10.1071/ZO21048

Australian Journal of Zoology

Supplementary Material

Understanding Australia's unique hopping species: a comparative review of the musculoskeletal system and locomotor biomechanics in Macropodoidea

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Suppl. Table 1. Slopes and confidence intervals for the scaling of bone length with body mass. Meta-analysis were conducted for individuals, species-means, and phylogenetically-corrected species-means with a Brownian model of evolution. See Supplementary file Bone_lengths.xlsx for references. Upper and lower 95% confidence intervals are presented. Isometry = 0.333

Bone	**All individuals**				**Species-means**				**Corrected species-means**			
	lower	**b**	upper	n	lower	**b**	upper	n species	lower	**b**	upper	n species
Femur	0.301	**0.316**	0.330	114	0.300	**0.322**	0.344	46	0.275	**0.310**	0.345	46
Tibia	0.399	**0.427**	0.456	112	0.342	**0.400**	0.458	46	0.330	**0.397**	0.464	46
Calcaneus				0	0.365	**0.406**	0.448	41	0.334	**0.392**	0.449	41
Metatarsal IV	0.295	**0.333**	0.370	48	0.246	**0.335**	0.424	44	0.277	**0.375**	0.472	44
Phalanx IV	0.254	**0.300**	0.346	26	0.224	**0.276**	0.328	38	0.211	**0.291**	0.372	38
Humerus	0.382	**0.411**	0.439	85	0.310	**0.379**	0.449	26	0.220	**0.325**	0.429	26
Radius	0.399	**0.433**	0.468	85	0.362	**0.421**	0.481	26	0.305	**0.404**	0.503	26
Ulna	0.390	**0.422**	0.454	85	0.296	**0.396**	0.495	16	0.111	**0.309**	0.508	16
Metacarpals III	0.158	**0.287**	0.416	9	0.099	**0.274**	0.450	9	0.001	**0.285**	0.570	9

Suppl. Table 2: Intraspecies scaling relationship of individual femur and tibia length with body mass for individuals. See Supplementary file Bone_lengths.xlsx for references. Upper and lower 95% confidence intervals are presented. Isometry = 0.333

	Femur length				**Tibia length**			
	lower	b	upper	n	lower	b	upper	n
Eastern grey (*Macropus giganteus*)	0.277	**0.287**	0.298	18	0.279	**0.291**	0.304	18
Red kangaroo (*Macropus rufus*)	0.230	**0.263**	0.295	18	0.276	**0.313**	0.350	18

Suppl. Table 3: Slopes and confidence intervals for the scaling of gastrocnemius (GAS), plantaris (PL), and flexor digitorum longus (FDL) muscle mass with body mass. Meta-analysis were conducted for individuals, species means, and phylogenetically corrected (with Brownian model of evolution) species means in Macropodoidea. See Supplementary file Muscle_mass.xlsx for references. Upper and lower 95% confidence intervals are presented. Isometry = 1.000

Muscle	**All individuals**				**Species-means**				**Corrected species-means**				**Placentals**			
	lower	b	upper	n	lower	b	upper	n species	lower	b	upper	n species	lower	b	upper	n
GAS	1.062	**1.101**	1.139	117	1.048	**1.162**	1.275	14	1.000	**1.179**	1.358	14	0.941	**1.009**	1.076	35
PL	1.145	**1.187**	1.229	116	1.223	**1.310**	1.398	13	1.052	**1.220**	1.389	13	0.905	**0.968**	1.030	33
FDL	1.059	**1.101**	1.144	101	1.073	**1.184**	1.295	13	1.000	**1.214**	1.428	13	0.979	**1.032**	1.085	35

Suppl. Table 4: Intraspecies scaling relationship of individual gastrocnemius (GAS), plantaris (PL), and flexor digitorum longus (FDL) muscle mass with body mass for individuals. See Supplementary file Muscle_mass.xlsx for references. Upper and lower 95% confidence intervals are presented. Isometry = 1.000

