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POPULATION DYNAMICS AND STOCK ASSESSMENT OF KOTH (*OTOLITHOIDES BIAURITUS*, CANTOR, 1850) ALONG THE NORTH-WEST COAST OF INDIA

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ABSTRACT

MSY, growth, selection and mortality parameters of *Otolithoides biauritus* have been worked out from data collected by *MFV Saraswati* of CIFE, and length frequency data from Ferry Wharf, Sasson dock, and Versova fish landing centres of Bombay. Values of $L\infty$, K, and t_o obtained from lenght frequency study are 1572mm, 0.2633/yr and 0.0289 yr respectively, and of weight growth parameters are $W\infty$ = 10067g, K= 0.03904/yr and t_o = 0.0137yr. Selection parameters are L_r + 150mm, t_r + 0.4167 yr lc + 240mm and t_c = 0.6367yr. Selection factor (K) for codend worked out to be 12. Based on Z=0.6486, the MSY of *Otolithoides biauritus* off northwest coast of India is assessed as 1,802 tons which is slightly higher than the current catch level of 1,634 tons.

INTRODUCTION

Otolithoides biauritus which is one of the important species of sciaenids, locally called as 'Koth' contribute about 3% of the sciaenid landing. In fishmarkets, Koth is generally sold in fresh condition without processing. It fetches higher price than all other species of Sciaenids except 'Ghol' *(Pseudosciaena diacanthus)*. Although some basic aspects of its taxonomy and biology have been studied by early workers, such as Kutty (1967) on the biology, Jayaprakash (1973, 1974 & 1976) on vertebrae, food and feeding habit and age and growth of Koth, studies on population biology, which is so much required for the management of the fishery resources of this species is very limited. The present studies deal with the aspects of stock assessment of this species off northwest coast of India.

MATERIAL AND METHODS

The length frequency data of 2,072 specimens of *Otolithoides biauritus* recorded at weekly intervals from Ferry Wharf, Sasson dock and Versova landing centres of Bombay, beside data collected from *MFV Saraswati* while on cruises, during the year 1987 - 1988 also have been utilised for this paper.

Age has been determined following Devaraj (1983) by tracing the modal progression of monthly length frequency scatter diagram. The empirical age-weight relationships were estimated by employing von Bertalanffy Growth Function (VBGF), converting length to weight from length relation. The total of mortality co-efficient (Z) was estimated from age composition data following Jackson (1939) and also applying Beverton and Holt (1956) method as supportive estimates to have better 'Z'. The natural mortality co-efficient (M) was estimated following the empirical equation of Pauly (1980). Yield/recruit was estimated by using the incomplete beta function yield tables (Beverton and Holt, 1966). Since the entries in the table are independent of units of yields and numbers, E, C and M/K were estimated for the equation (i) following Gulland's computational procedure. Rafail's iterative equation (1973) also was applied to have better L-C value.

The quantity of Y/R computed in the tables was converted into grams/recruit at age "t_r" by using the formula

$$\frac{RoW}{R} = W\infty \; e^{M(t_r - t_o)} = \frac{W\infty}{\left(\frac{1 - L_r}{Lc}\right)^{M/K}} \quad ---(1)$$

The parameters 'E', 'C' and 'M/K' (ratio of co-efficients determining the relative rate of natural change in numbers and length with age) of age yields equation are purely algebric and have functional interpretations.

The optimum age of exploitation (t_y) and potential yield perrecruit (Y) were estimated according to Kutty and Quasim, (1968). The age at recruitment (t_r) and age at first capture (t_c) were determined arbitarily from annual length frequency polygons for commercial and exploratory catches.

For the inshore fishery (in the 0 to 50m deep grounds) operating on inshore section of total stock, the annual yield data (Y) was used for the estimation of (1) total stock P (P=Y/E where E=F/Z), (2) recruits, (R_c) at t_c (R_c=Y+Y/R), (3) Mean number YN (YN = R_c X YN/R) as postulated by Beverton and Holt (1957). The maximum sustainable yield (MSY) for the inshore ground was computed by calibrating the current catch on to the Y/R curve. Length cohort analysis was performed as per Jones (1984).

The yield per recruit (Y/R) as function of fishing mortality co- efficient (F) was estimated as per the analytical model of Beverton and Holt (1957).

The sample frequencies were raised to total catches for the year ended 1987-1988 and average number caught in each clases was used for mortality analysis.

