A PRELIMINARY STUDY ON THE LENGTH FREQUENCY OF *PSEUDOSCIAENA SINA* (CUVIER AND VALENCIENNES) AT CALICUT DURING 1969-72

K. V. SOMASEKHARAN NAIR

Central Marine Fisheries Research Institute Substation, Calicut.

ABSTRACT

Length-frequency study made on *Pseudosciaena sina* (C & V) at Calicut during the years 1969-72 is presented in the paper. The probable growth rate of juveniles was observed to be 10-15 mm by analysing the boat-seine samples. The length-frequency graphs of trawl samples showed that in spite of prolonged spawning, recruitment of juveniles in to the fishery was in two peaks. The length of the fish at the completion of the first year was 135 mm and that at the completion of the second year was expected to be about 165 mm. The number of rings in the scales showed some correlation with the length of the fish. The fishery was constituted mainly by 0- and 1-year class individuals, though fishes probably belonging to higher age groups also occurred occasionally.

INTRODUCTION

Pseudosciaena sina (C & V) is one of the most important species contributing to the sciaenid fishery of the Malabar Coast. Literature on the biology of this species is meagre. The food and feeding habits of the fish were studied by Venkataraman (1960) and George *et al.* (1968). An investigation of the various aspects of the biology of this species was undertaken at Calicut from July 1969. The present paper deals with the length-frequency distribution of the catches of the species.

MATERIAL AND METHODS

Between July 1969 and June 1972, random samples of *Pseudosciaena sina* were collected every week from commercial bottom-trawl catches landed by mechanised vessels at Vellayil fish-landing centre. Specimens were also obtained from the catches by the Departmental boat-seine (*Paithuvala*), during the weekly experimental fishing operation carried out on inshore grounds off West Hill, Calicut. The scales from pectoral region were also examined for the purpose of comparison with length-frequency data.

Samples from the trawl net and the Departmental boat-seine were analysed separately. The total length of the fish was measured up to the nearest

mm, in fresh condition and grouped at 10-mm interval, with the mid-point representing the particular size group. The data collected were pooled month-wise and the size-frequency distribution was presented in terms of percentage. Regular commercial trawling and experimental fishing by the Department commenced every year in November and continued up to May. Figures 1, 2 and 3 give the length-frequency polygons for the period November 1969—May 1970, November 1970—May 1971 and November 1971—May 1972 respectively, and the various modes observed to occur in the samples from trawl catches are designated by capital letters and those of the *Paithuvala* by small letters.

LENGTH-FREQUENCY DISTRIBUTION IN THE DEPARTMENTAL BOAT-SEINE (*PAITHUVALA*) CATCH

An interesting feature in the length-frequency distribution of the *Paithuvala* samples was the predominance of juveniles, the adults being very poorly represented in the catch. (The *Paithuvala* is a flat conical cotton net of 9 meters length, the bag portion of which is 4 meters. The mesh size at the anterior portion of the bag is 15 mm and that at the posterior end 10 mm. To the anterior portion of the bag is attached wide meshed coir netting. The nets are operated at depths of 6 and 12 meters by dug-out canoes. The boat-seine collected mostly small sized bottom species, prawns and smaller and post-larval stages of shoaling fishes.)

1969-70. (*Figure* 1)

In November there was a conspicuous mode (a) at 115 mm. No samples were available in December. In January there was a new entry of juveniles indicated by mode (b) at 55 mm, the larger size groups being negligibly represented in the samples. During February an inconspicuous mode (d) occurred at 35 mm and a dominant one (c) at 85 mm. In March there was a mode (e) at 35 mm, the mode (c) being represented at 95 mm. During April the modes (e), (d) and (c) were seen at 45, 65 and 105 mm respectively. The mode (e) was at 65 mm and (c) at 115 mm in May.

1970-71. (*Figure* 2)

In November there was one dominant mode (e) at 105 mm. In December there was an entry of a fresh batch of juveniles represented by the mode (f) at 45 mm. This mode could be traced to 65 mm in January, 85 mm in February, 95 mm in March and 105 mm in April. During February, there was another entry of juveniles marked by an insignificant mode (g) at 45 mm. In March there was a new dominant mode (h) at 45 mm, which was seen at 65 mm in May.

