

Protognathia n. gen. *bathypelagica* (Schultz, 1977) Rediscovered in the Weddell Sea: A Missing Link Between the Gnathiidae and the Cirolanidae (Crustacea, Isopoda)

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Summary. A new genus (*Protognathia*) and family (*Protognathiidae*) are described for *Cirolana bathypelagica* Schultz, 1977. The morphology of this unique species proves that the Gnathiidae are closely related to the Cirolanidae. The characters of *P. bathypelagica* are intermediate between the carnivorous cirolanids and the highly specialized gnathiid fish parasites.

Introduction

The Gnathiidea Leach, 1814, a suborder of the Isopoda, and the Cirolanidae Harger, 1880, a family of the non-monophyletic suborder "Flabellifera", until now never were thought to be closely related. The idea of Müller (1871) to divide the isopods into two groups, the "Isopodes marcheurs" and the "Isopodes nageurs" (including cymothoids and gnathiids) was not considered by later taxonomists. The Gnathiidea even were completely separated from the remaining isopods ("Quatuordecempedes") as "Decempedes Latreille, 1825" by Monod (1922). This division was accepted by several important isopod specialists (Menzies 1962; Henry and Magniez 1983).

Monod (1926) discussed the affinities of the Gnathiidea and mentioned the fossil isopod *Urda rostrata* Kunth, 1870, which has large lateral eyes, frontally protruding mandibles, a very short, pleonite-like seventh pereonite, but he concluded that this fossil is closely related to the cirolanid genus *Gnatholana* Barnard, 1920.

A single specimen of a bathypelagic isopod collected by Dr. U. Piatkowski (University of Kiel) turned out to be a "*Cirolana*" *bathypelagica* Schultz, 1977. While preparing a redescription of this species it soon became obvious

that this really is a surviving primitive isopod with a morphology intermediate between the Cirolanidae and the Gnathiidae. It is necessary to erect a new family and a new genus for this species.

Material and Methods

One immature specimen, length 13 mm. The sample (Station 1269, 63° 58.4'S 49° 58.1'W) was collected with a rectangular midwater trawl (RMT 8) in a depth of 410 to 245 m (water depth 3000 m) in the north-western Weddell Sea (*John Biscoe* expedition, February 1982). The specimen was dissected under a WILD M5 dissecting microscope and drawn with the help of a camera lucida (microscope LEITZ DIALUX).

The specimen is kept in the collection of the first author.

Diagnosis of the New Family *Protognathiidae*

Isopoda with 5 coxal plates and a tail fan, the seventh pereopods absent. Pereonites 4 to 6 longer than remaining segments, pereonite 7 as long and broad as a pleonite. Pleonites 1 to 5 free, not fused. Uropods flat, slender, nearly as long as the pleotelson. Mandible with cirolanid-like pars molaris (Fig. 2), pars incisiva enlarged, distally with an acute point (ventral edge); palp of three articles. Maxilla 2 small, reduced, only inner lobe present. Palp of maxilliped with 5 articles, endite not much longer than first palpal article, epipod not present. Pereopods 1 to 3 not subchelate, but with small, triangular carpus; carpus of pereopods 4 to 6 rectangular in lateral view. All pleopods of similar outline, with large rami.

Type Genus: Protognathia n. gen.

Remarks. The mandibles have the typical pars molaris of the Cirolanidae and an enlarged pars incisiva, that covers in ventral view the more proximal parts of the endite, but it is not a cutting organ, as in the Cirolanidae. The acute distal point probably is used for stinging. The first maxilla resembles the maxilla 1 of *Cirolana*, there are even the two small setae at both sides of the more distal spine, but

* Abbreviations used in text and figures: A 1,2 = antenna 1,2; Md = mandible; Mx 1 = maxilla 1; Mxp = maxilliped; P 1–6 = pereopods 1–6; Plp 1–5 = pleopods 1–5; Tel = telson; Urp = uropod

