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SOME OBSERVATIONS ON THE SEASONAL VARIATION IN THE GONADS OF *INDONAIA CAERULEA* (LEA)

[MOLLUSCA : UNIONIDAE]

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ABSTRACT

Studies on *Indonaia caerulea* reveal that the species is unisexual. Hermaphroditism or intermediate sex stage is not observed. Partial spawning starts in a few individuals in the month of March and gradually rises till July and August. Then the percentage of the fully spent individuals increases from September to November, which gradually decreases in later months. Thus the species is considered to be a continuous breeder throughout the year, but with peak spawning in the months of October and November. After the onset of spawning, lipid globules appear in the lumen of the follicles. Spermatocytical morulae appear after the start of the spawning.

INTRODUCTION

Pelecypods are either dioecious or monoecious. In some of them change of sex also takes place. A perusal of literature reveals that the work on sex and seasonal gonadal changes has been done mainly on oysters and a few other pelecypods. Coe and Turner (1938) studied the development of the gonads and gametes in *Mya arenaria*; Coe (1936) also studied the sequence of sexual phases in *Teredo*. Loosanoff (1937*a*, 1937*b*) studied the gonadal changes in *Venus mercenaria*. Bloomer (1930, 1931, 1934, 1935, 1939 and 1946) made observations on *Lamellidens marginalis* and *Anodonta cygnea* in respect of sex and gonadal changes. Patil and Bal (1967) and Agrawal (in press) have elucidated seasonal gonadal changes in *Parreysia favidens* var. *marcens* and *Parreysia corrugata* respectively. In the present paper some observations have been made on the different maturity stages in the gonads of *Indonaia caerulea*.

MATERIAL AND METHODS

The material for investigation was collected from Gwarighat located near Jabalpur *C.* 16 km. SW of Jabalpur (23°10′ N lat., 80°E long.) during the period March 1975 to February 1976. The sex and gonads condition of each specimen was recorded. Five broad gonad stages, were distinguished; these were immature stage, maturing stage, mature stage, partially spent stage and spent stage. Only full grown adults measuring 36.0 to 53.0 mm in length and 25.0 to 30.0 in height were examined. Shells of the mussel are elliptical, inequilateral; umbones not so prominent, shell covered with brown

periostracum ; interior of the shell nacreous and tinged with pinkish yellow shade ; hinge narrow ; cardinal tooth lamelliform and somewhat oblique fitting into the opposite valve between two small unequal teeth, lateral teeth smooth and obliquely truncate at the posterior end.

Observations and Discussion

Indonaia caerulea is unisexual. The gonads are paired organs consisting of tubulo-alveolar follicles, surround the windings of the intestine. On either side, a gonoduct is present. It starts from the posterior end of the visceropedal mass and runs in the anterio-dorsal direction. The ductules of gonadal follicles unite to form lateral ducts which in turn open in the main gonoduct. Testis is whitish yellow and ovary pinkish in colour. The follicles show presence of globules as observed in *Parreysia corrugata* by Agrawal (in press).

Results of the different maturity stages in the gonads of the mussel are shown in the tables (1 & 2) and figures 1 and 2.

The sexual cycle in adult mussels during different months is as follows :

In March and April, mature mussels are found in maximum number. A few spawned individuals are also observed. In the females, mature oocytes are detached from the follicular wall and lie in its lumen. In the males, spermatogenesis starts resulting in the forma-

