Length-Weight Relationships of Demersal Fishes from the Upper Continental Slope off Colombia

L.S. Diaz, A. Roa, C.B. Garcia, A. Acero, and G. Navas

Abstract

Parameters of the length–weight relationship of the form $W=aL^b$ are presented for 45 demersal fish species caught on the upper continental slope of the Caribbean Sea off Colombia. The b values varied between 2.13 and 4.97, with the mean b = 3.042 (95% CI, 2.887- 3.196).

Introduction

The medium depth (300-500 m) demersal fish fauna of the Colombian Caribbean is relatively unknown (Gartner et al. 1997). Due to this, a survey was conducted in 1999 in order to initiate an inventory of species from such depths. Although primarily concerned with taxonomy, we took advantage of the materials collected to provide estimates of the length-weight relationship (LWR) parameters of 45 species (out of 140 species identified) for which enough data pairs were available.

An empirical relationship like LWR is an important piece of information in studying the natural history of fishes. For instance, LWR allows predictions of weight from length in yield assessments (Pauly 1993) and can also be indicative of the 'condition factor', i.e., the general well-being of fish populations. An interesting possibility, not yet explored to our knowledge, is to conduct comparisons of the parameters a and b in space (latitudinal and depth gradients) and time (period/season of the year) for both fish assemblages and for individual species. We believe there is something to be learned here in relation to the general metabolism of species and communities.

Materials and Methods

Sampling was done with a small otter trawl (7.5 m headline, 9.5 m footrope). About 80 stations were visited in 1999, covering the latitudinal range of the Colombian Caribbean (Fig. 1). Trawling lasted an average of 10 minutes at each station. Trawl hauls were conducted along two transects on the upper continental slopes, one at 300 m depth and the other at 500 m depth.

Individuals were measured (total length in all cases) to the nearest mm and weighed to the nearest hundredth gram in the laboratory. The parameters a and b of the LWR of the form:

$$W=a\,L^b$$

were estimated using the routines of the computer program FISHPARM (Prager et al. 1989) that implements Marquadt's algorithm for non-linear least-squares parameter estimation.

Results

The results of the length-weight analysis are given in Table 1. Fig. 2 shows the frequency distribution of the b values. With the exception of one extreme value to the right, the distribution tends to be symmetrical and in line with the distributions of b values found for shallower demersal fish assemblages from the Colombian Caribbean (Duarte et al. 1999). The b values varied between 2.13 *(Caelorinchus caelorincus)* and 4.97 *(Halosaurus ovenii)* with mean b equal to 3.042 (95% CI=2.887-3.196).

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Table 1. LWR parameters for 45 demersal fish species from the upper continental slope (300 m and 500 m depth) of the Colombian Caribbean.

