MATURITY AND SPAWNING HABITS OF SOME SCIAENIDS IN OFFSHORE WATERS AT VISAKHAPATNAM

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Introduction

Sciaenids form a commercially important group of fishes in the catches of both the powered and non-powered craft, along the Andhra and Orissa coasts. The important species entering the catches are *Pseudosciaena aneus* (Bloch), *Pseudosciaena bleekeri* (Day) and *Johnius carutta* (Bloch). The author has been studying the distribution, abundance and biology of these fishes off the Andhra and Orissa coasts. Preliminary results of the work on the spawning cycle of these fishes based on a study of ova diameter frequencies are presented here.

Studies from the Indian region on the spawning habits of sciaenids have been meagre. Observations on the larval development and the breeding of the Gangetic whiting *Pama pama* were made by Pantulu and Jones (1951). The larval development of *Pseudosciaena coitor* was described by Karamchandani and Motwani (1954). John (1951) studied the characters of larval and post-larval forms of what he thought was probably *Pseudosciaena aneus* from Madras coast. Rao (1963) studied the spawning habits of *Pseudosciaena diacanthus* from Bombay coast.

Material and Methods

This study was undertaken in 1960-61. Samples were collected on board the Government of India trawlers operating from Visakhapatnam and brought to the laboratory. After noting the total and standard lengths of the fishes, the ovaries were preserved in 5 percent formalin and allowed to harden for several days. The maturity scale adopted by the International council for the exploration of the sea for the herring has been followed by the author, for determining the stage of maturity of the sciaenids. It was observed that there was no significant difference in the size of ova in different parts of ovary, hence small samples, from middle region were teased out and spread uniformly on a glass slide, and their diameters measured according to the procedure described by Clark (1934). Only the ovaries in stage IV and above were examined during the present study. Ova less than 5 micrometer divisions were omitted (1 m.d. = 0.0176 mm.). The entire range in the size of ova was then divided into micrometer division size groups and the percentage frequency of each size group calculated and plotted in the figures.

Results

Pseudosciaena aneus (Bloch)

Pseudosciaena aneus is the most important species of sciaenid in the trawl catches of Visakhapatnam. Figure 1 shows the size distribution of ova in the mature ovaries of (stages IV-VI) of fish whose size varied from 16.5 to 23.7 cm. Figure 1A gives frequency distribution of mature ova, from the ovaries in stage IV of maturity. There is a distinct mode 'a' formed by the mature ova at 28 m.d. Besides these, maturing ova which are partially filled with yolk and a large number of immature eggs are also found. In figure 1B and 1C are shown the frequency polygon of mature ova from three ovaries in stage V of maturity. It was noted that the mode 'a' at 28 m.d. has shifted to 30 m.d. (fig. 1B) and then to 36 m.d. (Fig. 1C) showing growth in the size of ova from stage IV to V. In figure 1D the frequency polygon of ripe ova from two running individuals (18.2 and 19.4 cm. in total length) collected in January and February are represented. It is seen that the fully ripe eggs have a mode

