

## THE LARVAE OF ELAMENA (HYMENOSOMIDAE) AND PINNOTHERES (PINNOTHERIDAE) HATCHED IN THE LABORATORY (DECAPOD : CRUSTACEA)

SYED SALAHUDDIN HASHMI

Department of Marine Fisheries, Fish Harbour, Karachi

(Received September 5, 1968)

Only one specie of the family Hymenosomidae and one of the family Pinnotheridae have been hatched in the laboratory. First and third zoeal stages of *Elamena cristatipes* and first, second and third of *Pinnotheres placunae* have been figured and described.

### Introduction

There are eight species of the family Hymenosomidae and only one species of the family Pinnotheridae recorded from Karachi.<sup>1-2</sup> One species of the genus *Elamena* and one of the genus *Pinnotheres* have been reared in the laboratory. First to third zoeal stages of both were obtained but unfortunately the specimens of the second zoeal stage of *E. cristatipes* have been lost during the transit of material from Pakistan to England hence only first and third zoeal stages of *Elamena cristatipes* (Gravely) and first to third of *Pinnotheres placunae* (Hornell and Southwell) have been figured and described here.

Very little is known about the larval Oxyrhyncha of Indopacific region except Prasad and Tampi<sup>3</sup> on *Elamena sindenses* (Alcock) and Al-Kholy<sup>4</sup> on *Elamena mathaei* (Oesmaest).

However, from other parts of the world extensive research has been done on this group of decapod Crustacea. Cano<sup>5</sup> described the larvae of *Maia verrucosa* from the Mediterranean. He also described the larvae of *Liss*, *Herbstia*, *Acanthonyx* and *Lambrus*. Lebour<sup>6</sup> described the larvae of British Oxyrhyncha of the genus *Maia*, *Eurynome*, *Pisa*, *Hyas*, *Inachus*, *Macropodia* and *Achaeus* but none from the genus *Elamena*. Aikawa<sup>7</sup> described the first zoea of the family Hymenosomidae and genus *Phynchoplax*, *Trigonoplax* and *Halicarcinus* only. The same author<sup>8</sup> described the prezoaea of *Chionoecetes opilio* from plankton. Gurney<sup>9</sup> described the zoea of *Maia squinata* and *Elamena mathaei* but he mentioned that, due to the absence of common characters in the zoea of the family Hymenosomidae and other Oxyrhyncha, they must not be grouped together.

First zoea of only *Pinnotheres ridgewayi* (Southwell) has been described by Prasad and Tampi.<sup>3</sup> Chhappgar<sup>10</sup> gave only the dia of eggs of this species in ml Hyman<sup>11</sup> has described the zoeae of a number of species of this family from America

as follows: *Pinnotheres ostreum* (Say); *P. holothuriae* (Semper); *P. pisum* (Latreille); *P. veterum* (Bosc); and *P. maculatus* (Say). Smith<sup>12</sup> described the transformation of last zoeal stage into a megalopa in *P. chaetoptera*. Hart<sup>13</sup> described the larvae of this family found in British Columbia; Sandoz and Hopkins<sup>14</sup> described the zoea of *Pinnotheres ostreum* (Say); Foxon<sup>15</sup> described the last zoeal stage of *P. sayana* only.

Hence the description and figures of both *Elamena cristatipes* (Gravely) and *Pinnotheres placunae* (Hornell and Southwell) are given here for the first time.

### Materials and Method

Ovigerous female Crabs were collected from Buleji rocks, Manora Island and Korangi Creek, Karachi during June to September 1965. Methods of rearing, preservation and drawings were the same as employed in earlier papers.

### Moulting Periods

The first zoeae hatched direct from the eggs of *Elamena cristatipes* moulted after 4 days into second stage which moulted after 5 days into the third zoea. This stage remained mostly near the bottom and died after only 5 hr. The first zoeae of *Pinnotheres placunae* hatched from the eggs were very active. They moulted into the second zoea after 5 days which took 4-5 days to become the third stage. None survived after few hour in this stage.

