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Note

Some aspects of the biology of *Johnius macrorhynus* (Mohan 1976) from Mumbai waters

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Abstract

Various biological aspects of a sciaenid, *Johnius macrorhynus*, exploited off Mumbai are reported. The length-weight relationship was found to be LogW=-5.18 + 3.12 Log L. Crustaceans, dominated by *Acetes* spp. constituted the main food in the smaller fishes. However, the adult and larger fishes fed on prawns and fishes. Size at first maturity was calculated as 219.5 mm. The species was found to spawn in two seasons. Fecundity ranged from 87,935 to 1, 01,539 eggs per 100 g body weight.

Johnius macrorhynus (Mohan, 1976) of family Sciaenidae, is landed in large quantities, especially by the trawlers, throughout the year at various landing centers in Mumbai. Ever since the work of Chakraborty (1988), very little is known on the biology of this species along the west coast especially in the light of changing fishing scenario. Therefore, the results of a study conducted on various biological aspects of the species are presented.

Materials and methods

Random samples of *J. macrorhynus* were collected once a week from New Ferry Wharf / Sassoon dock / Versova landing centers of greater Mumbai during September 2001 to June 2002. A total of 305 fishes ranging in total length from 158-290 mm and weighing 40-230 g were studied in fresh condition. After recording the total length and total weight, the fishes were dissected to assess the stomach condition, sex, and stages of maturity as well as weight of gonad. The index of preponderance (Natarajan and Jhingran, 1961) was followed for grading the food items. The intensity of feeding was determined by the degree of distension of stomachs as gorged, full, ¾ full, ½ full, ¼ full, trace and empty. The volume of stomach content was determined by displacement method. The stages of maturity were classified on the basis of appearance and structure of ova and ovary in females and appearance of testes in males. For assessment of size at first maturity only females in stage V and VI were considered. Ova diameter was determined following Clark (1934). The data collected during the study period were pooled and percentages of cumulative frequencies were plotted against the size to determine the size at which 50 % fish become mature. For determination of fecundity only mature and ripe ovaries (stage V and VI) were taken into consideration. Gonado Somatic Index (GSI) was estimated by the formula GSI = W/ W1× 100, Where W and W1 is gonad weight and total weight of fish respectively. Month wise and length wise Ponderal index / Fulton's conditions was estimated by formula $K = W/ L^b \times 1000$, Where L and W are length and weight of fish and 'b' is the exponent.

Results

Length- weight relationship

The study of length weight relationship of *J. macrorhynus* was based on 88 males and 158 females in the length range of 167 to 290 mm weighing from 65 to 300 g. The linear relationship between weight and length was worked out as Log W = - 5.1806 + 3.12 Log L for pooled, Log W = - 5.2550 + 3.15 Log L for female and Log W = - 5.1904 + 3.12 Log L for male. Analysis of covariance (Snedecor and Cochran, 1967) indicated that the regression coefficients between males and females were not significant at 5 % and 1 % level.

Condition factor

Study on Ponderal index in relation to size indicated peak in 210-229 mm length group for male while at 170-189 mm and 250-269 mm in female (Fig. 1). In the case of females, higher 'K' value at 170-189 mm length group is perhaps associated with higher feeding intensity for preparation of spawning. Similarly females also showed two peaks of K, one in January and another in April, which could also be attributed to the ensuing breeding

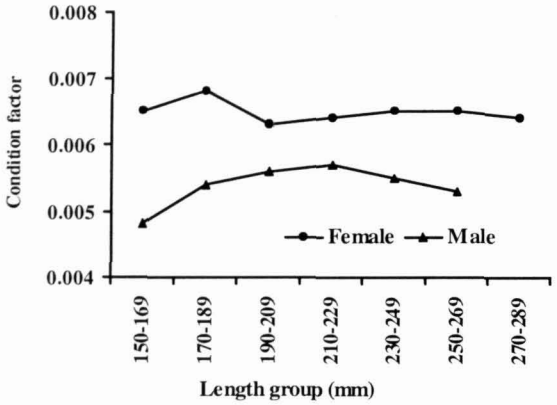

Fig. 1. Condition factor in various size groups of *J. macrorhynus*

season. Higher feeding intensity of males in October is reflected in higher value of Ponderal index (Fig. 2).

