Indian Journal of Marine Sciences
Vol 13, September 1984, pp. 105-108

Biology of the Hunter Shrimp *Exhippolysmata ensirostris* (Kemp) from Maharashtra Coast*

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Received 10 *January* 1984; *revised received* 27 *April* 1984

E. ensirostris, one of the components of non-penaeid prawns in Maharashtra, attains the size of 60 mm in the 1st y and 90 mm in the 2nd y. The testicular part of ovotestis does not get atrophied in higher lengths and the species functions as a regular hermaphrodite throughout. The absolute crop for an individual is estimated to be generally above 5,000 in number. An individual spawns once continuously in a number of batches. Spawning activity appears to reach its height in the size 66-80 mm.

Information on the post larval states[1,2], eggs and early larval stages[3,4], hermaphroditisum[7-9] and on the biology[5] of *Exhippolysmata ensirostris* (Hippolytidae) is available. In the present communication observations on age, growth, maturation, spawning and fecundity of *E. ensirostris* are reported.

Materials and Methods

Biweekly samples of *E. ensirostris*, one of the components of non-penaeid prawns of Maharashtra were obtained from 'dol', the bag net operating on the tidal currents upto a depth of 40 m, at the fishing centre Mudh near Bombay during January 1972 and March 1974. The fishing operations were totally suspended between mid-June and mid-September due to unfavourable monsoon conditions. The catch was estimated by the method followed by Kunju[6]. Sexes are not separate since this species is a hermaphrodite[7]. Total lengths were measured, the size range of 16-100 mm was grouped into 5 mm class interval and the monthly percentage frequency was calculated.

Relationship between testis length and prawn length was determined using the linear regression formula:

$$Y = a + bX$$

where X is prawn length and
Y is testis length.

Since the right testis was slightly longer than the left one, the length of the right testis was taken.

For maturity studies ovarian part of the ovotestis was examined. Spawning periodicity was determined by plotting frequency polygons of ova diameter of mature and ovigerous (berried) specimens.

Ovigerous specimens sometimes possessed either mature or spent ovaries. Spawning was observed to be in batches from a single stock of ova. Hence, the absolute crop for an individual was estimated by counting the number of yolky ova in the ovary and adding to it, if that individual were ovigerous, the number of eggs attached to the pleopods. Sukumaran[5] considered only the fertilized eggs attached to the pleopods. Estimations of ova and eggs were done by the usual gravimetric method in which the number of ova in a small weighed portion of the ovary in the case of former and number of eggs in the case of latter were counted and computed against the weight of the whole ovary and the weight of all eggs separated from the pleopods respectively. The yolky ova from the ovary were counted under the microscope because of their small size while the eggs were counted with naked eye.

Results and Discussion

Age and growth—A number of broods contributed to the fishery of *E. ensirostris* (Fig.1). The modes of 8 broods, 'c' to 'j' progressed at the rate of nearly 5 mm per month till they reached a length of 58 mm. This suggested that *E. ensirostris* grew at this rate to the size of 60 mm by the end of 1st y. Laboratory reared larval form of this species by Pillai[4] showed growth of 11.14 mm from 1st zoea to post larva in 43 days which worked out to 0.25 mm.d^{-1}. The modes of the broods 'a' and 'b' and also 'c' to 'h' after a length of 58 mm, progressed further at the rate of 2.5 mm per month and attained a length of 90 mm by the end of 2nd y. The modes 'i', 'j' and 'k' progressed till the period of observation. Growth of the modes numbering nine and appearing in different months during 1973 and 1974 could not be traced which may be due to the intermittent spawning nature of this species.

Very few individuals lived beyond 90 mm and the growth of these was not traceable. However, the percentage frequencies of this group are shown in Fig.1. The maximum size of 100 mm recorded might be