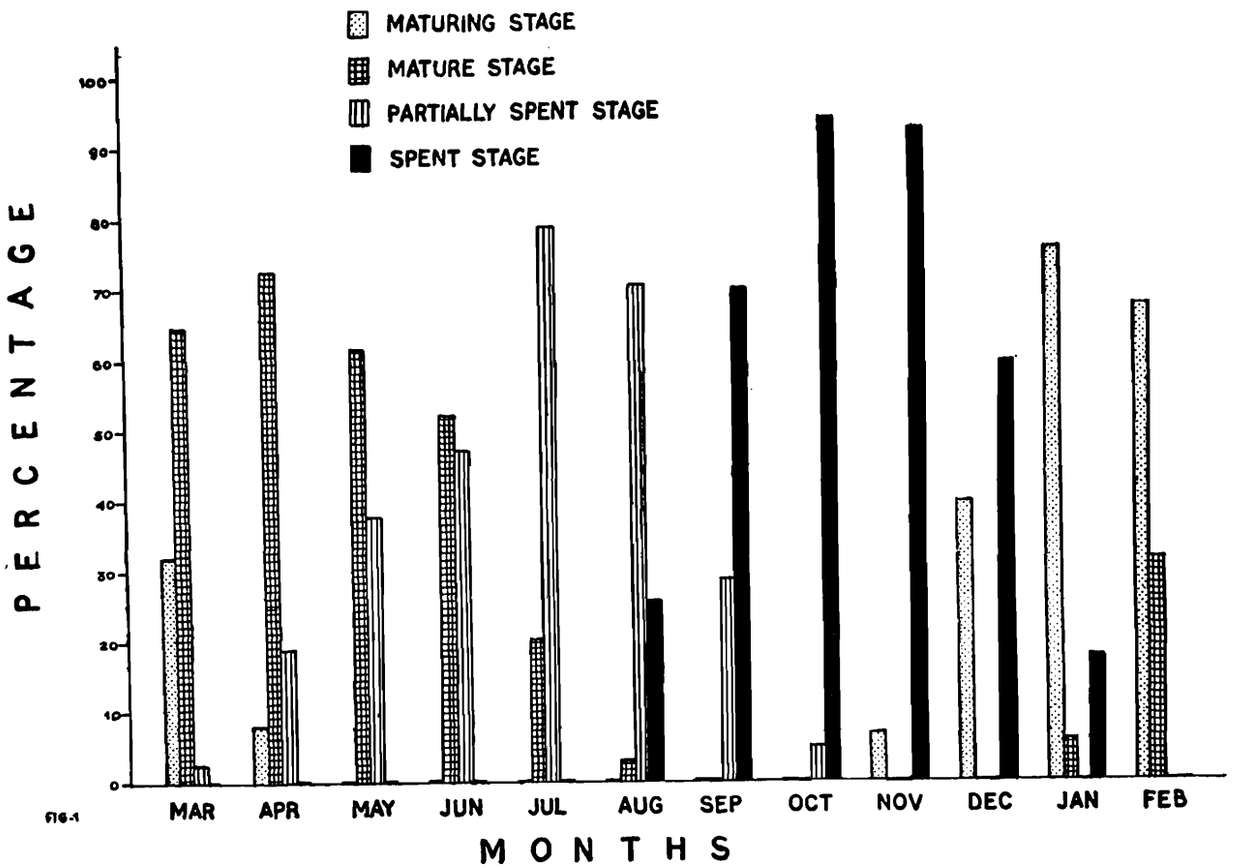

Fig. 1. Histograms showing the percentage composition of males and females respectively of *Indonaia caerulea* in different maturity stages during different months.

TABLE 1. Percentage composition of males of *Indonaia caerulea* in different maturity stages during different months.

Months	Maturing stage percentage	Mature stage percentage	Partially spent stage percentage	Spent stage percentage	No. of specimens examined
March	32.20	65.10	2.70	—	23
April	8.00	73.00	19.00	—	27
May	—	62.00	38.00	—	30
June	—	52.50	47.50	—	28
July	—	20.57	79.43	—	20
August	—	2.95	70.90	26.15	22
September	—	—	29.10	70.90	25
October	—	—	5.15	94.85	30
November	6.90	—	—	93.10	26
December	40.10	—	—	59.90	24
January	76.10	6.0	—	17.90	27
February	67.90	32.10	—	—	22

tion of the sperms. The spermatocytical morulae decrease in number. In both the follicles, lipid globules decrease in number. In mature individuals, the follicles are full of either with sperms or ova (oocytes), as the case may be, ready for discharge. In females, the interlamellar junctions of the gills are elongated. A partially spent condition is indicated by the individuals which have started spawning, the posterior part of the visceropedal mass becomes slightly thin than the anterior part. The follicles in the posterior part of the visceropedal mass show appearance of lipid globules.

In May, the specimens are either in the mature or partially spent stage. In the female, follicles have lipid globules and a few residual oocytes. In the male, spermatocytical morulae appear towards the periphery of the follicle.

During June and July, the partially spent mussels are considerably more than the mature ones, thus indicating beginning of peak spawning.

During the period August to October the percentages of partially spent specimens decreases and that of spent individuals increases. Since there is discharge of sperms or ova, the partially spent mussels enter into the spent condition. Such individuals have their visceropedal mass very thin containing watery fluid.

