STUDIES ON THE FISHERY AND BIOLOGY OF *HIPPOLYSMATA ENSIROSTRIS* KEMP IN BOMBAY COAST

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ABSTRACT

The results of investigations on the fishery and biology of *Hippolysmata ensirostris* during 1970-75 at Bombay are presented. The average growth rate recorded of this species is 5.3 mm per month. The life span of the prawn is estimated as 16-20 months. The bulk of the catch was contributed by the 0-year class, particularly above 7 months. It is a perennial spawner. Female matures when 7-8 months old. Maximum number of eggs produced by a female is 6000.

INTRODUCTION

Hippolysmata ensirostris, belonging to the family Hippolytidae, is available all along the coasts of India in varying quantities. It forms a fishery of importance only in Maharashtra (Kunju 1967) and the Godavary delta (Ganapathy and Subramaniam 1966).

Our knowledge of the fishery of this species is limited (Rai 1933, Chopra 1943, Shaikmahmud and Tembe 1960 and Kunju 1967). Some early developmental stages have been described by Bensam and Kartha (1967). Pillai (1974) has studied the complete larval history of this prawn. Based on the secondary sexual characters found on the endopodite of the first and second pleopods the present author concludes that this species is a protandric hermaphrodite. The examination of gonads also tends to support this view (Sukumaran 1973 and MSS). Apart from these observations no information is available on the fishery and biology of this species. The present account deals with the catch trends in Bombay along with biological features, a knowledge of which is essential for the rational utilization of the resource.

MATERIAL AND METHODS

The fishery mainly exploited by bag nets ('Dol') is considered here. Regular catch statistics were collected from Versova and Sassoon Docks, two important landing centres in Greater Bombay. At the former centre, the observations were conducted from 1969 to 1975, whereas, at Sassoon Docks, from 1969 to 1972. At Versova, fishing was suspended during the monsoon season

(June-September). Each boat-net combination was taken as a unit. On an average, 20% of the units landed were observed for recording the catch, based on which the total landings of prawns per day and for month and the CPUE (catch/boat/day) were estimated.

Random samples of the catch were collected for biological study. Since males were found negligible in the samples (this may possibly be due to the fact that they were males when below 30 mm in length and would easily escape through the meshes of the net which vary from 10-12 mm) females were only taken into consideration for the present study. Measurements were taken from the tip of rostrum to the tip of telson for the total length. Maturity stages were studied by examining the nature and colour of the gonad as well as by microscopic examination of the ova.

For fecundity studies, only fertilized eggs on pleopods were considered. Fecundity was calculated by employing the formula,

$$F = p/p_1 \times n$$

Where, p = the weight of the egg mass; p_1 = the weight of the subsample and n = the total number of eggs in the subsample.

To determine the development of ova and spawning frequency the diameter of 500 eggs each from 5 prawns in different stages of maturity were measured irrespective of their size and development. A microscope with an ocular magnification which gave a value of 0.015 mm to each microdivision was used to measure the diameter of eggs. The measurements were classified into size groups of 3 microdivisions.

Catch and Effort

The fishery revealed considerable fluctuations, annual (Table 1) and also within the season (Fig. 1). The landings varied from 5.5 tonnes during 1974-75 to 37.2 tonnes during 1973-74 at Versova. At Sassoon Docks, the highest and the lowest catches recorded were 40.1 and 26.1 tonnes during 1970-71 and 1971-72 respectively.

At Versova, 1973-74 season was the most productive with a catch rate of 7 kg/boat/day, whereas, 1970-71 registered the lowest catch rate of 0.8 kg. However, the catch rate obtained at Sasoon Docks showed only slight variations from year to year (1.4 kg during 1971-72 to 1.8 kg during 1970-71).

It was observed that, within the season, the highest catch was recorded during October-January and July-October at Versova and Sassoon Docks respectively (Fig. 1).

Kunju (1967) recorded a mean annual landing of 141 and 187 tonnes during 1959-63 as aginst the mean annual catch of 13 and 31 tonnes for the

TABLE 1. *Catch of* Hippolysmata ensirostris *at Versova and Sassoon Docks for the period* 1969 *to* 1975.

