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Off like a shot: scaling of ballistic tongue projection reveals extremely high performance in small chameleons

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SUPPLEMENTARY MATERIALS

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Supplemental Table S1. Summary of maximal performance recorded for feedings from each individual included in study.

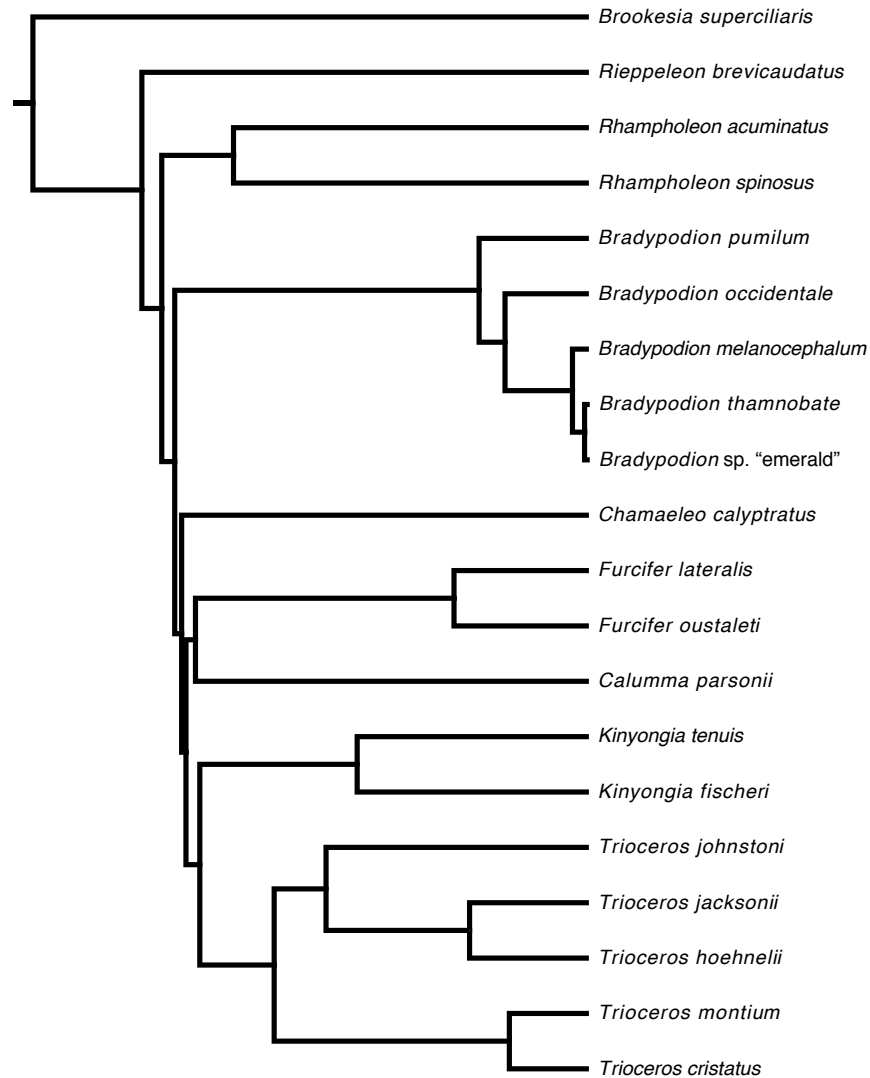
Species	Individual	Sex	<i>n</i>	SVL (mm)	Jaw length (mm)	Max. projection distance (mm)	Min. projection duration (ms)	Max. peak velocity (m s ⁻¹)	Max. peak acceleration (m s ⁻²)	Max. peak muscle mass-specific power (W kg ⁻¹)
<i>Bradypodion melanocephalum</i>	Bmelo01	♂	5	51	11.7	80.6	19.3	4.12	1,010	5,680
<i>Bradypodion melanocephalum</i>	Bmelo05	♂	2	55	12.4	83.2	23.3	3.92	940	5,280
<i>Bradypodion melanocephalum</i>	Bmelo06	♂	5	54	12.0	78.8	26.7	3.99	1,100	5,840
<i>Bradypodion melanocephalum</i>	Bmelo09	♂	5	53	12.4	80.5	24.7	4.29	920	4,920
<i>Bradypodion occidentale</i>	Bocci04	+	5	93	21.7	117.6	28.0	4.20	561	3,160
<i>Bradypodion occidentale</i>	Bocci08	+	5	92	20.6	94.1	25.3	3.86	565	2,880
<i>Bradypodion pumilum</i>	Bpum03	♂	3	69	13.4	101.3	34.7	3.91	716	3,860
<i>Bradypodion pumilum</i>	Bpum04	+	5	64	14.9	101.9	30.0	3.74	589	3,020
<i>Bradypodion pumilum</i>	Bpum06	+	4	63	12.9	83.6	27.3	3.75	813	4,140
<i>Bradypodion pumilum</i>	Bpum10	♂	6	70	17.2	116.5	26.7	3.85	686	3,580
