

Reproduction of the Pearl-Spot, *Etroplus suratensis* (Bloch) in the Nethravati – Gurpur Estuary, Mangalore

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Abstract

Spawning of *Etroplus suratensis* in the Nethravati-Gurpur estuary took place from August to November and January to February with peak activity during August. The male : female ratio was 1 : 2.73, indicating a significant dominance of females in the population. Up to size group 18 – 19 cm T.L., the females dominated. In the larger individuals there was no significant difference in the ratio. The fecundity ranged from 506 to 3053 eggs per female, the average being 1780 eggs. Linear relationships were found between fish length, fish weight, gonad weight and fecundity. The size at first maturity was between 10.0 and 11.9 cm T.L. in females and 12.0 and 13.9 cm T.L. in males. Seasonal variations in the condition indices of males, females and sex – indeterminates showed close similarity indicating comparable metabolic activity. Unlike in other fishes, changes in the condition of *E. suratensis* did not appear to be related to sexual cycle.

Introduction

The chromids or the pearl-spots (Family:Cichlidae) form an important group among the brackishwater fishes of the tropics. Species of *Etroplus*, especially *E. suratensis* being the largest, have many desirable features which make them ideal fishes for aquaculture. Its wide salinity tolerance, ability to breed in confined waters, fast rate of growth, good body weight, tasty flesh, highly adaptable feeding habits, robust and sturdy body and good market price are some of the favourable characteristics for selection of this fish as a candidate species for brackishwater aquaculture. In some parts of South India, *Etroplus* is considered a delicacy and priced as much as Rs.30/- per kg which is comparable to the market value of other high quality table fishes. There are only very few reports on the reproductive biology of *E. suratensis* inhabiting Indian waters (Hora and Pillay, 1962). The present study deals with the reproductive biology of this species inhabiting the Nethravati-Gurpur estuary at Mangalore.

Material and Methods

Weekly samples (Sample size ca. 30) of *E. suratensis* caught from the Nethravati-Gurpur estuary were obtained from February 1984 to January 1985. In the laboratory, total length, fresh weight, sex, stage of gonadal maturity, gonado-somatic index and relative condition of individual fish were recorded using standard methods. Ova diameter was measured using an ocular micrometer (1.0 md = 0.01 mm) from ovaries preserved in 5% formalin. Ova diameters were grouped into size groups of 2 ocular micrometer division (Omd) and frequency polygons drawn for all stages of maturity. Size at first maturity was determined from data on fish from stage-III and above. Fecundity was estimated gravimetrically. Sex ratio was studied with respect to season and size.

Results and Discussion

Maturity stages I to VI described by Dadzie (1980) have been recognised in this fish. The percentage frequency distribution of ova diameter of the above six stages is presented in Fig.1.

Immature ova with mode at 0.03 mm can be considered as the general stock of egg in all the maturity stages. The polygon for stage-II indicated withdrawal of a batch of ova with a modal size of 0.23 mm to undergo-maturation. In stage III, the mode at 0.23 mm in stage II progressed to 0.55 mm. In this stage another maturing group of ova is seen with a mode at 0.47 mm. The mode at 0.55 mm of III stage moved to 0.91 mm in stage IV. In stage V the mode of advanced group shifted to 1.11 mm. In this stage the second group of ova (i.e. mode at 0.83 mm in stage IV) shifted to a modal value of 1.03 mm. In stage VI the mode at 1.11 mm of the previous stage shifted to 1.19 mm. These are the ova which would be shed on the ensuing spawning season. In this stage, the second mature group of ova was seen with a mode at 1.11 mm.

Immature ova are invariably present in all stages of ovaries. In ovaries of stages V and VI, 2 batches of mature groups of ova which are not clearly separated from each other are present. After the extrusion of first group of mature ova, the second group which would make the spawning activity a continuous process i.e., all the ripe ova are released in a season. As the advanced group of ova exhibit a wider size range, it is reasonable to conclude that the fish spawns for a longer duration. Similarly, the presence of different stages of gonads at a given time

indicates that the species population would spawn for a greater part of the year.

