Supplementary Material

Nighthawk: acoustic monitoring of nocturnal bird migration in the Americas

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Table S1: Data summary by dataset. Train and test columns give the number of annotated audio segments included in each dataset. Annotations may be either flight calls or other non-flight call sounds. Pecentages give the proportion of the total train or test splits. The splits shown were used for training and evaluating the Core model; we modified some of these train and test splits for target analyses (Part 2) as described in the Methods.

ID	Train	Test	Description	References
1	68938 (16%)	5389 (11%)	Field recordings from Montana.	-
2	56990 (13%)	2300 (4.9%)	Field recordings from eastern North America.	[a]
3	36803 (8.6%)	1123 (2.4%)	FSD-50K: a public sound dataset.	[b]
4	30341 (7.1%)	8215 (17%)	Assets from Macaulay Library.	[c]
5	23814 (5.6%)	6739 (14%)	BirdVox-Full-Night dataset: extracted calls.	[d]
6	21838 (5.1%)	1112 (2.4%)	Field recordings from New York (extracted background noise).	[e]
7	20863 (4.9%)	1120 (2.4%)	BirdVox-Full-Night dataset: extracted background noise.	[d]
8	19576 (4.6%)	2579 (5.5%)	Field recordings from New York.	[a]
9	19452 (4.5%)	7181 (15%)	Field recordings from New York.	[e]
10	18177 (4.2%)	4711 (10%)	BirdVox-296h dataset: 296 h from Ithaca, NY in fall 2015.	[f]
11	17722 (4.1%)	1123 (2.4%)	AudioSet: a public sound dataset.	[g]
12	16456 (3.8%)	-	Annotated model results from Colombia.	-
13	12678 (3%)	-	Annotated model results from a selection of datasets.	-
14	11693 (2.7%)	1123 (2.4%)	Non-bird assets from the Macaulay Library.	[c]
15	9803 (2.3%)	-	Field recordings from Colorado.	-
16	7861 (1.8%)	870 (1.8%)	UrbanSound8K: a public sound dataset.	[h]
17	7235 (1.7%)	-	Field recordings from New Mexico.	-
18	7133 (1.7%)	-	Field recordings from Pennsylvania.	-
19	5601 (1.3%)	-	Annotated model results from Colombia.	-
20	4230 (0.99%)	915 (1.9%)	Captive recordings from PA, NY, and ME.	[i]
21	3745 (0.87%)	852 (1.8%)	Captive and field recordings from AZ, NY, PA, and TX.	-
22	3119 (0.73%)	929 (2%)	Captive recordings from Pennsylvania.	[j]
23	1597 (0.37%)	400 (0.85%)	ESC-50: a public sound dataset.	[k]
24	1350 (0.32%)	329 (0.7%)	Captive recordings from Ontario.	[l]
25	994 (0.23%)	295 (0.62%)	Field recordings of North American sparrows.	-

[a] http://OldBird.org
[b] Fonseca et al. (2020)
[c] http://macaulaylibrary.org
[d] Lostanlen et al. (2018); Lostanlen et al. (2017)
[e] Van Doren et al. (2015)
[f] Farnsworth et al. (2021)
[g] https://research.google.com/audioset
[h] Salamon et al. (2014)
[i] Morris et al. (2016)
[j] Lanzone et al. (2009)
[k] Piczak (2015)
[l] Landsborough et al. (2019)

Table S2: Species comprising each group. Groups are defined as two or more similar-sounding species that belong to the same family (see Evans and O'Brien 2002). In our modeling framework, each species can belong to at most one group.

group	species	name	sci_name	family
BUNT	blugrb1	Blue Grosbeak	Passerina caerulea	Cardinalidae
BUNT	indbun	Indigo Bunting	Passerina cyanea	Cardinalidae
BUNT	lazbun	Lazuli Bunting	Passerina amoena	Cardinalidae
BUNT	paibun	Painted Bunting	Passerina ciris	Cardinalidae
BUNT	varbun	Varied Bunting	Passerina versicolor	Cardinalidae
GROS	bkhgro	Black-headed Grosbeak	Pheucticus melanocephalus	Cardinalidae
GROS	robgro	Rose-breasted Grosbeak	Pheucticus ludovicianus	Cardinalidae
TANA	scatan	Scarlet Tanager	Piranga olivacea	Cardinalidae
TANA	sumtan	Summer Tanager	Piranga rubra	Cardinalidae
TANA	westan	Western Tanager	Piranga ludoviciana	Cardinalidae
BZWA	chswar	Chestnut-sided Warbler	Setophaga pensylvanica	Parulidae
BZWA	comyel	Common Yellowthroat	Geothlypis trichas	Parulidae
BZWA	hoowar	Hooded Warbler	Setophaga citrina	Parulidae
BZWA	kirwar	Kirtland's Warbler	Setophaga kirtlandii	Parulidae
DBUP	btnwar	Black-throated Green Warbler	Setophaga virens	Parulidae
DBUP	btywar	Black-throated Gray Warbler	Setophaga nigrescens	Parulidae
DBUP	colwar	Colima Warbler	Leiothlypis crissalis	Parulidae
DBUP	gchwar	Golden-cheeked Warbler	Setophaga chrysoparia	Parulidae
DBUP	grawar	Grace's Warbler	Setophaga graciae	Parulidae
DBUP	herwar	Hermit Warbler	Setophaga occidentalis	Parulidae
DBUP	lucwar	Lucy's Warbler	Leiothlypis luciae	Parulidae
DBUP	naswar	Nashville Warbler	Leiothlypis ruficapilla	Parulidae
DBUP	orcwar	Orange-crowned Warbler	Leiothlypis celata	Parulidae
DBUP	tenwar	Tennessee Warbler	Leiothlypis peregrina	Parulidae
DBUP	towwar	Townsend's Warbler	Setophaga townsendi	Parulidae
DBUP	virwar	Virginia's Warbler	Leiothlypis virginiae	Parulidae
DEWA	norpar	Northern Parula	Setophaga americana	Parulidae
DEWA	pinwar	Pine Warbler	Setophaga pinus	Parulidae
DEWA	yetwar	Yellow-throated Warbler	Setophaga dominica	Parulidae
MWAR	macwar	MacGillivray's Warbler	Geothlypis tolmiei	Parulidae
MWAR	mouwar	Mourning Warbler	Geothlypis philadelphia	Parulidae
SBUF	btbwar	Black-throated Blue Warbler	Setophaga caerulescens	Parulidae
SBUF	buwwar	Blue-winged Warbler	Vermivora cyanoptera	Parulidae
SBUF	gowwar	Golden-winged Warbler	Vermivora chrysoptera	Parulidae
SBUF	ovenbi1	Ovenbird	Seiurus aurocapilla	Parulidae
SBUF	palwar	Palm Warbler	Setophaga palmarum	Parulidae
SBUF	prowar	Prothonotary Warbler	Protonotaria citrea	Parulidae
SBUF	swawar	Swainson's Warbler	Limnothlypis swainsonii	Parulidae
SBUF	yerwar	Yellow-rumped Warbler	Setophaga coronata	Parulidae
ZEEP	babwar	Bay-breasted Warbler	Setophaga castanea	Parulidae
ZEEP	bkbwar	Blackburnian Warbler	Setophaga fusca	Parulidae
ZEEP	bkpwar	Blackpoll Warbler	Setophaga striata	Parulidae
ZEEP	camwar	Cape May Warbler	Setophaga tigrina	Parulidae
ZEEP	cerwar	Cerulean Warbler	Setophaga cerulea	Parulidae
ZEEP	conwar	Connecticut Warbler	Oporornis agilis	Parulidae
ZEEP	kenwar	Kentucky Warbler	Geothlypis formosa	Parulidae

ZEEP	louwat	Louisiana Waterthrush	Parkesia motacilla	Parulidae
ZEEP	magwar	Magnolia Warbler	Setophaga magnolia	Parulidae
ZEEP	norwat	Northern Waterthrush	Parkesia noveboracensis	Parulidae
ZEEP	refwar	Red-faced Warbler	Cardellina rubrifrons	Parulidae
ZEEP	woewar1	Worm-eating Warbler	Helmitheros vermivorum	Parulidae
ZEEP	yelwar	Yellow Warbler	Setophaga petechia	Parulidae
CCBRS	brespa	Brewer's Sparrow	Spizella breweri	Passerellidae
CCBRS	clcspa	Clay-colored Sparrow	Spizella pallida	Passerellidae
CUPS	amtspa	American Tree Sparrow	Spizelloides arborea	Passerellidae
CUPS	chispa	Chipping Sparrow	Spizella passerina	Passerellidae
DESP	bacspa	Bachman's Sparrow	Peucaea aestivalis	Passerellidae
DESP	fiespa	Field Sparrow	Spizella pusilla	Passerellidae
DESP	henspa	Henslow's Sparrow	Centronyx henslowii	Passerellidae
DESP	lecspa	LeConte's Sparrow	Ammospiza leconteii	Passerellidae
DESP	nstspa	Nelson's Sparrow	Ammospiza nelsoni	Passerellidae
DESP	savspa	Savannah Sparrow	Passerculus sandwichensis	Passerellidae
DESP	sstspa	Saltmarsh Sparrow	Ammospiza caudacuta	Passerellidae
HSSP	graspa	Grasshopper Sparrow	Ammodramus savannarum	Passerellidae
HSSP	seaspa	Seaside Sparrow	Ammospiza maritima	Passerellidae
HSSP	vesspa	Vesper Sparrow	Pooecetes gramineus	Passerellidae
HSSP	whcspa	White-crowned Sparrow	Zonotrichia leucophrys	Passerellidae
SFHS	foxspa	Fox Sparrow	Passerella iliaca	Passerellidae
SFHS	gocspa	Golden-crowned Sparrow	Zonotrichia atricapilla	Passerellidae
SFHS	harspa	Harris's Sparrow	Zonotrichia querula	Passerellidae
SFHS	sonspa	Song Sparrow	Melospiza melodia	Passerellidae
SFHS	whtspa	White-throated Sparrow	Zonotrichia albicollis	Passerellidae
SWLI	linspa	Lincoln's Sparrow	Melospiza lincolnii	Passerellidae
SWLI	swaspa	Swamp Sparrow	Melospiza georgiana	Passerellidae
GCBI	bicthr	Bicknell's Thrush	Catharus bicknelli	Turdidae
GCBI	gycthr	Gray-cheeked Thrush	Catharus minimus	Turdidae
THSH	herthr	Hermit Thrush	Catharus guttatus	Turdidae
THSH	swathr	Swainson's Thrush	Catharus ustulatus	Turdidae
THSH	veery	Veery	Catharus fuscescens	Turdidae
THSH	woothr	Wood Thrush	Hylocichla mustelina	Turdidae

Table S3: Annotation summary by dataset. "Prop. Negative" gives the proportion of annotations in the dataset that are non-flight calls. These may include ambient sound, insects, other animals, or bird vocalizations that are not flight calls. "Prop. Known Family" gives the proportion of annotations where the family is known. "Prop. Known Species" gives the proportion of annotations where the species is known.

Dataset ID	Total Annotations	Prop. Negative	Prop. Known Family	Prop. Known Species
1	74327	0.47	0.34	0.22
2	59290	0.01	0.98	0.62
3	37926	1.00	0.00	0.00
4	38556	0.25	0.73	0.69
5	30553	0.00	0.58	0.42
6	22950	0.99	0.00	0.00
7	21983	0.99	0.00	0.00
8	22155	0.00	0.81	0.58
9	26633	0.02	0.80	0.62
10	22888	0.14	0.53	0.36
11	18845	1.00	0.00	0.00
12	16456	0.96	0.04	0.03
13	12678	0.88	0.10	0.05
14	12816	1.00	0.00	0.00
15	9803	0.00	0.91	0.76
16	8731	1.00	0.00	0.00
17	7235	0.70	0.00	0.00
18	7133	0.72	0.23	0.14
19	5601	0.96	0.04	0.00
20	5145	0.01	0.99	0.98
21	4597	0.00	1.00	1.00
22	4048	0.07	0.93	0.90
23	1997	1.00	0.00	0.00
24	1679	0.00	1.00	1.00
25	1289	0.00	0.97	0.93

Table S4: Core model performance on Core test data by class, with number of train and test examples. Performance is measured by average precision (AP). Percentages are calculated separately for each taxonomic level. "Negative" examples contained no nocturnal flight calls (e.g. ambient noise or other bird vocalizations). "Other" examples were classified as taxa not included in the model and were treated identically as "negative" examples for model training purposes. "Unknown" examples did not incur loss at the taxonomic levels for which identity was not known, but they did contribute information if other taxonomic levels were known for that example. "N/A" group classifications correspond to species that were not assigned to a group and were masked from group-level training.

Level	Class	AP	Train	Test
order	Passeriformes	0.99	197558 (46%)	30794 (65%)
order	Cuculiformes	0.98	845 (0.2%)	235 (0.5%)
order	Charadriiformes	0.94	9606 (2.2%)	2403 (5.1%)
order	Pelecaniformes	0.94	2770 (0.65%)	671 (1.4%)
order	(negative)	-	204671 (48%)	11689 (25%)
order	(other)	-	6025 (1.4%)	1295 (2.7%)
order	(unknown)	-	6534 (1.5%)	247 (0.52%)
family	Parulidae	0.98	84817 (20%)	10740 (23%)
family	Passerellidae	0.98	40466 (9.5%)	5789 (12%)
family	Icteridae	0.98	989 (0.23%)	784 (1.7%)
family	Cuculidae	0.98	845 (0.2%)	235 (0.5%)
family	Haematopodidae	0.96	176 (0.041%)	103 (0.22%)
family	Turdidae	0.94	23946 (5.6%)	7183 (15%)

family	Ardeidae	0.94	2733 (0.64%)	663 (1.4%)
family	Scolopacidae	0.94	5573 (1.3%)	1544 (3.3%)
family	Bombycillidae	0.94	190 (0.044%)	34 (0.072%)
family	Charadriidae	0.93	2000 (0.47%)	272 (0.57%)
family	Calcariidae	0.93	506 (0.12%)	333 (0.7%)
family	Cardinalidae	0.92	5183 (1.2%)	910 (1.9%)
family	Motacillidae	0.92	1081 (0.25%)	241 (0.51%)
family	Sittidae	0.78	333 (0.078%)	52 (0.11%)
family	Laridae	0.72	1180 (0.28%)	323 (0.68%)
family	Regulidae	0.70	170 (0.04%)	38 (0.08%)
family	Alaudidae	0.68	148 (0.035%)	238 (0.5%)
family	Recurvirostridae	0.30	105 (0.025%)	35 (0.074%)
family	(negative)	-	204671 (48%)	11689 (25%)
family	(other)	-	8188 (1.9%)	1774 (3.7%)
family	(unknown)	-	44709 (10%)	4354 (9.2%)
group	CUPS	0.99	9552 (2.2%)	1116 (2.4%)
group	SWLI	0.99	1746 (0.41%)	541 (1.1%)
group	GCBI	0.99	1455 (0.34%)	735 (1.6%)
group	DESP	0.98	11802 (2.8%)	686 (1.4%)
group	SFHS	0.97	8026 (1.9%)	702 (1.5%)
group	HSSP	0.97	3215 (0.75%)	1292 (2.7%)
group	ZEEP	0.97	28380 (6.6%)	2681 (5.7%)
group	DEWA	0.96	1739 (0.41%)	573 (1.2%)
group	BZWA	0.96	8364 (2%)	1778 (3.8%)
group	GROS	0.95	1061 (0.25%)	464 (0.98%)
group	BUNT	0.94	3160 (0.74%)	204 (0.43%)
group	MWAR	0.92	1106 (0.26%)	340 (0.72%)
group	THSH	0.91	19284 (4.5%)	5398 (11%)
group	DBUP	0.91	13194 (3.1%)	1378 (2.9%)
group	SBUF	0.90	13254 (3.1%)	1897 (4%)
group	CCBRS	0.84	927 (0.22%)	60 (0.13%)
group	TANA	0.81	322 (0.075%)	98 (0.21%)
group	(N/A)	-	37747 (8.8%)	8709 (18%)
group	(negative)	-	204671 (48%)	11689 (25%)
group	(unknown)	-	59004 (14%)	6993 (15%)
species	gycthr	0.99	1367 (0.32%)	648 (1.4%)
species	savspa	0.99	11327 (2.6%)	595 (1.3%)
species	chswar	0.98	3185 (0.74%)	550 (1.2%)
species	whtspa	0.98	7118 (1.7%)	516 (1.1%)
species	graspa	0.98	1038 (0.24%)	505 (1.1%)
species	boboli	0.98	511 (0.12%)	671 (1.4%)
species	uplsan	0.98	465 (0.11%)	197 (0.42%)
species	semplo	0.98	451 (0.11%)	78 (0.16%)
species	chispa	0.97	8510 (2%)	527 (1.1%)
species	comyel	0.97	4209 (0.98%)	690 (1.5%)
species	norpar	0.97	1667 (0.39%)	542 (1.1%)
species	wlswar	0.97	4901 (1.1%)	521 (1.1%)
species	blkoys	0.97	67 (0.016%)	94 (0.2%)
species	robgro	0.96	1053 (0.25%)	462 (0.98%)
species	yebcuc	0.96	441 (0.1%)	135 (0.29%)
species	shbdow	0.96	469 (0.11%)	358 (0.76%)
species	sprpip	0.96	213 (0.05%)	24 (0.051%)

species	amered	0.95	7041 (1.6%)	615 (1.3%)
species	amtspa	0.95	902 (0.21%)	531 (1.1%)
species	woothr	0.95	883 (0.21%)	378 (0.8%)
species	norwat	0.95	1053 (0.25%)	169 (0.36%)
species	bkbcuc	0.95	404 (0.094%)	100 (0.21%)
species	grnher	0.95	632 (0.15%)	310 (0.65%)
species	macwar	0.95	464 (0.11%)	145 (0.31%)
species	solsan	0.95	510 (0.12%)	66 (0.14%)
species	canwar	0.94	1028 (0.24%)	317 (0.67%)
species	leasan	0.94	1432 (0.33%)	312 (0.66%)
species	bawwar	0.93	1085 (0.25%)	227 (0.48%)
species	camwar	0.93	1613 (0.38%)	383 (0.81%)
species	whcspa	0.93	1678 (0.39%)	364 (0.77%)
species	leabit	0.93	121 (0.028%)	29 (0.061%)
species	btbwar	0.92	2264 (0.53%)	498 (1.1%)
species	hoowar	0.92	753 (0.18%)	127 (0.27%)
species	herthr	0.91	901 (0.21%)	290 (0.61%)
species	amepip	0.91	868 (0.2%)	217 (0.46%)
species	killde	0.91	1400 (0.33%)	171 (0.36%)
species	indbun	0.90	2787 (0.65%)	150 (0.32%)
species	naswar	0.90	836 (0.2%)	333 (0.7%)
species	veery	0.89	1883 (0.44%)	658 (1.4%)
species	vesspa	0.88	476 (0.11%)	423 (0.89%)
species	sposan	0.88	640 (0.15%)	165 (0.35%)
species	mouwar	0.87	641 (0.15%)	195 (0.41%)
species	dickci	0.86	386 (0.09%)	110 (0.23%)
species	greyel	0.86	497 (0.12%)	128 (0.27%)
species	daejun	0.84	523 (0.12%)	325 (0.69%)
species	palwar	0.84	500 (0.12%)	298 (0.63%)
species	amerob	0.83	97 (0.023%)	41 (0.087%)
species	swathr	0.82	15582 (3.6%)	4072 (8.6%)
species	scatan	0.80	249 (0.058%)	98 (0.21%)
species	greegr	0.80	228 (0.053%)	21 (0.044%)
species	yerwar	0.79	3777 (0.88%)	494 (1%)
species	bcnher	0.79	459 (0.11%)	111 (0.23%)
species	ovenbi1	0.78	6500 (1.5%)	525 (1.1%)
species	laplon	0.77	285 (0.067%)	197 (0.42%)
species	rebnut	0.76	320 (0.075%)	52 (0.11%)
species	lesyel	0.74	91 (0.021%)	43 (0.091%)
species	amebit	0.72	318 (0.074%)	57 (0.12%)
species	clcspa	0.70	506 (0.12%)	49 (0.1%)
species	gockin	0.70	168 (0.039%)	38 (0.08%)
species	horlar	0.67	148 (0.035%)	238 (0.5%)
species	magwar	0.65	4057 (0.95%)	498 (1.1%)
species	fiespa	0.64	198 (0.046%)	43 (0.091%)
species	buwwar	0.59	97 (0.023%)	75 (0.16%)
species	caster1	0.50	154 (0.036%)	45 (0.095%)
species	amgplo	0.50	49 (0.011%)	8 (0.017%)
species	snobun	0.47	186 (0.043%)	99 (0.21%)
species	gocspa	0.46	182 (0.043%)	40 (0.085%)
species	lobcur	0.44	72 (0.017%)	22 (0.046%)
species	babwar	0.36	359 (0.084%)	176 (0.37%)

species	grbher3	0.36	303 (0.071%)	46 (0.097%)
species	sonspa	0.36	550 (0.13%)	105 (0.22%)
species	bkpwar	0.34	249 (0.058%)	195 (0.41%)
species	grawar	0.33	115 (0.027%)	45 (0.095%)
species	ameavo	0.27	59 (0.014%)	14 (0.03%)
species	btnwar	0.23	767 (0.18%)	171 (0.36%)
species	foxspa	0.23	94 (0.022%)	23 (0.049%)
species	lazbun	0.16	123 (0.029%)	32 (0.068%)
species	whimbr	0.15	59 (0.014%)	26 (0.055%)
species	pinwar	0.14	58 (0.014%)	31 (0.065%)
species	tenwar	0.13	145 (0.034%)	93 (0.2%)
species	ycnher	0.11	131 (0.031%)	16 (0.034%)
species	yelwar	0.06	314 (0.073%)	20 (0.042%)
species	(negative)	-	204671 (48%)	11689 (25%)
species	(other)	-	12223 (2.9%)	2616 (5.5%)
species	(unknown)	-	92873 (22%)	10023 (21%)

Table S5: Summary of model performance on the PA target dataset.

Data	Metric	Naive	Batch-Less (1ep)	Batch-Less (15ep)	Batch-More (1ep)	Batch-More (15ep)	Tuned
PA	AP: Passeriformes	0.978	0.981	0.979	0.995	0.996	0.993
PA	Precision (continuous listening): Passeriformes	0.498			0.754	0.731	0.590
PA	Precision (continuous listening): Passeriformes (reviewed)	0.666			0.995	0.993	0.932
PA	Recall (continuous listening): Passeriformes	0.591			0.763	0.777	0.892
PA	mAP: family (4 taxa)	0.972	0.973	0.972	0.982	0.978	0.961
PA	mAP: group (6 taxa)	0.980	0.984	0.981	0.993	0.992	0.977
PA	mAP: order (2 taxa)	0.965	0.966	0.964	0.972	0.963	0.940
PA	mAP: species (6 taxa)	0.981	0.981	0.981	0.987	0.985	0.969
Core	AP: Passeriformes	0.992	0.990	0.990	0.990	0.991	0.989
Core	mAP: family (18 taxa)	0.876	0.846	0.850	0.862	0.854	0.810
Core	mAP: group (17 taxa)	0.944	0.926	0.934	0.933	0.933	0.912
Core	mAP: order (4 taxa)	0.961	0.949	0.950	0.952	0.950	0.938
Core	mAP: species (82 taxa)	0.762	0.741	0.752	0.754	0.754	0.699

Table S6: Summary of model performance on the NM target dataset.

Data	Metric	Naive	Batch-Less (1ep)	Batch-Less (15ep)	Batch-More (1ep)	Batch-More (15ep)	Tuned
NM	AP: Passeriformes	0.922	0.551	0.972	0.992	0.991	0.992
NM	Precision (continuous listening): Passeriformes	0.635			0.771	0.815	0.672
NM	Precision (continuous listening): Passeriformes (reviewed)	0.812			0.965	0.965	0.935
NM	Recall (continuous listening): Passeriformes	0.689			0.777	0.689	0.915
Core	AP: Passeriformes	0.991	0.725	0.991	0.992	0.992	0.991

Table S7: Summary of model performance on the CO target dataset.

Data	Metric	Naive	Batch-Less (1ep)	Batch-Less (15ep)	Batch-More (1ep)	Batch-More (15ep)	Tuned
CO	AP: Passeriformes	0.766	0.855	0.771	0.946	0.940	0.942
CO	AP: gycthr	0.893	0.869	0.873	0.905	0.908	0.949
CO	AP: swathr	0.881	0.893	0.810	0.957	0.950	0.949
CO	Precision (continuous listening): Passeriformes	0.682			0.906	0.796	0.946
CO	Precision (continuous listening): Passeriformes (reviewed)	0.753			0.981	0.907	0.964
CO	Precision (continuous listening): gycthr	0.767			0.759	0.812	0.821
CO	Precision (continuous listening): swathr	0.925			0.867	0.852	0.918
CO	Recall (continuous listening): Passeriformes	0.142			0.119	0.509	0.153
CO	Recall (continuous listening): gycthr	0.719			0.688	0.812	0.719
CO	Recall (continuous listening): swathr	0.327			0.359	0.387	0.191
CO	mAP: family (1 taxa)	0.877	0.888	0.798	0.951	0.946	0.949
CO	mAP: group (2 taxa)	0.884	0.877	0.833	0.933	0.930	0.951
CO	mAP: order (1 taxa)	0.766	0.855	0.771	0.946	0.940	0.942
CO	mAP: species (2 taxa)	0.887	0.881	0.841	0.931	0.929	0.949
Core	AP: Passeriformes	0.992	0.991	0.990	0.987	0.986	0.971
Core	AP: gycthr	0.994	0.991	0.993	0.989	0.990	0.972
Core	AP: swathr	0.858	0.822	0.819	0.797	0.802	0.766

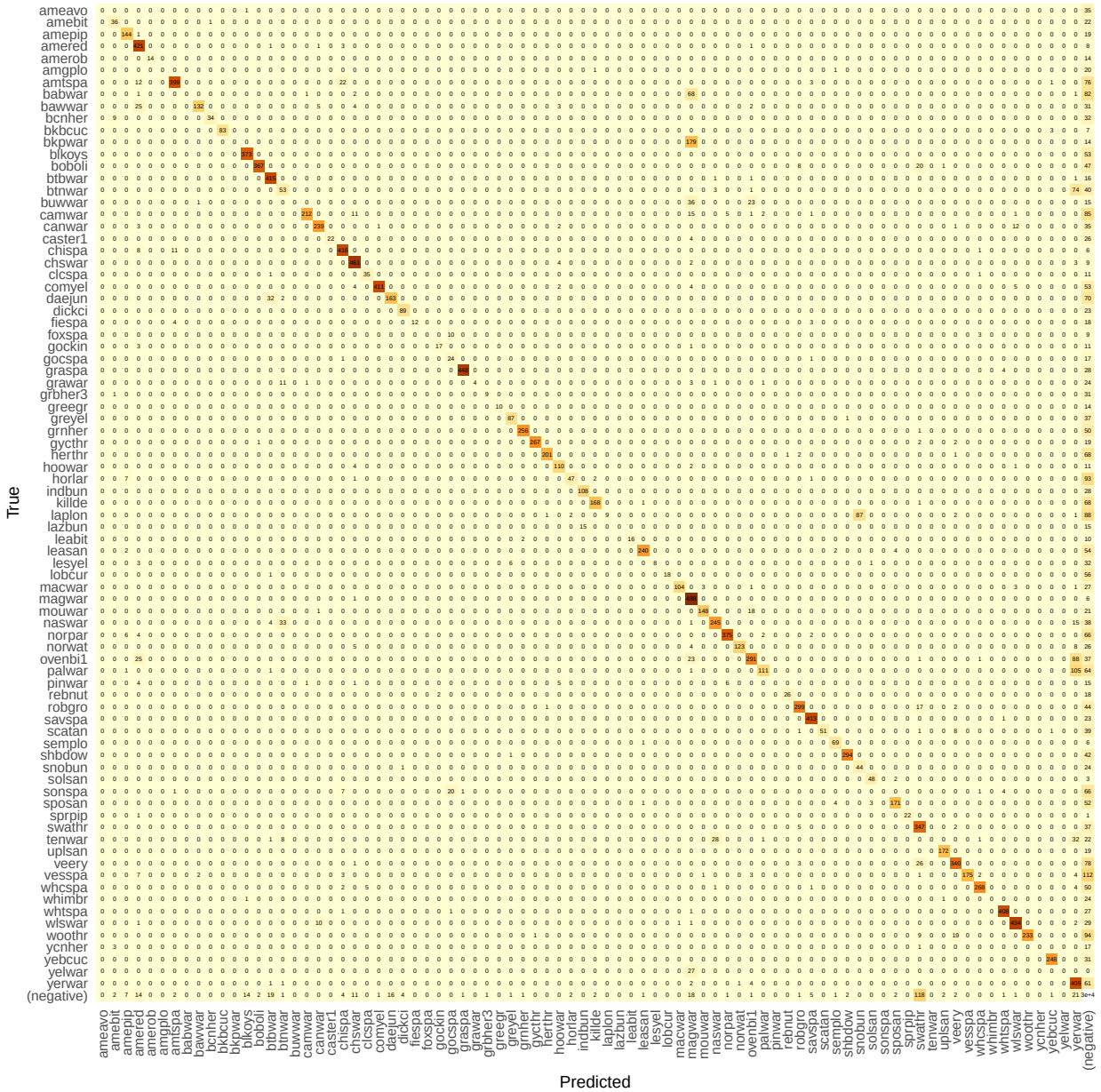


Figure S1: Confusion matrix for the Core model on Core test dataset by species using a score threshold of 0.50. The "negative" class indicates examples with no model predictions or no true observations, respectively.

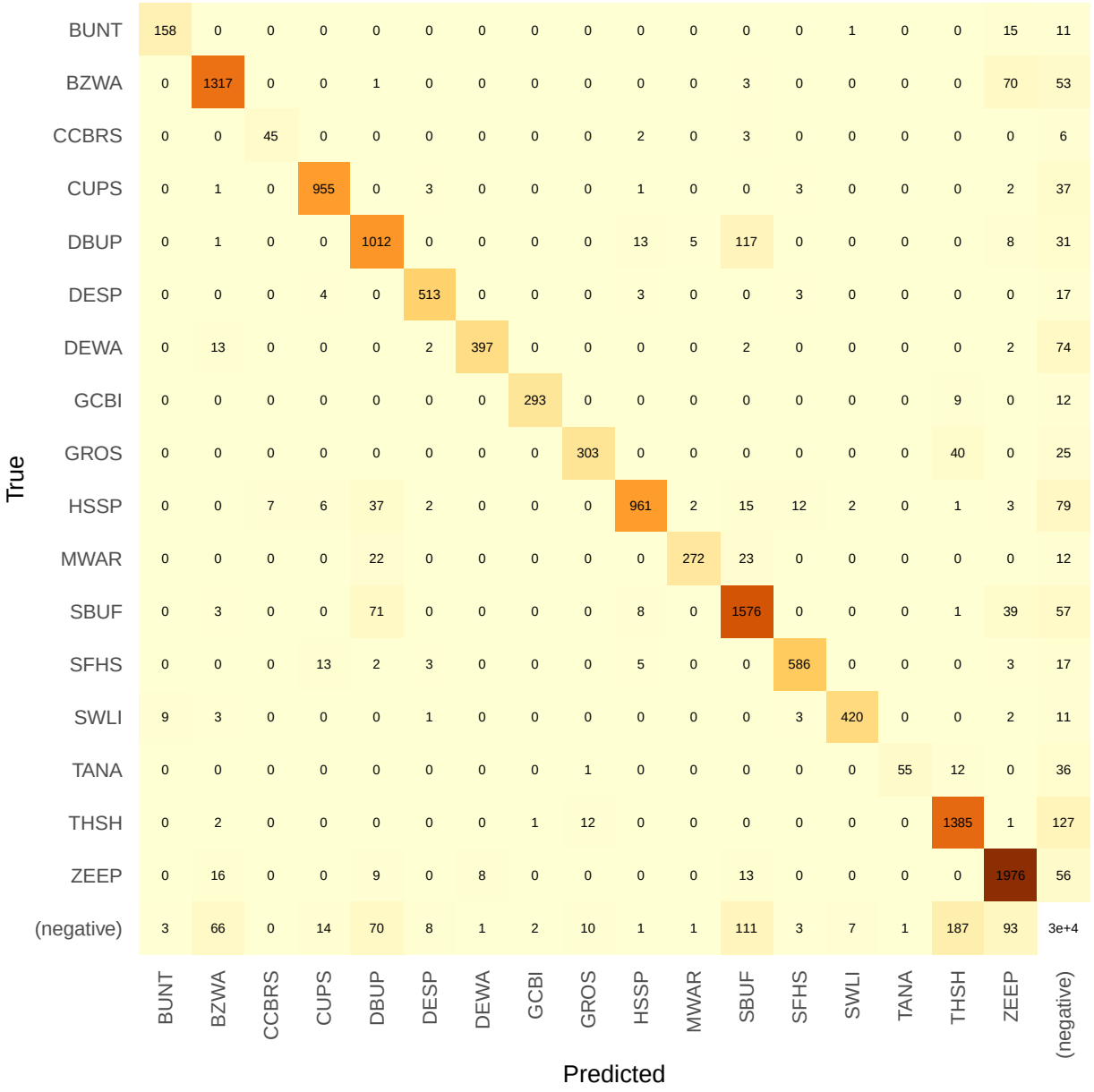


Figure S2: Confusion matrix for the Core model on Core test dataset by group using a score threshold of 0.50. The "negative" class indicates examples with no model predictions or no true observations, respectively.

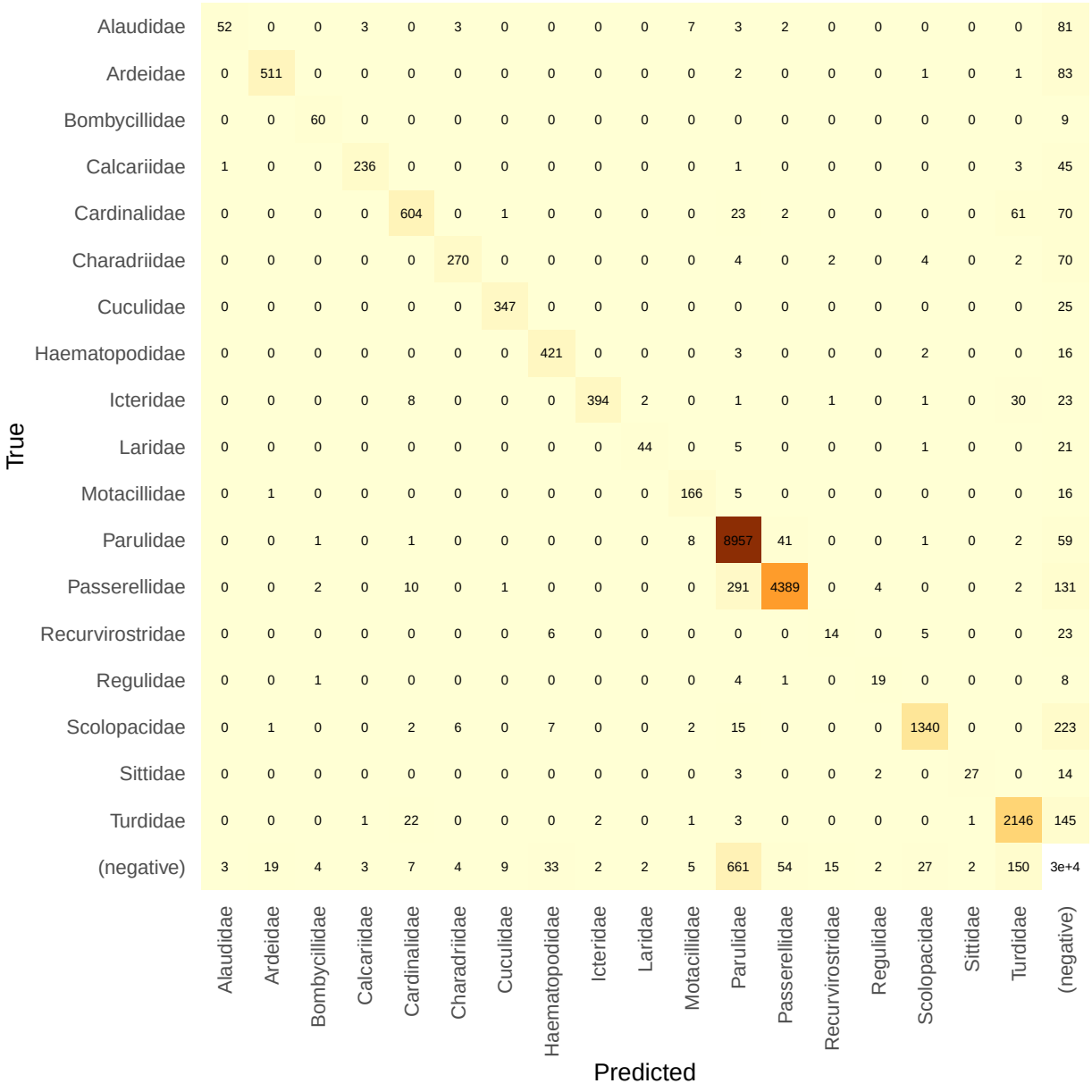


Figure S3: Confusion matrix for the Core model on Core test dataset by family using a score threshold of 0.50. The "negative" class indicates examples with no model predictions or no true observations, respectively.

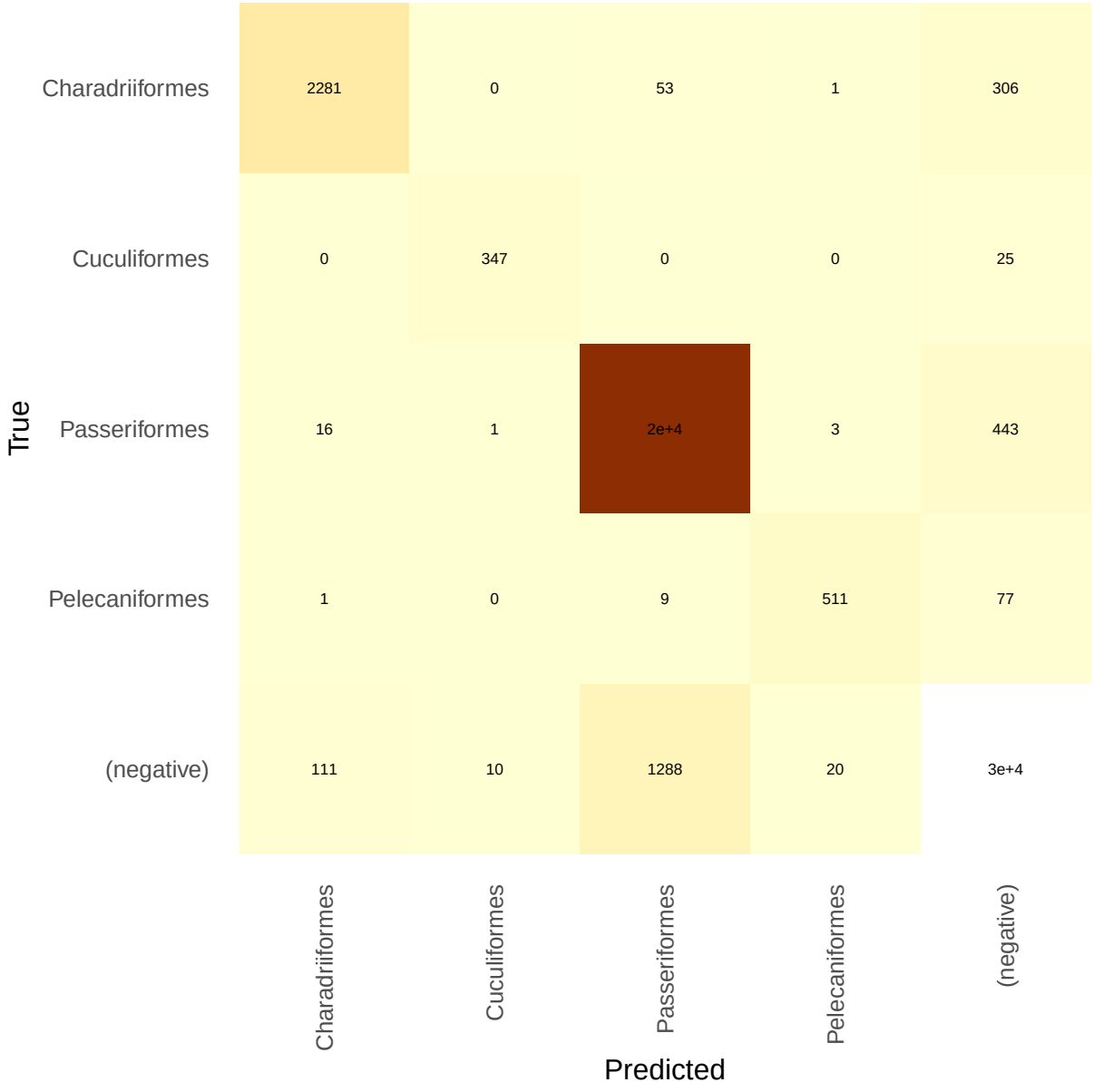


Figure S4: Confusion matrix for the Core model on Core test dataset by order using a score threshold of 0.50. The "negative" class indicates examples with no model predictions or no true observations, respectively.

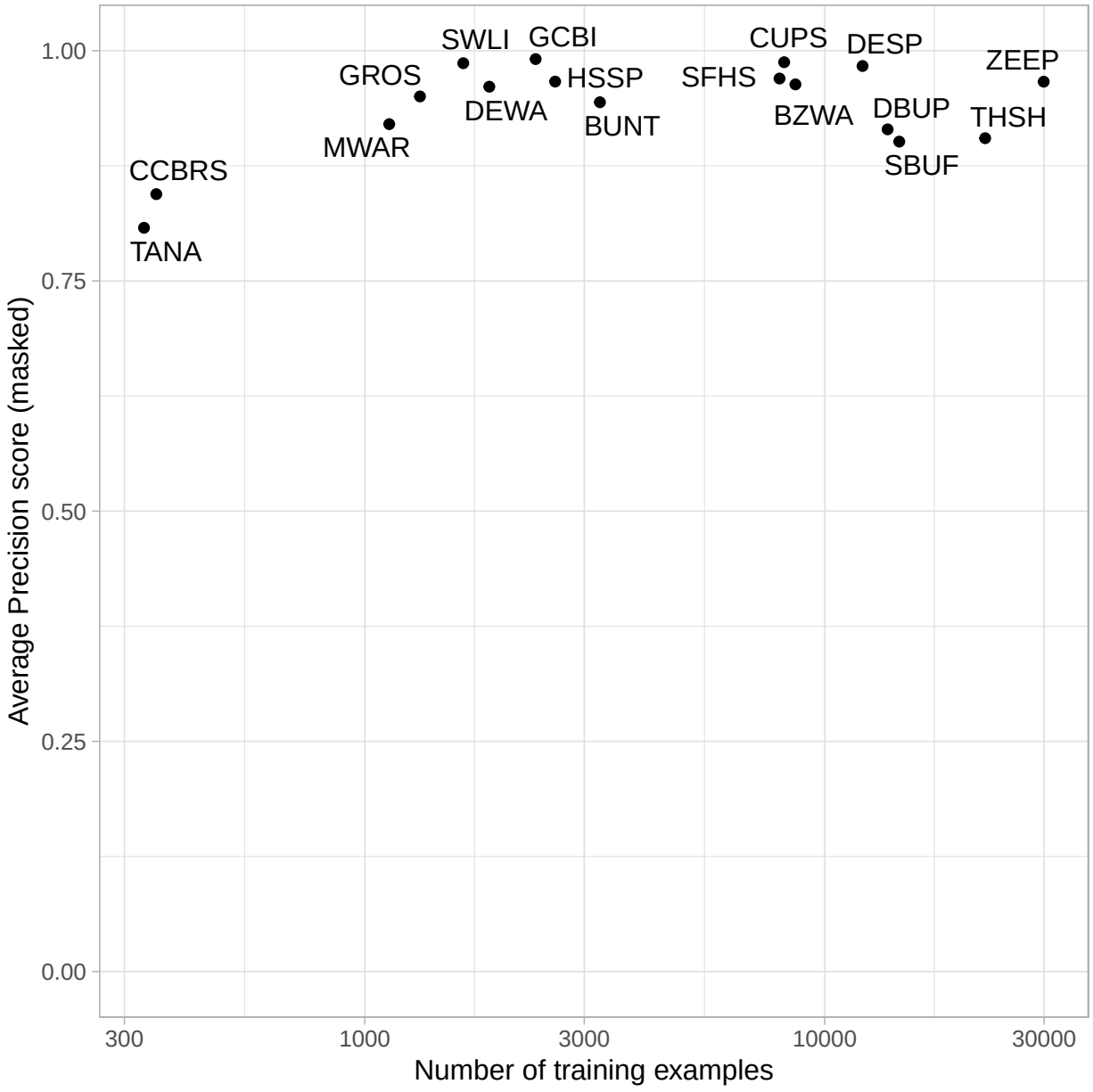


Figure S5: Model performance for group classes on Core test data. Performance is measured by average precision (AP) and plotted against the number of training examples. Groups with more training examples generally performed better.

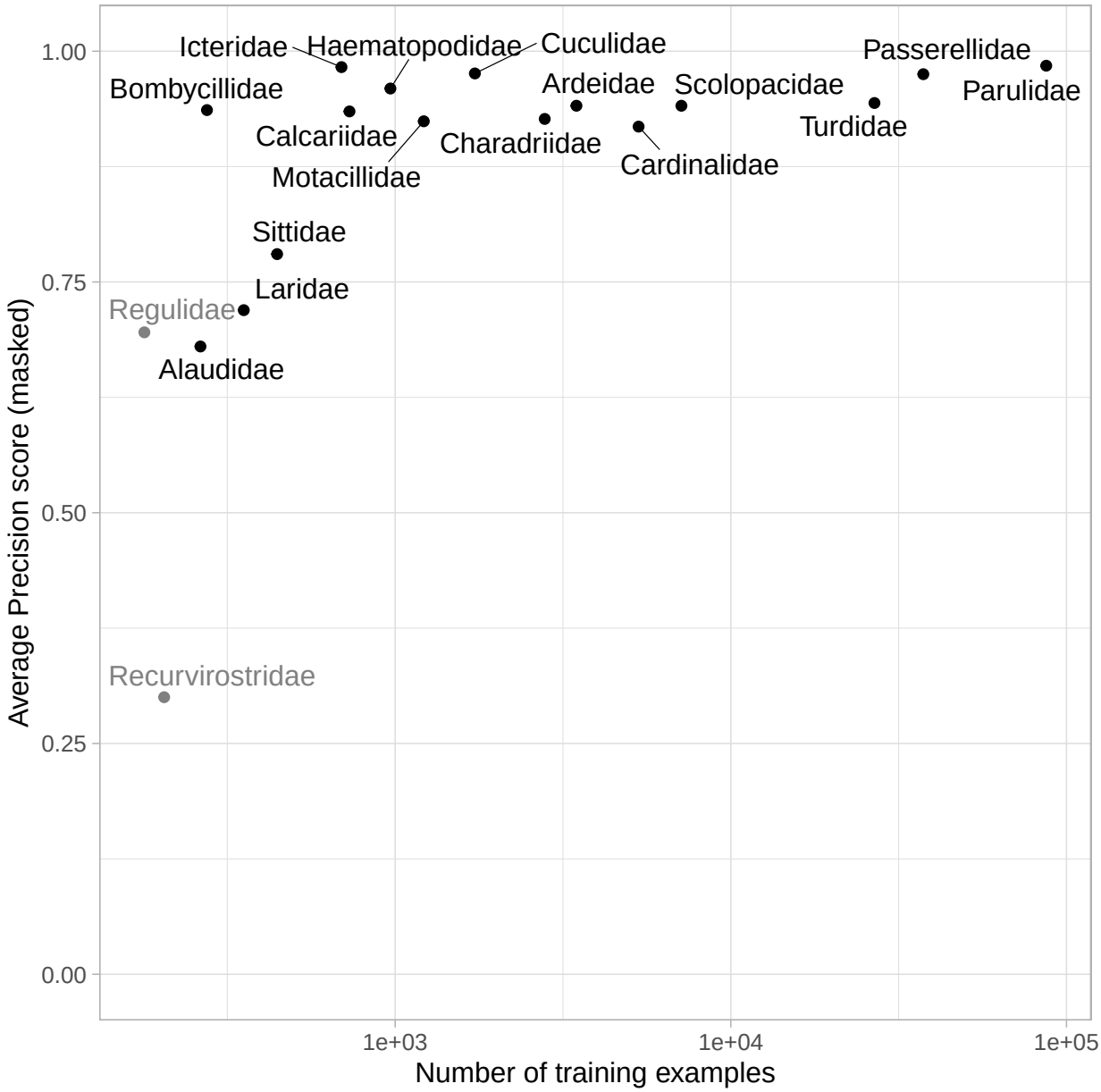


Figure S6: Model performance for family classes on Core test data. Performance is measured by average precision (AP) and plotted against the number of training examples. Families with more training examples generally performed better. Classes plotted in gray have less than 20 testing examples, so their reported performance is subject to increased uncertainty.

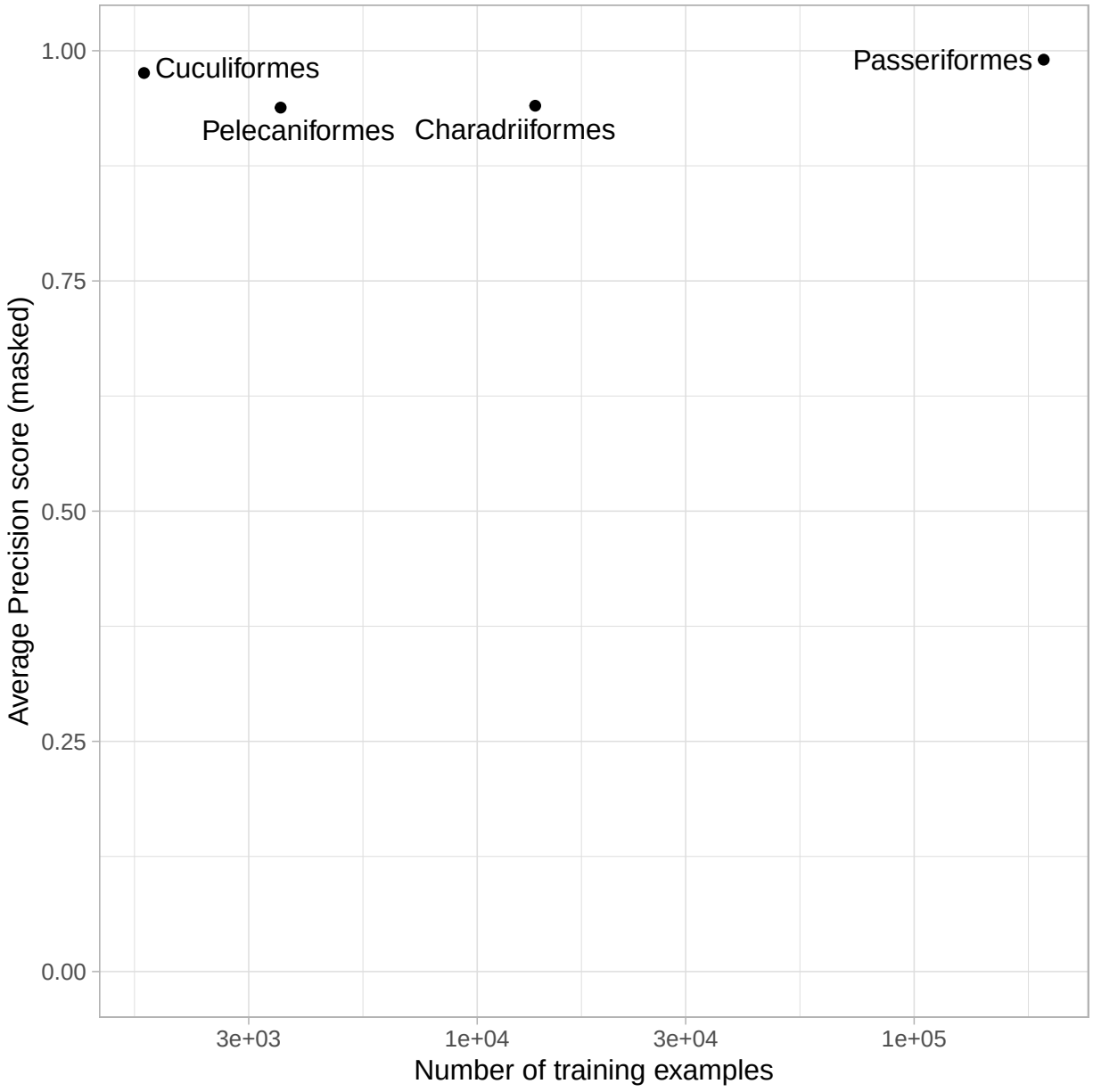


Figure S7: Model performance for order classes on the Core test data. Performance is measured by average precision (AP) and plotted against the number of training examples.

