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Appendix

Supplemental Information

Data gaps and opportunities for comparative and conservation biology

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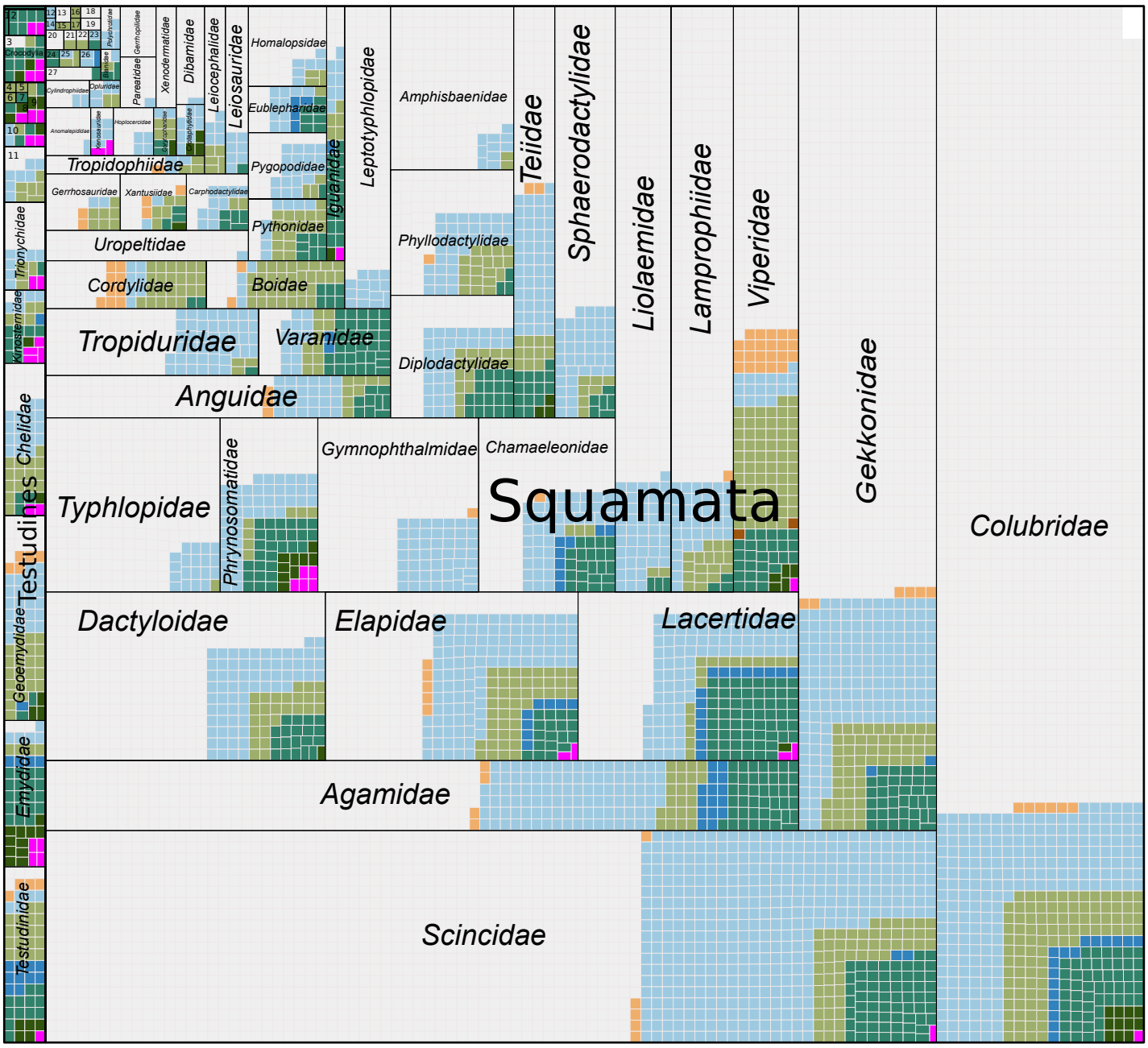
Reptilia

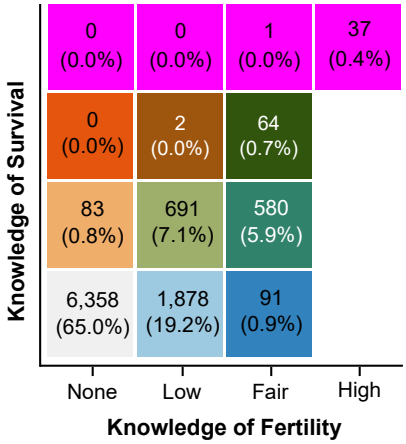


1: Gavialidae, 2: Alligatoridae, 3: Crocodylidae, 4: Carettochelyidae, 5: Platysternidae, 6: Dermatemydidae, 7: Dermatemydidae, 8: Chelydridae, 9: Cheloniidae, 10: Cheloniidae, 11: Pelomedusidae, 12: Aniliidae, 13: Cadeidae, 14: Rhineuridae, 15: Lanthanotidae, 16: Loxocemidae, 17: Shinisauridae, 18: Xenophidiidae, 19: Xenotyphlopidae, 20: Anomochilidae, 21: Bolyeridae, 22: Xenopeltidae, 23: Anniellidae, 24: Helodermatidae, 25: Acrochordidae, 26: Bipedidae, 27: Trogonophiidae

