LENGTH-WEIGHT RELATIONSHIP OF FISH CAUGHT AS BY-CATCH BY SHRIMP FISHERY IN THE SOUTHEASTERN COAST OF BRAZIL *

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ABSTRACT

Length-weight relationship (LWR) parameters of 51 species of demersal fish caught as by-catch by shrimp fishery trawl, in the southeastern coast of Brazil are reported. This is the first compilation of LWR for most of the cited species in Brazil, and indicates a positive allometric tendency for *b* in the sampled fish community.

Key words: length-weight relationship; demersal fish; southeastern coast of Brazil

RELAÇÃO PESO-COMPRIMENTO DE PEIXES CAPTURADOS COMO FAUNA ACOMPANHANTE NA PESCA DE CAMARÃO NA COSTA SUDESTE DO BRASIL

RESUMO

Parâmetros da relação peso-comprimento foram estimados para 51 espécies de peixes demersais capturados como fauna acompanhante da pesca de arrasto direcionada aos camarões, na costa sudeste do Brasil. Esta é a primeira estimativa da relação peso-comprimento, no Brasil, para muitas das espécies trabalhadas, e observa-se uma tendência de alometria positiva para o *b* na ictiocenose amostrada.

Palavras-chave: relação peso-comprimento; peixes demersais; costa sudeste do Brasil

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INTRODUCTION

The Length-Weight Relationship (LWR) is a basic information for fish stock assessment used to convert length to weight, conversion of equation of growth in length, comparisons between populations or species at different locations or time, to estimate fish biomass from visual census data and to the determination of the condition factor.

Recently, the number of publications on LWR data has grown, though Brazil still lacks this type of information. BENEDITO-CECILIO *et al.* (1997) make reference to continental fish, and HAIMOVICI and VELASCO (2000) and BERNARDES and ROSSI-WONGTSCHOWSKI (2001), to coastline species.

This paper contributes to the knowledge of biological parameters of teleostean species caught as by-catch by shrimp fishery trawl, in the southeastern coast of Brazil. For many of these species, i. e., *Ciclichthys spinosus*, *Gymnothorax ocellatus, Ogcocephalus vespertilio, Gymnachirus nudus,* this is the first LWR data publication.

MATERIAL AND METHODS

The fishes were caught by otter-trawl samplings in two stages, initially by fishing boats having Pink shrimp (*Farfantepenaeus paulensis* and *F. brasiliensis*) and Sea-bob shrimp (*Xiphopenaeus kroyeri*) as target species.

The Pink shrimp collecting period extended from 1995 to 1996, totalizing 51.5 trawling hours. The sampling area corresponds to the southeastern coast of Brazil, going from the South of Rio de Janeiro State to the northern part of the São Paulo State (23º 18' - 23º 58' S and 44º 30' - 45º 13' W), and has a mean depth of 40 meters. The closed season for Pink shrimp fishing occurred during March and April 1996, and the samples were collected by Sea-bob shrimp fishing boats, at depths around 20 meters, with a total of five hours of trawling. At the same time, another trawl catch series was conducted in the periods January - March and June - August 1996, simulating the commercial Sea-bob shrimp trawling, at four meters depth, summing 27 hours of experimental fishing. This sampling area corresponds to the Ubatuba Bay, at São Paulo State (23º 20' - 23º 35' S and 44º 50' - 45º 13' W).

During the fishing effort, the captured individuals were identified. Total and fork lengths (cm), total weight (g) and other biological informations were recorded. Considering all the species, a total of 18,281 individuals were analysed.

The length-weight relationships (LWR) were obtained through measured empirical values plotted in dispersion graphs; the mathematical expression was adjusted as a potential function, according to the species, being expressed as $W = a_* L^b$. Coefficients *a* and *b* were estimated, for the minimum square method, after *log* transformations for weight and length and the linearization of these equations. The adherence of the empirical points was analytically demonstrated by calculating the determination coefficient (r^2), which indicates the percentage of deviation from the theoretical straight line.

RESULTS AND DISCUSSION

Most of the collected fish were soft-bottom demersal and belonged to 51 species and 29 families. The table 1 summarizes the results, showing the number of collected species, the mean, minimum and maximum length recorded, the LWR and the determination coefficients for each species caught as by-catch in the shrimp fishery.

Most of the obtained parameters were based on large samples in that the number of individuals varied from 16, in *Urophycis brasiliensis,* to 3,018, in *Prionotus punctatus,* and thus may be considered reasonably representative and reliable. The majority of the determination coefficients values were high (r^2) and ranged from 0.827, in *Ciclichthys spinosus,* to 0.994, in *Urophycis brasiliensis*. However the values may be considered as average, whereas the LWR may change seasonally.

In MERELLA *et al.* (1997), the length range of many species was small, because most of the fishes were young (i.e., *Etropus crossotus, Ogcocephalus vespertilio, Pagrus pagrus, Priacanthus arenatus*). The data registered for these species may complement the information concerning the LWR based on the catch of large commercial fish, while the fishes of small size are only collected as by-catch of the shrimp fishery.

