

Supplementary material for

Quantifying extinction risk and forecasting the number of impending Australian bird and mammal extinctions

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Table S1. Taxa listed as Critically Endangered (Possibly Extinct) that were not assessed for probability of extinction.

Scientific name	Common name
<i>Cinclosoma punctatum anachoreta</i>	Mount Lofty Ranges spotted quail-thrush
<i>Neochima ruficauda ruficauda</i>	Southern star finch
<i>Melanodryas cucullata melvillensis</i>	Tiwi Islands hooded robin
<i>Zosterops albogularis</i>	White-chested white-eye
<i>Crocidura trichura</i>	Christmas Island shrew
<i>Petrogale concinna concinna</i>	Victoria River District subspecies of nabarlek

Table S2. Modified IUCN criteria to include an additional intensified “Extinction Imminent” category (red text). Modified from IUCN 2012.

	Extinction Imminent	Critically Endangered	Endangered	Vulnerable
A. Population reduction				<i>declines measured over the longer of 10 years or 3 generations</i>
A1	>95%	>90%	>70%	>50%
A2, A3 and A4	>90%	>80%	>50%	>30%
<p>A1. Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction are clearly reversible AND understood AND ceased based on and specifying any of the following: (a) direct observation; (b) an index of abundance appropriate to the taxon; (c) a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality; (d) actual or potential levels of exploitation; (e) effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.</p> <p>A2. Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not be reversible OR may not be understood OR may not have ceased based on any of (a) to (e) under A1.</p> <p>A3. Population reduction projected or suspected to be met in the future (up to a maximum of 100 years) based on any of (b) to (e) under A1.</p> <p>A4. An observed, estimated, inferred or suspected population reduction (up to a maximum of 100 years) where the time period must include both the past and the future, and where the causes of reduction may not be reversible OR may not be understood OR may not have ceased based on any of (a) to (e) under A1.</p>				
B. Geographic range in the form of either B1 (extent of occurrence) or B2 (area of occupancy)				
B1. Extent of occurrence (EOO)	<20 km ²	<100 km ²	<5000 km ²	<20 000 km ²
B2. Area of occupancy (AOO)	<2 km ²	< 10 km ²	<500 km ²	<2000 km ²
and 2 of the following 3:				
(a) Severely fragmented or no. of locations	=1	=1	≤5	≤10
(b) Continuing decline in (i) extent of occurrence, (ii) area of occupancy, (iii) area, extent and/or quality of habitat, (iv) number of locations or subpopulations, and (v) number of mature individuals.				
(c) Extreme fluctuations in any of (i) extent of occurrence, (ii) area of occupancy, (iii) number of locations or subpopulations, and (iv) number of mature individuals.				

C. Small population size and decline				
Number of mature individuals and either C1 or C2 :	<50	<250	<2500	<10 000
C1. An estimated continuing decline of at least	40%	25%	20%	10%
over the period (up to a maximum of 100 years)	in 3 years or 1 generation	in 3 years or 1 generation	in 5 years or 2 generation	in 10 years or 3 generations
C2. A continuing decline and (a) and/or (b)				
(a) (i) no. of mature individuals in largest subpopulation	<25	<50	<250	<1000
(ii) % mature individuals in 1 subpopulation	90-100%	90-100%	95-100%	100%
(b) extreme fluctuations in the number of mature individuals				
D. Very small or restricted population				
Either (1) number of mature individuals	<25	<50	<250	<1000
or (2) restricted area of occupancy	n/a	n/a	n/a	typically AOO <20 km ² or no. of locations ≤5
E. Quantitative analysis				
Indicating the probability of extinction in the wild to be at least	70% in 10 years or 2 generations (20 years maximum)	50% in 10 years or 3 generations (100 years maximum)	20% in 20 years or 5 generations (100 years maximum)	10% in 100 years

Table S3. Summary of NatureServe conservation status factors (adapted from Master *et al.* 2012), the data inputs used for determining scores for birds and mammals, and the source of data inputs. APAM, Action Plan for Australian Mammals (Woinarski *et al.* 2014). APAB, Action Plan for Australian Birds (Garnett *et al.* 2011). IUCN, International Union for Conservation of Nature.

