STUDIES ON THE BIOMETRY AND BIOLOGY OF *PENNAHIA ANEUS* BLOCH

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ABSTRACT

Biometry and biology of *Pennahia aneus* Bloch from Porto-Novo waters are discussed. The total length shows the fastest growth and the eye-diameter has the lowest rate of growth. The food consists of fishes, *Cymathoa* spp., prawns, prawn mysis and *Squilla* spp. The juveniles feed predominantly on crustaceans. The presence of *Cymathoa* spp. in the stomach contents of adults indicates that *Pennahia aneus* may exhibit cleaning association with other hosts of the parasite. The spawning takes place during a short period from September to October. *Pennahia aneus* attains sexual maturity at a length of 134 to 148 mm. Fecundity in the fish measuring 189 to 252 mm varies between 11423 and 79835.

INTRODUCTION

The literature on the biometry and biology of sciaenid fishes which form a considerable proportion of the catches all along the east and west coasts of India is meagre, although information regarding the food and feeding habits, age determination and the maturity and spawning behaviour, are available in respect of species, such as *Johnius aneus* (Rao 1964, Suseelan and Somasekharan Nair 1969), *Pseudosciaena diacanthus* (Rao 1961, 1967), *Sciaenoides brunneus* (Karandikar and Thakur 1951), *Otolithoides brunneus* (Kutty and Narayanan 1961), *Otolithoides brunneus* (Kutty 1968), *Otolithus argenteus* (Annigeri 1963), *Pseudosciaena aneus*, *Pseudosciaena bleekari* and *Johnius carutta* (Rao 1967) and *Otolithus ruber* and *Johnius dussumieri* (Devadoss 1969).

The present paper deals with the biometrical and the biological aspects such as size at first maturity, fecundity, period and duration of spawning in *Pennahia aneus* which forms a major component in the trawl catch of Porto-Novo.

MATERIALS AND METHODS

Samples were collected bi-weekly from the commercial catches of trawlers operated at a depth of 5-12 fathoms off Porto-Novo (11°29'N, 79°49'E), during the period November 1974 to October 1975. Each ovary was examined in fresh condition and maturity stages were determined as per ICES scale. The ovaries

were preserved in modified Gilson's fluid (Simpson 1951) and the fishes were preserved in 10% formaldehyde solution. To find out the relationship between various morphometric characters and standard length, the general equation $y = a+bx$ was employed. In order to determine the abundance of various food items in the gut of fish 'Index of Preponderance' method (Natarajan and Jhingran 1961) was followed. The occurrence of each food item and its volume were noted. If Vi and Oi are the volume and occurrence and index of food item i, the combined 'Index' (I) for the food item i may be calculated as follows:

$$Ii = \frac{Vi\ Oi \times 100}{\Sigma\ Vi\ Oi}$$

The Index designated as the "Index of Preponderance" is a actually a composite one based on volume and occurrence index. The occurrence of fish at different stages of maturity during different times of the year was noted. Based on this and the distribution of ripe, running and spent fish, the spawning season was determined. The spawning periodicity was determined by ova-diameter studies of 15 specimens ranging in maturity stages from I to VII. The method followed was, that employed by Clarke (1934). One micrometer division was found to be equivalent to 0.0137 mm. Fecundity estimates were made following the method described by Polder and Zijlestra (1959) by weighing the wet ovary after superficial drying with blotting paper. The estimated total number of eggs were obtained by weighing and counting 2 to 5 small samples and raising by the ratio of total weight to weight of samples. Only mature fish with stages IV and V were taken for fecundity estimation.

Results

The regression lines based on the angle of the tangent are presented in the Fig. 1, where the growth rate of various parameters are shown. The regression lines reveal that the total length has the fastest growth rate followed by the pre-anal length. Snout to ventral origin grows faster than snout to dorsal origing A comparison of the relative growth of the fin rays shows that the ventral fin ray shows faster growth than the dorsal and the anal fin ray. The rate of growth for head length is more than the head depth. The interorbital space, snout length and depth at caudal peduncle have the same growth rate. The slowest growth rate has been observed in the eye diameter.

The gut-content analysis of adult male and female reveals that they feed on the fishes *Bregmoceros* spp., *Cynathoa* spp., juvenile prawns, prawn mysis, *Asseragodes cyanes*, *Platycephalus* spp., *Lucifer* spp., *Apogon* spp., Amphipod, *Typhlatuchen vaginalis*, *Squilla* spp., *Sepia* sp., *Cynoglossus* spp., *Thrissa* spp., Gobids, crab juveniles and hermit crab. The juveniles feed only on prawn mysis and prawn juveniles (Table 1).

