



Mecynocera clausi I.C. Thompson, 1888 (Copepoda: Calanoida) is a paracalanid

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Abstract

Mecynocera clausi I.C. Thompson, 1888 is the type genus and species of the monotypic family Mecynoceridae Andronov, 1973. Based on the first description of male mouthparts of *Mecynocera clausi* Thompson, 1888 (Copepoda: Calanoida), evidence is presented for the transfer of this genus and species to the Paracalanidae Giesbrecht, 1893. Thus, Mecynoceridae Andronov, 1973 becomes a junior synonym of Paracalanidae.

Key words: Paracalanidae, Mecynoceridae, male, mouthparts, epipelagic

Introduction

The small, common, apparently widespread, tropical-subtropical epipelagic calanoid copepod species, *Mecynocera clausi* Thompson, 1888, has had an unstable classification history. A monotypic genus, it was placed in the Eucalanina by Giesbrecht (1893) (Holthuis & Vervoort (2006) show that the publication date was 1893, rather than the widely quoted 1892). The status of this taxon was elevated to the family Eucalanidae by Sars (1901). Then, by implication, it was removed to the Calocalanidae by Bernard (1958) (specimens of *Mecynocera* were erroneously ascribed to Farran's (1926) *Calocalanus tenuis* and a new genus name (*Dolichocera*) was given by Bernard to copepodites presented as adults). Subsequently, Bernard's (1958, 1963) error was recognised by Andronov (1970) and *Mecynocera* was explicitly transferred, with all genera in the Calocalanidae Giesbrecht 1893, into the Paracalanidae. Andronov (1973) then placed *Mecynocera* in its own family, the Mecynoceridae. This decision to create a new family was based on a comparison of 14 characters in *Mecynocera* with those of genera in the Eucalanidae and Paracalanidae: the number of free segments in female and male antennules, whether or not ancestral segments X and XI (free segments 8 and 9) of the antennule are fused, the type of rostrum in the male and female, the number of free female urosomites, presence of a dorsal cephalic hump in the male, position of the genital opening in the male, presence of inner seta on the basis of leg 1, the presence of teeth on the outer border of exopod segment 3 of legs 2–4, the number of spines on the outer border of the exopod segment 3 of legs 2–4, the number of setae on the inner border of endopod segment 2 of legs 2–4, the number of setae on endopod segment 3 of legs 2–4, and the segmentation of the left and right leg 5 of both males and females. This decision to create a new family was made without knowledge of male mouthparts of *Mecynocera*.

In order to fill gaps in data for an analysis of relationships between the Eucalanidae, Mecynoceridae, Paracalanidae and Calanidae, males of *Mecynocera clausi* were obtained from the tropical Atlantic ocean, kindly provided by Professor Sigrid Schiel (Alfred Wegener Institute for Marine and Polar Research), from which mouthparts were dissected and described for the first time. In addition, a habitus drawing is given and illustrations of legs 1, 2 and 5 (many of the swimming legs were not entire on all specimens) to demonstrate that the specimens examined are indeed *Mecynocera*.

Material and methods

Male *Mecynocera* specimens were stained with chlorazol black, dissected, and limbs mounted in gum-chloral (Pantin 1964). Drawings were made using a drawing tube. The system of morphological nomenclature used is based mainly on that of Huys & Boxshall (1991) but the major body segments are referred to as “somites” and the somites bearing swimming legs are “pedigerous somites”. Specimens are deposited in the collection of the National Institute of Water and Atmospheric Research, Wellington (NIWA 45661). Key references, only, are given in the synonymy.

Systematics

Paracalanidae Giesbrecht, 1893

Paracalanina Giesbrecht, 1893: 21.
Paracalanidae.-Sars, 1901: 16.-Bradford-Grieve, 1994: 44, 46.
Calocalanidae Bernard, 1958: 199.
Mecynoceridae Andronov, 1973: 1719–1720.

