*J. mar. biol. Ass. India*, 1976, 18 (1): 62-70

# LABORATORY BEHAVIOUR OF A CRANGONID SHRIMP *PONTOCARIS PENNATA* BATE AND ITS FIRST THREE LARVAL STAGES*

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ABSTRACT

Both field and laboratory observations on the feigning behaviour, locomotion, mouling, feeding, etc. have been conducted on the Crangonid shrimp *Pontocaris pennata* Bate. The first three larval stages of this shrimp, as reared in the laboratory, have been described and illustrated.

## INTRODUCTION

THE CRANGONID shrimp *Pontocaris pennata* Bate (Decapoda, Crustacea) appears generally in the trawl catches in summer months especially from March to the end of May, and in depths from 18 to 25 fathoms off Bombay and Ratnagiri. In monsoon months when no trawling could be conducted, and in the remaining months, i.e. October to February, when trawling is normally conducted in the depths from 7 to 15 fathoms, these prawns are not observed in the catches even if trawling is extended to deeper waters upto 25 fathoms.

The authors are thankful to Dr. C. V. Kulkarni, the then Director of Fisheries, Maharashtra State, and to Dr. M. R. Ranade, Research Officer, Marine Biological Research Station, Ratnagiri, for the kind facilities at the respective laboratories. They are also indebted to Dr. H. G. Kewalramani, Senior Scientific Officer, Taraporevala Marine Biological Research Station, Bombay, for his constant encouragement and for kindly going through the manuscript. To the crew members of the Departmental trawler, their sincere thanks for all their co-operation and ready help in collecting the material.

Alcock (1901) records this species from 56 to 58 fathoms dredged off Bombay. Our observations made at intervals from 1963 to 1968 indicate that this deep water prawn perhaps shows movements towards inshore waters mainly in the months of summer when most of the females are in ovigerous condition.

The authors first noticed this prawn in March 1963 when a few specimens were seen to be dropping on to the deck from meshes of the trawl net, while being hauled up. The specimens were fully covered with mud due to their heavily sculptured exoskeletal armature. These prawns had a peculiar dorsal flexture of the abdomen (Fig. 1 a) unlike the ventral flexture seen commonly in other prawns. When picked

* Presented at the 'Symposium on Indian Ocean and Adjacent Seas—Their Origin, Science and Resources' held by the Marine Biological Association of India at Cochin from January 12 to 18, 1971.

up and disturbed, the prawns did not show apparently any signs of life, whereas those that were lying on the deck without flexture, when picked up, immediately reacted by flexing the abdomen and remaining still. When introduced in small aquaria with sea water and left undisturbed for 15-30 minutes, most of them started moving about in the aquaria.

The live prawns were then taken to the laboratory in aquaria in sea water, where they survived for about 36 hours, probably due to lack of suitable substratum. Hence, in subsequent collections care was taken to provide on board itself, as a natural substratum the habitat mud collected from the fishing ground.

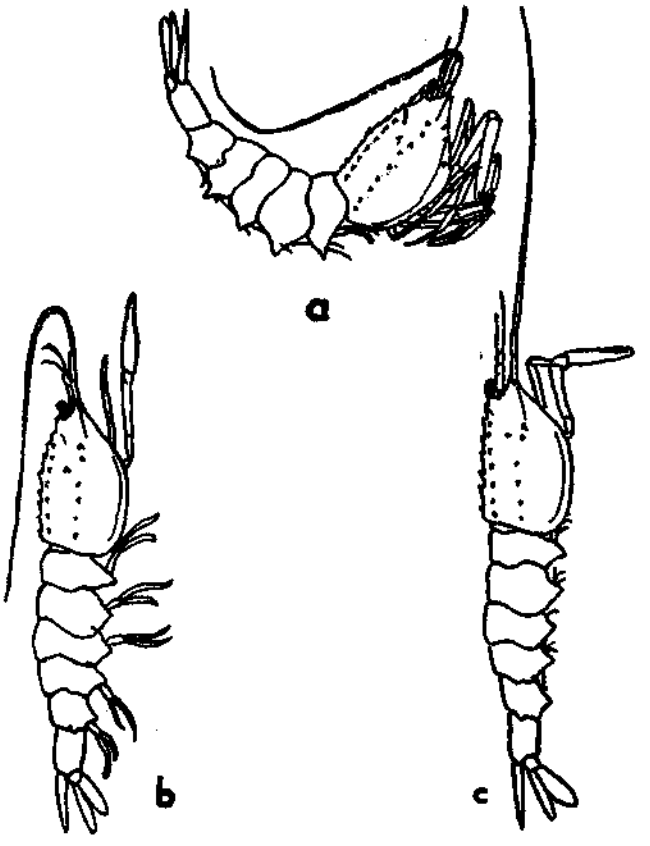


Fig. 1. *Pontocaris pennata* Bate : a. animal in lateral view showing the dorsal abdominal flexture (diagrammatic), b. animal in lateral view when swimming up (diagrammatic) and c. same as 'b' but when swimming down (diagrammatic).

