

## LENGTH–WEIGHT RELATIONS OF 70 FISH SPECIES (ACTINOPTERYGII) FROM TROPICAL COASTAL REGION OF PERNAMBUCO, NORTHEAST BRAZIL

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**Abstract.** The presently reported study provides length–weight relations (LWR) of 70 fish species (Actinopterygii) from the tropical coastal region of Pernambuco, Northeast Brazil: *Achirus declivis*, *Achirus lineatus*, *Anchoa spinifer*, *Anchoa tricolor*, *Anchovia clupeioides*, *Archosargus rhomboidalis*, *Aspistor luniscutis*, *Aspistor quadriscutis*, *Bagre bagre*, *Bagre marinus*, *Bairdiella ronchus*, *Bathygobius soporator*, *Carangoides bartholomaei*, *Caranx hippos*, *Caranx latus*, *Caranx ruber*, *Centropomus parallelus*, *Centropomus pectinatus*, *Centropomus undecimalis*, *Chaetodipterus faber*, *Chloroscombrus chrysurus*, *Citharichthys spilopterus*, *Conodon nobilis*, *Ctenogobius boleosoma*, *Cynoscion virescens*, *Diapterus auratus*, *Diapterus rhombeus*, *Engraulis anchoita*, *Etropus crossotus*, *Eucinostomus argenteus*, *Eucinostomus gula*, *Eucinostomus havana*, *Gobionellus oceanicus*, *Gobionellus stomatus*, *Haemulon plumierii*, *Isopisthus parvipinnis*, *Larimus breviceps*, *Lutjanus alexandrei*, *Lutjanus analis*, *Lutjanus jocu*, *Lutjanus synagris*, *Lycengraulis grossidens*, *Macrodon ancylodon*, *Menticirrhus americanus*, *Micropogonias furnieri*, *Mugil curema*, *Mugil liza*, *Nebris microps*, *Opisthonema oglinum*, *Paralonchurus brasiliensis*, *Pellona harroweri*, *Polydactylus virginicus*, *Pomadasys corvinaeformis*, *Rhinocardinia bahiensis*, *Sciades herzbergii*, *Selene brownii*, *Selene vomer*, *Sparisoma radians*, *Sphoeroides greeleyi*, *Sphoeroides testudineus*, *Sphyraena guachancho*, *Stellifer brasiliensis*, *Stellifer microps*, *Trichiurus lepturus*, and *Trinectes paulistanus*. Data were collected between 2011 to 2014, using different fishing gears. The variation of the *b* coefficient for the majority of species fell within the expected range of  $2.5 < b < 3.5$ . Additionally, this work provides the first LWR values for 3 fish species: *Lutjanus alexandrei* Moura et Lindeman, 2007; *Rhinocardinia bahiensis* (Steindachner, 1879); and *Thalassophryne nattereri* Steindachner, 1876

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The Length–Weight Relation (LWR) is very important for the fisheries management and for environmental monitoring programs (Morey et al. 2003) and it has been used to:

- Estimate the weight of individual fish from its length (Beyer 1991);
- Relate the changes of body shape and weight associated with different situations as growth or anthropogenic factors;
- Infer body condition indices;
- To compare fish populations or species from different regions and environment (Froese 2006, Siegle et al. 2014).

The objective of this study was to estimate the LWR for 70 fish species from the tropical coastal region of Pernambuco, Northeast Brazil.

Fish were collected in the estuarine and coastal regions of Pernambuco, Northeast Brazil, specifically in the district of Barra de Sirinhaém, southern littoral, and Itapissuma/Itamaracá, northern littoral. From 2011 to 2014, gill net, fixed trap, beach seine, fixed net, and trawler were deployed with the purpose to collect samples representing as many species as possible and representing different sizes. The species caught were identified based on the specific taxonomic keys (Figueiredo and Menezes

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2000, Allen 1985, Whitehead 1985, Carpenter 2002). Fishes were measured, weighed, and, whenever possible, the sexes were determined.

