

LABORATORY REARED LARVAL STAGES OF OCYPODID CRAB *MACROPHALMUS (VENITUS) LATREILLI* (DESMAREST)

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ABSTRACT

The larval development of the estuarine crab *Macrophthalmus (Venitus) latreilli* reared in the laboratory (salinity 28 ± 1 ppt and temperature $30 \pm 1^\circ\text{C}$) is reported. Five zoeal stages and a megalopa were observed during the development. Characteristics of the larval stages and first crab instar are described and compared with other known species of this genus. Time taken for development from hatching to first juvenile instar was 20 days.

Key-words: Zoeae, Megalopa, first crab instar

INTRODUCTION

Specimens of *Macrophthalmus (Venitus) latreilli* occur in the muddy substratum of Vellar estuary (Lat. $11^\circ 29' \text{N}$; Long. $79^\circ 46' \text{E}$) at Porto Novo. Berried crabs of this species could be collected during late postmonsoon (February and March) and summer months (April and May). Its larval life history as reared in the laboratory is dealt with here.

MATERIAL AND METHODS

An ovigerous female with advanced berry was collected on 1st June 1985 and placed in a fibre glass tank containing filtered sea water. The eggs hatched in the early hours on 3rd June 1985. Actively swimming larvae were separated and reared in groups of 10 in a glass bowl containing 150 ml filtered sea water. The larvae were transferred to clean glass bowls containing 150 ml filtered sea water. The larvae were transferred to clean glass bowls daily and were fed with freshly hatched *Artemia* nauplii. The larvae and moults were preserved as suggested by Thakur (1960). Larvae were dissected by using entomological needles under a binocular microscope in dilute glycerine and drawings were made with the aid of camera lucida. Setation was verified with moults.

RESULTS AND DISCUSSION

Larvae of *M.(V.) latreilli* reached the first crab instar, after passing through 5 zoeal and a megalopa stages.

First Zoea

Rostral spine length = 0.21 mm; dorsal spine length = 0.31 mm; carapace length = 0.54 mm and abdomen length = 0.83 mm.

Carapace with dorsal, rostral and a pair of lateral spines; rostral spine straight, shorter than dorsal spine and exceeding antennule and antenna; dorsal spine straight, long and broad based; lateral spines small, eyes swollen and sessile (Fig.1a & b).

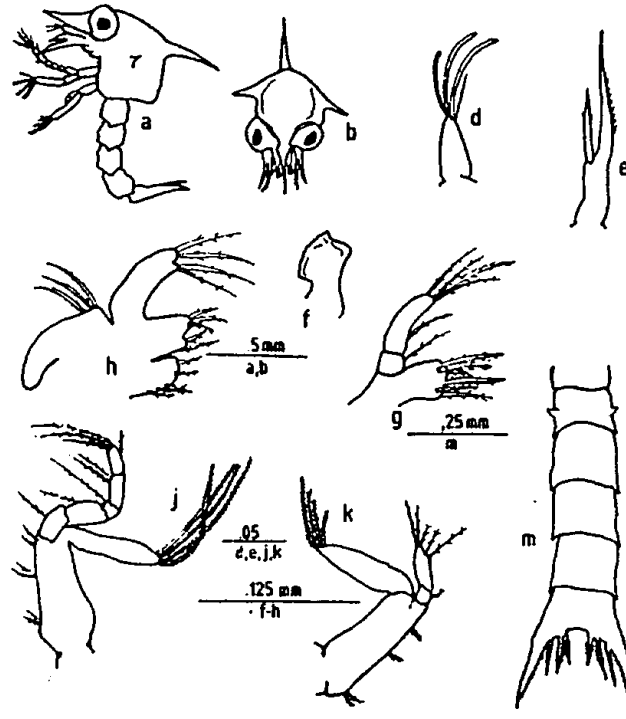


Fig.1. I zoea of *Macroptalmus latreilli*. (a) lateral view; (b) front view; (d) antennule; (e) antenna; (f) mandible; (g) maxillule; (h) maxilla; (j) I maxilliped; (k) II maxilliped; (m) abdomen-dorsal.

Antennule (Fig.1d): Uniramus, 3 aesthetascs of unequal size and a seta of moderate length.

Antenna (Fig.1e): Exopod half length of protopod with 2 small spinules one on either side, protopod with 8 serrations on its outer margin.

