AGE AND GROWTH OF THE SCAD *DECAPTERUS DAYI* WAKIYA

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ABSTRACT

Decapterus dayi Wakiya attains a length of 150 mm in the first year and 184 mm by 19 months at Vizhinjam. Maximum growth of 30 mm and 20 mm was noticed during the first and second months, respectively. Though many broods enter into the fishery in the same year, those born in April manifest strongly in the fishery than the earlier and later ones. The younger broods tend to catch up the older ones by faster growth and form a unimodal group at the size of 120-129 mm, and are found as a distinct unimodal size class then onwards.

Adopting Walford's and Van Bertalanffy's equation to the data the various growth parameters obtained were: L_{∞} = 260 mm; t_0 = - 0.50; k = 0.1858 and L_{to} = 20 mm. The observed and calculated values were found to be in close agreement. Fishery is dependent on the O-year class to the extent of 42.8% to 75.6%.

INTRODUCTION

Information on the age-length relationship in the carangid fish *Decapterus dayi* Wakiya is not available except for the brief remarks of Radhakrishnan (1973) on length composition, though the fish forms an important fishery at Vizhinjam and also along the south west coast of India. Therefore the results of investigations conducted during 1971-74 are presented in this account.

MATERIAL AND METHODS

Samples were collected biweekly from the local fish landing centre of Vizhinjam from January 1971 to December 1974. Fish were landed mainly by three gears, namely boat seines, shore seines and hooks and lines, and occasionally also by gill nets. Samples of the size of 50 numbers were collected on each day of observation from each gear. A total of 2863 fishes were measured in 1971, 881 in 1972, 997 in 1973 and 3153 in 1974. Fork length, measured from tip of snout to the tip of the smallest caudal ray, was utilised. However, the relationship existing between fork length and total length (from tip of snout to the tip of the largest caudal ray) was worked out based on 184 fish of length ranging from 21 mm to 212 mm for the purpose of mutual conversion. This relationship was observed to be linear (Fig. 1) and the regression equation obtained was:

Total length = −1.0176 + 1.1119 Fork length.

The correlation coefficient (r) was 0.9998 which is highly significant at 5% level.

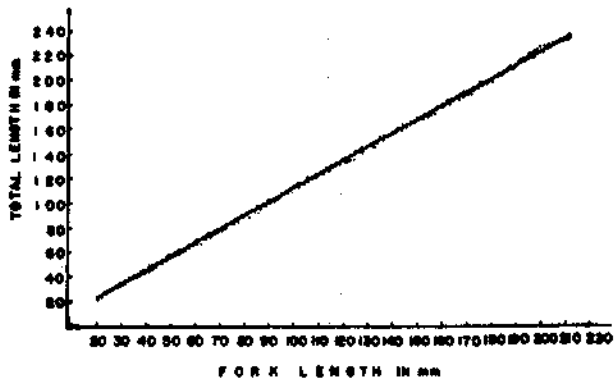

FIG. 1. Relationship between fork length and total length in *D. dayi*

Since it was observed that the length range and modal size groups of fish landed by three gears on a particular day were the same, the data were pooled for that day irrespective of gears.

Though Suzuki (1971) found scales useful for growth studies, Tiews et al (1968) could not get any evidence of age structures either in otolith or in scales in *Decapterus* spp. In the present study only length-frequency method was applied for estimating the growth of the fish. The fish were grouped into 10 mm size groups and percentage frequency of length groups were calculated on monthly basis.

OBSERVATIONS

Length frequency

Percentage frequency of length groups of *D. dayi* during the years 1971-74 are given in Fig. 2.

It can be observed from the figure that more than one modal size group was present, probably representing different broods spawned during the course of a continuous breeding period. However, when the modal size groups were plotted month-wise (Fig. 3) they assorted into various groups representing different year classes.

