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STOCK ASSESSMENT OF SIN CROAKER *JOHNIEOPS SINA* (CUVIER) FROM BOMBAY WATERS

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ABSTRACT

Growth, mortality and stock parameters of *Johnieops sina* (Cuvier) based on the data collected from 1989 to 1994 from Sassoon Dock and New Ferry Wharf landing centres of Greater Bombay has been discussed here. The von Bertallanffy's growth parameters for this species were estimated as follows, L_∞ = 266 mm, K = 0.91 per year and W_∞ = 193 g. This species grows to 159 and 223 mm at the end of first and second year of its life. The mortality parameters estimated were Z = 6.17, M = 2.03 and F = 4.14. The E and U were calculated as 0.62 and 0.63 respectively. Length cohort and Thompson Bell analyses show that there is no decline in the catches at the present level of fishing. But even by doubling the efforts the catches can go up by only 9.4 % indicating that the fishing efforts is not economical and proportional to the increase in yield.

INTRODUCTION

Sciaenids are one of the chief constituents of the commercial trawlers of Mumbai. The annual average of all India catch of this resource for the period 1985-92 stood at 1,06,753 tons while the annual average catch of Maharashtra for the same period was 22,781 tons. Maharashtra contributed 21.34 % to the total sciaenid catch of India. Croakers contributed 5.04% to the total catch at the all India level. The chief maritime states of India contributing to the sciaenid catches in order of abundance are Gujarat, Maharashtra, Tamil Nadu, Andhra Pradesh and Kerala.

Among the landing of shrimp trawlers at Mumbai, sciaenids locally known as dhoma is represented in fairly good quantities. Lesser sciaenids growing upto a size of 240-380 mm are represented by a dozen species out of which at any given time five species are represented in the catch in substantial quantity. The bigger sciaenids are represented by two species *viz Nibia diacanthus* and *Scianoides brunneus*. These two species grow to about one and half metre.

A number of workers have contributed to the studies on growth and population dynamics of sciaenids. Some of the important reports for Maharashtra coast are Rao (1966,

1971) and Rao (1971) on *N. diacanthus,* Kutty(1961) and Jayaprakash (1976) on *S. brunneus,* Muthiah (1982) and Chakraborty (1993) on *J. vogleri,* Gulati (1987) and Chakraborty (1989) on *O. cuvieri* and Chakraborty (1994) on *J. macrorhynus.*

Present investigation deals with growth, mortality and stock assessment of *Johnieops sina*(Cuvier) based on the data collected during the years 1989-'94 period at Sassoon Dock and New Ferry Wharf landing centres of Greater Bombay. This species contributed 4.53% to the total sciaenid catch at both the centres taken together.

MATERIAL AND METHODS

Weekly length measurement were taken at New Ferry Wharf and Sassoon Dock landing centres. The length frequency was grouped in 10 mm class intervals and raised for the day and subsequently for the month by Sekharan's method (1962). Growth was expressed employing von Bertalanffy's growth formula written as

$$Lt = L\infty\ (1\text{-}e^{K(t\text{-}to)})$$

in the usual notations.

Three methods were employed for the estimation of growth. They were

i) ELEFAN method (Gayanilo *et al.* 1988)

ii) Bhattacharya / Gulland and Holt (1967, 1959) plot

iii) Wetherall *et al.* (1987) plot

The instantaneous rate of total mortality (Z) was calculated from the length cohort analysis. The natural mortality rate (M) was calculated using Cushing's (1968) model. T_{max} was calculated following Beverton and Holt (1957). The exploitation rates and ratios were calculated by Beverton and Holt (1957). The length-weight relationship was calculated by the formula given as $W = a*L^b$ where weight is in g and length is in cm.

