



Morphometric relationships of *Pogonias cromis* (Teleostei, Sciaenidae) in southern Brazil

Relações morfométricas de *Pogonias cromis* (Teleostei, Sciaenidae) no sul do Brasil

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Abstract Length-opercule length and length-weight relationship were estimated for 499 and 156 *Pogonias cromis*, respectively, in southern Brazil. No significant differences between males and females, thus data were grouped, and the equations were $OL = 0.1717L^{0.9662}$ and $W = 0.0231L^{2.8476}$.

Key words: lack drum, fishing, length-opercule length relationship, length-weight relationship.

Resumo Relações comprimento-comprimento do opérculo e comprimento-peso foram estimados para 499 e 156 *Pogonias cromis*, respectivamente, no sul do Brasil. Não houve diferenças significativas entre machos e fêmeas, portanto, os dados foram agrupados, e as equações foram $OL = 0.1717L^{0.9662}$ e $W = 0.0231L^{2.8476}$.

Palavras-chave: miragaia, pesca, relação comprimento-comprimento do opérculo, relação comprimento-peso.

Introduction

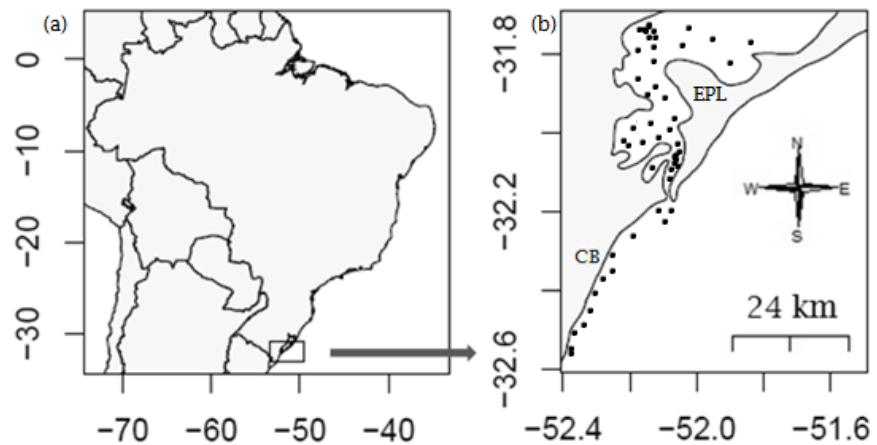
Morphometric relationships in fish have been used for several purposes in fisheries science, such as the production of dichotomic keys for species identification, physical condition analysis and determination of unknown parameters (Haimovici & Velasco, 2000; Bastos et al., 2016). The estimation of total length and total weight measures has a great importance for species that are landed eviscerated, since it allows the maintenance of the monitoring of biological information on the stock (Haimovici, 1987), this fact receives more attention when it refers to endangered species.

In southern Brazil, *Pogonias cromis* is an endangered fish species (MMA, 2014), due to overfishing of the population in previous decades (Reis et al., 1994; Haimovici et al., 2006). Currently, only small and medium-sized fish are caught by the artisanal fishing fleet. These specimens are commonly landed eviscerated, beheaded or in pieces, making impossible some biological samplings, necessary for elaborating future management plans (Santos et al., 2016). In view of this, the objective of the present work is to analyze two morphometric relationships: length-opercule length and length-weight, of the *P. cromis* captured in southern Brazil, for helping in the estimation of fishing yields.

Material and Methods

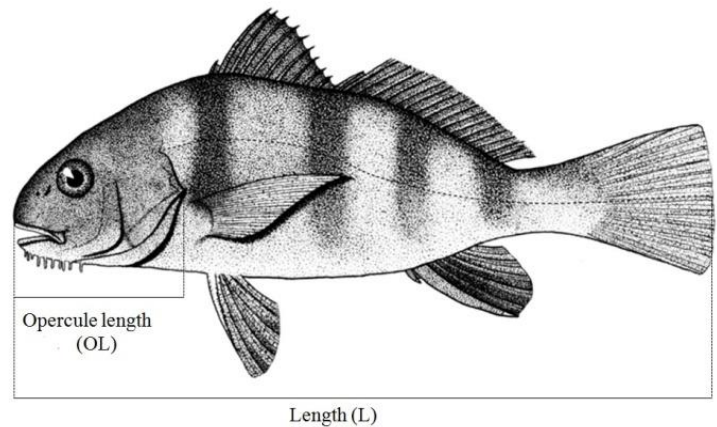
The study area is delimited to the region of activity of the artisanal gillnet fishing fleet, comprising the entire estuary of Patos Lagoon and the adjacent marine region on Cassino up to 33°S (Figure 1). The sampling occurred on 22 fishing trips between August 2013 and July 2014.

