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Technical Contribution

Length-weight relationships for 15 fish species from Atlantic rain forest streams, southeastern Brazil

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Summary

Length-weight relationships were determined for 15 fish species from the tributary Atlantic rain forest steams that drain into Sepetiba Bay, southeastern Brazil. This is the first record of length-weight relationships for 12 of these species and new maximum lengths for four species. These results will be useful for management and conservation of this area of the Atlantic rain forest drainages.

Introduction

Data on length–weight relationships (LWR) are still unavailable for most fish species from the Atlantic rain forest streams in southeastern Brazil, although this biome is seriously under pressure by anthropogenic activities due to a proximity to large urban centers. LWRs can be useful for the estimation of biomass, fish condition factor, and growth-in-weight (Froese, 2006) and can provide information for morphological and life history comparisons between fish species or fish populations from different habitats (e.g. Froese and Pauly, 1998; Nahum et al., 2009).

The present study provides information on the length-weight relationships for 15 native freshwater fish species from tributaries of the Guandu River that drains into Sepetiba Bay in Rio de Janeiro State, southeastern Brazil. For 12 species, no corresponding data was yet available in the FishBase dataset (Froese and Pauly, 2014).

Table 1
Descriptive statistics and length-weight relationship ($W = aL^b$) parameters for 15 fish species from Atlantic Rain Forest streams, Southeastern Brazil

Species	n	TL (cm)	*W* (g)	*a*	*a* $CL_{95\%}$	*b*	*b* CL $_{95\%}$	r^2
Characidae								
Bryconamericus ornaticeps[a] Bizerril & Perez-Neto, 1995	271	2.9–**7.7**	0.2–3.7	0.00845	0.00758–0.00942	2.99	2.93–3.06	0.97
Mimagoniates microlepis[a] (Steindachner, 1877)	75	3.4–7	0.3–2.7	0.00868	0.00717–0.01051	2.88	2.78–3.00	0.97
Callichthyidae								
Scleromystax barbatus[a] (Quoy & Gaimard, 1824)	42	4.6–9	1.2–8.8	0.01706	0.01260–0.02310	2.84	2.68–2.99	0.97
Loricariidae								
Ancistrus multispinis[a] (Regan, 1912)	132	2.8–12.2	0.3–23.3	0.01362	0.01159–0.01601	2.92	2.84–3.00	0.97
Kronichthys heylandi[a] (Boulenger, 1900)	84	2.6–11.4	0.2–16.3	0.01040	0.00849–0.01274	2.92	2.81–3.03	0.97
Parotocinclus maculicauda[a] (Steindachner, 1877)	67	3.0–6.1	0.2–1.8	0.00520	0.00424–0.00638	3.26	3.13–3.39	0.97
Schizolecis guntheri[a] (Miranda Ribeiro, 1918)	53	2.8–**4.8**	0.2–0.9	0.01212	0.01024–0.01435	2.74	2.63–2.86	0.97
Heptapteridae								
Acentronichthys leptos[a] Eigenmann & Eigenmann, 1889	60	2.7–**11**	0.1–4.6	0.00681	0.00530–0.00874	2.72	2.60–2.85	0.97
Pimelodella lateristriga[a] (Lichtenstein, 1823)	36	4.0–14	0.6–14.5	0.00644	0.00420–0.01000	2.91	2.72–3.09	0.97
Rhamdioglanis transfaciatus[a] Miranda Ribeiro, 1908	102	4.0–18	0.4–26.3	0.00856	0.00757–0.00968	2.76	2.71–2.81	0.99
Rhamdia quelen (Quoy & Gaimard, 1824)	34	6.5–30.5	1.7–331.9	0.00350	0.00230–0.00533	3.30	3.16–3.45	0.98
Trichomycteridae								
Trichomycterus zonatus[a] (Eigenmann, 1918)	81	2.4–**7.9**	0.1–3.4	0.00615	0.00522–0.00725	3.05	2.95–3.15	0.98
Gymnotidae								
Gymnotus carapo Linnaeus, 1758	37	6.8–26	0.9–49.4	0.00322	0.00224–0.00462	2.95	2.82–3.08	0.98
Cichlidae								
Crenicichla lacustris[a] (Castelnau, 1855)	23	3.6–15.5	0.3–36.3	0.00474	0.00377–0.00596	3.28	3.18–3.38	0.99
Geophagus brasiliensis (Quoy & Gaimard, 1824)	73	2.4–22.5	0.2–236	0.01498	0.01333–0.01683	3.02	2.97–3.08	0.99

n, sample size; TL, total length range; *W*, weight range; *a*, intercept; *b*, slope; $CL_{95\%}$, 95% confidence limits; r^2, coefficient of determination. New maximum size data in bold.
[a]Data represent first reporting of length–weight relationship for the species.

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Materials and methods

The study was carried out in three Atlantic rain forest streams (Santana, São Pedro, and D'ouro) that drain into the Guandu River, which is the major freshwater contributor to Sepetiba Bay, southeastern Brazil (Abell et al., 2008) near the metropolitan region of Rio de Janeiro Municipality. Fish samplings were conducted during two seasons (dry and wet) in 2010 and 2011 using electrofishing. Collected specimens were fixed in 10% formalin. After identification at species level, the total length was measured to the nearest mm and each individual was weighed to the nearest 0.1 gram. Species identification was based on Reis et al. (2003).

The relationships between total length and body weight were calculated from the log-transformed equation: $\log W = \log a + b \times \log TL$, where, W, weight in grams; TL, total length in centimeters; a = intercept and b = slope of the regression line or regression coefficient. Prior to regression, log-log plots were performed to detect outliers (Froese, 2006). Additionally, 95% confidence limits (CL) of a and b were estimated. The model fit to the data was measured by the coefficient of the Pearson r-squared (r^2).

Results

A total of 1185 fish representing 15 species and 7 families were collected during the sampling period. The number of individuals, size and weight ranges, length–weight parameters a and b, and the square correlation coefficient (r^2) are shown in Table 1.

Discussion

The taxa examined in this study included species covering a wide array of body shapes; this diversity in shape and size was reflected in the estimated parameters. All regressions were highly significant ($P < 0.001$), with the coefficient of determination (r^2) ranging from 0.97 to 0.99.

For four species, a maximum length greater than reported in Froese and Pauly (2014) was recorded. No length–weight relationships were available in FishBase (Froese and Pauly, 2014) for 12 species, and the LWR parameters are the first records in the scientific literature. Generally, the values of the exponent b remain within the range of 2.5–3.5 (Carlander, 1969). However, the estimated b for *Schizolecis guntheri* was 2.74, which represents a strongly negative allometric growth. This lower b value is probably related to allocation of more energy to axial growth rather than to biomass (Teixeira de Mello et al., 2009). Additional to the elongated body shape, this species has a flattened body with a well-developed lower mouth and lips, with a large number of papillae that assist in settling the fish on the stones and rocks in the streams and rivers (Oyakawa et al., 2006).

The results obtained here can be used for future comparison studies regarding these species in the Atlantic rain forest streams in southeastern Brazil, as well as for the management and conservation of similar drainages.

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