Spawning season was delineated from the distribution of spawning individuals with respect to time. The data based on an examination of 736 female and 276 male fishes are presented in Fig. 2. The data on the temporal distribution of maturity stages indicated that most of the stages were represented almost throughout the year. Data on size versus maturity (Table 1) show that the minimum sizes at first maturity were 10-11.9 cm in females and 12-13.9 cm in males. The cumulative distribution of maturity stages (Fig.3) indicate that these sizes were 16.3 cm in females and 18 cm in males. The sizes at maturity as determined from relative condition factor were 13 cm in females and 11 cm in males (Fig.4).

Female had higher gonadosomatic indices (Fig.5) than males in all months. In general, the higher values during the spawning periods were related to the occurrence of higher percentage of mature gonads. Fecundity ranged from 506 to 3053 eggs per mature female. The logarithmic relations between fish length (l)/weight (w)/ gonad weight (gw) and fecundity (f) were $f = 1.0452 + 1.7570 l$, $f = 1.7447 + 0.7016 w$ and $f = 2.8168 + 0.7657 gw$. Data on the sexuality of *E. suratensis* are presented in Table 2. Males to females ratio was 1 : 2.73 ($P < 0.05$). Data on the sexuality of fishes belonging to different size groups (Table 3) showed significant difference except in size groups between 20 and 23.9 cm T.L.

Presence of several maturity stages during most part of the year is noteworthy in this species. If there is periodicity in spawning, at a given time all fish collected must have same degree of gonadal development (Clark, 1934). This is not so in *E. suratensis*. The modes of mature/ripe ova are not distinctly separated from each other and therefore spawning would be continuous between August and November and January and February with peak activity in August. This fish is believed to spawn when the water is clear so that parental care is effective (Samarakoon, 1981). The Kerala backwaters, *E. suratensis* breeds throughout the year with two peaks, February to May and October to November.

The present study indicates that females mature slightly earlier than males. The size at first maturity in female is 16.3 cm T.L. The earlier reported size at first maturity is 150-180 mm (Hora and Pillay, 1962) and 105 mm (Jhingran

and Natarajan, 1969) in Chilka lake. Variations in lengths at first maturity may be related to ecological factors, food supply and assimilation. The Fecundity recorded in the present study was an average of 1780 eggs (range 506 to 3053 eggs.) This is comparable to earlier observations where the values ranged from 600 to 6000 egg (Bhaskaran, 1946; Menon *et al.*, 1959; Hora and Pillay, 1962).

The sex-ratio in different size groups indicated dominance of females upto size 19.9 cm T.L. Prasadam (1971) also observed dominance of females (43.36% females, 18.10% males, 38.54% juveniles). In the present instance, dominance of females is significant ($P < 0.005$) in all months except January. Dominance of either sex in a fish population is probably related to segregation of sexes through various periods of the year including segregation resulting from sex differences in age and maturity, gear selectivity related to sex differences in morphology and physiological activity and differences in natural and fishing mortality between the sexes (Del-Zarka and El-Sedfy, 1970).

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Table 1. Distribution of maturity stages with respect to size of fish.

Size groups (cm)	No. of fish		Stages of maturity												
			I		II		III		IV		V		VI		
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
6-7.9	0	4.0	0	100.00	0	0	0	0	0	0	0	0	0	0	0
8-9.9	10	40	90	97.50	10.0	2.50	0	0	0	0	0	0	0	0	0
10-11.9	19	108	94.74	87.15	5.26	11.93	0	0.92	0	0	0	0	0	0	0
12-13.9	60	161	80.33	57.67	16.39	36.20	3.28	3.68	0	1.84	0	0.61	0	0	0
14-15.9	67	200	69.12	30.35	20.59	38.80	10.29	16.92	0	8.96	0	3.98	0	1.00	0
16-17.9	58	130	13.79	27.48	44.83	12.98	32.76	35.88	3.45	10.69	5.17	9.92	0	3.05	0
18-19.9	41	70	12.20	30.00	29.27	2.86	46.34	30.00	9.76	21.43	2.44	10.00	0	5.71	0
20-21.9	13	20	0	0	23.08	0	46.15	45.00	15.38	25.00	0	15.00	0	15.00	0
22-23.9	2	3	0	0	0	0	0	66.67	100.00	33.33	0	0	0	0	0

Table 2. Relation between size groups and sexuality in *E. suratensis*.

