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Age and Growth of the Marine Catfish *Tachysurus dussumieri* (Val.) along the Dakshina Kannada Coast

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Abstract

Age and growth of the marine catfish, *Tachysurus dussumieri* along the Dakshina Kannada coast of Karnataka during March 1975 – May 1976 were studied using Petersen's and Bhattacharya's methods. The fish attains 230, 350, 471, 557, 613.6 and 662 mm respectively at the end of first to sixth year. Observations on vertebrae revealed formation of growth checks with in a short period and gradual decrease in growth rate with age. The length at formation of first growth check was 226.43 mm. Average back calculated lengths at formation of successive annual growth checks were 224.35, 357.01. 456.77. 553.59. 629.56. 692.05 and 770.90 mm. The Von Bertalanffy growth equation was $L_t = 1027\ [1-e^{-0.1666\ (t+0.50)}]$. The life span of the fish was about seven years.

Introduction

Marine catfishes constitute about 5.3% of the total marine fish production of India. Substantially high catches are from coasts of Kerala, Andra Pradesh, Tamil Nadu and Maharastra followed by Gujarat, Karnataka, West Bengal and Orissa (Sekharan, 1968). The annual catfish landings from Karnataka coast vary between 2.95 and 6.62% of the total marine fish production of Karnataka (Kurup *et. al,* 1987). Eight species of catfishes occur along the Dakshina Kannada coast, of which *Tachysurus dussumieri* (Valenciennes) is one of the dominant species. No detailed work has been carried out on the biology of this species. This paper deals with the age and growth of this species along the Dakshina Kannada coast.

Material and Methods

Samples of *T. dussumieri* were collected at weekly intervals from the fish landing centres in Mangalore, Malpe and Gangolli during the period April'75 to May '76. Age and growth was studied by analysis of length frequency data and observations on growth checks on operculum, cleithrum, vertebrae and otoliths.

For length frequency studies, the total length measurements of fish were grouped in to 30 mm size groups and analysed using Bhattacharya's method (1967). Operculum, cleithrum, vertebrae and otoliths were separated from fish of different sizes and examined for growth checks. The fifth vertebra from individual fish was removed, cleared and examined for growth checks. After confirming the annual nature of growth checks, expected lengths of fish at time of formation of each mark was estimated by back calculation method and mean calculated lengths for different yearclasses estimated. Empirical growth curve was fitted using Von Bertalanffy's (1957) growth equation.

Results and Discussion

The percentage frequencies of the various samples obtained from the different types of gear are presented in Figs. 1 to 4. The length frequency distribution of fishes collected from trawl catches off Mangalore and Gangolli (Figs. 1 and 2) showed a mode at 65 mm in March, April and May representing the zero year class since the fish spawned from December to March (Vasudevappa and James, 1980). Occurrence of juveniles (5.6 to 6.8 mm T.L.) in the mouths of male fishes captured off Malpe in gillnets in March supported this view. The modes at 215 mm in January and February '76, 245 mm in March, April and May '76 (Fig.2) and 215 mm in March '76 (Fig.1) represented fish which were one year old. Thus the fish attained a size between 215 mm and 245 mm at the end of one year. Based on juvenile growth rate (5.6 to 6.8 mm in about 3 months) the fish would attain a size of about 240 mm in one year.

Since it was not possible to determine the rate of growth by following the progression of modes, Bhattacharya's (1967) method was adopted for fish captured by gillnets off Malpe. The details are shown in Fig. 5. The modes obtained by this method in different months are shown by broken lines in Fig. 3. If the fish attains a size of about 230 mm at the end of first year, the modes at 350, 471, 557, 613.60 and 662 mm obtained by this method should represent sizes at the end of second to sixth year respectively. Based on these lengths, the growth rate would be 120, 121, 86, 56.60 and 48.40 mm during second to sixth year respectively.

Examination of growth checks on hard parts indicated occurrence of equal number of growth checks on all hard parts of a given fish. The average length of fish for one to six growth check varied from 244.08 to 248.15 mm, 363.9 to 369.5 mm, 482.71 to 484.5 mm, 566.64 to 569.79 mm, 626.7 to 626.82 mm and 688.33 to 708.33 mm respectively. Only the vertebra of fish 790 mm T.L. had seven growth checks.

The seasonality of growth checks formation was foundout by examining growth checks in formation. Vertebrae with growth checks in formation were observed in November and January to April (Fig.6). Though this period coincided with spawning season of the species (Vasudevappa and James, 1980), occurrence of growth checks in immature fish, rules out the possibility of their being spawning marks.

The first growth check in the process of formation occurred in fish of size 205 to 235 mm. compared well with the estimated length at the end of first year (230 to 240 mm). The ratio of distances between the vertebral focus and the first growth check and between the successive growth checks showed a decreasing trend indicating decrease in growth with age.

