

First records of a leptestherid clam shrimp in Australia (Crustacea, Spinicaudata, Leptestheriidae, *Eoleptestheria*)

Brian V. Timms

Honorary Research Associate, Australian Museum, 6-9 College Street, Sydney, 2000, Australia

Corresponding author: *Brian V. Timms* (brian.timms@newcastle.edu.au)

Academic editor: *Niel Bruce* | Received 02 February 2009 | Accepted 16 July 2009 | Published 24 August 2009

Citation: Timms BV (2009) First records of a leptestherid clam shrimp in Australia (Crustacea, Spinicaudata, Leptestheriidae, *Eoleptestheria*). In: Bruce N (Ed) Advances in the taxonomy and biogeography of Crustacea in the Southern Hemisphere. ZooKeys 18: 1–16. doi: 10.3897/zookeys.18.92

Abstract

Eoleptestheria ticinensis, a highly variable Eurasian species, was collected from three widely separated sites in northern Australia. Each population is described and compared with the eight described species of *Eoleptestheria*, now all synonyms of *E. ticinensis*. It is postulated that the Australian occurrences of these clam shrimps are initiated or maintained by dispersal due to migrating birds from China.

Keywords

Taxonomy, *Eoleptestheria ticinensis*, biogeography, dispersal, morphological variability

Introduction

Of the approximately 150 species of clam shrimps in the world (Brendonck et al. 2008), 31 are reported from Australia (Richter and Timms 2005; Timms in press; Timms and Richter in press). These are divided among the families Lynceidae (two species) Limnadiidae (17), Cyzicidae (11) and the Cyclestheriidae (1), but none in the Leptestheriidae. Of the later, Garcia and Pereira (2003) list 34 species worldwide, Brtek (1997) lists 35 valid species and Brendonck et al. (2008) count about 37 species. It is difficult to know how many species (and genera) there are because of wide variability within and between populations (e.g. Straškraba 1965) and because some authors synonymise species without argument (e.g. Brtek 1997; Naganawa 1999) and still others do not accept some genera (e.g. Brtek 1997; Dumont and Negrea 2002).

Herein, I report the first Australian records of leptestheriid clam shrimp, which on current understanding belongs to the genus *Eoleptestheria*.

Leptestheriid clam shrimps (Fig. 1) are characterised by having an elongated delicate carapace with numerous growth lines, head lacking a pyriforme frontal organ, a body of 22–32 segments, a rostral spine in both sexes, females with dorsal extensions to hold the eggs on thoracopods 10 and 11 or maybe up to number 15, a telson with numerous (>40) subequal fine dorsal spines, and a caudal furca also with numerous (>30) subequal fine spines (adapted from Dumont and Negrea 2002).

It is the purpose of this paper to describe three populations of *Eoleptestheria* recently found in Australian and to note their relationships.

Methods

Measurements were made using a stereomicroscope and a template placed under the specimens and marked in half millimetres (accurate to ± 0.25 mm). Drawings were made with the aid of an ocular drawing tube. Thoracopod terminology is after McLaughlin (1980) and Ferrari and Grygier (2003). In the drawings of the fifth thoracopod not all setae are shown. Classification follows Martin and Davis (2001), and synonymy Straškraba (1965) and Naganawa (1999). Specimens were sourced from the Australian Museum, Sydney (AM), National Museum of Victoria, Melbourne (NMV), and The Department of Environment and Conservation Research Laboratories, Woodvale, Western Australia (DEC).

Taxonomy

Order Diplostraca Gerstaecker, 1866

Suborder Spinicaudata Linder, 1945

Leptestheriidae Daday, 1923

***Eoleptestheria* Daday, 1913**

***Eoleptestheria ticinensis* (Balsamo-Crivelli, 1859)**

Isaura ticinensis Balsamo-Crivelli, 1859: 115, Tab I.

Estheria ticinensis.– Grube, 1865: 234.

Eoleptestheria ticinensis.– Daday, 1913: 96, Fig.8a-o; Daday 1923: 263, Fig. 82 a-q;

Straškraba, 1965: 578–584, Fig. 5–7, Tables III-V; Brtek and Thiery 1995: 266.

Eoleptestheria inopinata Daday, 1923: 262, Fig. 81 a-i; Straškraba, 1965: 581–582, Table V.

Eoleptestheria chinensis Daday, 1923: 269, Fig. 83 a-q; Uéno 1940: 99–100, 21–28;

Røen 1952: 212, Fig.19; Straškraba, 1965: 581–582, Table V; Zhang et al. 1976:

24; Hu 1988: 82, Figs 92–98; Shu et al. 1990: Table 1.

Eoleptestheria variabilis Botnariuc, 1947: 82, Pls 1,2,4,5, Figs. 2,3; Straškraba, 1965: 581–582, Table V.

Eoleptestheria spinosa Marinček, 1978: 103–118.

Eoleptestheria spinosa tenuis Marinček & Valvajter, 1979: 155–167.

Eoleptestheria spinosa magna Marinček & Valvajter, 1982: 63–72.

Eoleptestheria spinosa mira Marinček & Petrov, 1983: 89–103.

Eoleptestheria dongpingensis Hu 1987: 341–347, Fig. 1–15; Hu 1988: 82–83, Figs 99–109; Zhang and Hu, 1992: Table 1; Shu et al. 1990: Table 1.

Eoleptestheria yanchowensis Shu et al., 1990: 410–416, Figs. 1–21, Table 1.

Eoleptestheria sangziensis Zhang and Hu, 1992: 65–72, Figs. 1–12, Table 1, syn. n.

Descriptions of Australian populations

Toomaroo population

Figs 1–3

Material examined. 9 females, Queensland, via Thargomindah, Bindegolly National Park, Lake Toomaroo, 27° 59' S, 144° 12' E, 1 February 2006, Mark Handley, AM.

Description of female. Carapace (Fig 2A) 6–7 mm by 3.3–4.6 mm, oval, but dorsally centrally humped, a dorsoposterior angle and no dorsoanterior angle and broadly rounded both ventroanteriorly and ventroposteriorly. Umbo only slightly developed and associated with a small protuberance anteriodorsally. Growth lines 15–22, unevenly spaced, with tighter spacing marginally and interstices between lines granular. Carapace thin, semitransparent and usually brown in colour, especially in the older areas.

Head (Fig 2B) with a rounded occipital condyle and well separated from the trunk. Conspicuous ocular tubercle and large winged fornices of triangular rostrum terminating in an anteriorly directed rostral spine, about one-third length of the rostrum. Ocellus oval and within rostrum, usually in a ventrobasal position.

First antennae about 1.5 times the length of the base of the second antenna and with 10–13 lobes, each with 2–4 dorsal setae. Second antenna base (Fig. 2D) with about 12 rows of dorsal spines and bearing two rami with 13–14 antennomeres each. Each antennomere with 3–8 dorsal spines and 2–6 ventral setae, all evenly spaced except terminal on basal antennomeres. Flagellum middle antennomeres with most spines and setae, while terminal and basal antennomeres with least spines and setae.

Trunk segments 24 (Fig. 1). Posteriormost 14 segments (Fig. 2E,F), sometimes fewer, armed dorsally with numerous spines inserted on a common broad base, triangular in central segments of the array, pedunculate in the 3–4 most anterior segments. Segments around 17 th (i.e. seventh last segment) with strongest and most (typically 13) spines, and those anterior to and posterior to this segment with fewer spines, e.g. 5 spines on third last segment. Fifth thoracopod (Fig. 3) with five endites on the medial surface, each about the same size. Also a comb-like discoid lobe (Ferreira and Grygier 2003) with many closely packed setae basally at right

angles to the first endite. First endite with about 20 anterior and posterior setae, while remainder with about 12 anterior and posterior setae. All setae two segmented, but only the posterior setae plumose. Anterior setae 2–3 times longer on first endite than on endites 2–5. Distal posterior setae tend to be longer than proximal setae on each endite. Fifth endite with a long unsegmented palp with few setae and many setules apically. Sixth endite (= endopod of some authors) also elongated but longer and wider than the palp and with more setae than palp, more medially than externally. Bipolar exopod with distal part (the flabellum) long and finger-like and a similarly shaped but smaller proximal extension. Exopod clothed with a few setae similar in structure to the posterior setae of the endites. These setae limited to apex region of flabellum and middle external edge. Epipodite finger-like, about half the length of the proximal exopod. A triangular lamellar (cf Marinček 1978), edged with setae, protruding from base of flabellum. Gross examination of other thoracopods reveal slightly different proportions of some components, especially the exopod. Eleventh and twelfth pairs with flabellum sheathed and carrying eggs. Palp of fifth endopod of third thoracopod one segmented.

Telson (Fig. 2C) with a concave dorsal surface with about 40 (39–43) small spines of similar size throughout. Paired telsonic setae (filaments) inserted on slight mound between the first and second denticles. Caudal furca even curved, a little shorter than the dorsal surface of the telson, and with about 40 small, subequal spines arranged on a

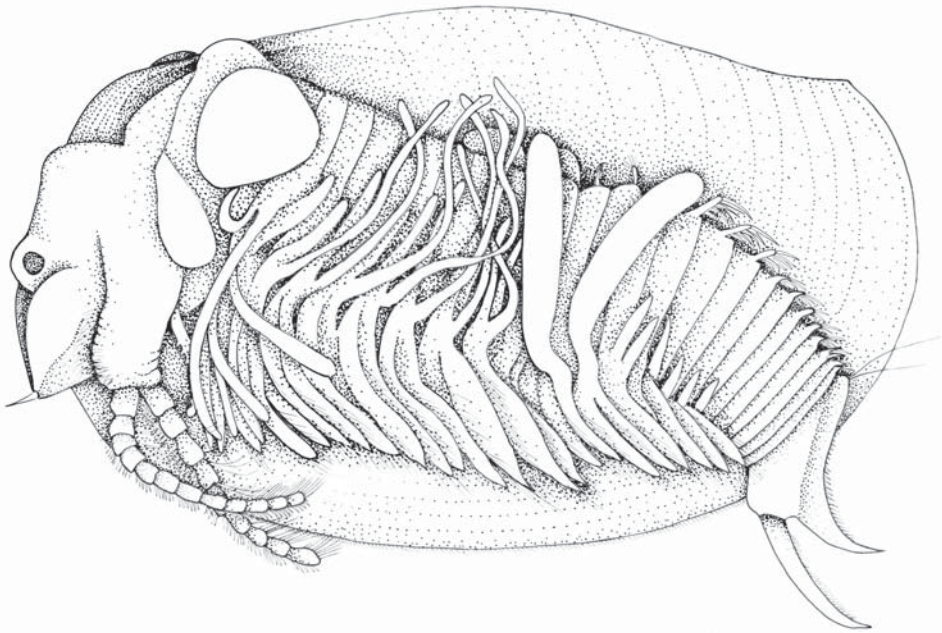


Figure 1. Lateral view of a whole female of *Eolephestheria ticinensis* from Lake Toomaroo, Queensland. Drawing by Jane McRae.

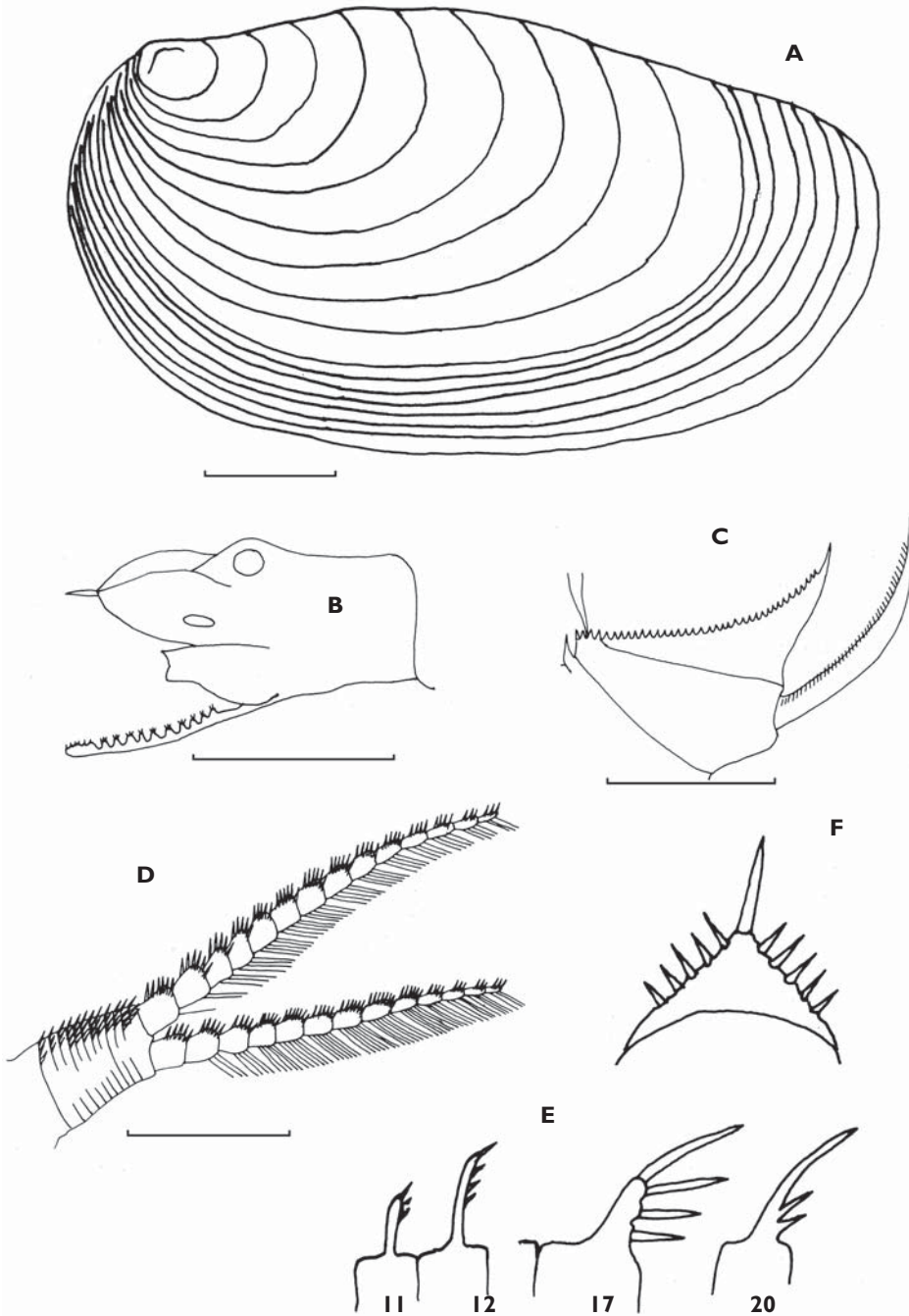


Figure 2. A female of *Eolepesteria ticinensis* from Lake Toomaroo. **A** carapace **B** head **C** telson **D** second antenna **E** dorsal spination on segments, 11, 12, 17 and 20 **F** frontal view of spines and their common triangular base on segment 18. Scale bars 1 mm.

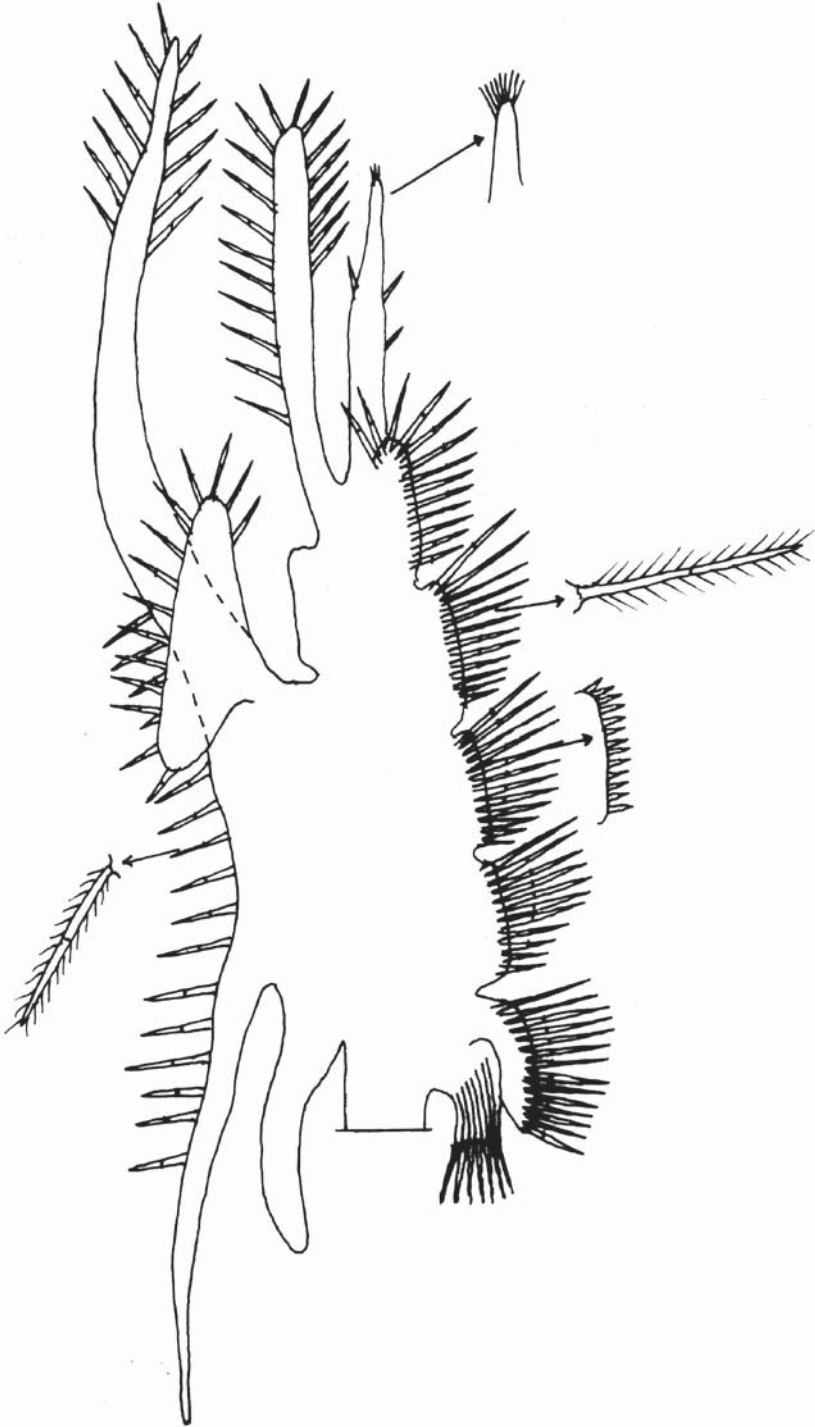


Figure 3. Fifth thoracopod of *Eolepestheria ticinensis* from Lake Toomaroo. Only posterior setae shown on endites, though for third endite they are shown on an extra outline to the right of the main diagram.

curved line commencing on medial surface basally but on dorsal surface apically. These spines slightly smaller than the telsonic spines.

Kuranda population

Fig. 4

Material examined. 5 females, Queensland, via Cairns, Kuranda, Mrs Armitage, 27 February 2006, NMV J93994.

Description of female. Carapace (Fig. 4A) larger 9.0–9.8 by 5.8–6.4 mm with more growth lines (26–32), but same shape as in the Toomaroo material and with same number of body segments (24). Head (Fig. 4C) as in Toomaroo material. Dorsal armature similar to that in the Toomaroo material, but with slightly more segments (15) involved. Similar arrangement and number of dorsal spines, i.e. those on central segments on a quasiequilateral triangular base and number up to 13 per segment, those most posterior segments number fewer (3–7) and on a slightly protruding triangular base, and the most anterior on a column.

First and second antenna similar to those of the Toomaroo material, but with slightly different numbers (9–12 lobes on antenna 1 and 12–13 rami of antenna II).

Telson (Fig. 4D) with more spines (ca 50–60) and more caudal furca spines (ca 50) than in the Toomaroo material, but their arrangement similar, i.e. equal sizes and in a curved line on the claw, basially mesodorsal and apically dorsal.

Benmore Well clay pan population

Fig. 4

Material examined. One female, Western Australia, Pilbara, near Karattha–Port Headland road, Benmore Well clay pan, 21° 2.7336'E, 117° 39.7836'E, J. Macrae and A. Pinder, 3 February 2006, DEC PSW096.

Description of female. Carapace (Fig. 4B) 5.9 by 3.9 mm, slightly humped mid-dorsally, with rounded dorsoanterior and dorsoposterior corners, and 34 closely spaced growth lines. Areas between growth lines with small rounded protuberances tending to lie, between outer growth rings, in meridian lines. Umbo most protruding of the three populations.

Head (Fig. 4E) as in Toomaroo population, but with winged fornices unevenly developed, widest centrally.

First and second antenna similar to those of the Toomaroo material, but with slightly different numbers of lobes and rami (9 lobes on first antenna and length only just longer than peduncle of second antenna and 12–13 rami on second antenna).

Body segments 23. Posteriormost 12 segments with dorsal spines; anterior most and posteriormost with spines on a peduncle, but central segments with spines on a

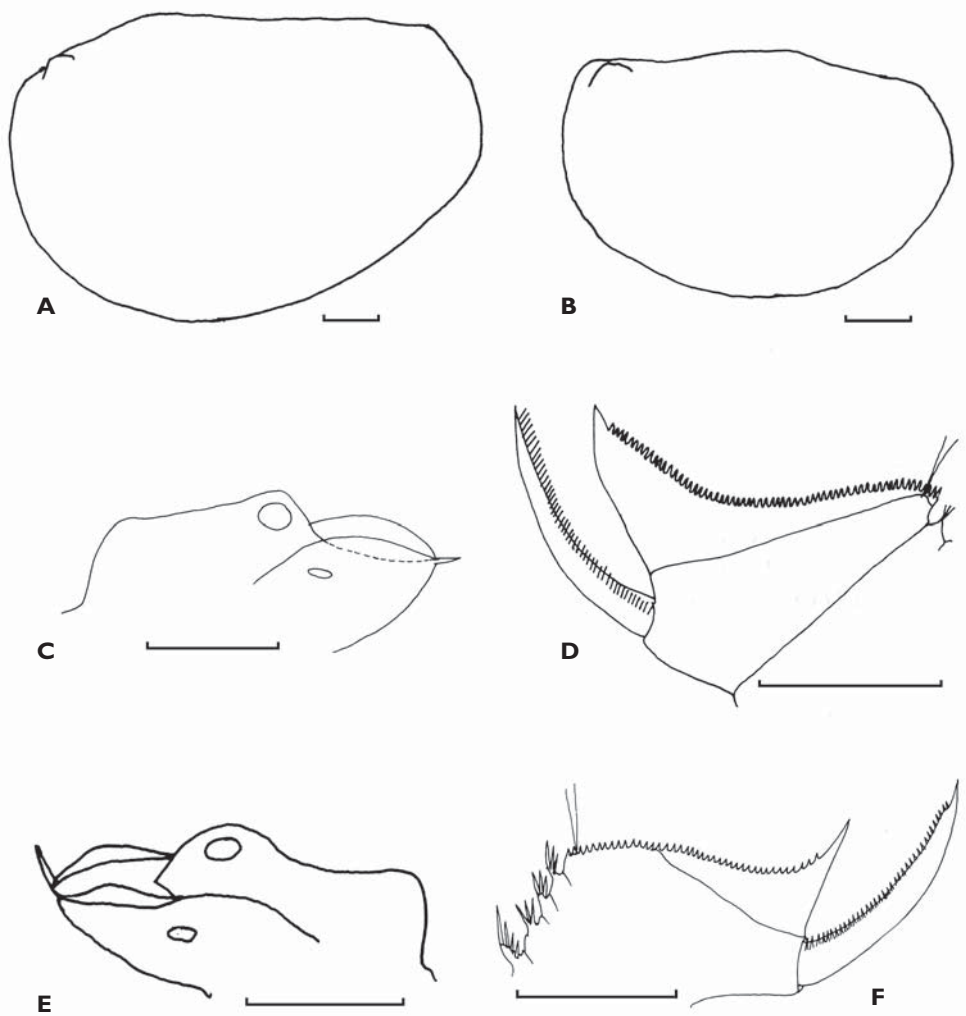


Figure 4. Females of *Eolepesteria ticinensis* from Kuranda, Queensland (A,C,D) and from Benmore Well clay pan, Western Australia (B,E,F). **A, B** carapaces, growth lines not shown as they are too numerous **C, E** heads **D, F** telsons. Scale bars 1 mm.

flat triangular base. Up to 13 spines on segments around the seventh posterior most, decreasing anteriorly and posteriorly.

Limbs unstudied, but segments 1–9 with long exopods (flabella). Segments 10 and 11, on one side only of the only specimen, with sheathed tubular extensions carrying eggs.

Telson (Fig. 4F) as in Toomaroo material; about 42 dorsal spines and about 30 spines on the caudal claw. Spines subequal, those on caudal furca in a weakly row, basally mesodorsal and apically dorsal.

Discussion

The presence of a rostral spine, dorsal extensions of exopods on some thoracopods to hold eggs, and the presence of numerous similar spines on the telson and caudal claw define these three Australian populations as a leptestheriid spinicaudatan (Daday 1923; Dumont and Negrea 2002). Moreover they are accommodated within the genus *Eoleptestheria*, by reason of the rounded occipital condyle.

There are a number of minor variations between the three populations:

- (a) Carapace size and number of growth lines vary, as do minor surface markings.
- (b) Rostral fornices are uneven in the Benmore Well clay pan specimen, but even in the other two populations.
- (c) The Benmore Well clay pan specimen also has a relatively shorter first antenna with fewer lobules, but the second antennae are similar in all three populations.
- (d) Trunk segments vary between 23 and 24, while the number of those dorsally armed vary a little, as does the extent of the armature, with the Toomaroo population with most spinose.
- (e) The Toomaroo and Kuranda populations have the epipodites of 11th and 12th segments sheathed for carrying eggs, but in the Benmore Well clay pan population it is the 10th and 11th segments that are so modified.
- (f) The shape of the telson and caudal claw is similar in all three populations, but the Kuranda population has far more spines than the other two (50–60 on telson cf ca 40; 50 on caudal furca cf ca 30).

Thoracopods are not thoroughly studied in *Eoleptestheria*, and the present study based on few specimens does little to redress the situation. It is clear however that while thoracopods conform to the generalised spinicaudatan structure (McLaughlin 1990; Ferrari and Grygier 2003), they have a character apparently unique to *Eoleptestheria*, a triangular lamella at the base of the distal exopodite (Fig. 2). Marinček (1978) thought that the basal discoid lobe was also unique to *Eoleptestheria*, but at least some cyzicids have it too (Ferreir and Grygier 2003). The triangular lamella is illustrated for the recently described Chinese species (Hu 1986; Shu et al. 1990; Zheng and Hu 1992), but only in *E. dongpingensis* is the discoid lobe shown (Hu 1986, Fig 13a). The component parts of the thoracopods apparently vary in relative size between individuals and certainly between thoracopods (Marinček 1978). Of most interest is the segmentation and relative size of the palp of the fifth endite (termed the palpus endopoditalis by many authors). It is one to three segmented but insufficient data are available on its variability in segment number and relative size, so that its use in species or population discrimination is presently limited.

Variations between the three populations are not systematic. Smaller size in the Toomaroo population (associated perhaps with their youth—see later) may explain the lower number of growth lines and telsonic and caudal claw spines, but other differences seem to be random. Similarities between the three groups far exceed their minor differences, so it is concluded they are all belong to the one species of *Eoleptestheria*. But is this species new or can it be accommodated within a described species?

The number of valid species of *Eoleptestheria* is disputed: Straškraba (1965) synonymised three European species and the only then known Chinese species into *E. ticinensis* (Balsamo-Crivelli 1859), Brtek (1997) accepted 4 of 8 species he listed, but Naganawa (1999) thinks, without giving any analyses, there is only one (but curiously omits *E. sangziensis* from his list). I am also of the opinion that there is only one widespread and variable species of *Eoleptestheria*. Evidence for this is provided firstly by Straškraba (1965) in his study of the variability of *E. ticinensis* in Czechoslovakia and on the overlap in characteristics of this species with those of *E. inopinata*, *E. variabilis* and *E. chinensis* (Table 1. *Eoleptestheria spinosa*, described after Straškraba study, also lies within the range of variability of the European material, thus confirming Naganawa's synonymy of it with *E. ticinensis*. Shu et al. (1990) give a comparative table supposedly separating *E. chinensis*, *E. dongpinensis* and *E. yanchowensis* and similarly Zhang and Hu (1992) give a table separating their *E. sanzhiensis* from *E. dongpingensis*, but the supposed differences are minor in all the Chinese forms and could be due to variability of characters in separate populations. This argument is strengthened by Petrov and Marinček's (1995) study of age induced variability in the closely related *Leptestheria saetosa* Marinček and Petrov. These authors show that many of the characters used in the separating of the various species of *Eoleptestheria* change with age, including proportions of the carapace, presence or absence of marginal hairs, shape of rostrum and occipital condyle, number of trunk segments equipped with dorsal spines, number of telsonic spines, and segmentation in the palp of the fifth endite. Also it is well known that carapace size and number of growth lines are variable and there is even some variation in number of trunk segments (Straškraba 1965; Richter and Timms 2005). Because of this, not one of the six differences between *E. sangziensis* and *E. dongpingensis* given by Zhang and Hu (1992) is significant, thus invalidating *E. sangziensis* as a separate species.

If there is but one variable species of *Eoleptestheria*, are the populations in Australia sufficiently different to be given species rank? Most of their characteristics (Table 1) are accommodated within the range of *E. ticinensis* s.l., except for the lower number of armed trunk segments, and lower number of lobes and rami on first and second antennae respectively. Also in two of the three populations there are more spines of the dorsum of the trunk segments than in overseas populations. All four of these features could be an expression of even wider variation (cf. Straškraba 1965) or of change with age (Petrov and Marinček 1995), or be due to founder effects associated with a small number of dispersing eggs (Provine 2004). The most parsimonious conclusion is to consider the Australian populations as further variations within the *E. ticinensis* complex, rather than a separate species.

Eoleptestheria is rare in Australia, though admittedly all three collections are from remote regions, and therefore not likely to be commonly encountered. However, the Lake Toomaroo population has occurred only once in a long term study (so far 15 years) of the lake (Mark Handley, pers. comm.). Two of the three occurrences are sites in far north of Australia and as such are likely to be visited by returning migrating birds from the northern hemisphere on arrival or soon

Table 1. Comparative characteristics of *Eoleptestheria* species

Character species	EUROPE			CHINA				AUSTRALIA			
	<i>E. inopinata</i>	<i>E. variabilis</i>	<i>E. tictinensis</i>	<i>E. spinosa</i>	<i>E. dongping-ensis</i>	<i>E. s angzhenensis</i>	<i>E. chinensis</i>	<i>E. yanchow-ensis</i>	Toomaroo	Kuranda	Benmore
author and date	Daday 1923	Botmariuc 1947	(Balsamo-Crivelli 1859)	Marinček 1978	Hu 1987	Zhang & Hu 1992	Daday 1923	Shu et al. 1990			
carapace length, females	—	8.5–15.5 mm	6.3–20 mm	11.3–12.1 mm	11–11.5 mm	—	10–11 mm	10.5–11 mm	6–7 mm	9–9.8 mm	5.9 mm
upper margin of carapace	straight	humped	straight to humped	straight	humped	—	humped	humped	humped	humped	humped
growth lines	—	—	ca 15	15 to 19	15 to 17	19 to 29	22 to 26	12	15 to 22	26 to 32	34
body segments	28	26 to 28	22 to 28	26 to 30	25	26	22 to 26	—	24	24	22
ovigerous legs	—	—	10 & 11	—	11 & 12	10 & 11	10 & 11	10 & 11	11 & 12	11 & 12	10 & 11
no. of armed body seg.	last 24	last 21 to 24	last 17 to 23	last 18 to 22	last 17	last 20 to 22	last 18	last 22	last 14	last 15	last 12
dorsal spines per segment	6	6 to 9	3 to 9	1 to 10	2 to 3	—	—	—	<13 spines	<13 spines	<13 spines
1st ant lobes	16 to 17	6 to 23	16 to 19	7 to 12	19 to 20	—	16 to 17	19	11	12	9
2nd ant rami	—	—	17 to 19	15 to 20	13 to 14	—	16 to 17	13	13 to 14	12 to 13	12 to 13
telsonic spines	ca 50	32 to 58	25 to 63	53 to 71	30 to 43	30 to 37	25 to 28	—	ca 39 to 43	ca 50 to 60	ca 42
telsonic spines	—	—	equal	equal	unequal	—	—	—	equal	equal	equal
caudal claw spines	—	—	—	ca 60	30 to 35	—	—	—	ca 40	ca 50	ca 30
caudal claw spines	—	—	variable	uniform	—	—	—	—	uniform	uniform	uniform
palp on 3rd endite	—	—	—	3 segments?	2 segments	2 segments	—	2 segments	2 segments	—	—
palp on 5th endite	—	—	—	—	2 segments	2 segments	—	1 segment	1 segment	1 segment	—

afterwards. These data suggest the possibility this clam shrimp is not an integral part of the Australian fauna and is occasionally being introduced by migrating birds from overseas, possibly China where *Eoleptestheria* is known to occur (op. cit.). There is at least one known occurrence of migration of lake fauna the other direction: the widespread Australian copepod *Boeckella triarticulata* in Mongolia (Bayly 1979). It is postulated that arriving birds deposit egg-laden faeces (Procter et al. 1967; Sánchez et al. 2007; Green et al. 2008) and so introduce eggs of Chinese *Eoleptostheria tacinensis* s.l.. Similarly, Thiery and Pont (1987) note that three southern European populations of *E. tacinensis* could have been introduced by migrating birds from central Europe. In Australia, there could be just one founding population and then subsequent dispersal, or two or all three populations could be founders. The most likely population to result from secondary dispersal in that in Toomaroo, given its more southerly and inland location. This theory of dispersal by birds from China is enhanced by the apparent absence of *Eoleptestheria tacinensis* in southeast Asia, but this could be due to lack of collecting there or lack of suitable habitat. Finally, it is significant that almost all other large branchiopods in Australia are endemic due to their isolation in remote Australia; the only known exceptions so far are the circumtropical *Cyclestheria hislopi* (Timms 1986) and now *Eoleptestheria tacinensis*.

The Toomaroo population was young (<2 weeks old) when collected and did not survive because of fish predation (Timms & Handley 2008). It was however old enough to have reproduced, in keeping with the known short life cycle of *E. tacinensis* (Popović & Gottstein-Matočec 2006). It will be interesting in years to come to see if this species reappears in Lake Toomaroo as a self-maintaining population.

Much has yet to be learnt on the diversity of Australian clam shrimps, but an outline is available in Richter & Timms (2005). Their key to genera needs modification to include *Eoleptestheria* and updated to include other recent discoveries (see below).

Key to Genera of Clam Shrimps in Australia

- 1 Carapace flattened and with growth lines (sometimes inconspicuous); telson with caudal furcae..... **2**
- Carapace spherical and without growth lines; telson without caudal furcae...
..... *Lynceus*

Two described species of *Lynceus*, but three species discernable genetically (Zofkova 2006). No key to species available.

- 2 Head with pyriforme frontal organ posterior to compound eyes **3**
- Head without a pyriforme frontal organ **5**

- 3 Growth lines weakly developed and generally restricted to carapace margin; movable finger of claspers in males with small sucker-like dorsodistal projection; usually <10 mm in length.....4
- Growth lines expressed and covering entire carapace; movable finger of claspers without sucker-like dorsodistal projection; usually >10 mm in length.....*Limnadopsis*¹
- 4 Telson with a spine on its lower distal angle.....*Eulimnadia*²
- Telson without a spine on its lower distal angle.....*Limnadia*
- 5 Carapace elongated, coloured brown/reddish/yellowish and > 6mm in adults; dorsal margin of telson without large spines similarly sized to caudal furcae 6
- Carapace circular, transparent and small (<5mm); dorsal margin of telson with large spines similarly sized to caudal furcae *Cyclestheria*³
- 6 Rostrum without an apical spine; telson with <25 spines, usually of variable size.....7
- Rostrum with an apical spines; telson with >30 subequal spines..*Eoleptestheria*⁴
- 7 Male rostrum in lateral view narrow, only with anterior and ventral margin and no obvious posterior margin; colour of mature specimens brown/reddish.....8
- Male rostrum in lateral view broad and hatchet-like, with posterior margin in addition to an anterior and ventral margins; colour generally yellowish *Eocycticus*⁵
- 8 Dorsoposterior end of head (occipital crest) with round and short condylus, distinct from the trunk; generally > 8 mm*Caenestheria*⁶
- Dorsoposterior of head with a pointed condylus, head and trunk dorsally not distinct; generally <6 mm *Caenestheriella*

Conclusions

Eoleptestheria ticinensis s.l. occurs uncommonly in northern Australia and is possibly introduced by migrating birds from Asia. Like other spinicaudatan families, the Leptestheriidae are now known to be world-wide in distribution. The three Australian populations have some variable morphological features, similar to those of overseas *E. ticinensis* s.l. and indeed many spinicaudatans.

1 Eight species of *Limnadopsis* identifiable by a key in Timms (in press)

2 Presently 2 species of *Eulimnadia* and 7 of *Limnadia* are recognised, but more are undescribed. Even the appropriate generic placement of Australian forms is in question (S. C. Weeks, pers. comm.). No key available.

3 Circumtropical *Cyclestheria hislopi* occurs in northern Australia (Timms, 1986).

4 The widespread Eurasian *E. ticinensis* s.l. occurs in northern Australia as reported here.

5 Two species of *Eocycticus* separable by a key in Timms and Richter (in press). In other regions *Cyzicus* would key out here, but this genus is not in Australia, despite many references to it in books (e.g. Williams, 1980).

6 Presently 2 species of *Caenestheriella* and 7 of *Caenestheria* are recognised, but some could be synonymous and others await description. No key available.

Acknowledgements

I am grateful to the ladies of the Australian Museum Library for finding obscure papers, to Jane McRae for drawing Figure 1 and to Christopher Rogers for his helpful comments on the manuscript.

References

- Balsamo-Crivelli G (1859) Di un nuovo crostaceo delle famiglia dei Branchiopodi filopodi riscontrato nella provincia di Pavia e considerazioni sovra i generi affini Memorie Istituto Lombardo di Lettere Scienze Morale e Storiche 7: 113–120.
- Bayly IAE (1979) Further contributions to a knowledge of the centropagid genera *Boeckella*, *Hemiboeckella* and *Calamoecia* (athalassic calanoid copepods). Australian Journal of Marine and Freshwater Research 30: 103–127.
- Botnariuc N (1947) Contribution á la connaissance des Phyllopo des Conchostracés de Roumanie. Notationes Biologicae 5: 68–158.
- Brendonck L, Rogers DC, Olesen J, Weeks S, Hoeh WR (2008) Global diversity of large branchiopods (Crustacea: Branchiopoda) in freshwater. Hydrobiologia 595: 167–176.
- Brtek J (1997) Checklist of the valid and invalid names of the “Large Branchiopods” (Anostraca, Notostraca, Spinicaudata and Laevicaudata), with a survey of the taxonomy of all Branchiopoda. Zborník Slovenského Národného Múzea 43: 3–66.
- Daday E (1923) Monographie systématique des Phyllopo des Conchostracés Deuxième partie Annales des Sciences Naturelles, Zoologie, 10e série 6: 255–390.
- Dumont HJ, Negrea V (2002) Introduction to the Class Branchiopoda. Guides to the Identification of the Microinvertebrates of the Continental Waters of the World. No. 19. Backhuys Publishers, Leiden. 398pp.
- Ferrari FD, Grygier MJ (2003) Comparative morphology among trunk limbs of *Caenestheriella gifuensis* and *Leptestheria kawachiensis* (Crustacea: Branchiopoda: Spinicaudata). Zoological Journal of the Linnean Society 139: 547–564.
- Garcia JV, Pereira G (2003) A review of the clam shrimp family Leptestheriidae (Crustacea: Branchiopoda: Spinicaudata) from Venezuela, with descriptions of two new species. Zootaxa 208: 1–12.
- Green AJ, Jenkins KM, Bell D, Morris PJ, Kingsford RT (2008) The potential role of waterbirds in dispersing invertebrates and plants in arid Australia. Freshwater Biology 53: 380–392.
- Hu W (1987) A new species of the genus *Eoleptestheria* Daday (Crustacea: Conchostraca) from Shandong, China. Oceanologia et Limnologia Sinica 18(4): 341–347. /in Chinese/.
- McLaughlin PA (1980) Comparative Morphology of Recent Crustacea. W.H. Freeman and Company, San Francisco. 177pp.
- Marinček M (1978) *Eoleptestheria spinosa*, a new species of Conchostraca (Phyllopo da) discovered in Yugoslavia. Bulletin du Muséum d’Histoire Naturelle Belgrade Série B 33: 103–117.

- Marinček M, Valvajter B (1979) *Eoleptestheria spinosa tenuis*, a new subspecies of Conchostraca (Phyllopoda) found in Yugoslavia. Bulletin du Muséum d'Histoire Naturelle Belgrade Série B 34: 155–167.
- Marinček M, Valvajter B (1982) *Eoleptestheria spinosa magna*, a new subspecies of Conchostraca (Phyllopoda) found in Yugoslavia. Bulletin du Muséum d'Histoire Naturelle Belgrade Série B 37: 63–72.
- Marinček M, Petrov (1983) *Eoleptestheria spinosa mira*, a new subspecies of Conchostraca (Phyllopoda). Bulletin du Muséum d'Histoire Naturelle Belgrade Série B 38: 89–103.
- Martin JW, Davis GE (2001) An updated classification of the Recent Crustacea. Natural History Museum of Los Angeles County Science Series 39, 124pp.
- Naganawa H (1999) A new spinicaudatan (Crustacea: Branchiopoda) from the island of Olkhon (Lake Baikal, Russia) and the zoogeography of East Asian Spinicaudata. Japanese Journal of Limnology 60: 585–606.
- Provine WB (2004) Ernst Mayr: Genetics and Speciation. Genetics 167: 1041–1046.
- Petrov B, Marinček M (1995) Age-influenced morphological changes in *Leptestheria saetosa* Marinček et Petrov, 1992 (Conchostraca, Crustacea). Hydrobiologia 298: 245–252.
- Popović M, Gottstein-Matočec S (2006) Biological aspects of the Spinicaudata (Branchiopoda, Diplostroca) in the largest alluvial wetland in Croatia. Crustaceana 79(4): 423–440.
- Procter VW, Malone CR, Se Vlaming VL (1967) Dispersal of aquatic organisms: viability of dissemules recovered from the intestinal tract of a captive killdeer. Ecology 48: 672–676.
- Richter S, Timms BV (2005) A list of the Recent clam shrimps (Crustacea: Laevicaudata, Spinicaudata, Cyclestherida) of Australia, including the description of a new species of *Eocycticus*. Records of the Australian Museum 57: 341–354.
- Sánchez MI, Green A J, Amat F, Castellanos EM (2007) Transport of brine shrimps via digestive system of migratory waders: dispersal probabilities depend on diet and season. Marine Biology 151: 1407–1415.
- Shu YF, Han MS, Liu ZS (1990) A new species of the genus *Eoleptestheria* from Shandong, China. Acta Zootaxonomica Sinica 15 (4): 410–416 (in Chinese).
- Straškraba M (1965) Taxonomical studies on Czechoslovak Conchostraca. III, family Leptestheriidae. With some remarks on the variability and distribution of Conchostraca and a key to the Middle-European species. Hydrobiologia 27 (3–4): 571–589
- Thierry A, Pont D (1987) *Eoleptestheria ticinensis* (Balsamo-Crivelli, 1859) Conchostracé nouveau pour la France (Crustacea, Branchiopoda, Conchostraca). Vie et Milieu 37: 115–121.
- Timms BV (1986) *Cyclestheria hislopi* (Conchostraca) in Australia. Crustaceana 51: 302–305.
- Timms BV (in press) A revision of the Australian endemic clam shrimp genus *Limnadopsis* Spencer & Hall (Crustacea: Branchiopoda: Spinicaudata: Limnadiidae) Records of the Australian Museum
- Timms BV, Richter S (in press) The clam shrimp *Eocycticus* (Crustacea: Branchiopoda: Spinicaudata: Cyzicidae) in Australia. Journal Crustacean Biology
- Timms BV, Handley M (2008) Invasion of the shrimps. Bush Telegraph Autumn 2008: 11.
- Williams WD (1980) Australian Freshwater Life Macmillan, South Melbourne. 321pp.
- Zhang WT, Hu W (1992) A new species of the genus *Eoleptestheria* (Crustacea: Conchostraca, Leptestheriidae). Journal Ocean University of Qingdao 22 (3): 65–72.

Zofkova M (2006) Evolutionary dynamics in ephemeral pools: Inferences from genetic architecture of large branchiopods. Ph D Thesis, Perth, Australia: School of Animal Biology, University of Western Australia.

New genera and species of the marine isopod family Serolidae (Crustacea, Sphaeromatidea) from the southwestern Pacific

Niel L. Bruce

Museum of Tropical Queensland, Queensland Museum and School of Marine and Tropical Biology, James Cook University, 70–102 Flinders St. Townsville, Australia 4810

urn:lsid:zoobank.org:author:9DA13F3D-AB3A-43E0-BF49-A71EBB8612D7

Corresponding author: *Niel L. Bruce* (niel.bruce@qm.qld.gov.au)

Academic editor: *Michael Sharkey* | Received 19 December 2008 | Accepted 19 January 2009 | Published 24 August 2009

urn:lsid:zoobank.org:pub:87B9757A-986D-4CCC-8276-146A617FC905

Citation: Bruce NL (2009) New genera and species of the marine isopod family Serolidae (Crustacea, Sphaeromatidea) from the southwestern Pacific. In: Bruce N (Ed) Advances in the taxonomy and biogeography of Crustacea in the Southern Hemisphere. ZooKeys 18: 17–76. doi: 10.3897/zookeys.18.96

Abstract

The marine isopod family Serolidae is reviewed for the oceanic regions of the tropical and subtropical southwestern Pacific, namely from off Lord Howe Island, Norfolk Island, northern Coral Sea, New Caledonia and Fiji. Two new genera are established: *Sedorolis* **gen. n.**, monotypic, from New Caledonia and *Myopiarolis* **gen. n.**, a widespread Southern Hemisphere genus with 11 (eight described) species. The following new species are described: *Heteroserolis pellucida* (New Caledonia), *Sedorolis simplex* (New Caledonia), *Myopiarolis koro* (Fiji), *M. systir* (New Caledonia), *M. norfanz* (Lord Howe Plateau and off Norfolk Island), *M. lippa* (northern Coral Sea), and *Thysanoserolis orbicula* (New Caledonia). Keys are provided to the serolid genera and the species of *Myopiarolis* from the southwestern Pacific. The genus *Caecoserolis* Wägele, 1994 is redefined and restricted to the type species.

Keywords

Isopoda, Serolidae, deep sea, Lord Howe Island, New Caledonia, Fiji, Norfolk Island, Queensland, Coral Sea, southwestern Pacific

Contents

Introduction	3
Species-level polymorphism in the Serolidae.....	3
Material and methods	5
Family Serolidae.....	5
Key to the genera of Indo-Pacific Serolidae	6
Heteroserolis Brandt, 1991	7
<i>Heteroserolis pellucida</i> sp. n.....	8
Sedorolis gen. n.....	14
<i>Sedorolis simplex</i> sp. n.....	15
<i>Sedorolis</i> sp.....	21
Myopiarolis gen. n.....	22
Key to the southwestern Pacific species of <i>Myopiarolis</i>	24
<i>Myopiarolis koro</i> sp. n.....	25
<i>Myopiarolis lippa</i> sp. n.....	31
<i>Myopiarolis norfanz</i> sp. n.....	34
<i>Myopiarolis novaecaledoniae</i> (Poore and Brandt, 1997), comb. n.....	40
<i>Myopiarolis systir</i> sp. n.....	42
<i>Myopiarolis</i> sp.....	48
Thysanoserolis Brandt, 1991	49
<i>Thysanoserolis orbicula</i> sp. n.....	49
Caecoserolis Wägele, 1994	54
<i>Caecoserolis brinki</i> (Kensley, 1978).....	55
Acknowledgements	56
References	57

Introduction

The Serolidae of the southwestern Pacific have received little attention, the most recent contributions being those of Bruce (2008), Harrison and Poore (1984), Holdich and Harrison (1980), Poore (1987) and Poore and Brandt (1997). This is in strong contrast to the state of knowledge for southern South America and Antarctica (summarised in Brandt 1988, 1991 and Wägele 1994; and see also Brandt 2003).

Prior to this present study only two species of serolid had been identified from the tropical and subtropical regions of Oceania, namely *Acutiserolis cidaris* Poore and Brandt, 1997 and *Caecoserolis novaecaledoniae* Poore and Brandt, 1997. The former species is also known from off the coast of Queensland, although none of the other tropical species described from Australia's eastern coasts have been recorded further east.

Examination of collections from the region of New Caledonia and other Pacific island nations, mostly held at the Muséum national d'Histoire naturelle in Paris, has revealed a hitherto unsuspected diversity of Serolidae in tropical and subtropical waters, there being at least ten species from New Caledonia and the Norfolk Ridge east to Fiji. One further species was present in collections from the northern part of the Australian Coral Sea. Use of fine-mesh collecting gear to capture small serolids would very likely further increase this number.

The family Serolidae has long been considered to be overwhelmingly Southern Hemisphere in its distribution being particularly rich in species in the Southern Ocean and Antarctic waters. This still remains the case, but clearly there are many more species in tropical and subtropical waters of the Southern Hemisphere that remain to be discovered. Five of the approximately 100 species of Serolidae are known from the Northern Hemisphere, namely *Heteroserolis carinata* (Lockington, 1877) and *H. tropica* (Glynn, 1976) from California and Pacific Panama respectively; *H. grayi* (Menzies and Frankenberg, 1966), *Atlantoserolis agassizi* (George, 1986) and *A. vema* (Menzies, 1962) from the Atlantic and Caribbean (Hessler 1967; Müller 1993).

Species polymorphism or cryptic species?

Holdich and Harrison (1980), Wägele (1986) and Poore and Brandt (1997) considered that there could be widespread species polymorphism in the Serolidae. Holdich and Harrison (1980) found 'a marked potential for intraspecific morphological variation within the family', their conclusion being extrapolated from the 'Serolis minuta group', the species of which have since been transferred to *Heteroserolis* Brandt, 1991 and *Serolina* Poore, 1987. Poore (1987) demonstrated that much of the polymorphism reported by Holdich and Harrison (1980) for *Serolina minuta* (Beddard, 1884) was due to there being five species included under that name. In contrast, Poore and Brandt (1997) later also concluded (p 167) that there was 'possible widespread polymorphism in the Serolidae'.

Held (2003) has shown that the supposed variation seen in *Ceratoserolis trilobitoides* (Eights, 1833) that had been reported by Wägele (1986) was better explained by the existence of cryptic species. Held and Wägele (2005) also demonstrated cryptic speciation in the large Antarctic isopod *Glyptonotus antarcticus* (Eights, 1833). Similar findings in the Asellota (e.g. Raupach and Wägele 2006; Raupach et al. 2007) suggest that cryptic species ‘flocks’ are to be expected, indeed commonplace, Brandt et al. (2007, supplement) stating that such flocks ‘seems to be a common phenomenon in the deep ocean’.

‘Swarms’ or ‘flocks’ of cryptic species are not phenomena restricted to the deep ocean, but are commonplace in the marine Isopoda at all depths and habitats. In the past, free-living species reported as highly variable or polymorphic were usually attributed wide distributions, both geographic and in terms of depth or habitat. In most such cases the variation attributed to the species in question proved to be due to multiple species being recorded and described as one. In the Serolidae examples are the mentioned species of *Serolina* and *Ceratoserolis trilobitoides*. In the Sphaeromatidae the reportedly polymorphic *Paracassidina pectinata* (Baker, 1911) (Holdich and Harrison 1981) proved to be six species (Bruce 1994), and a similar swarm of species exists within the genus *Oxinasphaera* (Bruce 1997). The purportedly highly variable *Cilicacaeopsis whiteleggei* (Stebbing, 1905) (see Harrison and Holdich 1984), known to occur throughout the Indo-West Pacific from East Africa to Fiji, will likely prove to be another such species complex. Within the Cirolanidae *Cirolana parva* Hansen, 1890 was once considered to be one world-wide species, but is a large swarm of 25 described species that have an extremely uniform morphology (e.g. see Bruce 2004a), and at some point it is probable that these exceedingly similar species of the *Cirolana* ‘parva-group’ may be separable only by using molecular data. In Aegidae the supposedly highly polymorphic and globally distributed *Aega deshaysiana* (Milne Edwards, 1840) (Brusca 1983) proved to be numerous species which, in most cases, could readily separated using morphological criteria (Bruce 2004b). Clearly, species flocks in the marine isopods are a widespread phenomenon throughout.

The data presented here show that there is a group of superficially similar southwestern Pacific species related to *Myopiarolis novaecaledoniae* (Poore and Brandt, 1997). The overall body shape and appendage morphology are similar, but distinct and consistent differences separate the species, as is here shown. The observed polymorphism (Poore and Brandt 1997) for *M. novaecaledoniae* was due to four species being present in the material included under that name. The characters that can be used to distinguish these species are given in the ‘remarks’ for *Myopiarolis*.

It is likely that cryptic (morphologically near identical or identical) groups of species will be found to exist in the Serolidae as is the case in many other families of the Cymothoidea and Sphaeromatoidea. It is possible that there may be at least one cryptic species close to *Sedorolis simplex* (here identified only as *Sedorolis* sp.). It would seem, therefore, that species of Serolidae are no more (or less) prone to large-scale polymorphism than other groups of free-living isopods. Groups of sibling and cryptic species do exist within the family, and while there is species-level variation,

notably in dorsal spines and tubercles, setation of pereopods and degree of prolongation of coxae, polymorphism is likely to be at a finer resolution than has been previously considered.

Material and methods

Descriptions. Descriptions are based on the male holotype or male holotype and matched topotypic paratype unless otherwise stated. Measurements: greatest body width is always stated at the most posterior widest pereonite; body length measured dorsally from tip of rostral point to posterior of pleotelson; sternal plate of pleonite 1 is described; those of pleonites 2 and 3 are similar but less developed, and are only described by exception; seta/setae means simple setae, robust setae (RS) are always explicitly stated.

Discussion of the relationships of the new genera relate to the discussion and figures presented by Wägele (1994). That character set is smaller than that used by Brandt (1991), but contains all the genera known at that time. No matrix was presented, so the distribution of the characters used by Wägele (1994) cannot be assessed. Wägele's dendrograms provide a useful framework for discussion, but reference to them here does not imply acceptance of those results.

Generic diagnoses and species descriptions were prepared from Serolidae character sets (under development) using the program DELTA (Dallwitz et al. 1977). Setal terminology broadly follows Watling (1989).

Abbreviations. MNHN—Muséum national d'Histoire naturelle, Paris; MTQ—Museum of Tropical Queensland, Queensland Museum, Townsville; NIWA—National Institute of Water and Atmospheric Research Ltd, Wellington, New Zealand; NMV—Museum of Victoria, Melbourne, Australia; RS—robust seta/e; SAM—South African Museum, Cape Town.

Taxonomy

Family Serolidae. Key works are the major reviews of Brandt (1988, 1992) and Wägele (1994); Held (2000) discussed the phylogeny and biogeography of the family based on molecular data derived from 16 species; the generic discussions given by Poore and Brandt (1997) and Bruce (2008) are also relevant. The most recent diagnosis to the family is that of Brandt and Poore (2003).

Implicit character states in species description, in addition to stated family and genus level characters, are: *Coxae* of pereonites 2–4 articulated, with dorsal sutures; *ventral coxal plates* 2–4 meeting midline; sternites 5–7 visible, fused; pleopod 4 exopod with complete transverse suture; uropods biramous (exceptions being *Spinoserolis* Brandt, 1988 and some species of *Atlantoserolis* Wägele, 1994).

Key to the genera of Indo-Pacific Serolidae

Since the publication of Brandt's (1988) review there has been a proliferation of genera within the Serolidae. Prior to that date five genera were recognised; the publication of six new genera by Wägele (1994) brought the total to 20 genera. The most recent key, to any region, is that of Brandt (1988), and that work no longer reflects the generic composition of the family. The key provided here is intended only to operate for the genera known to occur in the Indo-Pacific, the region bounded by East Africa in the west, eastwards to Hawai'i and the island nations of Oceania (e.g. see Briggs 1974). The key also serves to emphasize the character states now in use in defining genera.

