VIII

Larval development — *METAPENAEUS BREVICORNIS* (H. MILNE EDWARDS)

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Metapenaeus brevicornis spawned in the laboratory at Kakinada Research Centre of the Central Marine Fisheries Research Institute and the eggs were reared up to mysis I stage. The 6 nauplius substages, 3 protozoea substages and mysis I substage are described and illustrated in detail. At a rearing temperature of 29.2°C to 30.8°C the nauplii hatched out 9½ hours after spawning. The duration of the nauplius stage was 44 hours and protozoea stage 5 days.

Metapenaeus brevicornis, the yellow prawn, which is commercially important in West Bengal, Kakinada and Bombay, spawned during October 1978 in the laboratory of the Kakinada Research Centre of the Central Marine Fisheries Research Institute and the eggs were reared up to mysis I stage. The detailed structure and setation of the appendages of the various developmental stages are described and illustrated here. The temperature of the water in the rearing basins ranged from 29.2° C to 30.8° C and the salinity from 30.6 to 30.9‰.

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DESCRIPTION OF DEVELOPMENTAL STAGES

EGGS

Eggs are irregular or oval as soon as they are spawned but after 2 to 3 minutes assume a perfectly spherical shape. After fertilisation the vitelline membrane becomes separated from the cytoplasm of the egg and the perivitelline space is formed. The fertilised eggs measured from 0.28-0.29 mm in diameter with a yolkmass of 0.20-0.21 mm diameter. (Fig 1,a,b). Embryonic development, from spawning through cleavage, gastrulation and appendage formation, to hatching was closely observed and illustrated (Fig.1,b-h). Hatching process starts about 9 hours after spawning.

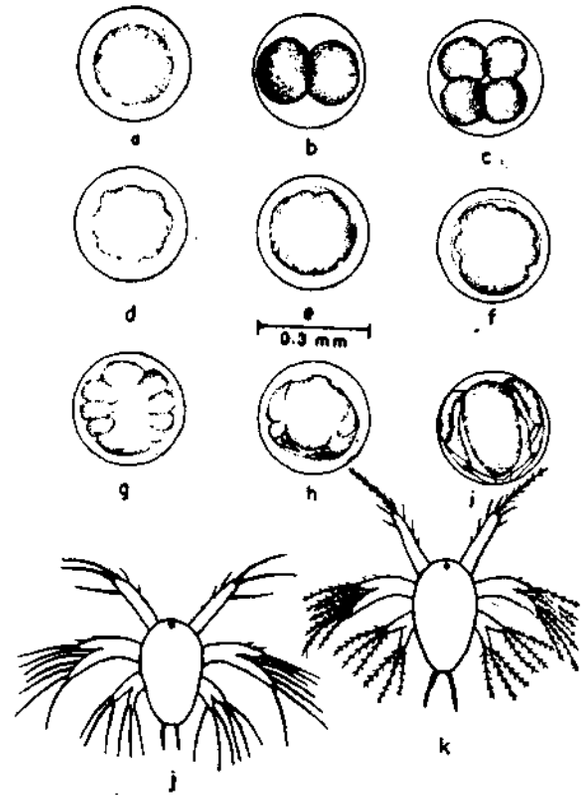

Fig. 1 *Metapenaeus brevicornis:* a - egg; b to i eggs on various stages of development; j - Nauplius I: k - Nauplius II.

NAUPLIUS I

MTL: 0.27 mm; MW:0.15 mm (0.15-0.17 mm); MFS: 0.27 mm.

Viewed laterally, the anterior part is elliptical due to the development of labrum. Viewed dorsally, the body is pear-shaped, the anterior part being wider, a median ocellus present near the anterior end ventrally; a dorsomedian spine present posteriorly; furcal seta 1+1 (Fig.1,j) which are approximately 1/4 to 1/5 as long as the body; 3 pairs of appendages present; A1 uniramous, 3 short lateral setae on inner margin, 1 short and 2 long setae terminally and 1 long seta on outer distal margin; A2 biramous, exopod slightly longer than endopod, endopod with 2 short lateral and 1 short and 2 long terminal setae, exopod with 5 long setae along inner lateral and terminal margin; Md biramous, each ramus with 3 long setae distally; all setae non-plumose. Duration of this substage was 5 hours.

NAUPLIUS II

MTL: 0.26 mm (0.25-0.27mm); MW: 0.155 mm; MFS: 0.07 mm (0.07-0.08mm).