Composition of food

Food of *J. macrorhynus* is comprised of fish, crustaceans and molluscs. Crustaceans were dominant in the food, which included prawns, *Acetes* species, crabs and squilla. Analysis of food items following the Index of Preponderance method (Natarajan and Jhingran, 1961) revealed crustacean contribution up to 70 % among all food items. *Acetes* spp. ranked first (40.3 %) followed by prawns (29.2 %) while occurrence of Squilla (0.3 %) and crabs (0.2 %) in the gut was occasional. After crustaceans, fish was the next dominant food item (5 %) comprising *Coilia dussumieri*, *Harpadon nehereus*, *Cynoglossus* spp., *Trichiurus* spp. and eel. Squid (*Loligo duvauceli*) was the only mollusc recorded in the gut but was negligible. Digested matter or semi-digested food ranked third (25 %) in the food composition.

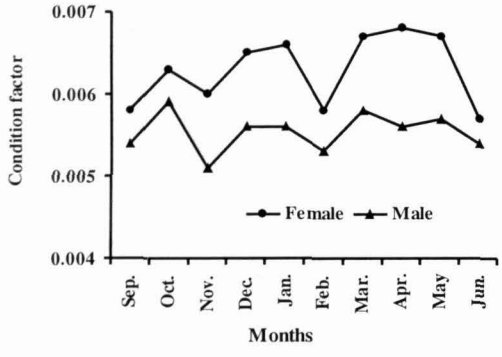

Fig. 2. Month wise condition factor for *J. macrorhynus*

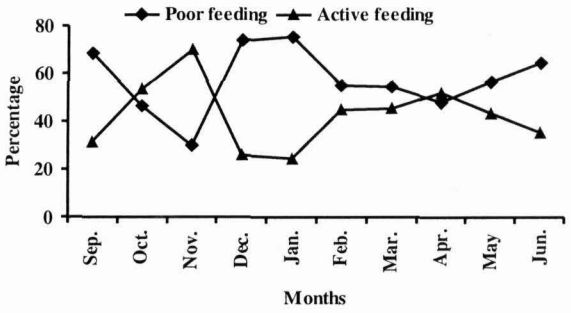

Fig. 3. Month wise feeding intensity in *J. macrorhynus*

Month wise food composition

Acetes spp. was recorded in gut contents throughout with a highest value in January (85.7 %) and lowest in September (0.6 %). The occurrence of prawns varied from lowest in June (12.8 %) to highest in April (72.8 %). Fish component of food was absent from the gut during November and December, however, it varied from 0.3 % in February to 28 % in June. Digested matter was recorded in all the months in the range of 1.4 % in January to 30 % in March. Squid (*Loligo* spp.) was observed only in the month of December (0.5 %). Crab was present during October (0.2 %) to May (2 %). Squilla was recorded for 4 months (0.2 % in October to 6.8 % in December).

Food composition in relation to size

Smallest length group 150-169 mm was found to feed totally on *Acetes* spp., but as the size increased the species preferred prawns and fish. Largest length group (270-289 mm) was found to subsist mostly on prawns (29.3 %) followed by squilla (24.4 %) and fish (9.8 %). Squids were recorded in 230-249 mm length group while squilla was recorded in 230-249 mm group (1.1 %) and 250-269 mm (0.5 %).

Feeding intensity

Analysis of stomachs in various degrees of fullness indicated variation in feeding intensity in all the months of study. Feeding intensity was highest in November and lowest during December and January (Fig. 3). Females showed highest feeding intensity during October and February. Males were low fed throughout the study period. Feeding intensity was very poor among young fish; however it increased as the fish grew with a maximum in 250-269 mm length group (Fig. 4).

Gastro somatic index

In females, a peak in index value was observed in February (3.5) while low values were seen in September