- 1 Uropods on posterolateral angle of pleotelson, uropods and pleonites forming part of continuous body outline ***Thysanoserolis* Brandt, 1991**
- Uropods mediolateral or anterolateral, not forming part of body outline **2**
- 2 Pleonites not extending posteriorly along pleotelson lateral margins; pleopod 2 endopod with distal stem; uropods greater than three-quarters length of pleotelson **3**
- Pleonites extending posteriorly along pleotelson lateral margins; pleopod 2 endopod without distal stem; uropods less than half length of pleotelson ... **5**
- 3 Pereonites 5–7 entire, with sutures distinct; pleotelson posterior margin broad, flat and truncate; uropodal mesial margin positioned in dorsal groove on pleotelson lateral margin ***Sedorolis* gen. n.**
- Pereonites 5–7 medially fused; pleotelson posterior margin narrowly rounded or truncate; uropodal mesial margin positioned ventrally on pleotelson lateral margin **4**
- 4 Pleonite sternal plate 1 with prominent process; pleotelson posterior margin narrow, excavate or indented ***Heteroserolis* Brandt, 1991**
- Pleonite sternal plate 1 without prominent process; pleotelson posterior margin narrowly rounded ***Serolina* Poore, 1987**
- 5 Coxae distally acute, those of pereonite 6 narrow, elongate, greatly extended posteriorly beyond pleotelson and pleonites; pleonites extending beyond pleotelson posterior margin ***Brucerolis* Poore & Storey, 2009¹**
- Coxae quadrate, not narrowed or greatly extended; pleonites extending along but not beyond pleotelson margin **6**
- 6 Coxae 6 overlapping and extending posterior to pleonites; antennal peduncle articles 4 and 5 slender (8.6–10.3 × as long as greatest width); uropods ventrolateral, inconspicuous in dorsal view ***Myopiarolis* gen. n.**

¹ Poore and Storey (2009) have redefined *Acutiserolis* and those species from the southwestern Pacific and New Zealand hitherto placed in that genus, notably *Acutiserolis cidaris* Poore & Brandt, 1977 from the Coral Sea, have been placed in *Brucerolis* (see Poore and Storey 2009 this issue; Storey and Poore 2009 in press).

- Coxae 6 overlapping but not extending posteriorly beyond pleonites; antennal peduncle articles 4 and 5 broad ($<5 \times$ as long as greatest width); uropods lateral, conspicuous in dorsal view..... *Caecoserolis* Wägele, 1994

Heteroserolis Brandt, 1991

Heteroserolis Nordenstam, 1933: 50 (nomen nudum, type species not designated).

Heteroserolis Brandt, 1991: 147.– Brandt, 1992: 230; Wägele, 1994: 52.

Type species. *Serolis australiensis* Beddard, 1884; by subsequent designation (Brandt 1991).

Species included. *H. australiensis* (Beddard, 1884), **type species**, South Australia, 2–124 m; *H. carinata* (Lockington, 1877), California 13–55 m; *H. elongata* (Beddard, 1884), New South Wales, Australia, 5–329 m; *H. levidorsata* (Harrison and Poore, 1984), Victoria, Australia, 13–14 m; *H. longicaudata* (Beddard, 1884), Bass Strait, Australia, 36–99 m; *H. mgrayi* (Menzies & Frankenberg, 1966), Caribbean to Georgia, USA, 5–95 m; *H. pallida* (Beddard, 1884), Bass Strait, Australia, 55–104 m; *H. pellucida* sp. n., New Caledonia, 557–792 m; *H. tropica* (Glynn, 1976), Pacific Panama, 5–40 m; *H. tuberculata* (Grube, 1875), Bass Strait, Australia, 5–91 m.

Remarks. The principal and diagnostic character states for *Heteroserolis* are the unique pleonal sternal plates 1 and 2 or 1–3, each with a strong posteriorly directed spine; long uropods that are inserted at mid-length on the pleotelson lateral margin, relatively broad pleonites that do not extend along the pleotelson lateral margins; and the narrow lacinia mobilis on the left mandible. A further character state, apparently common to all species of the genus is pleopod 4 exopod being comparatively elongate, approximately to 2.3 times as long as greatest width (compared to, for example, 1.8–1.9 for *Myopiarolis* gen. n.). *Heteroserolis* belongs within Wägele's (1994) 'Group B' characterised by having a stalked appendix masculina. A further characteristic of the 'Group B' genera that also includes *Serolina* and *Sedorolis* gen. n. is the quadrate and elongate pleopods 1–3 peduncles.

The new species described is here placed in *Heteroserolis* on the basis of the pleonal sternal plates having a strong spine, and agrees with most other characters for the genus. It does differ in having a wide lacinia mobilis on the left mandible, distally acute pleonites, weakly concave lateral margins of the head (compared to strongly convex in most species of the genus), and the robust setae of pereopod 1 propodus differ substantially from that illustrated for the type species (Brandt 1999).

The genus has an unusual and disjunct distribution, with six shallow-water species from Australia, a slope species from New Caledonia, two East Pacific species (Panama and California) and one North Atlantic species.

The most recent descriptive works on the genus are Harrison and Poore (1984, as *Serolis*), Müller (1993) and Brandt (1999); Brandt (1992) rediagnosed the genus.

Distribution. Species are known from shallow water, at depths between 18 and 140 m [with the exception of two records of *H. elongata* from the Bass Strait at 164–

273 and 73–329 m (Harrison and Poore 1984)]; the new species described here extends the known depth range for the genus to 792 metres.

***Heteroserolis pellucida* sp. n.**

urn:lsid:zoobank.org:act:9F6254B0-1B95-40DE-BEA4-3C17FF40A57C

Figs 1–4

Material

All material from New Caledonia.

Holotype: ♂ (10.6 mm), ‘Sud Landsdowne’, 21°05.254–04.244’S, 160°48.955–793’E, 21 Oct 2005, EBISCO stn CP2627, 736–711 m (MNHN Is.6016). *Paratypes*: ♂ (10.5 mm, dissected), 6♀ (4 ovig. 14.8 (drawn), 13.8, 13.5, 12.6, mm, 2 non-ovig. 12.4, 12.0 mm), ‘Sud Landsdowne’, 21°05.254–04.244’S, 160°48.955–793’E, 21 Oct 2005, EBISCO stn CP2627, 736–711 m (MNHN Is.6017). 2♀ (ovig. 14.6, 11.8 mm, 1 very damaged), ‘Sud Landsdowne’, 21°05.085–965’S, 160°47.425–510’E, 21 Oct 2005, EBISCO stn CP2628, 672–678 m (MNHN Is.6018). ♀ (ovig. 13.1 mm), ‘Sud Landsdowne’, 20°51.216–228’S, 161°00.528–160°59.336’E, 22 Oct 2005, EBISCO stn CP2643, 557–565 m (MNHN Is.6019). 6♀ (4 ovig. 13.2, 12.9, 12.6, 12.2 mm, 2 non-ovig. 11.2, 10.8 mm), ‘Sud Landsdowne’, 20°52.625–54.197’S, 160°58.687–568’E, 22 Oct 2005, EBISCO stn CP2644, 600–625 m (MNHN Is.6020). 2♀ (ovig. 13.5, 13.0 mm), ‘Sud Landsdowne’, 21°31.566–330’S, 162°32.069–33.008’E, 23 Oct 2005, EBISCO stn CP2649, 775–792 m (MNHN Is.6021).

Additional material: 2♀, Iles Chesterfields, 20°07.72’S, 160°55.76’E, 21 Jul 1988, CORAIL 2, stn DE15, 590–580 m, coll. ORSTOM, Richer de Forges (MNHN Is.6022; dissected ovig ♀ in separate tube). ♂ (pre-dissected), Iles Chesterfield, 21°00.69’S, 160°57.18’E, 21 Jul 1988, CORAIL 2, stn DE14, 650–660 m, ORSTOM, Richer de Forges (MNHN Is.6023).

Description. *Body* 1.2 as long as wide, widest at coxae 3, dorsal surfaces smooth. *Head* anterolateral lobes mesially concave, anterior submarginal ‘ridge’ entire; dorsally without tubercles, posterior margin with low rounded median tubercle. *Eyes* medium size (between 5 and 15% head width), reniform, ommatidia distinct. *Pereonite 1* anterolateral margin continuously convex; dorsal surfaces without tubercles. *Coxae* distal margins weakly convex; coxae 4 extending to mid-pleonite 2; coxae 5 extending posteriorly along 0.3 of pleotelson length; coxae 6 extending to mid-length of uropods, and along 0.6 of pleotelson length. *Ventral coxal plates* mesially flat, plates 2–4 mesially simple, smooth; plates 6 and 7 entirely separate. Sternal plate 1 with weak median ridge, with process extending to posterior of sternal plate 2. *Pleotelson* 1.2 times as long as anterior width, dorsal surface without median longitudinal carina, with paired sublateral carinae; lateral margins sinuate, posterior margin converging to angled caudomedial point, without distinct median excision.

Antennule peduncle article 2 3.6 times as long as wide; articles 3 and 4 2.0 times as long as article 2 (1.96); article 3 6.8 times as long as wide; flagellum 2.0 as long as pe-

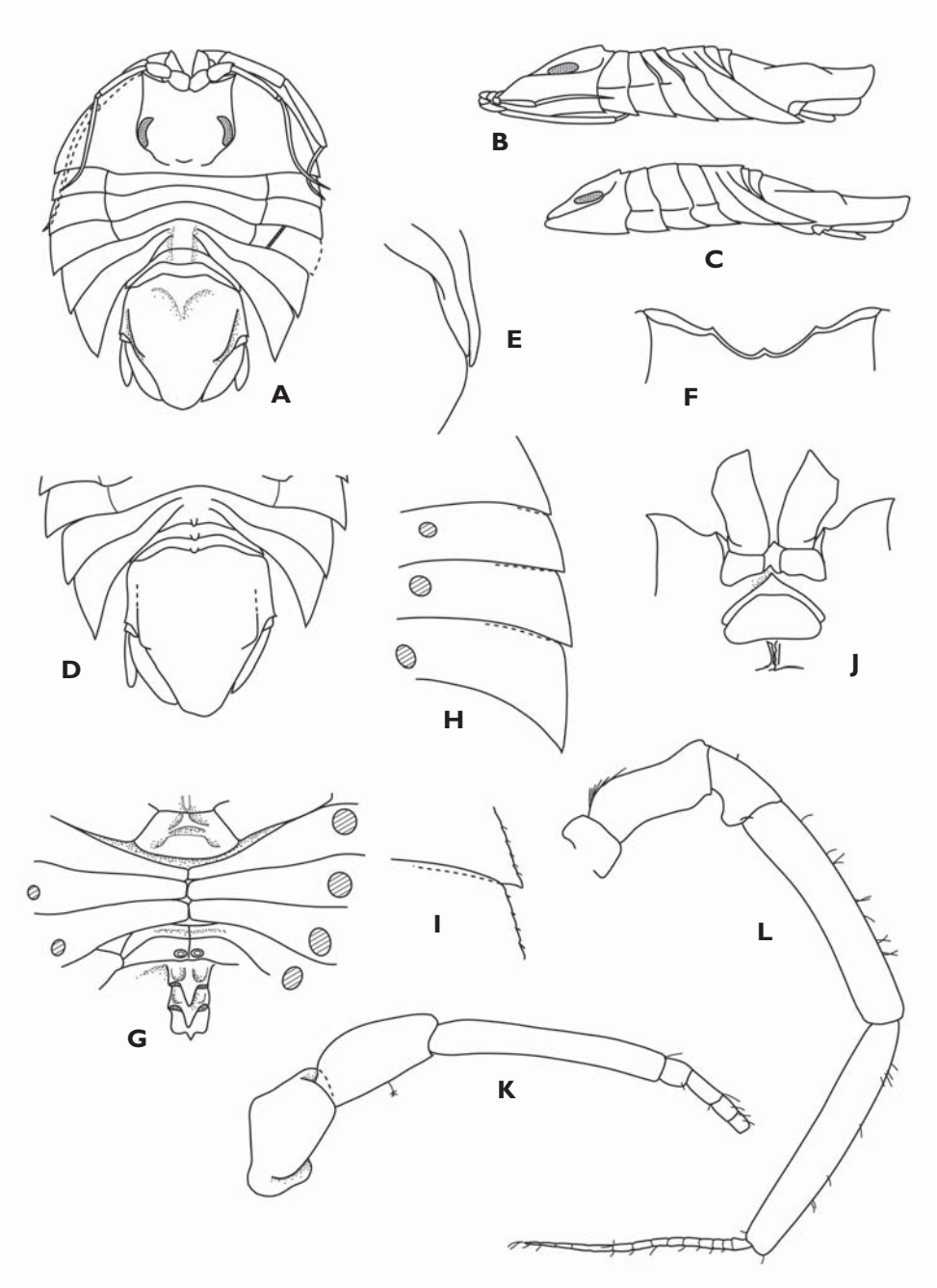


Figure 1. *Heteroserolis pellucida* sp. n. Holotype, except where indicated. **A** dorsal view **B** lateral view **C** lateral view (♀ 14.8 mm, Is.6017) **D** pleon and pleotelson, dorsal view (♀ 14.8 mm, Is.6017) **E** pleonites **F** head, anterior margin **G** sternites and ventral pleonites **H** ventral coxae 2–4 **I** ventral joint pereonites 2 and 3 **J** frons; ♂ 10.5 mm, Is.6017 **K** antennule **L** antenna.

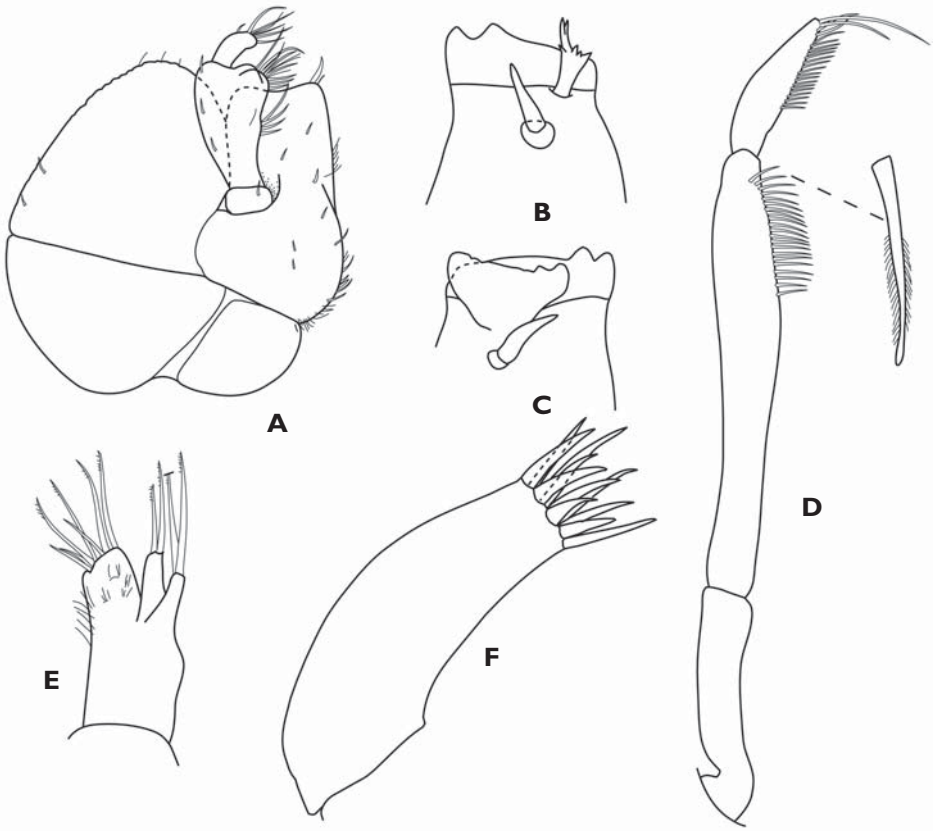


Figure 2. *Heteroserolis pellucida* sp. n. Paratype ♂ 10.5 mm, Is.6017. **A** maxilliped **B** right mandible **C** left mandible **D** mandible palp **E** maxillule **F** maxilla.

duncle articles 3 and 4, with ~34 articles, extending to pereonite 3. *Antenna* peduncle article 4 5.6 times as long as wide, 3.3 times as long as article 3; article 5 1.1 times as long as article 4, 6.3 times as long as wide; antennal flagellum 0.9 as long as peduncle article 5, with ~15 articles, extending to posterior of pereonite 3.

Epistome with acute median point. *Mandible incisor* with two distinct posterior cusps, left mandible lacinia mobilis 0.7 as wide as incisor, right mandible lacinia mobilis distally multicuspoid (with prominent process), mandibular spine simple; palp article 2 with 21 distolateral setae, article 3 with 23 biserrate setae. *Maxilla* mesial lobe with 7 long, finely serrate setae; middle lobe with 2 long simple setae; lateral lobe with 2 distal simple setae. *Maxilliped palp* article 2 proximomesial margin with 4 setae, distomesial margin with 10 setae, lateral margin distally with 3 setae; article 3 lateral margin with 1 seta, distal margin with 8 setae; endite distal margin RS serrate.

Pereopod 1 propodus 2.1 times as long as wide, inferior margin with ~38 RS; wide RS with deeply serrate margins and ridged surface, narrow RS simple, deeply

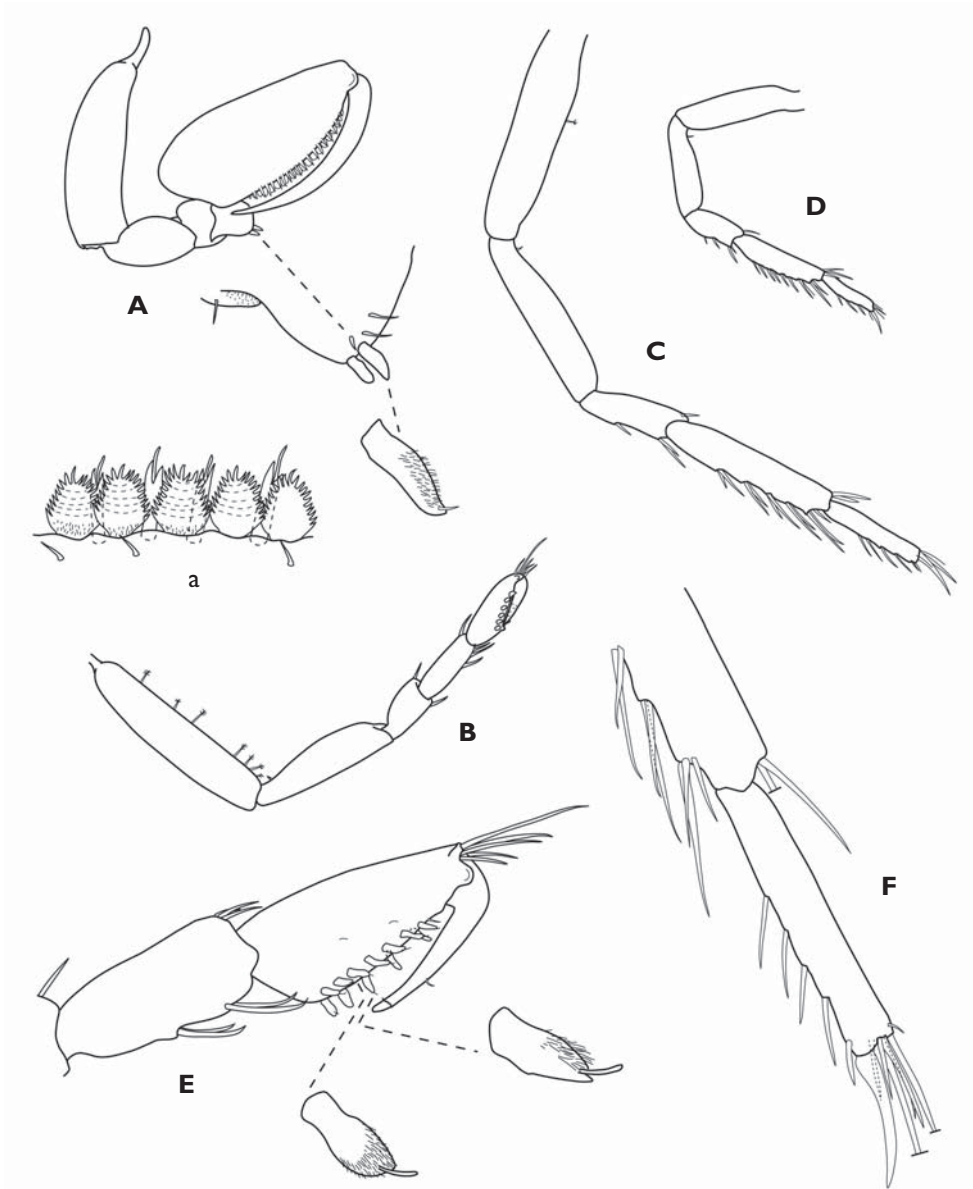


Figure 3. *Heteroserolis pellucida* sp. n. Paratype ♂ 10.5 mm, Is.6017. **A–D** pereopods 1, 2, 6 and 7 respectively; **a**, detail of pereopod 1 propodal palm setae **E** pereopod 2 distal articles **F** pereopod 6, distal articles.

bifid; dactylus with acute unguis. *Pereopod 2* basis 5.1 times as long as greatest width; 0.7 times as long as basis, ischium 3.8 times as long as wide; *merus* 0.4 as long as ischium, 1.5 times as long as greatest width, inferior margin with 1 cluster of setae (of 1), superior distal angle with 1 seta; *carpus* 0.5 as long as ischium, 2.7

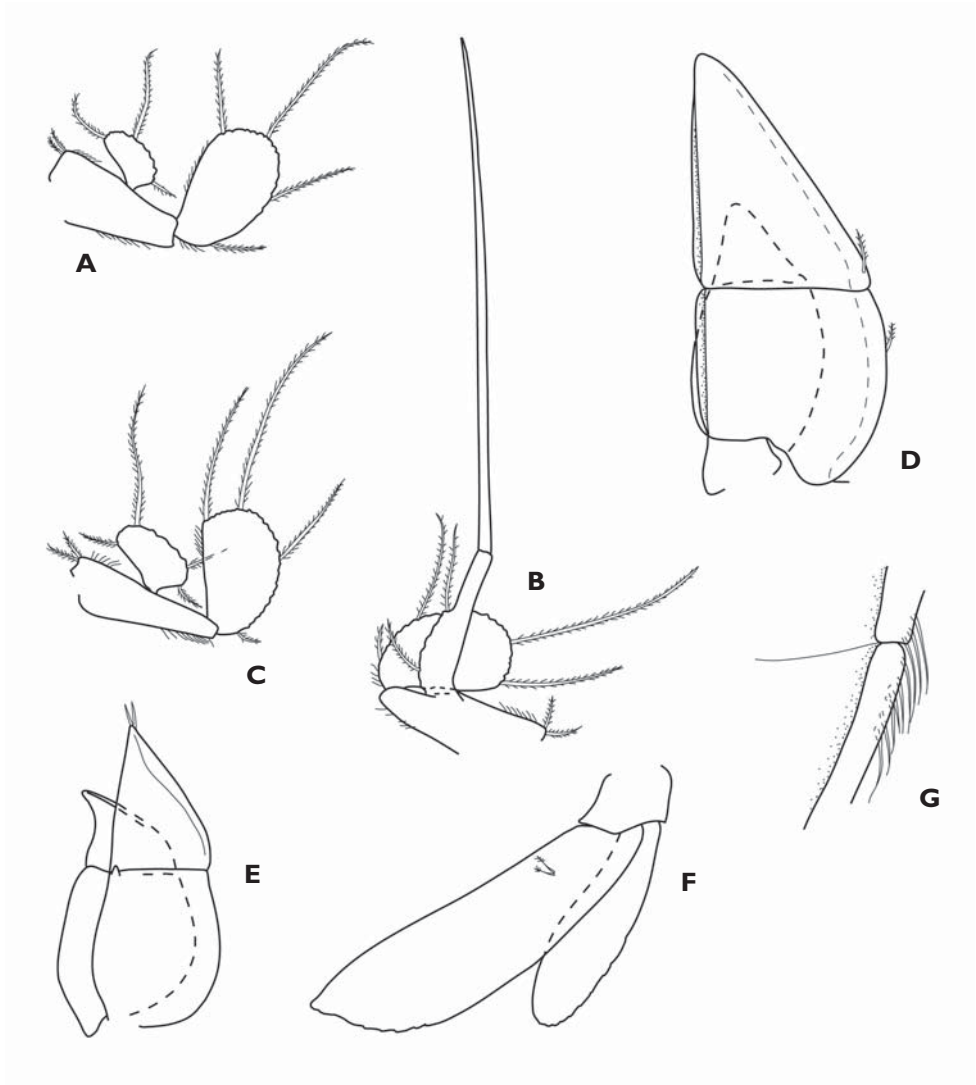


Figure 4. *Heteroserolis pellucida* sp. n. Paratype ♂ 10.5 mm, Is.6017. **A–E** pleopods 1–5 respectively **F** uropods **G** lateral margin, pleopod 1 exopod.

times as long as wide, inferior margin with 2 clusters of setae (as 2 and 2); *propodus* 0.5 as long as ischium, 2.0 times as long as wide, inferior margin with indistinct heel, palm straight, inferolateral margin with 6 RS, inferomesial margin with 5 RS, inferior margin RS both blunt and acute, distally pilose, distal margin with 5 setae; *dactylus* 0.8 as long as propodus, unguis simple, blunt. *Pereopod 6 basis* 4.5 times as long as greatest width; *ischium* 0.8 as long as basis, 4.9 times as long as wide, inferior margin with 0 clusters of setae, superior distal angle with 0 RS; *merus* 0.6 as long as ischium, 3.1 times as long as wide, inferior margin with 2 clusters of setae (as

1 and 2), superior distal angle with 1 setae; *carpus* as long as ischium, 5.1 times as long as wide, inferior margin with 5 clusters of setae (as 2, 2, 2, 2 and 3; setae stiff), superior distal angle with 2 setae; *propodus* 0.5 as long as ischium, 5.7 times as long as wide, inferior margin with 4 clusters of setae (as 1, 1, 1, 1; RS), distal margin with 6 setae, inferior distal angle with 1 RS; *dactylus* 5.4 as long as proximal width. *Pereopod* 7 similar to, but 0.6 as long as pereopod 6. Setae on inferior margins of pereopods 4–7 distally rough or finely plumose. Inferior margins of pereopods 2–7 setulose fringe absent.

Penial openings narrowly separated, *penes* opening flush with surface of sternite 7.

Pleopod 1 peduncle 2.1 times as long as wide, mesial margin with 2 plumose slender setae; exopod 1.6 as long as wide, with 22 PMS; endopod 2.1 times as long as wide, 0.5 as long as exopod, with 12 PMS. *Pleopod* 2 peduncle 2.5 as long as wide, mesial margin with 2 plumose slender setae; exopod 1.7 as long as wide, with 26 PMS; endopod 4.0 as long as greatest width, lamellar part 3.0 as long as wide, with 9 PMS; *appendix masculina* 3.5 times as long as endopod. *Pleopod* 3 exopod with 28 PMS, endopod with 16 PMS. *Pleopod* 4 exopod with complete transverse suture (lateral margin with conspicuously thickened rim), endopod without transverse suture. *Pleopod* 5 exopod with complete transverse suture (lateral margin distal part with thickened rim), endopod with incomplete transverse suture.

Uropods (rami + peduncle) 0.6 as long as pleotelson, peduncle 0.2 as long as endopod. *Endopod* 3.6 as long as wide; distally with apical point. *Exopod* 0.6 as long as endopod, 3.5 times as long as wide, distally broadly rounded.

Female. As for male, but pleonites 1–3 each have a weak sub-carinate nodules on pereonite 1, and the median nodule on the posterior margin if the head is more developed.

Size. Two males measured 10.5 and 10.6 mm; ovigerous females 11.8–14.8 mm (mean = 13.2 mm); non-ovigerous females 10.8–12.4 mm (mean = 11.6 mm).

Remarks. *Heteroserolis pellucida* sp. n. is characterised by the semi-transparent cuticle, lack of obvious dorsal nodules, the narrow and acute pleonite margins, a relatively short rostral point and the posterior margin of the pleotelson forming an angled medial point. In addition it is the only species of the genus with a wide lacinia mobilis on the left mandible. Most species of *Heteroserolis* show some degree of dorsal ornamentation, the exceptions being the East Pacific species *H. tropica* and two eastern Australian species, *H. longicaudata* and *Heteroserolis* sp. (Harrison and Poore 1984). *H. longicaudata* (southeastern Australia) has a nodular pleotelson and the pleotelson apex is excised, while *Heteroserolis* sp., known from two immature specimens from shallow water off Townsville, northern Queensland has a truncate pleotelson apex and obscure median nodules on pereonites 2 and 3.

Heteroserolis pellucida has a very distinctly thickened rim to the lateral margin of pleopod 4 exopod, and a slightly less prominent rim on the distal part of the exopod of pleopod 5. Pleopods 4 and 5, where illustrated for other species, have not appeared to show this character state, at present I regard this as a unique species character.

Distribution. New Caledonia; at depths of 557–792 metres.

Etymology. From the Latin adjective *pellucidus* ‘admitting light’ or semi-transparent.

***Sedorolis* gen. n.**

urn:lsid:zoobank.org:act:31C90C50-CE3E-4240-9A18-0539D38C5624

Type species. *Sedorolis simplex* sp. n., here designated.**Diagnosis.** *Male.* Pereonites with all segments indicated by entire suture lines, coxae 2–4 articulating; distal margin truncate; coxae 6 wide, laterally or distally broad, extending to mid-length of uropod peduncle; pleonites 1–3 sternal plate trilobed, lobes gently rounded, without median ridge; pleotelson posterior margin broadly truncate; pereopod 1 propodal palm setae all slender, bifid, all similar; antennule peduncle article half as long as wide; antenna peduncle articles 4 and 5 broad (less than 5 times as long as wide); pleopods 1–3 peduncles sub-rectangular, without coupling setae; pleopod 2 endopod lamellar part about half as long as ramus (= stalked); uropods inserted on pleotelson at anterolateral angle; rami positioned in a dorsal groove on pleotelson lateral margin.**Description.** *Male. Head* Lateral lobe mesial margin with single concavity; anterolateral lobes forming of continuous margin with pereonite 1; anterior submarginal ‘ridge’ on lateral lobes only; posterior margin without tubercle, or with prominent median spine. *Eyes* absent. pereonite 1 anterior margin not strongly bent dorsally, dorsally without tubercles. *Coxae* of pereonites 2–4 articulated, with dorsal sutures. *Ventral coxal plates* simple, smooth; plates 6 and 7 incompletely separated (sutures partly fused). *Pleonites 2 and 3* distally narrow or acute, laterally overlapped by coxae 6, not extending posteriorly along pleotelson. Sternites 5–7 visible, sternite 5 not mesially demarcated by suture. *Pleotelson* dorsal surface with median longitudinal carina (weak), without paired sublateral carinae; without distinct median excision.*Antennule* flagellum 1.2–2.0 as long as peduncle articles 3 and 4, extending to between pereonite 3 (anterior). *Antenna* peduncle articles 4 and 5 broad, article 5 less than 5 times as long as greatest width; flagellum two-thirds as long as peduncle article 5.*Epistome* with obtuse median point. *Mandible incisor* with two posterior cusps; left mandible lacinia mobilis two-thirds as wide as incisor, right mandible lacinia mobilis distally multicuspid, mandibular spine distally serrate. *Maxilla* lateral lobe with 2 distal simple setae, middle lobe with 2 long simple setae. *Maxilliped palp* with 3 articles, article 3 cordiform, longer than wide.*Pereopod 1* carpus RS with prominent pilose flagellum; propodal palm RS distally pilose. *Pereopod 2* propodus inferior margin with indistinct heel, palm straight; inferior margin RS distally bifid, smooth. *Pereopods 6 and 7* not sexually dimorphic.*Penial openings* narrowly separated, *penes* opening flush with surface of sternite 7.*Uropods* Biramous, uropods not forming part of continuous body outline, uropods more than half (0.8) as long as pleotelson. Uropod endopod distally rounded.**Remarks.** Probable derived character states (putative apomorphies) that uphold *Sedorolis* and that also serve to distinguish the genus from both *Serolina* and *Heteroserolis* are the broad antennal articles 4 and 5 and the unique position of the uropodal rami, which sit on a dorsal groove on the lateral margin of the pleotelson. The robust setae on pereopod 1 are all slender, bifid, all similar. *Sedorolis* is the only serolid genus to have a weakly vaulted pleotelson with a broadly truncate and flat posterior margin.

Serolina is distinguished from *Sedorolis* by numerous derived states, including a narrow posterior margin to pleotelson; male pereopod 2 merus and carpus inferior margins with long plumose setae; clubbed pereopod 2 dactylar unguis; ischium and carpus of pereopods 6 and 7 highly setose or with acute robust setae, in having sexually dimorphic pereopod 7 and the maxilla mesial and middle lobes with 2+1 long terminal setae (rather than the more usual 2+2). *Heteroserolis* is distinguished by the uropods being inserted at a mid-lateral or just anterior to mid-lateral position on the pleotelson; pleonal sternite 1 with large posteriorly-directed median spine, a unique apomorphy for the genus; slender antennal peduncle articles 4 and 5 (most species); and a clearly excavate (Australian species) or rounded and medially indented (Northern Hemisphere species) pleotelson apex.

Relationships of *Sedorolis*. *Sedorolis* belongs in the group of two genera, *Heteroserolis* and *Serolina*, characterised in part (Wägele 1994, see dendrogram, figure 37) by having 'enlarged' uropodal rami (at least the endopod is long) which reach to about the posterior margin of the pleotelson. These two genera belong to Wägele's 'Group B' part of a group defined by the presence of a 'stalked' pleopod 2 endopod ('stalked appendix masculina' in Wägele's terminology). All of 'Group B' and 'Group C' are characterised by having the 'palm of pereopod 1 each second spine scale-like'. Wägele (1994) considered the large uropods to be potentially plesiomorphic, but also that it was 'a character secondarily acquired in the stem-line of the group.'

On the basis of uropod and pleopod 2 morphology *Sedorolis* belongs with this pair of genera. Further character states, not previously recognized by Brandt (2001) or Wägele (1994) is that the peduncles of pleopods 1–3 are quadrate, or slightly narrower distally, lacking the mesial projection (with coupling hooks) the presence of which creates a triangular shaped peduncle, as in all other Serolidae. Both the elongate quadrate state and triangular states can be recognised as derived from a short quadrate state as shown in the Basserolidae (Poore 1985, 1990). The quadrate pleopod peduncle further upholds the monophyly of this group of genera.

Species included. *Sedorolis simplex* sp. n., the type species and *Sedorolis* sp.

Distribution. The genus is known only from New Caledonia, at depths of 440–680 metres.

Etymology. *Sedorolis*—from the Latin *sedo* smooth, in combination with [Se]rolis indicating family affinity.

Sedorolis simplex sp. n.

urn:lsid:zoobank.org:act:8F2B963A-1115-46F5-A4DD-9F828AA5B921

Figs 5–8

Material

All material from New Caledonia.

Holotype: ♂ (4.7 mm), 22°47.30'S, 167°14.30'E, 30 Aug 1985, 440 m, BIOCAL stn DW44 (MNHN Is.6000). *Paratypes*: ♂ (4.8 mm; NLB dissect left side, mouth,

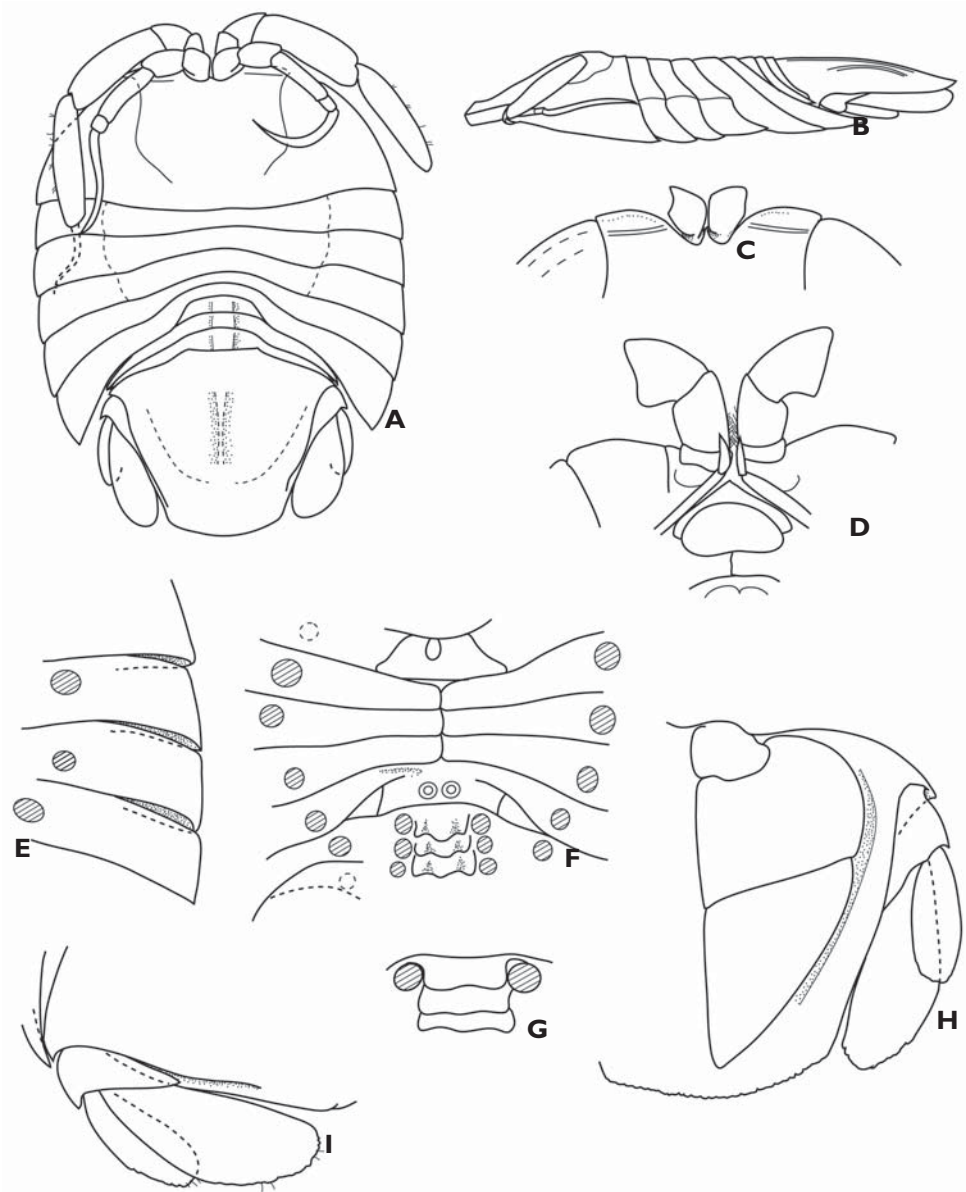


Figure 5. *Sedorolis simplex* sp. n. Holotype, except E. **A** dorsal view **B** lateral view **C** head, anterior margin **D** frons **E** ventral coxae 2–5 **F** male sternites and ventral pleonites **G** ventral pleonites, ♀ 5.3 mm, Is.6001 **H** pleotelson and uropods, ventral view **I** uropods, dorsal view in situ.

P1, P2, P6, P7, Plp 1, 2, 4, 5), ♀ (ovig. ~5.3 mm), same data as holotype (MNHN Is.6001, incl. 5 microslides). 2 ♂ (5.3, 5.5 mm), 22°15'S, 167°150'E, 05 Sep 1985, 440 m, BIOCAL, stn. DW 77, N.O. 'Jean Charcot' (MNHN Is.6002).

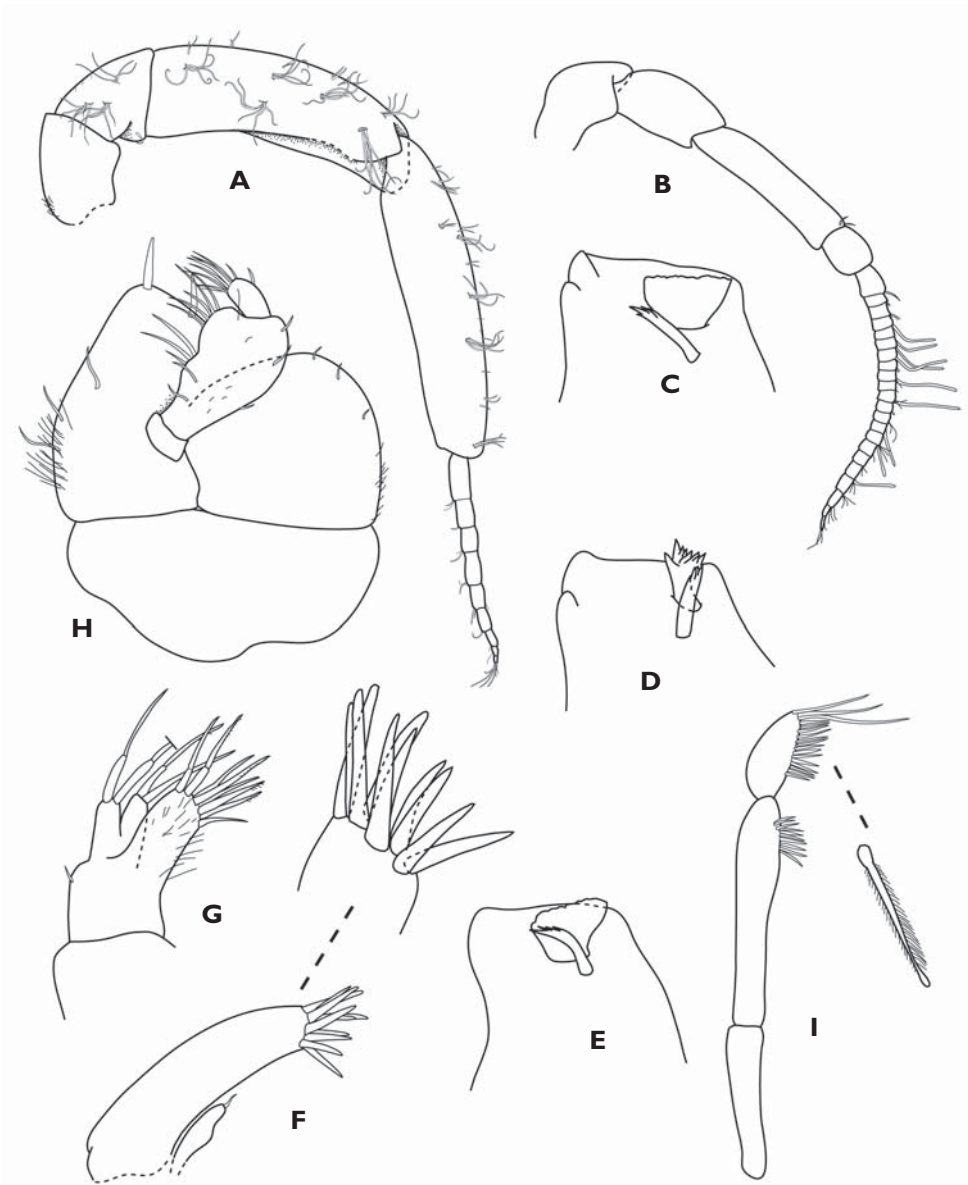


Figure 6. *Sedorolis simplex* sp. n. Paratype ♂ 4.8 mm, Is.6001, except C, D, ♀ ovig 5.3 mm, Is. 6001. **A** antenna **B** antennule **C** left mandible **D** right mandible **E** left mandible **F** maxillule **G** maxilla **H** maxilliped **I** mandible palp.

Additional material: All in poor condition, some specimens heavily dissected previously and extensively mutilated: 8 (all small <5 mm; one dissected), 440 m, BIOCAL, stn. DW 44 (MNHN Is.6003). ♂ (pre-dissected), ♀ (pre-dissected), 570 m, ex BIOCAL stn DW 46 (MNHN Is.6004). 5 (poor condition), 570, DW 46 m (MNHN

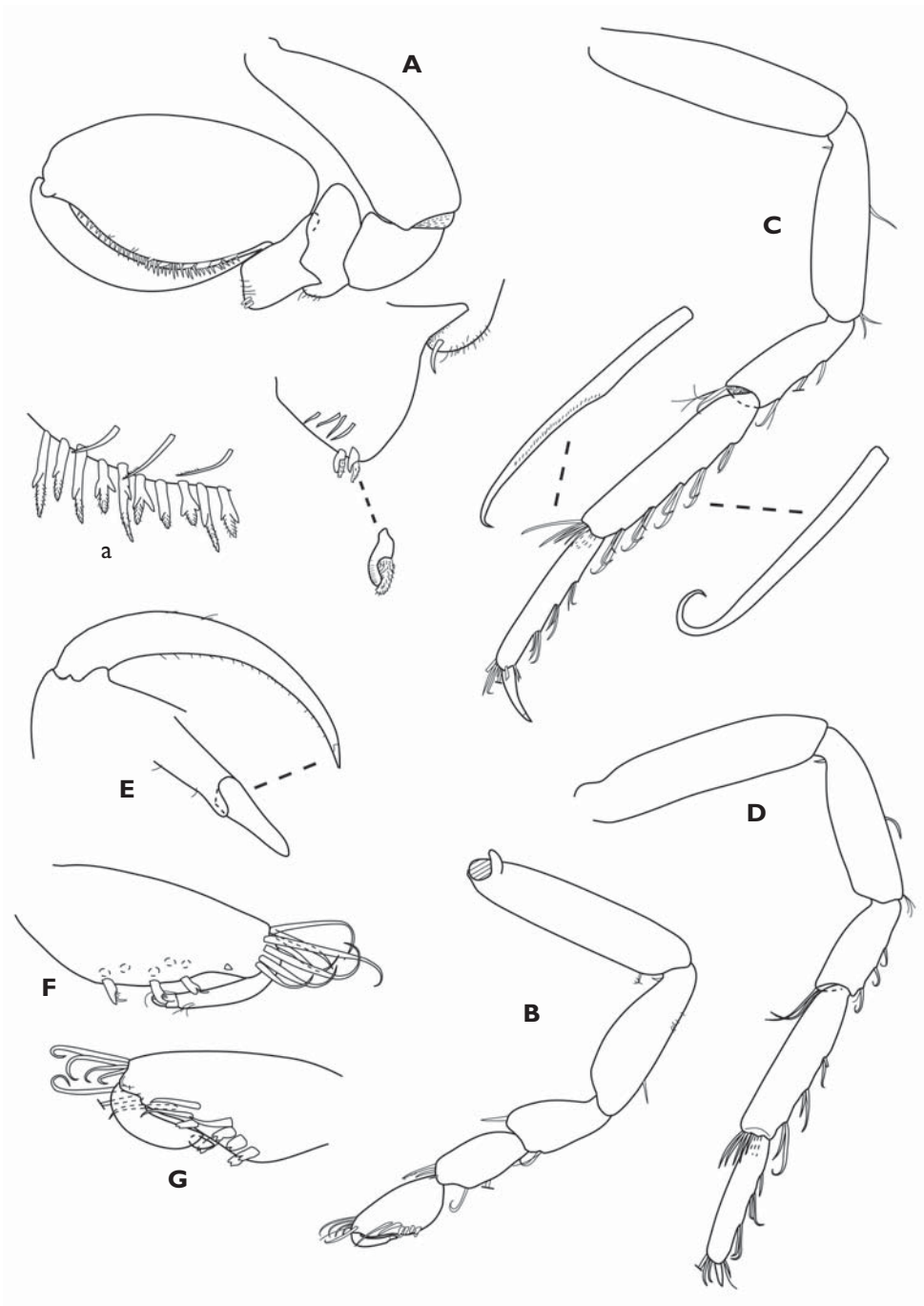


Figure 7. *Sedorolis simplex* sp. n. Paratype ♂ 4.8 mm, Is.6001, except E, F ♀ unmeasured, Is. 6004. **A–D** pereopods 1, 2, 6 and 7 respectively **a** detail of pereopod 1 propodal palm setae **E** pereopod 1 dactylus **F** pereopod 2 propodus, mesial **G** pereopod 2 propodus, lateral.

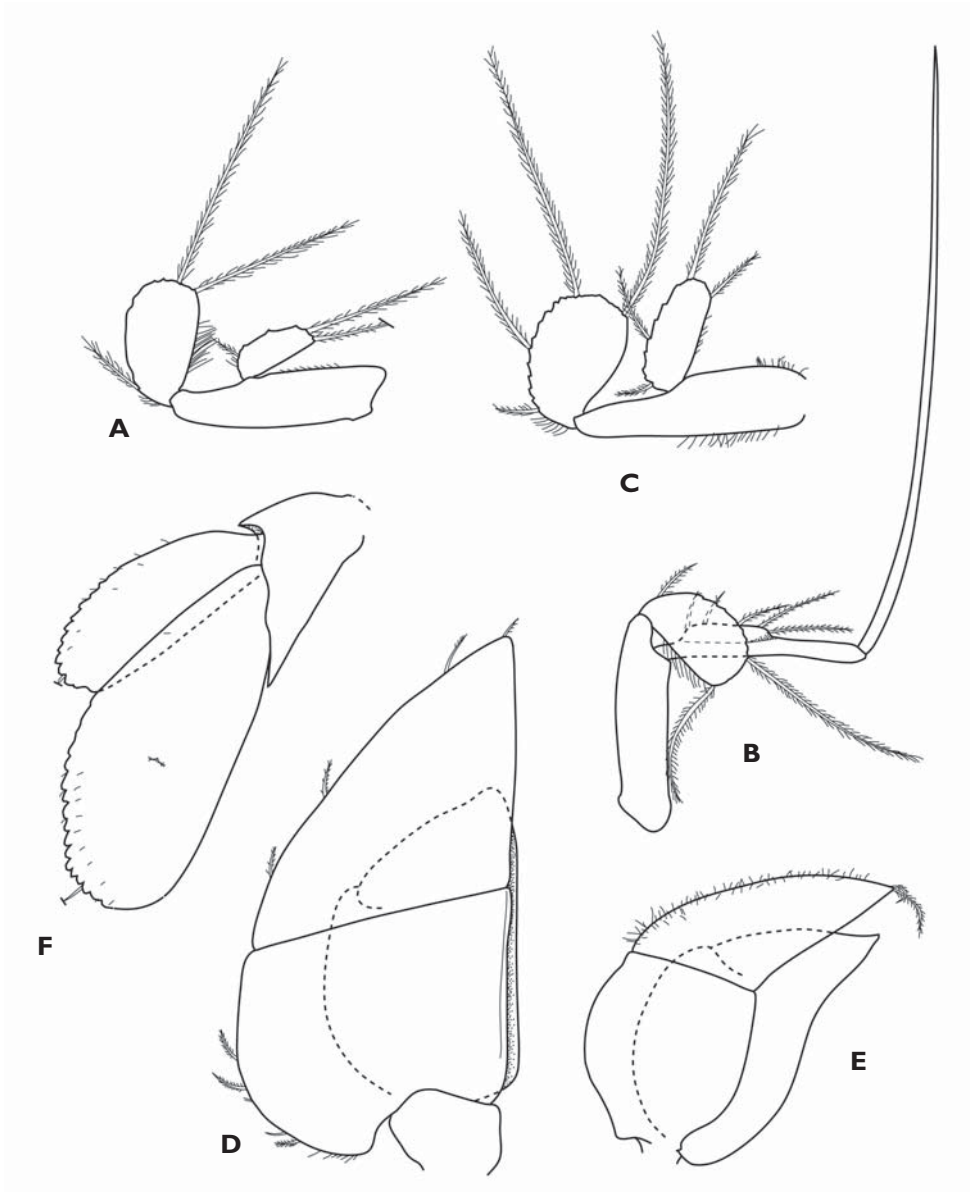


Figure 8. *Sedorolis simplex* sp. n. Paratype ♂ 4.8 mm, Is.6001. **A–E** pleopods 1–5 respectively **F** uropods.

Is.6005). 10 (condition very poor, possibly partly decomposed), 22°15'S, 167°150'E, 05 Sep 1985, 440 m, BIOCAL, stn. DW 77, N.O. 'Jean Charcot' (MNHN Is.6006). Appendages from the previously dissected ♂ DW46 (MNHN Is.6004) were not complete, missing one posterior leg, maxilliped and the maxilla; pleopod 5 lacked one ramus, and the maxillule lacked the endite.

Description. *Body* 1.3 as long as wide, widest at coxae 3 and coxae 4, *dorsal surfaces smooth*. *Head* anterolateral lobes *weakly convex*, anterior submarginal ‘ridge’ on lateral lobes only; dorsally without tubercles, posterior margin without median tubercle. *Pereonites* all with visible entire sutures, articulating, *pereonite 1* anterolateral margin continuously convex; dorsally without tubercles. *Coxae* of pereonites 2–4 articulated, with dorsal sutures (sutures weak), distal margins truncate; coxae 4 not posteriorly extended; 5 extending posteriorly along 0.3 of pleotelson length; coxae 6 extending to mid-length of uropod peduncle, and along 0.5 of pleotelson length. *Ventral coxal plates* 2–4 meeting midline, mesially flat, plates 2–4 mesially simple, smooth; plates 6 and 7 incompletely separated (partly fused). Sternites 5–7 visible, sternite 5 not mesially demarcated by suture. Pleonite 1 sternal plates trilobed, lobes gently rounded, sternal plate 1 without median ridge. *Pleotelson* 0.8 times as long as anterior width, dorsal surface with median longitudinal carina (weak), without paired sublateral carinae; lateral margins weakly sinuate, posterior margin broadly truncate, without distinct median excision.

Antennule peduncle article 2 1.6 times as long as wide; articles 3 and 4 2 times as long as article 2; article 3 4.2 times as long as wide; flagellum 1.4 as long as peduncle articles 3 and 4, with 22 articles, extending to anterior of pereonite 3. *Antenna* peduncle article 4 3.2 times as long as wide, 3.5 times as long as article 3; article 5 1.2 times as long as article 4, 4.3 times as long as wide; antennal flagellum 0.7 as long as peduncle article 5, with 9 articles, extending to posterior of pereonite 4.

Epistome with obtuse median point. *Mandible incisor* with 2 posterior cusps, left mandible lacinia mobilis 0.5 as wide as incisor, right mandible lacinia mobilis distally multicuspid, mandibular spine distally serrate; palp article 2 with 10 distolateral setae, article 3 with 19 biserrate setae. *Maxilla* mesial lobe with 28 long, finely serrate setae; middle lobe and lateral lobe each with 2 distal simple setae. *Maxilliped palp* article 2 proximomesial margin with 3 setae, distomesial margin with 7 setae, lateral margin distally with 2 setae; article 3 lateral margin with 1 setae, distal margin with 9 setae; endite distal margin RS simple.

Pereopod 1 carpus RS with prominent pilose flagellum; propodus 1.9 times as long as wide, inferior margin with ~38 RS; narrow RS trifold, distally pilose. *Pereopod 2 basis* 4.5 times as long as greatest width; 0.7 times as long as basis, ischium 3.2 times as long as wide; *merus* 0.5 as long as ischium, 1.8 times as long as greatest width, inferior margin with 1 cluster of setae (2), superior distal angle with 1 seta (RS); *carpus* 0.6 as long as ischium, 1.4 times as long as wide, inferior margin with 2 clusters of setae (as 1 and 1); *propodus* 0.6 as long as ischium, 2.1 times as long as wide, inferior margin with indistinct heel, palm straight, inferolateral margin with 4 RS (and 3 simple setae), inferomesial margin with 3 RS, inferior margin RS distally bifid, smooth, distal margin with 6 setae, *dactylus* 0.5 as long as propodus, unguis offset to axis of dactylus. *Pereopod 6 basis* 4.0 times as long as greatest width; *ischium* 0.8 as long as basis, 3.5 times as long as wide, inferior margin with 1 cluster of setae (1); *merus* 0.7 as long as ischium, 2.8 times as long as wide, inferior margin with 3 clusters of setae (as 1, 1, and 2), superior distal angle with 3

setae; *carpus* 1.1 as long as ischium, 4.6 times as long as wide, inferior margin with 5 clusters of setae (as 2, 2, 2, 3 and 3), superior distal angle with 7 setae; *propodus* 0.8 as long as ischium, 5.8 times as long as wide, inferior margin with 3 clusters of setae (as 2, 3 and 3), distal margin with 8 setae, inferior distal angle with 2 RS; *dactylus* 6.0 as long as proximal width. *Pereopod* 7 similar to, but 0.7 as long as pereopod 6. Setae on inferior margins of pereopods 4 to 7 simple and distally flexible. Inferior margins of pereopods 2–7 setulose fringe absent.