Prior to calculation of the LWR, outliers for each species were graphically identified using total length (TL) vs. total weight (TW) plots (Froese and Binohlan 2000) and removed. The LWR values were estimated using the equation (Santos et al. 2002, Froese 2006, Froese et al. 2011):

$$TW = a \times TL^b$$

where TW is the total weight (in g); TL is the total length (in cm);  $a$  is the intercept of the regression curve (intercept of TW when TL is zero or initial growth coefficient) and  $b$  is the regression slope (coefficient indicating isometric or allometric growth). The relation is considered to be isometric when  $b = 3$ , hypoallometric or negative allometric when  $b < 3$ , and hyperallometric or positive allometric when  $b > 3$  (Froese et al. 2011). LWR for combined sexes was estimated for 70 species, whereas for 32, the relation was also estimated by sex: 20 species—both sexes, 3 species—males, and 9 species—females.

To investigate whether the slope  $b$  was significantly different from the isometric value, a  $t$ -test were performed ( $H_0 = 3$ ), with a confidence level of 95% (Zar 2010). The differences between males and females were also compared by the Student's  $t$ -test. The fit of the model to the data was measured by the coefficient of Pearson  $r$ -squared ( $R^2$ ).

A total of 28 099 specimens from 70 species belonging to 23 families and 7 orders were analysed (Table 1). The result of LWR for combined sex showed that the  $b$  coefficient ranged from 2.71 to 3.47, (mean  $\pm$  SD =  $3.10 \pm 0.1$ ). Twenty-seven species presented an allometric relation: 24 WLR resulted in positive allometry, with  $b$  ranging from 3.10 to 3.47 ( $3.25 \pm 0.1$ ), and 3 in negative allometry, with  $b$  ranging between 2.87 and 2.93 ( $2.89 \pm 0.03$ ) (Table 1).

Considering the relation by gender, allometry was observed for 18 species, where 11 females and 7 males resulted in positive allometry, with  $b$  ranging from 3.11 to 3.44 ( $3.28 \pm 0.1$ ) (Table 1). Comparisons between sex of the LWR slope  $b$ , presented significant differences for 11 species (Table 1).

The variation of the LWR slope for the majority of species occurred within the expected range, between 2.50 and 3.50, as demonstrated by Froese (2006). Allometric tendencies may be the result of adaptations, such as ontogenetic, reproductive or environmental variations, mainly between sexes (Froese 2006). The estimates of  $a$  and  $b$  for the majority of species also fell within the obtained by the Bayesian approach for estimating LWR in fishes proposed by Froese et al. (2014) and the values are available in the database of FishBase (Froese and Pauly 2016).

The LWR of 3 species: *Lutjanus alexandrei* Moura et Lindeman, 2007; *Rhinocardinia bahiensis* (Steindachner, 1879); and *Thalassophryne nattereri* Steindachner, 1876 were determined for first time and will be included in the online database of FishBase (Froese and Pauly 2016).

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**Table 1**  
Weight–Length relations for 70 fish species captured in the coastal regions of Pernambuco, Northeast Brazil, from 2011 to 2014 (see table's footnote for symbol explanation)