1971-72. (*Figure* 3)

In November there was an entry of juveniles with a dominant mode (i) at 45 mm, which had shifted to 55 mm by December. During January there

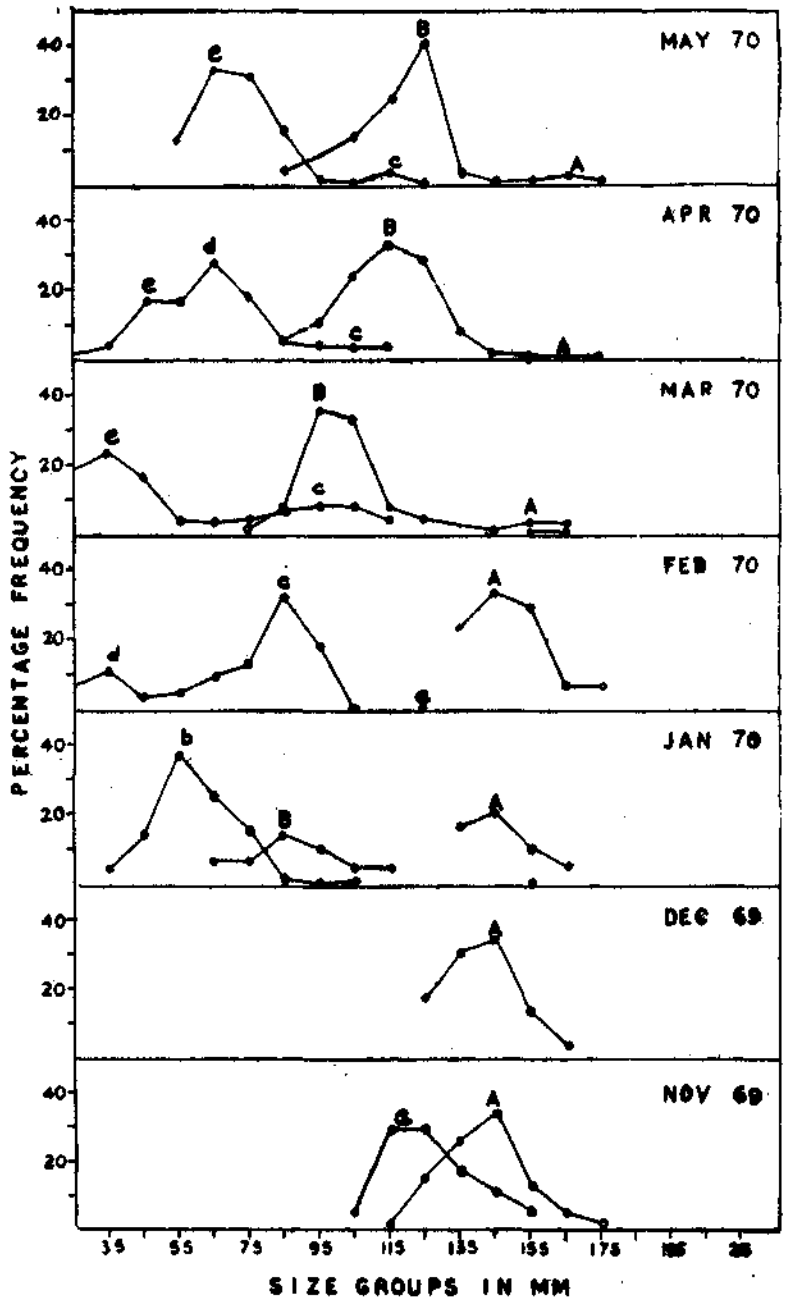

FIG. 1. Length-frequency distribution of *P. sina* in the boat-seine and trawler catches during 1969-70. ● Boat-seine catches O Trawler catches