### Description of Larvae

#### 1. *Elamena cristatipes* (Gravely). (Fig. 1-5).

First zoea: (Figs. 1 and 2) It is a small zoea measuring 908 $\mu$  in length; only rostral spine is present (very small (100 $\mu$ ) and blunt (Fig. 1a); cephalothorax globular (Fig. 1b); eyes sessile.

Abdomen with no lateral knobs or hooks on any segment; segments four and five large and broad; postero-lateral border of fifth segment overlaps the telson (Fig. 1c); telson (Fig. 1d); body length of telson is more than its fork depth ( $161$  and  $44\mu$  respectively); telson wider anteriorly; no outer, lateral or dorsal denticulation;

Antennule (Fig. 2a) ( $73\mu$ ) bears 2 long aesthetes ( $147\mu$ ) and 1 small seta.

Antenna (Fig. 2b): Protopodite ( $58\mu$ ) is smaller than the rostral spine of the cephalothorax; bears no teeth at its distal end; no exopodite.

Mandible (Fig. 2c) bears 4 large and 2 small teeth.

Maxillule (Fig. 2d) bears four ( $1+3$ ) plumose setae on coxal endite; five setose spines on basal endite; two terminal and two subterminal plumose setae on terminal segment and 1 on basal segment of the endopodite.

Maxilla (Fig. 2e) bears a single long plumose seta on coxal endite; six ( $3+3$ ) on basal endites; three terminal and two subterminal plumose setae on the unsegmented endopodite; three long setae on the margin of the scaphognathite which terminates as a thick spine.

First maxilliped (Fig. 2f) has eight plumose setae on the protopodite; four setae on the exopodite; five segmented endopodite bearing 3, 2, 1, 2, 4+1 setae respectively.

Second maxilliped (Fig. 2g and h) has three plumose setae on the protopodite; 4 swimming setae on exopodite; three segmented endopodite bearing 1, 1, 5 setae respectively.

Third zoea: (Figs. 3-5). It is  $1544\mu$  in length; the rostral spine is  $235\mu$  in length (Fig. 3a); 10-12 setae on postero-lateral margin of cephalothorax; eyes stalked; buds of thoracic appendages have appeared (Fig. 4c and f); only on the second segment of abdomen a pair of lateral knobs present

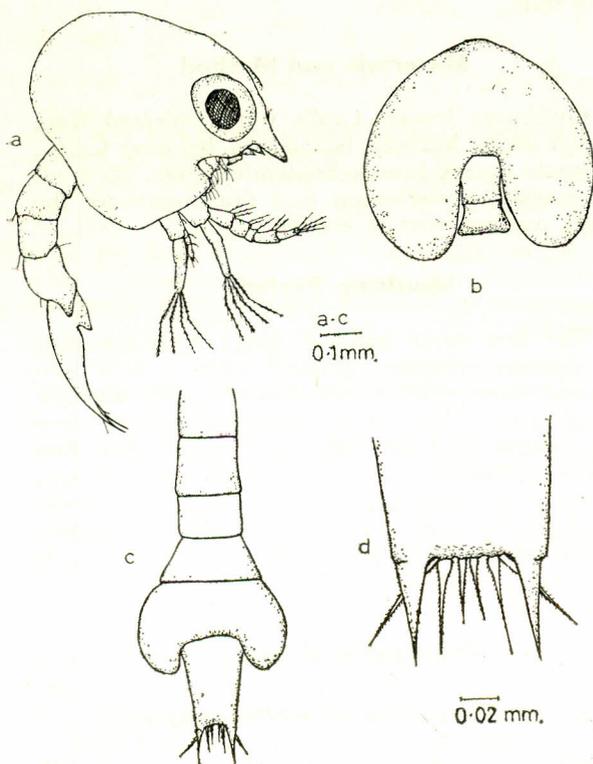


Fig. 1.—First zoeal stage of *Elamena cristatipes* (Gravely). a, side view of first zoea; b, back view of cephalothorax; c, abdomen plus telson; d, telson prong.

