



Technical Contribution

Length-weight relationships for nine fish species from shallow lakes of the Pampa plain, Argentina

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Summary

This study presents length-weight relationships for nine neotropical fish species collected from four shallow lakes from the southeastern Pampean region, representing the first record for these species. Also, new sizes for six species are also provided.

Introduction

Length-weight relationships (LWR) have a number of important applications in fish stock assessments as well as for the management of fishery resources. The aim of the study was to provide new LWR for nine fish species collected from shallow lakes in the southeastern Pampean area.

Materials and methods

This survey was conducted in four shallow lakes of the Pampa plain (Buenos Aires Province, Argentina, South America): Hinojales (37°24'S; 57°24'W), Las Mostazas (37°10'S; 57°15'W), Los Carpinchos (34°34'S, 60°53'W) and Nahuel Rucá (37°37'S; 57° 26'W). These lakes are very shallow (1 m), hypereutrophic and with alkaline waters (pH 8–9). Fish were caught using a fish trap (Colautti, 1998) in each lake over all seasons during the period 2008–2012. Fish were immediately iced, transported to the laboratory and stored in a freezer until identified (Ringuelet et al., 1967; Menni et al., 1995; Casciotta et al., 2005; Rosso, 2006). For small-sized species, determination of each individual was performed under a stereoscopic microscope. Thereafter, the standard length (SL) (to the nearest 0.1 cm, using a caliper) and total body weight (to the nearest 0.01 g) were determined.

The length-weight relationship was estimated as $W = aL^b$, where W is the total weight in g, L is the SL in cm, and a and b are the regression coefficients. Regressions were performed on log-transformed data. Outliers observed in log-log plots were excluded from the regressions.

Results and discussion

For this study, 677 individuals belonging to nine fish species in four families were measured to estimate LWR (Table 1). All regressions were highly significant ($P < 0.0001$) and the b values were within the expected range: 2.5–3.4 (Carlander, 1969).

According to the information in the FishBase (Froese and Pauly, 2012), this study reports the first references on

length-weight relationships for *Pimelodella laticeps*, *Corydoras paleatus*, *Cheirodon interruptus*, *Bryconamericus iheringii*, *Astyanax pampa* and *Astyanax eigenmanniorum*, and for male and female *Cyphocharax voga*, *Oligosarcus jenynsii* and *Rhamdia quelen* (Table 1). In addition, new maximum standard lengths are presented for *P. laticeps*, *A. eigenmanniorum*, *B. iheringii*, *A. pampa*, *C. voga* and both sexes of *R. quelen*. Also, maximum weights are reported for five species (*C. voga* and *R. quelen*, *P. laticeps*, *A. eigenmanniorum*, and *A. pampa*). In particular, values of SL and weight for *C. voga* and *R. quelen* adults in the pampean lakes exceed those reported in other systems of Uruguay and Brazil (Hartz and Barbieri, 1993; Gubiani et al., 2009; Teixeira-de Mello et al., 2009). The size at first maturity (L_{50}) was calculated using the same data set for *O. jenynsii* (La Sala, 2012), being 10.3 cm total length. For *C. voga* and *R. quelen*, the number of immature individuals was insufficient and did not allow for an estimation. In this study, mature specimens were identified at 8.5 and 9 cm (*C. voga*) and at 16.0 and 12.7 cm (*R. quelen*) of SL for females and males, respectively. Size at first maturity was determined for *C. voga* in Brazil at 12.8 and 12.1 of total length (TL) for females and males, respectively (Schifino et al., 1998). Size at first maturity for combined sexes of *R. quelen* was estimated at 24 cm TL (Olaya-Nieto et al., 2010). In accordance with our results, in Brazilian ecosystems the females and males begin gonad development at 16.5 and 13.4 cm, respectively (Gomes et al., 2000).