In 1971 the previous year class was represented by a large size group of 120-129 mm in January which progressed to 180-189 mm in October. Smaller size groups which were the products of spawning of 1971, appeared in the fishery

at 70-79 mm in August and 50-59 mm in October. In spite of such large gaps between their modal size groups, these broods merged to form a common size group at 120-129 mm in January 1972 and continued to be represented in the fishery until they reached 180-189 mm in October, 1972 . New broods of 1972

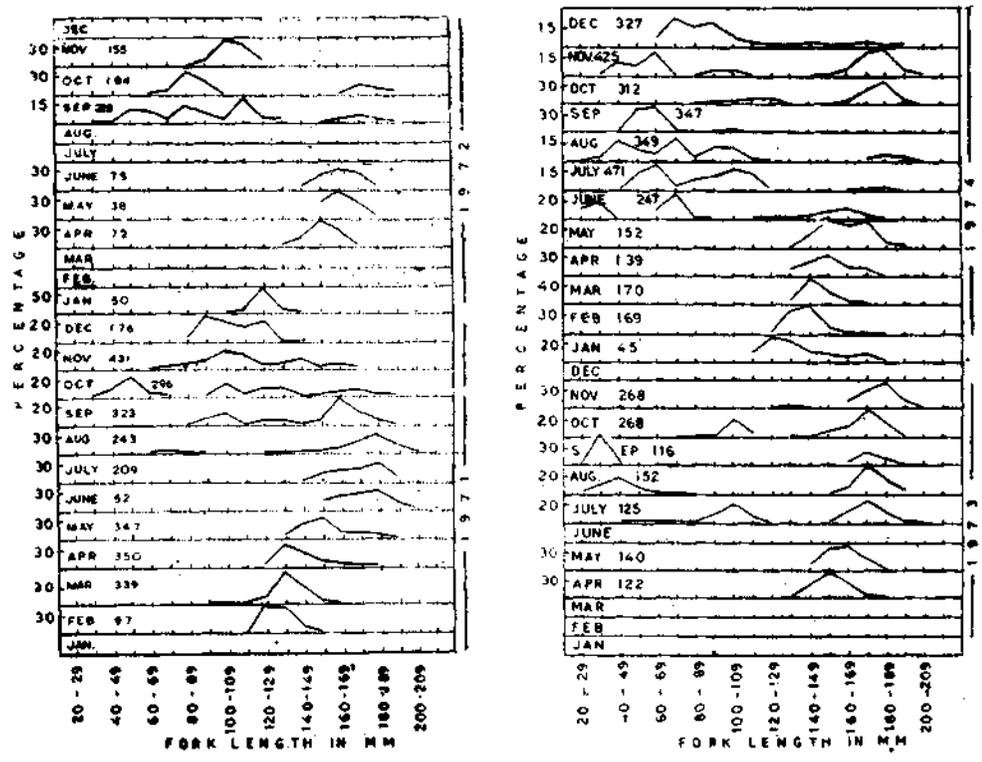

FIG. 2. Percentage length frequency of *D. dayi* during 1971-74.

appeared in the fishery in September at the sizes of 50-59, 80-89 and 110-119 mm, and were traceable in 1973 as they transformed into a separate entity until they reached the size of 180-189 mm in November. The broods of 1973 appeared in July, August and September and were noticed in the fishery up to December 1974 reaching a size of 170-179 mm. In 1974 new broods appeared during July-November period.

From the above observations it can be seen that there is a similarity between the broods of different years in that they appear in the fishery around June-September and continue up to November-December of next year. The number of broods appearing in each year varied. Considering the fact that the smaller size groups repeatedly appear in June to September-November of each year and disappear in November|December of next year, it was decided to plot the modal size groups in the same month of each year and such superimposed data are

presented in Fig. 4. It can be observed that the modal range was higher in smaller sizes, than the size groups above 120-129 mm. This clearly evidences the fact that, though the broods appear in different months, they tend to merge as a unimodal group of a year class later in life.

