

Short Communication

Stock assessment of small head hair tail *Eupleurogrammus muticus* (Gray) (Pisces/ Trichiuridae) from Mumbai coast

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Based on the data collected from New Ferry Wharf, Versova and Vasai in the years 1997-99, the age, growth, mortality and stock assessment of small head hair tail, *Eupleurogrammus muticus* (Gray) is reported in the present communication. The growth parameters - asymptotic length (L_{∞}) and growth coefficient (K) were estimated as 811 mm and 0.78 per year respectively. The average total, natural and fishing mortality coefficients were estimated as 4.36, 1.15 and 3.21 respectively. The yield isopleth diagram shows that eumetric fishing could be achieved at exploitation rate (E) of 0.68 and L_c / L_{∞} value of 0.68. The present E of 0.73 is well beyond the optimum E of 0.50. Thus some management measures should be taken to prevent depletion of this resource.

[Key words: *E. muticus*, age, growth, mortality and stock parameters]

Ribbon fish of the family Trichiuridae is one of the important fishes in India with an average production of 1.07×10^5 tonnes for the period 1990-98¹. It contributed 4.57% in the total marine capture fish production. Among pelagic group of fish, it ranked fifth and among total fish catch, it ranked seventh in terms of production in 1998-99 period¹. The recent spurt in the production of ribbon fish is chiefly due to new found export market of the larger variety *Trichiurus lepturus*. *Eupleurogrammus muticus* is however, a minor species. The other species contributing substantially to the ribbon fish fishery in Mumbai coast is *Lepturacanthus savala*. The export of ribbon fish has gone up since early nineties. The export of ribbon fish has increased from 35,342 t in 1992 to 77,840 t in 1996 with export earnings² of about 3.77 billion \$.

In India apart from export of larger varieties, the other utilities of ribbon fish include consumption by poor people in fresh and dried condition, and use as bait in hook for capturing seer fish, perch etc. A part of the catch is also exported in sun dried condition to nearby countries like Sri Lanka, Myanmar, Nepal, Malaysia and Bangladesh. Further, there is an increase in demand of pearl essence obtained from their body and cosmetics made from their skin.

From Indian waters the study on the biology and growth of ribbon fish has been done by various workers³⁻⁷. As there is no account of mortality and stock parameters of this species from Maharashtra, the present investigation on growth, mortality and stock assessment of *Eupleurogrammus muticus* was undertaken.

Random samples of this species were collected at Versova, Vasai and New Ferry Wharf landing centres at Mumbai (Bombay) for the year 1997-99. This species contributed 78.2% of the total ribbon fish landed from 'dol' net. The total length (mm) from the tip of the snout to the tip of the tail was taken. Fish with tail suspected to be broken were not taken for measurement. The sample of fish thus measured was weighed at the landing centre. The length frequency was distributed in 20mm groups and was raised for the day and then for the month following Sekheran⁸.

Growth study was done by Bhattacharya⁹ and Gulland & Holt¹⁰ plot. Both the methods were used by employing computer based FiSAT¹¹ programme. The total mortality coefficient (Z) was estimated by length converted catch curve method of Pauly¹² and natural mortality coefficient (M) by Alagaraja's¹³ method. The probability of capture was determined by backward extrapolating of length converted catch curve, which was used for the estimation of Z. The relative yield per recruit and biomass per recruit were estimated by keeping the L_c constant. With the help of different exploitation ratios (E) on the 'X' axis and

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different sizes at first capture by using L_c/L_∞ ratios on 'Y' axis, isovalues of Y/R were plotted to generate the isopleth diagram.

