

THE SCIAENID FISHERY AND SOME BIOLOGICAL ASPECTS OF
JOHNIUS CARUTTA FROM MADRAS

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ABSTRACT

The annual fluctuations in the sciaenid fish landings from mechanised trawlers in Madras during 1980-1984 are related to the effort. The maximum landings is during January. The dominant species *Johnius carutta*, matures at 140 mm total length and the major spawning season is June - July. The length-weight relationship can be described by the equation $\log W = -4.4063 + 2.7990 \log L$. The von Bertalanffy parameters of growth are estimated as $K = 0.726$; $t_0 = 0.281$ and $L_\infty = 259$ mm.

INTRODUCTION

SCIAENIDS form one of the major constituents of trawl catch in Madras Coast (6.5% of total trawl catch during 1981-'82) (Anon., 1983). Of the 16 species that contribute the fishery, *Johnius carutta* (Bloch) is the dominant species. As there is no publication so far either on fishery or on biological aspects of sciaenid *J. carutta* of Madras Coast, the present study is on these two aspects of this economically important group. I am thankful to Dr. T. Appa Rao of C.M.F.R.I. for valuable suggestions.

MATERIAL AND METHODS

Data on catch and effort of commercial trawlers operating from Kasimedu landing centre in Madras were recorded twice a week and weighted for monthly values. For biological studies also, samples were collected twice a week. Length data obtained on each observation day were raised to day's catch and these data were further raised to get monthly length composition of the catch.

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The parameters of growth were estimated using the von Bertalanffy equation :

$$l_t = L_\infty [1 - e^{-K(t-t_0)}]$$

where L_∞ is the asymptotic length ; K the growth coefficient ; t_0 the theoretical age when length is zero and l_t the length at age t . The L_∞ was estimated from the Ford-Walford plot (Ford, 1933 ; Walford, 1946) of l_{t+1} against l_t on the basis of lengths attained at intervals of 3 months.

FISHERY

The estimated catch and catch rates of sciaenids during the period 1980-1984 are given in Table I. The catch and catch rates increased substantially from 98,867 kg and 6.8 kg/unit in 1980 to 3,01,281 kg and 13.4 kg/unit in 1981. The catch increased further to 4,26,472 kg in 1982, but in the subsequent years there was slight decline in the sciaenid catch. The increase in the catches during 1981 and 1982 and subsequent decrease during 1983 and 1984 seem to be related to the effort employed during these years. The estimated effort increased from 14,585 units in 1980 to 22,435 units in 1981 and further

TABLE 1. Estimated effort (number of units), catch (kg) and catch rates (kg/unit) of sciaenids at Madras during 1980-1984

Year	Effort	Catch	Catch rate	% of <i>J. carutta</i> in sciaenid catch
1980	14585	98867	6.8	16.5
1981	22435	301281	13.4	13.6
1982	35823	426472	11.9	27.1
1983	30046	365390	12.2	32.5
1984	31578	397433	12.6	23.9
Average	26893	317889	11.8	24.4

increased to 35,823 units in 1982; in the subsequent years, the effort decreased marginally.

The contribution of *J. carutta* to the total sciaenid landings fluctuated from year to year and the average contribution was 24.4% (Table 1).

To understand seasonal variations in catches, the data obtained on monthwise sciaenid and *J. carutta* catches during the period 1980-1984 were pooled for respective months and the monthly percentage of sciaenids and *J. carutta* in the respective annual average landings is plotted in Fig. 1. The monsoon and post-monsoon months from November to February recorded maximum sciaenid landings with a peak in January (14.8% of annual average sciaenid catch). Similarly, the landings of *J. carutta* was maximum in January (18% of annual average *J. carutta* catch).

BIOLOGY

Length at first maturity

Only females whose ovaries were in Stages III and above were taken into consideration to study the length at first maturity. A total of

245 females were examined. The specimens were sorted into 10 mm length group and percentage of mature females in each length group was estimated. Fishes above 120 mm had mature ovaries and 50% of the fishes were mature at 140 mm (Fig. 2), which may be considered as length at first maturity of female *J. carutta*.