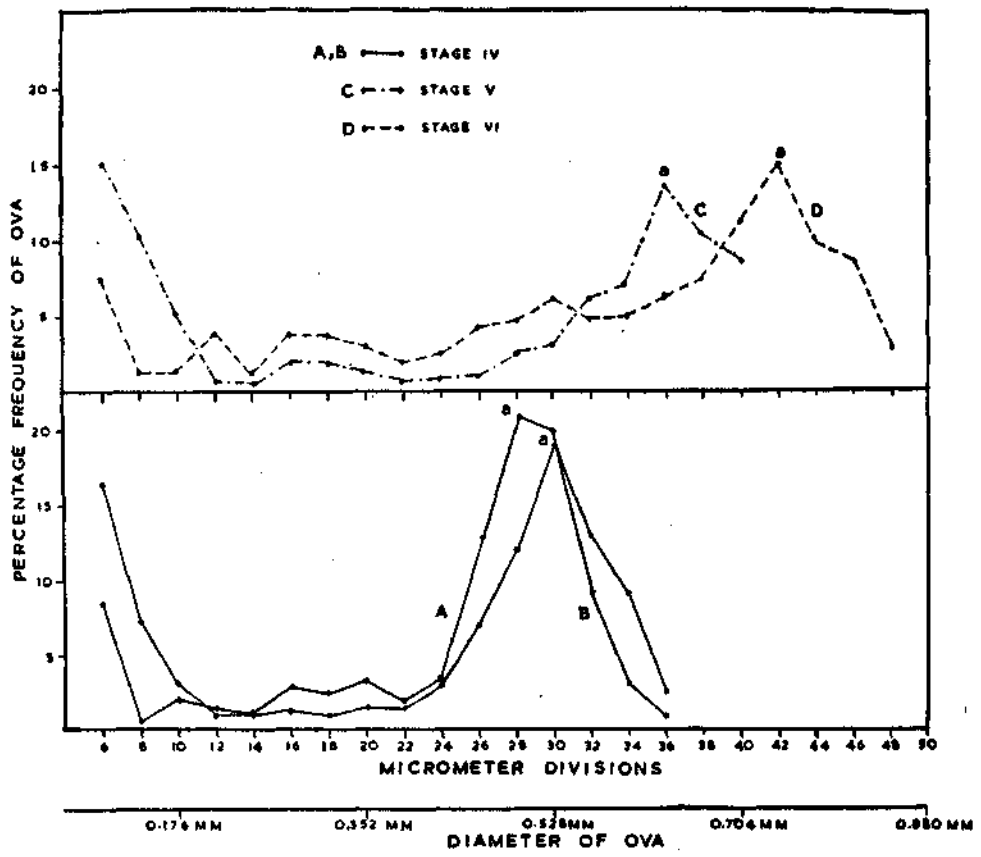

FIG. 1.—Ova—diameter frequency curves of mature and running ovaries of *Pseudosciaena aneus*.

at 42 m.d. Since there is only one mode formed by the mature ova, and as they are sharply seperated from the rest of the stock of the eggs, spawning period in this species could be regarded as short. Specimens of *Pseudosciaena aneus* with mature ovaries occurred in the catches during the period December to March. Specimens with running ovaries were obtained in the months of January, February and March. This is further supported by the fact that very young fish measuring less than 3 cm. are observed in the inshore catches during February to May.

Pseudosciaena bleekeri (Day)

Figure 2 shows the size distribution of ova, in the mature and running ovaries (stage IV-VI) of fish whose size varied from 20.0 to 24.2 cm. in total length. In figure 2A is shown the frequency polygon of ova from three ovaries in stage IV of maturity. The mature ova formed a mode at 26 m.d. (a). Figure 2B shows the frequency polygon of ova from three ovaries in stage V of maturity. There is a distinct mode at 28 m.d. The mode '*a*' at 26 m.d. of stage IV (fig. 2a) has obviously shifted to 28 m.d. in stage V. The figure 2C shows the frequency polygon of ova from two specimens in ripe condition (stage VI) measuring 20.0 and 22.0 cm. in total length. The eggs are transparent each with a distinct oil globule. They have a mode at 44 m.d.

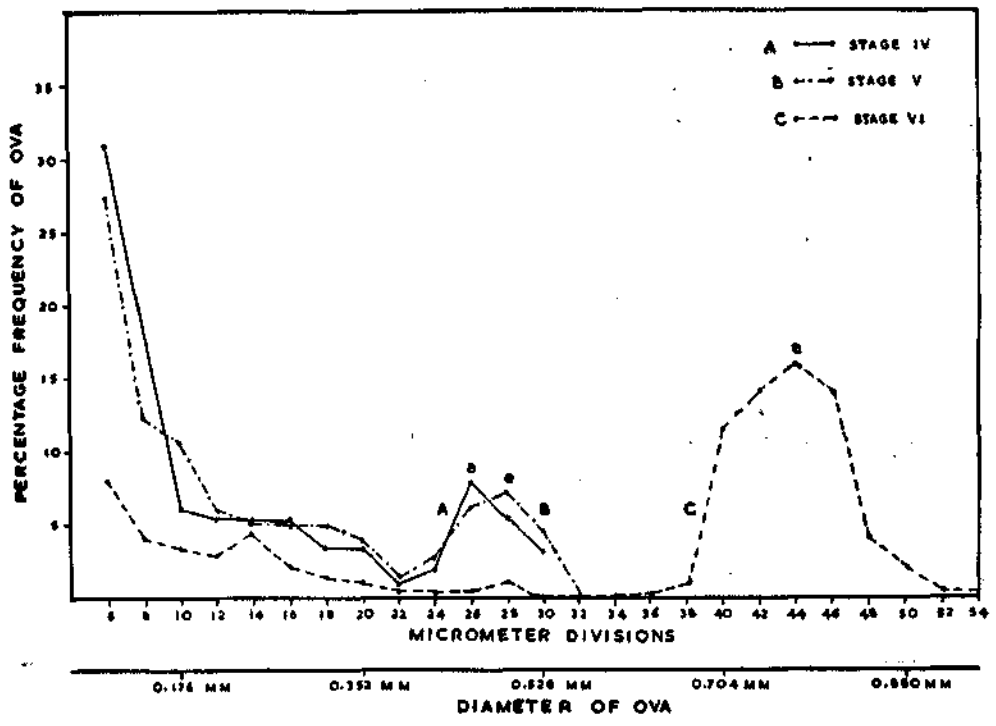

FIG. 2.—Ova—diameter frequency curves of mature and running ovaries of *Pseudosciaena bleekeri*.