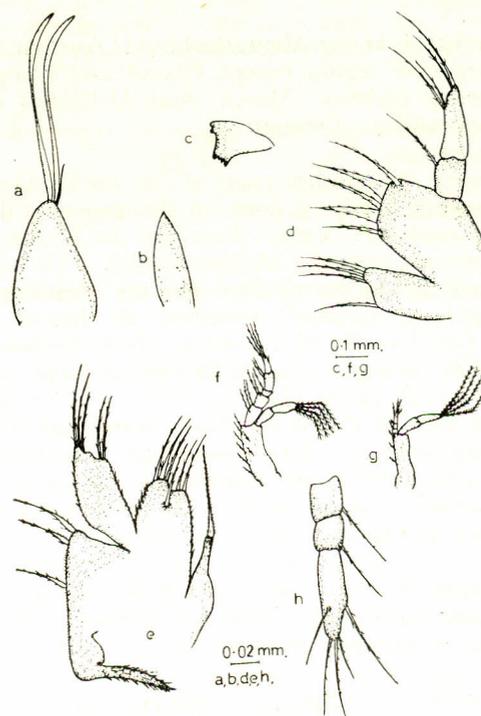


Fig. 2.—Limbs and mouth parts of first zoeal stage of *Elamena cristatipes* (Gravely). a, antennule; b, antenna; c, mandible; d, maxillule; e, maxilla; f, first maxilliped; g, second maxilliped; h, endopodite of second maxilliped.

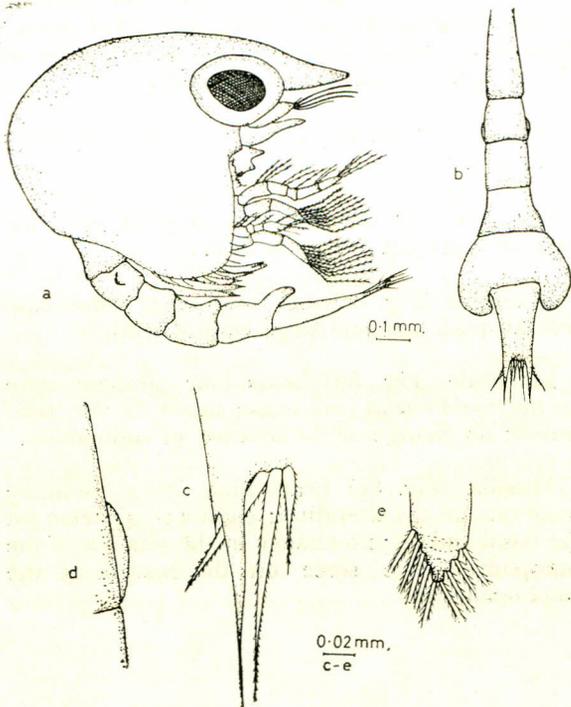


Fig. 3.—Third zoeal stage of *Elamena cristatipes* (Gravely). a, side view of third zoea; b, abdomen plus telson; c, prong of telson; d, lateral margin of second abdominal segment; e, tip of the exopodite of second maxilliped.

(Fig. 3b and d); a small spine has appeared on the outer side of the fork (Fig. 3c).

Antennule (Fig. 4a) has three long aesthetes ( $147\mu$ ) and two setae.

Antenna (Fig. 4b) smaller than the rostral spine of the cephalothorax.

Mandible (Fig. 4c) has a bud of the palp.

Maxillule (Fig. 4d) has seven setose spines on the basal endite; three terminal and two subterminal setae on the terminal segment and 1 on the basal segment of the endopodite; epipodital seta has also appeared.

Maxilla (Fig. 5a) has seven plumose setae on the basal endite; five setae on the endopodite; nine long plumose setae on the margin of the scaphognathite which terminates as two long setae.

First maxilliped (Fig. 5b and e) has 11 plumose setae on the protopodite; eight swimming setae on the exopodite; five segmented endopodite bearing 3, 2, 1, 2, 4+1 setae respectively.