Pleopod 1 Peduncle 3.5 times as long as wide; exopod 1.7 as long as wide, with 16 PMS; endopod 2.3 times as long as wide, 0.6 as long as exopod, with 6 PMS. *Pleopod* 2 peduncle 4.0 as long as wide; exopod 1.7 as long as wide, with 19 PMS; endopod 6.1 as long as greatest width, lamellar part 4.7 as long as wide, with 5 PMS; *appendix masculina* 2.9 times as long as endopod. *Pleopod* 3 exopod with 22 PMS, endopod with 12 PMS. *Pleopod* 4 exopod with complete transverse suture, endopod with incomplete or weak transverse suture. *Pleopod* 5 exopod with complete transverse suture, endopod with incomplete transverse suture.

Uropods (rami + peduncle) 0.8 as long as pleotelson, peduncle 0.6 as long as endopod. *Endopod* 2.3 as long as wide; distally broadly rounded. *Exopod* 0.6 as long as endopod, 2.3 times as long as wide, distally broadly rounded.

Size. 4.8 to 5.5 mm.

Colour: No chromatophores; pale cream–yellow.

Remarks. The species is identified by the characters of the genus. See *Sedorolis* sp. for comments on potential species character differences.

Distribution. New Caledonia, in the vicinity of the type locality; 440–570 m.

Etymology. From the Latin *simplex*, simple—in the sense of smooth, not ornamented.

Sedorolis sp.

Material ♂ (8.0 mm), ♀ (ovig. 9.2 mm, non-ovig. 8.2 mm), New Caledonia, 23°10'S, 167°10'E, 29 Aug 1985, 675–680 m, BIOCAL, stn. DW 33, N.O. 'Jean Charcot' (MNHN Is.6007). 1 ♀, N.O. 'Jean Charcot', BIOCAL, stn. DW 33, 23°10'S, 167°10'E, 29 Aug 1985, 675–680 m (MNHN Is.6008) [Previously dissected].

Remarks. These specimens are exceedingly similar to *Sedorolis simplex* sp. n., differing only in being larger (*S. simplex* is consistently less than 6 mm), the anterior head lobes a slightly different shape (weakly sinuate vs convex), the penial openings are mutually adjacent (narrowly separate in *S. simplex*) and the sternites of pleonites 1–3 seem to have slightly more developed lobes. The specimens are also from a slightly greater depth than *Sedorolis simplex*.

These differences may be due to the *Sedorolis* sp. material being larger in size. The material has been mutilated (by previous dissection), so description is not possible.

***Myopiarolis* gen. n.**

urn:lsid:zoobank.org:act:F4F859DF-3982-4749-B42D-CD8F1AAF8C62

Caecoserolis.— Poore and Brandt, 1997: 161 (part).

Type species. *Myopiarolis systir* sp. n., here designated.

Diagnosis. Eyes minute (less than 5% greatest width of head) elliptical (lenticular/ovoid) when present, or absent; coxae of pereonites 2–4 distal margin truncate; coxae 6 extending to between posterior of uropods and pleotelson posterior margin; pleonites 2 and 3 distally narrow or acute, laterally overlapped by coxae 6, extending posteriorly along pleotelson; antenna peduncle articles 4 and 5 slender (4.6–6.3 and 8.6–10.3 as long as wide respectively); left mandible lacinia mobilis three-quarters as wide as incisor or larger; propodal palm setae all RS, alternating straight and flattened; pleopod 2 endopod lamellar part slightly shorter than ramus; uropods biramous, inserted on pleotelson mid-laterally. Uropodal rami positioned ventrally, less than one-third as long as pleotelson (less than 0.3).

Description. *Head* lateral lobe mesial margin with two concavities; anterolateral lobes forming of continuous margin with pereonite 1; anterior submarginal ‘ridge’ entire; posterior margin with or without median tubercle. *Pereonites* 5–7 fused mid-dorsally; pereonite 1 anterior margin not strongly bent dorsally, dorsally with or without median tubercles on some or all of pereonites and pleonites. *Coxae* of pereonites 2–4 articulated, with dorsal sutures; 2–4 and pereonite 6 entirely lacking coxal keys; coxae 6 wide, posteriorly produced. *Ventral coxal plates* 2–4 meeting midline; simple, smooth, or with anterior and posterior ridge, or strongly punctate, or with mesial ridges forming X-shape; plates 6 and 7 entirely separate. *Sternites* 5–7 visible, fused. *Sternal plates* of pleonites 1–3 tri-cornered, with acute median point, with distinct median ridge (occasionally absent in plate 1). *Pleotelson* dorsal surface with paired sublateral carinae; posterior margin converging to caudomedial point, without distinct median excision.

Antennule flagellum 2.0–3.0 as long as peduncle articles 3 and 4, extending to between pereonites 3 and pereonite 5. *Antenna* peduncle articles 4 and 5 slender, article 5 8.6–10.3 times as long as greatest width; flagellum about as long as or longer (0.8–1.9) than peduncle article 5.

Epistome with blunt or acute median point. *Mandible incisor* even or minutely irregular; right mandible lacinia mobilis distally multicuspid, mandibular spine simple. *Maxilla* lateral lobe with 2 distal simple setae, middle lobe with 2–5 long simple setae. *Maxilliped palp* with 3 articles, article 3 cordiform, longer than wide.

Pereopod 1 carpus RS distally pilose; propodus wide, RS with finely ridged margins or with serrate margins, narrow RS distally bifid, with simple flagellum or distally bifid, with pilose flagellum. *Pereopod 2* propodus inferior margin with distinct heel, palm straight or angled or weakly concave; inferior margin RS simple, acute or simple, blunt, smooth or pilose; unguis simple, slender. *Pereopods 6 and 7* not sexually dimorphic.

Penial openings fused, *penes* opening flush with surface of sternite 7.

Pleopods 1–3 peduncles triangular, *pleopod 1–3* peduncles with coupling setae.

Uropods not forming part of continuous body outline, endopod distally rounded.

Remarks. *Myopiarolis* gen. n. can be distinguished from all other genera of Serolidae by the following combination of characters: small (<5% head width) lenticular eyes (when present), coxae 2–4 distally truncate forming continuous body outline, broad but posteriorly produced coxae 6 that extend laterally along the pleotelson, pleonites 2 and 3 that curve posteriorly and run along the side of the pleotelson, but are laterally overlapped by coxae 6, antenna with slender peduncle articles 4 and 5 (4.6–6.3 and 8.6–10.3 as long as wide respectively) and very short uropods (<0.3 pleotelson) that are ventrally inserted about halfway along the pleotelson lateral margins, the rami of which are consistently bluntly rounded. These character states are entirely consistent within the genus including several undescribed species from New Zealand (personal observation).

The most similar genus is *Caecoserolis* Wägele, 1994, known only from the south-western Indian Ocean, off the Natal coast of South Africa. That genus differs from *Myopiarolis* in having broad antennal articles 4 and 5 (less than 5.0 times as long as wide), all pereonites dorsally articulated and a weakly domed pleotelson that lacks sub-lateral carinae. Difference between the two genera are discussed in more detail under the remarks for *Caecoserolis*.

Unusually the setation of the maxilla middle lobe varies. This is a character that is generally consistent within serolid genera, with the middle and lateral lobes each having two apical setae. Two large species, *M. koro* sp. n. and *M. carinata* (Bruce, 2008) have the middle lobe with 5 or 6 long apical setae and one mid-length on the mesial margin.

Relationships of *Myopiarolis*. *Atlantoserolis* Wägele, 1994, *Caecoserolis* and *Glabroserolis* Menzies, 1962 form a monophyletic group according to Wägele (1994), to which *Myopiarolis* gen. n. also belongs. That group was characterised (Wägele 1994, fig 36) by lack of eyes, oval body shape, body widest at pereonites 1 or 2 and, more basally, Wägele's 'group B' was defined by having a 'stalked appendix masculina'. Loss of eyes is a frequent homoplasious occurrence within the Isopoda, and cannot be reliably used to characterise genera or groups of genera (in contrast to eye shape which is usually consistent). Body width and where the body is widest varies considerably within larger genera (in *Myopiarolis* body width ranges from 1.1–1.4 as long as greatest width, and is widest at coxae 3 or 4). Neither *Myopiarolis* nor *Caecoserolis* are widest at pereonites 1 and/or 2, and neither genus has a stalked appendix masculina.

A character not used by Wägele's (1994) is the shape of the coxae of pereonites 2–4. All of Wägele's 'group B' is characterised by having approximately quadrangular coxae, that is with the anterior, posterior and distal margins clearly demarcated, with the exception of *Serolina*. Wägele's (1994) 'Group C' has coxae that are distally acute, in effect three sided. *Myopiarolis* (and *Caecoserolis*) then belongs with the 'Group B' genera, but with unclear affinities with the remainder of that group, differing from most of the Group B genera in having triangular peduncles to pleopods 1–3, the state for *Caecoserolis*; *Heteroserolis* and *Sedorolis* gen. n., being quadrate or sub-quadrate.

The minute lenticular eye shape is a unique, probably apomorphic, character for *Myopiarolis*. The state of short uropods (0.2–0.3 length of pleotelson), also probably

apomorphic, is shared only with *Caecoserolis* Wägele, 1994, that genus being distinguished by the broad antennal peduncle articles 4 and 5, separate penial openings, all pereonites unfused, coxae 6 not extending posteriorly beyond the pleonites and a weakly domed pleotelson that lacks sub-lateral carinae.

Taxonomically useful characters. Dorsal ornamentation, including pattern and size of pereonal and pleonal tubercles, and of the pleotelson carinae; ornamentation of the ventral coxal plates of pereonites 2–4; extent that coxae 4–6 are posteriorly produced; extent that pleonites are produced along the pleotelson; body length to width ratio; relative proportions of the antennule and antenna peduncle articles and their flagellae (the latter of which vary considerably in relative length); extent, number and morphology of robust setae on pereopod 2 palm; shape of pereopod 2 palm; number, size and morphology of setae on the inferior margins of posterior pereopods; relative size of uropods and uropodal rami; presence or absence of eyes. Minor differences can be seen in the proportions of the pereopod articles and the relative length of pereopod 7 in relation to pereopod 6.

Species included. In addition to the type species, *Myopiarolis antarctica* (Beddard, 1884, sensu lato) comb. n., southern Indian Ocean and tropical Brazil (Beddard 1884); *M. apheles* (Schotte, 1992) comb. n., Mozambique Channel, southwestern Indian Ocean; *M. bicolor* (Bruce, 2008) comb. n., northeastern New Zealand; *M. carinata* (Bruce, 2008) comb. n., northwestern New Zealand; *M. koro* sp. n., Fiji; *M. norfanz* sp. n., Lord Howe Plateau, Tasman Sea; *M. novaecaledoniae* (Poore and Brandt, 1997) comb. n., New Caledonia; and *M. lippa* sp. n., northern Coral Sea.

There are least three known undescribed species: one recorded here, one from off the South Island of New Zealand (Bruce 2008), and the species from off Norfolk Island recorded by Poore and Brandt (1997); a further six probable new species are known from around New Zealand (NIWA NIC collections, personal observation).

Distribution. The genus is known from the Western Indian Ocean eastwards to Fiji and New Zealand, the Southern Ocean and the northern Coral Sea in the Gulf of Papua; at depths from 700 to 3184 metres.

Etymology. From the Greek ‘myopia’ in combination with [Se]-rolis; alluding the tiny or absent eyes. Gender neuter.

Key to the southwestern Pacific species of *Myopiarolis*

The key allows identification of males and females. Size is significant in species differentiation and size is included for all species even if not diagnostic. Dorsal tubercles may be small or weakly defined and need to viewed laterally and obliquely with reflected lighting to be clearly seen.

- | | | |
|---|--|---|
| 1 | Dorsal surfaces of pereonites and pleonites without tubercles..... | 2 |
| – | Dorsal surfaces of pereonites and pleonites with tubercles..... | 4 |
| 2 | Male coxal sternites 2–4 not elevated, without mesial X-shaped ridge;..... | 3 |

- Male coxal sternites 2–4 elevated, with mesial X-shaped ridge; average size of 11.6 mm (♂) and 12.7 mm (♀) *M. systir* sp. n.
- 3 Body dorsal surfaces punctate; head with submedian tubercle anterior to each eye; size range 18.4–21.6 mm *M. koro* sp. n.
- Body dorsal surfaces not punctate; head without submedian tubercles; size range of males 16.7–16.9 mm (♂), 18.5 mm (♀) ... *M. novaecaledoniae*
- 4 Posterior of pereonites 1–3 with row of fine submarginal tubercles; lateral margin of pereonites 3 and 4 with single small distinct tubercle; dorsum smooth; pleotelson without longitudinal median carina; average size 10.6 mm (♂), 12.8 mm (♀) *M. norfanz* sp. n.
- Posterior margin pereonite 3, 4, 6, 7 and pleonites with single fine median tubercle; dorsum punctate; pleotelson with longitudinal median carina; size 14.5 mm (♂) *M. lippa* sp. n.

***Myopiarolis koro* sp. n.**

urn:lsid:zoobank.org:act:93A1FB2C-15CB-4F55-8172-D0EAE37D5CB1

Figs 9–12

Material. *Holotype*: ♂ (18.4 mm), Fiji, Koro Sea, 17°22'S, 179°28'W, 5 Mar 1999, 1216–1226 m, BORDAU 1, stn CP 1458, N/O *Alis*, coll. Bouchet, Warren and Richer de Forges (MNHN Is.6009). *Paratype*: ♀ (ovig. 21.6 mm), same data as holotype (MNHN Is.6010).

Description. *Body* 1.3 as long as wide, widest at coxae 4, dorsal surfaces punctate. *Head* anterolateral lobes weakly convex, anterior submarginal 'ridge' laterally incomplete; dorsally with pair of low sub-median tubercles anterior to eyes, posterior margin with low rounded median tubercle. *Eyes* present. *Pereonite* 1 anterolateral margin continuously convex; dorsally without tubercles. *Coxae* 4 extending to mid-pleonite 1; 5 extending posteriorly along 0.2 of pleotelson length; coxae 6 extending to posterior of uropods, and along 0.6 of pleotelson length. *Ventral coxal plates* mesially flat, mesially simple, smooth. *Pleonites* extending posteriorly along 0.6–0.7 pleotelson lateral margin; pleonite 1 sternal plates with acute median point, sternal plate 1 with median ridge and 2 sub-median depressions. *Pleotelson* 0.7 times as long as anterior width, dorsal surface with median longitudinal carina, with paired sublateral carinae; lateral margins straight, posterior margin converging to angled caudomedial point, without distinct median excision.

Antennule peduncle article 2 1.8 times as long as wide; articles 3 and 4 2.2 times as long as article 2; article 3 8.5 times as long as wide; flagellum 2.4 as long as peduncle articles 3 and 4, with ~36 articles, extending to pereonite 4. *Antenna* peduncle article 4 4.6 times as long as wide, 2.6 times as long as article 3; article 5 1.3 times as long as article 4, 9.1 times as long as wide; antennal flagellum 1.0 as long as peduncle article 5, with ~18 articles, extending to posterior of pereonite 4.

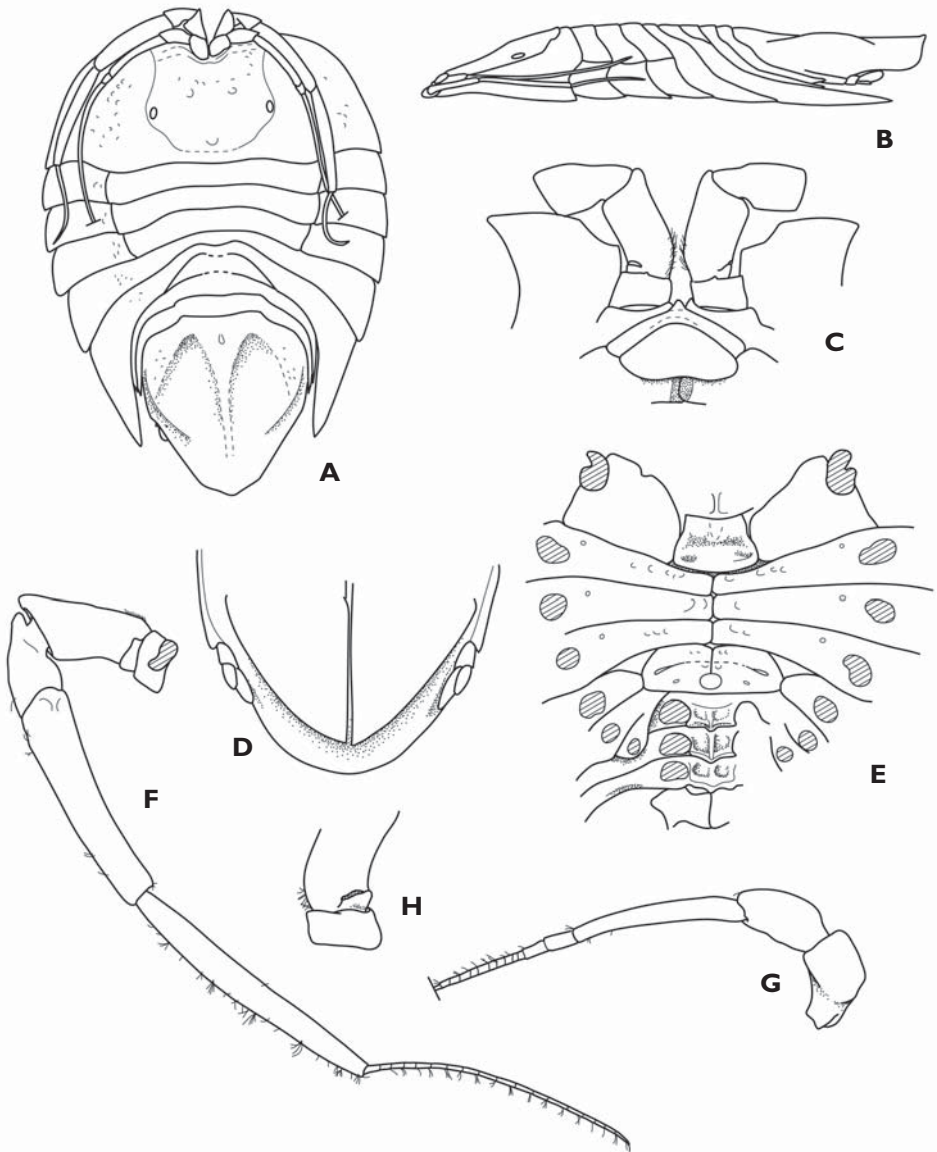


Figure 9. *Myopiarolis koro* sp. n. Holotype, except F–H, female paratype. **A** dorsal view **B** lateral view **C** frons **D** pleon and pleotelson, ventral view **E** sternites and ventral pleonites **F** antenna **G** antennule **H** antenna article 2, ventral side.

Epistome with acute median point. *Mandible incisor* with single posterior cusp, left mandible lacinia mobilis 1.0 (0.97) as wide as incisor, right mandible lacinia mobilis distally multicuspid, mandibular spine distally serrate; palp article 2 with 22 distolateral setae, article 3 with 40 biserrate setae. *Maxilla* mesial lobe with 18 long, finely serrate setae;

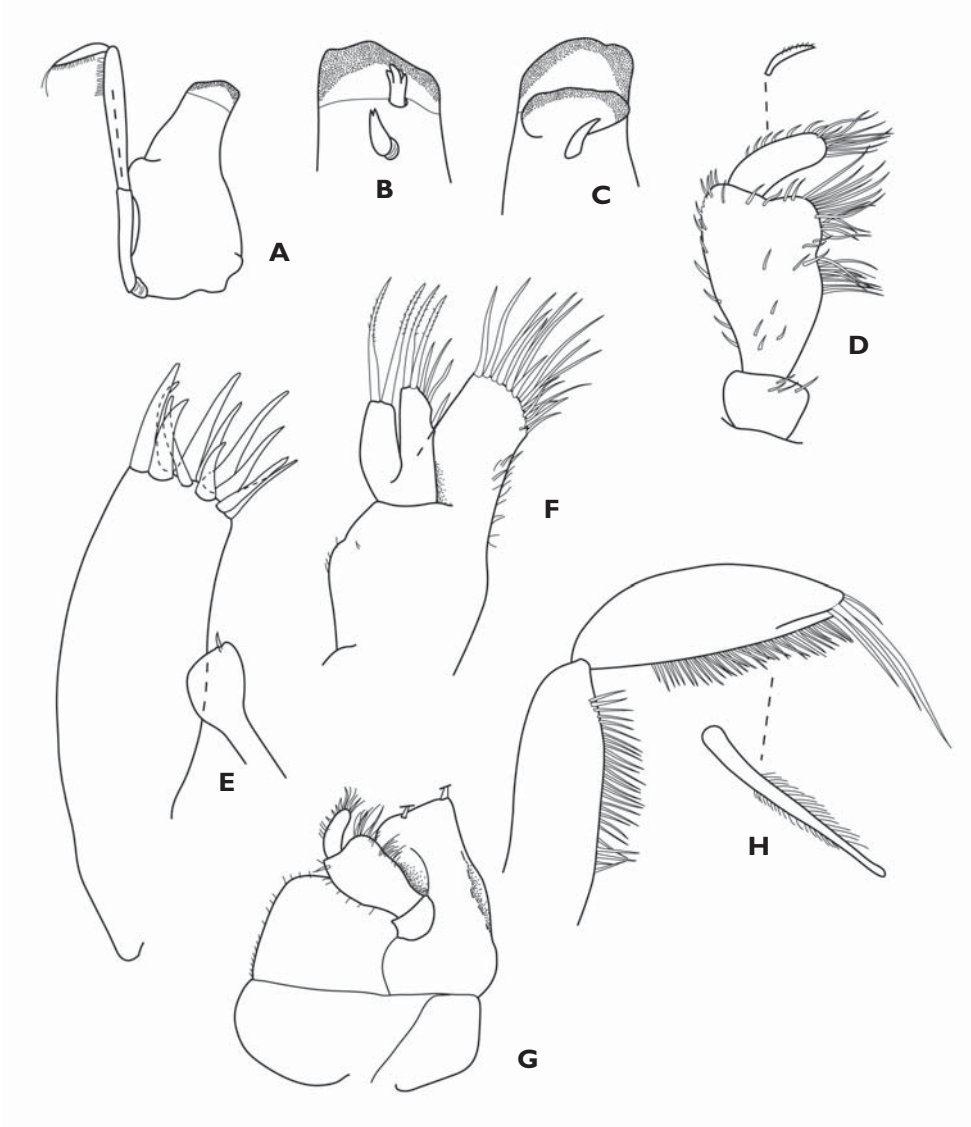


Figure 10. *Myopiarolis koro* sp. n. Female paratype, except D, holotype. **A** right mandible **B** right mandible **C** left mandible **D** maxilliped palp **E** maxillule **F** maxilla **G** maxilliped **H** mandible palp, distal article 2 and article 3.

middle lobe with 6 long simple setae (1 mesial, 5 terminal); lateral lobe with 2 distal simple setae. *Maxilliped palp* article 2 proximomesial margin with ~10 setae, distomesial margin with 16 setae, lateral margin distally with 12 setae (continuous along length); article 3 lateral margin with 6 setae, distal margin with 8 setae; endite distal margin RS simple.

Pereopod 1 carpus RS distally serrate; propodus 1.9 times as long as wide, inferior margin with ~66 RS, wide RS with finely ridged margins, narrow RS distally bifid,

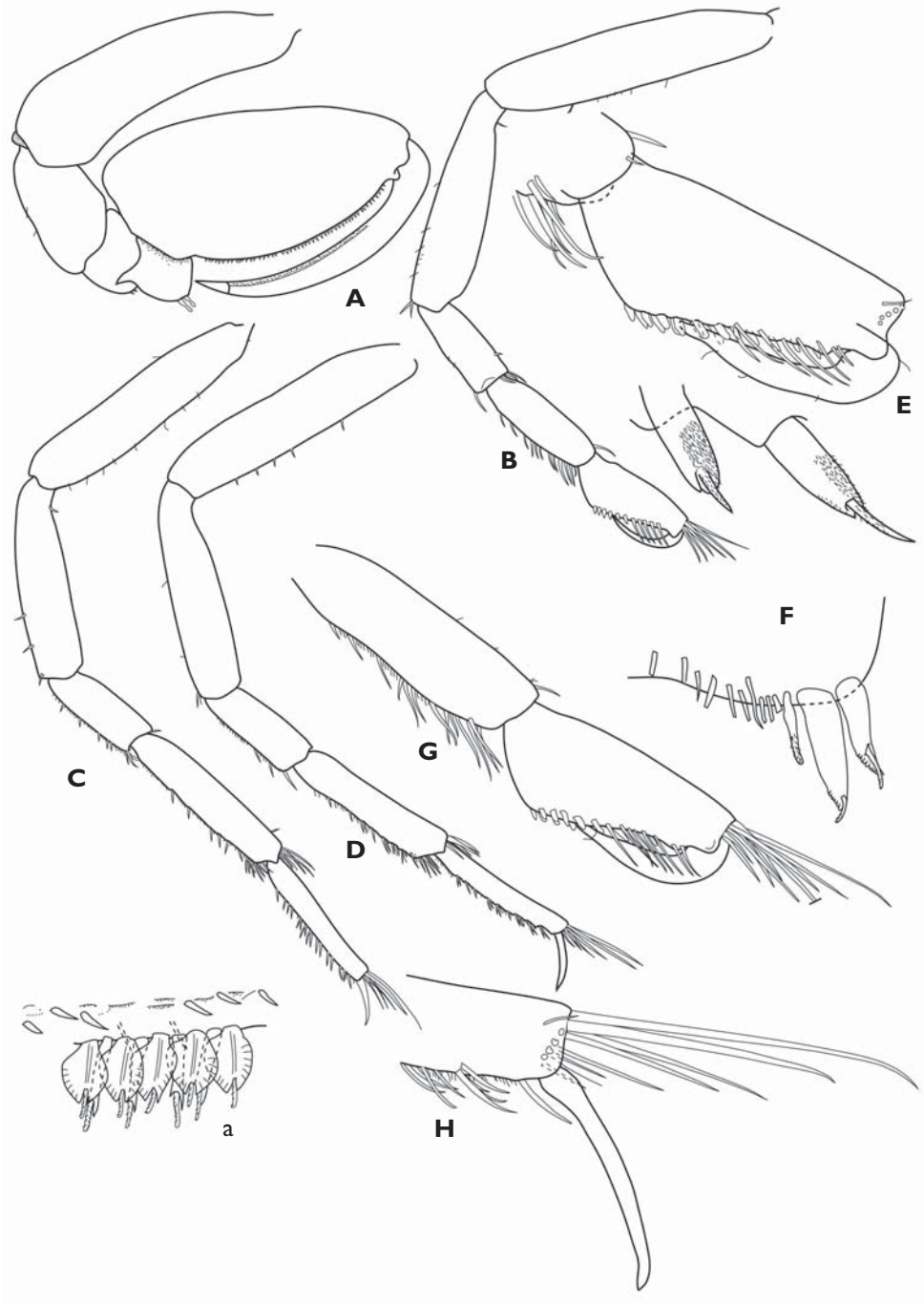


Figure 11. *Myopiarolis koro* sp. n. Holotype. **A–D** pereopods 1, 2, 6 and 7 respectively **a** detail of pereopod 1 propodal palm setae; **E** pereopod 2 propodus **F** pereopod 1 carpus, distal angle **G** pereopod 2 carpus and propodus **H** pereopod 7 propodus, distal margin and dactylus.

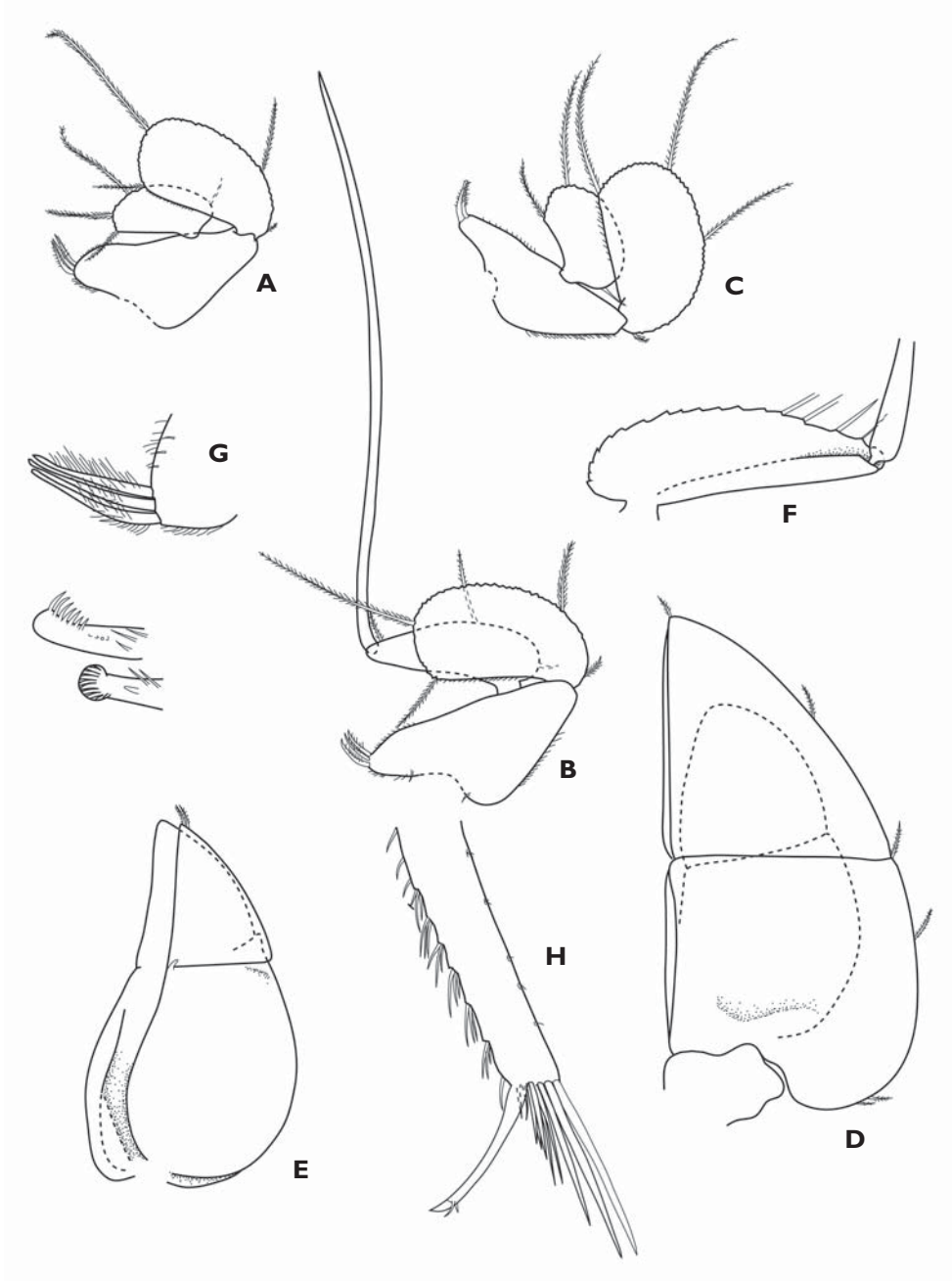


Figure 12. *Myopiarolis koro* sp. n. Holotype, except D, E, female paratype. **A–E** pleopods 1–5 respectively **F** pleopod 2 endopod detail **G** pleopod 1 peduncle **H** pereopod 7 propodus, distal margin and dactylus.

with pilose flagellum. *Pereopod 2 basis* 4.7 times as long as greatest width; 0.8 times as long as basis, *ischium* 3.8 times as long as wide; *merus* 0.5 as long as ischium, 2.7 times as long as greatest width, inferior margin with 1 cluster of setae (2), superior distal angle with 0 setae; *carpus* 0.6 as long as ischium, 3.1 times as long as wide, inferior margin with 8 clusters of setae (groups indistinct; as, 1, 1, 1, 2, 1, 2, 3, 4); *propodus* 0.5 as long as ischium, 2.4 times as long as wide, inferior margin with indistinct heel, palm weakly concave, inferolateral margin with 6 RS, inferomesial margin with 10 RS, inferior margin RS simple, blunt, distally pilose, distal margin with ~10 setae, *dactylus* 0.5 as long as propodus, unguis simple, blunt. *Pereopod 6 basis* 4.2 times as long as greatest width; *ischium* 0.9 as long as basis, 4.2 times as long as wide, inferior margin with 1 cluster setae (2), superior distal angle with 0 RS; *merus* 0.5 as long as ischium, 2.4 times as long as wide, inferior margin with 1 cluster of setae (1, 1 and 1), superior distal angle with 1 seta; *carpus* 0.8 as long as ischium, 4.7 times as long as wide, inferior margin with 10 clusters of setae (as 1, 1, 1, 2, 1, 2, 3, 3, 2, 7), superior distal angle with ~6 setae; *propodus* 0.6 as long as ischium, 7.0 times as long as wide, inferior margin with 9 clusters of setae (as 1, 1, 1, 3, 3, 3, 3, 3, 3), distal margin with ~11 setae, inferior distal angle with 1 RS; *dactylus* 8.7 as long as proximal width. *Pereopod 7* similar to, but 0.95 as long as pereopod 6. Setae on inferior margins of pereopods 4 to 7 finely plumose. Inferior margins of pereopods 2–7 setulose fringe prominent.

Pleopod 1 peduncle 1.4 times as long as wide, mesial margin with 3 coupling setae; exopod 1.8 as long as wide, with 44 PMS; endopod 2.2 times as long as wide, 0.7 as long as exopod, with 21 PMS. *Pleopod 2* peduncle 1.5 as long as wide, mesial margin with 3 coupling setae; exopod 1.5 as long as wide, with 48 PMS; endopod 3.0 as long as greatest width, lamellar part 4.2 as long as wide, with 16 PMS; *appendix masculina* 3.2 times as long as endopod. *Pleopod 3* exopod with 52 PMS, endopod with 20 PMS. *Pleopod 4* exopod with complete transverse suture, endopod with complete transverse suture. *Pleopod 5* exopod with complete transverse suture, endopod with incomplete transverse suture.

Uropods (rami + peduncle) 0.2 as long as pleotelson, peduncle 0.9 as long as endopod. *Endopod* 2.9 as long as wide; distally broadly rounded. *Exopod* 0.6 as long as endopod, 2.6 times as long as wide, distally broadly rounded.

Female. As for the male.

Remarks. *Myopiarolis koro* sp. n., the only serolid known from Fiji, is best identified by its large size, presence of small sub-median tubercles anterior to the eyes, a relatively wide posterior margin on the pleotelson and a lack of median tubercles on the peronites and pleonites.

Myopiarolis novaecaledoniae is similar in general appearance, but is smaller (14.6–18.5 mm compared to 18.4–21.6 mm), the dorsum is smooth not punctate, the palm of pereopod 2 has 3+6 robust setae (compared to 5+10), and the maxilla has the lateral and mesial lobes each with 2 long setae compared to 2 and 6 setae.

Colour. Pale brown, pale cream on coxal margins;

Distribution. Fiji, Koro Sea; depths of 1216–1226 metres.

Etymology. Taken from the region of the type locality, the Sea of Koro; noun in apposition.

***Myopiarolis lippa* sp. n.**

urn:lsid:zoobank.org:act:FFD8404E-8B2B-4821-BE05-7999BE42E67A

Figs 13, 14

Material. *Holotype*: ♂ (14.5 mm), northern Coral Sea, between Cape York and Gulf of Papua, 11°33'S, 146°14'E, 14 Feb 1992, CIDARIS III stn 13-2, 2053–2012 m (MTQ W13697).

Description. *Body* 1.3 as long as wide, widest at coxae 3, dorsal surfaces punctate. *Head* anterolateral lobes weakly convex, anterior submarginal 'ridge' laterally incomplete; dorsally with (pair of weak submedial tubercles and weak tubercle mesial to eyes), posterior margin with low rounded median tubercle. *Eyes* present. *Pereonite* 1 anterolateral margin continuously convex; dorsal surfaces with small median tubercle on pereonites 2, 4, 6 and 7 and pleonites 1 and 2. *Coxae* of pereonites 2–4 distal margins truncate; coxae 4 extending to mid-pleonite 2; coxae 5 extending posteriorly along 0.3 of pleotelson length; coxae 6 extending to mid-length of uropods, and along 0.8 of pleotelson length. *Ventral coxal plates* 2–4 mesially elevated, with ridges forming X-shape; plates 6 and 7 entirely separate. *Pleonites* extending posteriorly along 0.6 pleotelson lateral margin; pleonite 1 sternal plates with acute median point, sternal plate 1 without median ridge, with process extending to posterior of sternite 2. *Pleotelson* as long (0.99) as anterior width; with distinct longitudinal median carina and paired sublateral carinae; lateral carinae entirely carinate, lateral margins convex; posterior margin narrowly rounded, without distinct median excision.

Antennule peduncle article 2 2.1 times as long as wide; articles 3 and 4 2.8 times as long as article 2; article 3 9.6 times as long as wide; flagellum 2.9 as long as peduncle articles 3 and 4, with ~56 articles, extending to pereonite 6. *Antenna* peduncle article 4 5.9 times as long as wide, 2.9 times as long as article 3; article 5 1.2 times as long as article 4, 12.8 times as long as wide; antennal flagellum 1.2 as long as peduncle article 5, with ~20 articles, extending to middle of pereonite 3.

Epistome with obtuse median point.

Pereopod 1 carpus RS simple; propodus 2.2 times as long as wide, inferior margin with ~68 robust setae; dactylus with acute unguis. *Pereopod* 2 *basis* 4.5 times as long as greatest width; 0.8 times as long as basis, ischium 4.5 times as long as wide; *merus* 0.4 as long as ischium, inferior margin with 2 clusters of setae (as 1 and 3), superior distal angle with 4 setae; *carpus* 0.5 as long as ischium, 2.9 times as long as wide, inferior margin with 3 clusters of setae (as 1, 3 and 4); *propodus* 0.5 as long as ischium, 2.5 times as long as wide, inferior margin with indistinct heel, palm weakly concave, inferolateral margin with 6 RS, inferomesial margin with 10 RS, inferior margin RS both blunt and acute (distal 3 acute), distally pilose, distal margin with ~9 setae; *dactylus* 0.7 as long as propodus, unguis simple, blunt. *Pereopod* 6 *basis* 3.9 times as long as greatest width; *ischium* 0.8 as long as basis, 3.2 times as long as wide, inferior margin with 0 clusters of setae, superior distal angle with 0 RS; *merus* 0.6 as long as ischium, 2.5 times as long as wide, inferior margin with 2 clusters of setae (as 1, 2 and 3), superior distal angle with 2 setae; *carpus* 0.8 as long as ischium, 4.4 times as long as wide, inferior margin with 8 clusters of setae (as 1, 3, 3, 3, 1, 3, 3 and 3), superior distal angle with

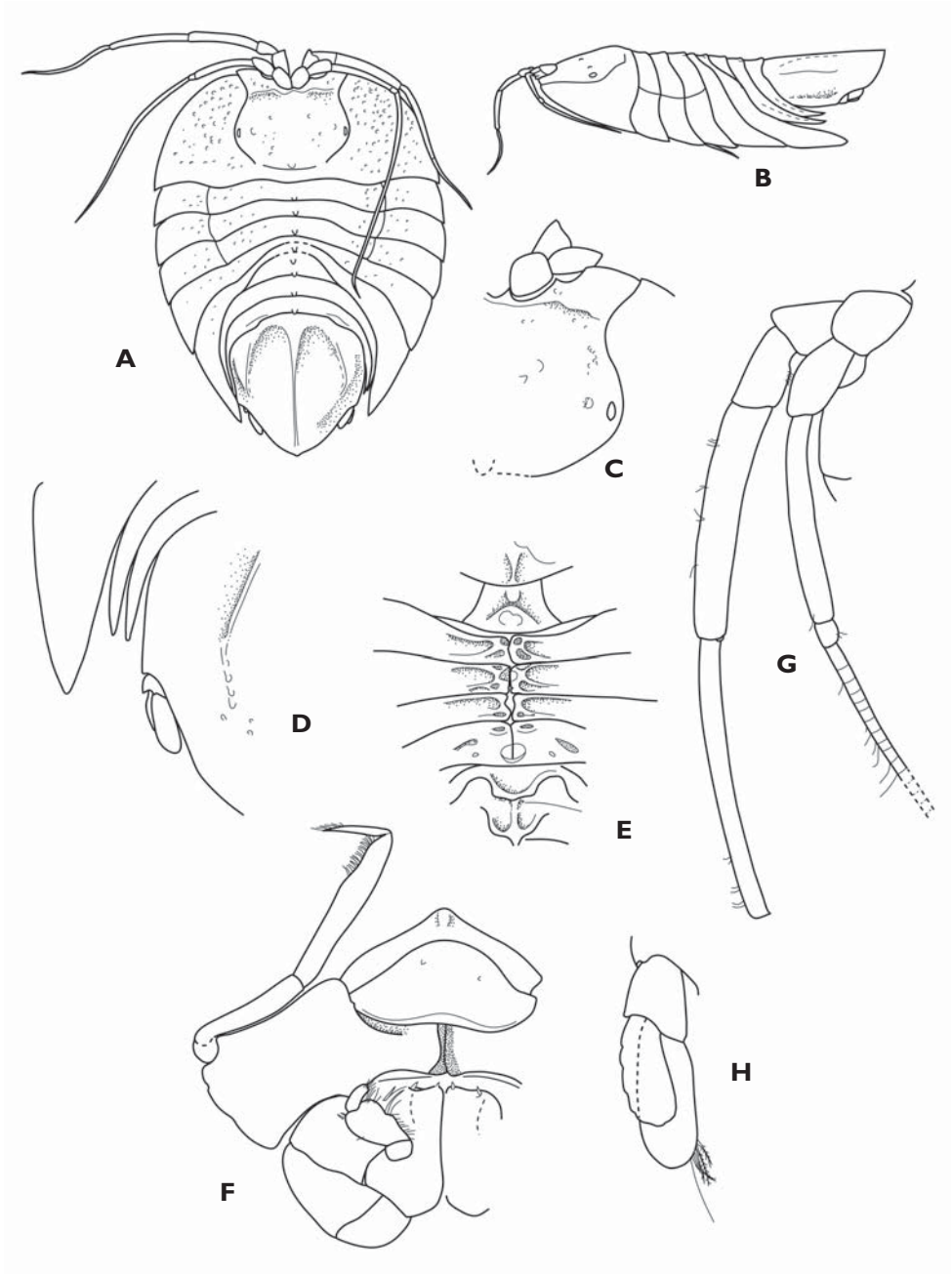


Figure 13. *Myopiarolis lippa* sp. n. Holotype. **A** dorsal view **B** lateral view **C** head, anterior margin **D** pleon and pleotelson, dorsal view **E** sternites and pleonites, ventral view **F** frons **G** antennule and antenna (in situ) **H** uropod (in situ).

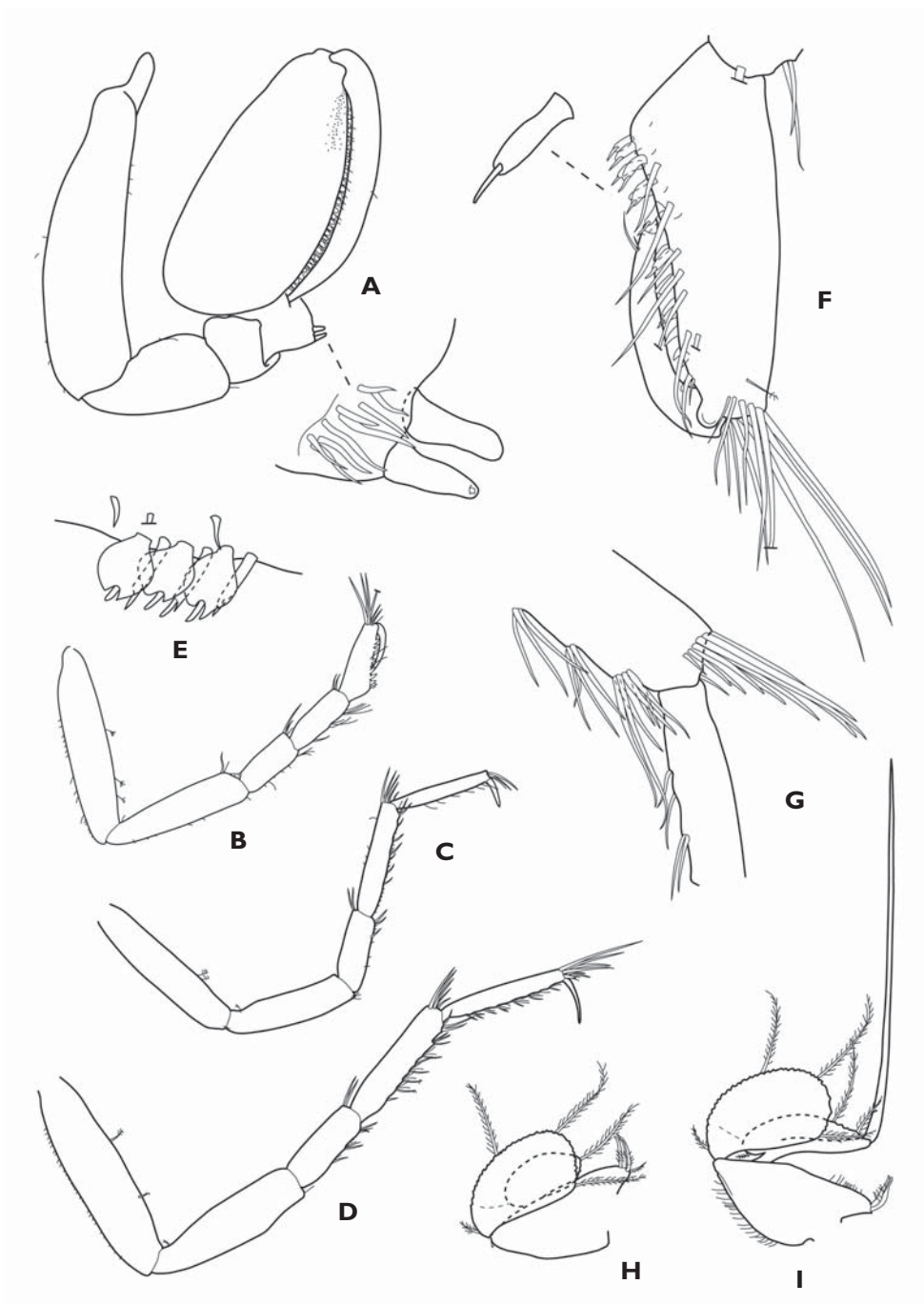


Figure 14. *Myopiarolis lippa* sp. n. Holotype. **A–D** pereopods 1, 2, 6 and 7 respectively **E** detail of propodal palm setae **F** pereopod 2 propodus **G** pereopod 6 distal articles **H** pleopod 1 **I** pleopod 2.

–9 setae; *propodus* 0.8 as long as ischium, 7.1 times as long as wide, inferior margin with 8 clusters of setae (as 1, 2, 3, 4, 4, 3, 1 and 2), distal margin with –7 setae, inferior distal angle with 0 RS; *dactylus* 6.8 as long as proximal width. *Pereopod* 7 similar to, but 0.8 as long as pereopod 6. Setae on inferior margins of pereopods 4–7 finely plumose. Inferior margins of pereopods 2–7 setulose fringe weakly developed.

Pleopod 1 peduncle 1.9 times as long as wide, mesial margin with 3 coupling setae; with 42 PMS; endopod 2.2 times as long as wide, 0.6 as long as exopod, with 22 PMS. *Pleopod* 2 peduncle 2.2 as long as wide, mesial margin with 2 coupling setae; exopod 1.8 as long as wide, with 44 PMS; endopod 3.5 as long as greatest width, lamellar part 3.9 as long as wide, with 22 PMS; *appendix masculina* 3.0 times as long as endopod.

Uropods (rami + peduncle) 0.2 as long as pleotelson, peduncle 0.6 as long as endopod. *Endopod* 2.4 as long as wide; distally broadly rounded. *Exopod* 0.8 as long as endopod, 2.5 times as long as wide, distally broadly rounded.

Remarks. *Myopiarolis lippa* sp. n. can be identified by the presence of a distinct medial longitudinal carina and prominent long sublateral carinae on the pleotelson, small median nodules on pereonites 6 and 7 and the pleonites, and the coxae 6 not extending to the uropod peduncle. All other species in the region lack a distinct median pleotelson carina.

The most similar species, both with medially ornate coxal sternites, are *M. norfanz* sp. n. and *M. systir* sp. n. *M. norfanz* is at once distinguished by the nodular ornamentation of the head and of the posterior lateral margins of pereonites 1–4; *M. systir* appears similar in dorsal view, but is not dorsally punctate, lacks the median pereonal and pleonal tubercles and has far longer coxae on pereonite 6.

Dissection and therefore description was minimised in order to conserve the physical integrity of the holotype. The antennae and uropods were described in situ, and of the mouthparts only the maxilliped was dissected; pleopods within the genus are rather uniform and only pleopods 1 and 2 were dissected and described.

Distribution. Northern Coral Sea, depth of 2012–2053 metres.

Etymology. The epithet is a Latin word meaning ‘dim-sighted, nearly blind’ (Brown 1956), alluding to the small eyes.

Myopiarolis norfanz sp. n.

urn:lsid:zoobank.org:act:9369B909-3B07-4350-9D19-3B9EBC872FB7

Figs 15–18

Caecoserolis novaecaledoniae Poore & Brandt, 1997: 161 (part).

Material. *Holotype*: ♂ (10.7 mm), Lord Howe Plateau, 32°26.70′S, 161°46.95′E, 25 May 2003, 1130–1147 m, NORFANZ stn TAN0308/77, RV *Tangaroa* (NIWA 27940). *Paratypes*: 3 ♂ (10.4, 10.5 [uropod], 10.7 [dissected] mm), 2 ♀ (ovig. 12.2, 13.7 mm), same data as holotype (NIWA 27536).

Additional material. Misidentified by Poore and Brand (1997) as *M. novaecaledoniae*. ♂ (11.8 mm), off Norfolk Island, 29°46.6′S, 167°58.9′E, 1 Jan 1976, 500 m, coll. J. E.

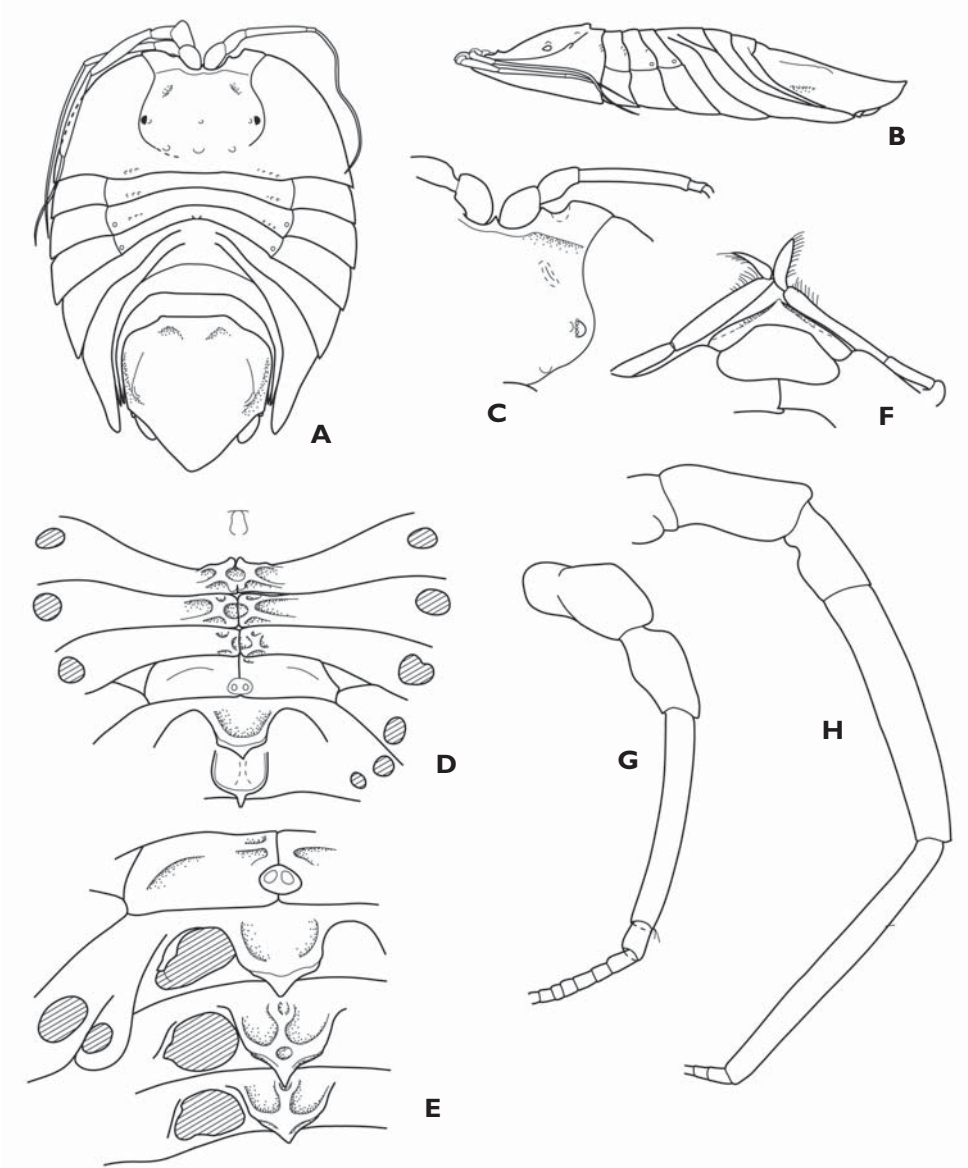


Figure 15. *Myopiarolis norfanz* sp. n. Holotype except E, paratype ♂ 10.7 mm. **A** dorsal view **B** lateral view **C** head, anterior margin **D** sternites and ventral pleonites **E** pleonites, ventral view **F** frons **G** antenna **H** antennule.