Diagnosis (emended): Male antennules symmetrically developed, neither of them geniculate; male antenna exopod with short terminal segment without 3 terminal setae; male maxilliped sexually dimorphic, endopod with 3 enlarged plumose setae (2 outer and 1 terminal), inner setae very atrophied; leg 1 endopod of 2-segments, exopod 3-segmented; legs 2–4 exopods and endopods of 3-segments, exopod segment 3 of legs 2–4 with 2 outer border articulated spines; terminal spine on exopod segment 3 of legs 2–4 blade-like, not serrated; female leg 5 uniramous with fused protopodal plate: of 2–4 segments but may be rudimentary or absent; male leg 5 uniramous; male right leg shortest, of 2–5 segments but may be rudimentary; male left leg elongate, slightly prehensile, 5-segmented.

Mecynocera clausi I.C. Thompson, 1888

Mecynocera clausi I.C. Thompson, 1888: 150, pl. 11, figs 1–4. Giesbrecht, 1893: 160, 161, pl. 5, fig. 1, pl. 11, figs 43–45, pl. 35, figs 21, 22.-Andronov, 1970: 980–984, figs 1, 2.-Corral, 1972: 37, pl. 11.- Bradford-Grieve 1994: 71, fig. 38.
Dolichocera tenuis.-Bernard, 1958: 195, fig. 15a (not *Calocalanus tenuis* Farran, 1926).
Dolichocerea tenuis.-Bernard, 1963: 160 (not *Calocalanus tenuis* Farran, 1926).

Material examined: 4 males, eastern tropical Atlantic collected by the Alfred Wegener Institute of Polar and Marine Research, Bremerhaven, Germany, ANT XX/1, Station 18, 20° 26'S, 05° 55'E, 19 November 2002, 0–300 m. One specimen in formalin (NIWA45661), two specimens dissected and mounted on slides, one specimen mounted whole on slide (NIWA45661/1-3).

Supplementary description of male: Male 0.91 mm total length (Fig. 1A)

Antennules symmetrically developed, neither of them geniculate, with 21 free segments, ancestral segments I–IV, V–VIII, XXVII–XXVIII fused.

Antenna (Fig. 2A) well developed, sexually dimorphic. Basis with 2 setae. Endopod 2-segmented, segment 1 without setae, segment 2 with 6 + 6 setae. Exopod 6-segmented, segment 1 short without seta, segment 2 elongate bearing enlarged distal seta, segments 3–6 each with 1 seta.

Mandible (Fig. 2B) with degenerate gnathobase. Palp well developed. Endopod 2-segmented, segment 1 with 2 setae, segment 2 with 8 setae, 5 of which elongate, exopod with 6 setae.