Taxononomic Rank

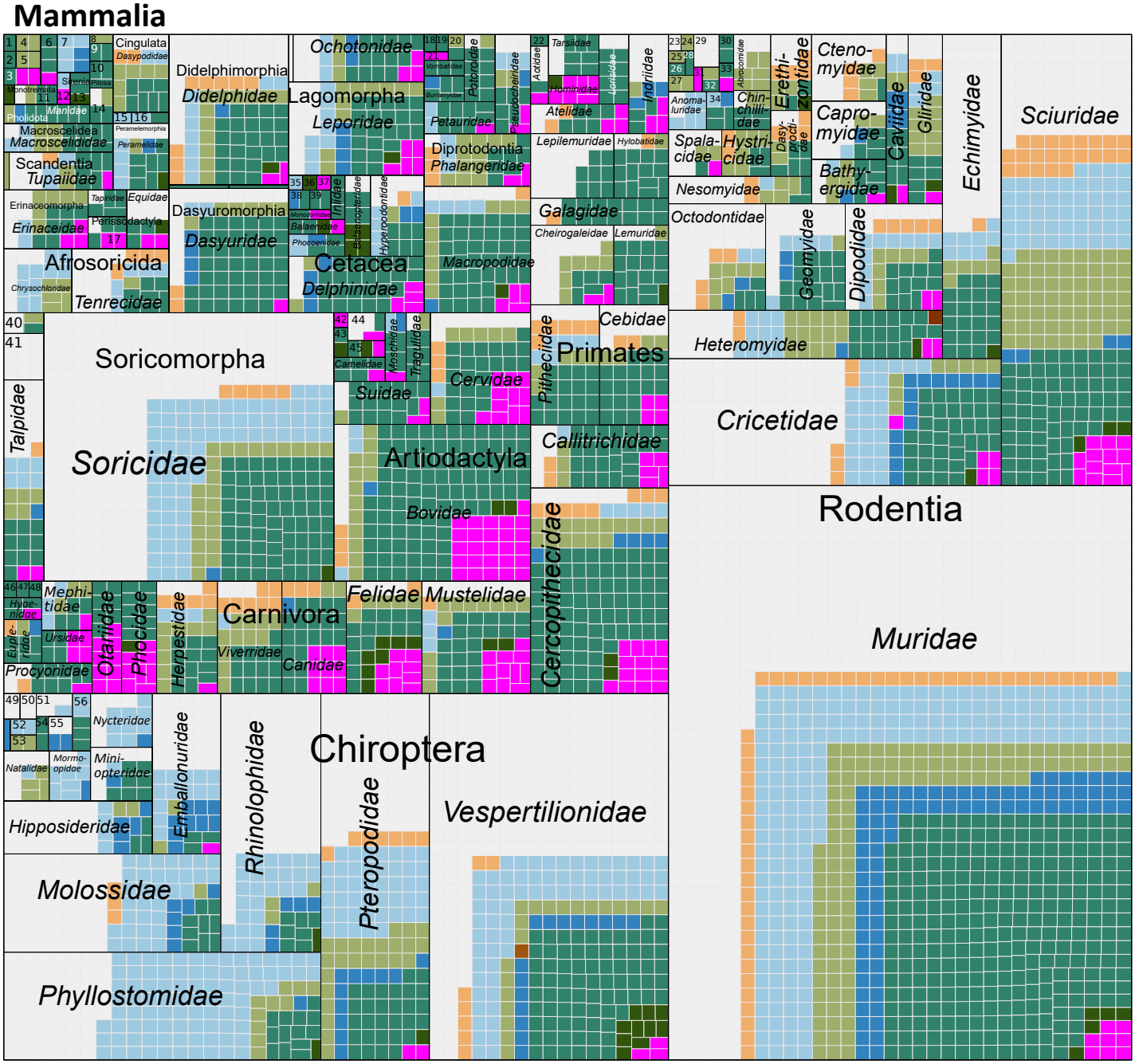
Order

Family



None: No demographic knowledge
Low: Single variable
Fair: Multiple variables
High: Population Matrix/Lifetable