Watson on *Dmitri Mendeleev* (NMV J6796). ♂ (11.4 mm), off Norfolk Island, 30°31.1'S, 161°54.2'E, 29 Dec 1976, 1210 m, coll. J. E. Watson on *Dmitri Mendeleev* (NMV J7763)

Description. *Body* 1.4 as long as wide, widest at coxae 3, dorsal surfaces smooth. *Head* anterolateral lobes weakly convex, anterior submarginal 'ridge' entire; dorsally

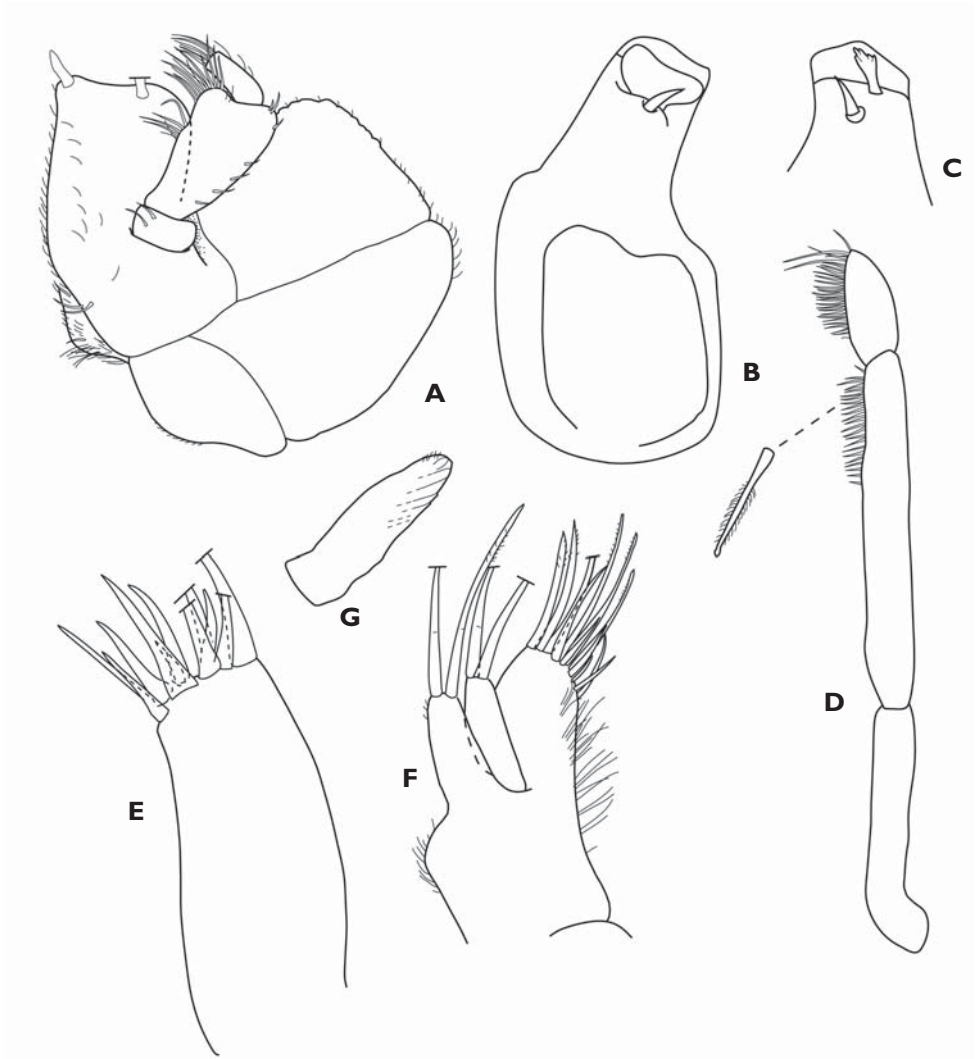


Figure 16. *Myopiarolis norfanz* sp. n. Paratype ♂ 10.7 mm. **A** maxilliped **B** left mandible **C** right mandible, distal margin **D** mandible palp **E** maxillule **F** maxilla **G** robust seta distal margin of maxilliped endite.

with central small tubercle, pair of sub-lateral tubercles on posterior margin and tubercle laterally adjacent to eye; posterior margin with low rounded median tubercle. *Eyes* present. *Pereonite 1* anterolateral margin continuously convex; dorsal surfaces posterolateral margins of pereonites 1–4 with row of small tubercles, pereonites 3 and 4 with single small tubercle at posterodistal corner. *Coxae* distal margins weakly convex; coxae 4 extending to mid-pleonite 1; coxae 5 extending posteriorly along 0.3 of pleotelson length; coxae 6 extending to mid-length of uropods, and along 0.8 of pleotelson length. *Ventral coxal plates* mesially elevated, plates 2–4 mesially with ridges forming

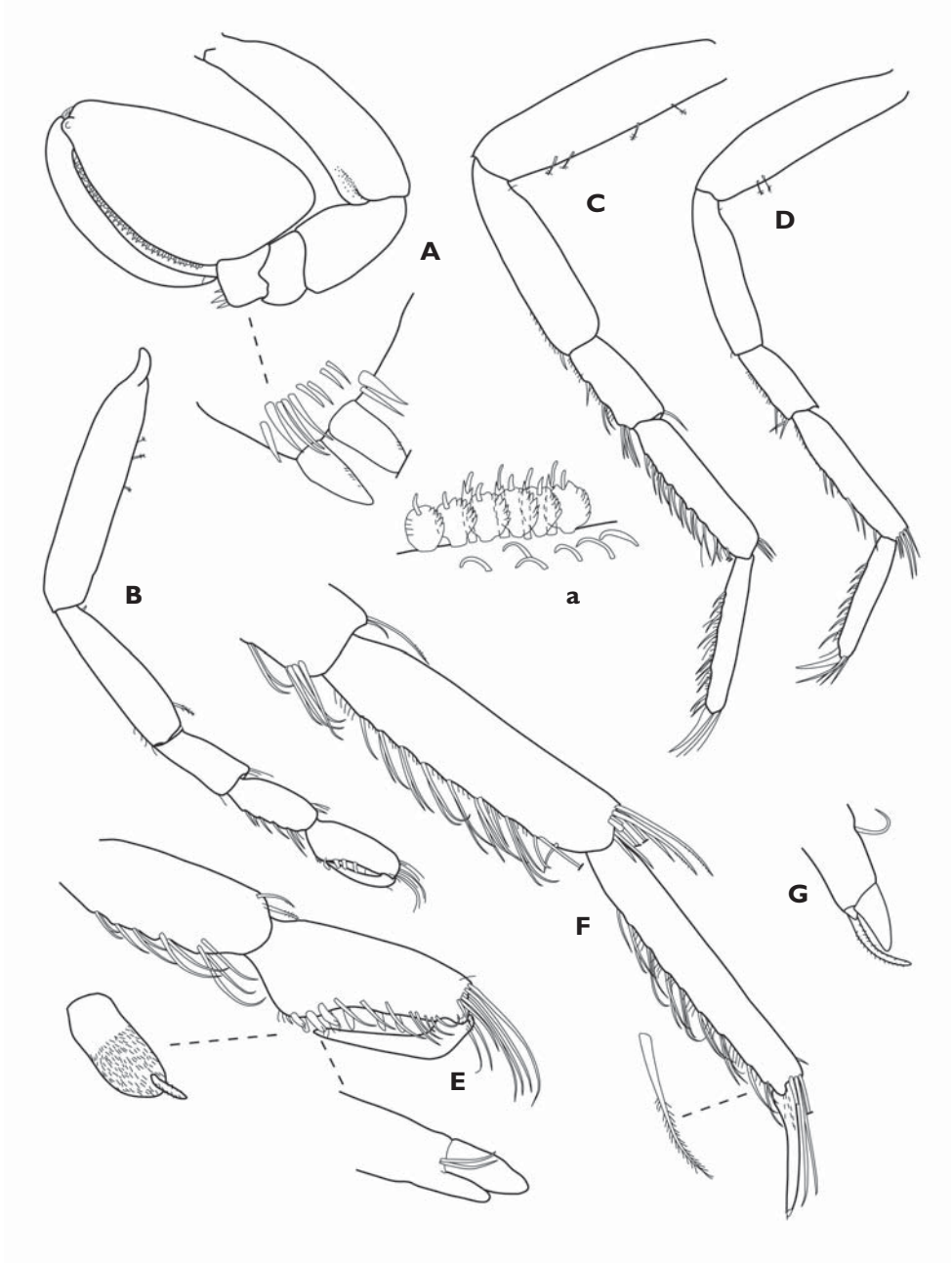


Figure 17. *Myopiarolis norfanz* sp. n. Paratype ♂ 10.7 mm. **A–D** pereopods 1, 2, 6 and 7 respectively **a** detail of pereopod 1 propodal palm setae **E** pereopod 2 carpus and propodus and detail of dactylus apex **F** pereopod 6 carpus and propodus **G** pereopod 2 carpus and propodus **H** pereopod 7, dactylus apex.

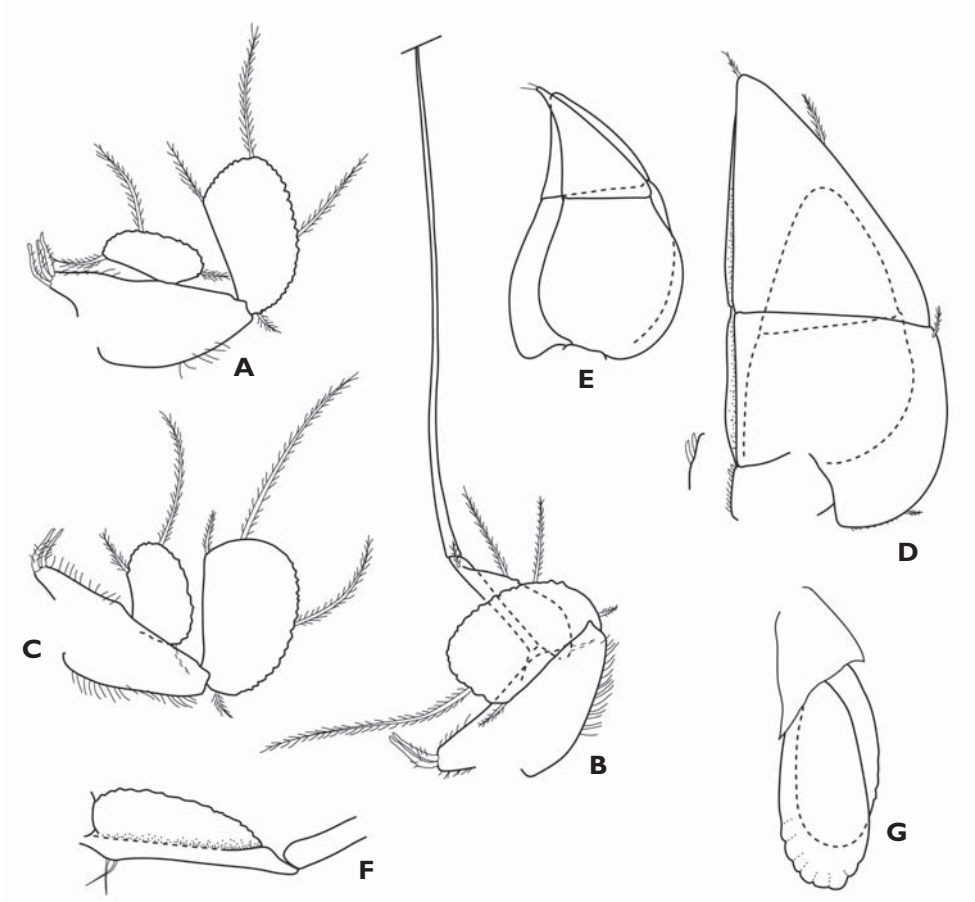


Figure 18. *Myopiarolis norfanz* sp. n. Paratype ♂ 10.7 mm., except G, paratype ♂ 10.5 mm. **A-E** pleopods 1–5 respectively **F** pleopod 2 endopod detail **G** uropod.

X-shape; plates 6 and 7 entirely separate. *Pleonites* extending posteriorly along 0.9 pleotelson lateral margin; pleonite 1 sternal plates with acute median point, sternal plate 1 without median ridge (plates 2 and 3 with median ridge). *Pleotelson* 1.0 times as long as anterior width; dorsal surface without median longitudinal carina, with paired sublateral carinae; lateral carinae angle of inflexion raised, thickened; lateral margins straight; posterior margin converging to rounded caudomedial point, without distinct median excision.

Antennule peduncle article 2 2.1 times as long as wide; articles 3 and 4 2.3 times as long as article 2; article 3 8.2 times as long as wide; flagellum 2.7 as long as peduncle articles 3 and 4, with ~50 articles, extending to pereonite 4. *Antenna* peduncle article 4 6.3 times as long as wide, 1.9 times as long as article 3; article 5 1.2 times as long as article 4, 10.9 times as long as wide; antennal flagellum 1.9 as long as peduncle article 5, with ~20 articles, extending to posterior of pereonite 3.

Epistome with acute median point. *Mandible incisor* even or minutely irregular, left mandible lacinia mobilis 0.9 as wide as incisor, right mandible lacinia mobilis distally multicuspid, mandibular spine simple; palp article 2 with 24 distolateral setae, article 3 with 26 biserrate setae. *Maxilla* mesial lobe with 12 long, finely serrate setae; middle lobe with 2 long simple setae; lateral lobe with 2 distal simple setae. *Maxilliped palp* article 2 proximomesial margin with 6 setae, distomesial margin with 12 setae, lateral margin distally with 7 setae; article 3 lateral margin with 3 setae, distal margin with 8 setae; endite distal margin RS serrate.

Pereopod 1 carpus RS simple; propodus 2.0 times as long as wide, inferior margin with ~56 RS; wide RS with serrate margins, narrow RS distally bifid, with pilose flagellum; dactylus with acute unguis. *Pereopod 2 basis* 5 times as long as greatest width; 0.7 times as long as basis, ischium 3.7 times as long as wide; *merus* 0.5 as long as ischium, 2.1 times as long as greatest width, inferior margin with 1 cluster of setae (of 1), superior distal angle with 3 setae; *carpus* 0.5 as long as ischium, 2.4 times as long as wide, inferior margin with 5 clusters of setae (as 2, 1, 2, 2 and 3); *propodus* 0.6 as long as ischium, 2.3 times as long as wide, inferior margin with distinct heel, palm weakly concave, inferolateral margin with 3 RS, inferomesial margin with 5 RS, inferior margin RS simple, blunt, distally pilose, distal margin with 8 setae; *dactylus* 0.7 as long as propodus, unguis blunt, with prominent secondary unguis. *Pereopod 6 basis* 4.0 times as long as greatest width; *ischium* 0.7 as long as basis, 3.6 times as long as wide, inferior margin with 1 cluster of setae (of 1), superior distal angle with 0 RS; *merus* 0.5 as long as ischium, 2.4 times as long as wide, inferior margin with 3 clusters of setae (as 1, 2 and 4), superior distal angle with 1 seta; *carpus* 0.9 as long as ischium, 4.5 times as long as wide, inferior margin with 9 clusters of setae (as 1, 2, 2, 2, 2, 3, 4, 3, 4), superior distal angle with ~9 setae; *propodus* 0.8 as long as ischium, 6.9 times as long as wide, inferior margin with 9 clusters of setae (as 1, 2, 2, 2, 2, 2, 3, 1 and 2), distal margin with 8–10 setae, inferior distal angle with 0 RS; *dactylus* 6.7 as long as proximal width. *Pereopod 7* similar to, but 0.9 as long as pereopod 6. Setae on inferior margins of pereopods 4–7 finely plumose. Inferior margins of pereopods 2–7 setulose fringe weakly developed.

Pleopod 1 peduncle 1.4 times as long as wide, mesial margin with 3 coupling setae; exopod 2.0 as long as wide (1.96), with 37 PMS; endopod 2.2 times as long as wide, 0.6 as long as exopod, with 19 PMS. *Pleopod 2* peduncle 1.7 as long as wide, mesial margin with 2 coupling setae; exopod 1.7 as long as wide, with 40 PMS; endopod 3.1 as long as greatest width, lamellar part 3.5 as long as wide, with 14 PMS; *appendix masculina* 3.5 times as long as endopod. *Pleopod 3* exopod with 40 PMS, endopod with 21 PMS. *Pleopod 4* exopod with complete transverse suture, endopod with complete transverse suture. *Pleopod 5* exopod with complete transverse suture, endopod with complete transverse suture.

Uropods (rami + peduncle) 0.3 as long as pleotelson, peduncle 0.7 as long as endopod. *Endopod* 2.5 as long as wide; distally broadly rounded. *Exopod* 0.8 as long as endopod, 2.2 times as long as wide, distally broadly rounded.

Females. Similar to males, differing only in lacking the ocular nodules, the marginal nodules on the pereonites being slightly more distinct and an obscure, low longitudinal ridge on pereonite 7.

Variation. Not detailed for the small number of specimens. The pattern of nodules for males and females was consistent for all specimens within each sex.

Size. Males 10.4–10.7 mm (mean = 10.6 mm), ovigerous females 12.0 and 13.7 mm.

Colour. Dull brick red in preserved specimens; fresh specimens dark slate grey with broad white bands across posterior and lateral margins of coxae; eyes white.

Remarks. *Caecoserolis norfanz* sp. n. can be identified by the pattern of nodules on the head and pereonites 1–4, and the pleotelson lateral carinae being thickened at the point of inflection. The most similar species are *C. novaecaledoniae* and *C. systir* sp. n., both from the New Caledonian region. These species can readily be separated by the lack of small tubercles on the head and pereonites 1–4.

Distribution. East of Lord Howe Island, Lord Howe Plateau; depths of 1130–1147 metres.

Etymology. The epithet is the name of the joint NIWA–CSIRO–IRD–Nouméa RV *Tangaroa* expedition to the Norfolk Ridge and Lord Howe Rise in 2003; noun in apposition.

***Myopiarolis novaecaledoniae* (Poore and Brandt, 1997), comb. n.**

Fig 19

Caecoserolis novaecaledoniae Poore and Brandt, 1997: 161, figs 7–10 (part).

Material. *Holotype*, *paratypes* and all original non-type specimens: all re-identified as *M. novaecaledoniae* except as discussed below; details in Poore and Brandt (1997).

New material: ♂ (14.6 mm), New Caledonia, 24°16'S, 167°38'E, 21 Nov 1996, 1128–1150 m, HALIPRO 2, stn BT 75; 'photo 1-13-14-15', coll. RV *Tangaroa*, (MNHN Is.6011).

Description. *Body* 1.2 as long as wide, widest at coxae 3, dorsal surfaces smooth. *Head* anterior submarginal 'ridge' entire; dorsally without tubercles, posterior margin with low rounded median tubercle. *Eyes* present. *Pereonites* dorsally without tubercles. *Coxae* 4 extending to mid-pleonite 2; coxae 5 extending posteriorly along 0.3 of pleotelson length; coxae 6 extending to between posterior of uropods and pleotelson posterior margin, and along 0.9 of pleotelson length. *Ventral coxal plates* 2–4 mesially flat, plates 2–4 mesially with anterior and posterior ridges. *Pleonites* extending posteriorly along 0.8 pleotelson lateral margin; pleonite 1 sternal plates 3 with acute median point, sternal plate 1 with median ridge and 2 sub-median depressions. *Pleotelson* dorsal surface with weak median longitudinal carina, with paired sublateral carinae; pleotelson lateral margins convex, pleotelson posterior margin converging to rounded caudomedial point.

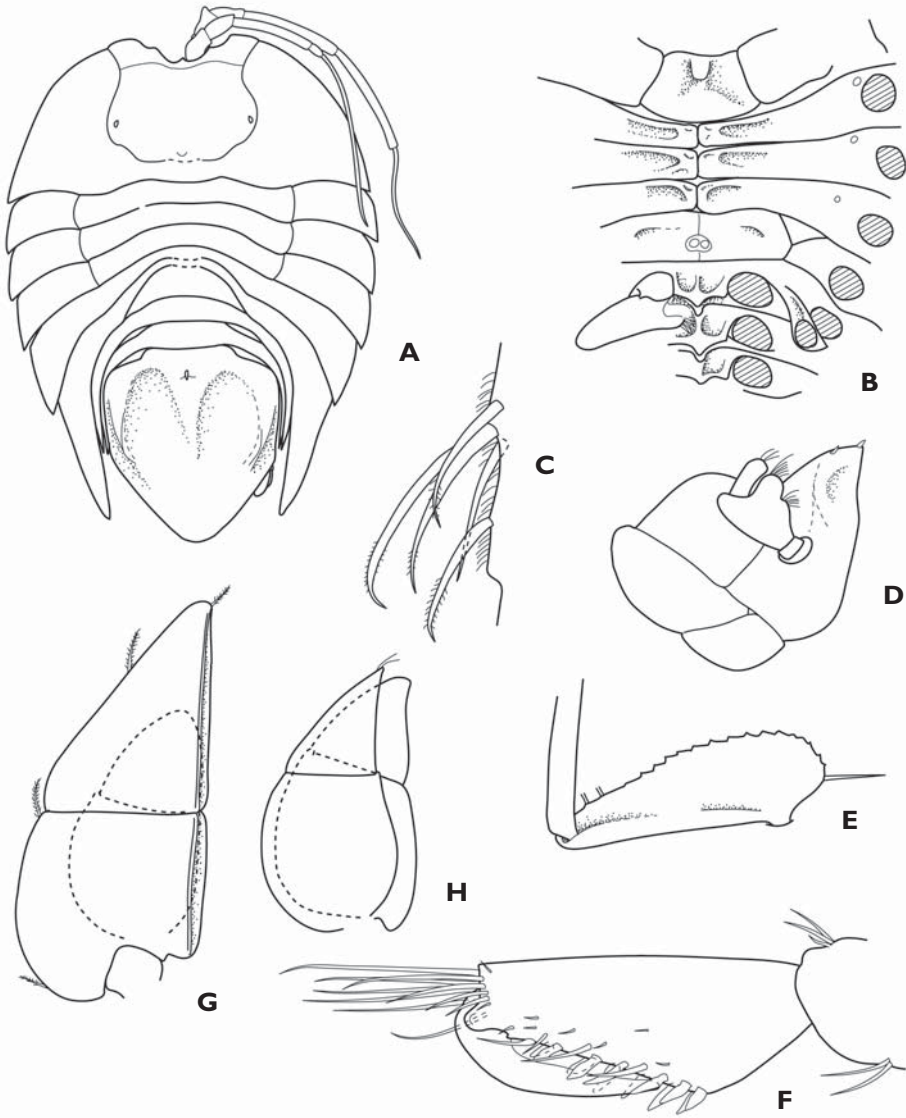


Figure 19. *Myopiarolis novaecaledoniae*. Holotype. **A** dorsal view **B** sternites and ventral pleonites **C** pereopod 6 carpus inferior margin setae **D** maxilliped **E** pleopod 2 endopod, detail **F** pereopod 2 propodus and dactylus **G** pleopod 4 **H** pleopod 5.

Antennule flagellum 2.0 as long as peduncle articles 3 and 4, extending to pereonite 3. *Antennal* flagellum 1.2 as long as peduncle article 5, extending to posterior of pereonite 4.

Pereopod 2 propodus 2.5 times as long as wide, inferior margin with indistinct heel, palm straight, inferolateral margin with 6 RS, inferomesial margin with 6 RS, inferior

margin RS simple, acute, smooth; *dactylus* 0.6 as long as propodus. *Pereopod* 7 similar to, but 0.8 as long as pereopod 6.

Size. Males 14.6–16.9 mm, ovigerous females 18.5 mm.

Remarks. *Myopiarolis novaecaledoniae* may be identified by the flat sternal coxae that have mesial ridges that do not form a clear mesial 'X', the lack of dorsal ornamentation, long coxae 6 that extend to near the pleotelson apex, the pleonites 2 and 3 extending along the pleon to close to the point of insertion of the uropods, and the number, arrangement and shape of the robust setae on the male pereopod 2 palm. The most similar species, also from New Caledonia, but apparently occupying a more shallow depth range, is *Myopiarolis systir* sp. n. Both species lack dorsal tubercles, and have long coxae 6, but *M. novaecaledoniae* can be distinguished from *M. systir* by lacking the prominent X-shaped ridges on the sternal coxae, and having the pleonites extend much further along the pleotelson. The numerous differences between these two species are discussed in detail under the remarks for *M. systir*.

One immature paratype is here re-identified as *Myopiarolis* sp. (p. 48, fig 24). Of the non-type material identified by Poore and Brandt (1997) one is an immature female of *M. systir*, and the specimens from off Norfolk Island are *Myopiarolis norfanz* sp. n.

Examination of the type material revealed some discrepancies between the specimens and the description, here emended. There are medial flanges on the mesial margin of pleopod 4 exopods, and lobes adjacent to sutures on pleopods 4 and 5; the pleotelson does have a longitudinal carina, but it is weak; pereonites 5–7 were figured as entire but are medially fused; there is a low rounded medial nodule on the posterior margin of the head; and the transverse ridge on the head is more anteriorly positioned.

Distribution. New Caledonia, 1128–1410 m.

Myopiarolis systir sp. n.

urn:lsid:zoobank.org:act:11B00636-BB4E-498D-9381-6B8908C963DC

Figs 20–23

Caecoserolis novaecaledoniae Poore & Brandt, 1997: 161 (part).

Material. *Holotype*: ♂ (11.6 mm), New Caledonia, 'sudest fairway', 21°27.008–24.374'S, 162°36.457–37.187'E, 23 Oct 2005, EBISCO stn CP2652, 1019–1147 m (MNHN Is.6012). *Paratypes*: 18 ♂ (11.0–12.5 mm; 2 immature 9.7, 9.9 mm; 11.4 mm [dissected]), ♀ (8 ovig. with eggs 12.5, 14.0, without eggs, 11.5–14.1 mm, 1 non-ovig. 10.5 mm), 1 manca (7.5 mm), same data as holotype (MNHN Is.6013; 1 microslide). 4♂ (11.3, 11.5, 11.5, 12.1 mm), 2♀ (ovig. 13.9, 14.5 mm), New Caledonia, 'sudest fairway', 21°29.187–26.855'S, 162°32.559–959'E, 23 Oct 2005, EBISCO stn CP2650, 825–894 m (MNHN Is.6014). 2♂ (11.0, 11.3 mm), ♀ (ovig. 14.5 mm), New Caledonia, 'sudest fairway', 21°28.134–711'S, 162°33.911–36.110'E, 23 Oct 2005, EBISCO stn CP2651, 883–957 m (MNHN Is.6015).

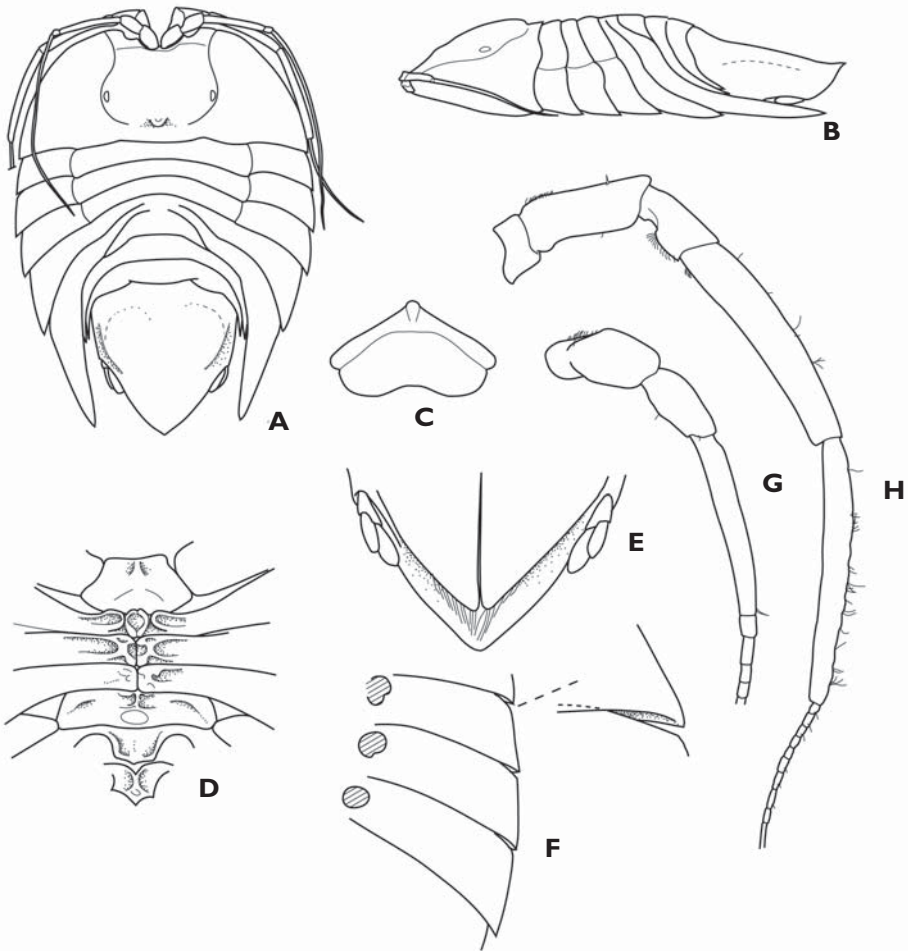


Figure 20. *Myopiarolis systir* sp. n. Holotype, except G, H, paratype ♂ 11.4mm, Is.6013. **A** dorsal view **B** lateral view **C** frons (labrum and clypeus) **D** sternites and ventral pleonites **E** pleotelson, ventral view **F** coxae 2–5, ventral **G** antennule **H** antenna.

Additional material. ♀ (imm. 12.2 mm), Chesterfield Is., 21°02.77'S, 160°55.00'E, 21 July 1988, 700–705 m, CORAIL stn DE13 (MNHN Is.4083; part of non-type material of misidentified by Poore and Brandt (1997) as *Caecoserolis novaecaledoniae*).

Description. *Body* 1.3 as long as wide, widest at coxae 3, dorsal surfaces punctate. *Head* anterolateral lobes weakly convex, anterior submarginal 'ridge' entire; dorsally without tubercles, posterior margin without median tubercle. *Eyes* present. *Peraeonite* 1 anterolateral margin continuously convex; dorsal surfaces without tubercles. *Coxae* distal margins truncate; coxae 4 extending to mid-pleonite 1; coxae 5 extending posteriorly along 0.3 of pleotelson length; coxae 6 extending to between posterior of uropods and pleotelson posterior margin, and along 0.7 (to 0.9) of pleotelson

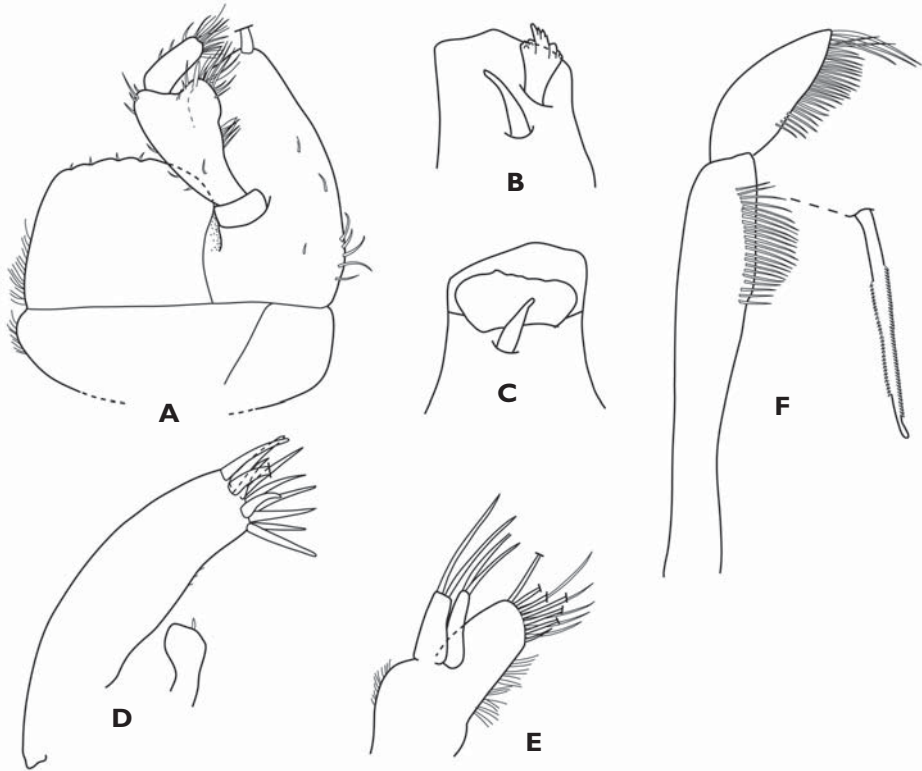


Figure 21. *Myopiarolis systir* sp. n. Paratype ♂ 11.4mm, Is.6013. **A** maxilliped **B** right mandible, distal margin **C** left mandible, distal margin **D** maxillule **E** maxilla **F** mandible palp.

length. *Ventral coxal plates* 2 mesially elevated, plates 2–4 mesially with ridges forming X-shape; plates 6 and 7 entirely separate. *Pleonites* extending posteriorly along 0.5 pleotelson lateral margin; pleonite 1 sternal plates 3-cornered, sternal plate 1 without median ridge. *Pleotelson* 1.04 times as long as anterior width, dorsal surface without median longitudinal carina, with paired sublateral carinae (weak); lateral margins weakly sinuate, posterior margin converging to angled caudomedial point, without distinct median excision.

Antennule peduncle article 2 2.2 times as long as wide; articles 3 and 4 2.4 times as long as article 2; article 3 7.4 times as long as wide; flagellum 3.0 as long as peduncle articles 3 and 4, with ~60 articles, extending to pereonite 5. *Antenna* peduncle article 4 5.5 times as long as wide, 3.0 times as long as article 3; article 5 1.1 times as long as article 4, 9.6 times as long as wide; antennal flagellum 1.0 as long as peduncle article 5, with ~20 articles, extending to middle of pereonite 4.

Epistome with blunt median point. *Mandible incisor* even or minutely irregular, left mandible lacinia mobilis 0.9 as wide as incisor, right mandible lacinia mobilis distally multicuspid, mandibular spine simple; palp article 2 with 22 distolateral setae, article 3

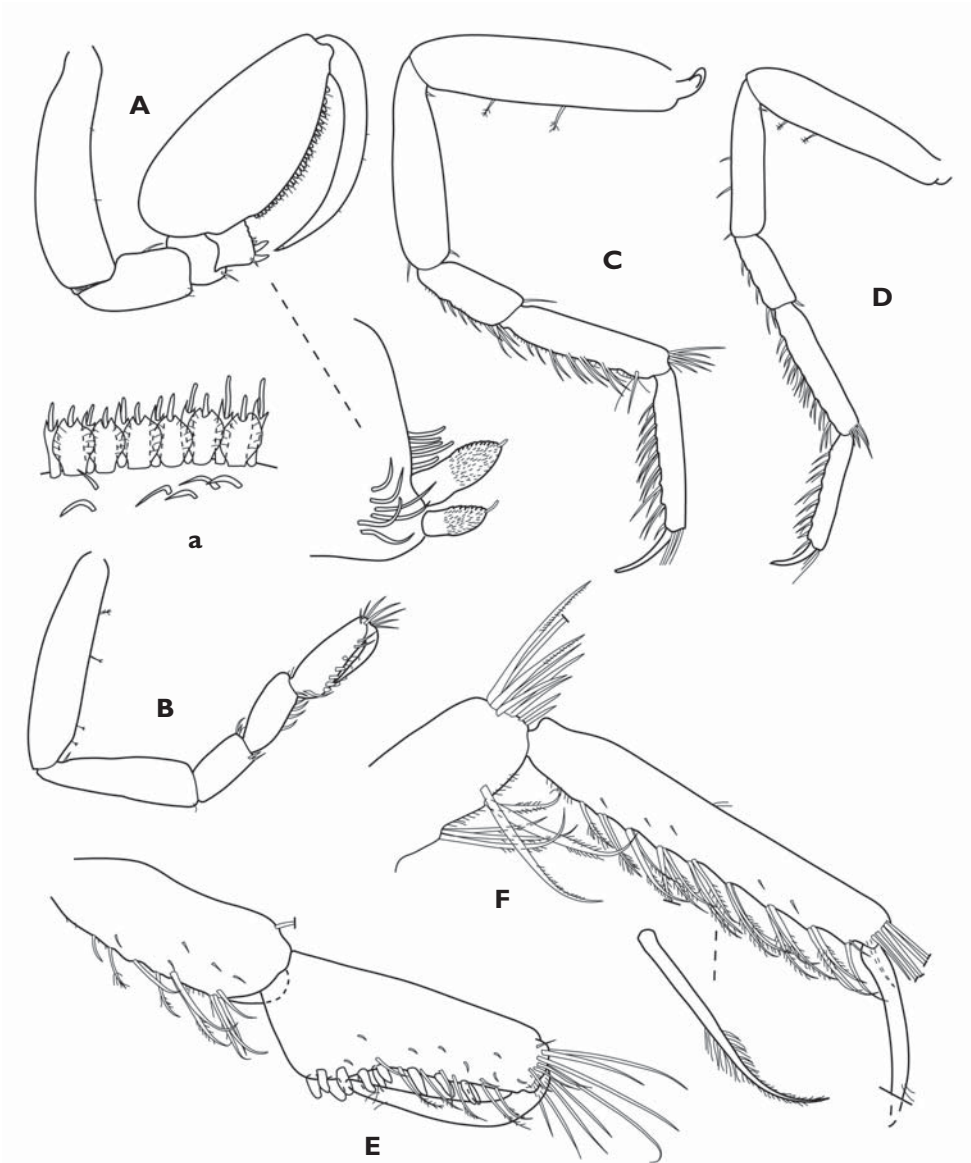


Figure 22. *Myopiarolis systir* sp. n. Paratype ♂ 11.4mm, Is.6013, except H, holotype. **A–D** pereopods 2, 6 and 7 respectively **a** detail of pereopod 1 propodal palm setae **E** pereopod 2 carpus and propodus **F** pereopod 6 carpus and propodus.

with 26–27 biserrate setae. *Maxilla* mesial lobe with 11 long, finely serrate setae; middle lobe with 2 long simple setae; lateral lobe with 2 distal simple setae. *Maxilliped palp* article 2 proximomesial margin with 6 setae, distomesial margin with 18 setae, lateral margin distally with 4 setae; article 3 lateral margin with 3 setae, distal margin with 14 setae; endite distal margin RS simple.

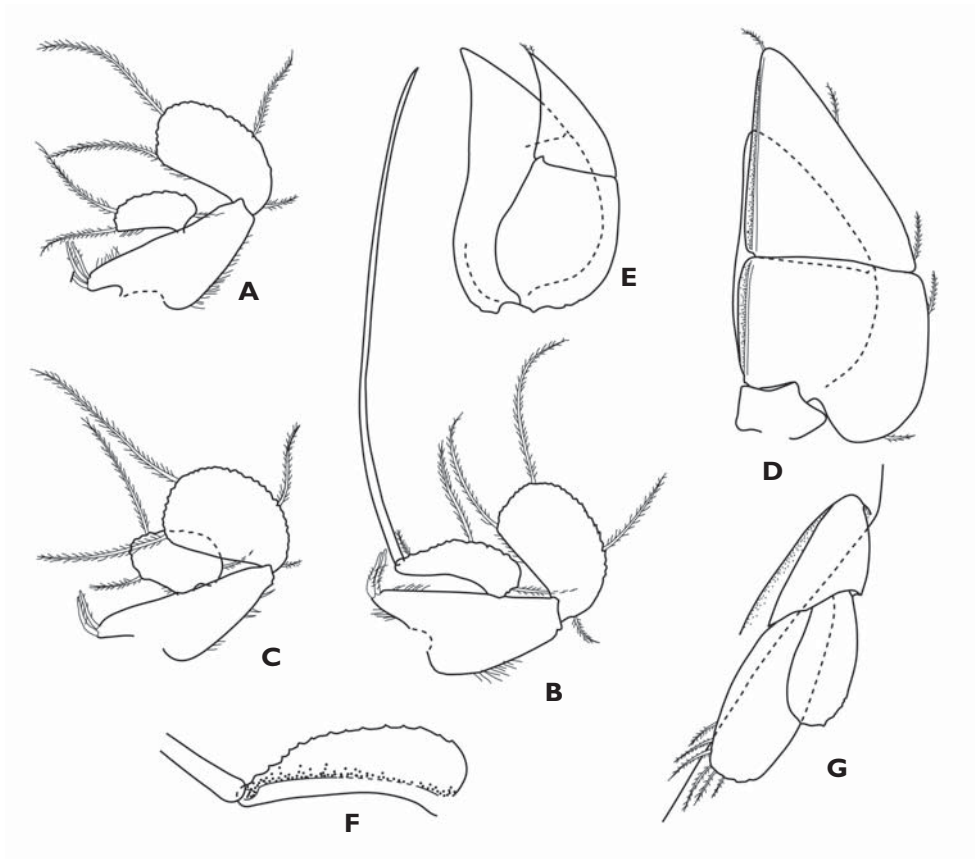


Figure 23. *Myopiarolis systir* sp. n. Paratype ♂ 11.4mm, Is.6013. **A–E** pleopods 1–5 respectively **F** pleopod 2 endopod detail **G** uropod.

Pereopod 1 carpus RS distally pilose; propodus 2.1 times as long as wide, inferior margin with ~56 RS; wide RS with finely ridged margins, narrow RS distally bifid, with simple flagellum; dactylus with acute unguis. *Pereopod 2* basis 4.5 times as long as greatest width; 0.7 times as long as basis, ischium 3.4 times as long as wide; *merus* 0.4 as long as ischium, 1.8 times as long as greatest width, inferior margin with 1 cluster of setae (as 2), superior distal angle with 3 setae; *carpus* 0.6 as long as ischium, 2.5 times as long as wide, inferior margin with 3 clusters of setae (as 1, 1 and 1); *propodus* 0.5 as long as ischium, 2.4 times as long as wide, inferior margin with distinct heel, palm angled, inferolateral margin with 4 RS, inferomesial margin with 7 RS, inferior margin RS simple, blunt, smooth, distal margin with ~12 setae; *dactylus* 0.8 as long as propodus, unguis simple, slender. *Pereopod 6* basis 4.2 times as long as greatest width; *ischium* 0.8 as long as basis, 4.1 times as long as wide, inferior margin with 0 clusters setae, superior distal angle with 1 robust seta; *merus* 0.4 as long as ischium, 2.1 times as long as wide, inferior margin with 5 clusters of setae (as 1, 1, 1, 1 and 4), superior distal angle with 1 seta; *carpus* 0.8 as

long as ischium, 4.6 times as long as wide, inferior margin with 7 clusters of setae (as 1, 1, 2, 2, 3 and 3), superior distal angle with -9 setae; *propodus* 0.8 as long as ischium, 6.2 times as long as wide, inferior margin with 9 clusters of setae (as 1, 2, 2, 3, 3, 2, 3, 3 and 1), distal margin with -12 setae, inferior distal angle with 0 RS; *dactylus* 8.8 as long as proximal width. *Pereopod* 7 similar to, but 0.8 as long as pereopod 6. Setae on inferior margins of pereopods 4–7 densely plumose. Inferior margins of pereopods 2–7 setulose fringe weakly developed.

Pleopod 1 peduncle 1.6 times as long as wide, mesial margin with 3 coupling setae; exopod 1.8 as long as wide, with 36 PMS; endopod 2.3 times as long as wide, 0.6 as long as exopod, with 18 PMS. *Pleopod* 2 peduncle 1.6 as long as wide, mesial margin with 2 coupling setae; exopod 1.6 as long as wide, with 38 PMS; endopod 2.9 as long as greatest width, lamellar part 3.6 as long as wide, with 18 PMS; *appendix masculina* 4.2 times as long as endopod. *Pleopod* 3 exopod with 42 PMS, endopod with 22 PMS. *Pleopod* 4 exopod with complete transverse suture, endopod with complete transverse suture. *Pleopod* 5 exopod with complete transverse suture, endopod with incomplete transverse suture.

Uropods (rami + peduncle) 0.3 as long as pleotelson, peduncle 0.8 as long as endopod. *Endopod* 2.4 as long as wide; distally broadly rounded. *Exopod* 0.7 as long as endopod, 2.2 times as long as wide, distally broadly rounded.

Females. Similar to males, slightly larger; coxae 6 not as produced as in males, rarely extending beyond the uropods.

Size. Males 11.0–12.5 mm, mean = 11.6 mm; immature males 9.7–9.9 mm (2 only); females—with eggs 12.5–14.5 mm (mean 13.7 mm), with oostegites only 11.4–14.5 mm (mean = 12.7 mm); non-ovig. 10.5 mm.

Colour. Dark grey–green, pale bands on dorsal somites and coxae noticeably broad.

Variation. Coxae 6 extends posteriorly to about the midpoint of the uropodal rami (tip of exopod) to a little beyond the rami (as in the holotype), with most (7 of 10) extending at least to the apex of the endopod or further. Ovigerous females have slightly shorter coxae, most (5 of 7) not extending beyond the uropodal exopod.

Setation of male pereopod 2 propodus (n=18) is variable, ranging from 3+6 RS (mesial + lateral margins) to 6+7 and 4+8, with no clear combination; lateral margin ranging from 5 to 8 RS, most frequently with 8 (16%), 7 (28%) and 6 (33%) (damaged limbs were discounted from the counts); mesial margin ranging from 3 to 6 RS, most frequently with 5 (22 %) or 4 (50%).

Remarks. *Myopiarolis systir* sp. n. can be identified by the lack of dorsal ornamentation, long coxae 6 which extend posteriorly to between the mid-point of the uropods to just short of the pleotelson apex, short pleonites that extend along the anterior one-third of the pleotelson, the strong sculpting of sternal coxae 2–4, and lack of median dorsal carina on the pleotelson.

Myopiarolis systir is similar in general appearance to *M. novaecaledoniae*, but differs consistently at least seven characters (state for *M. novaecaledoniae* in parentheses): small body size, with males averaging 11.6 mm, adult females 12.7 mm (males 16.9, 16.7 mm; females ovig. 18.5 mm); coxal sternites 2–4 are medially elevated and strongly

ornamented with ridges forming a prominent median excavation (not elevated, weakly ornamented); coxae 6 extend to and beyond uropods (not beyond uropods); pleonites extending posteriorly along anterior one-third of pleotelson (along anterior half of pleotelson); pleotelson without longitudinal median carina (longitudinal carina present) and pleotelson apex sub-acute (rounded); male pereopod 2 propodus with short, blunt robust setae (robust setae longer, acute) and a different pattern of robust setae (3–4+7–8 RS in *M. systir* vs. 6+6 in *C. novaecaledoniae*); pereopod 2 propodal ‘heel’ distinct (less distinct); and the setae on the inferior margins of pereopods 5–7 are prominently plumose from mid-length (weakly plumose). In addition the two species occupy somewhat different though potentially overlapping depth ranges: *M. systir* has been collected at depths from 500 to 1210 metres, while *C. novaecaledoniae* s. str. from 1395 to 1410 m

Distribution. New Caledonia, depths of 700–1147 metres.

Etymology. The Old Norse word for sister, alluding to the close ‘relationship’ between this species and *Caecoserolis novaecaledoniae* (noun in apposition).

***Myopiarolis* sp.**

Fig 24

Caecoserolis novaecaledoniae Poore & Brandt, 1997: 161 (part).

Manca (7.8 mm; paratype of *C. novaecaledoniae*), 23°56’S, 166°41’E, 1 Sep 1985, 2660–2750 m, BIOCAL stn CP58 (MNHN Is.4080).

Remarks. This specimen differs from the holotype and other paratypes of *M. novaecaledoniae* in a number of significant characters. The cuticle is heavily pitted,

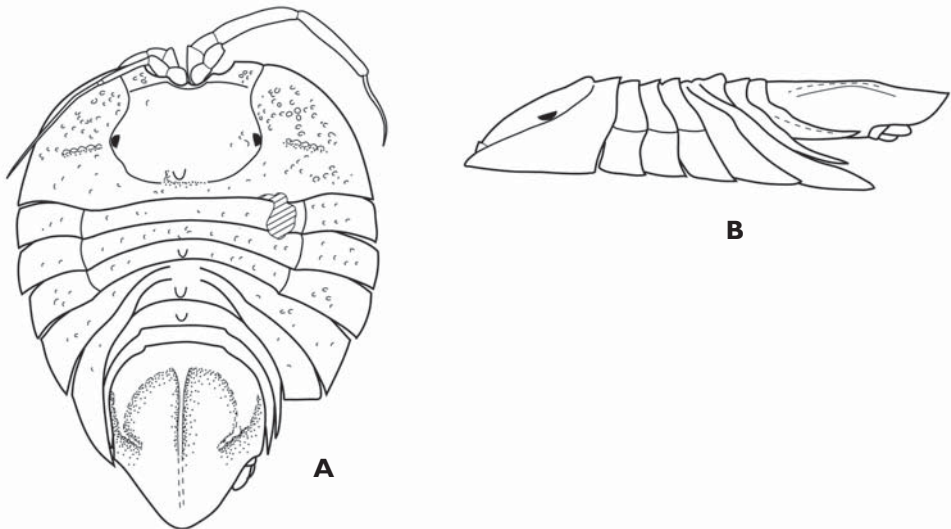


Figure 24. *Myopiarolis* sp. **A** dorsal view **B** lateral view.

the lateral margins of pereonite 1 are posteriorly nearly straight, the mid-dorsal region of pereonite 1 has an obscure transverse ridge, the eyes are set right against the lateral margin of the head, and the head, pereonites 4 and 7 and pleonite 1 each have a small but distinct median tubercle. This specimen is not *C. novaecaledoniae*, and is closer to large deep-water species such as *M. koro* sp. n. and *M. carinata* (Bruce, 2008).

***Thysanoserolis* Brandt, 1991**

Thysanoserolis Brandt, 1991: 132, 146; 1992: 233.– Wägele 1994: 48.

Type species. *Serolis completa* (Moreira, 1971); original designation (Brandt 1991).

Species included. The type species, *T. completa* (Moreira, 1971), Brazil; *T. elliptica* (Sheppard, 1933), southwestern Atlantic, from southern Brazil to Straits of Magellan and the Falkland Islands; and *T. orbicula* sp. n., New Caledonia.

Remarks. The new species described here conforms well with genus with regard to somatic morphology, and the diagnostic uropod morphology. In comparison to the other species the antennule is short, and the antenna far more massive and broad forming a more continual part of the body outline.

In his analysis of the Serolidae Wägele (1994) placed *Thysanoserolis* and *Neoserolis* in the same group, a sister group to all other Serolidae, primarily (according to the dendrogram fig. 37) on the basis of the superior margin of the male pereopod 1 being setose, and the basipod and epipod of the maxilliped being fused. Setation of the male pereopod 1 is unknown for the new species.

Brandt (1992) diagnosed the genus as having 'big eyes', but eye size varies within the three species, with moderately small, round eyes in *T. completa* and *T. elliptica*, and ommatidia absent in the new species, though a reniform–seleniform eye lobe seems to remain. Large eyes in the sense of genera such as *Serolis* or *Acutiserolis* are not present in *Thysanoserolis*.

Pleopod 4, in most serolid genera, has a thin flap that runs along the mesial margin of the exopod, effectively creating a flexible seal to the contained pleotelson. This flap seems to be present in most species of most genera, but is often not figured in illustrations. *T. orbicula* sp. n. lacks this mesial flange.

***Thysanoserolis orbicula* sp. n.**

urn:lsid:zoobank.org:act:DDA89194-4F26-4B9F-9FBC-6A02B3D69AC9

Figs 25–27

Material. *Holotype*: ♀ (ovig., 7.0 mm), off Lord Howe Island, 23°51.30–31'S, 161°43.13–42.96'E, 5 Oct 2005, BBISCOL stn DW2482, 400–430 m, manganese (MNHN Is.6024, 2 microslides).

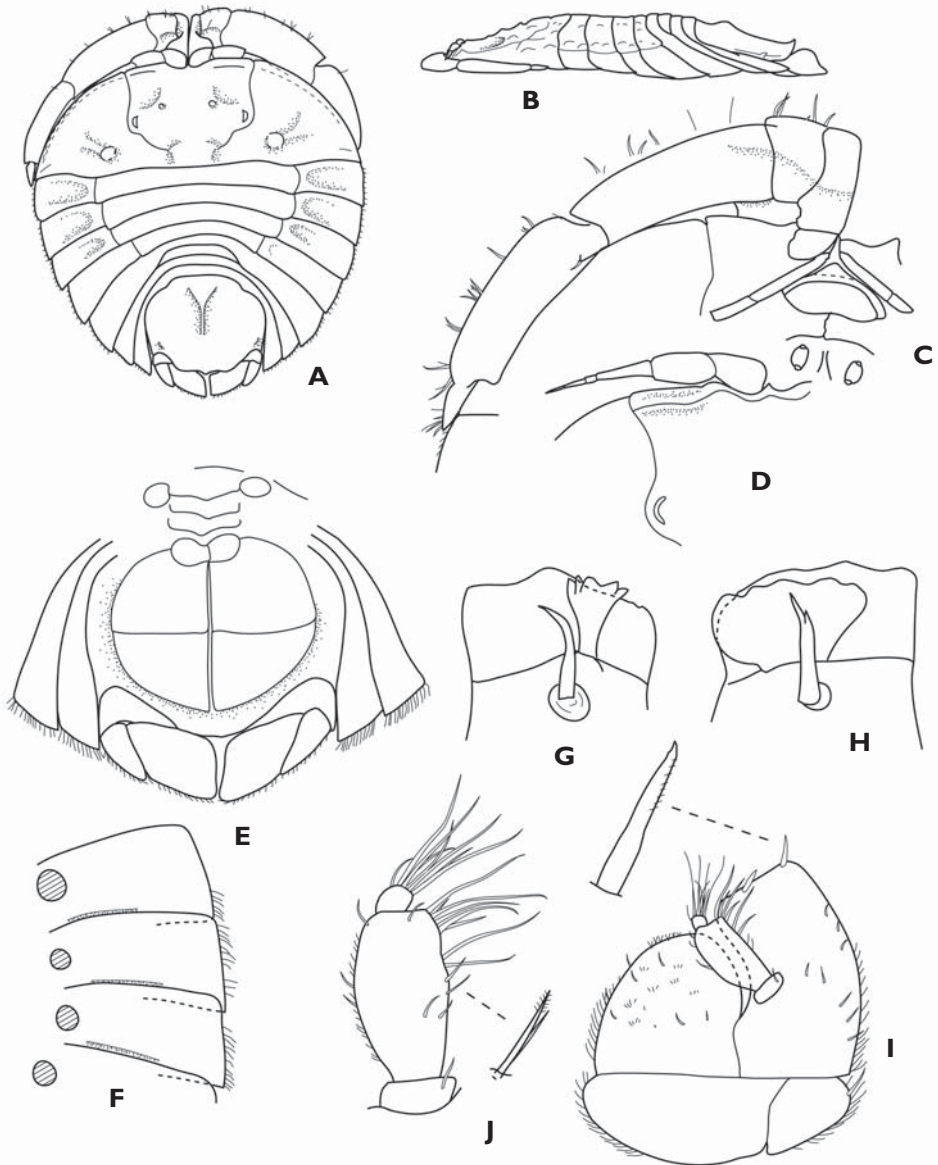


Figure 25. *Thysanoserolis orbicula* sp. n. Holotype. **A** dorsal view **B** lateral view **C** head, frons and antennae, ventral view **D** head, anterior margin **E** pleon and pleotelson, ventral view **F** coxae 2–5, ventral **G** right mandible **H** left mandible **I** maxilliped **J** maxillipedal palp.

Description. *Body* 0.9 as long as wide (1.2 as long as overall length inclusive of antenna and uropods), widest at coxae 2, dorsal surfaces polished in appearance and irregularly nodular. *Head* anterolateral lobes straight, anterior submarginal ‘ridge’ entire; dorsally with pair of low sub-median tubercles anterior to eyes, posterior margin

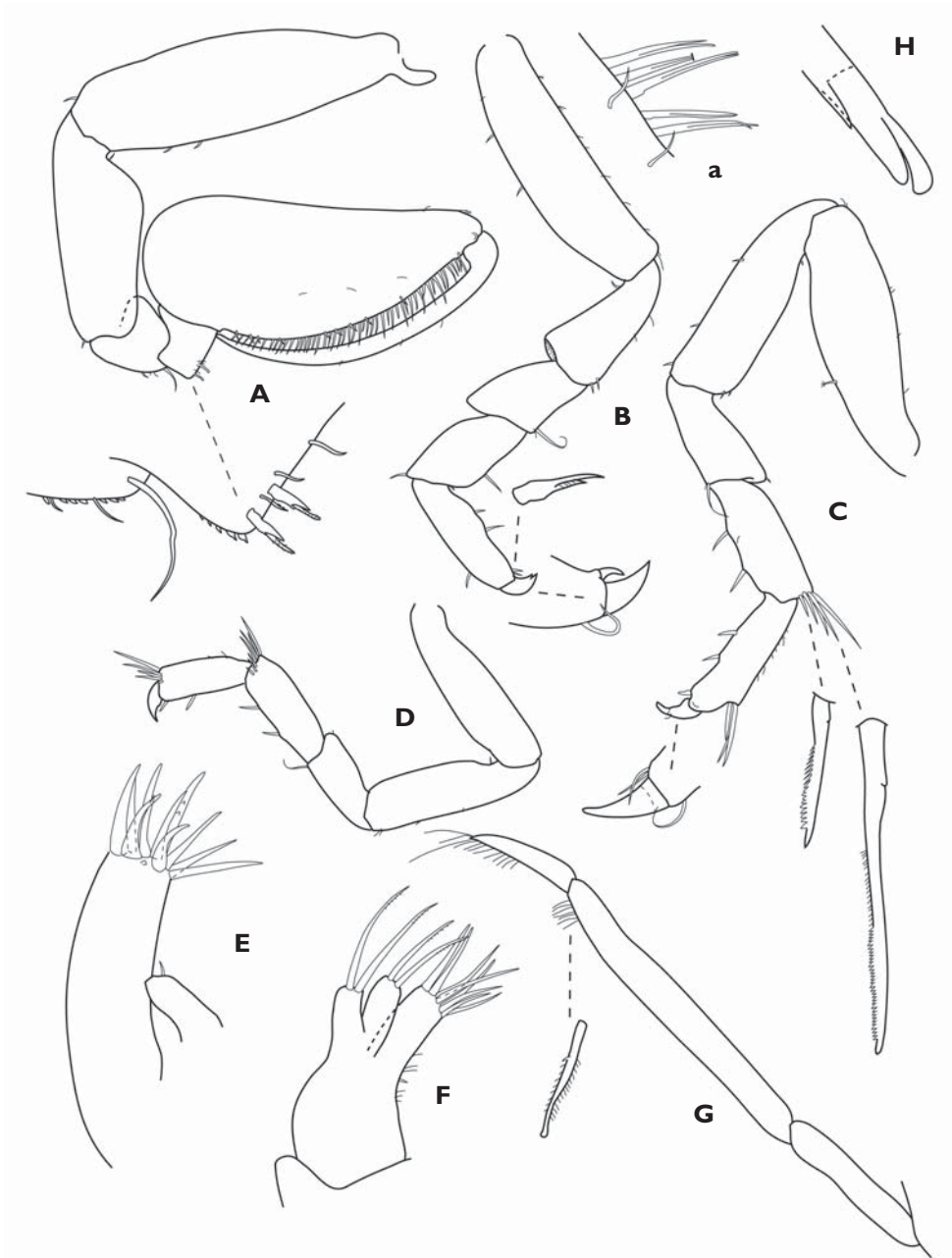


Figure 26. *Thysanoserolis orbicula* sp. n. Holo. type. **A–D** pereopods 1, 2, 6 and 7 respectively **a** detail of pereopod 1 propodal palm setae **E** maxillule **F** maxilla **G** mandible palp **H** pereopod 1, dactylus unguis.

