>Mesoprocta hypsodus</i>	SF	<i>Neoprocta australis</i>	<i>Neoprocta australis</i>	C	Similar features to <i>Cuniculus paca</i> , suggesting	(Candela, Rasia, and Pérez 2012)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

					good running and possibly swimming abilities		
<i>Mesoprocta hypsodus</i>	SF	<i>Neoprocta australis</i>	<i>Neoprocta australis</i>	C		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Mesoprocta hypsodus</i>	WF	Dasyproctidae	Dasyproctidae	C	Adapted for speed	(Patton, Pardiñas, and D'Elía 2015)	LR-E
<i>Mesoprocta hypsodus</i>	Sum			C			
<i>Mesotherium</i> sp.	WF	<i>Mesotherium cristatum</i> , <i>Plesiotypotherium achirensense</i> , <i>Trachytherus spegazzinianus</i>	Mesotheriidae	F		(Shockey, Croft, and Anaya 2007)	PCM, PB
<i>Micoureus laventicus</i>	WG	<i>Micoureus</i>	<i>Micoureus</i>	A	"Species of this genus are highly arboreal"	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Microbiotherium tehuelchum</i>	Tax	<i>Microbiotherium tehuelchum</i>	<i>Microbiotherium tehuelchum</i>	A		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Microcardiodon williensis</i>	PB	<i>Eocardia</i> , <i>Galea musteloides</i> , <i>G. spixii</i> , <i>Prodolichotis pridiana</i>	<i>Microcardiodon williensis</i> , by phylogenetic bracketing	GT	This study, based on: <i>Eocardia</i> and <i>Prodolichotis pridiana</i> were generalized terrestrial (Walton 1997); <i>Eocardia fissa</i> was somewhat cursorial but more generalized than <i>Dolichotis</i> (Candela,	(Walton 1997; Candela, Rasia, and Pérez 2012; Pérez 2010a; Patton, Pardiñas, and D'Elía 2015)	PB

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

854	Rasia, and Pérez 2012); Galea is generalized terrestrial (Patton, Pardiñas, and D'Elía 2015); Microcardiodon williensis is phylogenetically bracketed by Eocardia and the polytomy formed by Prodolichotis pridiana, Galea, and others interpreted as generalized in this study (Pérez 2010a)						
	<i>Microcavia aua</i> , <i>M. australis</i> , <i>M.</i> sp.	WG	<i>Microcavia</i>	<i>Microcavia</i>	GT	Occasionally digs, occasionally climbs, mostly terrestrial	(Nowak 1999) LR-E
	<i>Microcavia aua</i> , <i>M. australis</i> , <i>M.</i> sp.	WG	<i>Microcavia</i>	<i>Microcavia</i>	GT	Occasionally digs	(Elissamburu and Vizcaíno 2004) Un
	<i>Microcavia aua</i> , <i>M. australis</i> , <i>M.</i> sp.	Tax. SG	<i>Microcavia australis</i> , <i>M. criolloensis</i>	<i>Microcavia australis</i> , <i>M. criolloensis</i>	SF	<i>M. criolloensis</i> may possess additional adaptations for digging beyond extant <i>M. australis</i>	(Ubilla 2008) PCM
	<i>Microcavia aua</i> , <i>M. australis</i> , <i>M.</i> sp.	WG	<i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	<i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	SF	<i>Microcavia</i> : Digger, <i>Cavia</i> : Generalized terrestrial ("Ambulatory"), <i>Galea</i> : Generalized terrestrial ("Ambulatory")	(Morgan and Álvarez 2013) LR-E

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

855	Microcavia aua, M. australis, M. sp.	Sum	SF				
	Micronycteris sp.	WO	Chiroptera	Chiroptera	V	(Paleobiology Database)	Un
	<i>Microscleromys</i> <i>cribriphilus, M.</i> <i>paradoxalis</i>	SF	<i>Dasyprocta</i>	<i>Dasyprocta</i>	C	(Elissamburu 2004)	Un
	<i>Microscleromys</i> <i>cribriphilus, M.</i> <i>paradoxalis</i>	SF	<i>Dasyprocta</i>	<i>Dasyprocta</i>	C	(Elissamburu and Vizcaíno 2004)	PCM
	<i>Microscleromys</i> <i>cribriphilus, M.</i> <i>paradoxalis</i>	SF	<i>Dasyprocta</i> <i>azarae, D. leporina, D. punctata, Myoprocta acouchy</i>	<i>Dasyprocta</i> <i>azarae, D. leporina, D. punctata, Myoprocta acouchy</i>	C	(Weisbecker and Schmid 2007)	LR-E
	<i>Microscleromys</i> <i>cribriphilus, M.</i> <i>paradoxalis</i>	SF	<i>Neoprocta australis</i>	<i>Neoprocta australis</i>	C	Similar features to <i>Cuniculus paca</i> , suggesting good running and possibly swimming abilities	PCM
	<i>Microscleromys</i> <i>cribriphilus, M.</i> <i>paradoxalis</i>	SF	<i>Neoprocta australis</i>	<i>Neoprocta australis</i>	C	(Kay, Vizcaíno, and Bar-go 2012)	Un
	<i>Microscleromys</i> <i>cribriphilus, M.</i> <i>paradoxalis</i>	WF	Dasyproctidae	Dasyproctidae	C	Adapted for speed	LR-E
	Microscleromys cribriphilus, M. paradoxalis	Sum	C				

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Microsteiromys jacobsi</i> , M. sp.	Tax	<i>Microsteiromys jacobsi</i>	<i>Microsteiromys jacobsi</i>	A	(Kay and Madden 1997b)	Un
<i>Microsteiromys jacobsi</i> , M. sp.	WG	Argyrolagidae (<i>Argyrolagus</i> and <i>Microtragulus</i>)	Argyrolagidae	RS	(Simpson 1970b)	PCM, MA
<i>Microsteiromys jacobsi</i> , M. sp.	WF	Argyrolagidae	Argyrolagidae	RS	(Mares 1985)	Un
<i>Microsteiromys jacobsi</i> , M. sp.	WF	Argyrolagidae	Argyrolagidae	RS	(Mares 1993)	MA
<i>Microsteiromys jacobsi</i> , M. sp.	SF	<i>Proargyrolagus</i>	<i>Proargyrolagus</i>	RS	(Sánchez-Villagra and Kay 1997)	Mass, DM
<i>Microsteiromys jacobsi</i> , M. sp.	SF	<i>Argyrolagus scagliai</i>	<i>Argyrolagus scagliai</i>	RS	(Straccia 1999)	PCM
<i>Microsteiromys jacobsi</i> , M. sp.	SF	<i>Hondalagus altiplanensis</i>	<i>Hondalagus altiplanensis</i>	RS	(Sánchez-Villagra, Kay, and Anaya-Daza 2000)	LR
<i>Microsteiromys jacobsi</i> , M. sp.	SF	<i>Anargyrolagus</i>	Argyrolagidae	RS	(Carlini, Pascual, and Goin 2007)	MA
<i>Microsteiromys jacobsi</i> , M. sp.	WF	Argyrolagidae	Argyrolagidae	RS	(García-López and Babot 2015)	MA
<i>Microsteiromys jacobsi</i> , M. sp.	SF	<i>Hondalagus altiplanensis</i>	<i>Hondalagus altiplanensis</i>	RS	(Croft 2016)	Un
<i>Microsteiromys jacobsi</i> , M. sp.	Sum		Argyrolagidae	RS		
<i>Microtypotherium choqueco-tense</i>	WF	<i>Mesotherium cristatum</i> , <i>Plesiotypotherium achirensense</i> , <i>Trachytherus</i>	Mesotheriidae	F	(Shockey, Croft, and Anaya 2007)	PCM, PB

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>spegazzinianus</i>							
<i>Miocallicebus villaviejai</i>	WI O	Platyrrhini	Platyrrhini	A		(Ferrari 2009)	Un
<i>Miococheilus anomopodus</i> , <i>M. federicoi</i> , <i>M. sp.</i>	Tax, SG	<i>Miococheilus anomopodus</i>	<i>Miococheilus anomopodus</i>	C		(Stirton 1953)	PCM
<i>Miococheilus anomopodus</i> , <i>M. federicoi</i> , <i>M. sp.</i>	Tax, SG	<i>Miococheilus anomopodus</i>	<i>Miococheilus anomopodus</i>	C		(Kay and Madden 1997b)	Un
<i>Miococheilus anomopodus</i> , <i>M. federicoi</i> , <i>M. sp.</i>	WG	<i>Miococheilus</i>	<i>Miococheilus</i>	C		(Elissamburu 2007)	PCM
<i>Miococheilus anomopodus</i> , <i>M. federicoi</i> , <i>M. sp.</i>	WG	<i>Miococheilus</i>	<i>Miococheilus</i>	C		(Croft and Anderson 2008)	PCM
<i>Miococheilus anomopodus</i> , <i>M. federicoi</i> , <i>M. sp.</i>	Sum			C			
<i>Mirandabradys socorrensis</i> , <i>M. urumaquensis</i> , <i>M. zabasi</i>	SF	<i>Scelidothierium</i> , <i>Glossotherium</i>	<i>Scelidothierium</i> , <i>Glossotherium</i>	SF	Size of burrows consistent with mylodont builders, Claw marks inside burrows match mylodont hand, "anatomical, allometric, and biomechanical analysis of	(Vizcaíno et al. 2001)	PM, BM, Ich, Mass

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

					sloths limbs" suggests mylodonts could dig well		
Mirandabradys socorrensis, M. urumaquensis, M. zabasi	SF	Scelidotherium, Scelidodon	Scelidotherium, Scelidodon	SF	May be associated with searching for social insects as food	(Dondas, Isla, and Carbalido 2009)	Ich
Mirandabradys socorrensis, M. urumaquensis, M. zabasi	SF	Scelidotherium, Scelidodon	Scelidotherium, Scelidodon	SF	May be associated with searching for social insects as food	(Genise and Farina 2012)	Ich
Mirandabradys socorrensis, M. urumaquensis, M. zabasi	WF	Scelidotherium, Glossotherium	Mylodontidae	SF		(Pujos et al. 2012)	PB
Mirandabradys socorrensis, M. urumaquensis, M. zabasi	SF	Catonyx tarijensis, Glossotherium robustum, G. sp., Lestodon armatus, L. sp., Lestobradys sprechmanni, Paramylodon harlani, P. sp., Scelidotherium carlesi, S. leptcephalum, S. bravardi, S. sp.	Catonyx tarijensis, Glossotherium robustum, G. sp., Lestodon armatus, L. sp., Lestobradys sprechmanni, Paramylodon harlani, P. sp., Scelidotherium carlesi, S. leptcephalum, S. bravardi, S. sp.	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
Mirandabradys socorrensis, M.	AGp	Large-size mylodont	Large-size mylodont	SF		(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

urumaquensis, <i>M. zabasi</i>							
<i>Mirandabradys socorrensis</i>, <i>M. urumaquensis</i>, <i>M. zabasi</i>	Sum		Mylodontidae	SF			
<i>Mixotoxodon larens</i> is, <i>M. sp.</i>	SF, PB	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius imperator</i>	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius imperator</i>	Not Aq	Specialized knee joints with passive locks would allow them to stand for long periods of time and would be unneeded in the water	(Shockey 2001)	PCM
<i>Mixotoxodon larens</i> is, <i>M. sp.</i>	SF, PB	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	Am or GT	Part of a trend throughout evolution of Toxodontidae towards reduced cursoriality	(Elissamburu 2007)	PCM
<i>Mixotoxodon larens</i> is, <i>M. sp.</i>	SF, PB	<i>Adinotherium ovinum</i>	<i>Adinotherium ovinum</i>	Am		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Mixotoxodon larens</i>is, <i>M. sp.</i>	Sum		Toxodontidae	Am			
<i>Monodelphis domestica</i>	WG	Monodelphis	Monodelphis	S	Mostly terrestrial and usually found on ground but climbs well	(Nowak 1999)	LR-E
<i>Morenelaphus brachyceros</i>, <i>M. sp.</i>	WF	Cervidae	Cervidae	C	Cursorial (open habitats) or Cursorial-saltatorial (closed habitats)	(Curran 2012)	PCGM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Mormoops</i> sp.	WO	Chiroptera	Chiroptera	V		(Paleobiology Database)	Un
<i>Munizia paranensis</i>	SF	<i>Interatherium</i> , <i>Miocochilius</i> , <i>Protypotherium</i>	<i>Interatherium</i> , <i>Miocochilius</i> , <i>Protypotherium</i>	GT to cuso rial	<i>Protypotherium</i> : "generalized terrestrial mammal tending toward cursoriality" that was intermediate between basal interatheriids and <i>Miocochilius</i> , <i>Interatherium</i> : semi-fossorial possibly but not cursorial, <i>Miocochilius</i> : cursorial	(Croft and Anderson 2008)	
<i>Munizia paranensis</i>	SF	<i>Interatherium</i>	<i>Interatherium</i>	SF	Frequent diggers	(Elissamburu 2004)	PCM
<i>Munizia paranensis</i>	SF	<i>Interatherium</i>	<i>Interatherium</i>	SF	For rodent-like typotheres, including <i>Interatherium</i> , hypsodonty may be associated with digging habit and not diet	(Cassini et al. 2011)	CMM
<i>Munizia paranensis</i>	SF	<i>Interatherium</i>	<i>Interatherium</i>	SF	Intermediate between occasionally digging and digging caviomorphs: Better digger than most Santacrucian typotheres, but not as good as many extant caviomorphs	(Cassini, Vizcaíno, and Bargo 2012)	PCM
<i>Munizia paranensis</i>	SF	<i>Interatherium robustum</i>	<i>Interatherium robustum</i>	C		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Munizia paranensis</i>	SF	<i>Miocochilius anomopodus</i>	<i>Miocochilius anomopodus</i>	C		(Stirton 1953)	PCM
<i>Munizia</i>	SF	<i>Miocochilius</i>	<i>Miocochilius</i>	C		(Kay and Madden 1997b)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>paranensis</i>		<i>anomopodus</i>	<i>anomopodus</i>				
<i>Munizia paranensis</i>	SF	<i>Miocochilius</i>	<i>Miocochilius</i>	C		(Elissamburu 2007)	PCM
<i>Munizia paranensis</i>	See	Basal interatheriids, <i>Interatherium</i> , <i>Miocochilius</i> , <i>Protypotherium</i>	Basal interatheriids, <i>Interatherium</i> , <i>Miocochilius</i> , <i>Protypotherium</i>	C	This study, based on: Interatheriids show a general trend towards increased cursoriality over time (Croft and Anderson 2008), so for an interatheriid post-dating <i>Miocochilius</i> , "cursorial" is the most likely mode of locomotion	(Croft and Anderson 2008)	PCM
<i>Munizia paranensis</i>	Sum			C			
<i>Myiodon</i> sp.	SF	<i>Scelidothierium</i> , <i>Glossotherium</i>	<i>Scelidothierium</i> , <i>Glossotherium</i>	SF	Size of burrows consistent with mylodont builders, Claw marks inside burrows match mylodont hand, "anatomical, allometric, and biomechanical analysis of sloths limbs" suggests mylodonts could dig well	(Vizcaíno et al. 2001)	PM, BM, Ich, Mass
<i>Myiodon</i> sp.	SF	<i>Scelidothierium</i> , <i>Scelidodon</i>	<i>Scelidothierium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Dondas, Isla, and Carbalido 2009)	Ich
<i>Myiodon</i> sp.	SF	<i>Scelidothierium</i> , <i>Scelidodon</i>	<i>Scelidothierium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Genise and Farina 2012)	Ich

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Myodon</i> sp.	WF	Scelidotherium, Glossotherium	Myodontidae	SF		(Pujos et al. 2012)	PB
<i>Myodon</i> sp.	SF	Catonyx tarijensis, Glossotherium robustum, G. sp., Lestodon armatus, L. sp., Lestobradys sprechmanni, Paramylodon harlani, P. sp., Scelidotherium carlesi, S. leptcephalum, S. bravardi, S. sp.	Catonyx tarijensis, Glossotherium robustum, G. sp., Lestodon armatus, L. sp., Lestobradys sprechmanni, Paramylodon harlani, P. sp., Scelidotherium carlesi, S. leptcephalum, S. bravardi, S. sp.	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Myodon</i> sp.	AGp	Large-size mylodont	Large-size mylodont	SF		(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph
<i>Myodon</i> sp.	Sum		Myodontidae	SF			
<i>Myodonopsis ibseni</i>	SF	<i>Scelidotherium, Glossotherium</i>	<i>Scelidotherium, Glossotherium</i>	SF	Size of burrows consistent with mylodont builders, Claw marks inside burrows match mylodont hand, "anatomical, allometric, and biomechanical analysis of sloths limbs" suggests mylodonts could dig well	(Vizcaíno et al. 2001)	PM, BM, Ich, Mass
<i>Myodonopsis</i>	SF	<i>Scelidotherium</i>	<i>Scelidotherium</i> ,	SF	May be associated with	(Dondas, Isla, and Carbal-	Ich

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>ibseni</i>		<i>um, Scelidodon</i>	<i>Scelidodon</i>		searching for social insects as food	(lido 2009)	
<i>Mylodonopsis ibseni</i>	Sf	<i>Scelidothierium, Scelidodon</i>	<i>Scelidothierium, Scelidodon</i>	SF	May be associated with searching for social insects as food	(Genise and Farina 2012)	Ich
<i>Mylodonopsis ibseni</i>	WF	<i>Scelidothierium, Glossotherium</i>	Mylodontidae	SF		(Pujos et al. 2012)	PB
<i>Mylodonopsis ibseni</i>	SF	<i>Catonyx tarijensis, Glossotherium robustum, G. sp., Lestodon armatus, L. sp., Lestobradys sprechmanni, Paramylodon harlani, P. sp., Scelidothierium carlesi, S. leptcephalum, S. bravardi, S. sp.</i>	<i>Catonyx tarijensis, Glossotherium robustum, G. sp., Lestodon armatus, L. sp., Lestobradys sprechmanni, Paramylodon harlani, P. sp., Scelidothierium carlesi, S. leptcephalum, S. bravardi, S. sp.</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Mylodonopsis ibseni</i>	AGp	Large-size mylodont	Large-size mylodont	SF		(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph
<i>Mylodonopsis ibseni</i>	Sum		Mylodontidae	SF			
<i>Myocastor coypus, M. perditus, M. sp.</i>	Tax, SG	<i>Myocastor coypus</i>	<i>Myocastor coypus</i>	Aq		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Myrmecophaga (=Nunezia) caro-loameghinoi</i>	SG	<i>Myrmecophaga tridactyla</i>	<i>Myrmecophaga tridactyla</i>	SF	Specialized forelimbs for digging in order to open termite mounds	(Gambaryan et al. 2009)	Diss
<i>Myrmecophaga tridactyla</i>	Tax	<i>Myrmecophaga tridactyla</i>	<i>Myrmecophaga tridactyla</i>	SF	Specialized forelimbs for digging in order to open termite mounds	(Gambaryan et al. 2009)	Diss
<i>Nanoastegotherium prostatum</i>	Tax	<i>Nanoastegotherium prostatum</i> , extant Dasypodini	<i>Nanoastegotherium prostatum</i> , extant Dasypodini	SF	This study, based on: Closest structurally to Dasypodini descendents (Carlini et al. 1997); All extant Dasypodini are semi-fossorial (Vizcaíno and Milne 2002)	(Carlini et al. 1997; Vizcaíno and Milne 2002)	CLR, PCM
<i>Nasua</i> sp.	SG	<i>Nasua narica</i> , <i>N. nasua</i>	<i>Nasua narica</i> , <i>N. nasua</i>	S		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Necromys lactens</i> , <i>N. sp.</i>	WG	<i>Necromys</i>	<i>Necromys</i>	GT	"ambulatory": "species that usually use the ground to move about and do not have specializations that limit any particular activity"	(Carrizo et al. 2014)	FO, LR-E
<i>Nectomys squamipes</i>	WG	<i>Nectomys</i>	<i>Nectomys</i>	Aq	"Swimmer"	(Carrizo et al. 2014)	FO, LR-E
<i>Nectomys squamipes</i>	Tax	<i>Nectomys squamipes</i>	<i>Nectomys squamipes</i>	Aq		(Patton, Pardiñas, and D'Elía 2015)	LR-E
<i>Nectomys squamipes</i>	Sum			Aq			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Neobrachytherium ameghinoi</i> , <i>N. sp.</i>	AGp	<i>Brachytherium</i> , <i>Diplasiotherium</i> , <i>Eoauchenia</i>	Late proterotheriids	C	Nearly monodactyl	(Webb 1978a)	PCM
<i>Neobrachytherium ameghinoi</i> , <i>N. sp.</i>	SF	cf. <i>Licaphrium</i> (=Proterotherium)	cf. <i>Licaphrium</i> (=Proterotherium)	C	Late Oligocene	(Shockey 1999)	PCM
<i>Neobrachytherium ameghinoi</i> , <i>N. sp.</i>	WF	Proterotheriidae	Proterotheriidae	C	Early trend towards monodactyly	(Villafañe, Ortiz-Jaureguizar, and Bond 2006)	PCM
<i>Neobrachytherium ameghinoi</i> , <i>N. sp.</i>	WF	Proterotheriidae	Proterotheriidae	C		(Ubilla et al. 2009)	Un
<i>Neobrachytherium ameghinoi</i> , <i>N. sp.</i>	WF	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	Proterotheriidae	C		(Cassini et al. 2012)	PCM
<i>Neobrachytherium ameghinoi</i> , <i>N. sp.</i>	SF	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	C		(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Neobrachytherium ameghinoi</i> , <i>N. sp.</i>	SF	<i>Neobrachytherium ullaense</i>	<i>Neobrachytherium ullaense</i>	C		(Croft 2016)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

866	<i>Neobrachytherium ameghinoi</i> , <i>N. sp.</i>	Sum	C					
	<i>Neocavia depressidens</i> , <i>N. sp.</i>	SSF	<i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	<i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	GT	<i>Microcavia</i> : occasionally digs, occasionally climbs, mostly terrestrial; <i>Galea</i> : primarily terrestrial, dig occasionally; <i>Cavia</i> : generalized terrestrial	(Nowak 1999)	LR-E
	<i>Neocavia depressidens</i> , <i>N. sp.</i>	SSF	<i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	<i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	GT	<i>Microcavia</i> : occasionally digs; <i>Galea</i> : dig occasionally; <i>Cavia</i> : generalized terrestrial	(Elissamburu and Vizcaíno 2004)	Un
	<i>Neocavia depressidens</i> , <i>N. sp.</i>	PB	<i>Eocardia</i> , <i>Prodolichotis</i> , <i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	<i>Neocavia</i> , by phylogenetic bracketing	GT	This study, based on: <i>Eocardia</i> and <i>Prodolichotis</i> were similar in postcranial morphology and relatively generalized (Walton 1997), <i>Eocardia fissa</i> was cursorial but less so than <i>Dolichotis</i> / <i>Pediolagus</i> (Candela, Rasía, and Pérez 2012); <i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i> are generalized terrestrial (Patton, Pardiñas, and D'Elía 2015); Early Caviinae is phylogenetically bracketed by these taxa (Pérez 2010a)	(Walton 1997; Nowak 1999; Pérez 2010a; Candela, Rasía, and Pérez 2012)	PB

