

BULLETIN ZOOLOGISCH MUSEUM

UNIVERSITEIT VAN AMSTERDAM

Vol. 8 No. 23 1982

A NEW HYPOGEAN *CYATHURA* FROM NEW CALEDONIA

(CRUSTACEA, ISOPODA, ANTHURIDEA)

Johann Wolfgang WÄGELE

ABSTRACT

Cyathura numeae n.sp. from New Caledonia is the sixth blind species of the genus *Cyathura* Norman & Stebbing, 1886, found in hypogean habitats. The new species lives in the interstia of coastal sand or gravel, like *C. milloiti* Chappuis et al., 1956, from Réunion. A close relationship to the other species is not obvious; the specific shape of the appendix masculina can be derived from the *carinata*-type. In contrast to the slender species, *C. curassavica* Stork, 1940, and *C. specus* Bowman, 1965, in the new species the adaptations to hypogean life are limited to the small body size and reduction of the eyes.

INTRODUCTION

Faunal samples from coastal, interstitial waters collected by Prof. H.K. Schminke (Oldenburg) in New Caledonia, contained unexpectedly a new species of the genus *Cyathura*. Hypogean species of this genus were only known from the Caribbean and Central American area (*C. curassavica* Stork, 1940, *C. specus* Bowman, 1965, *C. sbordonii* Argano, 1971), from Réunion (*C. milloiti* Chappuis et al., 1956), and from Borneo (*C. chapmani* Andreev, 1982).

DESCRIPTION

Cyathura numeae n.sp.

Material.-

1) 20 specimens; manca stages 1.3-1.6 mm; postmanca stages 2.0 mm; non-reproductive adults 2.1-3.0 mm; males 2.1-2.7 mm; females 2.5-2.7 mm. Locality: Nouméa, beach of Anse Vata; coarse coral sand with fragments of mollusc shells from wave-line; salinity not known; August 28, 1967, leg. H.K. Schminke. 5 paratypes (2 females, 2 non-reproductive adults, 1 manca) deposited in the Zoölogisch Museum Amsterdam (ZMA Is. 105.186).