A total of 4,752 specimens of *E. muticus* in the length range of 190-775 mm were measured during the two-year period. The asymptotic length (L_∞) and the growth coefficient (K) estimated by using a combination of Bhattacharya & Gulland and Holt plot^{9,10} was 872 mm and 0.78/year respectively. The correlation coefficient (r) of 0.76 was also very reasonable (Fig. 1). The total mortality coefficient 'Z' was estimated as 4.13 and 4.60 respectively for 1997-98 and 1998-99. The average 'Z' for two years being 4.36 (Fig. 2). Alagaraja's¹³ method gave an estimate of the natural mortality coefficient as 1.15. The t_{max} was

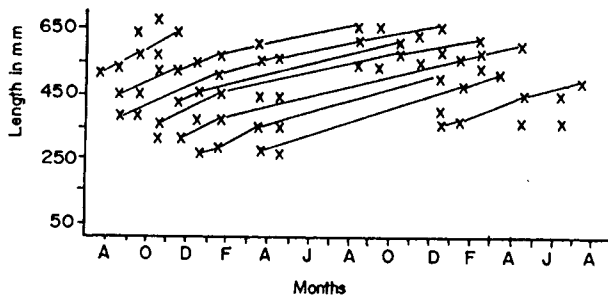


Fig. 1—Mean length of assumed cohorts connected for Bhattacharya analysis.

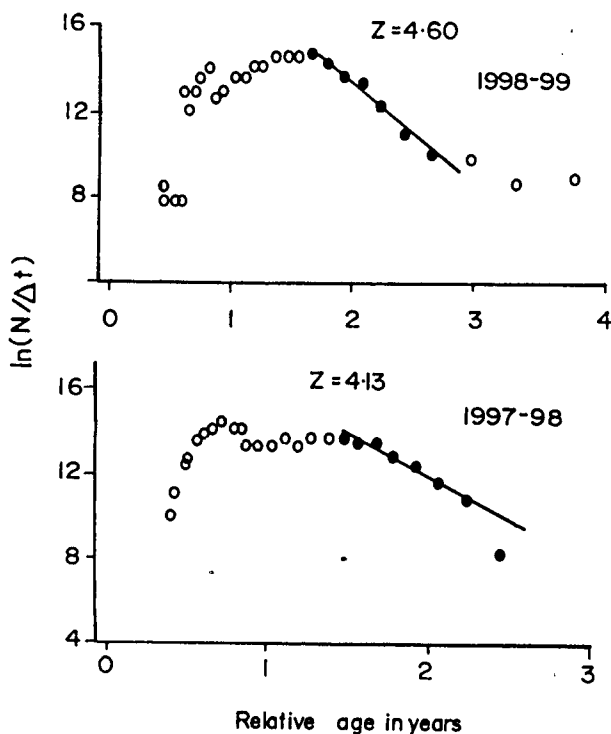


Fig. 2—Estimation of total mortality coefficient (Z) by length converted catch curve.

calculated by inverse von Bertalanffy's equation taking the maximum size of 775mm at which the age works out to be 3.99 years. The fishing mortality was estimated as $F=Z-M=4.36-1.15=3.21$. The exploitation rate (U) and exploitation ratio (E) were worked out as 0.72 and 0.73 respectively.

The selection for probability of capture gave L_{c50} for *E. muticus* as 544 mm. The original yield per recruit model of Beverton & Holt¹⁴ has been modified by Pauly & Soriano¹⁵ as relative yield per recruit model, which was used here employing FiSAT package. The relative yield per recruit (Y/R) and biomass per recruit was estimated taking L_c/L_∞ and M/K ratio as 0.62 and 1.47. The Y/R increased gradually to reach a peak at E of 0.676. However, at that level the biomass has already shown a considerable decline, which calls for reduction in the efforts (Fig. 3). The yield isopleth diagram suggested that eumetric fishing is possible when exploitation is kept at 0.65 and L_c/L_∞ ratio at 0.55 (Fig. 4).