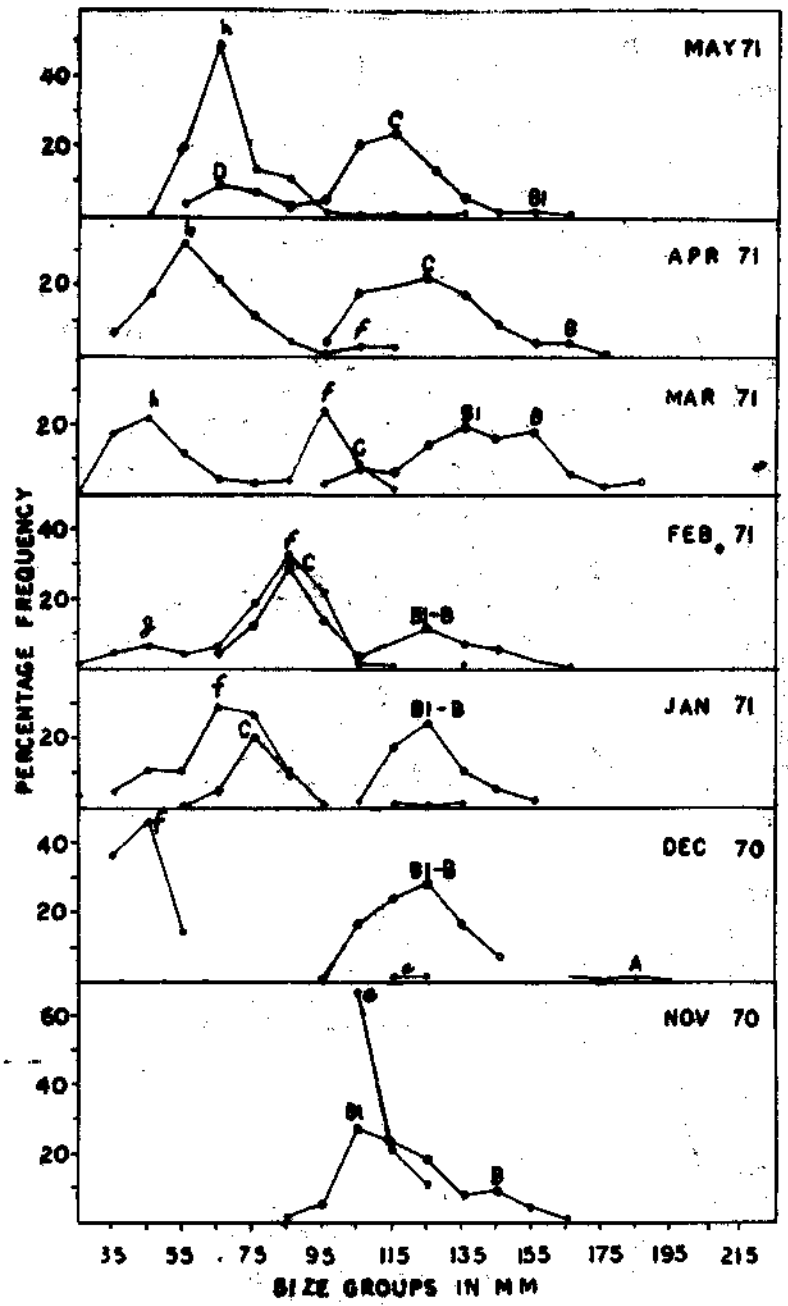

FIG. 2. Length-frequency distribution of *P. sina* in the boat-seine and trawler catches during 1970-71. ● Boat-seine catches O Trawler catches