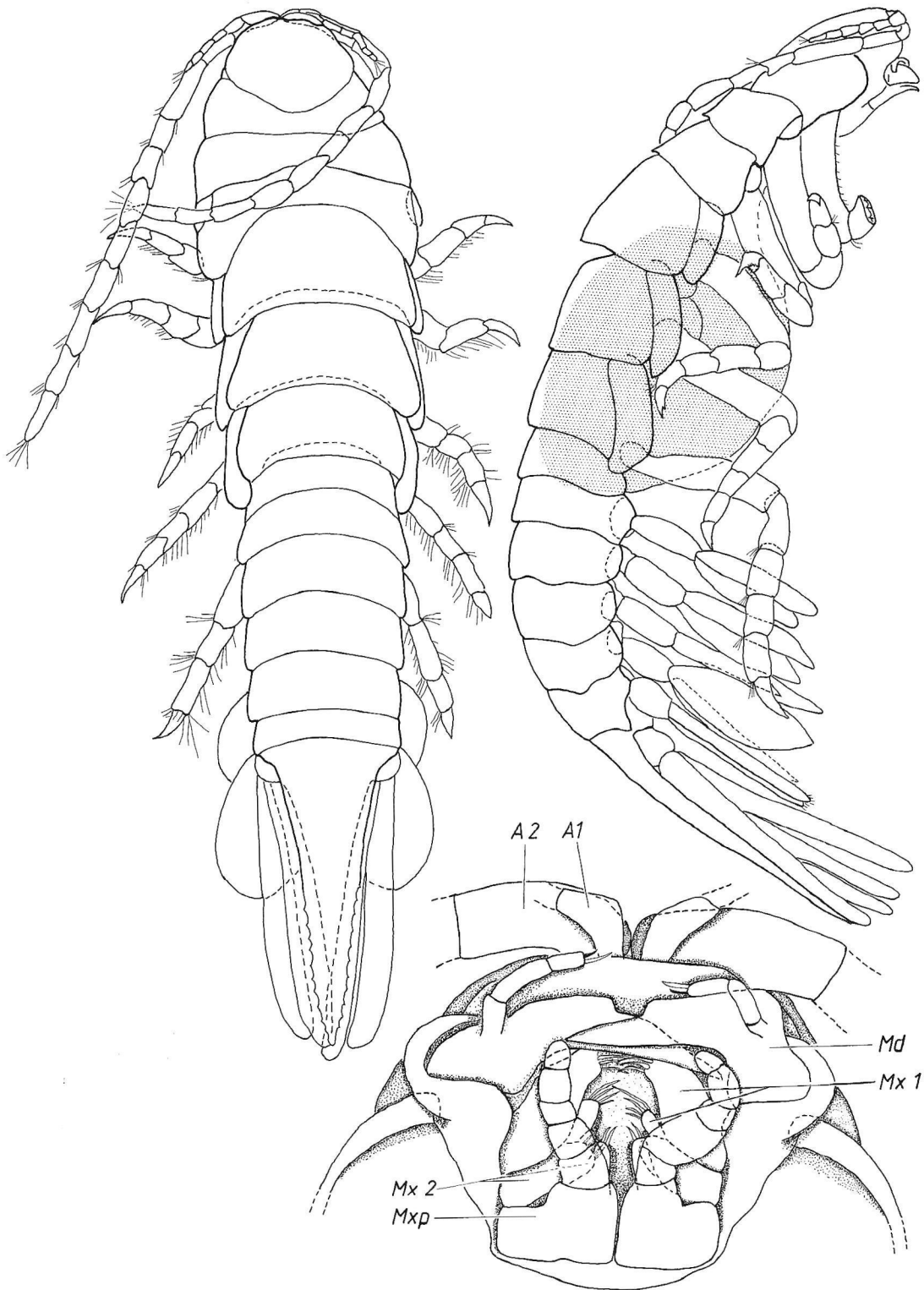


Fig. 1. *Protognathia* n. gen. *bathypelagica* (Schultz, 1977). Dorsal and lateral view of immature specimen (13 mm long) and ventral view of head. Note that the basal insertion of the mandibles protrudes laterally; incisor of *left Md* covering *right Md*. For symbols see list of abbreviations

the spines are more slender. The maxilla 2 is very small and has no distal lobes, the remaining setose lobe probably is homologous with the first, medial endite of other isopods. The maxilliped also has the cirolanid-like outline with a relatively short basis and a small endite.

These similarities induced Schultz (1977) to identify the species as a *Cirolana*.

