

## THE BRACHYURAN LARVAE OF WEST PAKISTAN HATCHED IN THE LABORATORY

### Part I.—Oxystomata, Calappidae (Decapod: Crustacea)

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Prezoea and first zoea of *Matuta lunaris* (Forsk.) and *M. planipes* (Fabricius) have been obtained by rearing the ovigerous females. These are figured and described. A comparative study of first zoeae of both the species has also been made.

It is intended in these studies of the West Pakistan Brachyura to rear as many species as possible from the berried crab, and thus to ascertain without doubt the identification of zoeal stages in Plankton. There are 12 species of sand crabs, so far recorded, in the Karachi area.<sup>1,2</sup> *Matuta lunaris* (Forsk.) and *Matuta planipes* (Fabricius) are dealt with here.

In the family Calappidae, studies have been made on the larval stages of *Calappa marmorata*,<sup>3</sup> *Calappa lophos*,<sup>4-5</sup> *Calappa flammena*,<sup>6</sup> *Hepatus ephelitious*,<sup>7</sup> *Matuta lunaris*,<sup>5</sup> No account has been found on the zoea of *Matuta planipes* (Fabricius).

#### Materials and Methods

Rearing experiments were done during 1964-66 in the laboratory of Marine Fisheries Department, Karachi. Collections of ovigerous female crabs were made from Sandspit, Hawkes Bay, Manora Island and from the catch of beach seine fishing by local fishermen at Korangi creek, Karachi.

The live specimens were kept in sea water in the laboratory (collected offshore, brought in carboys) and the water was changed every 12 hours. Crabs were fed bits of fresh shrimp and fish and excess food was removed soon after feeding. The salinity of sea water in the aquarium was maintained at 35 p.p.t. and temperature at 28°C during these experiments. Soon after hatching, the zoea were removed and some of them were preserved in 5% formalin, others were allowed to develop and were fed *Artemia* nauplii. Lactic acid was used as clearing agent<sup>8</sup> and dissections were made in it. The dissected specimens were covered with Hoyer's mounting medium. Drawings of whole as well as of the dissected parts and mouthparts were made with the help of camera lucida. Measurements were made with the help of an ocular micrometer.

#### Moulting Periods

Only prezoea and first zoea of *M. lunaris* and first zoea of *M. planipes* were obtained during the rearing experiments. Prezoea of *M. lunaris*, hatched from the egg moulted after 4 hr into the first zoea and *M. planipes* within half an hour only.

#### Description of Zoeae

(1) *Matuta lunaris* (Forsk.).—Prezoea: It is a minute zoea measuring 808 $\mu$  in length; the dorsal spine is slightly longer than the rostral spine of the cephalothorax (132 and 117 $\mu$  respectively); There is no lateral spine; postero-lateral flaps occur on the cephalothorax. Abdomen: Pair of knobs of second segment blunt and pointed outwards, and of third segment pointed downwards; fourth segment is broader than the rest and its postero-lateral margin is thick and extended as flap, overlapping the fifth segment telson fork well developed but its depth is less than its body length 58 and 89 $\mu$ , respectively; 3 setose spines emerge inside the fork.

Antennule is short and bears three aesthetes and one small seta.

Antenna: Protopodite (132 $\mu$ ) is longer than the rostral spine of the cephalothorax; it bears short teeth on the distal half; no exopodite. Mandible bears 3 large teeth. Maxillule bears 6 plumose setae on coal endites; 5 setose spines on basal endites and 5 setae on endopodite (4 on terminal segment and one on basal segment). Maxilla bears 9 (4+5) plumose setae on coxal endites; 7 (3+4) on basal endites; 4 (2+2) on endopodite, one long plumose seta on the margin of scaphognathite which terminates as a setose spine.

First maxilliped bears no seta on protopodite; 4 setae on exopodite; setation of the 5 segmented endopodite is 1,1,1,2,4+1.