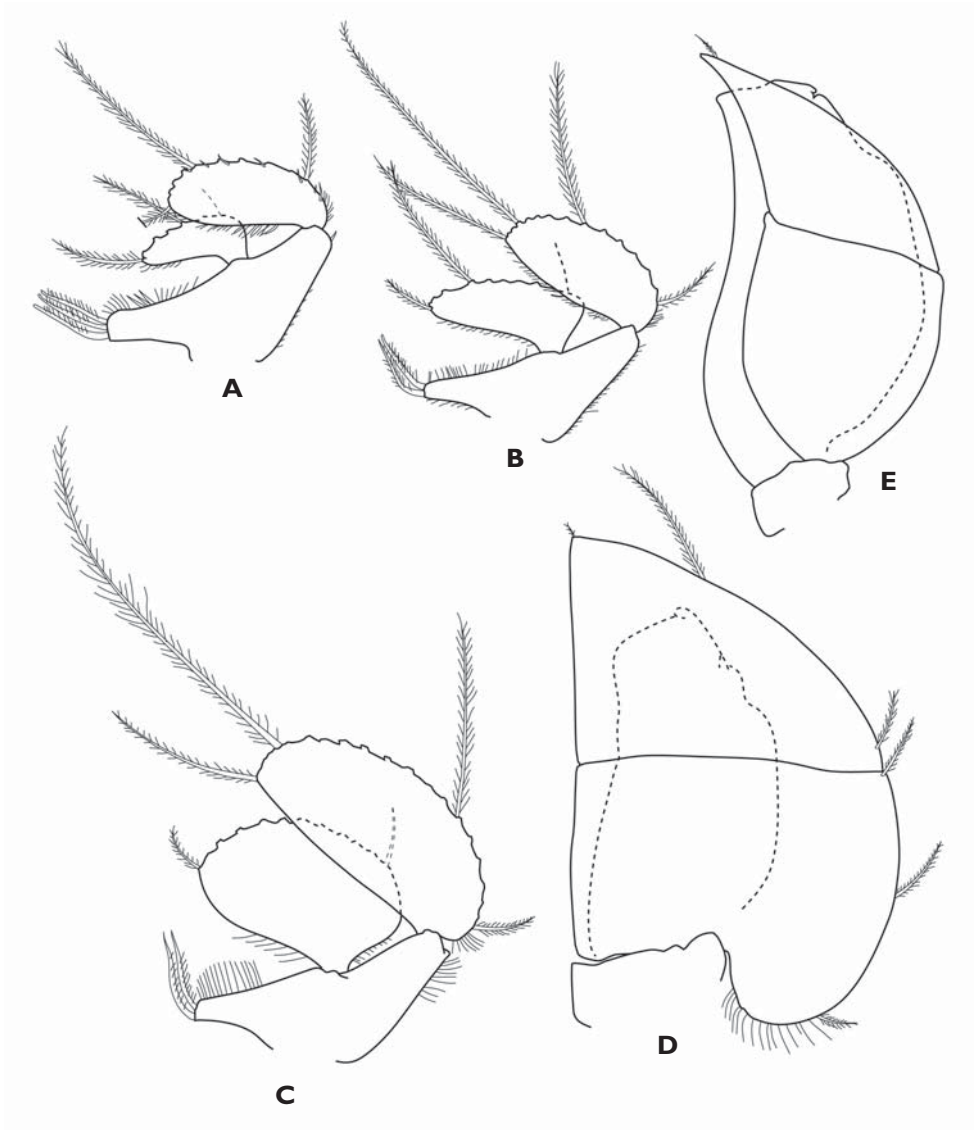


Figure 27. *Thysanoserolis orbicula* sp. n. Holotype. **A–E** pleopods 1–5 respectively.

without median tubercle. *Eyes* minute (less than 5% greatest width of head), reniform, ommatidia not distinct (possibly absent). *Pereonites* all entire, articulating; *Pereonite 1* anterolateral margin continuously convex; dorsal surfaces without tubercles. *Coxae* of pereonites 2–4 articulated, with dorsal sutures, distal margins weakly convex; coxae 4 extending to anterior margin of pleotelson; coxae 5 extending posteriorly along 0.5 of pleotelson length; coxae 6 extending to posterior margin of pleotelson, and along 0.8 of pleotelson length. *Pleonites* extending posteriorly along 1.1 pleotelson lateral margin; pleonite 1 sternal plates with single median lobe, sternal plate 1 without median ridge. *Pleotelson* 0.8 times as long as anterior width; dorsal surface with median

longitudinal carina (not reaching posterior margin), without paired sublateral carinae; lateral margins straight; posterior margin sub-truncate (with median point), without distinct median excision.

Antennule peduncle article 2 1.1 times as long as wide; articles 3 and 4 1.1 times as long as article 2; article 3 3.8 times as long as wide; flagellum 0.6 as long as peduncle articles 3 and 4, with 2 or 3 articles, extending to posterior margin of eye. *Antenna* peduncle article 4 2.7 times as long as wide, 3.8 times as long as article 3; article 5 0.9 times as long as article 4, 3.9 times as long as wide; antennal flagellum 0.3 as long as peduncle article 5, with 1 or 2 articles, extending to posterior of pereonite 1.

Epistome with obtuse median point. *Mandible incisor* even or minutely irregular, left mandible lacinia mobilis 0.8 as wide as incisor, right mandible lacinia mobilis distally multicuspid, mandibular spine simple or with 1 or 2 teeth; palp article 2 with 7 distolateral setae, article 3 with 13 biserrate setae. *Maxilla* mesial lobe with 8 long, finely serrate setae; middle lobe with 2 long simple setae; lateral lobe with 2 distal simple setae. *Maxilliped palp* article 2 proximomesial margin with 2 setae, distomesial margin with 6 setae, lateral margin distally with 3 setae; article 3 lateral margin with 0 setae, distal margin with 8 setae; endite distal margin RS serrate.

Pereopod 1 carpus RS simple; propodus 2.5 times as long as wide, inferior margin with ~48 RS; narrow RS simple, deeply bifid; dactylus with unguis distally bifid. *Pereopod 2* basis 3.8 times as long as greatest width; 0.5 times as long as basis, ischium 2.1 times as long as wide; *merus* 0.6 as long as ischium, 1.4 times as long as greatest width, inferior margin with 1 cluster of setae (of 1), superior distal angle with 0 setae; *carpus* 0.7 as long as ischium, 1.7 times as long as wide, inferior margin with 1 cluster of setae (of 1); *propodus* 0.9 as long as ischium, 3.0 times as long as wide, inferomesial margin with 2 RS; *dactylus* 0.2 as long as propodus, unguis acute, with prominent secondary unguis. *Pereopod 6* basis 3.3 times as long as greatest width; *ischium* 0.9 as long as basis, 3.5 times as long as wide, inferior margin with 3 clusters of setae (of 1, short), superior distal angle with 0 RS; *merus* 0.5 as long as ischium, 2.5 times as long as wide, inferior margin with 1 cluster of setae (of 1), superior distal angle with 1 seta (minute); *carpus* 0.6 as long as ischium, 3 times as long as wide, inferior margin with 2 clusters of setae (1 and 1 RS), superior distal angle with 5 setae; *propodus* 0.6 as long as ischium, 3.1 times as long as wide, inferior margin with 2 clusters of setae (RS), distal margin with 3 setae (RS), inferior distal angle with 1 RS; *dactylus* 1.6 as long as proximal width. *Pereopod 7* similar to, but 0.7 as long as pereopod 6. Setae on inferior margins of pereopods 4–7 simple. Inferior margins of pereopods 2–7 setulose fringe absent.

Pleopod 1 peduncle 3 times as long as wide, mesial margin with 3 coupling setae; exopod 2.3 as long as wide, with 11 PMS; endopod 2.7 times as long as wide, 0.7 as long as exopod, with 6 PMS. *Pleopod 2* peduncle 1.5 as long as wide, mesial margin with 2 coupling setae; exopod 2.2 as long as wide, with 15 PMS; endopod 2.8 as long as greatest width. *Pleopod 3* exopod with 24 PMS, endopod with 13 PMS. *Pleopod 4*

exopod with complete transverse suture, endopod without transverse suture. *Pleopod 5* exopod with complete transverse suture, endopod without transverse suture.

Uropods (rami + peduncle) 0.7 as long as pleotelson, peduncle 0.7 as long as endopod. *Endopod* 1.8 as long as wide; distally narrowly rounded. *Exopod* 0.6 as long as endopod, 2.3 times as long as wide, distally acute.

Remarks. The two other species in the genus, both from the western Atlantic, are abundantly different. *Thysanoserolis orbicula* can be immediately identified and separated from its congeners (and all other serolids) by the almost circular body outline (body shorter [0.9] than wide, compared to 1.4 as long as wide in *T. elliptica* and 1.2 as long as wide in *T. completa*), very flat body, conspicuously flattened and wide antennal peduncle articles that form part of the continuous body outline, the very short antennule flagellum, and geniculate antennal flagellum.

Distribution. New Caledonia; at depths of 400–430 metres.

Etymology. The epithet is derived from the Latin *orbis* meaning round.

Caecoserolis Wägele, 1994

Caecoserolis Wägele, 1994: 10 (not *Caecoserolis* of Poore and Brandt 1997: 161; = *Myopiarolis* gen. n.)

Type species. *Serolis brinki* Kensley, 1978; original designation (Wägele 1994).

Description. *Head* lateral lobe mesial margin with single concavity; anterolateral lobes forming of continuous margin with pereonite 1; anterior submarginal ‘ridge’ absent; posterior margin without ornamentation. *Eyes* absent. *Pereonites* all entire, articulating; pereonite 1 anterior margin not strongly bent dorsally, dorsally without tubercles. *Coxae* of pereonites 2–4 articulated, with dorsal sutures; 2–4 and pereonite 6 entirely lacking coxal keys; distal margin truncate; coxae 6 wide, laterally or distally broad, extending proximal to insertion of uropod peduncle. *Ventral coxal plates* 2–4 meeting midline; simple, smooth; plates 6 and 7 entirely separate. *Pleonites* distally narrow or acute, laterally overlapped by coxae 6, extending posteriorly along pleotelson. *Sternites* 5–7 visible, fused. *Sternal plates* of pleonites 1–3 3-cornered, with acute median point, without median ridge. *Pleotelson* dorsal surface not vaulted, with weak median longitudinal carina, without paired sublateral carinae; pleotelson posterior margin evenly rounded, without distinct exit channel.

Antennule flagellum 1.2–2.0 as long as peduncle articles 3 and 4, extending to pereonite 2. *Antenna* peduncle articles 4 and 5 broad, article 5 less than 5 times as long as greatest width; flagellum three-quarters as long as peduncle article 5.

Epistome evenly rounded. *Mandible* incisor with two posterior cusps; left mandible lacinia mobilis three-quarters as wide as incisor or larger, right lacinia mobilis distally multicuspoid; mandibular spine distally serrate. *Maxilliped* palp with 3 articles; article 3 cordiform, longer than wide.

Pereopod 1 carpus RS—state not known (pilose *vs* serrate); propodal palm setae all RS, alternating straight and flattened, wide RS finely pilose, narrow RS distally bifid, with simple flagellum. *Pereopod 2* propodus inferior margin without heel; palm straight; unguis simple, blunt.

Penial openings narrowly separated.

Pleopods 1–3 peduncles subquadrate, slightly narrower distally, pleopods 1–3 peduncles with coupling setae. *Pleopod 2* endopod lamellar part slightly shorter than ramus.

Uropods Biramous, inserted on pleotelson mid-laterally, positioned laterally, not forming part of continuous body outline; less than one-third as long as pleotelson, endopod distally rounded.

Remarks. *Caecoserolis* belongs with the group of genera characterised by having a distal stem on pleopod 2 endopod, approximating to the ‘Group B’ of Wägele (1994). The genus can be identified by the flat (or weakly domed) pleotelson that lacks lateral carinae, antenna with broad peduncular articles 4 and 5, pleopod peduncles that are sub-quadrate (slightly narrower distally than proximally) and by the short uropods inserted mid-laterally on the pleotelson; another less precise character is that *Caecoserolis* has a flatter body than related genera.

All but the type species of *Caecoserolis* have been transferred to the *Myopiarolis* gen. n. The characters that most readily separate these two genera (in parentheses for *Myopiarolis*) include antenna peduncle articles 4 and 5 broad with article 5 less than 5 times as long as greatest width (slender, elongate, 4.6–6.3 and 8.6–10.3 as long as wide respectively), pleopods 1–3 peduncles quadrate or subquadrate (triangular), pereonite 1 anterior margin anterior margin weakly indented (distinctly indented), pereonites all with visible entire sutures (pereonites 5–7 sutures medially fused), simple and flat pleotelson that lacks sub-lateral carina (pleotelson vaulted, with sub-lateral carinae), coxae 6 not extending posteriorly to pleonites (extending posteriorly to pleonites) and penial openings narrowly separated (fused in all species of *Myopiarolis*).

Distribution. The genus is monotypic, with one western Indian Ocean species, off the Natal coast of South Africa.

Caecoserolis brinki (Kensley, 1978)

Fig 28

Serolis brinki Kensley, 1978: 144, figs 14, 15.

Caecoserolis brinki.—Wägele, 1994: 10, 11 (type species by designation).

Material. *Holotype*: ♂ (8.4 mm), Indian Ocean; off the Natal Coast between Richards Bay and Lake St Lucia, South Africa, 28°31′S, 32°34′E, 24 May 1976, stn. SM103, 680 m, coll. RV *Meiring Naude* (SAM 15460).

Notes on the holotype: The label data differs slightly from that published in Kensley (1978). The specimen has one accompanying vial with dissected mandibles and pere-

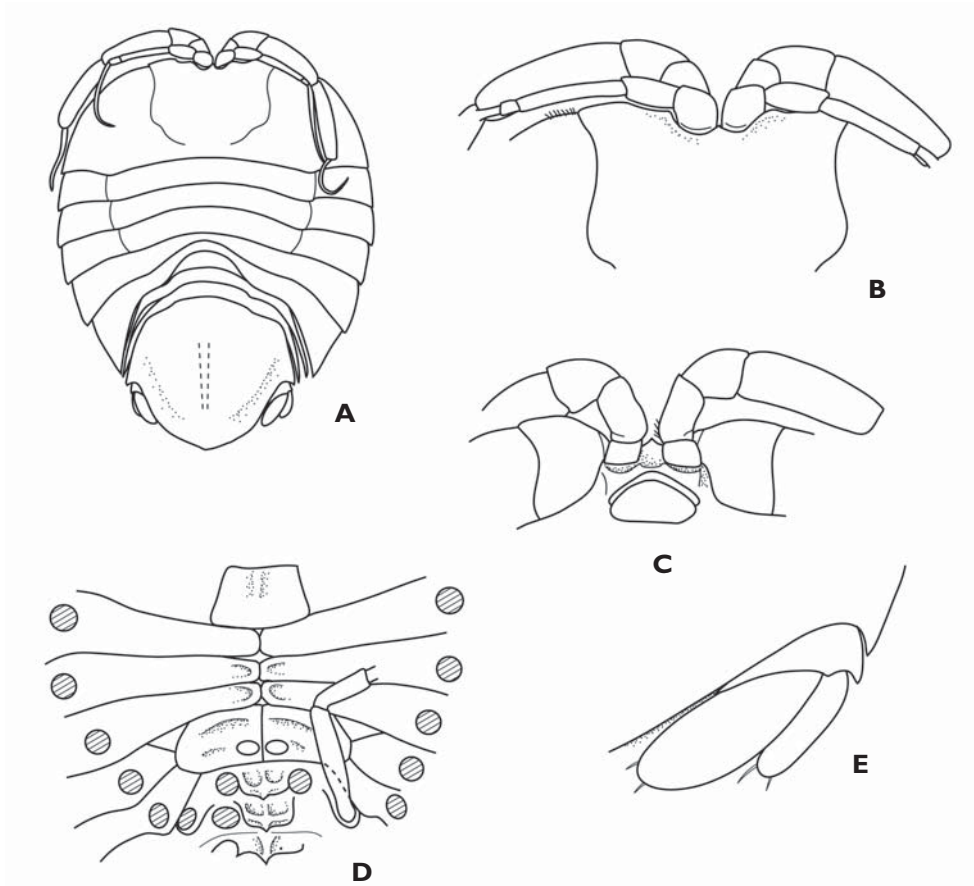


Figure 28. *Caecoserolis brinki* (Kensley, 1978). Holotype. **A** dorsal view **B** head, anterolateral margin **C** frons **D** ventral view sternites and pleonites **E** uropods (in situ).

opod 1; other dissected appendages (right hand maxilla, maxilliped, pereopods 2 and 7; pleopods 1 and 2) were not with the specimen.

Remarks. The species is identifiable on the basis of generic characters. Further material is needed to redescribe the species in detail (e.g. morphology of the pereopodal setae).

Acknowledgements

I thank Dr Danielle Defaye for logistic support and providing me with the opportunity to study the rich collections held at the Muséum national d'Histoire naturelle, Paris, and for her hospitality during my visit in 2007; Bertrand Richer de Forges (IRD, Noumea) whose outstanding collecting efforts during recent decades have yielded much valuable study material; and the offices of the Muséum national d'Histoire naturelle for providing the necessary funding for my visit. I thank Ré-

gis Cleva, Gabrielle Gadaleta, (all Muséum national d'Histoire naturelle, Paris) for their assistance during my visit. Dr Christoph Held (Alfred-Wegener Institut für Polar- und Meeresforschung, Germany) kindly arranged access to the holotype of *Serolis brinki*, an essential specimen, for which I am particularly grateful. Project leaders Dr Malcolm Clark and Dr Ashley Rowden are thanked for making NORFANZ (Ministry of Fisheries and National Oceans Office of Australia contract ZBD2002-16) material available for study. I thank Bronwen Scott (Melbourne) for the careful 'electronic inking' of my pencil drawings. The initial part of this study was supported a Visiting Professor award from the Muséum national d'Histoire naturelle, Paris and by NIWA international travel funds and contributes to FRST contract CO1X0502.

References

- Baker WH (1911) Notes on some species of the isopod family Sphaeromidae from southern Australian seas. Part III. Transactions of the Royal Society of South Australia 35: 89–93, pls 22, 23.
- Beddard FE (1884) Preliminary notice of the Isopoda collected during the voyage of H.M.S. *Challenger*.— Part 1. *Serolis*. Proceedings of the Zoological Society of London, London, 1884(23): 330–341.
- Brandt A (1988) Antarctic Serolidae and Cirolanidae (Crustacea: Isopoda): New Genera, New Species, and Redescriptions. Koeltz Scientific Books, Koenigstein, Germany, 143 pp.
- Brandt A (1991) Zur Besiedlungsgeschichte des antarktischen Schelfes am Beispiel der Isopoda (Crustacea, Malacostraca). *Berichte zur Polarforschung* 98: i–iv + 240.
- Brandt A (1992) Comparative morphology of *Frontoserolis* Brandt, 1991, *Heteroserolis* Brandt, 1991, and *Thysanoserolis* Brandt, 1991 (Crustacea, Isopoda, Serolidae). *Zoologischer Anzeiger* 229: 227–235.
- Brandt A (1999) Redescription of *Heteroserolis mgrayi* (Menzies & Frankenberg, 1966), the northernmost species of Serolidae from Florida. *Senckenbergiana Maritima* 79: 195–201.
- Brandt A (2003) *Frontoserolis abyssalis* n. sp. and *Serolis arntzi* n. sp. (Serolidae, Isopoda) from the Antarctic deep sea. *Beaufortia* 53: 111–128.
- Brandt A, Gooday AJ, Brandão SN, Brix S, Brökeland W, Cedhagen T, Choudhury M, Cornelius N, Danis B, De Mesel I, Diaz RJ, Gillan DC, Ebbe B, Howe JA, Janussen D, Kaiser S, Linse K, Malyutina MV, Pawlowski J, Raupach MJ, Vanreusel A (2007) First insights into the biodiversity and biogeography of the Southern Ocean deep sea [and supplement]. *Nature* 447: 307–311.
- Brandt A, Poore GCB (2003) Higher classification of the flabelliferan and related Isopoda based on a reappraisal of relationships. *Invertebrate Systematics* 17: 893–923.
- Briggs JC (1974) *Marine Zoogeography*. McGraw-Hill, New York, xiv, 475 pp.
- Brown RW (1956) *Composition of Scientific Words*. Smithsonian Institution Press, Washington, D.C., 863 pp.
- Bruce NL (1994) The Cassidininae Hansen, 1905 (Crustacea: Isopoda: Sphaeromatidae) of Australia. *Journal of Natural History* 28: 1077–1173.

- Bruce NL (1997) A new genus of marine isopod (Crustacea: Flabellifera: Sphaeromatidae) from Australia and the Indo-Pacific region. *Memoirs of the Museum of Victoria* 56: 145–234.
- Bruce NL (2004a) New species of the *Cirolana* 'parva-group' (Crustacea: Isopoda: Cirolanidae) from coastal habitats around New Zealand. *Species Diversity* 9: 47–66.
- Bruce NL (2004b) Reassessment of the isopod crustacean *Aega deshaysiana* (Milne Edwards, 1840) (Cymothoidea: Aegidae) – a world-wide complex of 21 species. *Zoological Journal of the Linnean Society* 142: 135–232.
- Bruce NL (2008) Two new deep-water species of *Caecoserolis* Wägele, 1994 (Isopoda, Sphaeromatidea, Serolidae) from off North Island, New Zealand. *Zootaxa* 1866: 453–466.
- Brusca RC (1983) A monograph on the isopod family Aegidae in the tropical eastern Pacific. The genus *Aega*. Allan Hancock Monographs in Marine Biology 12: 1–39.
- Eights J (1833) Description of a new crustacean animal found on the shores of the South Shetland Islands, with remarks on their natural history. *Transactions of the Albany Institute* 2: 53–69.
- Glynn PW (1976) A new shallow-water serolid (Isopoda: Flabellifera) from the Pacific coast of Panamá. *Journal of Natural History* 10: 7–16.
- Grube EA (1875) Beitrag zur Kenntniss der Gattung *Serolis*. *Archiv für Naturgeschichte*, 41: 208–234, pls v, vi.
- Harrison K, Holdich DM (1984) Hemibranchiate sphaeromatids (Crustacea: Isopoda) from Queensland, Australia, with a world-wide review of the genera discussed. *Zoological Journal of the Linnean Society* 81: 275–387.
- Harrison K, Poore GCB (1984) *Serolis* (Crustacea, Isopoda, Serolidae) from Australia, with a new species from Victoria. *Memoirs of the Museum of Victoria* 45: 13–31.
- Held C (2000) Phylogeny and biogeography of serolid isopods (Crustacea, Isopoda, Serolidae) and the use of ribosomal expansion segments in molecular systematics. *Molecular Phylogenetics and Evolution* 15: 165–177.
- Held C (2003) Molecular evidence for cryptic speciation within the widespread Antarctic crustacean *Ceratoserolis trilobitoides* (Crustacea, Isopoda). In: Huiskes AHL, Gieskes WWC, Rozema RML, Schorno SM, van der Vies SM, Wolff WJ (Eds) *Antarctic Biology in a Global Context*. Backhuys, Leiden, 305–309.
- Held C, Wägele J-W (2005) Cryptic speciation in the giant Antarctic isopod *Glyptonotus antarcticus* (Isopoda: Valvifera: Chaetiliidae). *Scientia Marina* 69: 175–181.
- Hessler RR (1967) A record of Serolidae (Isopoda) from the north Atlantic Ocean. *Crustaceana*, 12: 159–162.
- Holdich DM, Harrison K (1980) Morphological variation in the *Serolis minuta*-group (Isopoda: Serolidae) from Australian waters. *Zoological Journal of the Linnean Society* 68: 373–386.
- Holdich DM, Harrison K (1981) Platybranch sphaeromatids (Crustacea: Isopoda) from the Australian region with description of a new genus. *Records of the Australian Museum* 33: 617–643.
- Kensley BF (1978) The South African Museum's *Meiring Naude* cruises. Part 7. Marine Isopoda. *Annals of the South African Museum* 74: 125–158.

- Lockington WN (1877) Remarks on the Crustacea of the Pacific Coast, with description of some new species. *Proceedings of the California Academy of Sciences*, 9 (for 1876): 28–36.
- Menzies RJ Frankenberg, D (1966) *Handbook on the common marine isopod Crustacea of Georgia*. University of Georgia Press, Athens, i–viii + 93 pp.
- Milne Edwards H (1840) *Histoire Naturelle des Crustacés Comprenent l’anatomie, la physiologie et la classification de ces animaux*. Roret, Paris, i–ii + 638 pp.
- Moreira PS (1971) Species of *Serolis* (Isopoda: Flabellifera) from southern Brazil. *Boletim do Instituto Oceanográfico, São Paulo* 20: 85–144.
- Müller H-G (1993) On the occurrence of the isopod *Heteroserolis mgrayi* Menzies and Frankenberg, 1966. (Sphaeromatidea) in the Santa Marta area, Caribbean Sea of Colombia, with notes on its variation. *Zoologischer Anzeiger* 230(1–2): 35–44.
- Nordenstam Å (1933) Marine Isopoda of the families Serolidae, Idotheidae, Pseudidotheidae, Arcturidae, Parasellidae and Stenetriidae mainly from the South Atlantic. In: Bock S (Ed) *Further Zoological Results of the Swedish Antarctic Expedition 1901–1903*. Norstedt & Söner, Stockholm, 284.
- Poore GCB (1985) *Basserosolis kimblae*, a new genus and species of isopod (Serolidae) from Australia. *Journal of Crustacean Biology* 5: 175–181.
- Poore GCB (1987) *Serolina*, a new genus for *Serolis minuta* Beddard (Crustacea: Isopoda: Serolidae) with descriptions of eight new species from eastern Australia. *Memoirs of the Museum of Victoria* 48: 141–189.
- Poore GCB (1990) Two new species of isopod crustaceans belonging to Australian endemic genera (Serolidae and Chaetiliidae). *Memoirs of the Museum of Victoria* 51: 99–107.
- Poore GCB, Brandt A (1997) Crustacea Isopoda Serolidae: *Acutiserolis cidaris* and *Caecoserolis novaecaledoniae*, two new species from the Coral Sea. *Résultats de Campagnes MUSORSTOM, Volume 18. Mémoires du Muséum National d’Histoire Naturelle, Paris* 176: 151–168.
- Poore GCB, Storey M (2009) *Brucerolis*, new genus, and *Acutiserolis* Brandt, 1988, deep-water southern genera of isopods (Crustacea: Isopoda: Serolidae). *ZooKeys* 18: 143–160.
- Raupach MJ, Malyutina MV, Brandt A, Wägele J-W (2007) Molecular data reveal a highly diverse species flock within the munnopsoid deep-sea isopod *Betamorpha fusiformis* (Barnard, 1920) (Crustacea: Isopoda: Asellota) in the Southern Ocean. *Deep-Sea Research Part II, Topical Studies in Oceanography* 54: 1820–1830.
- Raupach MJ, Wägele J-W (2006) Distinguishing cryptic species in Antarctic Asellota (Crustacea: Isopoda) – a preliminary study of mitochondrial DNA in *Acanthaspidia drygalskii*. *Antarctic Science* 18: 191–198.
- Sheppard EM (1933) Isopod Crustacea. Part I. The family Serolidae. *Discovery Reports* 7: 253–362, pl. 14.
- Stebbing TRR (1905) Report on the Isopoda collected by Professor Herdman, at Ceylon, in 1902. Report to the Government of Ceylon on the Pearl Oyster Fisheries of the Gulf of Manaar, 1905 Supplementary Report 4: 47–64.
- Storey M, Poore GCB (in press) New species of *Brucerolis* (Crustacea: Isopoda: Serolidae) from seas around New Zealand and Australia. *Memoirs of Museum Victoria* 66.

- Watling L (1989) A classification concept for crustacean setae based on the homology concept. In: Felgenhauer BE, Watling L, Thistle AB (Eds) Functional morphology of feeding and grooming in Crustacea. A.A. Balkema, Rotterdam, 15–26.
- Wägele J-W (1986) Polymorphism and distribution of *Ceratoserolis trilobitoides* (Eights, 1833) (Crustacea, Isopoda) in the Weddell Sea and synonymy with *C. cornuta* (Studer, 1879). Polar Biology 6: 127–137.
- Wägele J-W (1994) Notes on Antarctic and South American Serolidae (Crustacea, Isopoda) with remarks on the phylogenetic biogeography and a description of new genera. Zoologische Jahrbücher der Systematik 121: 3–69.

A new species of *Foza* Reed & Cumberlidge, 2006, from northern Madagascar (Decapoda, Brachyura, Potamoidea, Potamonautidae), with a redescription of *F. goudoti* (H. Milne Edwards, 1853) comb. n., and comments on *Skelosophusa prolixa* Ng & Takeda, 1994

Neil Cumberlidge[†], Kirstin S. Meyer[‡]

Department of Biology, Northern Michigan University, Marquette, MI 49855, USA

[†] [urn:lsid:zoobank.org:author:05F6365E-D168-4AE3-B511-80FA7E31ACCI](https://orcid.org/urn:lsid:zoobank.org:author:05F6365E-D168-4AE3-B511-80FA7E31ACCI)

[‡] [urn:lsid:zoobank.org:author:AFE96B64-F661-44C4-BE21-11BCFAFF8192](https://orcid.org/urn:lsid:zoobank.org:author:AFE96B64-F661-44C4-BE21-11BCFAFF8192)

Corresponding author: Neil Cumberlidge (ncumberl@nmu.edu), Kirstin Meyer (kimeyer@nmu.edu)

Academic editor: Niel Bruce | Received 17 February 2009 | Accepted 31 July 2009 | Published 24 August 2009

[urn:lsid:zoobank.org/pub:9A407E72-AFDF-4997-AD04-D9FDAA54C3F3](https://orcid.org/urn:lsid:zoobank.org/pub:9A407E72-AFDF-4997-AD04-D9FDAA54C3F3)

Citation: Cumberlidge N, Meyer KS (2009) A new species of *Foza* Reed & Cumberlidge, 2006, from northern Madagascar (Decapoda, Brachyura, Potamoidea, Potamonautidae), with a redescription of *F. goudoti* (H. Milne Edwards, 1853) comb. n., and comments on *Skelosophusa prolixa* Ng & Takeda, 1994. In: Bruce N (Ed) Advances in the taxonomy and biogeography of Crustacea in the Southern Hemisphere. ZooKeys 18: 77–89. doi: 10.3897/zookeys.18.102

Abstract

Foza ambohitra sp. n. is described from Ambohitra, Antsiranana Province, northern Madagascar at 421 m elevation. This species is distinguished by characters of the carapace, the male anterior thoracic sternum, and the form of the male major cheliped and first gonopod. *Thelphusa goudoti* H. Milne Edwards, 1853, is transferred to *Foza* Reed & Cumberlidge, 2006, and redescribed, and a key to the three species of this genus is provided. Comments on the rare cave crab *Skelosophusa prolixa* Ng & Takeda, 1994, from Antsiranana Province are also included based on newly obtained material.

Keywords

Potamoidea, Potamonautidae, *Foza*, new species, Madagascar, identification key

Introduction

The present work reports on the discovery of a new species of freshwater crab, *Foza ambohitra*, from Antsiranana Province in northern Madagascar, from material obtained over a number of years by different collectors. In addition, *Hydrothelphusa goudoti* (H. Milne Edwards, 1853) is redescribed and reassigned here to *Foza* Reed & Cumberlidge, 2006, and a key to the three species of this genus is provided. We also describe new characters of the rare cave crab *Skelosophusa prolixa* Ng & Takeda, 1994, and provide habitus photographs of a large adult male specimen.

Material

The material is housed in the collections listed below:

- FMNH** Field Museum of Natural History, Chicago, Illinois, USA
MNHN Muséum national d'Histoire naturelle, Paris, France
NMU Department of Biology, Northern Michigan University, Marquette, Michigan, USA
NHM The Natural History Museum, London, UK
ZRC Zoological Research Collection, Raffles Museum of Biodiversity Research, National University of Singapore

Methods

All measurements were made with digital calipers, and are given in millimetres. Carapace width (CW) is the distance across the carapace at the widest point; the carapace length (CL) is measured along the median line, from the anterior to the posterior margin; the carapace height (CH) is the maximum height of the cephalothorax from the highest point of the gastric region to the suture between thoracic sternites s2 and s3; the front width (FW) is measured along the anterior frontal margin between the base of the orbits. The following abbreviations are used: a1–a6, abdominal somites 1–6; a7, telson of abdomen; asl, above sea level; e, thoracic episternite; s4/e4, s5/e5, s6/e6, s7/e7, episternal sulci between respective thoracic sternites and episternites thoracic sternite; GO1, first gonopod; GO2, second gonopod; p1–p5, pereopods 1–5; s4/s5, s4/s5, s5/s6, s6/s7, s7/s8, sternal sulci between respectively numbered thoracic sternites. The terminology is adapted from Cumberlidge (1999). Line drawings were prepared using a Leica MZ 16 stereobinocular microscope. Photographs were taken with a digital camera in combination with an eyepiece adapter. Post processing was done in Adobe Photoshop 7.0.

Description

Foza ambohitra sp. n.

urn:lsid:zoobank.org:act:1007E7DF-D87E-41A9-AB9D-B3628DB72C7D

(Figs 1–3, Table 1)

Type material. *Holotype*: adult male (CW 39.5, CL 32.4, CH 16.3, FW 8.7) northern Madagascar: Antsiranana Province, Diana Region, forest close to Ambohitra (formerly Joffreville) May 2005, 12°26'60"S, 49°7'60"E, 421 m asl, coll. R. Roy (MNHN B 30154). *Paratypes*: adult female (CW 37.8, CL 29.6, CH 15.5, FW 8.0), subadult female (CW 30.0, CL 23.6, CH 12.7, FW 6.6), northern Madagascar: Antsiranana Province, Réserve Spéciale d'Analamerana, Forêt d'Ankavanana, 15.8 km southeast Anivorano-Nord, from partially disturbed mixed dry deciduous and humid forest, collected in early morning, 23 January 2004, 14°52'00"S, 50°15'20"E, 200 m asl, coll. S. M. Goodman (FMNH 11045); adult male (CW 38.4, CL 28.8, CH 15.0, FW 8.3), adult female (CW 35.0, CL 28.0, CH 14.3, FW 8.1), Antsiranana Province, Réserve Spéciale d'Analamerana, Forêt d'Ankavanana, 15.8 km southeast Anivorano-Nord, from partially disturbed mixed dry deciduous and humid forest, collected during night at edge of small stream at forest edge, 23 January 2004, 14°52'00"S, 50°15'20"E, 200 m asl, coll. S. M. Goodman (FMNH 11046); adult male (CW 37.1, CL 29.2, CH 16.8, FW 8.1), Antsiranana Province, Réserve Spéciale d'Analamerana, Forêt d'Ankavanana, 15.8 km southeast Anivorano-Nord, from partially disturbed mixed dry deciduous and humid forest, collected in late afternoon, 25 January 2004, 14°52'00"S, 50°15'20"E, 200 m asl, coll. S. M. Goodman (FMNH 11050); adult female (CW 38.0, CL 28.7, CH 15.7, FW 8.5), adult male (CW 33.2, CL 26.2, CH 14.5, FW 7.5), Antsiranana Province, Réserve Spéciale d'Analamerana, Forêt d'Ankavanana, 15.8 km southeast Anivorano-Nord, from partially disturbed mixed dry deciduous and humid forest, collected in the late afternoon, 25 January 2004, 14°52'00"S, 50°15'20"E, 200 m asl, coll. S. M. Goodman (FMNH 11051); adult female (CW 39.1, CL 30.7, CH 17.1, FW 8.7) Antsiranana Province, Réserve Spéciale d'Analamerana, Forêt d'Ankavanana, 15.8 km southeast Anivorano-Nord, from partially disturbed mixed dry deciduous and humid forest, collected at forest edge during night, 25 January 2004, 14°52'00"S, 50°15'20"E, 200 m asl, coll. S. M. Goodman (FMNH 11052); adult female (CW 41.4, CL 31.9, CH 17.4, FW 8.7) Antsiranana Province, Réserve Spéciale d'Analamerana, Forêt d'Ankavanana, 15.8 km southeast Anivorano-Nord, from partially disturbed mixed dry deciduous and humid forest, found on ground during day, 26 January 2004, 14°52'00"S, 50°15'20"E, 200 m asl, coll. S. M. Goodman (FMNH 11054); adult female (CW 43.1, CL 34.2, CH 18.3, FW 9.9), Antsiranana Province, Réserve Spéciale d'Analamerana, Forêt d'Ankavanana, 15.8 km southeast Anivorano-Nord, from partially disturbed mixed dry deciduous and humid forest, collected in late afternoon, 28 January 2004, 14°52'00"S, 50°15'20"E, 200 m asl, coll. S. M. Goodman (FMNH 11056); juvenile male (CW 22.8, CL 17.6, CH 9.4,

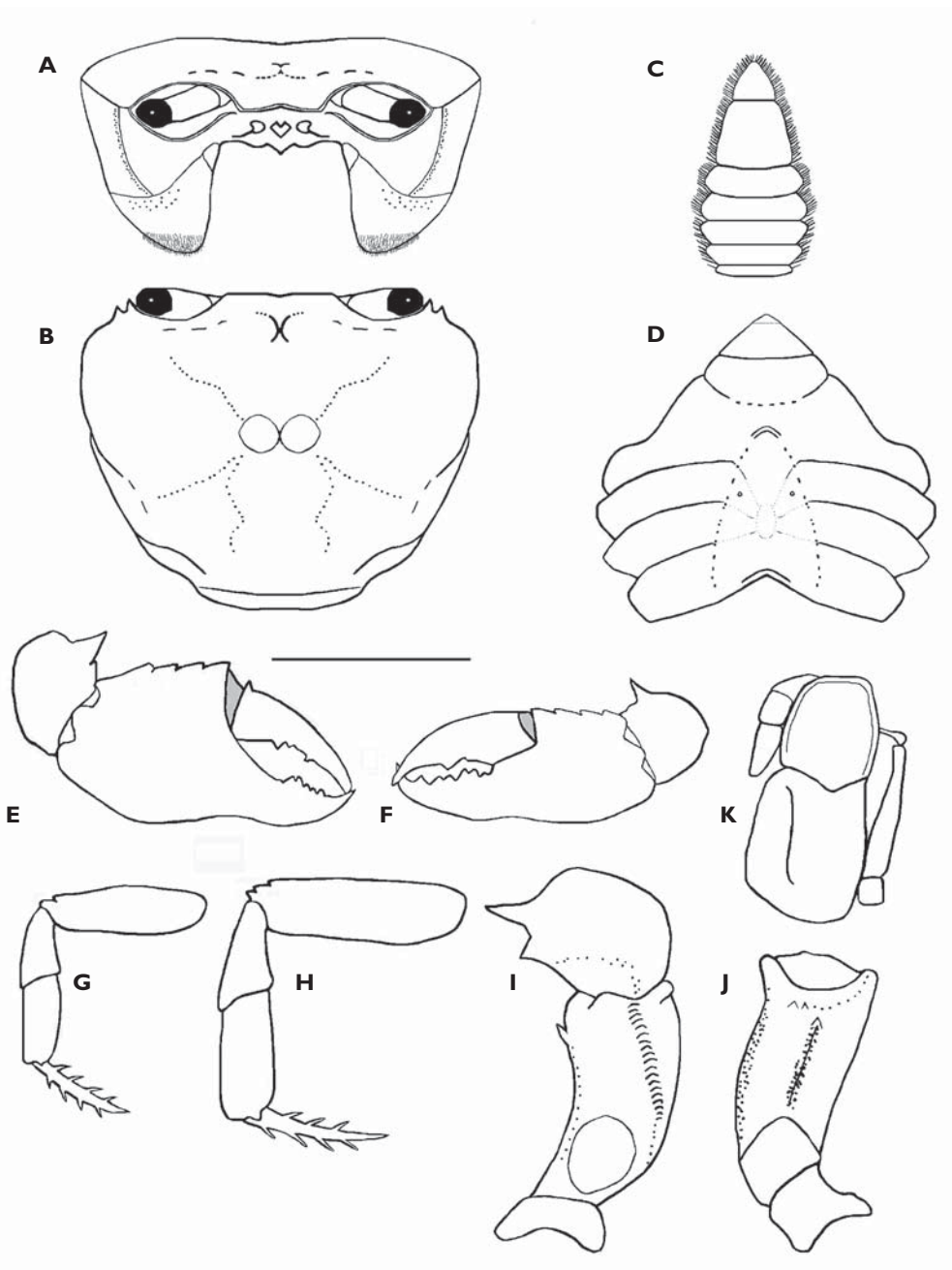


Figure 1. *Foza ambohitra* sp. n. **A** carapace, frontal view **B** carapace, dorsal view **C** male abdomen **D** male sternum **E** major (right) cheliped **F** minor (left) cheliped **G** pereiopod 3 **H** pereiopod 5 **I** carpus and merus of major cheliped, dorsal view **J** merus of major cheliped, ventral view **K** third maxilliped. Scale bar = 20 mm, **A–J**; 7.5 mm, **K**.

FW 4.7) Antsiranana Province, Réserve Spéciale d'Analamerana, 8.6 km southeast Menagisy, Forêt d'Analabe, along Bobakindro River, partially disturbed dry deciduous forest, collected early morning, 17 January 2004, 12°42'00"S, 49°28'00"E, 40 m asl, coll. S. M. Goodman (FMNH 11060); adult male (CW 43.0, CL 31.6, CH 17.7, FW 11.6), Toamasina Province, Montagne d'Akirindro, 7.6 km, 17–21 March 2003, 15°17'00"S, 49°32'34"E, NNE Ambinantelo, 600 m asl, coll. P. Naskrecki (NMU PN 17–21.3.2003).

Diagnosis. Anterolateral margin lined by small granules. Suborbital, subhepatic, pterygostomial regions smooth with small field of granules at junction of longitudinal, vertical sutures. Outer face of merus of cheliped (pereopod 1) smooth, granules present on upper margin only. Sternal sulcus s3/s4 complete, U-shaped, not meeting sterno-abdominal cavity. Terminal article of GO1 short, slim, tapered, with distinct raised rounded shoulder on external margin, slightly lower than junction with terminal article.

Description. Based on holotype, adult male. Carapace outline transversely oval, very high (CH/FW 1.90); front narrow (FW/CW 0.22), deflexed; epibranchial tooth small, pointed, advanced in position, almost touching exorbital tooth; anterolateral margin evenly curved outward, lined by small granules, continuous with posterolateral margin, latter margin with faint or absent striae; postfrontal crest faint to absent, epigastric crests faint, positioned forward on front almost touching frontal margin, postorbital crests faint; deep mid-groove between epigastric crests forked posteriorly; cardiac, urogastric grooves faint, semicircular grooves deep; cervical grooves faint, long, not meeting postorbital crest. Suborbital region of carapace smooth, subhepatic region smooth, pterygostomial region smooth except for setae on lower margin, small field of granules at junction between longitudinal, vertical sutures; vertical sulcus on carapace sidewall curved, granular, running downward from base of epibranchial tooth to epimeral sulcus.

Epistomial tooth triangular, deflexed, edges smooth. Mandibular palp bilobed. Exopod of third maxilliped reaching to lower half of merus, exopod with short flagellum, ischium with deep vertical groove, curving distally toward medial margin. Sternal sulcus s1/s2 short, very faint; sternal sulcus s2/s3 completely crossing sternum; sternal sulcus s3/s4 with broad U-shaped groove, deep at edges, faint in middle; anterior sterno-abdominal cavity lacking setae. Sternal sulcus s4/s5 meeting abdomen at abdominal sulcus at a7/a6; sternal sulcus s6/s7 meeting a6 one half of segment length from a6/a5. Episternal sulci s4/e4, s5/e5, s6/e6, s7/e7 absent, smooth.

Dactylus of both chelipeds relatively slender, approximately one-third height of palm, edges smooth except for 2 distinct teeth, one positioned basally, one half way along; upper margin of dactylus smooth; lower margin of propodus slightly indented. Fixed finger of propodus of major (right) cheliped slender with 3 large molars in proximal region (first 2 fused basally, third single) followed by series of small teeth. First carpal tooth on inner margin of carpus of cheliped large, pointed; second carpal tooth smaller, pointed, followed by a large granule. Medial, lateral margins of inferior face of merus of cheliped distinctly toothed, inferior face with

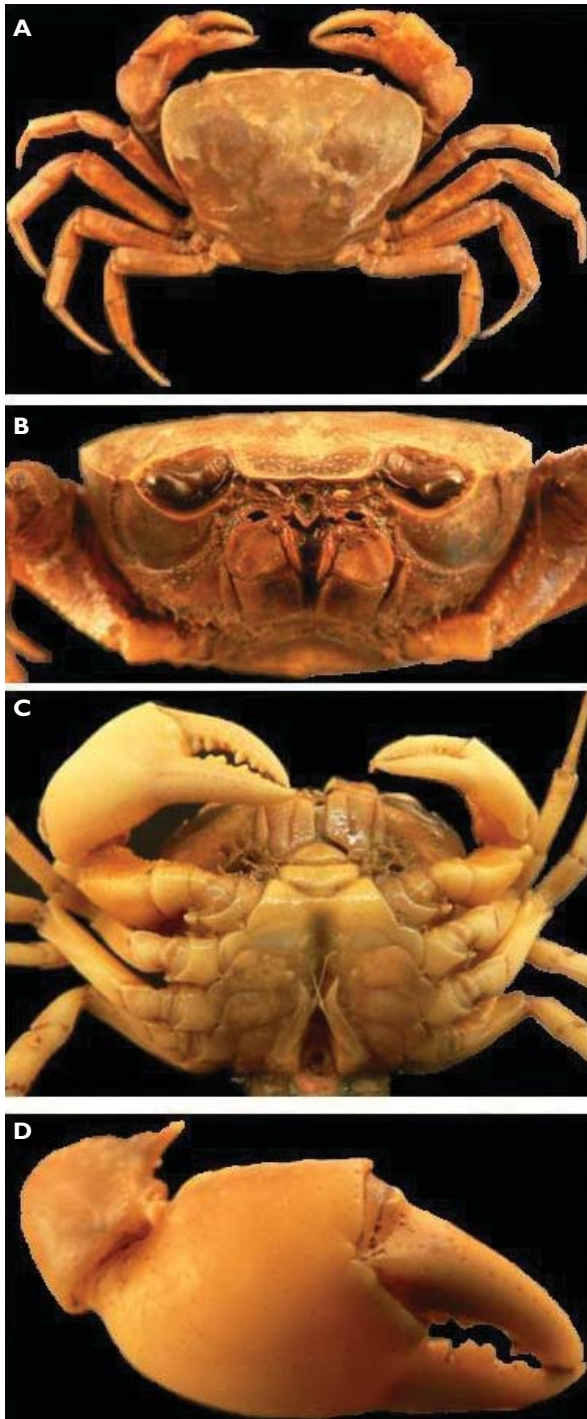


Figure 2. *Foza ambohitra* sp. n. **A** dorsal view **B** frontal view **C** sternal view **D** major (right) cheliped. **A, B** adult female (FMNH 11056), CW 43.1 mm **C, D** holotype, adult male, CW 39.5 mm.

pointed, granulated distal meral tooth; superior margin of merus of cheliped roughened by granules and short striae; outer face of merus smooth; granules on medial margin of merus, ischium of cheliped smooth, inferior margin of ischium rounded, smooth. Walking legs (p2-p5) elongated (ratio of merus length of p5 to CW 0.3), slender, inner margins of p2 to p5 propodi smooth. Male abdomen triangular, tapered distally, widest at a3, narrowest at a7 (telson); telson outline forming straight-sided triangle with broad base, rounded apex.

Terminal article of GO1 short (ratio of length of terminal article to subterminal segment 0.25), slim, tapered, directed slightly outwards, straight, smooth, apical

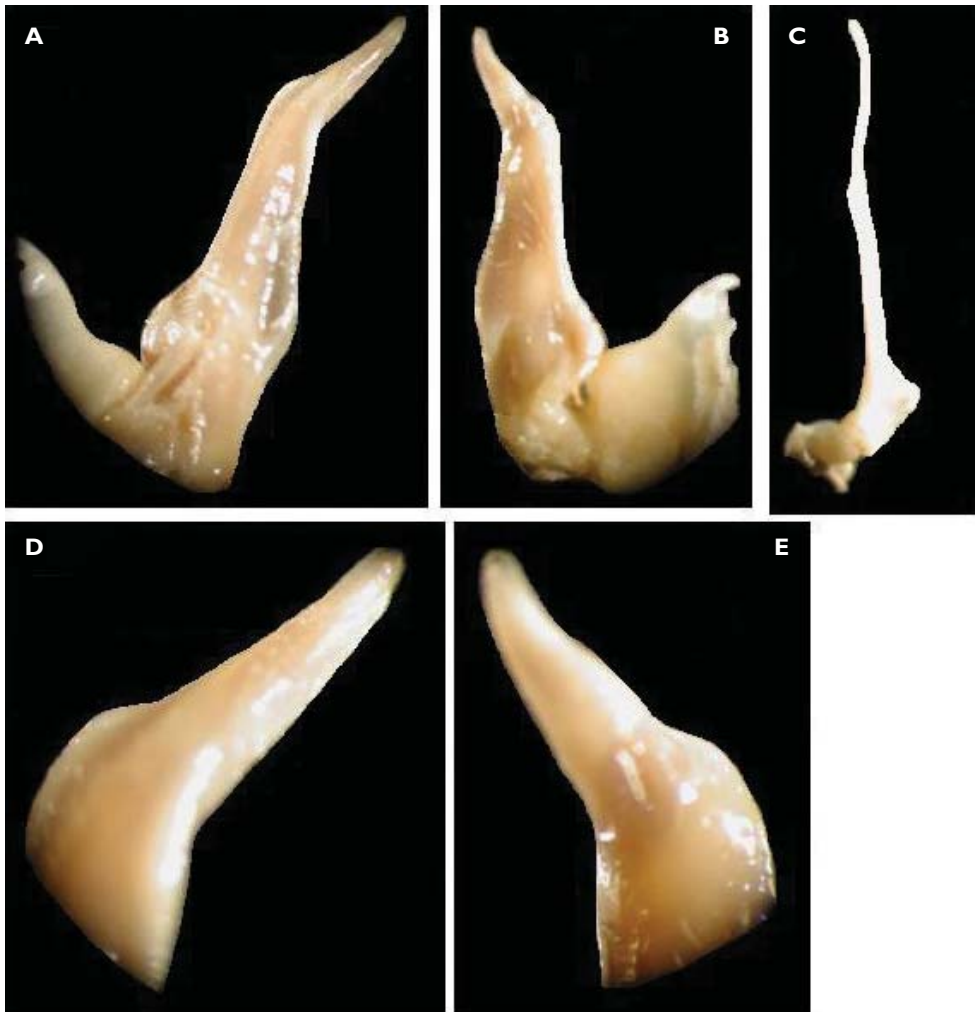


Figure 3. *Foza ambohitra* sp. n. **A** left GO1, ventral view **B** left GO1, dorsal view **C** left GO2, ventral view **D** terminal article of left GO1, close-up, ventral view **E** terminal article of left GO1, close-up, dorsal view. Holotype, adult male, length of the terminal article measured along the mid-line of the dorsal face from tip to dorsal membrane = 8.2 mm.

opening narrow; subterminal segment with junction between terminal article, subterminal segment not clearly visible on ventral side. Terminal article, subterminal segment separated on dorsal side by broad, trapezoid dorsal membrane; superior margin of dorsal membrane formed by diagonal basal margin of terminal article, inferior margin of membrane formed by diagonal J-shaped distal edge of subterminal segment; lateral margin of dorsal membrane broad, medial margin of membrane narrow, forming medial junction between subterminal segment, terminal article. Subterminal segments of GO1, GO2 subequal, but terminal article of GO2 much longer than terminal article of GO1. Terminal article of GO2 flagellum-like, about 2/3 length of subterminal segment, reaching anterior margin of sterno-abdominal cavity; tip of flagellum curving inward distally; distal parts of flagella of left, right GO2s crossing medially.

Comparisons. *Foza ambohitra*, sp. n., is assigned to the genus *Foza* on the basis of characters that it shares with *F. raimundi* Reed & Cumberlidge, 2006, the type-species of the genus (Reed and Cumberlidge, 2006). The two species share a weak postfrontal crest, a narrow frontal margin of the carapace (FW/CW 0.22 *F. ambohitra*, 0.25 *F. raimundi*) and a GO2 terminal article that curves inward distally; and the epibranchial tooth of both species is in a forward position, almost touching the exorbital tooth. *Foza ambohitra* can be distinguished from *F. raimundi* as follows: the terminal article of GO1 of *F. ambohitra* is cone-shaped and tapered (Fig. 2A), while that of *F. raimundi* is tube-shaped (Reed and Cumberlidge, 2006: Fig. 2B–D); both the superior part of the pterygostomial region and the sterno-abdominal cavity of *F. ambohitra* lack setae (Fig. 1D, 2C), whereas setae are present in these regions in *F. raimundi*; the anterolateral margin of *F. ambohitra* is granular and the posterolateral margin is smooth (Fig. 1A), whereas the anterolateral margin of *F. raimundi* is smooth and the posterolateral margin is carinated (Reed and Cumberlidge, 2006: Fig. 1B); and the major cheliped of *F. ambohitra* has three large molars (Fig. 1E) whereas that of *F. raimundi* has one large fused molar (Reed and Cumberlidge, 2006: Fig. 1E). The three species of *Foza* are compared in Table 1. The differences between *Foza* and the other Malagasy freshwater crab genera are discussed by Reed and Cumberlidge (2006).

Etymology. Ambohitra is the modern name of Joffreville, a French colonial town in northern Madagascar, near where the specimens described here were collected. Ambohitra is a noun in apposition.

Distribution. *Foza ambohitra* is found in the Analamerana Mountains (12°44′00″S, 49°36′00″E), as well as the Ankavanana River (14°52′00″S, 50°15′20″E) and the Bobakindro River (12°42′00″S, 49°28′00″E) in Antsiranana Province in northeastern Madagascar.

Habitat. Partially disturbed mixed dry deciduous and humid forest in northern Madagascar.

Redescription

Foza goudoti H. Milne Edwards, 1853, **comb. n.**

Thelphusa goudoti H. Milne Edwards, 1853: 212. A. Milne-Edwards 1869: 172; 1887: 135.

Telphusa goudoti.– De Man 1892: 235.

Potamon goudoti.– De Man 1898: 434.

Potamon (Potamon) goudoti.– Rathbun, 1904: 305, 306. Balss 1929: 355.

Potamon (Geothelphusa) methueni Calman, 1913: 920.

Bottia goudoti.– Pretzmann 1961: 164.

Gecarcinautes goudoti.– Bott 1965: 338, 339. Cumberlidge 1997: 585; 1998: 209.

Hydrothelphusa goudoti.– Cumberlidge and Sternberg 2002: 56–59. Ng et al., 2008: 169.

Type locality. Madagascar. *Thelphusa goudoti*: Madagascar, road between Bombetok and Tananarive. *Potamon (Geothelphusa) methueni*: Imerimandrosa.

Type material. Adult male (CW 45.3, CL 34.4, CH 20.7, FW 10.7), adult female (CW 40.5, CL 32.1, CH 17.0, FW 10.0), 1987, purchased live in market in Antananarivo by N. Cumberlidge (NMU NC 1987); adult male (CW 38.0, CL 28.1, CH 15.1, FW 10.2), adult male (CW 34.4, CL 27.5, CH 14.5, FW 8.4), adult female (CW 38.2, CL 33.1, CH 17.0, FW 9.5), adult female (CW 32.0, CL 25.1, CH 13.6, FW 8.2), from a lake near Antananarivo, coll. H. Morioka (ZRC 2000.2303).

Diagnosis. Frontal margin of carapace relatively narrow (FW/CW 0.25), sharply deflexed. Epibranchial tooth small, positioned forward close to exorbital tooth. Epigastric, postorbital crests fused forming long horizontal postfrontal crest. Anterolateral margin posterior to epibranchial tooth raised, granular; anterolateral region smooth with striae on posterolateral margin. Pterygostomial region of carapace sidewall lacking setae. Subhepatic region smooth, granules in suborbital and pterygostomial regions. Sternal sulcus s3/s4 complete, v-shaped. Terminal article of GO1 with medial flap near junction. Terminal article of GO2 long, not curving inward distally.