Figure S1. The landscape of demographic knowledge for Reptilia

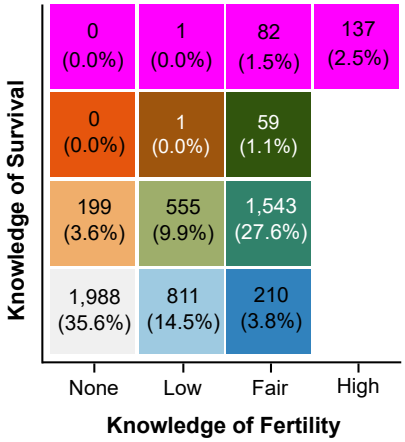


1: Microbiotheriidae, 2: Orycteropodidae, 3: Elephantine, 4: Cynocephalidae, 5: Notoryctidae, 6: Procaviidae, 7: Caenolestidae, 8: Cyclopedidae, 9: Megalonychidae, 10: Myrmecophagidae, 11: Tachyglossidae, 12: Dugongidae, 13: Trichechidae, 14: Bradypodidae, 15: Chaeropodidae, 16: Thylacomyidae, 17: Rhinocerotidae, 18: Hypsiprymnodontidae, 19: Tarsipedidae, 20: Acrobatidae, 21: Phascolarctidae, 22: Daubentoniidae, 23: Diatomyidae, 24: Dinomyidae, 25: Petromuridae, 26: Aplodontiidae, 27: Calomyscidae, 28: Pedetidae, 29: Heptaxodontidae, 30: Cuniculidae, 31: Myocastoridae, 32: Thryonomyidae, 33: Castoridae, 34: Ctenodactylidae, 35: Neobalaenidae, 36: Eschrichtiidae, 37: Physeteridae, 38: Kogiidae, 39: Platanistidae, 40: Solenodontidae, 41: Nesophontidae, 42: Antilocapridae, 43: Giraffidae, 44: Hippopotamidae, 45: Tayassuidae, 46: Ailuridae, 47: Nandiniidae, 48: Odobenidae, 49: Cistugidae, 50: Myzopodidae, 51: Thyropteridae, 52: Furipteridae, 53: Mystacinidae, 54: Noctilionidae, 55: Rhinopomatidae, 56: Megadermatidae

Taxononomic Rank

Order

Family



None: No demographic knowledge
Low: Single variable
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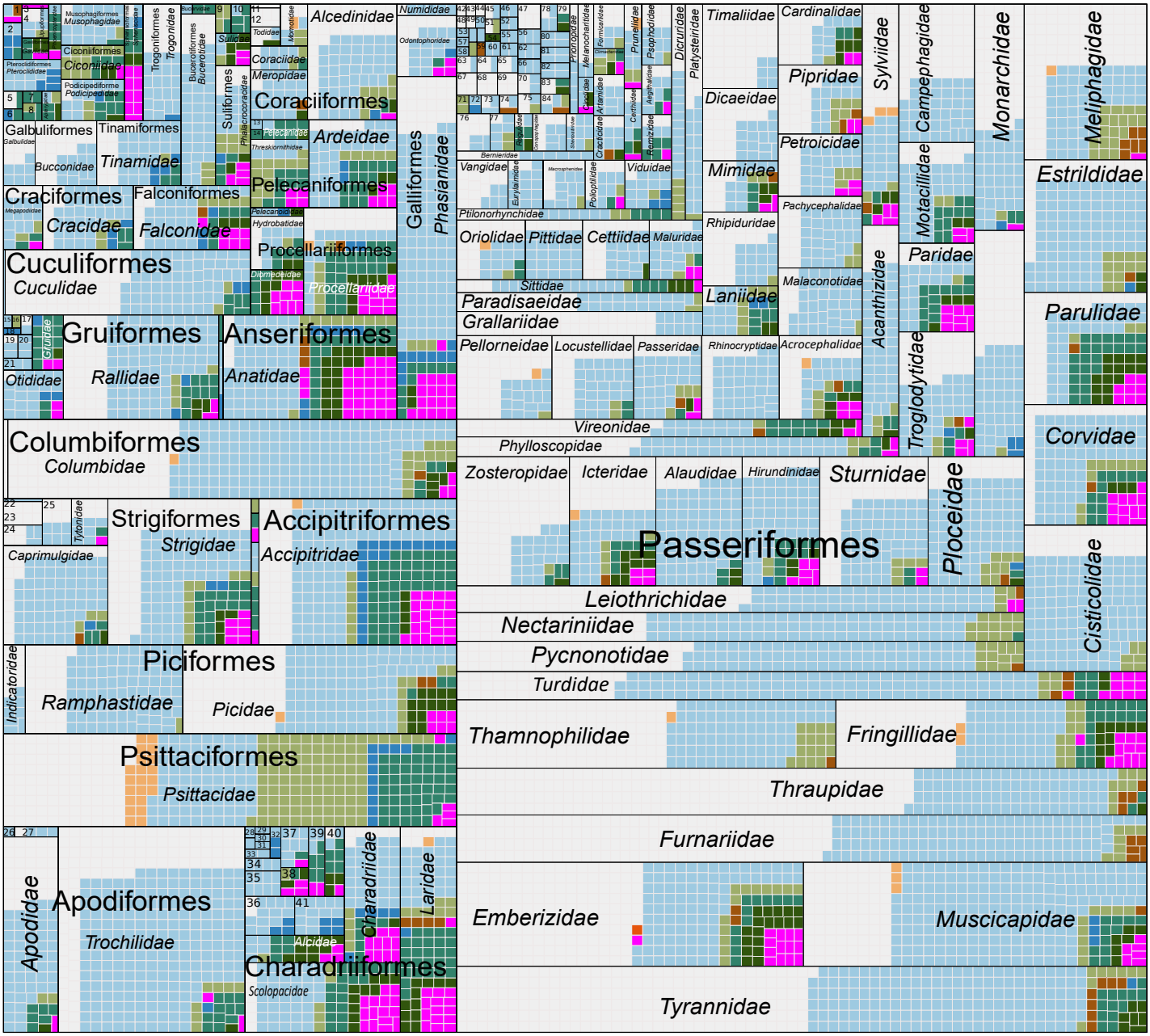
Figure S2. The landscape of demographic knowledge for Mammalia