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Neocavia depressidens</i> , N. sp.	SSF	<i>Microcavia australis</i> , <i>M. criolloensis</i>	<i>Microcavia australis</i> , <i>M. criolloensis</i>	SF	<i>M. criolloensis</i> may possess additional adaptations for digging beyond what extant <i>M. australis</i> has	(Martín Ubilla 2008)	PCM
<i>Neocavia depressidens</i> , N. sp.	SSF	<i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	<i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	SF to GT	<i>Microcavia</i> : Digger, <i>Cavia</i> : Generalized terrestrial ("Ambulatory"), <i>Galea</i> : Generalized terrestrial ("Ambulatory")	(C. C. Morgan and Álvarez 2013)	LR-E
<i>Neocavia depressidens</i>, N. sp.	Sum			GT			
<i>Neochoerus sirasakae</i> , N. sp.	PB	<i>C. chasicensis</i> , <i>C. orientalis</i> , <i>C. paranense</i> , <i>C. patagonicum</i>	<i>C. chasicensis</i> , <i>C. orientalis</i> , <i>C. paranense</i> , <i>C. patagonicum</i>	Aq	All found in deposits that formed in or near water, such as swamps, lakes, rivers	(Deschamps et al. 2007)	Tph
<i>Neochoerus sirasakae</i> , N. sp.	PB	<i>Cardiatherium</i> sp.	<i>Cardiatherium</i> sp.	Aq	Extant capybaras are semi-aquatic; fossil capybaras have all been found in "water-related settings"	(María Guiomar Vucetich et al. 2010)	CLR, Tph
<i>Neochoerus sirasakae</i> , N. sp.	PB	Derived forms of Hydrochoeridae, beginning with <i>Cardiatherium</i> (includes <i>Neochoerus</i>)	Derived forms of Hydrochoeridae, beginning with <i>Cardiatherium</i> (includes <i>Neochoerus</i>)	Aq	Semi-aquatic, social habits, large body size and novel dental morphology evolved roughly simultaneously (first evident in <i>Cardiatherium</i> spp.)	(Leandro M. Pérez, Scillato-Yané, and Vizcaíno 2014)	CLR, Tph, CDM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Nechoerus sirasakae</i> , <i>N.</i> sp.	PB	Derived forms of Hydrochoeridae, beginning with <i>Cardiatherium</i> (includes <i>Nechoerus</i>)	Derived forms of Hydrochoeridae, beginning with <i>Cardiatherium</i> (includes <i>Nechoerus</i>)	Aq	Semi-aquatic, social habits, large body size and novel dental morphology evolved roughly simultaneously (first evident in <i>Cardiatherium</i> spp.)	(María Guiomar Vucetich et al. 2015)	LR
<i>Nechoerus sirasakae</i>, <i>N.</i> sp.	Sum			Aq			
<i>Neoepiblema ambrosettianus</i> , <i>N. horridula</i> , <i>N.</i> sp.	WG	<i>Neoepiblema</i> , <i>Phoberomys</i>	<i>Neoepiblema</i> , <i>Phoberomys</i>	Aq		(María Guiomar Vucetich et al. 2015)	Un
<i>Neoepiblema ambrosettianus</i> , <i>N. horridula</i> , <i>N.</i> sp.	SF	<i>Phoberomys</i>	<i>Phoberomys</i>	Aq	Always found in water-related sedimentary environments	(María Guiomar Vucetich and Deschamps 2015)	Tph
<i>Neoepiblema ambrosettianus</i>, <i>N. horridula</i>, <i>N.</i> sp.	Sum			Aq			
<i>Neoglyptatelus originalis</i> , <i>N. sincelejanus</i> , <i>N.</i> sp.	See	<i>Pachyarmatherium leiseyi</i>	<i>Pachyarmatherium leiseyi</i>	SF	This study, based on: Relationship: Closely related to or congeneric with <i>Pachyarmatherium</i> (Croft 2016); <i>Pachyarmatherium</i>: Strong digging claws, ulnar proportions suggestive	(Downing and White 1995; Croft 2016)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

					of digging (Downing and White 1995)		
<i>Neohapalops rothi</i>	AGp	"Extinct sloths"	"Extinct sloths"	Am	Unlikely that they could have outrun predators; likely fought rather than ran	(McDonald 2012)	PCM
<i>Neohapalops rothi</i>	WF	Nothrotheriidae	Nothrotheriidae	T	Neither climbers nor diggers	(Pujos et al. 2012)	PB
<i>Neohapalops rothi</i>	SF	Nothrotheriops shastensis, N. sp.	Nothrotheriops shastensis, N. sp.	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Neohapalops rothi</i>	SF	Santacrucian sloths, including representatives of (Mega-theriidae + Nothrotheriidae), Megalonychidae, and Mylodontidae	Santacrucian sloths, including representatives of (Mega-theriidae + Nothrotheriidae), Megalonychidae, and Mylodontidae	Am	"Not well-suited for fast locomotion"	(Toledo 2016)	PCM
<i>Neohapalops rothi</i>	Sum			Am			
<i>Neolicaphrium recens</i>	AGp	Brachytherium, Diplasiotherium, Eoauchenia	Late proterotheriids	C	Nearly monodactyl	(Webb 1978a)	PCM
<i>Neolicaphrium recens</i>	SF	cf. <i>Licaphrium</i> (=Proterotherium)	cf. <i>Licaphrium</i> (=Proterotherium)	C	Late Oligocene	(Shockey 1999)	PCM
<i>Neolicaphrium</i>	WF	Proterother-	Proterotheriidae	C	Early trend towards	(Villafañe, Ortiz-	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>recens</i>		riidae			mondactyly	Jaureguizar, and Bond 2006)	
<i>Neolicaphrium recens</i>	WF	Proterotheriidae	Proterotheriidae	C		(Ubilla et al. 2009)	Un
<i>Neolicaphrium recens</i>	WF	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	Proterotheriidae	C		(Cassini et al. 2012)	PCM
<i>Neolicaphrium recens</i>	SF	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	C		(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Neolicaphrium recens</i>	SF	<i>Neobrachytherium ullumense</i>	<i>Neobrachytherium ullumense</i>	C		(Croft 2016)	PCM
<i>Neolicaphrium recens</i>	Sum		Proterotheriidae	C			
<i>Neonematherium</i> sp.	SG	<i>Neonematherium flabellatum</i>	<i>Neonematherium flabellatum</i>	S or T	Some features associated with climbing, some associated with terrestrial locomotion	(White 1997)	PCM
<i>Neonematherium</i> sp.	SG	<i>Neonematherium flabellatum</i>	<i>Neonematherium flabellatum</i>	A		(Kay and Madden 1997b)	Un
<i>Neonematherium</i> sp.	SSF	<i>Scelidothierium</i> , <i>Glossotherium</i>	<i>Scelidothierium</i> , <i>Glossotherium</i>	SF	Size of burrows consistent with mylodont builders, Claw marks in-	(Vizcaíno et al. 2001)	PM, BM, Ich,

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

					side burrows match mylodont hand, "anatomical, allometric, and biomechanical analysis of sloths limbs" suggests mylodonts could dig well		Mass
<i>Neonematherium</i> sp.	SSF	<i>Scelidotherium</i> , <i>Scelidodon</i>	<i>Scelidotherium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Dondas, Isla, and Carbalido 2009)	Ich
<i>Neonematherium</i> sp.	SSF	<i>Scelidotherium</i> , <i>Scelidodon</i>	<i>Scelidotherium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Genise and Farina 2012)	Ich
<i>Neonematherium</i> sp.	WF	<i>Scelidotherium</i> , <i>Glossotherium</i>	Mylodontidae	SF	.	(Pujos et al. 2012)	PB
<i>Neonematherium</i> sp.	SF	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Neonematherium</i>	See	<i>Nematherium</i>	<i>Nematherium</i>	SF	Relationship: Within	(Miño-Boilini 2012; Tole-	PCM,

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

872	<i>um</i> sp.				Scelidotheriinae, very closely related to <i>Nematherium</i> (Miño-Boilini 2012); Locomotion: <i>Nematherium</i> may have occasionally climbed to escape predation, but was mostly terrestrial	do et al. 2014)	Mass
	<i>Neonematherium</i> sp.	AGp	Large-size mylodont	Large-size mylodont	SF	(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph
	<i>Neonematherium</i> sp.	See	<i>Nematherium</i>	<i>Nematherium</i>	SF	Relationship: Within Scelidotheriinae, very closely related to <i>Nematherium</i> (Miño-Boilini 2012); Locomotion: Limited climbing ability , but much better digging ability than most contemporaneous sloths	(Toledo 2016) PCM
	<i>Neonematherium</i> sp.	Sum	Mylodontidae		SF		
	<i>Neophanomys biplicatus</i> , <i>N.</i> sp.	SisG	<i>Acarechimys</i> , <i>Neophanomys</i>	<i>Acarechimys</i>	S	This study, based on: <i>Acarechimys</i> is either the sister group of <i>Neophanomys</i> or is its junior synonym (Verzi, Vieytes, and Montalvo 2011; Verzi, Olivares, and Morgan 2014); <i>Acarechimys</i> is scanso-	(Kay and Madden 1997b; Verzi, Vieytes, and Montalvo 2011; Verzi, Olivares, and Morgan 2014) PB

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

					rial (Kay and Madden 1997b)		
<i>Neoreomys huilensis</i> , <i>N. sp.</i>	SG	<i>Neoreomys australis</i>	<i>Neoreomys australis</i>	C	Less cursorial than extant <i>Dasyprocta</i> , more similar to <i>Cuniculus</i> and still somewhat cursorial	(Candela, Rasia, and Pérez 2012)	PCM
<i>Neoreomys huilensis</i> , <i>N. sp.</i>	SG	<i>Neoreomys australis</i>	<i>Neoreomys australis</i>	C		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Neoreomys huilensis</i> , <i>N. sp.</i>	Tax	<i>Neoreomys huilensis</i>		C	This study, based on: <i>N. huilensis</i> very similar to <i>N. australis</i> (Walton 1997); <i>N. australis</i> is cursorial (Candela, Rasia, and Pérez 2012; Kay, Vizcaíno, and Bargo 2012)	(Walton 1997; Candela, Rasia, and Pérez 2012; Kay, Vizcaíno, and Bargo 2012)	PCM
<i>Neoreomys huilensis</i>, <i>N. sp.</i>	Sum			C			
<i>Neosaimiri fieldsi</i>	WIO	Platyrrhini	Platyrrhini	A		(Ferrari 2009)	Un
<i>Neosclerocalyp- tus heusseri</i> , <i>N. sp.</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyp- tus</i>	Large Glypto- dontidae	Am	Large glyptodonts "Ca- pable of only a slow run"	(Fariña 1995b)	PCM
<i>Neosclerocalyp- tus heusseri</i> , <i>N. sp.</i>	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Neosclerocalyp- tus heusseri</i> , <i>N. sp.</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> ,	Large Glypto- dontidae	Am	Long bone morphology not congruent with run- ning or galloping	(Bargo 2003)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>Sclerocalyptus</i>					
<i>Neosclerocalyp- tus heusseri</i> , <i>N.</i> sp.	PB	<i>Parapropalaeh oplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaeh oplophorus</i> , <i>Glyptodon</i> , <i>Pa- nochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaehoplopho- rus</i> : terrestrial and slow- moving	(Croft 2016)	Un
<i>Neosclerocalyp- tus heusseri</i> , <i>N.</i> sp.	Sum		Glyptodonti- dae	Am			
<i>Neosteiromys sp.</i> , <i>N. tordil- lense</i>	SG	<i>Neosteiromys pattoni</i>	<i>Neosteiromys pattoni</i>	S	Some features associat- ed with climbing, but more complete remains needed	(Candela and Picasso 2008)	PCM
<i>Neotamandua australis</i> , <i>N. borealis</i> , <i>N. conspicua</i>	Tax, SG	<i>Neotamandua borealis</i>	<i>Neotamandua borealis</i>	S		(Kay and Madden 1997b)	Un
<i>Neothoracopho- rus</i> sp.	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glypto- dontidae	Am	Large glyptodonts "Ca- pable of only a slow run"	(Fariña 1995b)	PCM
<i>Neothoracopho- rus</i> sp.	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Neothoracopho- rus</i> sp.	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glypto- dontidae	Am	Long bone morphology not congruent with run- ning or galloping	(Bargo 2003)	PCM
<i>Neothoracopho- rus</i> sp.	SF, PB	<i>Parapropalaeh oplophorus</i> ,	<i>Parapropalaeh oplophorus</i> ,	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>)	(Croft 2016)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>Glyptodon,</i> <i>Panochthus,</i> <i>Doedicurus,</i> <i>Sclerocalyptus</i>	<i>Glyptodon, Pa-</i> <i>nochthus,</i> <i>Doedicurus,</i> <i>Sclerocalyptus</i>		graviportal, <i>Parapropalaehoplopho-</i> <i>rus</i> : terrestrial and slow- moving		
<i>Neothoracoph-</i> <i>orus sp.</i>	Sum		Glyptodonti- dae	Am			
<i>Neotomys ebri-</i> <i>osus</i>	Tax	<i>Neotomys eb-</i> <i>riosus</i>	<i>Neotomys ebri-</i> <i>osus</i>	Aq	"Swimmer"	(Carrizo et al. 2014)	LR-E
<i>Nesodon imbri-</i> <i>catus, N. sp.</i>	SF, PB	<i>Toxodon,</i> <i>Adinotherium,</i> <i>Hoffstetterius</i> <i>imperator</i>	<i>Toxodon,</i> <i>Adinotherium,</i> <i>Hoffstetterius</i> <i>imperator</i>	Not Aq	Specialized knee joints with passive locks would allow them to stand for long periods of time and would be unneeded in the water	(Shockey 2001)	PCM
<i>Nesodon imbri-</i> <i>catus, N. sp.</i>	SF, PB	<i>Toxodon,</i> <i>Trigodon, Nes-</i> <i>odon,</i> <i>Adinotherium,</i> <i>Proadinotheri-</i> <i>um</i>	<i>Toxodon,</i> <i>Trigodon, Nes-</i> <i>odon,</i> <i>Adinotherium,</i> <i>Proadinotheri-</i> <i>um</i>	Am or GT	Part of a trend throughout evolution of Toxodonti- dae towards reduced cur- soriality	(Elissamburu 2007)	PCM
<i>Nesodon imbri-</i> <i>catus, N. sp.</i>	SF, PB	<i>Adinotherium</i> <i>ovinum</i>	<i>Adinotherium</i> <i>ovinum</i>	Am		(Kay, Vizcaíno, and Bar- go 2012)	Un
<i>Nesodon imbri-</i> <i>catus, N. sp.</i>	Sum		Toxodontidae	Am			
<i>Neuryurus gi-</i> <i>ganteus, N. sp.</i>	AGp	<i>Glyptodon,</i> <i>Panochthus,</i> <i>Doedicurus,</i> <i>Sclerocalyptus</i>	Large Glypto- dontidae	Am	Large glyptodonts "Ca- pable of only a slow run"	(Fariña 1995b)	PCM
<i>Neuryurus gi-</i> <i>ganteus, N. sp.</i>	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Neuryurus giganteus</i> , <i>N. sp</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glypto- dontidae	Am	Long bone morphology not congruent with run- ning or galloping	(Bargo 2003)	PCM
<i>Neuryurus giganteus</i> , <i>N. sp</i>	SF, PB	<i>Parapropalaeh oplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaeh oplophorus</i> , <i>Glyptodon</i> , <i>Pa- nochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaehoplopho- rus</i> : terrestrial and slow- moving	(Croft 2016)	Un
<i>Neuryurus gi- ganteus</i>, <i>N. sp</i>	Sum		Glyptodonti- dae	Am			
<i>Noctilio lacri- maelunaris</i>	WO	Chiroptera	Chiroptera	V		(Paleobiology Database)	Un
<i>Nothropus sp.</i>	AGp	"Extinct sloths"	"Extinct sloths"	Am	Unlikely that they could have outrun predators; likely fought rather than ran	(McDonald 2012)	PCM
<i>Nothropus sp.</i>	WF	Nothrothe- riidae	Nothrotheriidae	T	Neither climbers nor dig- gers	(Pujos et al. 2012)	PB
<i>Nothropus sp.</i>	SF	<i>Nothrotheriops shastensis</i> , <i>N. sp.</i>	<i>Nothrotheriops shastensis</i> , <i>N. sp.</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Nothropus sp.</i>	See	Santacrucian sloths, includ- ing representa- tives of (Mega- theriidae + Nothrothe- riidae), Megal-	Santacrucian sloths, includ- ing representa- tives of (Mega- theriidae + Nothrothe- riidae), Megal-	Am	"Not well-suited for fast locomotion"	(Toledo 2016)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		onychidae, and Mylodontidae	onychidae, and Mylodontidae				
<i>Nothropus</i> sp.	Sum			Am			
<i>Nothrotherium maquinense</i> , <i>N.</i> sp.	AGp	"Extinct sloths"	"Extinct sloths"	Am	Unlikely that they could have outrun predators; likely fought rather than ran	(McDonald 2012)	PCM
<i>Nothrotherium maquinense</i> , <i>N.</i> sp.	WF	Nothrotheriidae	Nothrotheriidae	T	Neither climbers nor diggers	(Pujos et al. 2012)	PB
<i>Nothrotherium maquinense</i> , <i>N.</i> sp.	SF	<i>Nothrotheriops shastensis</i> , <i>N.</i> sp.	<i>Nothrotheriops shastensis</i> , <i>N.</i> sp.	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Nothrotherium maquinense</i> , <i>N.</i> sp.	See	Santacrucian sloths, including representatives of (Mega-theriidae + Nothrotheriidae), Megalonychidae, and Mylodontidae	Santacrucian sloths, including representatives of (Mega-theriidae + Nothrotheriidae), Megalonychidae, and Mylodontidae	Am	"Not well-suited for fast locomotion"	(Toledo 2016)	PCM
<i>Nothrotherium maquinense</i>, <i>N.</i> sp.	Sum			Am			
<i>Notictis ortizi</i>	SF	<i>Prothylacynus patagonica</i> , <i>Cladosictis patagonica</i> , <i>Sipalocyon</i>	"most hathlyacynids"	S	All hathlyacynids for which sufficient postcranial remains are known were classified as scansorial	(Prevosti et al. 2012)	PCGM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

			<i>gracilis</i> , <i>Pseudonotictis pusillus</i>				
<i>Notictis ortizi</i>	SF	<i>Cladosictis patagonica</i> , <i>Sipalocyon gracilis</i> , <i>Perathereutes pungens</i>	<i>Cladosictis patagonica</i> , <i>Sipalocyon gracilis</i> , <i>Perathereutes pungens</i>	S	Postcranial remains not known for <i>P. pungens</i>	(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Notictis ortizi</i>	Sum			S			
<i>Notiomastodon</i> sp.	WO	Proboscidea	Proboscidea	Am		(Janis et al. 1998)	Un
<i>Notocynus hermosicus</i>	SF	<i>Prothylacynus patagonica</i> , <i>Cladosictis patagonica</i> , <i>Sipalocyon gracilis</i> , <i>Pseudonotictis pusillus</i>	"most hathlyacynids"	S	All hathlyacynids for which sufficient postcranial remains are known were classified as scansorial	(Prevosti et al. 2012)	PCGM
<i>Notocynus hermosicus</i>	SF	<i>Cladosictis patagonica</i> , <i>Sipalocyon gracilis</i> , <i>Perathereutes pungens</i>	<i>Cladosictis patagonica</i> , <i>Sipalocyon gracilis</i> , <i>Perathereutes pungens</i>	S	Postcranial remains not known for <i>P. pungens</i>	(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Notocynus hermosicus</i>	Sum			S			
<i>Notonycteris magdalenensis</i>,	WO	Chiroptera	Chiroptera	V		(Paleobiology Database)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>N. sucharadeus</i>							
<i>Nuciraptor rubricae</i>	WI O	Platyrrhini	Platyrrhini	A		(Ferrari 2009)	Un
<i>Ocnerotherium</i> sp.	SF, PB	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius</i> <i>imperator</i>	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius</i> <i>imperator</i>	Not Aq	Specialized knee joints with passive locks would allow them to stand for long periods of time and would be unneeded in the water	(Shockey 2001)	PCM
<i>Ocnerotherium</i> sp.	SF, PB	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	Am or GT	Part of a trend throughout evolution of Toxodontidae towards reduced cursoriality	(Elissamburu 2007)	PCM
<i>Ocnerotherium</i> sp.	SF, PB	<i>Adinotherium</i> <i>ovinum</i>	<i>Adinotherium</i> <i>ovinum</i>	Am		(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Ocnerotherium</i> sp.	Sum		Toxodontidae	Am			
<i>Octodontobradys</i> sp.	SF	<i>Acratocnus</i> <i>odontrigonus</i> , <i>A. sp.</i> , <i>Choloepus</i> <i>didactylus</i> , <i>C. hoffmanni</i> , <i>Eucholoeops</i> sp., <i>Hapalops</i> sp., <i>Megalonyx</i> <i>jeffersonii</i> , <i>Neocnus comes</i> ,	<i>Acratocnus</i> <i>odontrigonus</i> , <i>A. sp.</i> , <i>Choloepus</i> <i>didactylus</i> , <i>C. hoffmanni</i> , <i>Eucholoeops</i> sp., <i>Hapalops</i> sp., <i>Megalonyx</i> <i>jeffersonii</i> , <i>Neocnus comes</i> ,	Am	All scansorial except <i>Megalonyx</i> : terrestrial and <i>Choloepus</i> : arboreal (Categories: Terrestrial, Scansorial, Arboreal)	(Grass 2014)	PCGM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>Parocnus serus, Pelecyodon arcuatus</i>	<i>Parocnus serus, Pelecyodon arcuatus</i>				
<i>Octodontobradys</i> sp.	WF	Megalonychidae	Megalonychidae	Am	This study, based on: Most megalonychids are scansorial or arboreal but some are ambulatory (Pujos et al. 2012); <i>Octodontobradys</i> is comparable in size to <i>Pseudopreotherium</i> (Santos, Rancy, and Ferigolo 1993) (826-1025 kg (Croft 2000; Rincón et al. 2015; Rincón et al. 2016)); Around 150-200 kg is on the large end of what could reasonably be scansorial (Toledo et al. 2014)	(Pujos et al. 2012; Santos, Rancy, and Ferigolo 1993; Croft 2000; Rincón et al. 2015; Rincón et al. 2016; Toledo et al. 2014)	PB, Mass
<i>Octodontobradys</i> sp.	Sum			Am			
<i>Octomyodon aversus</i>	SF	<i>Scelidotherium, Glossotherium</i>	<i>Scelidotherium, Glossotherium</i>	SF	Size of burrows consistent with mylodont builders, Claw marks inside burrows match mylodont hand, "anatomical, allometric, and biomechanical analysis of sloths limbs" suggests	(Vizcaíno et al. 2001)	PM, BM, Ich, Mass