The specimens thus kept on board in aquaria, survived transhipment to the laboratory. They were kept for 2-3 days, after which they were transferred to another set of aquaria with about 5 cm layer of fine, clean sand provided at the bottom of the tanks. Even after conditioning them for 4-5 days to the laboratory environment, when disturbed, they feigned death, regaining normalcy after about 15 minutes as also observed on board the vessel.

The ovigerous females appeared to be more sensitive to the laboratory conditions since most of them died within 48 hours after their being brought to the laboratory or if survived longer, invariably shed their eggs prematurely.

These prawns showed a tendency to bury themselves in the substratum than to crawl. On coming in contact with the substratum, the prawns immediately started digging by bending at right angles the distal segments of their 3rd maxilliped and 1st pereiopod. Simultaneously, the pleopods also moved so fast that a current of mud particles was created from the anterior to the posterior direction of the animals. Other legs, at the same time, forced themselves down the depression resulted from the disturbance in the substratum. Within 10-15 seconds the prawns were completely buried, exposing only the eyes, antennules and antennae, rest all being covered by mud. These prawns were never observed to bury themselves deeper than 2.5 to 5 cm in the substratum though in the experimental tanks habitat mud columns of 20 to 25 cm were specially made available to the animals. The pereiopods, especially the 2nd to 5th, of these prawns, are feeble and this may be one of the reasons why it can not bury deeper.

An interesting behaviour of these prawns is their mode of swimming. They would swim mainly vertically rather than horizontally unlike in other prawns, straightaway up as if darting, holding their abdomen straight and the legs straight in front (Fig. 1 b). While sinking down to the bottom the tail is still pointed downwards and only the propod and dactylus of the chelipeds and 3rd maxillipeds are bent at right angles to the body (Fig. 1 c).

Food items such as minced prawn meat, clam and worm meat, and pieces of weeds were given to the prawns, but they did not respond to any of these items. However, when kept in clean sand they lived for 30-45 days and when kept in mud collected either from the intertidal zone or from the trawling grounds, they survived longer than even 4-5 months beyond which observations had to be discontinued. Unfortunately, no studies on the stomach contents of these prawns could be made.

During the period of study, it was observed that the prawns never moulted in the laboratory. Even ovigerous females did not moult after their eggs were shed or hatched.

Successful hatchings of the larvae were obtained only in April 1968. The larvae could be reared through three moults in the laboratory beyond which rearing was not successful.

## Larval Stages

In the genus *Pontocaris* of the family Crangonidae, the larvae of only one species, *Pontocaris cataphracta* (Olivi), have so far been described (Kurian, 1956; Casanova, 1960; Williamson, 1960 and 1967). Williamson (1960) gave a key to the larval stages of five Crangonid genera, *Pontocaris* being one of them, and in 1967 recorded the larvae of *P. cataphracta* from the Mediterranean Coast.

The present account deals with the first three stages of *Pontocaris pennata* Bate, as reared in the laboratory.

## DESCRIPTION OF LARVAL STAGES

### FIRST ZOEA (Fig. 2)

Carapace length—1.1 mm; Total length—3.3 mm.

Larva long and slender (Fig. 2 a), carapace about half length of abdomen ; eyes sessile, closely set as is characteristic of family ; rostrum acutely pointed, reaching less than half length of antennular peduncle ; a small mid-dorsal hump present on carapace behind the eyes ; antero-ventral margin of carapace denticulate (Fig. 2 $a_1$), anteriormost being an acute spine, followed by a row of 6-7 smaller spines.