Species	n	Weight range (g)	Length range (mm)	a	b
Antigonia capros	38	1.4 - 103.0	40 - 153	7.33 E -05	2.80
Antigonia combatia	63	1.3 - 102.1	35 - 155	5.60 E -06	3.31
Argentina striata	114	1.3 - 19.4	48 - 150	3.64 E -04	2.14
Bathyclupea argentea	11	15.0 - 150.0	146 - 256	2.24 E -07	3.66
Bathygadus macrops	61	2.6 - 225.0	87 - 414	8.44 E -05	2.85
Bathypterois dubius	16	5.5 - 20.3	121 - 75	8.28 E -07	3.29
Bembrops anatirostris	77	1.6 - 225.0	71 - 317	9.64 E -07	3.33
Benthodesmus tenuis	11	0.8 - 49.6	160 - 551	4.84 E -10	4.02
Bregmaceros atlanticus	12	0.3 - 1.3	40 - 68	2.52 E -05	2.54
Caelorinchus caelorhincus	251	3.1 - 110.0	81 - 356	4.24 E -04	2.13
Cealorinchus carribaeus	390	1.9 - 61.5	75 - 262	4.85 E -06	2.90
Chaunax suttkus	119	0.5 - 250.0	7 - 232	7.40 E -05	2.77
Chlorophthalmus agassizi	108	0.7 - 24.3	50 - 170	1.21 E -05	2.82
Coloconger meadi	13	6.5 - 24.7	135 - 265	5.11 E -06	2.91
Cyttopsis roseus	30	8.9 - 8.9	8.9 - 185	8.10 E -06	3.08
Dibranchus atlanticus	128	0.5 - 0.5	37 - 172	9.89 E -06	3.04
Epigonus pandionis	14	2.8 - 125.0	34 - 220	9.18 E -07	3.49
Halosaurus ovenii	12	0.8 - 79.1	117 - 425	6.72 E -12	4.97
Hemanthias aureorubens	19	1.6 - 215.0	48 - 310	3.21 E -06	3.15
Hoplostethus occidentalis	33	2.1 - 47.9	52 - 142	6.80 E -06	3.17
Laemonema goodebeanorum	222	0.4 - 150.0	17 - 285	6.32 E -07	3.14
Lonchopisthus lemur	*65*	0.9 - 10.0	45 - 100	1.24 E -04	2.41
Malacocephalus occidentalis	37	0.64 - 300.0	58 - 424	8.09 E -09	4.02
Myxne mccoskeri	36	5.6 - 32.0	163 - 282	2.07 E -05	2.50
Neobythites gillii	83	1.3 - 20.1	61 - 156	1.18 E -05	2.81
Neobythites bimarginatus	46	1.4 - 27.0	70 - 185	1.98 E -06	3.14
Neoscopelus macrolepidotus	105	0.8 - 22.5	47 - 165	7.42 E -05	2.52
Neoscopelus microchir	16	1.0 - 38.7	48 - 177	2.19 E -05	2.78
Nezumia aequalis	183	0.5 - 35.5	61 - 224	1.78 E -05	2.68
Peristedion gracile	12	3.3 - 27.2	89 - 183	9.84 E -07	3.28
Peristedion greyae	15	18.5 - 59.0	165 - 223	8.26 E -06	2.92
Peristedion miniatum	17	4.1 - 93.5	88 - 260	2.06 E -04	2.36
Physiculus fulvus	14	0.44 - 35.0	5.23 - 82	7.70 E -07	3.54
Poecilopsetta inermis	257	0.9 - 20.0	57 - 145	4.65 E -06	3.04
Polymixia lowei	20	4.7 - 58.9	76 - 178	1.00 E -05	3.02
Polyipnus asteroides	98	0.6 - 9.4	21 - 87	9.80 E -05	2.55
Pontinus longispinis	81	0.3 - 375.0	26 - 300	9.15 E -06	3.08
Pontinus nematophthalmus	29	0.2 - 33.8	23 - 155	9.60 E -06	2.99
Setarches guentheri	19	1.5 - 105.8	55 - 194	2.73 E -06	3.31
Steindachneria argentea	27	5.3 - 225.0	129 - 405	1.28 E -07	3.52
Synagrops bellus	56	0.1 - 125.0	23 - 235	7.45 E -06	3.04
Synagrops microlepis	15	3.2 - 12.8	69 - 109	6.97 E -05	2.59
Synagrops spinosus	13	4.6 - 26.9	78 - 144	2.62 E -06	3.25
Xenomystax congriodes	13	2.3 - 24.3	84 - 430	2.41 E -07	3.04
Zenion hololepis	70	0.5 - 8.4	32 - 86	4.71 E -05	2.72