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

					mylodonts could dig well		
<i>Octomyodon aversus</i>	SF	<i>Scelidothierium, Scelidodon</i>	<i>Scelidothierium, Scelidodon</i>	SF	May be associated with searching for social insects as food	(Dondas, Isla, and Carbalido 2009)	Ich
<i>Octomyodon aversus</i>	SF	<i>Scelidothierium, Scelidodon</i>	<i>Scelidothierium, Scelidodon</i>	SF	May be associated with searching for social insects as food	(Genise and Farina 2012)	Ich
<i>Octomyodon aversus</i>	WF	<i>Scelidothierium, Glossotherium</i>	Mylodontidae	SF		(Pujos et al. 2012)	PB
<i>Octomyodon aversus</i>	SF	<i>Catonyx tarijensis, Glossotherium robustum, G. sp., Lestodon armatus, L. sp., Lestobradys sprechmanni, Paramylodon harlani, P. sp., Scelidothierium carlesi, S. leptcephalum, S. bravardi, S. sp.</i>	<i>Catonyx tarijensis, Glossotherium robustum, G. sp., Lestodon armatus, L. sp., Lestobradys sprechmanni, Paramylodon harlani, P. sp., Scelidothierium carlesi, S. leptcephalum, S. bravardi, S. sp.</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Octomyodon aversus</i>	SF	<i>Nematherium</i>	<i>Nematherium</i>	SF	May have occasionally climbed to escape predation, but was mostly terrestrial	(Toledo et al. 2014)	PCM, Mass
<i>Octomyodon aversus</i>	AGp	Large-size mylodont	Large-size mylodont	SF		(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Octomylodon aversus</i>	SF	<i>Nematherium</i>	<i>Nematherium</i>	SF	Limited climbing ability, but much better digging ability than most contemporaneous sloths	(Toledo 2016)	PCM
<i>Octomylodon aversus</i>	Sum			SF			
<i>Odocoileus</i> sp.	WF	Cervidae	Cervidae	C	Cursorial (open habitats) or Cursorial (closed habitats)	(Curran 2012)	PCGM
<i>Oligoryzomys flavescens</i>, <i>O. longicaudatus</i>, <i>O. sp.</i>	WG	<i>Oligoryzomys</i>	<i>Oligoryzomys</i>	S	"Terrestrial but climbs well"	(Nowak 1999)	LR-E
<i>Orthomyctera</i> sp.	SSF	<i>Dolichotis</i>	<i>Dolichotis</i>	C	Relationship: Within Dolichotinae (Pérez et al. 2014)	(Elissamburu and Vizcaíno 2004)	Un
<i>Orthomyctera</i> sp.	SSF	<i>Dolichotis</i>	<i>Dolichotis</i>	C	Relationship: Within Dolichotinae (Pérez et al. 2014)	(Elissamburu and Santis 2011)	LR-E
<i>Orthomyctera</i> sp.	SSF	<i>Dolichotis patagonum</i>	<i>Dolichotis patagonum</i>	C	Relationship: Within Dolichotinae (Pérez et al. 2014)	(Patton, Pardiñas, and D'Elía 2015)	LR-E
<i>Orthomyctera</i> sp.	Sum			C			
<i>Ortotherium laticurvatum</i>	SF	<i>Acratocnus odontrius</i> , <i>A. sp.</i> , <i>Choloepus didactylus</i> , <i>C.</i>	<i>Acratocnus odontrius</i> , <i>A. sp.</i> , <i>Choloepus didactylus</i> , <i>C.</i>	Am	All scansorial except <i>Megalonyx</i> : terrestrial and <i>Choloepus</i> : arboreal (Categories: Terrestrial, Scansorial, Arboreal)	(Grass 2014)	PCGM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

			<i>hoffmanni</i> , <i>Eucholoeops</i> sp., <i>Hapalops</i> sp., <i>Megalonyx jefersonii</i> , <i>Neocnus comes</i> , <i>Parocnus serus</i> , <i>Peleciodon arcuatus</i>	<i>hoffmanni</i> , <i>Eucholoeops</i> sp., <i>Hapalops</i> sp., <i>Megalonyx jefersonii</i> , <i>Neocnus comes</i> , <i>Parocnus serus</i> , <i>Peleciodon arcuatus</i>			
<i>Ortotherium laticurvatum</i>	WF	Megalonychidae	Megalonychidae	Am	This study, based on: Most megalonychids are scansorial or arboreal but some are ambulatory (Pujos et al. 2012); <i>Ortotherium</i> is over 300 kg (Table S3.9); Around 150-200 kg is on the large end of what could reasonably be scansorial (Toledo et al. 2014)	(Pujos et al. 2012; Toledo et al. 2014)	PB, Mass
<i>Ortotherium laticurvatum</i>	Sum			Am			
<i>Oxymycterus</i> sp., <i>Oxymycterus wayku</i>	WG	<i>Oxymycterus</i>	<i>Oxymycterus</i>	SF		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

884	<i>Oxydontherium piramydatus</i> , <i>O. sp.</i> , <i>O. zeballozi</i>	WF	<i>Promacrauchenia antiqua</i> , <i>P. kraglievichi</i> , <i>P. chapadmalense</i> , <i>Windhausenia delacroixi</i> , <i>Pseudomacrauchenia yepesi</i> , <i>Macrauchenioptis ensenadensis</i> , <i>M. cf. M. ensenadensis</i> , <i>Macrauchenia patachonica</i> , <i>Xenorhinotherium bahiense</i>	Macrauchenidae	C		(Bond et al. 1995)	Un
	<i>Oxydontherium piramydatus</i> , <i>O. sp.</i> , <i>O. zeballozi</i>	SF	? <i>Coniopternium</i>	? <i>Coniopternium</i>	C	Locking knee would also allow standing for long periods of time	(Shockey 1999)	PCM
	<i>Oxydontherium piramydatus</i> , <i>O. sp.</i> , <i>O. zeballozi</i>	SF	<i>Coniopternium</i>	<i>Coniopternium</i>	C	Locking knee would also allow standing for long periods of time	(Shockey and Anaya 2008)	PCM
	<i>Oxydontherium piramy-</i>	SF	<i>Theosodon gracilis</i> , <i>T.</i>	<i>Theosodon gracilis</i> , <i>T. lydek-</i>	C		(Kay, Vizcaíno, and Bar-go 2012)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>datum</i> , <i>O. sp.</i> , <i>O. zeballozi</i>		<i>lydekkeri</i>	<i>keri</i>				
<i>Oxydontherium</i> <i>piramy-</i> <i>datum</i> , <i>O. sp.</i> , <i>O. zeballozi</i>	WF	Macrauche- niidae	Macrauche- niidae	C		(Schmidt and Ferrero 2014)	LR
<i>Oxydontherium</i> <i>piramy-</i> <i>datum</i> , <i>O. sp.</i> , <i>O. zeballozi</i>	SF, PB	<i>Theosodon</i> <i>lal-</i> <i>lemanti</i> , <i>Macrauchenia</i> <i>patachonica</i>	<i>Theosodon</i> <i>lal-</i> <i>lemanti</i> , <i>Macrauchenia</i> <i>patachonica</i>	C		(Croft 2016)	Un
<i>Oxydontherium</i> <i>piramy-</i> <i>datum</i>, <i>O. sp.</i>, <i>O. zeballozi</i>	Sum		Macrauche- niidae	C			
<i>Ozotoceros be-</i> <i>zoarticus</i> , <i>O. sp.</i>	WF	Cervidae	Cervidae	C	Cursorial (open habi- tats) or Curso- saltatorial (closed habi- tats)	(Curran 2012)	PCGM
<i>Pach-</i> <i>yarmatherium</i> <i>brasiliense</i>, <i>P.</i> <i>tenebris</i>	SG	<i>Pach-</i> <i>yarmatherium</i> <i>leiseyi</i>	<i>Pach-</i> <i>yarmatherium</i> <i>leiseyi</i>	SF	Strong digging claws, ulnar proportions sug- gestive of digging	(Downing and White 1995)	PCM
<i>Pachyrukhos</i> sp.	Tax	<i>Pachyrukhos</i>	<i>Pachyrukhos</i>	CS		(Elissamburu 2004)	PCM
<i>Pachyrukhos</i> sp	Tax	<i>Pachyrukhos</i>	<i>Pachyrukhos</i>	CS		(McCoy and Norris 2012)	PCM
<i>Pachyrukhos</i> sp	Sum			CS			
<i>Paedotherium</i> <i>bonaerense</i> , <i>P.</i> <i>minor</i> , <i>P. sp.</i> , <i>P.</i>	Tax, SG	<i>Paedotherium</i> <i>bonaerense</i> , <i>P.</i> <i>typicum</i>	<i>Paedotherium</i> <i>bonaerense</i> , <i>P.</i> <i>typicum</i>	SF	Fossorial and cursorial	(Elissamburu 2004)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>typicum</i>							
<i>Paedotherium bonaerense</i> , <i>P. minor</i> , <i>P. sp.</i> , <i>P. typicum</i>	WG	<i>Paedotherium</i>	<i>Paedotherium</i>	F or SF	Burrows	(Cenizo, Soibelzon, and Saffer 2015)	Tph
<i>Paedotherium bonaerense</i> , <i>P. minor</i> , <i>P. sp.</i> , <i>P. typicum</i>	Tax, SG	<i>Paedotherium typicum</i>	<i>Paedotherium typicum</i>	SF	Fossorial and cursorial	(Croft 2016)	Un
<i>Paedotherium bonaerense</i>, <i>P. minor</i>, <i>P. sp.</i>, <i>P. typicum</i>	Sum			SF			
<i>Palaehoplophorus antiquus</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Palaehoplophorus antiquus</i>	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Palaehoplophorus antiquus</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003)	PCM
<i>Palaehoplophorus antiquus</i>	SF, PB	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaeohoplophorus</i> : terrestrial and slow-moving	(Croft 2016)	Un
<i>Palaehoplophorus</i>	Sum		Glyptodonti-	Am			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>rus antiquus</i>		dae					
<i>Palaeocavia</i> sp.	SSF	<i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	<i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	GT	<i>Microcavia</i> : occasionally digs, occasionally climbs, mostly terrestrial; <i>Galea</i> : primarily terrestrial, dig occasionally; <i>Cavia</i> : generalized terrestrial	(Nowak 1999)	LR-E
<i>Palaeocavia</i> sp.	SSF	<i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	<i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	GT	<i>Microcavia</i> : occasionally digs; <i>Galea</i> : dig occasionally; <i>Cavia</i> : generalized terrestrial	(Elissamburu and Vizcaíno 2004)	Un
<i>Palaeocavia</i> sp.	PB	<i>Eocardia</i> , <i>Prodolichotis</i> , <i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	<i>Dolicavia</i> , by phylogenetic bracketing	GT	This study, based on: <i>Eocardia</i> and <i>Prodolichotis</i> were similar in postcranial morphology and relatively generalized (Walton 1997); <i>Eocardia fissa</i> was cursorial but less so than <i>Dolichotis</i> / <i>Pedilolagus</i> (Candela, Rasia, and Pérez 2012); <i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i> (Nowak 1999) are generalized terrestrial; <i>Palaeocavia</i> belongs to the polytomy formed by <i>Prodolichotis pridiana</i> , <i>Galea</i> , and others interpreted as generalized in this study and is bracket-	(Walton 1997; Nowak 1999; Pérez, Scillatoyané, and Vizcaíno 2014; Candela, Rasia, and Pérez 2012)	PB

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

					ed by <i>Eocardia</i> and <i>Microcavia</i> (Pérez, Scillato-Yané, and Vizcaíno 2014)		
<i>Palaeocavia</i> sp.	SSF	<i>Microcavia australis</i> , <i>M. criolloensis</i>	<i>Microcavia australis</i> , <i>M. criolloensis</i>	SF	<i>M. criolloensis</i> may possess additional adaptations for digging beyond what extant <i>M. australis</i> has	(Ubilla 2008)	PCM
<i>Palaeocavia</i> sp.	SSF	<i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	<i>Microcavia</i> , <i>Galea</i> , <i>Cavia</i>	SF to GT	<i>Microcavia</i> : Digger, <i>Cavia</i> : Generalized terrestrial ("Ambulatory"), <i>Galea</i> : Generalized terrestrial ("Ambulatory")	(Morgan and Álvarez 2013)	LR-E
<i>Palaeocavia</i> sp.	Sum			GT			
<i>Palaeolama major</i> , <i>P. sp.</i> , <i>P. weddelli</i>	See	<i>Palaeolama</i> , <i>Lama</i>		C	This study, based on: <i>Palaeolama</i> and <i>Lama</i> were similar in post-cranial morphology and less cursorial than <i>Hemiauchenia</i> (Webb 1974; Scherer 2013); but <i>Lama guanicoe</i> can still run at up to 56 km/hr (Nowak 1999)	(Webb 1974; Scherer 2013; Nowak 1999)	CLR, PCM
<i>Palaeomyrmidon</i> sp.	SF	<i>Cyclopes</i>		A	Closely related to <i>Cyclopes</i>	(Hirschfeld 1976)	CLR
<i>Palaeomyrmidon</i> sp.	Tax	<i>Cyclopes</i> , <i>Palaeomyrmidon</i>	<i>Cyclopes</i> , <i>Palaeomyrmidon</i>	A	Closely related to <i>Cyclopes</i> , which is highly arboreal, and long hiatus	(McDonald, Vizcaíno, and Bargo 2008)	CLR

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

689	without Cyclopidae representatives between 45-32 Ma to 9-7 Ma may be due to arboreal lifestyle of these anteaters						
	<i>Palaeomyrmidon</i> sp.	Sum	A				
	<i>Paleuphractus</i> sp.	ST	<i>Euphractus, Chaetophractus, Zaedyus</i>	<i>Euphractus, Chaetophractus, Zaedyus</i>	SF	(Vizcaíno and Milne 2002)	LR-E
	<i>Paleuphractus</i> sp.	ST	<i>Prozaedyus exilis, P. sp.</i>	<i>Prozaedyus exilis, P. sp.</i>	SF	(Vizcaíno, Fernicola, and Bargo 2012)	PCM
	<i>Paleuphractus</i> sp.	ST	<i>Prozaedyus proximus</i>	<i>Prozaedyus proximus</i>	SF	(Kay, Vizcaíno, and Bargo 2012)	Un
	<i>Paleuphractus</i> sp.	ST	<i>Macro-euphractus outesi</i>	<i>Macro-euphractus outesi</i>	SF	(Croft 2016)	Un
	<i>Paleuphractus</i> sp.	Sum	Euphractini		SF		
	<i>Pampatherium humboldtii, P. sp.</i>	SF	<i>Pampatherium humboldtii</i>	<i>Pampatherium humboldtii</i>	C	Adapted for fast movements, also may have been able to burrow	(Abrantes, Avilla, and Vizcaíno 2005) PCM
	<i>Pampatherium humboldtii, P. sp.</i>	Tax	<i>Pampatherium humboldtii</i>	<i>Pampatherium humboldtii</i>	C	Adapted for fast movements	(Rincón, White, and McDonald 2008) PCM
	<i>Pampatherium humboldtii, P. sp.</i>	Sum	C				

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

890	<i>Panochthus greslebini</i> , <i>P. intermedius</i> , <i>P. sp.</i> , <i>P. tuberculatus</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
	<i>Panochthus greslebini</i> , <i>P. intermedius</i> , <i>P. sp.</i> , <i>P. tuberculatus</i>	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
	<i>Panochthus greslebini</i> , <i>P. intermedius</i> , <i>P. sp.</i> , <i>P. tuberculatus</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003)	PCM
	<i>Panochthus greslebini</i> , <i>P. intermedius</i> , <i>P. sp.</i> , <i>P. tuberculatus</i>	SF, PB	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaeohoplophorus</i> : terrestrial and slow-moving	(Croft 2016)	Un
	<i>Panochthus greslebini</i>, <i>P. intermedius</i>, <i>P. sp.</i>, <i>P. tuberculatus</i>	Sum		Glyptodontidae	Am			
	<i>Panthera onca</i> , <i>P. sp.</i>	Tax, SG	<i>Panthera onca</i>	<i>Panthera onca</i>	S	Climbs well "and is almost as arboreal as the leopard, but most hunting is done on the ground."	(Nowak 1999)	LR-E

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Paraeuphractus</i> sp.	ST	<i>Euphractus, Chaetophractus, Zaedyus</i>	<i>Euphractus, Chaetophractus, Zaedyus</i>	SF		(Vizcaíno and Milne 2002)	LR-E
<i>Paraeuphractus</i> sp.	ST	<i>Prozaedyus exilis, P. sp.</i>	<i>Prozaedyus exilis, P. sp.</i>	SF		(Vizcaíno, Fernicola, and Bargo 2012)	PCM
<i>Paraeuphractus</i> sp.	ST	<i>Prozaedyus proximus</i>	<i>Prozaedyus proximus</i>	SF		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Paraeuphractus</i> sp.	ST	<i>Macro-euphractus outesi</i>	<i>Macro-euphractus outesi</i>	SF		(Croft 2016)	Un
<i>Paraeuphractus</i> sp.	Sum		Euphractini	SF			
<i>Paraglyptodon</i> sp.	AGp	<i>Glyptodon, Panochthus, Doedicurus, Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Paraglyptodon</i> sp.	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Paraglyptodon</i> sp.	AGp	<i>Glyptodon, Panochthus, Doedicurus, Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003)	PCM
<i>Paraglyptodon</i> sp.	SF, PB	<i>Parapropalaehoplophorus, Glyptodon, Panochthus, Doedicurus, Sclerocalyptus</i>	<i>Parapropalaehoplophorus, Glyptodon, Panochthus, Doedicurus, Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus, Glyptodon</i>) graviportal, <i>Parapropalaehoplophorus</i> : terrestrial and slow-moving	(Croft 2016)	Un
<i>Paraglyptodon</i> sp.	Sum		Glyptodontidae	Am			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Paramyocastor diligens</i>	See	<i>Clyomys, Euryzygomatomys, Hoplomys, Lonchothrix, Proechimys, Thrichomys, Trinomys</i>	<i>Clyomys, Euryzygomatomys, Hoplomys, Lonchothrix, Proechimys, Thrichomys, Trinomys</i>	SF	This study, based on: Ecologically more similar to <i>Eumysopinae</i> than extant <i>Myocastor</i> , and assuming the close relationship with <i>Myocastor</i> , is in a clade with <i>Thrichomys</i> , <i>Hoplomys</i> , and <i>Proechimys</i> , and was distributed in open semi-arid or arid southern plains (Galewski et al. 2005; Candela, Noriega, and Reguero 2007); <i>Hoplomys</i> : "Terrestrial", <i>Proechimys</i> : Semifossorial, <i>Thrichomys</i> : Generalized terrestrial, also <i>Clyomys</i> : Semifossorial, <i>Euryzygomatomys spinosus</i> : Semifossorial, <i>Trinomys</i> : Cursorial and (at least in <i>T. yonenagae</i>) semifossorial (Patton, Pardiñas, and D'Elía 2015)	(Galewski et al. 2005; Candela, Noriega, and Reguero 2007; Patton, Pardiñas, and D'Elía 2015)	LR
<i>Paranabradys vucetichae</i>	SF	<i>Acratocnus odontrigonus</i> , <i>A. sp.</i> , <i>Choloepus di-</i>	<i>Acratocnus odontrigonus</i> , <i>A. sp.</i> , <i>Choloepus di-</i>	Am or S	All scansorial except <i>Megalonyx</i> : terrestrial and <i>Choloepus</i> : arboreal (Categories: Terrestrial,	(Grass 2014)	PCGM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

			<i>dactylus</i> , <i>C. hoffmanni</i> , <i>Eucholoeops</i> sp., <i>Hapalops</i> sp., <i>Megalonyx jeffersonii</i> , <i>Neocnus comes</i> , <i>Parocnus serus</i> , <i>Pelecyodon arcuatus</i>	<i>dactylus</i> , <i>C. hoffmanni</i> , <i>Eucholoeops</i> sp., <i>Hapalops</i> sp., <i>Megalonyx jeffersonii</i> , <i>Neocnus comes</i> , <i>Parocnus serus</i> , <i>Pelecyodon arcuatus</i>		Scansorial, Arboreal)		
893	<i>Paranabradys vucetichae</i>	WF	Megalonychidae	Megalonychidae	Am	This study, based on: Most megalonychids are scansorial or arboreal but some are ambulatory(Pujos et al. 2012); <i>Paranabradys vucetichae</i> is comparable in size to <i>Ortotherium</i> (G. Scillato-Yané 1980); <i>Ortotherium</i> is over 300 kg (Table S3.9); Around 150-200 kg is on the large end of what could reasonably be scansorial (Toledo et al. 2014)	(Pujos et al. 2012; Toledo et al. 2014; Scillato-Yané 1980)	PB, Mass
	<i>Paranabradys vucetichae</i>	Sum			Am			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Paranauchenia denticulata</i>	SSF	<i>Promacrauchenia antiqua</i> , <i>P. kraglievichi</i> , <i>P. chapadmalense</i> , <i>Windhausenia delacroixi</i> , <i>Pseudomacrauchenia yepesi</i> , <i>Macrauchenia oopsis ensenadensis</i> , <i>M. cf. M. ensenadensis</i> , <i>Macrauchenia patachonica</i> , <i>Xenorhinotherium bahiense</i>	Macrauchenidae	C		(Bond et al. 1995)	Un
<i>Paranauchenia denticulata</i>	SF	? <i>Coniopternium</i>	? <i>Coniopternium</i>	C	Locking knee would also allow standing for long periods of time	(Shockey 1999)	PCM
<i>Paranauchenia denticulata</i>	SF	<i>Coniopternium</i>	<i>Coniopternium</i>	C	Locking knee would also allow standing for long periods of time	(Shockey and Anaya 2008)	PCM
<i>Paranauchenia denticulata</i>	SF	<i>Theosodon gracilis</i> , <i>T. lydekkeri</i>	<i>Theosodon gracilis</i> , <i>T. lydekkeri</i>	C		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Paranauchenia</i>	WF	Macrauchenia	Macrauchenia	C		(Schmidt and Ferrero	LR