<i>Bradypodion</i> sp. “emerald”	Bsp01	+	5	82	18.4	123.5	40.0	3.66	518	2,600
<i>Bradypodion</i> sp. “emerald”	Bsp05	+	10	69	16.8	129.9	32.7	4.59	786	5,100
<i>Bradypodion</i> sp. “emerald”	Bsp06	♂	5	70	16.3	111.1	29.0	4.51	944	5,720
<i>Bradypodion</i> sp. “emerald”	Bsp07	+	10	77	16.4	137.4	34.0	4.11	715	3,900
<i>Bradypodion</i> sp. “emerald”	Bsp08	♂	5	88	18.7	146.7	33.3	4.26	633	3,420
<i>Bradypodion thamnobates</i>	Btham01	+	10	96	20.1	141.6	33.3	3.84	549	2,940
<i>Bradypodion thamnobates</i>	Btham03	+	5	79	19.1	108.9	38.7	3.36	498	2,240
<i>Bradypodion thamnobates</i>	Btham05	♂	5	53	13.3	103.5	24.7	4.27	907	4,680
<i>Bradypodion thamnobates</i>	Btham06	+	5	77	16.9	97.2	20.0	3.37	529	2,440
<i>Bradypodion thamnobates</i>	Btham09	♂	5	73	17.6	122.8	30.7	3.98	736	3,660
<i>Bradypodion thamnobates</i>	Btham10	+	5	83	18.2	107.2	37.3	2.91	490	1,802
<i>Brookesia superciliaris</i>	superciliaris01	+	5	45	11.8	93.5	19.7	4.96	1,400	9,080
<i>Brookesia superciliaris</i>	superciliaris02	♂	1	40	10.3	68.8	17.7	4.41	1,350	7,920
<i>Calumma p. parsonii</i>	parsonii01	+	8	194	43.7	199.7	39.0	4.94	417	2,880
<i>Chamaeleo calypratus</i>	calypratus01	♂	10	135	32.9	195.8	30.3	4.59	514	3,480
<i>Chamaeleo calypratus</i>	calypratus02	♂	10	135	31.1	123.9	26.3	3.85	363	2,100
<i>Chamaeleo calypratus</i>	calypratus03	♂	10	140	34.1	182.8	39.3	4.45	406	2,720
<i>Chamaeleo calypratus</i>	calypratus04	♂	5	140	30.0	101.0	31.7	3.43	305	1,612