RESULTS AND DISCUSSIONS

The length frequency plot (Fig.1) reveals appearance of three main broods in January-February, June-July and September-October in a year. There is not much variation in the origin of broods during the successive years. This fish attains a length of 353mm in the first year, 646mm in the second year and 790mm in the third year of its life (Fig.2). The maximum size was 806mm.

Length growth parameters have been estimated to be L = 1572 mm, K = 0.2633/yr t_o = 0.0289 yr. Weight growth parameters have been found to be W = 10067 g, K = 0.3904/yr, t_o = 0.0137 yr while, application of Rafail's iterative equation (1973) for better L and K values indicated L and K values to be 1533,173mm and 0.27876/yr respectively, which are very close to values obtained by VBGE.

Length at recruitment (L_r) and length at first capture (L_c) have been worked out to be 150mm, and 240mm respectively, corresponding to 0.4167 year and 0.6367 year (Fig.3)

The selection factor (K) for trawl codend mesh (m=20 to 30mm streched kont to knot in most commercial trawlers) has been estimated to be 12 (K=240/20=12), the optimum age of exploitation and potential Yield/Recruit (Y/R) were estimated to be 3.24yr and 2206g respectively.

The Yield/Recruit (Y/R) atains a maximum of 698.4g at F=0.411 for the present t_c of 0.6367yr (keeping t_c constant) (Fig.4) while optimum Yield/Recruit (Y/R) found to be 1178g at corresponding L_c=1132mm (keeping F constant) above F as depicted in Fig.5.

The maximum catch exploited from the NW coast inshore grounds (Gujarat and Maharashtra), during the period 1987-1988 belonged to 45.0 to 48.0cm length group which constituted 14.55% (111.019 tons) to annual catch of 765.385 tons. Length cohort analysis for year 1987-1988 reveals that the group 45.0 to 48.0cm suffered the maximum fishing mortality (F=3.9911) and the maximum exploitation ratio (F/Z=0.9068) (Table1).

The natural mortality rate (M) obtained by Pauly's empirical equation (1986) at a mean temperature of 27.5° C gave annual m=0.41029, fishing mortality (F) was estimated as 0.2384, hence F/Z=0.3676

Four broods were found each year, three

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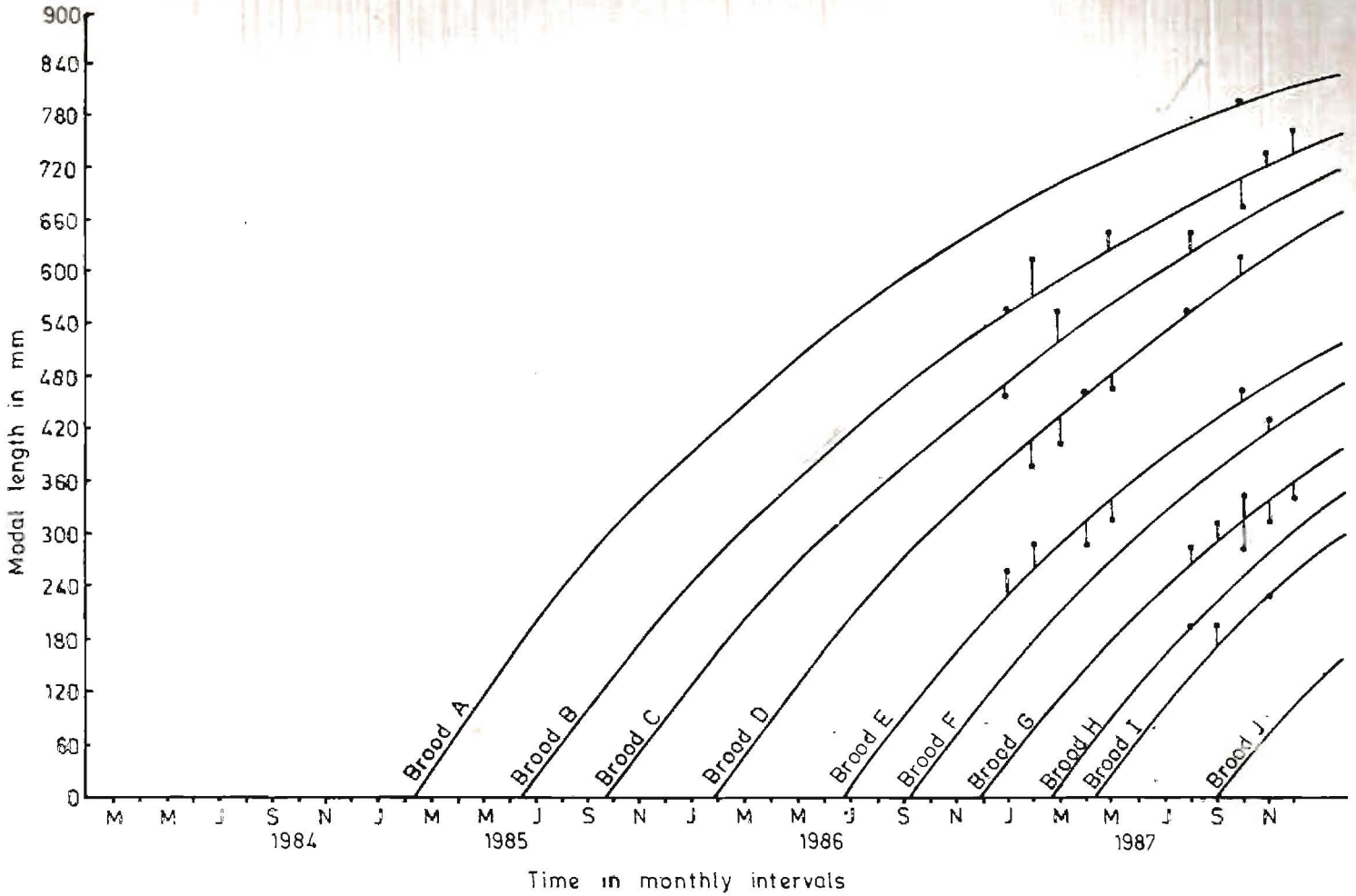