The length of fish at the time of formation of successive annuli was back calculated for each fish from relation log Y = a + b log X where Y was the radius of vertebrae and X the length of fish. The values of a and b were 1.4460 and 0.8878 respectively and the correlation co-efficient (0.9959) was highly significant. For back calculation, the regression co-efficient (b = 0.8878) of total length on radius of vertebrae (Smith 1955) was used as the estimates of back calculation formula are based on a calculated slope which climinates any error arising when a direct relation is assumed. Therefore the formula $\log l_n = \log L_t + b (\log r_n - \log R_t)$ where l_n was length of fish at age n, L_t the length at the time of capture, r_n the radius of vertebrae at age n, R_t the total radius of vertebra the time of capture, was used for back calculation. The results (Table-1) indicate that the rate of growth is 132.66, 100.76, 95.82, 72.97 and 65.49 mm during second to sixth year of life respectively. The length increment of 78.85 mm during the seventh year is rather high probably because of scanty data. The Von Bertlanffy growth equation (Von Bertlanffy, 1957) based on back calculated lengths was $l^t = 1027 (1\text{-}e_{-0.1666 (t+0.50)})$. Singh and Rege (1968) who estimated the age of *T. sona* based on growth checks showed good agreement between back calculated lengths and modes in length frequency plot, but not between von Bertlanffy's theoretical growth increments and length frequency modes. Pantulu (1961) examined the annual nature of growth checks found on pectoral spines in *Mystus gulio* and found good agreement between this method and Petersen's method.

The life span of *T. dussumieri* may be about seven years, as indicated by modes in the length frequency distribution and annuli on bones. Fish of one to five year classes are captured in gillnets and hook and line, the majority being three to five year classes. In trawl nets, the majority of fish captured belonged to zero and first year classes.

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Table 1. Average lengths (mm) of *T. dussumieri*, estimated by various methods

Age (years)	Vertebral studies	Bhattacharya's method	Growth equation
1	224.35	230.00	226.15
2	357.01	350.00	349.39
3	457.77	471.00	453.32
4	553.59	557.00	541.13
5	626.56	613.60	615.89
6	692.05	662.00	678.95
7	770.90	-	732.23

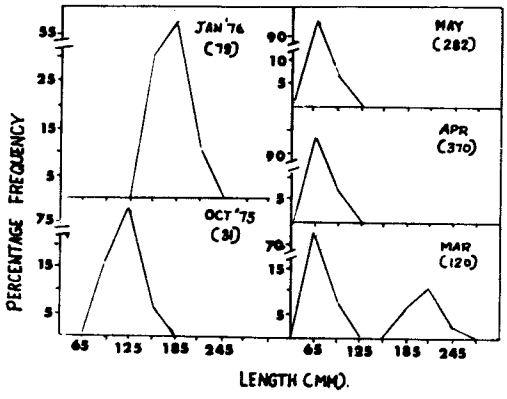

Fig. 1. Length frequency curves of *T. dussumieri* captured off Gangolli (trawl nets).

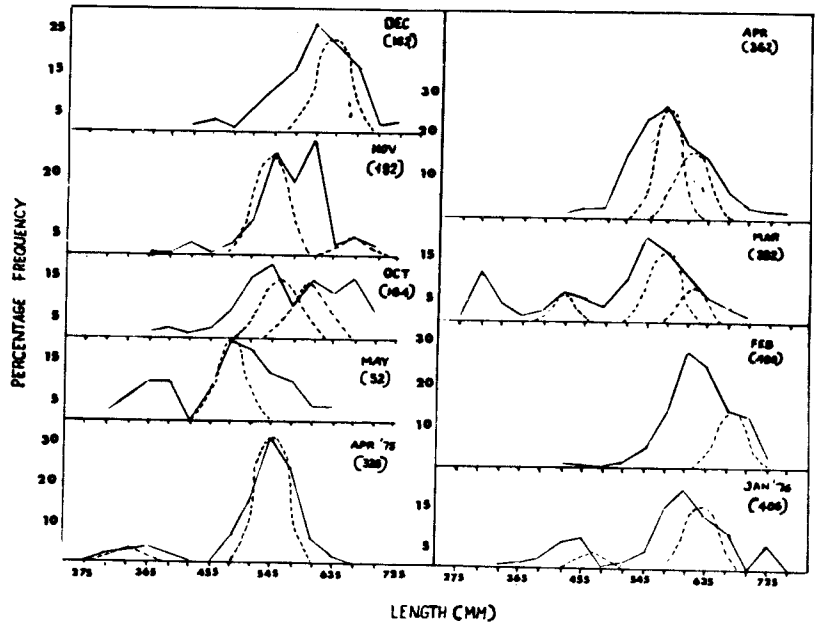

Fig. 3. Length frequency curves of *T. dussumieri* captured off Malpe (gillnets).

