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MATURITY AND SPAWNING OF *OSTEOMUGIL SPEIGLERI* (BLEEKER) IN PORTO NOVO WATERS

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ABSTRACT

The grey mullet *Osteomugil speigleri* (Bleeker) is of commercial importance in Porto Novo. Maturity and spawning of this mullet was studied by observations on fish gonads collected from January to December, 1977. It was found to have an extended breeding period from January to May, spawning only once during the breeding season as evidenced by (1) specimens with oozing gonads from January to May, (2) clearly separated mature group of ova from the immature stock and (3) gonado-somatic index and relative condition factor.

Males were found to attain maturity earlier than females. Fishes with maturing (stage III) gonads were only available in the Vellar Estuary, Killai Backwaters and Pitchavaram mangrove areas, whereas mature (stage IV), oozing (stage V) and spent (stage VI) fishes were available only in the inshore waters. This evidently indicates that *O. speigleri* breeds in the inshore waters and not in the estuary.

INTRODUCTION

GREY MULLET *Osteomugil speigleri* (Bleeker) is of commercial importance in Porto Novo coastal waters. The synonymy of *O. speigleri* with *O. cunnesius* (Sarojini, 1962 a, b) was found to be no longer tenable through studies on morphology, anatomy, osteology, serology and chemotaxonomy (Reddy, 1977). After establishing distinct identity of *O. speigleri* with *O. cunnesius*, Sathyashree *et al.* (1978) studied the breeding biology of *O. cunnesius* in Porto Novo waters. The present paper deals with maturity and spawning of *O. speigleri* in Porto Novo waters.

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MATERIAL AND METHODS

Fishes were collected between January to December 1977 by operating cast nets of different mesh sizes, during the day time, thrice or four times in a month, from the Vellar Estuary, Pitchavaram Mangrove areas and inshore waters (collections were not made in the month of November due to heavy rain and cyclone). A total of 1068

fish ranging from 55-189 mm in total length (T.L.) was collected. Fishes were brought to the laboratory and used in fresh condition. Fishes were first cleaned, measured, weighed and were then cut open to note the sex. Gonads were dissected out, weighed and ovaries were preserved in 5% neutral formalin for ova diameter studies.

Ova diameter studies were made in 200 ovaries of different maturity stages. Ova-diameter was measured with an ocular micrometer at a magnification which gave a value of 18.2 μ to each micrometer division. Diameters of 200 ova were measured as suggested by Clark (1934) and De Jong (1940). While drawing percentage frequencies, ova measuring 3 micro divisions and above were

TABLE 1. *Gonadal condition of O. speigleri*

Stage	Ovary	Testis	Maturity scale of I. C. E. S.
I Immature	Pinkish occupying $\frac{1}{4}$ to $\frac{1}{2}$ body cavity. Ova irregular and transparent.	Whitish, ribbon shaped occupying $\frac{1}{2}$ body cavity.	I - II
II Maturing I	Yellowish, occupying $\frac{1}{2}$ to $\frac{3}{4}$ body cavity. Ova round, partially yolk-laden.	Whitish, occupying $\frac{2}{3}$ body cavity.	III
III Maturing II	Yellowish, occupying $\frac{3}{4}$ to $\frac{1}{2}$ body cavity; ova round and fully laden with yolk.	Whitish occupying $\frac{2}{3}$ to $\frac{1}{2}$ body cavity.	IV
IV Mature	Yellowish, occupying nearly the entire body cavity with some ova visible to the exterior. Yolk vacuolated; perivitelline space present.	Creamy white, occupying the entire body cavity.	V
V Oozing	In the oozing stage	Fish in the oozing stage.	VI
VI Spent	Flaccid with blood vessels prominent over the surface occupying not more than $\frac{1}{4}$ the body cavity.	Flaccid occupying about $\frac{1}{2}$ body cavity.	VII

RESULTS AND DISCUSSION

a. *Maturation and spawning*

(i) *Development of ova to maturity and frequency of spawning*

The maturity stages adopted in the present study are given below along with the corresponding scale of the I. C. E. S. (Wood, 1930) for comparison.

only taken into consideration. The diameter frequencies were grouped into micro division groups viz., 3.0-3.9, 4.0-4.9, 5.0-5.9, etc.