Interspecies variability of the parameter *b* was low (s.d. = 0.26; CV = 8.39%), ranging from 2.36, in *Ciclichthys spinosus,* to 3.69, in *Gymnothorax ocellatus*, with a mean value of 3.07. The figure 1 shows the asymmetry existing in the right side of the exponent *b* distribution, similar to that found by BENEDITO-CECILIO *et al.* (1997).

The observed data indicate a positive allometric tendency of *b,* for the sampled fish community, suggesting a restricted use of the isometric condition

Table 1. Number of individuals (n), minimum, maximum and mean lengths (cm) and parameters of the length-weight relationship for each species caught by shrimp fishery as by-catch, in the southeastern coast of Brazil, during 1995-1996

Family/Species	n	Total length (cm)				Length-weight relationship			By-catch of shrimp fishery	
		mean	s.d.	min	max	*a*	*b*	r^2	Sea-bob	Pink
Balistidae										
Balistes capriscus *	66	19.47	2.03	13.5	25.0	0.0119	3.16	0.929		x
Batrachoididae										
Porichthys porosissimus	2033	15.94	3.09	2.5	29.0	0.005	3.15	0.940	x	x
Bothidae										
Citharichthys spilopterus	506	10.05	2.62	5.3	17.1	0.0055	3.22	0.980	x	x
Etropus crossotus	1377	8.52	2.43	3.8	18.6	0.0063	3.23	0.979	x	x
Carangidae										
Chloroscombrus chrysurus	402	12.36	2.21	3.5	24.5	0.0202	2.66	0.983	x	x
Selene setapinnis	153	15.4	3.07	5.6	22.0	0.0151	2.89	0.985	x	x
Trachurus lathami	383	14.19	1.63	4.5	17.0	0.0104	2.90	0.946		x
Cynoglossidae										
Symphurus tecelatus	95	11.81	2.23	4.6	17.1	0.005	3.15	0.966	x	x
Dactylopteridae										
Dactylopterus volitans	510	16.72	5.65	5.4	35.5	0.0071	3.10	0.991	x	x
Diodontidae										
Ciclichthys spinosus	601	10.68	2.34	3.7	20.2	0.3229	2.36	0.827	x	x
Ephippidae										
Chaetodipterus faber	93	7.22	6.75	2.2	41.5	0.0373	2.96	0.990	x	x
Gadidae										
Urophycis brasiliensis	16	25.38	11.68	5.0	42.0	0.0016	3.47	0.994		x
Gerreidae										
Diapterus rhombeus	81	9.52	2.05	5.6	16.1	0.0125	3.03	0.976	x	
Eucinostomus argenteus	420	12.48	3.52	2.5	20.0	0.0106	3.03	0.987	x	x
Haemulidae										
Conodon nobilis	64	19.03	6.38	5.0	32.0	0.0147	2.99	0.992	x	x
Haemulon steindachneri	84	7.07	0.90	4.6	9.4	0.0103	3.15	0.935	x	x
Orthopristis ruber	1061	16.54	3.64	7.5	32.5	0.0096	3.10	0.985	x	x
Lutjanidae										
Lutjanus synagrus	109	11.03	3.09	3.9	26.9	0.0203	2.87	0.980	x	
Monacanthidae										
Stephanolepis hispidus	135	15.05	4.50	4.8	23.5	0.0182	2.98	0.984		x
Mulidae										
Upeneus parvus	200	11.39	2.27	5.0	17.0	0.0044	3.31	0.960	x	x
Muraenidae										
Gymnothorax ocellatus	152	38.67	4.70	29.2	54.2	0.0001	3.69	0.904	x	x
Ogcocephalidae										
Ogcocephalus vespertilio	233	6.93	1.48	4.0	14.5	0.0302	2.61	0.850	x	x
Ophidiidae										
Raneya fluminensis	114	24.18	4.55	4.1	28.5	0.0078	2.86	0.978		x
Percophidae										
Percophis brasiliensis	17	28.59	5.97	18.5	39.0	0.0022	3.12	0.935		x

Table 1. (continuation)