Period of spawning

For determining the spawning period, only females above length at first maturity (140 mm) were taken into consideration. Number of mature females (Stages V and VI) pertaining to corresponding months of each year were pooled and the monthly percentage frequency distribution plotted in Fig. 3. Though mature females were observed during 8 months in a year, maximum percentage of mature females occurred during June (30.0%) and July (31.4%) and hence, these two months may be considered as the period of spawning of *J. carutta* off Madras. Based on a study of ova-diameter frequency, Rao (1967) considered January-April as the spawning season of *J. carutta* off Visakhapatnam. It appears that the spawning season in this species varies from place to place.

Length-weight relationship

The study was based on 253 females ranging in total length from 109 to 210 mm and 213 males ranging from 108 to 218 mm collected during 1982 and 1983. The relationship was calculated for the sexes by the method of least squares, using the formula $\log W = \log a + b \log L$, where, W=weight in g, L=total length in mm and a and b are constants. The regression equations for both the sexes are:

$$\text{Female : } \log W = -4.5278 + 2.8559 \log L$$

$$\text{Male : } \log W = -4.2969 + 2.7501 \log L$$

The significance of difference between the regression coefficients between sexes were tested by Analysis of Covariance following Snedecor

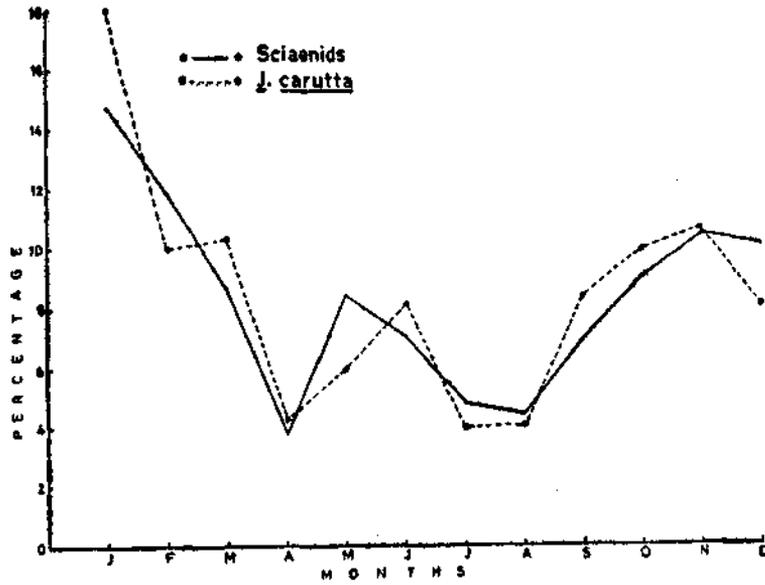


Fig. 1. Monthly percentage of scjaenids and *J. carutta* in the respective annual catches ; the data are pooled for the years 1980-1984.

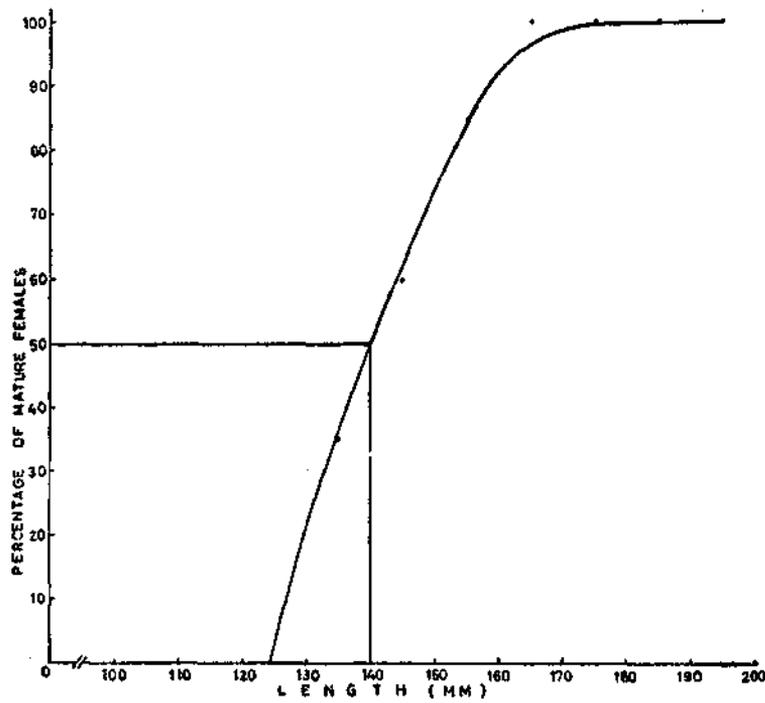


Fig. 2. Percentage frequency distribution of mature females of *J. carutta* in different length groups.