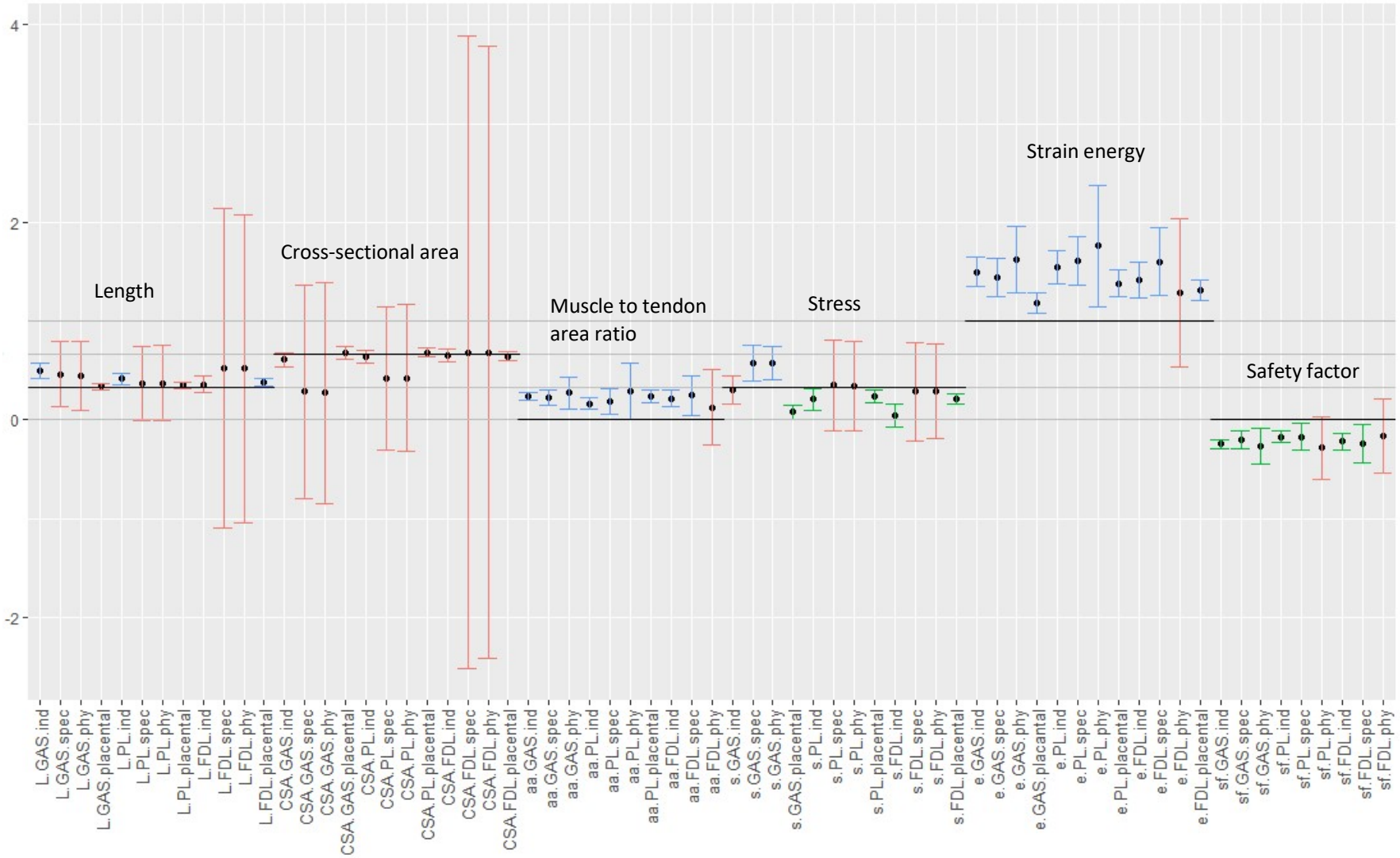
	GAS mass			**PL mass**			**FDL mass**			
	lower	b	upper	lower	b	upper	lower	b	upper	n
Eastern grey (*Macropus giganteus*)	1.015	**1.048**	1.082	1.051	**1.093**	1.135	1.030	**1.060**	1.090	45
Western grey (*Macropus fuliginosus*)	0.794	**0.845**	0.895	0.820	**0.880**	0.940	0.823	**0.876**	0.929	19
Red Kangaroo (*Macropus rufus*)	0.759	**0.928**	1.097	0.836	**0.972**	1.108	0.790	**0.944**	1.097	18