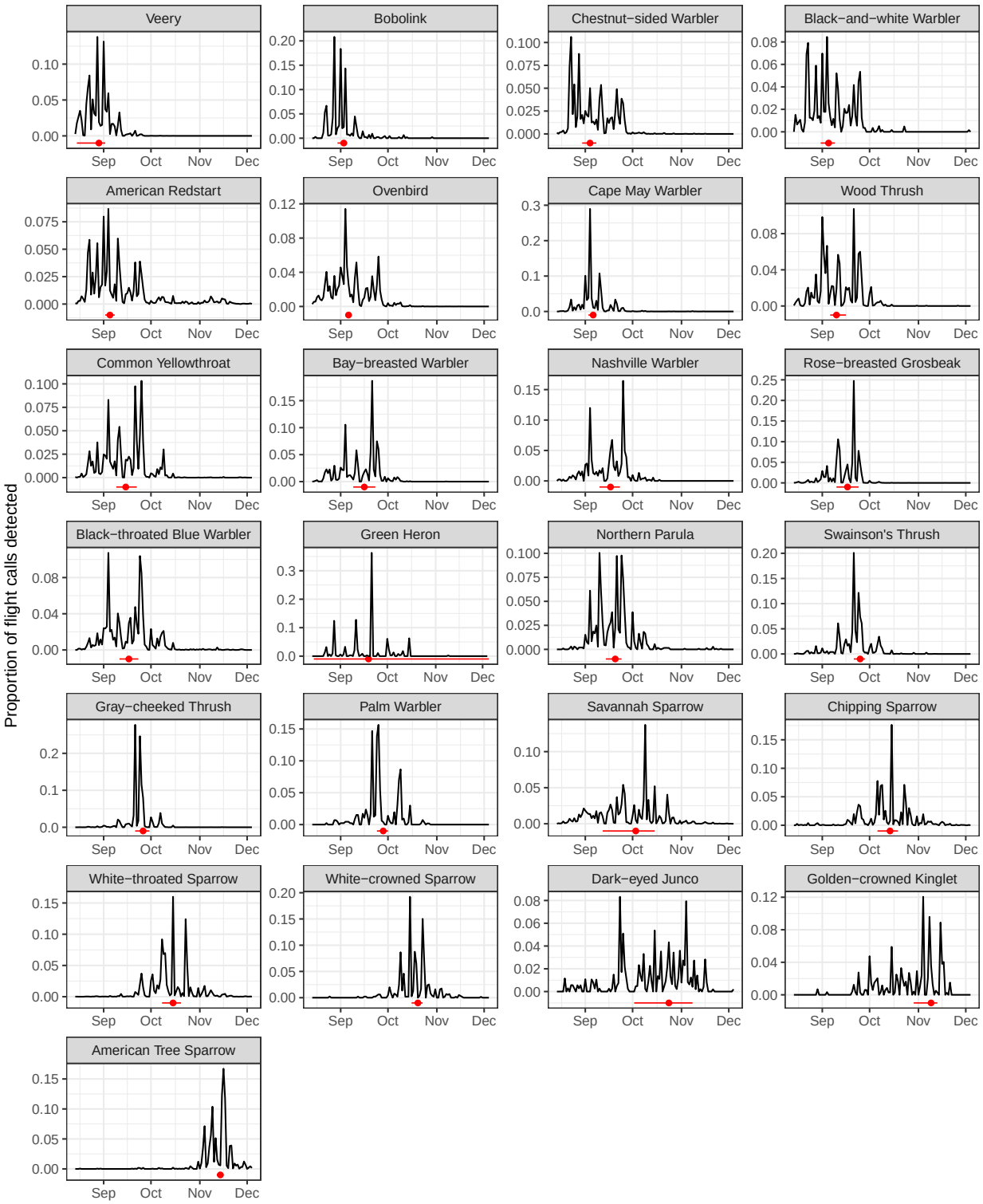


Figure S8: Nightly flight call detections made by Nighthawk in Ithaca, New York, USA during autumn 2015 for all migrant species. The y-axis shows the proportion of the season's calls detected for that species on a given night. For example, 29% of all Cape May Warbler calls recorded during this season were detected on 4 September. Red line and point beneath each plot shows estimated peak migration timing and 95% confidence interval.

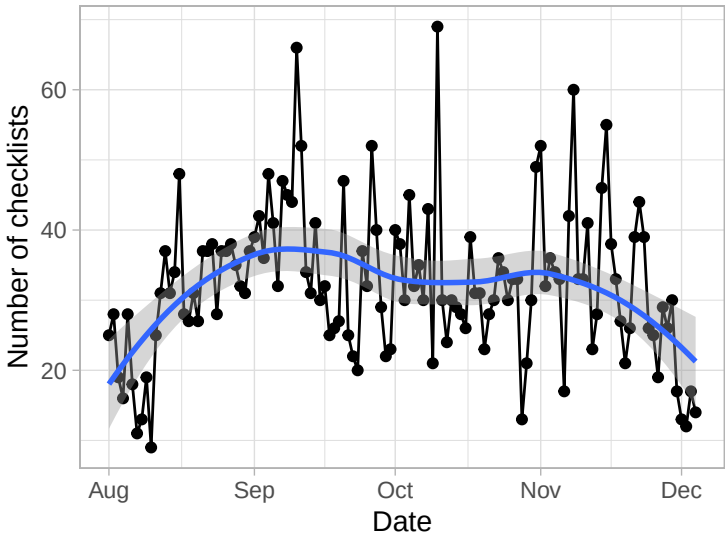


Figure S9: Daily number of complete eBird checklists submitted in Tompkins County, New York, USA in autumn 2015.

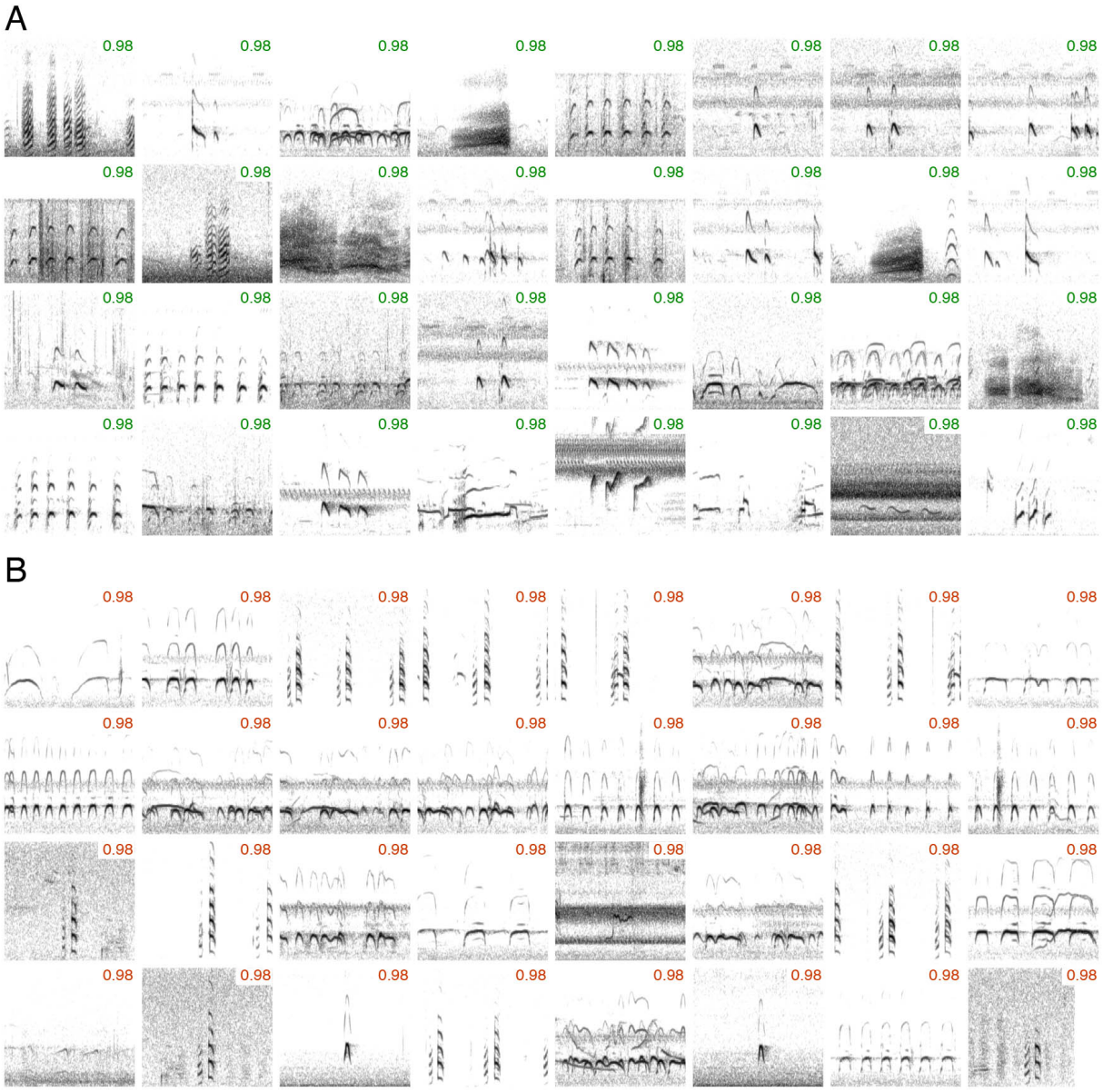


Figure S10: Classification examples for **Charadriiformes** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

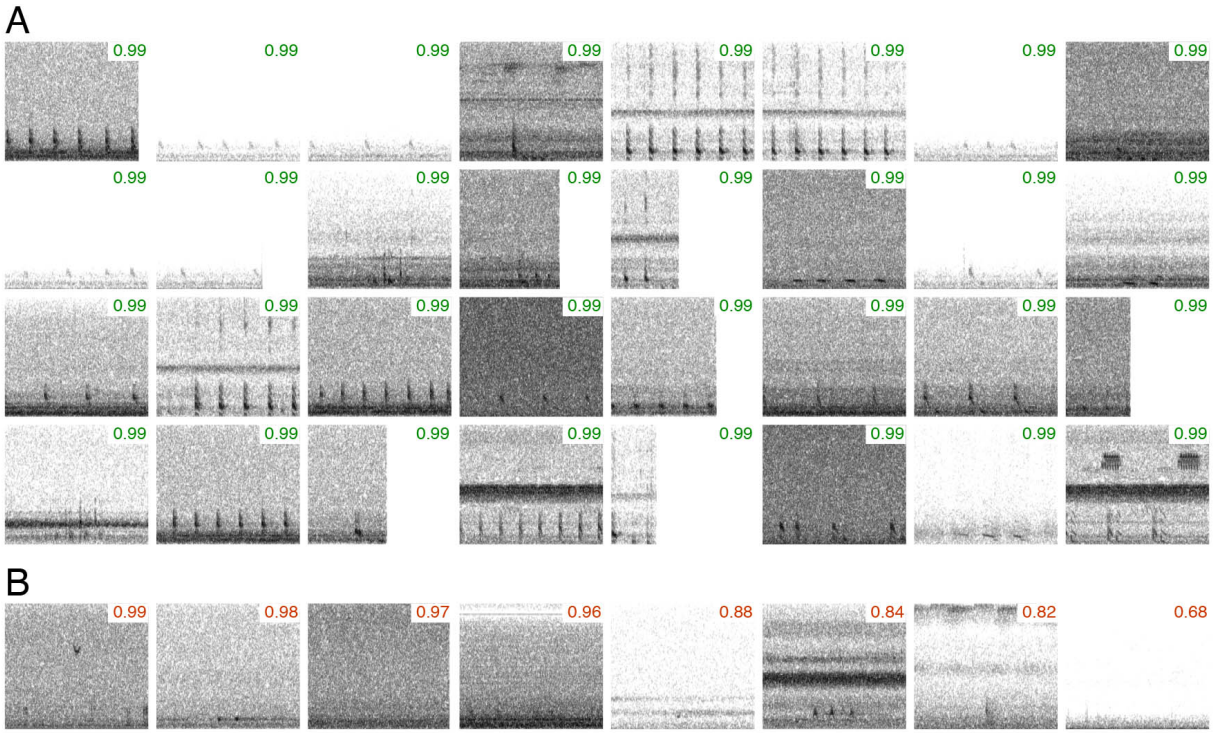


Figure S11: Classification examples for **Cuculiformes** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

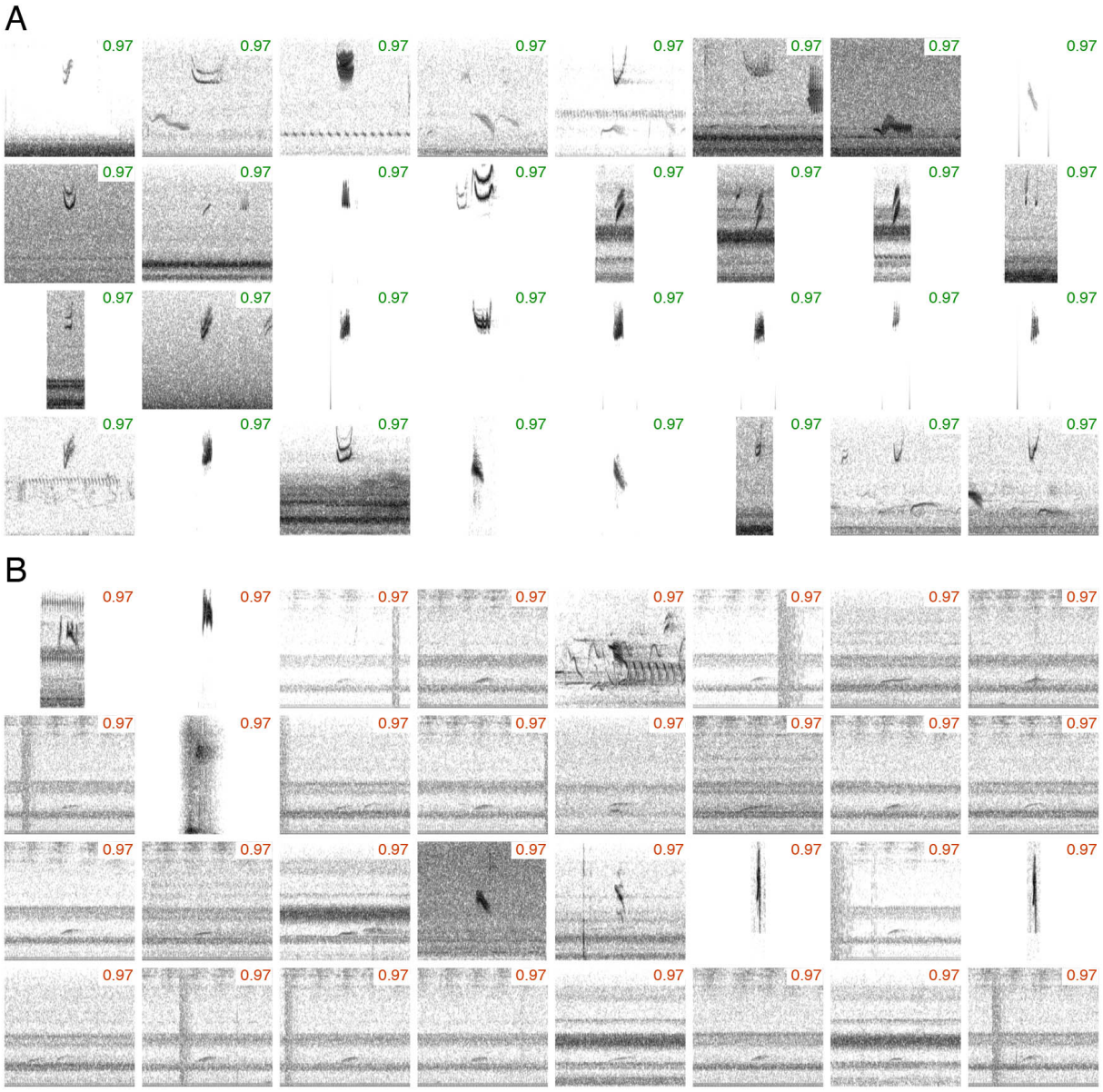


Figure S12: Classification examples for **Passeriformes** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

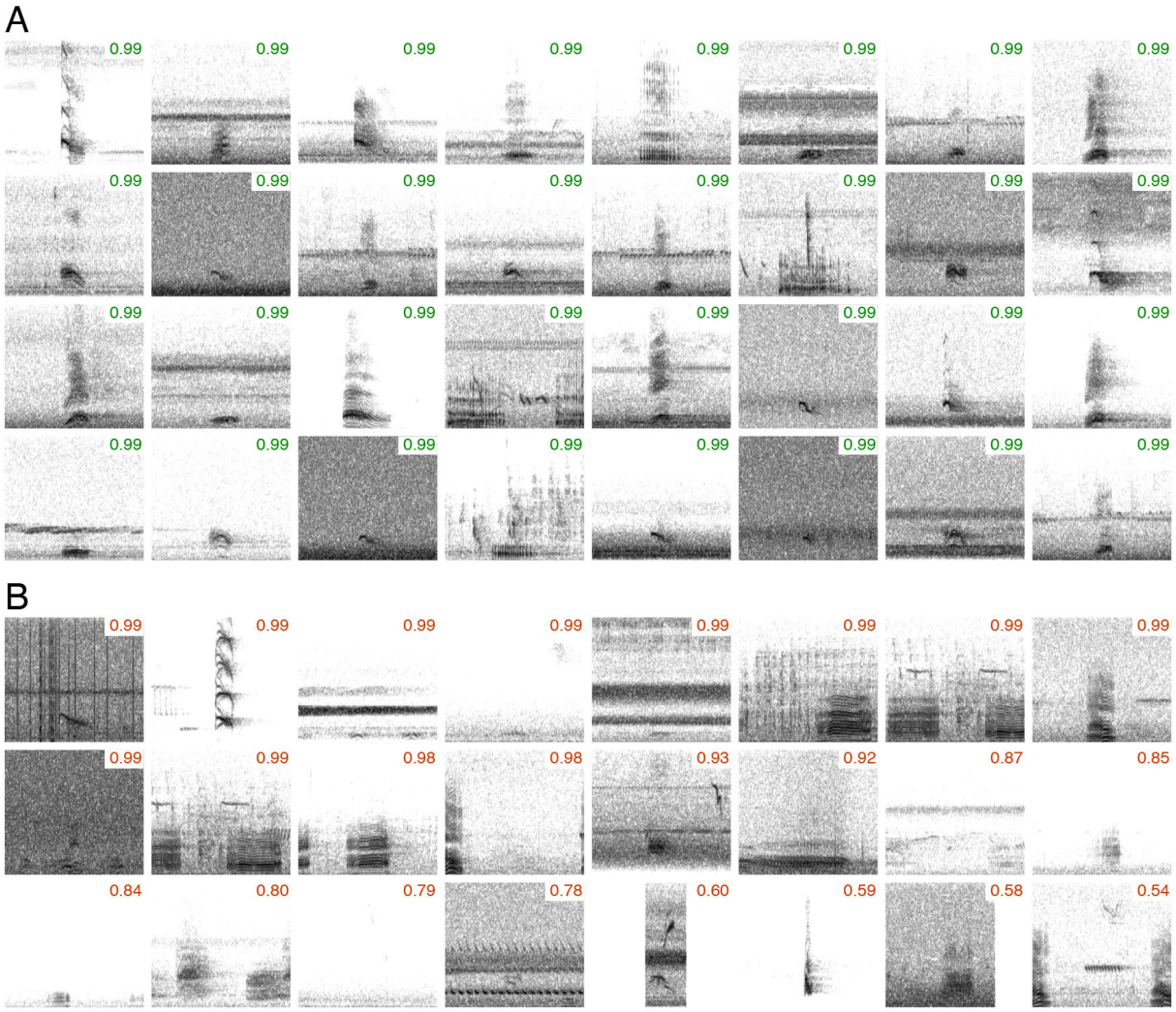


Figure S13: Classification examples for **Pelecaniformes** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

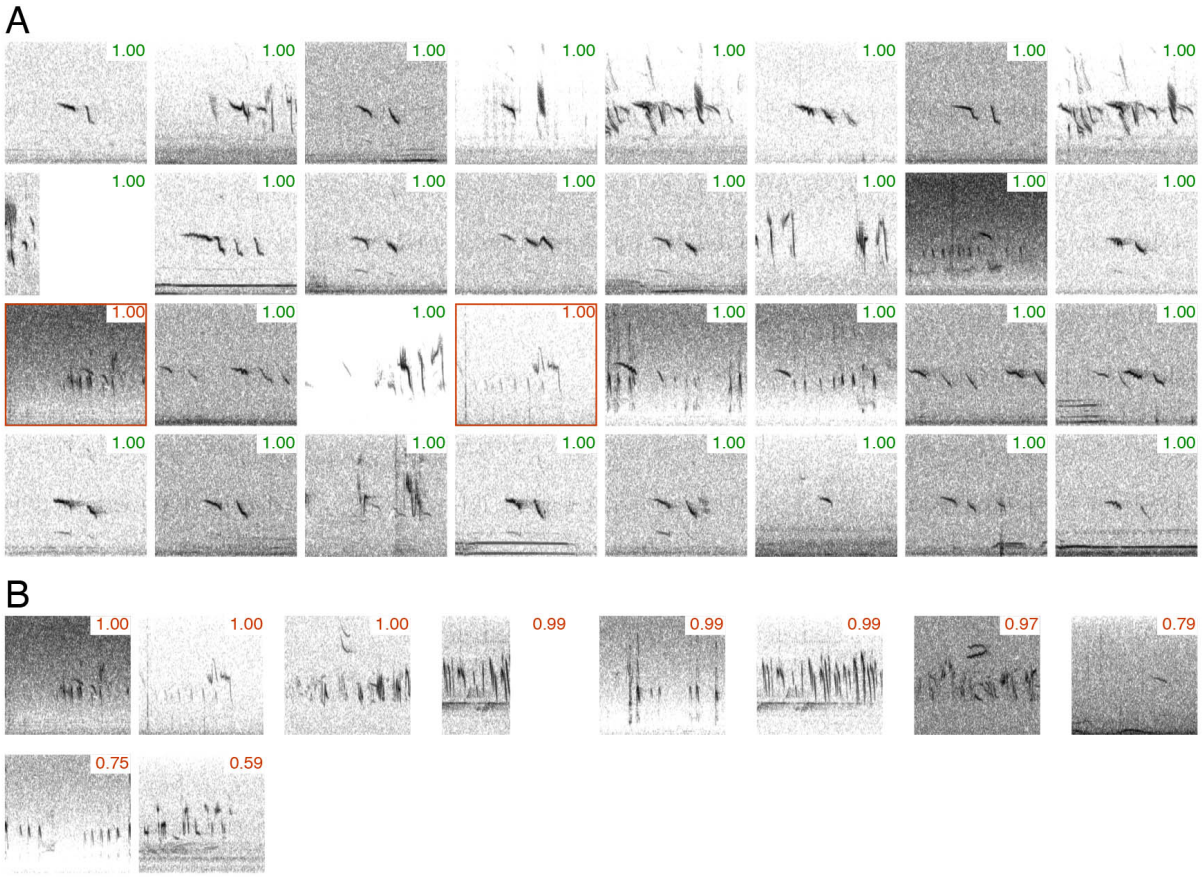


Figure S14: Classification examples for **Alaudidae** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

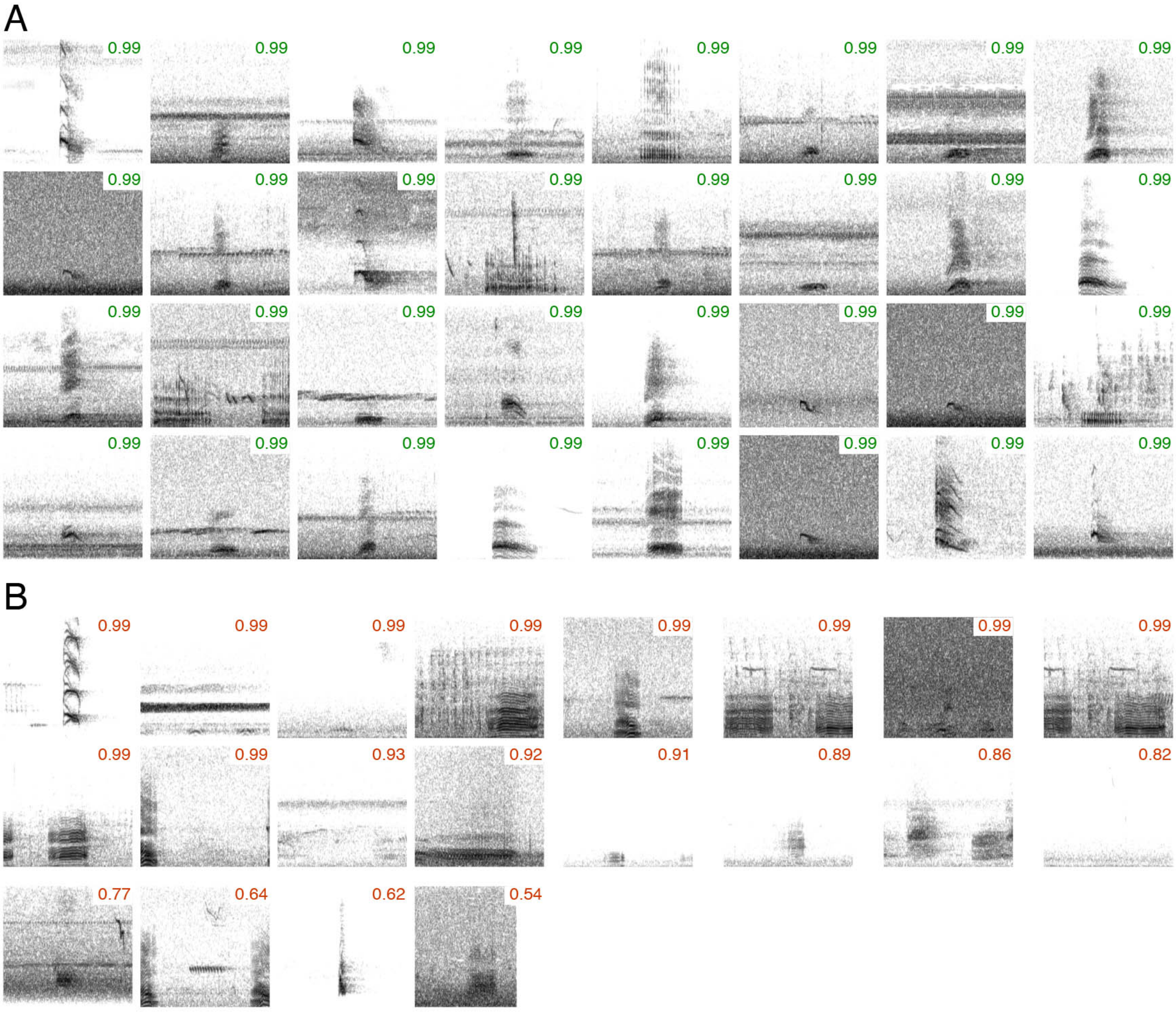


Figure S15: Classification examples for **Ardeidae** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

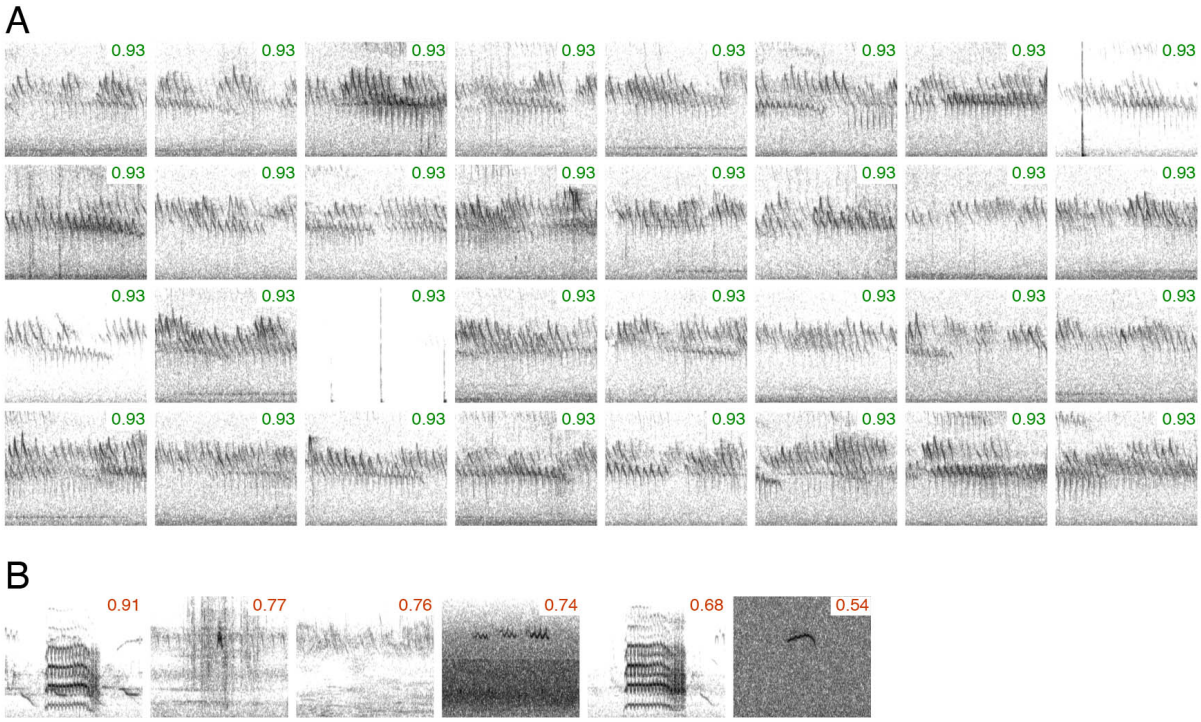


Figure S16: Classification examples for **Bombycillidae** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

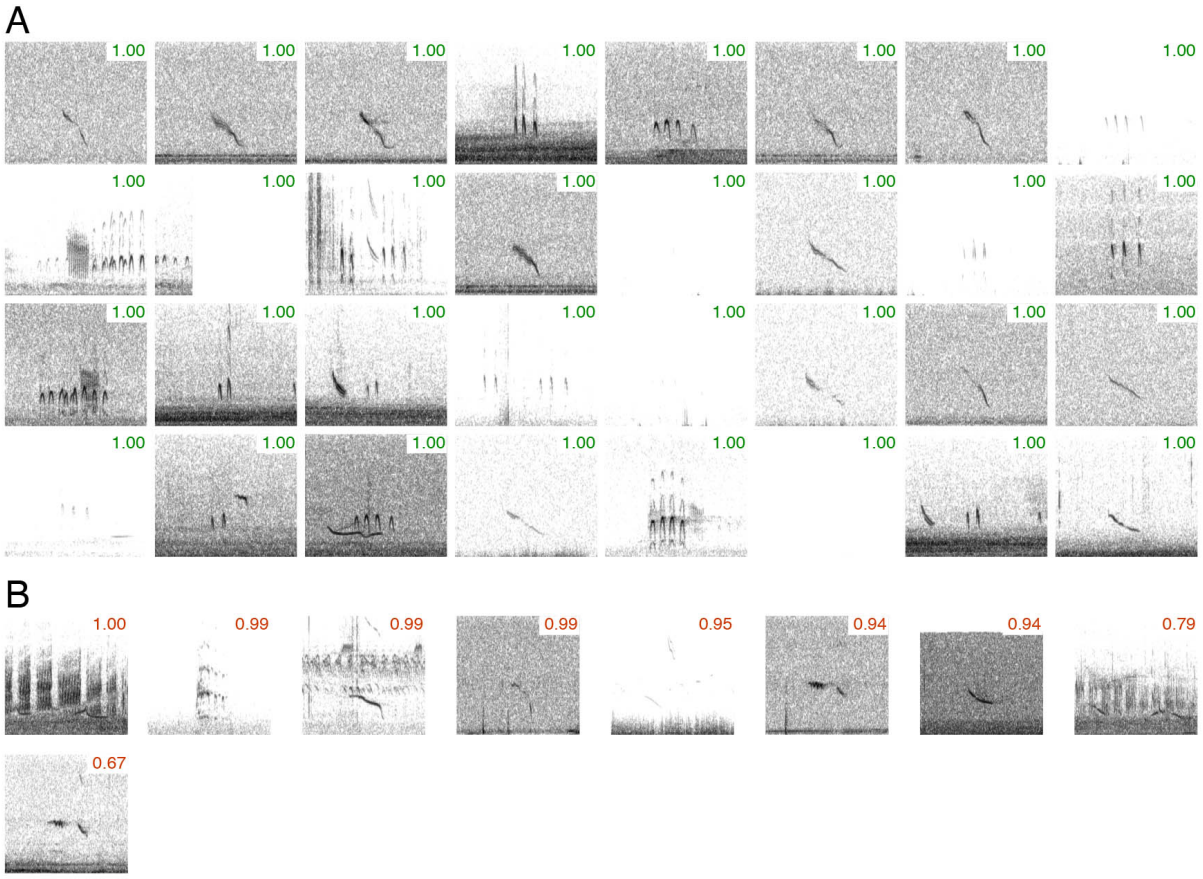


Figure S17: Classification examples for **Calcariidae** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

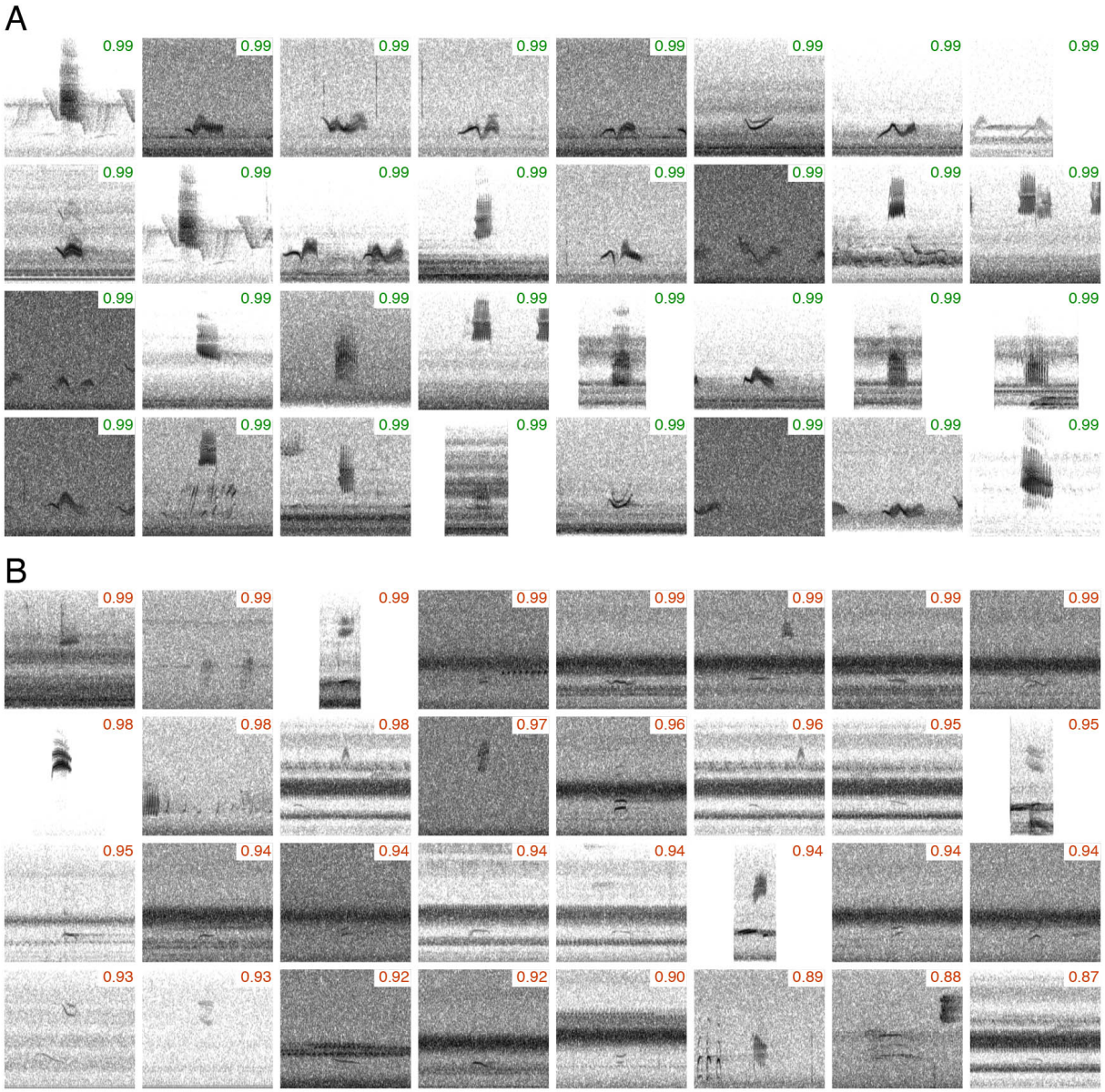


Figure S18: Classification examples for **Cardinalidae** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

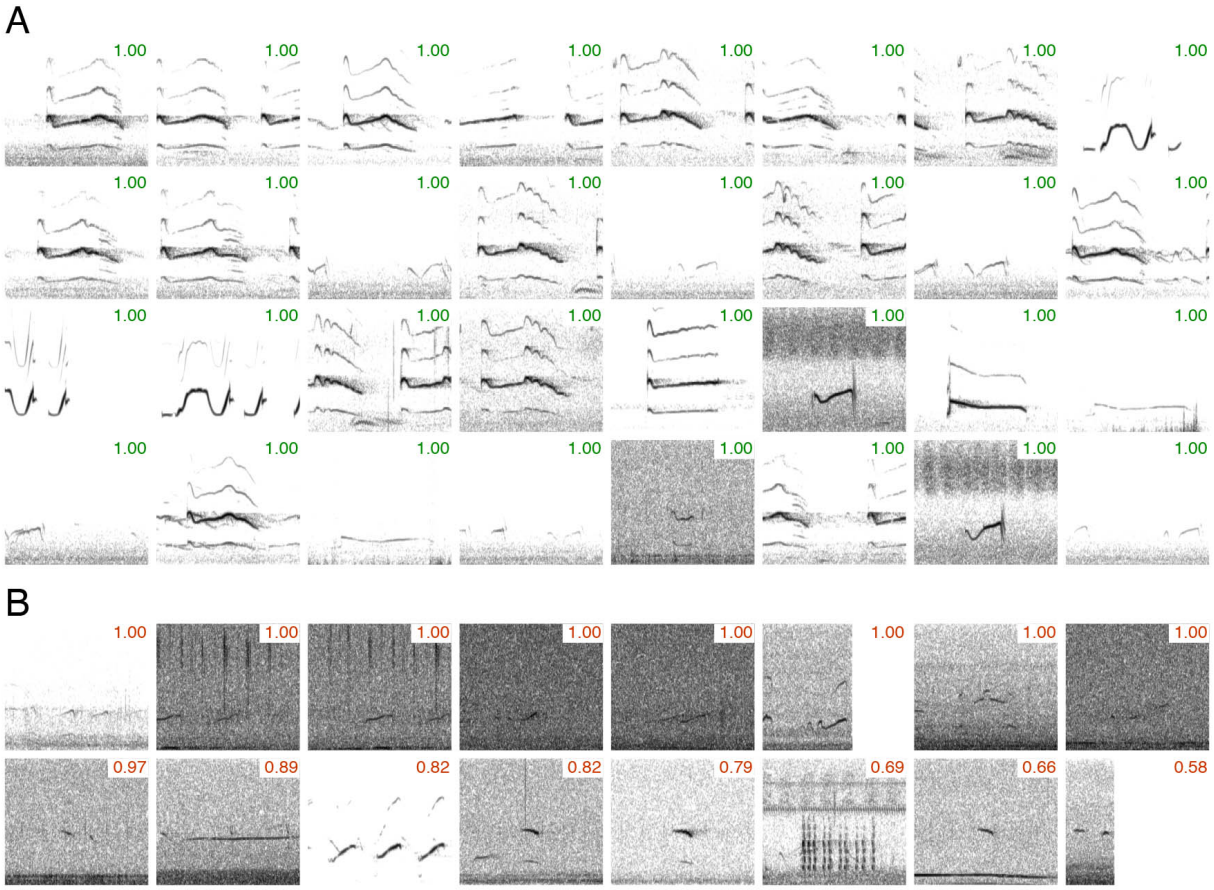


Figure S19: Classification examples for **Charadriidae** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

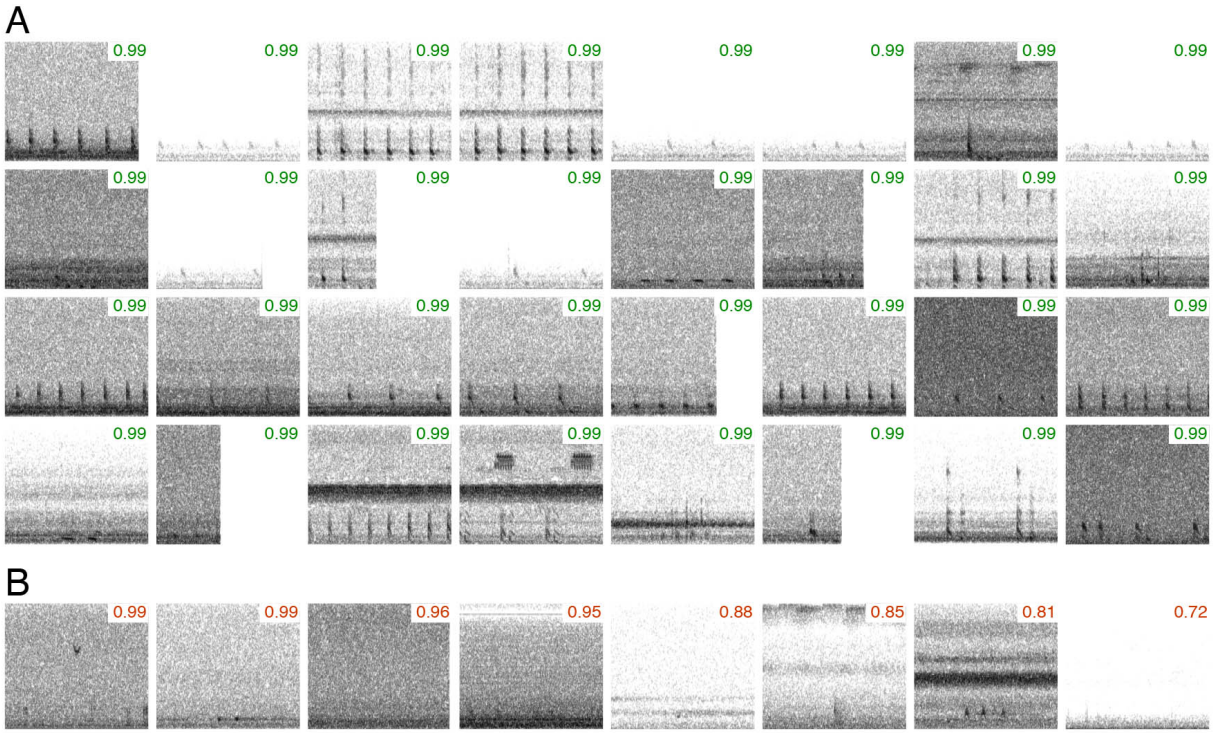


Figure S20: Classification examples for **Cuculidae** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

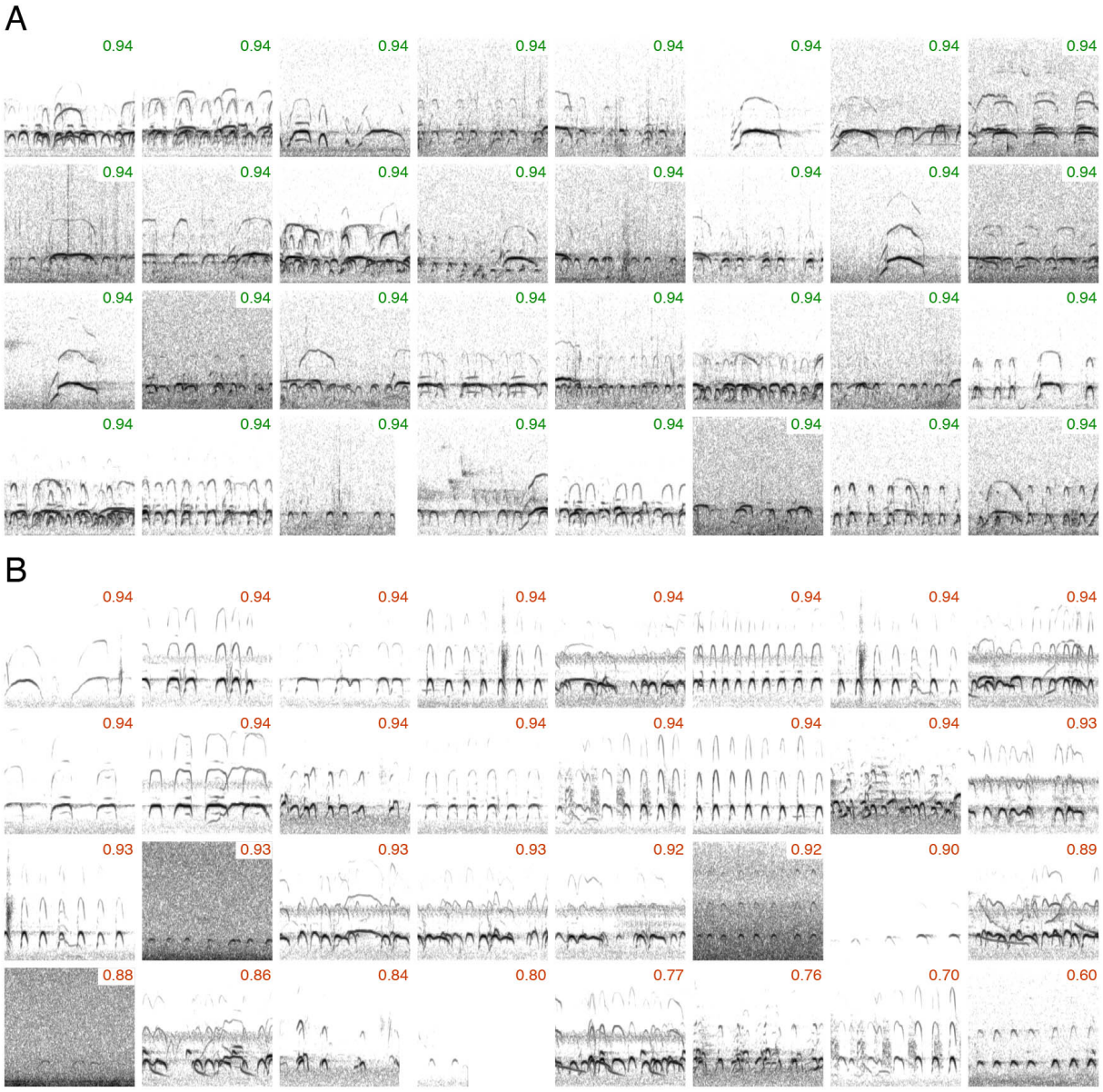


Figure S21: Classification examples for **Haematopodidae** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

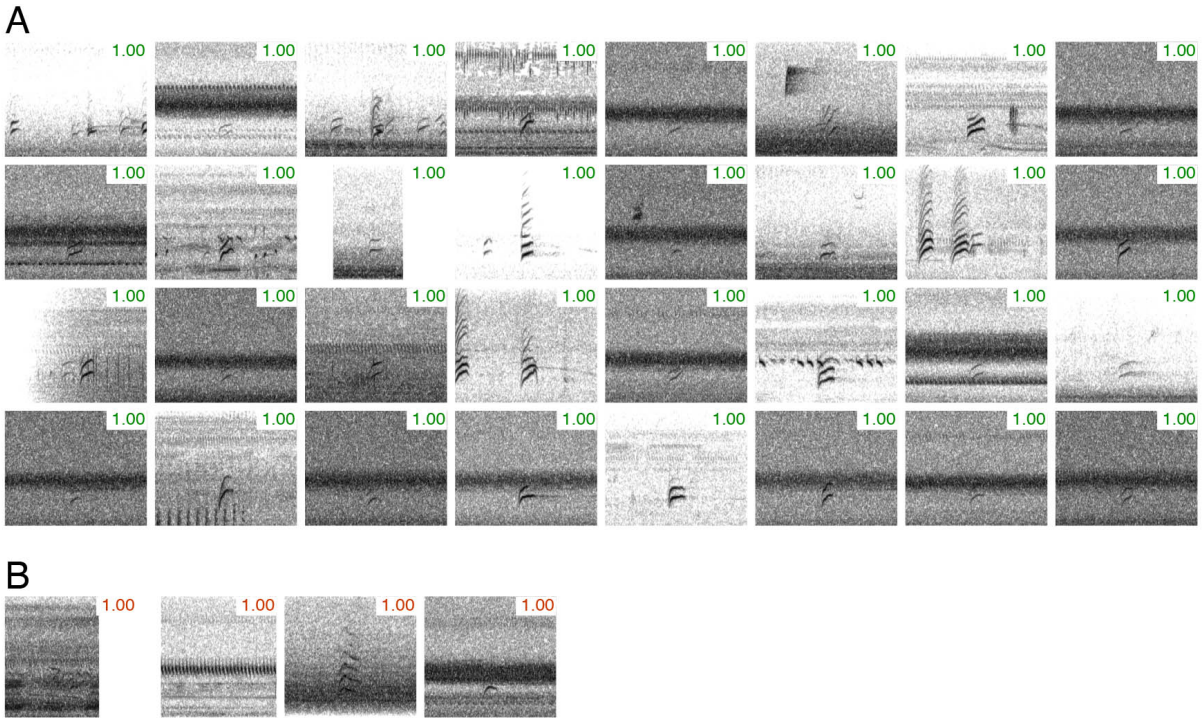


Figure S22: Classification examples for **Icteridae** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

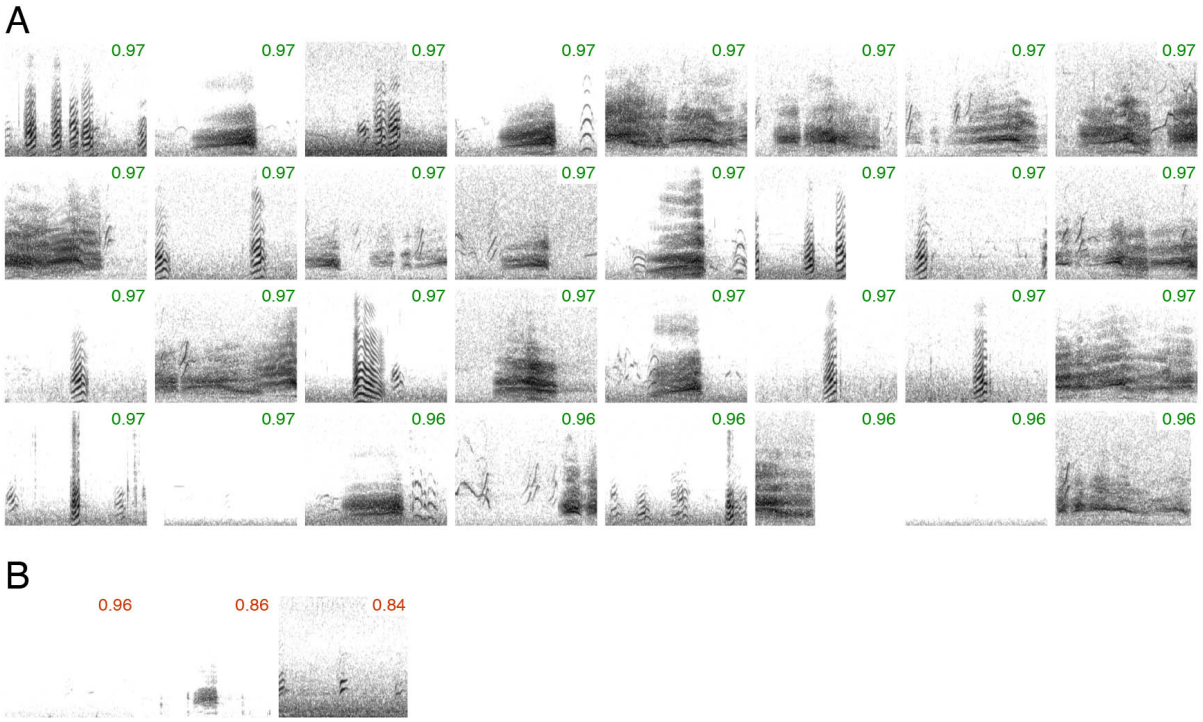


Figure S23: Classification examples for **Laridae** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

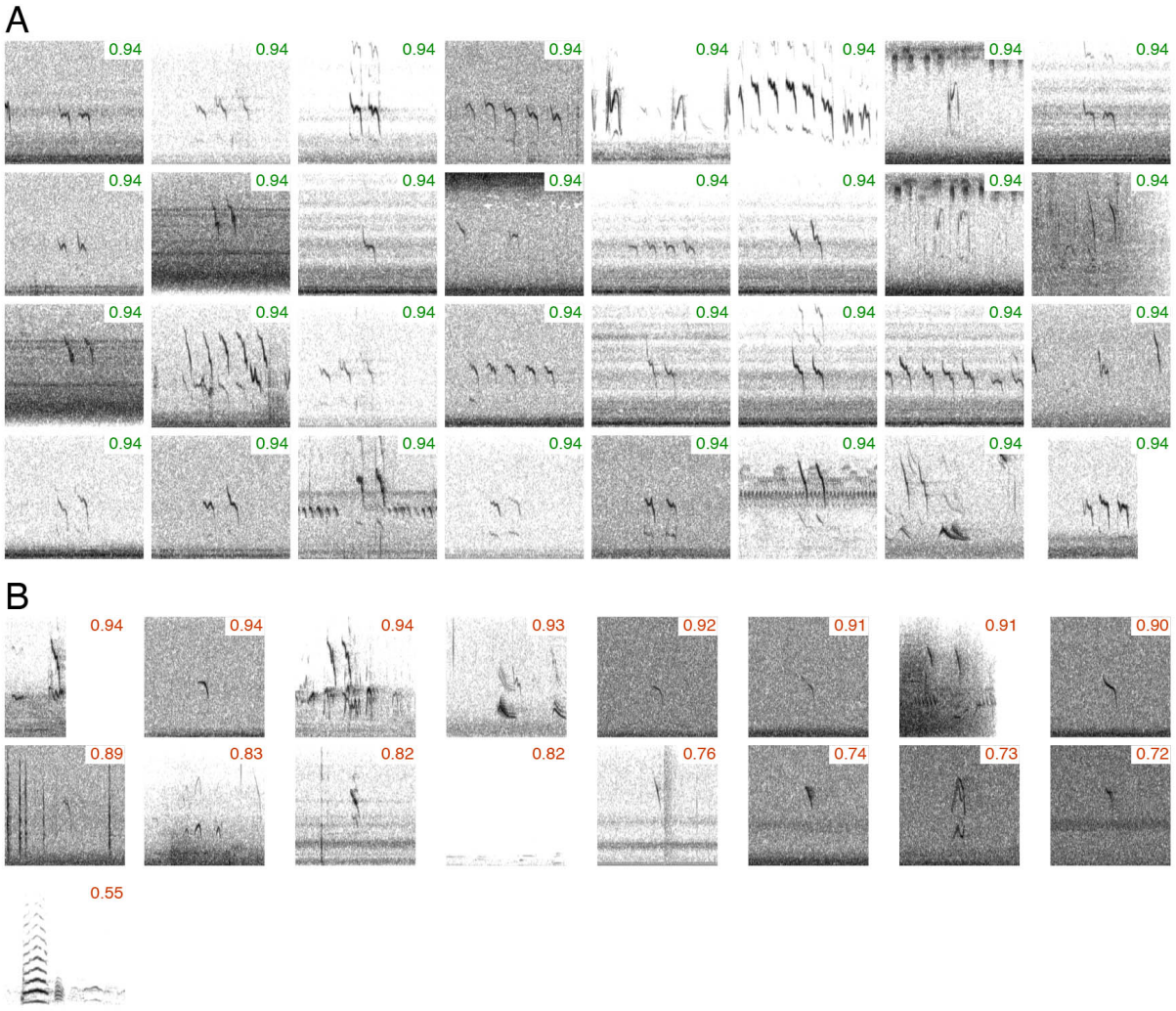


Figure S24: Classification examples for **Motacillidae** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

