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ON THE UNUSUAL OCCURRENCE OF PENAEID EGGS IN THE INSHORE WATERS OF MADRAS *

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DURING one of the routine inshore plankton collections along the Madras coast, in the first week of February 1964, the tow net happened to sink down about 3 metres below the surface. The resulting haul consisted of an unprecedented number of penaeid eggs. On estimation a total of 3,00,000 eggs and 15,000 free nauplii were found to be present in that particular haul of 30 minutes duration. There appears to be no other report of such an abundance of penaeid eggs occurring in Indian waters, especially in the coastal waters of Madras. This phenomenal abundance of penaeid eggs is of considerable significance as regards the bionomics of Indian penaeid prawns. These eggs were transferred to fresh sea water and the progress of development was followed. The present brief report embodies the results obtained.

DEVELOPMENT

Eggs (Figs. 1-4)

Eggs are perfectly spherical with considerable perivitelline space. Each egg measures 0.45 to 0.47 mm. The embryonic mass, encircled by a thin envelope of embryonic membrane, measures 0.23 mm. in diameter.

The earliest stage (Fig. 1) shows only the blastula. In the next stage a definite pattern of limb buds can be made out (Fig. 2). The outline of the nauplius is distinct with the appendages in the next stage (Fig. 3). In the final stage the embryonic membrane ruptures releasing the nauplius free within the egg capsule (Fig. 4). This nauplius has three pairs of appendages, a median nauplius eye and a pair of furcal setae. It exhibits twitching movements within in the capsule. Eggs start hatching out in the afternoon. As the eggs showed early stages of development in the morning it is probable that spawning might have taken place in the early hours of the morning.

Nauplius I (Figs. 5-8)

The nauplius, that has come out of the egg, is pear shaped and has no carapace fold (Fig. 5). It measures 0.29 to 0.30 mm. on the longitudinal axis, excluding the caudal setae. The median eye is prominent. The body is opaque due to the presence of yolk. Three pairs of appendages, antennules, antennae and mandibles are present.

Antennule (Fig. 6) : Antennule is uniramous, unsegmented and has two terminal setae. Two setae are present on the inner margin and one on the outer.

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Mandible (Fig. 8) : Mandible is biramous, unsegmented with short rami. Each ramus carries three setae at the tip. Masticatory process is absent.

This larva swims with lashing movements of the appendages but the swimming movements are sporadic and they remain passive over long intervals.

Nauplius II (Figs. 9-12).

This stage is obtained 20 hours after hatching. The nauplius measures 0.36 mm. in length. It is very active and can swim with lashing movements of the appendages. It is characteristic in having a distinct bilobed telson, each lobe beset with 3 spines. The body is elongate. On the ventral side (Fig. 9) the abdomen is well demarcated. The labrum is distinct though it is not free. In the lateral view the carapace lobe can be clearly seen (Fig. 10). The median eye persists.

Antennule : The structure is identical to that of nauplius I.

Antenna (Fig. 11) : The endopod shows no segmentation but the exopod develops faint segmentation. Three terminal setae and one on each segment are present. Setae have fine hairs on them.

Mandible (Fig. 12) : The structure is identical to that of the earlier nauplius but for the development of the masticatory process. The setae have fine hairs.

On the ventral side the rudiments of the two pairs of maxillae and the first pair of maxillipeds can be made out below the labrum and behind the paragnaths.

Nauplius III (Figs. 13-17)

Nauplius II changes into nauplius III the next day, 44 hours after hatching. This nauplius is characterised by elongated body and appendages, clear cut bilobed telson, each lobe carrying six spines and the 4th spine from the outside is the longest. The median notch of the telson is distinct (Fig. 13). The nauplius measures 0.42 to 0.43 mm. in length. The body is now transparent probably because of the expenditure of the yolk. Ventrally the labrum is free.

Antennule (Fig. 14) : Antennule develops faint segmentation. There are three spines terminally, the middle being the longest. There are two spines laterally.

Antenna (Fig. 15) : The exopod is segmented and has three terminal and four lateral setae, each segment carrying one seta. The endopod has two segments, three terminal setae and two lateral. The setae have fine hairs on them.

Mandible (Fig. 16) : There is no significant change from the previous stage but for the well developed masticatory process.

The rudiments of the two pairs of maxillae and the two pairs of maxillipeds are prominent below the labrum and paragnaths. The nauplius is very active and swims about.

This nauplius metamorphoses into protozoea I the next day, 68 hours after hatching. This larva resembles in all characteristics the protozoea I of *Penaeus indicus* described by Menon (1937) and so the description is not repeated here.

This conforms to the earlier observations as regards the eggs of *P. plebejus*, *P. esculentus* (Racek, 1955), *P. japonicus*, *P. semisulcatus* (Yasuda, 1955) and *P. setiferus* (Pearson, 1939 ; Anderson *et al.*, 1949).