Furcal setae 1+1 (Fig.1,k); no dorsomedian spine near the posterior end of body; A1 with 3 inner lateral setae; 3 terminal setae of which middle one is longest, and 1 outer lateral seta; endopod of A2 with 2 small inner lateral and 2 long terminal setae; exopod with 5 long setae and a small spike-like seta; distal region of the 4th seta bifurcate; the bifurcate condition is retained in other nauplius substages also; all setae plumose. Duration of this substage was 4½ hours.

NAUPLIUS III

MTL: 0.29 mm (0.28-0.29 mm); MW: 0.15 mm MFS: 0.11 mm (0.09-0.11 mm).

Caudal end of the body divided into 2 furcal processes each with 3 setae (Fig.2,a); endopod of A2 with 2 inner lateral and 3 distal setae, exopod with 6 setae and one spike-like seta. Duration of this substage was 7½ hours

NAUPLIUS IV

MTL: 0.31 mm (0.29-0.32mm); MW: 0.17 mm. (0.15-0.17 mm); MFS: 0.13 mm (0.13-0.14mm).

Developing frontal organ seen on either side of eye ; furcal setae 4+4; developing buds of mouth parts seen; Md (Fig.2,b) with a swelling at base. Duration of this substage was 3 hours.

NAUPLIUS V

MTL: 0.33 mm (0.32-0.34 mm); MW: 0.16 mm (0.15 mm-0.17 mm); MFS: 0.16 mm (0.15-0.17 mm).

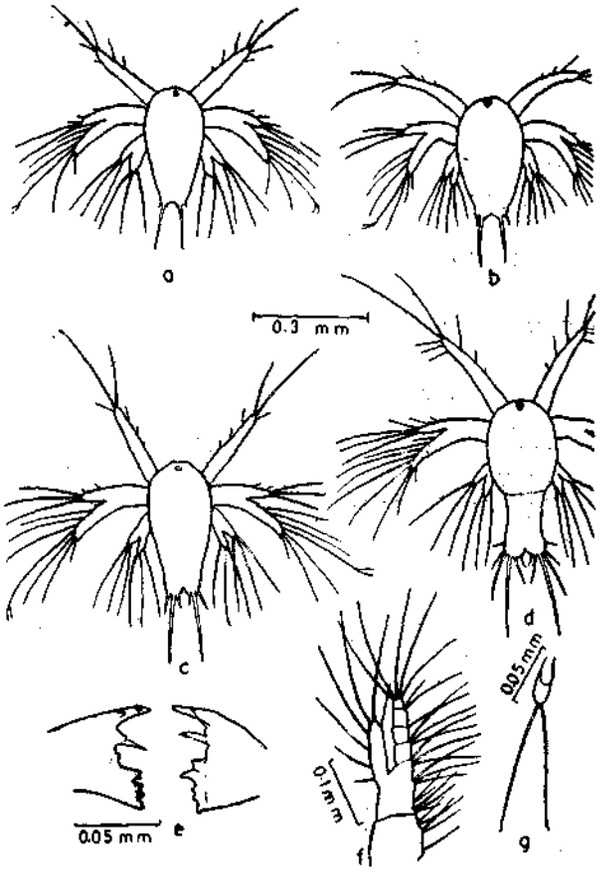

Fig: 2 *Metapenaeus brevicornis:* e - Nauplius III; b - Nauplius IV: c - Nauplius V; d - Nauplius VI. Protozoea I: e - Md; f - Mxp1; g - Mxp3.

Posterior region of larvae further elongated and furcal lobes more distinct bearing 6+6 setae (Fig.2,c); exopod of A2 with 7 long setae and 2 small spike-like setae, basal swelling of Md further developed. Duration of this substage was 4 hours.

NAUPLIUS VI

MTL: 0.39 mm (0.36-0.39 mm); MW: 0.16mm (0.15-0.18 mm); MFS: 0.22 mm (0.21-0.22mm).

Developing carapace clearly seen, developing frontal organ seen on either side of naupliar eye; furcal setae 7+7 (Fig.2, d), indistinct segmentation seen on proximal part of A1 and exopod of A2; A1 with 3 setae on inner margin, 3 setae apically and 3 setae on the distal outer margin; A2 endopod with 3 long and 1 short apical setae, and 2+1 inner lateral setae, exopod with 9 setae along inner and distal margin; protopod of Md with swelling which clearly shows developing Md tooth inside; buds of Mx and Mxp clearly developed. Duration of this substage was 20 hours.