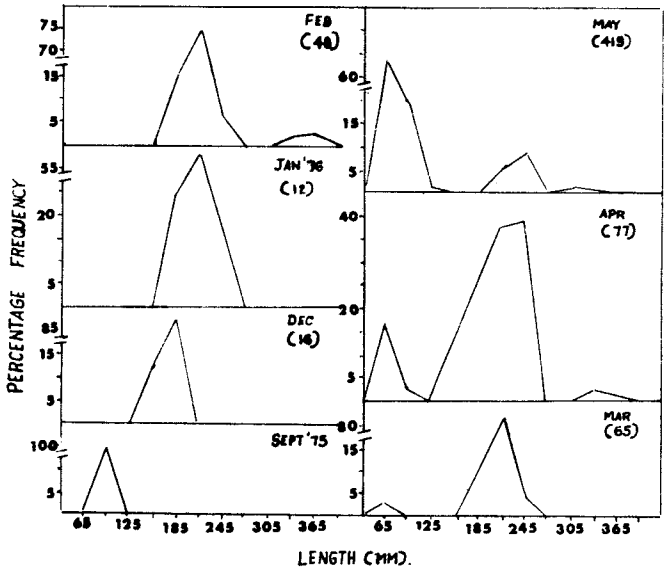

Fig. 2. Length frequency curves of *T. dussumieri* captured off Mangalore (trawl nets).

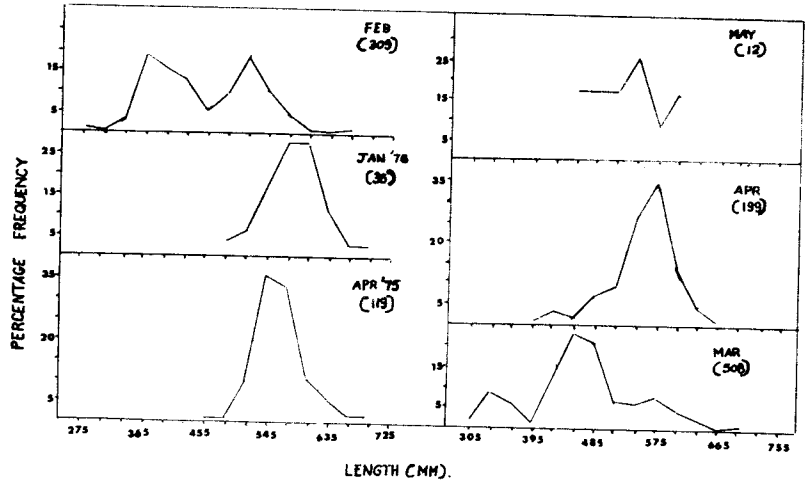

Fig. 4. Length frequency curves of *T. dussumieri* captured off Gangolli (hook and line).

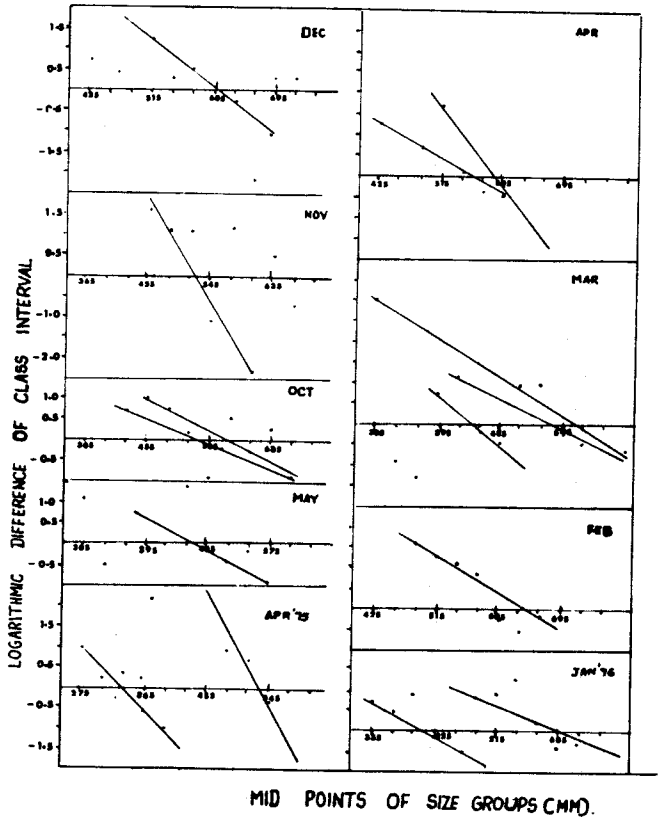

Fig. 5. Resolution of length frequency data in to Gaussian components.

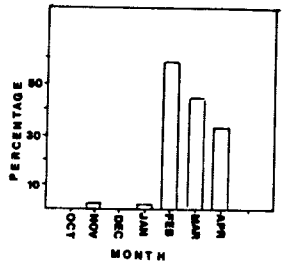

Fig. 6. Percentage frequency distribution of fish with growth checks in formation.

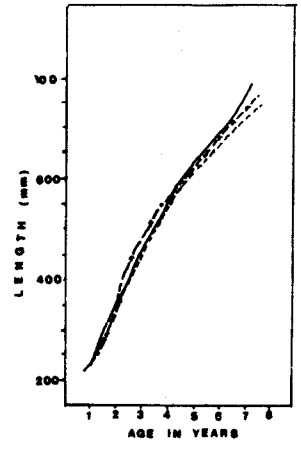

Fig. 7. Growth curves of *T. dussumieri* obtained by various methods.