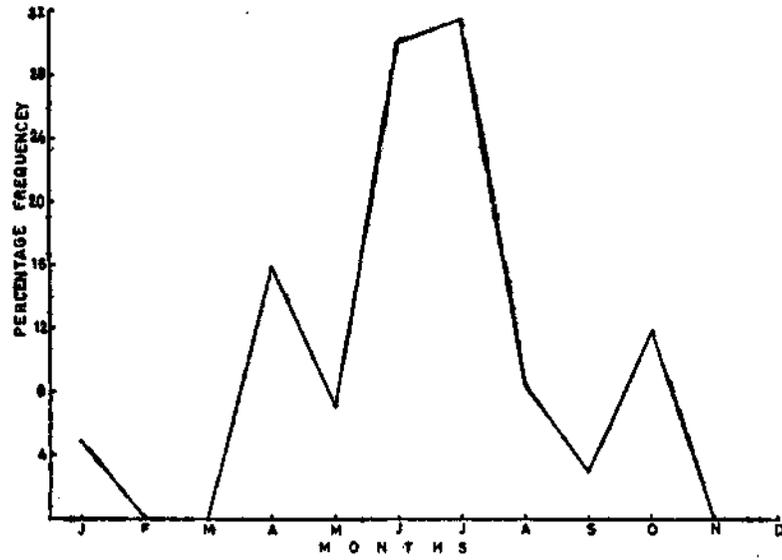


Fig. 3. Percentage frequency distribution of gravid and ripe (Stages V and VI) females of *J. carutta* in different months.

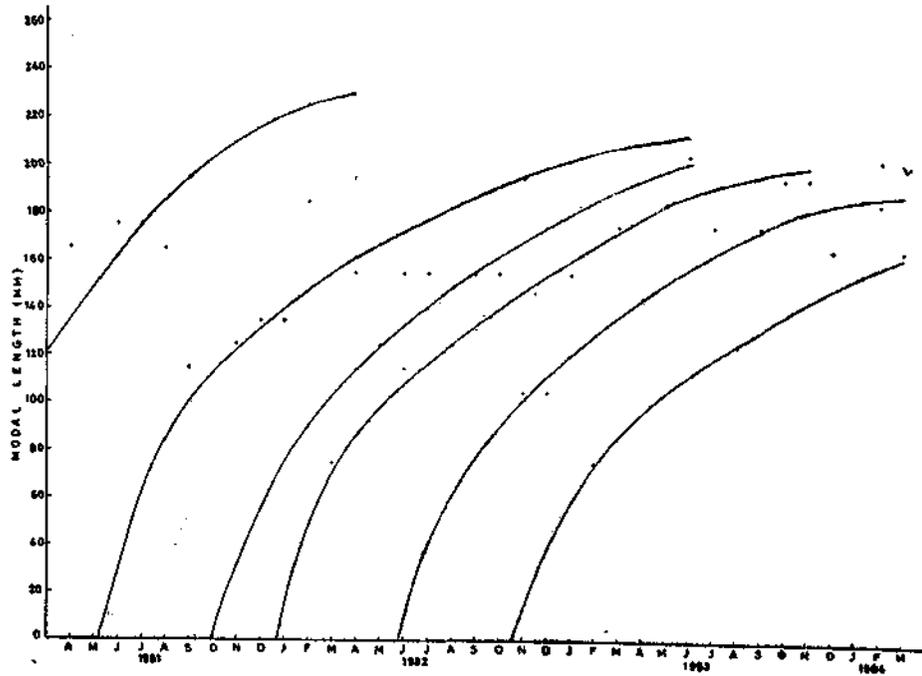


TABLE 2. Comparison of regression lines of length-weight relationship of males and females of *J. carutta* from Madras

	df	Σx^2	Σxy	Σy^2	Regression coefficient	df	Deviation from regression SS	MS
Within :								
Female	252	0.8550	2.4418	7.4228	2.8559	251	0.4492477	0.0017898
Male	212	0.9944	2.7347	8.7531	2.7501	211	1.2324000	0.0058408
						462	1.6816477	0.0036399
Pooled	464	1.8494	5.1765	16.1759	2.7990	463	1.6867942	0.0036432
					Difference between slopes	1	0.0051465	0.0051465

$F = 1.4139125$; $df = 1, 462$; not significant at 5% level.