The frequency curves of ova diameter measurements in different stages of maturity are given in Fig. 1. In the I stage, ova were small, measuring upto a maximum of 12 micro divisions (micr. div.). Majority

of the ova measured were in the 3.0-3.9 micr. div. group. In the II stage, a distinct mode stage, further progression of mode to 29.0-29.9 micr. div. could be seen and this was found

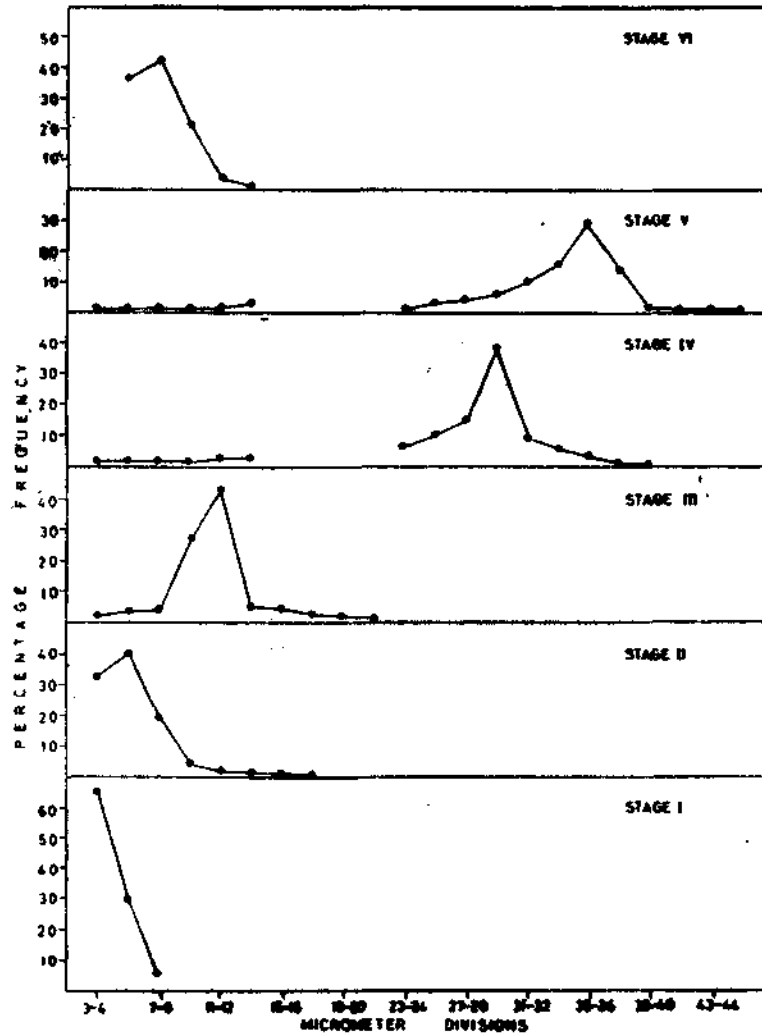


Fig. 1. Ova diameter percentage frequency of different maturity stages of *O. speigeri*.

appeared at 11.0-11.9 micr. div. indicating the separation of a batch of ova from the general stock. In the III stage, further development of the maturing batch of ova can be seen when the mode shifted to 21.9 micr. div. After the III stage, the development seem to be rapid. In the IV stage, the mode appeared at 25.0-25.9 micr. div. and this mode was completely separated from the immature stock. In the V

to be the most advanced stage in the present study. This mature batch of ova was separated from the rest. It can thus be inferred that this fish spawns only once during the season. Further, progression of the mature ova was not seen in the ova diameter frequency polygons of stage VI and only immature stock of ova was left with or without a few degenerating

ova. This further supports the fact that *O. speigleri* spawns once a year.

(ii) *Gonado-Somatic Index (GSI)*

Applying the method of June (1953) and Yuen (1955) the relative weight or gonado-somatic index of *O. speigleri* was calculated for both males and females by using the formula:

$$GSI = \frac{\text{Weight of ovary}}{\text{Weight of fish}} \times 100$$

Monthly average GSI values were calculated separately for females and males (Fig. 2).