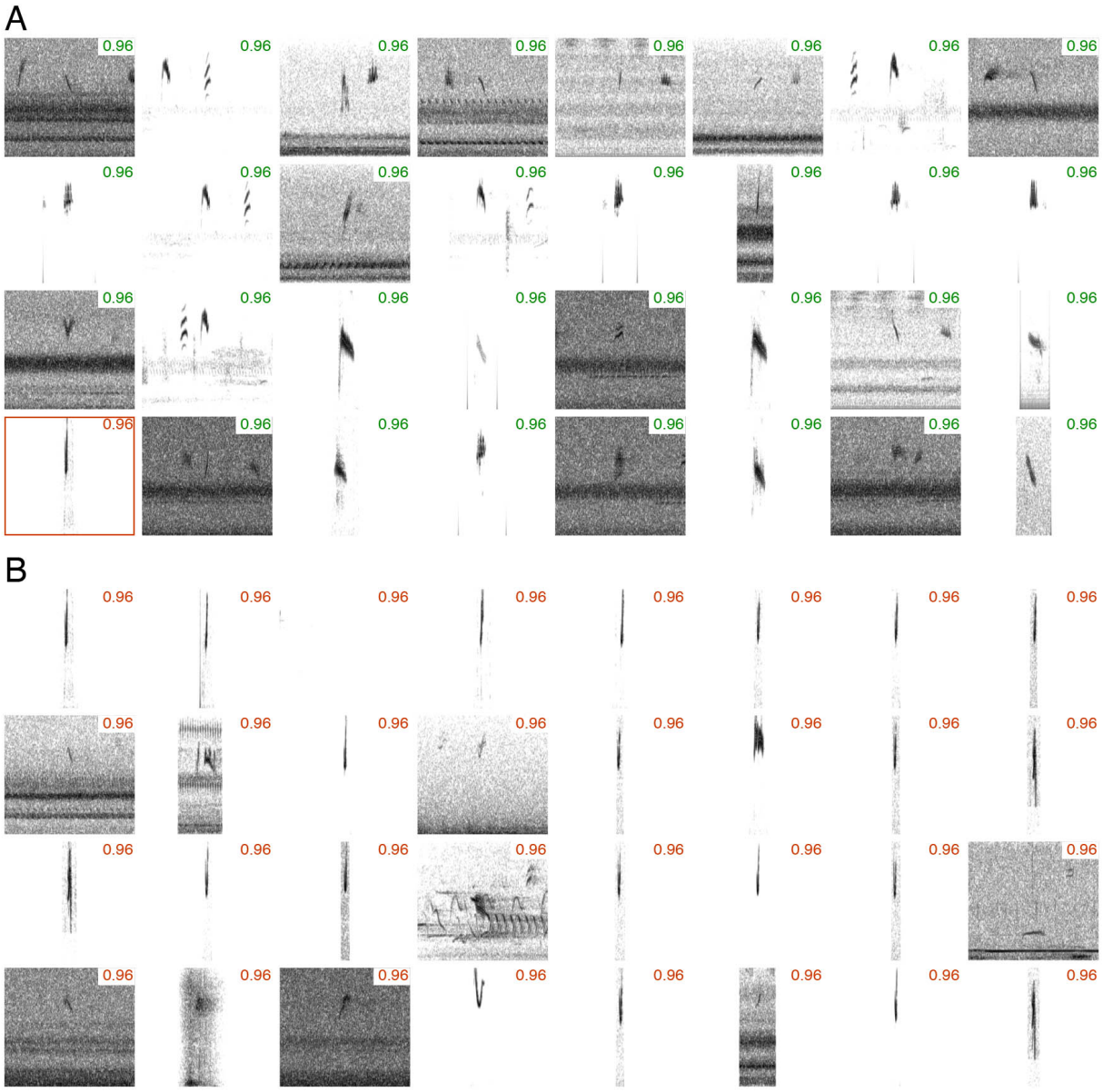


Figure S25: Classification examples for **Parulidae** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

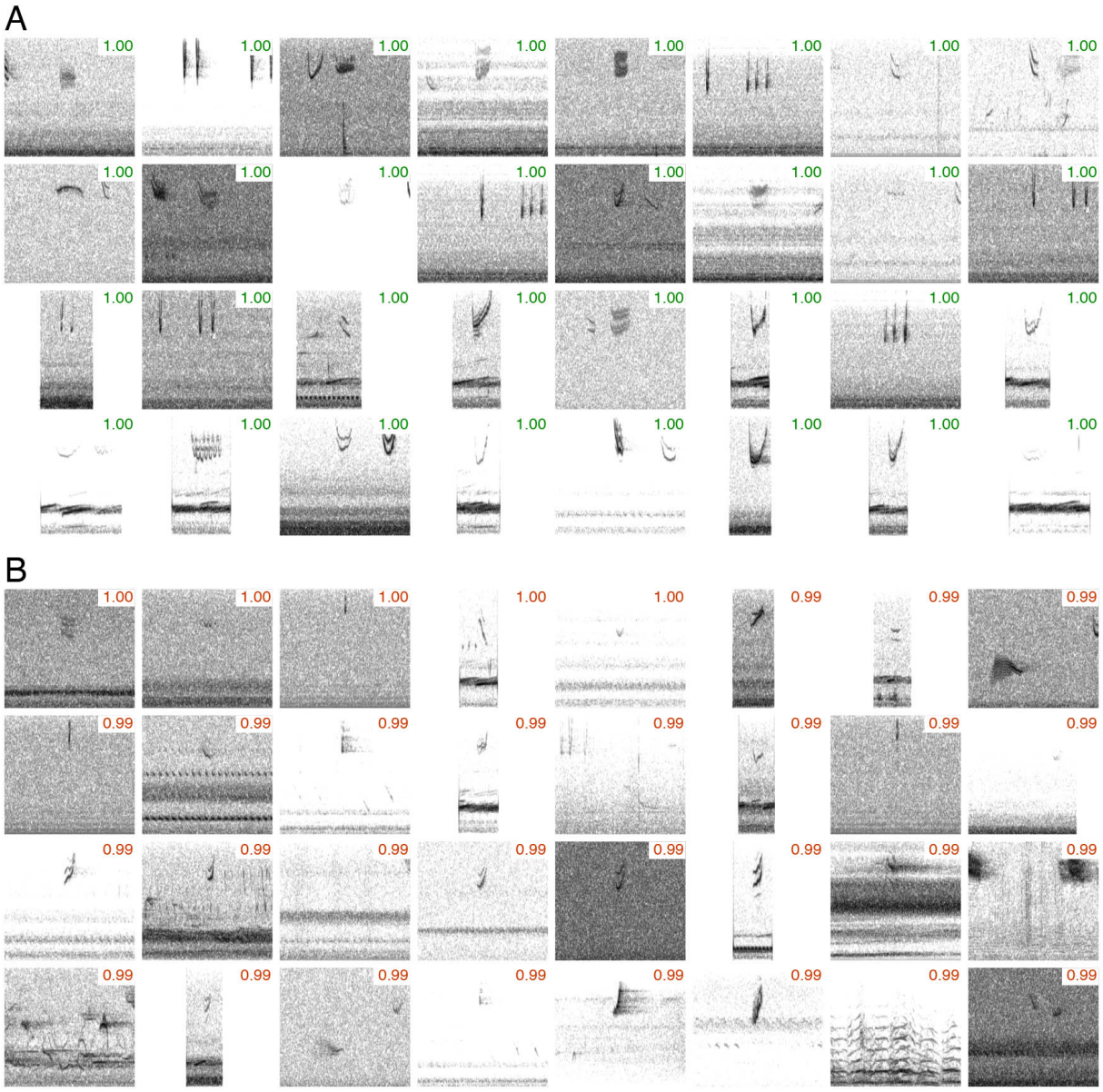


Figure S26: Classification examples for **Passerellidae** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

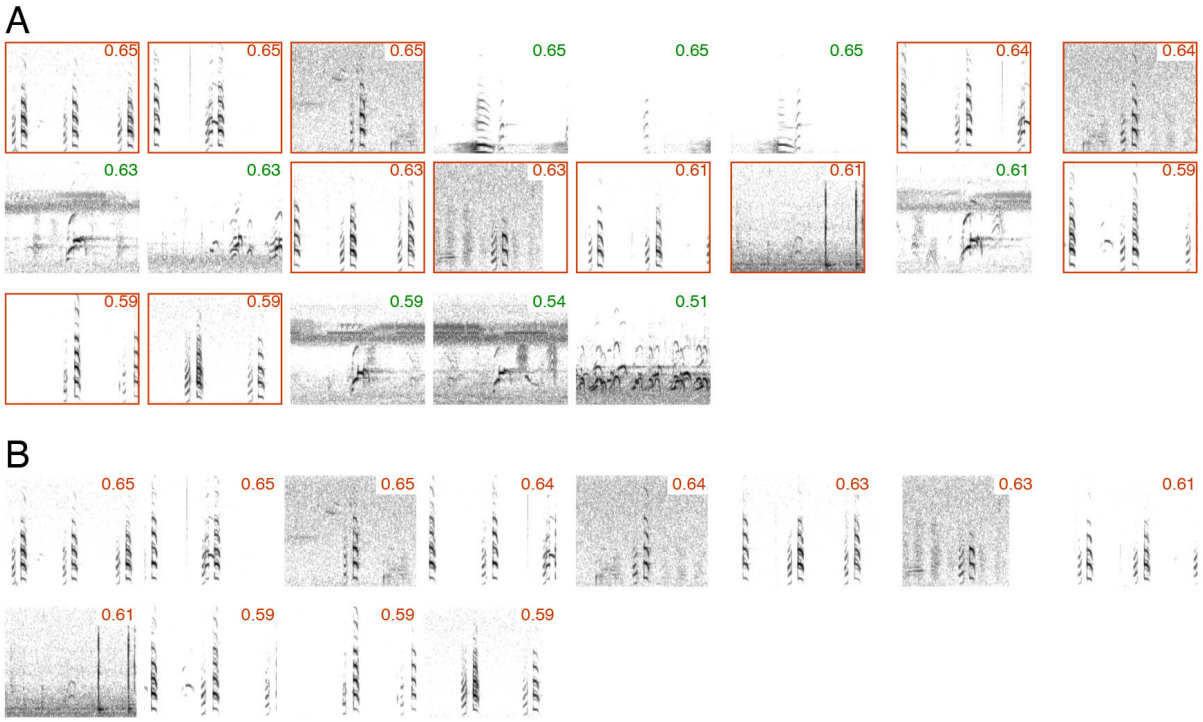


Figure S27: Classification examples for **Recurvirostridae** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

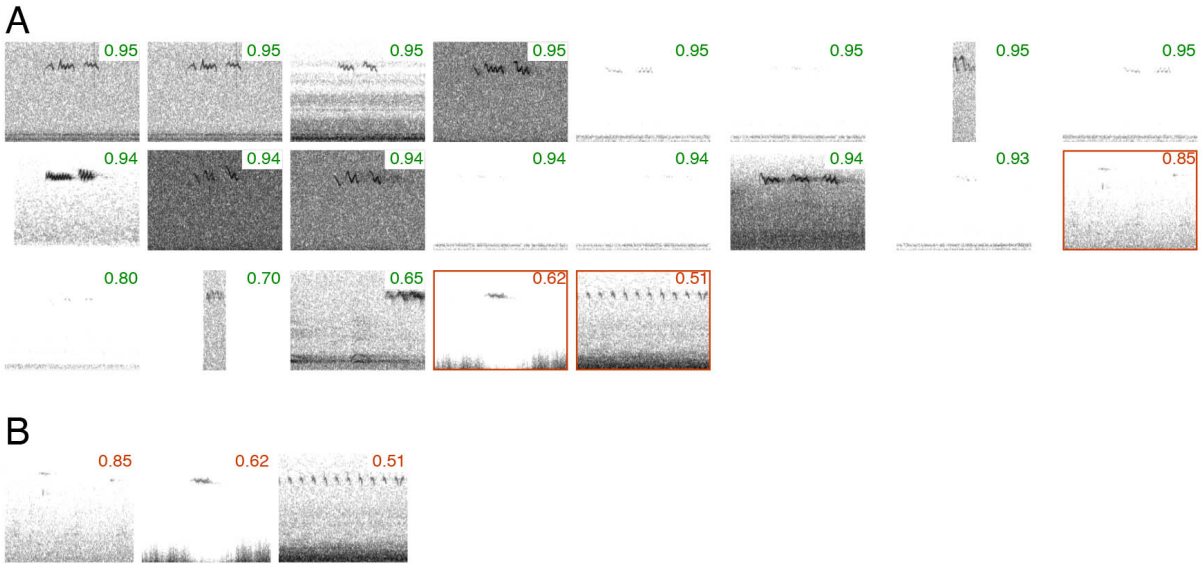


Figure S28: Classification examples for **Regulidae** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

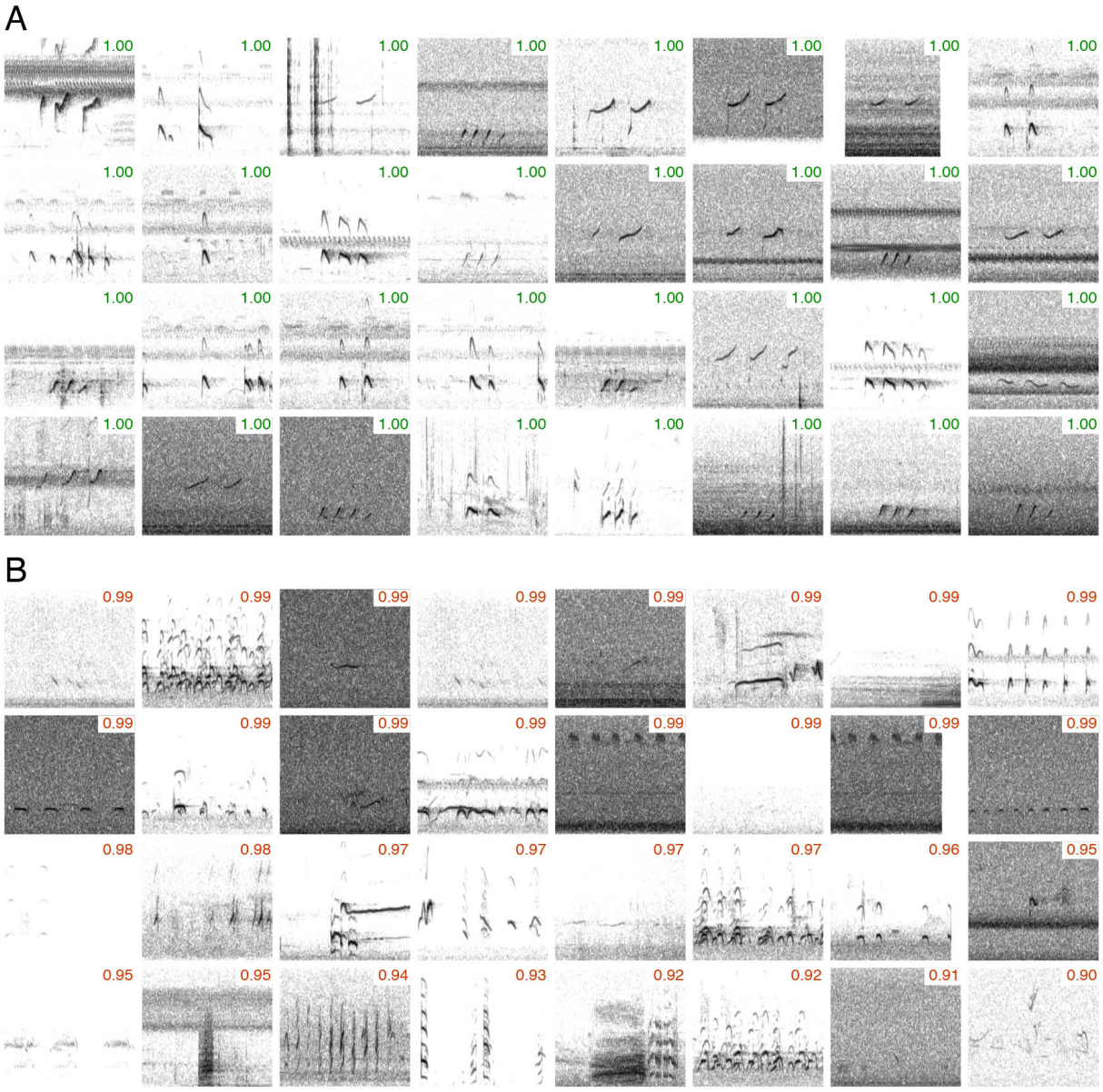
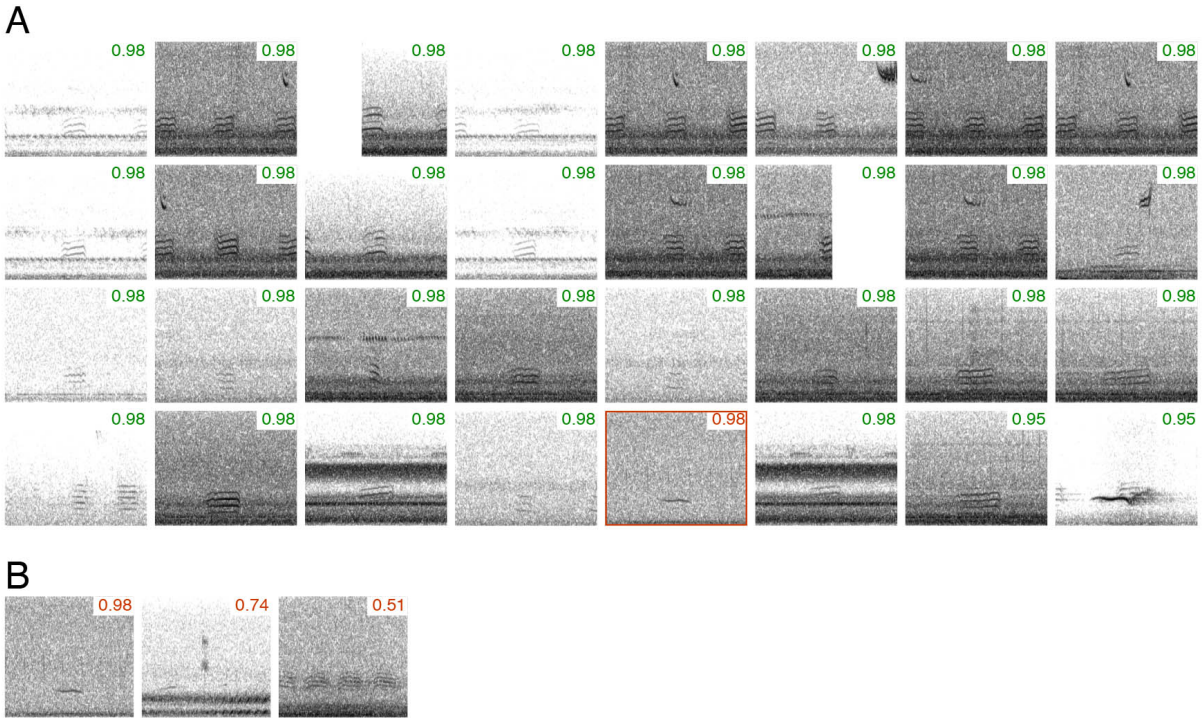


Figure S29: Classification examples for **Scolopacidae** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).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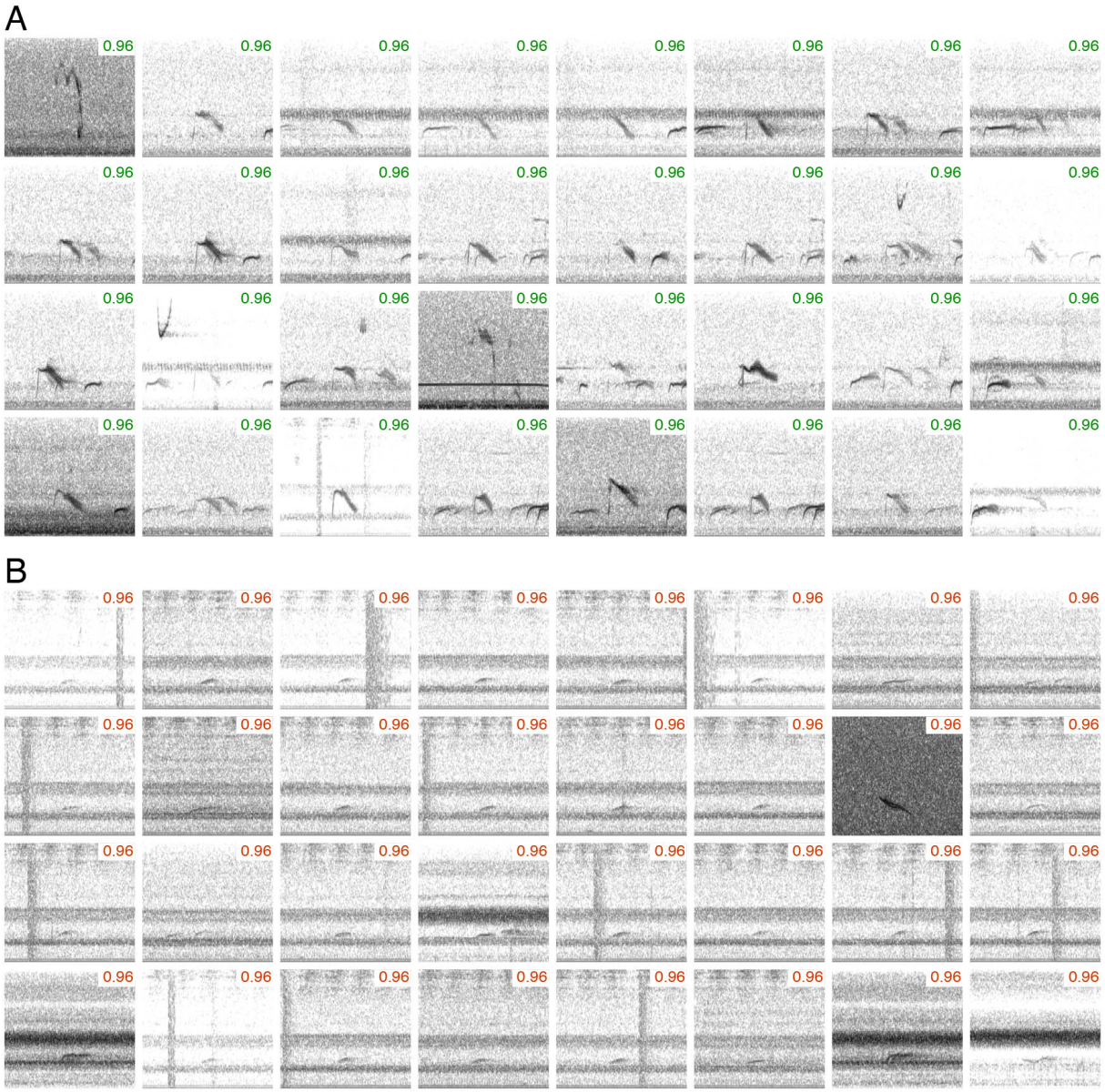

Figure S31: Classification examples for **Turdidae** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

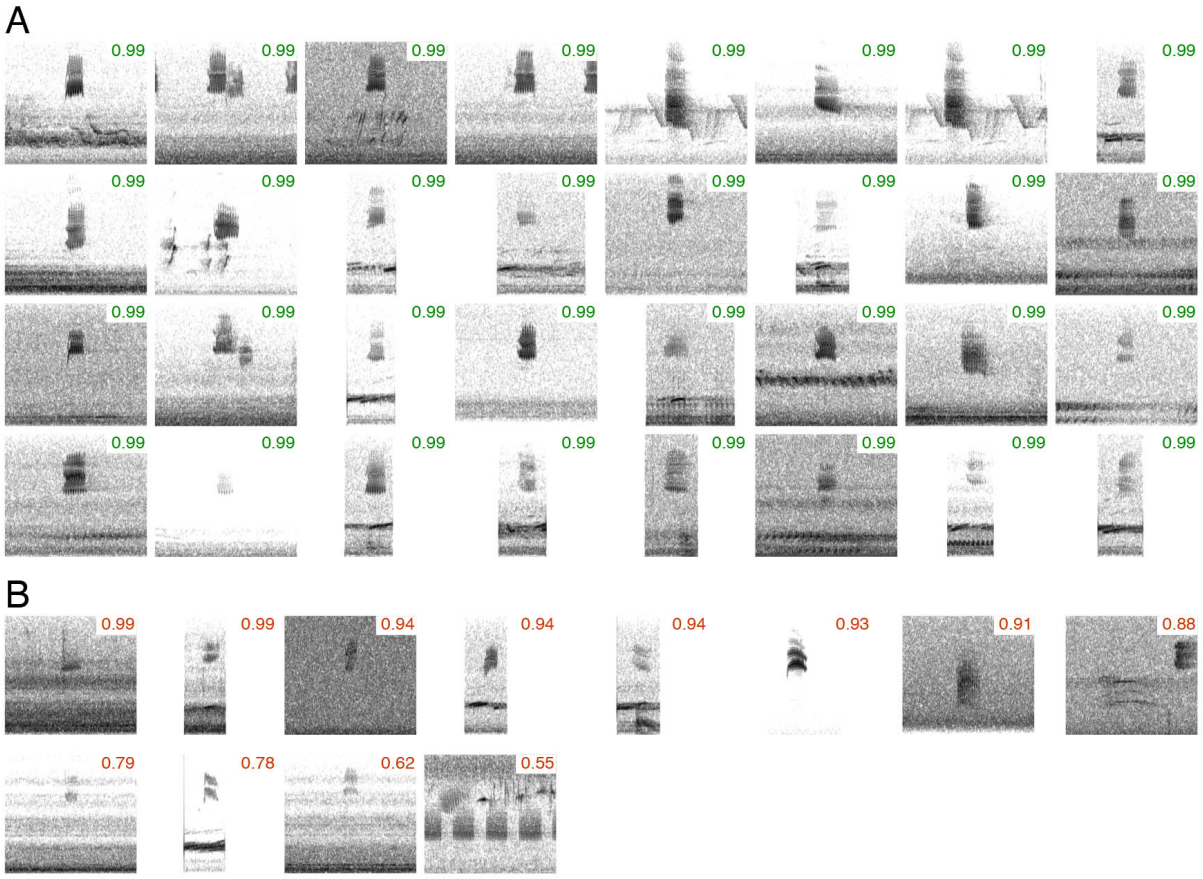

Figure S32: Classification examples for **BUNT** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

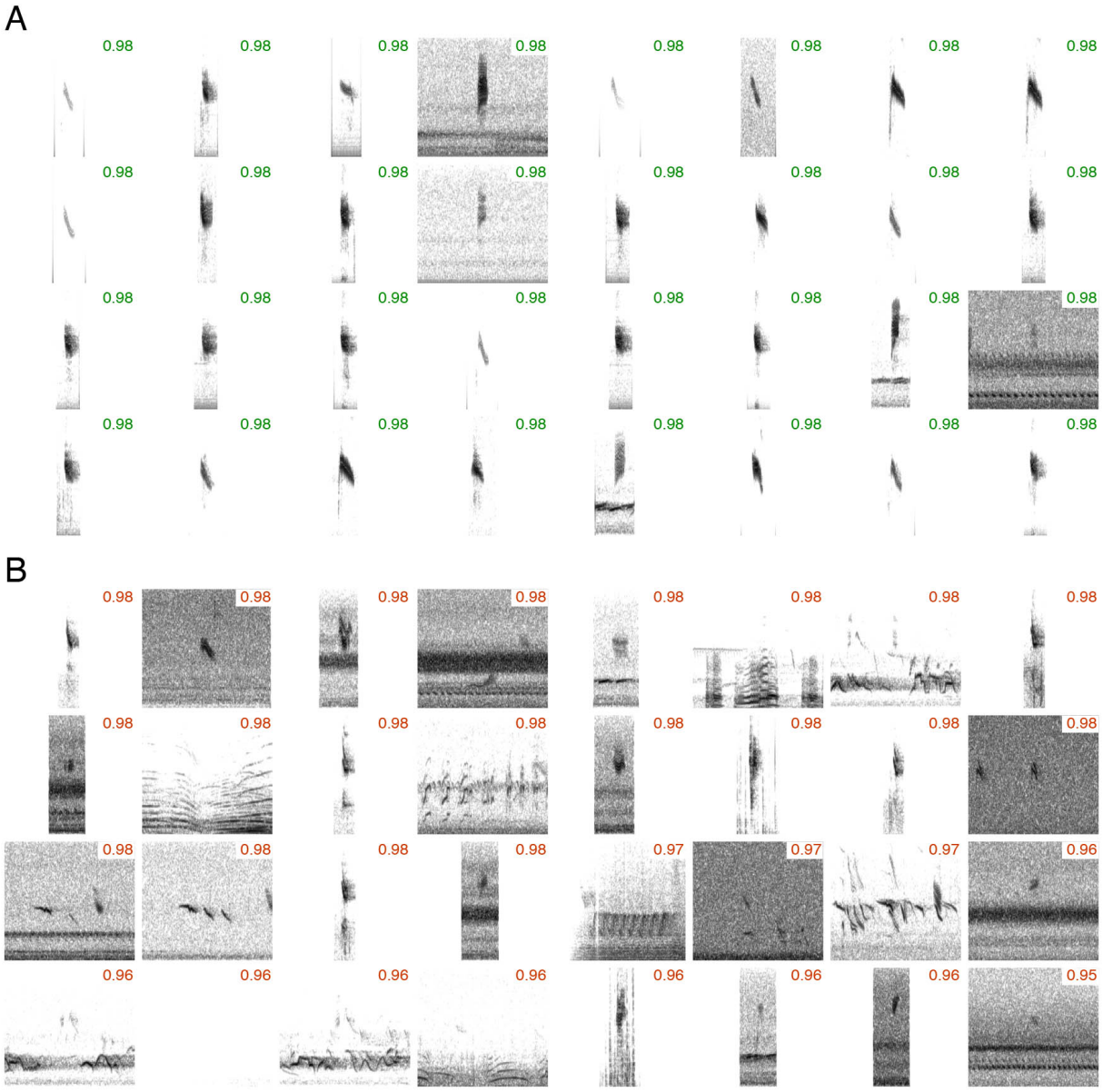

Figure S33: Classification examples for **BZWA** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

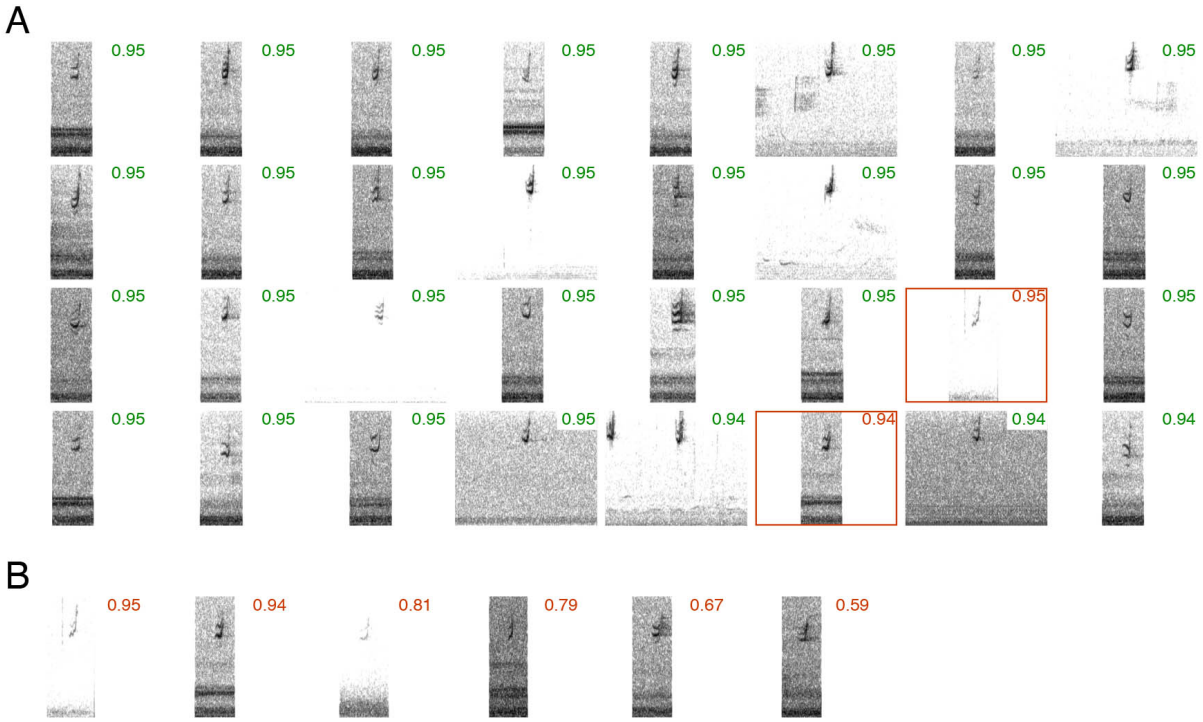

Figure S34: Classification examples for **CCBRS** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

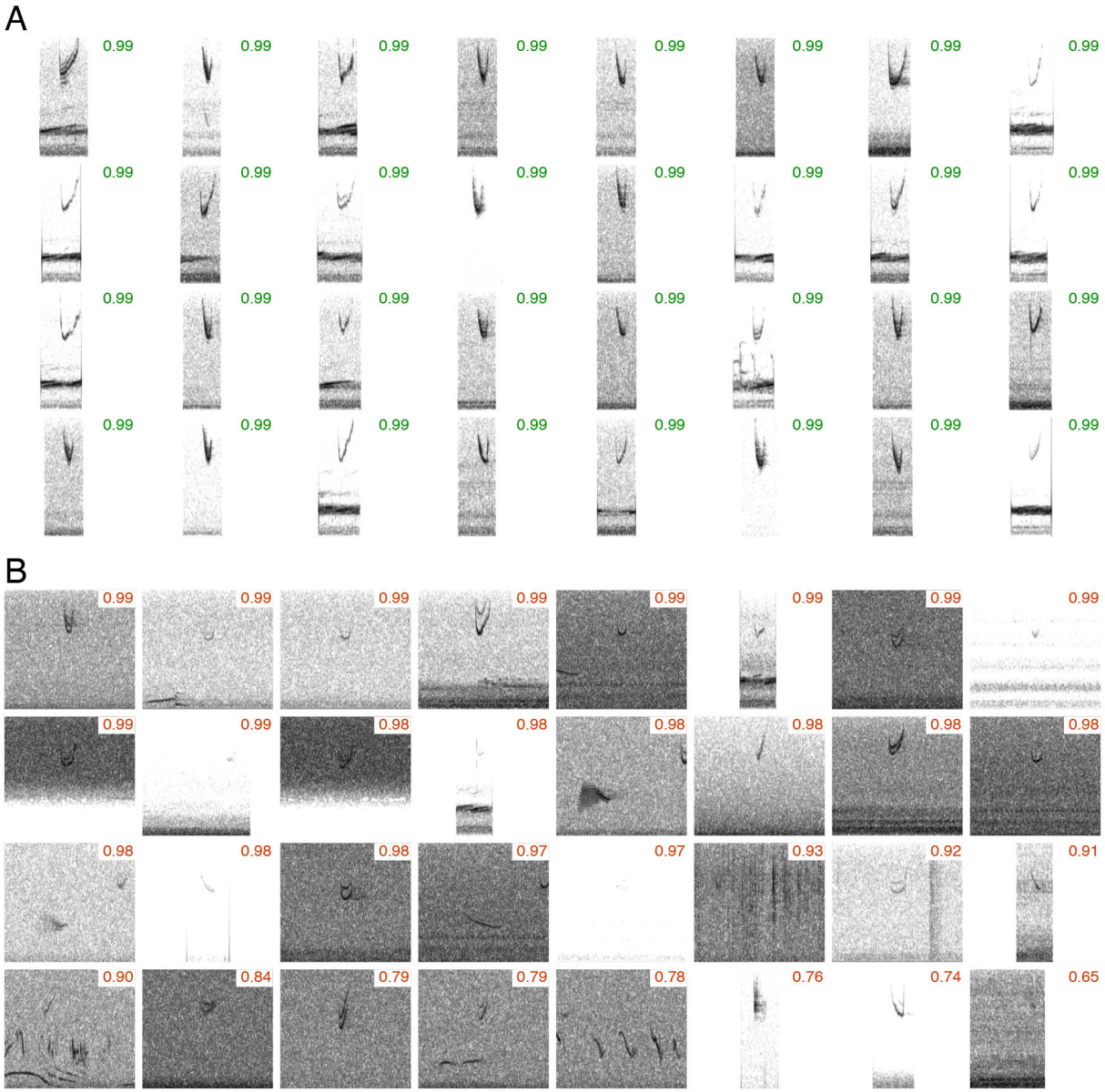

Figure S35: Classification examples for **CUPS** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

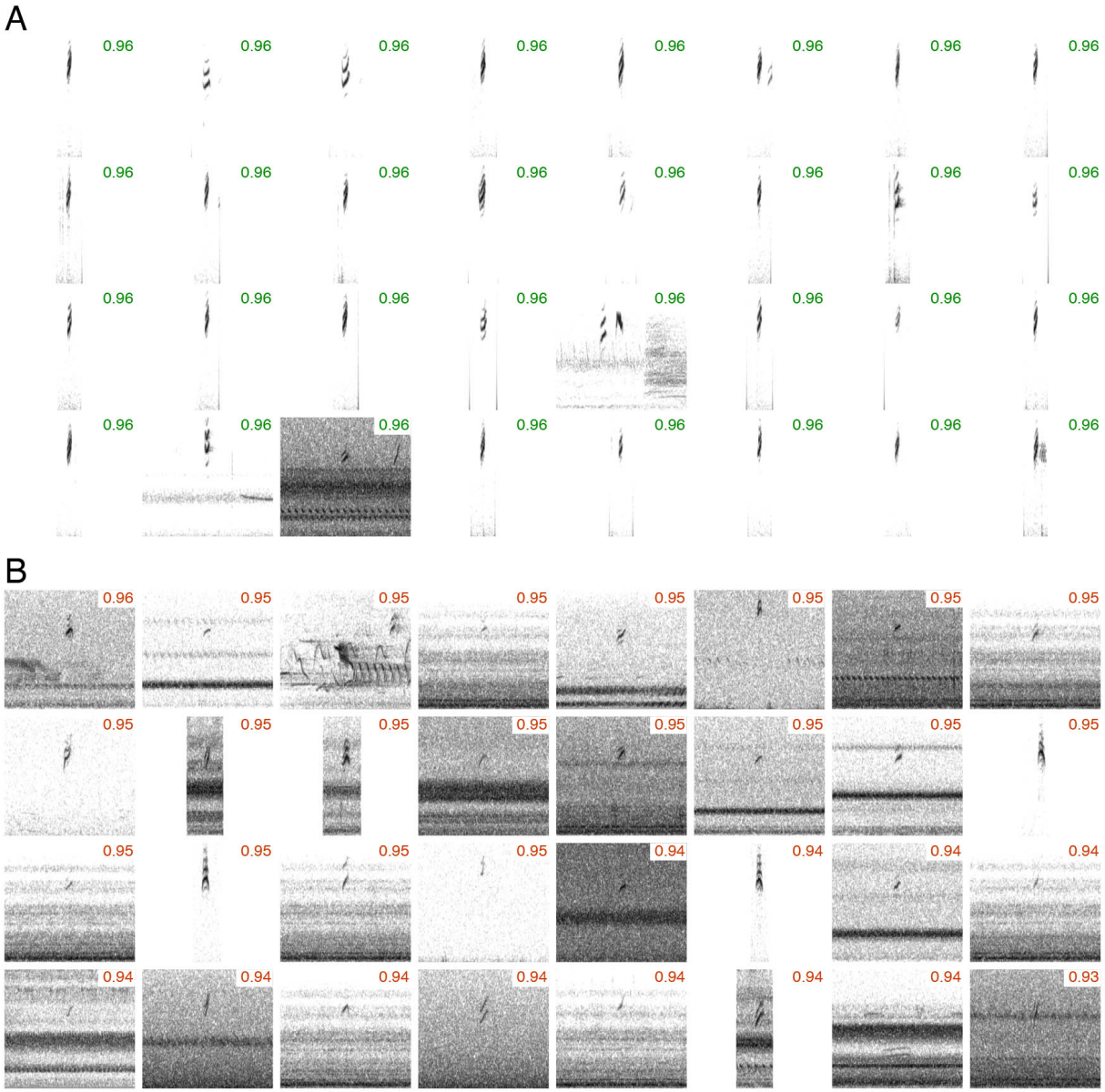

Figure S36: Classification examples for **DBUP** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

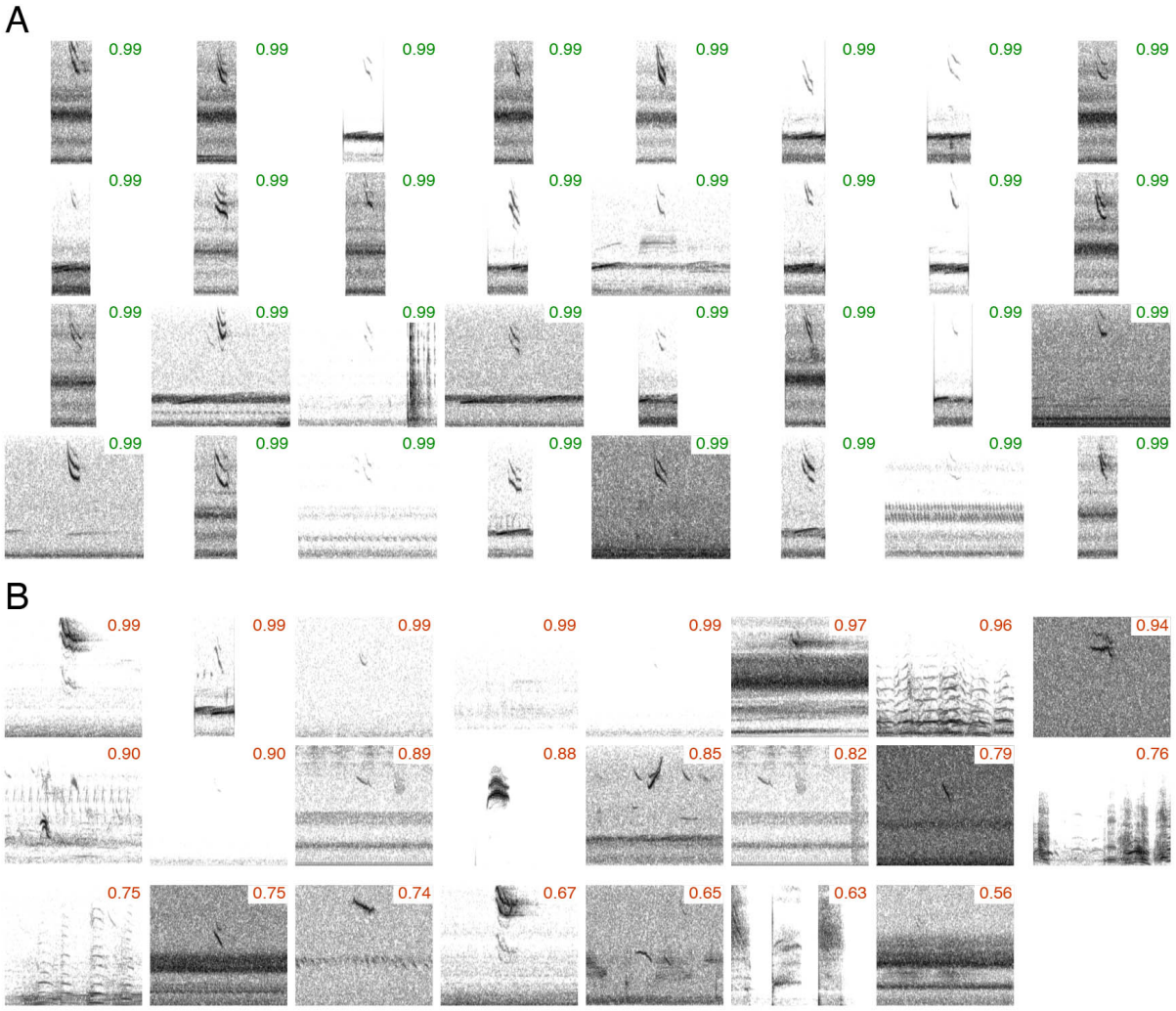

Figure S37: Classification examples for **DESP** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

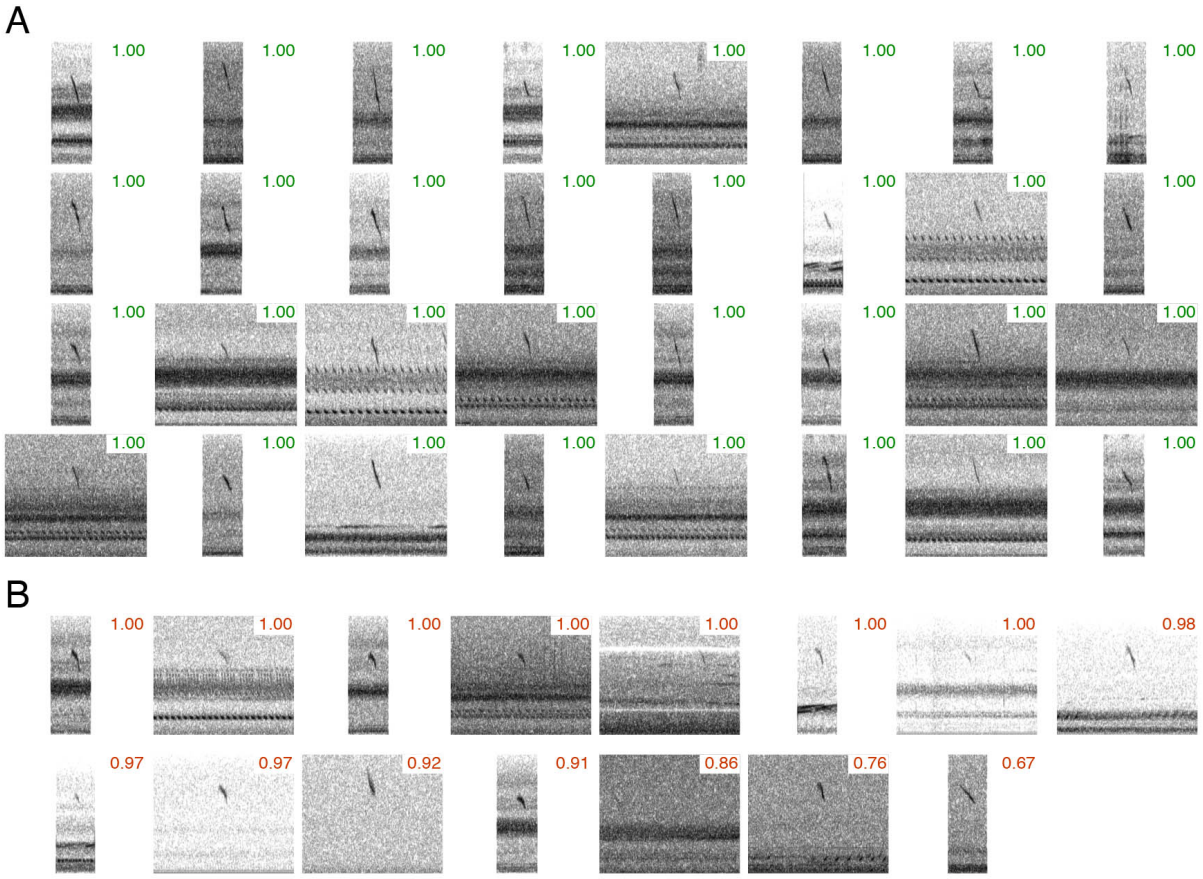

Figure S38: Classification examples for **DEWA** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

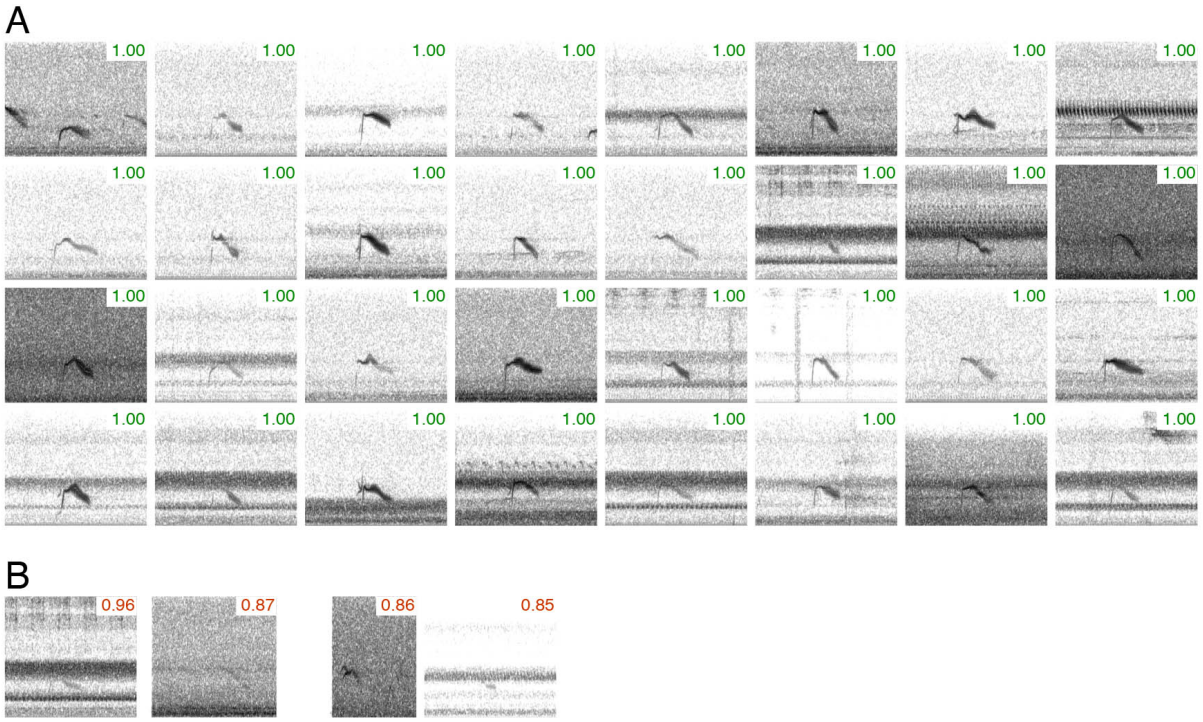

Figure S39: Classification examples for **GCBI** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

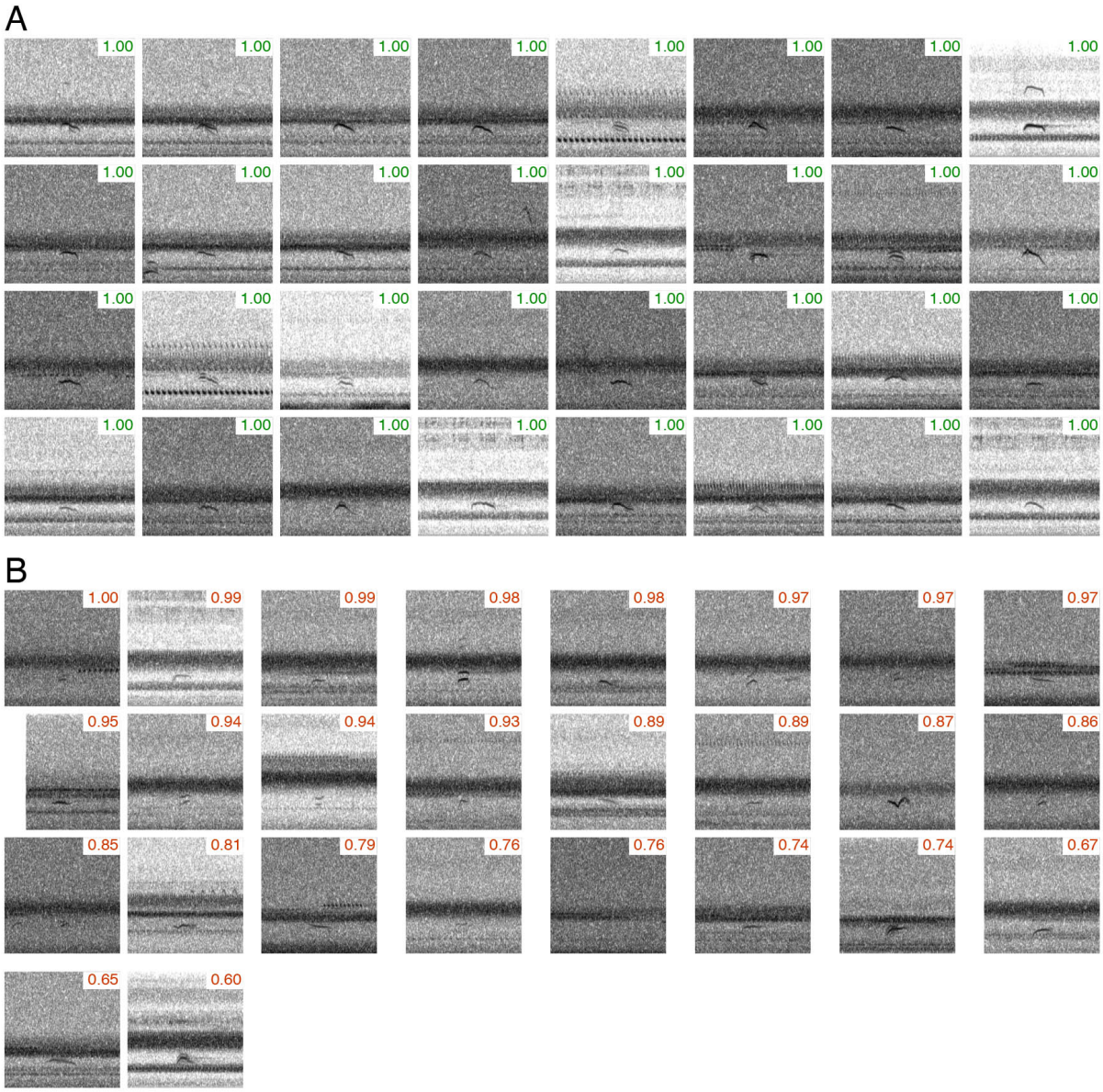

Figure S40: Classification examples for **GROS** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