PROTOZOEA I

MTL: 0.86mm (0.81-0.89 mm); MCL: 0.37mm (0.36-0.39 mm).

A1 (Fig. 3, b) uniramous, 3 segmented, proximal segment with 5 indistinct subsegments, basal segment with 1 short distal inner seta, middle segment with 3 distal setae of which one long, a small inner seta present at middle of this segment, distal segment bears terminally 2 long setae and 2 aesthaetes, a small seta present at distal outer aspect of this segment; A2 (Fig. 3, c) exopod 10 segmented carrying 10 setae along inner and distal margin, 2 short setae present on outer margin, endopod 2 segmented, distal segment with 4 long plumose and 1 short nonplumose setae apically, basal segment with 3 setae at distal inner margin, 2 in middle and 1 at base; Md (Fig. 2,d) almost symmetrical, incisor with 2-3 stout teeth, molar with a number of ridges, in between the 2 processes one free standing tooth present; Mx1 (Fig. 3, d) protopod with 2 endites, distal with 7 and proximal with 4 stout setae, exopod knob-like with 4 feathery setae, endopod 3 segmented, distal segment with 5 setae, 1st and 2nd segments bear 3 and 2 setae respectively; Mx2 (Fig. 3, e) protopod flat, with 5 endites on inner side, proximal endite carrying 6 setae, other endites with 3 to 4 setae, exopod knob-like carrying 5 feathery setae, endopod 4 segmented, segmentation between 2nd and 3rd segments indistinct, distal segment with 3 setae, other segments with 2 setae each; Mxp1 (Fig. 2, f) protopod 2 segmented, proximal with 5 and distal with 11-12 setae, exopod unsegmented carrying 7 plumose setae, endopod 4 segmented, 1st, 2nd, 3rd and 4th segments carrying 3, 1, 2 and 5 setae respectively; Mxp2 (Fig. 3, f) protopod indistinctly divided into 2, exopod unsegmented with 6 plumose setae, endopod 4 segmented, 1st, 2nd, 3rd, and 4th segments carrying 2, 1, 2 and 5 setae respectively; Mxp3 (Fig. 2, g) biramous bud, exopod carrying 2 setae apically, endopod bare; telson with 7 setae on each lobe. Duration of this substage was 48 hours.

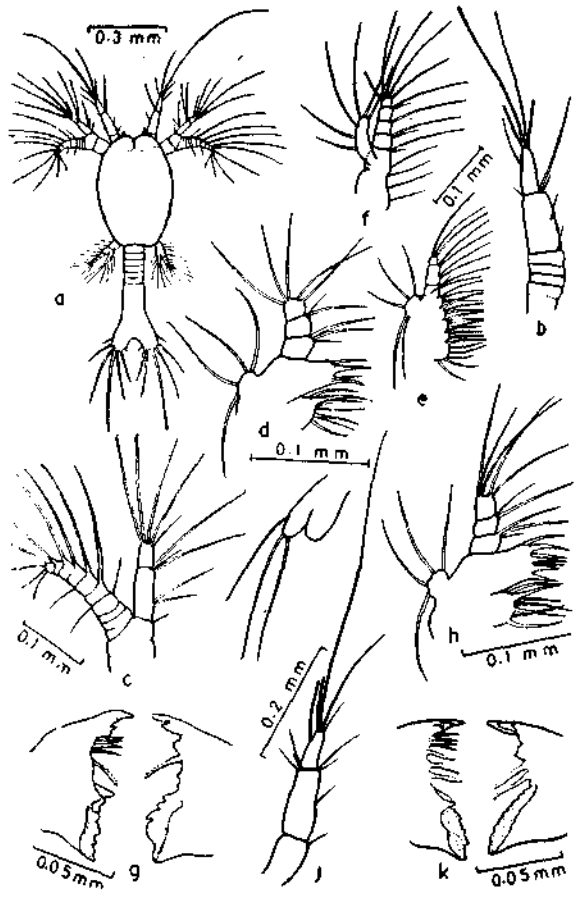

Fig. 3 *Metapenaeus brevicornis:* Protozoea I: a - dorsal view; b - A1; c - A2; d - Mx1; e - Mx2; f - Mxp2. Protozoea II: g - Md: h - Mx1; i - Mxp3. Protozoea III: j - A1; k - Md.