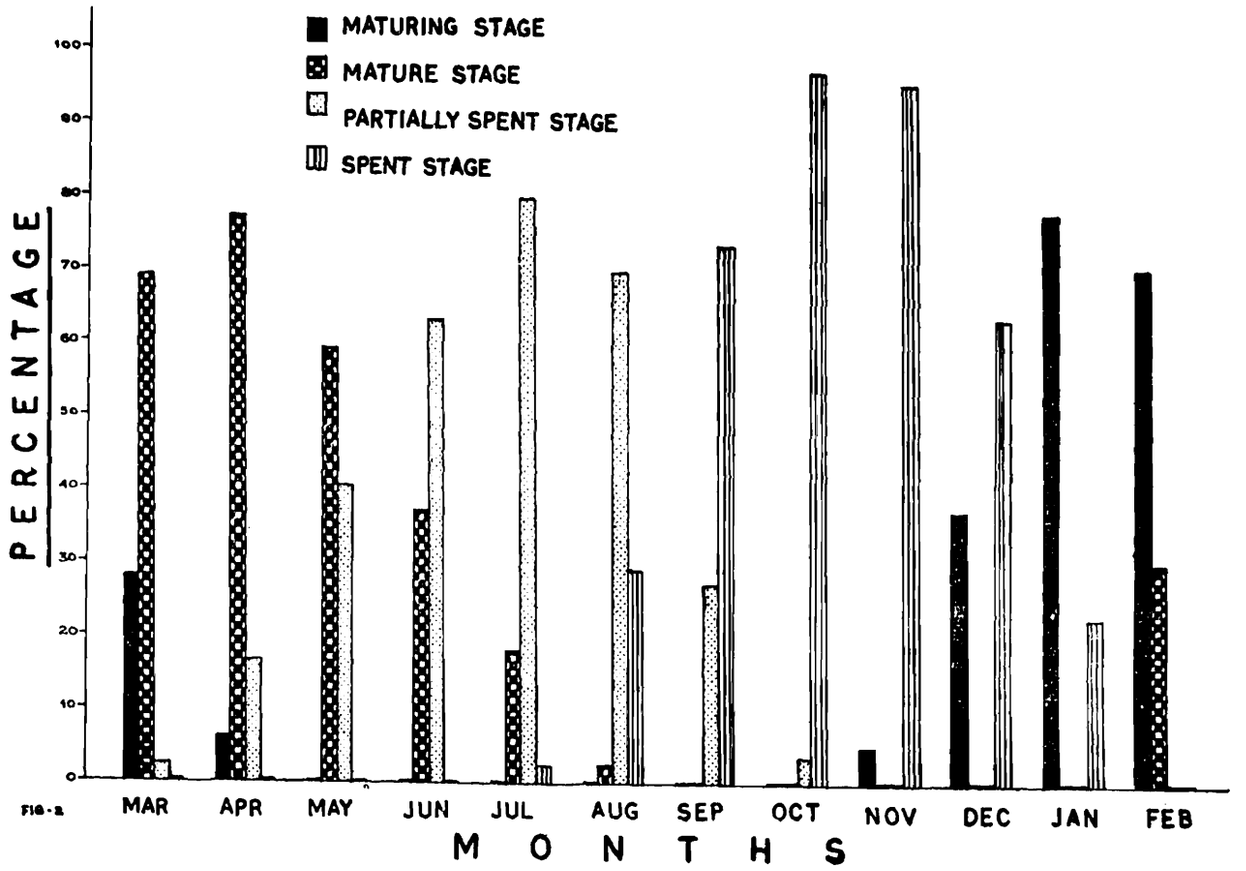

Fig. 2. Histograms showing the percentage composition of males and females respectively of *Indonaia caerulea* in different maturity stages during different months.

In females, the follicles have a few residual oocytes and lipid globules. In males, the follicles have many lipid globules, spermatocytical morulae and a few residual sperms.

In November, most of the specimens are observed in spent condition and the remaining in maturing stage. In the spent mussels the follicles have a functional germinal epithelium. Some of the follicles have well developed oogonia or spermatogonia. In maturing mussels posterior part of the viscero-pedal mass becomes somewhat thicker. The follicles contain maturing gametes.

In the month of December spent individuals are more than the maturing ones but the percentage of maturing individuals increases and that of spent ones decreases as compared with that of November month. The mussels after passing the spent stage enter into the maturing stage for the next breeding season.

In January, about 77% mussels are found in the maturing stage and rest of the specimens in the spent condition. In maturing mussels, the follicles of the posterior part of the viscero-pedal mass show rapid growth which results in the formation of fresh oocytes in the female and spermatocytes and sperms in the male. On the contrary, the follicles in the anterior part of the viscero-pedal mass show a large number of lipid globules. A few residual gametes indicate the spent condition.

TABLE 2. Percentage composition of females of *Indonaia caerulea* in different maturity stages during different months.

Months	Maturing stage percentage	Mature stage percentage	Partially spent stage percentage	Spent stage percentage	No. of specimens examined
March	28.25	69.00	2.75	—	18
April	6.00	77.05	16.95	—	20
May	—	59.40	40.60	—	15
June	—	36.95	63.05	—	16
July	—	18.00	79.60	2.40	18
August	—	2.40	68.60	29.00	21
September	—	—	27.00	73.00	24
October	—	—	3.45	96.55	20
November	5.10	—	—	94.90	21
December	37.00	—	—	63.00	17
January	77.50	—	—	22.50	21
February	70.05	29.95	—	—	18

In February, the percentage of mature mussels starts increasing and that of maturing starts decreasing.

The above description reveals that lipid globules in gonadal follicles are seen only after the beginning of spawning. The lumen of the follicle is full of lipid globules, showing spent condition. Gonadal follicles, spermatocytical morulae also appear after the beginning of spawning. The sexually inactive stage is very short. Peak spawning takes place in the months of October and November.

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