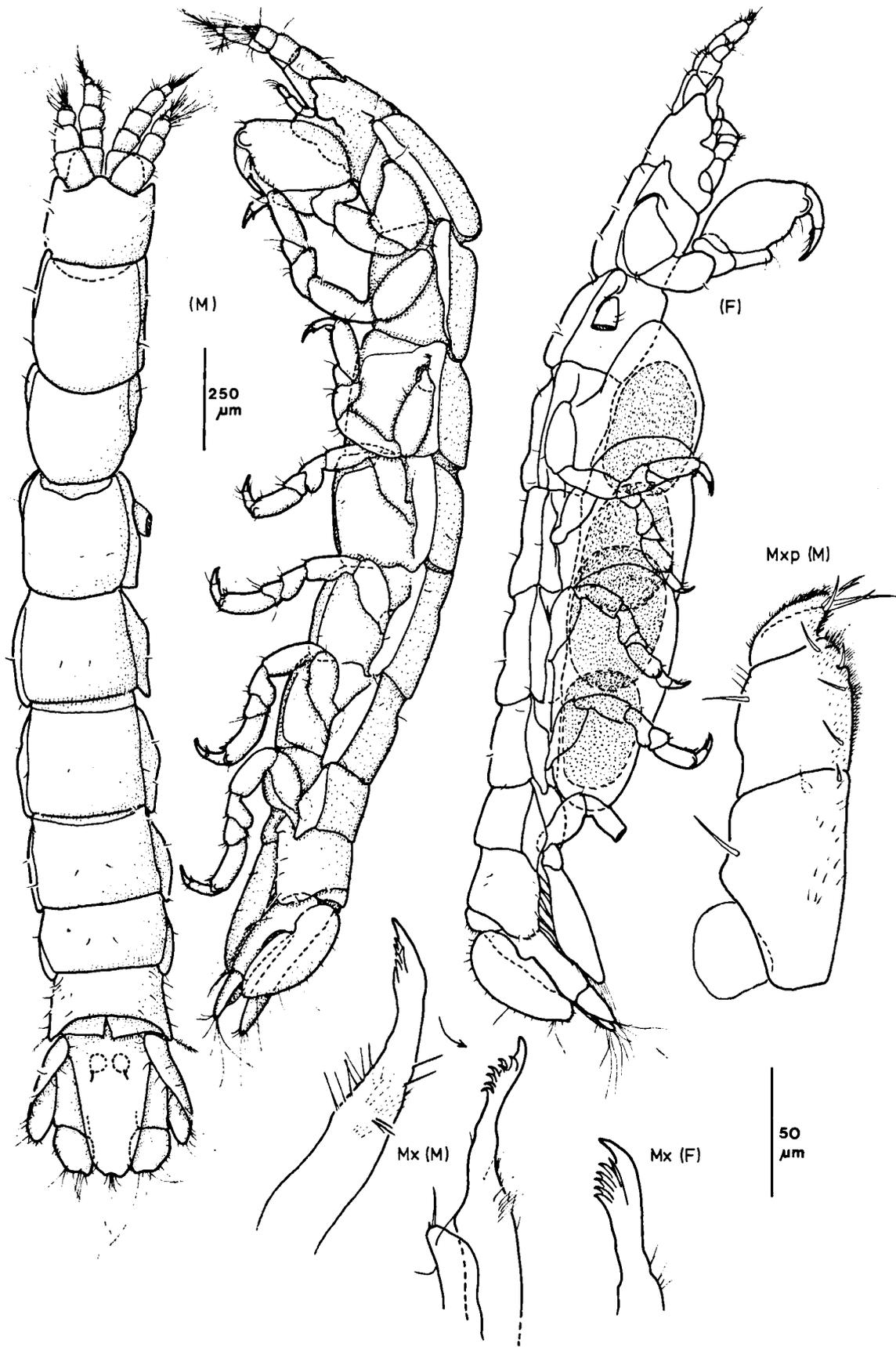


Fig. 1. *Cyathura numeae* n.sp.; for symbols see list of abbreviations. Holotype male (M) in dorsal and lateral view, ovigerous female (F) in lateral view.

2) 1 damaged specimen from mouth of Fausse Yaté; beach with fine gravel, groundwater at a depth of 50 cm, 20.7°C; September 9, 1967, leg. H.K. Schminke.

Holotype: male specimen, 2.7 mm, from first locality; Zoologisches Museum, Kiel, ZMK Cr. 2315.

Abbreviations used in text and figure captions.-

A1, 2: antenna 1, 2; Hy: hypopharynx (lower lip); Md: mandible; MdP: palp of mandible; Mx: first maxilla; MxP: maxilliped; P1-7: pereopods 1-7; Plp: pleopods 1-5; Tel: telson; Urp: uropod; (F): ovigerous female; (M): male; (pre-M): premale.

Male (holotype).-

Blind species without chromatophores, about 8 times longer than wide. Cephalothorax wider than long. Relative dorsal length of pereonites: C<1>2<3 = 4<5>6>7. Pleonites 1-5 fused, together shorter than pereonite 7. Sixth pleonite fused with Tel, with middorsal slid (Fig. 1: (M)).

Flagellum of A1, 4-segmented; first article with 1 feather-like bristle, second article with tuft of aesthetascs, last article with 3 aesthetascs and 5 setae. Flagellum of A2 short, of 2 articles, with distal tuft of simple setae; peduncle as in fig. 2. MdP 3-segmented; second article longest, last article shorter than first, apex bearing 4 serrated setae. Pars incisiva of Md with 3 notches, lamina dentata with 8-9 serrulations, pars molaris short, acutely pointed. Apex of lateral endite of Mx curved medially; besides the strong distal tooth depending on perspective 6 or 7 smaller teeth are visible. Medial endite of Mx short, with 1 apical seta. Hy as in fig. 2. Mxp with 2-segmented palp; basipodite without endite, but with 1 small dorsal protuberance; first palp article shorter than basipodite; second article shorter than wide, with 5 setae inserted on medial border. P1 stout, subchelate; propodus broad, palm convex, with 4 short setae and fringed with finely serrated scales; distally 2 further setae. P2 not subchelate, carpus triangular in lateral view, propodus long oval with straight palm; P3 similar to P2. P4 to 7 similar, P7 longest, carpi short trapezoid, propodi elongate cylindrical with slightly concave palm. Plp 1 with tiny, reduced endopodite; exopodite operculiform, with 14 swimming setae.

Exopodite of Plp 2 with 7 swimming setae, endopodite more slender, without setae. Appendix masculina very strong, surpassing branches of pleopod, with widened bifurcate apex (Fig. 3). Urp as long as Tel, endopodite somewhat longer than wide, sympodite twice as long as endopod; exopodite elongate oval, somewhat longer than sympodite, margin with some plumose setae. Tel narrowing caudally, apically rounded with medial notch, 3 pairs of distal setae; 2 statocysts present (Fig. 4).

