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### *MESOCYCLOPS CUTTACUTTAE* N.SP. FROM A CAVE IN NORTHERN AUSTRALIA (CRUSTACEA: *COPEPODA, CYCLOPOIDA*)

HENRI J. DUMONT AND SIBYLLE MAAS  
*Zoological Institute, The State University of Gent, Belgium.*

#### ABSTRACT

A second cave-dwelling species of *Mesocyclops* is described and figured. The first one is found in Madagascar, the only locality outside Australia where the decapod genus *Parisia*, which also inhabits Cutta Cutta cave, occurs. However, the *Mesocyclops* species are not related. *Mesocyclops cuttacuttiae* instead shows affinity in several characters with other Australian representatives of its genus. Its many special features are ascribed to a long period of isolation in a cave habitat, and are not considered to warrant the creation of a separate genus or subgenus.

#### INTRODUCTION

Little is known about cyclopoid copepods in Australian caves, but one may predict their occurrence in such environments with reasonable certainty given the known occurrence of several species of atyid prawns in subterranean waters of Australia (Holthuis, 1960; Williams, 1964). While on a recent visit to the Northern Territory, Australia, the senior author therefore endeavoured to collect from various cave pools in Cutta Cutta cave, near the town of Katherine. Cutta Cutta cave is a limestone cavity which reaches down to the water-table in several places. One of these, a shallow stagnant pool about 30 m below the

surface, was sampled on 17 October 1983, shortly before the onset of the monsoon season, during which the pool may be flooded and become temporarily incorporated in a cave stream. Cutta Cutta cave is unusual in showing constant high temperatures (ca. 36°C at the time of sampling), and its atmosphere is near saturation. Faunistically, it is known as the type locality (and, so far, only locality) for two species of atyid shrimp, both belonging to the genus *Parisia*. This genus, as understood today, occurs only in Madagascar and Australia (Williams, 1964).

At the time when the cave was visited, very high densities of *Parisia* were in evidence (of the order of tens per square metre, depth being of the order of tens of centimetres). However, some two months later (5 December 1983), and following a recent flood as the result of torrential rain on 4 December 1983, the population was much sparser (W. D. Williams, pers. comm. 8 December 1983). Two netsweeps (using a

plankton net of 100  $\mu\text{m}$  mesh size) likewise yielded a good series of colourless and eyeless cyclopoids, described here as a new species. These high population densities, besides being the result of the low water level at the time of sampling, are doubtlessly made possible by an abundant supply of organic matter in the form of bat excrement to both the terrestrial and aquatic ecosystems of the cave.

