Growth, Mortality and Recruitment of Short-Wing Flying Fish *Oxyphorhampus micropterus* in Bohol Sea, Philippines*

NEUYEDA C. YACAPIN
Department of Agriculture - Region 10
Cagayan de Oro
Philippines

Abstract

The von Bertalanffy growth parameters (L_∞ and K) were estimated, based on length-frequency data from the small-scale fishery, and the Compleat ELEFAN software, for short-wing flying fish *Oxyphorhampus micropterus* (Hemiramphidae) in the Bohol Sea, central Philippines. Related estimates (Z, M, F, mean length at first capture) are also presented. Also, it is shown that the annual recruitment to this stock is strongly bimodal.

Introduction

The short-wing flying fish *Oxyphorhampus micropterus* (Hemiramphidae), locally known as "laniw", is one of the most important fishes for the municipal (small-scale) fisheries in the Bohol Sea, central Philippines. Its fishery in the 1930s has been described by Martin (1938). However, very little is known on the fishery as it presently operates, or on its biology, as needed for the rational exploitation of this resource.

Oxyphorhampus micropterus (Fig. 1) is an abundant offshore species caught year-round using drive-in net in the waters of Bohol Sea (Fig. 2). The adults inhabit the surface waters, while the early juvenile stages are reported to be demersal.

Oxyporhamphus micropterus

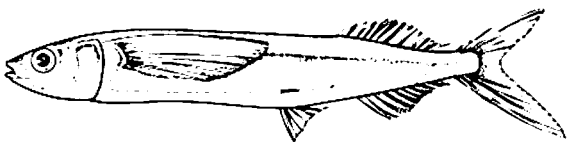

Fig. 1. The short-wing flyingfish *Oxyphorhampus micropterus*.

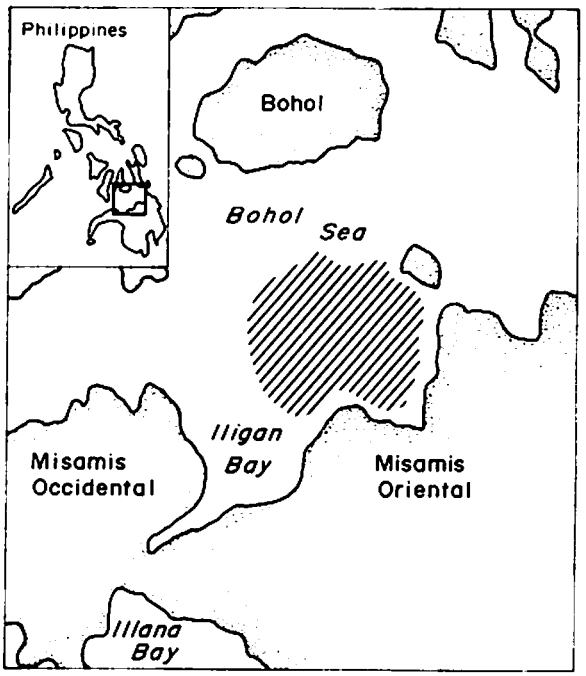

Fig. 2. Map showing the location of *O. micropterus* fishing grounds in central Philippines.

Materials and Methods

The length-frequency (L/F) data used for this study were obtained from the landings of drive-in netters at Initao, Misamis Oriental, from 1984 to 1987 (Table 1). Data collection was done ten times a month through random sampling. The L/F data were arranged in 1-cm class intervals on a monthly basis and pooled to form a single "artificial year".

All data manipulations and analyses were done using the Compleat ELEFAN software package of Gayanilo et al. (1989), and followed the standard format for such analyses.

Results and Discussion

The modified Wetherall plot (Wetherall 1986), incorporated in the Compleat ELEFAN yielded the regression line $Y = 3.55 - 0.155\ X$ ($r = -0.933$), from which $L_\infty = 22.9$ cm and $Z/K = 5.46$ can be estimated [Note that the three last points of the plot in Fig.3B had little influence on the results because the points used are weighted by the cumulative number of fishes they represent].

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Table 1. Length-frequency data of *O. micropterus* from the Bohol Sea, caught by drive-in net, 1984-1987 (N = 11,475).