Premale.-

This stage corresponds to the male, but the flagellum of the A1 has no tuft of aesthetascs (Fig. 2: A1 (pre-M)); the formation of the appendix masculina is visible inside the endopodite of Plp 2 (Fig. 4: Plp 2 (pre-M)).

Ovigerous female.-

Shape and size of the body as in the male, pereonites of the marsupial region dorsoventrally flattened. Oöstegites on pereonites 2, 3 and 4 (Fig. 1). Flagellum of A1 of 3 articles; first article with 1 feather-like bristle, last article very short, with 3 aesthetascs and 4 setae. A2, mouthparts, pereopods and tailfan as in the male. Exopodite of Plp 1 with 16 swimming setae, endopodite reduced. Exopodite of Plp 2 with 6 swimming setae, endopodite with 1 distal seta.

Etymology.-

The species was named after the locus typicus (Nouméa).

REMARKS ON THE ANTENNAL POLYMORPHISM

The polymorphism of the flagellum of A1, discovered by Cléret (1959) in *Cyathura carinata*, is caused by 2 moults of the maturing male. This differentiation can be observed in most Anthuridea. Young and non-reproductive animals of either sex have fundamentally the same morphology. Mature females can be identified by the ovary, the oöstegites and the genital papillae on the fifth pereonite. Mature males usually have longer flagella in A1, with tufts of aesthetascs, and an appendix masculina on Plp 2, genital papillae on pereonite 7 and