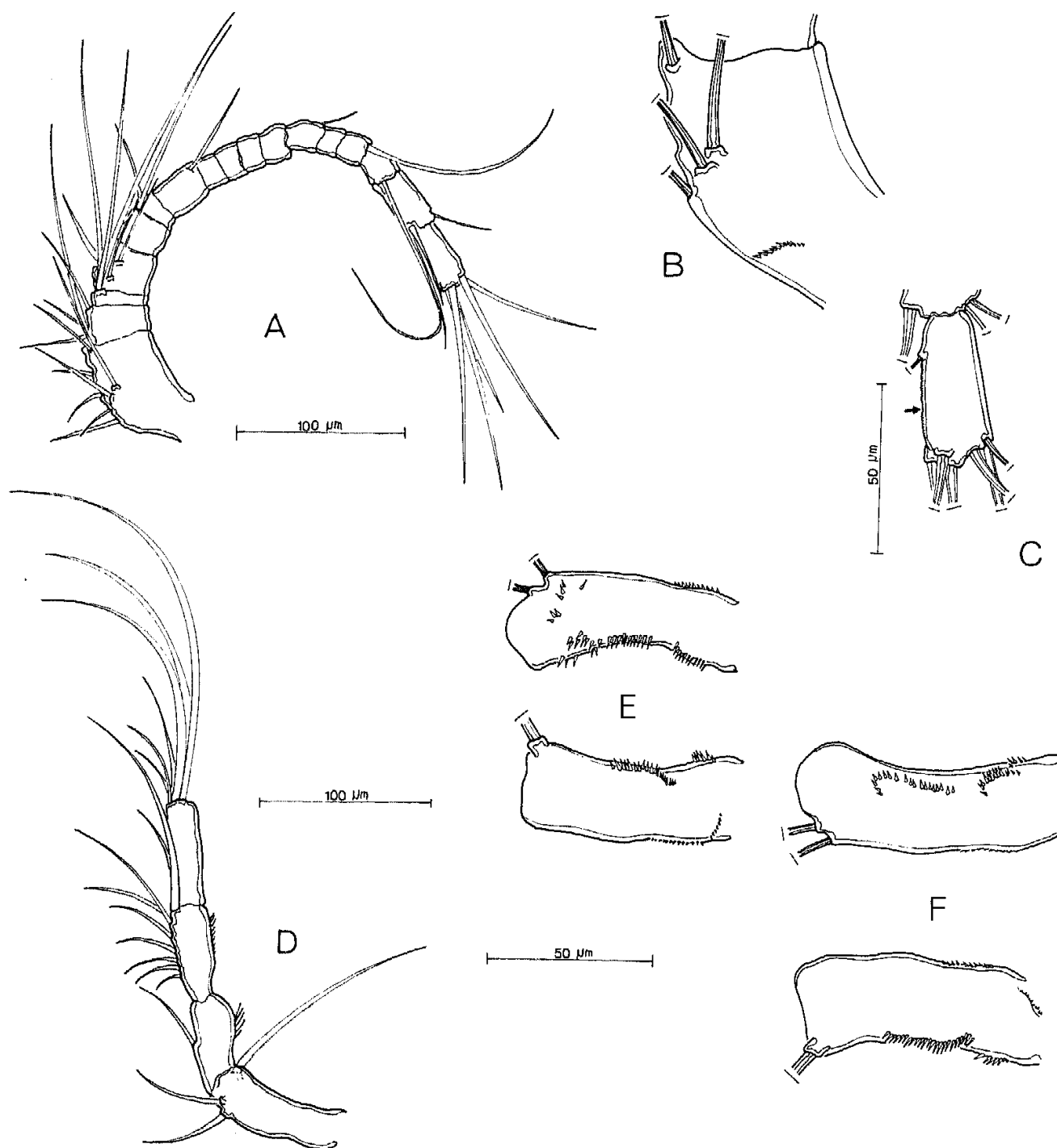


Fig. 1 *Mesocyclops cuttacuttiae* n. sp., ♀. A, first antenna ( $A_1$ ). B, basal segment of  $A_1$ . C, apical segment of  $A_1$  (arrow indicates reduced hyalin lamella). D,  $A_2$ . E-F, basipodite of  $A_2$  (2 specimens), top figure caudal surface, bottom figure frontal surface.

***Mesocyclops cuttacuttiae***

(figs. 1-5)

*Material examined* — ca. 40♂♂, ♀♀, preserved in formaldehyde, Cutta Cuta Cave, Katherine, 14°36'S., 132°32'E., 17 October 1983, coll. H. J. Dumont.

*Diagnosis* — A *Mesocyclops* with bisinuous anterior margin along the frontal horn of receptaculum seminis; shortened internal spine on apical segment of leg 5; small, blunt protruding tubercles on intercoxal plate of leg 4; spinulate furcal rami; strongly reduced membrane on segment 17 of first antenna.

*Description* — Female. Fairly small (total length 0.7-0.9 mm), compactly built (cephalothorax not much longer than wide) species (table 1). First antenna (fig. 1A)

17-segmented, largely devoid of rows of spinules, except for one short series on segment 1 (fig. 1B). Apical segment fairly compact, and with reduced hyaline membrane (fig. 1C). Second antenna composed of 4 segments (fig. 1D), basipodite with ornamentation typical of *Mesocyclops sensu* Van de Velde (1982, 1984), in particular with continuous row of spinules on the frontal and inner side of the segment, and two rows of spinules on caudal and more medial side of segment (fig. 1E, F).

Thoracopods ( $P_1$ - $P_4$ ): rami triarticulate.  $P_1$  without seta at implantation of endopodite (fig. 2A). Frontal side of basipodite with series of small spinules, and some spinules on articulation with coxopodite. Caudal side naked.