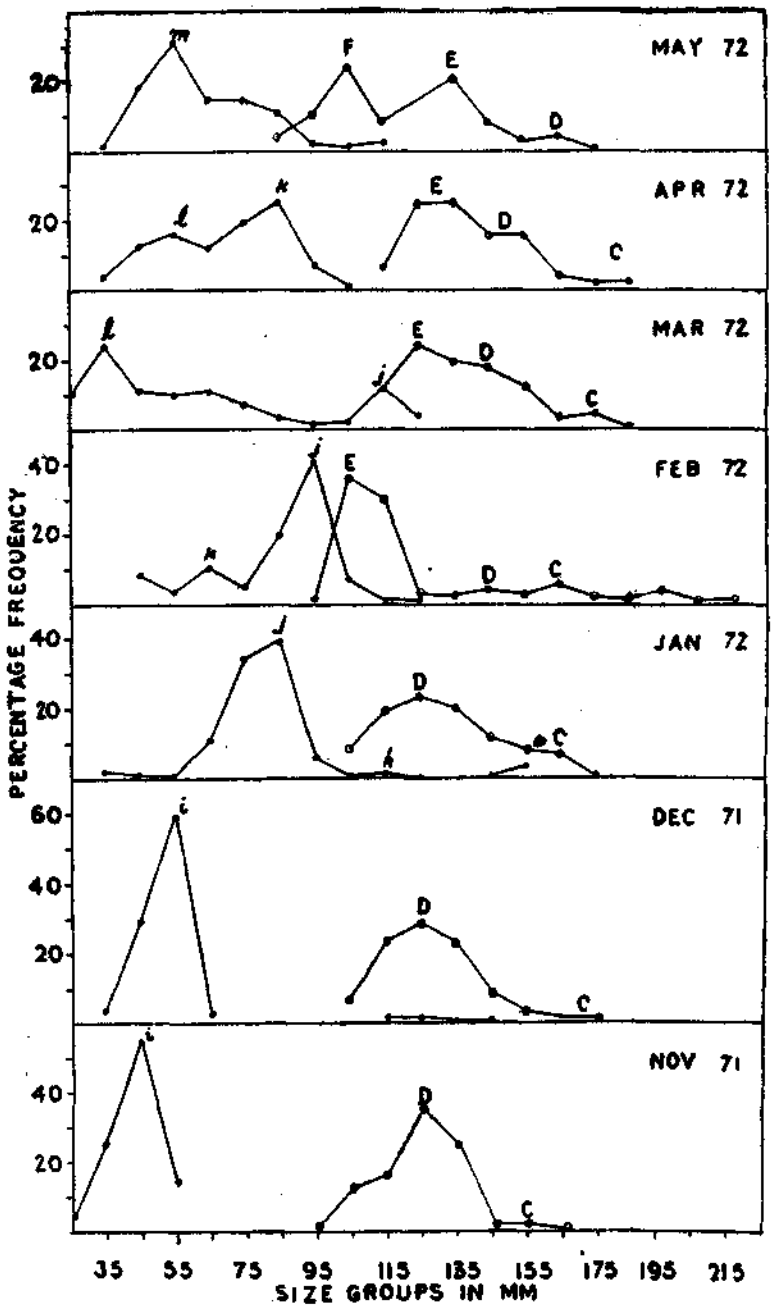

FIG. 3. Length-frequency distribution of *P. sina* in the boat-seine and trawler catches during 1971-72. ● Boat-seine catches O Trawler catches

occurred a batch of juveniles at 85 mm represented by mode (j), while fishes presumably belonging to mode (h) of the previous season formed an inconspicuous mode at 115 mm. In February there was a fresh batch of juveniles with an inconspicuous mode (k) at 65 mm, while mode (j) had shifted to 95 mm. In March there was another new entry of juveniles at 35 mm represented by mode (l), with mode (j) occurring at 115 mm. The position of mode (l) was at 55 mm and that of (k) at 85 mm in April. In May a dominant entry of juveniles (m) occurred at 55 mm, while other size groups were poorly represented in the samples.

Length — Frequency Distribution of the Trawl Catch

1969-70. (*Figure* 1)

In November there was a mode (A) at 145 mm, which could be traced to 165 mm in May. Juveniles with mode at 85 mm (mode B) were recorded in January and this group shifted to 125 mm in May, indicating a growth of 40 mm as against 20 mm for group (A) during the same period. From March to May the catches were composed mainly of the group (B).

1970-71. (*Figure* 2)

In November there was a mode for juveniles (B1) at 105 mm, while the mode (B) which was at 125 mm in May had shifted to 145 mm. In December, because of the continued recruitment of a large number of fish of (B1) size group and also due to the occurrence of lesser number of (B) group fish in the fishery, the two modes were no more distinct as hitherto, but tended to appear as a single mode at 125 mm, which may be designated (B1-B). Fish belonging to mode (A) was represented by a few individuals at 185 mm. During January (B1-B) continued to remain at 125 mm. In March the combined mode (B1-B) occurred as distinct ones, (B1) and (B) at sizes 135 mm and 155 mm respectively. (B1) moved to 155 mm in May. The difference in age between (B1) and (B) was thus about 5 months. In January juveniles with mode at 75 mm (C) entered the catch. This mode could be traced to 115 mm in May, indicating a growth of 40 mm in 4 months. The leftward shift of (C) from April to May indicates a continuous recruitment of younger fish of slightly smaller adjacent size groups. In April and May (B) and (B1) were reduced to insignificance in the fishery. In May there was a new entry of juveniles indicated by (D) at 65 mm.

1971-72. (*Figure* 3)

In November there were two modes at 125 and 155 mm, presumably (D) and (C) respectively of the previous season. The mode (D) shifted to 155 mm in May, thus indicating that the difference in age between (C) and (D) was about 6 months. The mode (C) shifted to 175 mm in April. In February there was a conspicuous mode of juveniles represented by (E) at

105 mm, which shifted to 135 mm in May. In May a fresh entry of juveniles represented by mode (F) at 105 mm was noted. The difference in age between modes (E) and (F) is obviously 3 months.

Results of the Examination of Scales

The examination of scales showed some indication of rings which appeared to have some correlation with the size of the fish. No rings were observed in fishes below the size group 105 mm. Majority of fishes in the size group 125-135 mm had one ring, while majority of fishes in the size group 145-165 mm had two rings. Deviations occurred in the number of rings in fishes of the same group, as can be seen from table 1.

Table 1. *Distribution of scale rings in* Pseudosciaena sina *(in percentage)*

Size groups in mm	0	1	2	3
105	100.00	—	—	—
115	82.00	18.00	—	—
125	30.80	69.20	—	—
135	7.10	42.60	50.30	—
145	—	15.60	84.40	—
155	8.30	—	91.70	—
165	—	—	16.66	83.34
175	—	—	—	100.00
185	—	—	—	100.00

Further investigations are necessary to attribute the causative factor for ring formation, the nature and time of ring formation etc.