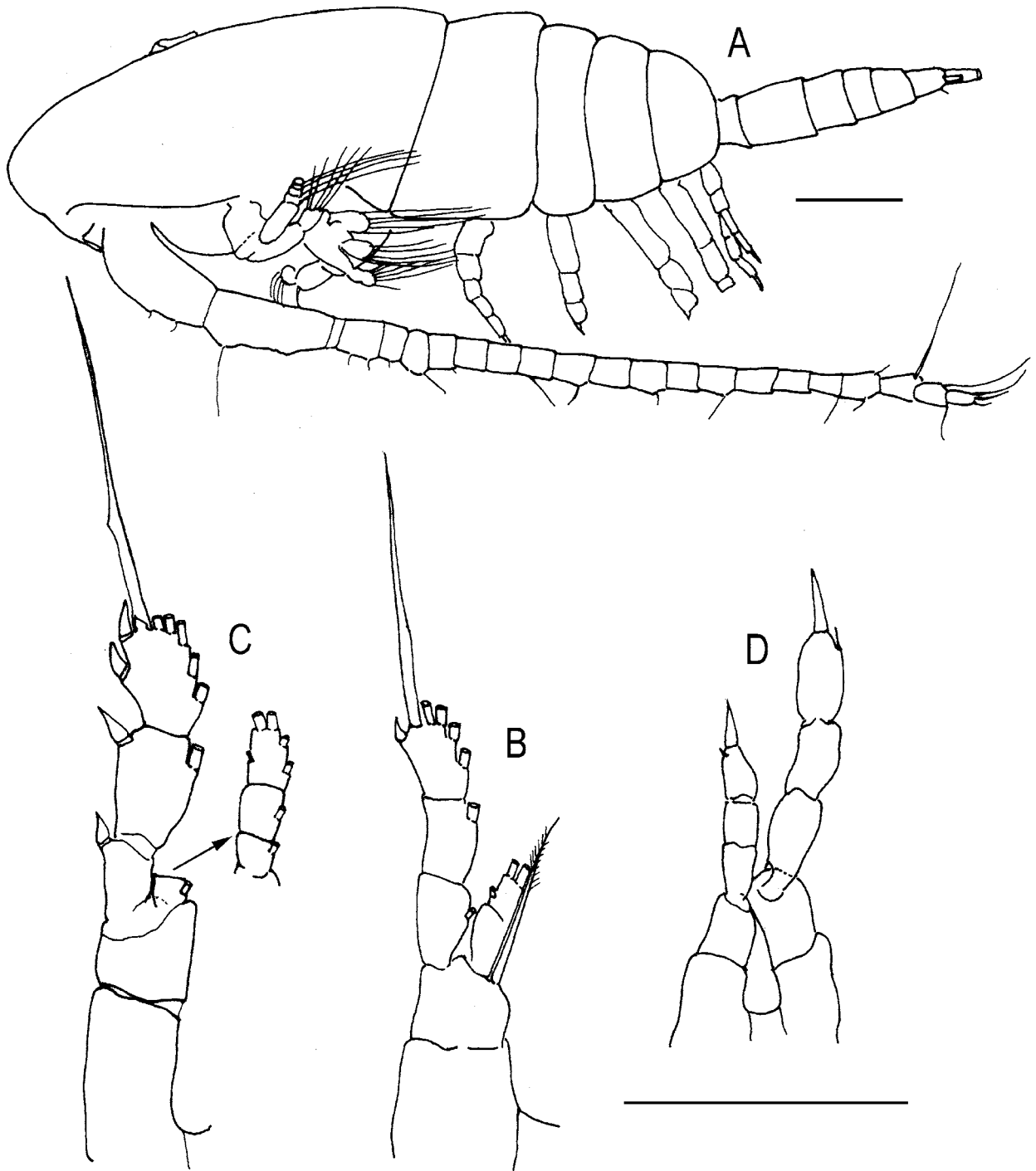


FIGURE 1. Male *Mecynocera clausi* I.C. Thompson, 1888: A (NIWA 45661), lateral view. (NIWA 45661/2): B, leg 1, anterior view. C, leg 2, anterior view. D, leg 5, anterior view. Scale marks 0.1 mm.

Maxillule (Fig. 2C) reduced with degenerate inner lobes and endopod with 2 small setae. Exopod with 8 setae, praecoxal epipodite with 6 large setae.

Maxilla (Fig. 2D) reduced to a small, knob-like remnant.

Maxilliped (Fig. 2E) sexually dimorphic. Inner setae of syncoxa, basis and endopod segments absent or very reduced; 1 terminal and 2 outer endopod setae enlarged, plumose, 2 outer setae directed towards base of limb as is typical of Paracalanidae, Calanidae and Eucalanidae.

Leg 1 (Fig. 1B) endopod indistinctly 2-segmented, segment 1 without inner seta, segment 2 with 2 terminal and 1 inner setae. Exopod segments 1 and 2 without outer distal spines and 1 seta on inner border of both segments, segment 3 with 1 outer border spine, 1 terminal spine and 4 inner border setae. Surfaces of rami not ornamented.

Leg 2 (Fig. 1C) endopod 3-segmented, segments 1 and 2 each with 1 inner seta, segment 3 with 2 inner, 2 terminal and 1 outer setae. Exopod 3-segmented, segment 1 with 1 outer distal spine and without inner border seta, segment 2 with 1 outer distal spine and 1 inner distal seta, segment 3 with 2 outer border spines, 1 distal spine and 5 inner setae. Surfaces of rami not ornamented.

Leg 5 (Fig. 1D) with right leg longest, 5-segmented on both sides, terminal segment on each side with 1 stout terminal spine and 1 small distal outer border setule. Surfaces of legs not ornamented.