PROTOZOEA II

MCL: 0.50 mm (0.49-0.52 mm); MTL 1.14 mm (1.09-1.15 mm).

Eyes stalked, carapace with rostrum, supraorbital present (Fig.4,a), abdomen 6 segmented, telson not demarcated from last abdominal segment, carrying 7+7 setae; A1 distal segment carrying 1 aesthaetes and 4 setae of which one is long; Md (Fig. 3, g) asymmetrical, left with 5 and right with 1 free standing teeth in between

incisor and molar processes; Mx1 (Fig. 3, h) proximal and distal endites of protopod each with 7 setae; Mxp3 (Fig.3,i) exopod with 3 setae terminally. Duration of this substage was 40 hours.

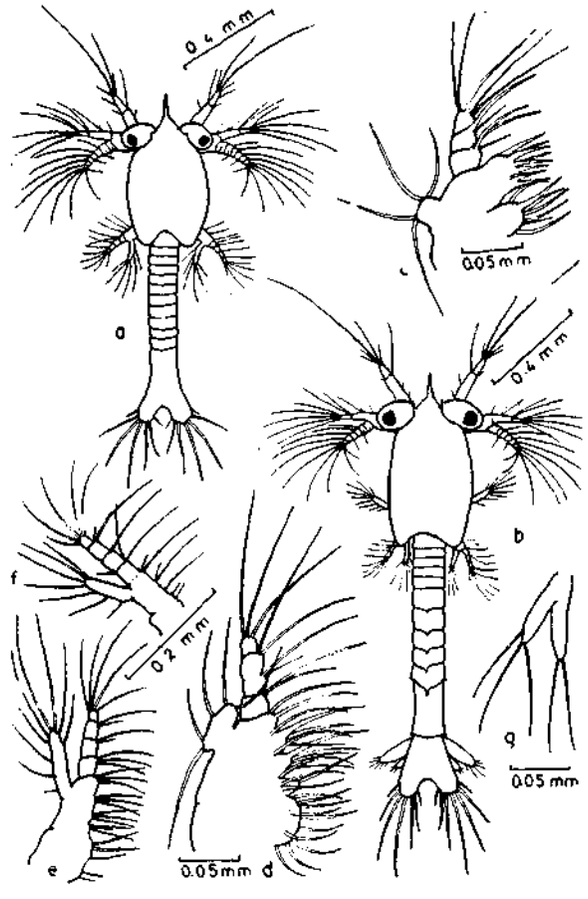

Fig. 4 *Metapenaeus brevicornis:* Protozoea II: a - dorsal view. Protozoea III: b - dorsal view; c - Mx1; d - Mx2; e - Mxp1; f - Mxp2; g- Mxp3.

PROTOZOEA III

MCL: 0.57 mm (0.56-0.58 mm); MTL: 1.46 mm (1.38-1.51 mm).

Rostrum prominent, supraorbital spine present, biramous buds of pereopods developed; 1st to 5th abdominal segments with dorsomedian spines, 5th segment with posterolateral spines; (Fig.4 b) telson demarcated from last abdominal segment by an articulating joint, each caudal lobe with 7+7 setae, uropod developed, exopod with 6 short setae apically and endopod with 3 short apical setae.

A1 (Fig. 3, j) 3 segmented, subsegments of basal segment absent, number of small setae on middle segment increased; Md (Fig.3,k) right and left Md with 2 and 7 standing teeth in between incisor and molar processes; Mx1 (Fig. 4, c) distal endite of protopod with 9 setae; Mxp1 (Fig.4, e) exopod with 9 setae Mxp 2 (Fig. 4, f) exopod with 7 setae; distal outer margin of 1st segment of endopod with 1 seta; Mxp3 (Fig. 4, g) exopod and endopod buds with 3 and 2 terminal setae respectively. Duration of this substage was 32 hours.

MYSIS I

MCL: 0.69 mm (0.67-0.70 mm); MTL: 1.97mm (1.96-1.99 mm).

