Supplementary Material

Exceptionally steep brain-body evolutionary allometry underlies the unique encephalization of Osteoglossiformes

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Sources for Silhouette images used in Figure 1-3

Anguilliformes	: Steven Traver (phylopic.org)
Beryciformes	: uncredited (phylopic.org)
Gadiformes	: Milton Tan (phylopic.org)
Osteoglossiformes	: Maija Karala (phylopic.org)*
Perciformes	: Milton Tan (phylopic.org)*
Scorpaeniformes	: Harold N. Eyster (phylopic.org) †
Syngnathiformes	: Francis de Laporte de Castelnau and T. Michael Keesey (phylopic.org)
Tetraodontiformes	: uncredited (phylopic.org)

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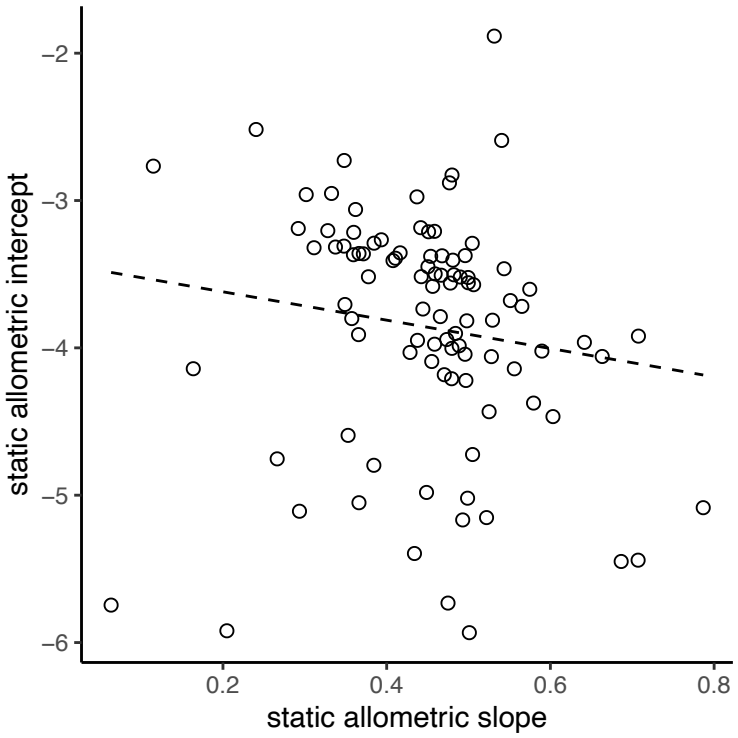

Figure S1. Relationship between static allometric slopes and intercepts. Dashed line shows an Ordinary Least Squares regression; slope±se = -0.96±0.70, intercept±se = -3.43±0.32, r^2 = 2%.