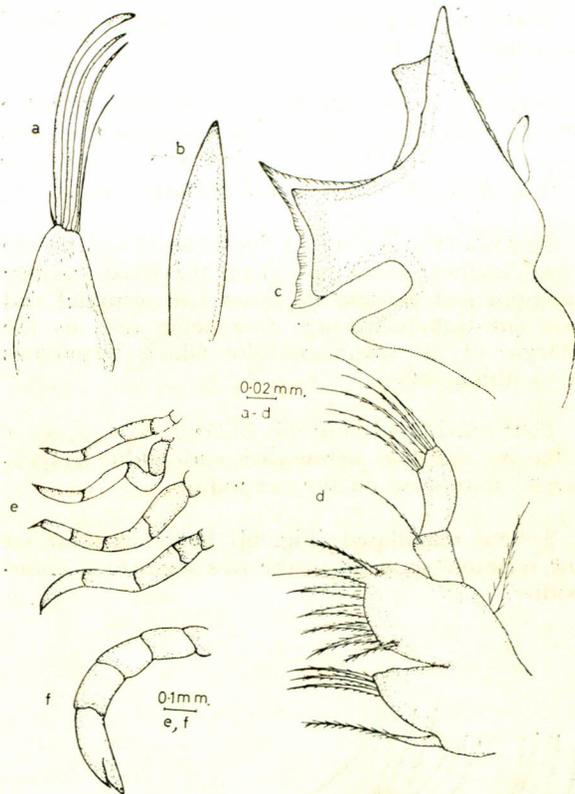


Fig. 4.—Limbs and mouth parts of third zoeal stage of *Elamena cristatipes* (Gravely). a, antennule; b, antenna; c, mandible; d, maxillule; e, thoracic appendages; f, cheliped.

Second maxilliped (Figs. 5c, d and 3e) have nine swimming setae on the exopodite; three segmented endopodite bears 1, 1, 6 setae respectively.

Third maxilliped (Fig. 5f) bud has appeared.

## 2. *Pinnotheres placunae* (Hornell and Southwell.) (Figs. 6-10).

First zoea: It is  $695\mu$  in length; only rostral and lateral spines are present ( $161$  and  $100\mu$  respectively) on the cephalothorax (Fig. 6a); eyes are sessile.

Abdomen with a pair of blunt lateral knobs each on second and third segment (Fig. 6b); fourth and fifth segments are broader than the rest; telson (Fig. 6c) has three lobes; three setae on either side of the middle lobe; three spines on the lateral lobe.

Antennule (Fig. 6d) bears two aesthetes.

Antenna (Fig. 6e) very small and pointed.

Mandible (Fig. 6f) bears three teeth on dorsal and three on the ventral side.

Maxillule (Fig. 6g) bears three plumose setae on the coxal endite; five setose spines on the basal endite; two segmented endopodite bears four (2+2) setae on the terminal segment only.

Maxilla (Fig. 6h) bears five setae (2+3) on the coxal endites; seven (4+3) on the basal endites; unsegmented endopodite bears two terminal and one sub-terminal setae; four setae are on the margin of the scaphognathite which terminates as a thick seta.

First maxilliped (Fig. 6i) bears 2, 2, 1, 2, 4+1 setae on the five segmented endopodite respectively; four setae on the exopodite.

Second maxilliped (Fig. 6j) bears six setae on the terminal segment of the two segmented endopodite.

Second zoea: (Figs. 7 and 8). This is 955 $\mu$  in total length; eyes are stalked now (Fig. 7a,b); there is not much difference in the armature of abdomen and telson (Fig. 7c and d).

Antennule (Fig. 8a) has two aesthetes and one small seta.

Antenna (Fig. 8b) bears small spine near the base to represent the exopodite.

Mandible (Fig. 8c) has three large dorsal and several small and one large ventral teeth.

Maxillule (Fig. 8d) bears four plumose setae on the coxal endite; six setose spines on the basal endite; no change in the setation of endopodite.

Maxilla (Fig. 8e) bears nine (5+4) plumose setae on the coxal endites; eight (4+4) setae on the basal endites; no change in the setation of the endopodite; five setae on the margin of the scaphognathite.