Size (cm)	To total No. of fish examined	Females (%)	Males (%)	Chi-square values
8-9.3	57	82.46	17.54	24.02*
10-11.9	127	81.88	18.11	51.66*
12-13.9	215	73.95	26.05	49.34*
14-15.9	265	74.72	25.28	64.76*
16-17.9	192	69.27	30.73	28.52*
18-19.9	117	62.39	37.61	7.19*
20-21.9	32	56.25	43.75	0.50
22-23.9	6	66.67	33.33	0.67
Total	1011	70.95	29.05	

* Significant at 5% level

Table 3. Sex ratio of *E. suratensis* during the period of study.

Month	n	Females	males	Female:male ratio	Chi-square values
Feb. '84	82	74	8	1:0.11	53.12*
Mar.	85	71	14	1:0.20	38.22*
Apr.	88	55	33	1:0.60	5.50*
May.	91	66	25	1:0.38	18.47*
Jun.	80	71	9	1:0.13	48.05*
Jul.	95	74	21	1:0.28	29.67*
Aug.	50	33	17	1:0.52	5.12*
Sep.	95	72	23	1:0.32	25.27*
Oct.	96	70	26	1:0.37	20.17*
Nov.	70	46	24	1:0.52	6.91*
Dec.	73	49	24	1:0.49	8.56*
Jan. '85	101	55	46	1:0.84	0.80
Total	1006	736	270	1:0.37	

* Significant at 5% level

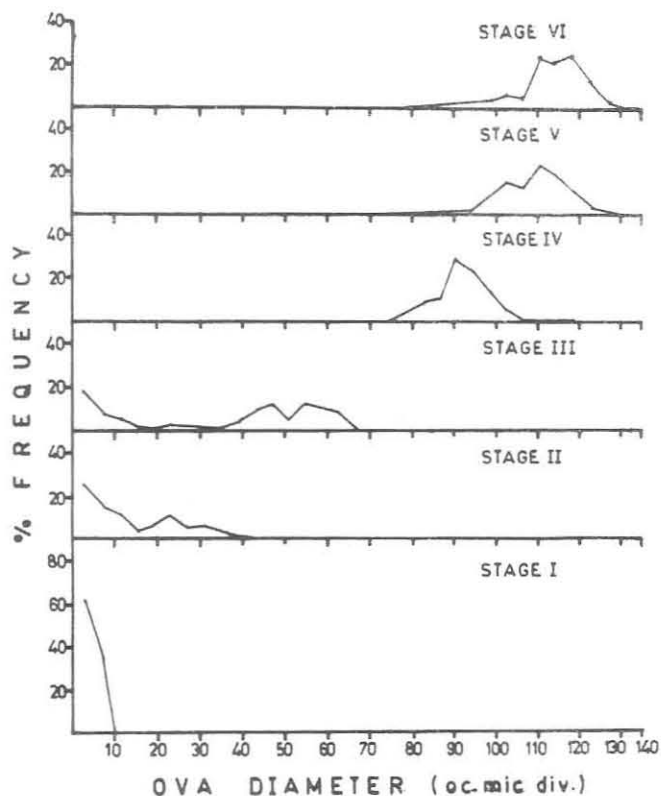


fig. 1. Ova diameter frequency polygons of *E. suratensis* in various stages of maturity.