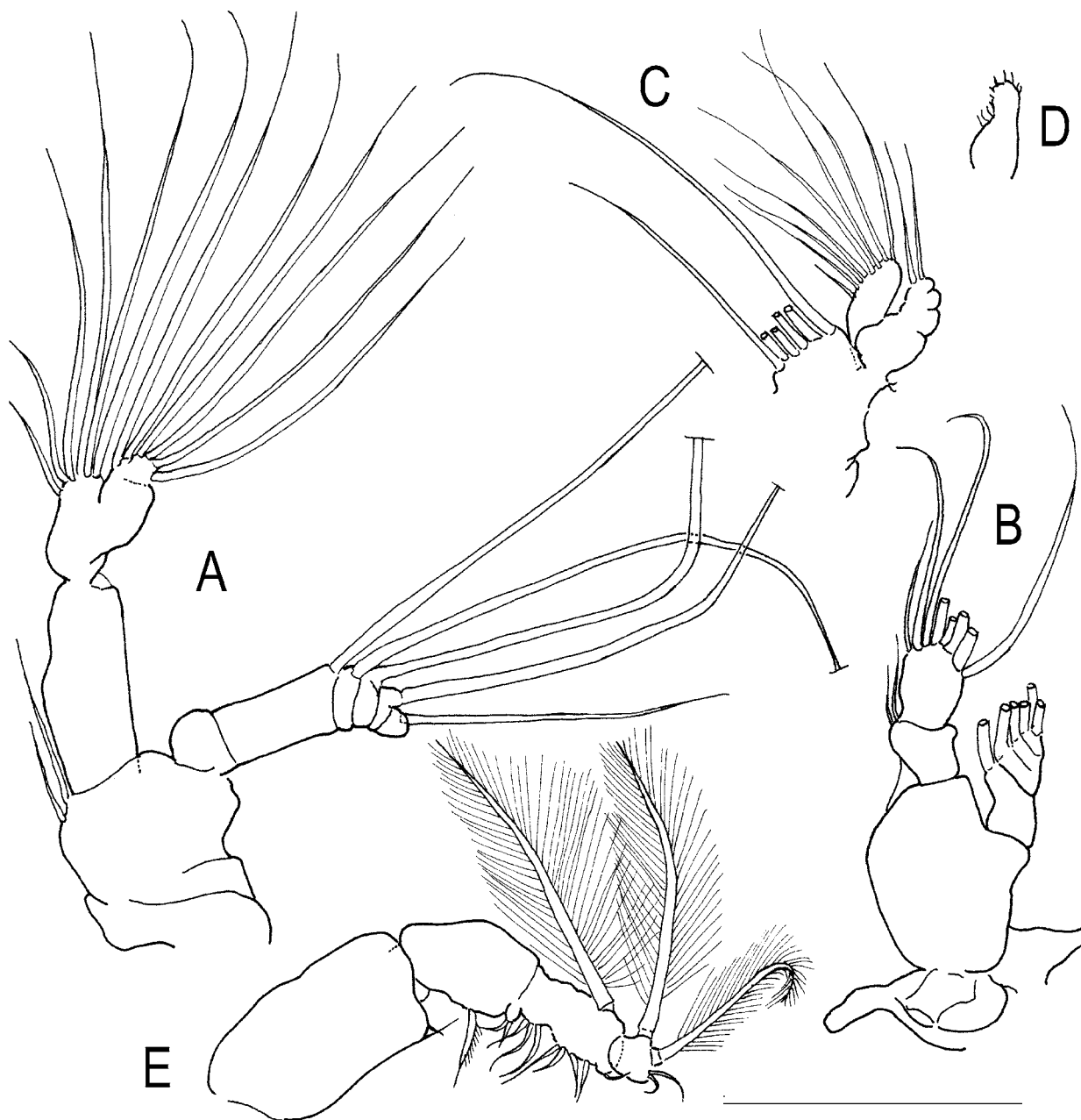


FIGURE 2. Male *Mecynocera clausi* I.C. Thompson, 1888. (NIWA 45661/2): A, left antenna. B, left mandible. (NIWA 45661/1): C, left maxillule. D, right maxilla. (NIWA 45661/2): E, right maxilliped. Scale mark 0.1 mm.