Species	Sex	N	Total length [cm]			Total weight [g]			Regression parameters			R <sup>2</sup>	
			Mean	SD	Range	Mean	SD	Range	a	95% CI of a	b		95% CI of b
<i>Achirus declivis</i>	CS	97	10.7	3.4	2.8–18.1	30.7	23.9	0.2–140.8	0.0102	0.0089–0.0118	3.25	3.19–3.31	0.99
	F	56	12.2	2.0	7.5–17.9	32.7	19.5	6.9–111.6	0.0176	0.0103–0.0301	3.03	2.81–3.24	0.93
<i>Achirus lineatus</i>	CS	1065	4.4	2.2	2.0–15.3	3.1	7.2	0.1–84.1	0.0091	0.0087–0.0095	<b>3.31+</b>	3.29–3.35	0.97
	F	89	9.6	1.5	6.0–15.3	16.1	11.7	3.9–84.1	0.0124	0.0083–0.0186	3.18	3.00–3.36	0.93
<i>Anchoa spinifer</i>	CS	103	9.0	2.8	4.1–20.2	6.9	9.3	0.2–70.5	0.0046	0.0035–0.0059	<b>3.17+</b>	3.06–3.30	0.96
<i>Anchoa tricolor</i>	CS	258	7.4	1.3	3.9–14.9	3.2	2.3	0.4–24.1	0.0064	0.0050–0.0083	3.02	2.91–3.16	0.89
<i>Anchovia clupeioides</i>	CS	163	13.8	1.1	11.8–16.6	18.7	4.8	10.7–31.9	0.0045	0.0033–0.0062	3.15	3.03–3.28	0.94
	F	43	14.6	0.0	12.8–16.0	21.9	0.1	12.3–27.6	0.0061	0.0024–0.0153	3.04	2.70–3.38	0.88
<i>Archosargus rhomboidalis</i>	CS	1231	6.1	2.1	2.5–27.9	5.9	19.6	0.2–404.8	0.0126	0.0117–0.0136	<b>3.14+</b>	3.10–3.19	0.95
<i>Aspistor luniscutis</i>	CS	138	24.1	5.2	10.7–36.5	146.9	97.3	11.0–470.1	0.0040	0.0026–0.0078	3.26	3.03–3.39	0.97
	F	49	28.5	3.5	18.5–36.5	209.3	89.6	61.7–456.6	0.0064	0.0027–0.0155	3.11	2.85–3.38	0.92
<i>Aspistor quadriscutis</i>	CS	31	25.7	7.0	5.7–40.2	181.2	116.4	1.5–465.0	0.0062	0.0041–0.0091	3.11	2.98–3.23	0.98
<i>Bagre bagre</i>	CS	52	13.2	8.8	6.2–34.1	39.9	74.7	1.3–246.0	0.0045	0.0038–0.0052	3.09	3.03–3.17	0.94
<i>Bagre marinus</i>	CS	198	16.0	10.1	7.0–50.5	90.2	216.1	1.7–1155.0	0.0027	0.0023–0.0031	<b>3.30+</b>	3.26–3.36	0.97
<i>Bairdiella ronchus</i> <sup>1</sup>	CS	185	13.7	3.8	6.6–21.1	38.5	27.8	2.7–135.5	0.0050	0.0042–0.0056	<b>3.33+</b>	3.28–3.38	0.98