The following synapomorphies of the new family are shared with the Gnathiidae:

- Pereopod 7 absent, pereonite 7 of the same size as a

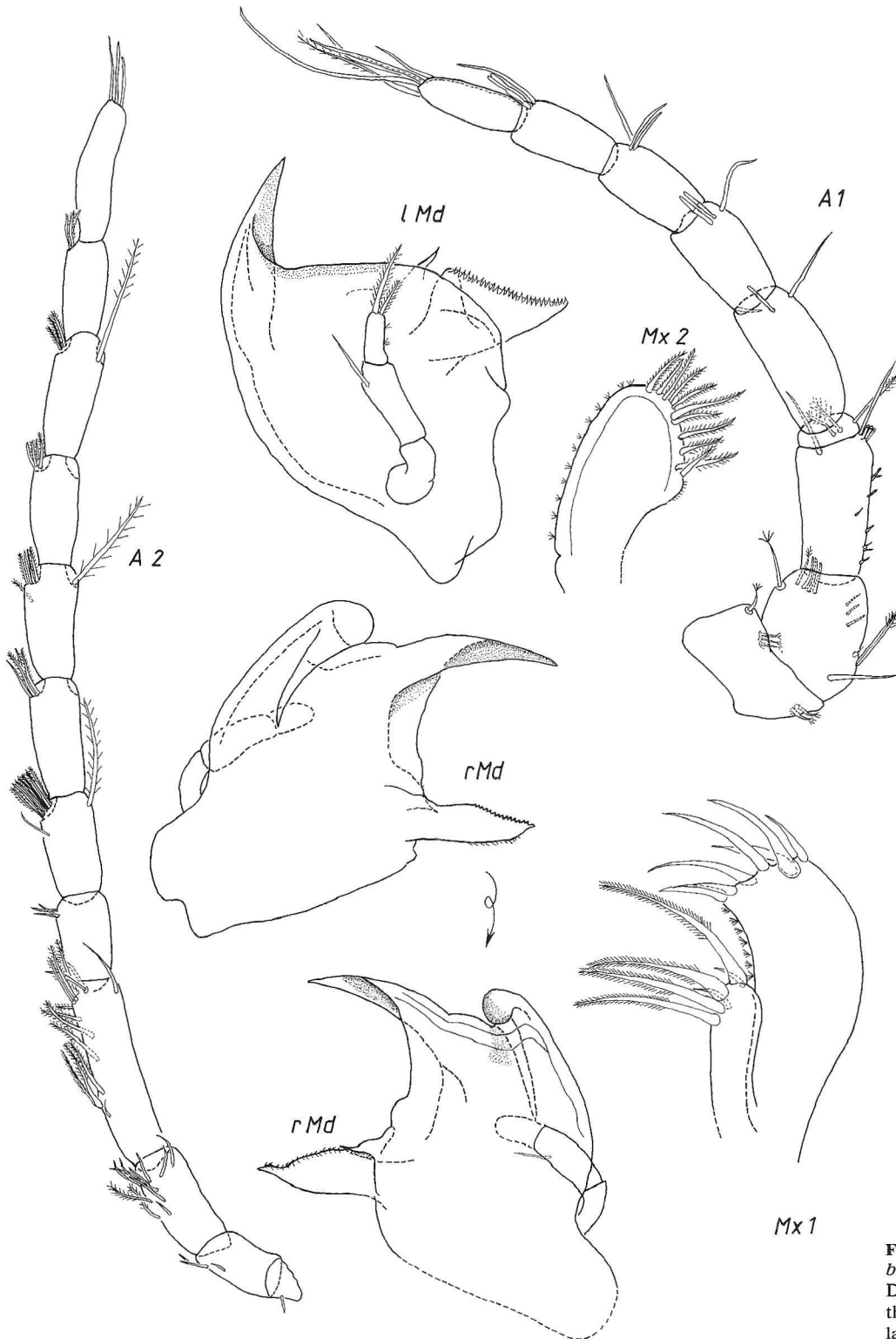


Fig. 2. *Protognathia* n. gen. *bathypelagica* (Schultz, 1977). Details of appendages. The palp of the right mandible (*rMd*) lost its last article during dissection

pleonite; – pereonites 4 to 6 somewhat enlarged, ventrally with a soft, expandable cuticle; – tail fan composed of long and slender elements; sympod of the uropods without medially projecting margin; – pars incisiva of mandible transformed into a stinging tool; – maxilla 2 reduced; – setae of maxilliped with fine spinules (nearly like swimming setae).