Fig. 1 : *Growth of individual broods on the basis of the modes in the length frequency distribution for successive months.*

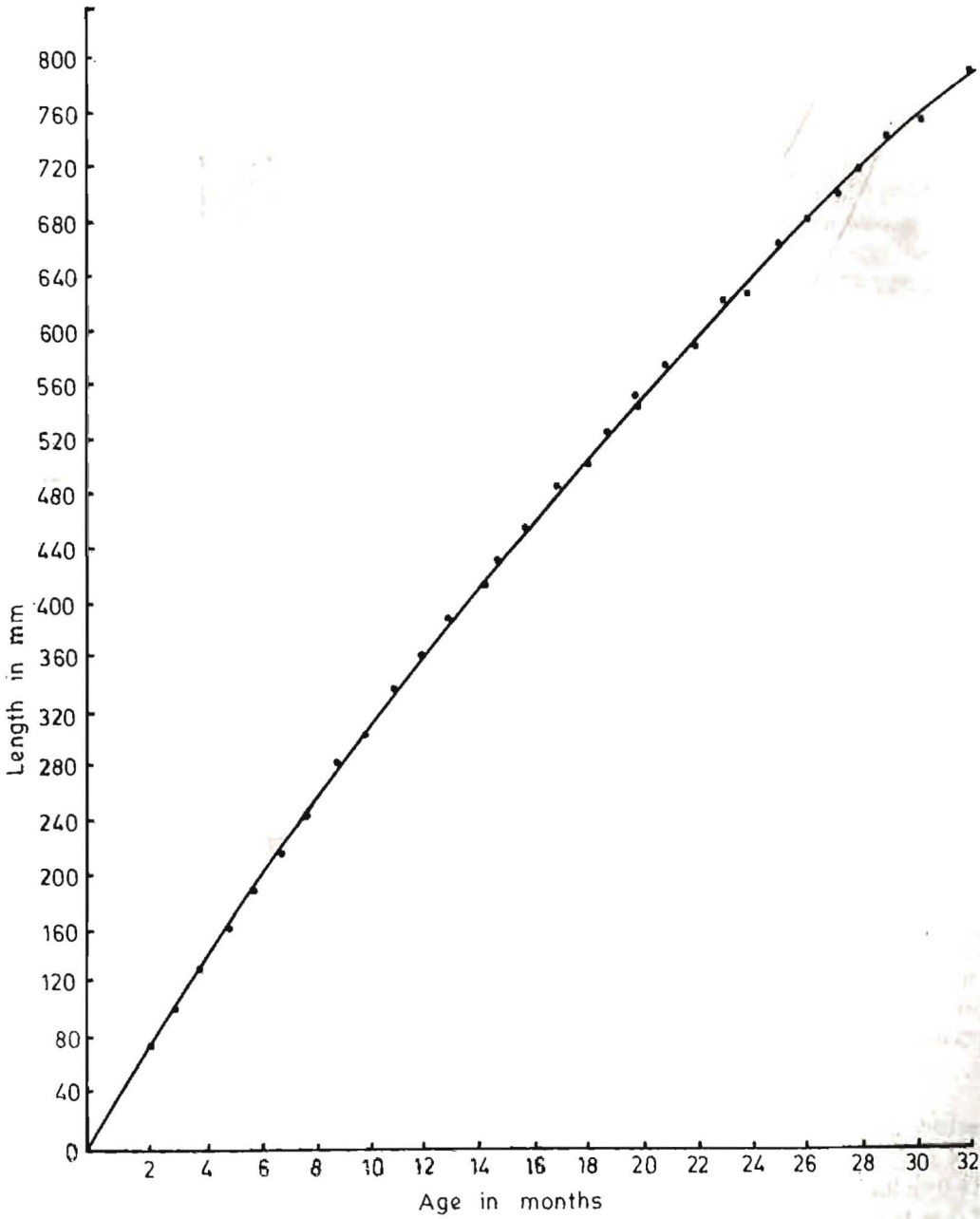

Fig. 2 : *Growth curve indicating the mean length at successive age in month.*

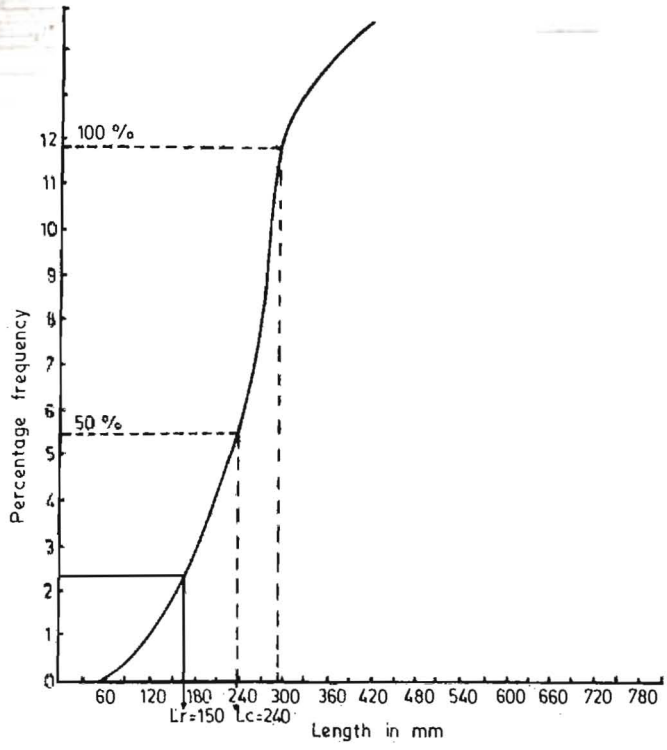

Fig. 3 : *Determination of the length at recruitment (L_r) and the length at first capture (L_c) from symmetrical' O give' curve.*