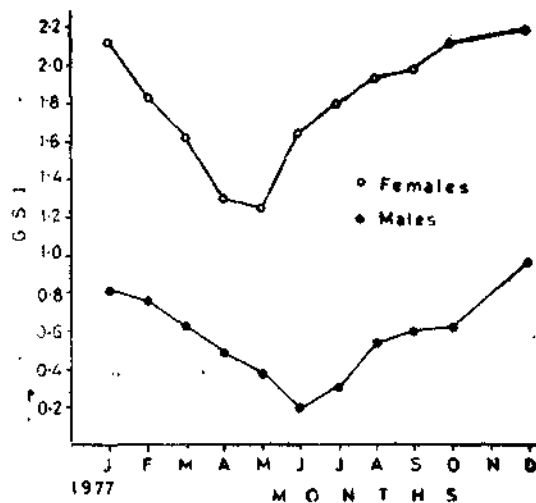


Fig. 2. GSI of males and females of *O. speigleri*.

It is evident from the figure that maximum GSI values were noticed in December after which a gradual decrease is evident upto May in the case of females and June in the case of males, followed by an increase, leading to maximum values in December in both the cases. Increase in GSI values of males and females indicate the development of gonads during these months and a decrease in values is due to spawning. The data clearly show that in *O. speigleri* the spawning period extended from January to May. In other words, it breeds only during post-monsoon and early summer months in Porto Novo waters.

(iii) *Relative condition factor ('Kn')*

Relative condition factor ('Kn') values were calculated from January to December 1977 for males and females, employing the formula $Kn = W/\bar{W}$ where 'W' represents the observed weight and ' \bar{W} ' the calculated weight of fish obtained by using logarithmic formula of length-weight relationship and graphically represented in Fig. 3. In females and males, maximum 'Kn' values were noticed in Decem-

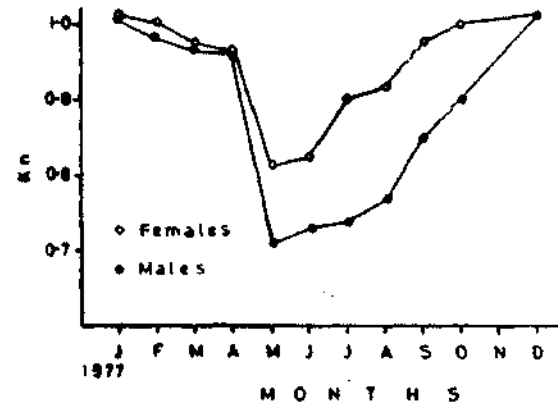


Fig. 3. 'Kn' of males and females of *O. speigleri*.

ber after which a gradual decrease was seen upto May, followed by an increase leading to the maximum values in December. Increase in 'Kn' values in both sexes may be considered as indications of preponderance of ripe gonads and a drop due to spawning which causes a drop in the weight of gonads. Monthly variations in 'Kn' values further confirms the fact that *O. speigleri* breeds from January to May in Porto Novo waters.

(iv) *Spawning season*

The percentage occurrence of fish in various stages of maturity is graphically represented in Fig. 4. Evidence on spawning is offered by stage V (oozing) gonads. From the figure it can be seen that stage V gonads were recorded from January to May which is the spawning period. Occurrence of stage IV (mature)

gonads from December to April is further proof for the spawning period. It is interesting to note that fishes upto stage III (maturing) were available only in the Vellar Estuary,

the estuary or backwaters at Porto Noov. Sarojini (1958) also opined that *M. cunnesius* of Bengal waters spawn only in the sea.