(CUPE is given in paranthesis)

	Catch	*percentage*	
Versova			
1969-70	12425	1.05	(2.6)
1970-71	6800	0.29	(0.8)
1971-72	8909	0.57	(1.5)
1972-73	9464	0.62	(1.4)
1973-74	37188	3.77	(7.0)
1974-75	5522	0.54	(1.0)
Sassoon Docks			
1969-70	26707	3.12	(1.5)
1970-71	40117	2.51	(1.8)
1971-72	26142	2.32	(1.4)

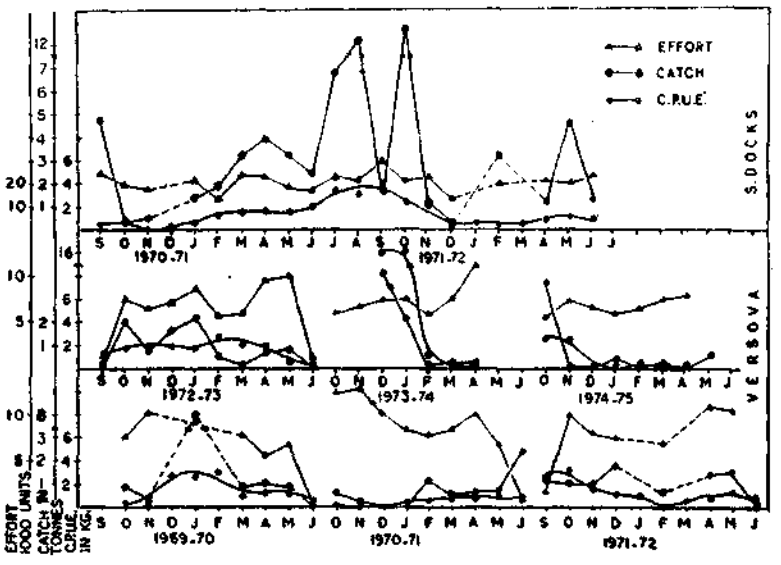

FIG. 1. Catch of *Hippolysmata ensirostris*, effort and CPUE during different months at Sassoon Docks and Versova for the period 1969-75.

period 1969-75 at Versova and Sassoon Docks respectively. Thus the present observations revealed a decline in the yield of this species by 80-90% at these centres.

Age and Growth

The length-frequency distribution of this species at Sassoon Docks and Versova is presented in Figures 2 and 3. This species is a perennial spawner. It may be said that the new recruits entering the fishery during January-February are possibly the products of the peak spawning during September-October and therefore, 4-5 months old.

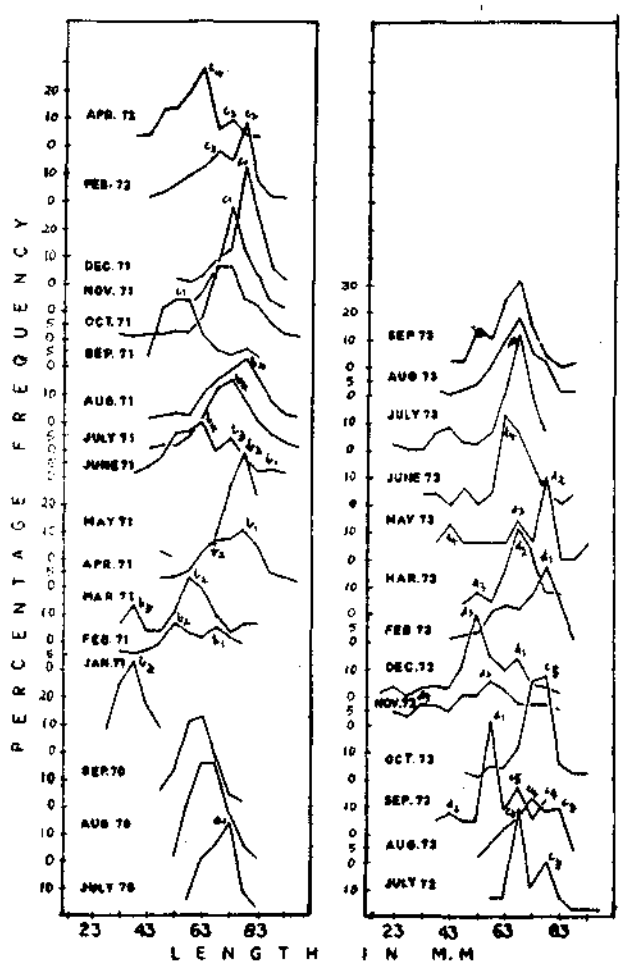

FIG. 2. Length frequency distribution of *Hippolysmata ensirostris* during different months for the period 1971-73 at Sasson Docks.

It is seen that at Sassoon Docks, the broods 'b3' (38 mm) of January '71, a product of previous year's spawning during September-October and 'd1' (58 mm) of September '72 and 'd3' (53 mm) of December. '72, both products of the same year's spawning attained a length of 78 mm in September '71, February '73 and May '73 respectively when one year old. Similarly, at Versova, the broods 'A3' (63 mm) of January '71, a product of the previous year's spawning during March-April attained a length of 78 mm in April '71 when one year old. It could, therefore, be inferred that this species attains a length of 78 mm when one year old.