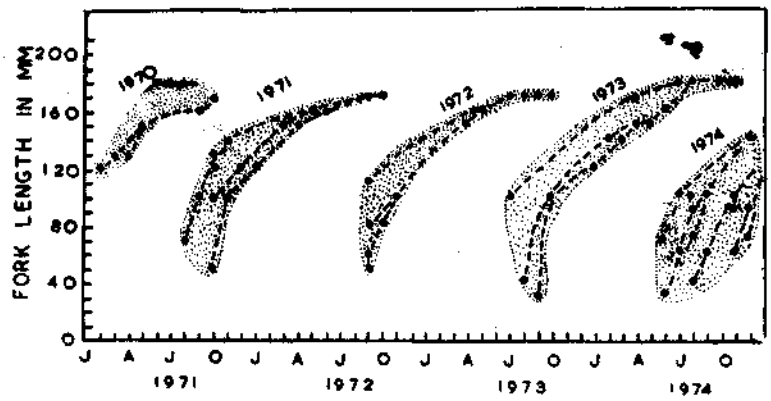

FIG. 3. Modal size groups of *D. dayi* (year classes are grouped separately. Different broods are connected to trace the growth).

Growth

For studying the rate of growth of *D. dayi* the average of superimposed modal groups were connected and best fit was drawn (Fig. 4). It was observed that the fish grew from 50 mm in June of first year to 184 mm in November of next year, thus getting an increase of 134 mm in 17 months. When the same line was extrapolated to 0 mm, it falls in the month of April, which can be concluded as the month of origin of the year class. This conclusion of taking April as the month of origin of the year class is justified since fish in active spawning conditions were collected in April 1971 and 1974. Therefore from the period of active spawning emerges a dominant modal size group when compared with the previous and later ones.

Starting from April, the fish grew to 30 mm in May, 55 mm in June, 65 mm in July and to 135 mm in February, at the rate of 10 mm per month; thence to 143 mm in March, 150 mm in April, 157 mm in May, 164 mm in June, 170 mm in July, 175 mm in August, 179 mm in September, 182 mm in October and 184 mm in November. This indicates a growth of 150 mm in the first year and the rest in further 7 months.

Growth rate was high in the first two months and was moderate from third to tenth month when the fish reached 135 mm. Then onwards the growth slowed down gradually. It is significantt that the gonads appeared in *D. dayi* at 90-99 mm length and the majority of fish were either in spawning or in spent condition at the size of 130-139 mm and 140-149 mm. Therefore, the slower growth rate

of fish larger than 130 mm could be due to diversion of metabolic activities towards the gonadial development and maintenance. Such instance of lowering down of body growth in the mature fishes was reported by Sreenivasan (1978) in the case of *Megalaspis cordyla*.

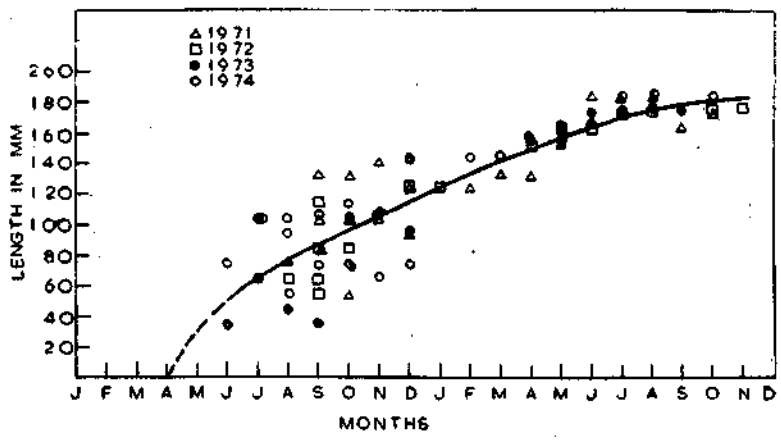

FIG. 4. Growth curve of *D. dayi* traced from mean values of each month of the years 1971-74.

In Philippine waters Tiews *et al* (1968) estimated a growth rate of 45 mm in 8 months from the size of 150 mm and above in total length for both *Decapterus russelli* and *D. lajang|macrosoma*. The present observation also gives an estimate very similar to the above findings.

