Supplementary Material

SOURCES OF DATA AND ESTIMATED PARAMETERS FOR BIRDS AND MAMMALS

Sources of data

Details for avian embryonic growth may be found in Ricklefs (1987). Details for mammalian fetal growth are presented in the following table. Growth curves were fit by non-linear least-squares regression (SAS procedure NLIN) of the equation $W = a(x - t_0)^b$, where W is embryo mass, x is age in days, t_0 is a lag in onset of embryo growth, b is the exponent of the relationship and a is a scaling constant. Results are presented as the estimate and its asymptotic standard error. N is the number of embryos or daily average masses used to estimate the growth function. Beta is the acceleration of aging-related mortality, estimated from age-at-death data in zoo populations, provided courtesy of the International Species Information System (ISIS). N_d is the number of ages at death used to construct the survival curve for each species.

Genus	Species	Common name	Ref	N	t_0	t_0 SE	log$a$	log$a$ SE	b	b SE	β	N_d
Capra	*hircus*	Goat	1	15	43.4	6.3	-1.615	0.707	2.50	0.33	1.90	109
Papio	*anubis*	Baboon	2	9	45.1	4.9	-1.690	0.626	2.18	0.30	2.12	37
Sus	*scrofa*	Pig	3	5	45.2	4.7	-0.119	0.648	1.65	0.34	2.49	35
Homo	*sapiens*	Human[1]	4	21	63.4	0.9	-1.865	0.082	2.31	0.04	2.95[5]	35
Homo	*sapiens*	Human[2]	4	21	65.0	1.0	-1.769	0.086	2.27	0.04	2.95[5]	35
Homo	*sapiens*	Human[3]	4	22	63.5	1.5	-1.917	0.134	2.34	0.06	2.95[5]	35
Lepus	*americanus*	Snowshoe hare	5	15	1.3	2.6	-6.643	1.372	5.60	0.80	3.43[6]	145
Oryctolagus	*cuniculus*	European rabbit	6	36	7.4	1.5	-4.870	0.840	4.91	0.53	3.43[6]	145
Bos	*taurus*	Cow	7	17	6.8	5.4	-7.861	0.923	5.24	0.39	3.88[9]	48
Bos	*taurus*	Cow	7	16	10.9	3.7	-7.169	0.644	4.94	0.28	3.88	48
Bos	*taurus*	Cow	8	7	-44.2	25.6	-8.704	1.814	5.32	0.66	3.88	48

Cervus	*canadensis*	Elk	9	8	17.1	1.5	-6.784	0.555	4.83	0.28	3.92	144
Rattus	*norvegicus*	Rat	10	7	9.1	1.0	-3.709	0.755	4.01	0.59	4.00[7]	23
Macaca	*mulatta*	Rhesus macaque	11	6	41.2	2.7	-1.163	0.425	1.87	0.21	4.02	16
Mus	*musculus*	Mouse	12	19	6.8	0.5	-4.267	0.441	4.03	0.37	5.06[8]	123
Mus	*musculus*	Mouse	13	11	7.3	0.1	-3.602	0.105	3.59	0.11	5.06[8]	123
Ovis	*aries*	Sheep	14	44	24.8	1.5	-3.267	0.272	3.33	0.13	3.71	54
Ovis	*aries*	Sheep	14	130	6.6	0.8	-6.496	0.212	4.77	0.10	3.71	54
Aepyceros	*melampus*	Impala	15	25	3.4	3.9	-6.594	0.623	4.50	0.27	4.28	208
Equus	*caballus*	Horse	16	26	--[4]	--	-7.613	0.706	3.69	0.29	3.48	135

[1]White male; [2]white female; [3]negro both sexes; [4]initial age fixed at 0; [5]value for zoo populations of the gorilla *Gorilla gorilla*; [6]value for the European rabbit *Oryctolagus cuniculus*; [7]value for the roof rat *Rattus rattus*; [8]lowest value of several inbred strains of the laboratory mouse; [9]data of Winters.

References: 1. (Elliott et al. 1934); 2. (Hendrickx 1971); 3. (Tumbleson et al. 1972); 4. (Weinbach 1941); 5. (Bookhout 1964); 6. (Danielson and Kihlström 1986); 7. (Nichols 1944); 8. (Hubbert et al. 1972); 9. (Morrison et al. 1959); 10. (Huggett and Widdas 1951); 11. (Bourne 1975); 12. (Rugh 1990); 13. (MacDowell and Allen 1927; MacDowell et al. 1927); 14. (Joubert 1956); 15. (Fairall 1969); 16. (Meyer and Ahlswede 1976).

Details for embryo growth and aging parameters for birds are presented in the following table.