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>denticulata</i>		niidae	niidae			2014)	
<i>Paranauchenia denticulata</i>	SSF	<i>Theosodon lallemanti</i> , <i>Macrauchenia patachonica</i>	<i>Theosodon lallemanti</i> , <i>Macrauchenia patachonica</i>	C		(Croft 2016)	Un
<i>Paranauchenia denticulata</i>	Sum		Macrauchenidae	C			
<i>Parapropalaeophorus septentrionalis</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Parapropalaeophorus septentrionalis</i>	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Parapropalaeophorus septentrionalis</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003)	PCM
<i>Parapropalaeophorus septentrionalis</i>	SF, PB	<i>Parapropalaeophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaeophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaeophorus</i> : terrestrial and slow-moving	(Croft 2016)	Un
<i>Parapropalaeophorus septentrionalis</i>	Sum		Glyptodontidae	Am			
<i>Paratrigodon</i> sp.	SF, PB	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius</i>	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius</i>	Not Aq	Specialized knee joints with passive locks would allow them to stand for	(Shockey 2001)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>imperator</i>	<i>imperator</i>		long periods of time and would be unneeded in the water		
<i>Paratrigodon</i> sp.	SF, PB	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	Am or GT	Part of a trend throughout evolution of Toxodontidae towards reduced cursoriality	(Elissamburu 2007)	PCM
<i>Paratrigodon</i> sp.	SF, PB	<i>Adinotherium ovinum</i>	<i>Adinotherium ovinum</i>	Am		(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Paratrigodon</i> sp.	Sum		Toxodontidae	Am			
<i>Patagosmilus goini</i>	PB	<i>Thylacosmilus atrox</i> , <i>Paraborhyaena boliviana</i> , <i>Arctodictis munizi</i> , <i>A. sinclairi</i> , <i>Borhyaena tuberata</i>	<i>Thylacosmilus atrox</i> , <i>Paraborhyaena boliviana</i> , <i>Arctodictis munizi</i> , <i>A. sinclairi</i> , <i>Borhyaena tuberata</i>	GT	This study, based on: <i>Thylacosmilus atrox</i> terrestrial and powerful for killing large prey but at most slightly cursorial, <i>Borhyaena tuberata</i> incipient cursoriality and terrestrial; <i>Arctodictis</i> terrestrial not cursorial (Argot 2004b; Ercoli, Prevosti, and Álvarez 2012); <i>Paraborhyaena boliviana</i> terrestrial (Croft 2016); <i>Patagosmilus</i> and <i>Thylacosmilus</i> are both in Thylacosmilidae, and	(Argot 2004b; Ercoli, Prevosti, and Álvarez 2012; Croft 2016; Forasiepi 2009; Engelman and Croft 2014; Forasiepi, Babot, and Zimicz 2015; Suarez et al. 2016)	PB

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

					all taxa discussed above are in a monophyletic clade containing both Borhyaenidae and Thyacodontidae (Forasiepi 2009; Engelman and Croft 2014; Forasiepi, Babot, and Zimicz 2015; Suarez et al. 2016); All spp. with known postcranial remains in these clades were terrestrial	
<i>Patasola magdalenae</i>	Tax	<i>Patasola magdalenae</i>	<i>Patasola magdalenae</i>	A	(Meldrum and Kay 1997a)	PCM
<i>Patasola magdalenae</i>	Tax	<i>Patasola magdalenae</i>	<i>Patasola magdalenae</i>	A	(Meldrum and Kay 1997b)	PCM
<i>Patasola magdalenae</i>	Tax	<i>Patasola magdalenae</i>	<i>Patasola magdalenae</i>	A	(Fleagle, Kay, and Anthony 1997)	PCM
<i>Patasola magdalenae</i>	Sum			A		
<i>Dolichotis</i> (=Pediolagus) <i>salinicola</i>	Tax	<i>Dolichotis</i> (=Pediolagus) <i>salinicola</i>	<i>Dolichotis</i> (=Pediolagus) <i>salinicola</i>	C	(Patton, Pardiñas, and D'Elía 2015)	LR-E
<i>Pecari</i> (=Tayassu) <i>tajacu</i>	Tax	<i>Pecari</i> (=Tayassu) <i>tajacu</i>	<i>Pecari</i> (=Tayassu) <i>tajacu</i>	C	Can run up to 35 km/hr (Nowak 1999)	LR-E
<i>Pedrolypeutes praecursor</i>	Tax	<i>Pedrolypeutes praecursor</i>	<i>Pedrolypeutes praecursor</i>	GT	Tolypeutinae "may have originated from a generalized Dasypodi-	(Carlini et al. 1997) PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

					dae" based on skeleton of <i>P. praecursor</i>		
<i>Peltephilus pumilus</i> , <i>P. sp.</i>	SG	<i>Peltephilus ferox</i> , <i>P. strepens</i>	<i>Peltephilus ferox</i> , <i>P. strepens</i>	F	Probably foraged underground	(Vizcaíno and Fariña 1997)	PCM
<i>Peltephilus pumilus</i> , <i>P. sp.</i>	SG	<i>Peltephilus ferox</i> , <i>P. strepens</i>	<i>Peltephilus ferox</i> , <i>P. strepens</i>	F	More fossorial than extant dasypodines and euphractines but less than priodontines and <i>Chlamyphorus</i> ; probably foraged underground for roots and tubers	(Vizcaíno, Bargo, and Cassini 2006)	PCM
<i>Peltephilus pumilus</i> , <i>P. sp.</i>	Tax, SG	<i>Peltephilus pumilus</i>	<i>Peltephilus pumilus</i>	F	Probably foraged underground	(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Peltephilus pumilus</i>, <i>P. sp.</i>	Sum			F			
<i>Pericotoxodon platignathus</i>	SF, PB	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius imperator</i>	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius imperator</i>	Not Aq	Specialized knee joints with passive locks would allow them to stand for long periods of time and would be unneeded in the water	(Shockey 2001)	PCM
<i>Pericotoxodon platignathus</i>	SF, PB	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	Am or GT	Part of a trend throughout evolution of Toxodontidae towards reduced cursoriality	(Elissamburu 2007)	PCM
<i>Pericotoxodon platignathus</i>	SF, PB	<i>Adinotherium ovinum</i>	<i>Adinotherium ovinum</i>	Am		(Kay, Vizcaíno, and Bargo 2012)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Pericotoxodon platignathus</i>	Sum		Toxodontidae	Am			
<i>Caluromys</i> (= <i>Philander</i>) <i>entrerianus</i>	WG	<i>Caluromys</i>	<i>Caluromys</i>	A	"Come to the ground infrequently"	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Phlyctaenopyga</i> sp.	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Phlyctaenopyga</i> sp.	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Phlyctaenopyga</i> sp.	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003)	PCM
<i>Phlyctaenopyga</i> sp.	SF, PB	<i>Parapropalaehoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaehoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaehoplophorus</i> : terrestrial and slow-moving	(Croft 2016)	Un
<i>Phlyctaenopyga</i> sp.	Sum		Glyptodontidae	Am			
<i>Phoberomys bordasi</i> , <i>P. burmeisteri</i> , <i>P. insolita</i> , <i>P. lozanoi</i> , <i>P. minima</i> , <i>P. pattersoni</i>	Tax, SG	<i>Phoberomys pattersoni</i>	<i>Phoberomys pattersoni</i>	Aq		(Sánchez-Villagra, Aguilera, and Horovitz 2003)	Tph

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

906	<i>ni</i> , <i>P. praecursor</i> , <i>P. sp.</i>					
	<i>Phoberomys bordasi</i> , <i>P. burmeisteri</i> , <i>P. insolita</i> , <i>P. lozanoi</i> , <i>P. minima</i> , <i>P. pattersoni</i> , <i>P. praecursor</i> , <i>P. sp.</i>	Tax, SG	<i>Phoberomys pattersoni</i>	<i>Phoberomys pattersoni</i>	Aq (Vucetich et al. 2010)	Tph
	<i>Phoberomys bordasi</i> , <i>P. burmeisteri</i> , <i>P. insolita</i> , <i>P. lozanoi</i> , <i>P. minima</i> , <i>P. pattersoni</i> , <i>P. praecursor</i> , <i>P. sp.</i>	WG	<i>Phoberomys</i>	<i>Phoberomys</i>	Aq (Vucetich et al. 2015)	Un
	<i>Phoberomys bordasi</i>, <i>P. burmeisteri</i>, <i>P. insolita</i>, <i>P. lozanoi</i>, <i>P. minima</i>, <i>P. pattersoni</i>, <i>P. praecursor</i>, <i>P. sp.</i>	Sum		Aq		

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Phugatherium cataclisticum</i> , <i>P. novum</i> , <i>P. sp.</i>	SSF, PB	<i>Hydrochoeropsis dasseni</i>	<i>Hydrochoeropsis dasseni</i>	Aq		(Reguero and Candela 2008)	CLR
<i>Phugatherium cataclisticum</i> , <i>P. novum</i> , <i>P. sp.</i>	SSF, PB	<i>C. chasicoensis</i> , <i>C. orientalis</i> , <i>C. paranense</i> , <i>C. patagonicum</i>	<i>C. chasicoensis</i> , <i>C. orientalis</i> , <i>C. paranense</i> , <i>C. patagonicum</i>	Aq	All found in deposits that formed in or near water, such as swamps, lakes, rivers	(Deschamps et al. 2007)	Tph
<i>Phugatherium cataclisticum</i> , <i>P. novum</i> , <i>P. sp.</i>	SSF, PB	<i>Cardiatherium</i> sp.	<i>Cardiatherium</i> sp.	Aq	Extant capybaras are semi-aquatic; fossil capybaras have all been found in "water-related settings"	(María Guiomar Vucetich et al. 2010)	CLR, Tph
<i>Phugatherium cataclisticum</i> , <i>P. novum</i> , <i>P. sp.</i>	SSF, PB	Derived forms of Hydrochoeridae, beginning with <i>Cardiatherium</i> (includes <i>Hydrochoeropsis</i>)	Derived forms of Hydrochoeridae, beginning with <i>Cardiatherium</i> (includes <i>Hydrochoeropsis</i>)	Aq	Semi-aquatic, social habits, large body size and novel dental morphology evolved roughly simultaneously (first evident in <i>Cardiatherium</i> spp.)	(Leandro M. Pérez, Scillato-Yané, and Vizcaíno 2014)	CLR, Tph, CDM
<i>Phugatherium cataclisticum</i> , <i>P. novum</i> , <i>P. sp.</i>	SSF, PB	Derived forms of Hydrochoeridae, beginning with <i>Cardiatherium</i> (includes <i>Hydrochoeropsis</i>)	Derived forms of Hydrochoeridae, beginning with <i>Cardiatherium</i> (includes <i>Hydrochoeropsis</i>)	Aq	Semi-aquatic, social habits, large body size and novel dental morphology evolved roughly simultaneously (first evident in <i>Cardiatherium</i> spp.)	(María Guiomar Vucetich et al. 2015)	LR
<i>Phugatherium cataclisticum</i> , <i>P. novum</i> , <i>P. sp.</i>	Sum			Aq			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

sp.							
<i>Phyllotis anitae</i>, WT		Phyllotini	Phyllotini	GT		(Patton, Pardiñas, and D'Elía 2015)	LR-E
<i>P. sp.</i>							
<i>Pisanodon</i> sp.	SF, PB	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius</i> <i>imperator</i>	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius</i> <i>imperator</i>	Not Aq	Specialized knee joints with passive locks would allow them to stand for long periods of time and would be unneeded in the water	(Shockey 2001)	PCM
<i>Pisanodon</i> sp.	SF, PB	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	Am or GT	Part of a trend throughout evolution of Toxodontidae towards reduced cursoriality	(Elissamburu 2007)	PCM
<i>Pisanodon</i> sp.	SF, PB	<i>Adinotherium</i> <i>ovinum</i>	<i>Adinotherium</i> <i>ovinum</i>	Am		(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Pisanodon</i> sp.	Sum		Toxodontidae	Am			
<i>Pithanotomys columnaris</i>, P. macer, P. sp.	WG	<i>Pithanotomys</i>	<i>Pithanotomys</i>	F		(Verzi, Olivares, and Morgan 2014)	PB
<i>Plaina intermedia</i> , <i>P. sp.</i>	SF	<i>Pampatherium</i> <i>humboldtii</i>	<i>Pampatherium</i> <i>humboldtii</i>	C	Adapted for fast movements, also may have been able to burrow	(Abrantes, Avilla, and Vizcaíno 2005)	PCM
<i>Plaina intermedia</i> , <i>P. sp.</i>	SF	<i>Pampatherium</i> <i>humboldtii</i>	<i>Pampatherium</i> <i>humboldtii</i>	C	Adapted for fast movements	(Rincón, White, and McDonald 2008)	PCM
<i>Plaina intermedia</i>, <i>P. sp.</i>	Sum			C			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Planops</i> sp.	SF	<i>Mesocnus</i> (Megalonychidae), <i>Megalocnus</i> (Megalonychidae), <i>Prepotherium</i> (Megatheriidae)	Mesocnus, Megalocnus, Prepotherium	Am	Morphology very different from cursorial animals, consistent with arboreal or ambulatory habits	(J. L. White 1993)	PCM
<i>Planops</i> sp.	SF	<i>Megatherium</i>	<i>Megatherium</i>	GT	Could have run	(Fariña and Vizcaíno 1999)	BM
<i>Planops</i> sp.	AGp	"Extinct sloths"	"Extinct sloths"	Am	Unlikely that they could have outrun predators; likely fought rather than ran	(McDonald 2012)	PCM
<i>Planops</i> sp.	WF	Megatheriidae	Megatheriidae	T	Neither climbers nor diggers	(Pujos et al. 2012)	PB
<i>Planops</i> sp.	SF	<i>Megatherium lundii</i> , <i>M. sp.</i> , <i>M. tarijense</i>	<i>Megatherium lundii</i> , <i>M. sp.</i> , <i>M. tarijense</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Planops</i> sp.	SF	<i>Pyramiodontherium</i>	<i>Pyramiodontherium</i>	Am	"Slow walking gait only"	(Melchor et al. 2015)	Un
<i>Planops</i> sp.	Tax	Santacrucian sloths, including representatives of Megatheriidae, Megalonychidae, and Mylodontidae	Santacrucian sloths, including representatives of Megatheriidae, Megalonychidae, and Mylodontidae	Am	"Not well-suited for fast locomotion"	(Toledo 2016)	PCM
<i>Planops</i> sp.	Sum			Am			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Platygonus narinoensis</i> , <i>P. sp.</i>	WG	<i>Platygonus</i>	<i>Platygonus</i>	C		(Gasparini, Kerber, and Oliveira 2009)	CM, PCM
<i>Plaxhaplous</i> sp.	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Plaxhaplous</i> sp.	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Plaxhaplous</i> sp.	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003)	PCM
<i>Plaxhaplous</i> sp.	SF, PB	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaeohoplophorus</i> : terrestrial and slow-moving	(Croft 2016)	Un
<i>Plaxhaplous</i> sp.	Sum		Glyptodontidae	Am			
<i>Plesiomegatherium</i> sp.	SF	<i>Mesocnus</i> (Megalonychidae), <i>Megalocnus</i> (Megalonychidae), <i>Prepothorium</i> (Megatheriidae)	<i>Mesocnus</i> , <i>Megalocnus</i> , <i>Prepothorium</i>	Am	Morphology very different from cursorial animals, consistent with arboreal or ambulatory habits	(J. L. White 1993)	PCM
<i>Plesiomegatherium</i> sp.	SF	<i>Megatherium</i>	<i>Megatherium</i>	GT	Could have run	(Fariña and Vizcaíno 1999)	BM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Plesiomegatherium</i> sp.	AGp	"Extinct sloths"	"Extinct sloths"	Am	Unlikely that they could have outrun predators; likely fought rather than ran	(McDonald 2012)	PCM
<i>Plesiomegatherium</i> sp.	WF	Megatheriidae	Megatheriidae	T	Neither climbers nor diggers	(Pujos et al. 2012)	PB
<i>Plesiomegatherium</i> sp.	SF	<i>Megatherium lundii</i> , <i>M. sp.</i> , <i>M. tarijense</i>	<i>Megatherium lundii</i> , <i>M. sp.</i> , <i>M. tarijense</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Plesiomegatherium</i> sp.	SF	<i>Pyramiodontherium</i>	<i>Pyramiodontherium</i>	Am	"Slow walking gait only"	(Melchor et al. 2015)	Un
<i>Plesiomegatherium</i> sp.	SF	Santacrucian sloths, including representatives of Megatheriidae, Megalonychidae, and Mylodontidae	Santacrucian sloths, including representatives of Megatheriidae, Megalonychidae, and Mylodontidae	Am	"Not well-suited for fast locomotion"	(Toledo 2016)	PCM
<i>Plesiomegatherium</i> sp.	Sum			Am			
<i>Plesiotoxodon</i> sp.	SF, PB	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetteriaus imperator</i>	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetteriaus imperator</i>	Not Aq	Specialized knee joints with passive locks would allow them to stand for long periods of time and would be unneeded in the water	(Shockey 2001)	PCM
<i>Plesiotoxodon</i> sp.	SF, PB	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> ,	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> ,	Am or GT	Part of a trend throughout evolution of Toxodontidae towards reduced cur-	(Elissamburu 2007)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>Adinotherium</i> , <i>Proadinotherium</i>	<i>Adinotherium</i> , <i>Proadinotherium</i>		sociality		
<i>Plesiotoxodon</i> sp.	SF, PB	<i>Adinotherium</i> <i>ovinum</i>	<i>Adinotherium</i> <i>ovinum</i>	Am		(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Plesiotoxodon</i> sp.	Sum		Toxodontidae	Am			
<i>Plesiotypotherium</i> <i>achirens</i>, <i>P. majus</i>, <i>P. sp.</i>	WG	<i>Plesiotypotherium</i>	<i>Plesiotypotherium</i>	F		(Shockey, Croft, and Anaya 2007)	PCM
<i>Pliodasypus</i> <i>vergelianus</i>	WT	Extant Dasy-podini	Extant Dasy-podini	SF	This study, based on: all extant Dasypodini are semi-fossorial (Vizcaíno and Milne 2002)	(Vizcaíno and Milne 2002)	CLRs
<i>Pliodolichotis</i> sp.	SSF	<i>Dolichotis</i>	<i>Dolichotis</i>	C		(Elissamburu and Vizcaíno 2004)	Un
<i>Pliodolichotis</i> sp.	SSF	<i>Dolichotis</i>	<i>Dolichotis</i>	C		(Elissamburu and Santis 2011)	LR-E
<i>Pliodolichotis</i> sp.	SSF	<i>Dolichotis patagonum</i>	<i>Dolichotis patagonum</i>	C		(Patton, Pardiñas, and D'Elía 2015)	LR-E
<i>Pliodolichotis</i> sp.	Sum			C			
<i>Pliolestes</i> <i>tripotamicus</i>, <i>P. venetus</i>	SF	Extant caenolestids	Extant caenolestids	CS		(Abello, Ortiz-Jaureguizar, and Candel-la 2012)	LR-E
<i>Pliomegatherium</i> <i>lelongi</i> , <i>P. sp.</i>	SF	<i>Mesocnus</i> (Megalonychi-dae), <i>Megalo-cnus</i> (Meg-	<i>Mesocnus</i> , <i>Megalocnus</i> , <i>Prepothorium</i>	Am	Morphology very different from cursorial animals, consistent with arboreal or ambulatory	(J. L. White 1993)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		alonychidae), <i>Prepotherium</i> (Mega-theriidae)		habits			
<i>Pliomegatherium lelongi</i> , <i>P.</i> sp.	SF	<i>Megatherium</i>	<i>Megatherium</i>	GT	Could have run	(Fariña and Vizcaíno 1999)	BM
<i>Pliomegatherium lelongi</i> , <i>P.</i> sp.	AGp	"Extinct sloths"	"Extinct sloths"	Am	Unlikely that they could have outrun predators; likely fought rather than ran	(McDonald 2012)	PCM
<i>Pliomegatherium lelongi</i> , <i>P.</i> sp.	WF	Megatheriidae	Megatheriidae	T	Neither climbers nor diggers	(Pujos et al. 2012)	PB
<i>Pliomegatherium lelongi</i> , <i>P.</i> sp.	SF	<i>Megatherium lundi</i> , <i>M.</i> sp., <i>M. tarijense</i>	<i>Megatherium lundi</i> , <i>M.</i> sp., <i>M. tarijense</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Pliomegatherium lelongi</i> , <i>P.</i> sp.	SF	<i>Pyramiodontherium</i>	<i>Pyramiodontherium</i>	Am	"Slow walking gait only"	(Melchor et al. 2015)	Un
<i>Pliomegatherium lelongi</i> , <i>P.</i> sp.	SF	Santacrucian sloths, including representatives of Megatheriidae, Megalonychidae, and Mylodontidae	Santacrucian sloths, including representatives of Megatheriidae, Megalonychidae, and Mylodontidae	Am	"Not well-suited for fast locomotion"	(Toledo 2016)	PCM
<i>Pliomegatherium lelongi</i> , <i>P.</i>	Sum			Am			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

sp.							
<i>Pliomorphus mutilatus</i> , <i>P. robustus</i> , <i>P. sp.</i>	SF	<i>Acratocnus odontrigonus</i> , <i>A. sp.</i> , <i>Choloepus didactylus</i> , <i>C. hoffmanni</i> , <i>Eucholoeps sp.</i> , <i>Hapalops sp.</i> , <i>Megalonyx jeffersonii</i> , <i>Neocnus comes</i> , <i>Parocnus serus</i> , <i>Peleciodon arcuatus</i>	<i>Acratocnus odontrigonus</i> , <i>A. sp.</i> , <i>Choloepus didactylus</i> , <i>C. hoffmanni</i> , <i>Eucholoeps sp.</i> , <i>Hapalops sp.</i> , <i>Megalonyx jeffersonii</i> , <i>Neocnus comes</i> , <i>Parocnus serus</i> , <i>Peleciodon arcuatus</i>	Am or S	All scansorial except <i>Megalonyx</i> : terrestrial and <i>Choloepus</i> : arboreal (Categories: Terrestrial, Scansorial, Arboreal)	(Grass 2014)	PCGM
<i>Pliomorphus mutilatus</i> , <i>P. robustus</i> , <i>P. sp.</i>	WF	Megalonychidae	Megalonychidae	Am	This study, based on: Most megalonychids are scansorial or arboreal but some are ambulatory (Pujos et al. 2012); <i>Pliomorphus</i> is over 500 kg (Table S3.9); Around 150-200 kg is on the large end of what could reasonably be scansorial (Toledo et al. 2014)	(Pujos et al. 2012; Cione et al. 2000; Toledo et al. 2014)	PB, Mass
<i>Pliomorphus mutilatus</i> , <i>P. robustus</i> , <i>P. sp.</i>	Sum			Am			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