. Carapace with rostrum just falling short of anterior end of eye (Fig.5,a), rostrum devoid of teeth, antennal and pterygostomial spines

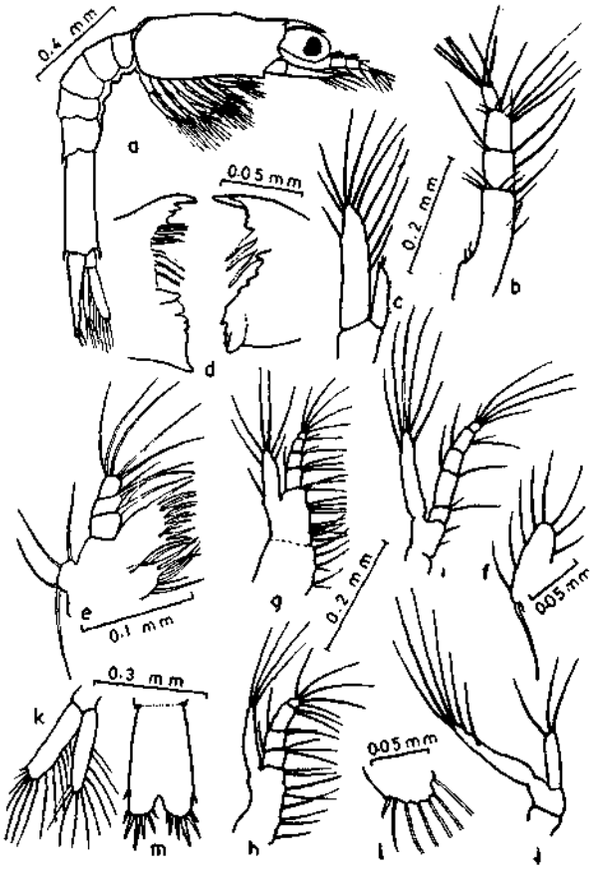

Fig. 5 *Metapenaeus brevicornis:* Mysis I: a - lateral view; b - A1; c - A2; d Md; e - Mx1; f - exopod of Mx2; g - Mxp1; h - Mxp2; i - Mxp3; j - P1; k - uropod. l: distolateral margin of exopod of uropod; m: telson.

well developed, small but distinct supraorbital spines present, 5th and 6th abdominal segments with dorsal spines, no lateral spine on 5th and 6th abdominal segments, a prominent ventro-median spine on posterior end of 6th abdominal segment at junction with telson, no pleopod bud on abdomen, telson with 7+ 7 setae, deep cleft reaching level of origin of outermost pair of setae.

A1 (Fig. 5, b) 3 segmented, basal segment with prominent ventral spine, slight basal swelling with 2 setae just above stylocerite rudiment, outer flagellum with 6 aesthaetes and 1 seta, inner flagellum short bearing 1 short and 1 long seta apically; A2 (Fig. 5, c) exopod and endopod unsegmented, exopod scale-like bearing 10 setae along inner and distal margin and 1 seta at distolateral angle, endopod half length of exopod, bearing short setae apically and on inner side; Md (Fig.5, d) left Md with 8 and right with 3 free standing teeth; Mx1 (Fig.5,e) distal endite of protopod with 11 setae; Mx2 exopod with 9 plumose seta (Fig.5,f); Mxp1 (Fig.5,g) exopod with 7 plumose setae, below the proximal outer lateral seta a few small hair-like setae seen, 1 outer lateral seta added to 1st segment of endopod; Mxp2 (Fig.5,h), 1st and 2nd segments of endopod acquired 1 distal outer seta each; Mxp3 (Fig.5,i) fully developed 5 segmented endopod, distal segment with 5 seta, 1st, 2nd and 4th segments carrying 2, 1 and 2 setae respectively, along the distal inner margin, 2nd and 3rd segments each carrying one seta on distal outer margin; P1 to P5 almost identical (Fig.5,j) exopod and endopod not segmented, exopod with 4 apical and 2 pairs of subapical plumose setae, endopod shorter than exopod bearing 3 apical setae; exopod of uropod (Fig.5,k) with 12 plumose setae and 1 nonplumose seta, endopod with 10 plumose seta.

REMARKS

This is the first time that the larvae of *M. brevicornis* are described. The pattern of development and the setation of appendages is closely similar to that of the other species of the genus *Metapenaeus* as described by Thomas *et. al.*, (1975, *ndian J, Fish.*, 21 (2): 575-579) Raje and Ranade (1975, *J. Indian Fish Ass.*, 2 (2): 30.46[2]). Intermoult lengthening of the thoracic and abdominal segments was observed in protozoea I and II. The newly hatched protozoea I moasured 0.69-0.73 mm in total length whereas it was 0.81-0.89 mm just before they moult into protozoea II. There was no change, however, in the carapace length. The presence of a distinct though small, supraorbital spine in mysis I appears to be characteristic of *M. brevicornis*.