The gnathiids are higher evolved than *Protognathia* n. gen., having a very pronounced sexual dimorphism and specialized larvae (see e.g. Wägele 1987), the first pereopod is transformed into a pylopod. The immature specimens of *Protognathia* neither have the stiletto-like mandibles of a praniza nor the huge mandibles of the male of *Gnathia*. The second maxilla is not absent, the

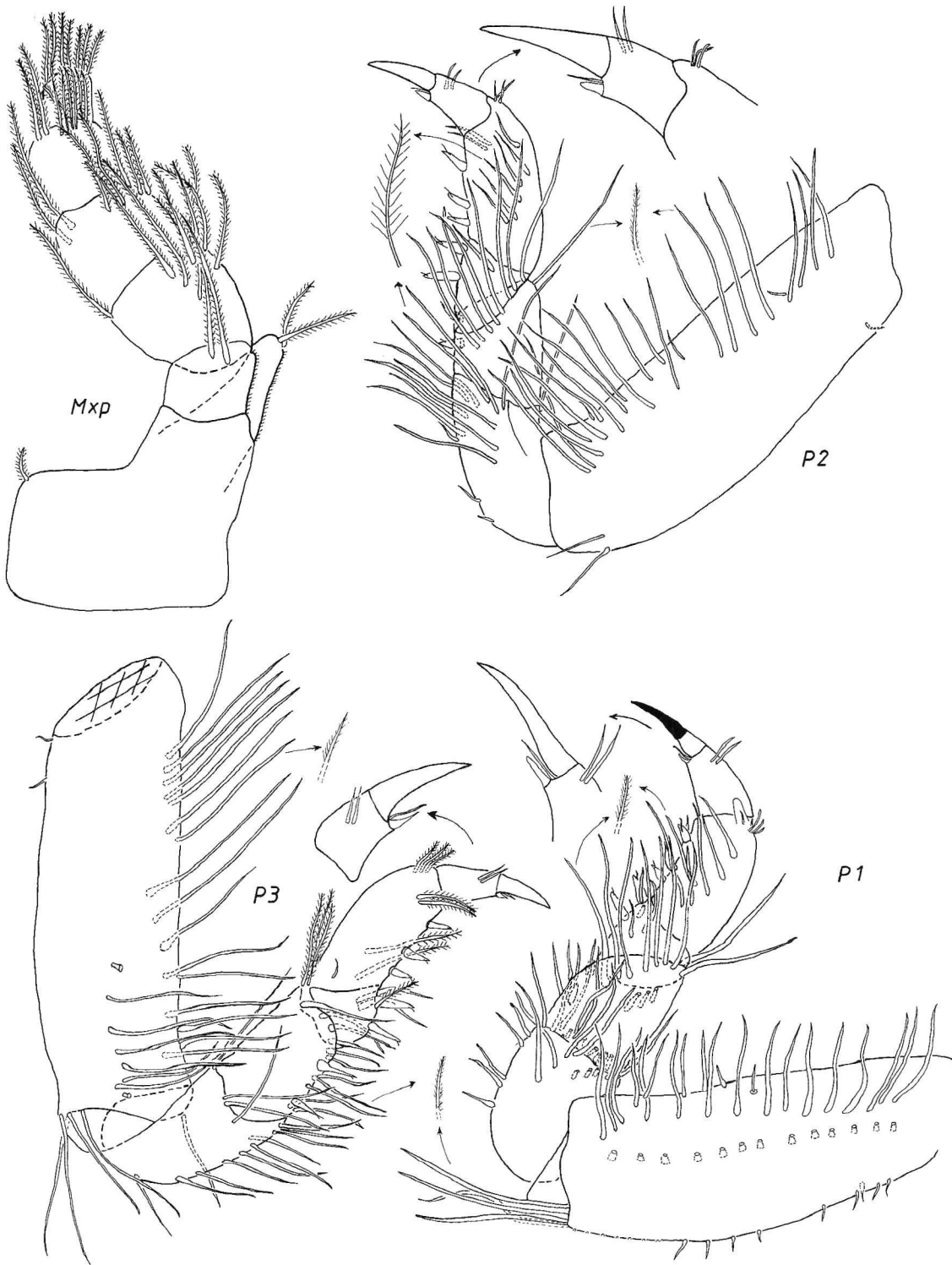


Fig. 3. *Protognathia* n. gen. *bathypelagica* (Schultz, 1977). Details of appendages. Long swimming setae of pereopods shown as simple setae