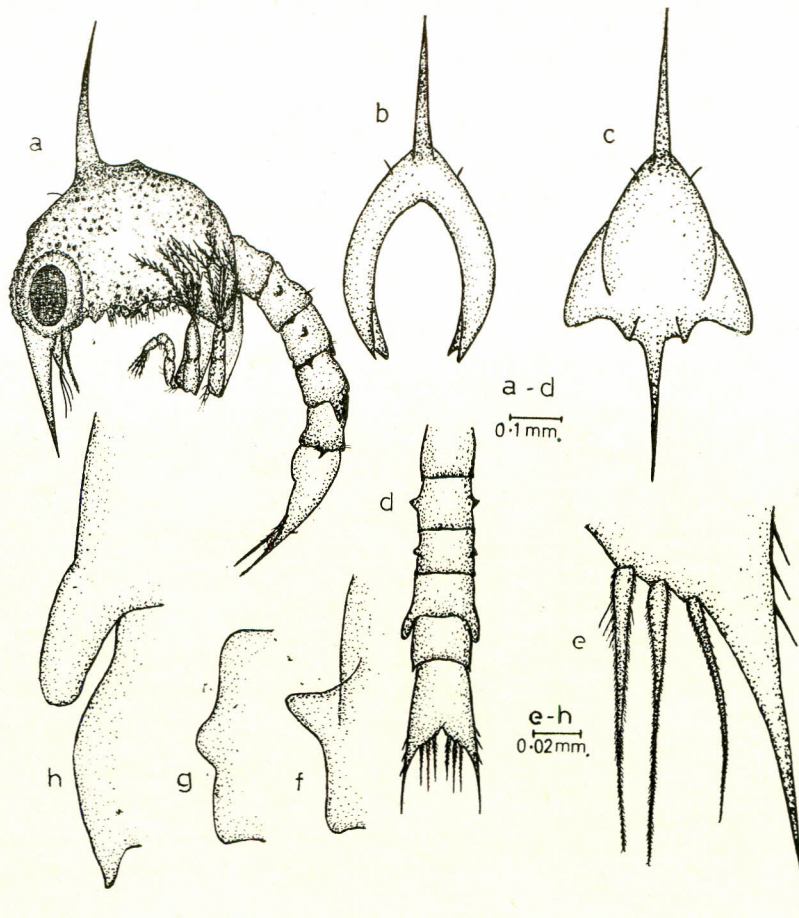


Fig. 1.—First zoeal stage of *Matuta lunaris* (Forskål): (a) Side view of first zoea, (b) Back view of cephalothorax, (c) Front view of cephalothorax, (d) Abdomen plus telson, (e) Prong of telson, (f) Lateral margin of second abdominal segment, (g) Lateral margin of third abdominal segment and (h) Lateral margins of fourth and fifth abdominal segments.