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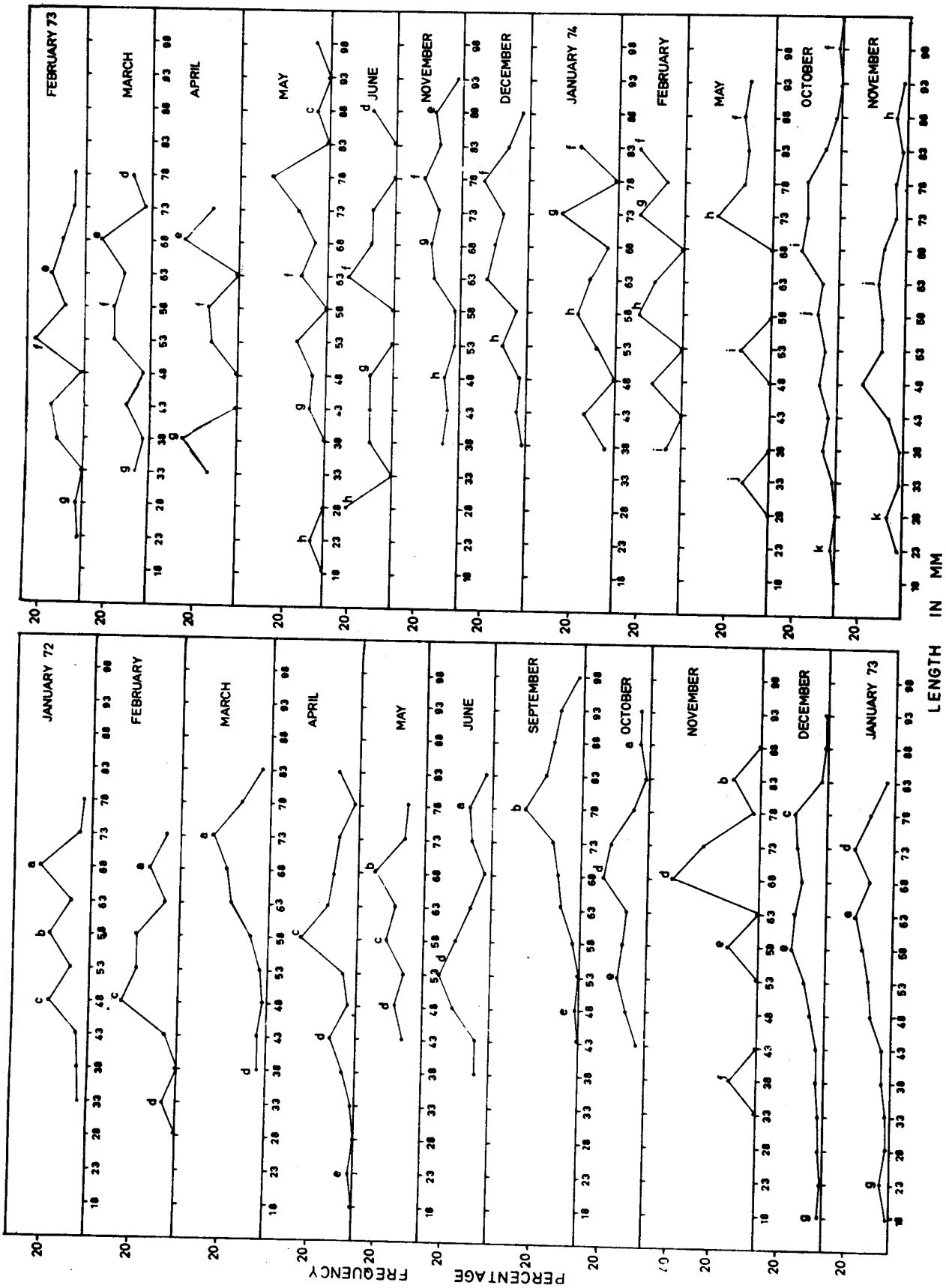

Fig. 1—Length frequency distribution of *E. ensirostris* during 1972-74

less than 3 y old. The present estimated growth of 60 mm in the 1st y with a further addition of 30 mm to measure 90 mm in the 2nd y, as evidenced by the progression of frequency modes right from the length of 18 mm, appears to be very valid for *E. ensirostris*.

Maturation—Sukumaran[8] mentioned that testicular portion of the ovotestis showed signs of degeneration and absorption as the size of the prawn increased. In the present study, the relationship between length of the testis and length of the prawn was linear ($Y = -1.4385 + 0.0472X$). There was no indication of testis getting atrophied or absorbed at any length of the prawn. This further proves that *E. ensirostris* is a functional hermaphrodite throughout without undergoing reversal of sex.

The ovarian part of the ovotestis in *E. ensirostris* undergoes a series of biological changes and the first 4 stages as reported by Sukumaran[5] are immature, early maturing, late maturing and mature. The diameter of the mature ova ranges from 0.4 to 1.04 mm. The fifth stage is ovigerous, also known as berried. In this, the mature ova are deep orange coloured and if fertilised, pass through their early embryonic phase on the pleopods. When the prawn is in ovigerous condition, the ovary of this species is either transparent in immature stage, yellow in early mature stage or orange in late maturing and mature stages. However, 83.8% of the ovigerous specimens possessed immature ovary while the rest in other stages.