	F	92	13.1	0.1	7.5–21.1	36.0	0.5	3.7–135.5	0.0043	0.0036–0.0053	<b>3.38+</b>	3.30–3.45	0.98
	M	74	14.7	2.9	6.6–19.2	42.9	18.5	2.7–87.1	0.0061	0.0046–0.0081	3.24	3.13–3.34	0.98
<i>Bathygobius soporator</i>	CS	74	6.8	1.7	3.0–9.9	5.6	3.2	0.3–13.0	0.0088	0.0074–0.0104	3.16	3.08–3.25	0.98
<i>Carangoides bartholomaei</i>	CS	36	23.8	7.7	13.0–41.8	203.3	197.5	33.9–720.0	0.0298	0.0207–0.0380	2.71	2.63–2.82	0.99
<i>Caranx hippos</i>	CS	231	21.0	25.6	4.3–105.0	848.4	2205.7	1.0–10115.0	0.0126	0.0117–0.0136	2.97	2.94–3.00	0.99
	F	26	57.8	30.5	15.0–100.8	2620.0	3410.3	44.2–9460.0	0.0231	0.0194–0.0275	2.83	2.63–2.82	0.99
<i>Caranx latus</i>	CS	89	14.5	12.4	6.0–86.3	218.4	994.7	2.6–6750.0	0.0132	0.0117–0.0150	3.02	2.97–3.07	0.99
<i>Caranx ruber</i>	CS	29	18.2	2.1	16.0–24.6	81.9	40.0	55.0–180.0	0.0197	0.0106–0.0327	2.86	2.68–3.07	0.97
<i>Centropomus parallelus</i>	CS	177	7.2	4.0	8.4–32.0	56.2	44.7	5.3–348.6	0.0067	0.0053–0.0085	3.11	3.02–3.19	0.97
<i>Centropomus pectinatus</i>	CS	28	23.4	5.8	14.8–33.4	104.1	70.8	22.6–252.7	0.0110	0.0071–0.0173	2.86	2.71–3.00	0.98
<i>Centropomus undecimalis</i>	CS	143	26.96	10.1	9–62.3	230.1	399.1	5.2–2150	0.0044	0.0037–0.0053	3.15	3.09–3.21	0.98
<i>Chaetodipterus faber</i>	CS	55	14.9	7.4	4.1–30.0	188.5	220.6	2.3–895.4	0.0507	0.0418–0.0617	2.86	2.79–2.94	0.99
<i>Chloroscombrus chrysurus</i>	CS	143	7.3	5.4	1.7–20.4	10.8	17.1	0.05–80.0	0.0111	0.0099–0.0125	2.93	2.87–2.99	0.98
<i>Citharichthys spilopterus</i>	CS	375	7.3	3.3	2.5–21	6.5	12.1	0.1–99.4	0.0050	0.0046–0.0054	<b>3.23+</b>	3.20–3.28	0.98
<i>Conodon nobilis</i> <sup>1</sup>	CS	297	14.5	3.9	6.6–26.9	53.2	40.4	3.8–266.7	0.0096	0.0084–0.0111	3.14	3.09–3.19	0.97
	F	115	15.6	0.1	6.6–24.5	64.0	0.4	3.8–182.5	0.0093	0.0077–0.0112	3.16	3.09–3.23	0.98