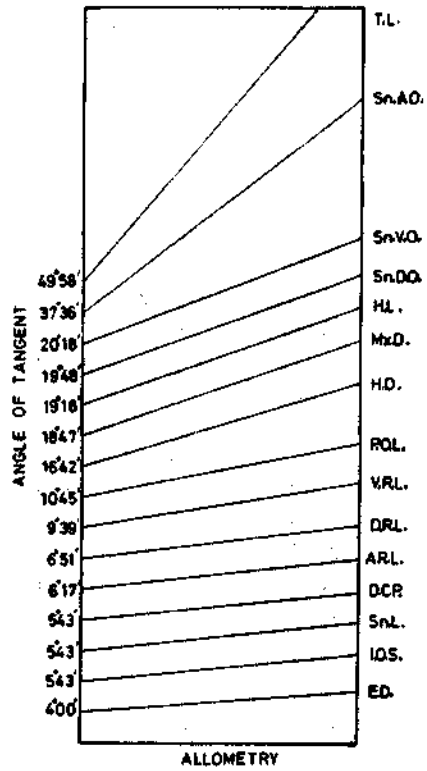

FIG. 1. Growth rate of various parameters of *P. aneus*.
T. L. - Total length; Sn. A. O. - Snout to anal orginal; Sn. V. O.- Snout to Ventral orgin; Sn. D.O. -Snout to dorsal origin; H. L. - Head length; Mx. D. - Maximum depth; H. D. - Head depth; P. O. L. - Post-orbital length; V. R. L. - Ventral ray length; D. R. L. - Dorsal ray length; A. R. L. - Anal ray length; D. C. P. - Depth at caudal peduncle: Sn. L. - Snout length: I. O. S. - Inter-orbital space; E. D. - Eye diameter;

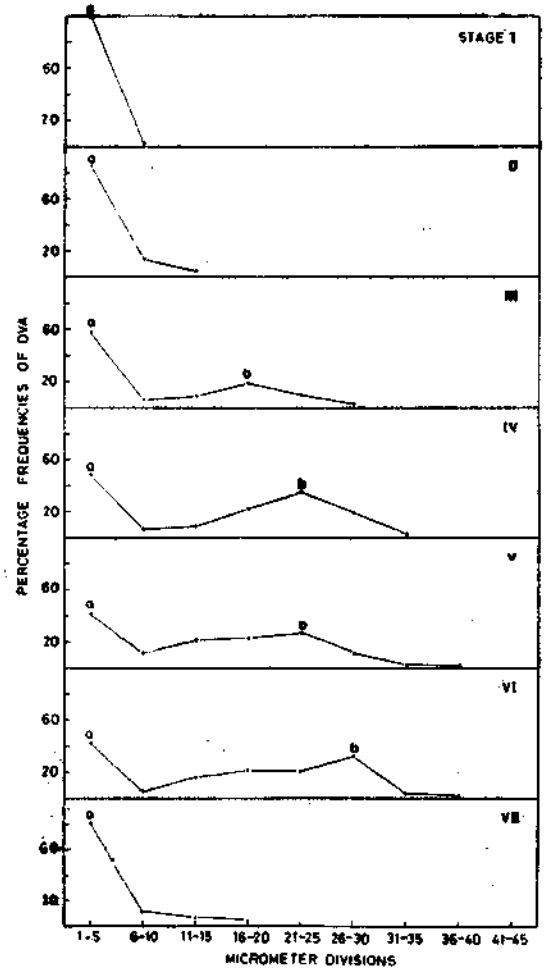

FIG. 2. Ova-diameter frequency of *P. aneus*. of maturity styles. I to VII.

The size distribution of ova in the ovaries (Stage I to VII) has been plotted in the Fig. 2. The mode 'a' represents the immature stock and the mode 'b' is the matured stock. The ripe ovary (Stage VI) contains fully mature ova with oil globules and yolk and the modal range is 0.356 to 0.411 mm. This batch of ova is sharply differentiated from the general stock of immature eggs. The ovaries with the ripe ova (Stage V and VI) were obtained during the months of September and October. Since only one mode formed by the matured ova and is very distinct from the rest of the stock of the egg, the spawning period could be assumed as short. The matured ovaries have been recorded during September to October. The spent ovaries have been obtained during the end of September to early November period.

TABLE 1. *Index of preponderance (based on occurrence and volume of food items) of* Pennahia aneus.