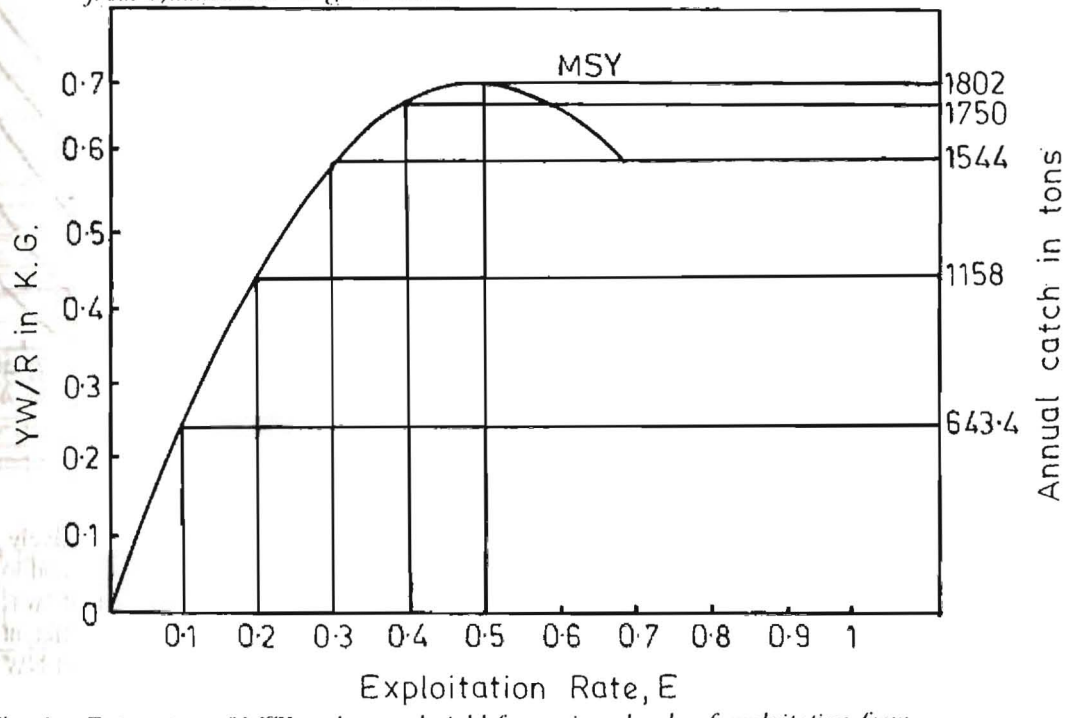

Fig. 4 : *Estimation of MSY and annual yield for various levels of exploitation from current yield and exploitation for the Northwest coast.*