Figure 1. Maps, (a) Brazil, (b) study area; EPL: estuary Patos Lagoon; CB: Cassino beach; (●) catches areas of the *Pogonias cromis* in southern Brazil.



All fish were weighed (W), with a scale (precision 0.05 g) and measured in total length (L in cm) as the distance between the tip of the snout and the extremity of the caudal fin, in natural position. Whenever possible, it was measured the length up to the opercule (OL) as the distance between the tip of the snout and the opercule external border (Figure 2).

Figure 2. Graphical representation of measured measurements of *Pogonias cromis* in southern Brazil.



The relationships L-OL and L-W were calculated using the equations $OL = aL^b$ and $W = aL^b$, where a is the intercept on the Y axis of the regression curve and b is the regression coefficient (Ricker, 1975). To test for possible differences between sexes, the estimated regressions in Calc spreadsheet (version 6.3) were compared through Covariance Analysis (Ancova, with L as covariate).

Results

There were sampled 499 fishes, being 262 females (27.8 - 90.6 cm / 275.0 - 8650.5 g) and 237 males (28.2 - 85.9 cm / 270.5 - 7435.5 g), no significant differences were found between males and females in relationship L-OL ($F= 1.875$, $p= 0.175$), for this relationship, data were collected from 156 fish, 82 females and 74 males (Table 1). In the same way, no significant differences in relationship L-W ($F= 1.195$, $p= 0.278$), were all fishes were included (Table 1). Thus the, data were grouped, and the equations for the stock were $OL= 0.1717L^{0.9662}$ and $W= 0.0231L^{2.8476}$ (Figure 3).

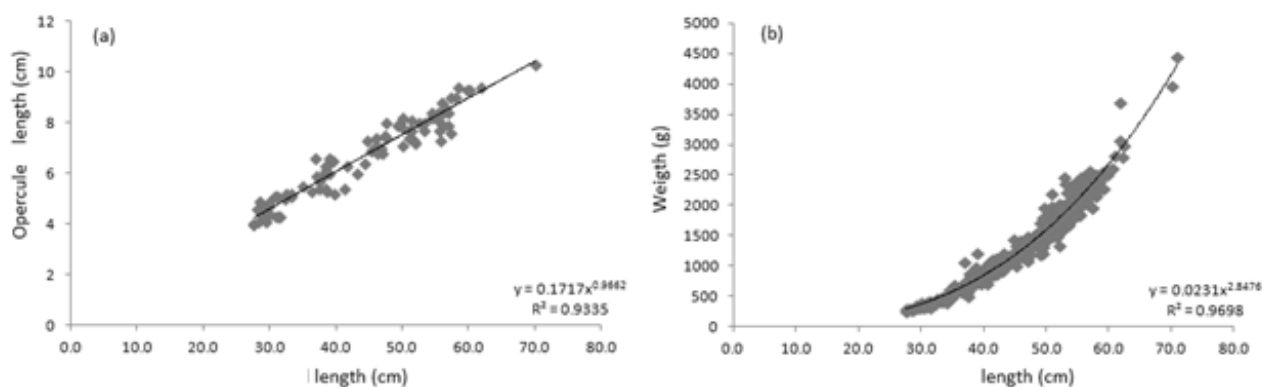


Figure 3. Length-opercule length (a) and length-weight (b) relationship of *Pogonias cromis* in southern Brazil.

Table 1. Estimated parameters of operculum length-total length and total weight-total length, of *Pogonias cromis*, in southern Brazil. *n*, number of samples; *a* and *b*, parameters of the equation; CI95%, limits of confidence; r^2 , coefficient of determination.

	n	a	CI 95% a	b	CI 95% b	r^2
L-OL	156	0.1717	0.1021 - 0.2235	0.9662	0.8914 - 1.0136	0.9335
L-W	499	0.0231	0.0198 - 0.0259	2.8476	2.6752 - 3.0012	0.9698

Discussion

Body structures, such as vertebrae, pharyngeal arches, otoliths and opercular bones, have helped in the determination of total length of bony fishes (Dietrich et al., 2011). In this study we demonstrated that the opercule length of *P. cromis* can also be used to calculate the total length of these fish, from the body remains of landed fish, or of the heads discarded by fishermen or merchants, and even found in the stomach contents of their predators.

The values of *a* and *b* estimates in the relationship L-W are next of the values found for *P. cromis* of smaller size individuals studied by Haimovici & Velasco (2000). These authors analyzed the relationship L-W of the species separately in two groups, below (*a* = 0.0234, *b* = 2.8985), and above 50 cm (*a* = 0.0898, *b* = 3.0404). This indicates that in the first stage *P. cromis* presents a negative allometric growth, with a smaller weight increase than in length, and after reaching a large size, it has positive allometric growth, with the inverse situation (Casselman, 1990).

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