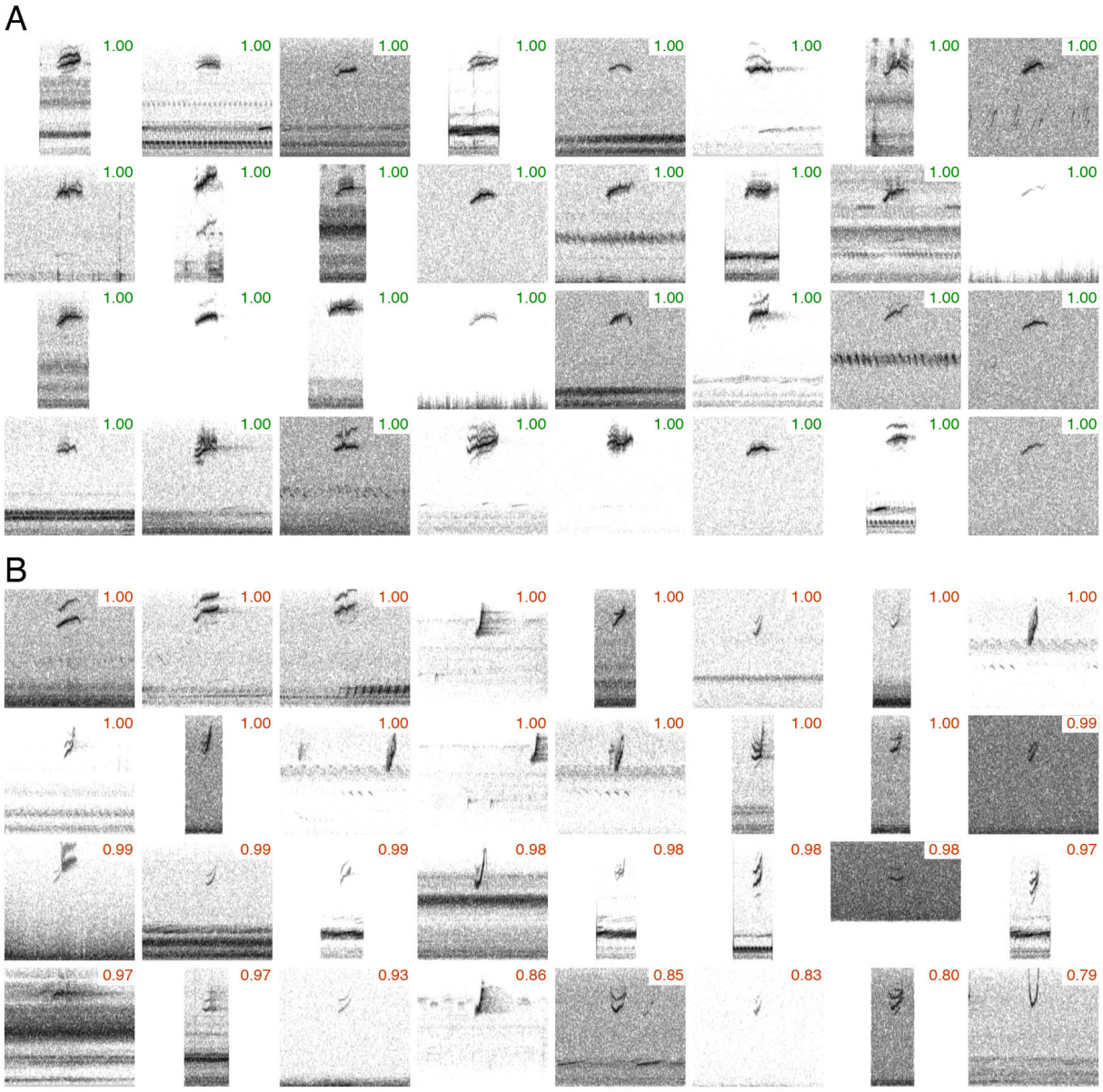

Figure S41: Classification examples for **HSSP** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

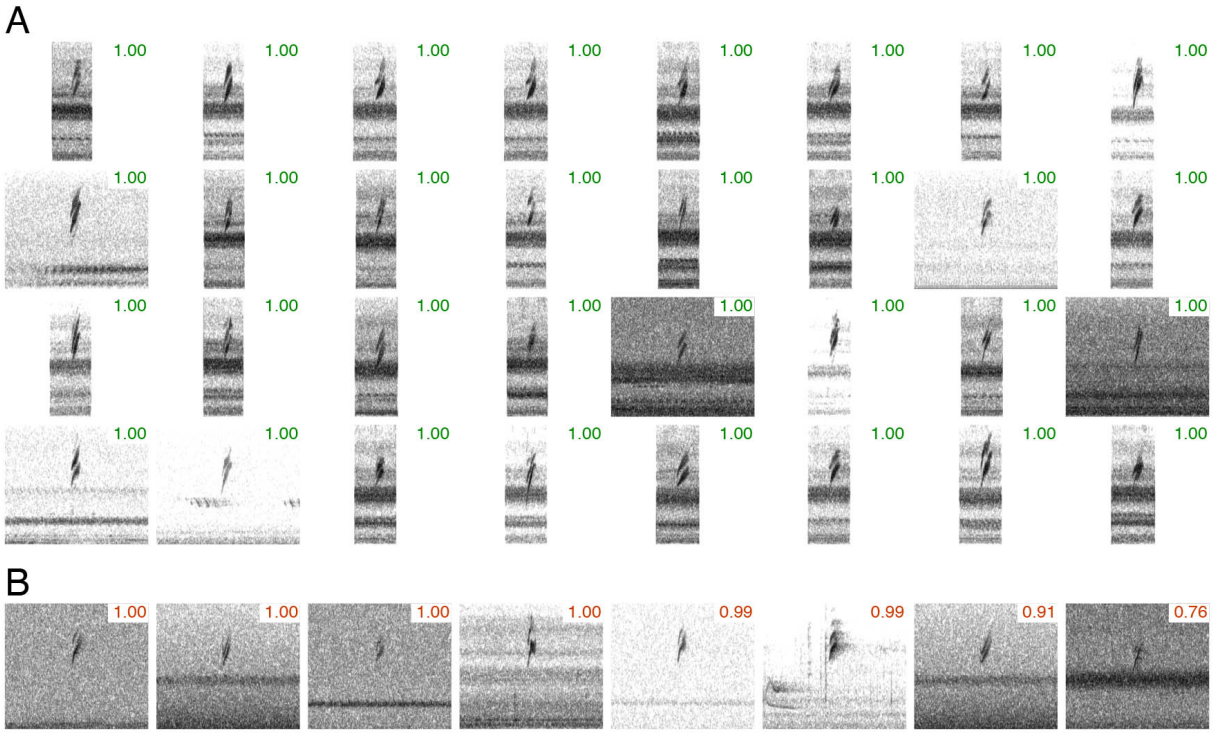

Figure S42: Classification examples for **MWAR** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

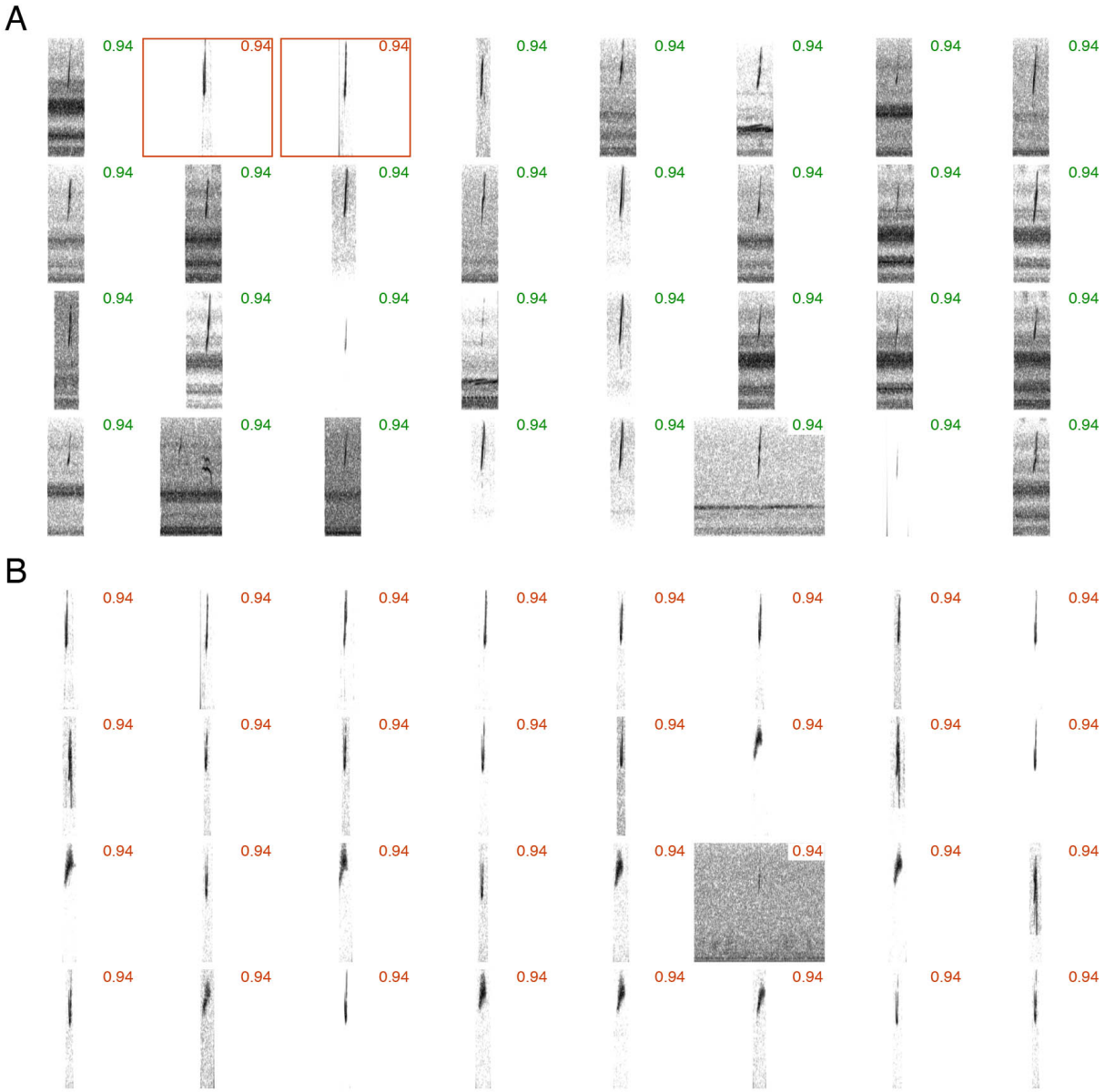

Figure S43: Classification examples for **SBUF** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

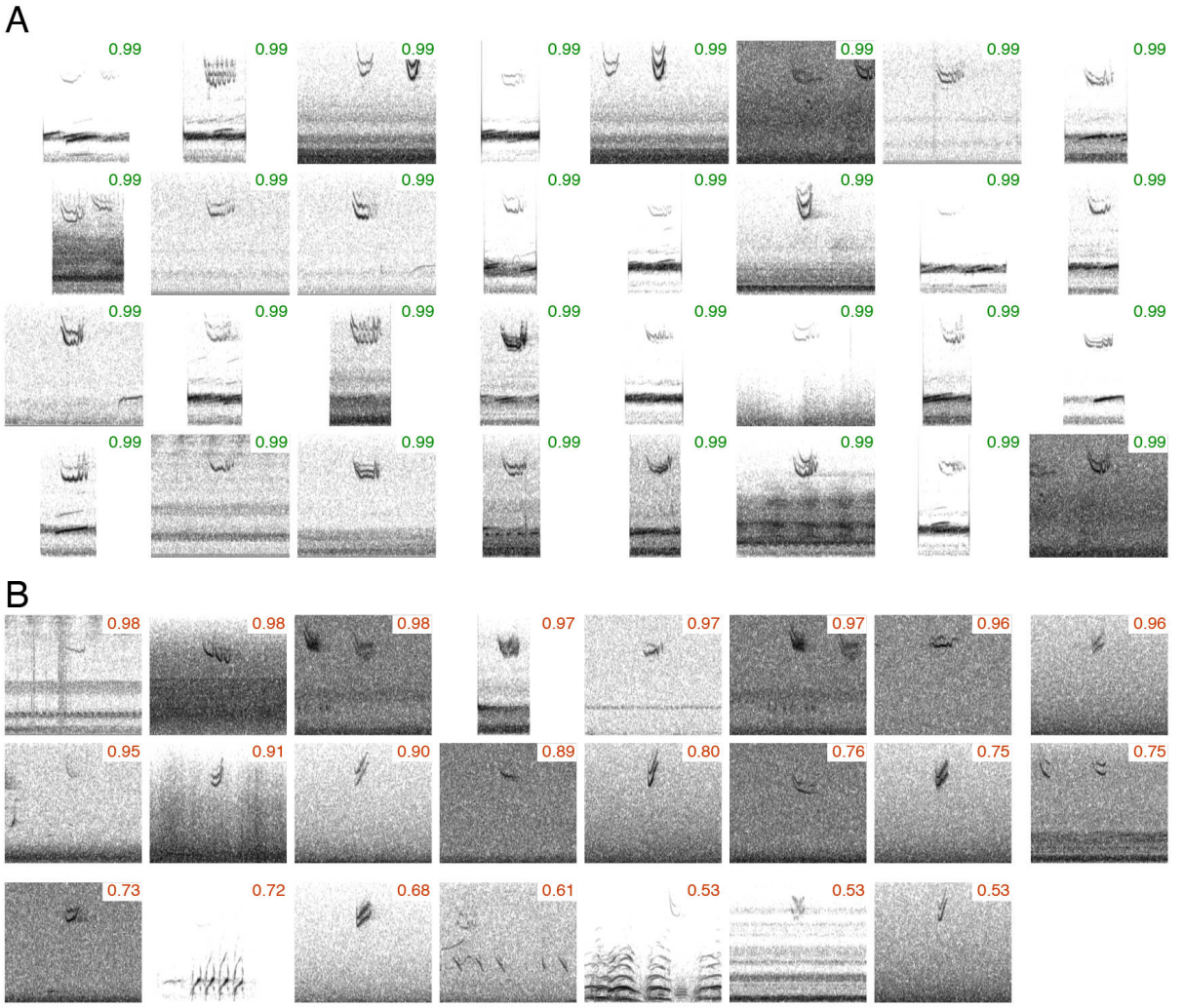

Figure S44: Classification examples for **SFHS** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

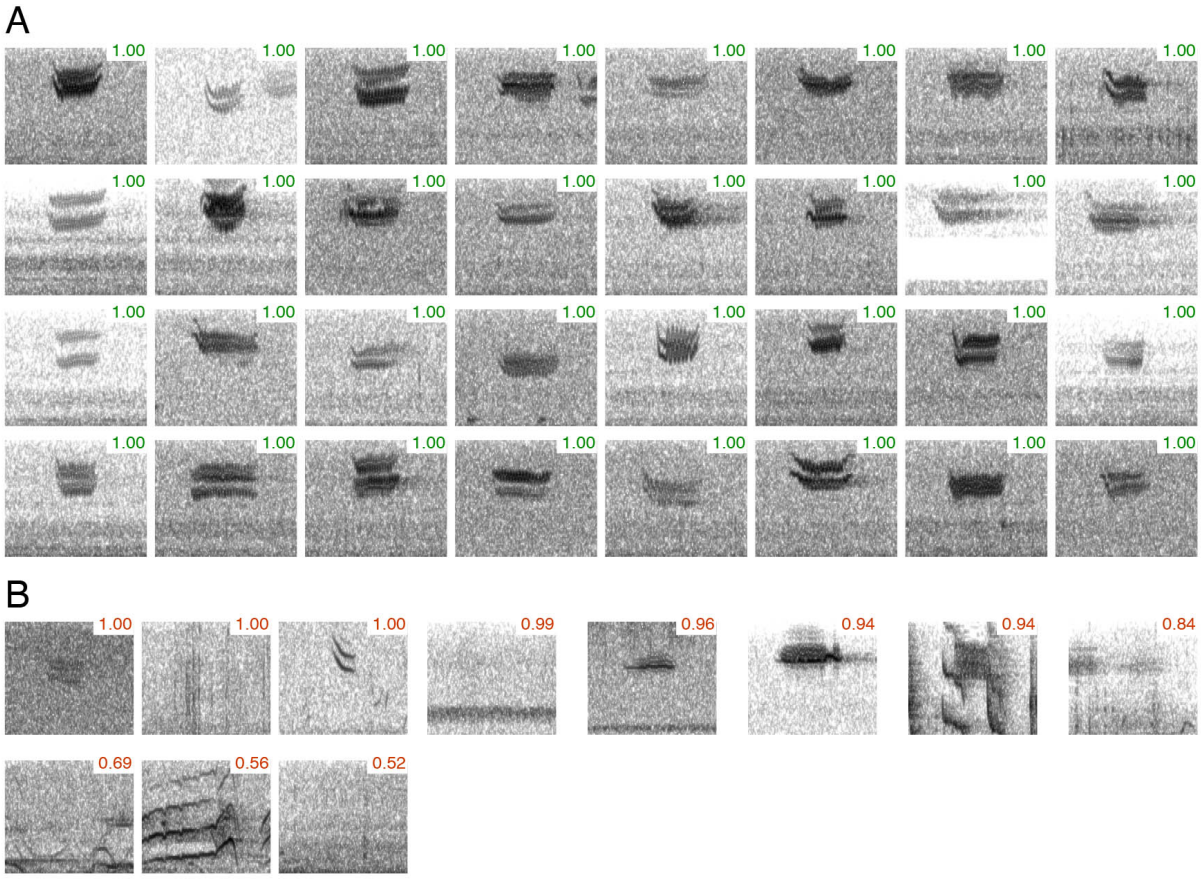

Figure S45: Classification examples for **SWLI** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 3-11 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

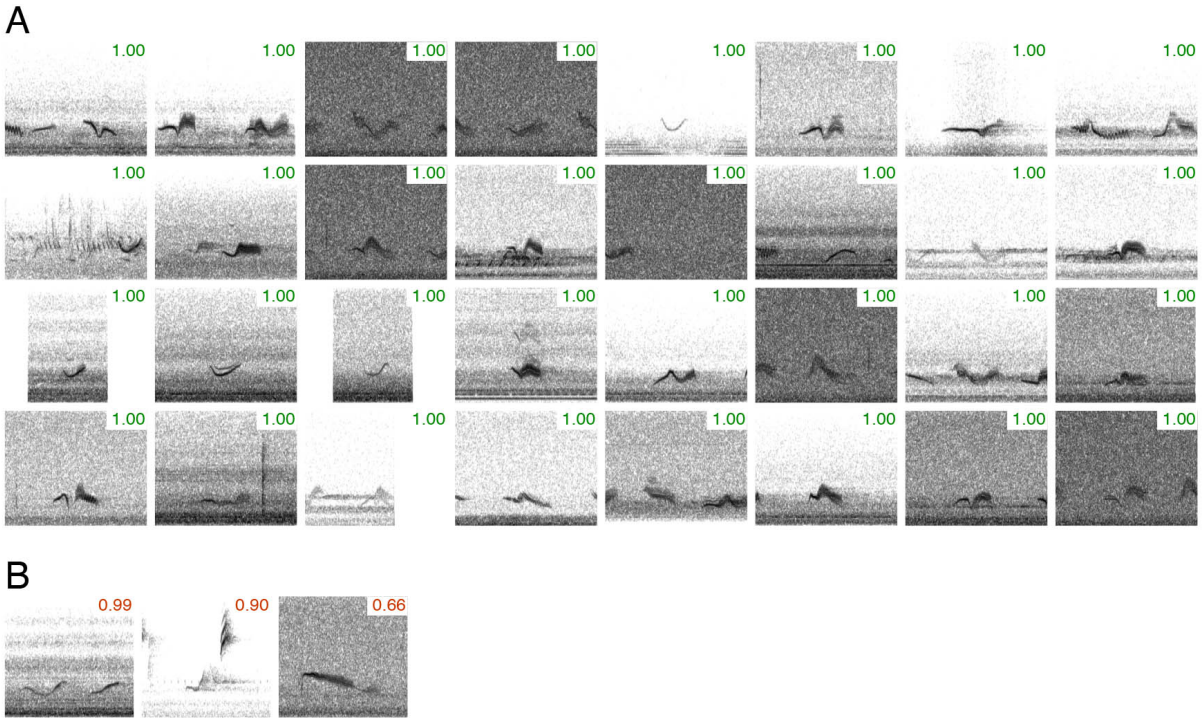

Figure S46: Classification examples for **TANA** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

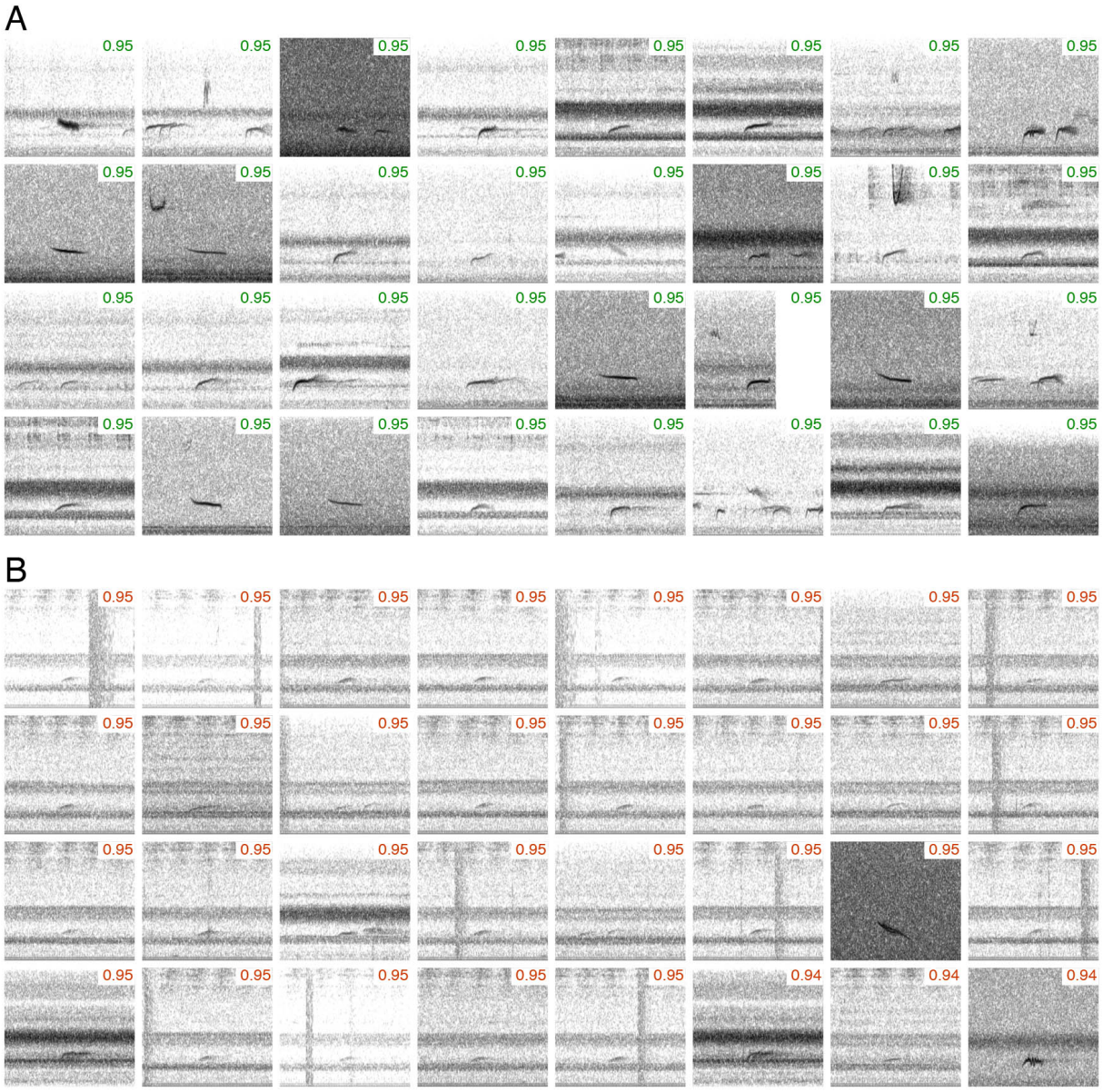

Figure S47: Classification examples for **THSH** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-10 kHz; window type: Hanning; window length: 300 samples; hop size: 30 samples; dynamic range floor: -50 dB).

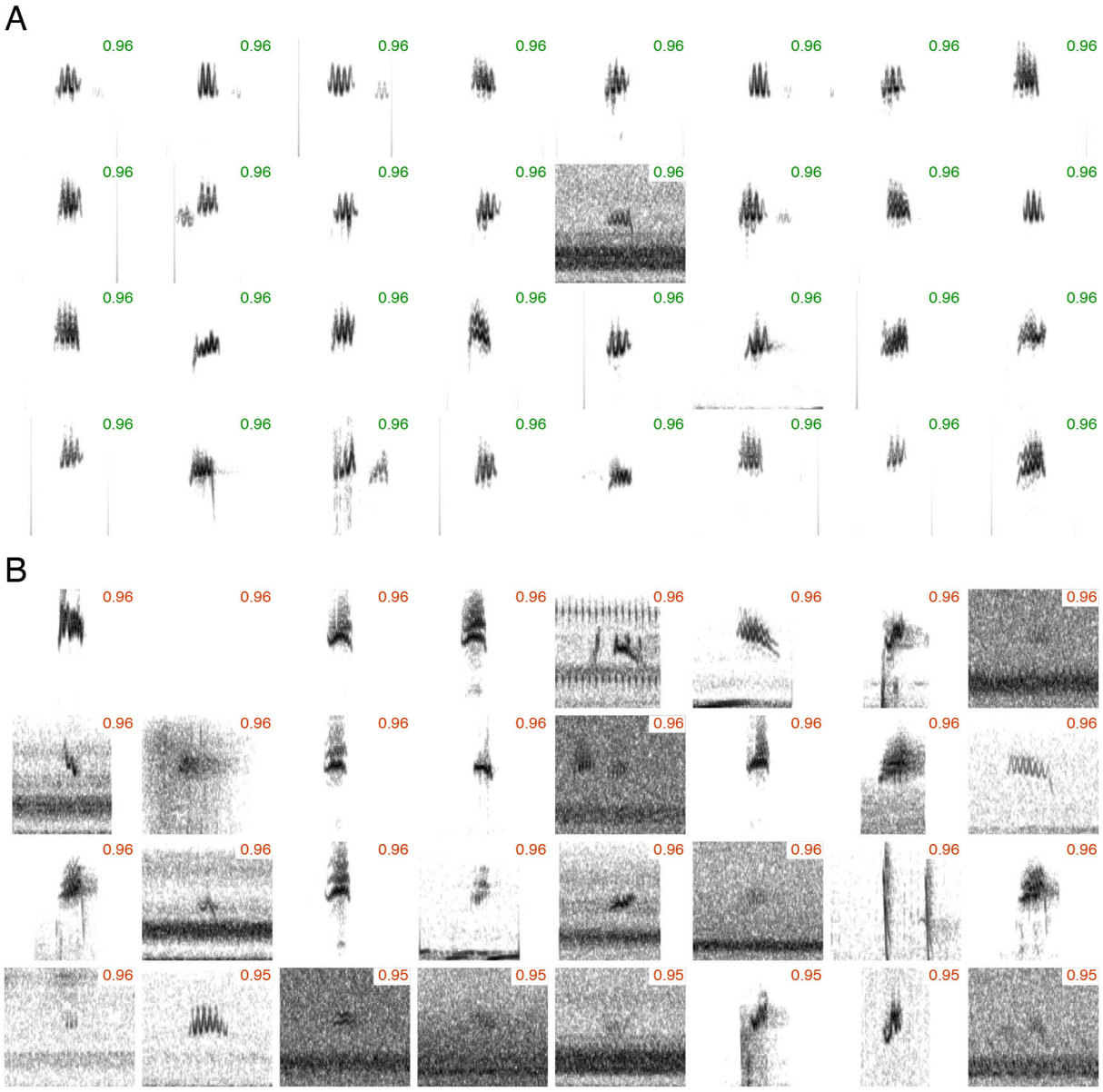

Figure S48: Classification examples for **ZEEP** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 3-10.5 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -50 dB).

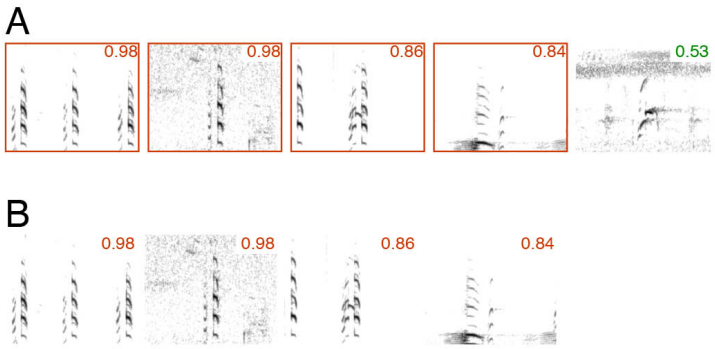

Figure S49: Classification examples for **ameavo** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-8 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

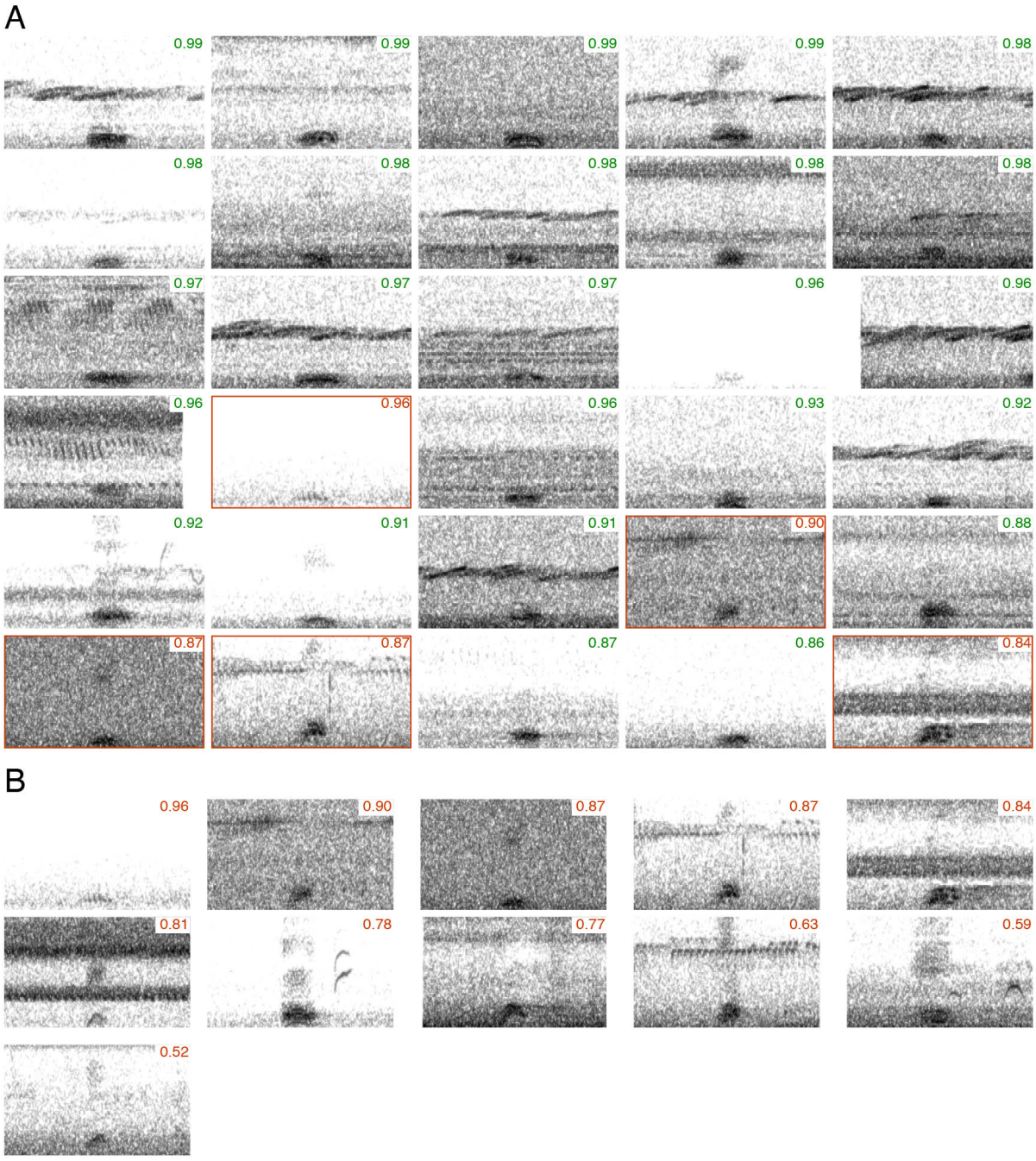

Figure S50: Classification examples for **amebit** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-5 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

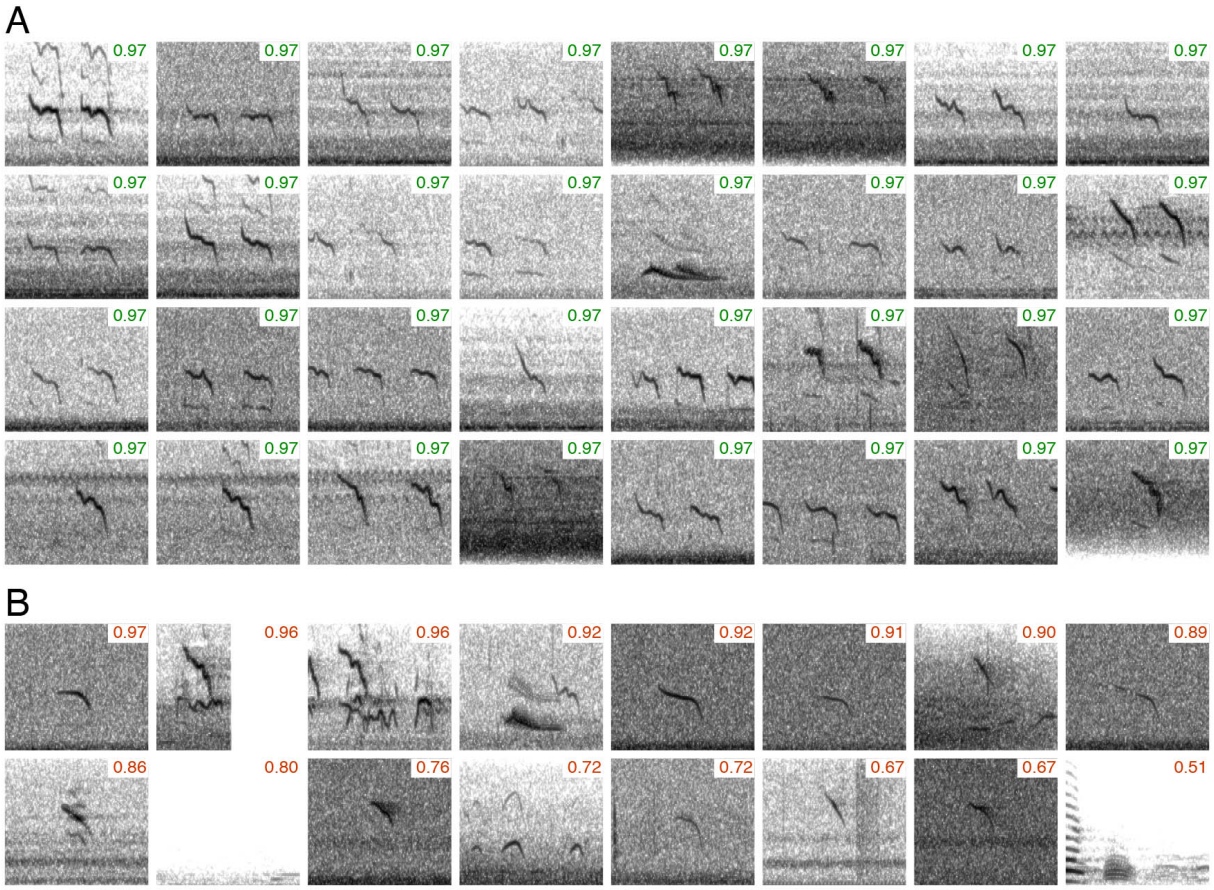

Figure S51: Classification examples for **amepip** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 1-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

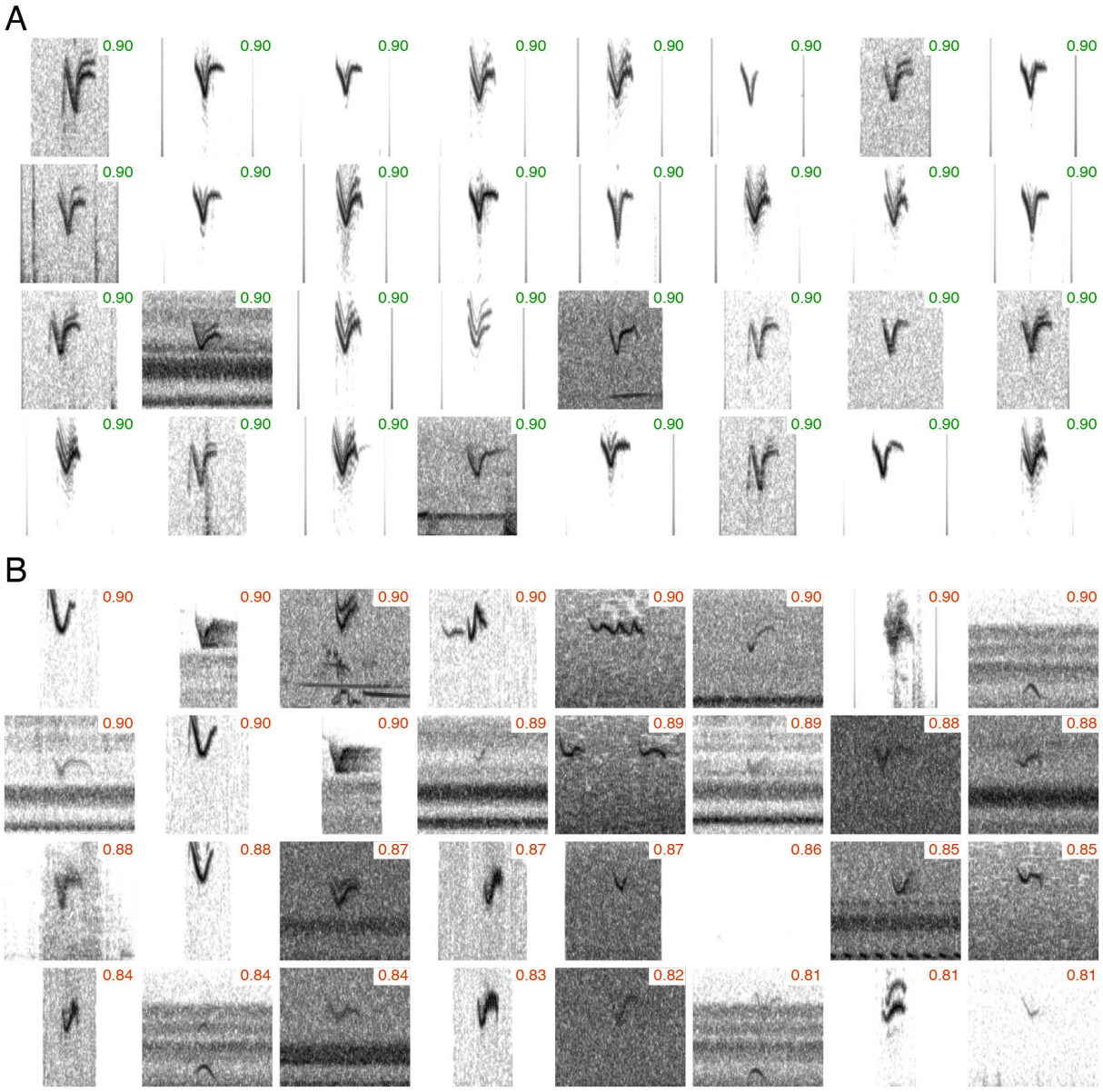

Figure S52: Classification examples for **amered** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

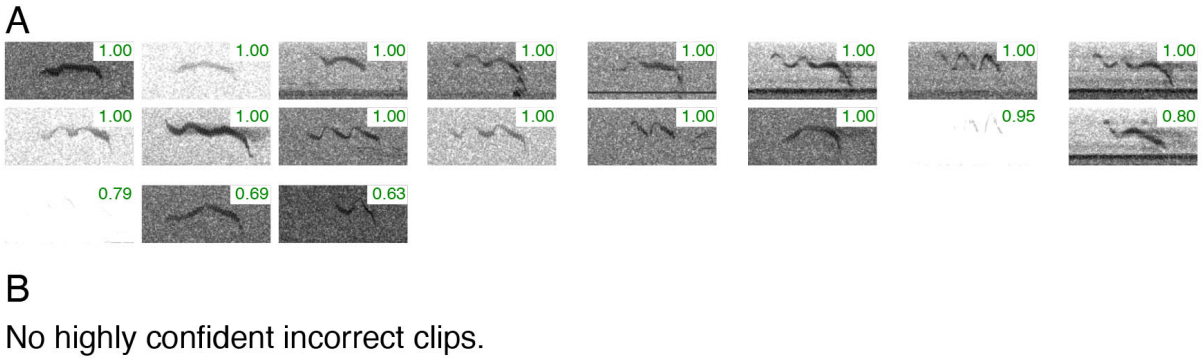

Figure S53: Classification examples for **amerob** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

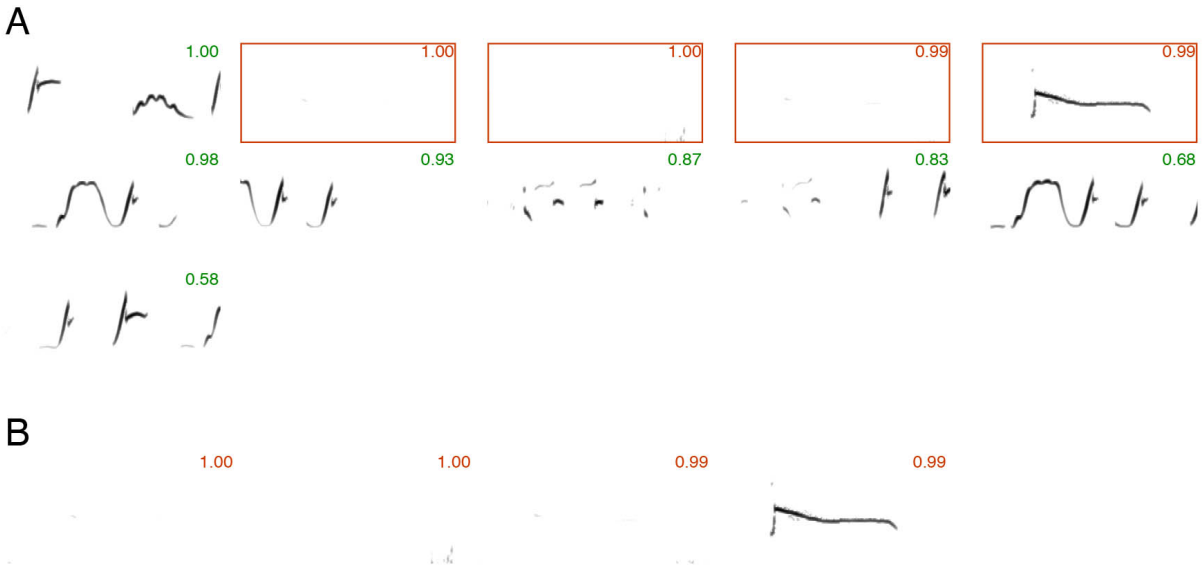

Figure S54: Classification examples for **amgplo** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-5 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -30 dB).

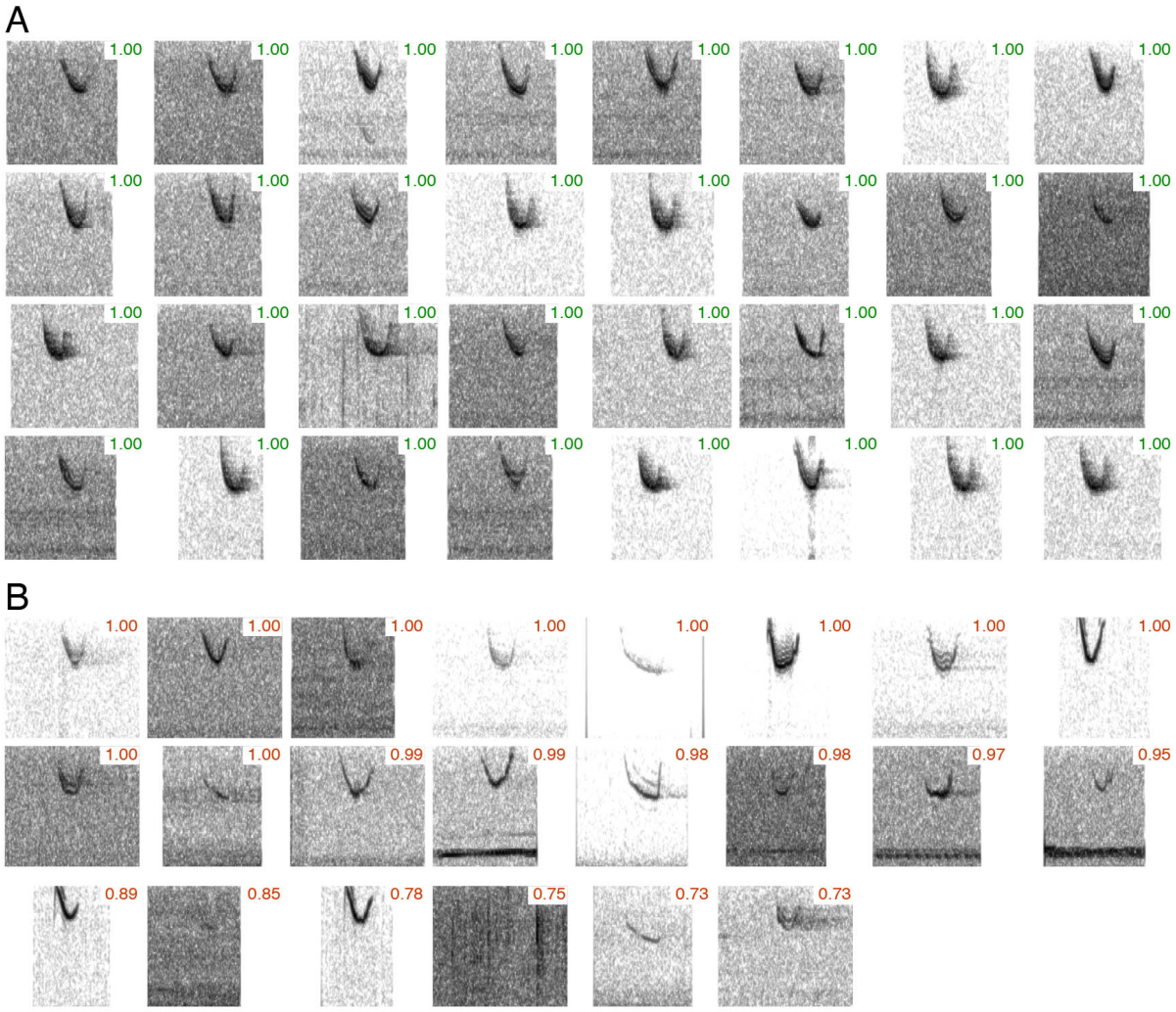

Figure S55: Classification examples for **amtspa** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

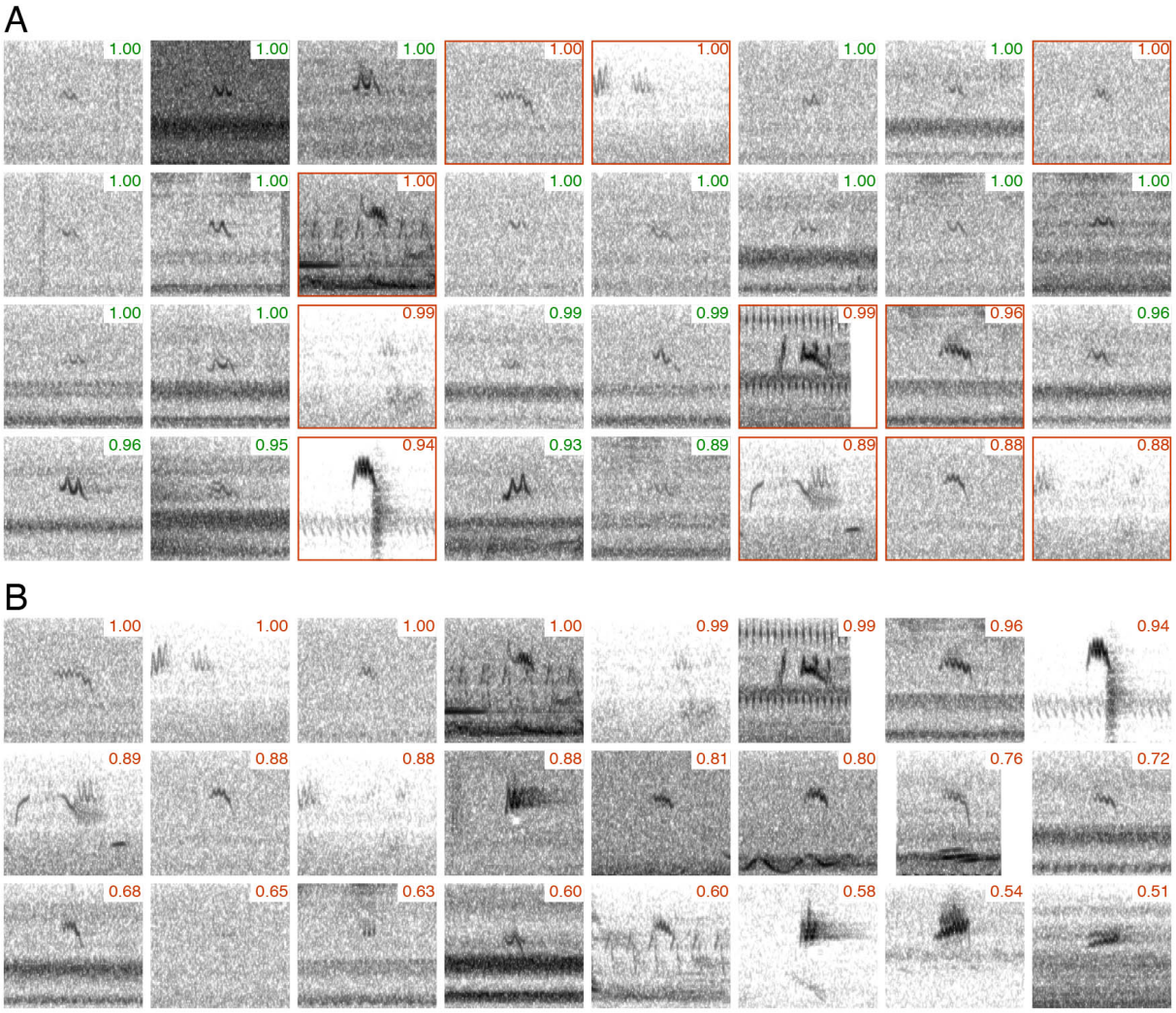

Figure S56: Classification examples for **babwar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