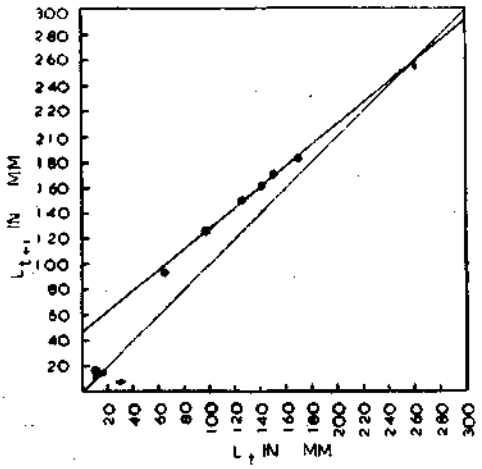

FIG. 5. Walford's growth transformation for length of *D. dayi*

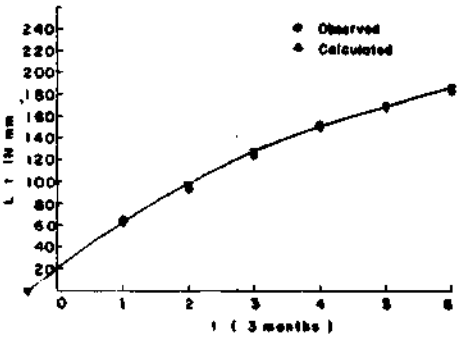

FIG. 6. Growth curve of *D. dayi* as per Von Bertalanffy's equation

Growth parameters

Adopting Walford's method (1946), the average lengths at every three months interval (L_t were plotted against those of succeeding ones (L_{t+1}) (Fig. 5). All the points fell in almost straight lines and the asymptotic length (L_∞) obtained was 260 mm. This size is close to the largest fish recorded for the species *ie.*, 271 mm during the present investigations.

The Von Bertalanffy's equation is expressed as:

$$L_t = L\infty\,(1-e^{-k(t-t_o)})$$

Where L_t = Length at time t,

$L\infty$ = the upper asymptotic length,

t_o = the time at which L_t is 0 and

k = a constant related to the co-efficient of catabolism or relative approach to the asymptotic size.

The corresponding values obtained were : $L\infty$ = 260 mm, k = 0.1858, t_o = −0.50 and L_{t_o} = 20 mm. This asymptotic length of 260 mm can be obtained at a hypothetical age of 50 intervals (*ie.*, 150 months or 12½ years). The observed

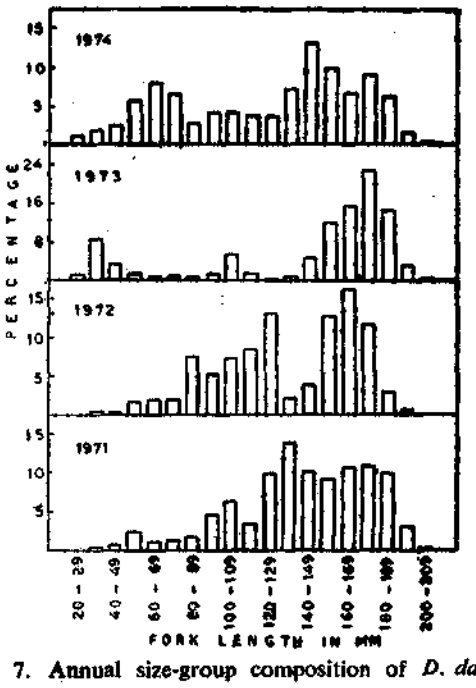

FIG. 7. Annual size-group composition of *D. dayi*

and calculated L_t were found to be more or less similar (Fig. 6). It is of significance to note that both Walford's and Von Bertalanffy's equation gave the same value indicating the correctness of the growth rate estimated above.

Relative Abundance of Age Classes in the Fishery

Average percentage composition of length groups of *D. dayi* during the years 1971 to 1974 is shown Fig. 7. During 1971, 1972 and 1974, 0-year class contributed to 65.0%, 65.6% and 75.6%, respectively, where as in 1973, one-year olds contributed 57.2% of the catch landed. Therefore, the fishery of *D. dayi* is mainly dependent upon fish of 0-year class.

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