The raised monthly frequencies of *J. sina* for 55 months (Jan'89 to June '94) was pooled and used for the input studies for the length cohort studies. Estimation of yield and biomass at different levels of fishing efforts was made using the length based Thompson and Bell (1934) analysis (Sparre, 1987) with the help of "MIX FISH" programme of the LFSA package developed by Sparre *et al.* (1989) on a PC. The terminal F/Z value was taken based on the studies on the other lesser sciaenids from Mumbai (Chakraborty, 1989, 1993 and 1994). The Ø factor was calculated as per Pauly and Munro (1984). Prices were assigned at the rate Rs. 2 per kg for fish in the length range of 60 - 129 mm, Rs. 3 per kg for fish from 130-179mm and Rs. 5 per kg for fish 180mm and above.

RESULTS AND DISCUSSION

The asymptotic length ($L\infty$) and the growth co-efficient (K) estimated by all the three methods are presented in Table 1. The third method gives an

Table 1 : *Estimation of growth parameters by various methods*

Method	L∞	K	Z/K
ELEFAN	266	0.91	-
Bhattacharya/Gulland & Holt plot	260	0.71	-
Wetherall *et al.*	259	-	8.49

estimate of Z/K only. The L∞ estimated by all the three methods is very close but the K estimated by Bhattacharya/ Gulland & Holt plot appears on the lower side. The L∞ and K of 266mm and 0.91/year was considered to be more realistic because this species is smaller in size so the K should be on the higher side and L∞ was closer to the largest specimen recorded in the catch (Fig. 1). This species grows to 159 and 223 mm at the end of I and II years of its life span. The VBGF equation for this species could thus be written as

$$Lt = 266(1-e^{0.91(t-to)})$$

The Ø factor was calculated as 2.80. The parameters used in the length cohort analysis are L∞ = 266mm, K = 0.91, M = 2.03, terminal F/Z 0.55, a = 0.001182 and b = 2.56. The results of length cohort analysis are presented in Fig 2. The fishing mortality increased to a maximum of 8.12 at 189.5 mm and then decreased to 2.81 at 249.5 mm. The average F for the fully recruited fish (L > 159.5 mm) was 4.14 and the Z was 6.27. The exploitation rate and ratio were calculated as 0.628 and 0.633 respectively.