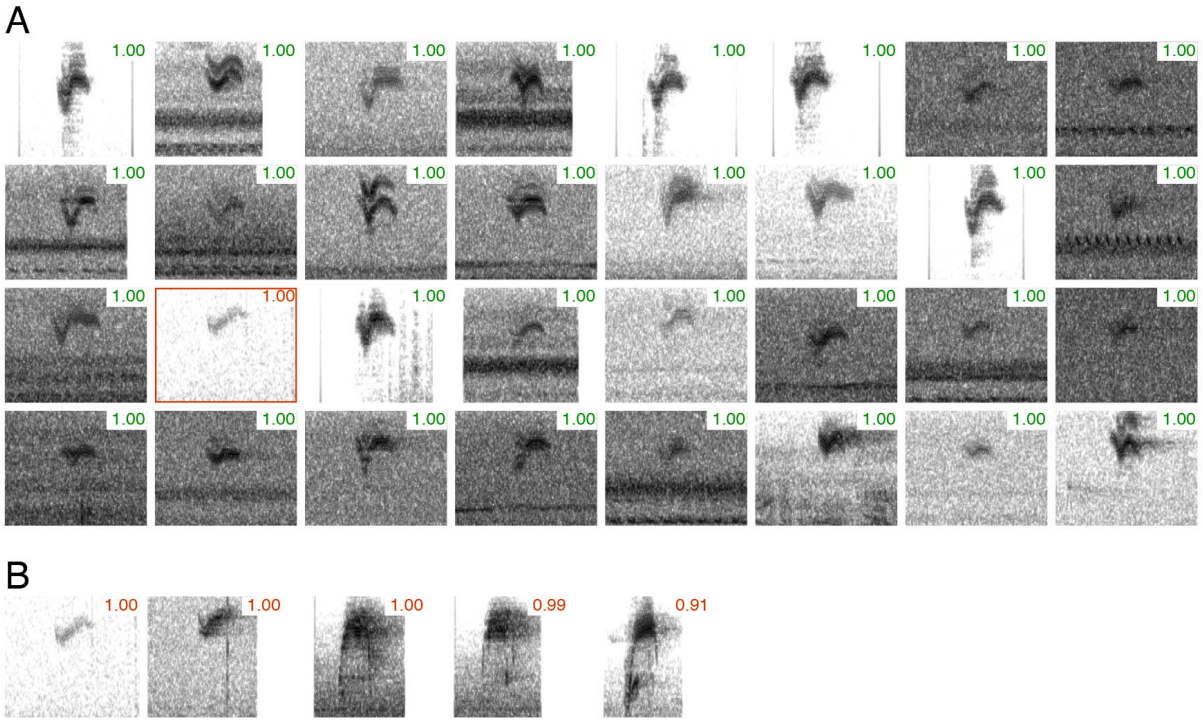

Figure S57: Classification examples for **bawwar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

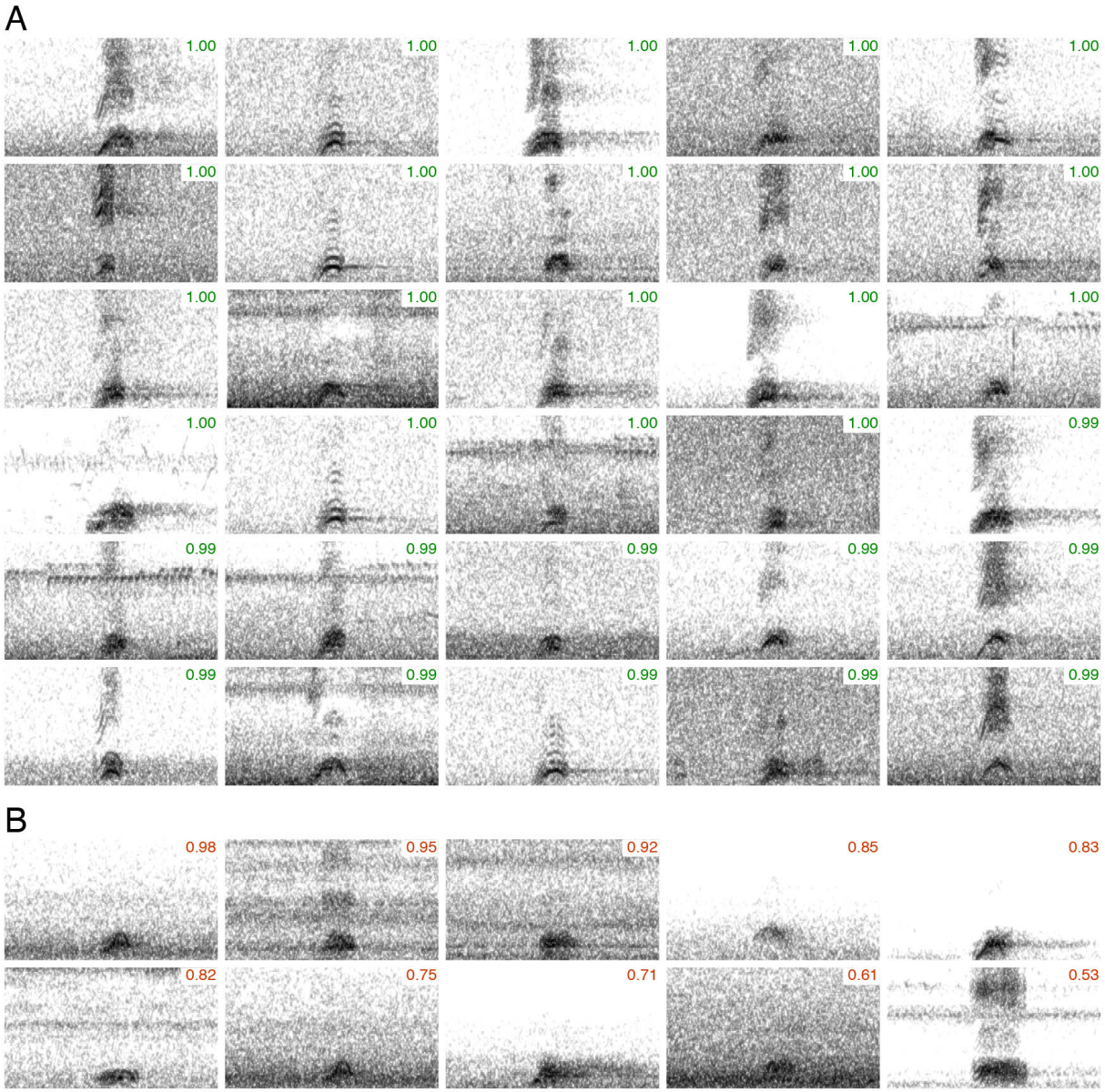

Figure S58: Classification examples for **bcnher** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-5 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

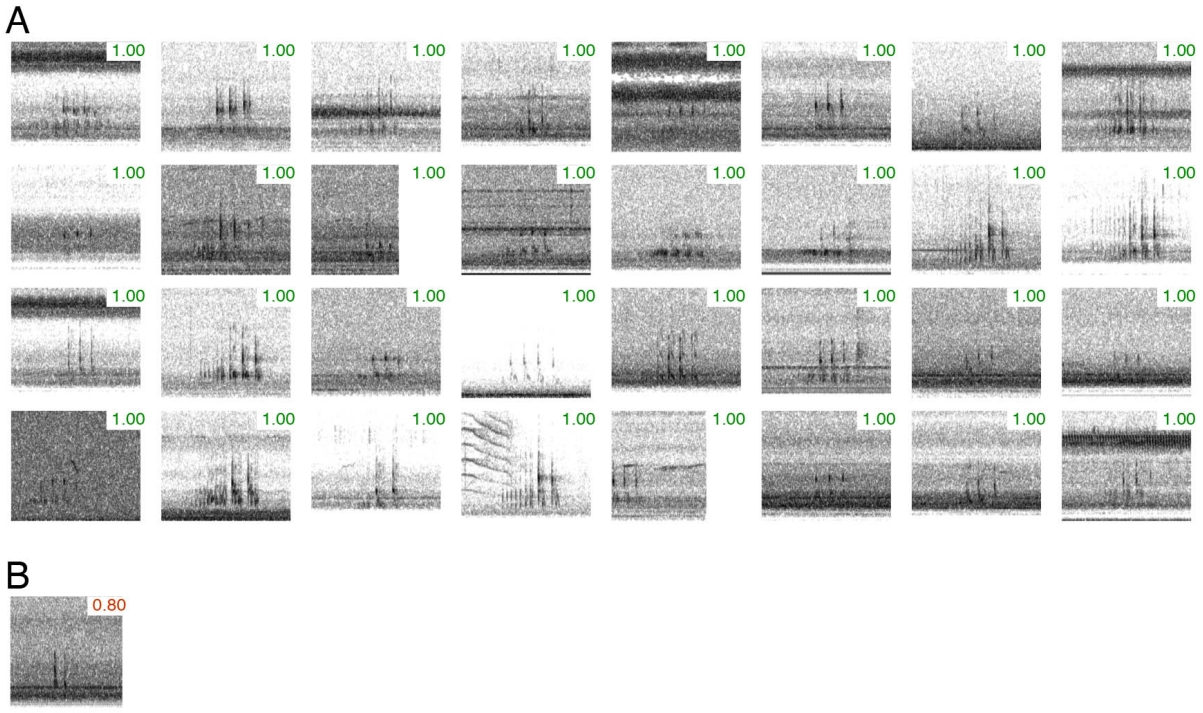

Figure S59: Classification examples for **bkbcuc** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-1 s; y-axis: 0-6 kHz; window type: Hanning; window length: 420 samples; hop size: 35 samples; dynamic range floor: -50 dB).

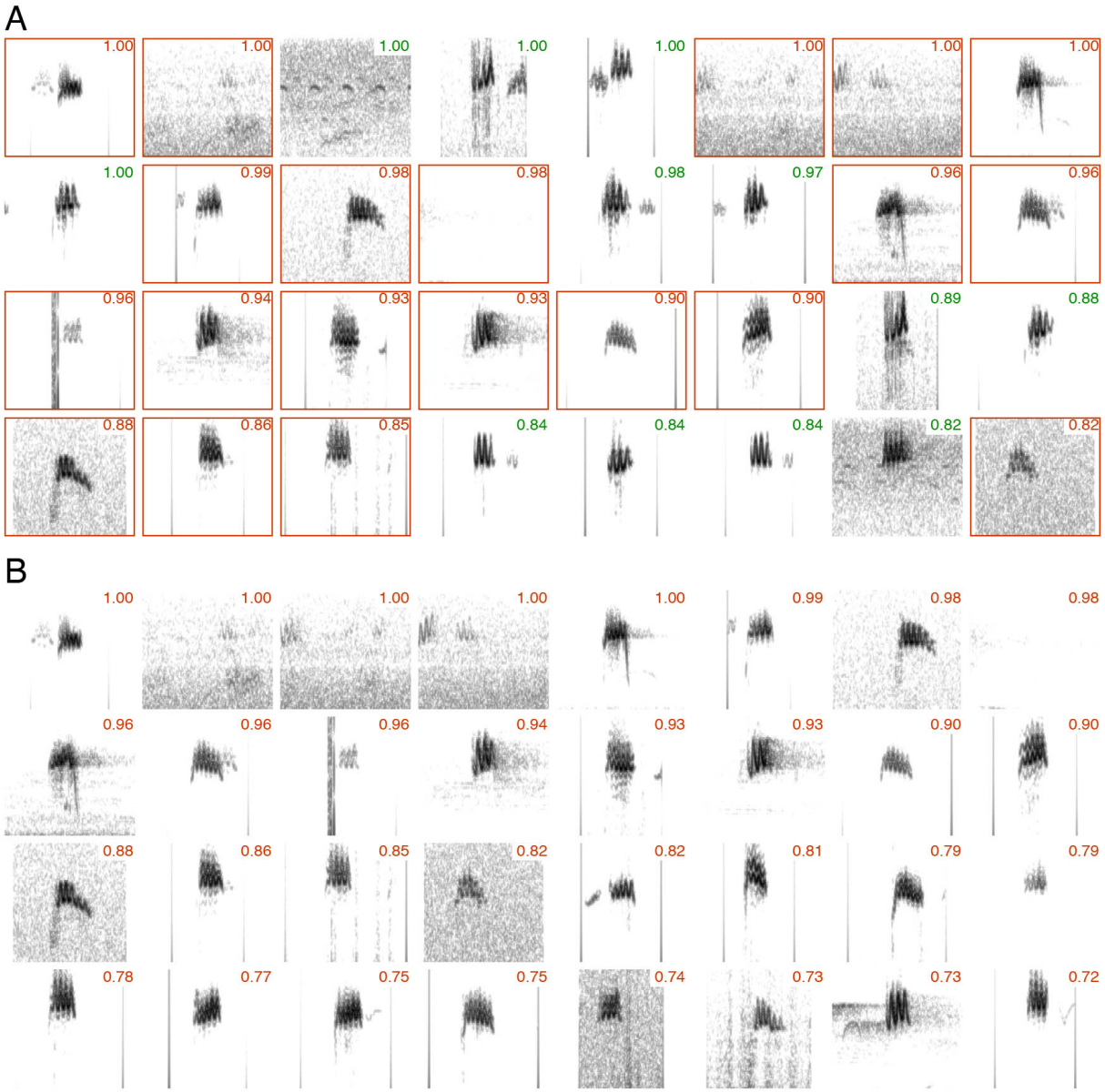

Figure S60: Classification examples for **bkpwar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

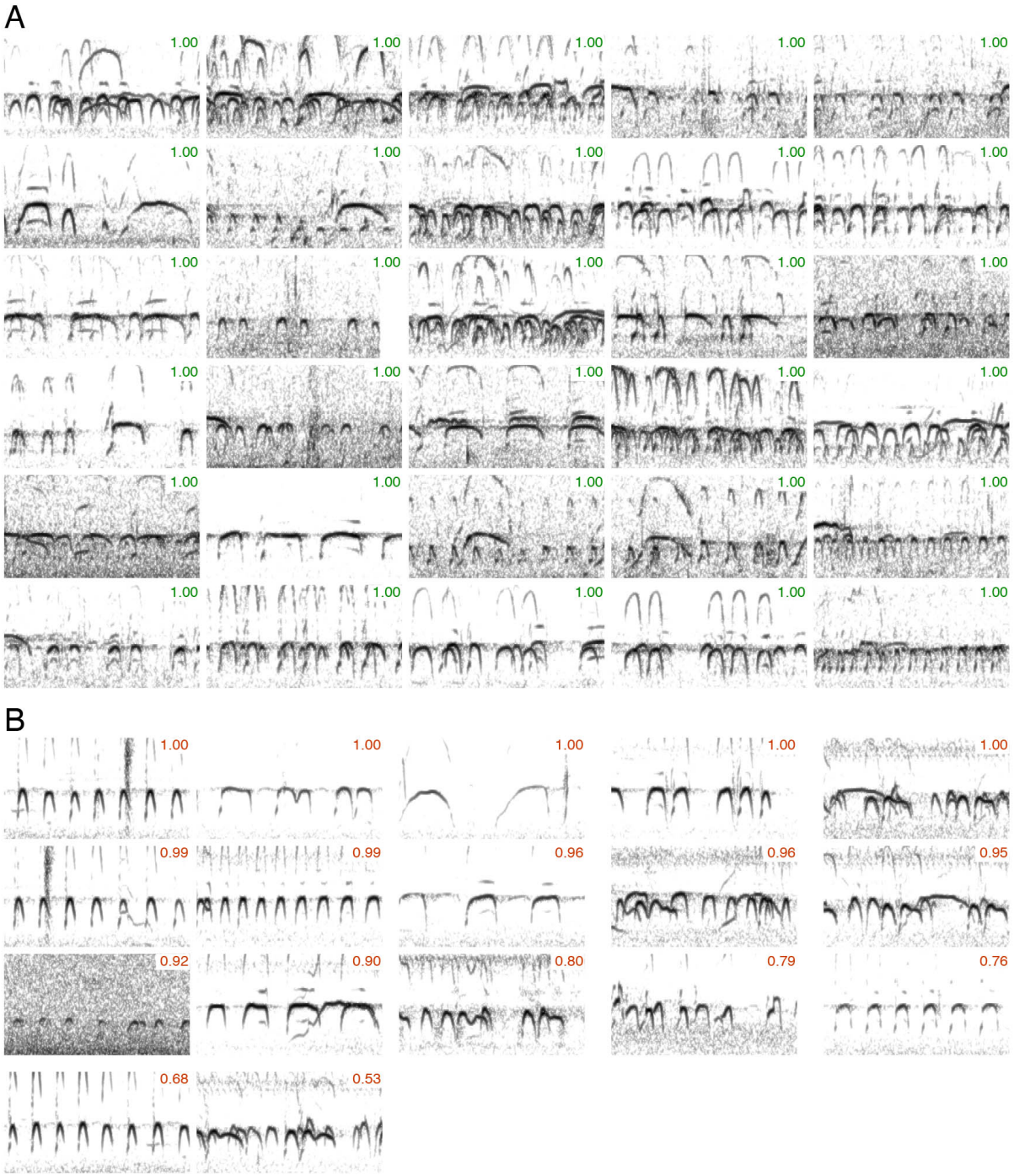

Figure S61: Classification examples for **blkoys** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-5 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

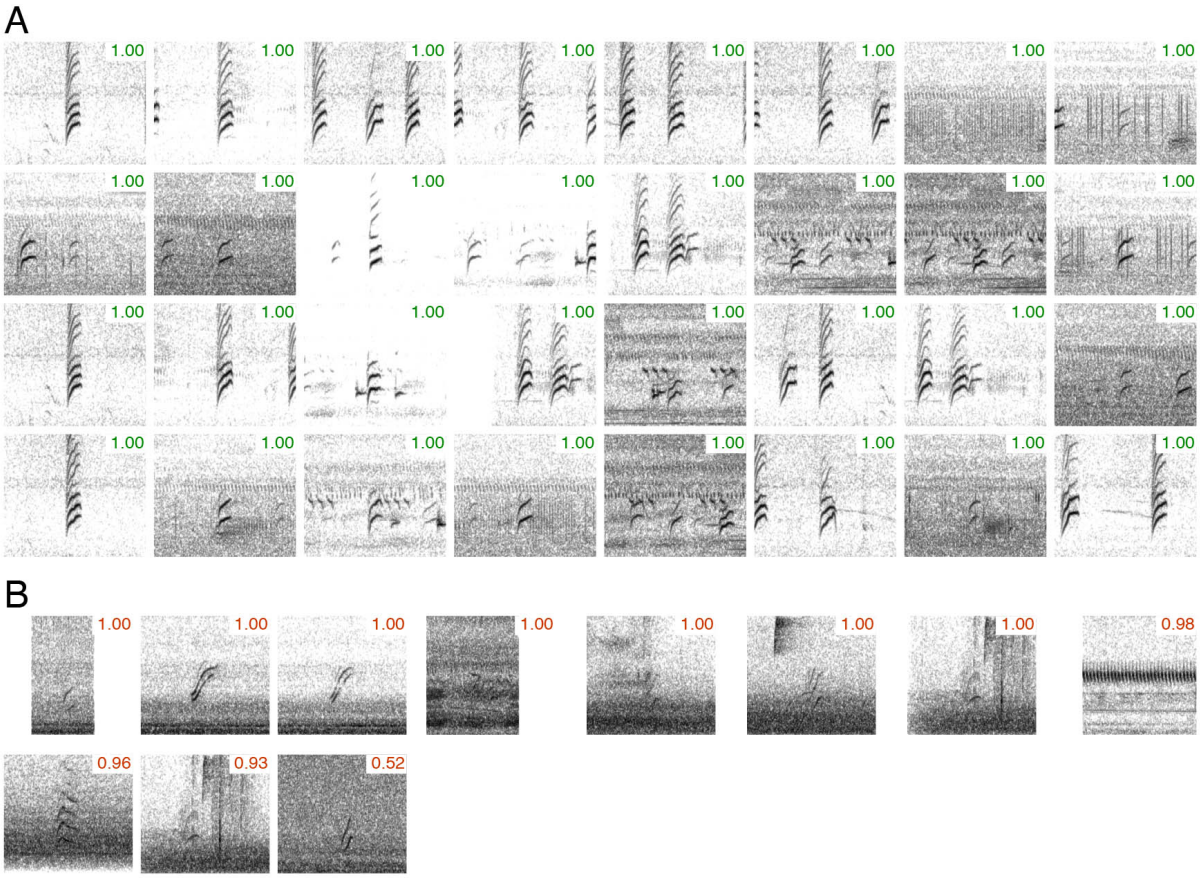

Figure S62: Classification examples for **boboli** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-8 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

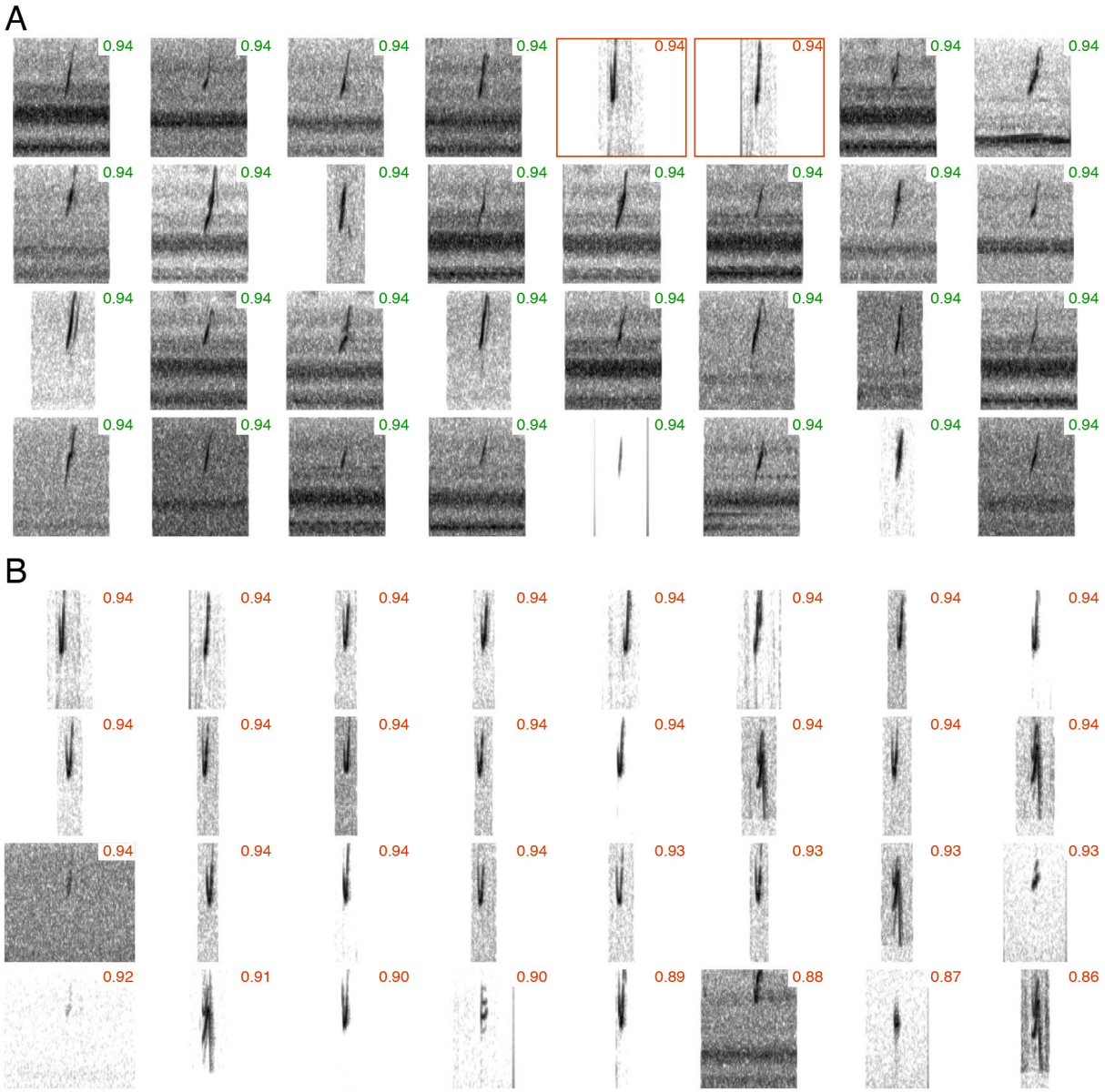

Figure S63: Classification examples for **btbwar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

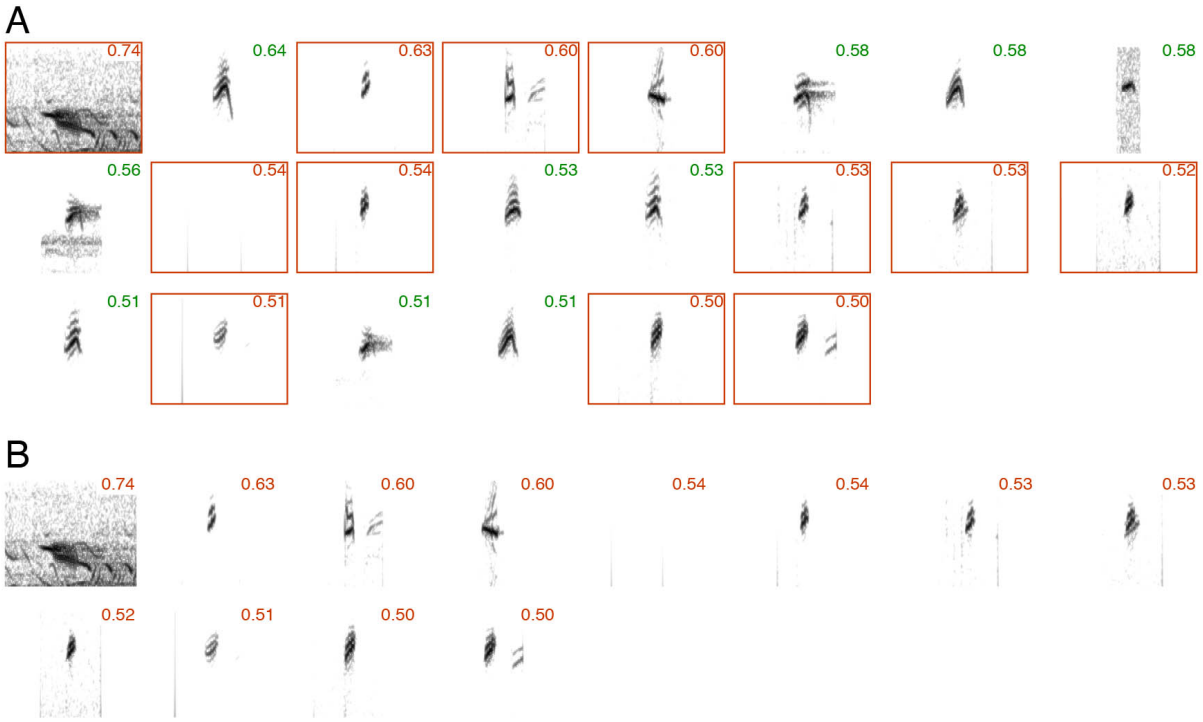

Figure S64: Classification examples for **btnwar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 3-11 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -50 dB).

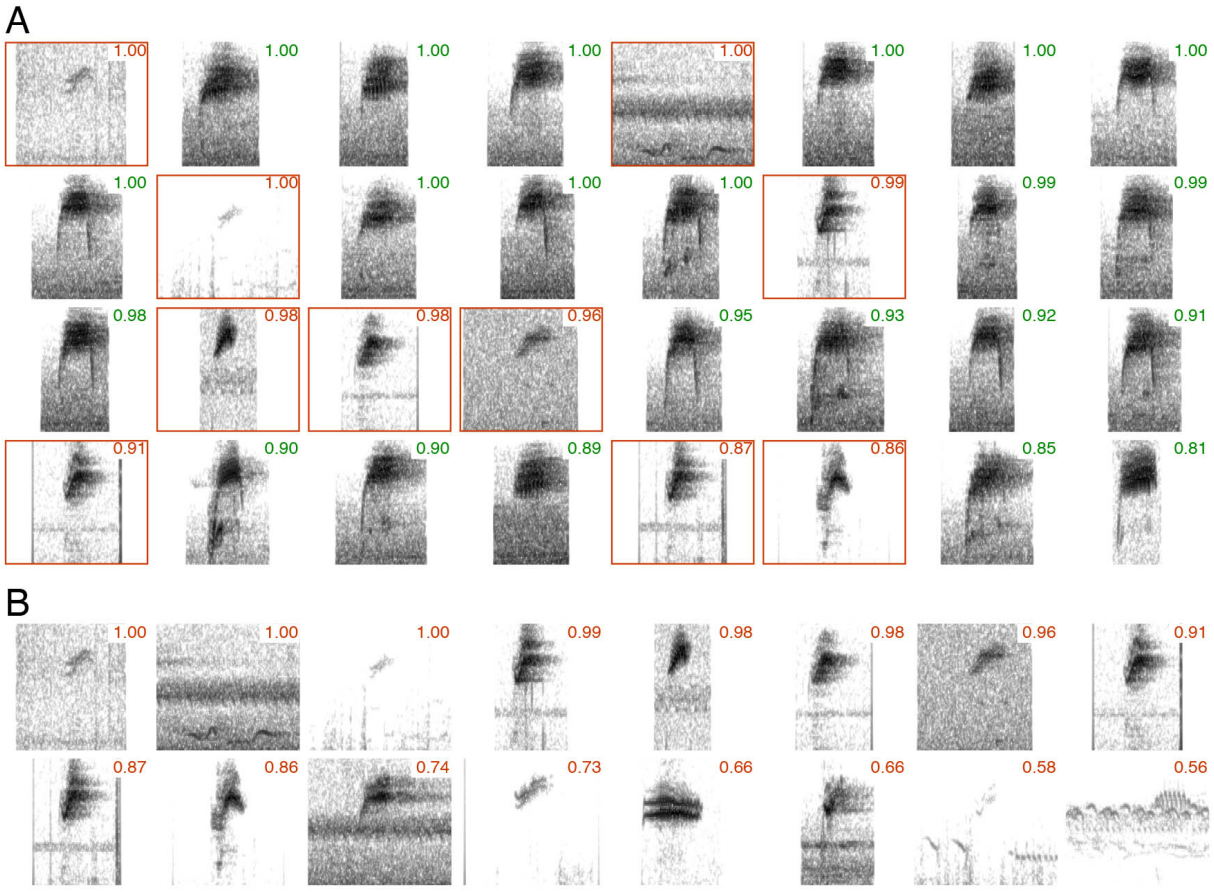

Figure S65: Classification examples for **buwwar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

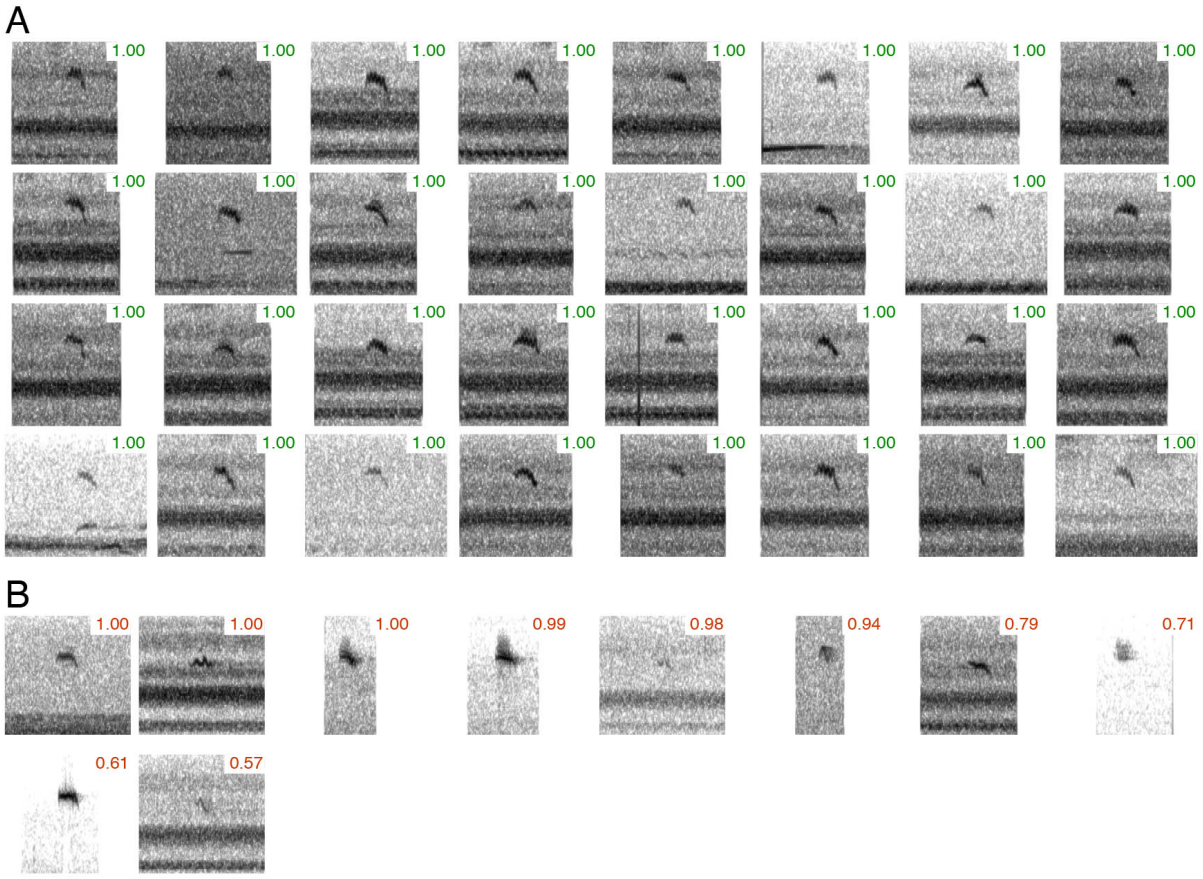

Figure S66: Classification examples for **camwar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

Figure S67: Classification examples for **canwar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 0-9 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

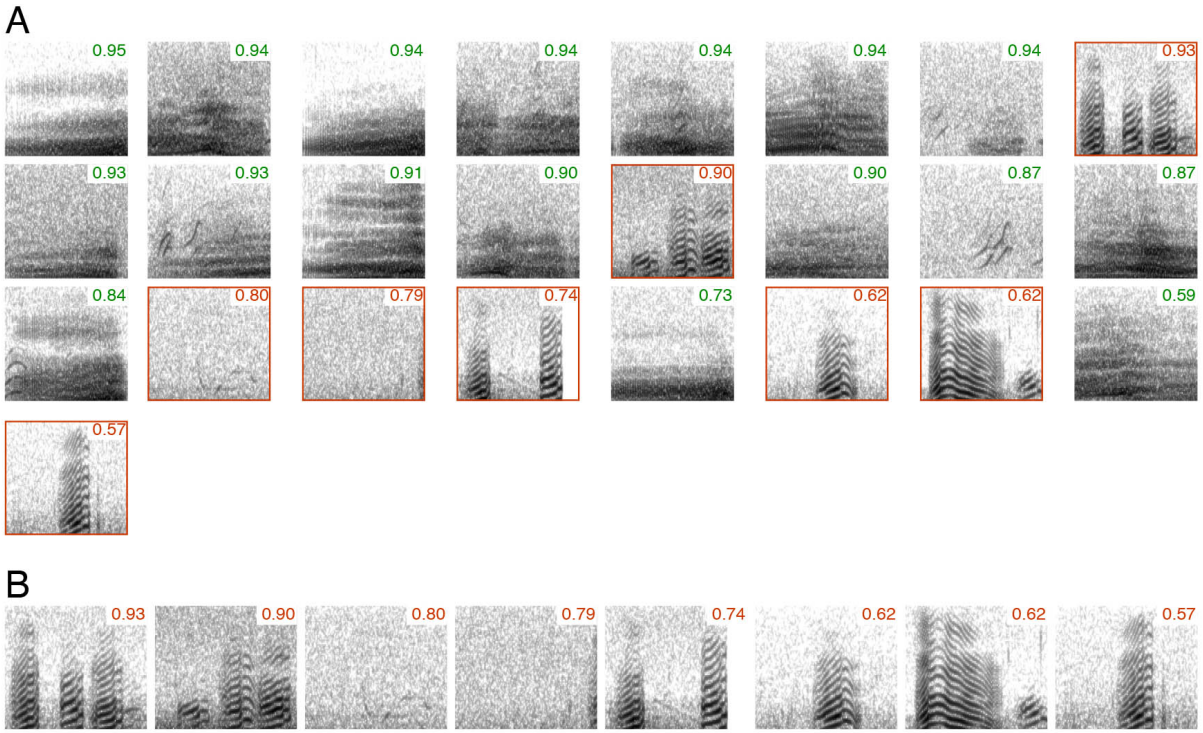

Figure S68: Classification examples for **caster1** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

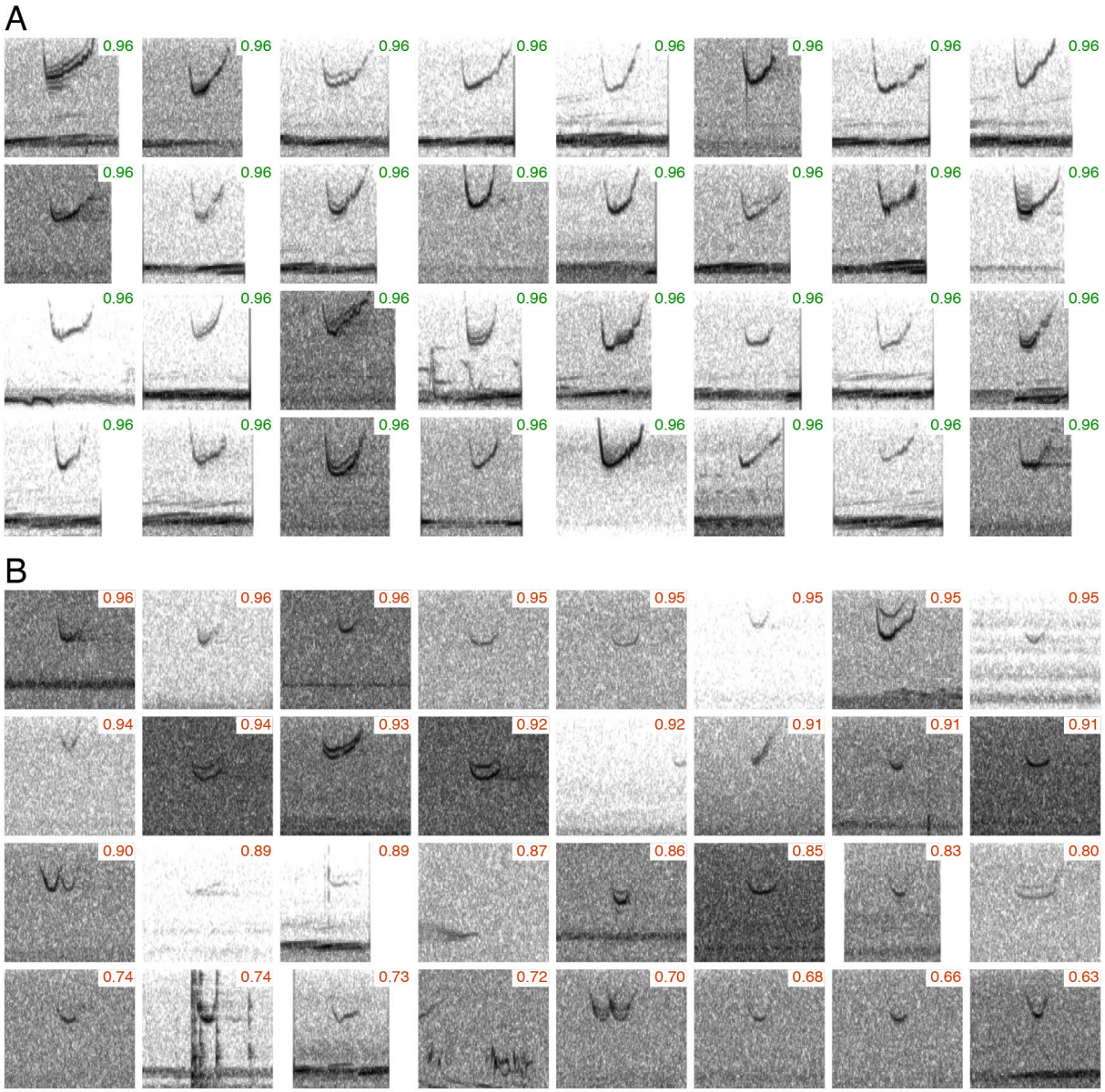

Figure S69: Classification examples for **chispa** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

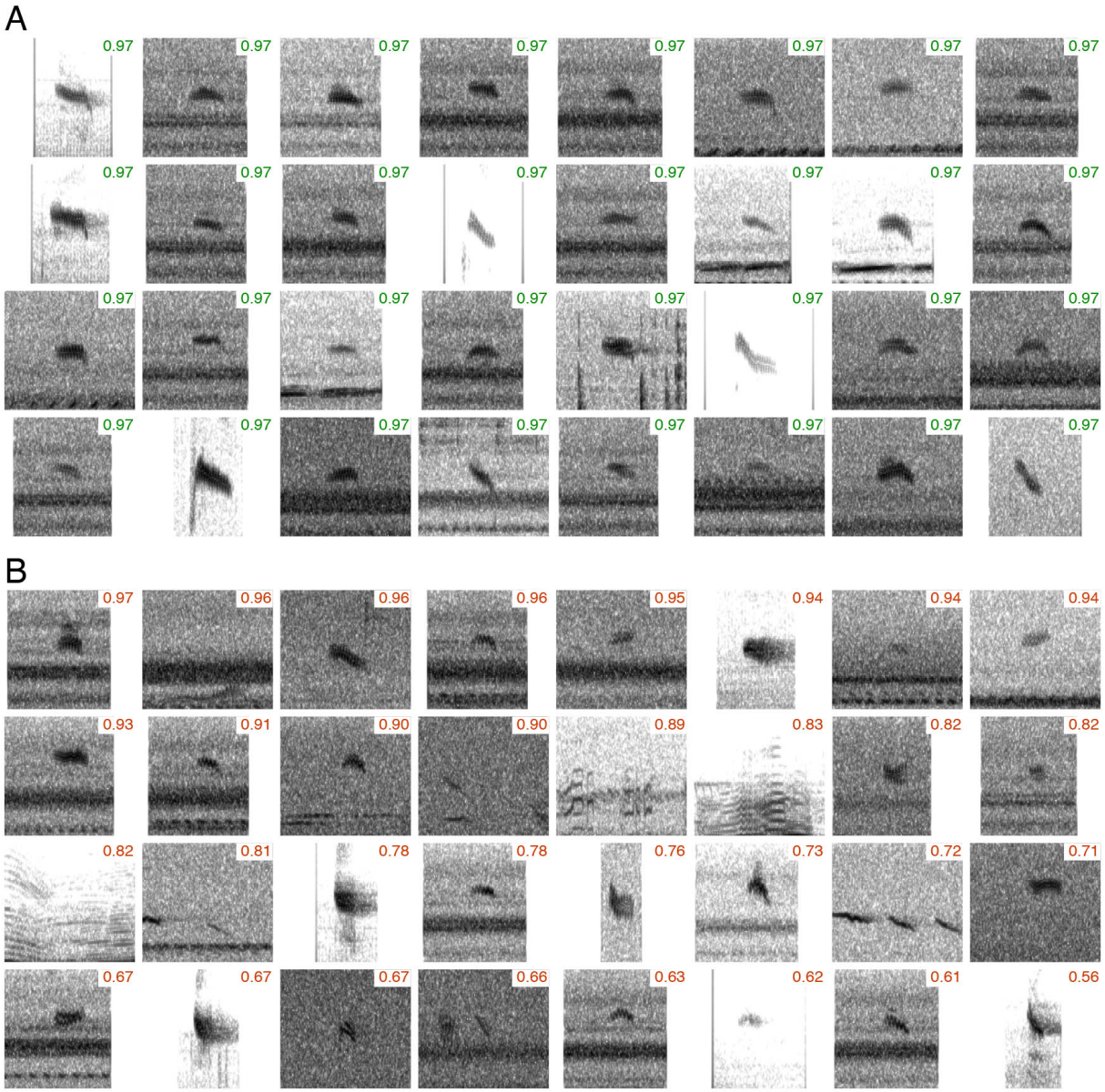

Figure S70: Classification examples for **chswar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

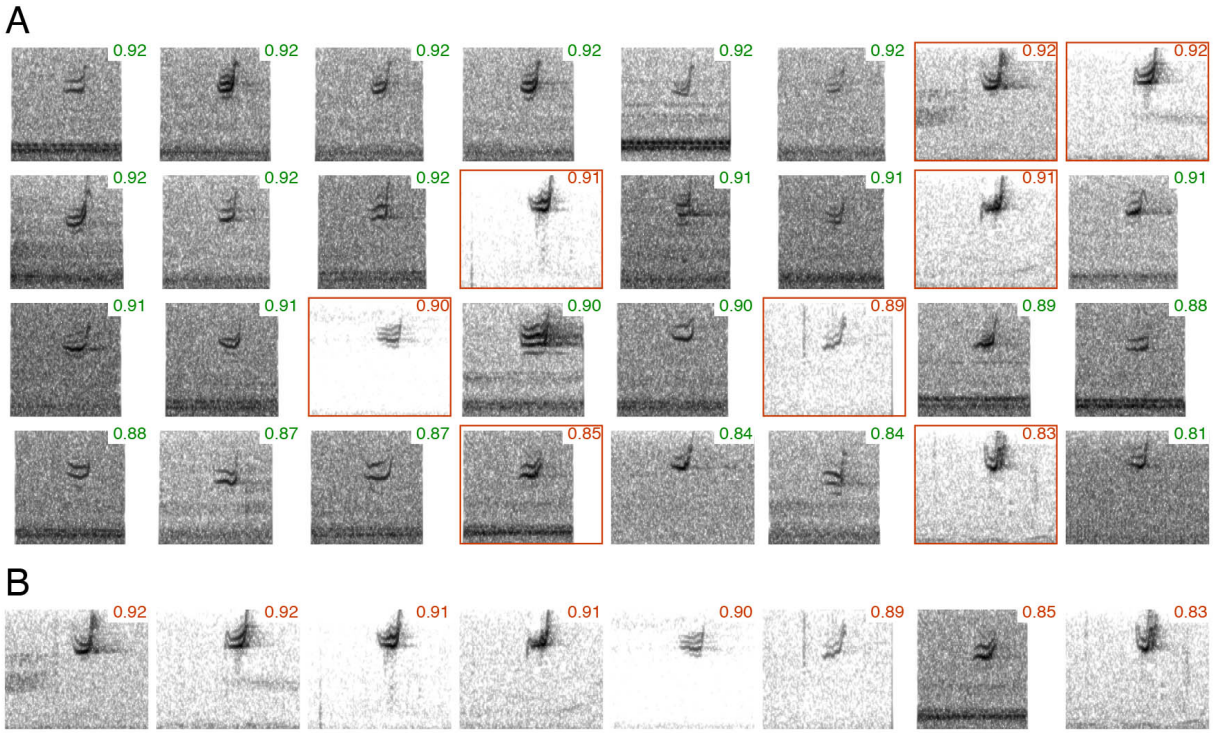

Figure S71: Classification examples for **clcspa** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-11 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

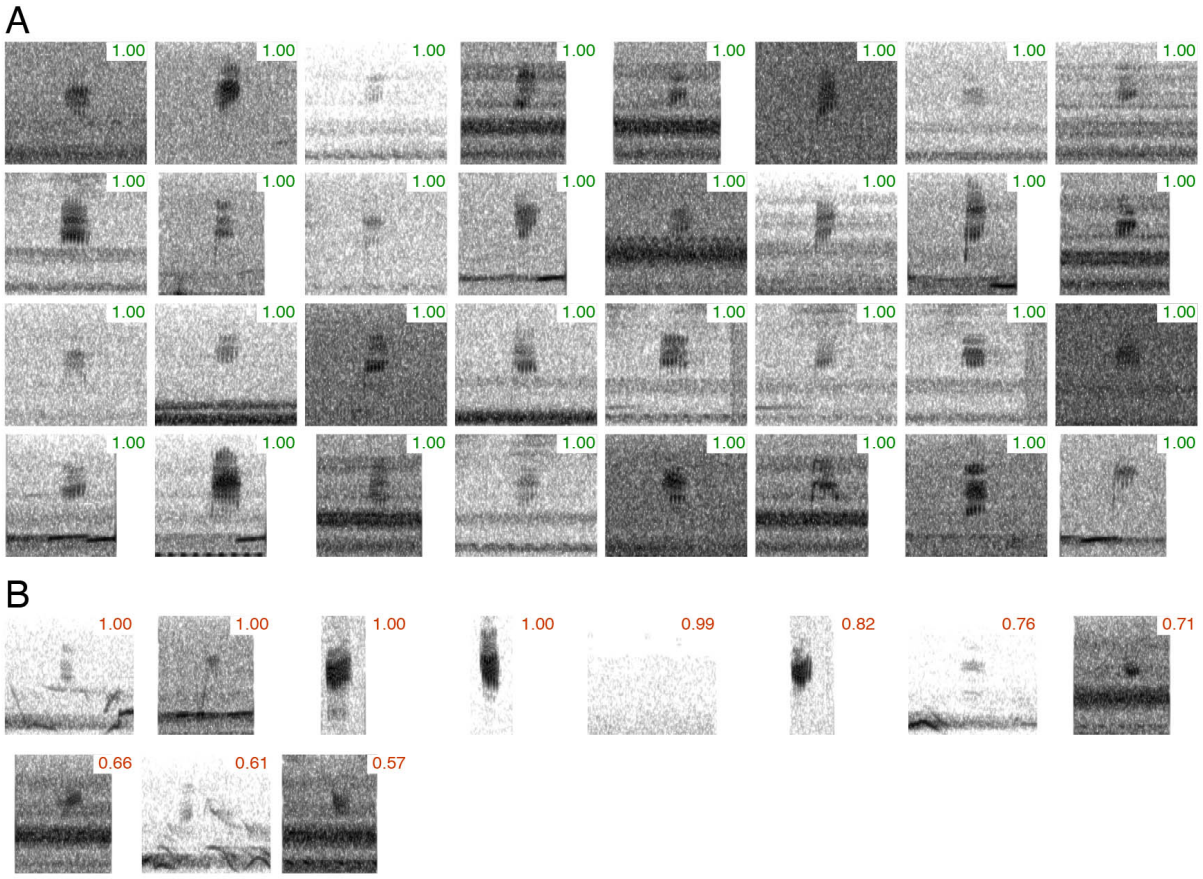

Figure S72: Classification examples for **comyel** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

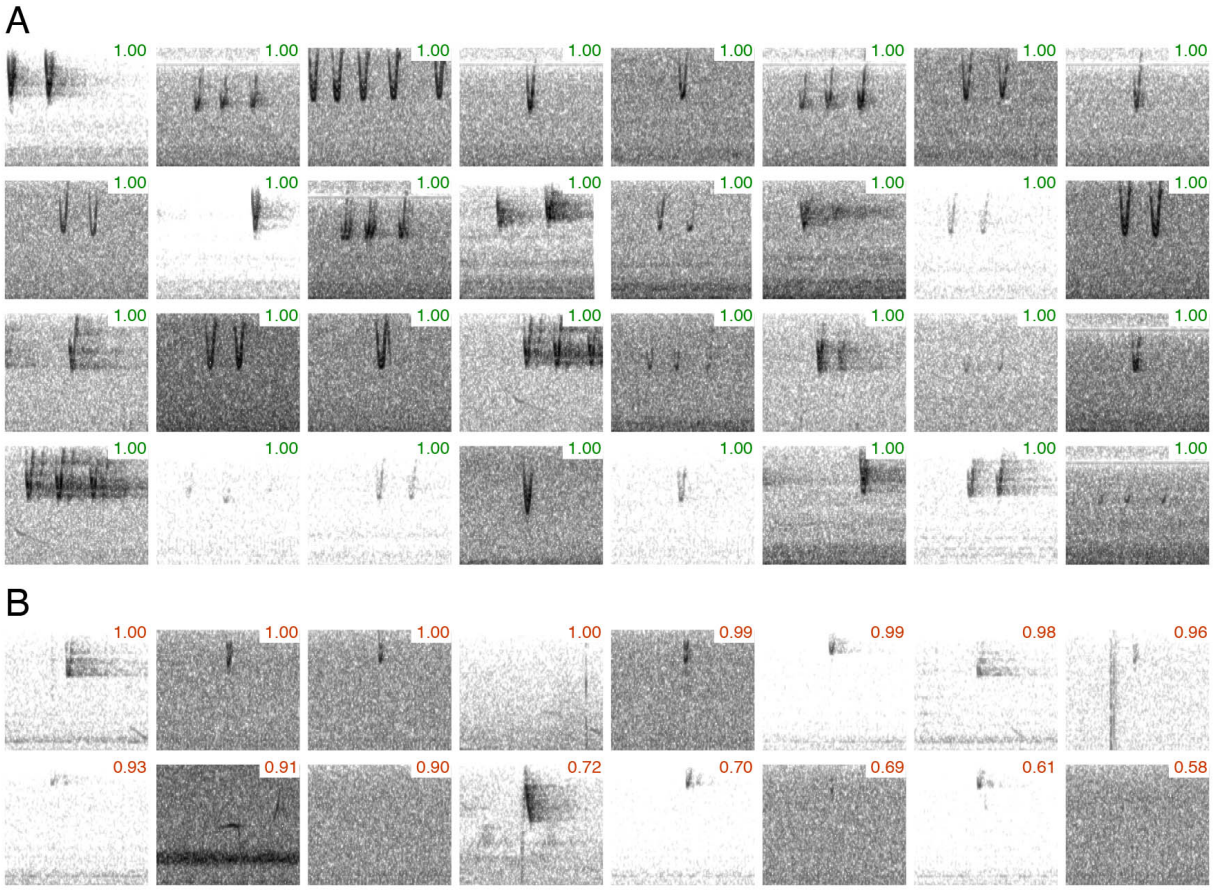

Figure S73: Classification examples for **daejun** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-11 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

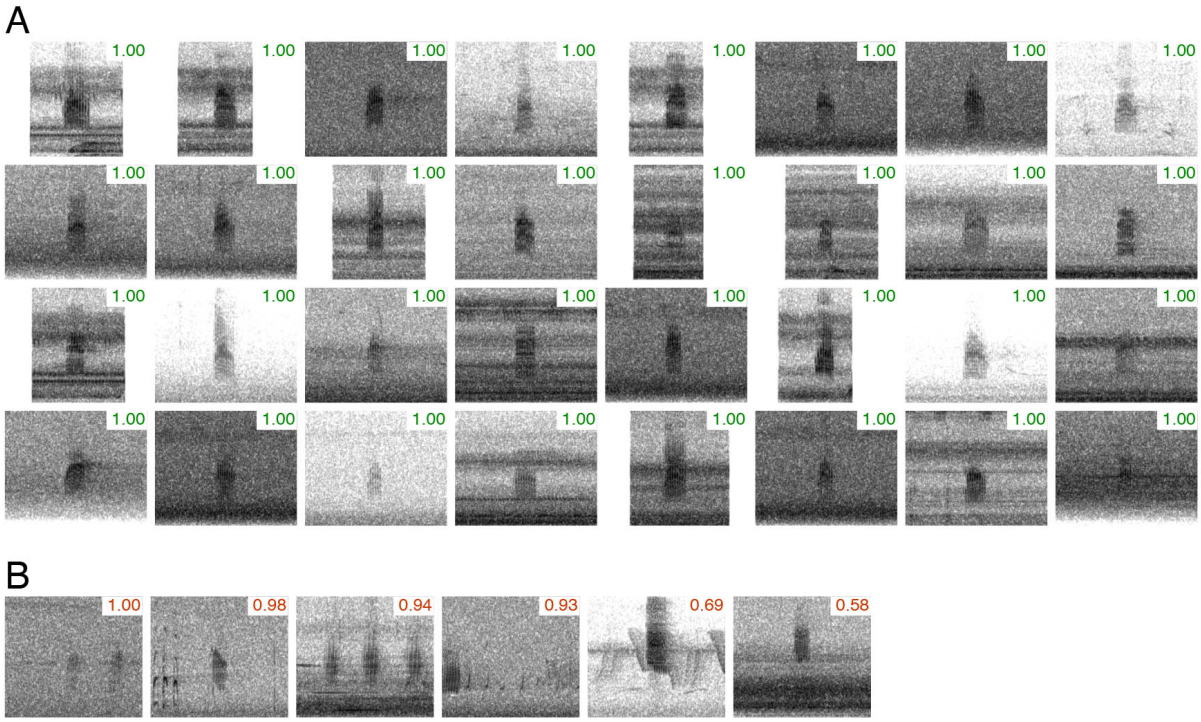

Figure S74: Classification examples for **dickci** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-8 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -60 dB).

