

LARVAE OF *MUNIDOPSIS TRIDENTATA* (ESMARK) (DECAPODA, ANOMURA) REARED IN THE LABORATORY

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ABSTRACT

Munidopsis tridentata (ESMARK) was found to have three zoeal stages and thus an abbreviated development. The second zoea, not earlier known, is described.

M. tridentata is the only species of the genus, *Munidopsis* WHITEAVES (synonymous to *Galathodes* MILNE-EDWARDS), that occurs in Norwegian waters (BOUVIER 1940). *M. tridentata* which is an obligate species of the *Lophelia* fauna has been found as far north as Andsfjorden, 69°14'N (DONS 1937). In the Bergen area, western Norway, the species has frequently been collected from 100–600 m depth (BURDON-JONES & TAMBS-LYCHE 1960; GRIEG 1926; and own observations). SARS (1890) has described pre-zoea, first zoea, and last zoea of *M. tridentata*.

MATERIAL AND METHODS

On 20 November 1969 Mr. A. WARÉN handed over to me a live ovigerous *M. tridentata* collected in Korsfjorden, S of Bergen, at a depth of 145–150 m (Biol. Station Reference No. E436–69). The specimen had a carapace length of 23.9 mm and carried 30 reddish-yellow eggs which measured 1.65 mm on the average. The specimen was kept in an aquarium with running seawater and the state of development of the eggs was checked periodically. All the eggs hatched on 20 January 1970. The average temperature in the aquarium was 7.5 °C in December 1969 and 5.5 °C in January 1970.

The 30 larvae were placed in individual compartments (cf. SAMUELSEN 1972) at 6.5 °C ($\pm 0.5^\circ$) and the filtered seawater was changed every second day. The larvae contained much yolk (in all stages obtained) and were unable to eat *Artemia* nauplii. No other food was offered.

Of the 30 larvae 22 developed into second zoea and 4 into third zoea. Exuvia and dead specimens were preserved in 4% formaldehyde in sea-water neutralized with hexamine. The specimens and casts to be dissected were stained with blue ink in lactic acid. The appendages were mounted in lactic acid and all drawings were made with aid of a Wild drawing apparatus. At least four specimens of each stage were studied in detail with respect to appendage setation and other characters. The total length (TL) was measured from the tip of the rostrum to the posterior border of the telson, exclusive of telson processes. The carapace length (CL) was measured from the tip of the rostrum to the most posterior lateral margin of the carapace.

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FIRST ZOEAE

Size. TL 5.5–6.0 mm, mean 5.81 mm; CL 3.2–3.6 mm, mean 3.40 mm.

Duration. 14–20 days, mean 15.1 days.

Description. See Sars (1890, p. 162, pl. 4, figs. 3–15).

Remarks. The first zoea, obtained in the laboratory, agrees with the first free larval stage described by Sars (op. cit.). Following variations in number of setae and spines should be noted, however: the antennal scale usually carries 15 plumose setae on the medial margin, but specimens with 14 to 17 setae were also found. Uneven numbers of setae on the two scales of one specimen also occurred. The scaphognathite of the maxilla carries from 32 to 34 plumose setae along the margin. The number of telson spines on each side is either 13 or 14; uneven numbers on the two halves occurred. On the posterior margin there are 3 to 4 plumose setules dorsally.

In addition to the features described by Sars (op. cit.) there are two pairs of plumose setules on the dorso-posterior half of the rostrum (as described for the second zoea, Fig. 1B). On the posterior margin of somites 2 to 5 there is a plumose setule on each dorso-lateral side, and on the posterior half of the telson, two longitudinal rows of four plumose setules dorsally.

SECOND ZOEAE

Size. TL 5.8–6.4 mm, mean 6.11 mm; CL 3.5–3.9 mm, mean 3.67 mm.

Duration. 22–30 days, mean 28.0 days.

Description. The eyes are rudimentary and partly covered by the base of the rostrum (Fig. 1A, B). The rostrum reaching the tips of the antennal scales, is broad, concave dorsally and tapers slightly. On the anterior end there is a tooth-like process. The lateral margins of the rostrum are denticulated and on the dorso-posterior half there are two pairs of plumose setules. The carapace is rounded and denticulated on the posterior- and lateral margins. Each antero-lateral margin tapers into a long, projecting spine with spinules. The sixth abdominal somite is fused to the telson. Each postero-lateral corner of the fifth somite bears a long prominent spine. On the posterior margin of somites 2 to 5 there is a plumose setule on each dorsolateral side. The telson is broader than long (L/W ratio about 0.6) and the posterior border is emarginated medially. There are from 13 to 15, but usually 14, telson spines on each side. Uneven numbers of spines occurred on the two halves. The first or the outermost and the third are fused plumose spines, the others articulated plumose spines. The longest (third) telson spine is about one third of the telson width. In addition to the telson spines there are five plumose setules on each side. The first is attached ventrally between the first and second spine, the other four dorsally between spine 6 and 7, 7 and 8, 9 and 10, and 11