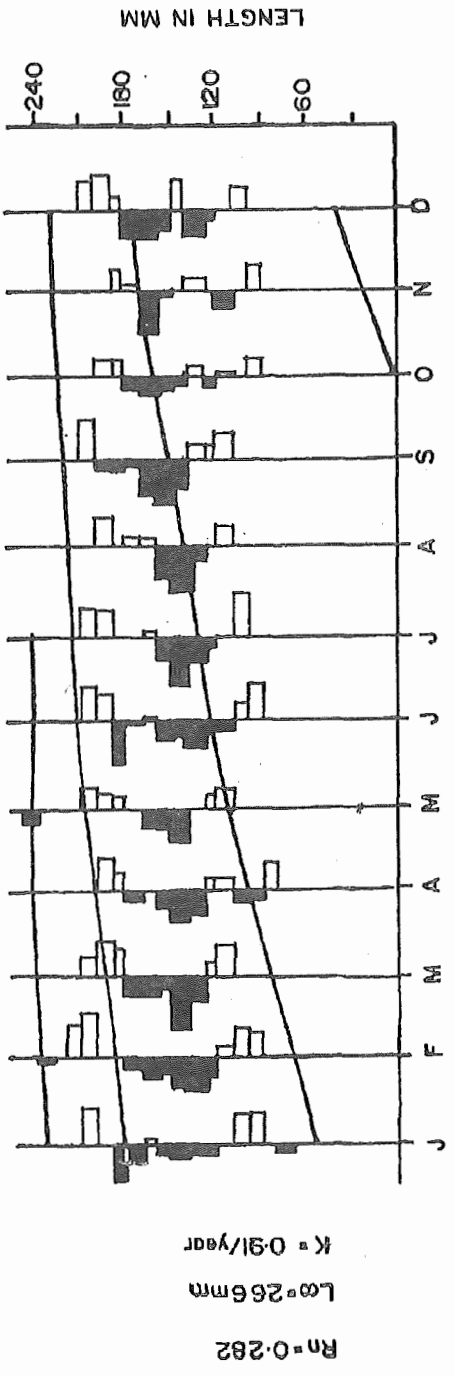

Fig. 1 : *Growth curve of J. sina indicated by ELEFAN*

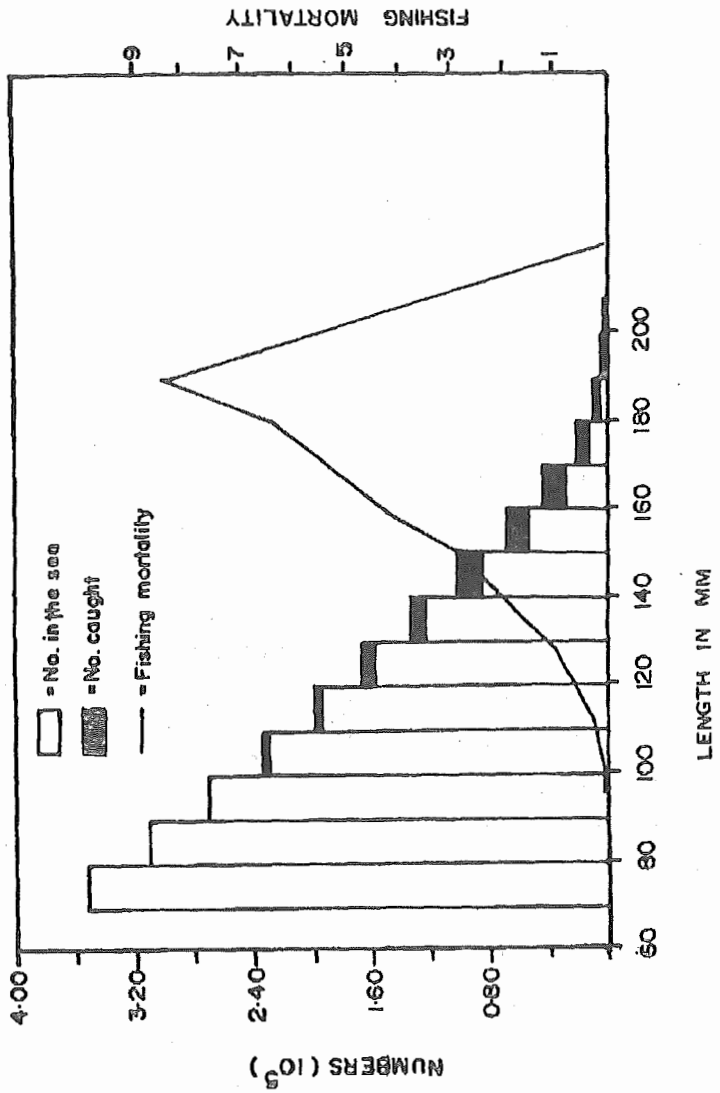

Fig. 2 : *Length cohort analysis of J. sina.*

Thompson and Bell analysis shows that (Fig. 3) at the present level of exploitation (X = 1), the yield is 3610 t and there is no decline in the catches even at the fishing efforts are doubled. By doubling the efforts the catches can go upto 3941 t that is an increase of 331 or by only 9.38%. But at the same time it is to be noted that the biomass shows a drastic decline. The MSE is at 1.6125 with total realisation of Rs.15,963/- giving an average of Rs. 4.14 per kg.

Age and growth studies of this species has been done by Nair (1972) from Calicut waters. Using Petterson's method the length at age estimated by him at the end of first and second year of its life was 135 and 175 mm respectively. The von Bertalanffy's growth parameters were not estimated by him. Rao *et al.* (1994), employing ELEFAN method have estimated $L\infty$ and K for *J. sina* from Kerala waters as 180mm and 0.80/per respectively. As evident from the growth parameters estimated, *J. sina* grows to a smaller size in Kerala waters. The length attained by this species in Bombay waters at the end of I and II years of its life is 159 and 223 mm respectively.