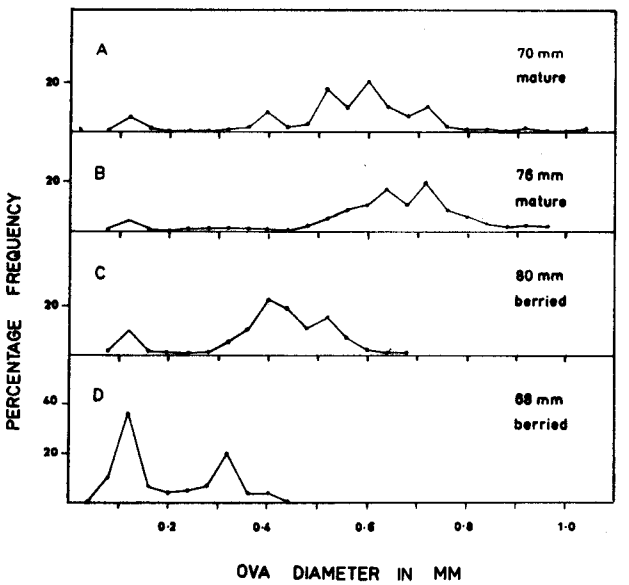

Fig. 2—Ova diameter measurements in *E. ensirostris*

Spawning—The frequency polygons of the ova diameter showed 2 distinct sets of ova in a mature specimen. One was of immature ova measuring <0.2 mm and the other of mature ova spreading over a wider range and stretching itself between 0.4 and 1.03 mm in diameter in a continuous multimodal pattern (Fig.2 A and B). This suggests that an individual spawned once but continuously in a number of batches. This is supported by the entry of many broods into the fishery (Fig.1).

An ovigerous specimen (Fig.2C) showed persistence of a group of mature ova till 0.68 mm size. It is very likely that this lot would grow to full size in a brief interval and be extruded again in batches. Another ovigerous individual (Fig.2D) showed a larger group of immature ova and comparatively a much smaller group of mature ova up to a size of 0.44 mm. It is unlikely that this lot would develop further and spawn. Probably, this would get resorbed.

Six groups of ovigerous prawns, the potential spawners, were recognised. Majority of these were in the size 66-80 mm when they were in the middle of 2nd y of age. A small number of them also appeared in the lower as well as higher lengths. The persistence of berried condition in the same size group for successive 2 or 3 months indicates that the eggs are carried on the pleopods during this duration. Vigorous spawning activity was noticed in the size between 66-80 mm in which more batches of eggs were continuously released for a longer period. In the sizes beyond this, when they are in the latter part of the 2nd y or in 3rd y, the number of batches of eggs and the duration of their release

Table 1—Fecundity in *E. ensirostris*

Total length mm	Maturity stage	No. of ova in ovary	No. of eggs attached to pleopod	Total number of ova and eggs
82	Mature	5720	—	5720
82	-do-	4335	—	4335
78	-do-	2800	—	2800
78	-do-	2082	—	2082
73	Ovigerous	268	2285	2553
76	-do-	2383	1330	4713
77	-do-	3825	2960	6785
79	Spent	—	5200	5200
81	-do-	—	5619	5619
82	-do-	—	5830	5830

appeared to be restricted. To this category, the type of ovigerous specimens in Fig.2C may belong and these may be the prospectives of the 2nd crop. The time lapse between the release of the developed eggs from the pleopod and the extrusion of next batch of ova from the ovary, during which period, growth of the spawners was recorded, might be a few days or a month for the size 66-80 mm. It was also noticed that this interval was about 2 to 3 months for the growth of the small batch of ova left in the ovary (Fig.2C) to be released for the 2nd time for a very short period.

Fecundity—The mature specimens (Table 1) showed marked differences in the number of ova in the ovary. There was no uniformity in the size of the specimen to the number of ova. This difference might be attributed to the presence of 2 crops. An ovigerous specimen measuring 73 mm showed a small number of 268 ova in the ovary. This small number might likely get resorbed rather than develop further. The specimens measuring 76 and 77 mm possessed more ova in their ovaries than the eggs extruded and attached to the pleopods. Such ones might be the potential spawners for the 2nd time as inferred from the ova diameter frequency polygons. Lastly, the spent individuals showed a sizeable number of eggs on the pleopods. The spent condition indicated that the season's crop might be over. The absolute crop was roughly above 5,000 in number for an individual.

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