The occurrence of as many as 3,00,000 eggs and 15,000 free nauplii in a single haul indicates the intense breeding activity of some penaeid prawn in the inshore environs. *Metapenaeus dobsoni* is the only Indian species the life history of which is completely known (Menon, 1951). The characteristics of the eggs in the present collection and the larvae therefrom differ from those of *M. dobsoni* in (a) eggs measuring 0.45 to 0.47 mm., (b) the three nauplii being slightly larger in size, (c) the second nauplius having 3 spines on each telson lobe and 4 setae on the endopod of antenna and (d) the third nauplius having 6 spines on each telson lobe and 5 setae on the endopod of antenna. Therefore they are different from those of *M. dobsoni*, a species that is a sporadic visitor in the coastal waters of Madras. The predominant species in the fishery at Madras is *Penaeus indicus*. During an earlier study it has been inferred that this species may spawn around the month of March (Subrahmanyam, 1963)., In February, 1964,58% of the females of this species were ripe and 18% spent. During the second week of the same month the three protozoea stages of *P. indicus* were abundant in the surface plankton of the inshore waters. The post-larvae also appear normally in the same habitat and in estuaries in the vicinity of Madras during March. This would suggest that the present type of eggs might belong to *Penaeus indicus* and so they are referred to this species. This would mean that 3 nauplii followed by 3 protozoea occur in the early life history of this important species taking into account Menon's report (1937) on the protozoea stages. It is of interest to note that 5 to 6 nauplii are recorded in the life histories of other species of the genus viz., *Penaeus setiferus* (Pearson 1939 ; Anderson *et al.*, 1949), *P. japonicus* (Hudinaga, 1942) and *P. duorarum* (Dobkin, 1961).

That the present type of eggs were obtained from waters near the shore, 20 metres deep, shows that *P. indicus* may breed in the inshore habitat. This would be in contrast to the existing belief that the species of *Penaeus* migrate offshore for breeding purposes (Racek, 1955 ; Panikkar and Menon, 1955). This would necessitate an intensive exploration and study programme and rethinking of the problem.

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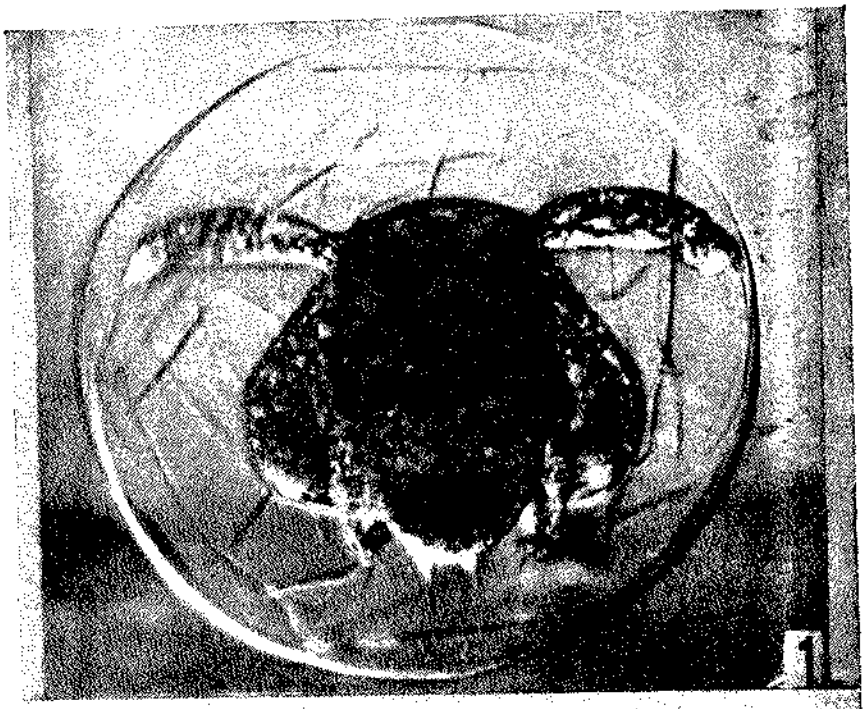
Summary

An unprecedented quantity of penaeid eggs amounting to 3,00,000 were obtained from a 30-minutes sub-surface haul from the inshore waters of Madras. The development of the species was followed until the third day, based on which these eggs have been referred to *Penaeus indicus*, the predominant species in the coastal fishery. The significance of this in the biology of the species is briefly discussed.



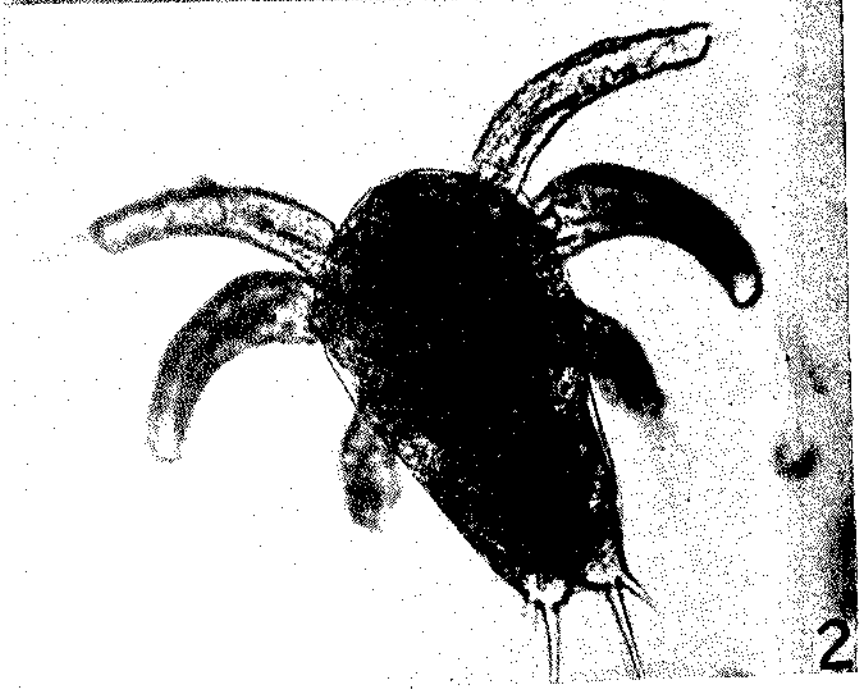


FIG. 1. Nauplius within the egg capsule. FIG. 2. Nauplius II.