Aves

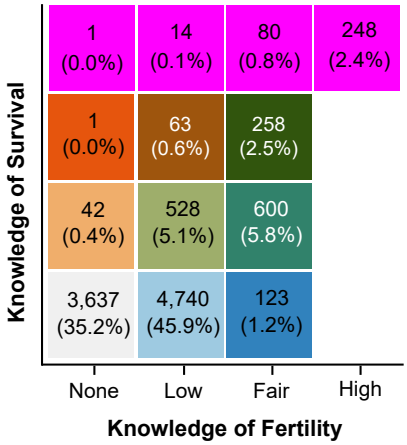


1: Phaethontidae, 2: Coliidae, 3: Upupidae, 4: Phoeniculidae, 5: Dromaiidae, 6: Rheidae, 7: Struthionidae, 8: Casuariidae, 9: Anhingidae, 10: Fregatidae, 11: Leptosomidae, 12: Brachypteraciidae, 13: Scopidae, 14: Balaenicipitidae, 15: Aramidae, 16: Eurypygidae, 17: Cariamidae, 18: Rhynochetidae, 19: Psophiidae, 20: Heliornithidae, 21: Mesitornithidae, 22: Steatornithidae, 23: Aegothelidae, 24: Nyctibiidae, 25: Podargidae, 26: Aegothelidae, 27: Hemiprocnidae, 28: Dromadidae, 29: Pedionomidae, 30: Pluvianellidae, 31: Pluvianidae, 32: Rostratulidae, 33: Chionidae, 34: Thinocoridae, 35: Jacanidae, 36: Turnicidae, 37: Burhinidae, 38: Stercorariidae, 39: Recurvirostridae, 40: Haematopodidae, 41: Glareolidae, 42: Calcariidae, 43: Eupetidae, 44: Hylocitreidae, 45: Paramythiidae, 46: Chaetopidae, 47: Mohoidae, 48: Pityriaseidae, 49: Sapayoaidae, 50: Donacobiidae, 51: Irenidae, 52: Machaerirhynchidae, 53: Dulidae, 54: Panuridae, 55: Menuridae, 56: Dasyornithidae, 57: Hypocoliidae, 58: Peucedramidae, 59: Coerebidae, 60: Buphagidae, 61: Picathartidae, 62: Nicatoridae, 63: Arcanatoridae, 64: Cnemophilidae, 65: Oreoicidae, 66: Orthonychidae, 67: Melanopareiidae, 68: Philepittidae, 69: Pnoepygidae, 70: Neosittidae, 71: Promeropidae, 72: Atrichornithidae, 73: Erythrocercidae, 74: Callaeatidae, 75: Acanthisittidae, 76: Chloropseidae, 77: Tephrodornithidae, 78: Hyliotidae, 79: Bombycrllidae, 80: Aegithinidae, 81: Pardalotidae, 82: Ptilogonatidae, 83: Corcoracidae, 84: Pomatostomidae