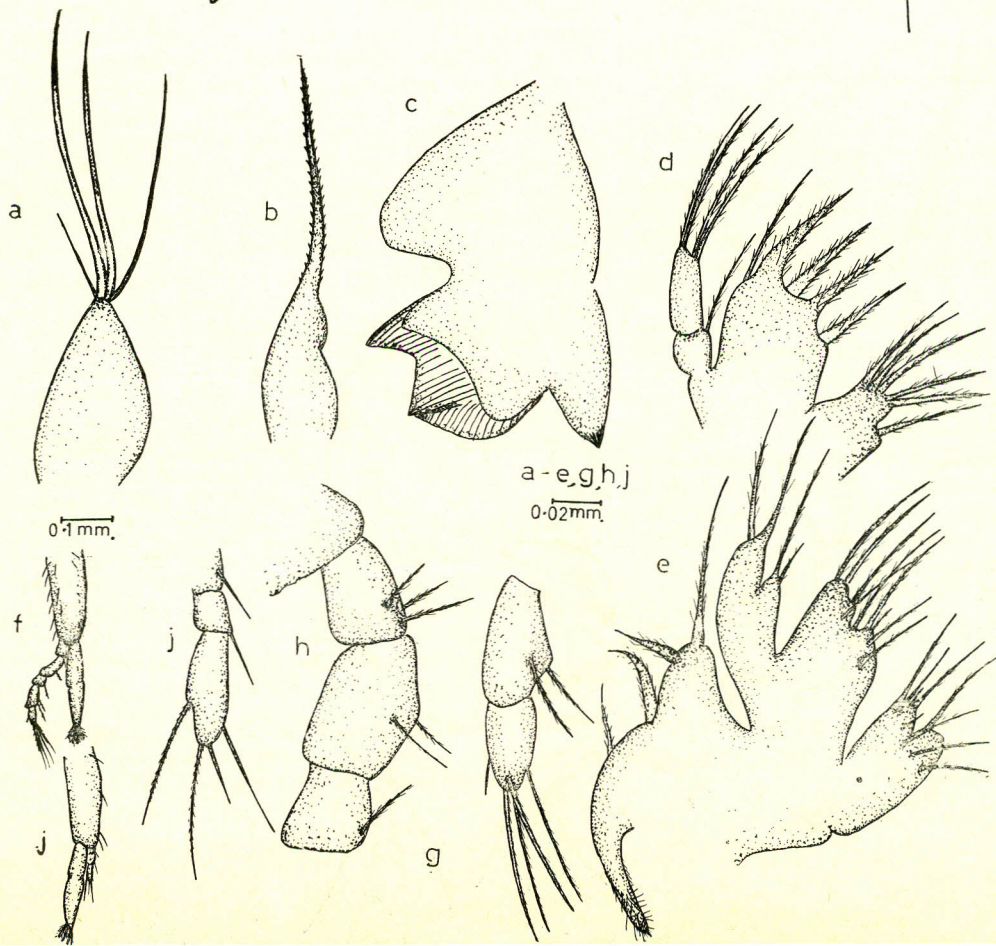


Fig. 2.—Limbs and mouth parts of first zoeal stage of *Matuta lunaris* (Forskål): (a) Antennule, (b) Antenna, (c) Mandible, (d) Maxillule, (e) Maxilla, (f) First maxilliped, (g-h) Endopodite of first maxilliped, (i) Second maxilliped, and (j) Endopodite of second maxilliped.

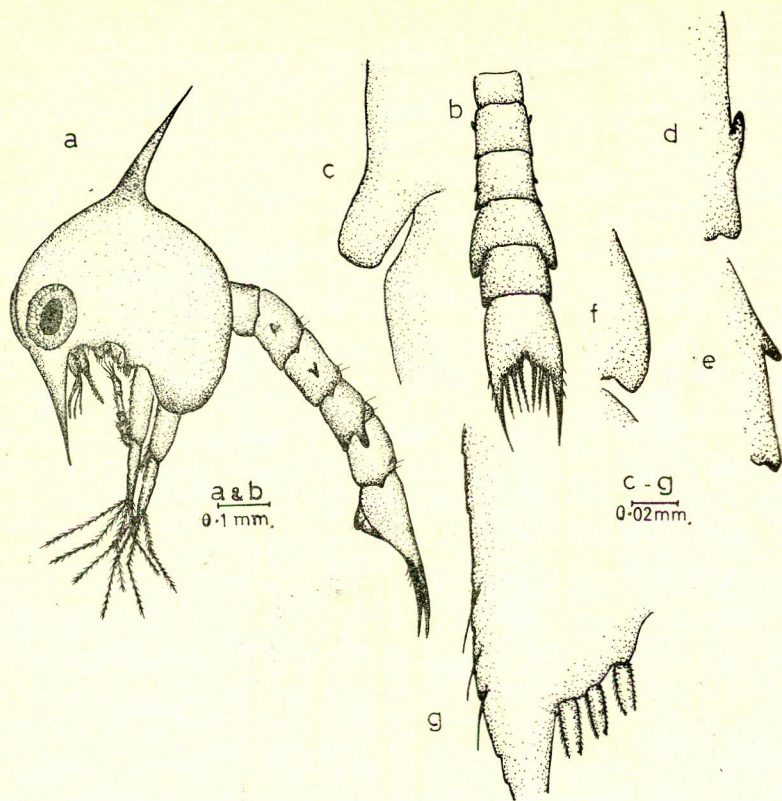


Fig. 3.—First zoeal stage of *Matuta planipes* (Fabricius). (a) Side view of first zoea, (b) Abdomen plus telson, (c) Lateral margin of fourth abdominal segment, (d-e) Lateral margins of second and third abdominal segments, and (f) Prong of telson.