Comparisons. Cumberlidge and Sternberg (2002) assigned *T. goudoti* to *Hydrothelphusa* on the basis of its bilobed mandibular palp, but commented on the differences in a number of other characters of the carapace between this species and the others included in that genus. For example, the exorbital and epibranchial teeth of *F. goudoti* are both low and blunt and positioned close together, and the carapace is very wide (CW/FW 3.9) and highly arched (CH/FW 1.6). In the other species of *Hydrothelphusa* these teeth are large and well spaced, and the carapace is not noticeably widened or inflated (Cumberlidge and Sternberg, 2002). This taxon is transferred here to the genus *Foza* because it shares a number of important taxonomic characters with both *F. raimundi* and *F. ambohitra* (Table 1).

Table 1. Comparison of the morphological characters of the species of genus *Foza*.

Character	<i>F. raimundi</i> ¹	<i>F. goudoti</i> ²	<i>F. ambobitra</i> ³
GO1 terminal segment	tube-shaped, not tapering	cone-shaped, tapering	cone-shaped, tapering
GO2 terminal segment	curving inward distally	straight, no distal curve	curving inward distally
Sterno-abdominal cavity	dense setae	no setae	no setae
Sternal sulcus s3/s4	complete, u-shaped	complete, v-shaped	complete, u-shaped
Postfrontal crest	faint, incomplete	distinct, complete	faint, incomplete
Anterolateral surface of carapace	smooth	smooth	granular
Anterolateral margin	smooth	raised, granular	smooth
Posterolateral surface of carapace	with carinae	with carinae	smooth
Cervical grooves	short	long, distinct	long, faint
Suborbital region	small granules	faint granules	smooth
Subhepatic region	conspicuous carinae	smooth	smooth
Pterygostomial region	dense setae on entire region, lacking granules	setae absent, granules present	setae near inferior margin only, small field of granules at junction of vertical and epimeral sutures
Major cheliped	one fused molar	more than one molar	three distinct molars

¹ Reed & Cumberlidge, 2006; ² Cumberlidge & Sternberg, 2002; ³ present work.

Key to the species of *Foza*

- 1 Terminal article of GO1 tube-shaped; dense setae on sterno-abdominal cavity and pterygostomial region; conspicuous striae present on subhepatic region; cervical grooves short; major cheliped with single fused molar ***F. raimundi* Reed & Cumberlidge, 2006**
- Terminal article of GO1 cone-shaped, tapering to a pointed tip; setae lacking on sterno-abdominal cavity and superior part of pterygostomial region; subhepatic region smooth, smooth; cervical grooves long; major cheliped with more than one fused molar **2**
- 2 Terminal article of GO2 long, straight; anterolateral region of carapace surface smooth; striae present on posterolateral region; postfrontal crest distinct, complete; suborbital, pterygostomial, subhepatic regions smooth, lacking granules at intersection of longitudinal, vertical sutures ***F. goudoti* (H. Milne Edwards, 1853)**
- Terminal article of GO2 long, strongly curved inward at tip; anterolateral region of carapace surface with fields of striae; posterolateral region smooth;

postfrontal crest weak, incomplete; suborbital, pterygostomial, subhepatic regions with small field of granules at intersection of longitudinal, vertical sutures *F. ambohitra* sp. n.

Remarks on *Skelosophusa prolixa* Ng & Takeda, 1994

(Fig. 4)

The first author discovered five specimens from northern Madagascar in the unidentified collection of the NHM (NHM 2009.119, NHM 2009.120 -121, NHM 2009.122, NHM 2009.123, NHM 2009.124) that proved to belong to *Skelosophusa prolixa*. All of these specimens were collected from Rivi re Cave, Ca on Forestier, Ankarana, 60 km south of Diego Suarez, northern Madagascar, 8 August-27 September 1986, by N. W. Lear and S. U. Fowler. Although the locality is similar to that reported for the holotype, it may be possible that these specimens are topotypic, and were collected at the same time as the original type series. However, it is difficult to be certain of this because the date of collection and the names of the collectors were not supplied in the original description (Ng and Takeda, 1994). *Skelosophusa prolixa* was previously known only from two specimens collected from this same locality. The holotype described by Ng and Takeda (1994) has a CW of 25.6 mm and CL of 18.8 mm; these two measurements give a cw/cl ratio of 1.3 (compared to 1.4 for the present specimens). This species possesses a number of adaptations (e.g. normal length eyestalks but

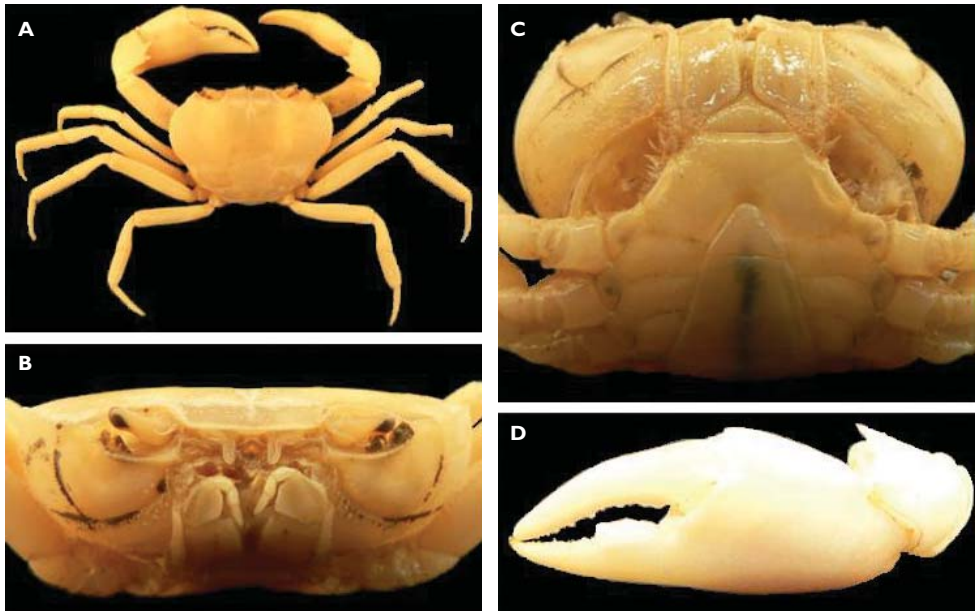


Figure 4. *Skelosophusa prolixa*. **A** dorsal view **B** frontal view **C** sternal view **D** major (left) cheliped. Adult male (NHM 2009.122), CW 29.3 mm.

with reduced corneas, lack of pigmentation of the carapace and legs, and extremely long ambulatory legs, p2-p5) typical of true cave-adapted species of freshwater crabs (Ng and Takeda, 1994). The adult male specimen among the new material photographed here (Fig. 4A–D) (CW 29.3 mm) is larger than the holotype male (CW 25.6 mm) and shows characters of the cheliped that have not previously been described. For example, the immovable finger of the major cheliped of *S. proluxa* has one large, fused molar tooth in adults, whereas that of the holotype male, a smaller specimen, has only small teeth (Ng and Takeda, 1994).

Acknowledgements

Prof. Danièle Guinot of the MNHN, Paris, France, is thanked for sending the holotype for identification that prompted this study. This work has been enhanced by the material collected from Madagascar over a number of years by Dr. Steven M. Goodman of the Field Museum, Chicago. Marty Prydzia, Joachim Gerber, and Dr. Janet Voight of the FMNH are also thanked for kindly loaning specimens used in this study and for hosting visits by the first author. We are grateful to Dr. Piotr Naskrecki, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, who donated several specimens of freshwater crabs from Madagascar, one of which proved to belong to *F. ambohitra*. Drs. Peter K. L. Ng and Darren C. J. Yeo of the National University of Singapore are thanked for loaning specimens of *F. goudoti* mentioned here. Finally, we thank Dr. Paul F. Clark and Miranda Lowe of The Natural History Museum, London, UK, who loaned specimens and hosted visits by the first author.

References

- Balss H (1929) Über Ostafrikanischer Potamonidae (Decapoda). Mit Anhang: Potamoiden von Madagaskar. Zoologische Jahrbücher, Abteilung für Systematik 58: 339–358.
- Bott R (1965) Die Süßwasserkrebbe von Madagaskar. Bulletin du Muséum national d'Histoire naturelle 37 (2): 335–350.
- Calman WT (1913) On Freshwater Decapod Crustacea (Families Potamonidae, Palaemonidae) collected in Madagascar by the Hon. Paul A. Methuen. Proceedings of the Zoological Society of London: 914–932.
- Cumberlidge N (1997) The African and Madagascan freshwater crabs in the Museum of Natural History, Vienna (Crustacea: Decapoda: Brachyura: Potamoidea). Annalen des Naturhistorischen Museums in Wien 99B: 571–589.
- Cumberlidge N (1998) The African and Madagascan freshwater crabs in the Zoologische Staatssammlung, Munich (Crustacea: Decapoda: Brachyura: Potamoidea). Spixiana 21 (3): 193–214.
- Cumberlidge N (1999) The Freshwater Crabs of West Africa, Family Potamonautidae. Faune et Flore tropicales 35, IRD, Paris, 382 pp.

- Cumberlidge N, Sternberg R (2002) The freshwater crabs of Madagascar (Crustacea, Decapoda, Potamoidea). *Zoosystema* 24 (1): 41–79.
- De Man JG (1892) Decapoden des Indischen Archipels, in Weber M (ed.) *Zoologische Ergebnisse einer Reise in Niederländisch Ost-Indien* 2: 265–527.
- De Man JG (1898) Description d'une espèce nouvelle du Genre *Potamon* Sav. provenant du pays des Somalis. *Annali del Museo Civico di Storia Naturale di Genova* (2) 19 (29): 262–270.
- Milne Edwards H (1853) Observations sur les affinités zoologiques et la classification naturelle des Crustacés. *Annales des Sciences naturelles, Zoologie, Série 3*, 20: 163–182.
- Milne-Edwards A (1869) Révision du genre *Thelphusa* et description de quelques espèces nouvelles faisant partie de la collection du Muséum. *Nouvelles Archives du Muséum d'Histoire naturelle* 5: 161–191.
- Ng PKL, Guinot D, Davie P (2008) Systema Brachyurorum: Part I. An annotated checklist of extant Brachyuran crabs of the world. *Raffles Bulletin of Zoology Supplement* 17: 1–286.
- Ng PKL, Takeda M (1994) *Skelosophusa* (Crustacea, Decapoda, Brachyura), a new genus of potamonautid freshwater crab from Madagascar, with descriptions of two new species. *Bulletin of the National Science Museum, Series A (Zoology)* 20(4): 161–172.
- Pretzmann G (1961) Die Reptantia der Oesterreichischen Madagaskar-Expedition 1958. *Mémoires de l'Institut scientifique de Madagascar serie F, IV*: 161–165.
- Rathbun MJ (1904) Les crabes d'eau douce (Potamonidae). *Nouvelles Archives du Muséum d'Histoire naturelle* 6 (4): 255–312.
- Reed SK, Cumberlidge N (2006) *Foza raimundi*, a new genus and species of potamonautid freshwater crab (Crustacea: Decapoda: Potamoidea) from northern Madagascar. *Proceedings of the Biological Society of Washington* 119(1): 58–66.

Do circum-Antarctic species exist in peracarid Amphipoda? A case study in the genus *Epimeria* Costa, 1851 (Crustacea, Peracarida, Epimeriidae)

Anne-Nina Lörz^{1,†}, Elizabeth W. Maas^{1,‡}, Katrin Linse^{2,§},
Charles Oliver Coleman^{3,1}

1 National Institute of Water and Atmospheric Research, Private Bag 14-901, Kilbirnie, Wellington, New Zealand
2 British Antarctic Survey, Natural Environmental Research Council, High Cross, Madingley Road, Cambridge, CB3 0ET, United Kingdom
3 Museum für Naturkunde Berlin, Invalidenstraße 43, D-10115 Berlin, F.R.G.

† [urn:lsid:zoobank.org:author:9442484E-43A4-4383-A1A6-AE493087BCA1](https://zoobank.org/urn:lsid:zoobank.org:author:9442484E-43A4-4383-A1A6-AE493087BCA1)

‡ [urn:lsid:zoobank.org:author:3B44FEC0-DF77-4074-BADD-EF549F6A0F74](https://zoobank.org/urn:lsid:zoobank.org:author:3B44FEC0-DF77-4074-BADD-EF549F6A0F74)

§ [urn:lsid:zoobank.org:author:E6628609-3C45-4A45-9337-D05303AABD23](https://zoobank.org/urn:lsid:zoobank.org:author:E6628609-3C45-4A45-9337-D05303AABD23)

| [urn:lsid:zoobank.org:author:1EC18609-2D14-462B-8E59-B1CE40166FAF](https://zoobank.org/urn:lsid:zoobank.org:author:1EC18609-2D14-462B-8E59-B1CE40166FAF)

Corresponding author: Anne-Nina Lörz (a.loerz@niwa.co.nz)

Academic editor: Niel Bruce | Received 19 December 2008 | Accepted 19 January 2009 | Published 24 August 2009

[urn:lsid:zoobank.org:pub:3A6234A8-F3A5-4F43-B4FB-89722D121684](https://zoobank.org/urn:lsid:zoobank.org:pub:3A6234A8-F3A5-4F43-B4FB-89722D121684)

Citation: Lörz AN, Maas EW, Linse K, Coleman CO (2009) Do circum-Antarctic species exist in peracarid Amphipoda? A case study in the genus *Epimeria* Costa, 1851 (Crustacea, Peracarida, Epimeriidae). In: Bruce N (Ed) Advances in the taxonomy and biogeography of Crustacea in the Southern Hemisphere. ZooKeys 18: 91-128. doi: 10.3897/zookeys.18.103

Abstract

The amphipod genus *Epimeria* is species rich in the Southern Ocean and at present eight of its 19 species are reported with circum-Antarctic distributions. For the first time, specimens of epimeriid species from the Antarctic Peninsula, the Weddell Sea and the Ross Sea were analysed using partial COI genes sequences and morphological characters. In total 37 specimens of 14 species of *Epimeria* and two species of *Epimeriella* were analysed and the resulting molecular topology checked by critically reviewing taxonomic characters. The genus *Epimeriella*, genetically grouping within *Epimeria* is synonymised with the genus *Epimeria*. Sequences distances between populations of the nominal species *Epimeria robusta* from the Weddell and Ross Sea led to detailed morphological investigations, resulting in the description of *Epimeria robustoides* new species from the Weddell Sea. *Epimeria robusta* Barnard, 1930 from the Ross Sea is redescribed. Sequences of a damaged *Epimeria* specimen of a species new to science from the lower continental shelf of the eastern Weddell Sea were included. Based on the current study, the hypothesis of circum-Antarctic species' distributions in brooding amphipods proved to be unlikely.

Keywords

Circum-Antarctic distribution, COI, Antarctica, New Zealand, Amphipoda, *Epimeriella*, *Epimeria* sp. n.

Introduction

In the Southern Ocean's benthic ecosystem, crustaceans are by far the most specious taxon. Among the crustaceans, amphipods are the most numerous group with more than 815 recorded species (De Broyer et al. 2007). The globally distributed amphipod family Epimeriidae Boeck, 1871 (formerly Paramphithoidae) belongs to the dominant members of Antarctic shelf benthos (Coleman 2007). Twenty-five species of Epimeriidae are known from Antarctic waters, that is 19 *Epimeria* Costa, 1851, four *Epimeriella* Walker, 1906, one *Metepimeria* Schellenberg, 1931a and one *Uschakoviella* Gurjanova, 1955b.

Based on their distribution records from the Weddell and Ross Sea shelves, eight species of Epimeriidae (*Epimeria grandirostris*, *E. inermis*, *E. macrodonta*, *E. puncticulata*, *E. "robusta"*, *E. macronyx*, *E. walkeri* and *E. scabrosa*) are believed to have circum-Antarctic distributions. *Epimeria robusta* Barnard, 1930 was originally described from the Ross Sea but because of insufficient descriptions and images Coleman (1994) re-described *E. robusta* based on specimens from the Weddell Sea. Five of the epimeriid species (*Epimeria extensa*, *E. heldi*, *E. reoproii*, *E. vaderi* and *E. truncata*) are known from locations only on the Antarctic Peninsula. Two species, *Epimeria rimicarinata* Watling and Holman, 1980 and the recently described *E. schiaparelli* Lörz, Maas, Linse and Fenwick, 2007 are found exclusively in the Ross Sea.

Epimeriella macronyx is known from the eastern Antarctic Peninsula, Davis Sea, Ross Sea, South Orkney Islands, South Shetland Islands and the Weddell Sea. *Epimeriella scabrosa* was found at Oats Coast and the Weddell Sea. *Epimeriella truncata* is known only from the type locality, at the western Antarctic Peninsula. *Epimeriella walkeri* has a distribution at the Davis Sea, Palmer Archipelago, Ross Sea, South Shetland Islands and Weddell Sea. The monotypic genus *Metepimeria* has never been found again after its original description and the finding of *Uschakoviella* by Watling and Holman (1981) could not be confirmed. All other known species of *Uschakoviella* are restricted to the Arctic Ocean.

The Antarctic Epimeriidae mostly occur on the continental shelves and upper slopes. So far only one epimeriid specimen has been caught on the deep slope (2157 m) off Kapp Norvegia in the Weddell Sea during the ANDEEP III expedition. This damaged species of *Epimeria* sp. proved to be new to science (authors personal observation).

Outside of the Southern Ocean only a few species of Epimeriidae have been described from the Southern Hemisphere. With the exception of *Epimeriella victoria* (Hurley, 1957) these belong to the genus *Epimeria* and show bathymetric affinities to the deep continental slopes and deep sea. Three have been found in depths greater than 1500 m off the Brazilian coast: *E. bathyalis* Wakabara and Serejo, 1999 (1200–1575 m), *E. rotunda* Wakabara and Serejo, 1999 (1190–1205 m) and *E. ultraspinosa* Wakabara and Serejo, 1999 (830 m). The deepest species of Epimeriidae found is *Epimeria bispinosa* Ledoyer, 1986 off Madagascar in 3450 m water depth. *Epimeria*

longispinosa Barnard, 1916 occurs off eastern Florida and False Bay, South Africa at depths of 345–750 m. The New Zealand Epimeriidae so far only comprises of four species [*Epimeria glaucosa* Barnard, 1961, 3710 m; *E. bruuni* Barnard, 1961, 2470 m; *E. horsti* Lörz, 2008, 1030m; and *E. victoria* (Hurley, 1957), 140 m] and to date none have been found in Australian waters (Lörz et al. 2008).

The first combined molecular and morphological phylogeny of Antarctic Epimeriidae and Iphimediidae was based on a total of 16 taxa. It was presented by Lörz and Held (2004) and proved the monophyly of the families Epimeriidae and Iphimediidae. This preliminary study based on only 16 specimens from the Weddell Sea included six species of *Epimeria* (Epimeriidae) and eight species of *Iphimediella*, *Echiniphimedia* and *Gnathiphimedia* (Iphimediidae).

Lörz and Brandt (2004) published the first extensive morphology-based phylogeny of Antarctic *Epimeria* based on all 17 Antarctic species described at that time, including species of the genera *Epimeriella* and *Metepimeria*. The resulting topology of this study confirmed the monophyly of the Epimeriidae and Iphimediidae but was not convincingly able to determine relationships between and within the genus *Epimeria*. *Epimeriella* and *Metepimeria* species appeared amongst the species of *Epimeria*, suggesting polyphyly for the latter genus.

Recent expeditions to the Ross Sea, seamounts off New Zealand and the Weddell Sea collected new epimeriid material, which was preserved in a state suitable for genetic studies. This new material enables us to shed light on open questions regarding the evolution of Southern Hemisphere Epimeriidae:

1. Do circum-Antarctic distributions occur amongst species of epimeriid Amphipoda?
2. How are New Zealand and Antarctic *Epimeria* species related? Do the Southern Ocean epimeriids form an Antarctic clade?
3. Are the genera *Epimeria* and *Epimeriella* monophyletic?

Our recent study contributes to the ongoing investigation and census of the Southern Ocean benthic biota, its diversity and biogeographic history.

Material and methods

Taxon sampling. During recent expeditions of RV *Tangaroa* to the Ross Sea (BioRoss, TAN0402; IPY, TAN0802) and seamounts off New Zealand (TAN0413, TAN0602), as well as RV *Polarstern* to the Weddell Sea (ANT XXI/2, BENDEX und ANDEEP III) new amphipod material was collected. Amphipods were sorted from collections immediately (often alive), fixed in 98% ethanol and later transferred to 70% ethanol. Of these collections 30 specimens of Epimeriidae and 1 specimen of Iphimediidae were identified to species level and included in the molecular analysis (Table 1). The final phylogenetic dataset includes the 31 new sequences of 14 epimeriid and one iphimediid species and 17 published sequences of six species of Epimeriidae, nine of Iphimediidae and *Eusirus* cf. *perdentatus* (Eusiridae).

Morphological description. Specimens were examined and dissected using a Leica MZ9.5 stereomicroscope and drawn using a camera lucida attachment. Small appendages (mouthparts, uropods, telson) were temporarily mounted in lactic acid, examined and drawn using a Nikon compound microscope fitted with a camera lucida. The body lengths of specimens examined were measured by tracing individual's mid-trunk lengths (tip of the rostrum to end of telson) using a camera lucida.

All illustrations were drawn by using the digital inking illustration method described by Coleman (2003). Within the description, abbreviations are used for slender setae (SS) and robust setae (RS). Type material was deposited in the Natural History Museum Berlin, Germany, and the NIWA Marine Invertebrate Collection Wellington, New Zealand. We cross checked with the type material from *E. robusta*, held at the Natural History Museum London (BMNH 1930.8.1.303–309). Coloured photographs of *Epimeria robusta* and *E. robustoides* sp. n. were taken on board immediately after the specimen were caught.

DNA extraction and analysis. Genomic DNA was isolated from amphipod pereopods using the DNEasy tissue extraction kit (Qiagen Ltd) and quantified using the PicoGreen quantification kit (Molecular Probes, Invitrogen Ltd). The partial mitochondrial cytochrome oxidase subunit I (COI) gene was amplified using the universal primers described by Folmer et al. 1994 using PuReTaq Ready-To-Go™ PCR Beads (GE Healthcare), 0.2 μM of each primer and between 20–200 ng of genomic DNA. PCR reactions were carried out in a GeneAmp 2720 thermocycler (Applied Biosystems, Foster City, California, USA) using the following conditions: an initial hold at 95°C for 5 minutes and then 30 cycles of 95°C for 30 seconds; 45°C for 30 seconds; 72°C for 1.5 minutes; and a final extension at 72°C for 7 minutes. PCR products were purified using QIAquick Spin Columns (Qiagen Ltd) and quantified using the PicoGreen Kit (Molecular Probes, Invitrogen Ltd). Sequencing of the COI gene was carried out at Macrogen Ltd, Korea, using the amplification primers.

The proof-read sequences of the 31 specimens were aligned using ARB software (Ludwig et al. 2004) against COI sequences available in EMBL of seven *Epimeria* species, three *Echiniphimedia* species, three *Iphimediella* species, two *Gnathiphimedia* species and *Eusirus* cf. *perdentatus* Chevreux, 1912 (Table 1). The Iphimediidae and *Eusirus* cf. *perdentatus* were chosen as the outgroup taxa, since Lörz and Held (2004) showed them to be the sister taxa of the Epimeriidae.

Evolutionary distances were calculated from sequence pair dissimilarities using only unambiguously sequenced positions. The partial COI gene sequences determined in this study are deposited in the EMBL database and the accession number for each specimen is shown in Table 1. The amphipod specimens are registered and curated at the National Institute for Water and Atmospheric Research (NIWA) (Table 1).

Phylogenetic analysis. Sequences were analyzed using maximum parsimony (MP) and maximum likelihood (ML) criteria in PAUP*4.0b10 (Swofford 2002). MP analyses were implemented in PAUP* as heuristic search, tree bisection-reconnection (TBR), random addition sequence. All characters were unordered and

Table 1. EMBL accession numbers, NIWA registration numbers and station data of specimens analysed.

	Accession Number	NIWA Registration number	Expedition / Station	Latitude	Longitude W or E and in min and sec not all dec	Start Depth (m)	Finish Depth (m)	Region
Epimeriidae								
<i>Epimeria schiaparelli</i>	FM955284	18186	TAN0402/25	71°47'55" S	170°55'58" E	127	140	Ross Sea
<i>E. inermis</i>	FM955280	20164	TAN0402/ 94	71°31'48" S	170°06'40" E	220	191	Ross Sea
<i>E. inermis</i>	FM955281	20169	TAN0402/ 184c	71°30'20" S	171°36'25" E	480	491	Ross Sea
<i>E. inermis</i>	FM955282	20171	TAN0402/233	67°25'40" S	163°54'56" E	230	227	Balleny Islands
<i>E. inermis</i>	FM955292	20168	TAN0402/134	71°38'30" S	170°09'90" E	65	64	Ross Sea
<i>E. inermis</i>	FM955285	20162	TAN0402/33	71°45'17" S	171°25'10" E	282	278	Ross Sea
<i>E. robusta</i>	FM955279	20263	TAN0402/25	71°47'55" S	170°55'58" E	127	140	Ross Sea
<i>E. robusta</i>	FM955283	20273	TAN0402/150	71°58'46" S	171°58'5" E	480	461	Ross Sea
<i>E. robusta</i>	FM955286	20257	TAN0402/22	71°48'40" S	170°56'29" E	151	180	Ross Sea
<i>E. robusta</i>	FM955287	20266	TAN0402/105	71°15'27" S	170°38'50" E	470	458	Ross Sea
<i>E. robustoides</i>	FM955288	34934	ANT XXI/2 PS65-293	72°51'54" S	019°39'19" W	541	518	Weddell Sea
<i>E. robusta</i>	FM955289	20261	TAN0402/39	71°45'18" S	171°08'33" E	251	253	Ross Sea
<i>E. robusta</i>	FM955291	20258	TAN0402/25	71°47'55" S	170°55'58" E	127	140	Ross Sea
<i>E. robusta</i>	FM955290	20274	TAN0402/154	72°00'50" S	172°13'20" E	536	586	Ross Sea
<i>E. annabellae</i>	FM955293	34935	ANT XXI/2 PS 65-337	70°56'41" S	010°32'70" W	306		Weddell Sea
<i>Epimeria</i> new species 1	FM955295	34937	ANDEP III PS67-078-11	71°09'39" S	013°59'33" W	2157	2147	Weddell Sea
<i>E. horsti</i>	FM955296	34938	TAN0604-111 #1119	42°47'51" S	179°59'16" E	970	1040	New Zealand
<i>E. horsti</i>	FM955297	34939	TAN0604-106 #990	42°43'36" S	180°06'20" E	1030	1156	New Zealand
<i>E. bruuni</i>	FM955298	4088	TAN0413-200 #2708 (3A)	39°22'34" S	179°50'35" E	2526	2550	New Zealand
<i>E. rimicarinata</i>	FM955300	19639	TAN0402/105	71°15'27" S	170°38'50" E	470	458	Ross Sea
<i>E. rimicarinata</i>	FM955302	19645	TAN0402/108	71°16'19" S	170°35'59" E	400	405	Ross Sea
<i>E. rimicarinata</i>	FM955304	19644	TAN0402/108	71°16'19" S	170°35'59" E	400	405	Ross Sea
<i>E. rimicarinata</i>	FM955303	19634	TAN0402/22	71°48'40" S	170°56'29" E	151	180	Ross Sea
<i>E. georgiana</i>	FM955299	34940	ANT XXI/2 PS 65-232	71°18'37" S	013°56'70" W	910	899	Weddell Sea

	Accession Number	NIWA Registration number	Expedition / Station	Latitude	Longitude W or E and in min and sec not all dec	Start Depth (m)	Finish Depth (m)	Region
<i>E. georgiana</i>	FM955305	34941	ANT XXI/2 PS65-232	71°18'37" S	013°56'70" W	910	899	Weddell Sea
<i>E. puncticulata</i>	FM955301	34943	ANT XXI/2 PS65-121	70°50'50" S	010°35'32" W	268	274	Weddell Sea
<i>E. grandirostris</i>	FM955307	34945	ANT XXI/2 PS65-144	70°57'10" S	010°48'26" W	401	406	Weddell Sea
<i>E. walkeri</i>	FM955308	20255	TAN0402/63	72°19'18" S	170°28'43" E	303	293	Ross Sea
<i>E. walkeri</i>	FM955306	34946	ANT XXI/2 PS65-90	70°56'8" S	010°31'42" W	274	288	Weddell Sea
<i>E. macronyx</i>	FM955309	20254	TAN0402/76	72°8'16" S	172°41'25" E	496	501	Ross Sea
<i>E. georgiana</i>	AF451341	x	see Lörz and Held 2004	62°49'30" S	060°49'18" W	202		Antarctic Peninsula
<i>E. roopri</i>	AF451342	x	see Lörz and Held 2004	63°00'60" S	060°31'00" W	48		Antarctic Peninsula
<i>E. macrodonta</i>	AF451343	x	see Lörz and Held 2004	71°11'54" S	012°20'42" W	316		Weddell Sea
<i>E. robustoides</i>	AF451344	x	see Lörz and Held 2004	71°11'54" S	012°20'42" W	323		Weddell Sea
<i>E. rubricrues</i>	AF451345	x	see Lörz and Held 2004	71°16'40" S	013°45'47" W	648		Weddell Sea
<i>E. similis</i>	AF451346	x	see Lörz and Held 2004	71°16'40" S	013°45'47" W	648		Weddell Sea
<i>E. georgiana</i>	AY061802	x	see Väinölä et al. 2001	Weddell				Antarctic Peninsula
Iphimediidae								
<i>Echiniphimedia scotti</i>	FM955294	34936	TAN0602-442	66°45'22" S	163°03'37" E	1930	1940	Ross Sea
<i>Iphimediella rigida</i>	AF451347	x	see Lörz and Held 2004	71°11'54" S	012°20'42" W	323		Weddell Sea
<i>I. cyclogena</i>	AF451348	x	see Lörz and Held 2004	71°11'54" S	012°20'42" W	323		Weddell Sea
<i>I. georgei</i>	AF451349	x	see Lörz and Held 2004	71°11'54" S	012°20'42" W	316		Weddell Sea
<i>E. bodgsoni</i>	AF451350	x	see Lörz and Held 2004	71°11'54" S	012°20'42" W	323		Weddell Sea
<i>E. waageleti</i>	AF451351	x	see Lörz and Held 2004	70°50'24" S	010°35'12" W	266		Weddell Sea
<i>E. echinata</i>	AF451352	x	see Lörz and Held 2004	70°50'24" S	010°35'12" W	266		Weddell Sea
<i>Gnathiphimedia mandibularis</i>	AF451353	x	see Lörz and Held 2004	70°50'12" S	010°34'53" W	269		Weddell Sea
<i>G. sexdentata</i>	AF451354	x	see Lörz and Held 2004	71°12'11" S	012°19'10" W	318		Weddell Sea
Eusiridae								
<i>Eusirus cf. perdentatus</i>	AF451355	x	see Lörz and Held 2004	63°01'12" S	59°09'12" W	673		Antarctic Peninsula

analyses were conducted under equal weights. Topological robustness was assessed using 1000 bootstrap replicates (Felsenstein 1985) and parsimony jackknifing (Farris et al. 1996). Jackknife frequencies were calculated in PAUP* using 1000 pseudoreplicates under a heuristic search with 30% character deletion. The ML analysis used the HKY85 model. The ML analysis was conducted using the heuristic search option in PAUP* and starting branch lengths were obtained using Rogers-Swofford approximation method. Bootstrap values for the ML tree were obtained from 100 replicates.

Morphological descriptions. The taxonomic differentiation within and between genera of the Epimeriidae is often based on a few morphological characters (Coleman and Barnard 1991, Lörz and Brandt 2004). A key to the Antarctic species of Epimeriidae was published by Coleman (2007). The morphological characterisation in Epimeriidae is hindered by the high plasticity of characters depending on sex and age of the specimens (Lörz and Brandt 2004), therefore taxon specific characteristics can be misinterpreted as intraspecific variability. Genetic information, here COI mtDNA, is used as additional characters to clarify and validate the taxonomic classification (Figure 1).

Here we give a new diagnosis of the genus *Epimeria* after placing *Epimeriella* in synonymy, describe one species new to science, *Epimeria robustoides* sp. n. and re-describe *Epimeria robusta*.

Systematics

Order AMPHIPODA Latreille, 1816

Suborder GAMMARIDEA Latreille, 1802

Family EPIMERIIDAE Boeck, 1871

Genus *Epimeria* Costa, 1851 in Hope, 1851

?*Vertumnus* White, 1847: 89 [*nomen nudum*].

Epimeria Costa, 1851: 24 [*nomen nudum*].— Costa in Hope, 1851: 46. — Karaman and Barnard, 1979: 108.— Watling and Holman, 1980: 642.— Coleman, 2007: 31.

Pseudepimeria Chevreux, 1912: 9 (type species *Pseudepimeria grandirostris* Chevreux, 1912; original designation).

Subepimeria Bellan-Santini, 1972b: 225 (type species *Subepimeria geodesiae* Bellan-Santini, 1972; original designation).

Epimeriella.— Walker, 1906: 17.— Karaman and Barnard, 1979: 107.— Coleman 2007: 56 (type species *Epimeriella macronyx* Walker, 1906; by monotypy). syn. n.

Type species. *Epimeria tricristata* Costa, 1851 in Hope, 1851; by monotypy.

Remarks. The most recent family diagnoses for the Epimeriidae is that of Coleman (2007), Coleman and Barnard (1991), and Barnard and Karaman (1991).

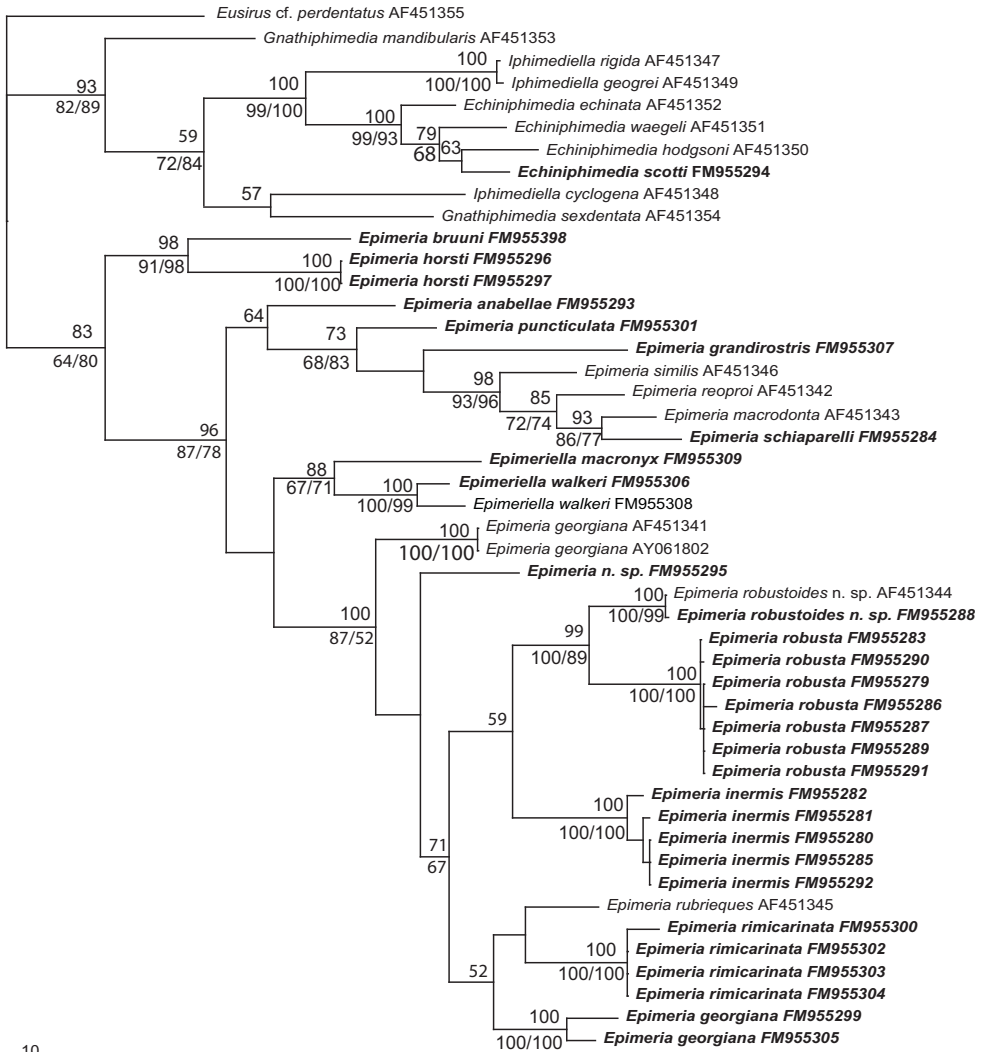


Figure 1. Consensus tree of maximum parsimony analysis (length 1599, CI 0.33, RI 0,6815). Branch support values are given: jackknife above, parsimony / likelihood bootstrap below branches. Sequences obtained in this study are marked in bold.

Based on the genetic data presented in the following and a detailed morphological evaluation of the weak morphological separation criteria between *Epimeriella* and *Epimeria* we herewith synonymize *Epimeriella* with *Epimeria*. Since we transfer the species *Epimeriella macronyx* Walker, 1906; *Epimeriella scabrosa* Barnard, 1930; *Epimeriella truncata* Andres, 1985; *Epimeriella victoria* (Hurley, 1957a) and *Epimeriella walkeri* Barnard, 1930 to the genus *Epimeria*, we herewith give a new genus diagnosis.

The diagnosis has been broadened from that given by Barnard and Karaman (1991) since it now included characters formerly predominantly occurring in the genus *Epimeriella* such as a smooth body and the laminar, none tritulative pars molaris.

Diagnosis. Body covered with teeth or processes or body poorly armed, almost smooth. Antenna 1 peduncular article 2 shorter than 1. Accessory flagellum present or absent. Mouthparts projecting quadrately. Upper lip incised or almost entire; epistome not very broad. Mandibular incisor ordinary, toothed, setal row present; molar blunt, strong, tritulative or simple, conical or laminar. Lower lip inner lobes absent, outer lobes relatively broad. Hypopharyngeal gap sometimes widened. Maxilla 1 palp 2-articulate, article 2 ordinary. Maxilla 2 inner plate without facial row of setae. Maxilliped inner plate narrower but as long as outer plate, latter elongate; palp article 2 narrow and unproduced; palp article 4 well developed, unguiform or serrate. Coxae 1–4 progressively longer; coxae 4–5 forming ventral arc; coxa 4 long, polycuspidate. Gnathopods alike, articles 5–6 elongate, subchelate (typical), sometimes simple. Telson incised or cleft.

After synonymising *Epimeriella* with *Epimeria*, the genus *Epimeria* now includes 46 species:

- Epimeria annabellae* Coleman, 1994;
- Epimeria bathyalis* Wakabara & Serejo, 1999;
- Epimeria bispinosa* Ledoyer, 1986;
- Epimeria bruuni* Barnard, 1961;
- Epimeria cora* Barnard, 1971;
- Epimeria concordia* Griffiths, 1977;
- Epimeria cornigera* (J.C. Fabricius, 1779);
- Epimeria extensa* Andres, 1985;
- Epimeria georgiana* Schellenberg, 1931;
- Epimeria glaucosa* Barnard, 1961;
- Epimeria grandirostris* (Chevreux, 1912);
- Epimeria heldi* Coleman CO (1998a);
- Epimeria horsti* Lörz, 2008;
- Epimeria inermis* Walker, 1903;
- Epimeria intermedia* Schellenberg, 1931;
- Epimeria longispinosa* Barnard, 1916;
- Epimeria loricata* G.O. Sars, 1879;
- Epimeria macrodonta* Walker, 1906;
- Epimeria macronyx* (Walker, 1906), comb. n.;
- Epimeria monodon* Stephensen, 1947;
- Epimeria obtusa* Watling, 1981;
- Epimeria oxycarinata* Coleman, 1990;
- Epimeria pacifica* Gurjanova, 1955;
- Epimeria parasitica* (M. Sars, 1858);

Epimeria pelagica Birstein & M. Vinogradov, 1958;
Epimeria pulchra Coleman, 1990;
Epimeria puncticulata Barnard, 1930;
Epimeria reoproii Lörz & Coleman, 2001;
Epimeria rimicarinata Watling & Holman, 1980;
Epimeria robusta Barnard, 1930;
Epimeria robustoides Lörz & Coleman, 2009, sp. n.;
Epimeria rotunda Wakabara & Serejo, 1999;
Epimeria rubrieques De Broyer & Klages, 1991;
Epimeria scabrosa (Barnard, 1930), comb. n.;
Epimeria schiaparelli Lörz, Maas, Linse & Fenwick 2007;
Epimeria semiarmata Barnard, 1916;
Epimeria similis Chevreux, 1912;
Epimeria subcarinata Nagata, 1963;
Epimeria tuberculata G.O. Sars, 1895;
Epimeria truncata Andres, 1985, comb. n.;
Epimeria ultraspinosa Wakabara & Serejo, 1999;
Epimeria vaderi Coleman CO (1998b);
Epimeria victoria (Hurley, 1957), comb. n.;
Epimeria walkeri (Barnard, 1930), comb. n.;
Epimeria yaquinae McCain, 1971.

***Epimeria robustoides* Lörz & Coleman, sp. n.**

urn:lsid:zoobank.org:act:96CEBCCA-C3EB-4219-AC2B-C6E81BD852D1

Figs 2–5

Epimeria robusta.— Barnard, 1958: 108; 1961: 103.— McCain, 1971: 161.— De Broyer and Klages, 1991: 164.— Coleman, 1994: 560.

Material examined. Holotype. Ovig. female 40 mm. 72°35.67'5S, 18°8.17'W, depth 604–656 m, collected during the *Polarstern* cruise ANT III 1985 by Agassiz-trawl, 27.I.1985, station 273.

Etymology. The species is named *robustoides* because of its morphological similarity to *Epimeria robusta*.

Diagnosis. Body (Fig. 2A, B) robust. Posterior margin of pereonites 5–6 with small medial protrusion, pereonite 7 with shallow keel, pereonite 7 and posterior margins of metasome segments 1–2 with an elevation (in lateral view). Metasome segments 1–3 with mid-dorsal keel, metasome segment 3 and urosomite 1 with pointed tooth. Urosomite 3 with shallow mid-dorsal keel. Coxa of pereopods 1–3 tapering distally, apically rounded (Figs 4A, B, E). Propodus of gnathopods 1–2 expanded distally, with well-developed palm. Coxa of pereopod 4 very large, with wide posteroventral angle projecting somewhat ventrally. Pereopod 5 (Fig. 5D) ba-

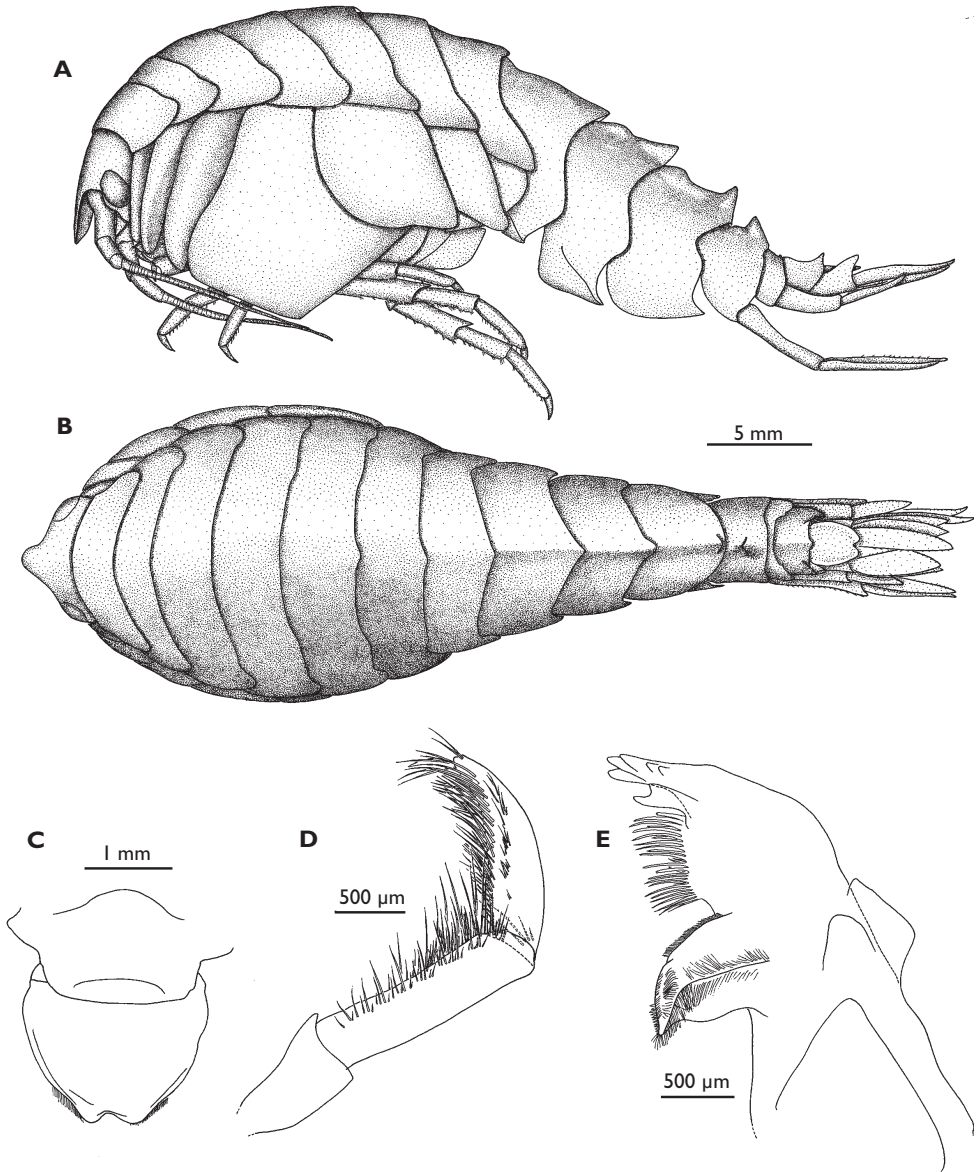


Figure 2. *Epimeria robustoides* sp. n., female, 40 mm. **A** Lateral habitus **B** dorsal habitus **C** labrum **D** mandibular palp **E** mandibular body.

sis with posteromarginal tooth, basis of pereopod 6 with similar tooth but larger, pereopod 7 basis (Fig. 5C) widened proximally, but without tooth, only posterodistal angle pointed.

Distribution. Weddell Sea, 604–656 m.

Description. Anterior cephalic margin sinuous, lateral cephalic lobe slightly produced; rostrum same length as head, reaching proximal part of antenna 1 peduncle

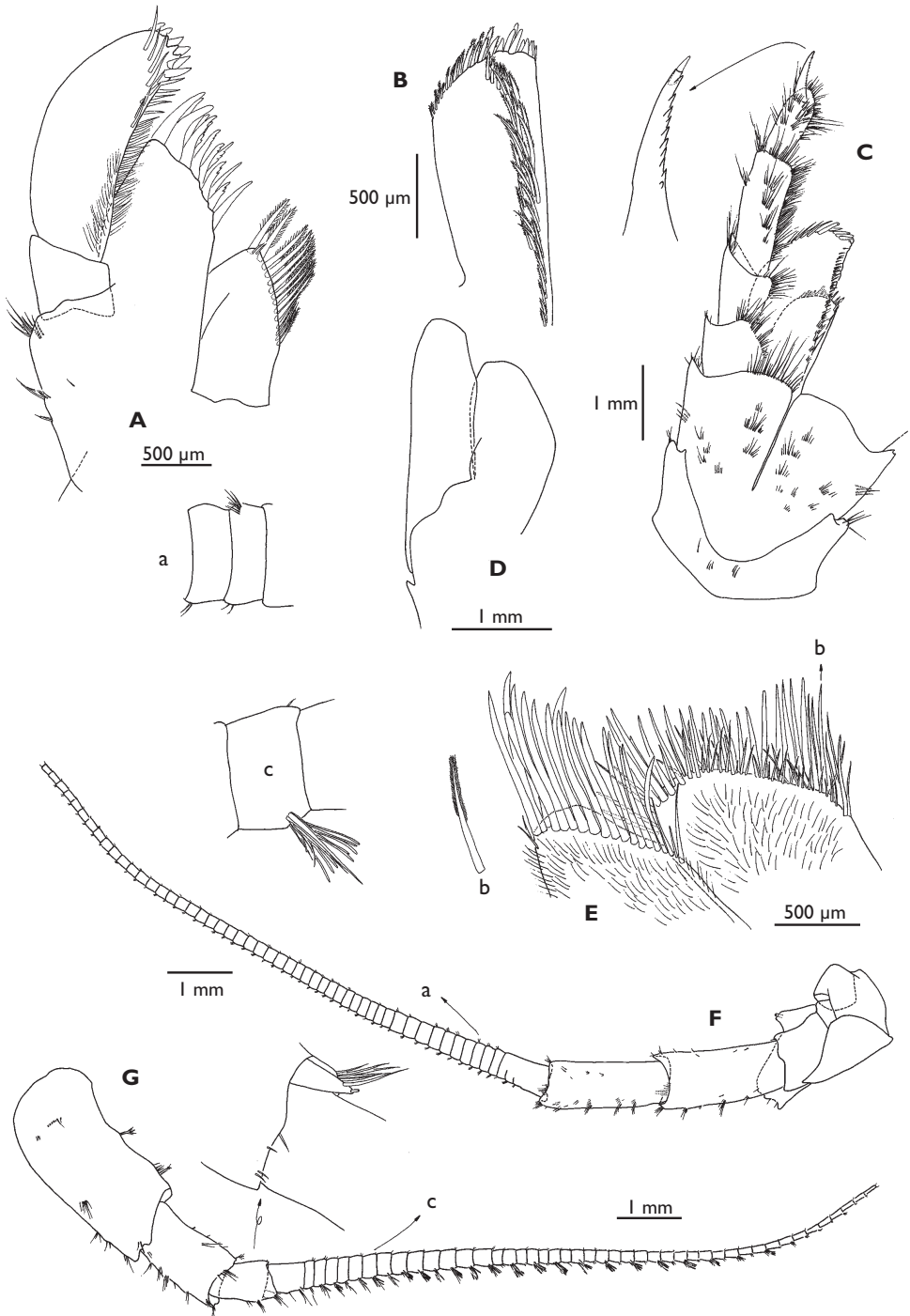


Figure 3. *Epimeria robustoides* sp. n., female, 40 mm. **A** Maxilla I **B** frontal face of inner maxillipedal endite **C** maxilliped, left palp and endites omitted **D** shape of maxilla 2 **E** details of maxilla 2 **F** antenna 2 **G** antenna 1.

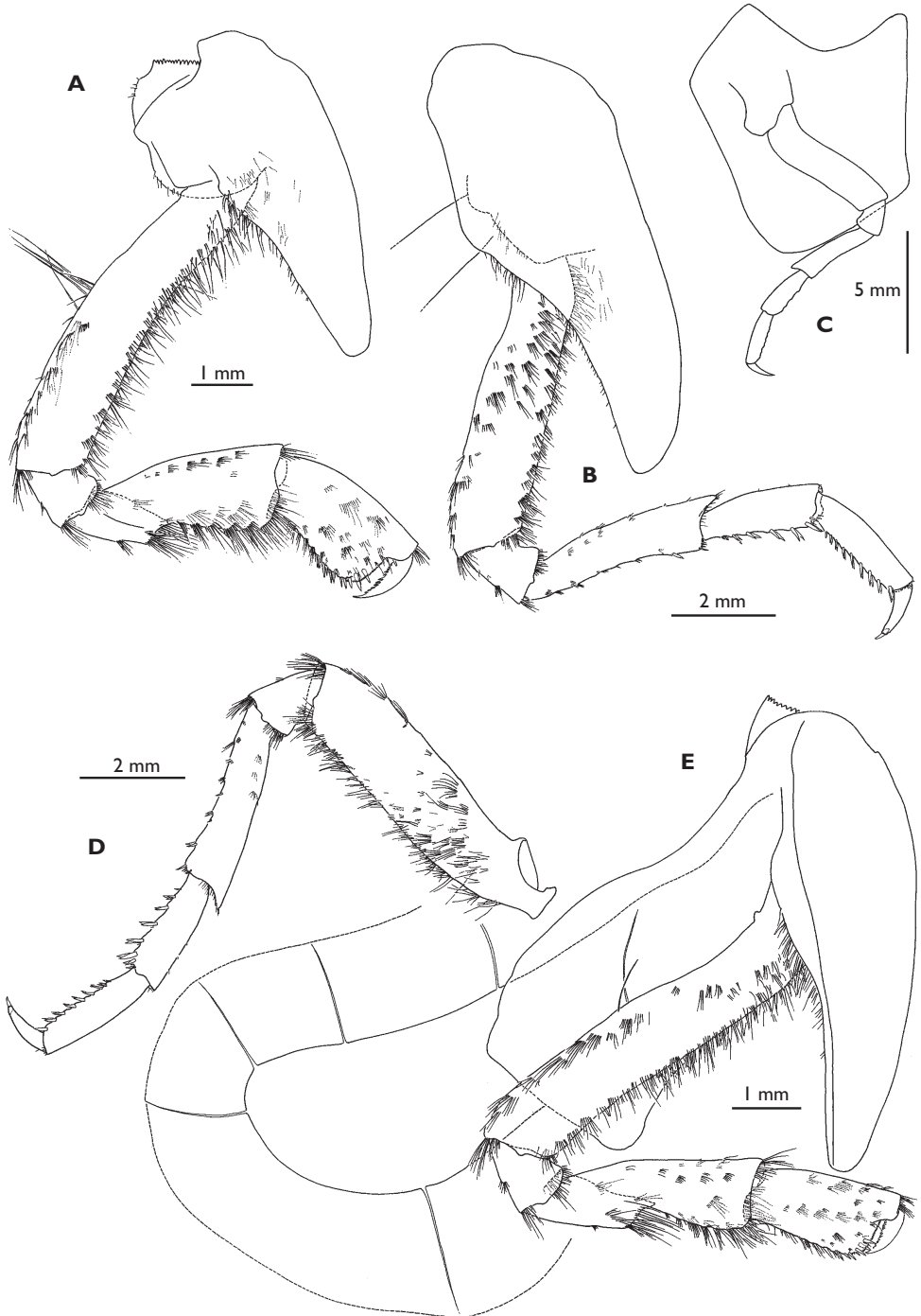


Figure 4. *Epimeria robustoides* sp. n, female, 40 mm. **A** Pereopod 1 **B** pereopod 3 **C** pereopod 4, medial face, setae omitted **D** pereopod 4, coxa dissected **E** pereopod 2, dotted line indicates length of oostegite setae, of which only some examples are given.

