LENGTH-WEIGHT RELATIONSHIPS OF 29 SPECIES OF TELEOST FISH FROM SHALLOW ESTUARINE ENVIRONMENT OF SAMBOROMBON BAY (RIO DE LA PLATA, ARGENTINA)

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ABSTRACT:

The length–weight relationships (LWR) of 29 teleost fish species from the shallow estuarine environments of the Samborombón Bay wetland (Río de la Plata, Argentina) were estimated. A total of 6,376 individuals belonging to 19 families were measured and weighed. The best represented family was Sciaenidae with 6 species, followed by Clupeidae (n = 3), and Heptapteridae and Characidae with 2 species each. Significant length–weight relationships with high correlation coefficients were found for all species, which mostly presented positive allometric growth. This study reports the first findings regarding the LWR of 29 species in the Samborombón Bay waters. New maximum sizes and geographic distribution records of certain species are also commented.

Keywords: Sciaenidae; Clupeidae; Heptapteridae; Characidae; geographic distribution

RELAÇÃO PESO-COMPRIMENTO DE 29 ESPÉCIES DE PEIXES TELEÓSTEOS DOS AMBIENTES ESTUARINOS POUCO PROFUNDOS DA BAÍA SAMBOROMBÓN (RIO DA PLATA, ARGENTINA)

RESUMO

As relações peso-comprimento (RPC) de 29 espécies de peixes teleósteos dos ambientes estuarinos rasas da zona húmida da Baía Samborombón (Río de la Plata, Argentina) foram estimados. Um total de 6.376 indivíduos pertencentes a 19 famílias foram medidos e pesados. A família mais representativa foi Sciaenidae com seis espécies, seguido por Clupeidae (n = 3), e Heptapteridae e Characidae com duas espécies de cada um. Significativas relações peso-comprimento com altos coeficientes de correlação foram encontrados para todas as espécies, que em sua maioria apresentou crescimento alométrico positivo. Este estudo relata as primeiras conclusões sobre o RPC de 29 espécies nas águas da Baía Samborombón. Novos tamanhos máximos e registros de distribuição geográfica de algumas espécies também são comentar.

Palavras-chave: Sciaenidae; Clupeidae; Heptapteridae; Characidae; distribuição geográfica

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INTRODUCTİON

Samborombón Bay is a shallow estuarine ecosystem located in the southern boundary of Río de la Plata. Its ichthyofauna encompasses a combination of freshwater, estuarine and marine species and the 80 % of the fish captures is dominated by juvenile (LASTA, 1995). This environment provides a unique habitat for feeding, mating, spawning and nursery ground for many species with commercial and recreational interest among others (BARLETTA et al., 2010; LASTA, 1995). The shallow environments of the Río de la Plata estuary are used by juveniles species for a short period of time and, subsequently, adults disperse other habitats spatially segregated (JAUREGUIZAR et al., 2003; 2006; 2009). So, analysis of the fish fauna of estuarine environments provides information of the biology at early stages of some species, some of them important for the future of fisheries activities (LASTA, 1995).The parameters estimation of the length-weight relationship (LWRs) is considered a key element to fishery scientist; the LWR can be used for the estimation of other life history parameters through empirical relations, and for the conversion of length structures into weight structures (FROESE, 2006).

The objective of this study was to provide for the first time the baseline data on LWRs for several juvenile estuarine teleosts fish species from the south-western Atlantic, among these there are many species that are targeted by the artisanal and commercial fisheries of the region.

MATERİAL AND METHODS

The length-weight relationship of 29 fish species was calculated, the fish samples were collected in shallow environments (< 2 m deep) of Ajó River and San Clemente Stream. Both environments are located in the southernmost portion of the Samborombón Bay wetland, on the west margin of the Río de la Plata, Buenos Aires Province, Argentina (Figure 1).

Sampling was conducted bimonthly between September 2007 and August 2009. With the objective of covering the environmental gradient from the freshwater to estuarine, five points on the Ajó River and three on San Clemente Stream were sampled using the modified Garlito/Bituron fixed net (Figure 1) (COLAUTTI, 1998).