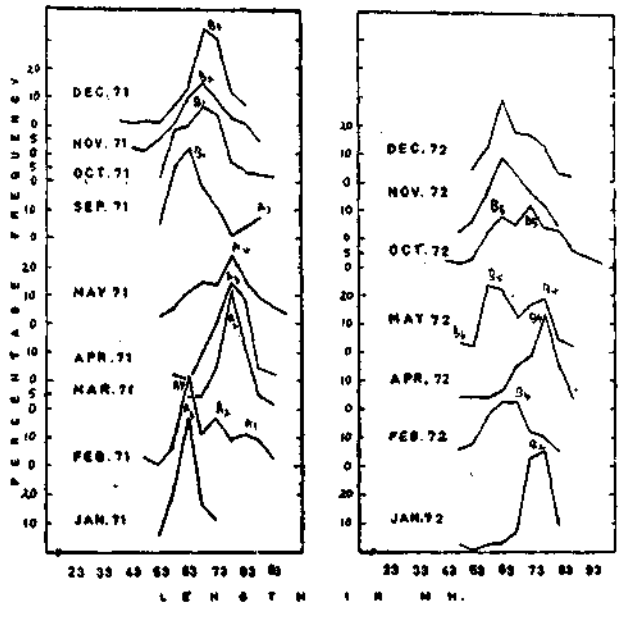

FIG. 3. Length frequency distribution of *Hippolysmata ensirostris* during different months for the period 1971-73 at Versova.

Age composition

The age composition of the population at Versova and Sasoon Docks is given in Table 2 based on the size at different ages determined approximately by the length-frequency studies. It could be seen that the bulk of the population was mainly contributed by 0-year class, particularly 7-11 months old prawns. Prawns below 6 months were found negligible. This may probably be due to the fact that mostly these smaller prawns escape through the meshes of the net as stated earlier. It is also noticed that prawns more than one year old were better represented only during 1971 at both the centres.

TABLE 2. *Age composition of* Hippolysmata ensirostris *in the commercial catches at Sassoon Docks and Versova for the period* 1971-73 (*Figures denote* CPUE *in numbers*).

Size range (in mm.)	*Estimated age in months*	1971	1972	1973
Sassoon Docks				
Upto 50	1-6	709	88	
51-80	7-12	8506	2006	
81-103	13-20	2120	209	
Versova				
Upto 50	1-6	100	71	898
51-80	7-12	6284	3995	3011
81-103	13-20	1001	454	713

BREEDING AND MIGRATION

Maturity Stages

Five maturity stages in the development of ovary have been recognised. The different stages with distinguishing characters are given below.

I. *Immature (virgins)*: Ovary very small colourless and not visible through exoskeleton. Ovum is transparent; nucleus large and clearly visible. No yolk granules. Diameter of ova 0.03 to 0.075 mm.

II. *Early maturing*: Ovary slightly enlarged and opaque; not visible through exoskeleton. Yolk granules appear in the cytoplasm; nucleus not visible. Diameter of ova 0.075 to 0.23 mm.

III. *Late maturing*: Ovary greatly enlarged; light orange in colour and slightly visible through exoskeleton. Ovum opaque, can be separated easily; nucleus not visible due to the accumulation of yolk in the cytoplasm. Diameter of ova 0.24 to 0.59 mm.

IV. *Mature*: Ovary deep orange in colour, occupies the entire carapace cavity. The ovum is opaque and nucleus not visible. Diameter of ova 0.33 to 0.81 mm.

V. *Spent recovering*: The ovary greatly reduced, flaccid and yellow or white in colour. The ovum is transparent with clear nucleus. Diameter of ova 0.03 to 0.16 mm. This stage, is, therefore, distinguished from virgin females on the basis of the size of the prawn as well as by the nature of ovary.

Size at first sexual maturity

To determine the size at maturity 4179 prawns were studied during the entire period of study. Prawns in berried and cemented conditions were also considered as mature for this study. It is seen that all prawns below 33 mm in total length were found to be immature. The size at first maturity at 50% level was determined to be 57 mm (Fig. 4).

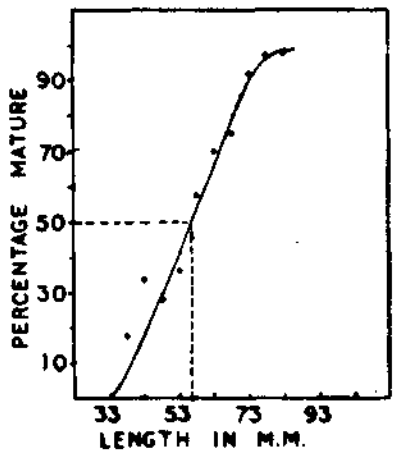

FIG. 4. The size at first maturity in *H. ensirostris*.