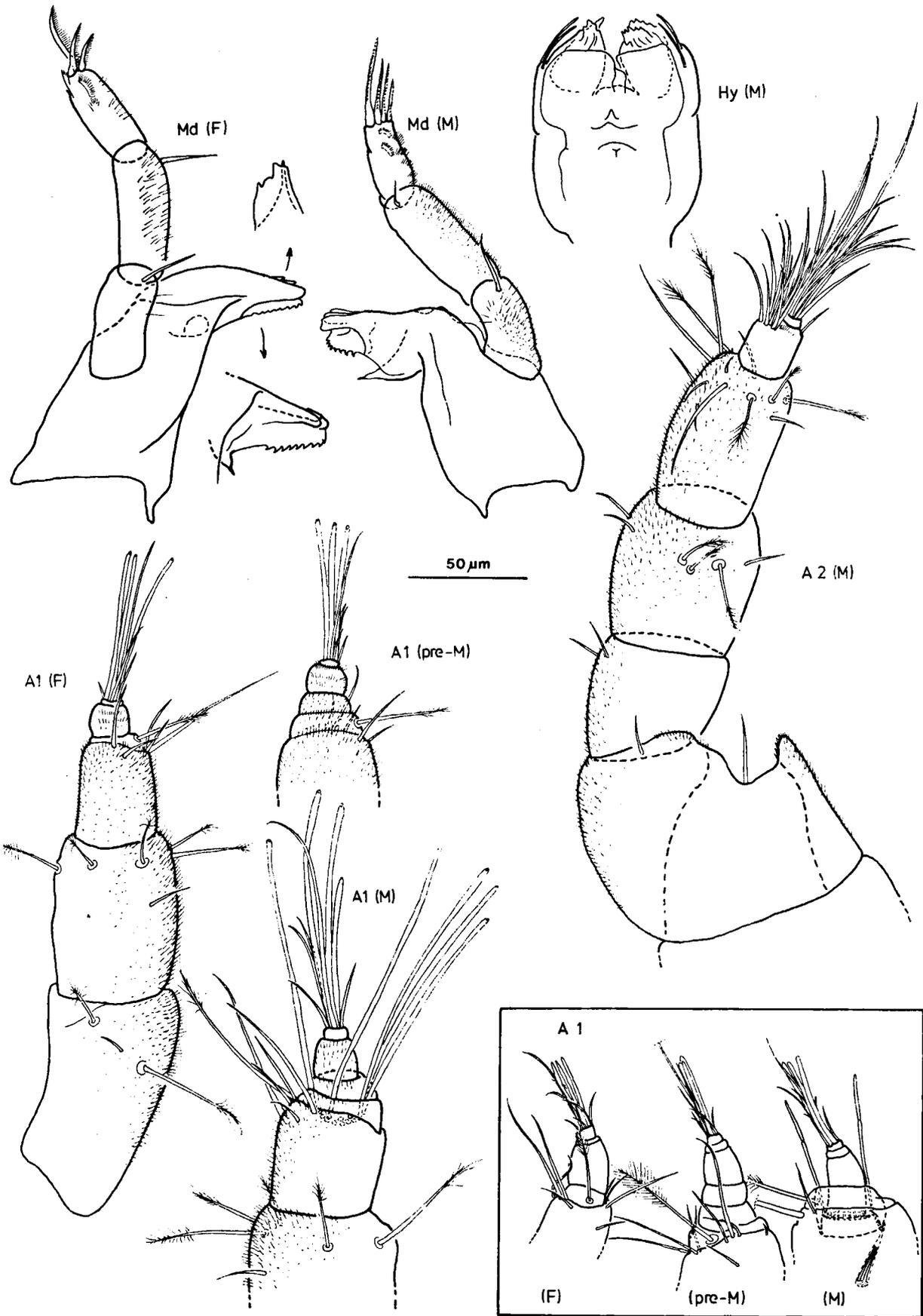


Fig. 2. *Cyathura numeae* n.sp.; for symbols see list of abbreviations; (pre-M): premale (non-reproductive male). Inset: flagellum of A1 of *Cyathura carinata* (Kröyer) (modified from Wägele, 1979). Most aesthetascs of A1 (M) are omitted.

often additional features, such as the dense setation of the pleurae 1 and 2 and setae on the propodus of P1 (in *Cyathura carinata*, see Jazdzewski, 1969).

Between the mature male and the non-reproductive adult an intermediate 'premale' stage is interposed, resembling the male, but having no tufts of aesthetascs and no differentiated appendix masculina on the endopodite of Plp 2.

The protogynic hermaphroditism of *C. carinata* was discovered in connection with the polymorphism of the A1 (Fig. 2) (Legrand & Juchault, 1963; Jazdzewski, 1969; Wägele, 1979). In *C. numeae* n.sp. no indication of such hermaphroditism was found; a study of the population structure would be necessary. The size of the specimens in the samples studied seems to indicate a normal bisexual life cycle.

An unusual feature of A1 of some species of *Cyathura* (*C. sbordonii*, *C. rudloei*) is the occurrence of aesthetascs on the third peduncular article of the male. This, probably erroneous, observation is caused by the following phenomenon: aesthetascs always occur on some of the flagellar articles of A1 in isopods as well as in other crustaceans (Ghiradella et al., 1968; Schultz, 1969; Schmallfuss, 1974); these chemosensory organs are very numerous in male anthurid specimens. Tufts of aesthetascs of male Anthuridea usually occur on the second and the following articles of the flagellum. Preserved animals often have a retracted flagellum, the first and second segments being telescoped into one another and into the third peduncular article (Fig. 2: A1 (M)). Observation of live anthurides shows that during the retraction of the flagellum the tuft of aesthetascs is laid together, but otherwise can be opened like an umbrella. Studying preserved specimens one can have the impression that the aesthetascs rise from the peduncle. A flagellum of this type, which is not retracted, can be seen in the drawings of *C. specus* (Bowman, 1965).

DISCUSSION

The reduction of the eyes, a characteristic feature of *C. numeae* n.sp., also occurs in *C. milloti*, from fresh or brackish waters in the

littoral zone, and the limnic species *C. sbordonii*, *C. specus*, *C. curassavica* and the recently discovered *C. chapmani* Andreev, 1982. *C. specus* and *C. curassavica* can easily be distinguished by the slender form of the body, pereopods and exopodites of the Urp. *C. numeae* n.sp. differs from *C. milloti* in the following features: appendix masculina without coiled lobe (Fig. 5), MdP with only 4 distal setae (instead of 7), propodus of P1 not sexually dimorph, endopodite of Plp1 shorter, lateral margins of Tel not parallel. The setation of the Tel also is clearly different. *C. chapmani* resembles in many features *C. milloti*. *C. sbordonii* differs from *C. numeae* n.sp. in the following features: appendix masculina with coiled lobe (Fig. 5), MdP with 13 distal setae, exopodite of Urp shorter and narrower.

The new species is adapted to life in interstitial spaces by the reduction of the body size and the absence of the eyes, but the general shape of body, pereopods and tailfan do not differ so much from the morphology of the larger species of *Cyathura* as it does in the limnic species *C. specus* and *C. curassavica*.

Comparing the descriptions of all known species of *Cyathura* some interesting features of the morphology of some species can be found (e.g. form of P1 of *C. eremophila* and blind species; appendix masculina of *C. burbancki*, *C. carinata*, *C. higoensis*, *C. polita*), which give an idea of possible relationships between groups of species. But the inaccuracy or incompleteness of many descriptions (e.g. *C. crucis*, *C. indica*) prevents an analysis. Often important features are not known (e.g. exact shape and setation of the tailfan of *C. estuaria*, *C. kikuchii*, *C. pusilla*, *C. rudloei*, etc.). In this situation it is difficult to study the phylogeny of the species.