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<i>Plohophorus araucanus</i> , <i>P. cuneiformis</i> , <i>P. figuratus</i> , <i>P. paranensis</i> , <i>P. sp.</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Plohophorus araucanus</i> , <i>P. cuneiformis</i> , <i>P. figuratus</i> , <i>P. paranensis</i> , <i>P. sp.</i>	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Plohophorus araucanus</i> , <i>P. cuneiformis</i> , <i>P. figuratus</i> , <i>P. paranensis</i> , <i>P. sp.</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003)	PCM
<i>Plohophorus araucanus</i> , <i>P. cuneiformis</i> , <i>P. figuratus</i> , <i>P. paranensis</i> , <i>P. sp.</i>	PB	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaeohoplophorus</i> : terrestrial and slow-moving	(Croft 2016)	Un
<i>Plohophorus araucanus</i>, <i>P. cuneiformis</i>, <i>P. figuratus</i>, <i>P. paranensis</i>, <i>P. sp.</i>	Sum		Glyptodontidae	Am			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Posnanskytherium de-saguaderoi</i> , <i>P. inchasense</i> , <i>P. sp.</i>	SF, PB	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius imperator</i>	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius imperator</i>	Not Aq	Specialized knee joints with passive locks would allow them to stand for long periods of time and would be unneeded in the water	(Shockey 2001)	PCM
<i>Posnanskytherium de-saguaderoi</i> , <i>P. inchasense</i> , <i>P. sp.</i>	SF, PB	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	Am or GT	Part of a trend throughout evolution of Toxodontidae towards reduced cursoriality	(Andrea Elissamburu 2007)	PCM
<i>Posnanskytherium de-saguaderoi</i> , <i>P. inchasense</i> , <i>P. sp.</i>	SF, PB	<i>Adinotherium</i> <i>ovinum</i>	<i>Adinotherium</i> <i>ovinum</i>	Am		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Posnanskytherium de-saguaderoi</i>, <i>P. inchasense</i>, <i>P. sp.</i>	Sum		Toxodontidae	Am			
<i>Potamarchus murinus</i>, <i>P. sp.</i>	WG	<i>Potamarchus</i>	<i>Potamarchus</i>	C		Rinderknecht pers. comm.	Un
<i>Potamops mascahehenes</i>	WO	Chiroptera	Chiroptera	V		(Paleobiology Database)	Un
<i>Praectenomys</i> <i>sp.</i>	Tax	<i>Praectenomys</i>	<i>Praectenomys</i>	F		(Reig 1989)	CDM
<i>Praectenomys</i>	Tax	<i>Praectenomys</i>	<i>Praectenomys</i>	F		(Verzi 2008)	CDM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

sp.							
<i>Praectenomys</i> sp.	Tax	<i>Praectenomys</i>	<i>Praectenomys</i>	F		(Verzi, Olivares, and Morgan 2014)	PB
<i>Praectenomys</i> sp.	Sum			F			
<i>Prepotherium</i> sp.	Tax	<i>Mesocnus</i> (Megalonychidae), <i>Megalocnus</i> (Megalonychidae), <i>Prepotherium</i> (Megatheriidae)	<i>Mesocnus</i> , <i>Megalocnus</i> , <i>Prepotherium</i>	Am	Morphology very different from cursorial animals, consistent with arboreal or ambulatory habits	(White 1993)	PCM
<i>Prepotherium</i> sp.	SF	Megatherium	Megatherium	GT	Could have run	(Fariña and Vizcaíno 1999)	BM
<i>Prepotherium</i> sp.	AGp	"Extinct sloths"	"Extinct sloths"	Am	Unlikely that they could have outrun predators; likely fought rather than ran	(McDonald 2012)	PCM
<i>Prepotherium</i> sp.	WF	Megatheriidae	Megatheriidae	T	Neither climbers nor diggers	(Pujos et al. 2012)	PB
<i>Prepotherium</i> sp.	SF	<i>Megatherium lundii</i> , <i>M. sp.</i> , <i>M. tarijense</i>	<i>Megatherium lundii</i> , <i>M. sp.</i> , <i>M. tarijense</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Prepotherium</i> sp.	SF	<i>Pyramiodontherium</i>	<i>Pyramiodontherium</i>	Am	"Slow walking gait only"	(Melchor et al. 2015)	Un
<i>Prepotherium</i> sp.	AGp	Santacrucian sloths, including representatives of Mega-	Santacrucian sloths, including representatives of Mega-	Am	"Not well-suited for fast locomotion"	(Toledo 2016)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		theriidae, Megalonychi- dae, and Mylodontidae	theriidae, Meg- alonychidae, and Mylodonti- dae				
<i>Prepotherium</i> sp.	Sum			Am			
<i>Procyon can- crivorus</i>	Tax	<i>Procyon can- crivorus</i>	<i>Procyon can- crivorus</i>	S		(Eisenberg 1989; Red- ford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Prodaedicurus</i> sp.	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glypto- dontidae	Am	Large glyptodonts "Ca- pable of only a slow run"	(Fariña 1995b)	PCM
<i>Prodaedicurus</i> sp.	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Prodaedicurus</i> sp.	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glypto- dontidae	Am	Long bone morphology not congruent with run- ning or galloping	(Bargo 2003)	PCM
<i>Prodaedicurus</i> sp.	SF, PB	<i>Parapropalae- hoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalae- hoplophorus</i> , <i>Glyptodon</i> , <i>Pa- nochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalae- hoplophorus</i> : terrestrial and slow- moving	(Croft 2016)	Un
<i>Prodaedicurus</i> sp.	Sum		Glyptodonti- dae	Am			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Prodolichotis guerreroi</i> , <i>P. pridiana</i> , <i>P. sp.</i>	Tax, SG	<i>Prodolichotis pridiana</i>	<i>Prodolichotis pridiana</i>	GT		(Walton 1997)	PCM, MAs
<i>Proechimys</i> sp.	Tax	<i>Proechimys</i>	<i>Proechimys</i>	SF	Can climb but rarely do, mostly live in underground burrows	(Nowak 1999)	LR-E
<i>Proeremotherium eljebe</i>	SF	<i>Mesocnus</i> (Megalonychidae), <i>Megalocnus</i> (Megalonychidae), <i>Prepothorium</i> (Megatheriidae)	<i>Mesocnus</i> , <i>Megalocnus</i> , <i>Prepothorium</i>	Am	Morphology very different from cursorial animals, consistent with arboreal or ambulatory habits	(J. L. White 1993)	PCM
<i>Proeremotherium eljebe</i>	SF	<i>Megatherium</i>	<i>Megatherium</i>	GT	Could have run	(Fariña and Vizcaíno 1999)	BM
<i>Proeremotherium eljebe</i>	AGp	"Extinct sloths"	"Extinct sloths"	Am	Unlikely that they could have outrun predators; likely fought rather than ran	(McDonald 2012)	PCM
<i>Proeremotherium eljebe</i>	WF	Megatheriidae	Megatheriidae	T	Neither climbers nor diggers	(Pujos et al. 2012)	PB
<i>Proeremotherium eljebe</i>	SF	<i>Megatherium lundii</i> , <i>M. sp.</i> , <i>M. tarijense</i>	<i>Megatherium lundii</i> , <i>M. sp.</i> , <i>M. tarijense</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Proeremotherium eljebe</i>	SF	<i>Pyramiodontherium</i>	<i>Pyramiodontherium</i>	Am	"Slow walking gait only"	(Melchor et al. 2015)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

914	<i>Proeremotherium eljebe</i>	AGp	Santacrucian sloths, including representatives of Megatheriidae, Megalonychidae, and Mylodontidae	Santacrucian sloths, including representatives of Megatheriidae, Megalonychidae, and Mylodontidae	Am	"Not well-suited for fast locomotion"	(Toledo 2016)	PCM
	<i>Proeremotherium eljebe</i>	Sum			Am			
	<i>Proeuphractus limpidus</i> , <i>P. sp.</i>	ST	<i>Euphractus</i> , <i>Chaetophractus</i> , <i>Zaedyus</i>	<i>Euphractus</i> , <i>Chaetophractus</i> , <i>Zaedyus</i>	SF		(Vizcaíno and Milne 2002)	LR-E
	<i>Proeuphractus limpidus</i> , <i>P. sp.</i>	ST	<i>Prozaedyus exilis</i> , <i>P. sp.</i>	<i>Prozaedyus exilis</i> , <i>P. sp.</i>	SF		(Vizcaíno, Fernicola, and Bargo 2012)	PCM
	<i>Proeuphractus limpidus</i> , <i>P. sp.</i>	ST	<i>Prozaedyus proximus</i>	<i>Prozaedyus proximus</i>	SF		(Kay, Vizcaíno, and Bargo 2012)	Un
	<i>Proeuphractus limpidus</i> , <i>P. sp.</i>	ST	<i>Macro-euphractus outesi</i>	<i>Macroeuphractus outesi</i>	SF		(Croft 2016)	Un
	<i>Proeuphractus limpidus</i>, <i>P. sp.</i>	Sum		Euphractini	SF			
	<i>Proeutatus sp.</i>	Tax	<i>Proeutatus</i>	<i>Proeutatus</i>	SF	No Santacrucian armadillos reached, "the degree of curoriality of <i>Tolypeutes matacus</i> , the fossoriality of <i>Priodontes maximus</i> , or the subterranean habits of <i>Chlamyphorus truncatus</i> ."	(Vizcaíno, Fernicola, and Bargo 2012)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Proeutatus</i> sp.	SG	<i>Proeutatus oenophorus</i>	<i>Proeutatus oenophorus</i>	SF	No Santacrucian armadillos reached, "the degree of curoriality of <i>Tolypeutes matacus</i> , the fossoriality of <i>Priodontes maximus</i> , or the subterranean habits of <i>Chlamyphorus truncatus</i> ."	(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Proeutatus</i> sp.	ST	<i>Eutatus seguini</i>	<i>Eutatus seguini</i>	SF	Less fossorial specialization than <i>Priodontes</i>	(Vizcaíno, Milne, and Bargo 2003)	PCM
<i>Proeutatus</i> sp.	ST	<i>Eutatus</i> , <i>Ringueletia simpsoni</i>	<i>Ringueletia simpsoni</i>	SF	Built burrows	(Cenizo, Soibelzon, and Saffer 2015)	Ich
<i>Proeutatus</i> sp.	Sum		Eutatini	SF			
<i>Prolagostomus</i> sp.	See	<i>Lagostomus maximus</i>	<i>Lagostomus maximus</i>	SF	This study, based on: <i>Prolagostomus</i> probably had similar habits to <i>Lagostoma maximus</i> (Croft 2016); <i>Lagostomus maximus</i> builds extensive burrow systems (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Prolicaphrium sanalfonensis</i>	AGp	<i>Brachytherium</i> , <i>Diplasiotherium</i> , <i>Eoauchenia</i>	Late proterotheriids	C	Nearly monodactyl	(Webb 1978a)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Prolicaphrium sanalfonensis</i>	SF	cf. <i>Licaphrium</i> (=Proterotherium)	cf. <i>Licaphrium</i> (=Proterotherium)	C	Late Oligocene	(Shockey 1999)	PCM
<i>Prolicaphrium sanalfonensis</i>	WF	Proterotheriidae	Proterotheriidae	C	Early trend towards monodactyly	(Villafañe, Ortiz-Jaureguizar, and Bond 2006)	PCM
<i>Prolicaphrium sanalfonensis</i>	WF	Proterotheriidae	Proterotheriidae	C		(Martin Ubilla et al. 2009)	Un
<i>Prolicaphrium sanalfonensis</i>	WF	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	Proterotheriidae	C		(Guillermo H. Cassini et al. 2012)	PCM
<i>Prolicaphrium sanalfonensis</i>	SF	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	C		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Prolicaphrium sanalfonensis</i>	SF	<i>Neobrachytherium ullumense</i>	<i>Neobrachytherium ullumense</i>	C		(Croft 2016)	PCM
<i>Prolicaphrium sanalfonensis</i>	Sum		Proterotheriidae	C			
<i>Promacrauchenia antiqua</i> , <i>P. sp.</i>	Tax	<i>Promacrauchenia antiqua</i> , <i>P. kraglievichi</i> , <i>P. chapad-</i>	Macraucheniiidae	C		(Bond et al. 1995)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

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					<i>malense</i> , <i>Windhausenia</i> <i>delacroixi</i> , <i>Pseudo-</i> <i>macrauchenia</i> <i>yepesi</i> , <i>Macraucheni-</i> <i>opsis ense-</i> <i>nadensis</i> , <i>M.</i> <i>cf. M. ense-</i> <i>nadensis</i> , <i>Macrauchenia</i> <i>patachonica</i> , <i>Xenorhinother-</i> <i>ium bahiense</i>		
<i>Promacrauchenia antiqua</i> , <i>P.</i> sp.	SF	? <i>Coniopternium</i>	? <i>Coniopternium</i>	C	Locking knee would also allow standing for long periods of time	(Shockey 1999)	PCM
<i>Promacrauchenia antiqua</i> , <i>P.</i> sp.	SF	<i>Coniopternium</i>	<i>Coniopternium</i>	C	Locking knee would also allow standing for long periods of time	(Shockey and Anaya 2008)	PCM
<i>Promacrauchenia antiqua</i> , <i>P.</i> sp.	SF	<i>Theosodon gracilis</i> , <i>T. lydekkeri</i>	<i>Theosodon gracilis</i> , <i>T. lydekkeri</i>	C		(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Promacrauchenia antiqua</i> , <i>P.</i> sp.	WF	<i>Macraucheniidae</i>	<i>Macraucheniidae</i>	C		(Schmidt and Ferrero 2014)	LR
<i>Promacrauchenia antiqua</i> , <i>P.</i> sp.	SF	<i>Theosodon lallemanti</i> , <i>Macrauchenia</i>	<i>Theosodon lallemanti</i> , <i>Macrauchenia</i>	C		(Croft 2016)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>patachonica</i>	<i>patachonica</i>				
<i>Promacrauchenia antiqua</i>, <i>P. sp.</i>	Sum		Macraucheniidae	C			
<i>Promylodon paranensis</i>	SF	<i>Scelidotherium</i> , <i>Glossotherium</i>	<i>Scelidotherium</i> , <i>Glossotherium</i>	SF	Size of burrows consistent with mylodont builders, Claw marks inside burrows match mylodont hand, "anatomical, allometric, and biomechanical analysis of sloths limbs" suggests mylodonts could dig well	(Vizcaíno et al. 2001)	PM, BM, Ich, Mass
<i>Promylodon paranensis</i>	SF	<i>Scelidotherium</i> , <i>Scelidodon</i>	<i>Scelidotherium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Dondas, Isla, and Carbalido 2009)	Ich
<i>Promylodon paranensis</i>	SF	<i>Scelidotherium</i> , <i>Scelidodon</i>	<i>Scelidotherium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Genise and Farina 2012)	Ich
<i>Promylodon paranensis</i>	SF	<i>Scelidotherium</i> , <i>Glossotherium</i>	Mylodontidae	SF	.	(Pujos et al. 2012)	PB
<i>Promylodon paranensis</i>	SF	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> ,	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> ,	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>	<i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>				
	<i>Promylodon paranensis</i>	AGp	Large-size mylodont	Large-size mylodont	SF	(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph
	<i>Promylodon paranensis</i>	Sum		Mylodontidae	SF		
	<i>Pronothrotherium figueirasi</i> , <i>P. mirabilis</i>	AGp	"Extinct sloths"	"Extinct sloths"	Am	Unlikely that they could have outrun predators; likely fought rather than ran	(McDonald 2012) PCM
	<i>Pronothrotherium figueirasi</i> , <i>P. mirabilis</i>	WF	Nothrotheriidae	Nothrotheriidae	T	Neither climbers nor diggers	(Pujos et al. 2012) PB
	<i>Pronothrotherium figueirasi</i> , <i>P. mirabilis</i>	SF	Nothrotheriops shastensis, <i>N. sp.</i>	Nothrotheriops shastensis, <i>N. sp.</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014) PCGM
	<i>Pronothrotherium figueirasi</i> , <i>P. mirabilis</i>	See	Santacrucian sloths, including representatives of (Mega-theriidae + Nothrotheriidae), Megalonychidae, and Mylodontidae	Santacrucian sloths, including representatives of (Mega-theriidae + Nothrotheriidae), Megalonychidae, and Mylodontidae	Am	"Not well-suited for fast locomotion"	(Toledo 2016) PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

920	<i>Pronothrotherium figueirasi</i>, <i>P. mirabilis</i>	Sum		Am			
	<i>Propalaeophorus australis</i> , <i>P. sp.</i>	SF	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b) PCM
	<i>Propalaeophorus australis</i> , <i>P. sp.</i>	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001) LR
	<i>Propalaeophorus australis</i> , <i>P. sp.</i>	SF	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003) PCM
	<i>Propalaeophorus australis</i> , <i>P. sp.</i>	SF, PB	<i>Parapropalaeophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaeophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaeophorus</i> : terrestrial and slow-moving	(Croft 2016) Un
	<i>Propalaeophorus australis</i>, <i>P. sp.</i>	Sum		Glyptodontidae	Am		
	<i>Propithecina neuquenensis</i>	WIO	Platyrrhini	Platyrrhini	A	(Ferrari 2009)	Un
	<i>Propraopus sp.</i> , <i>P. sulcatus</i>	SG	<i>Propraopus grandis</i>	<i>Propraopus grandis</i>	SF	Same "generalized habits of the subfamily Dasypodinae"	(Fariña and Vizcaíno 1997) PCM
	<i>Propraopus sp.</i> , <i>P. sulcatus</i>	WG	<i>Propraopus</i>	<i>Propraopus</i>	SF		(Vizcaíno et al. 2001) PCM, Tph

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

921	<i>Propaopus</i> sp., <i>P. sulcatus</i>	Sum	SF					
	<i>Proscelidodon patrius</i> , <i>P. sp.</i>	SSF	<i>Scelidothierium</i> , <i>Glossotherium</i>	<i>Scelidothierium</i> , <i>Glossotherium</i>	SF	Size of burrows consistent with mylodont builders, Claw marks inside burrows match mylodont hand, "anatomical, allometric, and biomechanical analysis of sloths limbs" suggests mylodonts could dig well	(Vizcaíno et al. 2001)	PM, BM, Ich, Mass
	<i>Proscelidodon patrius</i> , <i>P. sp.</i>	SSF	<i>Scelidothierium</i> , <i>Scelidodon</i>	<i>Scelidothierium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Dondas, Isla, and Carbalido 2009)	Ich
	<i>Proscelidodon patrius</i> , <i>P. sp.</i>	SSF	<i>Scelidothierium</i> , <i>Scelidodon</i>	<i>Scelidothierium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Genise and Farina 2012)	Ich
	<i>Proscelidodon patrius</i> , <i>P. sp.</i>	WF	<i>Scelidothierium</i> , <i>Glossotherium</i>	Mylodontidae	SF		(Pujos et al. 2012)	PB
	<i>Proscelidodon patrius</i> , <i>P. sp.</i>	SF	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , <i>P. sp.</i> ,	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , <i>P. sp.</i> ,	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>	<i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>				
<i>Proscelidodon patrius</i> , <i>P. sp.</i>	AGp	Large-size mylodont	Large-size mylodont	SF		(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph
<i>Proscelidodon patrius</i>, <i>P. sp.</i>	Sum		Mylodontidae	SF			
<i>Protabrocoma sp.</i>	SF	<i>Abrocoma</i>	<i>Abrocoma</i>	S		(Patton, Pardiñas, and D'Elía 2015)	LR-E
<i>Protacaremys denisae</i>	SG	<i>Protacaremys prior</i>, <i>Acarechimys minutus</i>, and 'Acaremys' <i>preminutus</i>	<i>Protacaremys prior</i>, <i>Acarechimys minutus</i>, and 'Acaremys' <i>preminutus</i>	SF	This study, based on: Closely related to <i>Acarechimys</i> (Arnal and Vucetich 2015); <i>Acarechimys</i> is part of the semifossorial-fossorial clade (Verzi, Olivares, and Morgan 2014)	(Arnal and Vucetich 2015; Verzi, Olivares, and Morgan 2014)	PB
<i>Protamandua rothi</i>	Tax	<i>Protamandua rothi</i>	<i>Protamandua rothi</i>	S		(Bargo, Toledo, and Vizcaíno 2012)	PCM
<i>Protamandua rothi</i>	Tax	<i>Protamandua rothi</i>	<i>Protamandua rothi</i>	S		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Protamandua rothi</i>	Tax	<i>Protamandua rothi</i>	<i>Protamandua rothi</i>	S		(Vizcaíno and Bargo 2014)	LR
<i>Protamandua</i>	Sum			S			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

rothi							
<i>Proterotherium cervioides</i> , P. sp.	AGp	<i>Brachytherium</i> , <i>Diplasiotherium</i> , <i>Eoauchenia</i>	Late proterotheriids	C	Nearly monodactyl	(Webb 1978a)	PCM
<i>Proterotherium cervioides</i> , P. sp.	SF	cf. <i>Licaphrium</i> (= <i>Proterotherium</i>)	cf. <i>Licaphrium</i> (= <i>Proterotherium</i>)	C	Late Oligocene	(Shockey 1999)	PCM
<i>Proterotherium cervioides</i> , P. sp.	WF	Proterotheriidae	Proterotheriidae	C	Early trend towards monodactyly	(Villafañe, Ortiz-Jaureguizar, and Bond 2006)	PCM
<i>Proterotherium cervioides</i> , P. sp.	WF	Proterotheriidae	Proterotheriidae	C		(Ubilla et al. 2009)	Un
<i>Proterotherium cervioides</i> , P. sp.	WF	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	Proterotheriidae	C		(Cassini et al. 2012)	PCM
<i>Proterotherium cervioides</i> , P. sp.	SF	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	C		(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Proterotherium cervioides</i> , P. sp.	SF	<i>Neobrachytherium ullumense</i>	<i>Neobrachytherium ullumense</i>	C		(Croft 2016)	PCM
Proterotherium	Sum		Proterotheri-	C			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

924	<i>cervioidea</i> , <i>P.</i> <i>sp.</i>		riidae				
	<i>Prothoatherium</i> <i>sp.</i>	SG	<i>Prothoatherium</i> <i>colombianus</i>	<i>Prothoatherium</i> <i>colombianus</i>	C	(Cifelli and Diaz 1989)	PCM
	<i>Prothylacynus</i> <i>patagonicus</i>	Tax	<i>Prothylacynus</i> <i>patagonicus</i>	<i>Prothylacynus</i> <i>patagonicus</i>	S	Ambush predator	(Argot 2004b)
	<i>Prothylacynus</i> <i>patagonicus</i>	Tax	<i>Prothylacynus</i> <i>patagonicus</i>	<i>Prothylacynus</i> <i>patagonicus</i>	S		(Ercoli, Prevosti, and Álvarez 2012) PCM
	<i>Prothylacynus</i> <i>patagonicus</i>	Tax	<i>Prothylacynus</i> <i>patagonicus</i>	<i>Prothylacynus</i> <i>patagonicus</i>	S		(Kay, Vizcaíno, and Bargo 2012) Un
	<i>Prothylacynus</i> <i>patagonicus</i>	Sum			S		
	<i>Protocyon</i> <i>orcesi</i> , <i>P. sp.</i> , <i>P. tarijensis</i> , <i>P. troglodytes</i>	Tax, SG	<i>P. orcesi</i> , <i>P. troglodytes</i> , <i>P. sp. nov.</i>	<i>P. orcesi</i> , <i>P. troglodytes</i> , <i>P. sp. nov.</i>	C		(Prevosti, Zurita, and Carlini 2005) PCM
	<i>Protocyon</i> <i>orcesi</i> , <i>P. sp.</i> , <i>P. tarijensis</i> , <i>P. troglodytes</i>	WG	<i>Protocyon</i>	<i>Protocyon</i>	C		(Soibelzon and Prevosti 2013) LR
	<i>Protocyon</i> <i>orcesi</i> , <i>P. sp.</i> , <i>P. tarijensis</i> , <i>P. troglodytes</i>	Sum			C		
	<i>Protyglyptodon</i> <i>primiformis</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalypus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b) PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Protoglyptodon primiformis</i>	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Protoglyptodon primiformis</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glypto- dontidae	Am	Long bone morphology not congruent with run- ning or galloping	(Bargo 2003)	PCM
<i>Protoglyptodon primiformis</i>	SF, PB	<i>Parapropalae- hoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalae- hoplophorus</i> , <i>Glyptodon</i> , <i>Pa- nochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalae- hoplophorus</i> : terrestrial and slow- moving	(Croft 2016)	Un
<i>Protoglyptodon primiformis</i>	Sum		Glyptodonti- dae	Am			
<i>Protomegalonyx chasicoensis</i> , <i>P. doellojuradoi</i> , <i>P. praecursor</i> , <i>P. sp.</i>	SF	<i>Acratocnus odontrigonus</i> , <i>A. sp.</i> , <i>Choloepus di- dactylus</i> , <i>C. hoffmanni</i> , <i>Eu- choloeps sp.</i> , <i>Hapalops sp.</i> , <i>Megalonyx jef- fersonii</i> , <i>Ne- ocnus comes</i> , <i>Parocnus se- rus</i> , <i>Pelecyo- don arcuatus</i>	<i>Acratocnus odontrigonus</i> , <i>A. sp.</i> , <i>Choloepus di- dactylus</i> , <i>C. hoffmanni</i> , <i>Eu- choloeps sp.</i> , <i>Hapalops sp.</i> , <i>Megalonyx jef- fersonii</i> , <i>Ne- ocnus comes</i> , <i>Parocnus serus</i> , <i>Peleciodon ar- cuatus</i>	Am or S	All scansorial except <i>Megalonyx</i> : terrestrial and <i>Choloepus</i> : arboreal (Categories: Terrestrial, Scansorial, Arboreal)	(Grass 2014, 201)	PCGM
<i>Protomegalonyx chasicoensis</i> , <i>P.</i>	WF	Megalonychi- dae	Megalonychi- dae	Am	This study, based on: Most megalonychids are	(Pujos et al. 2012; Toledo et al. 2014)	PB, Mass