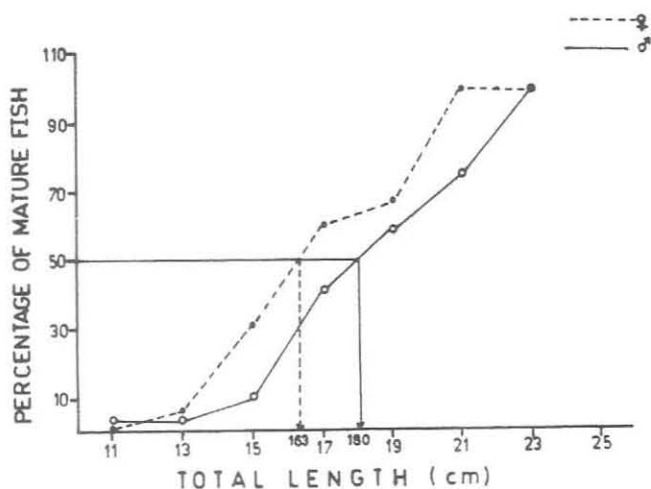


Fig. 3. Size at first maturity of *E. suratensis* by using matured ovary.

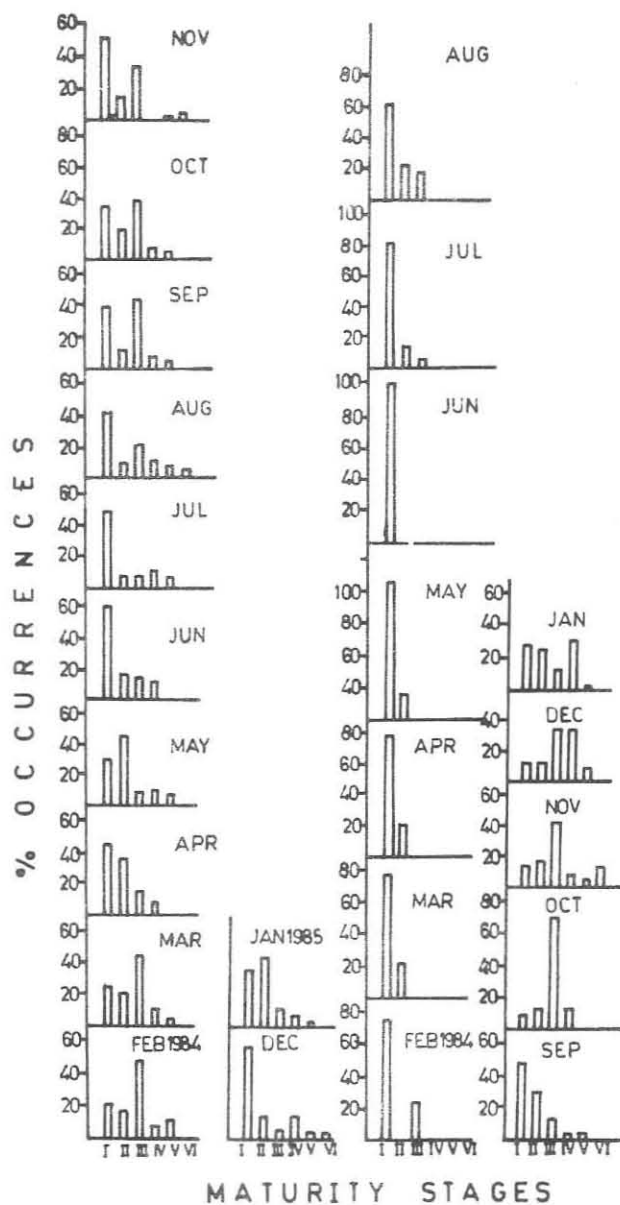


Fig. 2. Percentage occurrence of gonads of *E. suratensis* in different stages of maturity from February 1984 to January 1985.