Suppl. Table 5: Slopes and confidence intervals for the scaling of tendon properties with body mass. Meta-analysis were conducted for individuals, species means, and phylogenetically corrected (with Brownian model of evolution) species means in Macropodoidea. See Supplementary file Tendon_traits.xlsx for references. Upper and lower 95% confidence intervals are presented. Isometry: length = 0.333, cross-sectional area (CSA) = 0.667, muscle to tendon area ratio (Am/At) = 0, stress = 0.333, elastic energy = 1, safety factor = 0

	All individuals				**Species-means**				**Corrected species-means**				**Placental mammals**			
Tendon	**lower**	**b**	**upper**	**n**	**lower**	**b**	**upper**	**n species**	**lower**	**b**	**upper**	**n species**	**lower**	**b**	**upper**	**n**

GAS Length	0.425	**0.499**	0.573	46	0.133	**0.464**	0.795	6	0.103	**0.446**	0.789	6	0.305	**0.337**	0.369	35
PL Length	0.354	**0.416**	0.478	41	-0.002	**0.372**	0.745	5	-0.003	**0.374**	0.752	5	0.322	**0.352**	0.382	35
FDL Length	0.273	**0.360**	0.446	23	-1.099	**0.518**	2.136	3	-1.042	**0.519**	2.080	3	0.338	**0.376**	0.415	35
GAS CSA	0.533	**0.609**	0.684	42	-0.797	**0.285**	1.367	5	-0.843	**0.276**	1.394	5	0.618	**0.684**	0.750	34
PL CSA	0.575	**0.638**	0.702	42	-0.299	**0.426**	1.151	5	-0.318	**0.426**	1.169	5	0.637	**0.683**	0.728	35
FDL CSA	0.593	**0.655**	0.717	22	-2.521	**0.685**	3.892	3	-2.410	**0.684**	3.779	3	0.601	**0.645**	0.689	35
GAS Am/At	0.201	**0.239**	0.276	58	0.143	**0.221**	0.299	15	0.109	**0.273**	0.438	15				
PL Am/At	0.106	**0.165**	0.224	58	0.055	**0.187**	0.318	15	0.001	**0.287**	0.572	15	0.174	**0.236**	0.298	33
FDL Am/At	0.131	**0.215**	0.300	56	0.049	**0.247**	0.445	15	-0.255	**0.126**	0.507	15				
GAS Stress	0.163	**0.303**	0.442	33	0.400	**0.580**	0.760	4	0.412	**0.581**	0.749	4	0.005	**0.080**	0.155	33
PL Stress	0.096	**0.208**	0.320	33	-0.110	**0.352**	0.814	4	-0.104	**0.346**	0.797	4	0.176	**0.239**	0.302	31
FDL Stress	-0.076	**0.040**	0.156	22	-0.208	**0.288**	0.783	3	-0.191	**0.287**	0.766	3	0.160	**0.212**	0.263	33
GAS Elastic energy	1.349	**1.499**	1.650	61	1.251	**1.446**	1.640	14	1.281	**1.618**	1.955	14	1.086	**1.185**	1.285	34
PL Elastic energy	1.373	**1.541**	1.709	61	1.366	**1.608**	1.850	14	1.148	**1.760**	2.372	14	1.249	**1.382**	1.515	32
FDL Elastic energy	1.235	**1.416**	1.596	57	1.262	**1.603**	1.943	14	0.531	**1.287**	2.043	14	1.210	**1.312**	1.414	35
GAS Safety factor	-0.285	**-0.241**	-0.197	62	-0.291	**-0.203**	-0.116	15	-0.440	**-0.264**	-0.088	15				

PL Safety factor	-0.229	**-0.170**	-0.111	62	-0.304	**-0.169**	-0.034	15	-0.597	**-0.284**	0.029	15				
FDL Safety factor	-0.300	**-0.219**	-0.139	60	-0.435	**-0.243**	-0.051	15	-0.535	**-0.164**	0.207	15				



Suppl. Figure 1: Display of the data from Table 6 for individuals (ind), species-means (spec), phylogenetically-corrected species-means (phy), and placental

mammals (placentals). Traits include tendon length (L), cross-sectional area (CSA), muscle to tendon ratio (aa), tendon stress (s), strain energy (e), and safety factor (sf). Scaling of the GAS, PL and FDL tendons with 95% confidence intervals coloured by isometry (red), positive allometry (blue) and negative allometry (green). Horizontal lines indicate isometry (L = 0.333, CSA = 0.667, aa = 0, s = 0.33, e = 1, sf = 0).