first pereopod is not transformed into a pylopod. Therefore the immature *Protognathia* neither has the features of an immature nor of a mature gnathiid. But *Protognathia* already has features that suggest a blood-sucking, probably ectoparasitic way of life: The pereonites 4

to 6 are expandable, the mouthparts are intermediate between the chewing-cutting mouthparts of the Cirolanidae and the stinging mouthparts of the gnathiid praniza. The mandible is very interesting, as it allows an evolution to a stilet-like tool, present in a praniza, or into a broad,

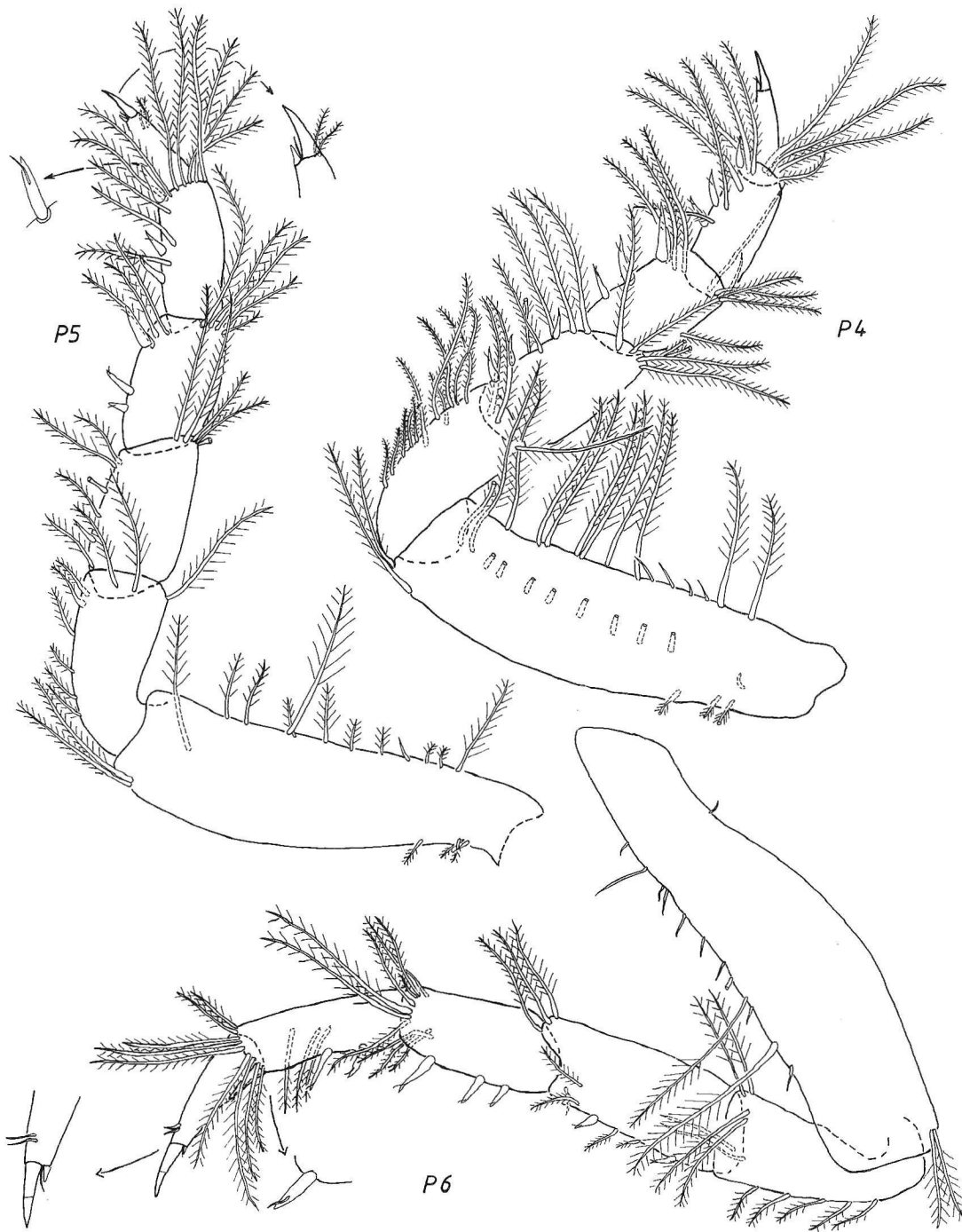


Fig. 4. *Protognathia* n. gen. *bathypelagica* (Schultz, 1977). Pereopods 4 to 6 with details of claws and sensory spines

antler-like organ, as in the male of *Gnathia*, but it still has the typical flat, serrated pars molaris of the Cirolanidae.

Further taxonomic and phylogenetic implications of this discovery will be discussed in a different publication.

Protognathia n. gen. is not a perfect model for the gnathiid ancestor: these animals are specialized for a bathypelagic life, have no eyes and bear "swimming setae" on the pereopods.

Diagnosis of *Protognathia* n. gen.

In addition to the features mentioned in the diagnosis of the Protognathiidae (see above) this genus has the following characters:

Eyes lacking. Peduncle of A 1 with 3 articles, third article longest, less wide than preceding articles; flagellum of 6 articles. A 2 of 12 articles (with a peculiar setation that allows no homologization of the first flagellar article