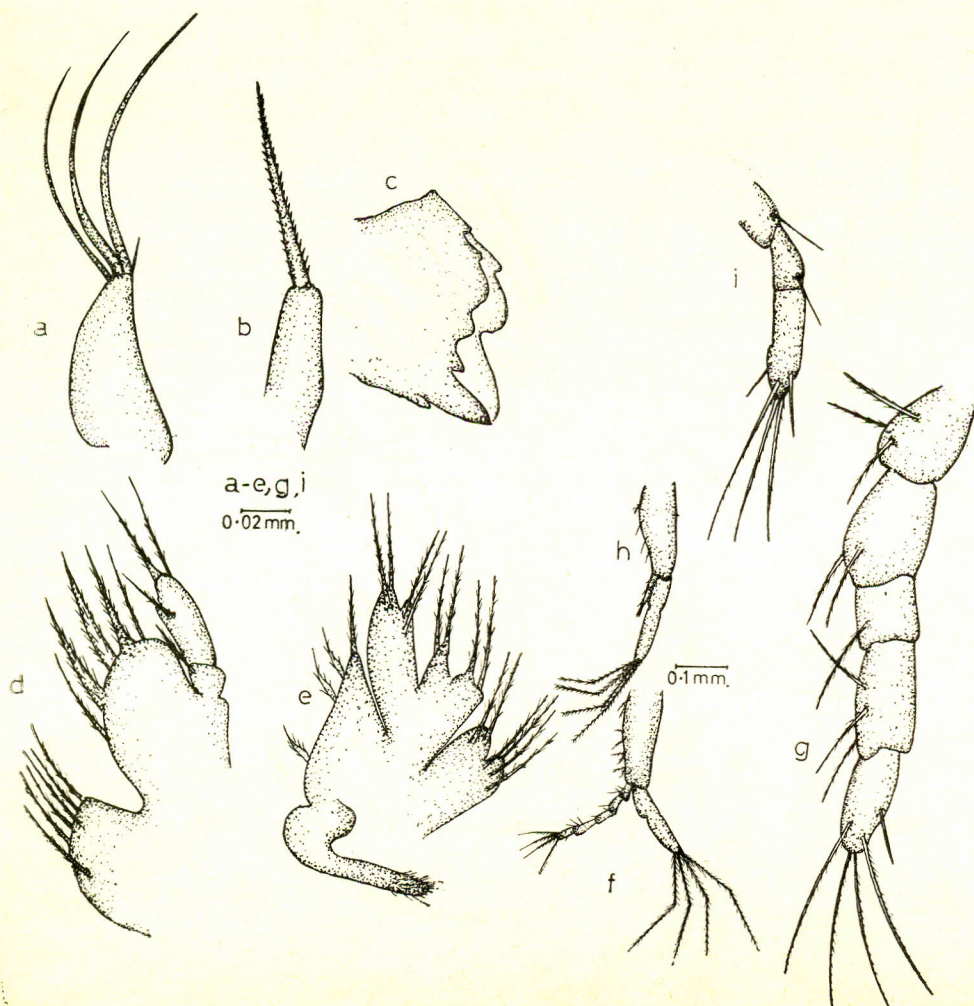


Fig. 4.—Limbs and mouth parts of first zoeal stage of *Matuta planipes* (Fabricius): (a) Antennule, (b) Antenna, (c) Mandible, (d) Maxillule, (e) Maxilla, (f) First maxilliped, (g) Endopodite of first maxilliped, (h) Second maxilliped and (i) Endopodite of second maxilliped.

Second maxilliped has no seta on basipodite; 4 swimming setae on exopodite; 3 segmented endopodite bearing 1, 1, 4 setae, respectively.

First zoea (Figs. 1 and 2): It is a small size zoea measuring  $1242\mu$  in length; the dorsal spine is longer than the rostral spine of the cephalothorax ( $242$  and  $178\mu$ , respectively). There are no lateral spines (Fig. 1a); postero-lateral border of cephalothorax is like a flap (Figs. 1 b and c); eyes are sessile; a pair of setae on either side of the dorsal spine.

Abdomen (Figs. 1 d, f, g): pair of knobs of second and third segments extends outward; fourth segment is broader than the rest and its postero-lateral margin bears flaps, extending to overlap the fifth segment (Fig. 1 h); telson (Fig. 1 e): fork well developed; its depth is equal to the body length of the telson ( $147\mu$ ); 3 spines on the lateral margin of the prong.

Antennule (Fig. 2a) is uniramous and short ( $88\mu$ ) and bears 3 long aesthetes ( $132\mu$ ) and 1 small seta.

Antenna (Fig. 2b): Protopodite ( $147\mu$ ) is smaller than the rostral spine of the cephalothorax; bears small teeth on either side of the distal half; no exopodite is present.

Mandible (Fig. 2c) is a simple, hard and asymmetrical toothed process, bearing 5 large teeth.

Maxillule (Fig. 2d) bears 6 (1+5) plumose setae on coxal endites; setose spines and one plumose seta on basal endite; 2 terminal and 2 subterminal plumose setae on the terminal segment and one plumose seta on the basal segment of the endopodite.

Maxilla (Fig. 2e) bears 9 (4+5) plumose setae on coxal endite; 9 (5+4) on basal endites; 2 terminal and 2 subterminal setae on the unsegmented endopodite; 4 long and thick setae on the margin of scaphognathite which terminates as a thick setose spine.

First maxilliped (Fig. 2 f, g and h) has 9 small bristles on the basis; 4 swimming setae on the exopodite; 5 segmented endopodite bearing 3, 2, 1, 2, 4+1 setae, respectively.