Table continues on next page.

Table 1 cont.

Species	Sex	N	Total length [cm]			Total weight [g]			Regression parameters				
			Mean	SD	Range	Mean	SD	Range	a	95% CI of a	b	95% CI of b	R <sup>2</sup>
<i>Cynoscion virescens</i>	M	93	16.1	3.6	8.6–26.9	68.3	41.5	8.1–266.7	0.0134	0.0108–0.0166	3.02	2.95–3.10	0.98
	CS	74	14.9	6.0	2.9–31.5	39.2	49.0	0.3–262.7	0.0108	0.0067–0.0174	2.86	2.69–3.04	0.93
	CS	130	4.7	0.5	3.3–5.9	0.7	0.2	0.2–1.2	0.005	0.0036–0.0063	<b>3.13+</b>	2.96–3.31	0.90
<i>Diapterus auratus</i>	CS	489	15.7	5.1	3.7–42.8	67.2	85.8	0.6–1005.4	0.0095	0.0084–0.0109	3.09	3.05–3.14	0.97
	F	97	19.5	0.1	9.6–42.8	124.0	0.4	12.3–1005.4	0.0139	0.0108–0.0178	2.98	2.90–3.07	0.98
<i>Diapterus rhombeus</i>	M	100	17.5	4.8	9.4–33.6	89.7	89.4	10.2–559.6	0.0145	0.0112–0.0189	2.96	2.87–3.05	0.97
	CS	549	7.7	4.5	4.2–42.3	15.7	67.3	1–1000	0.0100	0.0094–0.0105	<b>3.10+</b>	3.07–3.13	0.98
	F	31	13.2	0.1	10.2–19.5	37.4	0.2	15.4–109	0.0230	0.0120–0.0439	2.83	2.58–3.08	0.94
<i>Engraulis anchoita</i>	M	27	16.2	3.0	11–22.5	56.6	33.4	17.2–143	0.0197	0.0087–0.0447	2.84	2.54–3.13	0.88
	CS	43	9.2	0.5	8.2–10.3	6.6	1.2	4.4–9.0	0.0048	0.0022–0.0105	3.24	2.89–3.59	0.90
	CS	115	6.3	2.4	2.9–13.5	3.6	5.5	0.4–25.9	0.0089	0.0072–0.0112	2.99	2.86–3.11	0.95
<i>Eucinostomus argenteus</i>	CS	1914	7.4	4.0	2.5–18	9.4	14.7	0.13–73.9	0.0085	0.0083–0.0087	<b>3.13+</b>	3.12–3.14	0.98
	F	306	10.7	0.2	3.3–18	19.7	0.5	0.5–73.7	0.0090	0.0085–0.0095	<b>3.11+</b>	3.09–3.13	0.99
	M	95	11.6	3.0	4.7–15.9	21.5	13.7	1.3–57.8	0.0102	0.0086–0.0120	3.06	2.99–3.12	0.98
<i>Eucinostomus gula</i>	CS	1504	7.0	2.6	3.2–16.2	6.3	7.3	0.4–51.8	0.0072	0.0067–0.0072	<b>3.26+</b>	3.26–3.29	0.98
	F	436	9.7	0.1	5.0–17.9	13.6	0.3	1.2–79.7	0.0099	0.0089–0.0111	<b>3.12+</b>	3.07–3.16	0.97
	M	73	9.9	1.6	5–14.2	14.5	6.8	1.8–38.1	0.0101	0.0072–0.0141	3.12	2.97–3.27	0.96
<i>Eucinostomus havana</i>	CS	27	11.7	2.8	7.8–15.0	23.4	15.1	5.3–53.6	0.0111	0.0089–0.0139	3.04	2.95–3.13	0.99
	CS	1677	16.6	3.7	4.0–27.0	22.2	13.4	0.2–73.3	0.0061	0.0055–0.0066	<b>2.87–</b>	2.83–2.90	0.94
	F	211	10.9	0.0	8.2–13.3	6.1	0.1	2.3–10.7	0.0054	0.0033–0.0087	2.93	2.80–3.12	0.80
<i>Gobionellus stomatus</i>	CS	54	16.2	1.6	9.4–22.3	69.9	21.9	11.3–187.6	0.0167	0.0084–0.0333	2.98	2.74–3.23	0.91
	CS	804	11.5	5.0	3–41.5	24.4	46.8	0.2–740.8	0.0056	0.0052–0.0060	<b>3.18+</b>	3.16–3.22	0.98
	F	180	16.2	0.1	8.7–41.5	54.3	0.4	5.5–740.8	0.0047	0.0037–0.0059	<b>3.26+</b>	3.18–3.35	0.96
<i>Isopisthus parvipinnis</i> <sup>1</sup>	M	158	15.0	3.9	6.8–33.2	40.0	40.7	2.8–348.1	0.0052	0.0041–0.0065	<b>3.22+</b>	3.14–3.30	0.97
	CS	994	11.9	3.0	6.0–23.2	21.2	24.0	2.6–152.6	0.0075	0.0068–0.0082	<b>3.16+</b>	3.12–3.20	0.96
	F	255	13.1	0.1	7.9–26.0	30.9	0.3	5.2–231.1	0.0068	0.0054–0.0086	<b>3.19+</b>	3.11–3.28	0.95
<i>Lutjanus alexandrei</i>	M	323	12.5	3.0	6.8–23.4	27.9	30.0	3.1–177.4	0.0071	0.0057–0.0083	<b>3.18+</b>	3.12–3.27	0.94
	CS	141	15.4	3.2	4.7–22.4	69.2	39.7	1.3–199.9	0.0136	0.0108–0.0167	3.07 <sup>2</sup>	2.99–3.15	0.98
	M	54	16.6	2.4	11.8–22	80.8	34.4	27.4–173.8	0.0207	0.0117–0.0369	2.99	2.71–3.12	0.93
<i>Lutjanus analis</i>	CS	237	6.4	4.3	2.4–27.6	12.2	39.4	0.1–320	0.0122	0.0115–0.0130	3.07	3.06–3.13	0.99
	CS	102	9.8	4.7	3.2–24.9	27.4	40.3	0.5–273.5	0.0156	0.0124–0.0199	3.00	2.90–3.11	0.97

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Table 1 cont.