Discussion

The general habitus and swimming legs are as described by Andronov (1970) and Corral (1972) for *Mecynocera clausi*. The obvious male characters that specifically diagnose this genus are the 5-segmented left leg 5 and the triangular shape of the anterior head which extends well beyond the insertion of the antennules in lateral view.

The style of sexual dimorphism observed in the antenna and maxilliped of the male of *M. clausi* suggests family relationships that are not currently reflected in the classification of this species (e.g., Boxshall & Halsey 2004). The state of the terminal part of the male antennal exopod (the terminal segment is in the form of a small knob without 3 terminal setae) is an apomorphy shared exclusively with the Paracalanidae (Bradford-Grieve 1994). Also, the almost complete atrophy of inner setae of the syncoxa, basis and endopod segments of the maxilliped (compared with the Eucalanidae and Calanidae where these setae are better developed) and the well-developed 2 outer and 1 terminal seta of the maxilliped endopod is another apomorphy shared with the Paracalanidae. Other male character states that are consistent with most Paracalanidae are: the presence of a dorsal cephalic hump, the atrophied inner lobes of the maxillule and the extremely reduced maxilla. The female and male leg 5 are at one end of the range of variability in segment numbers already found in the Paracalanidae. The 3 free urosomites of female *M. clausi* are already accommodated within the family whose taxa may have 2–4 free female urosomites. Thus, *Mecynocera* shares a number of apomorphies with other paracalanids and most appropriately belongs in the Paracalanidae. It appears that the characters used by Andronov (1973) are all characters that vary in their state within families and, therefore, do not reliably diagnose families.

At present it is not possible to be certain of the segmental homologies of the male antennal exopod, compared with the female. In female *M. clausi*, the antennal exopod is 8-segmented and has 12 setae, 3 of which are on the terminal segment. This suggests that the female antennal exopod comprises 10 ancestral segments (the first two being double segments) and that ancestral segments IX and X are separate, unlike the rest of the Paracalanidae. The form of the male antennal exopod of *Mecynocera* and its setation is similar to that of *Paracalanus* and *Calocalanus* (e.g. Bradford-Grieve 1994). The loss of setae on the proximal exopod segments makes it difficult to be certain of the male segmental homologies. Nevertheless, it is hypothesised that segment 1 represents ancestral segments I and II, without setae; segment 2 (ancestral segments III–V) with 1 distal seta; segments 3–6 separate (ancestral segments VI–IX), each with 1 seta; ancestral segment X is absent along with its 3 terminal setae (this segment and its setae are present in the female). This proposition could perhaps be investigated by following the development of the musculature from copepodites to the adult female and male (e.g. Boxshall 1985).

Mecynocera differs from other Paracalanidae in that the female terminal antennal exopod segment is short, apparently because it is separated from the penultimate segment, whereas in *Paracalanus*, these two segments are fused (Bradford-Grieve 1994). The setation of the endopods of the swimming legs and terminal exopod segment of leg 1 of *Mecynocera* differs from other Paracalanidae. In *Mecynocera*, the outer border of exopod segment 3 of leg 1 has one fewer spine; there is one fewer seta on the inner border of endopod segment 2 of legs 2–4; and the outer and inner borders of endopod segment 3 have one fewer setae. Also the outer distal border of exopod segment 3 of legs 2–4 is smooth, unlike *Paracalanus*, *Acrocalanus* and *Parvocalanus*. On the basis of these characters, it is plausible that *Mecynocera* may be considered the sister-group of the remaining paracalanids.

Mecynocera clausi is, therefore, transferred here to the Paracalanidae, primarily on the basis of the form of the exopod of the male antenna and the maxilliped. Details of the setation of the mouthparts and swimming legs and segmentation of the female urosome lie within the variation already noted in the family (Boxshall & Halsey 2004). The family name Mecynoceridae Andronov, 1973, therefore, becomes a junior synonym of Paracalanidae Giesbrecht, 1893.

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