The specimens were measured to the nearest cm (0.1 cm) and weighed (0.1 g). For the analysis, standard length (SL) measures were used, except for Symphurus plagusia where total length (TL) was used.

The parameters for the equation W = aSLb (RICKER, 1973) were estimated by least-square the LWR as follows: log 10(W) = log10a+b*log10(SL), where log10a is the intersection of the regression line (coefficient related to body shape), and b is the slope of the regression line. Values of b indicates whether the growth is isometric (= 3) or positive allometric (> 3) or negative allometric (< 3). The 95 % confidence intervals (95 % CI) of the parameter estimates were computed by assuming normally distributed errors. The 95 % CI of b was used to test the hypothesis of isometry.

RESULTS

A number of 6,376 specimens belonging to 29 species included in 19 families were analyzed (Table 1), representing the 59 % of the species registered to the area (SOLARI et al., 2009).

The data presented below comes from samples taken seasonally during two annual cycles, thus, the values of a and b must be taken as mean annual values for each of the species analyzed.

The linear model described above was highly significant for all species (P < 0.05) and the coefficient of determination (r2) ranged from 0.95 to 0.99. Excluding Trachinotus carolinus, Dactylopterus volitans and Syngnathus folletti, the interspecies variability of the parameter b was low (s.d. = 0.21; CV = 6.91 %), with a mean value of 3.08 ranging between 2.5 and 3.5, results that its agreement with the suggestion of CARLANDER (1969). The minimum value (2.69) was recorded for Parona signata, and the maximum (3.47) for Brevoortia aurea. The parameter b obtained for S. folletti was higher than 3.5 (3.61) event related probably to body shape (eel-like shape) exhibited by this species. In the case of T. carolinus and D. volitans, the parameter b of the LWRs was low (Table 1), and it may be associated with the low sample size. However, this specimens were included in the analysis because they are the first record of these species in the Samborombón Bay. The analyses of the regression coefficient b and

their 95 % CI shows that only 4 species (13.8 %), have isometric growth; 17 (58.6 %), positive allometric growth; and8 (27.6 %), with negative allometric growth (Table 1).

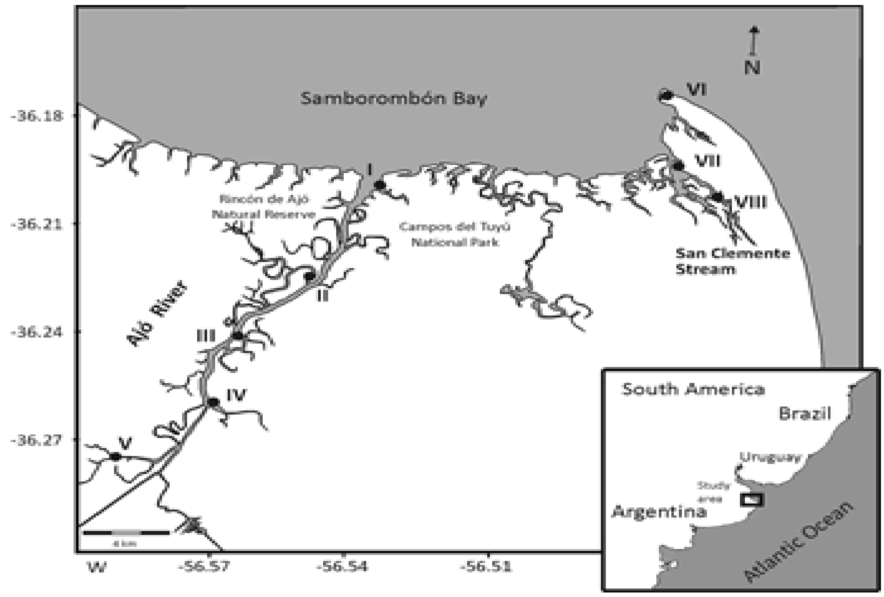

Figure 1. Study area in Samborombón Bay, Río de la Plata, Argentina. I to VIII: samples stations.