Mandible (Fig.1f): Without palp, well developed incisor process with faintly indicated teeth.

Maxillule (Fig.1g): Protopod not distinctly separated into coxa and basis, with 6 setae (4+2), endopod 2-segmented, distal segment with 5 setae (4+1), 4 terminal and 1 proximal segment with a seta.

Maxilla (Fig.1h): Coxa with 5 setae, basis bifurcated into proximal and distal lobes with 3 setae, 2 long and 1 short and 3 setae respectively, endopod with 4 setae with a distinct notch at distal region, scaphognathite with 3 setae on distal margin.

Maxilliped I (Fig.1j): Basipod with 6 setae (2,2 and 2), 5-segmented endopod with 1,1,1,2 and 4 (3+1) setation arranged distally, 2-segmented exopod with 4 natatory setae.

Maxilliped II (Fig.1k): Basipod with 4 short setae (2,1 and 1), endopod 3-segmented with one seta on middle segment, 5 unequal setae on distal segment, exopod with 4 natatory setae.

Abdomen (Fig.1m): 5-segmented with short posterolateral spines, a pair of lateral protruberance on second segment.

Telson (Fig.1m): Widely forked telson, median notch with 3 pairs of setae on its outside on posterior margin, second and third pairs with minute hair on either side in middle region, cornua with sharp spinules on its inner margin.

Second Zoea

Rostral spine length = 0.26 mm; dorsal spine length = 0.41 mm; carapace length = 0.68 mm and abdomen length = 1.05 mm.

Eyes stalked, carapace with 2 setae posteriorly (Fig.2a & b).

Antennule (Fig.2d): No change except slight increase in size.

Antenna (Fig.2e): Exopod with only one small sharp spinule on outer margin protopod with 12 serrations.

Maxillule (Fig.2g): Protopod with 8 setae, a plumose seta on outer margin, distal segment of endopod with 5 setae, 4 (2+2) terminally, one in middle, proximal segment with one seta in middle.

Maxilla (Fig.2h): Coxa with 6 setae (4+2), proximal and distal lobes of basal endite with 4 (2+2) and 3 (2+1) setae respectively, scaphognathite with 5 plumose setae distally, 3 proximally.

Maxilliped I (Fig.2j): Basipod with 8 setae (2,2,2 and 2), 5-segmented endopod with 2,2,1,2 and 5 (4+1) setae, natatory setae of exopod increased to 6.

Maxilliped II (Fig.2k): No change except increase in natatory setae to 6.

Abdomen (Figs. 2m & n): First segment with a seta in middle, posterolateral spines well developed.

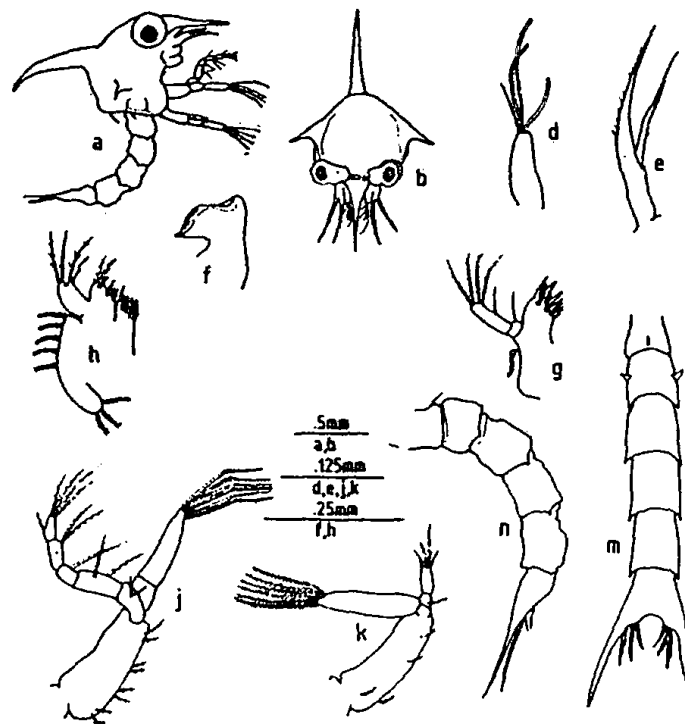


Fig.2. II zoea of *M. latreilli*. (a) lateral view; (b) front view; (d) antennule; (e) antenna; (f) mandible; (g) maxillule; (h) maxilla; (j) maxilliped; (k) II maxilliped; (m) abdomen-dorsal; (n) abdomen-lateral.