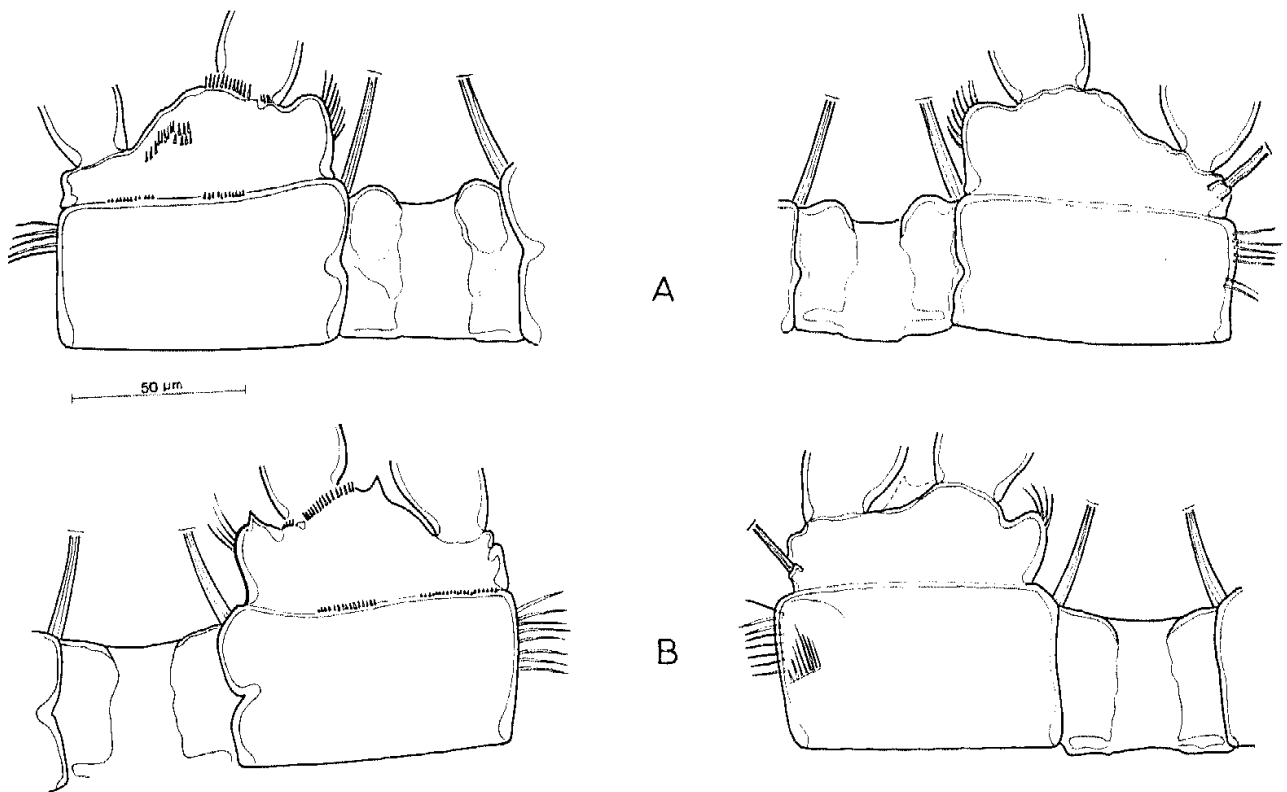


Fig. 2 *Mesocyclops cuttacuttiae* n. sp., ♀. A,  $P_1$  basipodite, coxopodite and intercoxal plate, left, frontal surface: right, caudal surface. B,  $P_2$  same, left, frontal surface: right, caudal surface.

$P_2$  (fig. 2B) with some spinules only on basipodite-coxopodite articulation on frontal surface (2B, left), one row of long spinules on external side of caudal surface (2B, right).

$P_3$  (fig. 3A) with one row of spinules on frontal surface of coxopodite (3A, right), two rows (one short, one long) on caudal surface (3A, left).