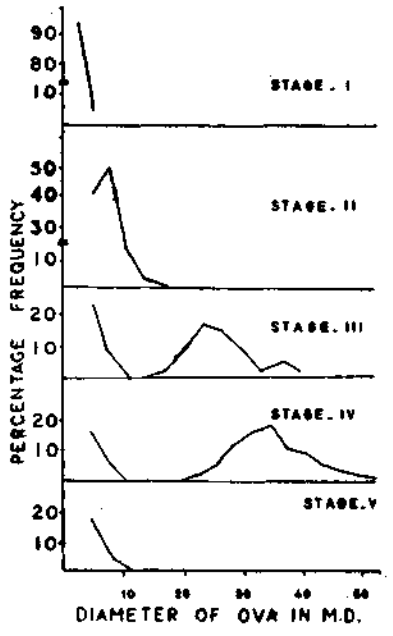

FIG. 5. Ova-diameter polygons of ovaries of *H. ensirostris* in different stages of maturity.

Maturation and spawning season

Frequency distribution of ova at different stages of maturity is depicted in Fig. 5 from which it could be seen that only one batch of eggs gets separated from the immature and maturing group and partakes in the spawning activity.

During breeding season, the setae on the podomeres of the first four pairs of pleopods carry bunches of eggs attached by certain adhesive substance. Just after hatching the young, it appears that the prawn may turn to berry again in succession as it is evident from the presence of fully matured ovary in large number of berried prawns.

TABLE 3. *Maturity stages of* H. ensirostris *during different months pooled together at Sassoon Docks and Versova for the period* 1971-73 (*only percentage is given*)

(IM - immature; EM - early maturing; LM - late maturing; ORM - mature; BE - berried; BE ORM - berried with ovary matured; C - cemented; and C ORM - cemented with ovary matured)

Month	IM	EM	LM	ORM	BE	BE ORM	C	C ORM
				SASSOON DOCKS				
January	100	—	—	—	—	—	—	—
February	13	12	8	20	44	1	—	1
March	47	23	10	5	17	—	—	—
April	11	10	10	13	46	2	3	5
May	19	8	3	10	43	—	8	8
June	21	15	6	7	32	3	9	8
July	8	6	3	10	50	4	12	8
August	1	8	1	21	39	2	17	11
September	25	7	2	13	46	4	21	15
October	9	3	1	6	36	5	16	26
November	12	14	5	5	23	4	23	15
December	28	31	4	2	29	1	—	4
	12	11	5	12	39	3	10	9
				VERSOVA				
January	4	10	4	11	48	2	14	9
February	4	—	12	8	46	—	17	12
March	4	2	3	2	53	—	36	—
April	1	1	—	4	76	1	12	5
May	4	10	1	6	52	1	20	8
June	6	6	—	6	69	—	6	6
July-August	—	—	—	—	—	—	—	—
September	4	—	—	—	39	39	—	18
October	1	7	1	1	66	2	11	12
November	2	7	2	5	60	—	23	—
December	12	7	4	13	29	—	31	2
	4	7	3	6	52	2	19	7

Fecundity

The number of eggs produced by an individual prawn varied from 700 to 6000 according to size, the average number being 2700. The relationship between the size of the prawn and fecundity determined by the method of least squares, is found to be linear (Fig. 6). Logarithmically the relationship can be expressed by the formula,

$$\text{Log } Y = 1.8806 \text{ Log } X + 0.0111$$

where, Y = number of eggs and X = total length of prawn.

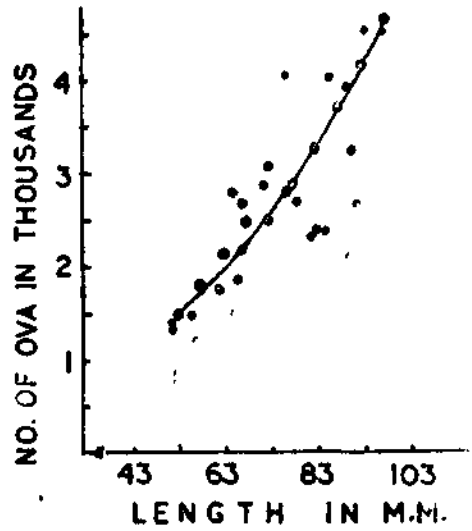

FIG. 6. Relationship between fecundity and length of *Hippolysmata ensirostris*.

Migration

Adult prawns above 80 mm were observed to be poorly represented durinng November-January in the 'dol' net catches as it is evident from the length-frequequency distribution. Such large sized prawns were found in the comparatively deeper waters. Most of these prawns were in berried condition. It would, therefore, appear that these prawns migrate into the deeper areas for breeding purpose.

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