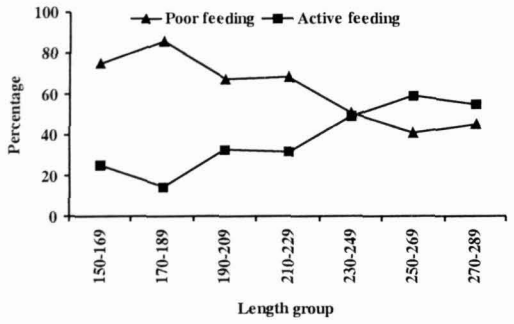

Fig. 4. Feeding intensity in various size groups of *J. macrorhynus*

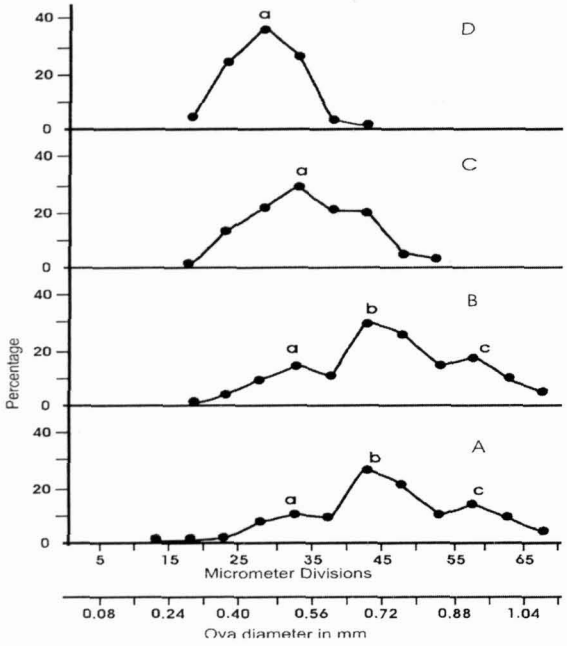

Fig. 5. Ova-diameter frequencies for different stages of maturity of *J. macrorhynus*

(1.2) and June (1.4). In males, three peaks in gastro somatic index were seen, respectively during November (1.6), February (1.6) and June (2.4).

Spawning season

The peak occurrence of mature females in December and March indicated two not widely separated peak breeding seasons.The findings confirm the earlier observations of Chakraborty (1988). Ova diameter study also indicated

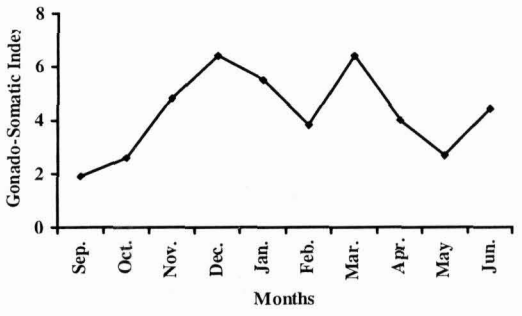

Fig. 6. Gonado-Somatic Index for females of *J. macrorhynus*

two spawning seasons (Fig. 5). Two prominent peaks in Gonado Somatic Index, in December and March indicated peak spawning during these two months (Fig. 6). Size at first maturity was found to be 219.5 mm *i.e.* 220 mm (Fig. 7).

Fecundity

Fecundity was estimated for 5 specimens ranging in total length from 240 to 262 mm and weighing 160 to 260 g respectively. Absolute fecundity ranged from 1, 59,924 to 2, 64,003 eggs. Relative fecundity ranged from 97,935 to 1, 01,539 eggs /100 g body weight. According to Chakraborty (1988) fecundity ranged from 44,668 to 1, 79,659 for this species. The correlation between fecundity against body length, against body weight and against ovary weight was worked out as

$F = -904221 + 4431.88 \times L$ ($r = 0.9734$) against fish length

$F = -1831.73 + 974.74 \times W$ ($r = 0.9517$) against fish weight

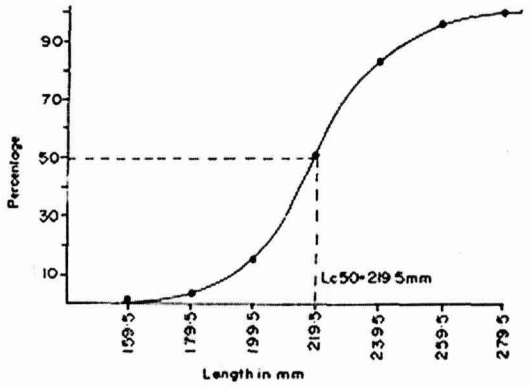

Fig. 7. Size at first maturity of *J. macrorhynus*

F = 105686.88 + 4754.79 × OW (r = 0.9549) against ovary weight.

Discussion

J. macrorhynus feeds mainly on crustaceans preferably *Acetes* spp. and prawns. Occasional occurrence of squids, crabs and squilla in the guts may be due to non-availability of preferred food items in sufficient quantities. Other available food items generally substitute deficit of one particular item of food in the stomach during the course of feeding (Gulati, 1987).

The feeding intensity is gradually influenced as the females attain maturity. The feeding activity shows some relative increase till the ovary becomes mature (Haynes, 1950; Bapat and Bal, 1952). In the present investigation the feeding activity in general was found to be low and correlation between maturity and cessation of feeding activity could not be established with certainty.

It can be concluded that this fish has two spawning seasons, which is similar to the findings of Muthiah (1983) while working on *Johnieops vogleri* from Bombay waters, Rao (1963) on *Pseudosciaena diacanthus*, Devdoss (1969) on *Johnius dussumieri* and Chakraborty (1988) on three species of sciaenids.

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