Taxononomic Rank

Order

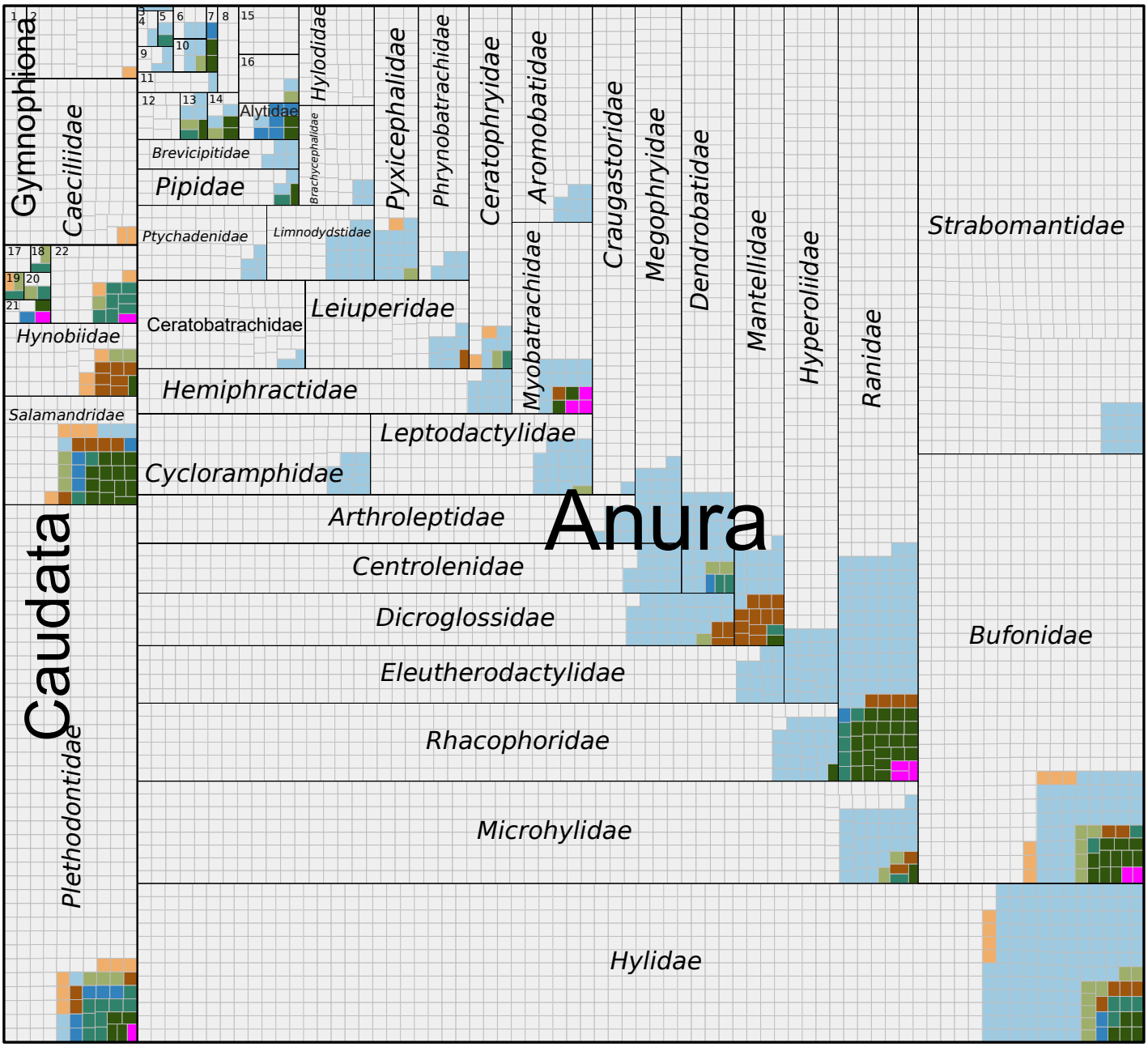
Family



None: No demographic knowledge
Low: Single variable
Fair: Multiple variables
High: Population Matrix/Lifetable

Figure S3. The landscape of demographic knowledge for Aves

Amphibia

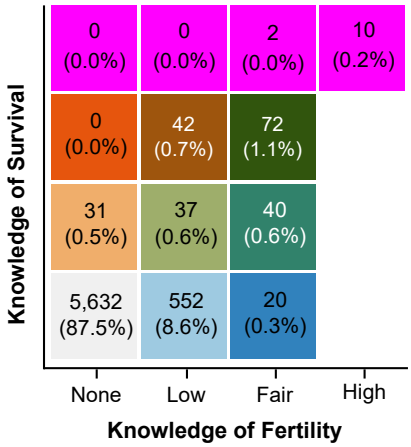


1: Rhinatrematidae, 2: Ichthyophiidae, 3: Rhinophrynidae, 4: Calyptocephalellidae, 5: Pelodytidae, 6: Heleophrynidae, 7: Pelobatidae, 8: Ranixalidae, 9: Sooglossidae, 10: Leiopelmatidae, 11: Hemisotidae, 12: Micrixalidae, 13: Scaphiopodidae, 14: Bombinatoridae, 15: Nyctibatrachidae, 16: Petropedetidae, 17: Rhyacotritonidae, 18: Amphiumidae, 19: Cryptobranchidae, 20: Sirenidae, 21: Proteidae, 22: Ambystomatidae