Food items	% of occurrence (Oi)	% of volume (Vi)	Vi Oi	$\frac{Vi\ Oi \times 100}{\Sigma Vi\ Oi}$	Rank
MALE					
Bregmaceros spp.	3.37	17.99	60.63	3.56	3
Cymothoa spp.	60.76	23.43	1423.61	83.68	1
Prawn juveniles	11.49	13.81	158.68	9.34	2
Prawn mysis	12.84	0.84	10.79	0.63	5
Asseragodes cyanes	1.35	19.66	26.54	1.56	4
Platecephalus spp.	0.68	0.84	0.57	0.03	11
Lucifer spp.	0.68	8.37	5.69	0.33	7
Apogon spp.	2.71	2.51	6.80	0.40	6
Trypauchen vaginalis	0.68	4.18	2.84	0.17	8
Squilla spp.	1.35	1.67	2.25	0.13	9
Sepia spp.	0.68	1.18	0.80	0.05	10
Cynoglossus spp.	0.68	0.63	0.43	0.03	11
Thrissa spp.	1.35	0.21	0.28	0.02	12
crab	0.68	0.42	0.29	0.02	12
Hermit crab	0.68	1.26	0.86	0.05	10
	100.00	100.00	1701.06	100.00	
FEMALE					
Bregmaceros spp.	2.14	17.95	38.41	2.06	3
Cymathoa spp.	49.27	23.18	1142.08	61.39	1
Prawn juveniles	19.99	31.79	635.48	34.15	2
Prawn mysis	7.14	0.41	2.93	0.16	8
Apogon spp.	16.43	1.28	21.03	1.13	4
Amphipods	0.72	0.26	0.19	0.01	11
Trypauchen vaginalis	0.72	11.79	8.49	0.46	5
Cynoglossus spp.	0.72	1.03	0.74	0.04	10
Thrissa spp.	0.72	3.59	2.58	0.14	9
Gobids	0.72	5.64	4.06	0.22	7
Crab	1.43	3.08	4.40	0.24	6
	100.00	100.00	1860.39	100.00	
JUVENILES					
Prawn juveniles	33.34	60.00	1000.20	27.29	2
Prawn mysis	66.66	40.00	2666.40	72.72	1
	100.00	100.00	3666.60	100.00	

TABLE 2. *The fecundity in various size groups of* Pennahia aneus *Bloch.*

Length of fish (mm)	Wt. of fish (g)	Wt. of ovary (g)	No of ova
189	85.000	0.5122	11423
191	99.000	0.6913	13952
192	100.000	0.7972	18190
194	100.500	0.8112	18420
197	103.000	0.8619	23539
225	110.000	1.4030	26082
233	185.000	2.4479	56560
252	231.700	2.6840	79835

It has been found that the fecundity of the species increases in relation to the size of the fish (Table 2). The maximum number of ova was 79835 for the fish of total length 252 mm and the minimum number 11423 for the fish of total length 189 mm.

The female and the male attain their sexual maturity at a total length of 134-148 mm.

DISCUSSION

From the biometrical studies of *Pennahia aneus*, it has been observed that the total length shows the fastest rate of growth and the eye diameter has the slowest rate of growth.

The studies on food and feeding habits reveal that the feeding habits depend mainly on the availability of the fish food in the environment. The adult fish feeds on *Cymathoa* spp., *Bregmaceros* spp., and juvenile prawns only. Rao (1964) and Suseelan and Somasekharan Nair (1969) have also recorded the occurrence of *Acetes indicus*, teleost remains, prawns, crabs, *Squilla* spp., alima, *Lucifer* spp., mysids, isopods, amphipods, copepods, euphausids, prawn larvae and fish. The frequent presence of known external parasitic isopod *Cymathoa* spp., in the gut contents of adult fish indicates that the fish may exhibit cleaning association. The present observation is in quite agreement with Rao (1964) who recorded isopods from the gut content of the same fish.

Rao (1964) stated that *Pseudosciaena aneus* spawns within a short period from December to March in the Visakhapatnam region. John (1951) examined ripe specimens of *Pseudosciaena aneus* during May and June from Madras coast. During the present study, the mature and spent fishes have been collected from September to October. Thus it appears that the spawning season for this species vary from place to place. The results of present investigation from Porto Novo waters reveal that the spawning season of *Pennahia aneus* in the area is from September to October. The ova-diameter study indicates that the species has a very short spawning period as per the criteria given by Hickling and Rutenburg (1936).

ACKNOWLEDGEMENTS

I wish to express my indebtedness to Professor Dr. R. Natarajan, Director, Centre of Advanced Studies in Marine Biology, Porto-Novo, for suggesting the problem and his encouragement throughout the period of this work. My sincere thanks are due to Dr. V. Ramaiyan, Research Associate and Shri. N. Ramanathan, Junior Research Fellow for their guidance and valuable help in this work. I am very grateful to Shri. G. Venkataraman, Scientist S-3, and Shri K. V. Narayana Rao, Scientist S-3, CMFR Institute, Cochin who have gone through this manuscript critically and made valuable suggestions and corrections.

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