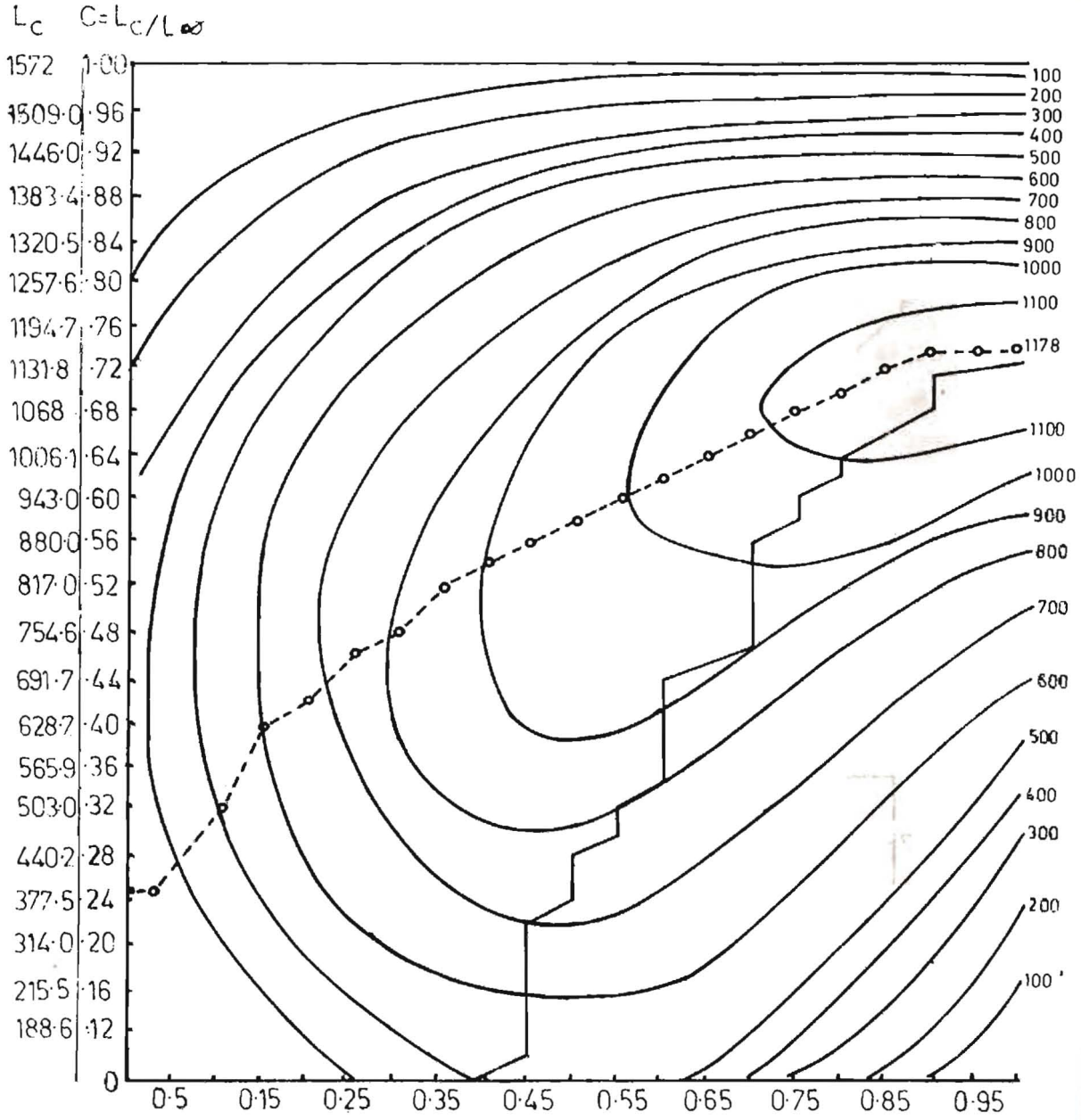

Fig. 5 : *Yield isopleth diagram depicting Y/R as function of length at first capture (L_c) and exploitation ratio (E)*

main broods and one auxillary brood. On the basis of the growth in length sutdy it has been observed that it grows 353mm, 646mm, and 848mm in the first, second and third year respectively. The maximum size specimen (798mm) sampled was 3yrs old. Length at infinity (L_1) and corresponding weight worked out to be 1573.8mm and 10067g respectively. Growth co-efficient K for weight was found to be 0.39039/yr and corresponding length was found to be 0.26234/yr. Growth co-efficient value shows that growth of *O.biauritus* off NW coast of India is not fast except in the first two years.

Table I. : *Length Cohort analysis of the Koth, Otolithoides biauritus, caught off North-west Coast*

Length group (cm)	Number caught (in 000)	Exploitation ratio (F/Z)	Total mortality	Catch landed (tons)	Biomass (tons)
6.0-09.0	745.00	---------	---------	---------	---------
9.0-12.0	---------	---------	---------	---------	---------
12.0-15.0	---------	---------	---------	---------	---------
15.0-18.0	9,687	0.1242	0.4684	0.421	91.439
18.0-21.0	45,453	0.4053	0.6898	3.079	137.014
21.0-24.0	29,060	0.3113	0.5956	2.901	190.765
24.0-27.0	50,669	0.4492	0.7447	7.048	252.750
27.0-30.0	1,11,770	0.6556	1.1910	20.879	318.378
30.0-33.0	1,87,774	0.7819	1.8942	46.305	373.660
33.0-36.0	1,63,920	0.7839	1.8982	50.802	400.943
36.0-39.0	1,38,595	0.7820	1.8812	53.580	419.320
39.0-42.0	1,91,499	0.8588	2.9051	90.790	430.210
42.0-45.0	1,75,597	0.8808	3.4413	101.172	392.118