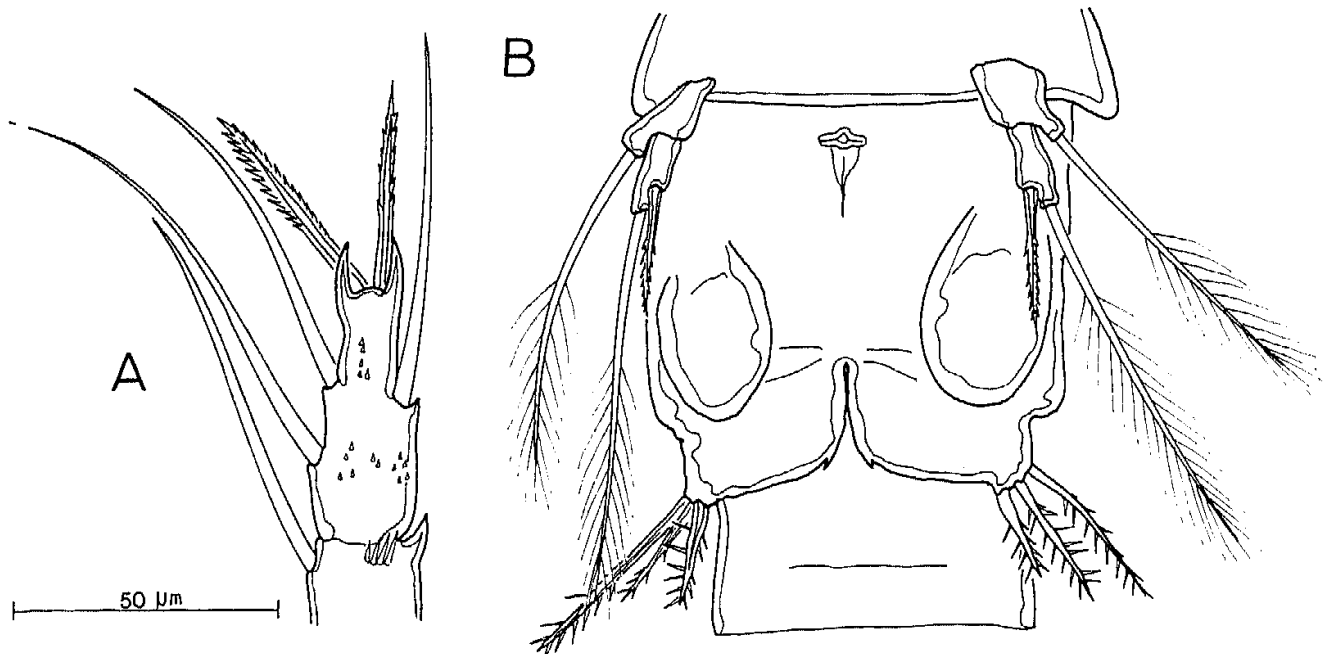


Fig. 3 *Mesocyclops cuttacuttiae* n. sp., A, ♀, enp 3 P<sub>4</sub>, B, ♂, genital segment, P<sub>5</sub> and P<sub>6</sub>.

P<sub>4</sub> (fig. 3B) frontal side of coxopodite with one row of short spinules (3B, left); caudal side with four distinct groups of spinules, and lateral boss (fig. 3B, right). Intercoxal plate with pair of blunt tubercles.

Endopodite 3 of P<sub>4</sub> fairly short, with two apical spines in divergent position, both about equal in length (fig. 4A). The spine and seta formula of the terminal segment of the exopod of P<sub>1</sub>-P<sub>4</sub> is given in Table 2.