No cyathurans are known from the Southwest Pacific, where *C. numeae* n.sp. was found, though some species occur on the Indomalaysian, Chinese and Japanese coasts (*C. indica*, *C. siamensis*; 3 species from Japan; '*C. carinata*' from China: Tattersall, 1921; *C. chapmani* from Borneo). Probably more new species are to be discovered in the upper littoral and in estuaries of the Southwest Pacific. The origin of *C. numeae* n.sp. is an enigma.

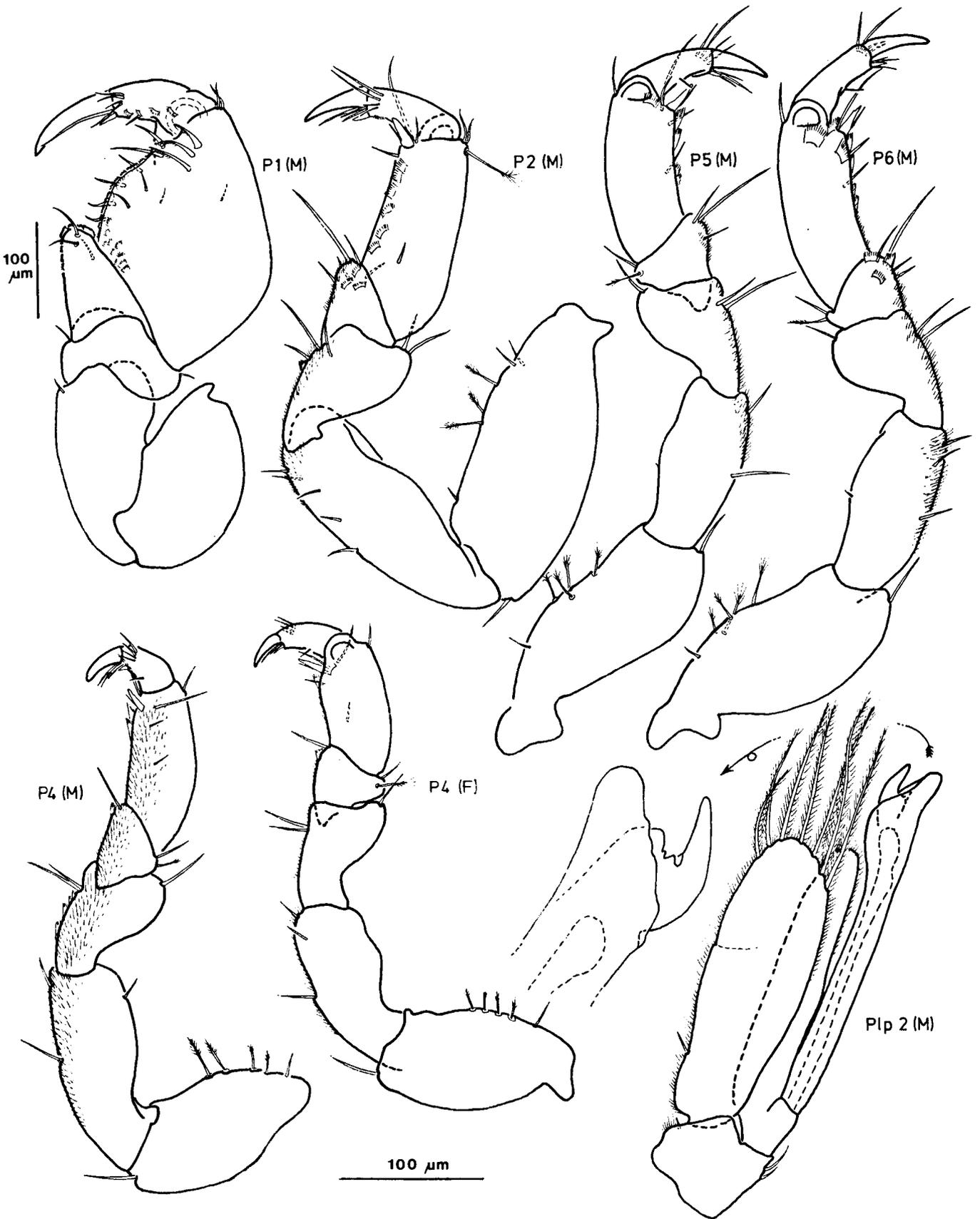


Fig. 3. *Cyathura nuneae* n.sp.; P1 drawn less enlarged than P2-6.