Discussion

In fishes with a short and specific spawning period, if the length-frequency distribution presents a multimodal curve, the modes are interpreted as different year classes. The length-frequency curves in such fishes may also help in determining the monthly and annual rates of growth of respective year classes. Where there is prolonged and continuous spawning activity such as in P. *sina*, it presents some difficulty to trace the growth accurately through different months. The presence of young ones in the boat-seine samples throughout the period of observation indicates that the fish breeds all round the year. Here an attempt is made to trace the progress of different modes as far as possible to understand the recruitment and growth pattern of the species.

The size range and the modes occurring in the samples are determined by many factors, like mesh size of the net, time and duration of haul, tendency

of fishes to shoal in particular size groups etc. It was observed that the modal length was different in nets having different mesh sizes, the larger the mesh, the larger the mode of fish (Hodgson, 1927). Sekharan (1959) has made a detailed study on the correlation between mesh size and the modal size of *Sardinella albella* and S. *gibbosa* caught in different types of nets. In the present investigations it was observed that occurrence of modes was at small size groups in the small meshed Departmental boat seine and as was to be expected, occurrence of modes for the larger meshed trawl nets was at higher size groups. The boat-seine data were used in studying the growth increments in the first months of its life, since it consisted almost entirely of young individuals in the early 0-year class which were not represented in the trawl catches.

The *Paithuvala* catches indicated the abundance of juveniles. There was continuous appearance of new broods obviously due to prolonged spawning. The examination of monthly progression of various modes indicated that after a brood enters the boat-seine catch, its average growth per month is 10 to 15 mm for the first 5-6 months. Of course, variations in monthly growth rate were observed as can be expected. Differential growth rates between years have been observed in a variety of fishes mentioned in the literature, due to variation between years in the availability of food, changes in the environment etc. Antony Raja (1970) recorded differential rate of growth of various groups of *Sardinella longiceps* for the same interval of time between different years and also between various months of the same season. He also noticed that in juvenile broods the earlier recruits showed lesser growth increments as compared to the later recruits.

On the assumption that the growth rate was 10 to 15 mm as already stated, the mode (c) which appeared in the *Paithuvala* samples at 85 mm in February would have completed 6 months. This mode appeared as mode (B) in the trawl catch at 125 mm in May 1970 and 165 mm in April 1971, i.e., there is an increment of 80 mm in a period of 14 months, which means that the fish had attained a length of 135 mm at the completion of one year by adding about 50 mm in six months. The 165 mm group of April 71 appears to have completed more than one and a half years, but thereafter no data was available to trace the growth and determine the size at the completion of second year. However, based on the growth pattern, it was assumed to be about 165 mm only. (The growth was almost negligible during this period.) The mode (e) which appeared for the first time at 35 mm in March 70, was seen at 105 mm in the trawl catch in November 70 and 135 mm in March 71, which means, that the increment in size was 100 mm during the course of one year, showing that the fish grew to about 130 mm in one year. Tracing the growth of mode (C) in the trawl catch (presumably corresponding to mode (f) of the *Paithuvala* samples) it was seen that the fish increased in size from 45 mm in December 70 to 165 mm in March 72. From this also it could be reasonably assumed that

the size at the end of the first year was 135 mm and that at the end of the second year 165 mm. The mode (h) which appeared in the *Paithuvala* samples at 45 mm in March 71 was traced to 65 mm in trawl catch in May 71 and 165 mm in May 72, showing an increment of 120 mm in 14 months. Following this group also, it appeared that the first year of the fish was completed when about 135 mm in length. The mode (j) that appeared in the *Paithuvala* samples at 85 mm in January 72 was seen at 135 mm in May 72. This apparently was another brood that was just completing one year. The presence of large sized individuals with some indications of modal formations in certain months (mode at 195 mm in February 72) indicated that the lifespan of the species was beyond two years though this group was very rarely encountered in the commercial catch, the fishery being constituted mainly by 1-year class individuals.

Thus it is seen that the growth pattern of each brood is more or less identical, which seems to justify the alignment of modal developments. Because of the above reasons it is asumed that the fish grows to about 135 mm at the end of the first year and to about 165 mm at the end of the second year. The scale analysis also supports this view. It is also seen that the growth is generally poor during November to February.

In spite of prolonged spawning, as is evidenced by the continued occurrence of young ones in the boat seine samples, the length-frequency graphs of trawl samples showed only two distinct modes which indicate that recruitment of juveniles into the fishery is in two peaks.

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