As expected from estuarine environments, 11 of the species analyzed (38 %) were represented only be juveniles (Table 1) and over 50 % of these fishes had positive allometric growth. This situation indicates a higher somatic condition for larger size individuals, highlighting the importance of shallow estuarine areas as nursery habitats for fish marine species.

DİSCUSSİON

Comparing with data in FROESE and PAULY (2013), the present study provides new records of maximum sizes for seven species (Table 1). Most of the LWRs reported in this study agreed with those obtained previously by SEGURA et al. (2012), TEIXEIRA-DE MELLO et al. (2009), GIARRIZZO et al. (2006), VIANNA et al. (2004) in the South American coast. Nevertheless, some species such as Lycengraulis grossidens, Oligosarcus jenynsii, Pimelodella laticeps, Rhamdia quelen, Odontesthes argentinensis, and Cynoscion guatucupa showed higher b values than those obtained by TEXEIRA-DE MELLO et al. (2009), and HAIMOVICI & VELASCO (2000). Other species such as D. volitans, Prionotus punctatus, Macrodon ancylodon, Menticirrhus americanus and Micropogonias furnieri showed a lower b value than the one obtained by SEGURA et al. (2012), VIANNA et al. (2004), and HAIMOVICI and VELASCO (2000) at the nearby areas.These discrepancies could be due to several factors such as differences in the number of sampled specimens, narrower or wider size ranges and/or differences in the environment habitat condition (temperature, salinity, food) that affect the growth.The results obtained in this study highlight the importance of shallow estuarine areas as nursery habitats for estuarine and marine fishes, contributing to the knowledge of fish populations in this area plus assist fisheries scientists and managers for future studies.

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Table 1.. Descriptive statistics and estimated parameters of length–weight relationship of 29 species of fishes collected in shallow estuarine environments of the Samborombón Bay.