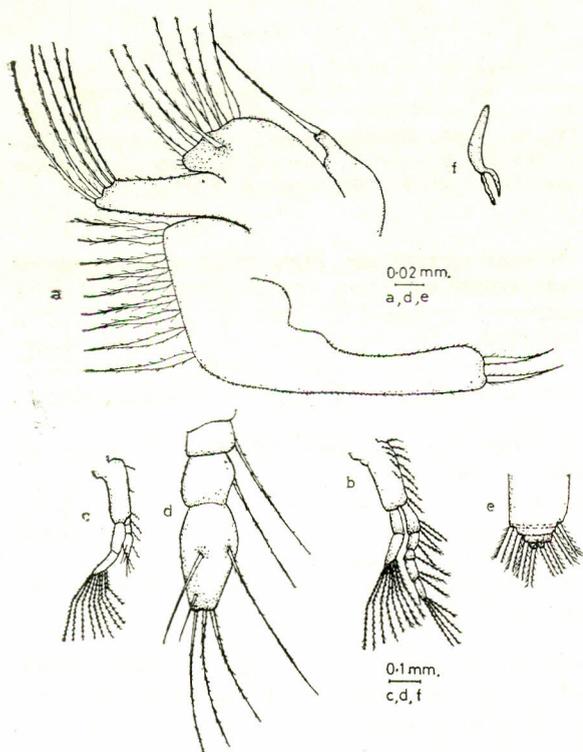


Fig. 5.—Mouth parts of third zoeal stage of *Elamena cristatipes* (Gravely). a, maxilla; b, first maxilliped; c, second maxilliped; d, endopodite of second maxilliped; e, tip of the exopodite of first maxilliped; f, third maxilliped.

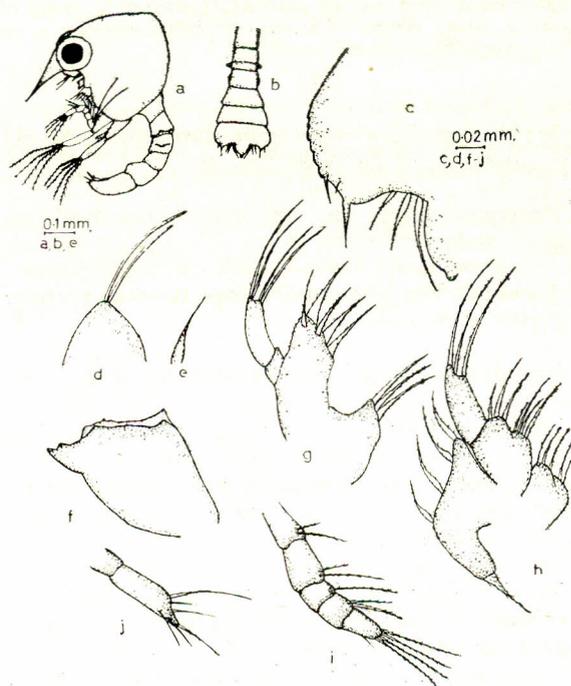


Fig. 6.—First zoea of *Pinnotheres placunae* (Hornell and Southwell). a, side view of the first zoea; b, abdomen plus telson; c, portion of telson; d, antennule; e, antenna; f, mandible; g, maxillule; h, maxilla; i, endopodite of first maxilliped; j, endopodite of second maxilliped.