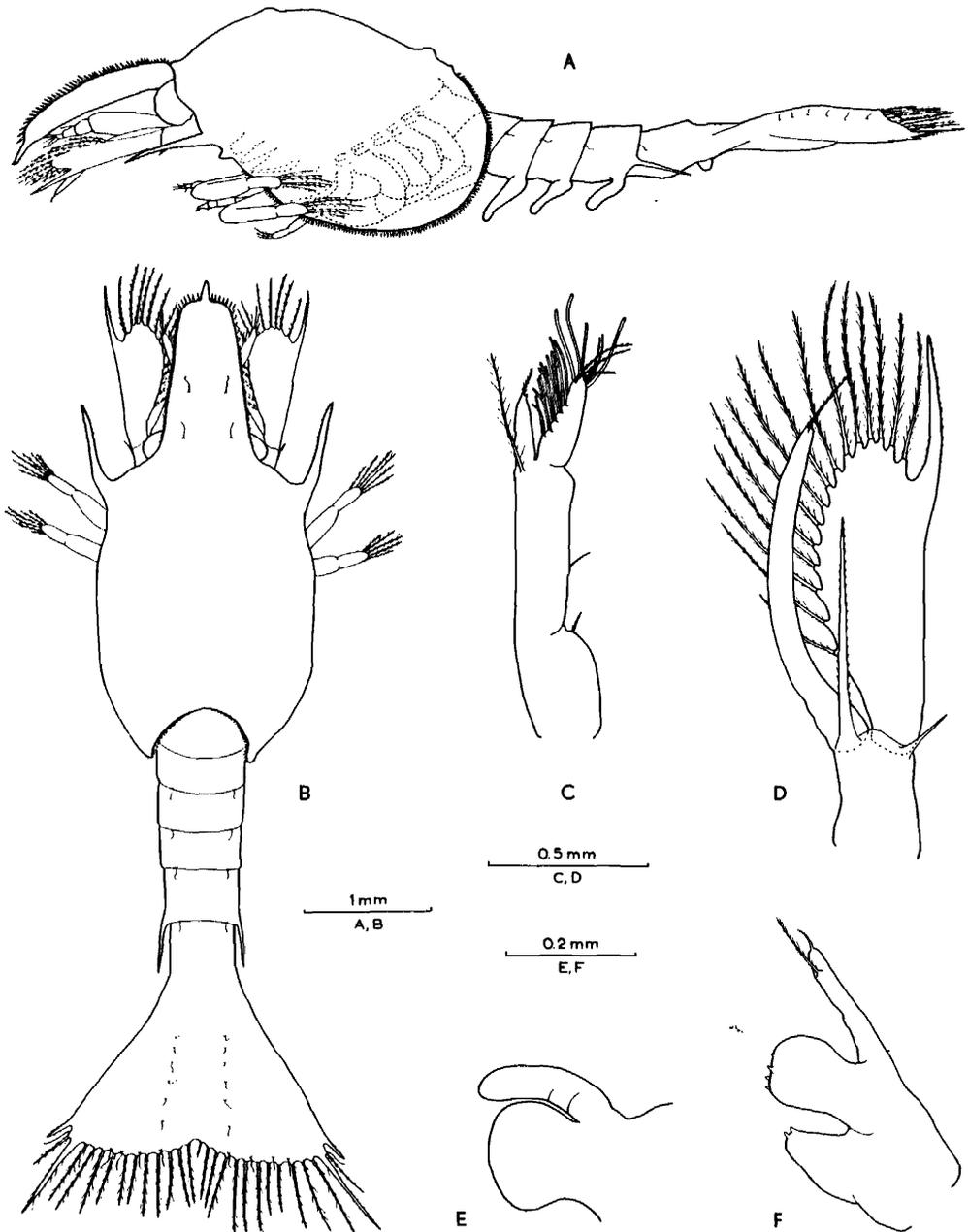


Fig. 1. Second zoea of *Munidopsis tridentata* (ESMARK). A. Lateral view. B. Dorsal view. C. Antennule. D. Antenna. E. Mandible. F. Maxillule.

and 12. There are two longitudinal rows of six small plumose setules on the dorsal side of the telson.