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>doellojuradoi</i> , <i>P. praecursor</i> , <i>P. sp.</i>					scansorial or arboreal but some are ambulatory; <i>Protomegalonyx</i> is ~150 kg (Table S3.9); Around 150-200 kg is on the large end of what could reasonably be scansorial (Toledo et al. 2014)		
<i>Protomegalonyx chasicoensis</i> , <i>P. doellojuradoi</i> , <i>P. praecursor</i> , <i>P. sp.</i>	Tax, SG	<i>Protomegalonyx chasicoensis</i>	<i>Protomegalonyx chasicoensis</i>	Am	"Terrestrial"	(Croft 2016)	Un
<i>Protomegalonyx chasicoensis</i>, <i>P. doellojuradoi</i>, <i>P. praecursor</i>, <i>P. sp.</i>	Sum			Am			
<i>Protopithecus brasiliensis</i>	Tax	<i>Protopithecus brasiliensis</i>	<i>Protopithecus brasiliensis</i>	A		(Halenar 2011a; Halenar 2012)	PCM
<i>Protypotherium antiquum</i>, <i>P. australe</i>, <i>P. sp.</i>	WG	<i>Protypotherium</i>	<i>Protypotherium</i>	GT	"<i>Protypotherium</i> was most likely a generalized terrestrial mammal tending toward cursoriality."	(Croft and Anderson 2008)	PCM
<i>Prozaedyus proximus</i> , <i>P. sp.</i>	Tax, SG	<i>Prozaedyus proximus</i>	<i>Prozaedyus proximus</i>	SF		(Vizcaíno, Fernicola, and Bargo 2012)	PCM
<i>Prozaedyus proximus</i> , <i>P. sp.</i>	Tax, SG	<i>Prozaedyus proximus</i>	<i>Prozaedyus proximus</i>	SF		(Kay, Vizcaíno, and Bargo 2012)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Prozaedyus proximus</i> , <i>P. sp.</i>	Sum	SF					
<i>Lycalopex (=Pseudolopex) gymnocercus</i>	Tax	<i>Lycalopex (=Pseudolopex) gymnocercus</i>	<i>Lycalopex (=Pseudolopex) gymnocercus</i>	C	(Samuels, Meachen, and Sakai 2013)		LR-E
<i>Pseudolycopsis cabrerai</i>	SSF	<i>Prothylacynus</i>	<i>Prothylacynus</i>	S	(Ercoli, Prevosti, and Álvarez 2012)		PCM
<i>Pseudoplateomys formosus</i>	SG	<i>Pseudoplateomys innominatus</i>	<i>Pseudoplateomys innominatus</i>	SF	(Verzi, Olivares, and Morgan 2014)		PB
<i>Pseudoplohophorus absolutus</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Pseudoplohophorus absolutus</i>	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Pseudoplohophorus absolutus</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003)	PCM
<i>Pseudoplohophorus absolutus</i>	SF, PB	<i>Parapropalaehoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaehoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaehoplophorus</i> : terrestrial and slow-moving	(Croft 2016)	Un
<i>Pseudoplohophorus</i>	Sum	Glyptodontidae		Am			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

928	absolutus						
	<i>Pseudopre-</i> <i>pothorium con-</i> <i>fusum, P. sp., P.</i> <i>venezuelanum</i>	SF	<i>Scelidotheri-</i> <i>um, Glos-</i> <i>sotherium</i>	<i>Scelidothorium,</i> <i>Glossotherium</i>	SF	Size of burrows con- sistent with mylodont builders, Claw marks in- side burrows match mylodont hand, "anatom- ical, allometric, and bio- mechanical analysis of sloths limbs" suggests mylodonts could dig well	(Vizcaíno et al. 2001) PM, BM, Ich, Mass
	<i>Pseudopre-</i> <i>pothorium con-</i> <i>fusum, P. sp., P.</i> <i>venezuelanum</i>	SF	<i>Scelidotheri-</i> <i>um, Scelidodon</i>	<i>Scelidothorium,</i> <i>Scelidodon</i>	SF	May be associated with searching for social in- sects as food	(Dondas, Isla, and Carbal- lido 2009) Ich
	<i>Pseudopre-</i> <i>pothorium con-</i> <i>fusum, P. sp., P.</i> <i>venezuelanum</i>	Sf	<i>Scelidotheri-</i> <i>um, Scelidodon</i>	<i>Scelidothorium,</i> <i>Scelidodon</i>	SF	May be associated with searching for social in- sects as food	(Genise and Farina 2012) Ich
	<i>Pseudopre-</i> <i>pothorium con-</i> <i>fusum, P. sp., P.</i> <i>venezuelanum</i>	WF	<i>Scelidotheri-</i> <i>um, Glos-</i> <i>sotherium</i>	Mylodontidae	SF	.	(Pujos et al. 2012) PB

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Pseudopre- pothorium con- fusum</i> , <i>P. sp.</i> , <i>P. venezuelanum</i>	SF	<i>Catonyx tari- jensis</i> , <i>Glos- sotherium ro- bustum</i> , <i>G. sp.</i> , <i>Lestodon ar- matus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. lep- tocephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>	<i>Catonyx tari- jensis</i> , <i>Glos- sotherium ro- bustum</i> , <i>G. sp.</i> , <i>Lestodon ar- matus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. lep- tocephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Pseudopre- pothorium con- fusum</i> , <i>P. sp.</i> , <i>P. venezuelanum</i>	AGp	Large-size mylodont	Large-size mylodont	SF		(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph
<i>Pseudopre- pothorium con- fusum</i>, <i>P. sp.</i>, <i>P. venezue- lanum</i>	Sum		Mylodontidae	SF			
<i>Pseudosig- momys sp.</i>	Tax	<i>Pseudosig- momys</i>	<i>Pseudosig- momys</i>	C		Rinderknecht pers. comm.	Un
<i>Pseudoty- pothorium sp.</i>	WF	<i>Mesotherium cristatum</i> , <i>Ple- siotypotherium achirense</i> , <i>Trachytherus</i>	Mesotheriidae	F		(Shockey, Croft, and Anaya 2007)	PCM, PB

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>spegazzinianus</i>							
<i>Pteronotus</i> sp.	WO	Chiroptera	Chiroptera	V		(Paleobiology Database)	Un
<i>Pteronura brasiliensis</i>	Tax	<i>Pteronura brasiliensis</i>	<i>Pteronura brasiliensis</i>	Aq		(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Puma concolor</i> , <i>P. sp.</i> , <i>P. yagouaroundi</i>	Tax, SG	<i>Puma concolor</i> , <i>P. yagouaroundi</i>	<i>Puma concolor</i> , <i>P. yagouaroundi</i>	S		(Nowak 1999)	LR-E
<i>Puma concolor</i> , <i>P. sp.</i> , <i>P. yagouaroundi</i>	Tax, SG	<i>Puma concolor</i>	<i>Puma concolor</i>	S		(Samuels, Meachen, and Sakai 2013)	LR-E
<i>Puma concolor</i>, <i>P. sp.</i>, <i>P. yagouaroundi</i>	Sum			S			
<i>Purperia cribatidens</i>	SF	<i>Huilatherium pluripicatum</i>	<i>Huilatherium pluripicatum</i>	Aq		(Kay and Madden 1997b)	Un
<i>Purperia cribatidens</i>	SF	<i>Huilatherium pluripicatum</i>	<i>Huilatherium pluripicatum</i>	Aq		Chapter 5	SI
<i>Purperia cribatidens</i>	Sum			Aq			
<i>Pyramiodontherium scillatoyanei</i> , <i>P. sp.</i>	SF	<i>Mesocnus</i> (Megalonychidae), <i>Megalocnus</i> (Megalonychidae), <i>Prepothierium</i> (Megatheriidae)	<i>Mesocnus</i> , <i>Megalocnus</i> , <i>Prepothierium</i>	Am	Morphology very different from cursorial animals, consistent with arboreal or ambulatory habits	(White 1993)	PCM
<i>Pyramiodon-</i>	SF	<i>Megatherium</i>	<i>Megatherium</i>	GT	Could have run	(Fariña and Vizcaíno	BM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

931	<i>therium scilla-</i> <i>toyanei</i> , <i>P. sp.</i>					1999)	
	<i>Pyramiodon-</i> <i>therium scilla-</i> <i>toyanei</i> , <i>P. sp.</i>	AGp	"Extinct sloths"	"Extinct sloths"	Am	Unlikely that they could have outrun predators; likely fought rather than ran	(McDonald 2012) PCM
	<i>Pyramiodon-</i> <i>therium scilla-</i> <i>toyanei</i> , <i>P. sp.</i>	WF	Megatheriidae	Megatheriidae	T	Neither climbers nor dig- gers	(Pujos et al. 2012) PB
	<i>Pyramiodon-</i> <i>therium scilla-</i> <i>toyanei</i> , <i>P. sp.</i>	SF	<i>Megatherium</i> <i>lundi</i> , <i>M. sp.</i> , <i>M. tarijense</i>	<i>Megatherium</i> <i>lundi</i> , <i>M. sp.</i> , <i>M. tarijense</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014) PCGM
	<i>Pyramiodon-</i> <i>therium scilla-</i> <i>toyanei</i> , <i>P. sp.</i>	WG	<i>Pyramiodon-</i> <i>therium</i>	<i>Pyramiodon-</i> <i>therium</i>	Am	"Slow walking gait only"	(Melchor et al. 2015) Un
	<i>Pyramiodon-</i> <i>therium scilla-</i> <i>toyanei</i> , <i>P. sp.</i>	AGp	Santacrucian sloths, includ- ing representa- tives of Mega- theriidae, Megalonychida- dae, and Mylodontidae	Santacrucian sloths, includ- ing representa- tives of Mega- theriidae, Meg- alonychidae, and Mylodonti- dae	Am	"Not well-suited for fast locomotion"	(Toledo 2016) PCM
	<i>Pyramiodon-</i> <i>therium scilla-</i> <i>toyanei</i>, <i>P. sp.</i>	Sum			Am		
	<i>Ranculus sca-</i> <i>labrinianus</i> , <i>R.</i> <i>sp.</i>	SF	<i>Scelidotheri-</i> <i>um</i> , <i>Glos-</i> <i>sotherium</i>	<i>Scelidothorium</i> , <i>Glossotherium</i>	SF	Size of burrows con- sistent with mylodont builders, Claw marks in- side burrows match	(Vizcaíno et al. 2001) PM, BM, Ich, Mass

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

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					mylodont hand, "anatomical, allometric, and biomechanical analysis of sloths limbs" suggests mylodonts could dig well		
<i>Ranculcus scalabrinianus</i> , R. sp.	SF	<i>Scelidotherrum</i> , <i>Scelidodon</i>	<i>Scelidotherrum</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Dondas, Isla, and Carbalido 2009)	Ich
<i>Ranculcus scalabrinianus</i> , R. sp.	SF	<i>Scelidotherrum</i> , <i>Scelidodon</i>	<i>Scelidotherrum</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Genise and Farina 2012)	Ich
<i>Ranculcus scalabrinianus</i> , R. sp.	WF	<i>Scelidotherrum</i> , <i>Glossotherium</i>	Mylodontidae	SF		(Pujos et al. 2012)	PB
<i>Ranculcus scalabrinianus</i> , R. sp.	SF	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , G. sp., <i>Lestodon armatus</i> , L. sp., <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , P. sp., <i>Scelidotherrum carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , S. sp.	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , G. sp., <i>Lestodon armatus</i> , L. sp., <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , P. sp., <i>Scelidotherrum carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , S. sp.	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Ranculcus scalabrinianus</i> , R.	AGp	Large-size mylodont	Large-size mylodont	SF		(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

933	sp.							
	<i>Ranculus scalabrinianus</i>, R. sp.	Sum	Mylodontidae		SF			
	<i>Reigomys</i> (=Holochilus) <i>primigenus</i>	PB	<i>Holochilus</i> , <i>Reigomys</i> , <i>Pseudoryzomys</i> , <i>Lundomys</i>	<i>Holochilus</i> , <i>Reigomys</i> , <i>Pseudoryzomys</i> , <i>Lundomys</i>	Aq	Intermediate between <i>Lundomys</i> and <i>Holochilus</i> , both of which are semi-aquatic	(Steppan 1996)	Phylogeny
	<i>Reigomys</i> (=Holochilus) <i>primigenus</i>	PB	<i>Holochilus</i> , <i>Reigomys</i> , <i>Pseudoryzomys</i> , <i>Lundomys</i>	<i>Holochilus</i> , <i>Reigomys</i> , <i>Pseudoryzomys</i> , <i>Lundomys</i>	Aq	This study, based on: Phylogenetically bracketed immediately between <i>Holochilus</i> and <i>Pseudoryzomys</i> and <i>Lundomys</i> (which is basal to <i>P.</i>), which all are adapted to amphibious lifestyles in open habitats (Machado et al. 2014)	(Machado et al. 2014)	PB
	<i>Reigomys</i> (=Holochilus) <i>primigenus</i>	Sum	Aq					
	<i>Reithrodon auritus</i> , R. sp.	Tax	<i>Reithrodon physodes</i> (=R. <i>auritus</i>)	<i>Reithrodon physodes</i> (=R. <i>auritus</i>)	GT	Will build their own burrows or use <i>Ctenomys</i> burrows	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
	<i>Reithrodon auritus</i> , R. sp.	WG	<i>Reithrodon</i>	<i>Reithrodon</i>	GT	Will build their own burrows or use armadillo or other burrows, with or without modification	(Nowak 1999)	LR-E

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Reithrodon auritus</i> , <i>R. sp.</i>	WG	<i>Reithrodon</i>	<i>Reithrodon</i>	GT	"Ambulatory": "species that usually use the ground to move about and do not have specializations that limit any particular activity"	(Carrizo et al. 2014)	LR-E
<i>Reithrodon auritus</i> , <i>R. sp.</i>	Sum			GT			
<i>Rhogeessa sp.</i>	WO	Chiroptera	Chiroptera	V		(Paleobiology Database)	Un
<i>Ricardomys longidens</i>	Tax	<i>Ricardomys longidens</i>	<i>Ricardomys longidens</i>	S		(Kay and Madden 1997b)	Un
<i>Ringueletia sp.</i>	ST	<i>Proeutatus</i>	<i>Proeutatus</i>	SF	No Santacrucian armadillos reached, "the degree of curoriality of <i>Tolypeutes matacus</i> , the fossoriality of <i>Priodontes maximus</i> , or the subterranean habits of <i>Chlamyphorus truncatus</i> ."	(Vizcaíno, Fernicola, and Bargo 2012)	PCM
<i>Ringueletia sp.</i>	ST	<i>Proeutatus</i>	<i>Proeutatus</i>	SF	No Santacrucian armadillos reached, "the degree of curoriality of <i>Tolypeutes matacus</i> , the fossoriality of <i>Priodontes maximus</i> , or the subterranean habits of <i>Chlamyphorus truncatus</i> ."	(Vizcaíno, Fernicola, and Bargo 2012)	Un
<i>Ringueletia sp.</i>	ST	<i>Eutatus seguini</i>	<i>Eutatus seguini</i>	SF	Less fossorial specialization than <i>Priodontes</i>	(Vizcaíno, Milne, and Bargo 2003)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Ringueletia</i> sp.	SG	<i>Eutatus</i> , <i>Ringueletia</i> <i>simpsoni</i>	<i>Ringueletia</i> <i>simpsoni</i>	SF	Built burrows	(Cenizo, Soibelzon, and Saffer 2015)	Ich
<i>Ringueletia</i> sp.	Sum			SF			
<i>Sairadelphys</i> <i>tocantinensis</i>	SisG	<i>Hyladelphys</i> <i>kalinowskii</i>	<i>Hyladelphys</i> <i>kalinowskii</i>	S	This study, based on: <i>Sairadelphys</i> is the sister group to <i>Hyladelphys</i> (Oliveira et al. 2011); <i>Hyladelphys</i> is scansorial (Moraes et al. 2016)	(Oliveira et al. 2011; Moraes et al. 2016)	CLR
<i>Scalabrinitherium</i> <i>bravardi</i> , S. sp.	WF	<i>Promacrauchenia</i> <i>antigua</i> , <i>P. kraglievichi</i> , <i>P. chapadmalense</i> , <i>Windhausen</i> <i>delacroixi</i> , <i>Pseudomacrauchenia</i> <i>yepesi</i> , <i>Macrauchenia</i> <i>opsis ensenadensis</i> , <i>M. cf. M. ensenadensis</i> , <i>Macrauchenia</i> <i>patachonica</i> , <i>Xenorhinother-</i>	<i>Macrauchenia</i> <i>niidae</i>	C		(Bond et al. 1995)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>ium bahiense</i>							
<i>Scalabrinitherium bravardi</i> , S. sp.	SF	? <i>Coniopternium</i>	? <i>Coniopternium</i>	C	Locking knee would also allow standing for long periods of time	(Shockey 1999)	PCM
<i>Scalabrinitherium bravardi</i> , S. sp.	SF	<i>Coniopternium</i>	<i>Coniopternium</i>	C	Locking knee would also allow standing for long periods of time	(Shockey and Anaya 2008)	PCM
<i>Scalabrinitherium bravardi</i> , S. sp.	SF	<i>Theosodon gracilis</i> , T. lydekkeri	<i>Theosodon gracilis</i> , T. lydekkeri	C		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Scalabrinitherium bravardi</i> , S. sp.	WF	Macraucheniiidae	Macraucheniiidae	C		(Schmidt and Ferrero 2014)	LR
<i>Scalabrinitherium bravardi</i> , S. sp.	SF	<i>Theosodon lallemanti</i> , <i>Macrauchenia</i>	<i>Theosodon lallemanti</i> , <i>Macrauchenia</i>	C		(Croft 2016)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>patachonica</i>	<i>patachonica</i>				
<i>Scalabrinitherium bravardi</i> , S. sp.	Sum		Macraucheniidae	C			
<i>Scapteromys hershkovitzi</i>	See	<i>Kunsia tomentosus</i> , <i>Glydenstopia fronto</i> , G. <i>planaltensis</i>	<i>Kunsia tomentosus</i> , <i>Glydenstopia fronto</i> , G. <i>planaltensis</i>	SF	This study, based on: <i>Scapteromys hershkovitzi</i> is closer related to, and possibly congeneric with one of, <i>Kunsia</i> and <i>Glydenstopia</i> (Pardiñas, D'Elía, and Teta 2008; Pardiñas 2013; Bezerra and Pardiñas 2016); <i>Kunsia</i> and <i>Glydenstopia</i> are semi-fossorial (Patton, Pardiñas, and D'Elía 2015)	(Pardiñas, D'Elía, and Teta 2008; Pardiñas 2013; Bezerra and Pardiñas 2016; Patton, Pardiñas, and D'Elía 2015)	CLR
<i>Scapteromys tumidus</i>	Tax	<i>Scapteromys tumidus</i>	<i>Scapteromys tumidus</i>	Aq		(Patton, Pardiñas, and D'Elía 2015)	LR-E
<i>Scelidotherridium</i> sp.	SSF	<i>Scelidotherridium</i> , <i>Glossotherium</i>	<i>Scelidotherridium</i> , <i>Glossotherium</i>	SF	Size of burrows consistent with mylodont builders, Claw marks inside burrows match mylodont hand, "anatomical, allometric, and biomechanical analysis of sloths limbs" suggests mylodonts could dig well	(Vizcaíno et al. 2001)	PM, BM, Ich, Mass

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Scelidotheridium</i> sp.	SSF	<i>Scelidotherium</i> , <i>Scelidodon</i>	<i>Scelidotherium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Dondas, Isla, and Carbalido 2009)	Ich
<i>Scelidotheridium</i> sp.	SSF	<i>Scelidotherium</i> , <i>Scelidodon</i>	<i>Scelidotherium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Genise and Farina 2012)	Ich
<i>Scelidotheridium</i> sp.	WF	<i>Scelidotherium</i> , <i>Glossotherium</i>	Mylodontidae	SF	.	(Pujos et al. 2012)	PB
<i>Scelidotheridium</i> sp.	SSF	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Scelidotheridium</i> sp.	AGp	Large-size mylodont	Large-size mylodont	SF		(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph
<i>Scelidotheridium</i> sp.	Sum		Mylodontidae	SF			
<i>Scelidotherium leptcephalum</i> , <i>S. sp.</i>	WG	<i>Scelidotherium</i> , <i>Glossotherium</i>	<i>Scelidotherium</i> , <i>Glossotherium</i>	SF	Size of burrows consistent with mylodont builders, Claw marks in-	(Vizcaíno et al. 2001)	PM, BM, Ich,