Factor category	Factor	Condition (rule)	Birds	Mammals	Source
Rarity Weighted (0.7)	Range extent	Always use (if available)	Yes	Yes	APAM and APAB
	Area of occupancy ^	Always use (if available)	Yes	Yes	APAM and APAB
	Population size (mature individuals) ^	Always use (if available)	Yes	Yes	APAM and APAB
	Number of occurrences	Always use (if available)	Yes	Yes	APAM and APAB
	Percent area with good viability/ecological integrity	Always use (if available)	NA	Yes	APAM
	Environmental specificity	Only use if number of occurrences and area of occupancy are unknown or null	No	No	NA
Trends *	Long-term trend	Always use (if available)	Yes	Yes	APAM and APAB
	Short-term trend ^	Always use (if available)	Yes	Yes	APAM and APAB
Threats Weighted (0.3)	Threats	Always use (if available)	Yes	Yes	IUCN threat impact scoring system
	Intrinsic vulnerability	Only use if other threats is unknown or null	No	No	NA

^ Parameters given higher weighting, attributed to greater importance in ascertaining extinction risk (scores multiplied by 2).

* Allocated negative values unless stable trends reported (i.e. < 10% change in population over the past 200 years).

Table S4. The likelihood of extinction (EX) in the next 20 years (based on expert elicitation, with lower/upper confidence intervals) for all of the birds and mammals considered to be less imperilled (i.e. those that did not rank in the top 20), ranked from highest to lowest probability of extinction. Also shown: whether they met intensified IUCN Red List Criteria (EI), their pessimistic (pes) and optimistic (opt) NatureServe (NS) scores (i.e. scores calculated using the *lower* and *upper* bounds of NatureServe conservation status factors – see Table S3 in Supplementary Material) and their pessimistic and optimistic NatureServe ranks respective to the total number of birds (n = 235) and mammals (n = 41) assessed. CI = Confidence Interval.

Rank	Taxon	EX	Lower 95% CI	Upper 95% CI	IUCN (EI)	NS score (pes)	NS rank (pes)	NS score (opt)	NS rank (opt)
Birds									
21	Forty spotted pardalote <i>Pardalotus quadragintus</i>	0.11	0.04	0.27	No	0.0 ^B	4	1.3 [^]	9
22	Norfolk Island green parrot <i>Cyanoramphus novaezelandiae cookii</i> ^A	0.10	0.04	0.21	No	0.9 ^B	12	1.2 [^]	7
23	Soft plumaged petrel <i>Pterodroma mollis</i>	0.09	0.02	0.24	Yes	1.9	63	2.2	28
24	Gulf St Vincent slender- billed thornbill <i>Acanthiza iredalei rosinae</i>	0.08	0.01	0.31	No	1.9	61	3.1	100
25	Anadyr bar-tailed godwit	0.07	0.01	0.28	Yes	1.2 ^B	18	2.7	59

Rank	Taxon	EX	Lower 95% CI	Upper 95% CI	IUCN (EI)	NS score (pes)	NS rank (pes)	NS score (opt)	NS rank (opt)
	<i>Limosa lapponica</i> <i>anadyrensis</i>								
26	Norfolk Island scarlet robin <i>Petroica multicolor</i>	0.05	0.01	0.15	No	1.8	51	2.1	22
27	Gawler Ranges short-tailed grasswren <i>Amytornis</i> <i>merrotsyi pedleri</i>	0.04	0.00	0.14	No	1.6 ^B	38	3.0	94
28	Wandering albatross <i>Diomedea exulans</i> ^C	0.04	0.01	0.10	Yes	2.2	98	2.5	48
29	Grey-headed albatross <i>Thalassarche chrysostoma</i> ^C	0.02	0.00	0.08	No	1.6	41	2.0	20
30	Lord Howe pied currawong <i>Strepera graculina crissalis</i>	0.02	0.00	0.07	Yes	1.6	38	1.9	17
31	Western partridge pigeon <i>Geophaps smithii blaaui</i>	0.02	0.00	0.12	No	1.6	37	3.2	109
32	Night parrot <i>Pezoporus</i> <i>occidentali</i> ^A	0.02	0.00	0.12	No	0.8 ^B	11	2.3	30
33	Slender-billed white-eye <i>Zosterops tenuirostris</i>	0.01	0.00	0.07	Yes	2.0	73	2.3	31
34	Far eastern curlew <i>Numenius</i> <i>madagascariensis</i> ^A	0.01	0.00	0.08	Yes	1.5 ^B	33	2.8	67
35	Northern Siberian bar-tailed godwit <i>Limosa lapponica</i>	0.01	0.00	0.08	Yes	1.4 ^B	26	2.9	74