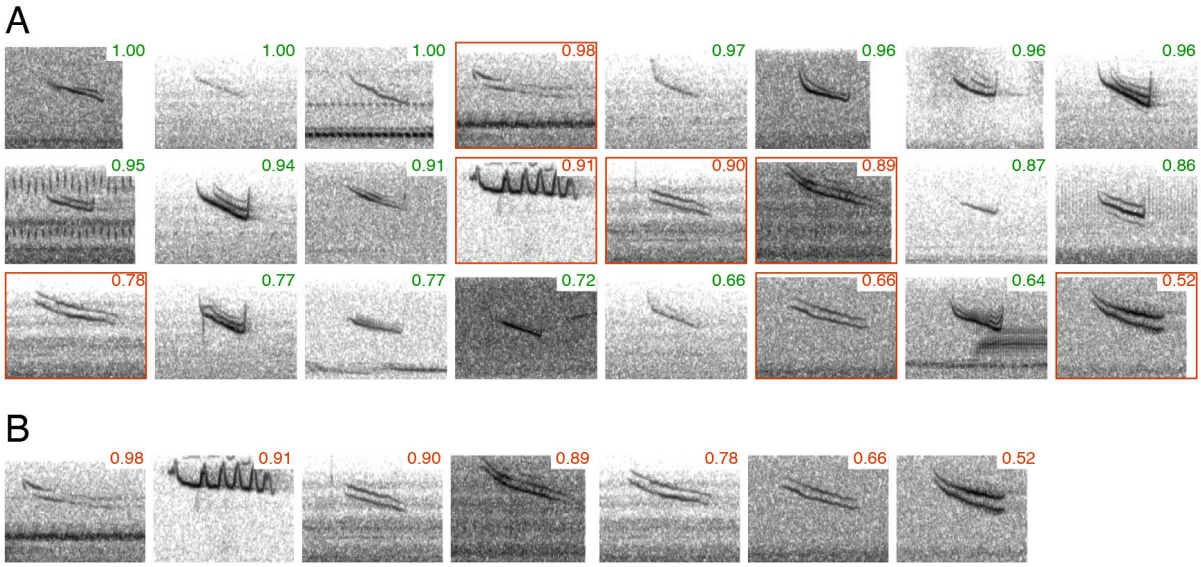

Figure S75: Classification examples for **fiespa** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-11 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

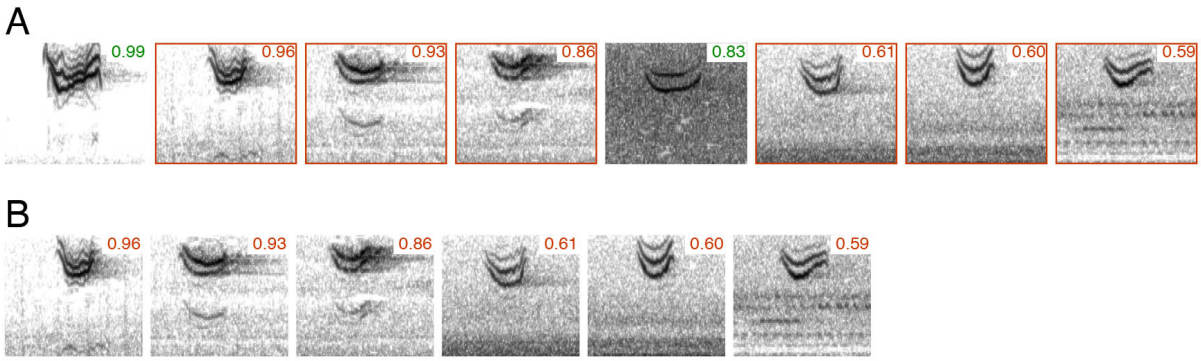

Figure S76: Classification examples for **foxspa** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

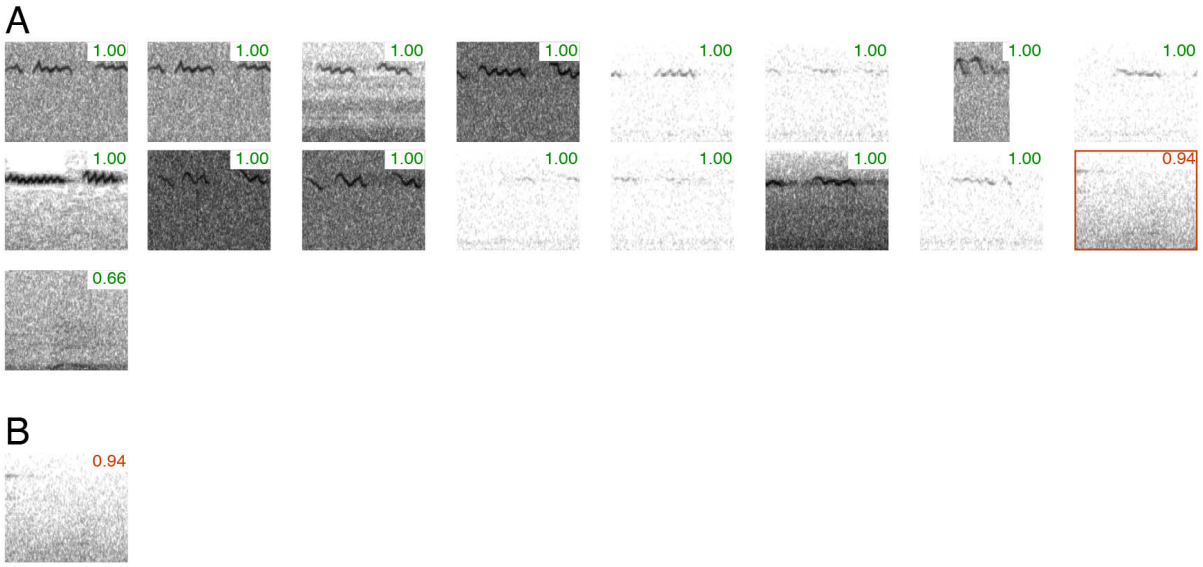

Figure S77: Classification examples for **gockin** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

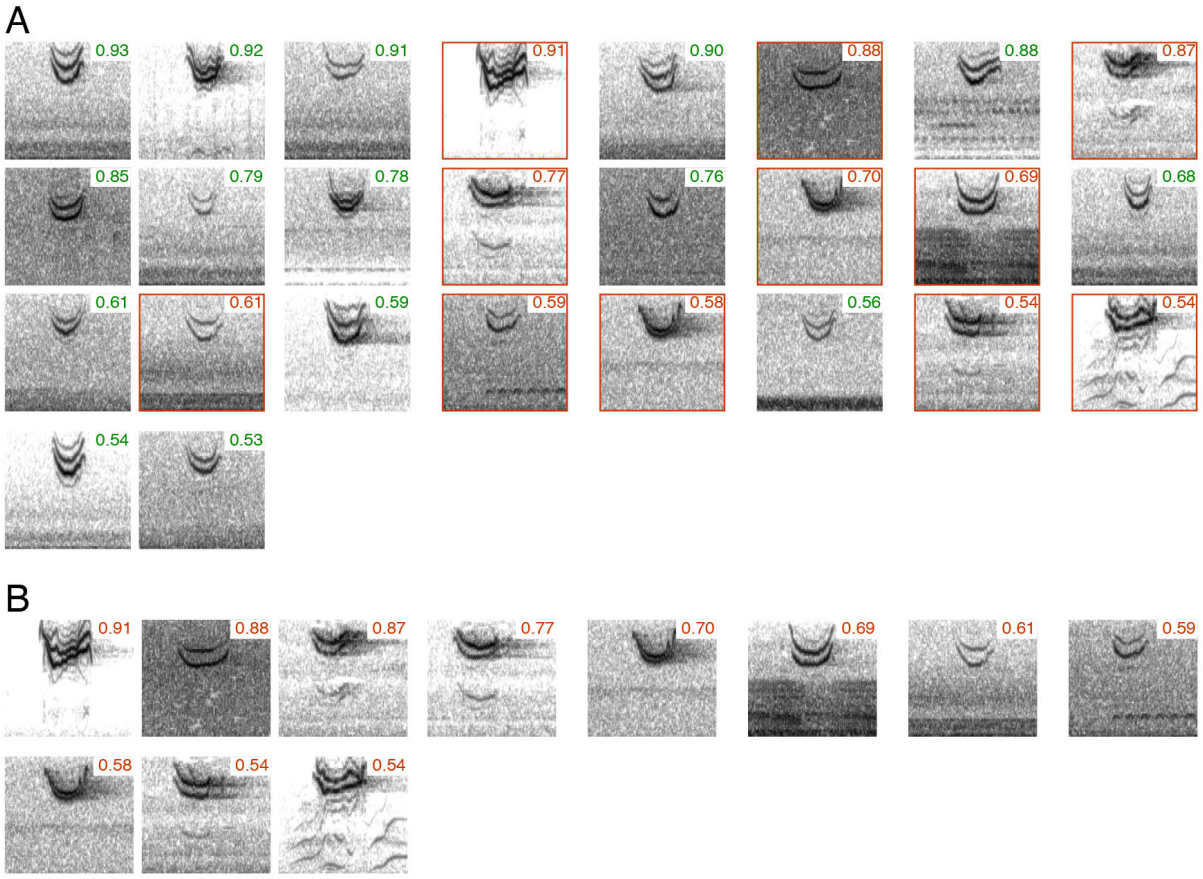

Figure S78: Classification examples for **gocspa** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

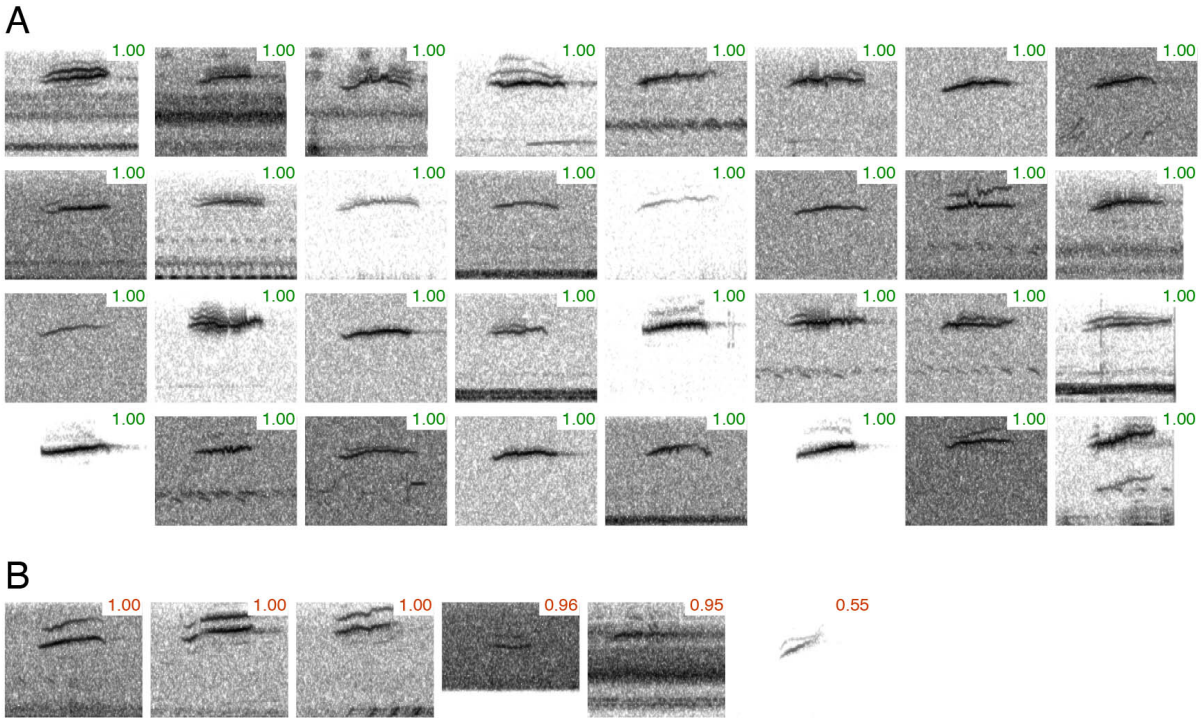

Figure S79: Classification examples for **graspa** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-11 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

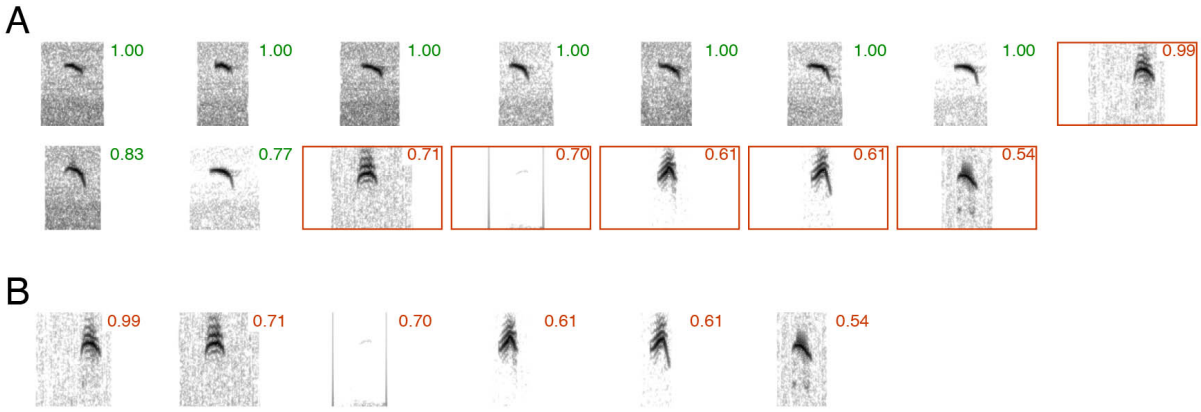

Figure S80: Classification examples for **grawar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

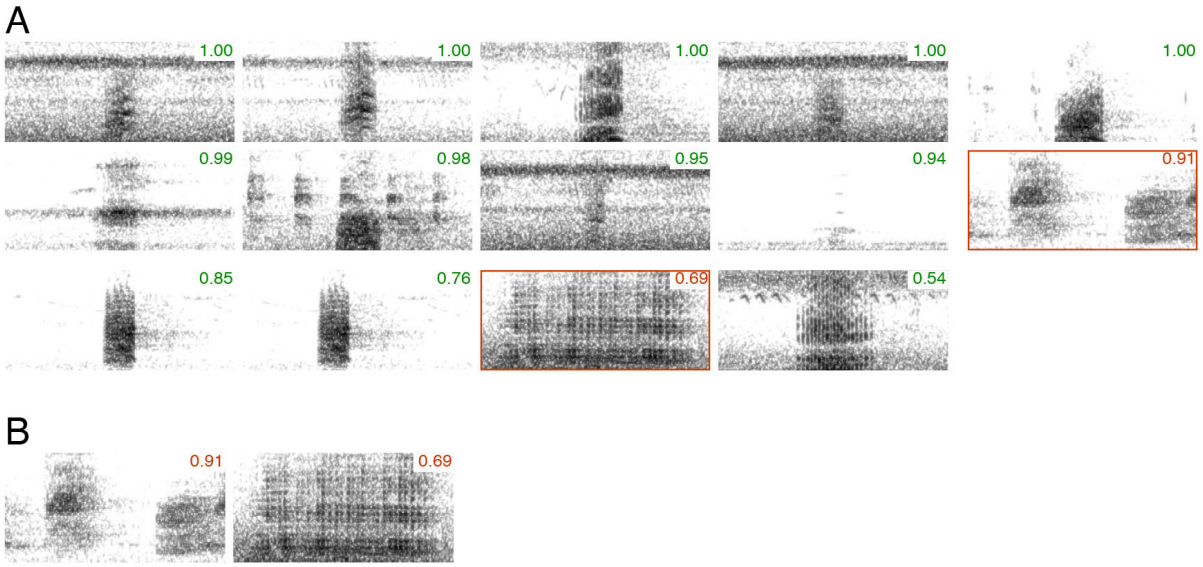

Figure S81: Classification examples for **grbher3** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-5 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

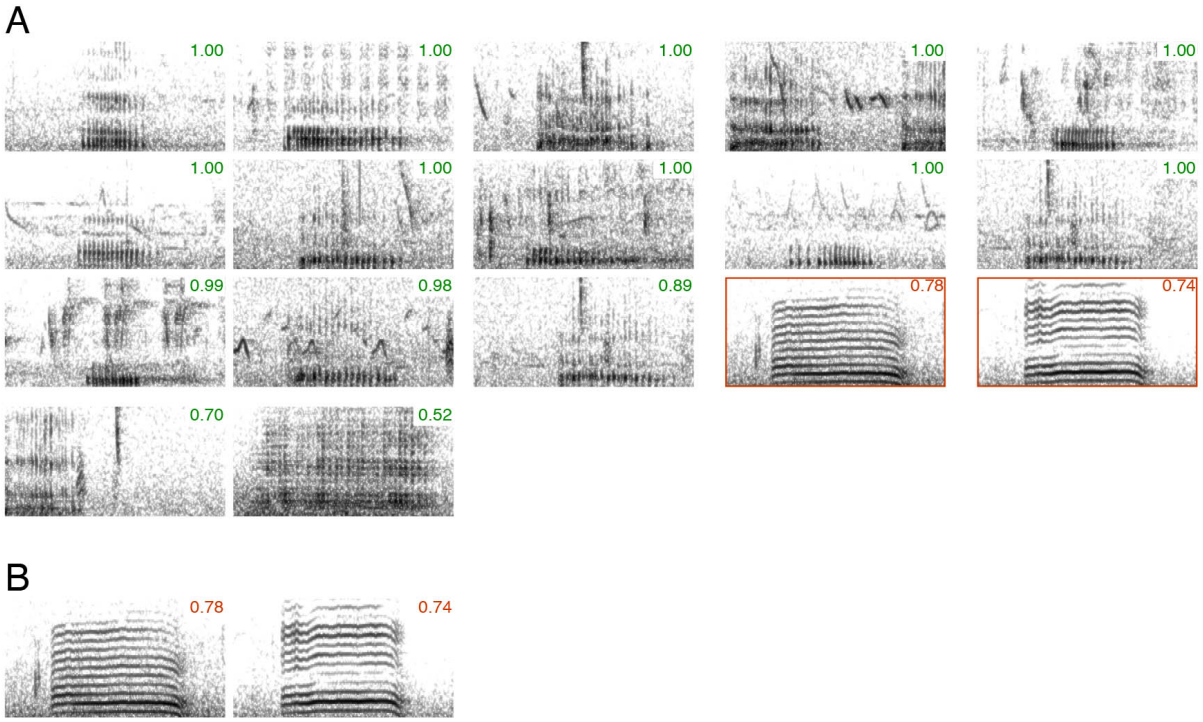

Figure S82: Classification examples for **greegr** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-5 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

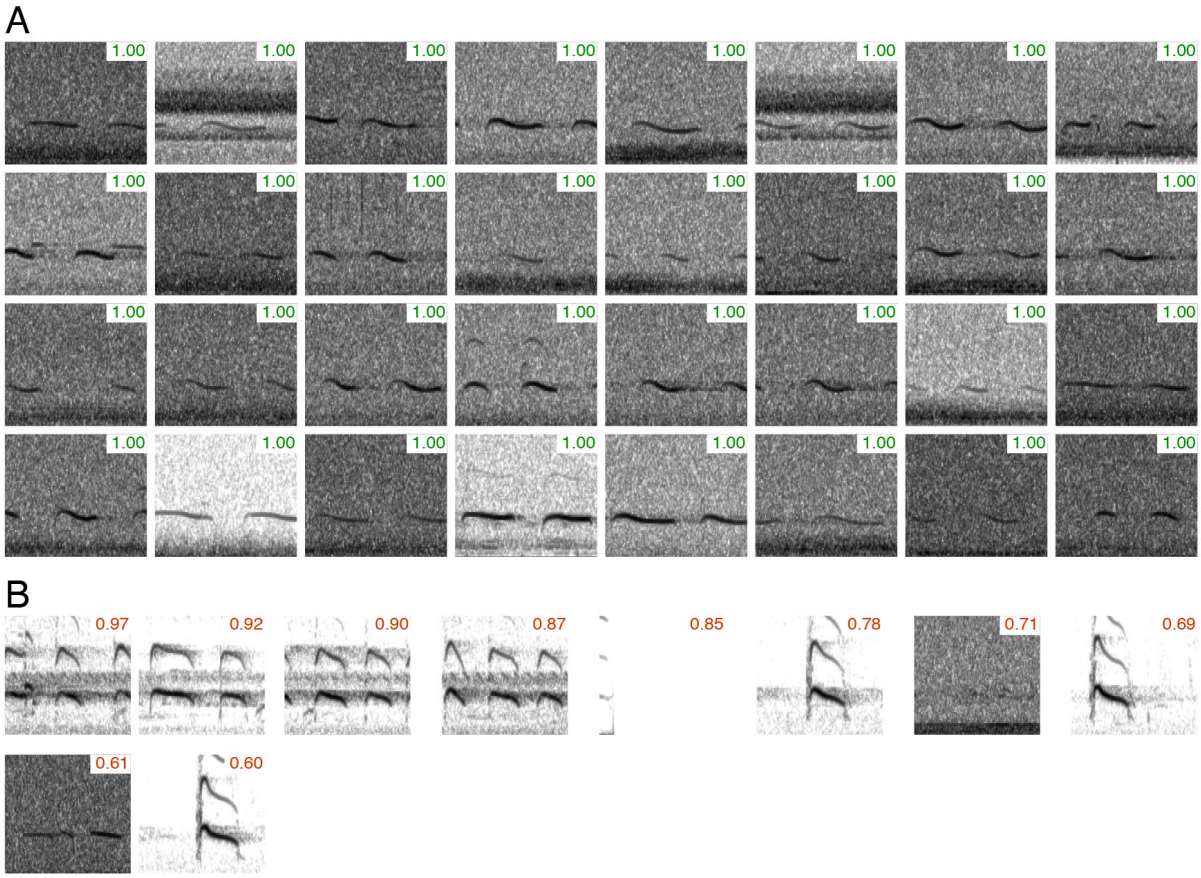

Figure S83: Classification examples for **greyel** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 0.5-8 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

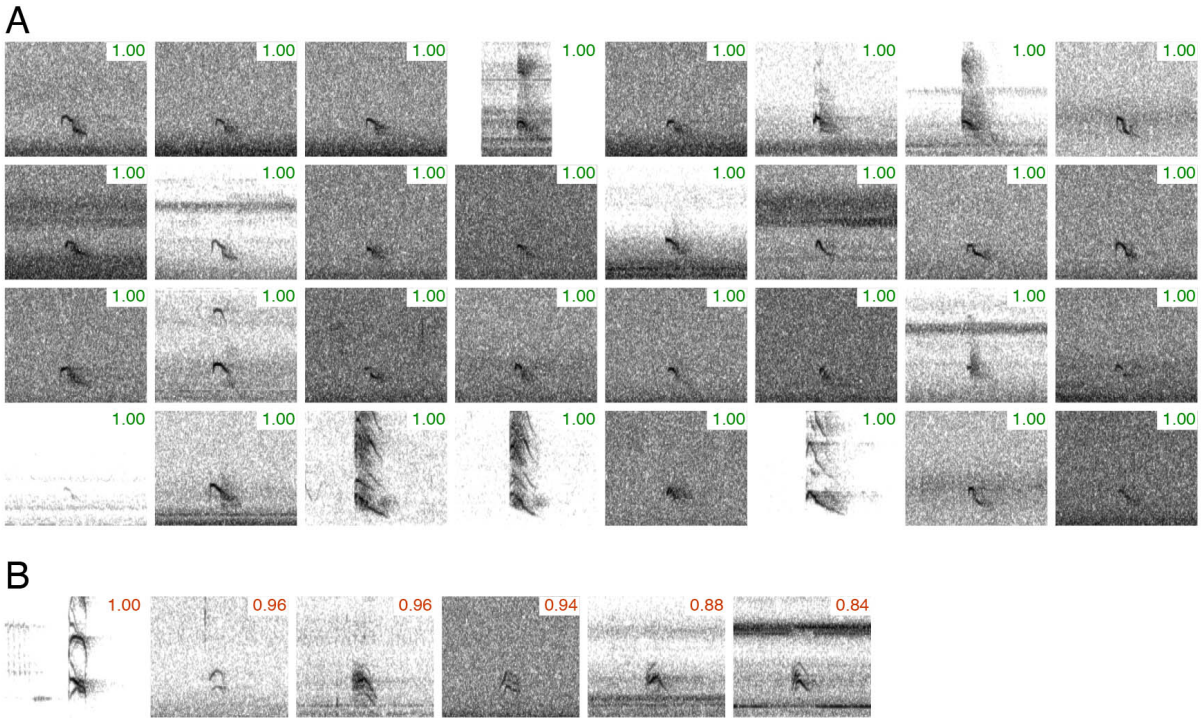

Figure S84: Classification examples for **grnher** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-6 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -50 dB).

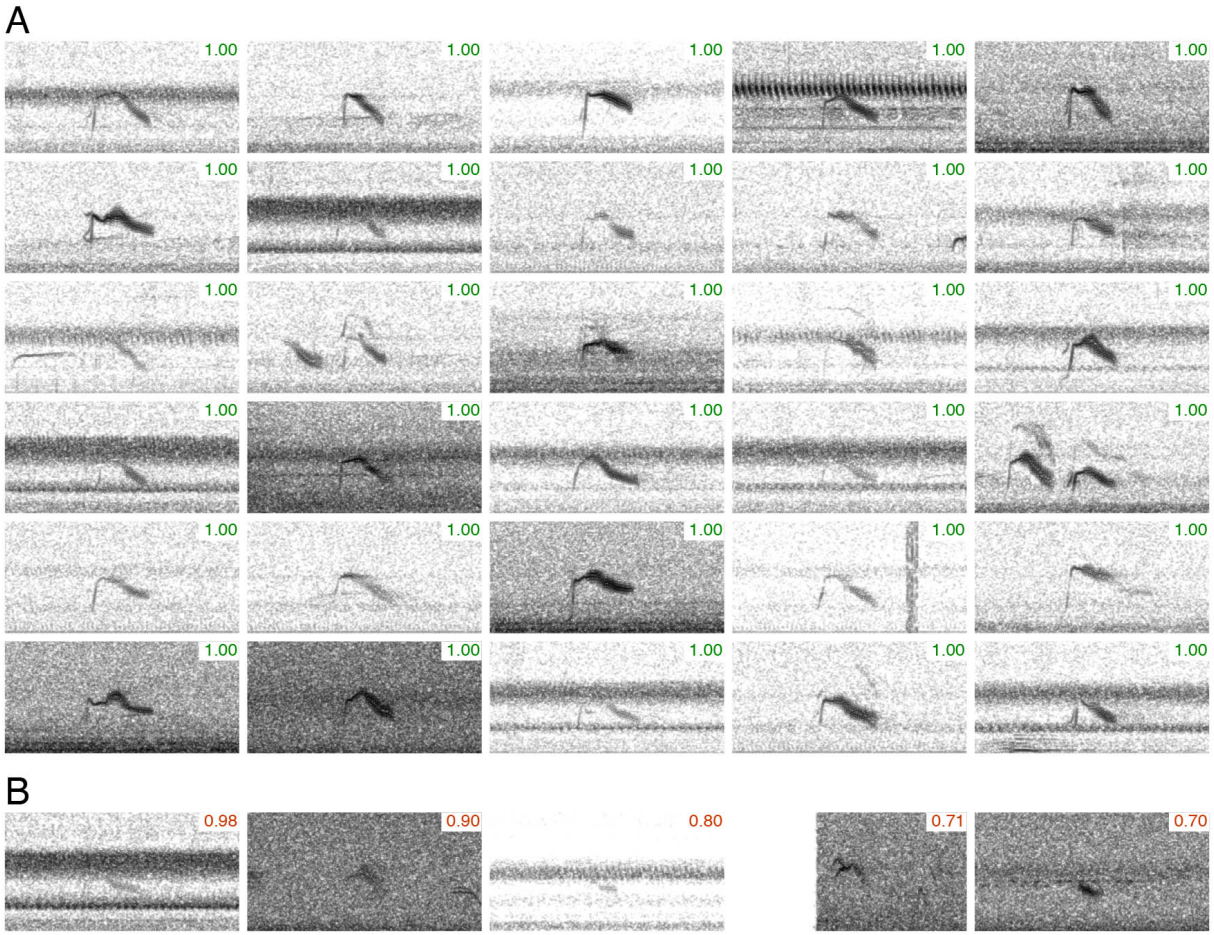

Figure S85: Classification examples for **gycthr** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-7 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -50 dB).

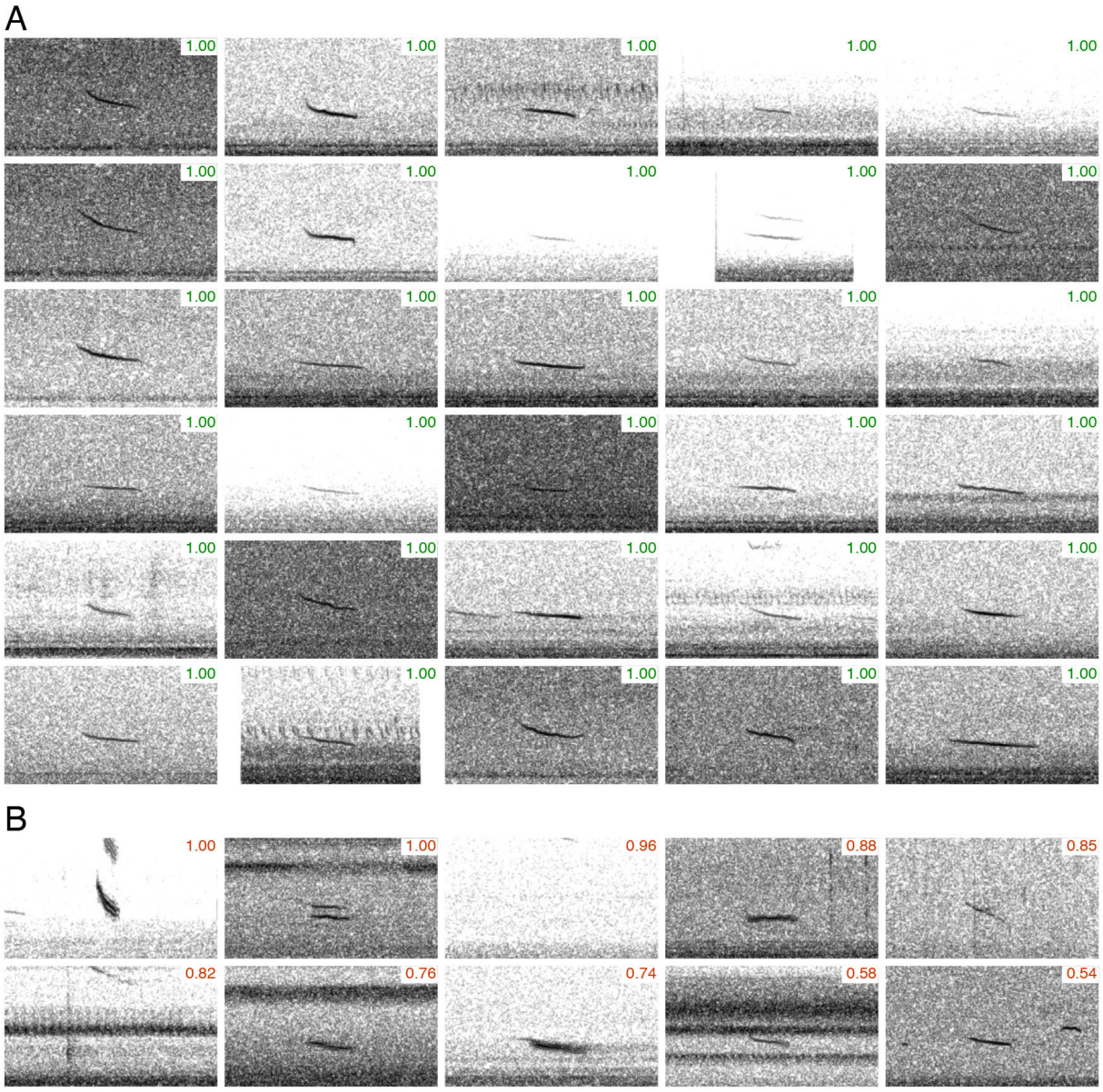

Figure S86: Classification examples for **herthr** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-7 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

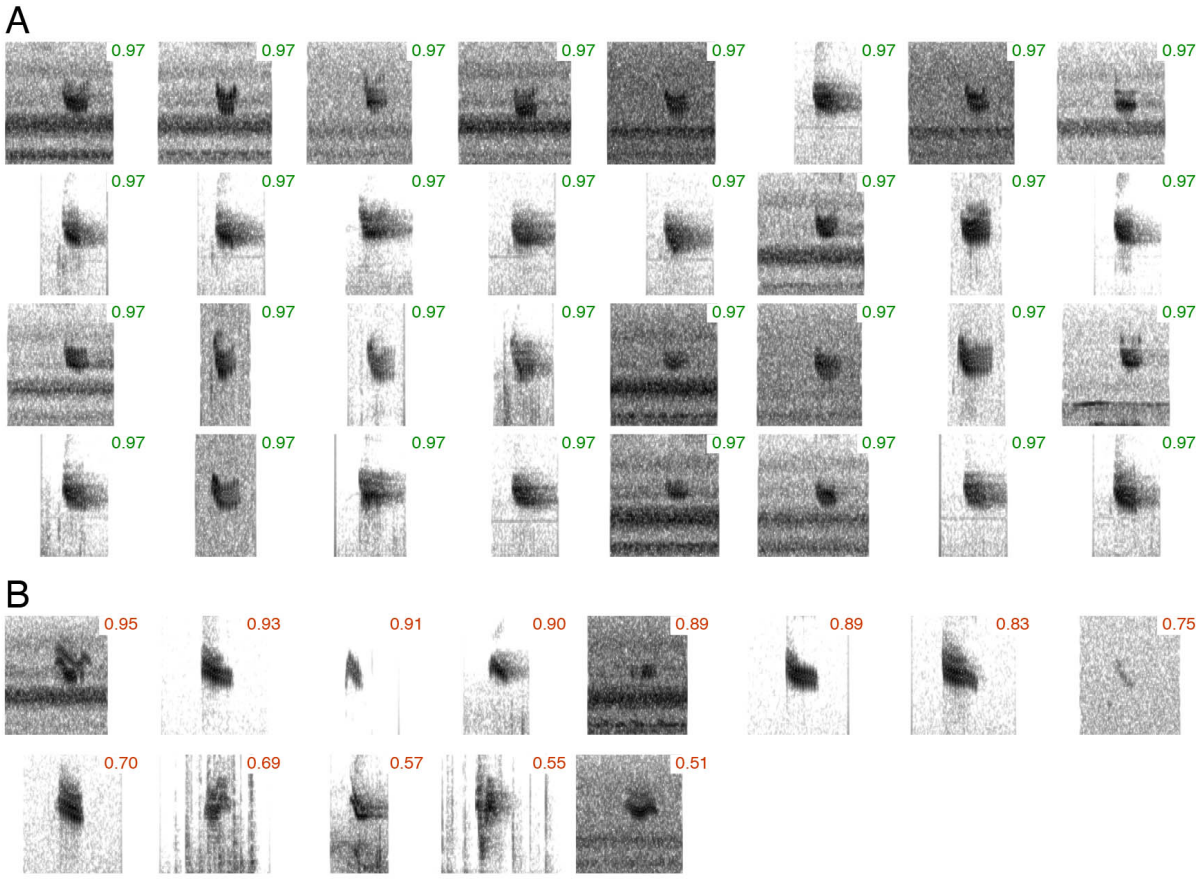

Figure S87: Classification examples for **hoowar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

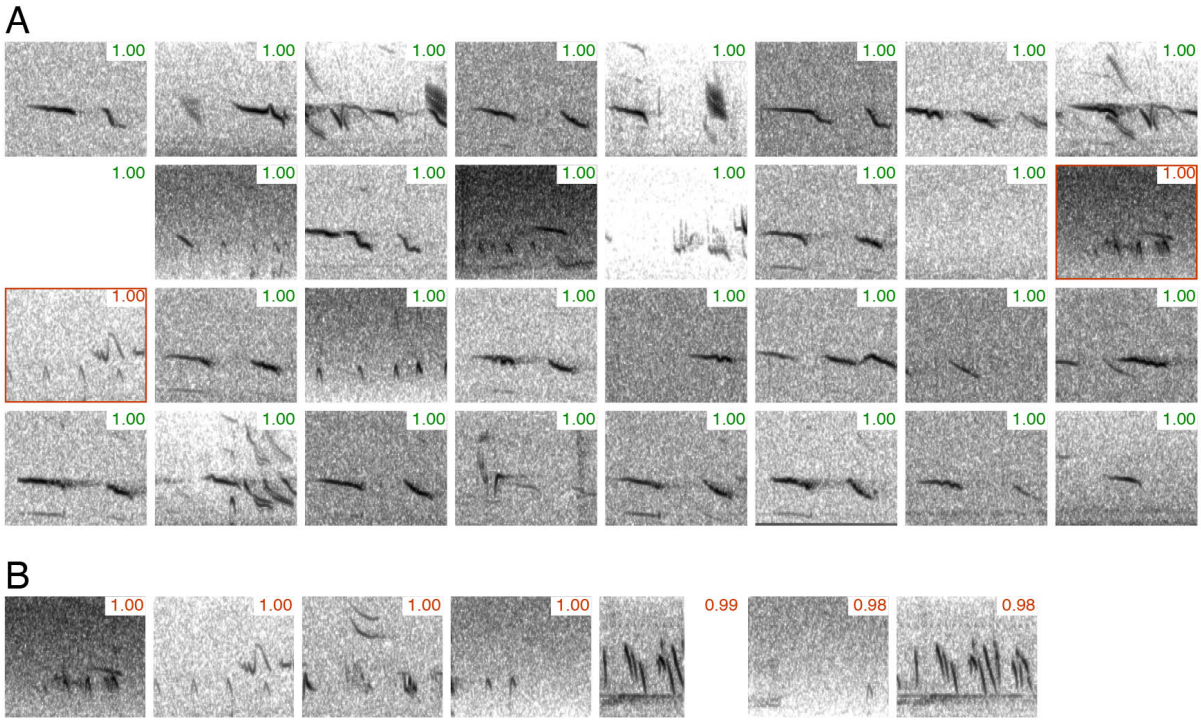

Figure S88: Classification examples for **horlar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

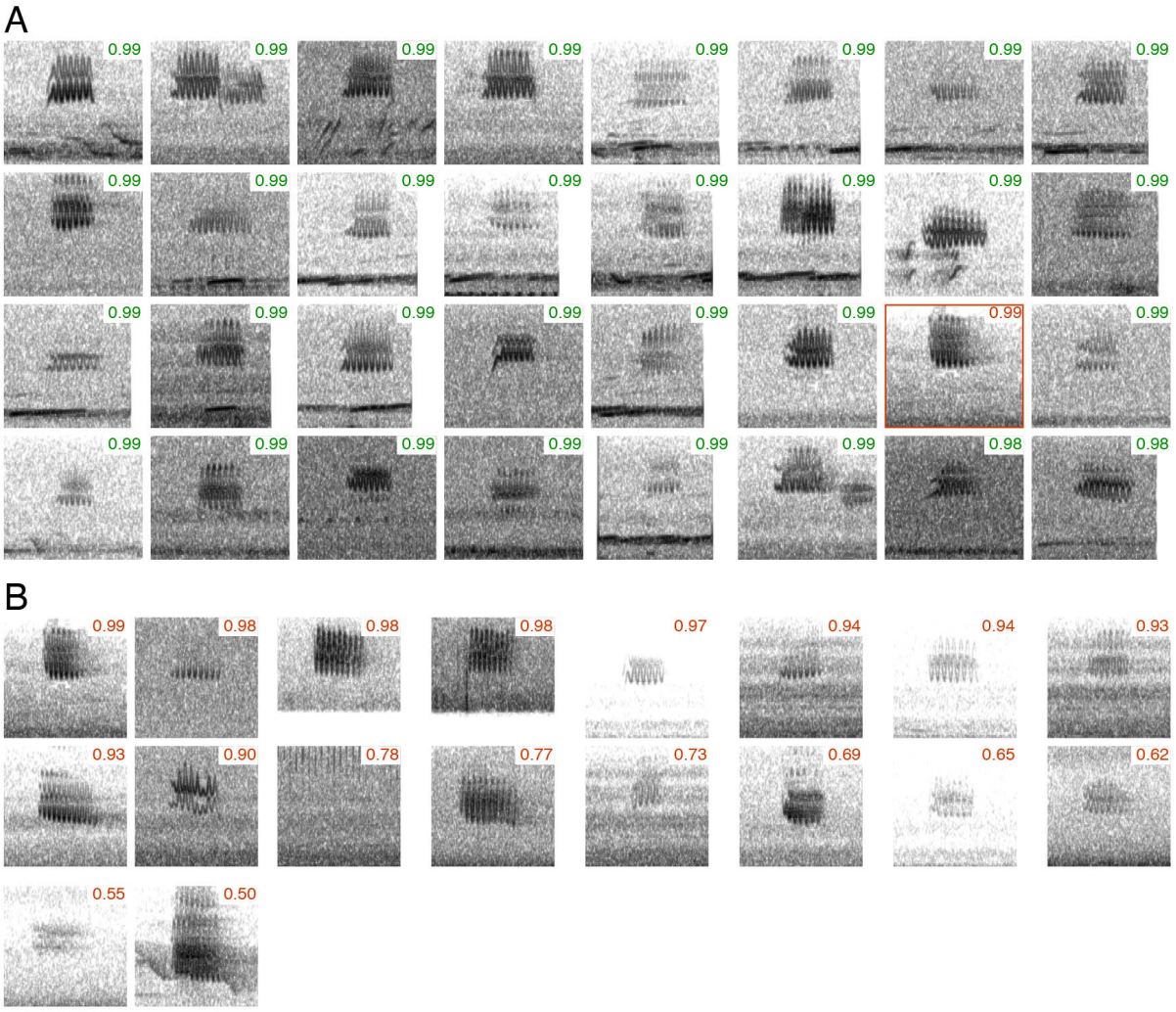

Figure S89: Classification examples for **indbun** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

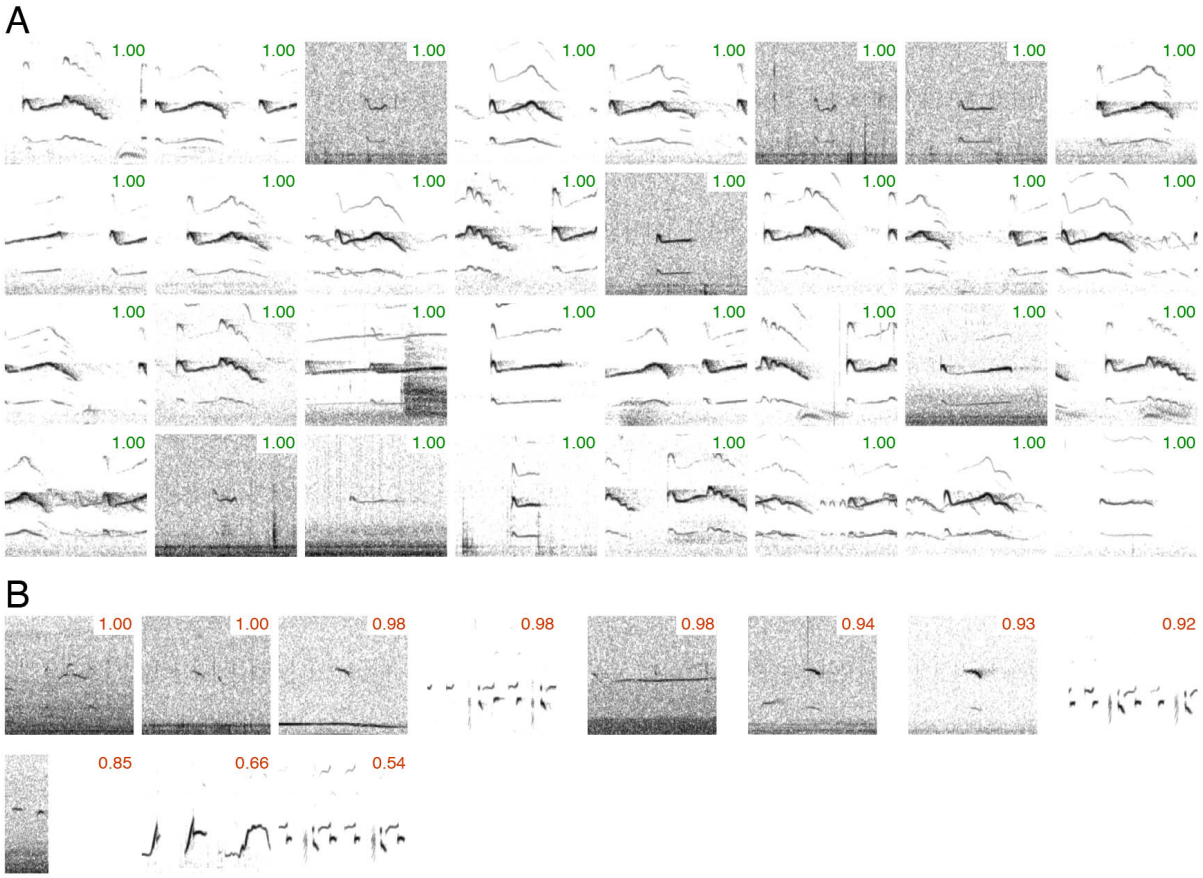

Figure S90: Classification examples for **killde** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-8 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

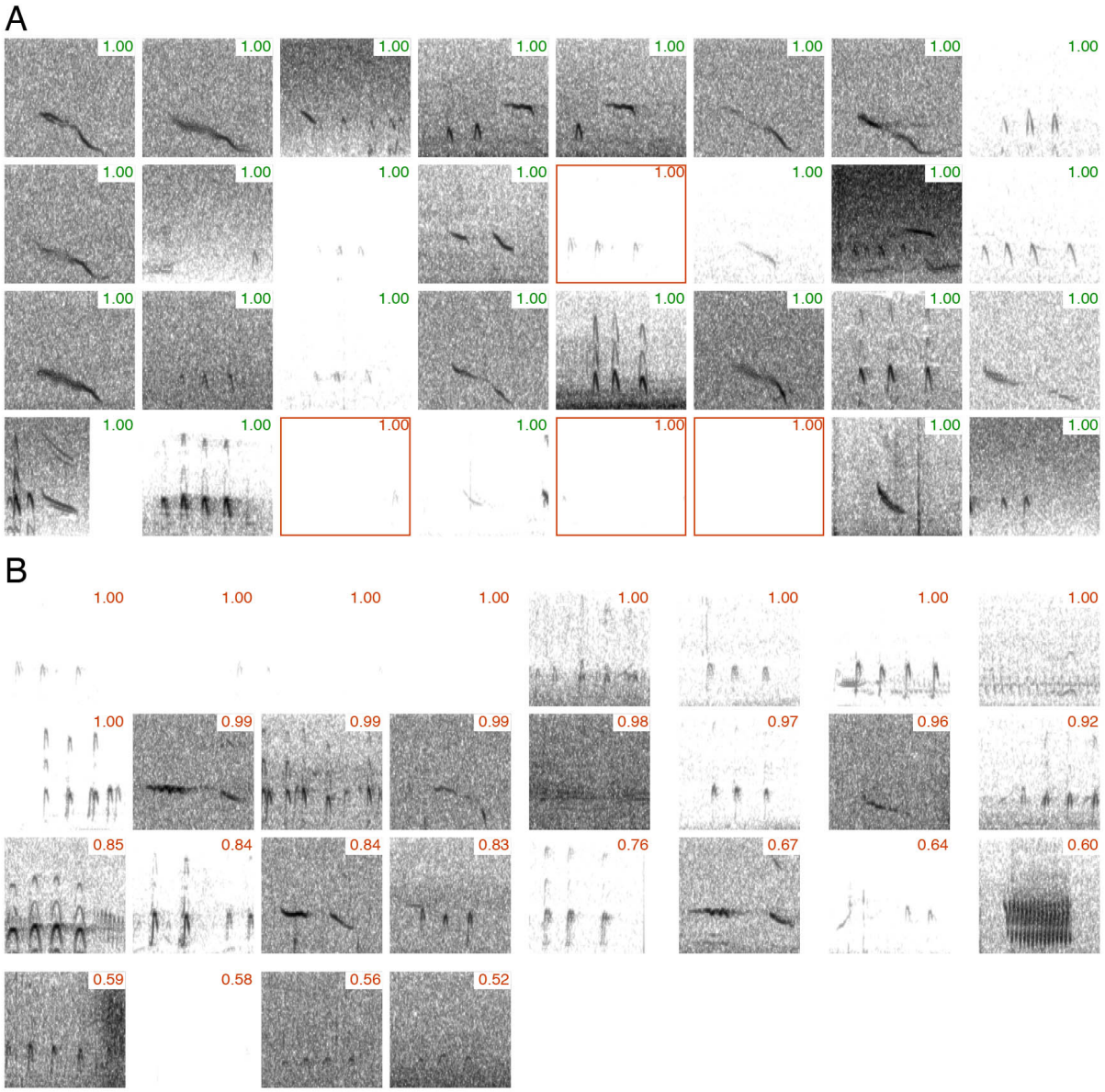

Figure S91: Classification examples for **laplon** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

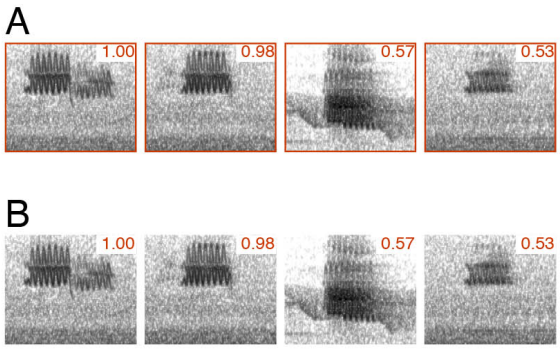

Figure S92: Classification examples for **lazbun** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

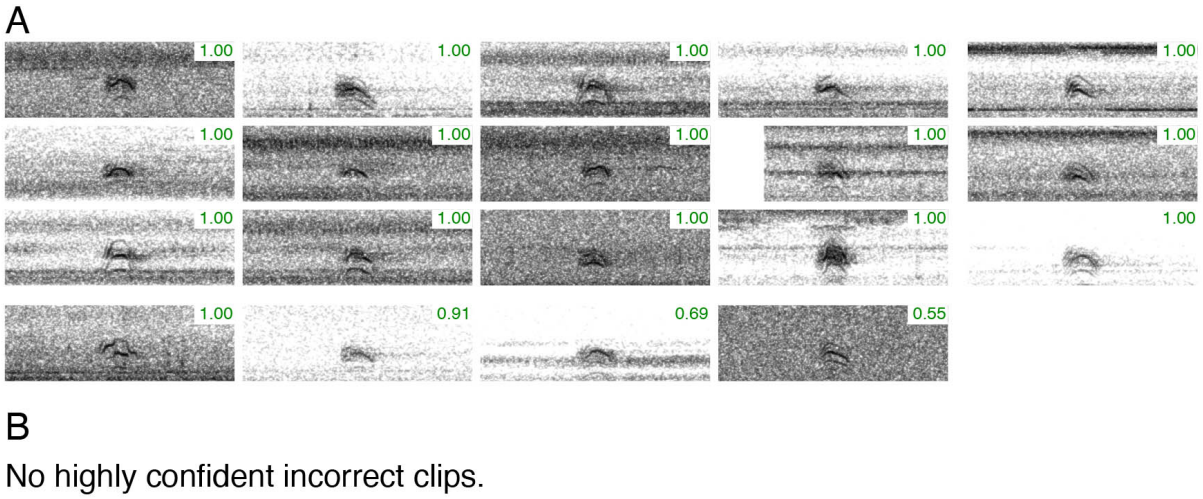

Figure S93: Classification examples for **leabit** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-5 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