Second maxilliped (Fig. 2 i and j) has 4 plumose setae on the basis; 4 swimming, jointed setae on exopodite; three segmented endopodite bearing 1, 1, 4 setae respectively.

(2) *Mututa planipes* (Fabricius) (Figs. 3 and 4).— First zoea: It is a small zoea measuring  $1120\mu$  in length; the dorsal spine is longer and more slender than the rostral spine of cephalothorax ( $279$  and  $220\mu$ , respectively); there are no lateral spines; eyes are sessile (Fig. 3a).

Abdomen (Figs. 3 b-f): pair of knobs of the second segment is pointed upwards and of third segment pointed downwards; fourth segment is broader than the rest and its postero-lateral margin is enlarged and overlapping the fifth segment (Fig. 3c); telson (Fig. 3g) fork well developed and its depth is equal to its body length ( $132\mu$ ); lateral margins of the telson curved; 3 outer spines on the lateral side of the fork; 3 pairs of setose spines in the middle of the fork.

Antennule (Fig. 4a): ( $73\mu$ ) bearing 3 long aesthetes ( $117\mu$ ) and 1 small seta.

Antenna (Fig. 4b): Protopodite ( $132\mu$ ) is smaller than the rostral spine of the cephalothorax; bears small teeth on either side of the distal half; no exopodite is present.

Mandible (Fig. 4c): is armed with several large and small teeth.

Maxillule (Fig. 4d): bears 6 plumose setae on coxal endites; 4 thick setose spines and 1 plumose seta on basal endite; 3 plumose setae on the terminal and 1 on subterminal segment of the endopodite.

Maxilla (Fig. 4e) bears (4+2) plumose setae on coxal endites; (2+2) setae on basal endites; 2 terminal and 2 subterminal setae on the unsegmented endopodites; 4 setae on the margin of scaphognathite which terminates as a thick and blunt setose spine.

First maxilliped (Figs. 4 f and g) has 8 small bristles on the basis; four swimming; jointed and terminal plumose setae on exopodite; 5 segmented endopodite bearing 3, 2, 1, 3, 4+1 setae respectively.

Second maxilliped (Figs. 4h and i) has 4 small bristles on the basis; 4 swimming setae on exopodite; 3 segmented endopodite bearing 1, 1, 5 setae, respectively.

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## COMPARISON OF FIRST ZOEAE.

<i>Matuta lunaris</i> (Forsk.) as described by Naidu (1959)	<i>M. lunaris</i> (F.) (present author)	<i>M. planipes</i> (Fabricius)
1. Two aesthetes and one seta on the antennule	Three aesthetes and one seta on the antennule	Three aesthetes and one seta on the antennule
2. Teeth on one side of the propodite; flagellum present on antenna	Teeth on both sides of the propodite; no flagellum on antenna	Teeth on both sides; no flagellum on antenna
3. Four setose spines on the basal endite of maxillule	Five setose spines on the basal endite of the maxillule	Five setose spines on the basal endite of the maxillule
4. Three plumose setae on the terminal segment of the endopodite of maxillule	Four terminal setae on the endopodite of maxillule	Three terminal setae on the endopodite of maxillule
5. Six setae on the coxal endites of the maxilla; seven on the basal endites of the maxilla	Nine setae on the coxal endites and nine setae on the basal endites of the maxilla	Six setae on the coxal endite and four setae on the basal endites of the maxilla
6. Five segmented endopodite of the first maxilliped bears 2,2,1,2, 4+1 setae, respectively	Five segmented endopodite of the first maxilliped bears 3,2,1,2, 4+1 setae, respectively	Five segmented endopodite of the first maxilliped bears 3,2,1,3, 4+1 setae, respectively
7. Three bristles on the basis of the second maxilliped	Four bristles on the basis of the second maxilliped	Four bristles on the basis of the second maxilliped
8. Three setae on terminal segment of the endopodite of the second maxilliped	Four setae on terminal segment of the endopodite of the second maxilliped	Five setae on terminal segment of the endopodite of the second maxilliped
9. Measurements not given by Naidu (1959)	Total length 1242 $\mu$ Dorsal spine 279 $\mu$ Rostral spine 178 $\mu$  Rostral process of antenna=147 $\mu$ Telson=294 $\mu$ Fork depth=147 $\mu$	Total length 1120 $\mu$ Dorsal spine 279 $\mu$ Rostral spine 220 $\mu$  Rostral process of antenna=132 $\mu$ Telson=264 $\mu$ Fork depth=132 $\mu$

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