Third Zoea

Rostral spine length = 0.42 mm; dorsal spine length = 0.48 mm; carapace length = 0.90 mm and abdomen length = 1.17 mm. 4 setae on posterior margin of carapace.

Antennule (Fig.3d): With only 2 aesthetascs and a seta.

Antenna (Fig.3e): Exopod without spinules, protopod with 10 serrations, endopod buds well developed.

Maxillule (Fig.3g): Protopod divisible into coxa and basis with 4 and 5 (4+1) setae respectively, no change in endopod.

Maxilla (Fig.3h): Coxa with 7 setae, proximal and distal lobes of basal endite with 5 setae each (4+1 and 4+1), scaphognathite with 7 setae on distal margin, 2 in middle, 5 on lower portion.

Maxilliped I (Fig.3j): Basipod with 9 setae (1,2,1,1,2 and 2), setation of 5-segmented endopod 2,2,2,2 and 5 (4+1) arranged distalwards, natatory setae increased to 8.

Maxilliped II (Fig.3k): No change except increase in natatory setae to 8.

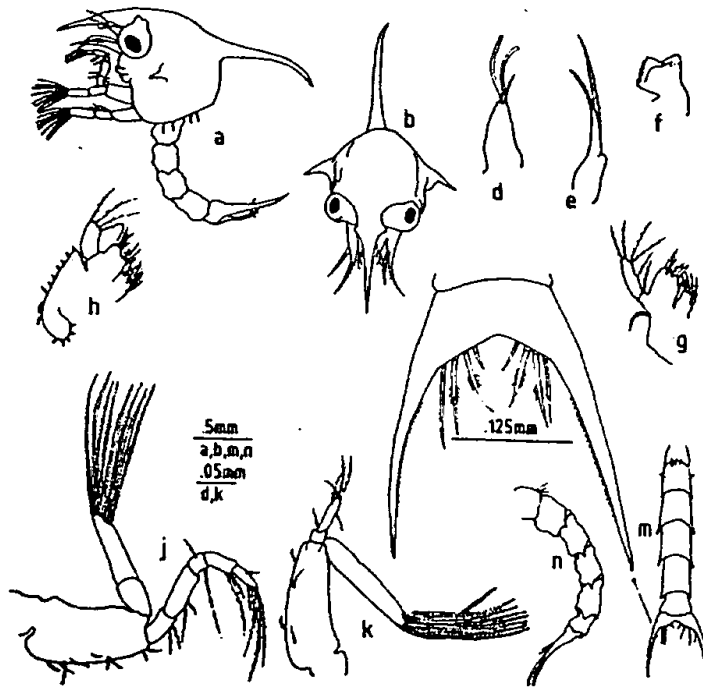


Fig.3. III zoea of *M. latreilli*. (a) lateral view; (b) front view; (d) antennule; (e) antenna; (f) mandible; (g) maxillule; (h) maxilla; (j) I maxilliped; (k) II maxilliped; (m) abdomen-dorsal; (n) abdomen-lateral.

Abdomen (Fig.3m & n): First abdominal segment with 3 setae.

Telson (Fig.3m): Telson process formula 4+4, both outer and innermost pairs smooth, second and third pairs with minute hair in middle, sixth segment separated from telson, pleopod bud rudimentary on sixth segment.

Fourth Zoea

Rostral spine length = 0.68 mm; dorsal spine length = 0.85 mm; carapace length = 1.16 mm and abdomen length = 1.81 mm. Carapace with 6 setae posteriorly.

Antennule (Fig.4d): With 3 aesthetascs and a small seta.

Antenna (Fig. 4e): Endopod bud well developed protopod with 15 serrations.

Mandible (Fig.4f): Without palp, with well developed incisor and molar processes.

Maxillule (Fig.4g): Coxal and basal endites with 4 and 10 (8+2) setae respectively, 2 pulvose setae on outer margin, no change in endopod.