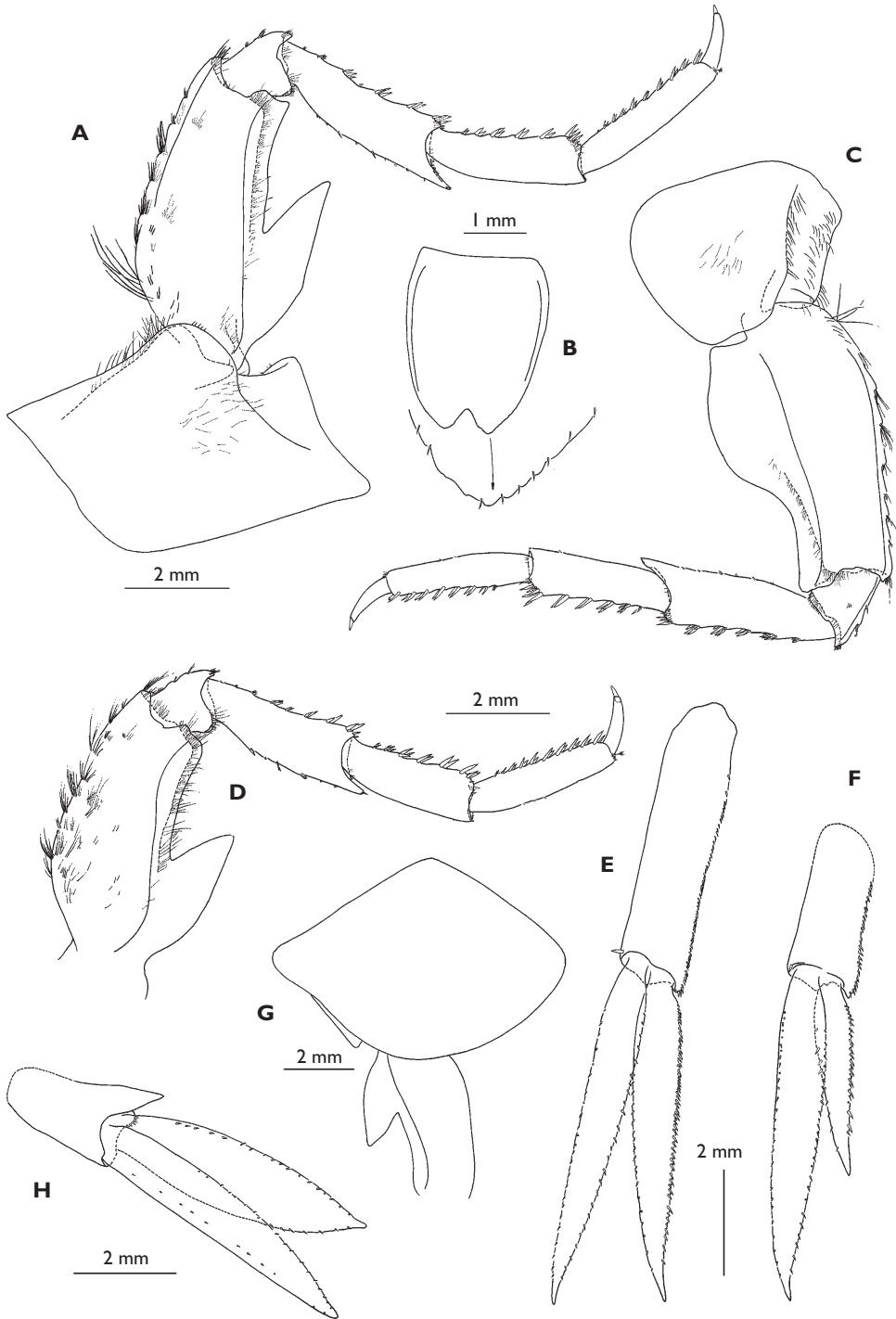


Figure 5. *Epimeria robustoides* sp. n. **A** Pereopod 6 **B** telson **C** pereopod 7 **D** pereopod 5, coxa dissected **E** uropod 1 **F** uropod 2 **G** coxa and part of basis of pereopod 5 **H** uropod 3.

article 1; eyes present, oval, $0.4 \times$ head height. Pereonite 1 subequal in length to head (excluding rostrum), pereonite 2 approx. $0.75 \times$ length of pereonite 1, pereonites 1 to 6 lacking mid-dorsal or dorsolateral processes; pereonite 7 posterior margin with dorso-lateral carina weakly developed; pleonites 1–3 with carinae, pereonite 3 and urosomite 1 with acute mid-dorsal process. Urosomite 2 shortest, lacking mid-dorsal process, urosomite 3 with pointed posterior process.

Epimeron. 1 antero- and posteroventral angle rounded; epimeron 2 and 3 posteroventral angle produced.

Antenna. 1 peduncle article 1 with 2 small processes; article 2 with no process, shorter than article 1; article 3 shortest; accessory flagellum scale-like; primary flagellum of 45 articles. Antenna 2 articles 1–5 lacking distal processes, flagellum with 53 articles.

Mandible. Incisor and lacinia mobilis strongly dentate; molar produced and triturative; palp article 3 densely setose medially, with long stout SS distally. Maxilla 1 medial plate subtriangular, obliquely convex inner margin with 11 stout, plumose SS; lateral plate distal margin oblique, with medially lobate RS; palp strongly exceeding outer plate; palp article 1 short, article 2 slightly curved medially with stout SS distomedially, stout RS distally. Maxilla 2 with long, distally crenulate setae distally on lateral and medial plates. Maxilliped lateral plate broadly rounded distally, medial plate with nodular RS and a row of long plumose SS on medial, anterior face; palp medial margin strongly setose; merus distally slightly expanded; dactyl with serrate medial margin.

Pereopods. Gnathopod 1: coxa 1 long and slender, basis linear, slender, posterior margin with numerous fine SS; merus slightly longer than ischium, anterior margin very short, distal margin oblique, posterodistal angle acute, setose; carpus linear, distal half of posterior margin with long SS; propodus slightly expanded distally, anterior margin naked except for distal fringe of short SS, palm finely crenulate, slightly oblique, with cluster of RS defining rounded distal margin, posterior margin with numerous long SS; dactylus slender, slightly curved, posterior margin strongly serrate. Gnathopod 2: coxa 2 wider than coxa 1, basis linear, ischium anterior margin very short, distal margin obliquely articulating with carpus, carpus linear, anterior margin naked except for transverse row of SS distally, posterior margin with numerous stout SS distally; propodus linear, palm almost transverse, rounded, finely crenulated, lined with numerous submarginal RS; dactylus large, not exceeding palm, posterior margin serrate. Pereopod 3: coxa similar to coxa 2, basis linear, anterior and posterior margin finely setulose; merus slightly expanded distally; carpus shorter than merus, anterior margin naked, posterior margin with 6 pairs of RS; propodus naked anteriorly, posterior margin with 9 pairs of RS; dactylus stout, curved. Pereopod 4: coxa much larger than 3, wide posteroventral angle projecting somewhat ventrally; basis to dactylus as for pereopod 3. Pereopod 5: coxa rectangular; basis bearing posteromarginal tooth; merus drawn out posterodistally; carpus slightly widened distally, posterior margin with 7 pairs of RS; propodus linear, posterior margin with 10 pairs of RS; dactylus curved, stout,

approx. $0.3 \times$ propodus length. Pereopod 6: coxa anterior half hidden by coxa 5, anterior margin weakly concave, posterior margin slightly drawn out; basis postero-marginal tooth larger than in pereopod 5; merus drawn out posterodistally, ischium to dactylus as in pereopod 5. Pereopod 7: coxa subrectangular; basis widened distally, but without tooth, only posterodistal angle pointed; ischium to dactylus as in pereopods 5 and 6.

Urosome and telson. Uropod 1: peduncle subequal in length to inner ramus, medial margin with 1 RS distally, distal margin with close row of short RS; inner ramus lateral margin with spaced row of short RS, medial margin with sparse RS; outer ramus marginally shorter than inner. Uropod 2: peduncle with row of short setae; inner ramus nearly twice the length outer ramus, both margins sparse lined with RS; outer ramus, both margins with few short RS. Uropod 3: peduncle short, approx. $0.3 \times$ length of inner ramus, medial and inner margins of both rami with sparse row of short RS. Telson slightly longer than wide, u-shaped emargination $0.2 \times$ lengths, lobes triangular, broadly rounded apically.

Coloration. Freshly captured specimen (s) of *Epimeria robustoides* show distinct red eyes (Fig. 10 A) and some bear orange patches on their bodies.

***Epimeria robusta* Barnard, 1930**

Figs 6–9

Epimeria robusta Barnard 1930: 375, 449, figs 40a, 41.

Figured individual: NIWA 20257, TAN0402/22, 71.8010°S, 170.9413°E, 151–180m, 09 02 2004 female, 37 mm.

Additional material examined. The following *Epimeria robusta* specimen were collected during “The International Polar Year” expedition TAN0802: NIWA 36856, NIWA 36618, st 100, 76°12.13’S, 176°14.86’E, 447 m; NIWA 37110, NIWA 37148, st 117, 72 35.41 S, 175 20.53 E, 475 m; NIWA 37209, st 115, 72 35.10 S, 175 18.49 E, 447 m; NIWA 37613, st 157, 72 01.41 S, 173 10.81 E, 814 m. Following *Epimeria robusta* specimen were collected during the BioRoss expedition TAN0402: NIWA 20258, NIWA 20259, NIWA 20263, st 25, 71 47.92 S, 170 55.96 E, 140 m; NIWA 202760, NIWA 20261, st 39, 71 45.30 S, 171 08.55 E, 251 m; NIWA 20262, st 48, 72 19.00 S, 170 21.73 E, 132 m; NIWA 20264, NIWA 20265, NIWA 20267, st 105, 71 15.45 S, 170 38.08 E 470 m; NIWA 202668, st 124, 71 18.58 S, 170 28.63 E, 212 m; NIWA 20269, st 126, 71 18.55 S, 170 27.01 E, 161 m; NIWA 20270, st 130, 71 19.80 S, 170 27.55 E, 120 m; NIWA 20271, st 140, 72 00.81 S, 170 46.47 E, 231 m; NIWA 20272, st 149, 71 58.87 S, 171 57.99 E, 456 m; NIWA 20273, st 150, 71 58.77 S, 171 58.09 E, 480 m; NIWA 20274, st 153, 72 00.51 S, 172 13.36 E, 540 m; NIWA 20275, NIWA 20276, st 154, 72 00.07 S, 172 13.33 E, 586 m; NIWA 20277, st 157, 71 59.11 S, 172 10.71 E, 737 m; NIWA 20278, st 190, 71 34.75 S, 170 52.36 E, 230 m.

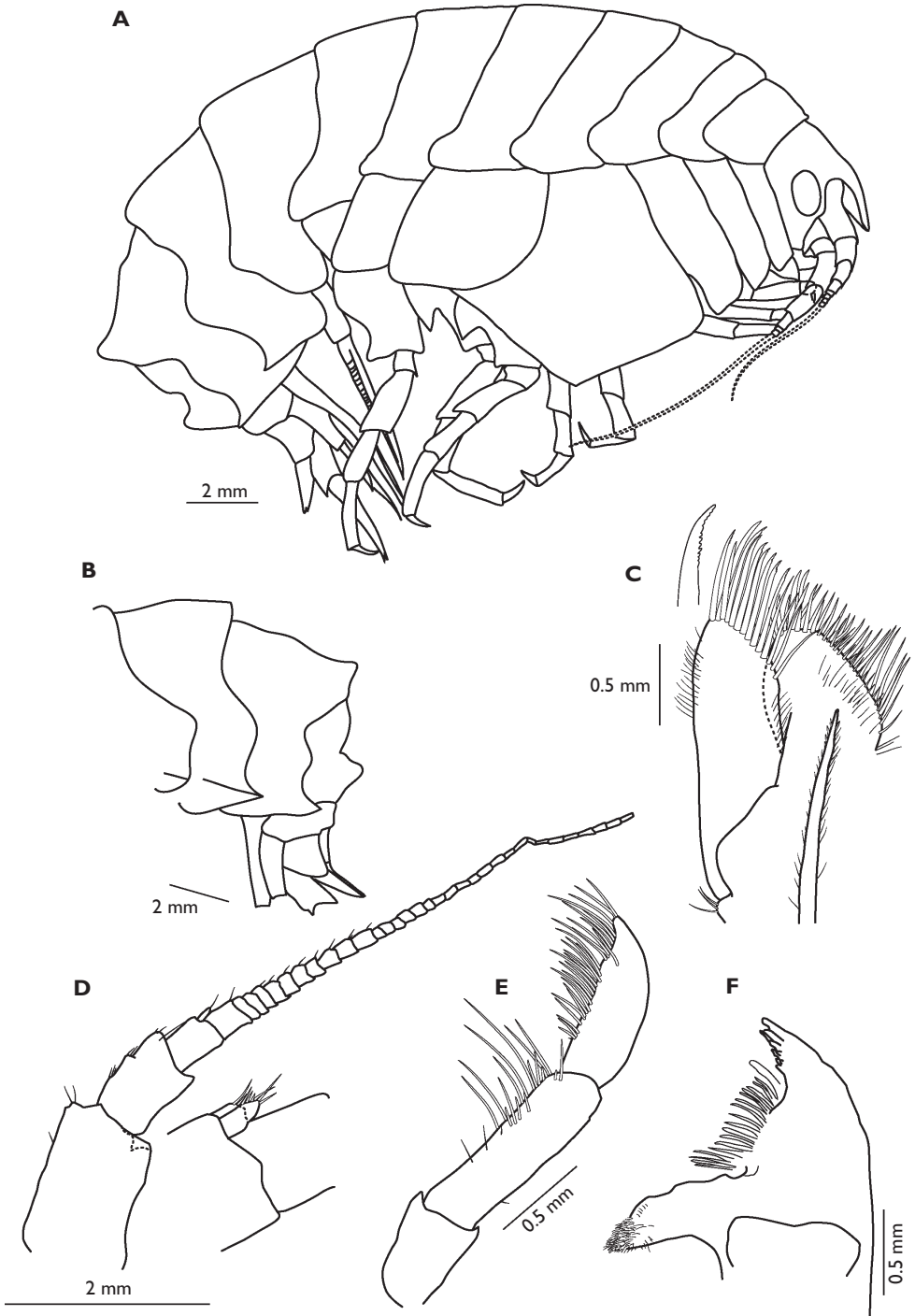


Figure 6. *Epimeria robusta*, NIWA 20257, female, 37 mm. **A** Lateral habitus **B** metasome and urosome **C** maxilla 2 **D** antenna 1 **E** mandibular palp **F** mandibular body.

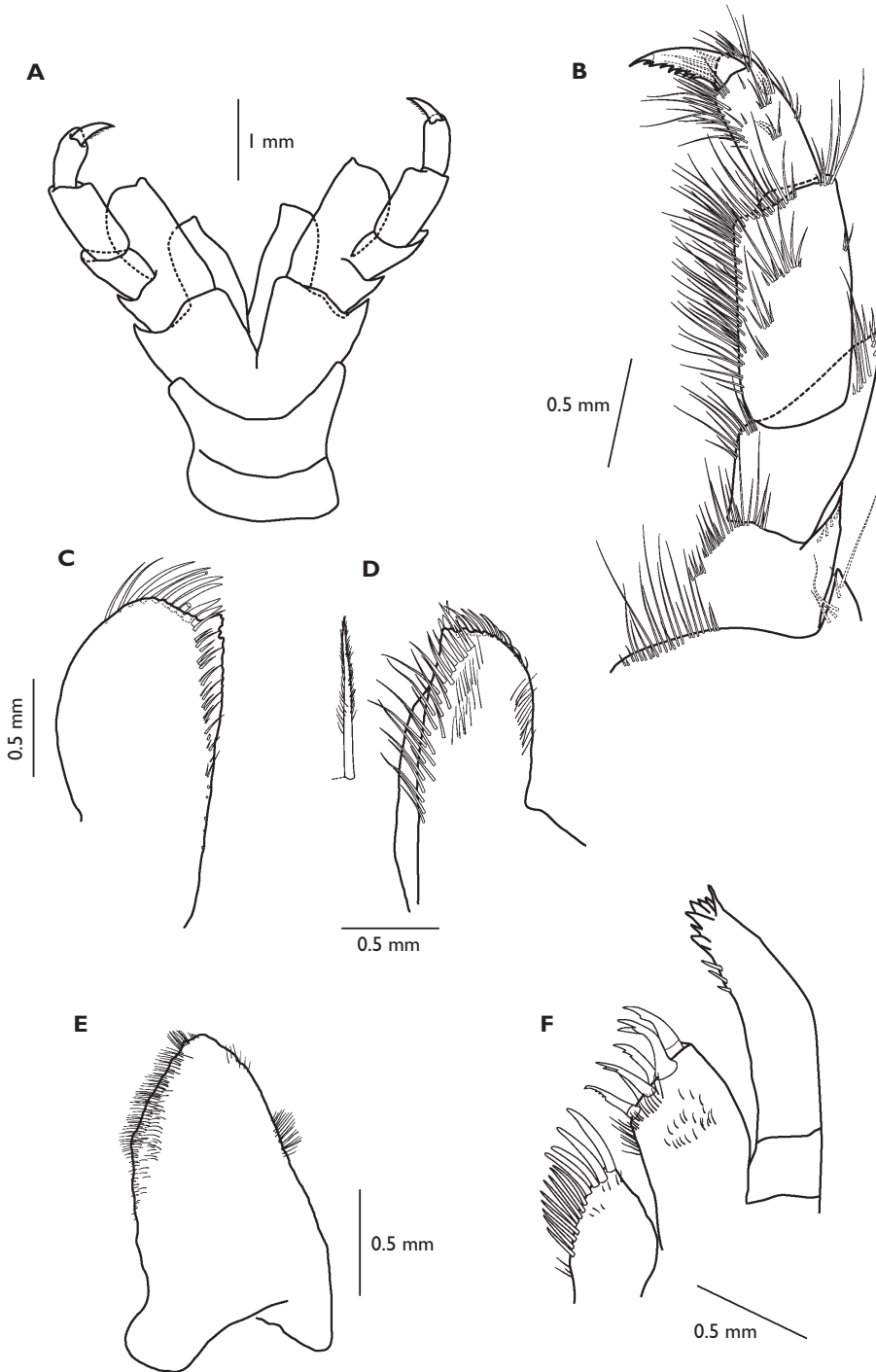


Figure 7. *Epimeria robusta*, NIWA 20257, female, 37 mm. **A** Maxilliped **B** maxillipedal palp **C** frontal face of inner maxillipedal endite **D** frontal face of outer maxillipedal endite **E** labrum **F** maxilla 1.

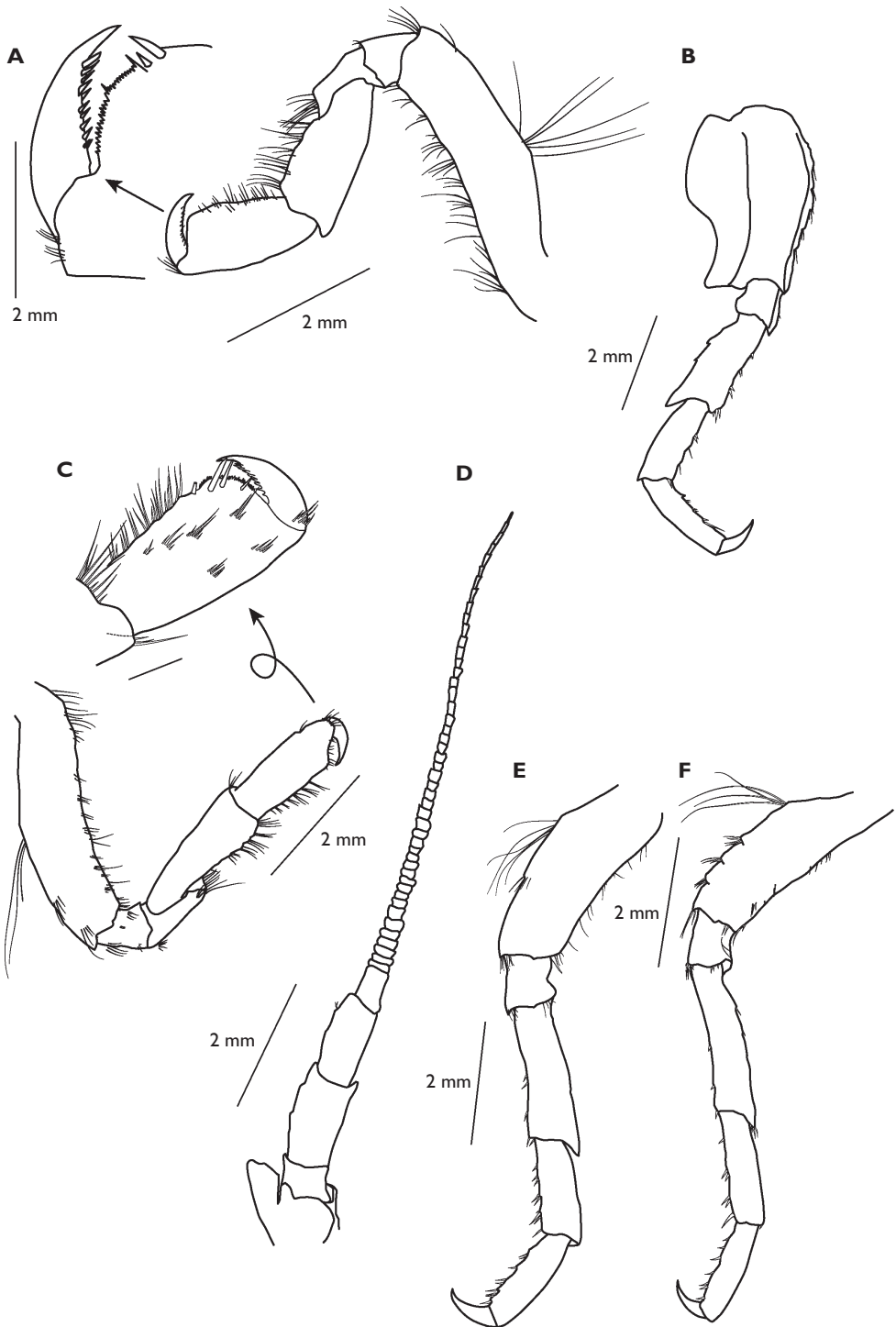


Figure 8. *Epimeria robusta*, NIWA 20257, female, 37 mm. **A** Gnathopod 1 **B** pereopod 7 **C** gnathopod 2 **D** antenna 2 **E** pereopod 4 **F** pereopod 3.

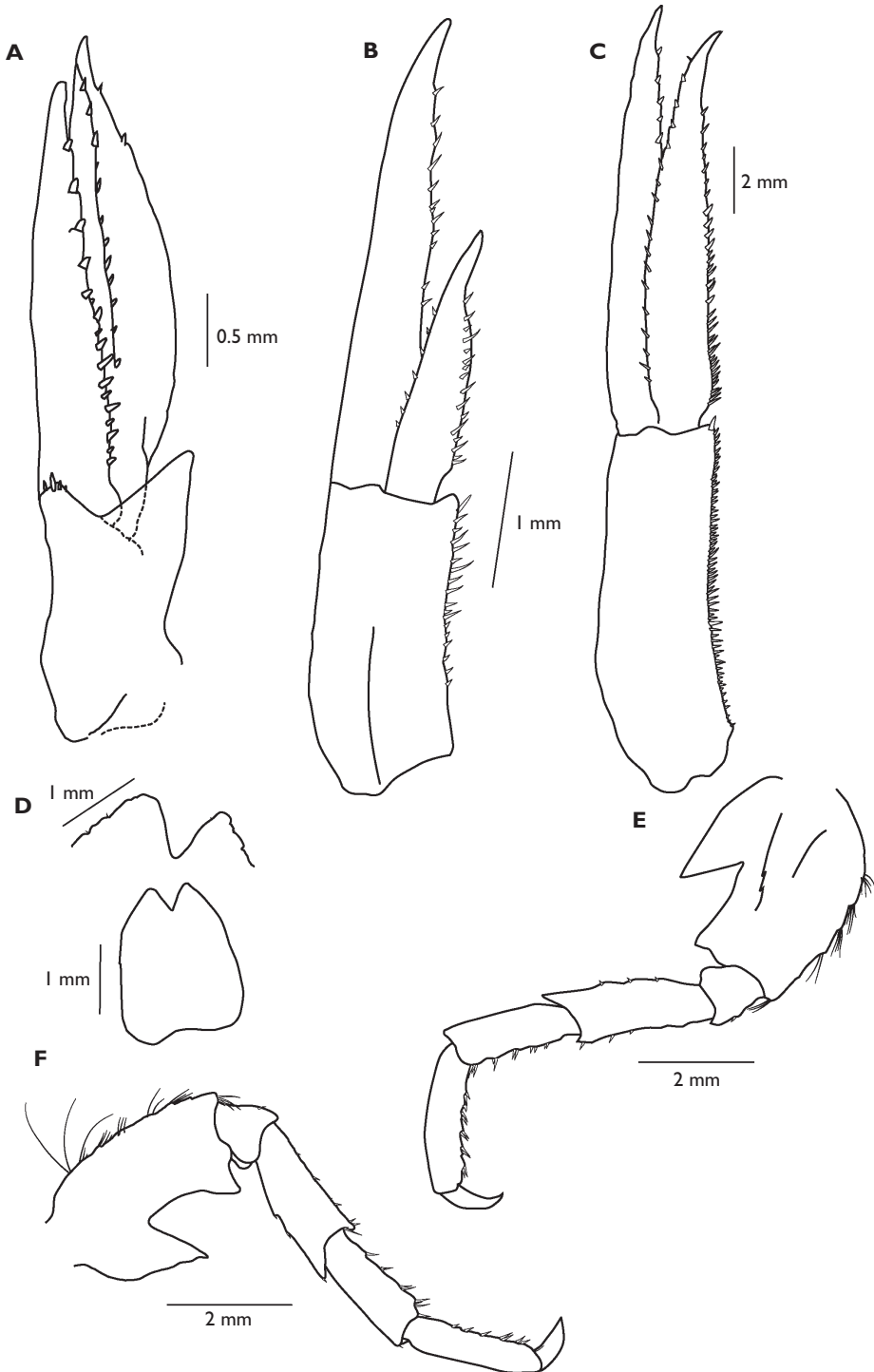


Figure 9. *Epimeria robusta*, NIWA 20257, female, 37 mm. **A** Uropod 1 **B** uropod 2 **C** uropod 3 **D** telson **E** pereopod 6 **F** pereopod 7.

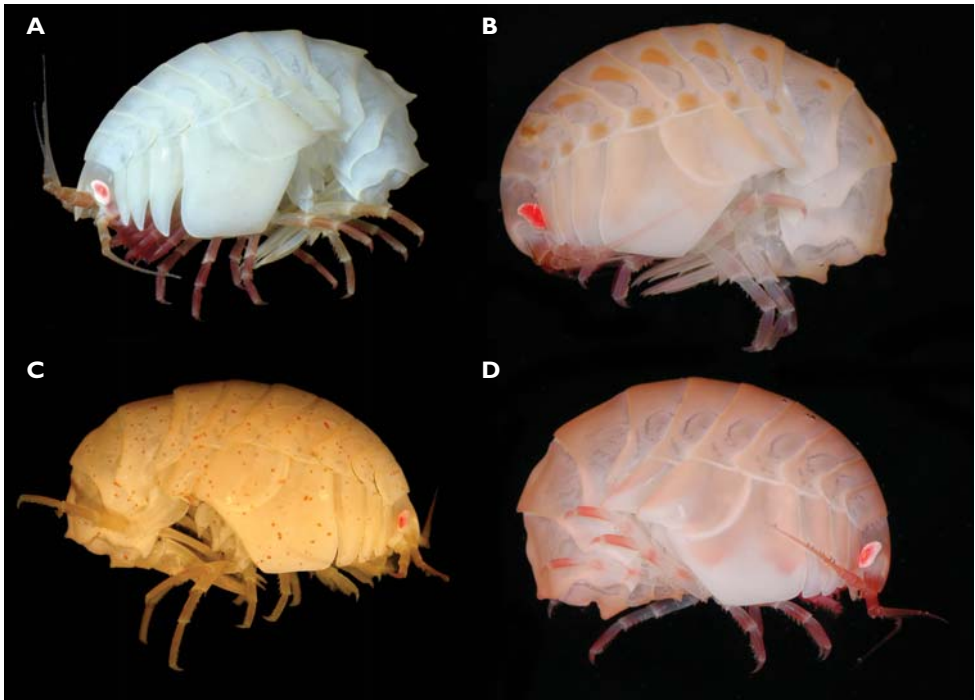


Figure 10. **A** *Epimeria robustoides* sp. n. Weddell Sea, photographed by Dr. Martin Rauschert on RV *Polarstern* **B-D** colour variations of *Epimeria robusta* from the Ross Sea pictured by Dr. Stefano Schiaparelli on RV *Tangaroa* **B** NIWA 37110, TAN0802/117 **C** NIWA 20270 TAN0402/130 **D** NIWA 37109, TAN0802/117.

Description. Anterior cephalic margin sinuous, lateral cephalic lobe slightly produced; rostrum same length as head, reaching proximal part of antenna 1 peduncle article 1; eyes present, oval, $0.4 \times$ head height. Pereonite 1 subequal in length to head (excluding rostrum), pereonite 2 approx. $0.75 \times$ length of 1, pereonites 1 to 6 lacking mid-dorsal or dorsolateral processes; pereonite 7 posterior margin with dorsolateral carina weakly developed; pleonite 1 shallow keel, post margin not drawn out straight, pleonite 2 with shallow keel, pleonite 3 with carinae. Urosomite 2 shortest, lacking mid-dorsal process, urosomite 3 with pointed posterior process.

Epimeron 1 antero- and posteroventral angle rounded; epimeron 2 and 3 posteroventral angle produced.

Antenna 1 peduncle article 1 with 2 small processes; article 2 with no process, shorter than article 1; article 3 shortest; accessory flagellum scale-like; primary flagellum of 45 articles. Antenna 2 articles 1–5 lacking distal processes, flagellum with 53 articles.

Mandible Incisor and lacinia mobilis strongly dentate; molar produced and tritritative; palp article 3 densely setose medially, with long stout SS distally. Maxilla 1

medial plate subtriangular, obliquely convex inner margin with 11 stout, plumose SS; lateral plate distal margin oblique, with medially lobate RS; palp strongly exceeding outer plate; palp article 1 short, article 2 slightly curved medially with stout SS distomedially, stout RS distally. Maxilla 2 with long, distally crenulate setae distally on lateral and medial plates. Maxilliped lateral plate broadly rounded distally, medial plate with nodular RS and a row of long plumose SS on medial, anterior face; palp medial margin strongly setose; merus distally slightly expanded; dactyl with serrate medial margin.

Pereopods. Gnathopod 1: coxa 1 long and slender, basis linear, slender, posterior margin with numerous fine SS; merus slightly longer than ischium, anterior margin very short, distal margin oblique, posterodistal angle acute, setose; carpus linear, distal half of posterior margin with long SS; propodus slightly expanded distally, anterior margin naked except for distal fringe of short SS, palm finely crenulate, slightly oblique, with cluster of RS defining rounded distal margin, posterior margin with numerous long SS; dactylus slender, slightly curved, posterior margin strongly serrate. Gnathopod 2: coxa 2 wider than coxa 1, basis linear, ischium anterior margin very short, distal margin obliquely articulating with carpus, carpus linear, anterior margin naked except for transverse row of SS distally, posterior margin with numerous stout SS distally; propodus linear, palm almost transverse, rounded, finely crenulated, lined with numerous submarginal RS; dactylus large, not exceeding palm, posterior margin serrate. Pereopod 3: coxa anteroventrally obliquely truncate, basis linear, anterior and posterior margin finely setulose; merus slightly expanded distally; carpus shorter than merus, anterior margin naked, posterior margin with 6 pairs of RS; propodus naked anteriorly, posterior margin with 9 pairs of RS; dactylus stout, curved. Pereopod 4: coxa much larger than 3, wide posteroventral angle projecting somewhat ventrally; basis to dactylus as for pereopod 3. Pereopod 5: coxa posteroventrally subacute, pointed; basis bearing posteromarginal tooth; merus drawn out posterodistally; carpus slightly widened distally, posterior margin with 7 pairs of RS; propodus linear, posterior margin with 10 pairs of RS; dactylus curved, stout, approx. $0.3 \times$ propodus length. Pereopod 6: coxa posteroventrally subacute, pointed, anterior half hidden by coxa 5, anterior margin weakly concave, posterior margin slightly drawn out; basis posteromarginal tooth larger than in pereopod 5; merus drawn out posterodistally, ischium to dactylus as in pereopod 5. Pereopod 7: coxa subrectangular; basis widened distally, but without tooth, posterodistally and posteroventrally pointed; ischium to dactylus as in pereopods 5 and 6.

Urosome and telson. Uropod 1: peduncle subequal in length to inner ramus, medial margin with 1 RS distally, distal margin with close row of short RS; inner ramus lateral margin with spaced row of short RS, medial margin with sparse RS; outer ramus marginally shorter than inner. Uropod 2: peduncle with row of short setae; inner ramus nearly twice the length outer ramus, both margins sparse lined with RS; outer ramus, both margins with few short RS. Uropod 3: peduncle short, approx. $0.3 \times$ length of inner ramus, medial and inner margins of both rami with sparse row of short RS. Telson slightly longer than wide, u-shaped emargination $0.2 \times$ lengths, lobes triangular, broadly rounded apically.

Remarks

Coleman (1994) based a detailed redescription of *E. robusta* on material from the Weddell Sea, while the type material of *Epimeria robusta* is from the Ross Sea. He found minute morphological differences between material of the opposing Antarctic shelves but interpreted them as intraspecific variation (Coleman 1994). Results of the phylogenetic analysis (see below) showed an *Epimeria robusta* species-complex comprising of a species each in the Weddell Sea and the Ross Sea.

The new species, *Epimeria robustoides* sp. n. from the Weddell Sea (Figs 2–5; Fig. 10a) is morphologically very similar to *Epimeria robusta* Ross Sea (Figs 6–9, Fig. 10b–d). There is morphological variation amongst the *E. robusta* specimens from the Ross Sea: 1) in the relative length of pereonite 3 bearing a shallow mid dorsal keel and 2) coxae 2 and 3 are more acute in some specimen, not as obliquely truncate as in the pictured specimen. The morphological differences between *Epimeria robusta* and *E. robustoides* are summarized in the following:

	<i>Epimeria robusta</i>	<i>E. robustoides</i> sp. n.
posteroventral corner of coxa 5 and 6	subacute/ pointed	more rounded
coxa 3 anteroventrally	obliquely truncate	tapering
epimeral plate 2 dorsally	shallow keel	pointed posterior process
pereopod 7 basis posteroventrally	pointed process	angular corner
urosomite 3	smooth	bearing process
pleonite 1	shallow keel posterior margin not drawn out straight	posterior part of dorsal keel elevated and drawn out straight

Coleman (1994, 2007) pointed out some morphological variation between the type specimen from the Ross Sea and a redescription of material from the Weddell Sea and Elephant Island. We studied more than 30 *E. robusta* specimens from the Ross Sea and all agree with the type description (contrasting the Weddell Sea specimen): having a keel pleonite only well developed on segment 3, the posterior margin of pleonite 1 is drawn into a tooth and short teeth occur only on pleonite 3 and urosomite 1.

The main difference to the Coleman (1994) description is that our animal has a rostrum reaching the end of the second article of antenna 1, whereas Coleman's redescription shows a rostrum just reaching the end of the first article of antenna 1. The morphological variation of *Epimeria* species, including the high variability of rostrum length of *E. robusta* related to size has been studied in detail by Lörz (2003).

Our current genetic analysis shows that *Epimeria georgiana* contains at least two species (see below). *Epimeria georgiana* is very similar to *E. rimicarinata* and *E. inermis*. *Epimeria georgiana* has the lateral face of coxa 4 sculptured, posterodistal and apical margins concave, the distal margin of coxa 4 is not curved around the ventral body

side; and bases 5–7 notched posteromarginally, whereas in *E. inermis* coxa 4 is smooth, shield-like curved, with a somewhat convex ventral margin and a straight posterodistal margin, slightly curved under the ventral body side. Bases 5–7 are excavate, but not notched. *E. rimicarinata* has similarly shaped coxae as *E. georgiana*, however, the dorsal carinae are bilobed from lateral view, there are additional dorsolateral teeth on pereonites 5–7 and rounded humps on pleonites 1–3; basis 5 is not notched, basis 6 with a posteromarginal tooth, but this is directing posteriorly and not ventrally as in *E. georgiana*. We assume that specimen(s) that key out to *E. georgiana* belong to a species complex containing more than the two species shown by the present genetic separation. We are currently collating material of the different morphotypes of *E. georgiana* at the moment, but presently have too little material to discriminate sufficiently what minor morphological differences are non-variable features. Potentially, specimen from South Georgia, Bransfield Strait, Palmer Archipelago, South Shetland Islands and the eastern Weddell Sea shelf may be distinct species.

Phylogenetic analysis

Partial COI mtDNA sequences for 31 amphipod specimens were generated to examine the intraspecific and phylogenetic relationships in Southern Hemisphere Epimeriidae (EMBL Assession numbers FM955279-FM955309, Table 1). In addition 17 sequences of Antarctic Epimeriidae, Iphimediidae and *Eusirus* cf. *perdentatus* were downloaded from EMBL, the latter two taxa as outgroup sequences (Table 1).

COI analysis

In the final analysis dataset comprised 47 sequences of 28 species. The total length of the partial COI mtDNA sequence was 496 characters of which 274 were variable and 222 were parsimony informative. The mean nucleotide composition is A=0.27604, C=0.24216, G=0.16383, T=0.31794. The amino acid translation with invertebrate mitochondrial code revealed no stop codons. A heuristic search found three most parsimonious trees when transitions and transversions are weighted equally (length 1599, CI 0.3333, RI 0.6815). The consensus maximum parsimony tree is shown in Fig. 1. The HKY85 maximum likelihood tree (data not shown) was similar in its topology except for changes in the position of clades while the species composition within the clades was retained. The bootstrap values performed for the Maximum Likelihood analysis are given after the bootstrap values performed for the Maximum Parsimony analysis.

The tree inferred from maximum parsimony analysis was rooted with *Eusirus* cf. *perdentatus* (Fig. 1). The Iphimediidae (jk=93, bs=82/89) and Epimeriidae (jk=83, bs=64/80) formed well-supported monophyletic clades. Within the Iphimediidae two of the three analysed genera, *Gnathiphimedia* and *Iphimediella*, showed para-

phyly, while only *Echiniphimedia* appeared to be monophyletic. Within the Epimeriidae the two species from the New Zealand seamounts (*E. bruuni* and *E. horsti*) formed a supported sister group (jk=98, bs=91/98) to the Southern Ocean species group (jk=96, bs=87/78). The latter group split into two clades of lower support, one containing seven species from the shelves of the Weddell and Ross Seas, the other comprising nine nominal species from the shelves and slopes of the Antarctic Peninsula, Weddell Sea and Ross Sea. The two species identified as *Epimeriella* before, *E. macronyx* and *E. walkeri*, form a well-supported group (jk=88, bs=67/71). The specimens examined from *Epimeria georgiana* showed paraphyly, forming two groups. One group consisted of the two specimens from the Antarctic Peninsula (AF452341 and AY061802), the other of two specimens from the Weddell Sea (FM955299, FM955305). *Epimeria robustoides* and *E. robusta* form a well-supported sister group to *E. inermis*. Within the well-supported species *Epimeria robusta* (jk=100, bs=100/100) four haplotypes were identified. Three haplotypes were found in *E. inermis* from the Ross Sea area, where the specimen from the Balleny Islands (FM955282) formed a sister lineage to the Victoria Land specimens.

Pairwise sequence divergences between and within the genera and species of the Epimeriidae and Iphimediidae were highly variable (Table 2, 3).

Intergeneric distances

The maximum uncorrected distances between epimeriid and iphimediid genera varied from 23.99 to 35.2% (Table 2). Within the genera of the Iphimediidae uncorrected COI distances varied from 21 to 31.1%. As the Epimeriidae were represented by only one genus, no intergeneric distances could be analysed.

Interspecific distances

Interspecific uncorrected COI sequence distances in the Iphimediidae varied from 7.9% (*Echiniphimedia scotti* to *E. hodgsoni*) to 29.5% (*Iphimediella cyclogena* to *I. georgei*)

Echiniphimedia scotti collected from the Ross Sea has a genetic distance of 7.9–8.5 to the *Echiniphimedia* species *E. waegeli*, *E. hodgsoni* and *E. echinata* from the Weddell Sea. The Weddell Sea species have interspecific distances of 9.9–10.5% amongst each other.

Within the Epimeriidae sequences distances varied from 8.5% (*E. schiaparelli* to *E. macrodonta*) to 26.15% (*E. horsti* to *E. annabellae*) (Table 2). The species from New Zealand's seamounts, *Epimeria horsti* and *E. bruuni* had more similar genetic sequences to each other than to any of the Antarctic *Epimeria* species, but the distance between them was high with nearly 20%. *Epimeria walkeri* and *E. macronyx* showed an interspecific distance of 15.7–17.1%. The new deep-water species, *Epimeria new species 1*, from 2157 m in the eastern Weddell Sea (Table 1) was

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27		
<i>E. rubriques</i> AF451345	20.6	24.8	11.7	15.1	24.8	24.6	17.7	18.4	19.6	14.1	19.8	21.2	11.1	16.3	12.7														
<i>E. schiaparelli</i> FM955284	20.0	25.4	21.2	24.0	22.8	26.6	22.2	8.5	23.2	22.8	15.1	11.5	21.8	22.0	20.4	20.0													
<i>E. similis</i> AF451346	20.6	25.8	21.2	23.0	21.2	27.0	23.0	12.7	20.8	22.0	14.7	11.7	23.4	22.4	20.0	21.0	13.3												
<i>E. walkei</i> FM955308	18.2	24.0	19.0	18.6	23.0	24.0	20.8	20.6	17.0	18.6	18.4	19.8	21.0	22.0	19.8	18.8	21.2	19.8											
<i>Echinopimmedia</i> <i>echinata</i> AF451352	30.9	30.9	30.1	32.9	30.5	30.3	33.9	30.5	30.9	31.7	29.7	30.9	29.9	32.9	31.9	31.5	31.7	30.3	29.1										
<i>E. boedsoni</i> AF451350	30.5	30.5	32.3	33.7	30.5	30.3	33.5	31.5	31.5	32.5	31.5	31.1	31.9	33.1	30.9	33.5	30.5	30.9	28.7	10.1									
<i>E. scotti</i> FM955294	29.7	30.5	29.9	31.7	29.9	30.1	33.1	30.9	31.1	31.3	30.5	30.1	29.9	33.1	31.5	30.9	31.3	29.5	28.5	8.3	7.8								
<i>E. waagelei</i> AF451351	30.1	29.5	30.3	31.1	30.5	29.9	32.3	30.1	30.7	30.9	29.1	31.1	29.5	31.5	30.3	30.3	30.9	31.1	27.5	9.9	10.5	8.5							
<i>Gnathopimmedia</i> <i>sexdentata</i> AF451354	29.0	28.4	27.2	28.0	28.2	26.6	28.8	28.0	29.2	26.2	28.0	28.2	27.2	28.8	25.4	27.0	30.0	27.2	27.8	23.0	23.2	22.8	23.2						
<i>G. mandibularis</i> AF451353	24.0	27.6	24.0	26.8	28.2	28.6	28.8	25.8	28.0	25.6	25.2	25.8	29.2	25.8	25.0	25.4	24.4	24.6	26.1	26.7	24.7	25.1	23.6						
<i>Iphimediella</i> <i>cytogenus</i> AF451348	29.9	24.0	29.2	29.2	29.4	27.2	28.4	30.7	29.8	29.4	28.8	29.0	27.4	31.1	27.8	28.6	30.0	31.1	28.6	26.7	26.1	25.5	26.5	22.6	23.0				
<i>I. georgi</i> AF451349	31.5	31.3	30.3	32.9	33.5	31.3	35.2	30.7	35.2	31.7	31.5	30.3	29.7	33.9	33.1	31.7	33.1	31.7	31.1	21.0	22.4	21.2	21.6	28.3	27.9	29.5			
<i>I. rigida</i> AF451347	31.3	31.1	30.1	32.7	33.1	31.1	35.0	30.3	35.0	31.5	31.1	29.9	29.5	33.7	32.9	31.5	32.7	31.3	30.9	20.6	22.0	20.8	21.2	28.1	27.3	29.3	0.6		

closest related to *Epimeria georgiana* and *E. rubriques* from the Weddell Sea, with interspecific distances of 14.72% and 14.11% respectively. Sequence distances between *Epimeria robusta* from the Ross Sea and *E. robustoides* from the Weddell Sea were 12.3 to 13.1%.

Intraspecific distances

Analysing the intraspecific differences the partial COI gene showed 0.0–1.2% sequence divergence within the seven *E. robusta* specimens from the Ross Sea and 0.2% sequence divergence within *E. robustoides* from the Weddell Sea. Sequence distances of 0.0–2.4% were found between the four *E. inermis* specimens, collected at four stations within the Ross Sea. The four *E. rimicarinata* specimens were collected from three different stations of the Ross Sea and had intraspecific distances of less than 2.1%. The two specimens of *Epimeria walkeri* collected in the Weddell and Ross Seas showed 5.04% sequence divergence while within *Epimeria georgiana* the two specimens collected at the Antarctic Peninsula varied by ~15% from the two specimens collected in the eastern Weddell Sea.

Discussion

Taxonomic implications

In amphipod taxonomy it is common to have small morphological distances for separation between genera and even families (e.g. Coleman and Barnard 1991). The three families examined in this study, the Epimeriidae, Iphimediidae and Eusiridae, have only a few characters distinguishing them. Therefore members of the Iphimediidae and Eusiridae were chosen as outgroups in the molecular part of this study. Iphimediidae differ from Eusiridae in having at least one of coxae 1–4 being pointed (Barnard and Karaman 1991). The family Iphimediidae only differs from the Epimeriidae in having at least one pair of chelate gnathopods and in lacking the mandibular raker spines (Coleman and Barnard 1991).

Within the Epimeriidae, *Metepimeria* is separated from *Epimeria* by bearing a 3-articulate maxilliped palp, vs the 4 articulate maxilliped palp of *Epimeria*. The only morphological separation of *Epimeria* and *Epimeriella* was the latter having a drawn out pars molaris without triturative surface and the lower lip bearing a wide hypopharyngeal gap. However, it was questionable whether this is a strong enough character for a valid generic distinction. Lörz and Brandt (2004) measured the variability in width of the hypopharyngeal gap within selected epimeriid species and found no significant differences between *Epimeria macrodonta* and *Epimeriella truncata*. Lörz and Brandt (2004) discussed that *Epimeriella* shows plesiomorphic characters of Antarctic *Epimeria* and indicated that the genus should therefore be synonymised with *Epimeria*. In their phylogeny based on 106 morphological characters, they analysed two *Epimeriella* spe-

cies grouped within the Antarctic species of *Epimeria* and formed a clade with *Epimeria annabellae* (Lörz and Brandt 2004). The habitus of these three dorsally smooth species is similar (see e.g. Coleman 2007). The present molecular investigation shows the analysed species of *Epimeriella*, *E. macronyx* and *E. walkeri*, amongst the Antarctic *Epimeria* clade, supporting the former morphological studies by Lörz and Brandt (2004) of paraphyletic genera. Based on the here presented genetic data and a detailed morphological evaluation of the weak morphological separation criteria between *Epimeriella* and *Epimeria* we herewith synonymise *Epimeriella* with *Epimeria*. The topology of the molecular phylogeny showed the iphimeriidae genera *Iphimeriella* and *Gnathiphimeria* to be paraphyletic taxa. The Iphimeriidae, like the Epimeriidae, require more detailed morphological and molecular investigations to reveal their taxonomic characters.

Phylogeny of Southern Hemisphere *Epimeria*

The molecular phylogenetic analysis revealed the presence of a New Zealand seamount clade and an Antarctic clade of *Epimeria*. *Epimeria horsti*, collected from the New Zealand Ghaul and Gothic seamounts, is genetically closest to *E. bruuni* collected from the Young Hicks seamount, Hikurangi Plateau in New Zealand. Even though the New Zealand species have a genetic distance of over 20% from any *Epimeria* in the Southern Ocean, these two *Epimeria* species from rather close geographic localities also show a very large genetic distance, nearly 20% (Table 2). The New Zealand specimens show a strong monophyletic support (Fig. 1) whereas the support for the monophyly of Antarctic species is not so high in the likelihood analysis (78 bootstrap value), but the parsimony analysis shows higher values (bootstrap 87, jackknife 96). Without sequences of *Epimeria* outside of New Zealand and Antarctic waters it is not possible to determine the origin of the species based on this data. One likely scenario is that epimeriid amphipods “populated” New Zealand waters many million years ago or that several colonizations from the Ross Sea shelf to New Zealand shores have taken place. Another even more probable scenario is that epimeriids are Gondwanan and became isolated during sea-floor spreading in the Cretaceous. Our hypotheses are that all non-Antarctic epimeriids are monophyletic. Lörz and Brandt (2004) studied the phylogeny of *Epimeria* via morphological characters, with exception of *E. loricata* the species studied occurring beyond Antarctic waters form a well supported clade with the following synapomorphies: produced and pointed ventral angle of coxa 5; midventrally pointed coxa 4; lateral surface of coxa 5 bearing bump or tooth; merus of P5–P7 not produced. Based on their morphological characters, the two recently described and redescribed New Zealand species, *E. horsti* and *E. bruuni*, would be part of this non-Antarctic clade.

The specimens identified as *Epimeria georgiana* show a genetic distance of ~15%, a distance value that proved to separate species within the Epimeriidae. Therefore we take this high genetic difference as evidence for dealing with a *Epimeria-georgiana* species complex consisting of at least two different species. According to Coleman (2007) *E. georgiana* occurs at South Georgia, in the Bransfield Strait, along the Palmer Archipelago

(latter two both Western Antarctic Peninsula), the South Shetland Islands, and eastern shelf of the Weddell Sea. Coleman noted (pers. com.) that the fourth coxa of *E. georgiana* specimen from the Antarctic Peninsula is quite different compared to the specimen from the Weddell Sea. The latter specimen resembled *E. inermis*, but show hooks at the basis of pereopods five and six. Väinölä et al. (2001) included cytochrome oxidase sequences from an *Epimeria georgiana* specimen in their “Phylogeography of “glacial relict” *Gammaracanthus* from boreal lakes and the Caspian and White seas”, but did not note the exact sampling location. The *E. georgiana* specimens in this study are from the Weddell Sea and the Antarctic Peninsula. We will separate the two cryptic species keyed out to *Epimeria georgiana* following the identification key of Coleman (2007) in the near future.

Previous analysis of the partial COI gene showed 0.0–2.2% sequence divergence within eleven specimens of the *E. schiaparelli* from the Ross Sea (Lörz et al. 2007) forming a distinct group within *Epimeria*. This intraspecific divergence within *E. schiaparelli* is much less than this group’s divergence from *E. macrodonta* (8.93–8.38%), the most closely related species. Divergences between other species were much larger (e.g. 12.02% divergence for *E. similis* and *E. macrodonta*) further supporting the conspecificity of all specimens identified as *E. schiaparelli*, despite conspicuous variation in morphological characters as pointed out by Lörz et al. (2007).

It is remarkable that the interspecific variation of the iphimeriid genus *Echiniphimedia* is smaller between the Ross Sea species *E. scotti* and any of the three Weddell Sea species than any distance of the Weddell Sea species to each other (Tab. 2). A possibility is that the origin of the genus *Echiniphimedia* is in the Ross Sea and it has “populated” the Antarctic shelf several times. However, the Ross Sea shelf has been overrun by grounding ice sheets several times during the last glacial maxima. According to literature records, *Echiniphimedia scotti*, *E. hodgsoni* and *E. echinata* are accounted to have circum-Antarctic distributions with occurrences in the Ross Sea and at the Antarctic Peninsula (Coleman 2007). No records are known from a species of *Echiniphimedia* below 720 m, with the exception of *Echiniphimedia hodgsoni* (1120m). Unfortunately not enough material had been available of any of the three species from both geographic distant locations and none suitably fixed for genetic studies.

The interspecific genetic differences between species of the genus *Epimeria* are 12–26%, those of *Echiniphimedia* 7.8–29.1% (Table 2), the genetic distances between genera of Epimeriidae and Iphimeriidae is 23–32% (Table 2). Molecular studies on the COI gene of non-Antarctic amphipods found 33.6–36.4% sequence differences between species in *Gammarus* (Meyran et al. 1997, Hou et al. 2007) Cristeascu and Herbert (2005) discovered ~28% sequence divergence in Ponto-Caspian amphipods of the genera *Dikerogammarus*, *Echinogammarus*, *Obesogammarus* and *Pontogammarus*. Witt et al. (2006) found COI nucleotide divergences among these *Hyalella* species ranging from 4.4% to 29.9%.

The interspecific divergence of Epimeriidae and Iphimeriidae from the Southern Ocean compared with the studied Gammaridae is low (Meyran et al. 1997, Hou et al. 2007) but similar to the divergences discovered in *Hyalella* (Witt et al. 2006). A low interspecific divergence indicates a relatively recent speciation. One reason for a successful recent speciation could be their variety in feeding patterns (Coleman 1989,

Dauby et al. 2001, DeBroyer et al. 2001). Examination of the mandibles (mouthparts) of some species underscores their specialised food preferences. *Gnathiphimedia mandibularis*, which feeds on bryozoan colonies, has hammer-like mandibles (non-cutting) to crush the bryozoans' calcareous (calcium carbonate) exterior. The mandibles of *Echiniphimedia hodgsoni*, however, have sharp cutting edges for biting through tough sponge tissue (Coleman 1989).

Dauby et al. (2001) have identified eight different feeding types among Antarctic amphipods, members of Epimeriidae and Iphimediidae are suspension feeders, deposit feeders, deposit feeders coupled with predation, opportunistic predators, micropredatory browsing, macropredation coupled with opportunistic necrophagy.

Another explanation for the recent speciation could be the variety in modes of mobility (Dauby et al. 2001). Epimeriidae and Iphimediidae show a great variation in their ability to move around, from sedentary (*Epimeria georgiana*, *Epimeria rubriques*) to highly mobile (*Epimera walkeri*). Their degree of mobility is closely related to their food preferences, with the less mobile species more likely to be suspension-feeders and the more agile more inclined to be predators (Dauby et al. 2001).

The colour variation of these families might also add to their rate of speciation. These specimens are predominantly red. Some species, such as *Epimeria inermis*, occur in several colours. *Epimeria schiaparelli*, comes in two different patterns: striped and speckled, DNA analysis proved that both forms are the same species (Lörz et al. 2007).

Many specimens are covered with extravagantly long spines. We can only speculate on the role of these spines, since we know so little about the creatures' biology. A spiny exterior may offer protection from predators by breaking up the body outline and making the animal harder to see, or by rendering it unpleasant to eat. *Echiniphimedia hodgsoni* lives in sponges, and its many small white spines camouflage it within the sponge tissue.

The diversity of microhabitats and of potential foods combined with the different mobility patterns most likely encouraged the spread and speciation of Southern Ocean amphipods.

Does circum-Antarctic distribution occur amongst species of epimeriid Amphipoda?

Our present genetic and morphological studies revealed no circum-Antarctic epimeriid species in the examined specimens. Intraspecific genetic divergence in specimens from the same species from the same region was generally under 2.3%, except *Epimeria walkeri*, for example Ross Sea *E. robusta* (n=7, <1.2%); *E. inermis* (n=4, <2.4%), *E. rimicarinata* (n=4, <2.1%) or *E. schiaparelli* (in Lörz et al. 2007) (n=11, 0–2.19% sequence divergence). However, the specimen keyed out as *E. robusta* from the Weddell Sea showed a distance over 12% to the Ross Sea *E. robusta*, definitely suggesting a new species, thus described as *Epimeria robustoides* above.

The two species are morphologically very similar; the table above shows the morphological features separating *Epimeria robusta* and *E. robustoides*. Previous collections of *Epimeria robusta* from the Weddell Sea most likely have to be treated as findings of *Epimeria robustoides*, unless further genetic studies reveal a sympatric distribution of *E. robustoides* and *E. robusta*.

Epimeria walkeri shows a genetic distance of 5.04% between the Ross Sea and the Weddell Sea. A COI sequence divergence value of >4% is often applied for separating marine invertebrate species in molecular barcoding (Witt et al. 2006). Since our data either show intraspecific variation of less than 2.5%, and an interspecific variation of at least 8.4%, we suggest that *Epimeria walkeri* is in the process of speciation.

The taxonomic relationships within the nominal *Epimeria-georgiana*-group were discussed above. The genetic sequence distances of ~15% between specimens from the Antarctic Peninsula and the eastern Weddell Sea are enough evidence for the existence of two species and to state that *E. georgiana* does not have a circum-Antarctic distribution but consists of a complex of cryptic species.

High values of intraspecific mitochondrial gene sequence divergence (COI and 16S mtDNA) indicating the existence of cryptic species are not only found in Antarctic species of Amphipoda from distant localities on the Southern Ocean. Similar results were found in studies on Isopoda (e.g. Held and Wägele 2005, Raupach and Wägele 2006, Raupach et al. 2007, Brökeland and Raupach 2008), Bivalvia (Linse et al. 2007), Octopoda (Allcock et al. 2004, Strugnell et al. 2008), Pycnogonida (Mahon et al. 2008), Crinoidea (Wilson et al. 2007) and benthic fish (Smith et al. 2008). Some reasons for the possible circum-Antarctic distribution of some breeding taxa is the dispersal via the Antarctic Circumpolar Current (ACC hypothesis) or extinction of a high proportion of taxa with pelagic development during vicariant events (extinction hypothesis) or the speciation enhanced in taxa with nonpelagic development in refuges during glacial maxima over the Antarctic Continental Shelf in the Pliocene/Pleistocene (ACS hypothesis) (Pearse et al. 2009). Nominal species collected at several distant localities, for example from the eastern Weddell Sea and Antarctic Peninsula or the Weddell Sea and Ross Sea, resulted in the discoveries of species complexes.