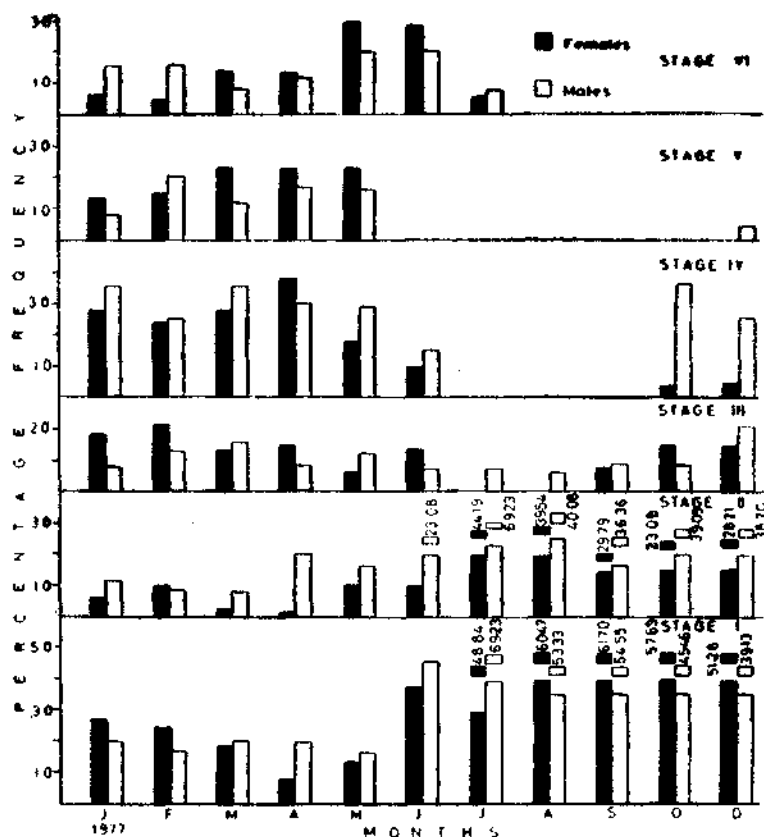


Fig. 4. Percentage distribution of different maturity stages of *O. speigleri*.

Killai Backwaters and Pitchavaram mangrove areas whereas fishes with gonads in stage IV (mature), stage V (oozing) and stage VI (spent) could be collected only from inshore waters (Bay of Bengal). This species obviously spawns only in inshore area of the sea and not in

b. Length at first maturity

The size at first maturity was determined by studying 842 specimens (458 females and 384 males). The percentage occurrence of mature fishes of both sexes are

represented in Fig. 5 which shows that all the males below 130-139 mm length group were immature. At 180-189 mm all the individuals examined were mature. All the females below 140-149 mm length group were immature and

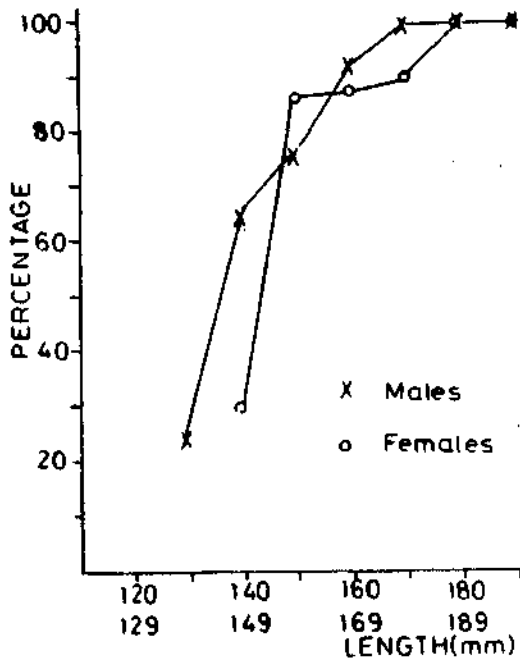


Fig. 5. Length at first maturity of males and females of *O. speigleri*.

the percentage increased from 180-189 mm size, when all the individuals examined were found to be mature. The 50% levels in the maturity curves (Fig. 5) which may be taken to represent the mean length at which maturity was observed were 136.5 mm for males and 143.5 mm for females. It is thus evident that males attain maturity earlier than females.

A comparison of maturity and spawning of *O. speigleri* with *O. cunnesius* (Sathyashree *et al.*, 1978) reveals that both the species breed in inshore waters at Porto Novo and they have overlapping spawning season extending from January to May. Length at first maturity (50% level) was found to be almost same for males in both the species. However, a marked difference was noticed in females, 154 mm in *O. cunnesius* and 143.5 mm in *O. speigleri*.

It is interesting to note that *O. cunnesius* occurs throughout the year, but its peak fishery is between November and February/March, for *O. speigleri* it is from September and the peak period in November/December. They gradually disappears by May from Vellar Estuary and mangrove areas and could be collected only from inshore waters.

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