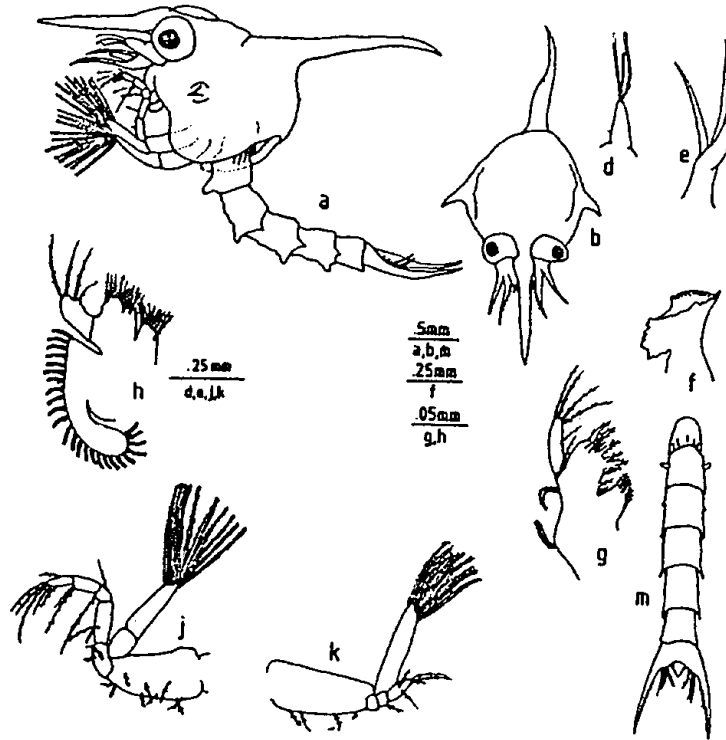


Fig.4. IV zoea of *M. latreilli*. (a) lateral view; (b) front view; (d) antennule; (e) antenna; (f) mandible; (g) maxillule; (h) maxilla; (j) I maxilliped; (k) II maxilliped; (m) abdomen-dorsal.

Maxilla (Fig.4h): Coxal endite with 9 setae, proximal and distal lobes of basal endite with 6 (5+1) and 5 setae respectively, scaphognathite fringed with 25 setae on its margin.

Maxilliped I (Fig.4j): Natatory setae increased to 10, distal segment of endopod with 6 (4+2) setae, 4 at tip, 2 on outer side.

Maxilliped II (Fig.4k): Natatory setae increased to 10.

Abdomen (Fig.4m): First abdominal segment with 5 setae, lateral processes well developed on second and fairly on third segment.

Telson (Fig.4m): Telson process formula as in previous stage.

Fifth Zoea

Rostral spine length = 0.85 mm; dorsal spine length = 1.04 mm; carapace length = 1.38 mm and abdomen length = 2.25 mm. Carapace with 13 setae posteriorly.

Antennule (Fig.5d): With 5 aesthetascs of unequal size and a seta.

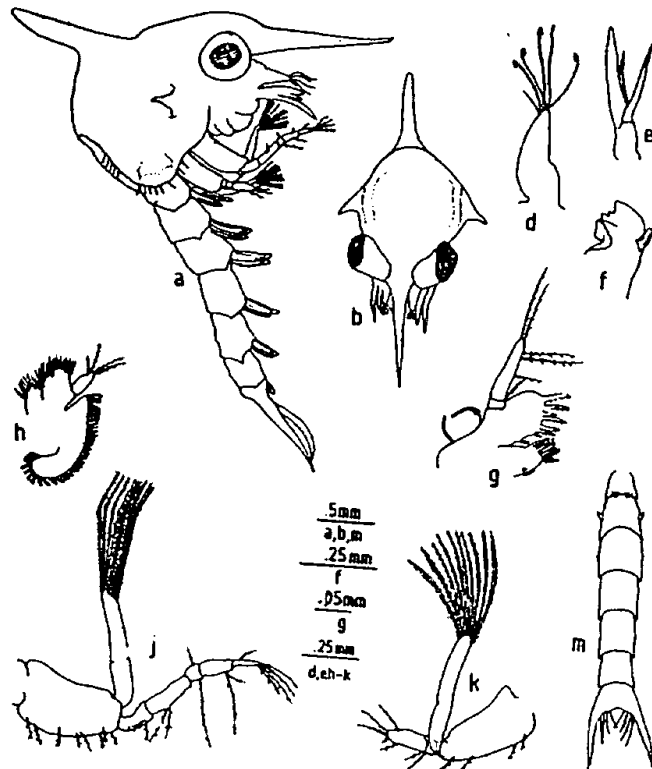


Fig.5. V zoea of *M. latreilli*. (a) lateral view; (b) front view; (d) antennule; (e) antenna; (f) mandible; (g) maxillule; (k) II maxilliped; (m) abdomen-dorsal.