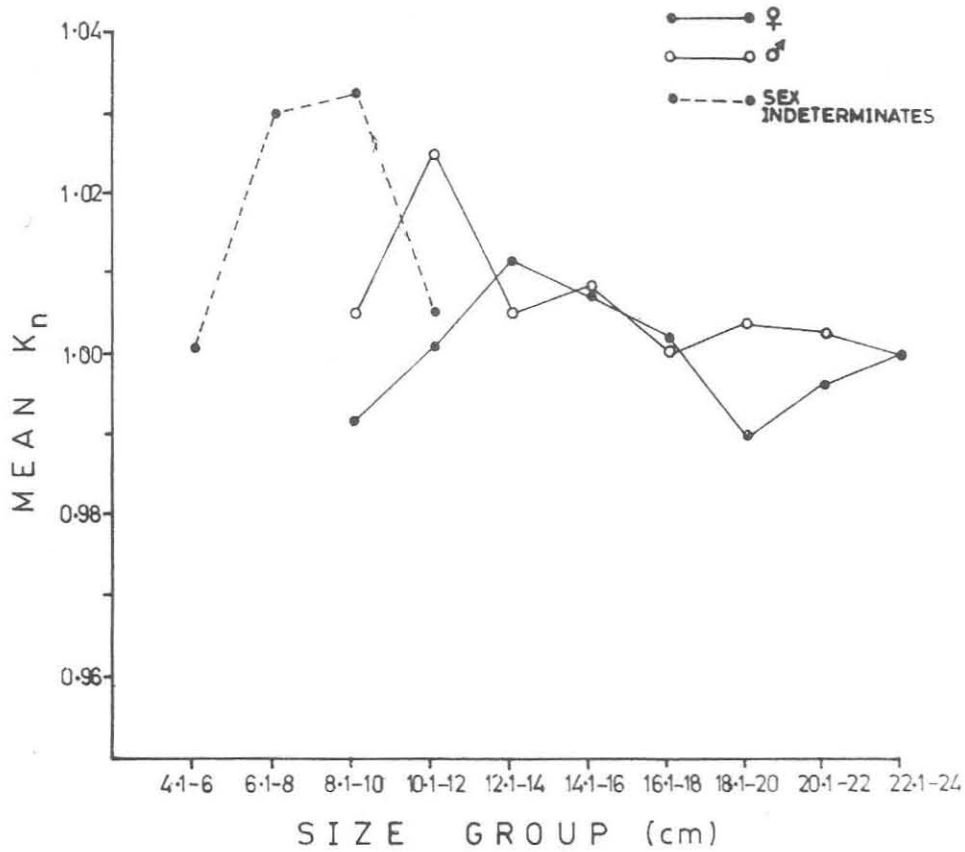


Fig. 4. Mean values of relative condition factor of different lengths of *E. suratensis*.

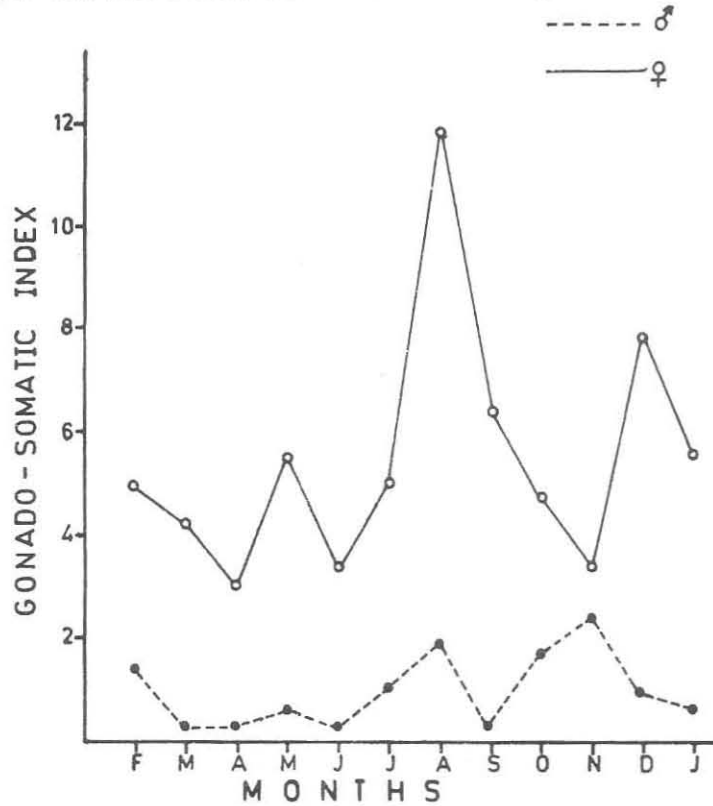


Fig. 5. Monthly variations in the gonado-somatic index of *E. suratensis*.