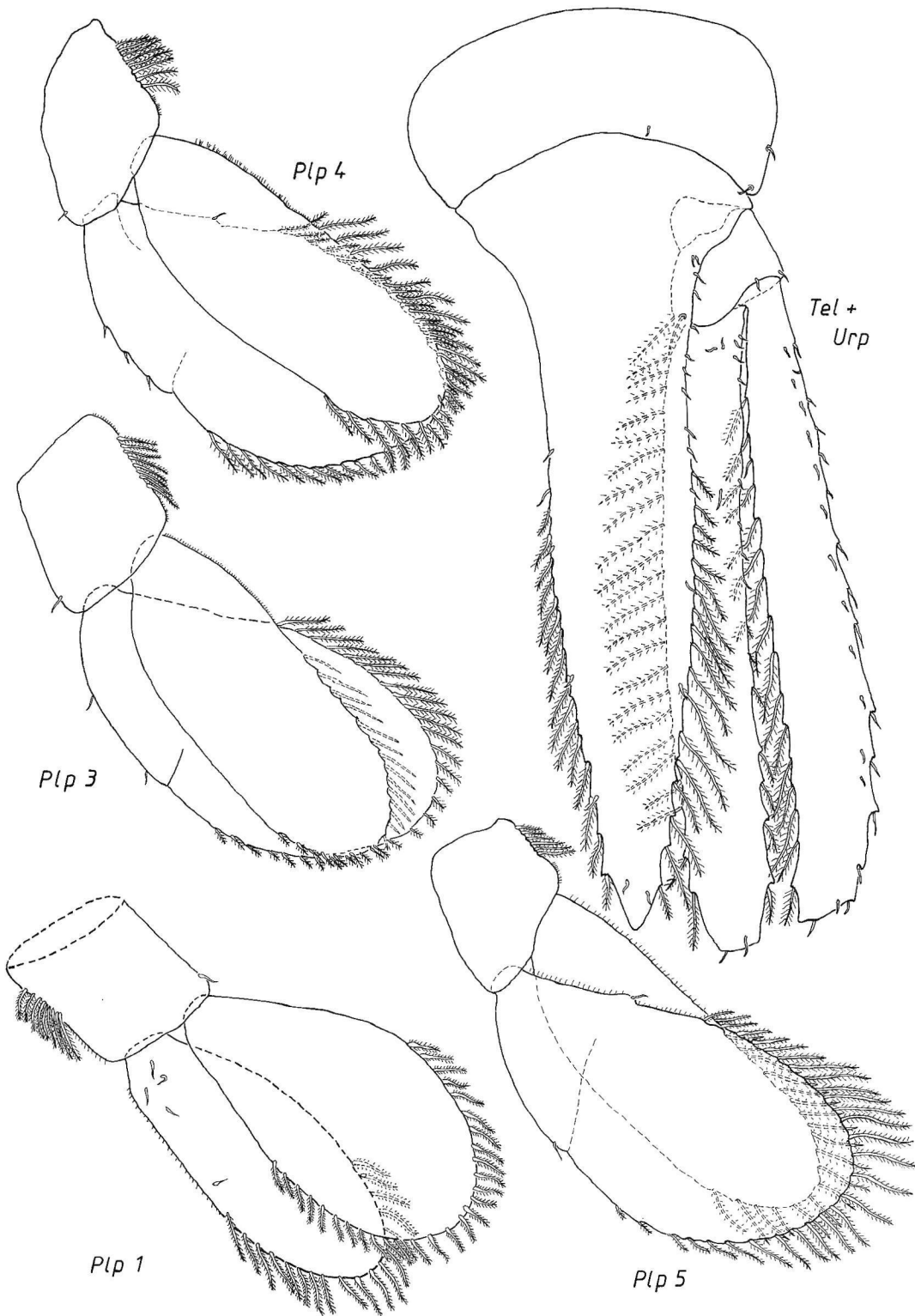


Fig. 5. *Protognathia* n. gen. *bathypelagica* (Schultz, 1977). Pleopods and tail fan (without left uropods). Pleopod 2 (not shown) is very similar to pleopod 1

with that of other isopods). Palp of Md short; between pars incisiva and pars molaris a small, acute lobe (the reduced spine row of the cirrolanids). Merus, carpus and propodus of all pereopods with few (2 to 3) sensory

spines on ventral side. Exopod of pleopods wider than endopod, laterally protruding from the slender pleotelson and visible in dorsal view.

Type species: Cirolana bathypelagica Schultz, 1977

Descriptive Notes on *P. bathypelagica* (Figs. 1–5)

Synonym: Cirolana bathypelagica Schultz, 1977

Schultz (1977) briefly described the most important features from the small, juvenile holotype (6.6 mm long). The specimen collected by Dr. Piatkowski is larger and has a more complete setation; therefore a redescription was prepared.

Flagellum of A 1 of 6 articles, peduncle of 3 articles; first article of flagellum bearing 3 plumose setae, the following articles each with 2 short aesthetascs and 1 or 2 (article 5) simple setae, last article with 3 simple and 1 feather-like seta. A 2 without clear limit between peduncle and flagellum, of 12 articles, setation as in Fig. 2. Mandibles asymmetrical; right Md with a dorsolateral groove into which the rim of the labrum fits; second article of palp longest, with a single seta, last article distally