Antenna (Fig.5e): Protopod with 20 serrations, endopod larger than protopod.

Mandible (Fig.5f): With well developed palp bud.

Maxillule (Fig.5g): No change in endopod, coxa and basis with 7 and 8 setae respectively.

Maxilla (Fig.5h): Coxal endite bilobed, with 6 (5+1) setae and 3 (2+1) setae on its proximal and distal lobes, proximal and distal lobes of basal endite with 7 (5+2) setae and 10 (7+3) setae respectively, scaphognathite fringed with 34 setae on its margin.

Abdomen (Fig.5m): First abdominal segment with 6 setae.

Megalopa

Carapace length = 1.23 mm; carapace width = 0.96 mm. Carapace spines absent, posterior margin of carapace highly depressed in middle, eyes large (Fig.6c).

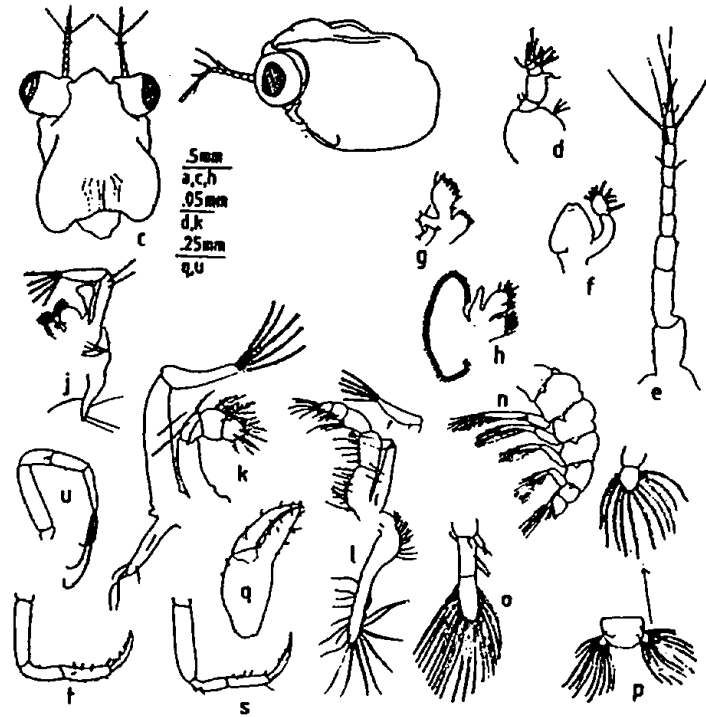


Fig.6. Megalopa of *M. latreilli*. (c) dorsal view; (d) antennule; (e) antenna; (f) mandible; (g) maxillule; (h) maxilla; (j) maxilliped I; (k) maxilliped II; (l) maxilliped III; (m) abdomen; (o) II pleopod; (p) uropod; (q) chela; (s) II pereopod; (t) III pereopod; (u) IV pereopod.

Antennule (Fig.6d): Biramus, base enlarged with 3 setae, 2 setae present on proximal segment of endopod, inner ramus with a seta terminally, exopod 3-segmented with 10 aesthetascs, 3 on proximal, 4 (3+1) on middle and 3 on terminal segments respectively.

Antenna (Fig.6e): Peduncle 3-segmented, distal and proximal segments each with a seta, 7-segmented flagellum bearing 0,0,2,1,2,2 and 3 setae distalwards, segments 4,5 and 7 with considerably longer setae.

Mandible (Fig.6f): Palp 2-segmented, with 9 setae on distal segment.

Maxillule (Fig.6g): Coxal and basal endites without lobes, with 9 setae (8+1) and 16 setae (14+2) respectively.

Maxilla (Fig.6h): Bilobed coxa with 9 setae on proximal lobe, 2 setae on distal lobe, that of basal endite with 6 setae (3+3) and 8 setae (5+3) respectively.

Maxilliped I (Fig.6j): Coxal and basal endites with 14 setae (7+7) and 8 setae respectively, unsegmented endopod with narrower proximal and bulb like distal end, latter with 2 setae distally; exopod 2-segmented with 5 setae terminally, epipod broad-based, with 3 setae proximally, 4 long setae distally, 2 at tip and 2 median.