(Fig. 2C). The presence of single batch of mature eggs, sharply separated from the general stock, indicates that the spawning period in this species also is not prolonged. Specimens with mature gonads were collected during the period, December to April and specimens with ripe gonads in March and April. Thus it is reasonable to conclude that the fish spawns during the period, February-May. This is supported by the fact that juveniles measuring less than 3 cm. are available in the inshore catches during the period, April-June.

Johnius carutta (Bloch)

Figures 3A, 3B, 3C represent ova diameter frequencies from fishes of stage IV, V aud VI respectively, and ranging from 18.9 to 20.3 cm. in total length. In fig. 3A (stage IV) all the mature ova are grouped around a single mode, the percentage of ova at this mode 'a' being about 20. That there is perhaps no further significant addition to the stock of maturing eggs after stage IV, is shown by figures 3B and 3C, where also the total percentage of the mature ova at the modes remains about the same (about 16-20%) as that observed in 3A (stage IV). Only in 3B and 3C the mature eggs are grouped around two modes ('a' and 'b') in contrast to what is seen in the earlier stage. In other words 20% of the eggs contribute to one mode 'a' in 3A (stage IV), but to two modes in 3B and 3C is at the same position as 'a' of 3A. It is therefore

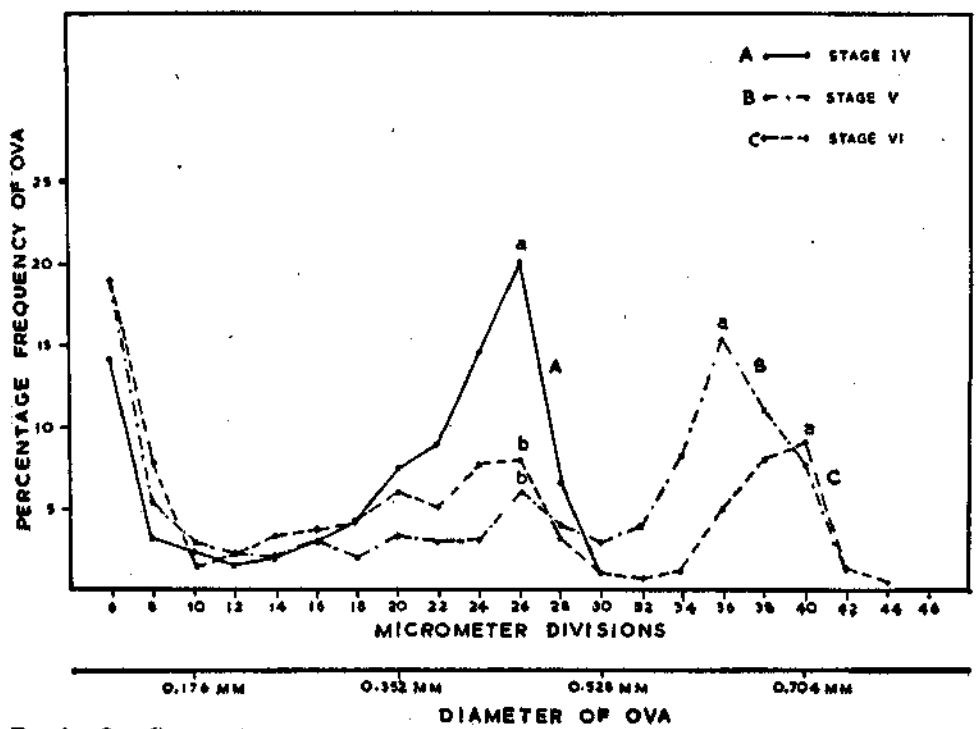

FIG. 3.—Ova-diameter frequency curves of mature and running ovaries of *Johnius carutta*.

reasonable to conclude that the second mode of mature ova of 3B and 3C, is the result of differentiation of a group of fast growing ova, from the mature stock of 3A. The maturing process therefore has probably two stages in this fish, (1) differentiation of a batch of eggs as a mature group, (2) further differentiation of another batch from the mature group. Probably, only this last batch under the mode 'a' is to be liberated during the ensuing spawning season. Only further studies will show, what happens to the mode left, after the shedding of this group. The author's data show that mature fish of stage V and above are available in trawl catches from November to March and running individuals are obtained in February and March. Hence it would appear that duration of spawning season is short extending from January to April. This is confirmed by the fact that young specimens measuring less than 3 cm. were available in the inshore catches during the period of February-May.