	1984				1985					1986											1987								
Date\ Length	3	6	8	9	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	12	3	5	6	7	8	9	10	11	12
9	-	-	-	-	5	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	10	6	-	2	-	-	-	-	2	4	1	2	-	-	2	2	-	-	1	-	-	-	-	-	-
11	1	-	-	-	5	7	1	5	-	-	-	-	5	10	11	16	1	2	3	4	-	-	6	2	5	11	13	-	-
12	-	2	3	2	12	14	1	8	3	4	-	3	1	16	19	28	3	8	13	23	-	-	32	3	24	0	13	28	24
13	-	4	10	0	16	22	2	9	13	11	-	0	5	24	29	77	5	6	8	57	-	-	56	9	46	39	39	60	99
14	-	4	12	8	24	18	11	12	14	0	-	0	1	20	71	88	10	9	20	76	2	-	105	10	101	0	51	84	25
15	-	17	19	12	52	46	31	28	17	18	2	1	3	20	121	169	31	22	34	93	4	1	66	20	102	6	129	120	64
16	-	46	14	14	96	102	54	48	11	22	14	5	13	35	166	174	72	51	55	57	4	6	100	26	137	71	299	315	123
17	-	58	16	18	126	133	44	58	16	24	22	17	29	51	115	133	96	72	74	50	2	14	108	82	170	157	573	535	322
18	-	36	3	5	67	40	9	23	6	10	-	5	15	25	83	56	34	26	40	44	9	24	104	60	187	173	239	279	346
19	-	13	-	-	126	12	2	9	-	4	3	-	7	2	29	14	8	9	13	10	9	2	78	35	115	66	126	107	135
20	-	0	-	-	20	1	3	1	-	-	-	-	-	-	5	1	1	-	3	6	4	2	34	14	34	18	32	3	32
21	-	1	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	1	0	-	-	-
22	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-	-	-
Sum	1	181	77	59	562	404	158	203	80	93	41	31	81	207	650	758	261	205	265	423	34	49	690	262	924	549	1514	1531	1170

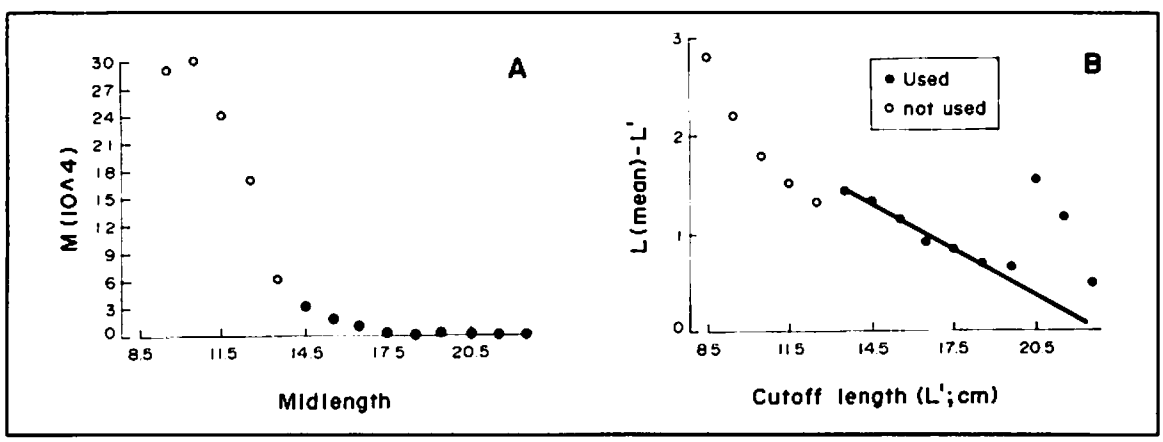

Fig. 3. Wetherall plot for estimating L_∞ and K from length-frequency data in *Oxyphorhamphus micropterus*, Bohol Sea, 1984-1987. A: cumulated data, without transformation, used to select the points for the plot; B: Wetherall plot proper (see text for comments on outliers).

Subsequent analysis of the L/F data using ELEFAN I yielded L_∞ = 23 cm and K = 1 year^{-1}; the corresponding growth curve is shown on Fig. 4, superimposed on the restructured data [a secondary growth curve was added to account for the bimodal pattern of recruitment, see below].

The estimate of L_∞ = 23 obtained here is higher than the maximum size reported in Collette (1986), but corresponds exactly to the maximum size in Table 1.

Fig. 5 presents a length-converted catch curve for *O. micropterus* in the Bohol Sea, and (inset) the resultant curve derived from the left, ascending side of the catch curve. The corresponding parameter estimates are: Z = 6.96 year^{-1}, M = 1.92 year^{-1}, F = 5.04 year^{-1}, E = F/Z = 0.72 and $L_{50} \approx$ 10 cm. This preliminary analysis suggests that *O. micropterus*, in the Bohol Sea, suffers excessive fishing mortality.