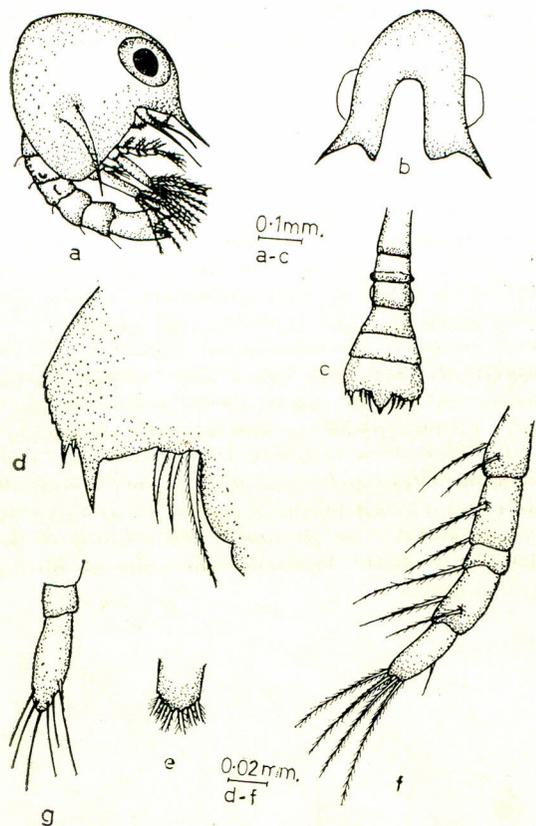


Fig. 7.—Second zoeal stage of *Pinnotheres placunae* (Hornell and Southwell). a, side view of second zoea; b, back view of cephalothorax; c, abdomen plus telson; d, portion of telson; e, exopodite of first maxilliped; f, endopodite of first maxilliped; g, endopodite of second maxilliped.

First maxilliped (Figs. 8f and 7e and f) bear nine setae on the basis; six swimming setae on the exopodite.

Second maxilliped (Figs. 8g and 7g) bear four setae on the basis; six swimming setae on the exopodite.

Third zoea (Fig. 9 and 10). It is  $1102\mu$  in length; thoracic appendages have appeared below the cephalothorax (Fig. 9b); eyes are considerably stalked (Fig. 9a, b and c) pleopods have developed on first to fourth abdominal segments (Fig. 9a) no change in the armature of abdomen and telson (Fig. 9d and e).

Antennule (Fig. 10a) bears two aesthetes and three long setae.

Antenna (Fig. 10b) bears a well-developed spine near the base.

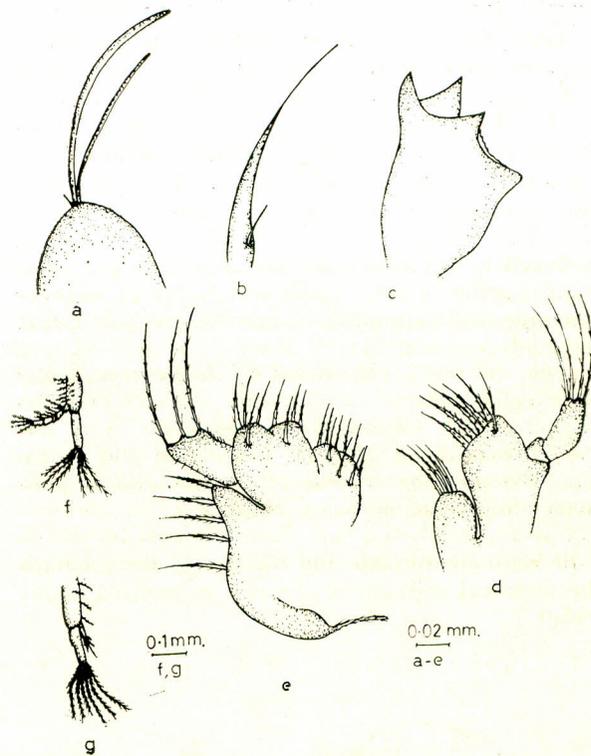


Fig. 8.—Limbs and mouth parts of second zoeal stage of *Pinnotheres placunae* (Hornell and Southwell). a, antennule; b, antenna; c, mandible; d, maxillule; e, maxilla; f, first maxilliped; g, second maxilliped.

Mandible (Fig. 10c) bears three large teeth on the dorsal side.

Maxillule (Fig. 10d) bears six plumose setae on the coxal endite; eleven setae on the basal endite; one seta on the epipodite has appeared.

Maxilla (Fig. 10e) bears 10 setae on the coxal endite; seven long and seven small setae on the margin of the scaphognathite which bears three setae on its terminal end.

First maxilliped (Fig. 10f, g and h) bears seven setae on the basis; eight setae on the exopodite.

Second maxilliped (Figs. 10g, 9g) bears eight setae on the exopodite; no change in the setation of basis and endopodite.