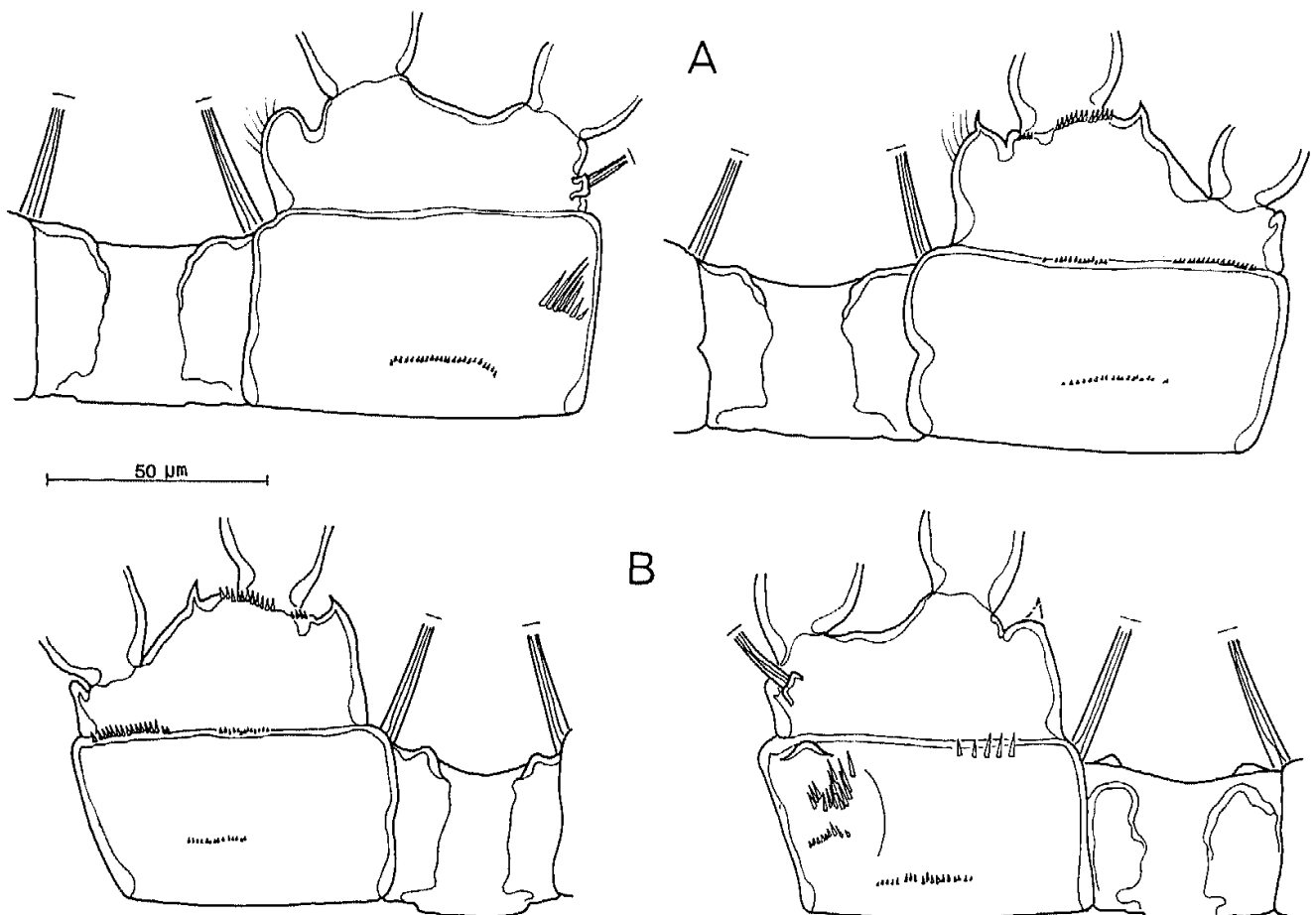


Fig. 4 *Mesocyclops cuttacuttiae* n. sp., ♀. A, P<sub>3</sub> (as fig. 2), left, caudal surface; right, frontal surface. B, P<sub>4</sub>, left, frontal surface; right, caudal surface.

P<sub>5</sub> (fig. 5B) two segmented. Basical segment with external seta, apical segment with terminal seta and internal spine. Spine distinctly (up to two times) longer than supporting segment, but less than half length of terminal seta.

Receptaculum seminis (fig. 5B): pars anterior with bisinuous anterior margin, and deep concavity in middle. Lateral horn tapering, rounded. Pars distalis rounded, saccate, rather plumply built.

P<sub>6</sub> (fig. 5C) composed of one fairly short internal seta, and two lateral buds.

Characteristic group (*sensu* Van de Velde 1982) of very small pores present at its basis. Furcal rami about 3.2-4.5 times as long as wide (fig. 5A, table 1), inner margins slightly sinuous. Length of various elements, see table 1. Dorsal seta only slightly shorter than the terminal seta (T<sub>i</sub>). The plumosities on all setae long, filiform, and well spaced. Furcal rami adorned with rows of spinules on entire dorsal surface (fig. 6D), and on basal half of ventral surface (fig. 6E).