with 2 feather-like setae. Pars incisiva of both mandibles ending in an acute point; lacinia mobilis absent, of the spine row a single, small spine remains; pars molaris flat and frontomedial margin serrated. Lateral endite of Mx 1 with 7 long, medially directed spines; 4 spines of medial endite bearing fine spinules. Of the Mx 2 only the inner lobe is retained, it bears 11 setae (Fig. 2).

Setation of Mxp as in Fig. 3, all setae with fine spinules. Basis with endite, bearing apically 2 setae; palp of 5 articles adorned with setulated setae. Pereopods 1 to 6 of similar size (Figs. 3 and 4), the basis being the longest podomere. Dorsal claw of P 1–3 longer than in P 4–6. Carpus and propodus always with 2 and 3 sensory spines, respectively, merus with 2 spines in P 1–3 and 3 in P 4–6. All long setae of the pereopods are feather-like “swimming” setae. Pleopods all of subsimilar outline, with broad rami, margins bearing short swimming setae.

These are also present on the margins of the tail fan with the exception of the outer margin of the uropodal exopod (Fig. 5). Uropods slightly surpassing pleotelson, with very short sympod, exopod and endopod of similar size, nearly eight times longer than wide. Pleotelson narrow, in its middle, only about one and a half times wider than an uropodal ramus.

Distribution

Known only from the type locality (58°S 110°W) and from the Weddell Sea (64°S 50°W).

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