Rank	Taxon	EX	Lower 95% CI	Upper 95% CI	IUCN (EI)	NS score (pes)	NS rank (pes)	NS score (opt)	NS rank (opt)
	<i>menzbieri</i>								
36	Lord Howe golden whistler <i>Pachycephala pectoralis</i> <i>contempta</i>	0.01	0.00	0.07	Yes	1.4 ^B	28	2.5	45
37	Lord Howe silvereye <i>Zosterops lateralis</i> <i>tephropleurus</i>	0.01	0.00	0.07	Yes	1.4 ^B	28	2.5	45
38	Lord Howe woodhen <i>Hypotaenidia sylvestris</i>	0.01	0.00	0.03	Yes	1.4 ^B	60	2.0	19
39	Amsterdam albatross <i>Diomedea exulans</i> <i>amsterdamensis</i>	0.00	0.00	0.03	No	1.4 ^B	25	1.4 ^B	10
40	Tristan albatross <i>Diomedea</i> <i>dabbenena</i>	0.00	0.00	0.03	Yes	2.1	94	2.5	49
Mammals									
21	Mala <i>Lagorchestes hirsutus</i> ^A	0.12	0.06	0.23	Yes	0.6 ^B	10	0.6 ^B	9
22	Black-footed rock wallaby (West Kimberley) <i>Petrogale</i> <i>lateralis</i> undescribed subsp ^A	0.10	0.03	0.26	No	0.43 ^B	8	0.58 ^B	8
23	Eastern barred bandicoot (Vic) <i>Perameles gunnii</i> ^A	0.10	0.05	0.20	No	0.34 ^B	5	0.49 ^B	6
24	Arnhem leaf-nosed bat	0.10	0.03	0.26	No	2.04	35	2.19	34

Rank	Taxon	EX	Lower 95% CI	Upper 95% CI	IUCN (EI)	NS score (pes)	NS rank (pes)	NS score (opt)	NS rank (opt)
	<i>Hipposideros inornatus</i>								
25	Dibbler <i>Parantechinus apicalis</i>	0.10	0.04	0.20	No	1.29 ^B	24	1.44 ^B	25
26	Mahogany glider <i>Petaurus gracilis</i> ^A	0.09	0.03	0.21	No	2.14	37	2.29	36
27	Cape York rock wallaby <i>Petrogale coenensis</i>	0.09	0.03	0.22	No	1.57	30	1.72	30
28	Numbat <i>Myrmecobius fasciatus</i> ^A	0.09	0.04	0.18	No	1.13 ^B	20	1.28 ^B	19
29	Nabarlek (Kimberley) <i>Petrogale concinna monastria</i>	0.08	0.03	0.20	No	0.86 ^B	16	1.14 ^B	17
30	Northern hairy-nosed wombat <i>Lasiorhinus krefftii</i>	0.08	0.04	0.15	Yes	1.32 ^B	25	1.32 ^B	21
31	Black-flanked rock wallaby <i>Petrogale lateralis lateralis</i>	0.07	0.03	0.17	No	0.71 ^B	12	0.86 ^B	12
32	New Holland mouse <i>Pseudomys novaehollandiae</i>	0.07	0.02	0.16	Yes	1.26 ^B	22	1.42 ^B	23
33	Spotted-tailed quoll (North Qld) <i>Dasyurus maculatus gracilis</i>	0.06	0.02	0.15	No	2.11	36	2.26	35
34	Eastern quoll <i>Dasyurus viverrinus</i> ^A	0.06	0.03	0.12	No	1.47 ^B	28	1.64	29

Rank	Taxon	EX	Lower 95% CI	Upper 95% CI	IUCN (EI)	NS score (pes)	NS rank (pes)	NS score (opt)	NS rank (opt)
35	Proserpine rock wallaby <i>Petrogale persephone</i>	0.06	0.02	0.15	No	1.82	34	1.96	33
36	Woylie <i>Bettongia penicillata</i> ^A	0.04	0.02	0.09	Yes	0.71	13	0.71 ^B	11
37	Yellow-bellied glider (wet tropics) <i>Petaurus australis</i> <i>spp.</i>	0.04	0.01	0.11	No	3.34	41	3.49	38
38	Bridled nail-tail wallaby <i>Onychogalea fraenata</i>	0.03	0.01	0.09	No	0.72	14	0.88 ^B	13
39	Tasmanian devil <i>Sarcophilus harrisii</i>	0.02	0.01	0.05	No	0.92	18	1.10 ^B	15
40	Northern quoll <i>Dasyurus hallucatus</i>	0.02	0.01	0.04	No	2.5	40	2.72	37
41	Kangaroo Island echidna <i>Tachyglossus aculeatus multiaculeatus</i>	0.01	0.00	0.02	No	1.39	27	1.54	27

^AIncluded in the priority list of 20 birds and 20 mammals under the National Threatened Species Strategy (2016).

^BCritically Imperilled based on NatureServe criteria.

^CRefers to Australian breeding population.

References

- Garnett, S.T., Szabo, J., and Dutson, G. (2011). *The Action Plan for Australian Birds 2010*. CSIRO, Melbourne.
- IUCN (2012). *IUCN Red List Categories and Criteria: Version 3.1. Second edition*. Gland, Switzerland and Cambridge, UK: IUCN.
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