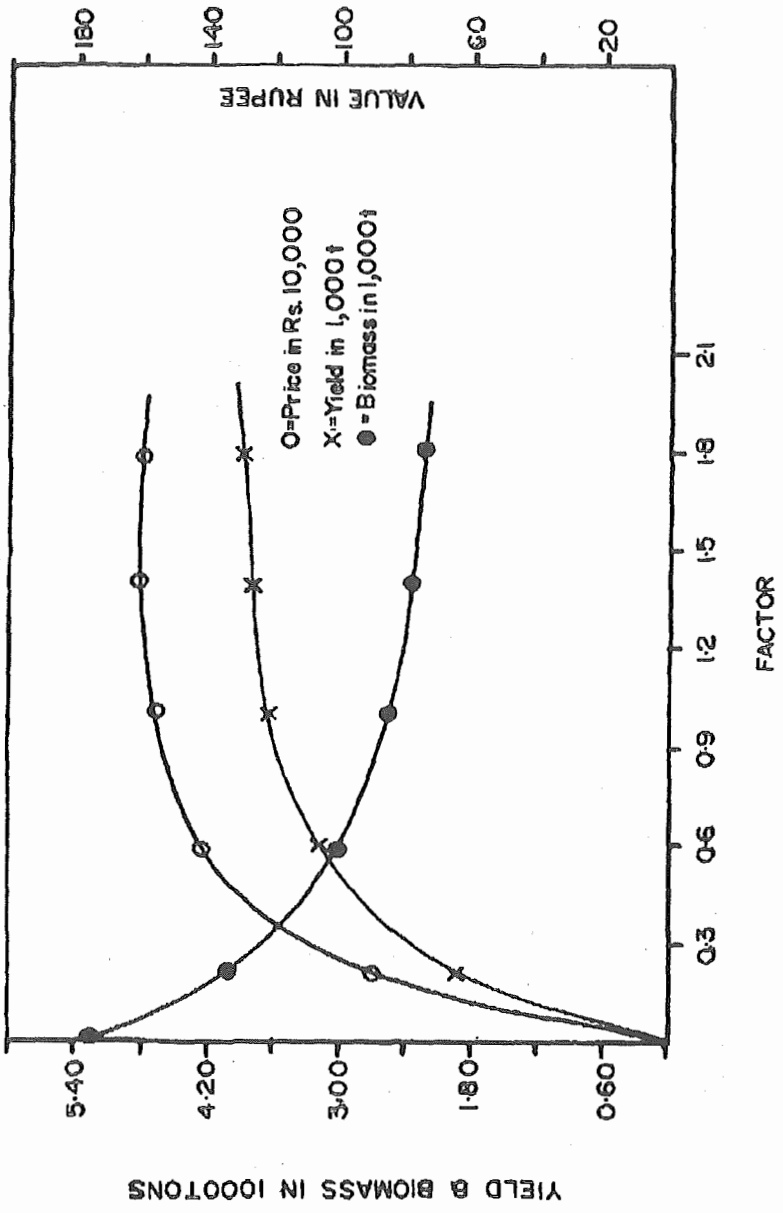

Fig. 3 : *Thompson and Bell analysis of J. sina.*

Taking M = K and M = 1.5 K, Rao *et al.* (1994) have estimated the MSY of *J. sina* as 1670 and 1743 tonnes respectively. With M = K a decline in the catches were observed at F = 1.01 whereas at M = 1.5 K the fishing efforts could be increased upto 3.01. But in spite of increasing the efforts to three times, the increase in catches is only 5.12%. Thus the increase in the efforts is not remunerative.

A similar situation exists in Bombay too for the same species. The increase in catch is only 9.38% by doubling the efforts. Again the increase in catch cannot be considered in isolation. A drastic decline in the biomass and catch per unit of efforts would set in if the efforts are doubled. Thus for the benefit of the stock of *J. sina* it would be better if the fishing efforts are kept at the present level.

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