Remarks

The present study shows that *Pseudosciaena aneus, Pseudosciaena bleekeri* and *Johnius carutta* spawn only once a year and the spawning period is probably of short duration extending for 3 to 4 months. *Pseudosciaena aneus* and *Pseudosciaena bleekeri* are similar in having only one batch of mature eggs. But *Johnius carutta* has two batches, the second batch in the advance stage of maturation (V-VI) being formed apparently by the differentiation of a group of fast growing ova from the only stock of mature ova of stage IV. Rao (1963) reported that in *Pseudosciaena diacanthus* there were at least two batches of mature eggs.

John (1950) stated that at Madras, he could examine the ripe specimens of *Pseudosciaena aneus* in May and June; larval and post larval forms, of what he considered probably, the same species, were collected by him from June to October. But the investigations of the present author indicate that the spawning period of *Pseudosciaena aneus* in the Visakhapatnam region is from December to March. Thus it would appear, that the spawning period in this species varies from place to place.

Gopinath (1946) observed post larval forms of *Sciaena albida* along the Trivandrum coast from November to March. From Bombay Bapat and Bal (1949) reported the occurrence of post larval and young ones of various species of sciaenids, namely *Sciaena miles, Sciaena albida, Sciaena semiluctosa, Sciaena glauca, Otolithus argenteus* during the winter rainy and summer seasons. Chacko (1950) observed larval and post larval forms of *Otolithus ruber*, during the period August to September in Gulf of Mannar. Pantulu and Jones (1951) stated that in the river Hooghly *Pama Pama*, spawned throughout the year. From Bombay Rao (1963) reported that in *Pseudosciaena diacanthus*, the spawning period extended from June to September. Longhurst (1964) while studying the spawning habits of sciaenids of tropical West Africa stated that *Pseudosciaena*

senegalensis and *Pseudootolithus typus* spawned throughout the year and there were two periods in spawning activity, one of maximum activity between February and June and another of minimal spawning activity extending from July to September. Such a type of prolonged spawning at the same place has not been observed in any of the species from the Indian region except in the case of *Pama pama* (Pantulu and Jones, 1950). However the possibility of the same species spawning during different periods at different sections of the coast cannot be ruled out in view of the observations of various authors referred to above.

Summary

Spawning habits of three species of sciaenids, namely *Pseudosciaena aneus*, *Pseudosciaena bleekeri* and *Johnius carutta* are given as determined by ova diameter measurements from the ovaries in stage IV-VI of maturity. All the three species spawn only once a year. The spawning period *Pseudosciaena aneus* is from December to March of *Pseudosciaena bleekeri*, from February to May and for *Johnius carutta*, January-April. *Pseudosciaena aneus* and *Pseudosciaena bleekeri* are similar in having only a single batch of mature eggs, while *Johnius carutta* has two batches.

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References

Bapat, S.V. and Bal, D.V. 1952 — The food of some young fishes from Bombay. *Proc. Indian. Acad. Sci.* **35**:78-92.

Chacko, P.I. 1949 — Food and feeding habits of the fishes of Gulf of Mannar. *Proc. Indian Acad. Sci.* **29**(B); 83-97.

Clark 1934 — Maturity of the California Sardine (*Sardina caerulia* determined by ova diameter measurements. *Calif. Fish. and Game* **42**: 1-49.

Gopinath, K. 1942 — Distribution and feeding of the post larval fishes of Trivandrum coast. *Curr. Sci.* **11**:337.

John, M.A. 1951 — Pelagic fish eggs and larvae of Madras coast. *J. Zool. Soc. India.* **3**: 38-66.

Karamchandani, S.J. and Motwani, M.P. 1954. — On the larval development of *Pseudoscianena coiter* (Ham) *J. Zool. Soc. India* **6** (1):71-79.

Longhurst, R. 1964 — Bionomics of the Sciaenidae of tropical West Africa. *Jour. Du. Conseil* **29** (1): 93-114.

Pantulu, V.R. and Jones, S. 1951 — On the larval development of the Gangetic whiting. *Pama pama* (Hamilton). *J. Zool. Soc. India.* **3**(1): 105-111.

Rao, K.V.S. 1963 — Some aspects of the biology of 'Ghol' *Pseudosciaena diacanthus* (Lacepede) *Indian. Jour. Fish.* **10** (In press).