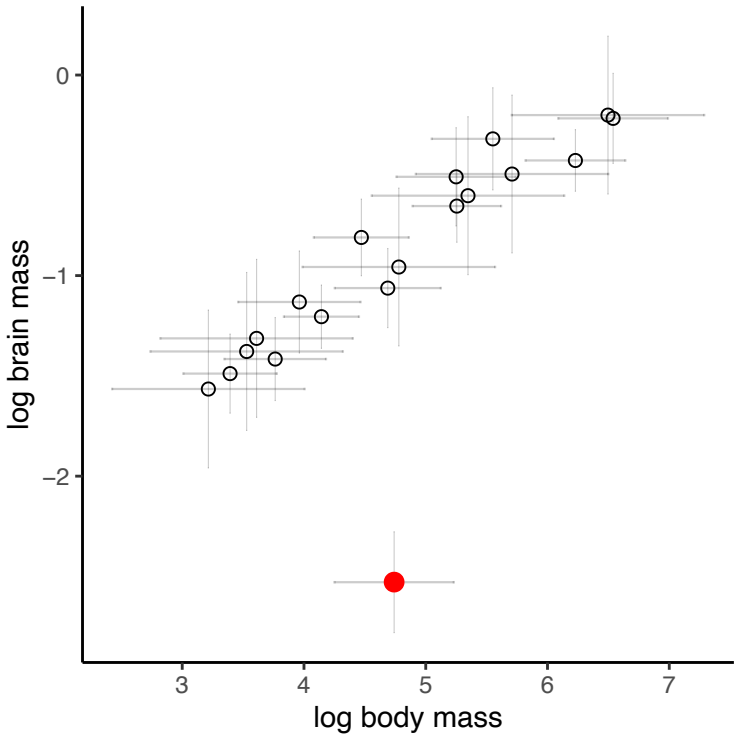

Figure S2. Relationship between log brain mass and log body mass in Beryciformes. Circles indicate species means and error bars are standard errors. Red filled circle represents *Anoplogaster cornuta*, which is an obvious outlier and has removed from the analyses reported in the main text.

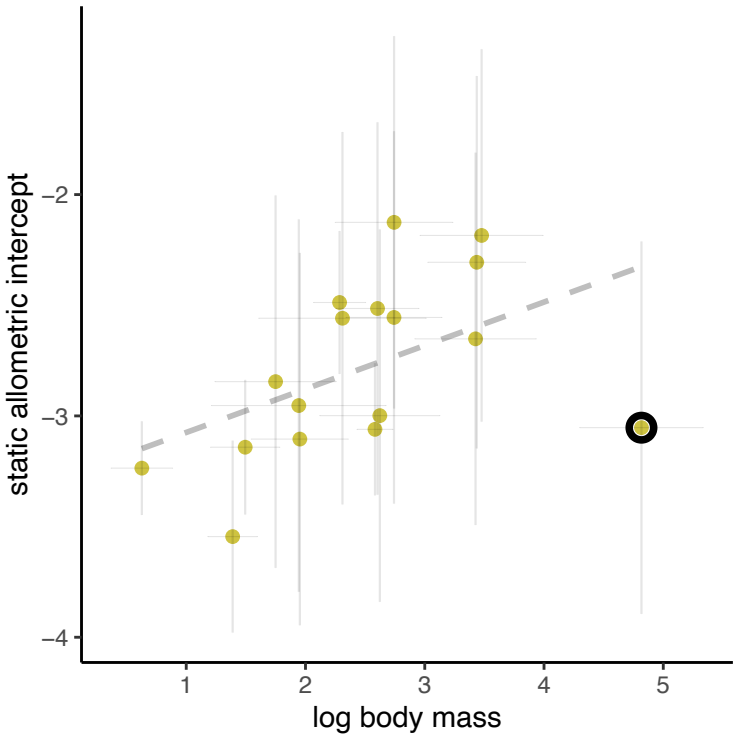

Figure S3. Relationship between static allometric intercept and log body mass in Osteoglossiformes. Dashed line shows an Ordinary Least Squares regression; slope±se = 0.20±0.09, intercept±se = -3.27±0.25, r^2 = 23%. Thick black circle shows *Mormyrus tapius*.

Table S1. Evolutionary brain-body allometry estimated by direct-effect SLOUCH model in the whole dataset excluding one of 8 orders of Teleost at a time.

Excluded Order	$t_{1/2}$	$v_{st.}$	Intercept ± SE	Slope ± SE	r^2
Anguilliformes	∞ [3.636-∞]	-	-4.478 ± 0.377	0.556 ± 0.009	85.1%
			(-4.437 ± 0.377)	(0.527 ± 0.010)	
Beryciformes	∞ [3.636-∞]	-	-4.483 ± 0.373	0.554 ± 0.009	85.2%
			(-4.378 ± 0.373)	(0.526 ± 0.010)	
Gadiformes	∞ [3.510-∞]	-	-4.499 ± 0.381	0.558 ± 0.010	84.4%
			(-4.387 ± 0.381)	(0.527 ± 0.010)	
Osteoglossiformes	∞ [3.636-∞]	-	-4.523 ± 0.364	0.548 ± 0.009	85.9%
			(-4.429 ± 0.364)	(0.523 ± 0.009)	
Perciformes	∞ [1.000-∞]	-	-4.438 ± 0.426	0.544 ± 0.015	83.3%
			(-4.354 ± 0.426)	(0.520 ± 0.016)	
Scorpaeniformes	∞ [3.510-∞]	-	-4.502 ± 0.372	0.559 ± 0.009	85.4%
			(-4.397 ± 0.372)	(0.530 ± 0.010)	
Syngnathifoemes	∞ [3.313-∞]	-	-4.451 ± 0.351	0.549 ± 0.009	85.3%
			(-4.434 ± 0.351)	(0.519 ± 0.010)	
Tetraodontiformes	∞ [3.367-∞]	-	-4.491 ± 0.377	0.557 ± 0.009	85.0%
			(-4.387 ± 0.378)	(0.528 ± 0.010)	