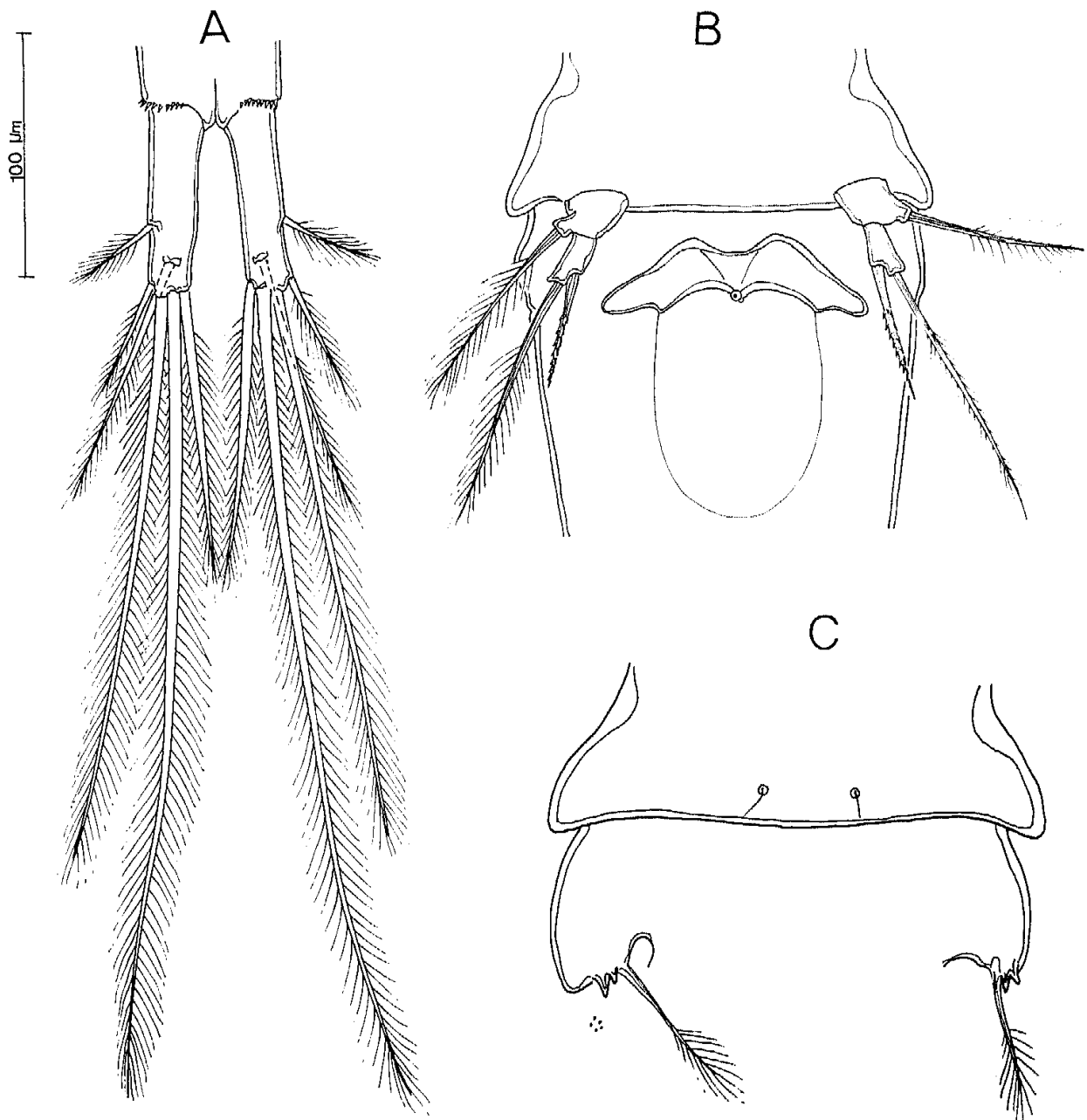


Fig. 5 *Mesocyclops cuttacuttiae* n. sp., ♀. A, furca. B, receptaculum genitalis and P<sub>5</sub>. C, P<sub>6</sub>.