Species	Sex	N	Total length [cm]			Total weight [g]			Regression parameters				
			Mean	SD	Range	Mean	SD	Range	a	95% CI of a	b	95% CI of b	R <sup>2</sup>
<i>Lutjanus synagris</i>	CS	63	4.4	1.2	3.1–8.1	1.5	1.8	0.4–8.2	0.0125	0.0101–0.0155	3.08	2.93–3.23	0.97
<i>Lycengraulis grossidens</i> <sup>1</sup>	CS	353	11.9	3.5	3.7–22.0	16.3	14.7	0.3–92.9	0.0042	0.0038–0.0047	<b>3.22+</b>	3.18–3.26	0.98
	F	117	13.6	0.1	10.3–22.0	21.2	0.3	7.4–92.9	0.0036	0.0025–0.0051	<b>3.29+</b>	3.15–3.43	0.95
	M	89	12.6	1.4	9.0–15.5	15.5	5.6	4.1–29.9	0.0060	0.0034–0.0103	3.08	2.87–3.30	0.90
<i>Macrodon ancylodon</i>	CS	159	15.0	5.8	5.3–36.0	39.7	67.0	0.9–398.5	0.0056	0.0042–0.0075	3.08	2.97–3.19	0.95
	F	35	18.6	0.1	10.5–33.6	71.7	0.4	8.0–353.9	0.0074	0.0032–0.0175	3.01	2.71–3.31	0.92
	M	27	18.0	6.7	8.0–36.0	63.5	89.0	4.2–398.5	0.0060	0.0035–0.0101	3.06	2.88–3.25	0.97
<i>Menticirrhus americanus</i> <sup>1</sup>	CS	237	15.3	5.4	7.5–32.0	53.4	72.7	4.2–414.6	0.0045	0.0040–0.0051	<b>3.28+</b>	3.24–3.32	0.98
	F	110	18.1	0.1	9.0–32.0	86.6	0.4	6.9–414.6	0.0034	0.0029–0.0041	<b>3.38+</b>	3.32–3.44	0.99
	M	45	15.3	3.8	10.0–27.3	41.5	40.5	6.6–220.3	0.0056	0.0037–0.0083	3.19	3.05–3.34	0.97
<i>Micropogonias furnieri</i> <sup>1</sup>	F	65	30.4	0.1	17.0–47.5	353.4	0.4	51.1–980.0	0.0205	0.0137–0.0306	2.80	2.68–2.92	0.97
	M	50	26.1	7.8	16.5–47.0	217.3	195.5	32.0–845.0	0.0156	0.0078–0.0310	2.86	2.65–3.08	0.93
<i>Mugil curema</i> <sup>1</sup>	CS	2041	17.9	3.9	10.1–40	68.2	61.4	11.6–650	0.0108	0.0101–0.0116	2.98	2.96–3.01	0.96
	F	334	20.9	0.1	13.5–40.1	108.6	0.3	24.3–780.0	0.0143	0.0121–0.0167	2.90	2.85–2.95	0.97
	M	162	20.6	4.1	15.3–35.7	103.9	72.3	37.9–465.0	0.0182	0.0142–0.0233	2.82	2.74–2.90	0.96