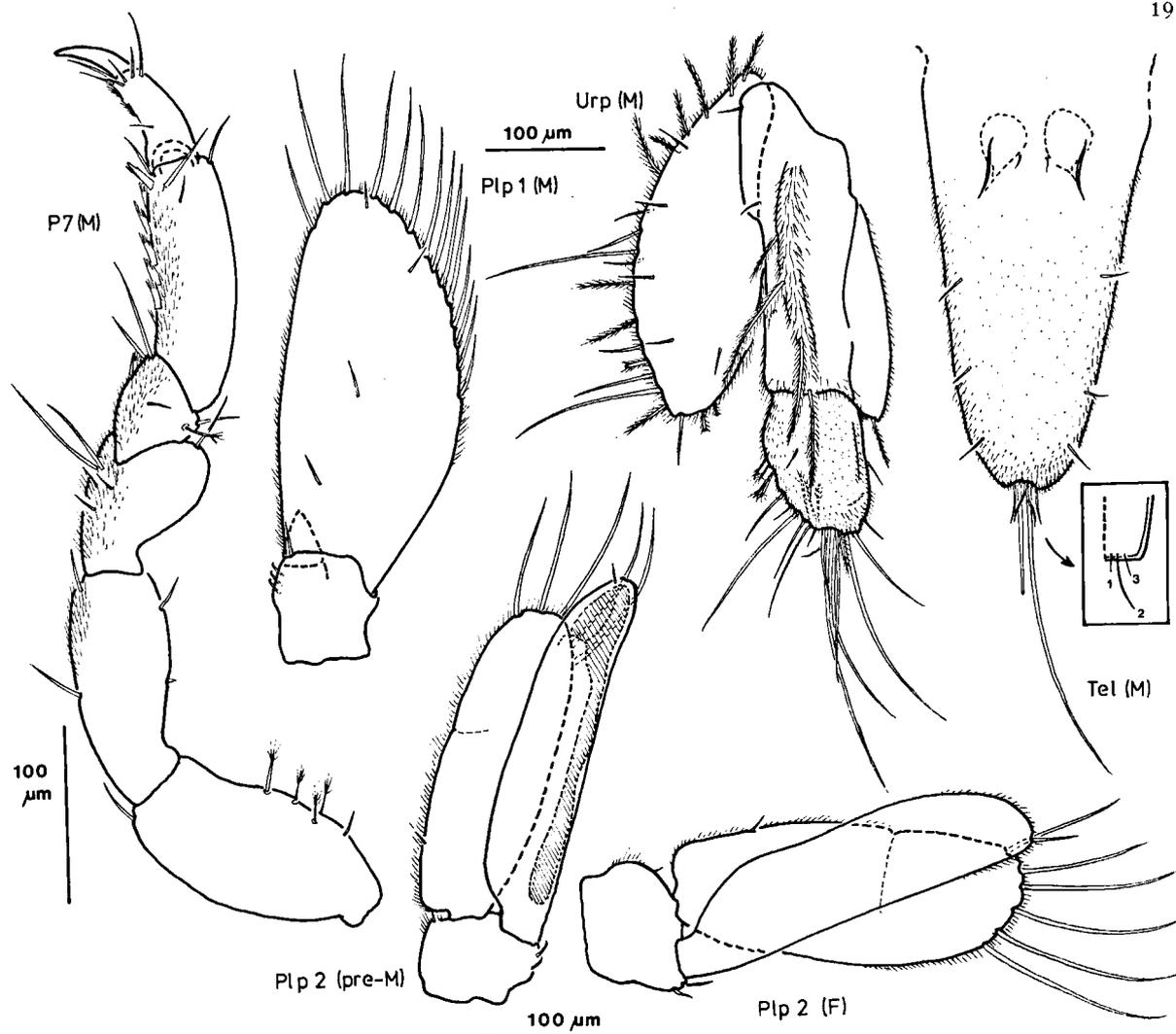


Fig. 4. *Cyathura numeae* n.sp.; swimming setae of pleopods shown as simple setae.