The entire larva, the eyes included, is pale yellow in colour and some reddish-yellow yolk is visible through the carapace in all stages obtained. No single chromatophores were observed in either of the stages.

The antennule (Fig. 1C) is segmented and biramous. The exopodite bears six aesthetascs and three plumose setae terminally. Subterminally aesthetascs are arranged in five groups: 2, 4, 4, 3, 2, progressing proximally. The endopodite is about two thirds the length of the exopodite and has a short terminal plumose seta. Subterminally there is a small conical projection. The peduncle is two-segmented. On the proximal segment there is a distal lateral seta, the distal segment bears a small lateral seta and a large medial distal plumose seta.

The antennal scale (excluding the terminal spine) is slightly less than three times its maximum width (Fig. 1D). The terminal spine is slightly curved and carries spinules. Along the medial margin there are from 14 to 17, but usually 16 plumose setae. The jointed endopodite is slightly longer than the scale and has two small conical processes and one plumose seta terminally. At the base of the endopodite there is a very long and prominent spine with spinules; at the base of the scale there is a lateral projecting spine.

The mandible (Fig. 1E) is lobe-like, without teeth, and has a large palp which is incompletely divided into three segments. The mandibles are symmetrical.

The coxal endite of the maxillule (Fig. 1F) bears two terminal conical processes and the basal endite four. The unsegmented endopodite has a simple seta terminally and one larger plumose seta subterminally.

The scaphognathite of the maxilla (Fig. 2A) has from 34 to 36 plumose setae along the margin. The endopodite carries two plumose setae terminally and one small conical process subterminally. The distal lobe of the basal endite is without processes, the proximal lobe bears one small conical process terminally. The distal and the proximal lobe of the coxal endite have respectively one and three small conical processes terminally.

The unsegmented exopodite of the first maxilliped (Fig. 2B) has six natatory setae. The endopodite with four segments bears upon the last segment two terminal plumose setae and one subterminal plumose seta. The penultimate segment has two distal plumose setae and the antepenultimate one simple seta on the distal medial margin. The basipodite is unarmed.

The unsegmented exopodite of the second maxilliped (Fig. 2C) has six natatory setae. The four-segmented endopodite has two terminal simple setae. On the distal end of the penultimate segment there is one simple seta. The basipodite carries a simple seta on the medial proximal corner.

The unsegmented exopodite of the third maxilliped (Fig. 2D) carries three natatory setae. The endopodite with five segments is larger than the exopodite and without setae.