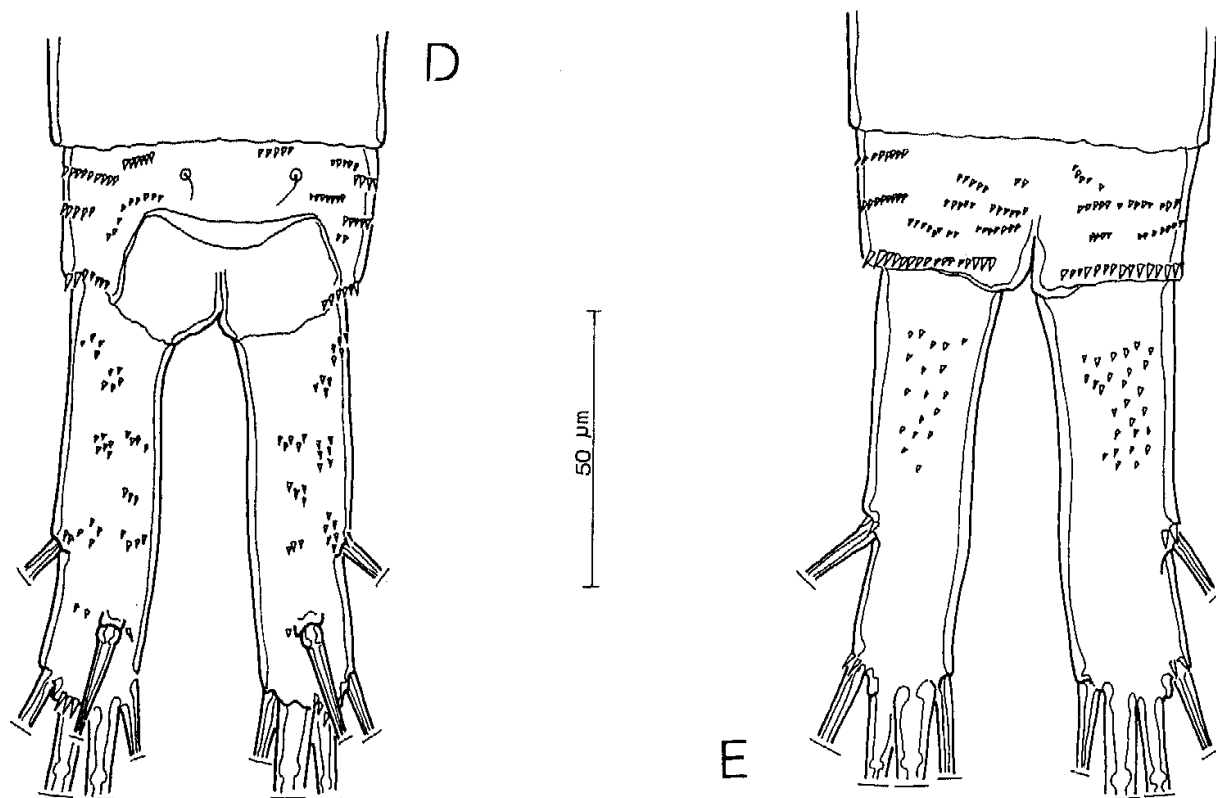


Fig. 6 *Mesocyclops cuttacuttiae* n. sp., ♀ D-E, furcal rami in dorsal and ventral view.

Male (fig. 4B). Smaller than females (ca. 0.65 mm total length) and with geniculate first antenna.  $P_5$  as in female.  $P_6$  (fig. 4B) composed of three barbed elements, external one longest, and median ones subequal in length.

*Holotype* — A dissected ♀, mounted in glycerine, deposited at the Northern Territory Museum and Art Galleries, Darwin, Australia (NTM Cr. OO 2743).

*Paratypes* — 3 dissected ♀♀, 1♂, author's collection; 3 ♀♀, (NTM Cr. OO 2744).