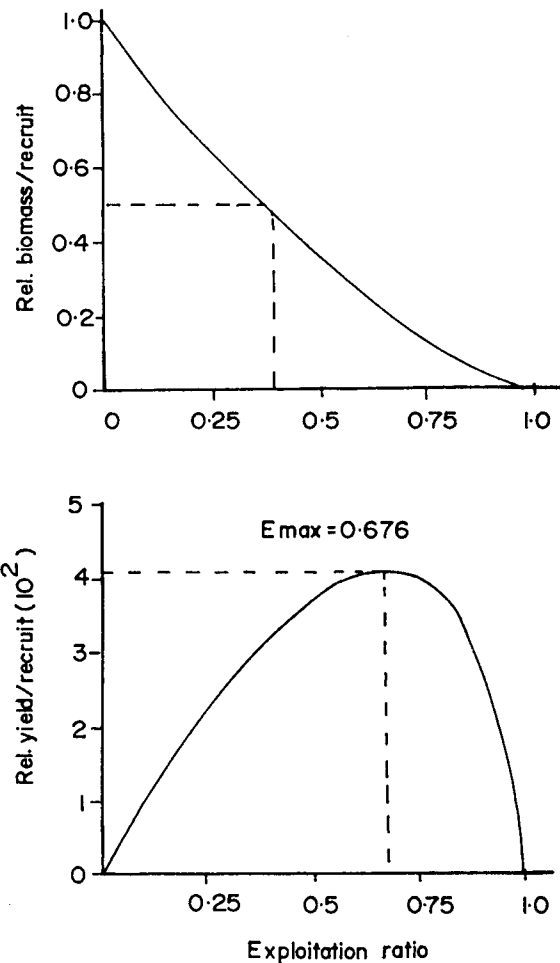


Fig. 3—Relative yield per recruit and biomass per recruit.

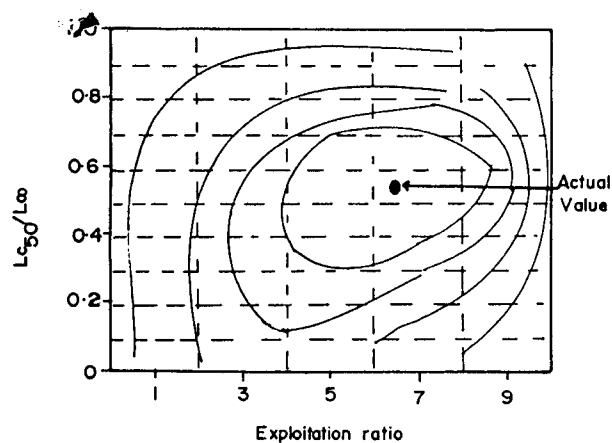


Fig. 4—Yield isopleth diagram of *E. muticus*.

Although there were no earlier studies on the age and growth of *E. muticus*, James⁴ has reported about the growth of a related species, *E. intermedius* based on otolith and length frequency studies from Rameswaram waters. He found that *E. intermedius* attains 21.1, 33.9 and 42.9 cm at the end of I-III years of its life span. The present study from Mumbai waters indicates the growth of *E. muticus* to be much faster—43.96, 64.11, and 73.35 cm at the end of I - III years respectively.

Earlier workers followed the growth pattern of tropical fishes similar to that of temperate waters, who gave very slow rate of growth for tropical fish. Longhurst & Pauly¹⁶ and several other workers have shown that the tropical fishes grow much faster than their temperate counterparts. Thus the faster growth obtained in the present investigation is justified.

Beverton & Holt¹⁷ pointed out that the natural mortality coefficient (M) is directly related to growth coefficient (K) and inversely related to asymptotic length (L_{∞}) and the life span. This appears to be true for some of the species of ribbon fish worked out *viz.* *L. savala* with K of 0.87 per year has a life span of 3.33 year and also had a higher natural mortality of 1.35 whereas *E. muticus* with a life span of 3.99 year has M of 1.15. There are no comparative figures on the natural mortality of *E. muticus* from Indian waters. However, the much worked out species of ribbon fish *T. lepturus* which is bigger in size and has a large life span shows M of 0.9, 1.08, 0.8, 1.05 and 1.0 (ref. 18-22). As *E. muticus* is a relatively smaller species the M of 1.15 is reasonable.

The relative yield per recruit study shows that MSY can be obtained at E of 0.676. whereas the present E . (F/Z) is 0.73. This suggests reduction in

efforts by 13.4%. However, in a multispecies system such suggestions are to be given with utmost care as we have to consider the effort of fishing on the concomitant species occurring in the same aquatic system.

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