Fig. 6 shows the seasonal structure of recruitment in *O. micropterus* from the Bohol Sea. As might be

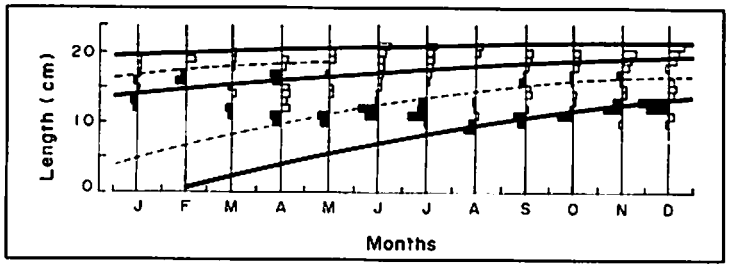

Fig. 4, Restructured length-frequency data for *Oxyphorhampus micropterus* from Bohol Sea, 1984-1987 with superimposed growth curve estimated by ELEFAN I (L_{∞} = 23 and K = 1.0 year^{-1}); dotted line indicates cohort resulting from minor recruitment pulse (see also Fig. 6).

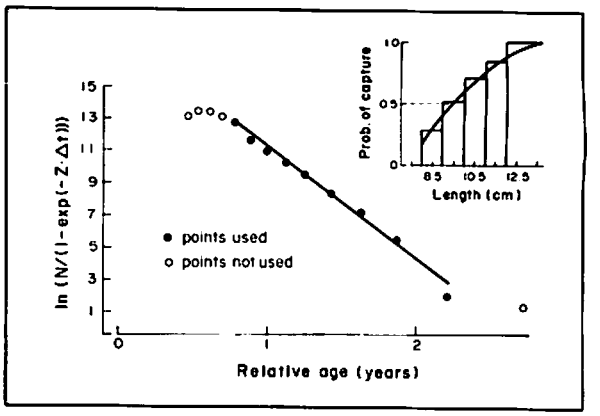

Fig. 5. Catch curve (and selection curve, inset) of *Oxyphorhampus micropterus* from Bohol Sea, 1984-1987, leading to Z ≈ 7 year^{-1} (and L_{50} ≈ 10 cm).

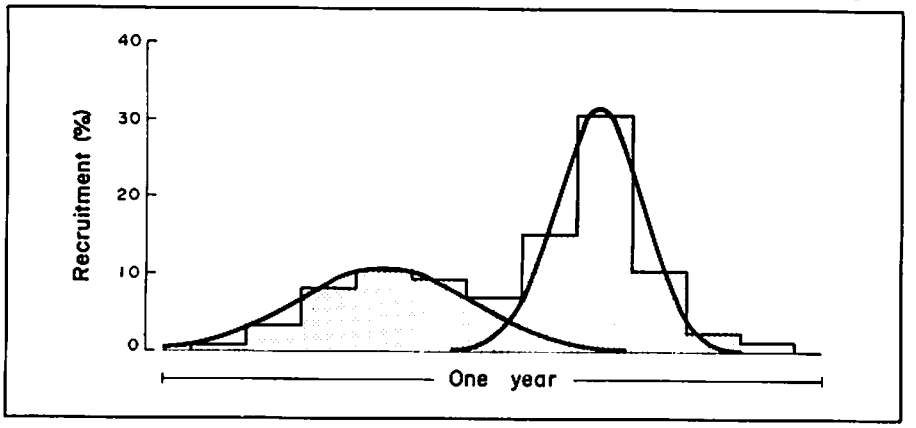

Fig. 6. Recruitment pattern of *Oxyphorhampus micropterus* in Bohol Sea, central Philippines.

seen, two cohorts are produced per year (see also Fig. 4), as also reported from Caribbean flying fishes (Storey 1983; Mahon et al. 1985).

The results of this study, apparently the first ever on the growth and related vital statistics of *O. micropterus*, are tentative[a]. Particularly, it would be useful to verify the (relative) ages implied by the growth curve presented here, using, e.g., daily otolith rings (Brothers 1980).

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[a]Editor's note:

Mr. P. Dalzell (South Pacific Commision, Nouméa) who is presently analyzing his own L/F data on Philippine flying fish feels that their lifespan is shorter than suggested in this contribution, implying values of K ranging from 1.5 - 2.5 year^{-1}. This is not supported by the data on Table 1, but maybe due to the lack of small fish. Hence the results presented herein must indeed be considered as very tentative.