*Antennule* (Fig. 2 b) : Peduncle fairly long, bearing a small unsegmented inner ramus and a 2-segmented flagellum, which is a characteristic feature ; inner ramus with 4 long setae, one of which is densely plumose ; a cluster of 3-4 small setae also present at base of inner ramus, flagellum is more than 3-times length of inner ramus, but without any setae. *Antenna* (Fig. 2 c) : Peduncle 2-segmented ; scale long, narrow with a minute terminal spine and 9 plumose setae of which 7 are on inner and 2 on outer margins ; endopod represented by a stout bristle-like seta with a bulbous base ; a small, sharp spinule present at the base of the endopod. *Mandible* (Fig. 2 d) : Well developed with about 6 blunt, tubercle-like teeth on lower cutting edge and a long, curved and 2-3 small teeth on upper cutting edge respectively. *First maxilla* (Fig. 2 e) : Palp unsegmented but distally notched giving a 2-segmented appearance, and provided with 3 terminal and 2 subterminal setae ; basal endite with 3 small serrated teeth and 2 minute setae and coxal endite with 4 bristle-like setae. *Second maxilla* (Fig. 2 f) : Scaphognathite broad, fringed on inner margin with fine hairs, with 5 plumose setae with proximal lobe not yet demarcated ; palp indistinctly 3-segmented as indicated by notches and bearing three groups of setae of 2, 1 and 3 each from basal to terminal lobes ; coxal endite with a characteristically globular proximal lobe ; distribution of setae on endites is—8, 1, 2 and 3 respectively, from proximal to distal lobes.

*Maxillipeds*—all the three maxillipeds are functional, segmentation of two rami, however, being rather indistinct. *First maxilliped* (Fig. 2 g) : Endopod which is about 3/4 exopod in length, appears 5-segmented with 2, 1, 1, 2 and 3 setae respectively on first to last segments ; unsegmented exopod provided with 3 terminal and 1 subterminal setae ; protopod well developed, lined with about 10 setae. *Second maxilliped* (Fig. 2 h) : A small, indistinctly 4-segmented endopod, bearing 1-2 setae on each segments ; exopod more than twice as long as endopod, unsegmented, provided with 3 terminal and a pair of subterminal setae. *Third maxilliped* (Fig. 2 i) : Endopod which is longer than that of second maxilliped, is armed with fewer and stiffer setae than in second maxilliped ; exopod as in other maxillipeds.

*Pereiopods :* Only first pair of pereiopods present as small, rudimentary buds at the base of third maxilliped (Fig. 2 j). *Abdomen :* About double carapace length and 5-segmented ; no spines on any segments although presence of spines is considered as an important character of the family by Williamson (1960). *Telson* (Fig. 2 k) : Triangular in outline, narrowing basally ; central notch fairly deep and fringed with fine hairs, process formula 7+7 ; all processes are plumose except for median pair which is spinulose on outer margin, and 1st process is plumose on inner margin only ; no anal spine.