Taxononomic Rank

Order

Family



None: No demographic knowledge
Low: Single variable
Fair: Multiple variables
High: Population Matrix/Lifetable

Figure S4. The landscape of demographic knowledge for Amphibia

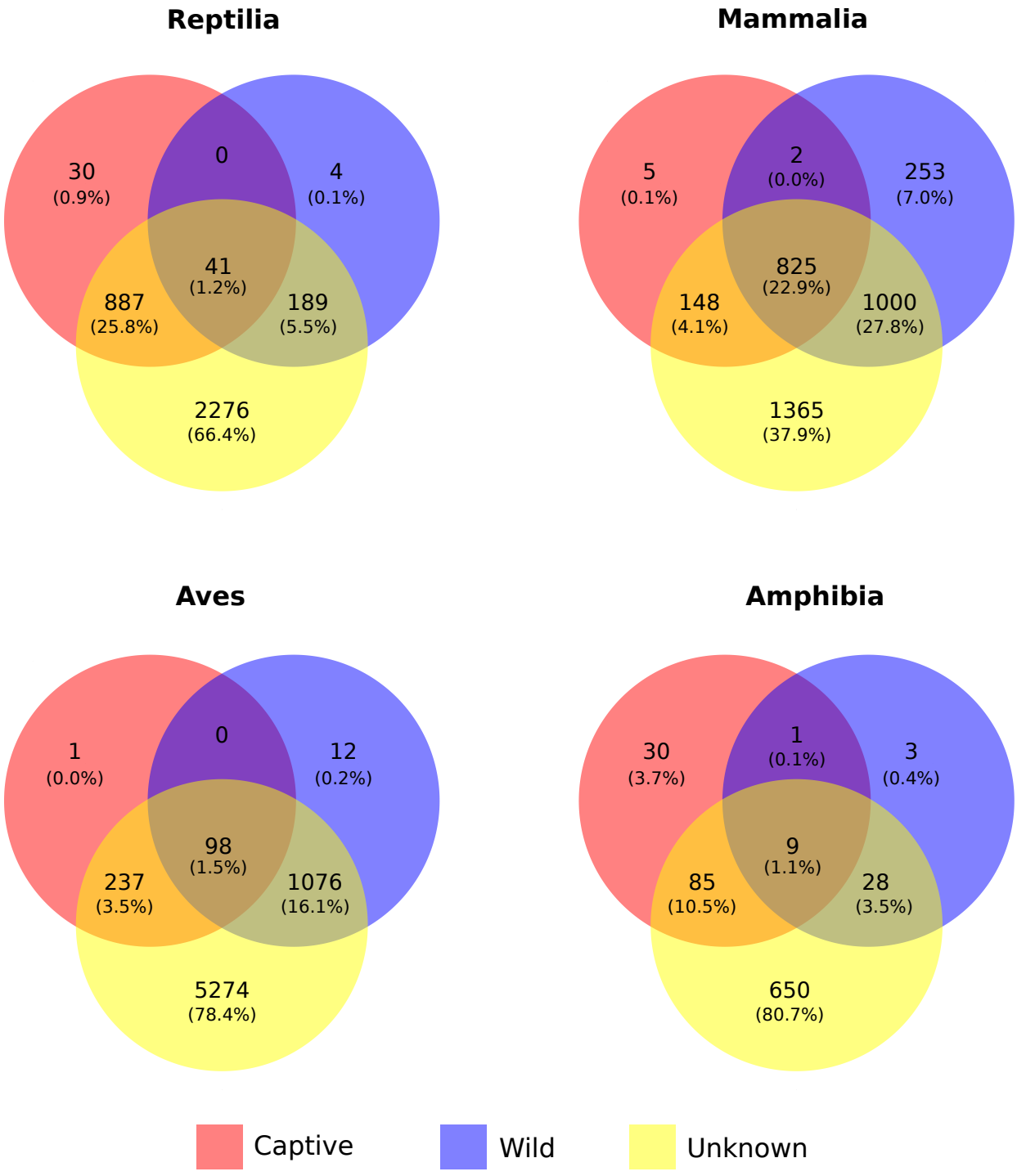


Figure S5. Origin of information across the 22 data repositories analyzed. Diagrams show all possible combinations of the number of species with data from populations with different origins (captive (left), wild (right), and unknown (bottom)).