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<i>Chamaeleo calypttratus</i>	calypttratus05	♂	10	125	30.9	189.6	31.3	4.61	503	3,240
<i>Furcifer lateralis</i>	lateralis01	♀	2	77	20.2	109.8	32.3	4.07	726	4,080
<i>Furcifer oustaleti</i>	oustaleti03	♂	5	189	49.0	267.6	54.3	4.82	440	2,980
<i>Furcifer oustaleti</i>	oustaleti04	♂	3	198	49.3	235.6	54.7	4.24	453	2,760
<i>Furcifer oustaleti</i>	oustaleti05	♀	5	196	43.5	175.0	47.3	3.57	286	1,410
<i>Kinyongia fischeri</i>	fischeri01	♂	4	114	24.2	179.0	37.0	4.50	661	4,420
<i>Kinyongia fischeri</i>	fischeri02	♂	5	104	23.3	177.2	41.3	4.83	580	3,820
<i>Kinyongia tenuis</i>	tenuis01	♀	8	60	15.3	101.7	12.3	4.85	1,140	7,820
<i>Rhampholeon acuminatus</i>	acuminatus01	♀	3	54	12.0	97.1	22.7	5.19	1,300	8,840
<i>Rhampholeon acuminatus</i>	acuminatus02	♀	1	55	11.8	81.5	23.3	4.82	1,170	7,720
<i>Rhampholeon spinosus</i>	spinosus01	♀	4	47	11.6	111.3	18.3	5.05	1,770	12,100
<i>Rhampholeon spinosus</i>	spinosus02	♂	8	47	11.9	116.0	22.7	5.32	2,590	14,040
<i>Rieppeleon brevicaudatus</i>	Brev01	♂	6	55	14.2	99.5	12.3	5.41	1,620	11,620
<i>Rieppeleon brevicaudatus</i>	Brev02	♀	2	50	13.5	101.0	14.3	4.90	1,520	9,420
<i>Rieppeleon brevicaudatus</i>	Brev03	♂	3	50	13.4	88.4	15.0	4.64	1,340	8,240
<i>Rieppeleon brevicaudatus</i>	Brev04	♀	2	45	12.6	65.9	18.7	3.60	1,090	5,120
<i>Rieppeleon brevicaudatus</i>	Brev05	♂	1	45	11.5	37.0	9.7	4.15	1,210	6,740
<i>Rieppeleon brevicaudatus</i>	Brev06	♀	1	50	12.7	56.2	13.3	4.74	1,350	9,020
<i>Rieppeleon brevicaudatus</i>	Brev07	♀	2	45	12.0	49.2	11.0	4.29	1,480	8,660
<i>Trioceros cristatus</i>	cristatus01	♀	10	108	24.3	165.5	36.7	4.70	763	5,220
<i>Trioceros hoehnelii</i>	hoehnelii01	♂	7	88	23.0	203.3	44.3	4.06	757	3,480
<i>Trioceros hoehnelii</i>	hoehnelii02	♀	2	78	18.2	169.4	48.4	4.28	757	4,500
<i>Trioceros hoehnelii</i>	hoehnelii03	♀	3	75	17.9	110.7	31.0	4.03	751	4,240
<i>Trioceros jacksonii xantholophus</i>	jacksonii01	♂	2	100	24.5	160.5	34.0	4.43	641	4,140
<i>Trioceros johnstoni</i>	johnstoni01	♂	3	115	25.2	193.0	47.7	4.60	608	4,000
<i>Trioceros montium</i>	montium01	♀	8	93	20.8	175.8	39.3	4.21	670	3,920
<i>Trioceros montium</i>	montium02	♂	5	107	23.7	159.0	33.3	4.49	701	4,560