In conclusion, this study provides new information on LWR for nine neotropical fish species of shallow pampean lakes. These results will assist in the management and conservation of the fish fauna in the region.

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Table 1

Regression coefficient (*a*), slope (*b*), 95% confidence limits ($\pm 95\%$ CI), and coefficients of determination (r^2) for new length-weight relationships of Pampean fish species in four lakes of Buenos Aires Province, Argentina

Family	Species	N	Weight (g)		SL (cm)		<i>a</i>	<i>b</i>	<i>a</i> ($\pm 95\%$ CI)	<i>b</i> ($\pm 95\%$ CI)	r^2
			Min.	Max.	Min.	Max.					
Curimatidae	<i>Cyphocharax voga</i> (Hensel, 1870)	76	13.0	551.3	8.0	25.0	0.0082	3.34	0.0059–0.0113	3.23–3.45	0.98 ^a
	<i>Cyphocharax voga</i> f	53	13.0	551.3	8.3	25.0	0.0135	3.30	0.0091–0.0201	3.17–3.44	0.98 ^a
Characidae	<i>Cyphocharax voga</i> m	21	16.3	378.5	8.5	21.0	0.0091	3.45	0.0044–0.0187	3.18–3.72	0.97 ^a
	<i>Oligosarcus jenynsii</i> (Günther, 1864)	221	1.5	129.4	4.2	18.3	0.0082	3.33	0.0059–0.0113	3.26–3.40	0.98 ^a
	<i>Oligosarcus jenynsii</i> f	69	4.0	129.4	6.5	18.3	0.0093	3.29	0.0059–0.0148	3.10–3.48	0.95 ^a
	<i>Oligosarcus jenynsii</i> m	17	2.0	52.0	5.8	13.7	0.0064	3.42	0.0042–0.0099	3.24–3.60	0.99 ^a
	<i>Astyanax eigenmanniorum</i> (Cope, 1894)	23	1.5	12.2	4.4	8.0	0.0099	3.47	0.0055–0.0178	3.14–3.80	0.96 ^a
	<i>Astyanax pampa</i> Casciotta, Almirón & Azpelicueta, 2005	32	0.3	3.4	3.0	6.2	0.0201	2.80	0.0163–0.0247	2.65–2.95	0.98 ^b
	<i>Cheirodon interruptus</i> (Jenyns, 1842)	49	1.0	3.4	3.5	5.4	0.0270	2.89	0.0203–0.0358	2.69–3.08	0.95 ^c
Pimelodidae	<i>Bryconamericus iheringii</i> (Boulenger, 1887)	11	0.5	6.7	3.2	7.1	0.0109	3.25	0.0062–0.0192	2.92–3.58	0.98 ^c
	<i>Pimelodella laticeps</i> Eigenmann, 1917	47	2.2	17.1	6.0	11.7	0.0124	2.92	0.0076–0.0205	2.67–3.18	0.95 ^c
	<i>Rhamdia quelen</i> (Quoy & Gaimard, 1824)	98	19.8	1550.0	10.4	39.7	0.0195	3.04	0.0132–0.0289	2.92–3.15	0.97 ^c
	<i>Rhamdia quelen</i> f	59	19.8	1550.0	10.4	39.7	0.0168	3.08	0.0150–0.0187	2.94–3.22	0.97 ^c
Callichthyidae	<i>Rhamdia quelen</i> m	29	40.8	1011.0	12.7	37.0	0.0233	2.98	0.0159–0.0342	2.94–3.01	0.95 ^c
	<i>Corydoras paleatus</i> (Jenyns, 1842)	32	1.2	3.3	3.25	4.5	0.0567	2.65	0.0416–0.0771	2.42–2.88	0.95 ^b

New maximum lengths and weights presented in bold.

N, number of individuals analyzed; SL, Standard Length; Min., minimum values reported; Max., maximum values reported; f: females, m: males.

^{a,b}Positive and negative allometric growth.

^cIsometric growth.

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