Family/Species	n	W	TL	SL	Relationship Parameters				
		min - max	min - max	min - max	$Log_{10}a$	b	b CI %95	r^2	Growth type
Engraulidae									
Lycengraulis grossidens	21	0.2 - 22.5	3.2 - 14.7	2.6 - 12.3	-2.05	3.06	2.88 - 3.29	0.98	I
Clupeidae									
Brevoortia aurea *	387	0.2 - 6.9	3.1 - 9.4	2.6 - 7.3	-2.13	3.46	3.38 - 3.53	0.99	A+
Platanichthys platana	105	1 - 7.2	5.9 - 9.4	4.2 - 7.9	-1.71	2.8	2.71 - 2.90	0.97	A-
Ramnogaster arcuata	43	0.1 - 7.6	2.6 - 9.7	2.1 - 8.0	-2.08	3.29	3.27 - 3.31	0.99	A+
Cyprinidae									
Cyprinus carpio	701	12.3 - 6820	8.5 - 79.9	7.3 - 69	-1.32	2.78	2.76 - 2.80	0.99	A-
Curimatidae									
Cyphocharax voga	180	16.1 - 365.3	10.2 - 28.2	8.5 - 23.5	-1.71	3.13	3.08 - 3.18	0.99	A+
Characidae									
Oligosarcus jenynsii	141	0.7 - 117.2	4.6 - 21.2	3.9 - 17.7	-2.02	3.27	3.22 - 3.31	0.99	A+
Cheirodon interruptus	112	0.4 - 3.4	3.3 - 7	2.7 - 5.2	-1.78	3.21	3.13 - 3.30	0.98	A+
Callichthyidae									
Corydoras paleatus	164	1.5 - 11	4.3 - 8.1	3.3 - 6.9	-1.27	2.75	2.67 - 2.82	0.99	A-
Heptapteridae									
Pimelodella laticeps	67	0.7 - 12	4.5 - 11.9	3.7 - 9.5	-2.16	3.28	3.10 - 3.45	0.96	A+
Rhamdia quelen	175	17 - 702	14 - 37.6	1.4 - 32	-2.15	3.31	3.19 - 3.42	0.98	A+
Phycidae									
Urophycis brasiliensis *	196	0.6 - 51.8	5.2 - 18.7	4.5 - 16.5	-2.17	3.14	3.08 - 3.20	0.98	A+
Mugilidae									
Mugil liza	730	0.1 - 418	2.5 - 35.1	2.1 - 28.4	-1.62	2.89	2.87 - 2.91	0.99	A-
Atherinidae									
Odontesthes argentinensis	279	0.1 - 195.2	2.9 - 30.4	2.5 - 24.8	-2.18	3.23	3.18 - 3.27	0.99	A+
Anablepidae									
Jenynsia multidentata	97	0.2 - 2.7	2.6 - 5.8	2.0 - 4.8	-1.75	3.16	2.91 - 3.41	0.98	I
Syngnathidae									
Syngnathus folletti	181	0.1 - 3.5	9.9 - 21	9.6 - 2.2	-4.23	3.61	3.48 - 3.73	0.95	A+
Dactylopteridae									
Dactylopterus volitans *	5	4.2 - 7.1	7.7 - 8.8	5.9 - 7.3	-1.1	2.23	1.70 - 2.76	0.95	A-
Triglidae									
Prionotus punctatus *	23	1.6 - 23.7	5.2 - 13.2	4.2 - 1.6	-1.53	2.79	2.63 - 2.95	0.98	A-
Carangidae									
Parona signata *	51	0.5 - 50.5	3.9 - 19.5	3.0 - 15.9	-1.53	2.69	2.59 - 2.77	0.99	A-
Trachinotus carolinus *	6	1 - 2.2	4.1 - 7.1	3.0 - 5.6	-0.62	1.33	1.04 - 1.61	0.97	A-
Sciaenidae									
Cynoscion guatucupa *	120	0.1 - 3.7	2.3 - 7.3	1.9 - 6.0	-1.87	3.14	3.06 - 3.21	0.98	A+
Macrodon ancylodon	45	8.8 - 121.9	11.6 - 24.6	9.0 - 21.2	-1.88	3.01	2.98 - 3.04	0.99	I
Menticirrhus americanus	236	2.5 - 353.1	6.8 - 31.1	5.1 - 26	-1.98	3.13	3.08 - 3.19	0.98	A+
Micropogonias furnieri *	944	0.1 - 159.8	2.1 - 25.3	1.8 - 21.1	-1.73	2.98	2.96 - 3.00	0.99	I
Paralonchurus brasiliensis *	563	0.7 - 104.1	4.4 - 22.0	2.9 - 17.9	-2.03	3.23	3.19 - 3.27	0.99	A+
Pogonias cromis *	406	0.1 - 376	2.5 - 29.8	1.8 - 24.9	-1.71	3.06	3.03 - 3.09	0.99	A+
Paralichthyidae									
Paralichthys orbignyanus	28	0.4 - 123.6	4.4 - 23.3	3.4 - 19.2	-1.96	3.18	3.04 - 3.32	0.99	A+
Pleuronectidae									
Oncopterus darwinii	262	0.1 - 64.2	2.6 - 17.9	2.2 - 14.9	-1.86	3.13	3.08 - 3.18	0.98	A+
Cynoglossidae									
Symphurus plagusia *	108	0.7 - 17.1	5.2 - 13.7	-------	-2.35	3.14	3.04 - 3.23	0.98	A+

Observations: n: sample size, W: weight ranges in g (minimum and maximum), TL: total length ranges in cm (minimum and maximum), SL: standard length ranges in cm (minimum and maximum), $log_{10}a$: intercept of the relationship, b: slope of the relationship, b 95 % CI: 95 % confidence interval of b, r^2: coefficient of determination, Growth: I: isometric, A+: allometric positive, A-: allometric, * species in which only juveniles were analyzed, in bold: species with new records of maximum sizes.

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