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

					side burrows match mylodont hand, "anatomical, allometric, and biomechanical analysis of sloths limbs" suggests mylodonts could dig well		Mass
<i>Scelidotherium leptocephalum</i> , S. sp.	WG	<i>Scelidotherium</i> , <i>Scelidodon</i>	<i>Scelidotherium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Dondas, Isla, and Carbalido 2009)	Ich
<i>Scelidotherium leptocephalum</i> , S. sp.	WG	<i>Scelidotherium</i> , <i>Scelidodon</i>	<i>Scelidotherium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Genise and Farina 2012)	Ich
<i>Scelidotherium leptocephalum</i> , S. sp.	WG	<i>Scelidotherium</i> , <i>Glossotherium</i>	Mylodontidae	SF		(Pujos et al. 2012)	PB
<i>Scelidotherium leptocephalum</i> , S. sp.	Tax, SG	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , G. sp., <i>Lestodon armatus</i> , L. sp., <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , P. sp., <i>Scelidotherium carlesi</i> , <i>S. leptocephalum</i> , <i>S. bravardi</i> , S. sp.	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , G. sp., <i>Lestodon armatus</i> , L. sp., <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , P. sp., <i>Scelidotherium carlesi</i> , <i>S. leptocephalum</i> , <i>S. bravardi</i> , S. sp.	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Scelidotherium leptcephalum</i> , S. sp.	AGp	Large-size mylodont	Large-size mylodont	SF		(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph
<i>Scelidotherium leptcephalum</i>, S. sp.	Sum		Mylodontidae	SF			
<i>Sciamys petisensis</i> , S. sp.	SF, PB	<i>Acarechimys</i> , <i>Acaremys</i> , <i>Caviocricetus</i> , <i>Neophanomys</i>	<i>Acarechimys</i> , <i>Acaremys</i> , <i>Caviocricetus</i> , <i>Neophanomys</i>	SF	This study, based on: Inclusion of acaremyids in the semifossorial-fossorial group (Verzi, Olivares, and Morgan 2014)	(Verzi, Olivares, and Morgan 2014)	PB
<i>Scirrotherium carinatum</i> , S. <i>hondaensis</i> , S. sp.	SF	<i>Pampatherium humboldtii</i>	<i>Pampatherium humboldtii</i>	C	Adapted for fast movements, also may have been able to burrow	(Abrantes, Avilla, and Vizcaíno 2005)	PCM
<i>Scirrotherium carinatum</i> , S. <i>hondaensis</i> , S. sp.	SF	<i>Pampatherium humboldtii</i>	<i>Pampatherium humboldtii</i>	C	Adapted for fast movements	(Rincón, White, and Mcdonald 2008)	PCM
<i>Scirrotherium carinatum</i>, S. <i>hondaensis</i>, S. sp.	Sum			C			
<i>Sclerocalyptus ornatus</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Sclerocalyptus ornatus</i>	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Sclerocalyptus ornatus</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glypto- dontidae	Am	Long bone morphology not congruent with run- ning or galloping	(Bargo 2003)	PCM
<i>Sclerocalyptus ornatus</i>	SF	<i>Parapropalaeh oplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaeh oplophorus</i> , <i>Glyptodon</i> , <i>Pa- nochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaehoplopho- rus</i> : terrestrial and slow- moving	(Croft 2016)	Un
<i>Sclerocalyptus ornatus</i>	Sum		Glyptodonti- dae	Am			
<i>Scleromys co- lombianus</i> , <i>S. schurmanni</i> , <i>S. sp.</i>	Tax, SG	<i>Scleromys co- lombianus</i> , <i>S. schurmanni</i>	<i>Scleromys co- lombianus</i> , <i>S. schurmanni</i>	GT	More cursorial than <i>Dinomys branickii</i> but less cursorial than <i>Da- syprocta</i> and <i>Myoprocta</i>	(Walton 1997)	PCM
<i>Sigmodon his- pidus</i> , <i>S. sp.</i>	Tax, SG	<i>Sigmodon his- pidus</i>	<i>Sigmodon his- pidus</i>	GT	"Terrestrial," Catego- ries: Terrestrial, Cur- sorial, Semifossorial, Fossorial, Gliding, Ric- ochetal, Semiaquatic, Scansorial, Arboreal	(Samuels and Van Valkenburgh 2008)	LR-E
<i>Simplimus sp.</i>	Tax	<i>Simplimus</i>	<i>Simplimus</i>	C		Rinderknecht pers. comm.	Un
<i>Sipalocyon gra- cilis</i> , <i>S. sp.</i>	Tax, SG	<i>Sipalocyon gracilis</i>	<i>Sipalocyon gra- cilis</i>	S		(Argot 2004b)	PCM
<i>Sipalocyon gra- cilis</i> , <i>S. sp.</i>	Tax, SG	<i>Sipalocyon gracilis</i>	<i>Sipalocyon gra- cilis</i>	S		(Ercoli, Prevosti, and Ál- varez 2012)	PCM
<i>Sipalocyon gra- cilis</i> , <i>S. sp.</i>	Tax, SG	<i>Sipalocyon gracilis</i>	<i>Sipalocyon gra- cilis</i>	S		(Kay, Vizcaíno, and Bar- go 2012)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Sipalocyon gracilis</i> , <i>S. sp.</i>	Sum			S			
<i>Smilodon fatalis</i> , <i>S. gracilis</i> , <i>S. populator</i> , <i>S. sp.</i>	Tax, SG	<i>Smilodon fatalis</i>	<i>Smilodon fatalis</i>	GT	Powerful, but not adapted for running distances or running very fast	(Samuels, Meachen, and Sakai 2013)	PCM
<i>Solimoea acensis</i>	WI O	Platyrrhini	Platyrrhini	A		(Ferrari 2009)	Un
<i>Sparassocynus heterotopicus</i> , <i>S. sp.</i>	SG	<i>Sparassocynus derivatus</i>	<i>Sparassocynus derivatus</i>	SF	Specifies that details are unknown, but that based on analogy with dasyurid marsupials of Australia, likely dug burrows and may have searched for prey underground as well	(Croft 2016)	MA
<i>Speothos sp.</i>	SG	<i>Speothos venaticus</i>	<i>Speothos venaticus</i>	SF		(Samuels, Meachen, and Sakai 2013)	LR-E
<i>Sphenotherus paranensis</i> , <i>S. sp.</i>	SF	<i>Scelidotherium</i> , <i>Glossotherium</i>	<i>Scelidotherium</i> , <i>Glossotherium</i>	SF	Size of burrows consistent with mylodont builders, Claw marks inside burrows match mylodont hand, "anatomical, allometric, and biomechanical analysis of sloths limbs" suggests mylodonts could dig well	(Vizcaíno et al. 2001)	PM, BM, Ich, Mass
<i>Sphenotherus paranensis</i> , <i>S. sp.</i>	SF	<i>Scelidotherium</i> , <i>Scelidodon</i>	<i>Scelidotherium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Dondas, Isla, and Carbalido 2009)	Ich

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Sphenotherus paranensis</i> , S. sp.	SF	<i>Scelidothierium</i> , <i>Scelidodon</i>	<i>Scelidothierium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Genise and Farina 2012)	Ich
<i>Sphenotherus paranensis</i> , S. sp.	WF	<i>Scelidothierium</i> , <i>Glossotherium</i>	Mylodontidae	SF		(Pujos et al. 2012)	PB
<i>Sphenotherus paranensis</i> , S. sp.	SF	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , G. sp., <i>Lestodon armatus</i> , L. sp., <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , P. sp., <i>Scelidothierium carlesi</i> , S. <i>leptocephalum</i> , S. <i>bravardi</i> , S. sp.	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , G. sp., <i>Lestodon armatus</i> , L. sp., <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , P. sp., <i>Scelidothierium carlesi</i> , S. <i>leptocephalum</i> , S. <i>bravardi</i> , S. sp.	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Sphenotherus paranensis</i> , S. sp.	AGp	Large-size mylodont	Large-size mylodont	SF		(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph
<i>Sphenotherus paranensis</i>, S. sp.	Sum		Mylodontidae	SF			
<i>Stegomastodon platensis</i>, S. sp.	WO	Proboscidea	Proboscidea	Am		(Janis et al. 1998)	Un
<i>Steiromys</i> sp.	SG	<i>Steiromys duplicatus</i>	<i>Steiromys duplicatus</i>	S		(Candela and Picasso 2008)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Steiromys</i> sp.	SG	<i>Steiromys duplicatus</i>	<i>Steiromys duplicatus</i>	S		(Candela, Rasia, and Pérez 2012)	PCM
<i>Steiromys</i> sp.	SG	<i>Steiromys duplicatus</i>	<i>Steiromys duplicatus</i>	S		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Steiromys</i> sp.	Sum			S			
<i>Stenotatus</i> sp.	SG	<i>Stenotatus patagonicus</i>	<i>Stenotatus patagonicus</i>	SF	Good digging ability but foraged largely above ground and more cursorial than subterranean armadillos	(Vizcaíno, Bargo, and Cassini 2006)	PCM
<i>Stenotatus</i> sp.	SG	<i>Stenotatus patagonicus</i>	<i>Stenotatus patagonicus</i>	SF		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Stenotatus</i> sp.	Sum			SF			
<i>Stenotephanos plicidens</i>	SF, PB	<i>Toxodon, Adinotherium, Hoffstetterius imperator</i>	<i>Toxodon, Adinotherium, Hoffstetterius imperator</i>	Not Aq	Specialized knee joints with passive locks would allow them to stand for long periods of time and would be unneeded in the water	(Shockey 2001)	PCM
<i>Stenotephanos plicidens</i>	SF, PB	<i>Toxodon, Trigodon, Nesodon, Adinotherium, Proadinotherium</i>	<i>Toxodon, Trigodon, Nesodon, Adinotherium, Proadinotherium</i>	Am or GT	Part of a trend throughout evolution of Toxodontidae towards reduced cursoriality	(Elissamburu 2007)	PCM
<i>Stenotephanos plicidens</i>	SF, PB	<i>Adinotherium ovinum</i>	<i>Adinotherium ovinum</i>	Am		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Stenotephanos</i>	Sum		Toxodontidae	Am			

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>plicidens</i>							
<i>Stirtonia</i> sp., <i>S. tatacoensis</i>, <i>S. victoriae</i>	WI O	Platyrrhini	Platyrrhini	A		(Ferrari 2009)	Un
<i>Stromaphorus</i> sp.	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Stromaphorus</i> sp.	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Stromaphorus</i> sp.	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003)	PCM
<i>Stromaphorus</i> sp.	SF, PB	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaeohoplophorus</i> : terrestrial and slow-moving	(Croft 2016)	Un
<i>Stromaphorus</i> sp.	Sum		Glyptodontidae	Am			
<i>Surameryx acrensis</i>	WSF	Dromomerycinae	Dromomerycinae	GT	This study, based on Janis 2000: Shorter limbs than Aletomerycinae	(Janis 2000)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Surameryx acrensis</i>	WSF	Dromomerycinae	Dromomerycinae	GT	Shorter legs than cursorial Aletomerycinae, suggesting denser woodland habitats (which is consistent with microwear, mesowear, and morphological records of diet as well)	(Semprebon, Janis, and Solounias 2004)	PCM, DMc, DMs, DM
<i>Surameryx acrensis</i>	Sum			GT			
<i>Sylvilagus floridanus</i> , <i>S. sp.</i>	Tax, SG	<i>Sylvilagus floridanus</i>	<i>Sylvilagus floridanus</i>	CS		(Chapman, Hockman, and Ojeda C. 1980)	LR-E
<i>Sylvochoerus woodburnei</i>	See	<i>Tayassu pecari</i>	<i>Tayassu pecari</i>	C	This study, based on: <i>S. woodburnei</i> is closely related to <i>Tayassu pecari</i> (Frailey and Campbell 2012), and <i>T. pecari</i> is cursorial (Nowak 1999)	(Nowak 1999; Frailey and Campbell 2012)	LR-E
<i>Tadarida brasiliensis</i>	WO	Chiroptera	Chiroptera	V		(Paleobiology Database)	Un
<i>Tafimys powelli</i>	Tax	<i>Tafimys powelli</i>	<i>Tafimys powelli</i>	GT		Ortiz pers. comm.	Un
<i>Tapirus greslebini</i> , <i>T. mesopotamicus</i> , <i>T. olivaresi</i> , <i>T. sp.</i> , <i>T. terrestris</i>	WG	<i>Tapirus</i>	<i>Tapirus</i>	Aq		(Nowak 1999)	LR-E
<i>Tayassu pecari</i> , <i>T. sp.</i>	Tax, SG	<i>Tayassu pecari</i>	<i>Tayassu pecari</i>	C		(Nowak 1999)	LR-E

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Telicomys amazonensis</i>	WG	<i>Telicomys</i>	<i>Telicomys</i>	C		Rinderknecht pers. comm.	Un
<i>Tetramerorhinus cingulatum</i> (= <i>T. fortis</i>), <i>T. sp.</i>	SG	<i>Tetramerorhinus mixtum</i>	<i>Tetramerorhinus mixtum</i>	C		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Tetrastylus araucanus</i> , <i>T. sp.</i>	WG	<i>Tetrastylus</i>	<i>Tetrastylus</i>	C		Rinderknecht pers. comm.	Un
<i>Thalassocnus antiquus</i>	Tax	<i>Thalassocnus antiquus</i>	<i>Thalassocnus antiquus</i>	Aq	Slightly younger than <i>T. yaucensis</i> , but similar morphologically; both share a lot with terrestrial nothrotheres	(Muizon et al. 2003)	CDM, PCM, Tph
<i>Thalassocnus carolomartini</i> , <i>T. littoralis</i> , <i>T. natans</i> , <i>T. sp.</i>	Tax, SG	<i>Thalassocnus carolomartini</i> , <i>T. littoralis</i> , <i>T. natans</i>	<i>Thalassocnus carolomartini</i> , <i>T. littoralis</i> , <i>T. natans</i>	Aq	<i>T. natans</i> is intermediate, with <i>T. littoralis</i> and then <i>T. carolomartini</i> progressively more specialized	(McDonald and De Muizon 2002)	CDM, PCM, Tph
<i>Thalassocnus yaucensis</i>	Tax	<i>Thalassocnus yaucensis</i>	<i>Thalassocnus yaucensis</i>	Aq	Oldest sp., least aquatic	(Muizon et al. 2004)	CDM, PCM, Tph

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Theosodon</i> sp.	WF	<i>Promacrauchenia antiqua</i> , <i>P. kraglievichi</i> , <i>P. chapadmalense</i> , <i>Windhausenia delacroixi</i> , <i>Pseudomacrauchenia yepesi</i> , <i>Macrauchenioptis ensenadensis</i> , <i>M. cf. M. ensenadensis</i> , <i>Macrauchenia patachonica</i> , <i>Xenorhinotherium bahiense</i>	Macrauchenidae	C		(Bond et al. 1995)	Un
<i>Theosodon</i> sp.	SF	? <i>Coniopternium</i>	? <i>Coniopternium</i>	C	Locking knee would also allow standing for long periods of time	(Shockey 1999)	PCM
<i>Theosodon</i> sp.	SF	<i>Coniopternium</i>	<i>Coniopternium</i>	C	Locking knee would also allow standing for long periods of time	(Shockey and Anaya 2008)	PCM
<i>Theosodon</i> sp.	SG	<i>Theosodon gracilis</i> , <i>T. lydekkeri</i>	<i>Theosodon gracilis</i> , <i>T. lydekkeri</i>	C		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Theosodon</i> sp.	WF	Macrauchen-	Macrauchen-	C		(Schmidt and Ferrero	LR

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		niidae	niidae			2014)	
<i>Theosodon</i> sp.	SG	<i>Theosodon lallemanti</i> , <i>Macrauchenia patachonica</i>	<i>Theosodon lallemanti</i> , <i>Macrauchenia patachonica</i>	C		(Croft 2016)	Un
<i>Theosodon</i> sp.	Sum		Macrauchenidae	C			
<i>Theriodictis</i> sp.	Tax	<i>Theriodictis</i>	<i>Theriodictis</i>	C		(Soibelzon and Prevosti 2013)	LR
<i>Thrichomys</i> sp.	Tax	<i>Thrichomys</i>	<i>Thrichomys</i>	GT		(Patton, Pardiñas, and D'Elía 2015)	LR-E
<i>Thylacosmilus atrox</i> , <i>T. sp.</i>	Tax, SG	<i>Thylacosmilus atrox</i>	<i>Thylacosmilus atrox</i>	GT	Powerful, but not adapted for running distances or running very fast	(Argot 2004b)	PCM
<i>Thylacosmilus atrox</i> , <i>T. sp.</i>	Tax, SG	<i>Thylacosmilus atrox</i>	<i>Thylacosmilus atrox</i>	GT to C	Slightly cursorial	(Ercoli, Prevosti, and Álvarez 2012)	PCM
<i>Thylacosmilus atrox</i>, <i>T. sp.</i>	Sum			GT			
<i>Thylamys minutus</i> , <i>T. pinei</i> , <i>T. sp.</i>	SG	<i>T. elegans</i>	<i>T. elegans</i>	S	"Can be captured both arboreally and terrestrially"	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	LR-E
<i>Thylatheridium hudsoni</i> , <i>T. sp.</i>	SisG	<i>Monodelphys</i>	<i>Monodelphys</i>	GT	This study, based on: <i>Thylatheridium</i> and <i>Monodelphys</i> sister groups (Forasiepi, Goin, and Martinelli 2009; Chemisquy et al. 2015); <i>Monodelphys</i> is "terrestrial-to-semi-fossorial"	(Forasiepi, Goin, and Martinelli 2009; Chemisquy et al. 2015; Gardner 2007b)	LR-E

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

					although at least some species (<i>M. brevicaudata</i> , <i>M. domestica</i> , <i>M. palliolata</i> , <i>M. sp.</i>) also have climbing ability (Gardner 2007b)		
<i>Thylophorops chapalmalensis</i>	SG	<i>Thylophorops lorenzinii</i>	<i>Thylophorops lorenzinii</i>	SF	This study, based on: Found in a burrow, though burrow probably built by xenarthran (Goin et al. 2009); Use of burrows may suggest broader semifossorial habits	(Goin et al. 2009)	Tph
<i>Tolypeutes sp.</i> , <i>T. tricinctus</i>	WG	<i>Tolypeutes</i>	<i>Tolypeutes</i>	GT	Runs "relatively rapidly" but depends largely on armor for defense against predation	(Nowak 1999)	LR-E
<i>Torcellia paranense</i>	SF	<i>Acratocnus odontrigonus</i> , <i>A. sp.</i> , <i>Choloepus didactylus</i> , <i>C. hoffmanni</i> , <i>Eucholoepus sp.</i> , <i>Hapalops sp.</i> , <i>Megalonyx jeffersonii</i> , <i>Neocnus comes</i> , <i>Parocnus se-</i>	<i>Acratocnus odontrigonus</i> , <i>A. sp.</i> , <i>Choloepus didactylus</i> , <i>C. hoffmanni</i> , <i>Eucholoepus sp.</i> , <i>Hapalops sp.</i> , <i>Megalonyx jeffersonii</i> , <i>Neocnus comes</i> , <i>Parocnus serus</i> ,	Am or S	All scansorial except <i>Megalonyx</i> : terrestrial and <i>Choloepus</i> : arboreal (Categories: Terrestrial, Scansorial, Arboreal)	(Grass 2014)	PCGM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>rus, Pelecyo-</i> <i>don arcuatus</i>	<i>Peleciodon ar-</i> <i>cuatus</i>				
<i>Torcellia</i> <i>paranense</i>	WF	Megalonychidae	Megalonychidae	Am	This study, based on: Most megalonychids are scansorial or arboreal but some are ambulatory (Pujos et al. 2012); <i>Torcellia paranense</i> is over 500 kg (Table S3.9); Around 150-200 kg is on the large end of what could reasonably be scansorial (Toledo et al. 2014)	(Pujos et al. 2012; Toledo et al. 2014)	PB, Mass
<i>Torcellia</i> <i>paranense</i>	Sum			Am			
<i>Toxodon bilobidens</i> , <i>T. paranensis</i> , <i>T. platensis</i> , <i>T. sp.</i>	SF, PB	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius imperator</i>	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius imperator</i>	Not Aq	Specialized knee joints with passive locks would allow them to stand for long periods of time and would be unneeded in the water	(Shockey 2001)	PCM
<i>Toxodon bilobidens</i> , <i>T. paranensis</i> , <i>T. platensis</i> , <i>T. sp.</i>	SF, PB	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	Am or GT	Part of a trend throughout evolution of Toxodontidae towards reduced cursoriality	(Elissamburu 2007)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Toxodon bi-lobidens</i> , <i>T. paranensis</i> , <i>T. platensis</i> , <i>T. sp.</i>	SF, PB	<i>Adinotherium ovinum</i>	<i>Adinotherium ovinum</i>	Am		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Toxodon bi-lobidens</i>, <i>T. paranensis</i>, <i>T. platensis</i>, <i>T. sp.</i>	Sum		Toxodontidae	Am			
<i>Trachops cirrhosus</i>	WO	Chiroptera	Chiroptera	V			Un
<i>Trachycalyptoides</i> sp.	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Trachycalyptoides</i> sp.	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Trachycalyptoides</i> sp.	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003)	PCM
<i>Trachycalyptoides</i> sp.	SF, PB	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaeohoplophorus</i> : terrestrial and slow-moving	(Croft 2016)	Un
<i>Trachycalyptoides</i> sp.	Sum		Glyptodontidae	Am			
<i>Trachycalyptus cingulatus</i> , <i>T.</i>	AGp	<i>Glyptodon</i> , <i>Panochthus</i> ,	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

sp.		<i>Doedicurus,</i> <i>Sclerocalyptus</i>					
<i>Trachycalyptus</i> <i>cingulatus</i> , T. sp.	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Trachycalyptus</i> <i>cingulatus</i> , T. sp.	AGp	<i>Glyptodon,</i> <i>Panochthus,</i> <i>Doedicurus,</i> <i>Sclerocalyptus</i>	Large Glypto- dontidae	Am	Long bone morphology not congruent with run- ning or galloping	(Bargo 2003)	PCM
<i>Trachycalyptus</i> <i>cingulatus</i> , T. sp.	SF, PB	<i>Parapropalaeh</i> <i>oplophorus,</i> <i>Glyptodon,</i> <i>Panochthus,</i> <i>Doedicurus,</i> <i>Sclerocalyptus</i>	<i>Parapropalaeh</i> <i>oplophorus,</i> <i>Glyptodon, Pa-</i> <i>nochthus,</i> <i>Doedicurus,</i> <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus, Glyptodon</i>) graviportal, <i>Parapropalaehoplopho-</i> <i>rus</i> : terrestrial and slow- moving	(Croft 2016)	Un
<i>Trachycalyptus</i> <i>cingulatus</i> , T. sp.	Sum		Glyptodonti- dae	Am			
<i>Trachytypother-</i> <i>ium</i> sp.	WF	<i>Mesotherium</i> <i>cristatum, Ple-</i> <i>siotypotherium</i> <i>achirens,</i> <i>Trachytherus</i> <i>spgazzinianus</i>	Mesotheriidae	F		(Shockey, Croft, and Anaya 2007)	PCM, PB
<i>Tremacyllus</i> <i>impressus</i> , T. sp.	WG	<i>Tremacyllus</i>	<i>Tremacyllus</i>	SF	Similar craniodental and postcranial adapta- tions to sister group, <i>Paedotherium</i> , which is semifossorial	(Candela, Noriega, and Reguero 2007)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Trigodon gaudryi</i> , <i>T. sp.</i>	SF, PB	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius</i> <i>imperator</i>	<i>Toxodon</i> , <i>Adinotherium</i> , <i>Hoffstetterius</i> <i>imperator</i>	Not Aq	Specialized knee joints with passive locks would allow them to stand for long periods of time and would be unneeded in the water	(Shockey 2001)	PCM
<i>Trigodon gaudryi</i> , <i>T. sp.</i>	WG	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	<i>Toxodon</i> , <i>Trigodon</i> , <i>Nesodon</i> , <i>Adinotherium</i> , <i>Proadinotherium</i>	Am or GT	Part of a trend throughout evolution of Toxodontidae towards reduced cursoriality	(Elissamburu 2007)	PCM
<i>Trigodon gaudryi</i> , <i>T. sp.</i>	SF, PB	<i>Adinotherium</i> <i>ovinum</i>	<i>Adinotherium</i> <i>ovinum</i>	Am		(Kay, Vizcaíno, and Bargo 2012)	Un
<i>Trigodon gaudryi</i> , <i>T. sp.</i>	Sum		Toxodontidae	Am			
<i>Typotheriopsis</i> sp.	WF	<i>Mesotherium cristatum</i> , <i>Plesiotypotherium achirensense</i> , <i>Trachytherus spegazzinianus</i>	Mesotheriidae	F		(Shockey, Croft, and Anaya 2007)	PCM, PB
<i>Typotherium cristatum</i>	WF	<i>Mesotherium cristatum</i> , <i>Plesiotypotherium achirensense</i> , <i>Trachytherus spegazzinianus</i>	Mesotheriidae	F		(Shockey, Croft, and Anaya 2007)	PCM, PB
<i>Urocyon cinereogargenteus</i>	Tax	<i>Urocyon cinereogargenteus</i>	<i>Urocyon cinereogargenteus</i>	S	Documented climbing and lives in forests, with	(Samuels, Meachen, and Sakai 2013)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