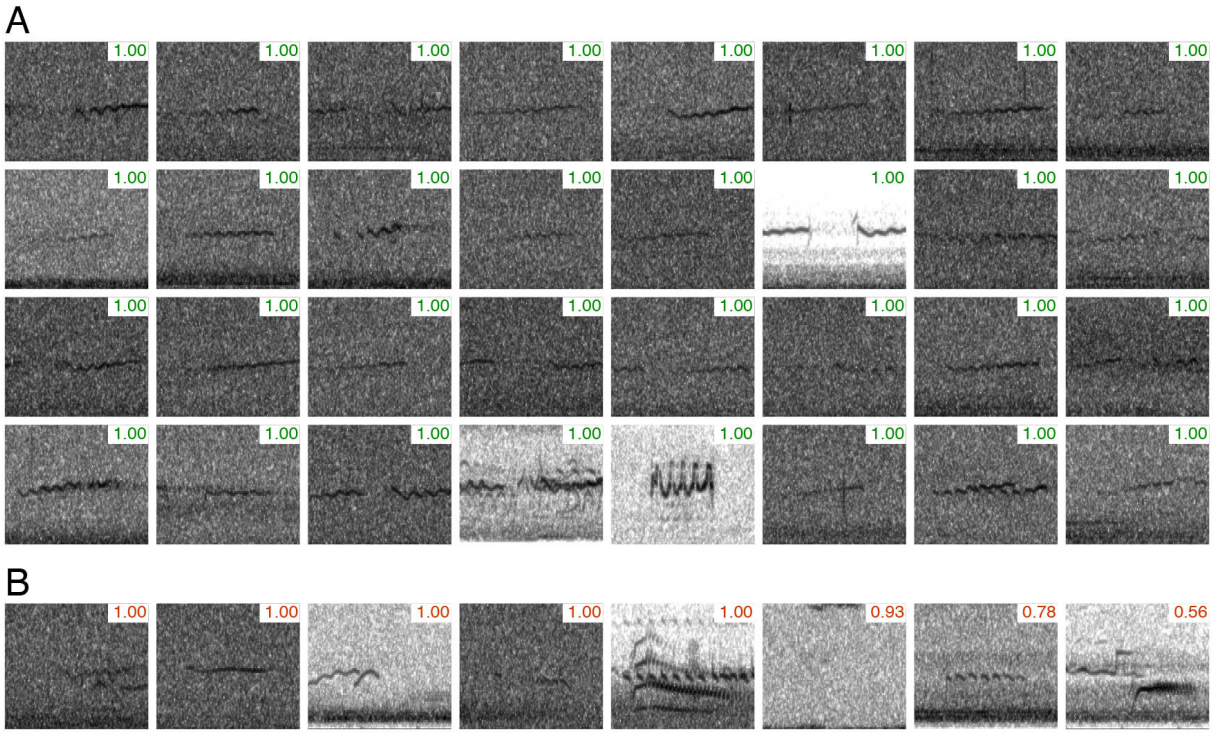

Figure S94: Classification examples for **leasan** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 0.5-8 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

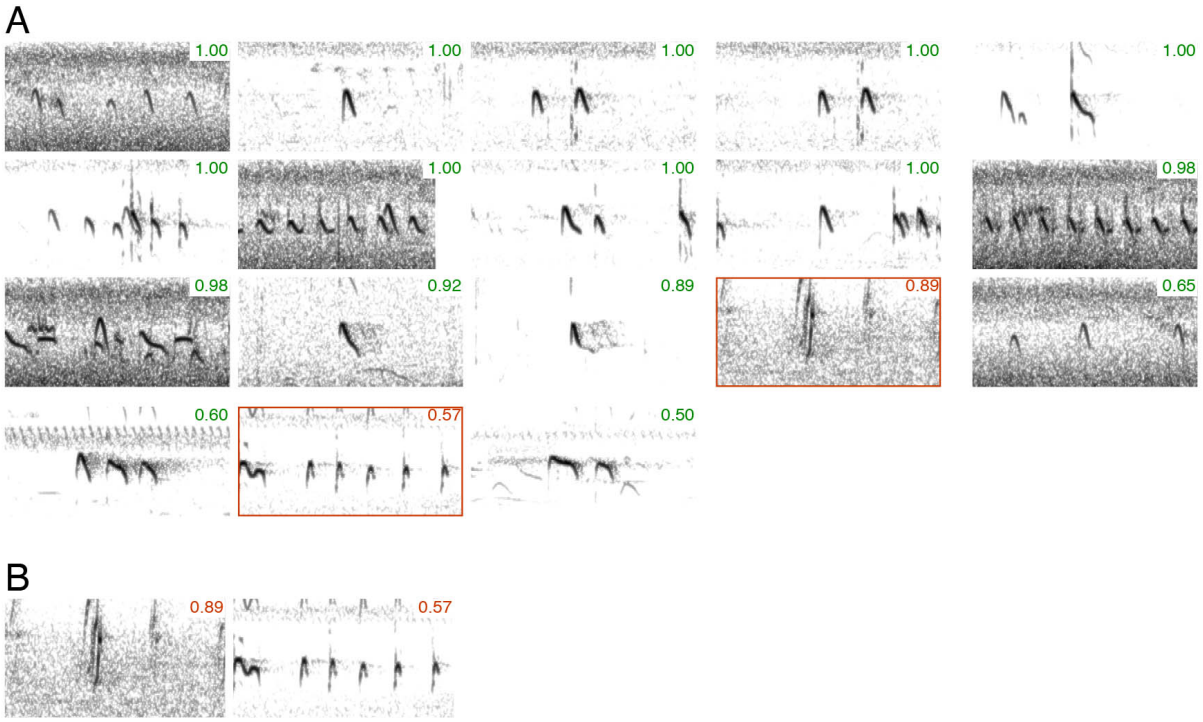

Figure S95: Classification examples for **lesyel** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-5 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

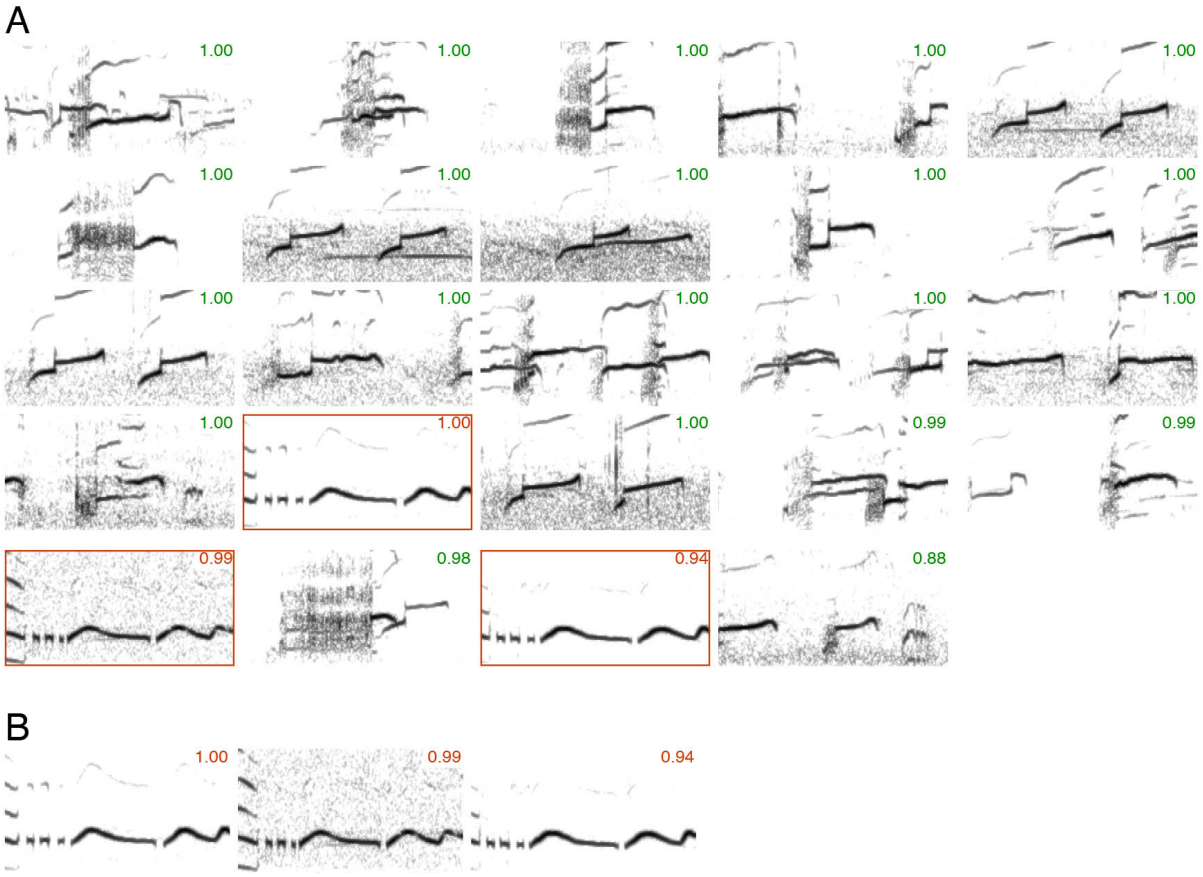

Figure S96: Classification examples for **lobcur** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-5 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

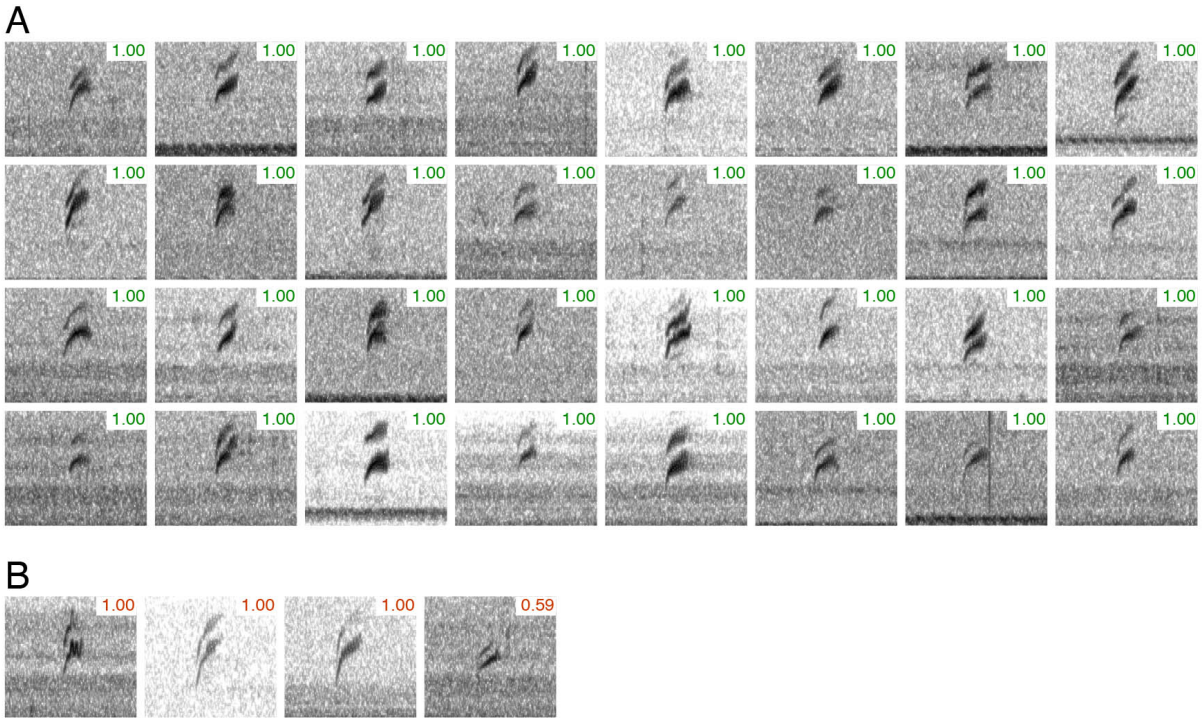

Figure S97: Classification examples for **macwar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 3-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

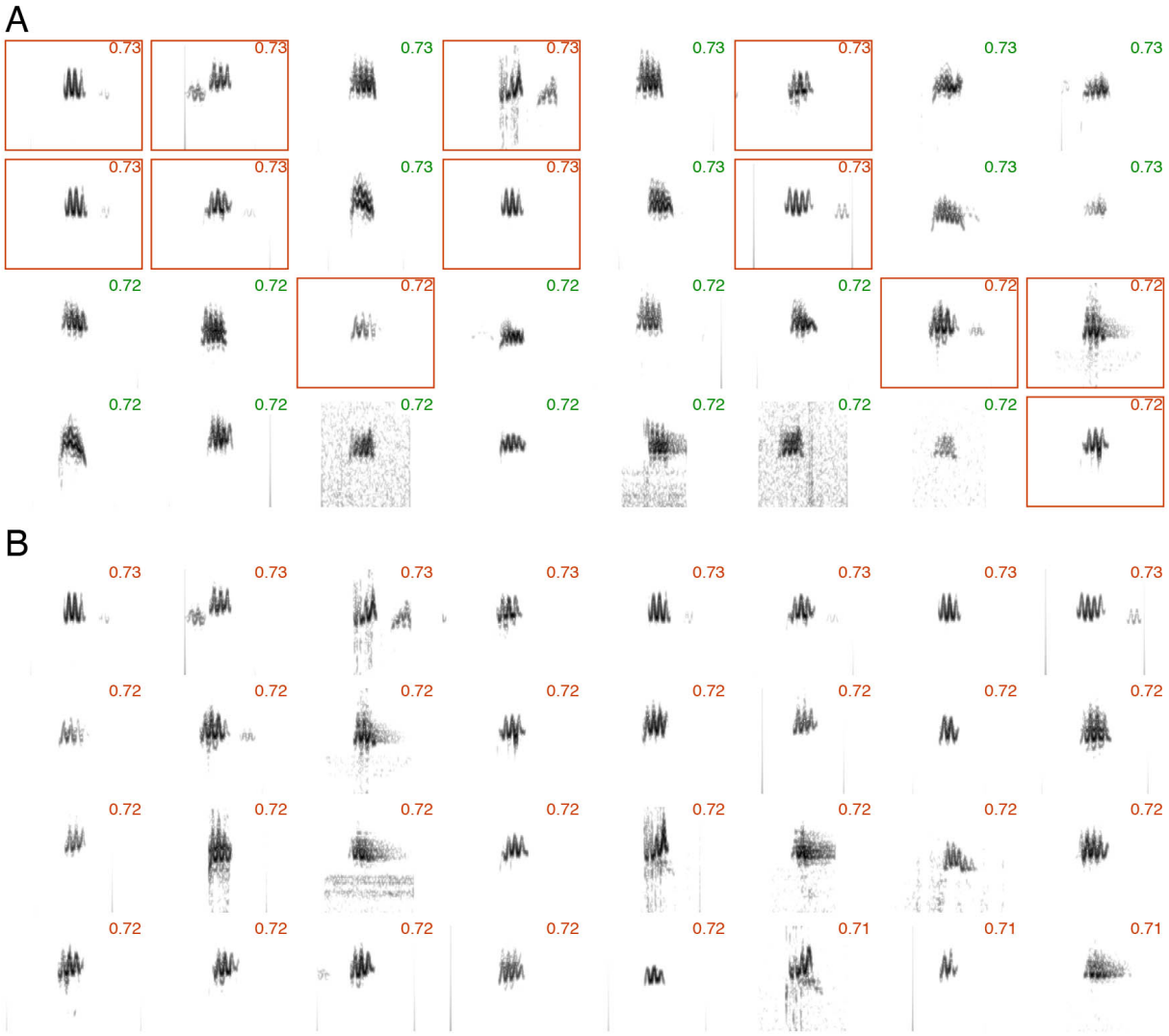

Figure S98: Classification examples for **magwar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 3-11 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -50 dB).

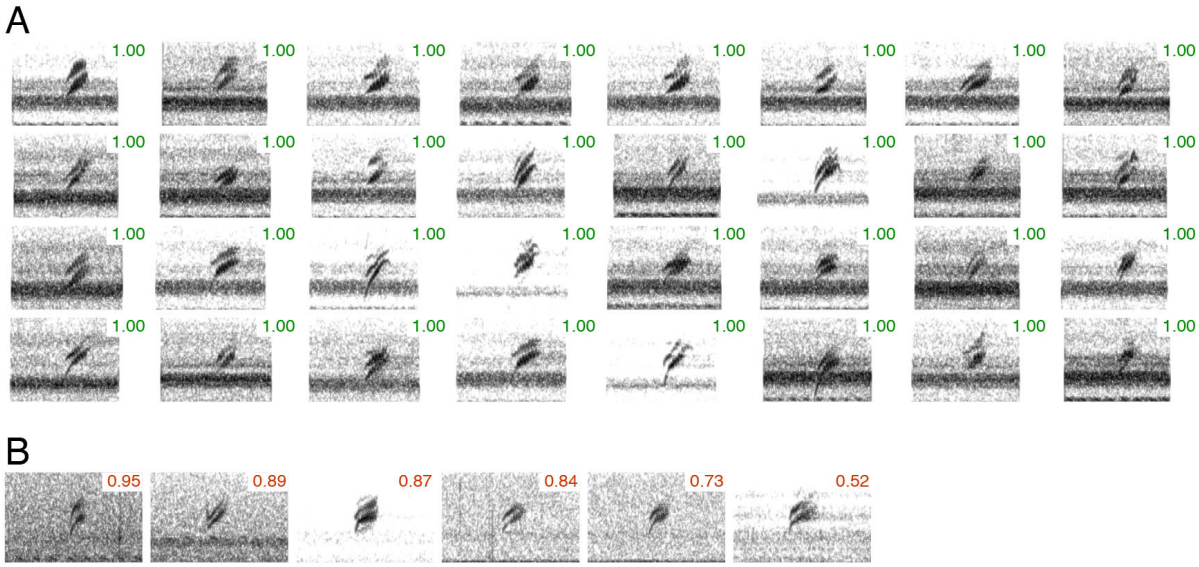

Figure S99: Classification examples for **mouwar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 3-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -45 dB).

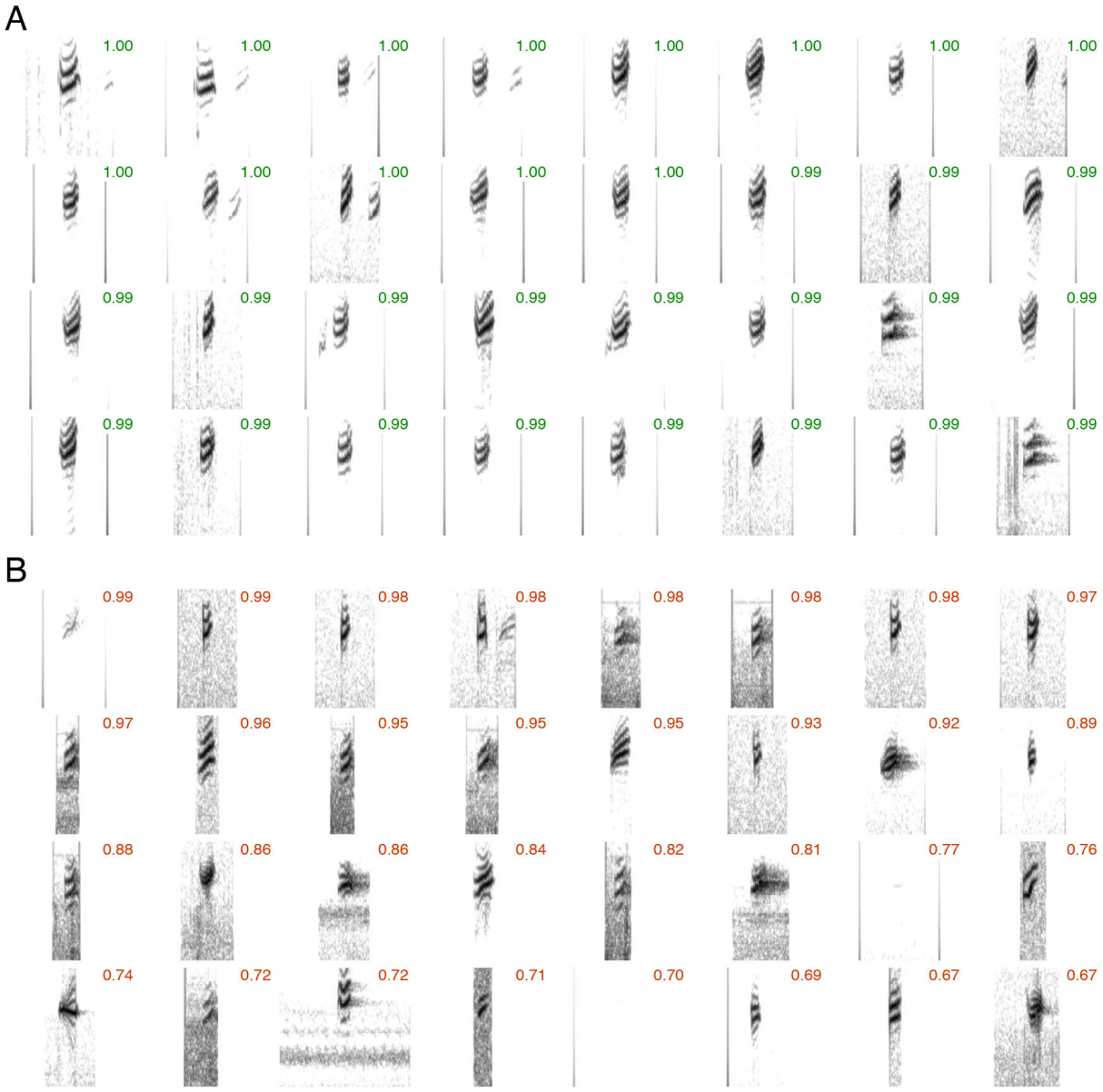

Figure S100: Classification examples for **naswar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

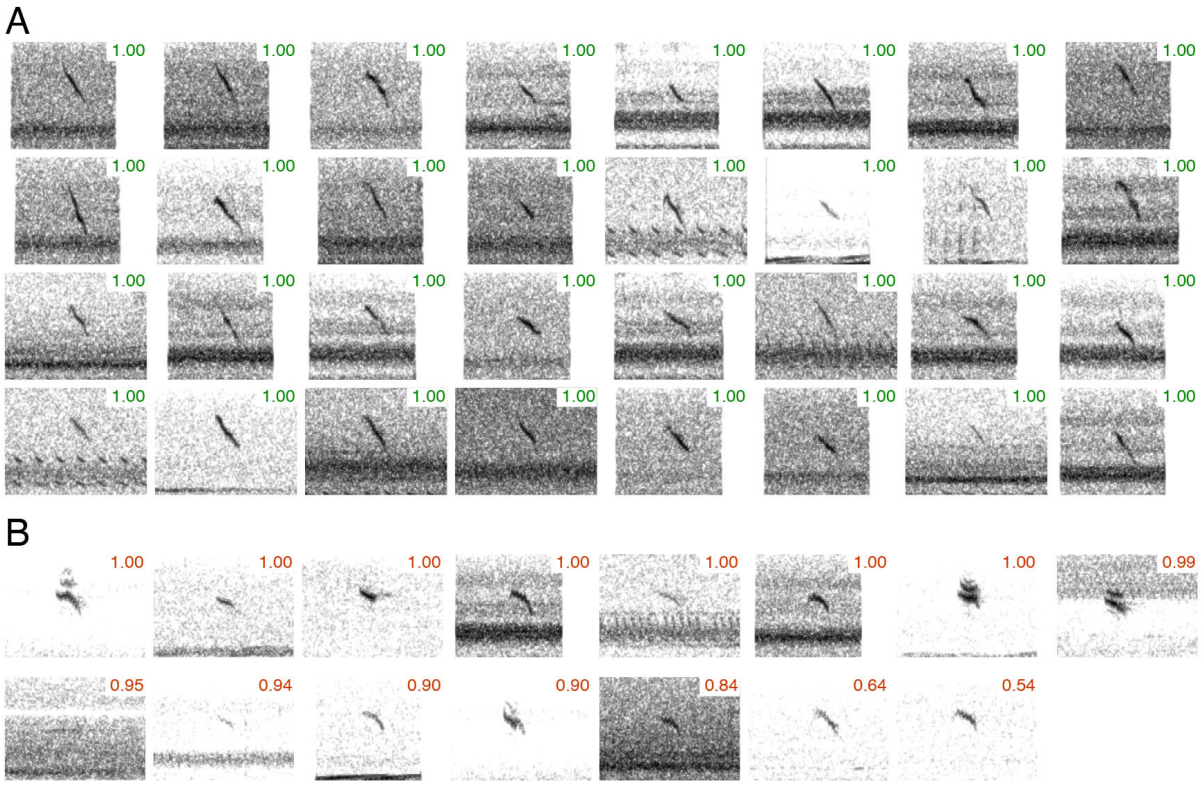

Figure S101: Classification examples for **norpar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 3-10 kHz; window type: Hanning; window length: 250 samples; hop size: 20 samples; dynamic range floor: -45 dB).

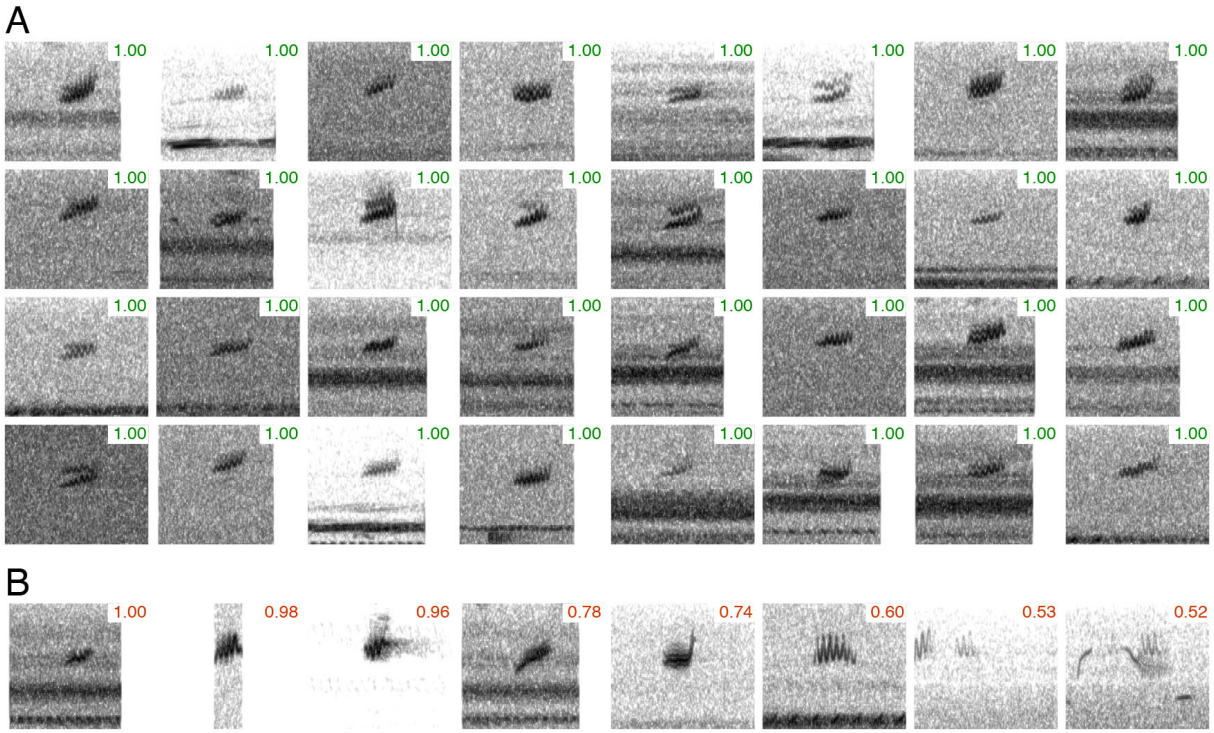

Figure S102: Classification examples for **norwat** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

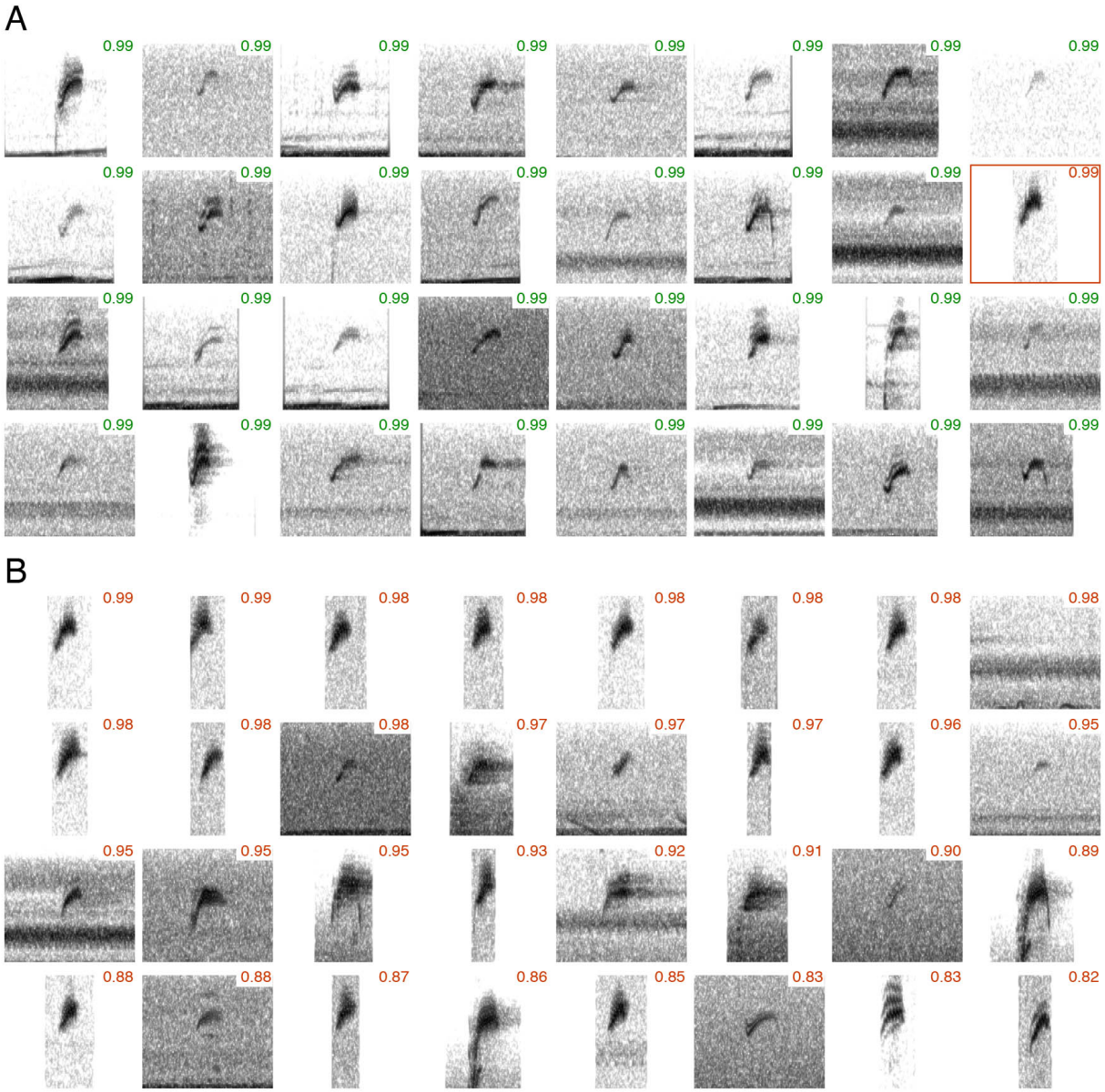

Figure S103: Classification examples for **ovenbi1** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 3-11 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

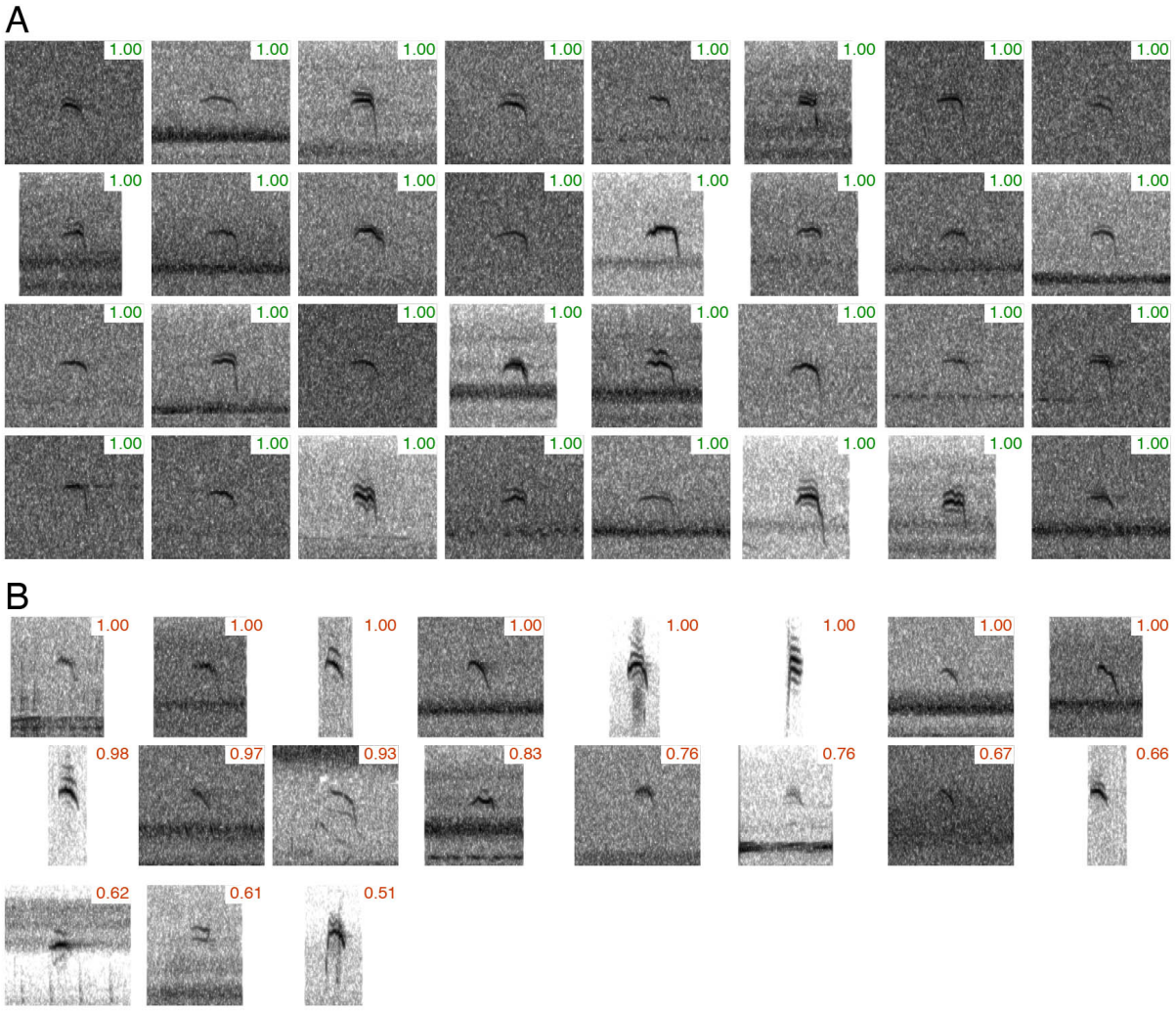

Figure S104: Classification examples for **palwar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

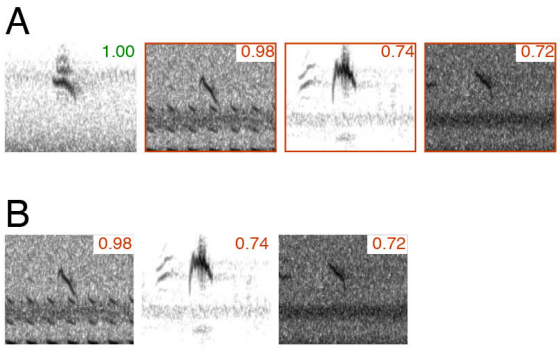

Figure S105: Classification examples for **pinwar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

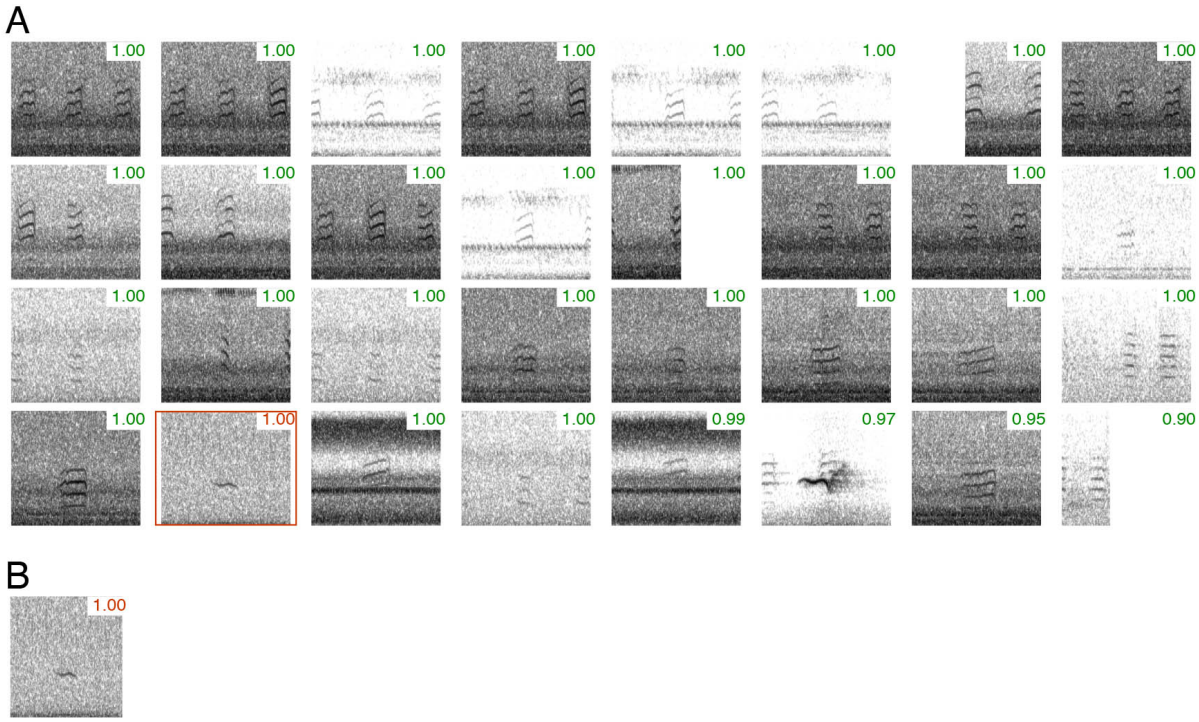

Figure S106: Classification examples for **rebnut** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-1 s; y-axis: 1-6 kHz; window type: Hanning; window length: 420 samples; hop size: 35 samples; dynamic range floor: -50 dB).

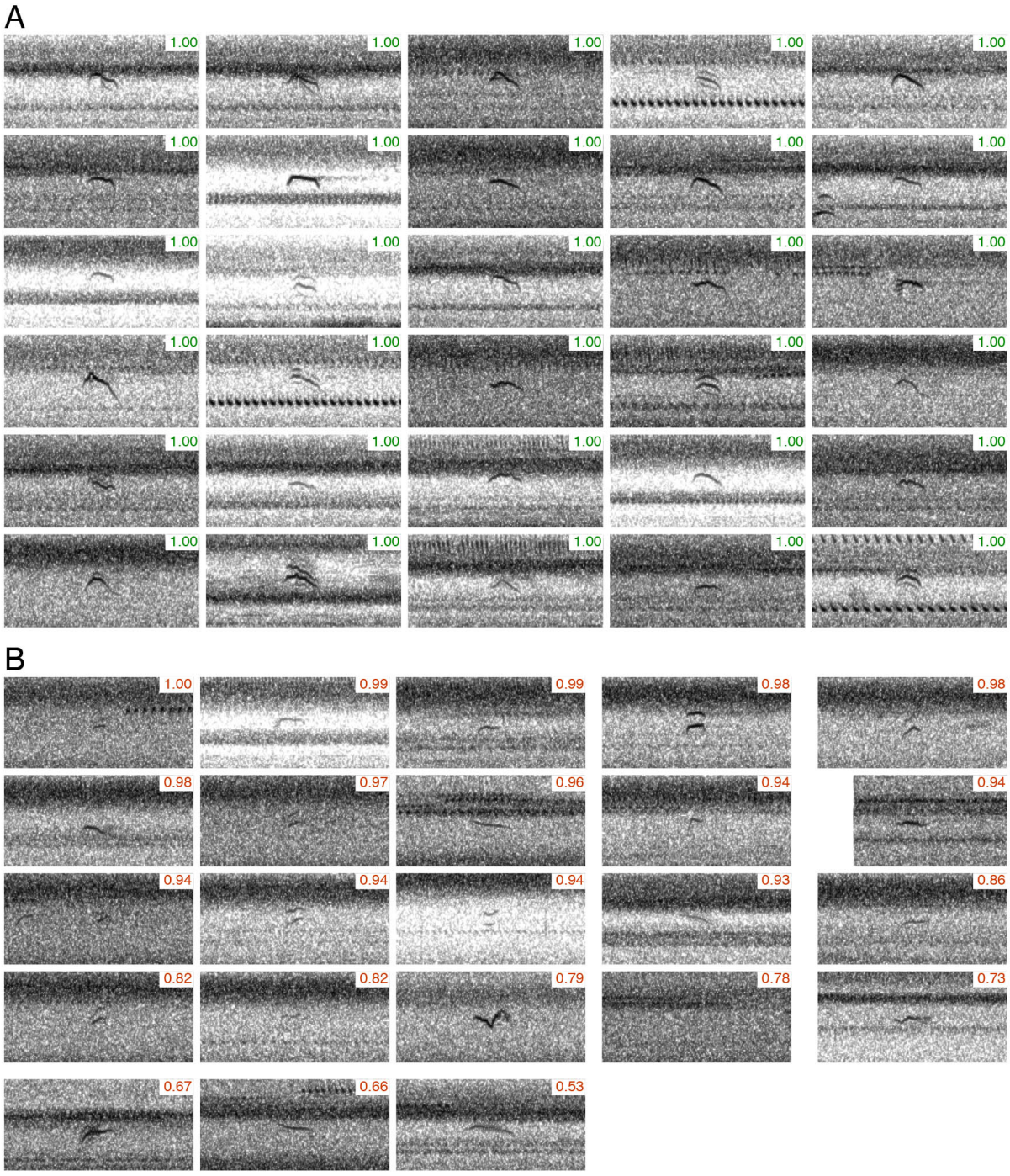

Figure S107: Classification examples for **robgro** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-5 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

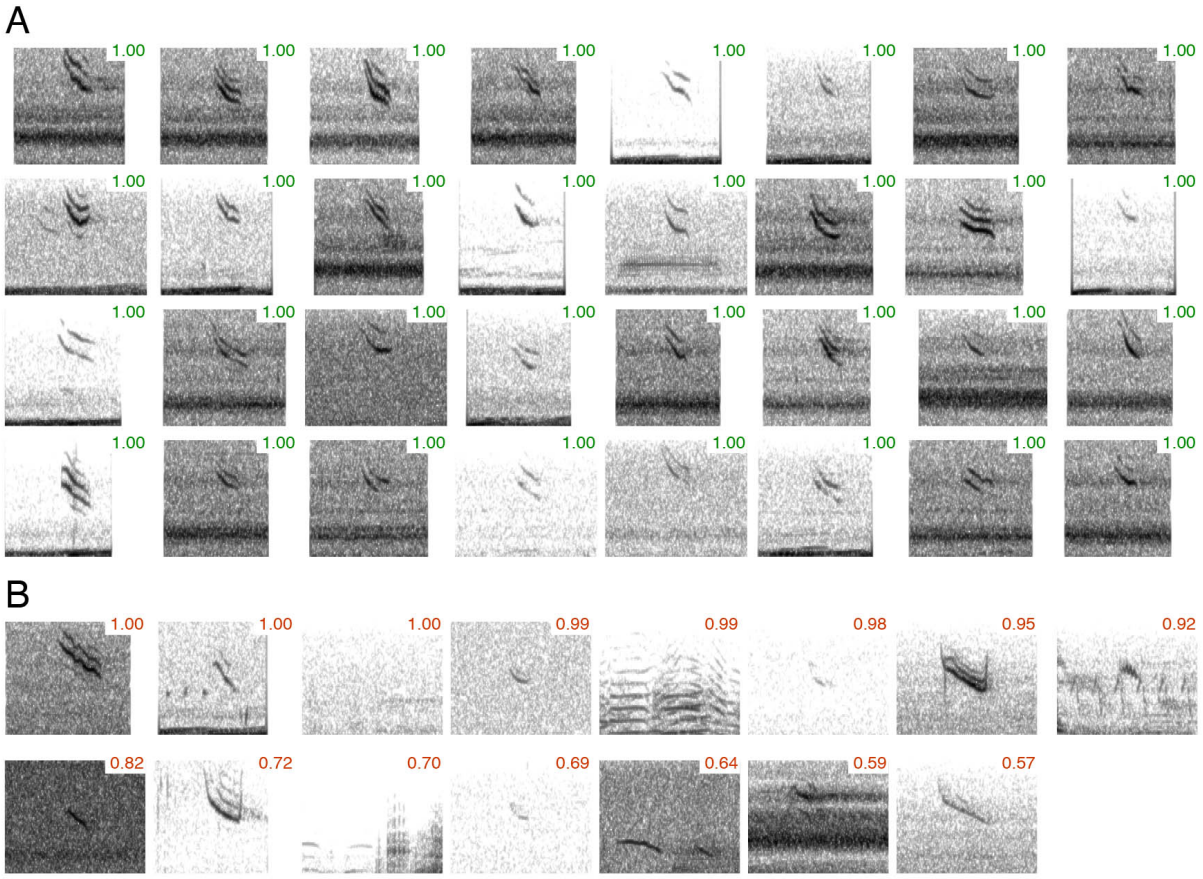

Figure S108: Classification examples for **savspa** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 3-11 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

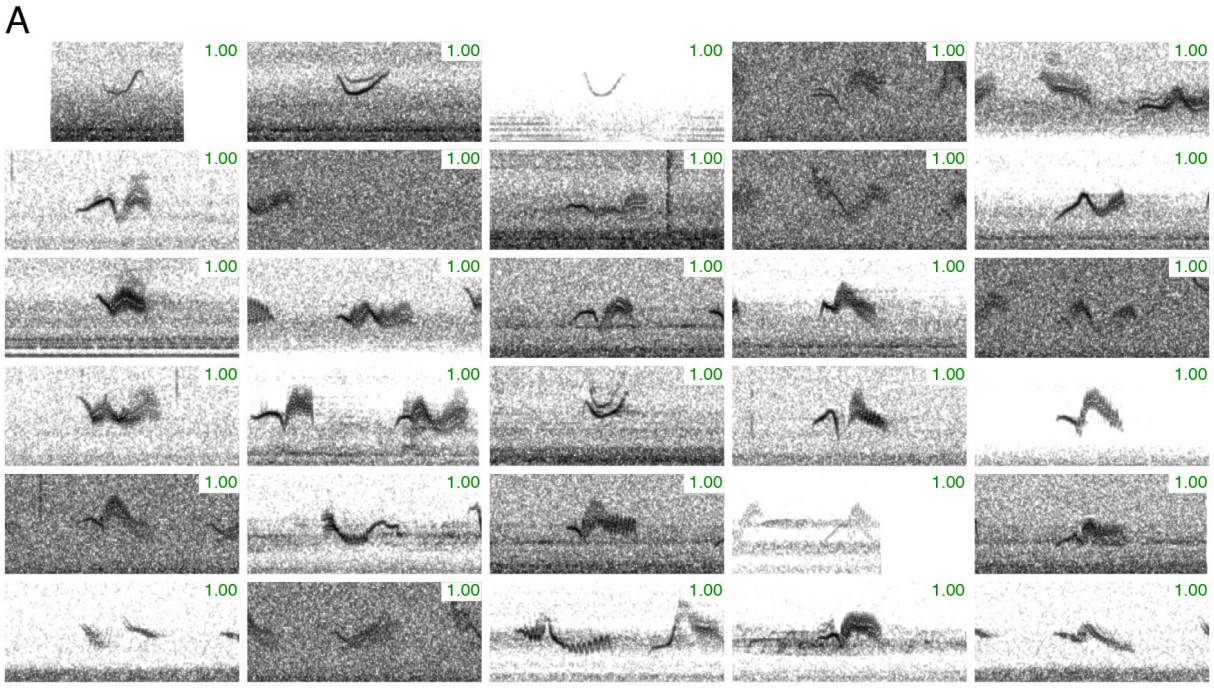

Figure S109: Classification examples for **scatan** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-5 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

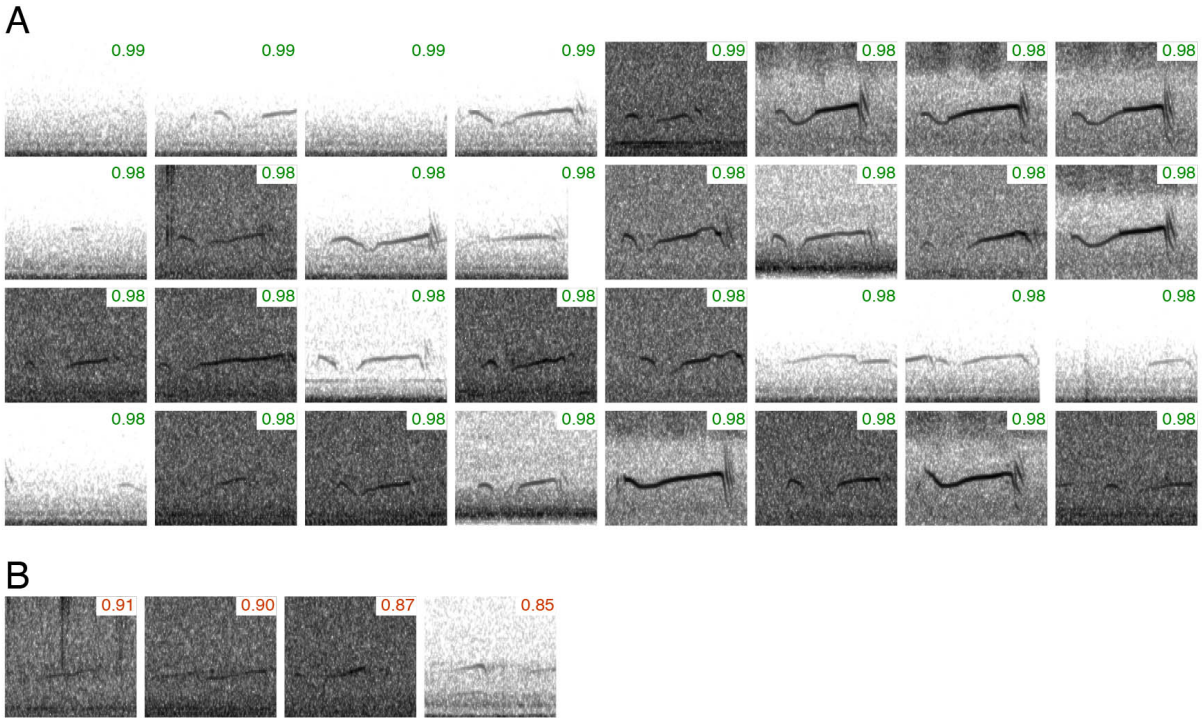

Figure S110: Classification examples for **semplo** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 0.5-8 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

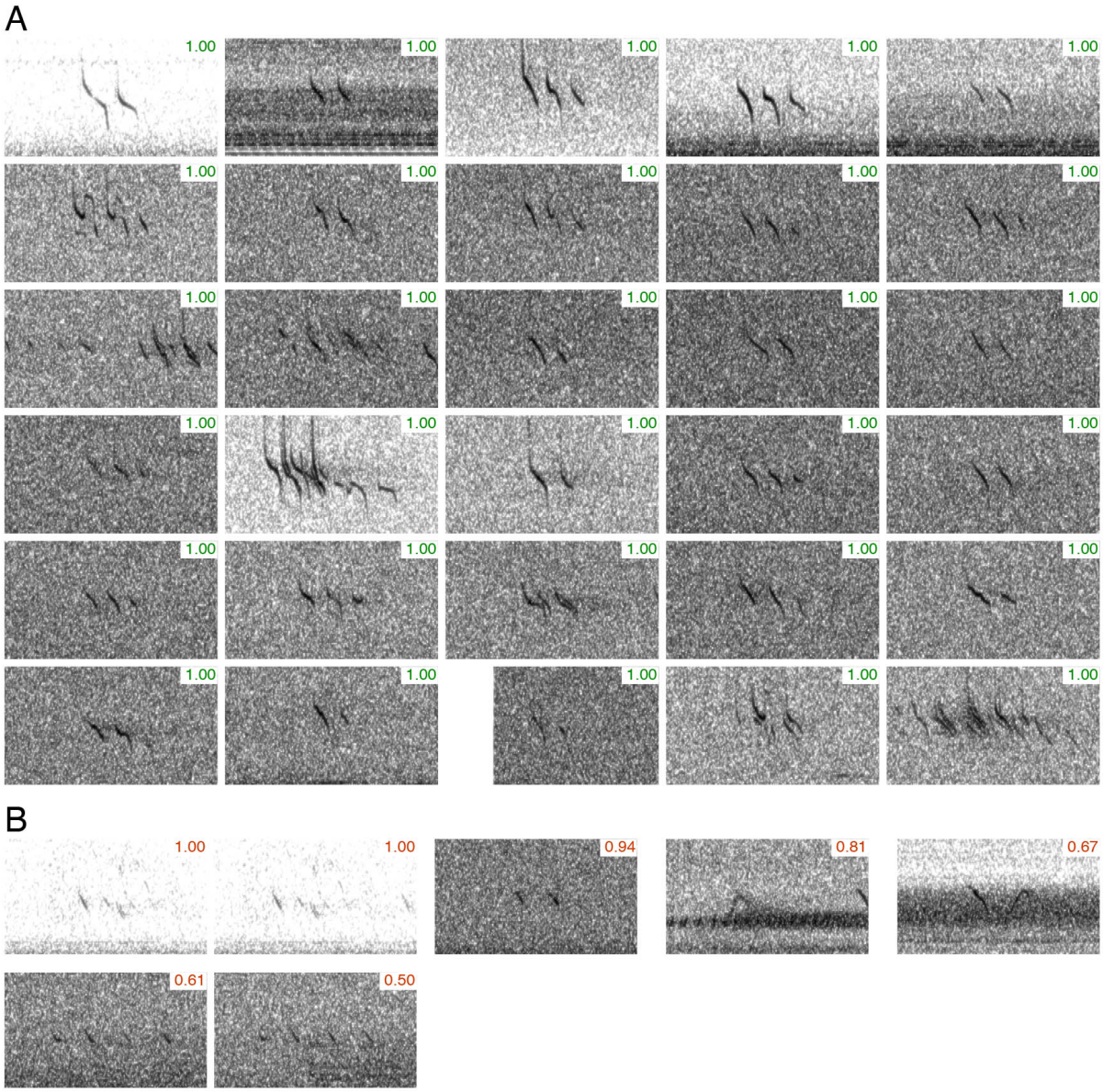

Figure S111: Classification examples for **shbdow** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-5 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