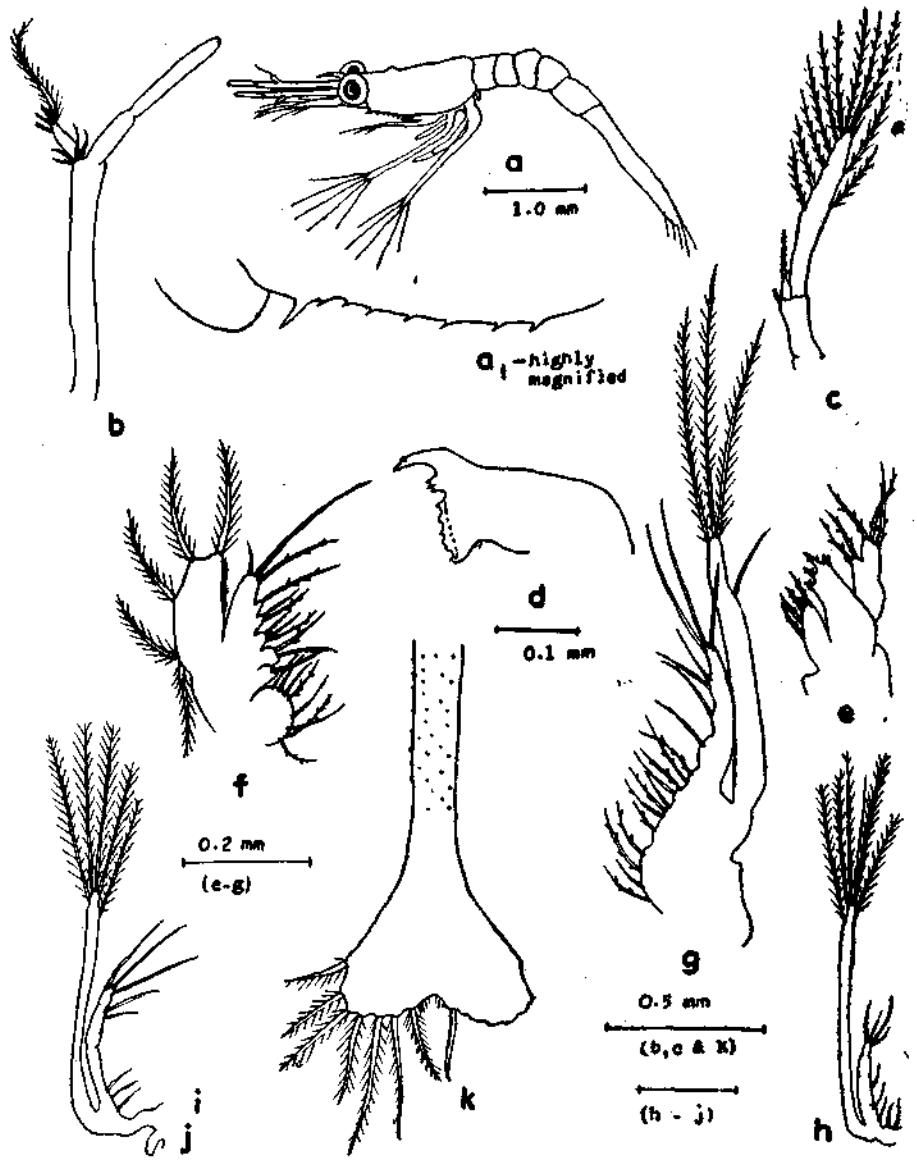


Fig. 2. *Pontocaris pennata* Bate—Ist zoea.

(a. entire larva. $a_1$. ventral margin of carapace magnified. b. antennule. c. antenna. d. mandib e. e. first maxilla. f. second maxilla. g. first maxilliped. h. second maxilliped. i. third maxilliped. j. first pereiopod. k. telson/telson + uropod.)

An interesting feature of the telson is the presence of microscopic tubercles dorsally on the long, narrow basal part. These dorsal tubercles also extend on to the lateral margins.

## Second Zoea (Fig. 3)

Carapace length—1.2 mm ; Total length—3.8 mm.

Eyes stalked. Antennular flagellum further segmented, far exceeding carapace length—a characteristic feature of genus *Pontocaris* as described by Williamson (1960). Exopod setae on maxilliped more in number ; telson process formula 8+8.

*Antennule* (Fig. 3 c) : Flagellum now 8-segmented, with 2 long terminal plumose setae, and reaching far beyond carapace ; setae on inner ramus slightly increased in number. *Mandible* (Fig. 2 d) : Teeth on upper cutting edge now become sharp and pectinate in appearance ; no palp. *First and second maxilla :* Practically no change over previous stage except slight increase in number of setae. *Maxillipeds :* Exopod of first maxilliped with same number of setae as in 1st stage, but that of second and third (Fig. 3 h, i) with 4+2+1 and 4+2+2 setae respectively ; no other changes in maxillipeds.

*Abdomen :* Remains as in previous stage, 6th segment still fused to telson. *Telson* (Fig. 3 k) : Process formula increased to 8+8, with an addition of a small, median pair of delicately plumose setae.

## Third Zoea (Fig. 4)

Carapace length—1.2 mm ; Total length—4.2 mm.

Larva at this stage (Fig. 4 a) is characterised by long antennular flagellum which is more than 2.5 times longer than carapace ; 6th abdominal segment separated from telson ; and uropods present with functional exopods.

*Antennule* (Fig. 4 c) : Peduncle becomes 2-segmented with 2 setae each on distal margin of basal segment ; flagellum now of 13 to 14 segments with 1-2 small setae at distal end of each segment. *Antenna* (Fig. 4 d) : Scale with 13 plumose setae, extending over more than half inner margin ; no setae on outer margin ; no other change. *Mandible and first maxilla* (Fig. 4 d, e) : Practically no change. *Second maxilla* (Fig. 4 f) : Number of setae on endites considerably increased. Scaphognathite with 8 marginal plumose setae but no posterior lobe. *Maxillipeds.* Exopod of the first, second and third maxillipeds (Fig. 4 g, h, i) with 4+1, 4+2+1 and 4+2+2 setae respectively.