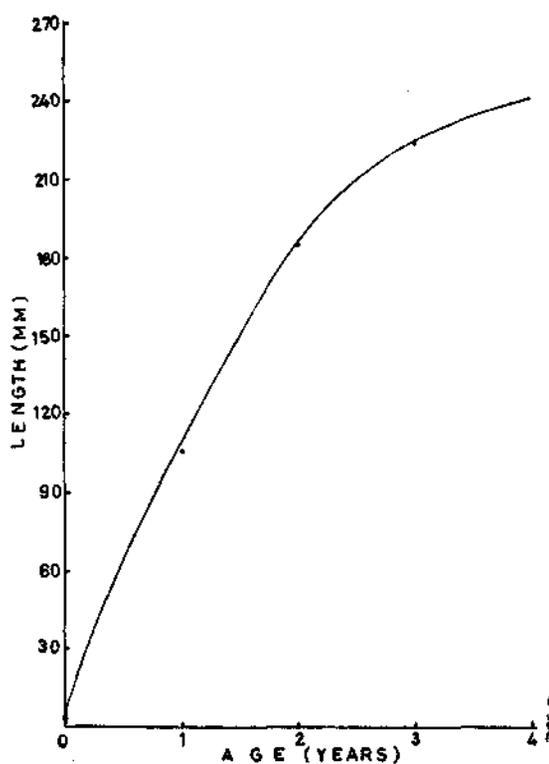


Fig. 5. von Bertalanffy growth curve for *J. carutta*.

and Cochran (1967). The difference was not significant at 5% level (Table 2). Therefore,

a common relationship was obtained by pooling all data:

$$\log W = -4.4063 + 2.7990 \log L.$$

Rao (1983) also did not find significant difference between the regression coefficients between sexes of *J. carutta* collected off Andhra/Orissa Coast.

Growth

A total of 1,119 specimens of *J. carutta* of the length range 55-258 mm were measured during the period April, 1981-March, 1984 and the modes in the length frequency distribution of each month were plotted (Fig. 4). By connecting the maximum number of modes, it was possible to obtain 6 growth curves from the available data. The lengths attained at quarterly intervals read off from each curve (starting from the minimum modal length) were used to estimate the von Bertalanffy parameters of growth.

The values of K , t_0 and L_∞ thus estimated were 0.726, 0.281 and 259 mm respectively. The lengths are 105, 185 and 223 mm at the completion of 1, 2 and 3 years respectively (Fig. 5). The K value obtained in the present study is within the range of values (0.21-1.01) reported for different species of sciaenids from Indian waters (Pauly, 1980).

REFERENCES

- ANON. 1983. Trends in marine fish production in India — 1982-83. *Mar. Fish. Infor. Serv. T & E Ser.* 52 : 20 pp.
- FORD, E. 1933. An account of the herring investigations conducted at Plymouth during the years 1924 - 1933. *J. Mar. Biol. Ass. U.K.*, 19 : 305-384.
- PAULY, D. 1980. A selection of simple methods for the assessment of tropical fish stocks. *FAO Fish. Circ.*, 729 : 54 pp.
- RAO, T. A. 1967. Maturity and spawning habits of sciaenids in offshore waters at Visakhapatnam. *Indian J. Fish.*, 11 : 121-126 (1964).
- 1983. Length-weight relationship in *Pennahia macrophthalmus* (Bleeker) and *Johnius carutta* (Bloch). *Ibid.*, 29 : 263-266 (1982).
- SNEDECOR, G. W. AND W. G. COCHRAN 1967. *Statistical Methods*. Oxford and IBH Publishing Co., New Delhi, Sixth Edition, 593 pp.
- WALFORD, L. A. 1946. A new graphic method of describing the growth of animals. *Biol. Bull. Woods Hole*, 90 : 141-147.