Length-weight Relationship of Some Marine Fish Species in Réunion Island, Indian Ocean

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Abstract

The length-weight relationship of 29 marine fish species from Réunion Island (SW Indian Ocean) belonging to 14 families were computed. Data from 5 340 individuals were used for this purpose. Fish were sampled using different techniques, mainly with rotenone poisoning on coral reef flats, beach seine and handlines on shallow coastal bays, and longline fishing in the nearby open sea.

Introduction

For the past 10 years, the Laboratoire d'Ecologie Marine at the Université de La Réunion has conducted abundance estimates of coral reef fish in Réunion Island. For most of these studies, underwater visual censuses (UVC) were used to estimate densities of a large spectrum of fish species (Letourneur 1992, 1996a, 1996b; Chabanet 1994). Biomasses were not estimated in these studies due to a lack of length-weight (L-W) data, except in one case on the windward rocky coast (Letourneur 1998). In order to make biomass estimates, it is necessary to know the L-W relationships of the species studied. These relationships are estimated from specimen obtained by experimental fishing in various biotopes.

Although information on L-W relationships are available from other tropical areas, such as New Caledonia where large data sets exist (Kulbicki et al. 1993; Letourneur et al., this vol.), nothing is known on L-W relationships estimated using samples from Réunion Island. The aim of the present work is thus to establish the first length-weight relationships for some marine fish species from this island, and thus to improve the accuracy of biomass estimates from subsequent UVCs.

Materials and Methods

Fish individuals were mainly obtained from catches made during Ph.D. research on coral reef fishes, during which 19 rotenone poisonings were done (Letourneur 1992) from catches of pelagic fishes with longlines in the nearby open ocean (Poisson and Mace 1997) and from catches of semi-pelagic fishes with beach seine and handlines in shallow coastal bays (Roos et al. 1995). Total length (T) in cm was the measure taken for all species, except for two particular cases: fork length (F) was used for the small Carangidae *Selar crumenophthalmus* (Roos et al. 1995), and length between fork and inferior mandibule (maxillar-fork length = MFL) for the swordfish *Xiphias gladius* (Poisson and Mace 1997). For the latter, the weight measured was not the total weight (TW) but the eviscerated weight (EW). However, Poisson and Mace (1997) indicated that EW=0.9 TW.

The sexes were not differentiated here, although we are aware that males and females may have different length-weight relationships.

The parameters **a** and **b** of the L-W relationship of the form:

$$W = a \cdot L^b \qquad ...1)$$

were estimated through logarithmic transformation, i.e.,

$$\ln W = \ln a + b \cdot \ln L \qquad ...2)$$

with **a** and **b** estimated by ordinary least squares regression.

Results and Discussion

The results presented (Table 1) identify species following Letourneur et al. (1998) and are arranged by families according to Eschmeyer (1990). Species within each family are given alphabetically. This data set covers 28 fish species and presents original results for these species in Réunion Island. The case of the 29th species, *Xiphias gladius*, was the following:

$$TW = \frac{(1.753 \cdot 10^{-6} \times (MFL^{3.3433}))}{0.9} \qquad ...3)$$

with N=430 individuals, MFL_{min} = 51 cm, MFL_{max} = 215 cm, and r^2 = 0.959.

Table 1. Parameters of the length-weight relationship for 28 fish species in Réunion Island.