*Relationship within the genus* — The characters listed in the diagnosis might, at first sight, seem sufficient to create a new genus for this species. The structure of  $P_5$  would indeed suggest a genus that bridges the gap between *Diacyclops* and *Mesocyclops*. However, both the structure of the receptaculum seminis and of the basipodite of  $A_2$ , to which much weight has recently been given by Van de Velde (1982), are very characteristic of *Mesocyclops*. The new species is therefore better considered as a species of *Mesocyclops* with a shortened

internal spine on  $P_5$ , than a species of *Diacyclops* with a lengthened spine in this position. In particular, the basipodite of  $A_2$  in *Diacyclops* shows only few, ill-defined spine-groupings, and cannot easily be linked up with *Mesocyclops*.

Of particular interest with regard to the distribution of *Mesocyclops* species is the fact that the only other subterranean and cave-dwelling *Mesocyclops* species known thus far is *M. pilosus* Kiefer, 1930, from Madagascar. Such distribution parallels that of the atyid prawn *Parisia*, the other inhabitant of the pools of Cutta Cutta cave, also known only from Madagascar. However, *M. pilosus* from Madagascar is so different in the structure of its  $P_5$ , its intercoxal plate of  $P_4$ , receptaculum seminis, and the furcal area (Kiefer, 1981), that it cannot possibly be derived from or related to the Australian taxon. The two species have independently invaded the subterranean environment.

A closer relationship is found with the Australian species *M. australiensis* (Sars) and *M. notius* (Kiefer), and possibly with

some other, as yet undescribed species (Morton, pers. comm.), especially in the shape of their receptaculum seminis, in which the pars anterior is typically as in *M. cuttacutiae* (see e.g. Kiefer, 1981, fig. 6). The blunt tubercles on the intercoxal plate

are also a feature of *M. australiensis*, but less so of *M. notius*. However, both species have a well-developed, denticulate membrane on  $A_1$ , a long spine on segment 2 of  $P_5$ , and furcal appendages of proportions different from those in *M. cuttacutiae*.

TABLE 1 MEASUREMENT (in  $\mu\text{m}$ )

Specimen	L ceph	W ceph	THORAX				ABDOMEN				L. Furc. rami	W. Furc. rami	FURCA						Total L	L/B Furca	ENDOPODITE 3 $P_4$			
			Th <sub>2</sub>	Th <sub>3</sub>	Th <sub>4</sub>	Th <sub>5</sub>	L GS	abd sg <sub>3</sub>	abd sg <sub>4</sub>	abd sg <sub>5</sub>			T <sub>d</sub>	T <sub>c</sub>	T <sub>mc</sub>	T <sub>mi</sub>	T <sub>i</sub>	T <sub>1</sub>			L	B	Term- inal Spines	ext.
1♂	233	216	66	50	41	41	65	34	34	26	56	17	94	47	250	332	121	40	646	3.25	39	153	32	27
2♀	287	252	73	65	65	43	100	47	35	35	56	17	110	47	226	330	108	38	808	3.25	38	153	33	29
3♀	304	282	100	78	65	35	117	43	39	35	78	17	112	56	269	347	139	38	895	4.50	38	153	33	29
4♀	243	247	69	69	56	43	113	35	35	35	74	17	113	47	247	334	121	38	774	4.25	38	170	32	29
5♀	230	252	78	69	49	39	104	49	30	30	78	17	119	56	260	343	121	42	756	4.25	38	157	33	29

TABLE 2  
SPINE AND SETA FORMULA OF THE TERMINAL SEGMENTS OF EXOPODS

Segment 1		Segment 2		Segment 3		
int.	ext.	int.	ext.	int.	apic.	ext.
1s	1sp	1s	1sp	2s	2s, 1sp	1sp
1s	1sp	1s	1sp	3s	1s, 2sp	1sp
1s	1sp	1s	1sp	3s	1s, 2sp	1sp
1s	1sp	1s	1sp	3s	1s, 2sp	1sp

## RESUMÉ

Nous décrivons une espèce nouvelle de *Mesocyclops* d'une cave chaude en Australie du Nord, où elle vit en compagnie de deux espèces de crevettes du genre *Parisia*. Comme ce dernier genre n'est connu que de caves au Madagascar et en Australie, il était intéressant de préciser la position systématique du nouveau *Mesocyclops*. Celui-ci s'est avéré apparenté aux espèces australiennes épigées, et non pas aux espèces malgaches.

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