Maxilliped II (Fig.6k): Endopod 4-segmented, with 1,1,8 (7+1) and 9 (7+2) setae arranged from proximal segment to distal one; 2-segmented exopod with 5 setae on distal segment, 2 setae on proximal segment; epipod with 5 setae 4 distally and 1 in middle.

Maxilliped III (Fig.6 l): Endopod 5-segmented, arrangement of setae 13,5,4,5 and 8 distalwards; 2-segmented exopod with 3 setae on proximal, 5 setae on distal segments, epipod large and 2-segmented, proximal segment with 4 setae, long distal segment with 10 setae proximally, 16 setae distally.

Pereiopods 1-5 (Fig.6 q-u): First pair of pereiopods equal, chelate with well developed teeth, second and third walking legs with 3 spines on dactylus, last pair with 3 feelers.

Abdomen (Fig.6 n): 6-segmented, segments with postero-lateral spines; 5 pairs of pleopods in segments 2-6, in second pair of pleopod (Fig.6 o), exopod with 18 setae distally, 2 setae on proximal segment, endopod with 1 long and 1 short setae terminally.

Telson (Fig.6 p): Devoid of any seta.

Uropod (Fig.6 p): Armed with 11 long setae.

First Crab Instar

Carapace length = 2.01 mm and carapace width = 1.5 mm. Antennule and antenna visible well from dorsal view, front in between two antennules concave, eyes large, attached closely to inner orbital angle, therefore outer orbital angle with more space. Including outer orbital spine 4 spines on lateral margin, first 3 spines including orbital spine well developed while fourth one smaller (Fig.7 c), all spines highly denticulated, posterior region bearing markings (ornamentation) as shown in figure.

Antennule (Fig.7 d): Basal segment of peduncle broad with 22 setae, middle and distal segments each with 2 setae, 5-segmented outer ramus bearing 16 aesthetascs, proximal segment devoid of any, segments 2-5 with 3,6,2 and 5 respectively, aesthetascs of moderate length, inner ramus with irregular outer margin bearing 2 setae terminally and 2 in middle.

Antenna (Fig.7 e): Peduncle 3-segmented, and flagellum 7-segmented, setation 9,5,2,0,3,1,4,1,1 and 2 (terminal) arranged distalwards as shown in figure.

Mandible (Fig.7 f): 3-segmented palp with numerous bristle like setae on its segments, all setae thick, sharp and stout, middle segment with 5 dorsal setae (2 distal ones larger), 16 dorsal setae on distal segment, cutting edge smooth.

Maxillule (Fig.7 g): Coxal endite with 9 dorsal and 14 marginal setae, basal endite with 37 dorsal and 4 marginal setae; endopod 2-segmented with

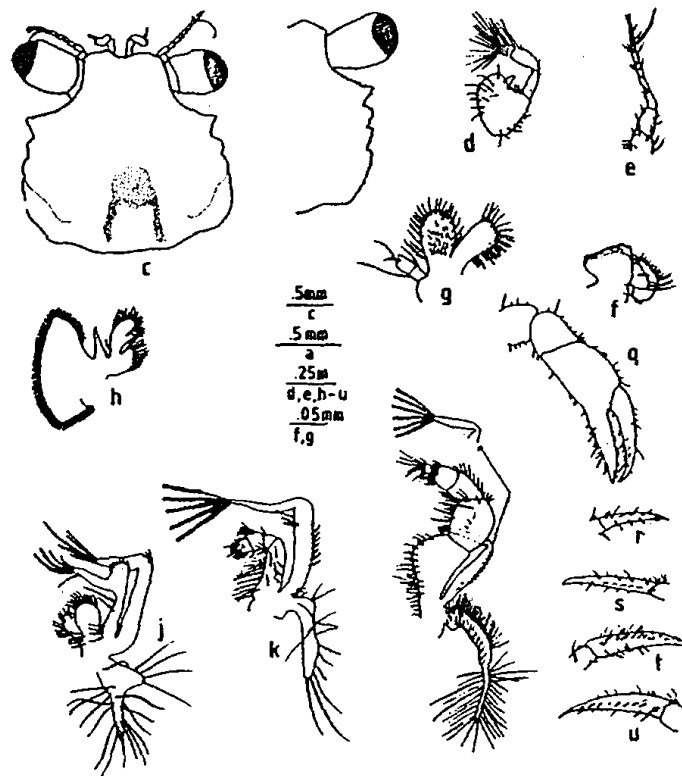


Fig.7. First crab instar of *M. latreilli*. (c) dorsal view; (d) antennule; (e) antenna; (f) mandible; (g) maxillule; (h) maxilla; (j) maxilliped I; (k) maxilliped II; (l) maxilliped III.