Family/Species	n	Total length (cm)				Length-weight relationship			By-catch of shrimp fishery	
		mean	s.d.	min	max	*a*	*b*	r^2	Sea-bob	Pink
Pomadasyidae										
Pomadasys corvinaeformis	67	7.34	1.68	4.9	14.0	0.0139	2.99	0.963	x	x
Pristigasteridae										
Chirocentrodon bleekerianus	73	9.66	1.34	5.0	12.0	0.0191	2.42	0.834	x	x
Harengula clupeola	76	14.90	1.28	12.0	18.0	0.0054	3.24	0.884	x	x
Pellona harroweri	271	8.67	2.33	3.5	14.0	0.0156	2.70	0.946	x	x
Sciaenidae										
Ctenosciaena gracilicirrhus	1093	12.17	2.85	5.5	19.5	0.0184	2.84	0.965	x	x
Cynoscion jamaicensis	180	15.50	2.91	8.0	26.0	0.0056	3.17	0.946	x	x
Isopisthus parvipinnis	40	11.62	2.83	8.0	19.8	0.0071	3.10	0.977	x	
Larimus breviceps	1056	10.72	2.90	3.7	23.0	0.0093	3.10	0.985	x	x
Menticirrhus americanus	404	18.36	5.97	5.5	36.0	0.0063	3.14	0.990	x	x
Micropogonias furnieri	438	21.90	9.26	4.1	53.0	0.0083	3.05	0.991	x	x
Paralonchurus brasiliensis	556	13.44	3.59	5.1	24.5	0.0028	3.36	0.974	x	x
Stellifer brasiliensis	199	9.07	2.56	4.7	16.8	0.0048	3.37	0.986	x	x
Stellifer rastrifer	561	7.63	1.32	3.6	15.5	0.0085	3.09	0.954	x	
Stellifer stellifer	307	7.21	0.96	5.1	10.5	0.0097	3.02	0.919	x	
Umbrina coroides	39	9.67	3.94	5.7	22.5	0.0066	3.20	0.978	x	x
Serranidae										
Diplectrun formosum	35	17.39	2.12	11.5	20.0	0.0038	3.38	0.967	x	x
Diplectrun radiale	156	13.44	3.40	7.50	22.0	0.0071	3.22	0.987	x	
Serranus auriga	101	7.85	3.59	3.5	15.5	0.0056	3.39	0.993		x
Soleidae										
Achirus lineatus	136	10.96	2.09	4.6	14.5	0.0162	3.12	0.964	x	
Gymnachirus nudus	149	10.22	2.40	6.5	17.5	0.0024	3.62	0.959		x
Sparidae										
Pagrus pagrus	137	12.78	3.42	4.0	23.5	0.0098	3.14	0.991		x
Stromateidae										
Peprilus paru	33	13.23	4.92	6.0	25.6	0.0152	3.05	0.991		x
Synodontidae										
Synodus foetens	61	25.40	11.14	8.0	44.0	0.0029	3.21	0.993	x	x
Tetraodontidae										
Lagocephalus laevigatus	87	10.87	8.55	4.2	54.4	0.0232	2.89	0.988	x	x
Sphoeroides testudineus	67	5.49	3.23	2.4	19.0	0.0371	2.72	0.975	x	x
Triglidae										
Prionotus punctatus	3018	13.70	4.38	2.2	38.6	0.0116	2.96	0.980	x	x

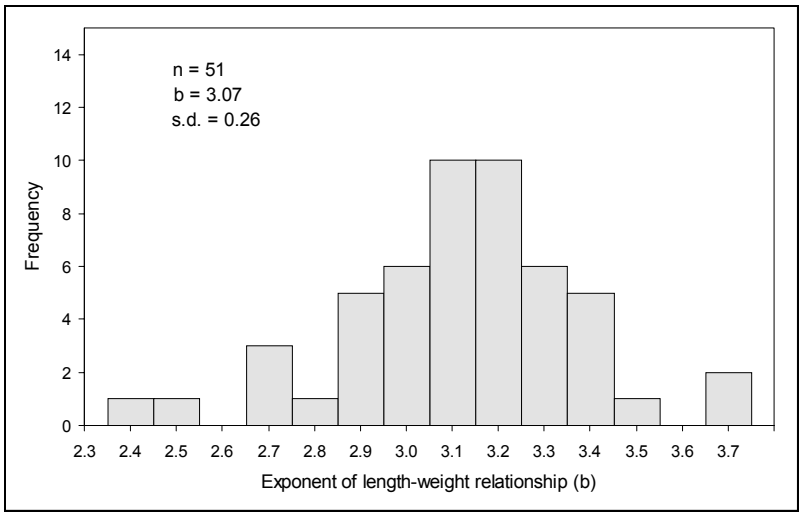

Figure 1. Frequency distribution of *b* values (LWR) for demersal fish species from the southeastern coast of Brazil, during 1995-1996

factor, and recommending the use of the allometric condition factor. Similar observations were made by BRAGA (1997), in the analysis of the allometric equation in the weight-length relationship and that of the condition factor in *Plagioscion squamosissimus,* and VIANNA *et al*. (2000), in *Porichthys porosissimus*. According to BRAGA (1997), the regression coefficient on the weight-length relationship cannot be used as an accessory feature in the diagnosis of fish populations, since it exhibits variability connected to the intercept. In turn, the intercept, that is the condition factor and is affected by many factors related to the biology of the fish (i.e., size and maturity of the individuals), acts on the regression coefficient causing it to change inversely to its variation (VIANNA *et al*., 2000).

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