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Technical contribution

Length-weight relationships of 20 fish species in the Guandu River, Rio de Janeiro State, Southeastern Brazil

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Summary

The present work reports the length–weight relationships (LWR) for 20 fish species from the Guandu River basin, Southeastern, Brazil, a lotic system that supplies most of the water for Rio de Janeiro Municipality and nearby cities. Length–weight relationships for nine of these species were unknown to Fishbase, and new maximum lengths are given for eight of the species.

Introduction

Despite the ecological role and regional importance for commercial and subsistence fisheries (Carolsfeld et al., 2003), very little is known on the biology of most freshwater fishes in Southeastern Brazil. The present paper describes the LWR of the 20 most abundant fish species from the Guandu River basin and is the first reference for LWRs for nine of these species.

Materials and methods

Fish samplings were conducted during two seasons (dry and wet) in 2010 and 2011 in four river stretches (ca. 1000 m long) evenly distributed along the Guandu River. At each stretch, seven locations were randomly chosen for sampling. Three gill nets (25 × 2.5 m) with mesh sizes ranging from 25 to 65 cm between knots and covering an area of ca. 190 m^2 were used in each location. Collected fishes were identified to species level, measured (nearest millimeter) and weighed (nearest 0.1 g).

The length–weight relationship was calculated using log W = log a + b log L, where W is the weight of the fish in grams and L is the total length of the fish measured in centimetres,

Table 1
Descriptive statistics and estimated parameters of weight–length relationship ($W = aL^b$) for 20 freshwater fish taxa, Guandu River, Rio de Janeiro State, Southeastern Brazil. New maximum size data in bold

Family	Species	n	Length range (cm)	Weight range (g)	*a*	95% CL *a*	*b*	95% CL*b*	r^2
Curimatidae	*Cyphocharax gilbert*[a]	31	14.6–**23.0**	41.7–177.8	0.0054	0.0029–0.0102	3.33	3.12–3.55	0.97
Anostomidae	*Leporinus copelandii*[a]	35	18.5–**54.0**	59.4–2447.8	0.0051	0.0027–0.0096	3.23	3.05–3.41	0.97
Characidae	*Astyanax bimaculatus*	68	6.7–14.2	3.6–81.1	0.0239	0.0158–0.0363	2.77	2.60–2.94	0.94
	Astyanax parahybae[a]	19	6.5–**16.9**	2.9–77.1	0.0066	0.0023–0.0185	3.26	2.85–3.66	0.94
	Oligosarcus hepsetus[a]	54	8.6–23.0	4.3–88.7	0.0061	0.0037–0.0103	3.06	2.87–3.25	0.95
Erythrinidae	*Hoplias malabaricus*	51	21.8–46.1	121.8–1216	0.0113	0.0046–0.0280	3.02	2.76–3.28	0.91
Callichthyidae	*Hoplosternum littorale*	148	10.2–**24.1**	17.5–305.3	0.0201	0.0138–0.0294	2.95	2.82–3.08	0.93
Loricariidae	*Loricariichthys castaneus*[a]	155	12.0–**35.5**	4.6–243.3	0.0018	0.0014–0.0024	3.21	3.13–3.29	0.97
	Hypostomus affinis[a]	45	12.0–**43.3**	16.5–760.3	0.0161	0.0078–0.0331	2.82	2.60–3.03	0.94
Heptapteridae	*Rhamdia quelen*	21	17.3–35.2	48.5–491.7	0.0048	0.0017–0.0134	3.2	2.89–3.51	0.96
Auchenipteridae	*Trachelyopterus striatulus*[a]	56	15.7–**22.4**	52.4–172.9	0.0093	0.0049–0.0175	3.16	2.94–3.37	0.94
Ariidae	*Genidens genidens*	40	19.0–32.0	73.2–363.3	0.0092	0.0030–0.0283	3.01	2.66–3.36	0.89
Pimelodidae	*Pimelodus maculatus*	32	24.5–39.0	189.6–773.7	0.0104	0.0040–0.0269	3.05	2.77–3.33	0.94
Gymnotidae	*Gymnotus carapo*	18	26.5–42.7	62.5–285.8	0.0132	0.0036–0.0484	2.61	2.24–2.98	0.93
Sternopygidae	*Eigenmannia virescens*	11	16.0–33.6	17.7–67.57	0.0643	0.0176–0.2345	1.97	1.57–2.35	0.93
Mugilidae	*Mugil liza*	9	21.0–39.5	65.8–555.3	0.0033	0.0006–0.0184	3.24	2.75–3.74	0.97
Centropomidae	*Centropomus parallelus*	39	9.0–42.0	6.4–769	0.0047	0.0030–0.0073	3.19	3.05–3.33	0.98
Cichlidae	*Crenicichla lepidota*[a]	18	7.9–**20.4**	4.38–117.3	0.0049	0.0026–0.0093	3.29	3.07–3.51	0.98
	Geophagus brasiliensis[a]	16	8.0–27.8	9.1–627.8	0.0098	0.0041–0.0234	3.24	2.95–3.54	0.97
	Oreochromis niloticus	10	9.0–26.4	11.19–452.2	0.0099	0.0044–0.0223	3.22	2.96–3.48	0.99

n, number of fish in sample; total length (cm); weight (g); *a* and *b*, parameters of relationship; r^2, coefficient of determination.
[a]Data = first report on length–weight relationships.

a is the intercept (coefficient related to body form) and *b* the slope (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) test. Outliers observed in the log–log plots of all species were excluded from the regression.

Results and discussion

Values of *a* and *b* and their associated statistical information of 876 individuals covering 20 species across 15 families are provided in Table 1. For eight of these species, the data represent the first LWR references. New maximum lengths for eight species are marked in bold in Table 1.

Two species had *b*-values lower than the previous records. *Astyanax bimaculatus* in this study (n = 68; *b* = 2.77; CL = 2.60–2.94) had *b*-values significantly lower than in the upper Uruguay River (n = 1776; *b* = 3.23; CL = 3:19–3:26) (Nuñer and Zaniboni-Filho, 2009), and *Eigenmannia virescens* had lower values (n = 11; *b* = 1.97; CL = 1.57–2.35) than those for the Black River, Uruguay (n = 13; *b* = 3.01; CL = 2.74–3.28) (Teixeira-de Mello et al., 2011). On the other hand, *Geophagus brasiliensis* showed higher *b*-values (n = 16; *b* = 3.24; CL = 2.95–3.54) compared with those for the Paranapanema River, Brazil (n = 15; *b* = 2.62; CL = 2.32–2.93) (Oliva-Paterna et al., 2009), and *Oreochromis niloticus* also had higher *b*-values in the Guandu River (n = 10; *b* = 3.22; CL = 2.96–3.48) compared with those for the Indus River in Pakistan (n = 125; *b* = 2.72; CL = 2.57–2.87) (Naeem et al., 2010).

This study represents the first reference on LWR for eight species based on the data in FishBase (Froese and Pauly, 2012). It is hoped that this work will be helpful in future ecological studies in the region.

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