*Pereiopods :* First pair (Fig. 4 j) now biramous with a small bud-like endopod and indistinctly 2-segmented exopod, bearing 4+2 terminal setae and 1 basal seta. *Abdomen :* 6th segment separated from telson ; no pleopod buds as yet. *Uropods* (Fig. 4 k) : Not yet distinctly segmented but outer ramus functional with 8-9 apical, plumose setae. Inner ramus slightly smaller than outer and provided with only 1 or 2 setae. *Telson* (Fig. 4 k) : Now more or less rectangular in outline ;

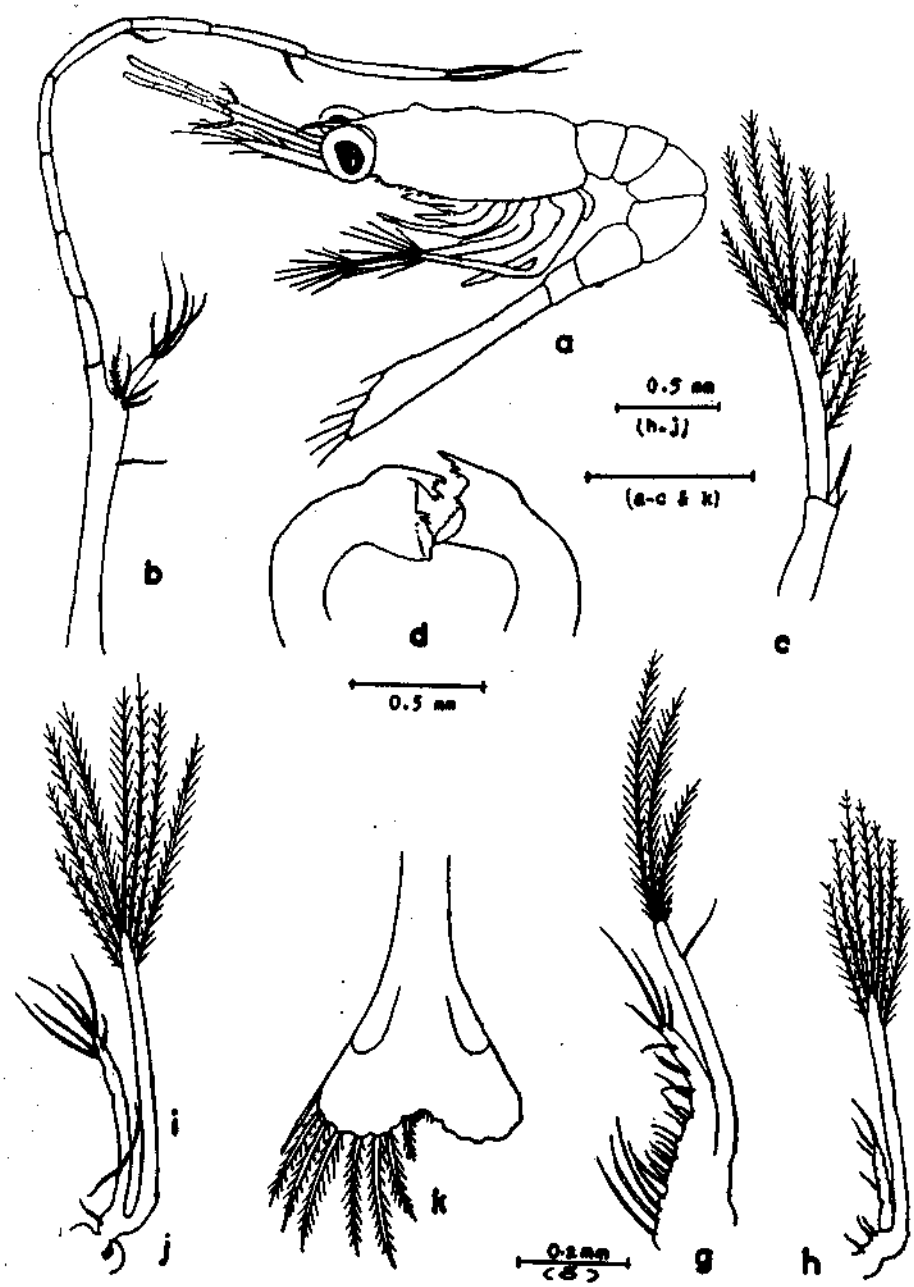


Fig. 3. *Pontocaris pennata* Bate—IInd zoea. (For explanation see Fig. 2).