### Discussion

*Elamena cristatipes* (Oxyrhyncha; Hymenosomidae) was reared and first, second and third

zoal stages were obtained but according to Lebour<sup>6</sup> there must be only two zoal stages in this group and according to Gurney<sup>9</sup> who described the zoea of *Elamena mathaei* and concluded that due to the absence of common characters in the zoea this (family Hymenosomidae) can hardly belong to Oxyrhyncha. The telson of *Elamena cristatipes* is very much like the telson of *Tyloidiplax indica* (Alcock) Ocypod carb); dorsal and lateral spines are absent in both cases. The rostral spine is very small and blunt in *Elamena cristatipes* and thin and pointed in *Tyloidiplax indica*.

The following characters of *Elamena cristatipes* are different from the common features of Oxyrhyncha. (1) Cephalothorax globular and has only rostral spine which is very small and blunt. (2) Abdomen is without any lateral knobs and hooks on any segment. (3) Segments four and five are large and broad. (4) Posterolateral border of fifth segment overlaps the telson. (5) Body length

of telson is more than its fork depth. (6) Telson is wider anteriorly; no outer lateral or dorsal denticulations. (7) Antenna is very small and without an exopodite. (8) Maxilla bears a single seta on coxal endite and it is vestigial. (9) Three setae on the margin of the scaphognathite.

Most of the taxonomists have included the Hymenosomidae in the Oxyrhyncha. In its larval characters, however, it shows no affinity with the other two families of Oxyrhyncha i.e. Maïidae and Parthenopidae. Apart from the presence of lateral knobs on the abdominal segments and the vestigial character of the coxal endite of the maxilla the larvae show more resemblance to those Pinnotheridae (which have undergone modifications as a result of their parasitic habit) and Leucosiidae. But until we have a comprehensive knowledge of the larvae of more of the Oxyrhyncha, it is not profitable to speculate on the relationships of the families within the group.

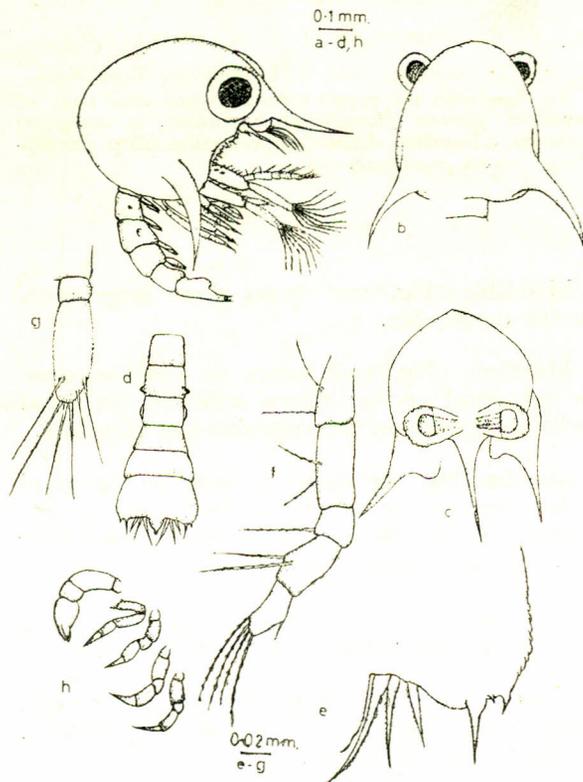


Fig. 9.—Third zoeal stage of *Pinnotheres placunae* (Hornell and Southwell). a, side view of third zoea; b, back view of cephalothorax; c, front view of cephalothorax; d, abdomen plus telson; e, portion of telson; f, endopodite of first maxilliped; g, endopodite of second maxilliped; h, thoracic appendages.