<i>Mugiliza</i>	CS	31	21.2	4.5	14.8–33.0	110.8	78.8	34.3–370.0	0.0105	0.0072–0.0154	2.99	2.86–3.12	0.99
<i>Nebris microps</i>	CS	73	13.8	6.0	4.3–33.0	42.6	75.2	0.9–418.0	0.0094	0.0074–0.0119	3.00	2.91–3.09	0.98
<i>Opisthonema oglinum</i>	CS	249	16.1	5.2	5.8–26.0	47.6	40.9	1.4–155.9	0.0082	0.0075–0.0091	3.01	2.98–3.05	0.99
<i>Paralichthys brasiliensis</i> <sup>1</sup>	CS	501	13.4	2.8	4.1–21.4	22.7	16.2	0.4–118.2	0.0023	0.0020–0.0027	<b>3.47+</b>	3.42–3.53	0.96
	F	220	14.7	0.1	9.3–21.3	30.1	0.3	5.0–113.6	0.0025	0.0017–0.0038	<b>3.44+</b>	3.29–3.59	0.90
	M	141	14.1	2.3	9.6–21.8	25.9	16.7	5.2–107.4	0.0026	0.0018–0.0039	<b>3.43+</b>	3.28–3.58	0.93
<i>Pellona harroweri</i>	CS	1594	10.0	1.7	6.0–15.3	9.7	4.5	1.9–33.0	0.0089	0.0274–0.0339	3.02	2.43–2.52	0.99
<i>Polydactylus virginicus</i>	CS	392	12.9	6.1	3.4–32.3	38.1	63.5	0.3–386.5	0.0065	0.006–0.0070	<b>3.13+</b>	3.10–3.160	0.98
	F	60	22.5	0.1	9.5–32.3	149.8	0.4	7.3–386.5	0.0075	0.0048–0.0118	3.11	2.96–3.26	0.96
	M	37	15.7	3.9	8.4–25.8	46.3	40.3	5.1–164.2	0.0049	0.0022–0.0108	3.24	2.96–3.53	0.93
<i>Pomadourus corvinaeformis</i>	CS	1191	13.0	2.9	8.3–19.8	31.3	21.1	6.8–103.0	0.0093	0.0087–0.0100	<b>3.15+</b>	3.12–3.17	0.97
	F	453	13.3	0.1	7.0–22.1	37.1	0.3	4.2–167.9	0.0106	0.0091–0.0124	3.09	3.04–3.15	0.96
	M	347	12.9	2.3	7.1–20.0	31.8	18.3	4.5–133.5	0.0108	0.009–0.0130	3.09	3.01–3.16	0.95
<i>Rhinosardinia bahiensis</i>	CS	51	8.1	0.7	6.5–9.9	4.9	1.1	2.1–7.3	0.0111	0.0065–0.0193	2.89 <sup>2</sup>	2.63–3.16	0.91
<i>Sciades herzbergii</i>	CS	222	27.0	6.1	4.5–39.6	190.7	101.6	0.6–643.6	0.0059	0.0051–0.0066	3.11	3.07–3.15	0.99
	M	30	28.2	3.1	21.5–36.8	193.7	65.7	42.2–355.6	0.0052	0.0010–0.0265	3.14	2.65–3.63	0.85