45.0-48.0	1,61,694	0.9608	4.4013	111.019	330.070
48.0-51.0	97,612	0.8998	4.0938	78.764	246.630
51.0-54.0	53,650	0.8787	3.3819	50.586	185.912
54.0-57.0	3,88,447	0.8811	3.4502	42.331	148.710
57.0-60.0	16,393	0.8091	4.6485	20.541	115.747
60.0-63.0	20,886	0.3831	0.6649	2.865	98.706
63.0-66.0	19,373	0.8744	3.2662	31.522	108.103
66.0-69.0	1,88,412	0.8761	3.3103	24.617	81.279
69.0-72.0	2,235	0.6032	1.0338	4.604	59.677
72.0-75.0	5,961	0.8315	2.4346	13.714	58.134
75.0-78.0	2,980	0.7619	1.7233	7.622	46.288
78.0-81.0	5,216	0.3676	0.6446	0.145	40.179

Annual fishing mortality (F=0.2384) is comparatively low since annual natural mortality and total mortality were found to be 0.41034 and 0.6986 respectively. According to Beverton and Holt (1956), Z=1.982933.

The optimum age of exploitation was 3.24yr; at this optimum age of exploitation and fishing mortality at highest rate of exploitation (E=1) the potential Yield/Recruit was found to be 1178g (Fig.5) which is not very close to the potential Yield/Recruit (2206.3g) following Kutty and Quasim (1968), hence yet to be increased by undertaking management measures an intermediate yield of these two yields should be taken.

The stock of *O.biauritus* along the NW coast of India is 4416 tons, present yield from this stock along the NW coast is 1634 tons and average annual yield of the fish along the NW coast of India at an exploitation rate of 0.37 is close to its maximum sustainable yield of 1,802 tons. Scope for increasing efforts for more exploitation of this species is very less.

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