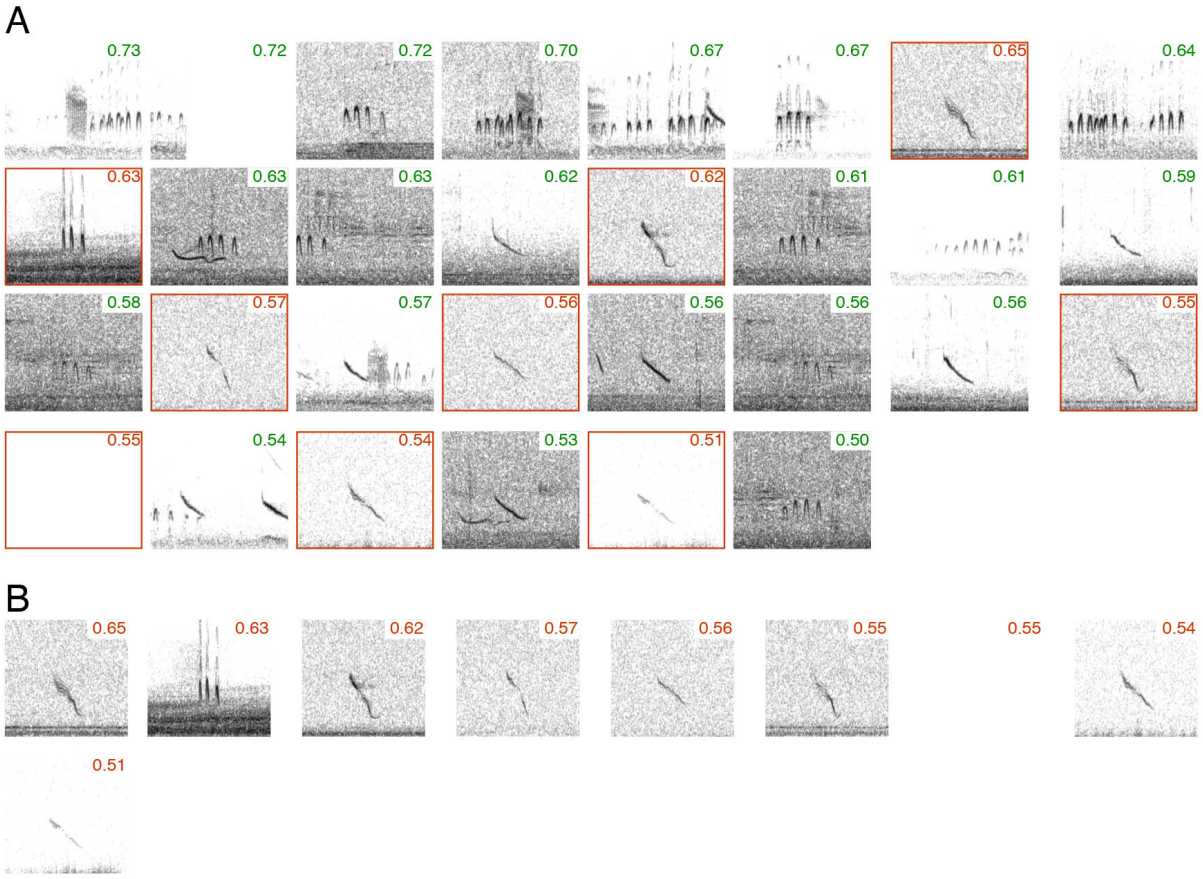

Figure S112: Classification examples for **snobun** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-8 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

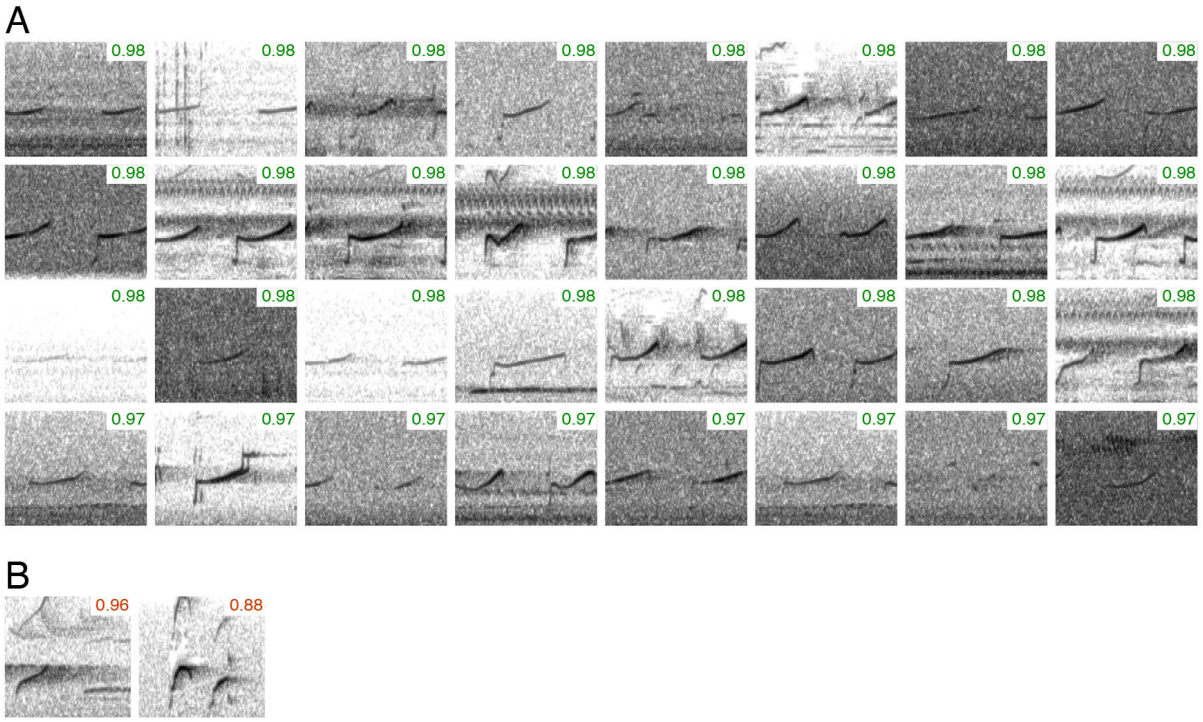

Figure S113: Classification examples for **solsan** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

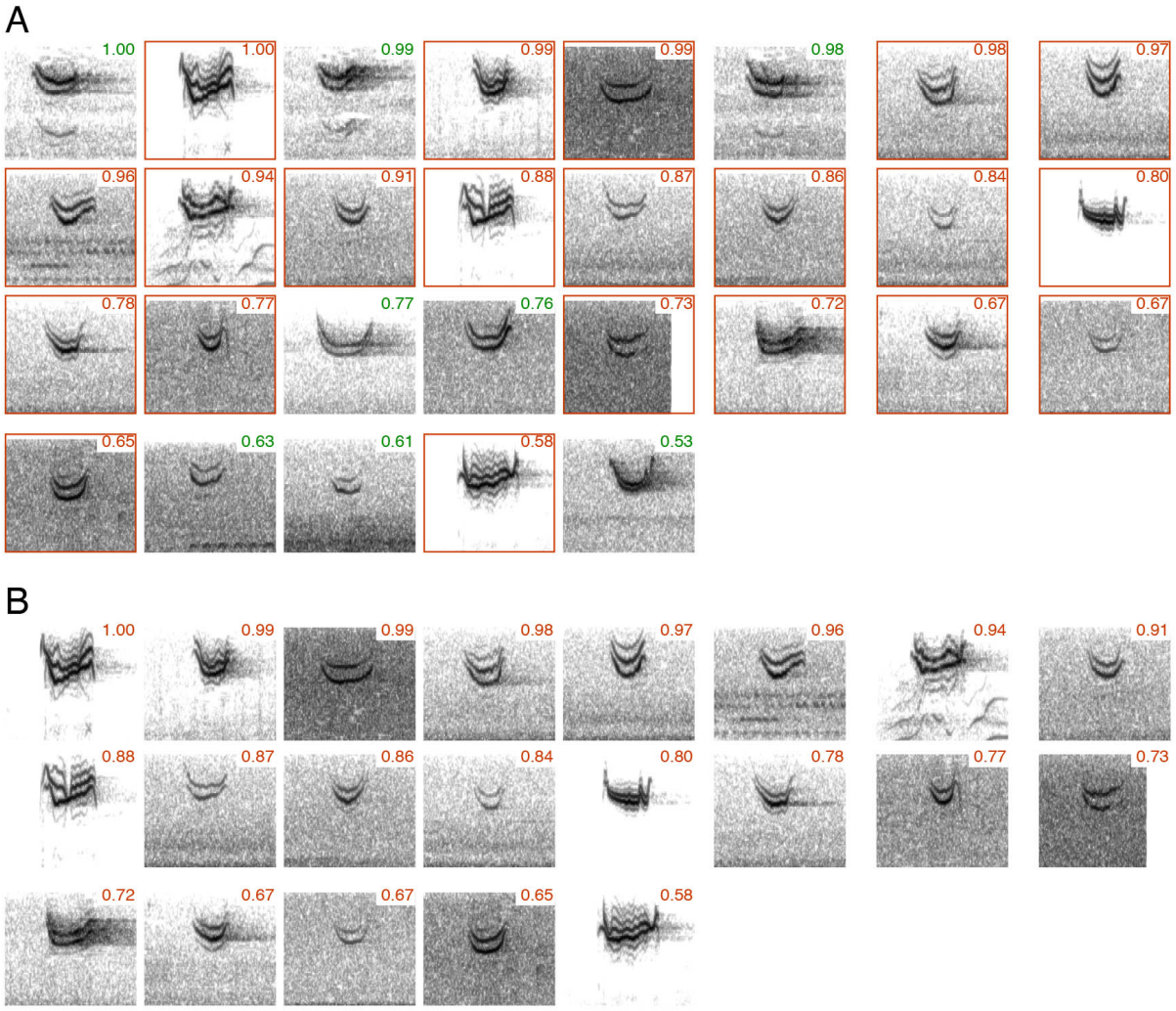

Figure S114: Classification examples for **sonspa** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 3-11 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

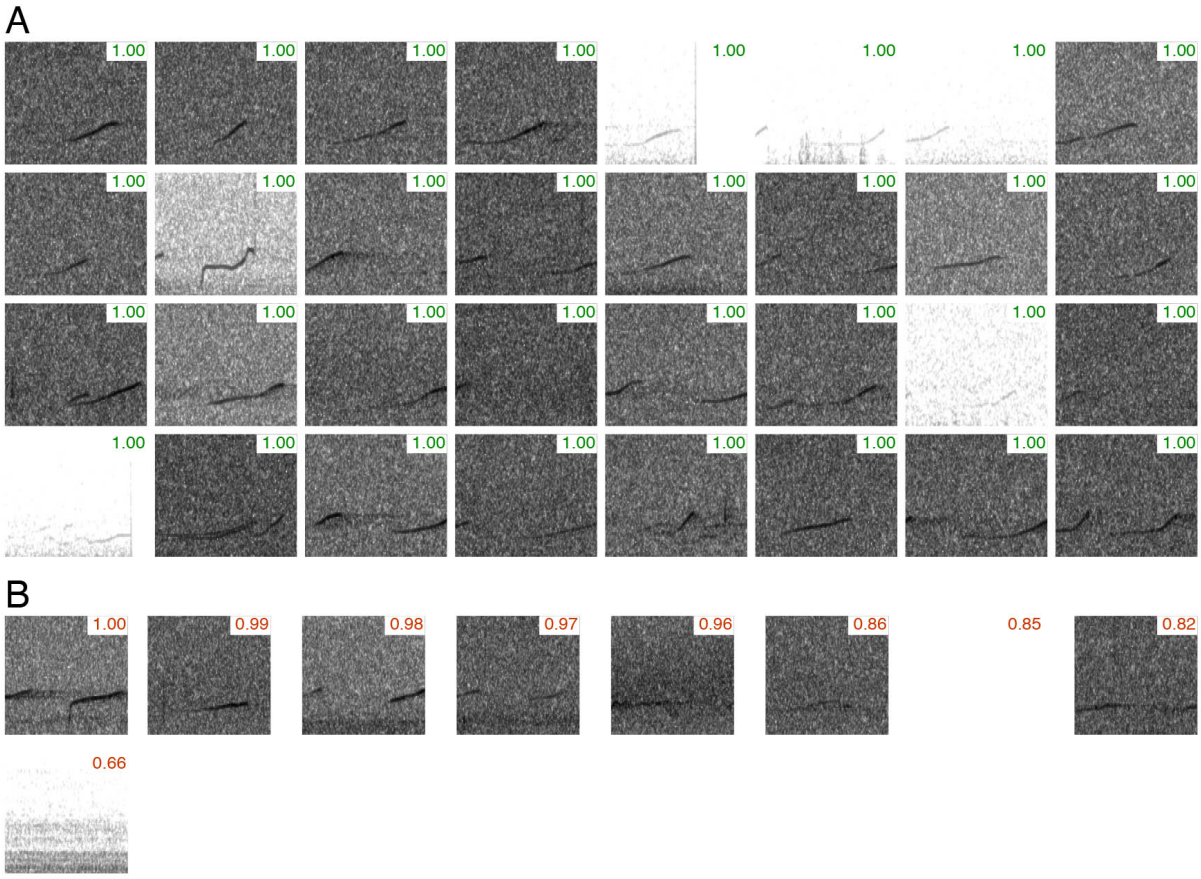

Figure S115: Classification examples for **sposan** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

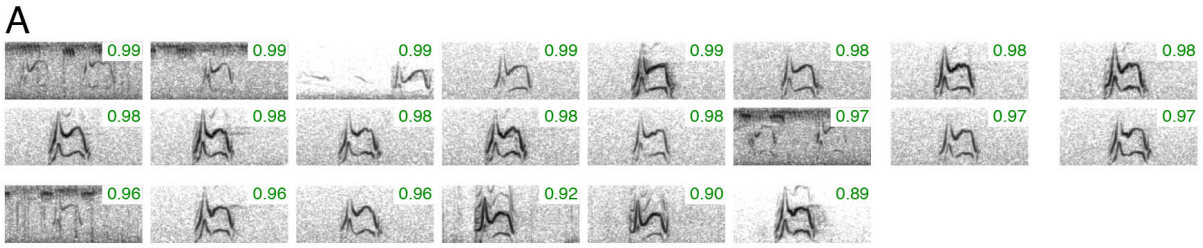

Figure S116: Classification examples for **sprpip** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

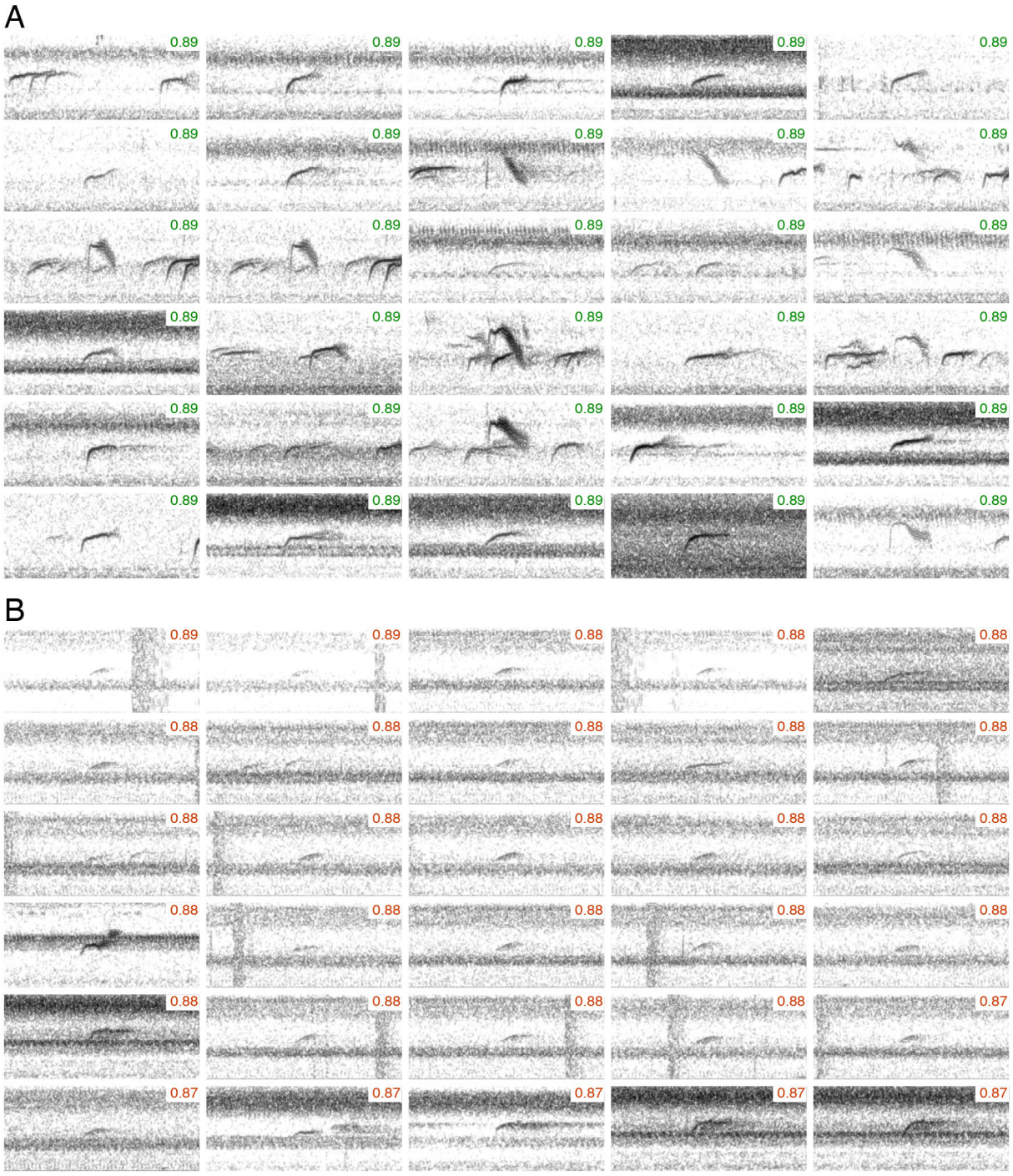

Figure S117: Classification examples for **swathr** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-5 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

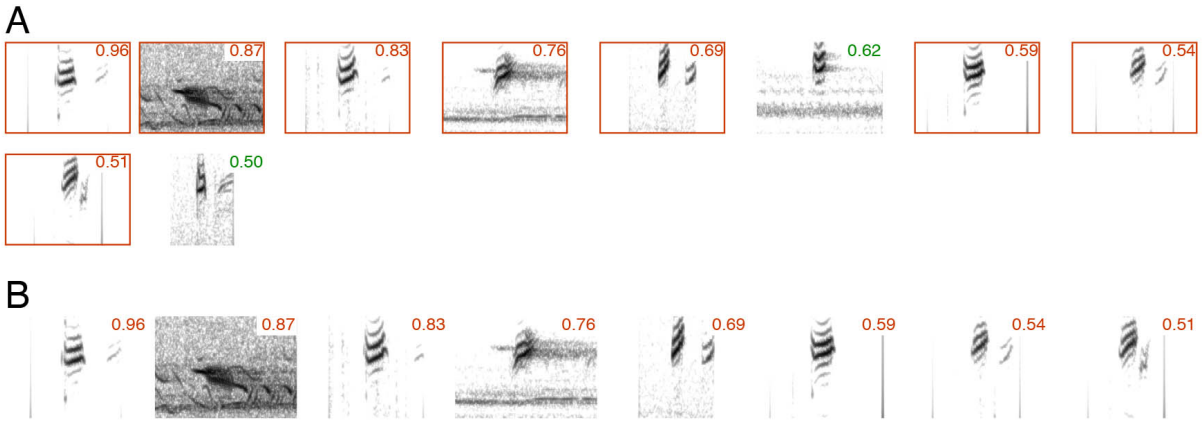

Figure S118: Classification examples for **tenwar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

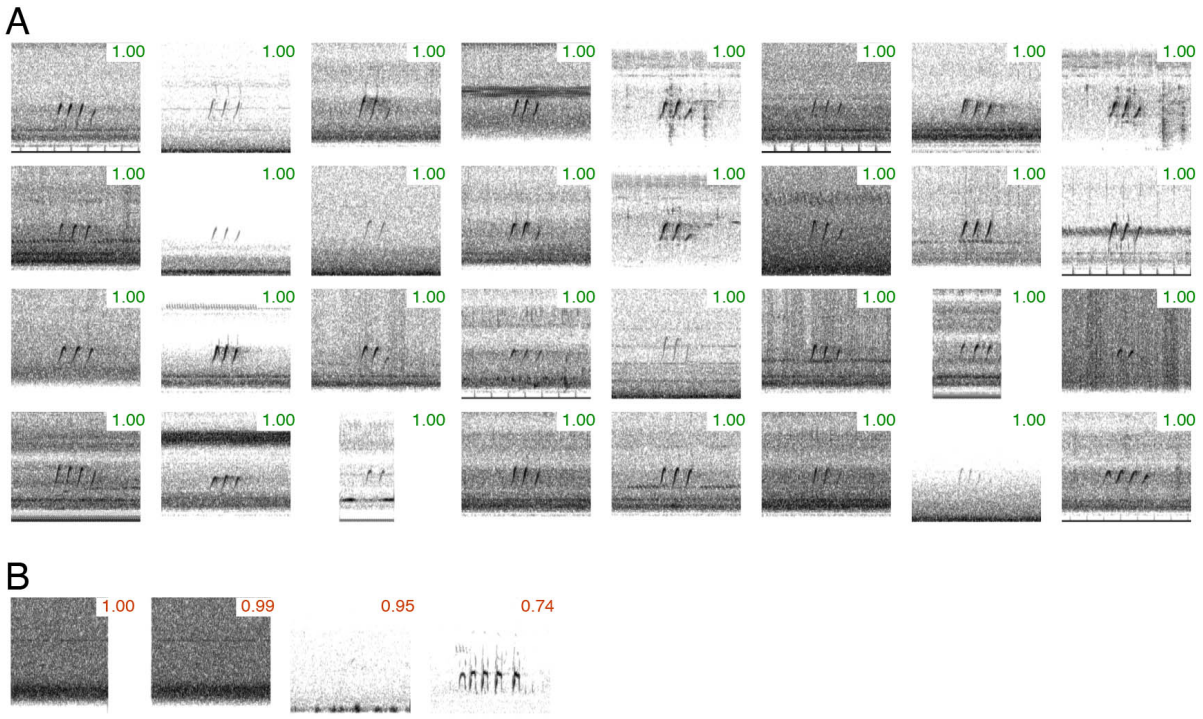

Figure S119: Classification examples for **uplsan** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-1 s; y-axis: 0-6 kHz; window type: Hanning; window length: 420 samples; hop size: 35 samples; dynamic range floor: -50 dB).

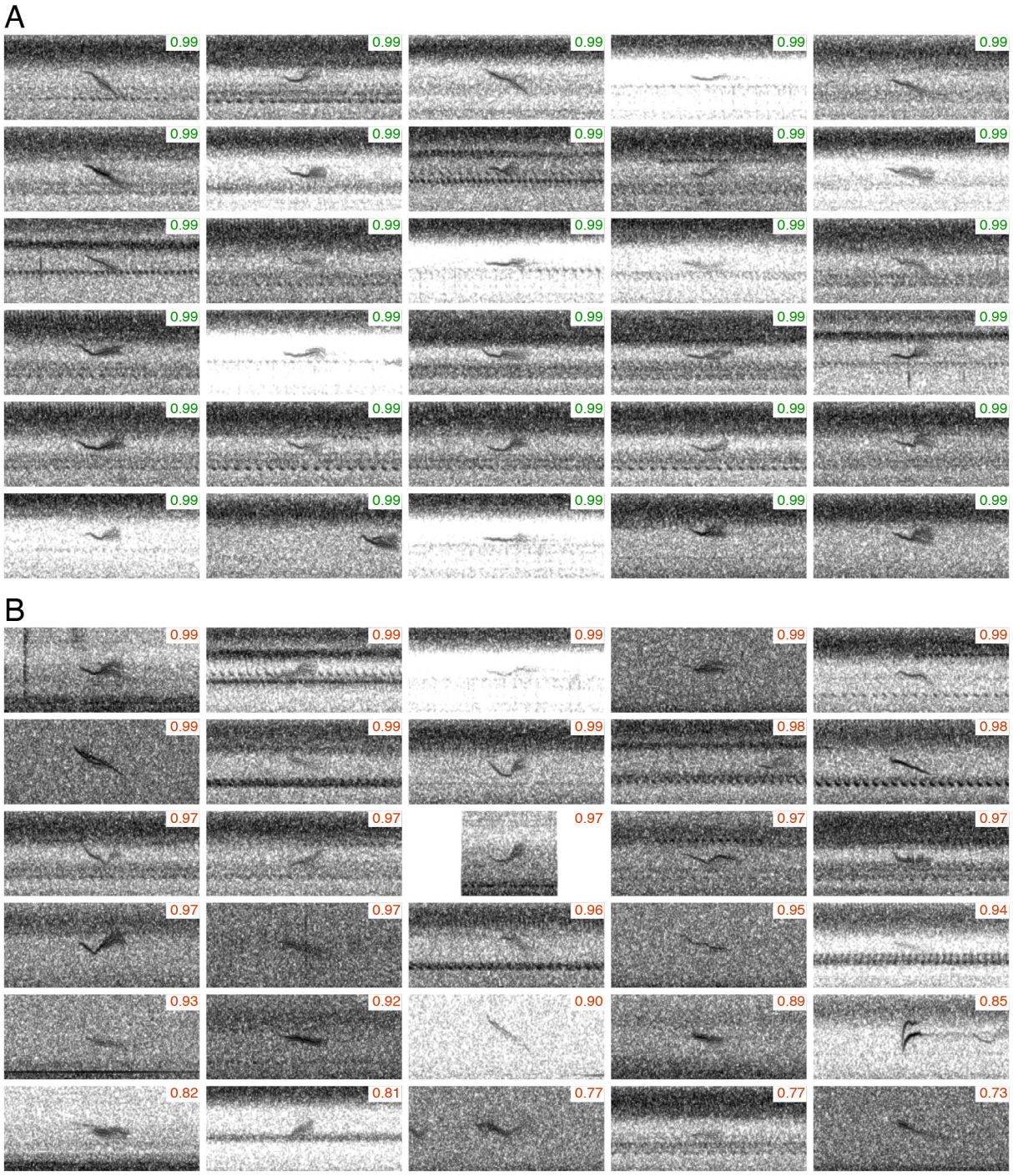

Figure S120: Classification examples for **veery** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-5 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

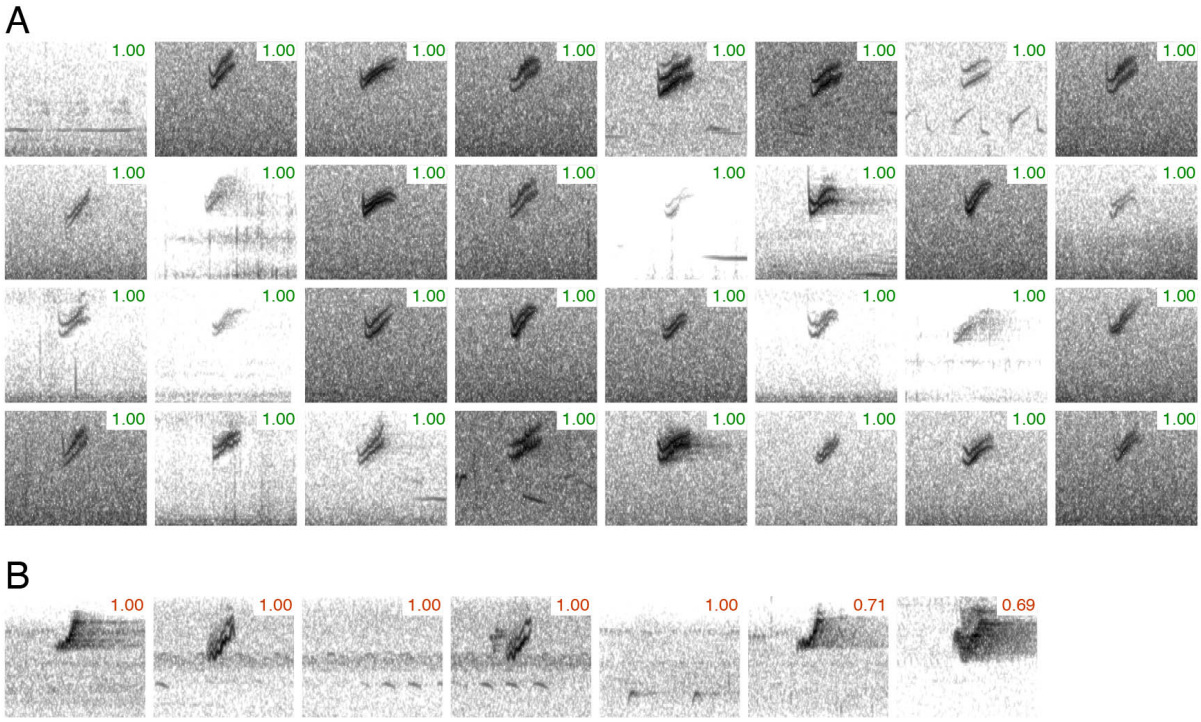

Figure S121: Classification examples for **vesspa** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

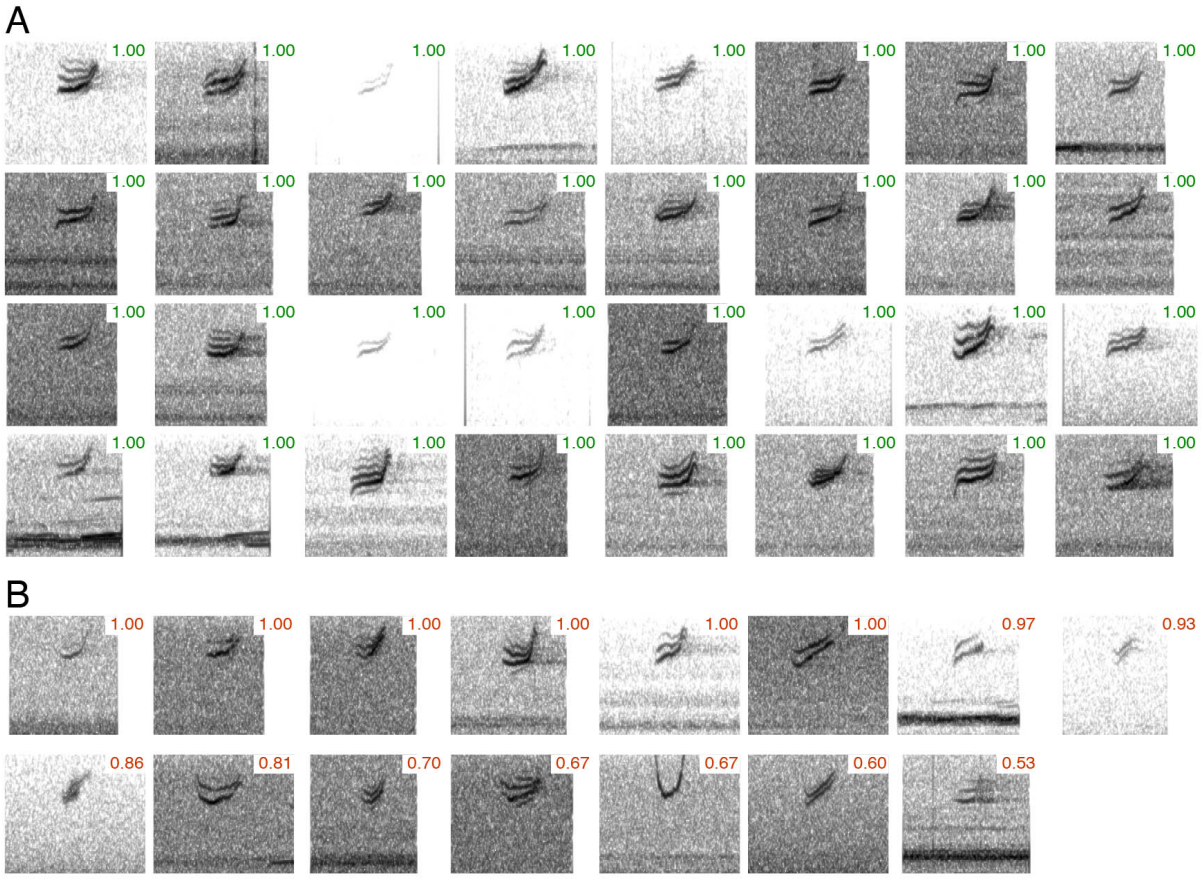

Figure S122: Classification examples for **whcspa** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

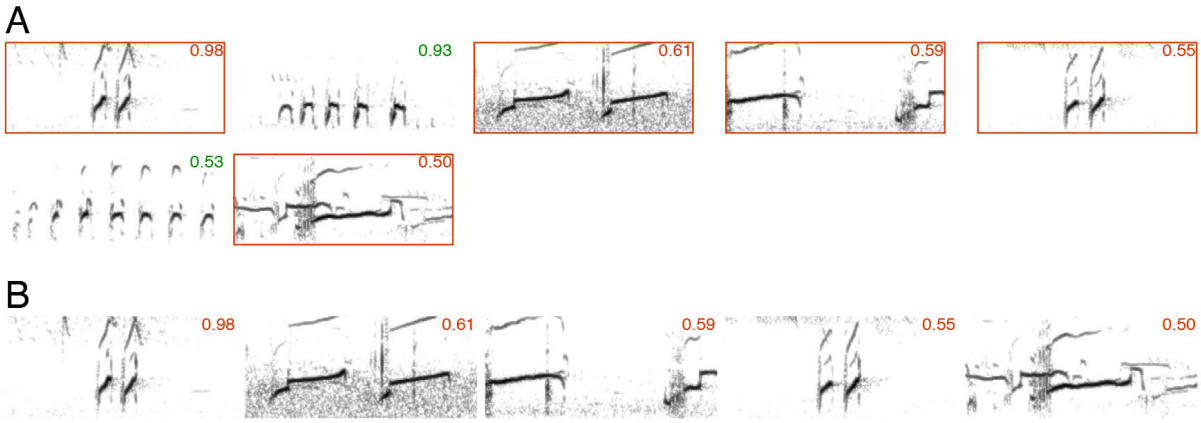

Figure S123: Classification examples for **whimbr** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-5 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

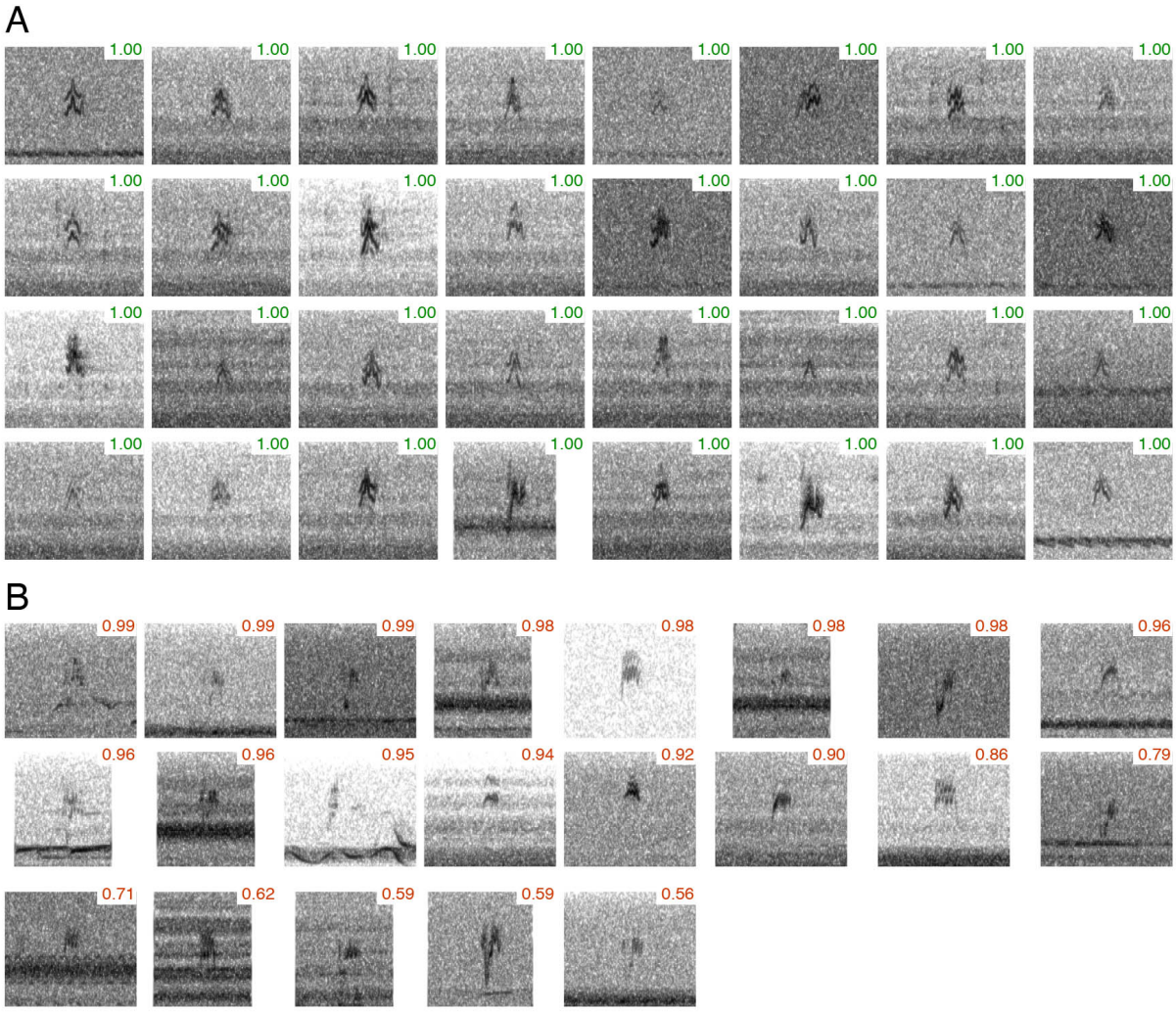

Figure S124: Classification examples for **wlswar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-11 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

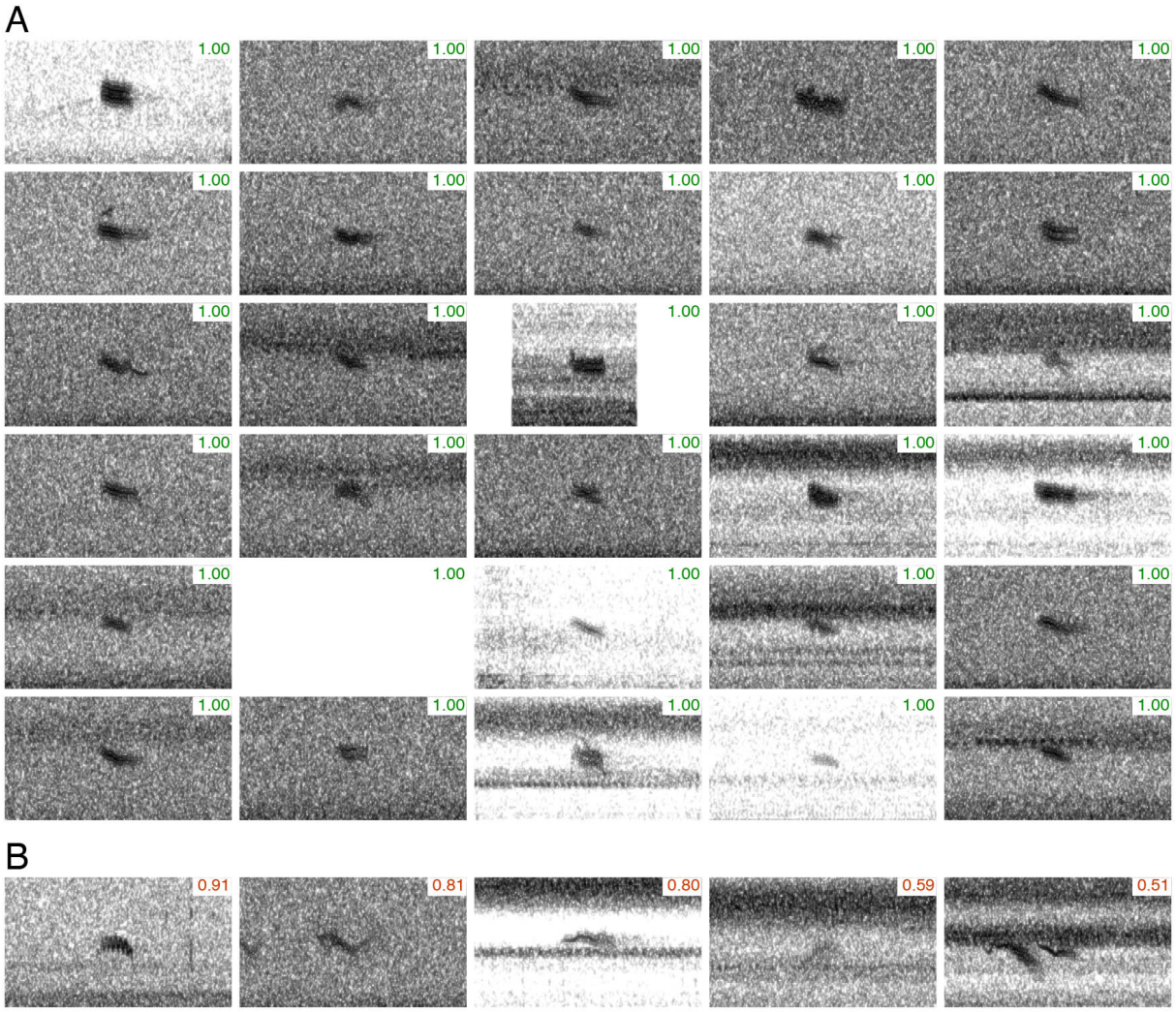

Figure S125: Classification examples for **woothr** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-5 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

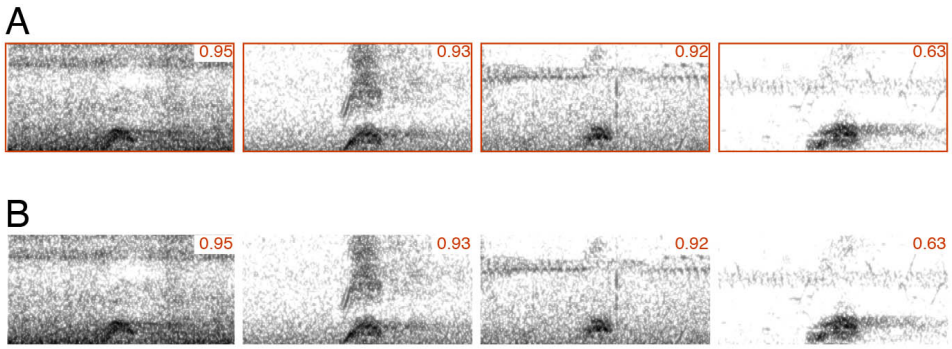

Figure S126: Classification examples for **ycnher** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-5 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

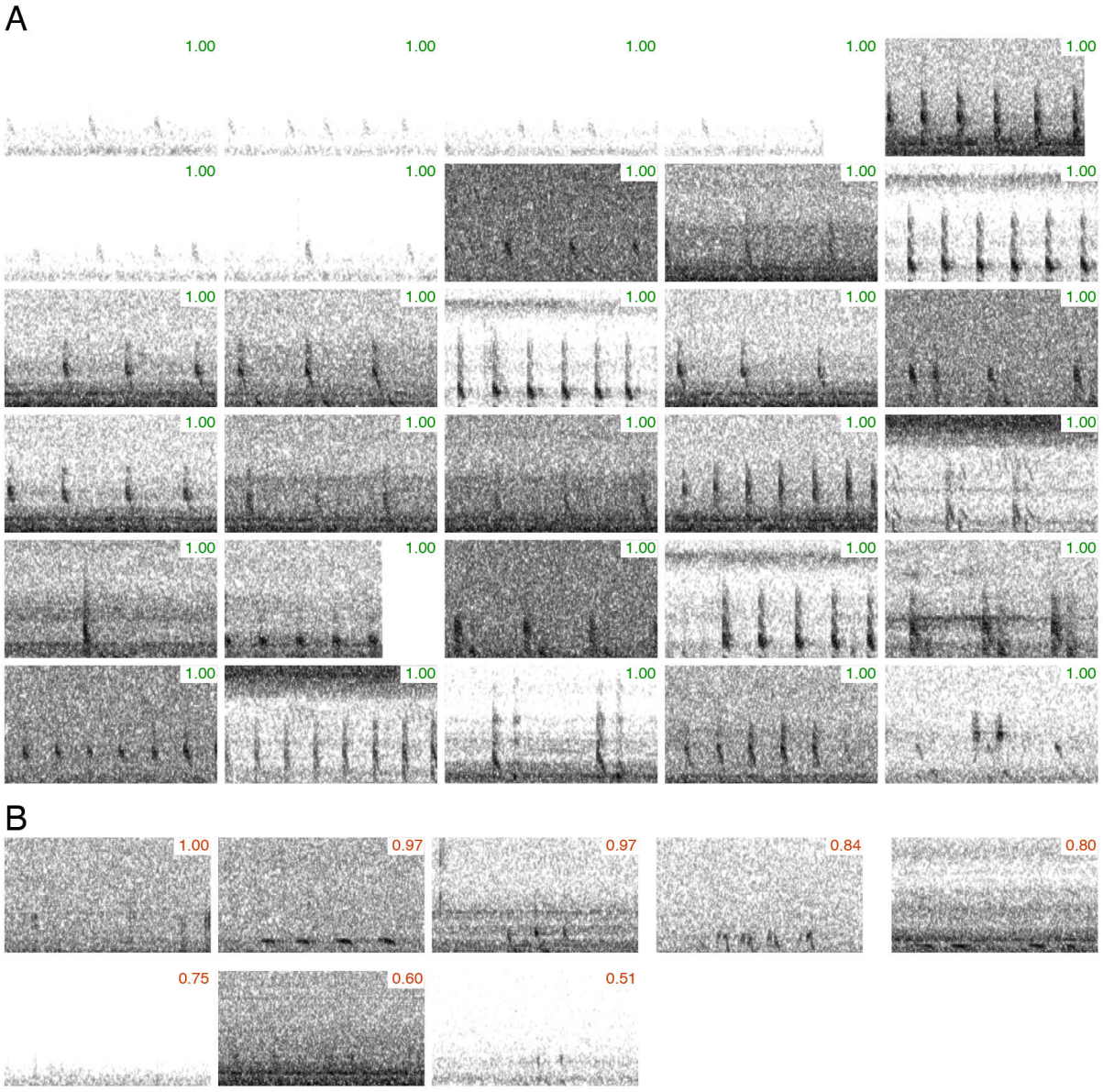

Figure S127: Classification examples for **yebcuc** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.8 s; y-axis: 1-5 kHz; window type: Hanning; window length: 400 samples; hop size: 30 samples; dynamic range floor: -45 dB).

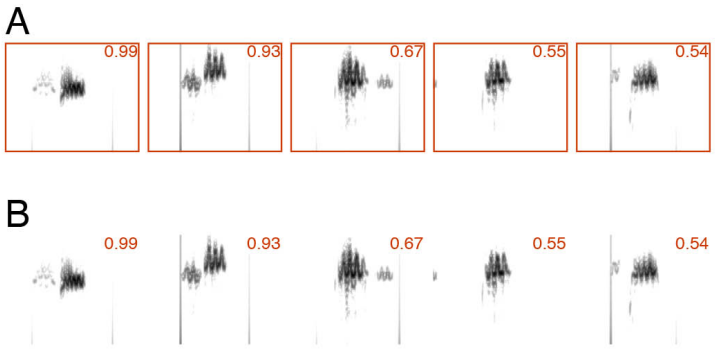

Figure S128: Classification examples for **yelwar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

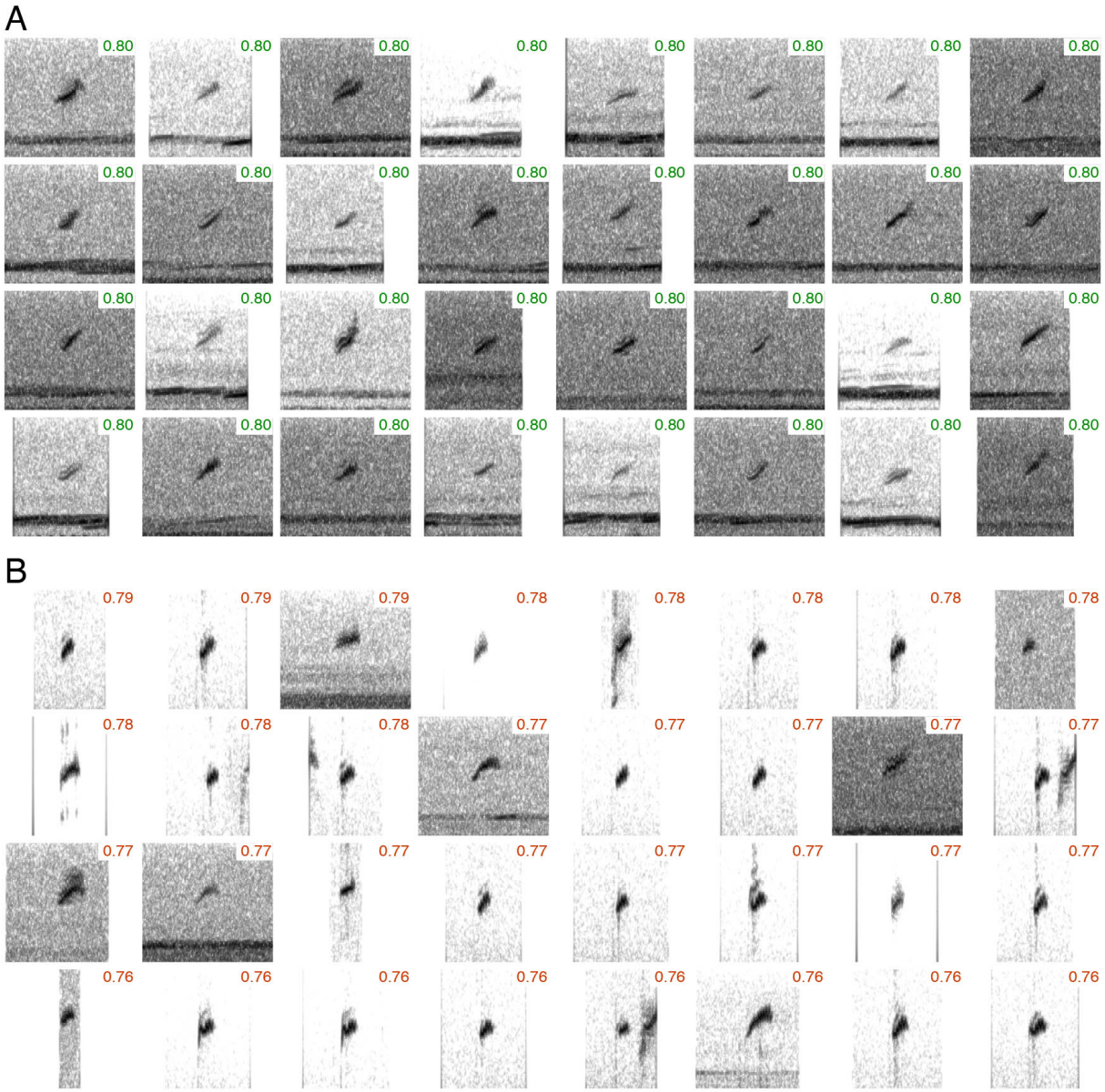

Figure S129: Classification examples for **yerwar** drawn from the test dataset, shown as cropped spectrograms. Numbers in upper-right corners are calibrated probability values returned by the model. (A) Test examples scoring highest for this species. Any incorrect classifications are outlined in red. (B) Incorrectly-classified examples scoring highest for this species (i.e., the most confusing cases for the model). Spectrogram parameters: x-axis: 0-0.3 s; y-axis: 2-10 kHz; window type: Hanning; window length: 200 samples; hop size: 20 samples; dynamic range floor: -60 dB).

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