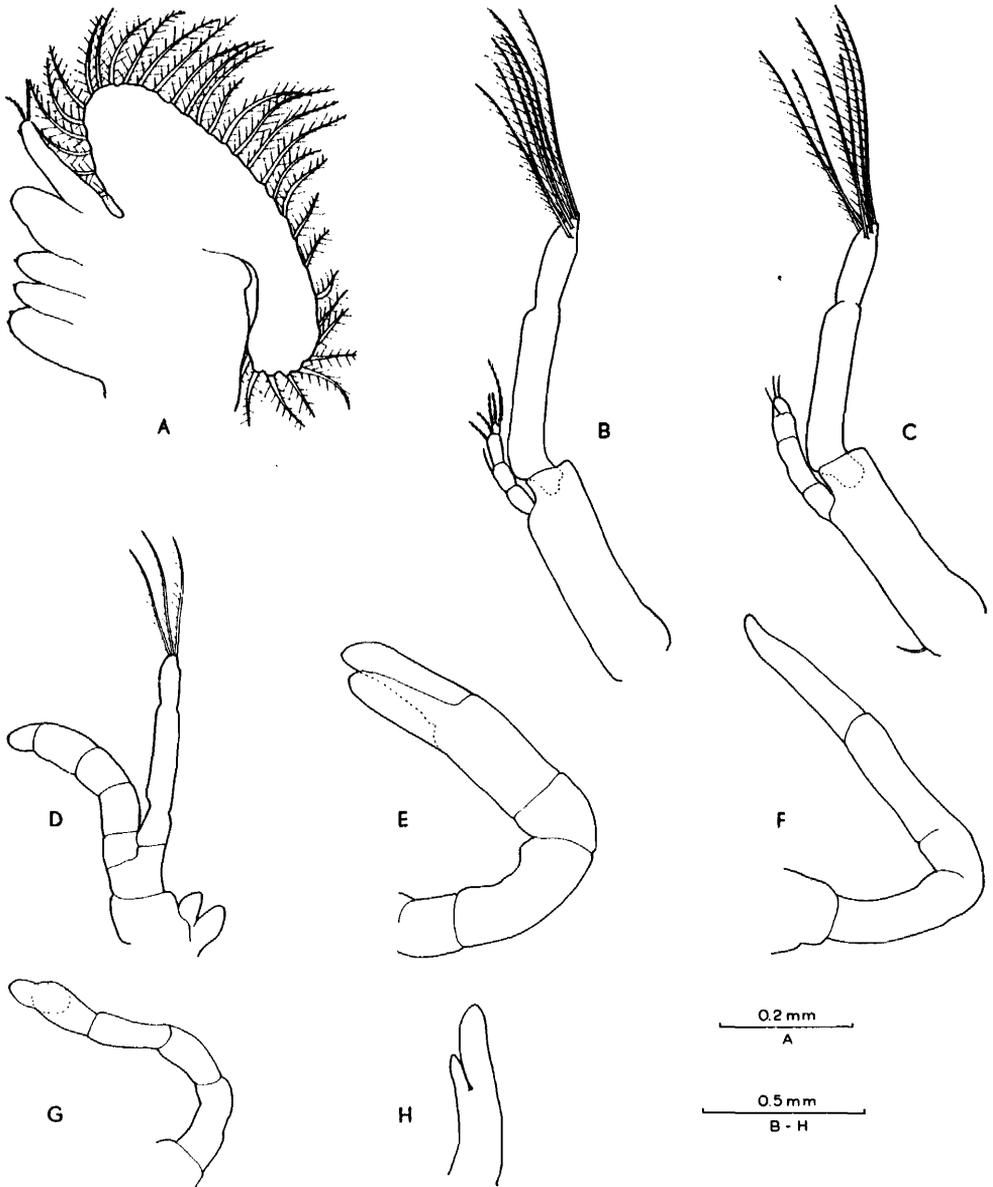


Fig. 2. Second zoea of *Munidopsis tridentata* (ESMARK). A. Maxilla. B. First maxilliped. C. Second maxilliped. D. Third maxilliped. E. First pereopod. F. Second pereopod. G. Fifth pereopod. H. Second pleopod.

The five pairs of pereopods are segmented; the first (Fig. 2E) and the last (Fig. 2G) are chelated, the others are simple (Fig. 2F).

The four pairs of pleopods on somite 2 to 5 are unsegmented and two-lobed without setae (Fig. 2H).

THIRD ZOEAE

Size. Tl 6.0, 6.1, 6.3, 6.4 mm; CL 3.5, 3.5, 3.7, 3.9 mm.

Duration. Lived 2, 2, 2, 6 days (none reached the next stage).

Description. See Sars (1890, p. 166, pl. 4, figs. 16–30).

Remarks. The third zoea, obtained in the laboratory, agrees with the last larval stage described by Sars (op. cit.). However, as was the case with the first zoea, variations in number of setae and spines were found: the antennal scale possesses 15 or 16 plumose setae on the medial margin. The scaphognathite of the maxilla has 41 or 42 plumose setae along the margin, and the telson carries 14 or 15 spines on each side.

This stage also possesses the plumose setules on the rostrum, on the somites 2 to 5, and on the telson as described for the second zoea. However, there is an additional pair of plumose setules on the proximal lateral corner of somite 6 at the base of the uropods.

On the exopodites of the pleopodes there are several small conical processes terminally. In one specimen one of these processes is developed into a short plumose seta.

DISCUSSION

Although the next stage after the third zoea was not obtained in the laboratory it should be, beyond doubt, the megalopa stage (sensu WILLIAMSON 1969); this because the third zoea of *M. tridentata* is mainly in the same state of development as the fourth zoea which precedes the megalopa in most of the galatheidean species (GURNEY 1942) and the fact that a precursor of pleopod setae was found.

Sars (1890) pointed out that *M. tridentata* had an abbreviated development compared with the *Galathea* species, but he did not mention the number of larval stages involved. *Munidopsis polymorpha* KOELBEL collected from the cave Jameo de Agua in the Canary Islands was also found to have an abbreviated development (PAGE & MONOD 1936). This species possessed large eggs (1.8 mm) too as was the case with *M. tridentata*. According to GURNEY (1939) several species of *Munidopsis* have large eggs, and later GURNEY (1942) discussed the relationship between large eggs in decapods and abbreviated development.

The mouthparts of *M. tridentata* are reduced in size in all the three zoea stages and are partly without setae and teeth. It seems therefor unlikely that the zoeas are able to eat which is confirmed by the fact that they did not eat newly hatched *Artemia* nauplii. The yolk found in all the zoeas seems to be the sole supply of food during the development as Sars (1890) also suggested.

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