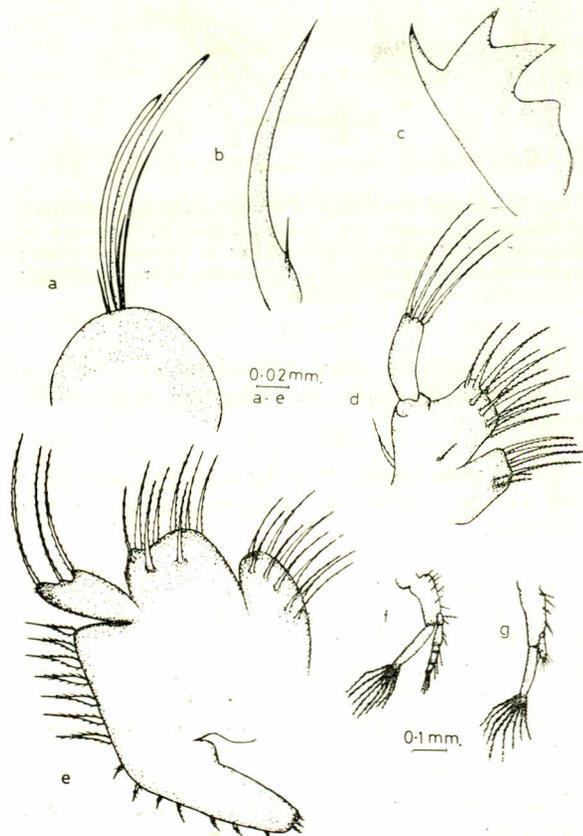


Fig. 10.—Limbs and mouth parts of third zoeal stage of *Pinnotheres placunae* (Hornell and Southwell). a, antennule; b, antenna; c, mandible; d, maxillule; e, maxilla; f, first maxilliped; g, second maxilliped.

The following are the important features of the Pinnotherid zoea: (1) Very small antenna; (2) Exceptionally long lateral spines of cephalothorax (Mostly); (3) Shape of the telson (Forked or trilobed); (4) Broad fourth abdominal segment (when the telson is trilobed).

Except the first feature all are variable. As pointed out by Hyman,<sup>11</sup> the spines on the cephalothorax and shape of telson are different in different species. The common characteristic of inhabiting a mollusc as parasite must be the reason of grouping together. This family also needs revision. There are some extreme examples like *P. holothuria* which bears no spine on the cephalothorax except the rostrum, and in *Dissodactylus mellitae* all the spines are present. The abdomen and telson of *Dissodactylus* and *Pinnotheres maculatus* resemble those of a typical *Macrophthalmus* (a widely separated form) the other type of telson with three lobes is quite common and very like that of the Leucosiidae. Reduction of the antenna is one more piece of evidence to support this proposed close relationship.

**Acknowledgments.**—The author is grateful to Professor L.A. Harvey, University of Exeter, U.K., for his guidance. He is indebted to Dr. M.R. Qureshi, Director Marine Fisheries Department, Pakistan, for giving laboratory facilities.

#### References

1. S.S. Hashmi, Agri. Pakistan, **11**, 237 (1963).
2. S.S. Hashmi, Agr. Pakistan, **15**, 451 (1964).
3. R.R. Prasad and R.S. Tampi, J. Zool. Soc. India, **9**, 22 (1957).
4. A.A. Al-Kholy, Larval stages of four Brachyuran crustacea (From Red Sea). Publ. Mar. Biol. Sta. Ghardaqa, **10**, 239(1959).
5. G. Cano, *Sviluppore morfologia degli Oxyrhyncha*, Mitt. Zool. Stat. Neapel, 1893 Vol. X.
6. M.V. Lebour, Proc. Zool. Soc. London, **15**, 473(1928).
7. H. Aikawa, Records Oceanog. Works, Japan, **2**, 17(1929).
8. H. Aikawa, Records Oceanog. Works, Japan, **9**, 87(1937).
9. R. Gurney, *Larvae of Decapod Crustacea*, Ray Soc. London, 8-306(1942).
10. B.F. Chhapgar, Records Indian Museum, **54**, 1 & 2, 33-52 (1956).
11. O.W. Hyman, Nat. Museum, **14** (2497) (1924).
12. S.I. Smith, Occasional occurrence of tropical and sub-tropical species of Decapod Crustacea on the coast of New England. Trans. Conn. Acad. Arts. Sci., **4**, 254 (1880).
13. J.F.L. Hart, Can. J. Res., **12**, 411 (1935).
14. M.D. Sandoz, and S.H. Hopkins Biol. Bull., **93**, 250(1947).
15. W. Fonn, Bull. Museum Comp. Zool. (5) **11**, 233 (1879).