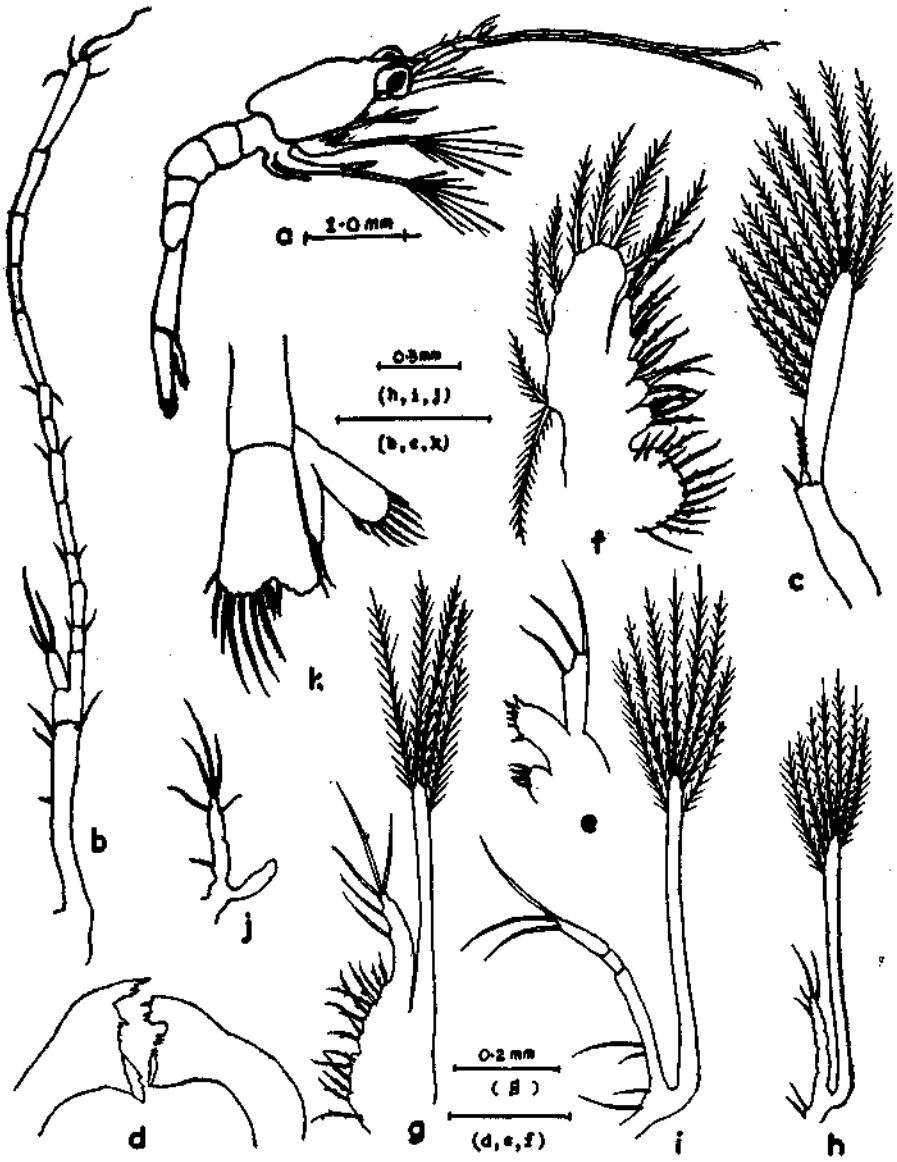


Fig. 4. *Pontocaris pennata* Bate—IIIrd zoea.
(For explanation see F.g. 2)

process formula remains 8+8 but short, spine-like 1st process is more laterally shifted ; 2nd to 6th and 8th processes plumose, whereas 7th process is serrated on outer margin.

Distinctive features of the larvae of *Pontocaris pennata* Bate can be summarised as follows :—

1. Carapace denticulate on the antero-ventral margin. Also, a small hump present behind the rostrum.

2. Antennular flagellum long and segmented, 8-segmented in IInd and 13 to 14-segmented in IIIrd stages, and much longer than carapace, as also observed by Williamson (1960) in *P. cataphracta*.

3. Absence of spines on the abdominal segments.

4. Telson—the long, narrow basal portion armed with microscopic tubercles dorsally.

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