To support Burbank's theory (1967) of the Tethys-origin of recent species of *Cyathura* more exact studies on morphology and distribution are necessary. It is imaginable that the marine as well as the few limnic species evolved from brackish water populations, which have a large distribution. Recent species living in estuaries, brackish waters and on the sea floor near the mouth of rivers have an appendix of the *carinata*-type (*C. carinata*, *C. burbancki*, *C. higoensis*, *C. kikuchii*, *C. muro-mienseis*, *C. polita*); they probably occur world-wide (from Europe to Japan, including Africa; Atlantic coast of North America). The different types of appendices masculinae found in hypogean species (Fig. 5) could be derived from the bifurcate *carinata*-type. The question is, whether the limnic species evolved several times independently or if they have a

common ancestor. In the latter case the long lateral lobes of the apex of the appendix masculina in *C. milloti* (Réunion) and *C. sbordonii* (Mexico) (species with coiled lobe), and of *C. chapmani* (Borneo) would be homologous structures. Another homology could be the reduction of the medial tooth on the palm of P1. Among the blind species the tooth only occurs in the male of *C. milloti*. These features can be used to discuss a close relationship of these species. The reductions of the endopodite of Plp1 and the exopodite of Urp could be analogies, which evolved of functional necessities. Not all of the blind species show these features: the endopodite of Plp1 has nearly normal size in *C. specus* and *C. chapmani*, the endopod of the Urp is oval and not very slender in *C. numeae* n.sp. and *C. sbordonii*. Similar analogies can also be found in hypogean Paranthuri-

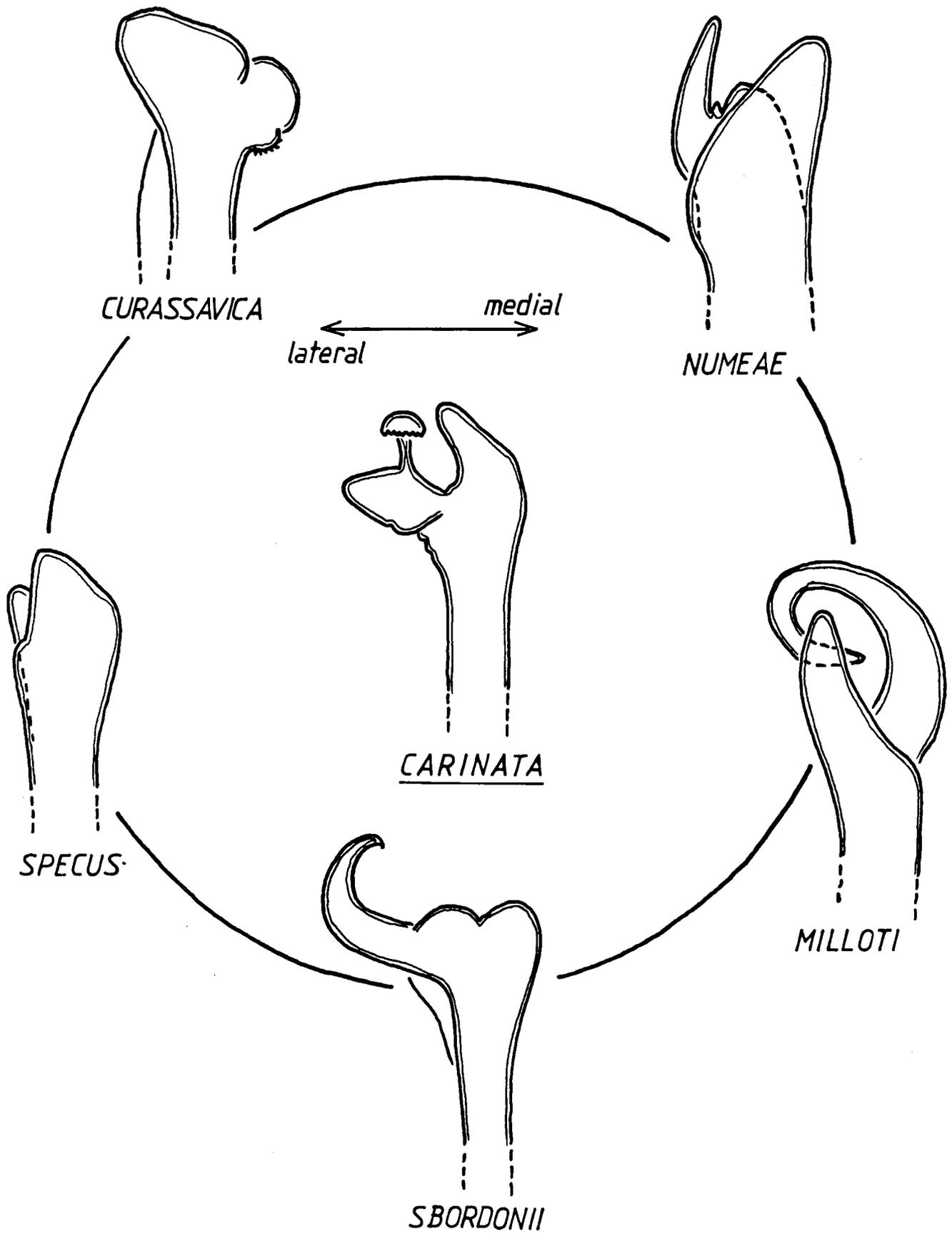


Fig. 5. Different types of apices of the appendix masculina (copulatory organ) in the genus *Cyathura*.

dae (Wägele, in press). It would be premature to use these few features alone for far-reaching conclusions.