	Embryo growth parameters[2]						Aging parameters[3]	
Species[1]	t_0	SE	log$a$	SE	b	SE	α	β
Pygoscelis adeliae[4]	1.4	4.3	-11	3.8	4.42	0.95	5.36E-05	3.14
Pelecanus occidentalis	-3	1	-14	1.2	5.16	0.32	5.90E-07	4.48
Larus marinus[5]	-1.3	4.2	-8.4	3.7	3.81	0.96	3.33E-05	2.96
Sterna hirundo[6]	-1.1	5.2	-7.7	4.9	3.38	1.37	5.76E-05	3.11
Uria algae[7]	-0.2	2	-13.1	2.5	5	0.64	1.55E-03	2.23
Diomedia immutabilis[8]	18.7	3.7	-3.2	1.4	2.23	0.33	6.68E-05	2.01
Diomedia nigripes[8]	17.7	2.3	-3.6	1	2.32	0.23	6.68E-05	2.01
Pterodroma hypoleuca[9]	9.6	2.7	-2.9	1.1	1.67	0.27	2.26E-03	1.34
Anous stolidus[6]	1.8	2.2	-5.6	1.3	2.54	0.32	5.76E-05	3.11
Dendrocygnus autumnalis[10]	-3.4	2.7	-9.2	2.5	3.62	0.65	7.09E-03	1.38
Domestic goose[11]	0.7	0.2	-7.3	0.4	3.62	0.11	5.34E-07	4.69
Embden (domestic) goose[11]	0.2	0.6	-8.6	1	3.96	0.29	5.34E-07	4.69
Aythya americana	0.4	2.7	-8.3	2.9	3.75	0.8	5.49E-03	1.29
Anas strepera	-1.9	3.8	-10.9	4	4.47	1.03	1.39E-05	4.17
Anas platyrhynchos	3.1	0.6	-4.9	0.6	2.73	0.62	4.46E-03	1.33
Phasianus colchicus	1.9	0.1	-5.3	0.2	2.7	0.07	1.87E-03	2.01
Domestic turkey[12]	1.5	0.1	-6	0.2	3.09	0.07	1.06E-03	2.46
Jungle fowl[13]	0.4	0.4	-8.2	0.6	3.82	0.19	1.11E-04	3.63

Domestic pigeon[14]	-0.4	0.4	-8.2	0.5	3.67	0.17	7.27E-07	4.87
Agapornis roseicollis	2	0.6	-7.1	0.7	2.69	0.21	4.70E-03	2.32
Sturnus vulgaris[15]	1.3	0.4	-6.3	0.9	3.38	0.35	3.24E-04	2.52
Poephila guttata[16]	2.3	0.6	-5.3	0.8	1.98	0.28	3.89E-02	1.17

Notes:

[1]Species names apply to embryo growth data; sources of survival data are explained in notes below when they do not pertain to the same species. The genus name for *D. immutabilis* and *D. nigripes* as been changed to *Phoebastria*.

[2]All embryo growth data are from Ricklefs (1987). Values are expressed as estimates and their asymptotic standard errors (SE). t_0 is the lag time prior to the onset of increase in embryo mass described by a power function.

[3]Parameters α and β of the Weibull functions relating mortality rate to age; estimates of initial mortality rate (m_0) not shown. All original data are based on survival records from captive populations in zoos (data from the International Species Information System, ISIS) except for *L. marinus, D. immutabilis, D. nigripes, P. hypoleuca,* and *P. colchicus*, which pertain to wild populations and are from Ricklefs (1998).

[4]Survival data for *Spheniscus humboldti*; for *S. demersus* the value of β was 3.60.

[5]Survival data for European gull *Larus canus*.

[6]Survival data for the South American tern *Larosterna inca*.

[7]Survival data for the North Atlantic alcid *Fratercula arctica*; for the closely related *Lunda cirrhata*, $\beta = 2.97$.

[8]Survival data for the southern ocean albatross, *Diomedia exulans.*

[9]Survival data for the related petrel *Puffinus tenuirostris*.

[10]Survival data for *D. autumnalis* may be atypical; for the related species *D. viduata* and *D. bicolor*, values of β were 3.27 and 3.73, respectively.

[11]Survival data for the domestic goose *Anser anser*.

[12]Survival data for the domestic turkey *Meleagris gallopavo*.

[13]Survival data for the jungle fowl *Gallus gallus* in captivity.

[14]Survival data for the domestic pigeon (rock dove) *Columba livea* in captivity.

[15]Average from survival data for the related starlings *Lamprotornis iris* and *Spreo superbus*; β values for other species of starling were *Leucopsar rothschildi* = 2.57 and *Gracula religiosa* = 2.72.

[16]Value of β for *Poephila guttata* is lower than for the related *P. acuticauda* (2.91).

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