Table S1. Number of species per Demographic Species Knowledge Index category and IUCN Red List categories (LC: least concern, NT: near threatened, VU: vulnerable, EN: endangered, CR: critically endangered, EW: extinct in the wild, DD: data deficient, and NE: not evaluated).

Reptilia

Demographic Species Knowledge Index											
Mortality	**Fertility**	**LC**	**NT**	**VU**	**EN**	**CR**	**EW**	**EX**	**DD**	**NE**	**Total**
None	None	2090	228	264	316	173	2	15	864	2406	6358
None	Low	951	54	77	80	27	1	0	68	620	1878
None	Fair	49	8	5	9	6	0	0	0	14	91
Low	None	27	0	7	3	5	0	0	3	38	83
Low	Low	297	29	33	34	15	0	1	11	271	691
Low	Fair	325	33	43	17	21	0	1	4	136	580
Fair	None	0	0	0	0	0	0	0	0	0	0
Fair	Low	1	0	0	0	0	0	0	0	1	2
Fair	Fair	30	2	9	3	3	0	0	0	17	64
High	None	0	0	0	0	0	0	0	0	0	0
High	Low	0	0	0	0	0	0	0	0	0	0
High	Fair	1	0	0	0	0	0	0	0	0	1
High	High	20	3	6	3	1	0	0	0	4	37
Total		3791	357	444	465	251	3	17	950	3507	9785

Aves

Demographic Species Knowledge Index											
Mortality	**Fertility**	**LC**	**NT**	**VU**	**EN**	**CR**	**EW**	**EX**	**DD**	**NE**	**Total**
None	None	2007	380	315	172	91	2	63	32	575	3637
None	Low	3451	270	201	117	54	1	8	8	630	4740
None	Fair	86	8	9	6	3	0	0	0	11	123
Low	None	22	6	5	2	2	0	0	0	5	42
Low	Low	382	34	28	23	8	0	2	0	51	528
Low	Fair	372	38	48	26	6	1	7	0	102	600
Fair	None	0	0	0	0	0	0	0	0	1	1
Fair	Low	48	3	2	0	1	0	0	0	9	63
Fair	Fair	187	16	9	10	4	0	0	0	32	258
High	None	1	0	0	0	0	0	0	0	0	1
High	Low	9	0	2	0	0	0	0	0	3	14
High	Fair	59	3	6	3	0	0	0	0	9	80
High	High	174	21	14	9	7	0	0	0	23	248
Total		6798	779	639	368	176	4	80	40	1451	10335

c) Mammalia

Demographic Species Knowledge Index											
Mortality	**Fertility**	**LC**	**NT**	**VU**	**EN**	**CR**	**EW**	**EX**	**DD**	**NE**	**Total**
None	None	754	93	160	177	73	0	43	393	295	1988
None	Low	514	44	57	35	12	0	5	63	81	811
None	Fair	128	14	9	20	5	0	1	9	24	210
Low	None	100	12	23	12	5	0	2	23	22	199
Low	Low	329	36	55	31	12	0	5	40	47	555
Low	Fair	872	92	144	134	54	2	6	71	168	1543
Fair	None	0	0	0	0	0	0	0	0	0	0
Fair	Low	0	1	0	0	0	0	0	0	0	1
Fair	Fair	34	5	8	6	0	0	0	0	6	59
High	None	0	0	0	0	0	0	0	0	0	0
High	Low	0	0	0	1	0	0	0	0	0	1
High	Fair	60	5	5	4	3	0	0	0	5	82
High	High	81	9	18	11	5	0	0	1	12	137
Total		2872	311	479	431	169	2	62	600	660	5586

d) Amphibia

Demographic Species Knowledge Index											
Mortality	**Fertility**	**LC**	**NT**	**VU**	**EN**	**CR**	**EW**	**EX**	**DD**	**NE**	**Total**
None	None	1758	276	481	666	434	1	11	1195	810	5632
None	Low	390	26	28	46	14	0	1	7	40	552
None	Fair	11	3	3	2	0	0	0	0	1	20
Low	None	20	2	4	2	1	1	0	0	1	31
Low	Low	23	6	1	1	2	0	0	0	4	37
Low	Fair	32	3	0	2	1	0	0	0	2	40
Fair	None	0	0	0	0	0	0	0	0	0	0
Fair	Low	20	4	7	7	1	0	0	2	1	42
Fair	Fair	54	8	5	1	1	0	0	0	3	72
High	None	0	0	0	0	0	0	0	0	0	0
High	Low	0	0	0	0	0	0	0	0	0	0
High	Fair	1	0	1	0	0	0	0	0	0	2
High	High	6	1	1	0	2	0	0	0	0	10
Total		2315	329	531	727	456	2	12	1204	862	6438

See main manuscript methods section on measures of demographic knowledge for further information about the Demographic Species Knowledge Index (D-SKI).