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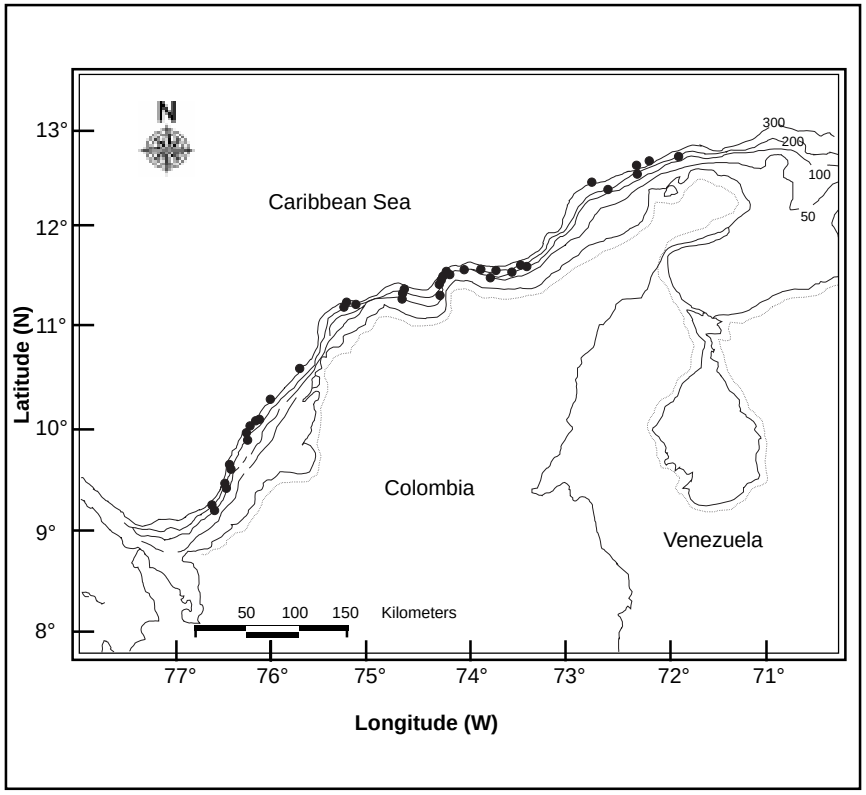

Fig. 1. Location of the sampling stations off the Caribbean coast of Colombia.

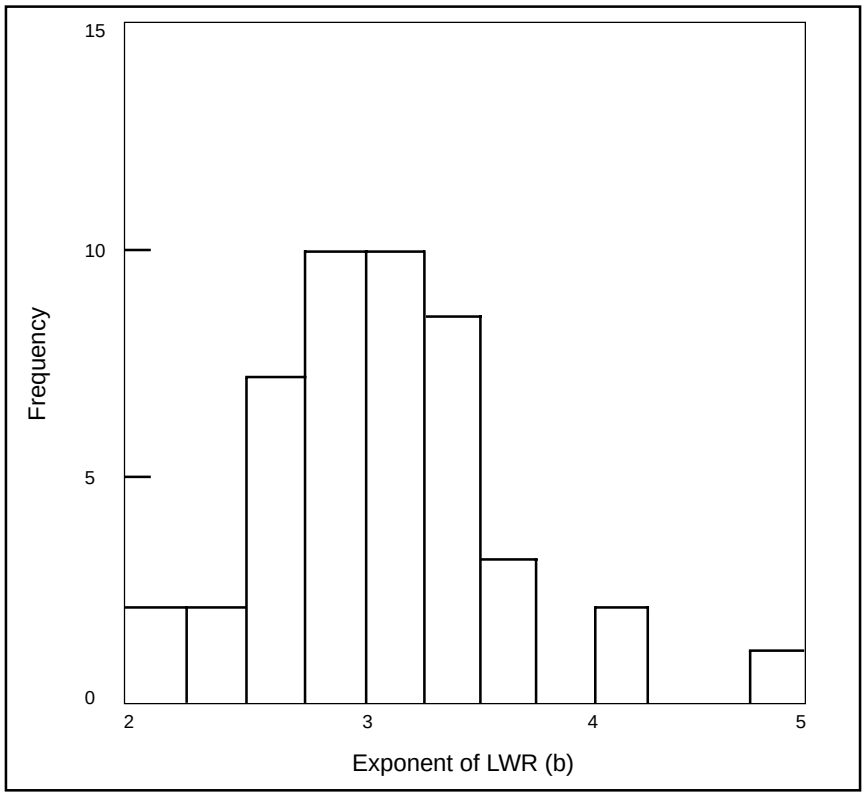

Fig. 2. Frequency distribution of b values for 45 species from the upper continental slope of the Caribbean Sea off Colombia (mean b = 3.042; 95% CI,2.087-3.196).