	<i>teus</i>			postcranial adaptations for climbing			
<i>Urotherium interundatum</i> , U. sp.	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Urotherium interundatum</i> , U. sp.	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Urotherium interundatum</i> , U. sp.	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003)	PCM
<i>Urotherium interundatum</i> , U. sp.	SF, PB	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaeohoplophorus</i> : terrestrial and slow-moving	(Croft 2016)	Un
<i>Urotherium interundatum</i> , U. sp.	Sum		Glyptodontidae	Am			
<i>Urumacotherium</i> (= <i>Stenodon</i>) <i>campbelli</i> , U. sp.	SF	<i>Scelidothierium</i> , <i>Glossotherium</i>	<i>Scelidothierium</i> , <i>Glossotherium</i>	SF	Size of burrows consistent with mylodont builders, Claw marks inside burrows match mylodont hand, "anatomical, allometric, and biomechanical analysis of sloths limbs" suggests	(Vizcaíno et al. 2001)	PM, BM, Ich, Mass

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

mylodonts could dig well							
<i>Urumacotherium</i> (= <i>Stenodon</i>) <i>campbelli</i> , U. sp.	SF	<i>Scelidotherium</i> , <i>Scelidodon</i>	<i>Scelidotherium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Dondas, Isla, and Carbalido 2009)	Ich
<i>Urumacotherium</i> (= <i>Stenodon</i>) <i>campbelli</i> , U. sp.	SF	<i>Scelidotherium</i> , <i>Scelidodon</i>	<i>Scelidotherium</i> , <i>Scelidodon</i>	SF	May be associated with searching for social insects as food	(Genise and Farina 2012)	Ich
<i>Urumacotherium</i> (= <i>Stenodon</i>) <i>campbelli</i> , U. sp.	WF	<i>Scelidotherium</i> , <i>Glossotherium</i>	Mylodontidae	SF		(Pujos et al. 2012)	PB
<i>Urumacotherium</i> (= <i>Stenodon</i>) <i>campbelli</i> , U. sp.	SF	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , G. sp., <i>Lestodon armatus</i> , L. sp., <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , P. sp., <i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , S. sp.	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , G. sp., <i>Lestodon armatus</i> , L. sp., <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , P. sp., <i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , S. sp.	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Urumacotherium</i> (= <i>Stenodon</i>) <i>campbelli</i> , U.	AGp	Large-size mylodont	Large-size mylodont	SF		(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

sp.							
Urumacotherium (= <i>Stenodon</i>) campbelli, U. sp.	Sum		Mylodontidae	SF			
<i>Urumaquia robusta</i>	SF	<i>Mesocnus</i> (Megalonychidae), <i>Megalocnus</i> (Megalonychidae), <i>Prepotherium</i> (Megatheriidae)	<i>Mesocnus</i> , <i>Megalocnus</i> , <i>Prepotherium</i>	Am	Morphology very different from cursorial animals, consistent with arboreal or ambulatory habits	(White 1993)	PCM
<i>Urumaquia robusta</i>	SF	<i>Megatherium</i>	<i>Megatherium</i>	GT	Could have run	(Fariña and Vizcaíno 1999)	BM
<i>Urumaquia robusta</i>	AGp	"Extinct sloths"	"Extinct sloths"	Am	Unlikely that they could have outrun predators; likely fought rather than ran	(McDonald 2012)	PCM
<i>Urumaquia robusta</i>	WF	Megatheriidae	Megatheriidae	T	Neither climbers nor diggers	(Pujos et al. 2012)	PB
<i>Urumaquia robusta</i>	SF	<i>Megatherium lundii</i> , <i>M. sp.</i> , <i>M. tarijense</i>	<i>Megatherium lundii</i> , <i>M. sp.</i> , <i>M. tarijense</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Urumaquia robusta</i>	SF	<i>Pyramiodontherium</i>	<i>Pyramiodontherium</i>	Am	"Slow walking gait only"	(Melchor et al. 2015)	Un
<i>Urumaquia robusta</i>	SF	Santacrucian sloths, including representa-	Santacrucian sloths, including representa-	Am	"Not well-suited for fast locomotion"	(Toledo 2016)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		tives of Mega- theriidae, Megalonychi- dae, and Mylodontidae	tives of Mega- theriidae, Meg- alonychidae, and Mylodonti- dae				
<i>Urumaquia ro- busta</i>	Sum			Am			
<i>Valgipes buck- landi</i>	SF	<i>Scelidotheri- um, Glos- sotherium</i>	<i>Scelidothorium, Glossotherium</i>	SF	Size of burrows con- sistent with mylodont builders, Claw marks in- side burrows match mylodont hand, "anatom- ical, allometric, and bio- mechanical analysis of sloths limbs" suggests mylodonts could dig well	(Vizcaíno et al. 2001)	PM, BM, Ich, Mass
<i>Valgipes buck- landi</i>	SF	<i>Scelidotheri- um, Scelidodon</i>	<i>Scelidothorium, Scelidodon</i>	SF	May be associated with searching for social in- sects as food	(Dondas, Isla, and Carbal- lido 2009)	Ich
<i>Valgipes buck- landi</i>	SF	<i>Scelidotheri- um, Scelidodon</i>	<i>Scelidothorium, Scelidodon</i>	SF	May be associated with searching for social in- sects as food	(Genise and Farina 2012)	Ich
<i>Valgipes buck- landi</i>	WF	<i>Scelidotheri- um, Glos- sotherium</i>	Mylodontidae	SF		(Pujos et al. 2012)	PB

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Valgipes bucklandi</i>	SF	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>	<i>Catonyx tarijensis</i> , <i>Glossotherium robustum</i> , <i>G. sp.</i> , <i>Lestodon armatus</i> , <i>L. sp.</i> , <i>Lestobradys sprechmanni</i> , <i>Paramylodon harlani</i> , <i>P. sp.</i> , <i>Scelidotherium carlesi</i> , <i>S. leptcephalum</i> , <i>S. bravardi</i> , <i>S. sp.</i>	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Valgipes bucklandi</i>	AGp	Large-size mylodont	Large-size mylodont	SF		(Cenizo, Soibelzon, and Saffer 2015)	Ich, Tph
<i>Valgipes bucklandi</i>	Sum		Mylodontidae	SF			
<i>Vassallia sp.</i>	SF	<i>Pampatherium humboldtii</i>	<i>Pampatherium humboldtii</i>	C	Adapted for fast movements, also may have been able to burrow	(Abrantes, Avilla, and Vizcaíno 2005)	PCM
<i>Vassallia sp.</i>	SF	<i>Pampatherium humboldtii</i>	<i>Pampatherium humboldtii</i>	C	Adapted for fast movements	(Rincón, White, and McDonald 2008)	PCM
<i>Vassallia sp.</i>	Sum			C			
<i>Vetelia sp.</i>	ST	<i>Euphractus</i> , <i>Chaetophractus</i> , <i>Zaedyus</i>	<i>Euphractus</i> , <i>Chaetophractus</i> , <i>Zaedyus</i>	SF		(Vizcaíno and Milne 2002)	LR-E
<i>Vetelia sp.</i>	ST	<i>Prozaedyus exilis</i> , <i>P. sp.</i>	<i>Prozaedyus exilis</i> , <i>P. sp.</i>	SF		(Vizcaíno, Fernicola, and Bargo 2012)	PCM
<i>Vetelia sp.</i>	ST	<i>Prozaedyus</i>	<i>Prozaedyus</i>	SF		(Kay, Vizcaíno, and Bar-	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>proximus</i>	<i>proximus</i>			go 2012)	
<i>Vetelia</i> sp.	ST	<i>Macro-euphractus outesi</i>	<i>Macroeuphractus outesi</i>	SF		(Croft 2016)	Un
<i>Vetelia</i> sp.	Sum		Euphractini	SF			
<i>Vicugna vicugna</i>	Tax	<i>Vicugna vicugna</i>	<i>Vicugna vicugna</i>	C	Runs up to 47 km/hr	(Nowak 1999)	LR-E
<i>Villarroelia totoyoi</i>	AGp	<i>Brachytherium</i> , <i>Diplasiotherium</i> , <i>Eoauchenia</i>	Late proterotheriids	C	Nearly monodactyl	(Webb 1978a)	PCM
<i>Villarroelia totoyoi</i>	SF	cf. <i>Licaphrium</i> (=Proterotherium)	cf. <i>Licaphrium</i> (=Proterotherium)	C	Late Oligocene	(Shockey 1999)	PCM
<i>Villarroelia totoyoi</i>	WF	Proterotheriidae	Proterotheriidae	C	Early trend towards monodactyly	(Villafañe, Ortiz-Jaureguizar, and Bond 2006)	PCM
<i>Villarroelia totoyoi</i>	WF	Proterotheriidae	Proterotheriidae	C		(Ubilla et al. 2009)	Un
<i>Villarroelia totoyoi</i>	WF	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> , <i>Thoatherium minusculum</i>	Proterotheriidae	C		(Cassini et al. 2012)	PCM
<i>Villarroelia totoyoi</i>	SF	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> ,	<i>Diadiaphorus majusculus</i> , <i>Tetramerorhinus mixtum</i> ,	C		(Kay, Vizcaíno, and Bar-go 2012)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		<i>Thoatherium minusculum</i>	<i>Thoatherium minusculum</i>				
<i>Villarroelia totoyoi</i>	SF	<i>Neobrachytherium ullaumense</i>	<i>Neobrachytherium ullaumense</i>	C	(Croft 2016)	PCM	
<i>Villarroelia totoyoi</i>	Sum		Proterothere- riidae	C			
<i>Waldochoerus bassleri</i>	See	<i>Pecari tajacu</i>	<i>Pecari tajacu</i>	C	This study, based on: <i>Pecari tajacu</i> runs up to 35 km/hr (Nowak 1999); and <i>Waldochoerus bassleri</i> closely related to and morphologically very similar to <i>Pecari tajacu</i> (Frailey and Campbell 2012)	(Nowak 1999; Frailey and Campbell 2012)	LR-E
<i>Windhausenina</i> sp.	SG	<i>Promacrauchenia antiqua</i> , <i>P. kraglievichi</i> , <i>P. chapadmalense</i> , <i>Windhausenina delacroixi</i> , <i>Pseudomacrauchenia yepesi</i> , <i>Macrauchenia opsis ensenadensis</i> , <i>M.</i>	<i>Macrauchenia</i> niidae	C	(Bond et al. 1995)	Un	

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

		cf. <i>M. ensenadensis</i> , <i>Macrauchenia patachonica</i> , <i>Xenorhinotherium bahiense</i>					
<i>Windhauseniasp.</i>	SF	? <i>Coniopternium</i>	? <i>Coniopternium</i>	C	Locking knee would also allow standing for long periods of time	(Shockey 1999)	PCM
<i>Windhauseniasp.</i>	SF	<i>Coniopternium</i>	<i>Coniopternium</i>	C	Locking knee would also allow standing for long periods of time	(Shockey and Anaya 2008)	PCM
<i>Windhauseniasp.</i>	SF	<i>Theosodon gracilis</i> , <i>T. lydekkeri</i>	<i>Theosodon gracilis</i> , <i>T. lydekkeri</i>	C		(Kay, Vizcaíno, and Bar-go 2012)	Un
<i>Windhauseniasp.</i>	WF	Macraucheniidae	Macraucheniidae	C		(Schmidt and Ferrero 2014)	LR
<i>Windhauseniasp.</i>	WF	<i>Theosodon lallemanti</i> , <i>Macrauchenia patachonica</i>	<i>Theosodon lallemanti</i> , <i>Macrauchenia patachonica</i>	C		(Croft 2016)	Un
<i>Windhauseniasp.</i>	Sum		Macraucheniidae	C			
<i>Xenastrapotherium aequatorialis</i> , <i>X. amazonense</i> , <i>X. kraglievichi</i> , <i>X. sp.</i>	SF	<i>Astrapotherium</i>	<i>Astrapotherium</i>	Aq		(Riggs 1935)	Tph
<i>Xenastrapotherium aequatori-</i>	SF	<i>Astrapotherium</i> , <i>Parastra-</i>	<i>Astrapotherium</i> , <i>Parastrapother-</i>	Aq	"Short and weak" limbs; Often found in or near	(Scott 1937)	PCM, Tph

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>alis, X. ama-</i> <i>zonense, X. kra-</i> <i>glievichi, X. sp.</i>		<i>potherium</i>	<i>ium</i>	ancient river channels			
<i>Xenastrapother-</i> <i>ium aequatori-</i> <i>alis, X. ama-</i> <i>zonense, X. kra-</i> <i>glievichi, X. sp.</i>	Tax, SG	<i>Granastra-</i> <i>potherium</i> <i>snorki, Xenas-</i> <i>trapotherium</i> <i>kraglievichi</i>	<i>Granastra-</i> <i>potherium snor-</i> <i>ki, Xenastra-</i> <i>potherium kra-</i> <i>glievichi</i>	Aq		(Kay and Madden 1997b)	Un
<i>Xenastrapother-</i> <i>ium aequatori-</i> <i>alis, X. ama-</i> <i>zonense, X. kra-</i> <i>glievichi, X. sp.</i>	SF	<i>Astrapotheri-</i> <i>um magnum</i>	<i>Astrapotherium</i> <i>magnum</i>	Aq		(Avilla and Vizcaíno 2005)	PCM
<i>Xenastrapother-</i> <i>ium aequatori-</i> <i>alis, X. ama-</i> <i>zonense, X. kra-</i> <i>glievichi, X. sp.</i>	SF	<i>Astrapotheri-</i> <i>um</i>	<i>Astrapotherium</i>	GT	Likely could swim and run	(Cassini et al. 2012)	PCM
<i>Xenastrapother-</i> <i>ium aequatori-</i> <i>alis, X. ama-</i> <i>zonense, X. kra-</i> <i>glievichi, X. sp.</i>	SF	<i>Astrapotheri-</i> <i>um magnum</i>	<i>Astrapotherium</i> <i>magnum</i>	Aq		(Flynn et al. 2012)	PCM, Tph
<i>Xenastrapother-</i> <i>ium aequatori-</i> <i>alis, X. ama-</i> <i>zonense, X. kra-</i> <i>glievichi, X. sp.</i>	SF	<i>Astrapotheri-</i> <i>um magnum</i>	<i>Astrapotherium</i> <i>magnum</i>	Am		(Kay, Vizcaíno, and Bar- go 2012)	Un
<i>Xenastrapother-</i> <i>ium aequatori-</i>	WSF	Astrapotheres, especially	Astrapotheres, especially Uru-	Aq		(Catena et al. 2016)	LR

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

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<i>alis</i> , <i>X. amazonense</i> , <i>X. kraglievichi</i> , <i>X. sp.</i>		Uruguaytheriinae	guaytheriinae					
<i>Xenastrapotherium aequatorialis</i> , <i>X. amazonense</i> , <i>X. kraglievichi</i> , <i>X. sp.</i>	SSF	<i>Granastrapotherium snorki</i>	<i>Granastrapotherium snorki</i>	Aq		(Croft 2016)		Tph
<i>Xenastrapotherium aequatorialis</i> , <i>X. amazonense</i> , <i>X. kraglievichi</i> , <i>X. sp.</i>	SF	<i>Parastrapotherium</i>	<i>Parastrapotherium</i>	Am or Aq		(Houssaye, Fernandez, and Billet 2016)		BH
<i>Xenastrapotherium aequatorialis</i> , <i>X. amazonense</i> , <i>X. kraglievichi</i> , <i>X. sp.</i>	WG	<i>Granastapotherium</i> and/or <i>Xenastapotherium</i>	<i>Granastapotherium</i> and/or <i>Xenastapotherium</i>	Am	Inconsistent with semi-aquatic habits	Chapter 5		SI
<i>Xenastrapotherium aequatorialis</i>, <i>X. amazonense</i>, <i>X. kraglievichi</i>, <i>X. sp.</i>	Sum			Am				
<i>Xenodontomys sp.</i>	Tax	<i>Xenodontomys</i>	<i>Xenodontomys</i>	SF	Chisel-tooth digger	(Verzi 2008)		CDM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Xenorhinotherium bahiense</i> , X. sp.	Tax, SG	<i>Promacrauchenia antiqua</i> , <i>P. kraglievichi</i> , <i>P. chapadmalense</i> , <i>Windhausenia delacroixi</i> , <i>Pseudomacrauchenia yepesi</i> , <i>Macrauchenia oopsis ensenadensis</i> , <i>M. cf. M. ensenadensis</i> , <i>Macrauchenia patachonica</i> , <i>Xenorhinotherium bahiense</i>	Macrauchenidae	C		(Bond et al. 1995)	Un
<i>Xenorhinotherium bahiense</i> , X. sp.	SF	? <i>Coniopternium</i>	? <i>Coniopternium</i>	C	Locking knee would also allow standing for long periods of time	(Shockey 1999)	PCM
<i>Xenorhinotherium bahiense</i> , X. sp.	SF	<i>Coniopternium</i>	<i>Coniopternium</i>	C	Locking knee would also allow standing for long periods of time	(Shockey and Anaya 2008)	PCM
<i>Xenorhinotherium bahiense</i> , X. sp.	SF	<i>Theosodon gracilis</i> , <i>T. lydekkeri</i>	<i>Theosodon gracilis</i> , <i>T. lydekkeri</i>	C		(Kay, Vizcaíno, and Bargo 2012)	Un

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

<i>Xenorhinotherium bahiense</i> , X. sp.	WF	Macrauchenidae	Macrauchenidae	C		(Schmidt and Ferrero 2014)	LR
<i>Xenorhinotherium bahiense</i> , X. sp.	SF	<i>Theosodon lallemanti</i> , <i>Macrauchenia patachonica</i>	<i>Theosodon lallemanti</i> , <i>Macrauchenia patachonica</i>	C		(Croft 2016)	Un
<i>Xenorhinotherium bahiense</i>, X. sp.	Sum		Macrauchenidae	C			
<i>Xiphuroides</i> sp.	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Large glyptodonts "Capable of only a slow run"	(Fariña 1995b)	PCM
<i>Xiphuroides</i> sp.	WF	Glyptodontidae	Glyptodontidae	Am	Not suited for digging	(Vizcaíno et al. 2001)	LR
<i>Xiphuroides</i> sp.	AGp	<i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Large Glyptodontidae	Am	Long bone morphology not congruent with running or galloping	(Bargo 2003)	PCM
<i>Xiphuroides</i> sp.	SF, PB	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	<i>Parapropalaeohoplophorus</i> , <i>Glyptodon</i> , <i>Panochthus</i> , <i>Doedicurus</i> , <i>Sclerocalyptus</i>	Am	Large glyptodonts (<i>Doedicurus</i> , <i>Glyptodon</i>) graviportal, <i>Parapropalaeohoplophorus</i> : terrestrial and slow-moving	(Croft 2016)	Un
<i>Xiphuroides</i> sp.	Sum		Glyptodontidae	Am			
<i>Xyophorus</i> sp.	AGp	"Extinct sloths"	"Extinct sloths"	Am	Unlikely that they could have outrun predators; likely fought rather than	(McDonald 2012)	PCM

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

					ran		
<i>Xyophorus</i> sp.	WF	Nothrotheriidae	Nothrotheriidae	T	Neither climbers nor diggers	(Pujos et al. 2012)	PB
<i>Xyophorus</i> sp.	SF	<i>Nothrotheriops shastensis</i> , <i>N.</i> sp.	<i>Nothrotheriops shastensis</i> , <i>N.</i> sp.	T	Categories: Terrestrial, Scansorial, Arboreal	(Grass 2014)	PCGM
<i>Xyophorus</i> sp.	See	Santacrucian sloths, including representatives of (Mega-theriidae + Nothrotheriidae), Megalonychidae, and Mylodontidae	Santacrucian sloths, including representatives of (Mega-theriidae + Nothrotheriidae), Megalonychidae, and Mylodontidae	Am	"Not well-suited for fast locomotion"	(Toledo 2016)	PCM
<i>Xyophorus</i> sp.	Sum			Am			
<i>Zaedyus pichiy</i> , <i>Z.</i> sp.	SF	<i>Euphractus</i> , <i>Chaetophractus</i> , <i>Zaedyus</i>	<i>Euphractus</i> , <i>Chaetophractus</i> , <i>Zaedyus</i>	SF		(Vizcaíno and Milne 2002)	LR-E
<i>Zaedyus pichiy</i> , <i>Z.</i> sp.	Tax, SG	<i>Zaedyus pichiy</i>	<i>Zaedyus pichiy</i>	SF		(Superina 2007)	Un
<i>Zaedyus pichiy</i>, <i>Z.</i> sp.	Sum			SF			
<i>Zygolestes paranensis</i>	See	<i>Gracilinanus agilis</i> , <i>G. dryas</i> , <i>G. microtarsus</i>	<i>Gracilinanus agilis</i> , <i>G. dryas</i> , <i>G. microtarsus</i>	S	This study, based on: <i>Zygolestes</i> is closely related to <i>Gracilinanus</i> (Goin, Noriega, and Reyes 2013); <i>G. agilis</i> : Scansorial; <i>G. dryas</i> : Forages both arboreally and ter-	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999; Goin, Noriega, and Reyes 2013)	LR-E

Table S4.10: Locomotion and substrate usage data for South American fossil taxa, cont.

					restrially (Scansorial); <i>G. microtarsus</i> : Probably scansorial or arboreal (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)		
<i>Zygolestes tatei</i>	See	<i>Gracilinanus agilis</i> , <i>G. dryas</i> , <i>G. microtarsus</i>	<i>Gracilinanus agilis</i> , <i>G. dryas</i> , <i>G. microtarsus</i>	S	This study, based on: <i>Zygolestes</i> is closely related to <i>Gracilinanus</i> (Goin, Noriega, and Reyes 2013); <i>G. agilis</i> : Scansorial; <i>G. dryas</i> : Forages both arboreally and terrestrially (Scansorial); <i>G. microtarsus</i> : Probably scansorial or arboreal (Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999)	(Eisenberg 1989; Redford and Eisenberg 1992; Eisenberg and Redford 1999; Goin, Noriega, and Reyes 2013)	LR-E

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