Table S2. Number of species that have information on the eight demographic measures in the 22 databases (DB) analyzed. In parenthesis we show the number of species that are in the Species360's zoo and aquarium network that can help to close the knowledge gap for each demographic measure. For the threatened categories we included CR, VU, EN, and EW; in the non-threatened categories we included the LC, NT, and DD species from the IUCN Red List.

	Reptilia			**Mammalia**			**Aves**			**Amphibia**		
Demographic measure	# Threatened	# Non-threatened	% of species in the 22 DB	# Threatened	# Non-threatened	% of species in the 22 DB	# Threatened	# Non-threatened	% of species in the 22 DB	# Threatened	# Non-threatened	% of species in in the 22 DB
Fertility												
Age at first reproduction	123 (121)	634 (546)	7.7 (6.8)	426 (44)	1545 (165)	35.7 (3.8)	155 (171)	1117 (1502)	12.4 (16.3)	35 (80)	164 (231)	3.1 (4.8)
Inter-litter/Inter-birth interval	12 (185)	50 (820)	0.6 (10.3)	283 (94)	878 (317)	21.0 (7.4)	20 (236)	55 (2092)	0.7 (22.7)	1 (91)	1 (323)	0 (6.4)
Litter/Clutch size	392 (38)	2946 (129)	34.2 (1.7)	616 (24)	2731 (35)	60.6 (1.1)	597 (33)	6038 (237)	64.7 (2.6)	105 (71)	605 (149)	11.0 (3.4)
Proportion of reproductive females	0 (193)	0 (849)	0 (10.7)	0 (248)	0 (734)	0 (17.8)	6 (240)	38 (2103)	0.4 (22.8)	0 (91)	0 (324)	0 (6.5)
Recruitment	0 (193)	0 (849)	0 (10.7)	0 (248)	0 (734)	0 (17.8)	3 (242)	19 (2116)	0.2 (23.0)	0 (91)	0 (324)	0 (6.5)
Mortality/Survival												
Maximum recorded lifespan	199 (84)	1229 (303)	14.6 (4.0)	531 (11)	2028 (31)	46.3 (0.8)	194 (141)	1438 (1306)	15.9 (14.1)	39 (73)	187 (208)	3.5 (4.4)
Mean age of (adult) population	0 (193)	0 (849)	0 (10.7)	0 (248)	0 (734)	0 (17.8)	0 (243)	0 (2126)	0 (23.1)	22 (85)	92 (273)	1.8 (5.6)
Crude mortality	22 (177)	81 (800)	1.1 (10.0)	49 (213)	187 (595)	4.3 (14.6)	72 (217)	736 (1725)	7.9 (18.9)	2 (91)	20 (305)	0.3 (6.2)

Table S3. Number of species by taxonomic class indicating the origin (captive, wild or/and unknown) of the information reported in the 22 databases (as shown in SI Appendix, Fig. S5). A single species may have data from populations of different origins.

Demographic measure	Origin/Number of Species					
	Reptilia			Mammalia		
Fertility	**Wild**	**Captive**	**Unknown**	**Wild**	**Captive**	**Unknown**
Age at first reproduction	18	1	758	808	42	1910
Inter-litter/Inter-birth interval	-	-	62	402	10	1117
Litter/Clutch size	-	-	3340	1970	31	3038
Proportion of reproductive females	-	-	-	-	-	-
Recruitment	-	-	-	-	-	-
Age- or stage-specific fertility rates	32	1	6	131	6	6
Mortality/Survival						
Maximum recorded lifespan	176	957	896	399	953	2536
Mean age of (adult) population	-	-	-	-	-	-
Crude mortality	55	-	72	190	12	105
Age- or stage-specific death rates	33	1	6	205	31	9

	Aves			Amphibia		
Fertility	**Wild**	**Captive**	**Unknown**	**Wild**	**Captive**	**Unknown**
Age at first reproduction	396	-	1247	-	-	199
Inter-litter/Inter-birth interval	-	-	75	-	-	2
Litter/Clutch size	443	-	6646	-	-	711
Proportion of reproductive females	44	-	-	-	-	-
Recruitment	22	-	-	-	-	-
Age- or stage-specific fertility rates	243	7	10	10	0	0
Mortality/Survival						
Maximum recorded lifespan	882	325	1586	26	123	110
Mean age of (adult) population	-	-	-	-	-	114
Recruitment	804	-	31	6	1	21
Age- or stage-specific death rates	331	15	11	11	1	0