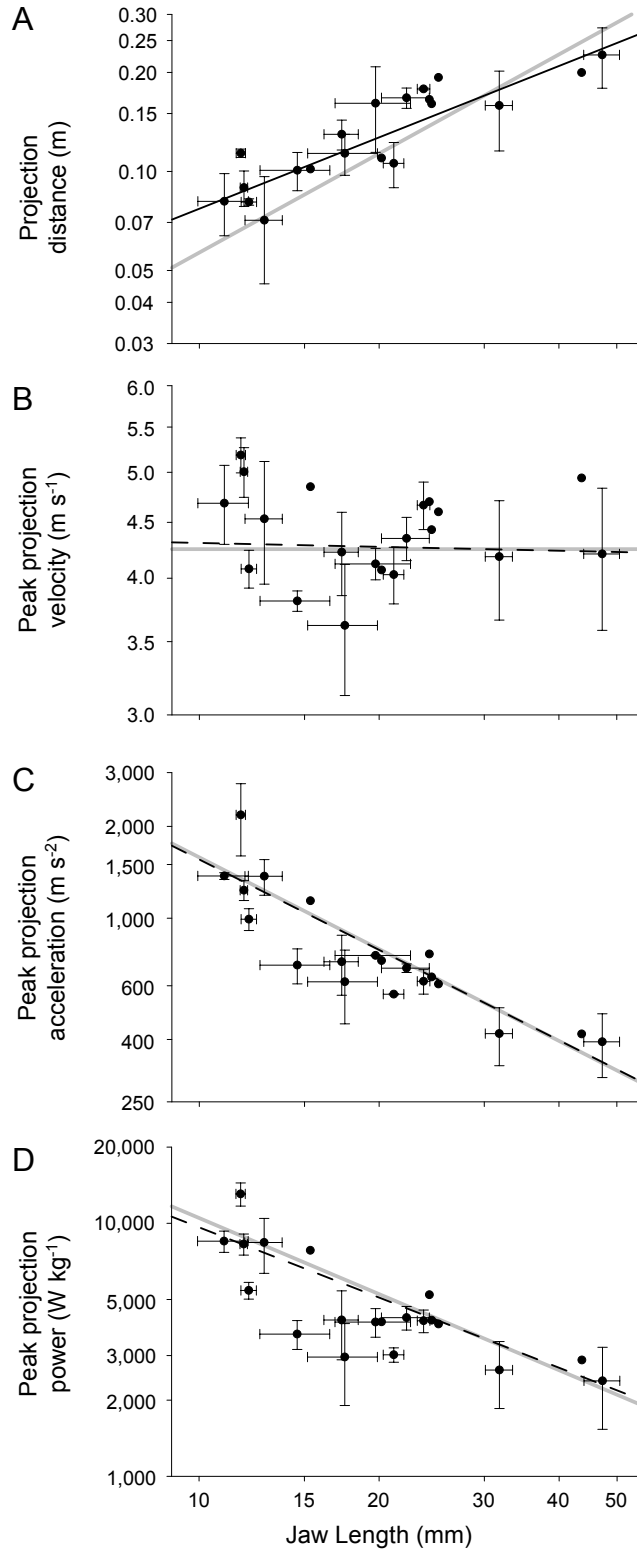
The total number of feedings for each individual is given as *n*. Reported performance values represent the highest performance across all collected feedings for each individual.

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Supplementary Fig. S1. Chronogram estimating the relationships among species used in this study for phylogenetic comparative methods. Phylogenetic hypothesis based on a pruned chronogram from Tolley et al.⁴⁹ with the addition of *Bradypodion* sp. “emerald” as a sister taxon to *B. thamnobates* and assigned branch lengths close to zero based on other published studies incorporating this as yet undescribed taxon⁵¹⁻⁵⁴.

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Supplementary Fig. S2. Scaling relationships among species for (A) peak projection distance, (B) peak projection velocity, (C) peak projection acceleration and (D) peak mass-specific power output with respect to jaw length. Graphs depict raw species averages and standard deviations of maximal performance for individuals on log axes. Solid light gray lines represent isometric slope. Dark gray lines represent observed scaling relationships among species. Solid dark gray lines represent observed scaling relationships significantly different from that expected by isometry (i.e., expected slope falls outside the 95% confidence interval around the observed slope). Dashed dark gray lines represent observed scaling relationships not significantly different from that expected by isometry.

References

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