ACKNOWLEDGEMENT

My sincere thanks are due to Prof. Dr. H.K. Schminke of the University of Oldenburg, who collected the material described herein, for making the anthurids available to me for study.

REFERENCES

- ANDREEV, S., 1982. Une nouvelle *Cyathura cavernicole* de Sarawak - Kalimantan du Nord (Isopoda, Anthuridae).- *Bull. Zool. Mus. Univ. Amst.*, 8 (18): 149-155.
- ARGANO, R., 1971. *Cyathura sbordonii*, nuova specie cavernicola del Messico sudorientale. Diagnosi preliminare.- *Fragm. ent.*, 7: 303-305.
- BOWMAN, T.E., 1965. *Cyathura specus*, a new cave isopod from Cuba.- *Stud. Fauna Curacao*, 22: 88-97.
- BURBANCK, W.D., 1967. Evolutionary and ecological implications of the zoogeography, physiology and morphology of *Cyathura*.- In: G.H. LAUFF (ed.), *Estuaries*, *Publs Am. Ass. Advnt Sci.*, 83: 564-573.
- CHAPPUIS, P.A., DELAMARE-DEBOUTTEVILLE, C. & PAULIAN, R., 1956. Crustacés des eaux souterraines littorales d'une résurgence d'eau douce à la Réunion.- *Mém. Inst. scient. Madagascar*, (A) 11: 51-78.
- CLÉRET, J.J., 1959. Polytypisme antennulaire et rapport numérique des sexes chez *Cyathura carinata*.- *C.r. Acad. Sci. Paris*, 248: 2508-2510.
- GHIRADELLA, H.T., CASE, J.F. & CRONSHAW, J., 1968. Structure of aesthetascs in selected marine and terrestrial decapods: chemoreceptor morphology and environment.- *Ann. Zool.*, 8: 603-621.
- JAZDZEWSKI, K., 1969. Biology of two hermaphroditic crustaceans, *Cyathura carinata* (Kröyer) (Isopoda) and *Heterotanais oerstedii* (Kröyer) (Tanaidacea) in waters of the Polish Baltic Sea.- *Zoologica Pol.*, 19: 5-25.
- KENSLEY, B., 1980. Anthuridean Isopod Crustaceans from the International Indian Ocean Expedition, 1960-1965, in the Smithsonian Collections.- *Smithson. Contr. Zool.*, 304: 1-37.
- LEGRAND, J.J. & JUCHAULT, P., 1963. Mise en évidence d'un hermaphroditisme protogynique fonctionnel chez l'isopode anthuridé *Cyathura carinata* (Kröyer) et étude de mécanisme de l'inversion sexuelle.- *C.r. Acad. Sci. Paris*, 256: 2931-2933.
- SCHMALFUSS, 1974. Skelett und Extremitätenmuskulatur des Isopoden - Cephalothorax.- *Z. Morph. Okol. Tiere*, 78: 1-91.
- SCHULTZ, G.A., 1969. How to know the marine isopod crustacea: 1-359 (W.C. Brown Co., Dubuque).
- STORK, H.A., 1940. A new Fresh-Water Isopod from Curacao.- *Stud. Fauna Curacao*, 2: 147-150.
- TATTERSTALL, W.M., 1921. Zoological results of a tour in the far East, pt. 7. Mysidacea, Tanaidacea and Isopoda.- *Mem. Asiat. Soc. Beng.*, 6: 403-433.
- WÄGELE, J.W., 1979. Der Fortpflanzungszyklus von *Cyathura carinata* (Isopoda, Anthuridea) im Nord-Ostsee-Kanal.- *Helgoländer wiss. Meeresunters.*, 32: 295-304.
- , (in press). The hypogean Paranthuridae *Cruregens Chilton* and *Curassanthura Kensley* (Crustacea, Isopoda), with remarks on their morphology and adaptations.- *Bijdr. Dierk.*, 52 (1).

Dr. J.W. Wägele,
 Fachbereich 7,
 Universität Oldenburg,
 Pb. 2503,
 D-2900 Oldenburg,
 B.R.D.

received : 7.I.1982.
 distributed : 14.V.1982.