Note: Phylogenetic half-life ($t_{1/2}$, unit: total tree height) and stationary variance ($v_{st.}$) are shown with 2 maximum-likelihood support range from the maximum likelihood estimate. Estimates within parenthesis indicate parameters estimated without correcting for measurement errors. Stationary variance ($v_{st.}$) is not shown in models where the best estimates of phylogenetic half-lives are infinity because stationary phases are never reached in such cases.

Table S2. Phylogenetic associations among brain mass, body mass, static slope and static intercept in the full static data.

Response	Predictor	$t_{1/2}$	$v_{st.}$	Intercept (θ)	Slope	r^2	AICc
(full static data, n = 87)							
log (brain mass)	log (body mass)	∞ [1.242-∞]	-	-4.185 ± 0.293	0.545 ± 0.023	86.0%	48.1
log (brain mass)	log (body mass)	∞ [1.242-∞]	-	-4.792 ± 0.286	0.561 ± 0.023	86.7%	45.7
	+ static slope				1.220 ± 0.086		
log (brain mass)	log (body mass)	∞ [0.968-∞]	-	-1.942 ± 0.372	0.479 ± 0.026	90.0%	26.0
	+ static intercept				0.538 ± 0.065		
log (brain mass)	log (body mass)	∞ [1.242-∞]	-	-1.436 ± 0.316	0.446 ± 0.023	94.9%	2.2
	+ static intercept				1.012 ± 0.063		
	+ static slope				3.071 ± 0.096		

Note: Phylogenetic half-life ($t_{1/2}$, unit: total tree height) and stationary variance ($v_{st.}$) are presented with lower - upper 2 maximum-likelihood units support interval and intercept (θ) and slope are presented with standard errors. Stationary variance ($v_{st.}$) is not shown in models where the best estimates of phylogenetic half-lives are infinity because stationary phases are never reached in such cases.

Table S3 Static brain-body allometry of 11 species of Osteoglossiformes

Taxa	n	Intercept ± SE	Slope ± SE	r^2
Brienomyrys brachyistius	12	-3.06 ± 0.19	0.36 ± 0.07	70.3%
Chitala ornata	6	-3.14 ± 0.07	0.63 ± 0.05	98.0%
Gnathonemus longibarbis	7	-2.64 ± 0.14	0.63 ± 0.04	98.4%
Gnathonemus petersii	9	-2.49 ± 0.18	0.54 ± 0.08	86.2%
Marcusenius victoriae	11	-2.59 ± 0.04	0.54 ± 0.03	98.0%
Mormyrus kannume	10	-1.88 ± 0.96	0.53 ± 0.17	53.8%
Pantodon buchholzi	11	-3.99 ± 0.04	0.49 ± 0.04	93.4%
Paramormyrops sp.	8	-2.60 ± 0.54	0.41 ± 0.18	45.6%
Petrocephalus catostoma	9	-3.24 ± 0.04	0.37 ± 0.04	91.0%
Pollimyrus adspersus	7	-3.55 ± 0.28	0.76 ± 0.21	73.2%
Xenomystes nigri	15	-3.46 ± 0.05	0.54 ± 0.03	95.6%