Fish Taxa	a	b	n	r	Length range (cm)	
					L_{min}	L_{max}
Synodontidae						
Saurida gracilis	0.0047	3.216	17	0.996	5.1	18.6
Holocentridae						
Myripristis berndti	0.0168	3.061	50	0.995	4.6	13.8
Sargocentron diadema	0.0117	3.138	296	0.975	5.1	13.5
Sargocentron punctatissimum	0.0141	3.059	126	0.912	4.8	8.5
Alostomidae						
Aulostomus chinensis	0.0001	3.793	40	0.989	15.6	32.7
Scorpaenidae						
Scorpaenodes guamensis	0.0305	2.755	19	0.968	3.2	10.2
Serranidae						
Cephalopholis argus	0.0166	3.015	14	0.982	4.2	18.6
Epinephelus merra	0.0096	3.196	229	0.968	3.9	15.8
Apogonidae						
Apogon kallopterus	0.0074	3.335	45	0.992	3.8	12.6
Carangidae						
Selar crumenophthalmus	0.004	3.259	1 104	0.991	6.7	25.5
Mullidae						
Parupeneus bifasciatus	0.0075	3.205	42	0.990	5.5	11.7
Parupeneus macronema	0.0052	3.381	69	0.986	5.7	12.6
Chaetodontidae						
Chaetodon trifasciatus	0.0387	2.894	80	0.994	2.4	9.7
Pomacentridae						
Dascyllus aruanus	0.0289	3.035	150	0.962	2.3	9.0
Plectroglyphidodon johnstonianus	0.0612	2.635	33	0.906	6.1	8.5
Stegastes limbatus	0.0179	3.126	43	0.996	3.1	15.5
Stegastes lividus	0.0275	2.973	21	0.993	2.4	13.0
Stegastes nigricans	0.0220	3.086	2 140	0.994	0.7	12.6
Labridae						
Cheilinus trilobatus	0.0210	2.972	42	0.990	2.6	13.4
Stethojulis albovittata	0.0128	3.077	38	0.994	3.6	10.6
Thalassoma hardwicke	0.0139	3.048	12	0.996	3.9	9.2
Thalassoma lunare	0.0183	2.862	11	0.933	3.9	7.5
Acanthuridae						
Acanthurus nigrofuscus	0.0089	3.278	140	0.989	5.7	16.5
Ctenochaetus striatus	0.0137	3.083	71	0.983	4.1	16.0
Naso unicornis	0.0328	2.789	12	0.988	6.5	10.8
Zebrasoma scopas	0.0304	2.957	25	0.993	3.1	10.1
Monocanthidae						
Cantherhines pardalis	0.0170	3.070	16	0.988	7.2	12.4
Pervagor janthinosoma	0.0250	2.946	25	0.940	6.5	10.6

The ichthyofauna of Réunion Island includes 915 known fish species, but other species, in particular from deep habitats, probably remain to be sampled (Letourneur et al. 1998). Thus, despite the number of species for which L-W relationships are now available, much still needs to be known, in particular for smaller species and mainly those living on coral reefs. These species are probably not major contributors to total biomass and stocks, but may play a significant role in trophodynamic processes and fish production. Additional sampling is underway to complete this first data set. The current range of the sizes sampled for some species was restricted, mainly due to the fact that most individuals caught on reef flats (Letourneur 1992) were juveniles or young adult stages.

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Length-weight Relationship of Fishes from Coral Reefs and Lagoons of New Caledonia - An Update

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Abstract

Length-weight relationships of 316 reef and lagoon fish from New Caledonia (SW Pacific Ocean) belonging to 68 families are computed. A total of 43 750 individuals was used for this purpose. Fish were sampled by different techniques, such as rotenone poisoning, handline and bottom longline fishing, gill and trammel nets, and trawling in various biotopes (coral reefs, lagoon bottoms and mangroves).

Introduction

For the last 15 years, the ORSTOM Centre of Nouméa has conducted stock estimates of lagoon fish in New Caledonia. For most of these studies, underwater visual censuses (UVC) are used to estimate densities and biomasses of a large spectrum of fish species (Kulbicki 1988, 1997; Letourneur et al. 1997a; Wantiez et al. 1997). In order to make biomass estimates it is necessary to know the length-weight relationships of the species studied. These relationships are estimated from specimens obtained by experimental fishing in various biotopes.

The present work is an update of the work presented by Kulbicki et al. (1993). The previous work on New Caledonian reef and lagoon fish gave length-weight relationships for 279 coral reef and lagoonal species based on data from New Caledonia. This work had also cited literature on relationships for 56 species occurring in New Caledonia but based on data from other Indo-Pacific locations. The present update takes into account 9 300 new specimens (on a total of 43 700 individuals). The aim is both to improve previous length-weight relationships of reef and lagoon fish, and to add relationships for a number of species for which no previous information was available from New Caledonia. Most of this new information comes from the northern lagoons of New Caledonia which had previously never been sampled (Labrose et al. 1996, 1997; Letourneur et al. 1997b), and from studies on juvenile fishes (Rossier and Kulbicki, unpublished data).