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Table 1 cont.

Species	Sex	N	Total length [cm]			Total weight [g]			Regression parameters				
			Mean	SD	Range	Mean	SD	Range	a	95% CI of a	b	95% CI of b	R <sup>2</sup>
<i>Sparisoma radians</i>	CS	128	6.7	2.3	4.1–17.2	6.7	14.2	0.4–88.9	0.0057	0.0036–0.0090	<b>3.42+</b>	3.18–3.66	0.86
<i>Sphoeroides greeleyi</i>	CS	385	4.8	1.0	2.0–8.5	2.2	1.5	0.1–9.9	0.0217	0.0189–0.0250	<b>2.87–</b>	2.78–2.95	0.91
<i>Sphoeroides testudineus</i>	CS	1925	10.2	4.2	1.8–25.5	37.5	39.5	0.1–288.7	0.0213	0.0203–0.0224	<b>2.93–</b>	2.91–2.95	0.97
	F	73	16.6	0.1	7.6–25.5	105.6	0.4	9.7–330.1	0.0164	0.0122–0.0222	3.06	2.95–3.16	0.97
<i>Selene brownii</i>	CS	307	16.8	7.1	4.0–34.1	99.7	93.1	1.0–585.0	0.0123	0.0113–0.0134	3.03	3.00–3.06	0.99
<i>Selene vomer</i>	CS	115	21.3	10.9	2.6–45.7	224.8	234.9	0.3–1375.0	0.0167	0.0147–0.0188	2.93	2.89–2.97	0.99
<i>Sphyaena guachancho</i>	CS	76	15.6	5.7	6.9–45.0	26.6	46.9	2.0–376.2	0.0091	0.0075–0.0110	2.77	2.71–2.85	0.97
<i>Stellifer brasiliensis</i> <sup>1</sup>	CS	267	9.9	2.0	4.9–17.5	11.7	8.3	1.3–57.1	0.0096	0.0077–0.0122	3.03	2.93–3.13	0.92
	F	181	10.2	0.1	6.1–17.5	12.7	0.3	2.0–57.1	0.0106	0.0080–0.0140	3.00	2.87–3.12	0.92
	M	62	9.8	1.8	6.5–16.5	11.3	8.2	2.0–53.5	0.0084	0.0051–0.0138	3.11	2.89–3.32	0.93
<i>Stellifer microps</i> <sup>1</sup>	CS	1549	11.1	2.2	5.1–19.5	17.3	13.6	1.5–122.1	0.0058	0.0054–0.0063	<b>3.26+</b>	3.22–3.29	0.96
	F	668	11.7	0.1	6.5–19.5	20.1	0.3	2.5–122.1	0.0064	0.0055–0.0074	<b>3.22+</b>	3.28–3.17	0.94
	M	449	11.2	2.0	6.1–17.5	17.7	11.4	2.1–84.0	0.0057	0.0047–0.0067	<b>3.27+</b>	3.20–3.35	0.94
<i>Stellifer rastrifer</i> <sup>1</sup>	CS	627	10.7	2.4	4.5–19.8	17.8	16.1	0.4–103.9	0.0050	0.0044–0.0056	<b>3.36+</b>	3.31–3.41	0.96
	F	228	11.2	0.1	6.0–19.8	21.1	0.3	2.2–103.9	0.0044	0.0037–0.0051	<b>3.41+</b>	3.34–3.48	0.97
	M	225	10.9	2.2	6.7–18.5	18.5	15.3	2.8–97.4	0.0050	0.0042–0.0061	<b>3.36+</b>	3.28–3.44	0.96
<i>Stellifer stellifer</i>	CS	501	9.6	2.0	4.4–18.8	11.2	8.6	0.9–88.7	0.0059	0.0052–0.0068	<b>3.26+</b>	3.20–3.310	0.96
	F	222	10.1	0.1	5.8–18.8	12.7	0.3	2.0–88.7	0.0066	0.0055–0.0079	<b>3.21+</b>	3.13–3.29	0.96
	M	140	10.1	1.7	6.1–17.2	12.4	7.8	1.8–69.5	0.0067	0.0049–0.0091	<b>3.21+</b>	3.08–3.35	0.93
<i>Symphurus plagusia</i>	CS	34	9.9	3.3	3.0–18.5	8.7	8.4	0.2–46.7	0.0033	0.0027–0.0039	3.29	3.21–3.37	0.99
<i>Symphurus tessellatus</i>	CS	111	14.0	2.6	3.9–17.8	21.6	9.7	0.2–43.4	0.0027	0.0022–0.0032	<b>3.35+</b>	3.28–3.42	0.98
	F	53	15.0	1.3	12.2–17.5	26.1	6.9	11.2–41.1	0.0040	0.0018–0.0092	3.22	2.91–3.52	0.90
<i>Thalassophryne nattereri</i>	CS	26	9.7	6.2	3.6–21.3	9.2	74.0	0.7–230.8	0.0117	0.0098–0.0139	3.23 <sup>2</sup>	3.15–3.31	0.99
<i>Trichiurus lepturus</i>	CS	285	49.7	23.2	7.4–103.7	146.5	209.7	0.1–810.0	0.0001	0.0001–0.0001	<b>3.41+</b>	3.36–3.45	0.98
	M	70	38.6	6.3	28.0–75.1	35.8	32.4	15.0–281.0	0.0001	0.0001–0.0003	<b>3.40+</b>	2.74–3.23	0.91
<i>Trinectes paulistanus</i>	CS	228	9.3	3.6	2.2–16.6	20.6	16.0	0.1–80.9	0.0081	0.0073–0.0089	<b>3.33+</b>	3.29–3.38	0.98
	F	83	11.5	1.6	7.0–15.7	27.4	12.3	5.3–68.9	0.0105	0.0077–0.0143	3.23	3.10–3.35	0.96

CS = both sexes combined, F = female, M = male, SD = standard deviation, a = intercept of the regression curve, b = regression slope, R<sup>2</sup> = coefficient of Pearson r-squared; values in bold represent the significant difference for Student's t-test, where H<sub>0</sub> = 3, + = positive allometry, – = negative allometry; <sup>1</sup> significant difference for Student's t-test comparing the slopes of the regressions for males and females, where H<sub>0</sub> = 3; <sup>2</sup> = value of slope b as a first reference in the online FishBase database.

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