1 long and 1 short setae on proximal and 2 setae of unequal size on distal segment.

Maxilla (Fig.7 h): Coxal endite, without lobe, with 10 setae (4 marginal, 6 dorsal), basal endite bilobed with 13 and 8 setae on its distal and proximal lobes; endopod devoid of setae; scaphognathite fringed with 88 setae.

Maxilliped I (Fig.7 j): Endopod not segmented, in middle a bulb like projection pointing upward having 8 setae, distal region with 5 setae, exopod 2-segmented with 2 setae on proximal and 5 setae on distal segments, coxal endite with 14 setae, basal endite with 11 setae; epipod with 19 long setae.

Maxilliped II (Fig.7 k): Endopod 4-segmented, with 21, 1, 6 and 11 (2 larger dorsal) setae arranged distalwards; exopod 2-segmented, proximal segment with 17 setae, distal segment with 5 setae terminally, epipod with 14 setae of unequal size.

Maxilliped III (Fig.7 l): Endopod 5-segmented, with 26 (10+16), 19 (11+8), 13, 11 (7+4) and 10 setae distalwards; exopod 2-segmented with 11 dorsal setae on proximal segment, distal segment with 5 setae; epipod large, narrower distal portion with 29 long setae, proximally 35-40 marginal setae and 30-35 dorsal setae present.

Pereiopods 1-5 (Fig.7 q-u): Propodus of chelate leg with 4 teeth or projections on its inner margin, setation of walking legs as shown in figure.

Abdomen and Telson: Bent under thorax and consists of seven segments, first six representing abdomen and last one representing telson, pleopods simple without setae, uropod absent.

Information on the larval stages of the genus *Macrophthalmus* is available only from other waters. While the description of first zoea is available for 6 species (Aikawa, 1929; Wear, 1968; Hashmi, 1969; Rice, 1975), complete development has been reported in only 3 species including the present one. The above genus is represented by 8 species in Indian waters and the present work gives the first larval account. In *M. japonicus*, while Terada (1979) described 6 zoeal stages, a megalopa and the first juvenile instar, Muraoka (1976) described 6 zoeal stages in *M. dilatatus*. As information on complete larval development is available only for 3 species (*M. japonicus*, *M. dilatatus* and *M.(V.) latreilli*), comparison has been made only amongst the above 3 species.

In zoeal stages of *M.(V.) latreilli*, lateral carapace spines are present and the exopod of antenna in first zoeal stage is provided with 2 spinules and that of second zoeal stage with a single spinule along the lateral margins. Except on the first abdominal segment, setae are absent in all zoeal stages. In zoeal stages of *M. japonicus* and *M. dilatatus*, lateral carapace spines are absent, exopod of antenna is smooth and all the abdominal segments are provided with a pair of setae. The above characters distinguish the zoeal stages of *M.(V.) latreilli* from those of others in which development has been complete.

At present megalopa stage and first crab instar are known only in 2 species including the present species viz. *M. japonicus* and *M.(V.) latreilli*. Megalopa of *M. japonicus* has slightly produced rostrum which is absent in *latreilli*. The first juvenile instar of *M.(V.) latreilli* can also be distinguished from that of *M. japonicus*. In the propodus of chelate leg in *M.(V.) latreilli*, 3 prominent teeth are present but teeth are absent in *M. japonicus*.

Present knowledge on the larval life history of *Macrophthalmus* species is restricted to very few species. Information on more number of species will be helpful in formulating a key for identification of larvae of different species and in understanding the interrelationship between them.

ACKNOWLEDGEMENTS

The authors are thankful to prof. V.K. Venugopalan, Director, Centre of Advanced Study in Marine Biology, Parangipettai and authorities of Annamalai University for the facilities and to the Department of Science & Technology, New Delhi for the financial support.

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