Conclusions. The morphological and molecular analysis on the validity of the epimeriid genus *Epimeriella* Walker, 1906 confirmed earlier the suggestion by Lörz and Brandt (2004) that this genus is a junior subjective synonym of *Epimeria* Costa, 1851. Five species are affected by this and are now named *Epimeria macronyx* comb. n., *E. scabrosa* comb. n., *E. truncata* comb. n., *E. victoria* comb. n. and *E. walkeri* comb. n. The analysed epimeriid specimens from New Zealand's seamounts and Antarctic localities formed two distinct clades separated by their geographic distributions. Within the Antarctic clade no further phylogeographic separation based on the species' distributions were observed. In order to evaluate the relationships between the Southern Hemisphere Epimeriidae, species from the Northern Hemisphere need to be included in the analysis. The use of the barcoding gene COI showed high sequence distances (12–13%) in the formerly circum-Antarctic distributed species *Epimeria robusta* and led to the description of *Epimeria robustoides* new species. The

sequence distances within *Epimeria georgiana* of 15% between specimens from the Antarctic Peninsula and the eastern Weddell Sea gives evidence of another species complex in the Epimeriidae. Morphological variations in Antarctic amphipod populations from distant geographic localities have to be treated with care, potentially indicating the existence of cryptic species, all new to science. Based on our results, the hypothesis of circum-Antarctic species' distributions in brooding amphipods proved to be unlikely.

Acknowledgements

This study was partially funded through the New Zealand Foundation for Research Science and Technology (FRST) programme CO01X0502. Most specimens were provided by the National Institute of Water and Atmospheric Research (NIWA) Invertebrate Collection. The Ross Sea material examined during the current study was mainly obtained during a biodiversity surveys of the northwestern Ross Sea and Balleny Islands undertaken by (NIWA) and financed by the Ministry of Fisheries (BioRoss project ZBD200303 and IPY-CAML project LIN08302). Further samples were provided through the NIWA program 'Seamount Ecosystems and Fisheries', funded by the New Zealand FRST with complementary funding from the New Zealand Ministry of Fisheries, ZBD2004/01 and ENV2005/16. Dr. Angelika Brandt (University of Hamburg) and Dr. Bruno Davis (Royal Belgian Institute of Natural Sciences, Brussels) kindly collected material during the RV *Polarstern* expeditions ANT XXI/2 (BENDEX) and ANT XXII/3 (ANDEEP III) and made it available for this study. Erika Mackay (NIWA) kindly digitally inked some morphological images plates. The photograph of *Epimeria robustoides* was taken by Dr. Martin Rauschert on the RV *Polarstern*, the ones of *E. robusta* were taken by Dr. Stefano Schiaparelli on the RV *Tangaroa*. We thank Dr. Shane Ah Yong (NIWA), Dr. Niel Bruce (Museum of Tropical Queensland, Townsville) and two anonymous reviewers for critical comments on earlier versions of the paper.

References

- Allcock AL., Breirley AS, Thorpe JP, Rodhouse PG (2004) Restricted gene flow and evolutionary divergence between geographically separated populations of the Antarctic octopus *Pareledone turqueti*. *Marine Biology* 129: 97–102.
- Andres HG (1985) Die Gammaridea (Crustacea: Amphipoda) der Deutschen Antarktis-Expeditionen 1975/76 und 1977/78. 4. Acanthonotozomatidae, Paramphithoidae und Stegocephalidae. *Mitt hamb zool Mus Inst* 82: 119–153.
- Barnard KH (1916) Contributions to the crustacean fauna of South Africa. *Annals of the South African Museum* 15: 105–302.
- Barnard KH (1930) Amphipoda. *Zoology*. Vol. 8. Natural History Reports. British Antarctic "Terra Nova" Expedition 1910. *Natural History Report, Zoology* 8 (4): 307–454.

- Barnard J.L. (1958) The Question of Decline in Systematic Activity, Measured in the Marine Amphipoda. *Systematic Zoology* 7: 123 - 125.
- Barnard JL (1961) Gammaridean Amphipoda from depths of 400 to 6000 meters. *Galathea Report* 5: 23–128.
- Barnard JL (1971) Gammaridean Amphipoda from a deep-sea transect off Oregon. *Smithsonian Contributions of Zoology* 61: 1–86.
- Barnard JL, Karaman G S (1991) The families and genera of marine gammaridean Amphipoda (except marine gammaroids). *Records of the Australian Museum Supplement* 13: 1–866.
- Bellan-Santini D (1972b) Invertébrés marins des XIIème et XVème expéditions Antarctiques françaises en Terre Adélie. 10. –Amphipodes gammariens. *Tethys Suppl* 4: 157–238.
- Bellan-Santini D (1972) Amphipodes provenant des contenus stomacaux de trois espèces de poissons Nototheniidae récoltés en Terre Adélie (Antarctique). *Tethys* 4: 684–702.
- Birstein, A. J, Vinogradov, E. M (1958) Pelagic amphipods (Amphipoda, Gammaridea) of the northwestern part of Pacific Ocean. *27*: 219–257.
- Chevreaux ME (1912) Deuxième expédition dans l'Antarctique, dirigée par le Dr Charcot, 1908–1910. *Bulletin du Muséum National d'Histoire Naturelle, Paris*. 18: 208–221.
- Coleman C (2007) Acanthonotozomellidae, Amathillopsidae, Dikwididae, Epimeriidae, Iphimediidae Ochlesidae and Vicmusiidae. *Census of Antarctic Marine Life. Synopsis of the Amphipoda of the Southern Ocean*. Bruxelles: Institut Royal des Sciences Naturelles de Belgique.
- Coleman CO (1989) On the nutrition of two Antarctic Acanthonotozomatidae (Crustacea: Amphipoda). Gut contents and functional morphology of mouthparts. *Polar Biology* 9: 287–294.
- Coleman CO (1990) Two new Antarctic species of the genus *Epimeria* (Crustacea: Amphipoda: Paramphithoidae), with descriptions of juveniles. *Journal of the Royal Society of New Zealand* 2: 151–178.
- Coleman CO (1994) A new *Epimeria* species (Crustacea: Amphipoda: Epimeriidae) and redescription of three other species in the genus from the Antarctic Ocean. *Journal of Natural History* 28: 555–576.
- Coleman CO (1998a) *Epimeria heldi*, a new species of Amphipoda (Crustacea, Epimeriidae) from the Antarctic Ocean. *Beaufortia* 48: 17–25.
- Coleman CO (1998b) *Epimeria vaderi*, an new species (Crustacea, Amphipoda, Epimeriidae) from the Antarctic Ocean. *Mitteilungen aus dem Museum für Naturkunde in Berlin, Zoologische Reihe* 74: 215–224.
- Coleman CO (2003) “Digital inking”: How to make perfect line drawings on computers. *Organism, Diversity and Evolution, Electronic Supplement*, <http://senckenberg.de/odes/03-14.htm> 14, 1–14.
- Coleman CO, Barnard JL (1991) Revision of Iphimediidae and similar families (Amphipoda: Gammaridea). *Proceedings of the Biological Society of Washington* 104: 253–268.
- Costa A (1851) In Gugli. Hope's Catalogo dei Crostacei Italiani e di Molti Altri del Mediterraneo. Napoli: Azzolino. 1851–1853. Fauna del Regno di Napoli (and) Catalogo de' Crostacei del Regno di Napoli.

- Cristescu MEA, Hebert PDN (2005) The “Crustacean Seas” – an evolutionary perspective on the Ponto-Caspian peracarids. *Canadian Journal of Fisheries and Aquatic Science* 62: 505–717.
- Dauby P, Scailteur Y, Chapelle G, De Broyer C (2001) Potential impact of the main benthic amphipods on the eastern Weddell Sea shelf ecosystem (Antarctica). *Polar Biology* 24: 657–662.
- De Broyer C, Klages M (1991) A new *Epimeria* (Crustacea, Amphipoda, Paramphithoidae) from the Weddell Sea. *Antarctic Science* 3: 159–166.
- De Broyer C, Lowry JK, Jazdzewski K, Robert H (2007) Catalogue of the gammaridean and corophiidean Amphipoda (Crustacea) of the Southern Ocean with distribution and ecological data. In: De Broyer C. (Ed.). *Census of Antarctic Marine Life. Synopsis of the Amphipoda of the Southern Ocean. Vol. 1. Bulletin de l'Institut Royal des Sciences naturelles de Belgique, Biologie* 77, Suppl. 1, part 1: 1–325.
- De Broyer C, Scailteur Y, Chapelle G, Rauschert M (2001) Diversity of epibenthic habitats of gammaridean amphipods in the eastern Weddell Sea. *Polar Biology* 24: 744–753.
- Fabricius, C. J (1779) *Reise nach Norwegen mit Bemerkungen aus der Naturhistorie und Oekonomie*. Carl Ernst Bohn, Hamburg, 1–388 pp.
- Folmer O, Black M, Hoeh W, Lutz R, Vrijenhoek R. (1994) DNA primers for amplification of mitochondrial cytochrome c oxidase subunit I from diverse metazoan invertebrates. *Molecular Marine Biology and Biotechnology* 3: 294–299.
- Felsenstein J (1985) Confidence limits on phylogenies; an approach using the bootstrap. *Evolution* 39: 783–791.
- Farris JS, Albert, VA, Källersjö M, Lipscomb D, Kluge AG (1996) Parsimony jackknifing outperforms neighbour-joining. *Cladistics* 12: 99–124.
- Griffiths CL (1977) Deep-sea amphipods from west of Cape Point, South Africa. *Ann S Afr Mus* 73: 93–104.
- Gurjanova EF (1955) Novye vidy bokoplavov (Amphipoda, Gammaridea) iz severnoi chasti Tixogo Okeana. *Zoologicheskogo Instituta Akademii Nauk SSSR, Trudy* 18: 166–218.
- Hall TA (1999) BioEdit: a user-friendly biological sequence alignment editor and analysis program for Windows 95/98/NT. *Nucleic Acids Symp. Ser.* 41: 95–98.
- Held C, Wägele JW (2005) Cryptic speciation in the giant Antarctic isopod *Glyptonotus antarcticus* (Isopoda: Valvifera: Chaeriliidae). *Scientia Marina* 69: 175–181.
- Hou Z, Fu J, Li S (2007) A molecular phylogeny of the genus *Gammarus* (Crustacea: Amphipoda) based on mitochondrial and nuclear gene sequences. *Molecular Phylogenetics and Evolution* 45: 596–611.
- Hurley DE (1957) Some Amphipoda, Isopoda and Tanaidacea from Cook Strait. *Zoology Publications from Victoria University College* 21: 1–20.
- Karaman GS, Barnard LJ (1979) Classificatory revisions in gammaridean Amphipoda (Crustacea), part 1. *Proceedings of the Biological Society of Washington* 92: 106–165.
- Kelly DW, Macisaac HJ, Heath DD (2006) Vicariance and dispersal effects on phylogeographic structure and speciation in a widespread estuarine invertebrate. *Evolution* 60: 257–267.
- Ledoyer M (1986) Crustacés amphipodes gammariens. Familles des Haustoriidae a Vitjazianidae. *Faune de Madagascar* 59: 599–1112.

- Linse K, Cope T, Lörz AN, Sands CJ (2007) Is the Scotia Sea a center of Antarctic marine diversification? Some evidence of cryptic speciation in the circum-Antarctic bivalve *Lissarca notorcadensis* (Arcoidea: Philobryidae). *Polar Biology* 30: 1059–1068.
- Lörz AN, Coleman CO (2001) *Epimeria reoproii* n. sp., a new amphipod (Epimeriidae) from the Antarctic. *Crustaceana* 74: 991–1002.
- Lörz AN (2003) Untersuchung zur Biodiversität der Amphipoda (Malacostraca, Crustacea) in der Antarktis. In *Fachbereich Biologie*, pp. 150. Hamburg: Universität Hamburg.
- Lörz AN (2008) Epimeriidae (Crustacea, Amphipoda) from New Zealand with a description of a new species. *Zootaxa* 1847: 49–61.
- Lörz AN, Maas EW, Linse K, Fenwick GD (2007) *Epimeria schiaparelli* sp. n., an amphipod crustacean (family Epimeriidae) from the Ross Sea, Antarctica, with molecular characterisation of the species complex. *Zootaxa* 1402: 23–37.
- Lörz AN, Brandt A (2004) Phylogeny of Antarctic *Epimeria* (Epimeriidae: Amphipoda). *Journal Marine Biological Association U.K.* 84: 179–190.
- Lörz AN, Held C (2004) A preliminary molecular and morphological phylogeny of the Antarctic Epimeriidae and Iphimediidae (Crustacea, Amphipoda). *Molecular Phylogenetics and Evolution* 31: 4–15.
- Mahon AR, Arango CP, Halanych KM (2008) Genetic diversity of *Nymphon* (Arthropoda: Pycnogonida: Nymphonidae) along the Antarctic Peninsula with a focus on *Nymphon australe* Hodgson 1902. *Marine Biology* 155: 315–323.
- McCain JC (1971) A new deep-sea species of *Epimeria* (Amphipoda, Paramphithoidea) from Oregon. *Crustaceana* 20: 159–166.
- Meyran JC, Monnerot M, Taberlett P (1997) Taxonomic status and phylogenetic relationships of some species of the genus *Gammarus* (Crustacea, Amphipoda) deduced from mitochondrial DNA sequences. *Molecular Phylogenetics and Evolution* 8: 1–10.
- Nagata K (1963) Two new gammaridean amphipods (Crustacea) collected by the. *Publications of the Seto Marine Biological Laboratory* 11: 1–6.
- Pearse JS, Mooi R, Lockhart S, Brandt, A (2009) Brooding and Species Diversity in the Southern Ocean: Selection for Brooders or Speciation within Brooding Clades? 181–196 in *Smithsonian at the poles*, editor Krupnik K, in press.
- Raupach MJ, Held C, Wägele JW (2004) Multiple colonization of the deep sea by the Asellota (Crustacea: Peracarida: Isopoda). *Deep-Sea Research II. Topical Studies in Oceanography* 51: 1787–1795.
- Raupach MJ, Wägele JW (2006) Distinguishing cryptic species in Antarctic Asellota (Crustacea: Isopoda) – a preliminary study of mitochondrial DNA in *Acanthaspidia drygalskii*. *Antarctic Science* 18: 191–198.
- Sars GO (1879) Crustacea et Pycnogonida nova in itinere secundo et tertio expeditionis Norvegicae anno 1877–78 collecta. *Archiv for Mathematik og Naturvidenskab, Kristiania (Oslo)* 4: 427–476.
- Sars GO (1895) An account of the Crustacea of Norway. Alb. Cammermeyers Forlag, Christiania, Copenhagen, 701 and 248 plates pp.
- Sars M (1859) Oversigt over de i den norsk-arctiske Region forekommende Krebsdyr. *Forhandlinger i Videnskaps-selskabet i Christiania* 1858 99: 122–163.

- Schellenberg A (1931) Gammariden und Caprelliden des Magellangebietes, Südgeorgien und der Westantarktis. Further zoological Results of the Swedish Antarctic Expedition 1901–1903 2: 1–290.
- Schellenberg A (1931) Gammariden und Caprelliden des Magellangebietes, Südgeorgiens und der Westantarktis. Further zoological Results of the Swedish Antarctic Expedition 1901–1903 2: 1–290.
- Smith PJ, Steinke D, McVeagh SM, Stewarts AL., Struthers CD, Roberts CD (2008) Molecular analysis of Southern Ocean skates (*Bathyraja*) reveals a new species of Antarctic skate. *Journal of Fish Biology* 73: 1170–1182.
- Stephensen R (1947) Tanaidacea, Isopoda, Amphipoda and Pycnogonida. Scientific results of the Norwegian Antarctic Expedition 1927–1928 28: 1–90.
- Strugnell JM, Rogers AD, Prodöhl PA, Collins MA, Allcock AL. (2008) The thermohaline expressway: the Southern Ocean as a centre of origin for deep-sea octopuses. *Cladistics* 24: 853–860.
- Swofford DL (2002) Paup*. Phylogenetic Analysis using Parsimony (*and other methods). (Version 4.10 beta). Sinauer Associates, Sunderland, Massachusetts.
- Thompson JD, Higgins DJ, Gibson TJ (1994) CLUSTAL W: improving the sensitivity of progressive multiple sequence alignment through sequence weighting, positions-specific gap penalties and weight matrix choice. *Nucleic Acids Research* 22: 4673–4680.
- Väinölä R, Vainio JK, Palo JU (2001) Phylogeography of “glacial relict” *Gammaracanthus* (Crustacea, Amphipoda) from boreal lakes and the Caspian and White seas. *Canadian Journal Fisheries Aquatic Science* 58: 2247–2257.
- Wakabara Y, Serejo C (1999) Amathillopsidae and Epimeriidae (Crustacea, Amphipoda) from bathyal depths off the Brazilian coast. *Zoosystema* 21: 625–645.
- Walker AO (1903) Amphipoda of the “Southern Cross” Antarctic Expedition. *Journal of the Linnean Society of London (Zoology)* 29: 38–64.
- Walker AO (1906) Preliminary descriptions of new species of Amphipoda from the “Discovery” Antarctic Expedition 1902–1904. *Annals and Magazine of Natural History 7 Serie*: 13–18.
- Walker AO (1907) Crustacea. III. Amphipoda. *National Antarctic Expedition 1901–1904, Natural History 3*: 1–38, pls 1–13.
- Watling L (1981) Amphipoda from the northwestern Atlantic: The genera *Jerbarnia*, *Epimeria*, and *Harpinia*. *Sarsia* 66: 203–211.
- Watling L, Holman H (1980) New Amphipoda from the Southern Ocean, with partial revision of the Acanthonotozomatidae and Paramphithoidae. *Proceedings of the Biological Society of Washington* 93: 609–654.
- Wilson NG, Hunter RL, Lockhart SJ, Halanych KM (2007) Multiple lineages and absence of panmixia in the “circumpolar” crinoid *Promachocrinus kerguelensis* from the Atlantic sector of Antarctica. *Marine Biology* 152: 895–904.
- The correct details are: White A (1847) List of species in the collection of the British Museum. *British Museum, London, I–VIII, 1–143 pp.*
- Witt JDS, Threlloff DL, Hebert PDN (2006) DNA barcoding reveals extraordinary cryptic diversity in an amphipod genus: implications for desert spring conservation. *Molecular Ecology* 15: 3073–3082.

A new species of *Metatanais* Shiino, 1952 (Crustacea, Tanaidacea, Paratanaoidea) from Australian coral reefs, with a redefinition of the genus

Magdalena Błażewicz-Paszkowycz[†], Karol Zemko[‡]

Department of Polar Biology and Oceanobiology, University of Łódź, Łódź, Poland

[†] [urn:lsid:zoobank.org:author:59C602A9-67E0-4373-AAAC-EFA2F9252748](https://doi.org/urn:lsid:zoobank.org:author:59C602A9-67E0-4373-AAAC-EFA2F9252748)

[‡] [urn:lsid:zoobank.org:author:9AC12B34-DB19-45B9-93F1-B0746D4E9CE6](https://doi.org/urn:lsid:zoobank.org:author:9AC12B34-DB19-45B9-93F1-B0746D4E9CE6)

Corresponding author: *Magdalena Błażewicz-Paszkowycz* (magdab@biol.uni.lodz.pl)

Academic editor: *Niel Bruce* | Received 25 February 2009 | Accepted 23 July 2009 | Published 24 August 2009

[urn:lsid:zoobank.org:pub:7760E22B-E679-4821-9993-E90BE9CD1FB2](https://doi.org/urn:lsid:zoobank.org:pub:7760E22B-E679-4821-9993-E90BE9CD1FB2)

Citation: Błażewicz-Paszkowycz M, Zemko K (2009) A new species of *Metatanais* Shiino, 1952 (Crustacea, Tanaidacea, Paratanaoidea) from Australian coral reefs, with a redefinition of the genus. In: Bruce N (Ed) Advances in the taxonomy and biogeography of Crustacea in the Southern Hemisphere. ZooKeys 18: 129–141. doi: 10.3897/zookeys.18.114

Abstract

This paper presents a description of the new species *Metatanais bipunctatus* **sp. n.** found on coral reefs at two sites in Australia: Lizard Island (Queensland) and Ningaloo Reef (north-western Australia). The new species is the second member of the genus and it is morphologically almost identical to type species *M. cylindricus* Shiino, 1952, recorded from algae on the surface of ascidians or sponges in shallow waters off Seto (north-western coast of Japan). The new species was compared with the holotype of *M. cylindricus* and it can be distinguished from it by relatively short first article in antennule, compact propodus of pereopod 6 (about three times as long as wide) and robust ventral spiniform seta on propodus of last three pairs of pereopods. The definition of the genus has been amended and appendages (where possible) of *M. cylindricus* has been figured.

Keywords

Metatanais, Tanaidacea, coral rubble, CReefs, Australia

Introduction

The genus *Metatanais* was erected by Shiino (1952) to accommodate *M. cylindricus* Shiino, 1952 which was collected together with two new pseudomorph species, *Parapseudes latifrons* (Shiino, 1952) and *Gollumnudes littoralis* (Shiino, 1952), in the vicinity of Seto (Honshu, Japan). *M. cylindricus* and *P. latifrons* inhabited algae and the surface of sponges at shallow depths (*P. latifrons*), while *G. littoralis* lived among barnacles growing on littoral rocks. No further material of *Metatanais* has been recorded since Shiino's original description.

The genus *Metatanais* is a valid taxon and is clearly distinct from other tanaidomorph genera. The original definition by Shiino (1952) is imprecise and did not address the key diagnostic characters of the genus sufficiently. The discovery of a new species of *Metatanais* at two sites in Australia, Lizard Island (Queensland) and Ningaloo Reef (Western Australia), during the CReefs Program (Census of Coral Reefs; <http://www.aims.gov.au/creefs/field-program.html>) has offered the opportunity to interpret the morphology of this taxon more comprehensively and to redefine the genus.

Material and methods

The material was collected during two CReefs (Australia) fieldtrips organized by AIMS (Australian Institute of Marine Science) to Lizard Island (Great Barrier Reef) and Ningaloo Reef (mid-Western Australia).

Pieces of coral rubble were collected by hand using SCUBA and, at the laboratory, were placed into buckets (20L) with a few drops of formaldehyde for a while to agitate animals causing them to leave their microhabitats (tubes and crevices). The samples with animals still alive were then washed through a fine mesh (0.3 mm), the residue sorted under a microscope and tanaidacean specimens collected were preserved in 80% ethanol. The type material is deposited at the Museum of Tropical Queensland (Great Barrier Reef specimens) and at the Western Australian Museum, Perth (Ningaloo specimens). Terminology follows Larsen (2003).

Systematics

Order Tanaidacea Dana, 1849

Suborder Tanaidomorpha Sieg, 1980

Superfamily Paratanaoidea Lang, 1949

Family Nototanaididae *sensu lato* Sieg, 1976

Genus *Metatanais* Shiino, 1952

Metatanais Shiino, 1952: 23.

Diagnosis: Body rigid, well calcified, cuticle surface smooth and glossy; eyes present, pigmented; all pereonites wider than long; pleon half as long as pereon. Antennule robust, 3-articled with article 1 large, embracing base of article 2; articles 2 and 3 as long as wide. Antenna robust, 6-articled; article 4 only little longer than article 2. Labrum hood-shaped, setose. Mandibles robust, lacinia mobilis of moderate size; molar with 5–6 tubercles. Maxillule with eight terminal spines and distally setose outer margin; palp with two distal setae. Maxilliped endites oval, plate-like, longer and wider than basis, with a few short setae terminally. Epignath with cluster of short setae distally. Cheliped compact, attached by sidepiece, merus and carpus without setae ventrally; fixed finger with minute seta ventrally and two minute setae on inner margin. Pereopods 1–6 ambulatory; pereopods 1–3 ischium lacking setae; pereopods 1–2 merus lacking setae; pereopods 3–6 merus with spines; pereopods 1–6 carpus with spines. Pleopods absent in females. Uropods uniramous; endopod biarticulated.

Type species: *Metatanais cylindricus* Shiino, 1952; by original designation; gender masculine.

Species included: *M. cylindricus*, *M. bipunctatus* sp. n.

Remarks

Metatanais has a well-calcified, smooth and glossy cuticle. The calcification is much stronger than in most Pseudotanaididae (Sieg 1976) or Nototanaididae (Sieg 1976), in which families the genus have been classified in the past, and can be only compared to some genera of the Agathotanaididae (Lang 1971) and Colletteidae *sensu lato* (Larsen and Wilson 2002) for example *Libanius* Lang, 1971, although their cuticle is rather more matte in appearance.

Metatanais has a three-articulated antennule, with the first article robust and overlapping the small second article, a disc-shaped maxilliped endite, an epignath tipped by bunch of small setae, a lack of regular setae on the merus and carpus of all pereopods, and a uniramous uropod. This unique combination of characters was not used in the definition given by Shiino (1952), while the emphasis in his discussion was on 'degenerated pleopods' and for this reason an affinity of *Metatanais* with *Pseudotanais* Sars, 1882 was suggested.

In the first phylogenetic tree for the Tanaidomorpha (Larsen and Wilson 2002), *Metatanais* was classified with the Nototanaidae *sensu lato*, owing to its three-articled antennule, and lack of plumose seta on pleonites (characteristic for the Paratanaidae Lang, 1949), its short uropod and lack of spines on second and third antenna articles (in contrast to the Leptognathiidae Sieg, 1976) and regularly developed pleonites (in contrast to the Pseudozeuxidae Sieg, 1982). Further attempts to understand the relationships within the Tanaidomorpha have demonstrated that the Nototanaidae is a polyphyletic family (Bird and Larsen in press., Błażewicz-Paszkowycz and Poore 2008) and none of the taxa formerly included show affinities to *Metatanais* (Błażewicz-Paszkowycz and Poore 2008). Alternatively, Bird and Larsen (in press) implied a weak relationship between *Metatanais* and the Paratanaidae. This uncertain position of *Metatanais* compels us to regard it as Nototanaidae *sensu lato* at present, until the whole suprageneric classification within the Paratanaoidea is resolved better.

Metatanais cylindricus Shiino, 1952

Figs 1, 2

Metatanais cylindricus Shiino, 1952: 24–27, figs 6–7; Larsen and Shimomura, 2007: 2.

Material examined: *Lectotype* female (dissected on slides) (NSMT-Cr 14507), among algae and on surface of sponges and compound ascidiae, coll. Sakata and Toshima, Seto, 9–12 May, 1948.

Diagnosis: Body three times as long as wide. Carapace shorter than wide. Antennule article 1 more than twice as long as wide. Pereopod 4–6 propodus slim (about five times as long as wide), with small setae ventrally.

Remarks: *Metatanais cylindricus* was described from 23 specimens found in shallow water off Seto (north-western coast of Japan) among aggregation of sponges and ascidiae, and catalogued as syntypes at the National Museum of Nature and Science in Tokyo. From this collection we have been loaned only one specimen which we have here designated the lectotype. It was partially dissected and drawn.

In the original species description Shiino stated that specimens studied by him were females as “Neither rudimental oostegites nor mare genital papillae ...” were discovered. Based on the present knowledge about the tanaid life history we can assume that Shiino has dealt with both sexes, where males had the rudimental pleopods (Shiino, 1952: 26, fig 7M), and females lacked them, as loaned lectotype.

M. cylindricus is morphologically almost identical to *M. bipunctatus* sp. n. It can be distinguished from the new species by most compact body, with cephalothorax clearly shorter than its length (Fig 1). The antennule article 1 in *M. cylindricus* is almost three times as long as wide and ‘columnar’ according to Shiino (1952), while it seems to be more robust and just less than twice as long as wide in the new species (Fig 2A). The species also has much slimmer propodus in pereopod of the last three pairs (over four times as long as wide). The obvious difference between the species is the form of seta

on ventral margin of the propodus in pereopod 4–6 that is small and weak seta in *M. cylindricus* (Fig 2 G–I) and robust in the new species (Fig 5 E–G).

***Metatanais bipunctatus* sp. n.**

urn:lsid:zoobank.org:act:0DFA750C-CDC5-43FB-9083-CB8FD71AA9CA

Figs 3–5

Material examined: *Holotype:* Female (1.7 mm) (MTQ W31164), CGLI 31, 14.68039°S, 145.4453°E, Lizard Island, Casuarina Beach, dead coral, depth 1 m, 15

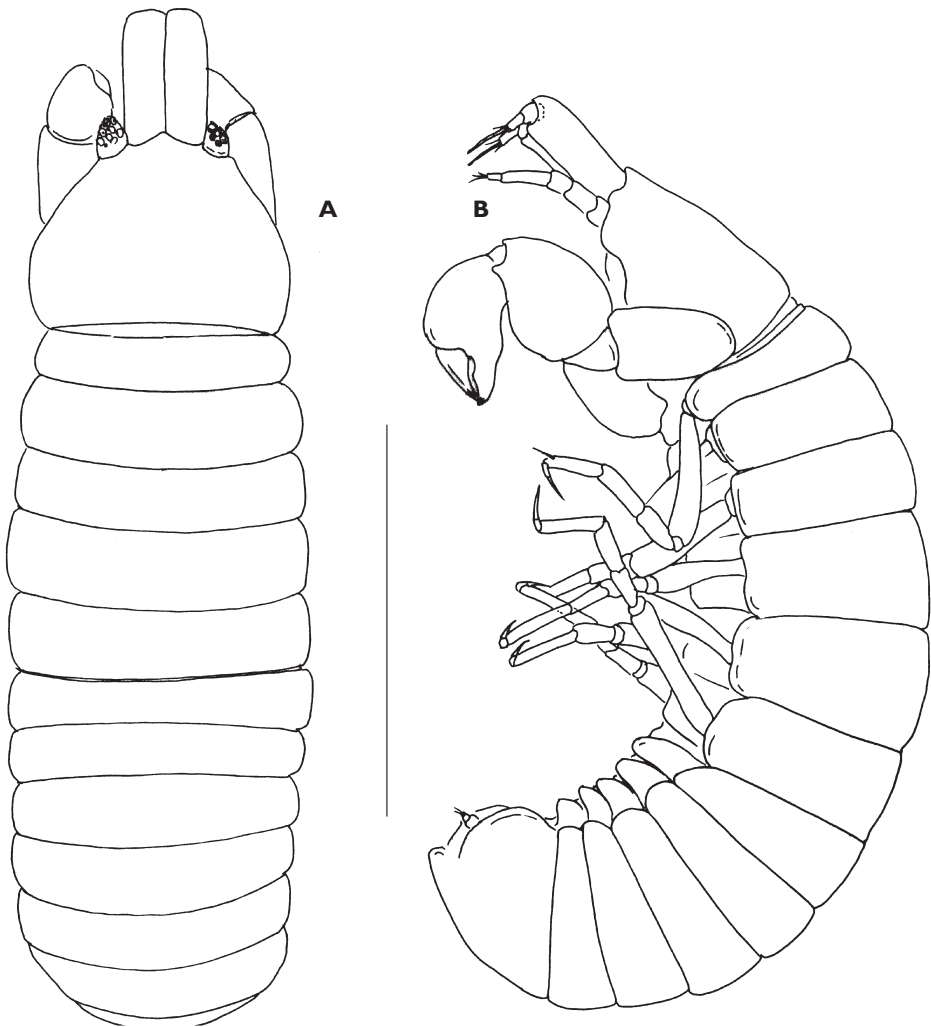


Figure 1. *Metatanais cylindricus* Shiino, 1952 female, lectotype **A** body, dorsal **B** body, lateral. Scale bar equals 1 mm.

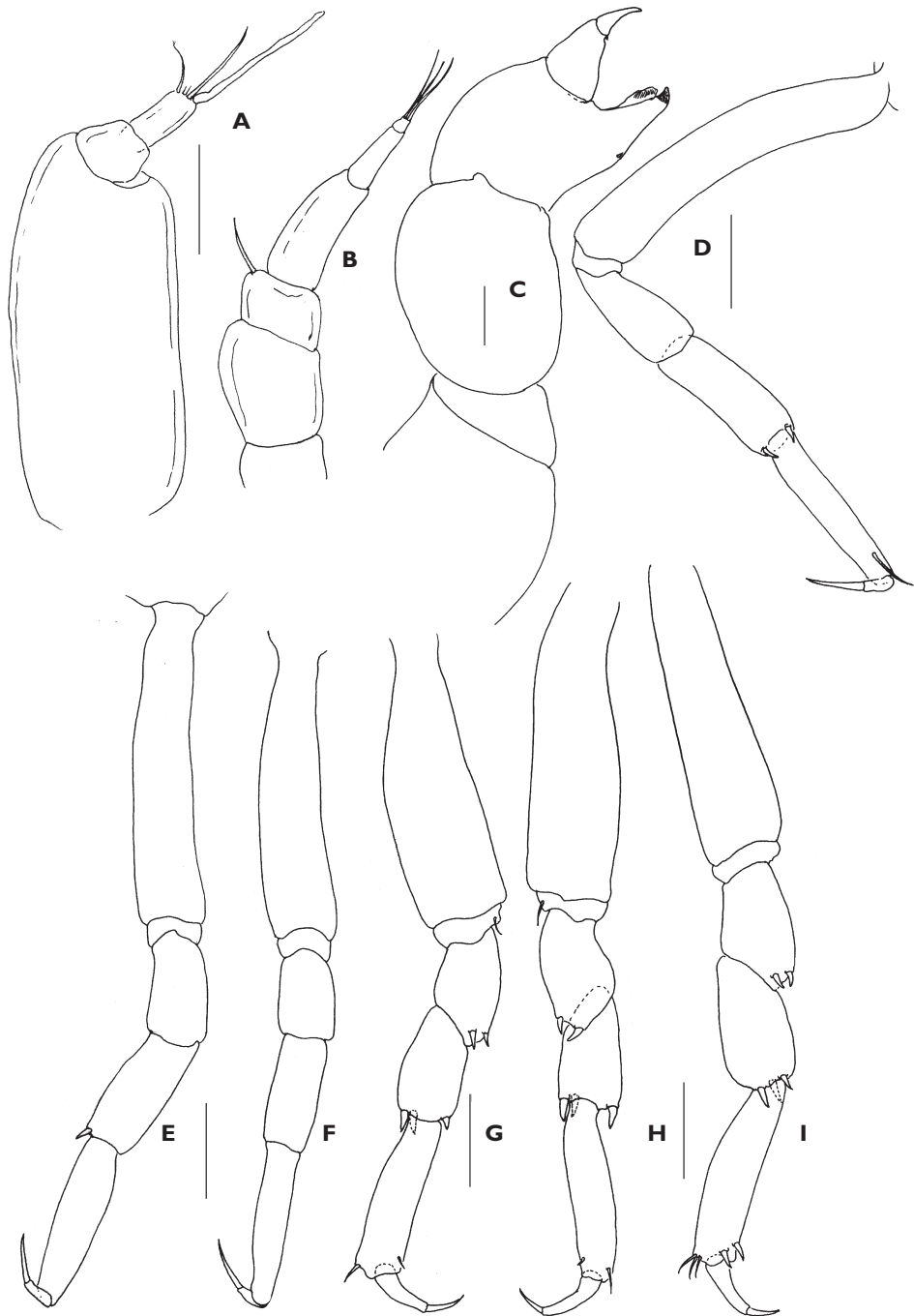


Figure 2. *Metatanais cylindricus* Shiino, 1952, female, lectotype. **A** antennule **B** antenna **C** chela **D** pereopod 1 **E** pereopod 2 **F** pereopod 3 **G** pereopod 4 **H** pereopod 5 **I** pereopod 6. Scale bars equal 0.1mm.

Apr 2008. *Paratypes*: 1 specimen (1.5 mm), (MTQ W31164), CGLI 20, 14°64.553'S, 145°65.335'E, North Point, dead coral rubble, depth 0.5–1.5 m, 12 Apr 2008. 1 specimen, dissected in slides (WAM C42469), NIN 17, Western Australia, Ningaloo

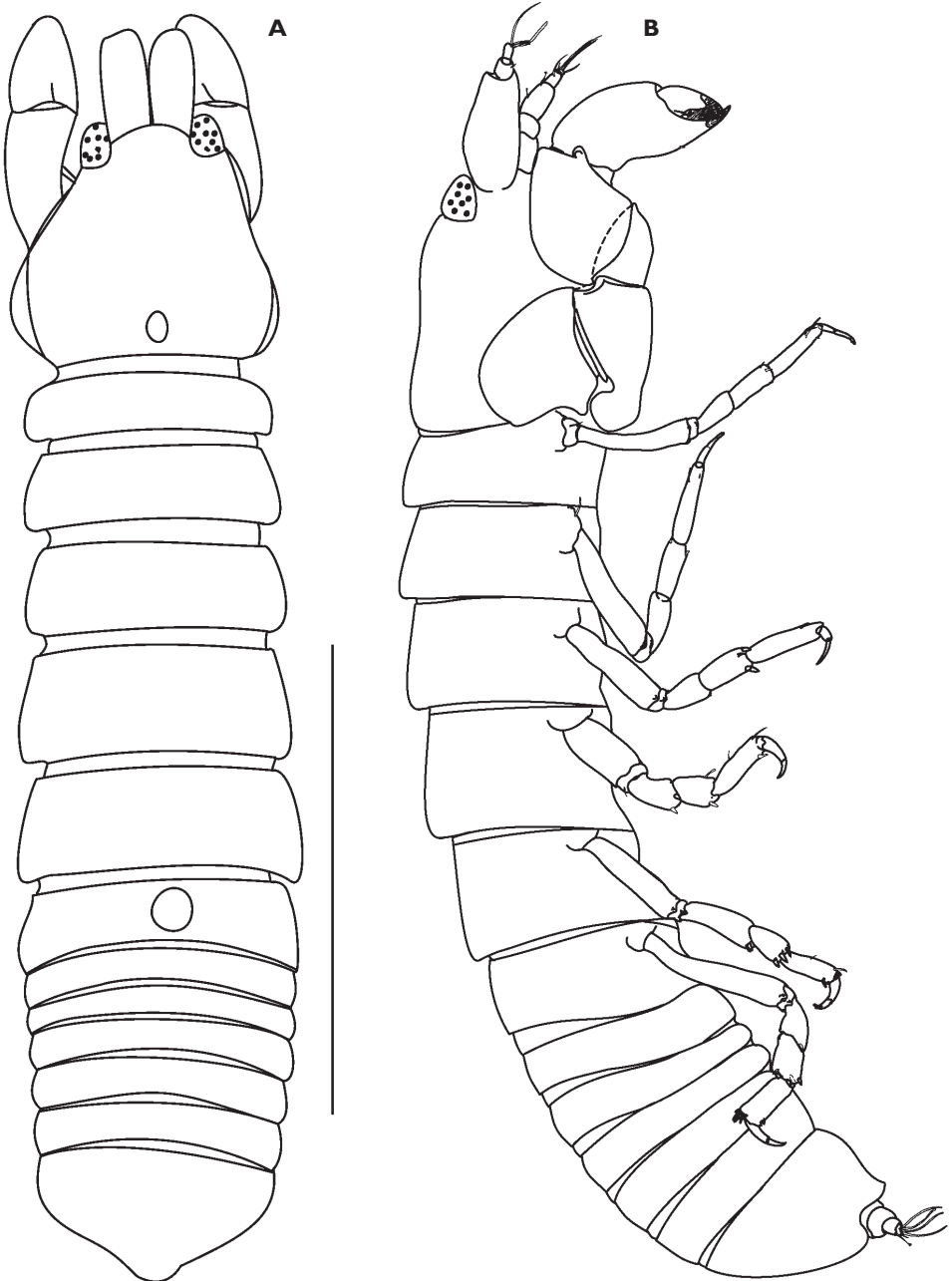


Figure 3. *Metatanais bipunctatus* sp. n. female, **A** body, dorsal **B** body, lateral. Scale bar equals 1 mm.

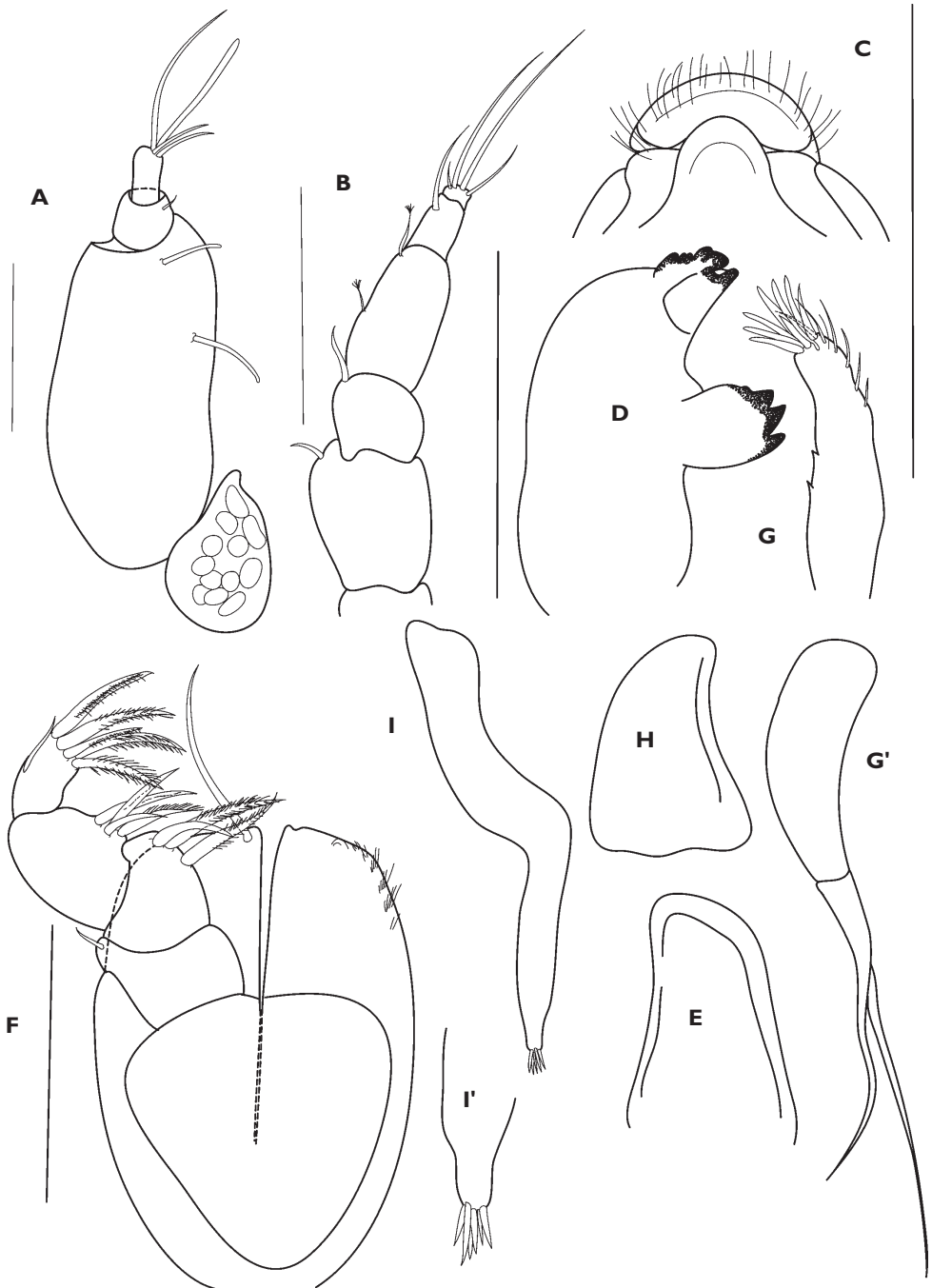


Figure 4. *Metatanaïs bipunctatus* sp. n. paratype, female. **A** antennule **B** antenna **C** labrum **D** left mandible **E** right mandible **F** maxilliped **G** maxillule **G'** maxillule palp **H** maxilla **I** epignath **I'** detail of epignath. Scale bars equals 0.01mm.

Reef, off Tantabiddy, reef front 21.92833°S, 113.9196°E, dead *Acropora* head, depth 13–15 m, 17 Jun 2008.

Diagnosis: Body over four times as long as wide. Antennule article 1 less than twice as long as wide. Pereopod 4–6 propodus compact (about three times as long as wide), with spiniform setae ventrally.

Etymology: *bipunctatus* [Latin]: with two spots, referring to presence of dorsal orange spots, one on the posterior of the carapace and one on pereonite 6.

Description: Female without oostegites (Fig. 1A, B) 1.5 mm long. Body about 4.5 times as long as wide. Carapace 16% of body length, as long as wide, without rostrum, tapering towards the anterior, with mid-dorsal orange spot near posterior margin. Pereon about half of total body length. All pereonites wider than long, margins rounded in dorsal view. Pereonite 1 0.25 times as long as wide; pereonites 2 and 3 subequal and little longer than pereonite 1. Pereonites 4 and 5 subequal, 0.4 times as long as wide. Pereonite 6 subequal to pereonite 2, with orange spot mid-dorsally. Pleonites subequal in size (0.15 times as long as wide); pleotelson as long as combined length of pleonites 3 to 5, tapering posteriorly, produced medially.

Antennule (Fig. 2A) three-articled; article 1 barrel-shaped, half as long as carapace, less than twice as long as wide, with two simple, blunt setae on distal upper margin, distally overlapping base of article 2. Article 2 as long as wide, about one fifth as long as article 1, with one seta. Article 3 subequal in length to article 2, but slightly narrower, with one long and two short rod setae and one aesthetasc distally.

Antenna (Fig. 2B) six-articled. Article 2 1.1 times as long as wide, with one setae distally. Article 3 little shorter than wide, half as long as article 2, with one simple setae distally. Article 4 compact, about twice as long as wide, and subequal in length to article 2, with two pinnate setae along the dorsal margin. Article 5 1.3 times as long as wide, with one simple seta distally. Article 6 minute, with two long and two short distal setae.

Mouthparts: Labrum (Fig. 2C) hood shaped, with fine setae. Left mandible (Fig. 2D) molar robust, as long as wide, incisor with sharp processes distally; *lacinia mobilis* of moderate size, distal margin crenulated; right mandible (Fig. 2E) incisor process simple, *lacinia mobilis* absent. Maxillule (Fig. 2I) endite with eight spiniform setae distally and setose outer margin. Palp (Fig. 2G) with two articles, distal article tipped by two long simple setae. Maxilla (Fig. 2H) triangular, naked. Maxilliped (Fig. 2F) bases semi-fused; endites plate-like, exceeding bases of maxilliped distally and laterally, with one long simple setae distally and anterolateral rows of fine setae. Maxilliped palp article 1 with simple seta on outer margin; article 2 wedge-shaped with two plumose and one simple seta on the inner margin; article 3 with one plumose seta and three simple setae on the inner margin; article 4 with five plumose setae distally and one simple seta on outer margin. Epignath (Fig. 2J, J') tipped with about seven short setae.

Epignath (Fig. 2D) narrow with six short simple setae on distal margin.

Cheliped (Fig. 3A) basis as long as wide; similar in size to sidepiece. Merus wedge-shape, naked. Carpus 1.3 times as long as wide, with one seta on dorsal margin. Propodus massive about twice as long as wide; palm little longer than dactylus; fixed finger

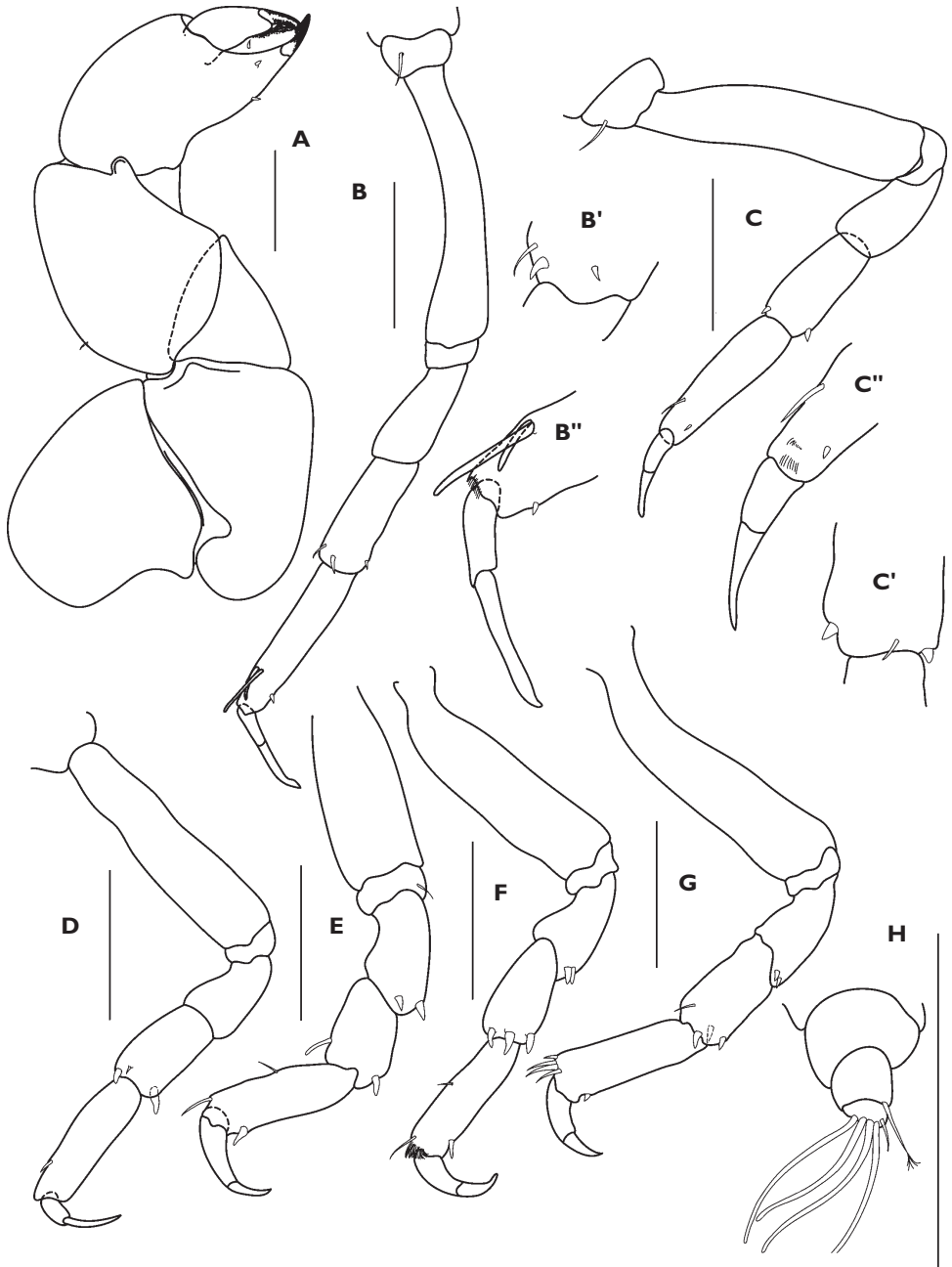


Figure 5. *Metatanais bipunctatus* sp. n. paratype female. **A** cheliped **B** pereopod 1 **B'** pereopod 1 carpus detail **B''** pereopod 1 propodus detail **C** pereopod 2 **C'** pereopod 2 carpus detail **C''** pereopod 2 propodus detail **D** pereopod 3 **E** pereopod 4 **F** pereopod 5 **G** pereopod 6 **H** uropod. Scale bars equal 0.1mm for A–G; 0.01 mm for H.

(Fig. 3A') with strongly calcified inner margin; two small setae on ventral margin. Dactylus little longer than well-calcified unguis.

Pereopod 1 (Fig. 3B) coxa with one simple seta on dorsal margin; basis about as long as combined length of carpus and propodus, 5.3 times as long as wide. Ischium naked. Merus as long as carpus, naked. Carpus with two spines and one seta distally (Fig. 3B'). Propodus (Fig. 3'') 1.4 times as long as carpus, with two dorso-distal rod setae and one minute spine ventrally. Dactylus shorter than unguis.

Pereopod 2 (Fig. 3C–C'') similar to pereopod 1, but propodus (Fig. 3C'') with one rod seta dorso-distally.

Pereopod 3 (Fig. 3D) similar to pereopod 2, but merus with two minute distal spines ventrally, propodus without simple setae on the dorsal margin.

Pereopod 4 (Fig. 3E) basis broken; ischium with one simple seta, merus with two short spines disto-ventrally; carpus with one rod seta and spine distally, propodus with one simple seta distally, one spine ventrally and one fine seta in middle of dorsal margin; dactylus twice as long as unguis, curved.

Pereopod 5 (Fig. 3F) similar to pereopod 4, but ischium naked and carpus with three thick short distal spines.

Pereopod 6 (Fig. 3G) similar to pereopod 5, but propodus with four short simple setae distally.

Uropod (Fig. 3H) rudimentary; uniramous, basal article wider than long, embracing base of ramus article 1; article 2 rudimentary with one short and four long rod setae distally.

Distribution. The species was recorded from reefs around Lizard Island (north-eastern Australia) and Ningaloo Reef, (north-western Australia) in coral rubble and on dead heads of coral at depths down to 15 m.

Discussion

Metatanais bipunctatus sp. n., is the second species to be placed in this genus. The setation and ornamentation of the particular appendages is so similar that in the first glance both species could be easily classified as one species. Close examination of the morphology indicates they are separate species and their disjunctive distribution and different habitats support this observation. The characters pinpointed in the diagnosis are stable through the specimens and distinguish the new species from the *M. cylindricus*.

In general appearance the new species is more slender than *M. cylindricus*, which is three times as long as wide. This is explained by the carapace being longer than wide (as wider than long in *M. cylindricus*) and the relatively long first pereonite that is subequal to the sixth pereonite; Shino (1952) stated that the sixth pereonite in his species is shorter than the first. A size of an article (or segment) is often difficult to substantiate as a quantitative character. There is always a risk that the size can be distorted during ontogeny, by environmental conditions or is the effect of relaxation

of the individual that may either elongate or constrain its body. The last is less possible when an animal is more calcified, as in this case, but even so the flexible segment joints allow overlap of their edges, blurring their actual size; unfortunately the size often remains the only (or one of few) character between sister species (Błażewicz-Paszkowycz 2007).

The new species has a whitish, slightly transparent, glossy cuticle. The pigmentation only involves the eyes and the posterior edge of the carapace and the sixth pereonite where each bears an orange spot. The dark-pigmented eye has less pigment than is found in leptognathids, paratanaisids or nototanaisids, giving the impression that an eye is minute. This pigment however lasts reasonably long after preservation, while the orange pigment on the pereonites vanishes almost immediately after preservation in ethanol. Shiino (1952) stated that the specimens studied by him were whitish 'without developing any pigment except that of the eye'. It is unknown if he dealt with fresh material and how far we can rely on pigmentation as the character distinguishing both species.

Metatanais bipunctatus has been found in coral rubble and on dead coral heads on opposite sides of tropical Australia: Lizard Island, on the Great Barrier Reef (north-east) and Ningaloo Reef (north-west). This distribution is unusual, owing to the low mobility and lack of free-living larvae in tanaids, particularly in a genus such as *Metatanais*, which is without pleopods. A similar disjunctive distribution has been found in the unrelated paratanaisid *Bathytanais culterformis* (Larsen and Heard 2001), originally recorded from north-western Australia while Bamber (2008) later recorded the same species in Moreton Bay, southern Queensland. The tanaidacean fauna of the northern coasts of Australia, between these two regions, is very poorly known. It is possible that the western and eastern populations of *M. bipunctatus* represent two cryptic species, which can only be distinguished by molecular markers.

Acknowledgements

We are grateful to Julian Caley and Shawn Smith (Australian Institute of Marine Sciences) for the invitation to the CReefs Australia Program (Census of Marine Life) and for their great support in the field both under and above sea level. The CReefs Australia Project is generously sponsored by BHP Billiton in partnership with the Great Barrier Reef Foundation and the Australian Institute of Marine Science. CReefs is a field program of the Census of Marine Life.

Dr Hironori Komatsu (National Museum of Nature and Science, Tokyo) has kindly lent the holotype of *M. cylindricus*.

The research has been financed by EU Marie Curie Grant, OIF 040613-DiPoT.

References

- Bamber RN (2008) Tanaidaceans (Crustacea: Peracarida: Tanaidacea) from Moreton Bay, Queensland. In: Davie PJF, Phillips JA (Eds) Proceedings of the Thirteenth International Marine Biological Workshop, The Marine Fauna and Flora of Moreton Bay, Queensland. Memoirs of the Queensland Museum. Nature 54(1): 143–218.
- Bird GJ, Larsen K (in press). Tanaidacean Phylogeny: The second step. The basal Paratanaoidae families. *Arthropod Systematics and Evolution*.
- Błażewicz-Paszkowycz M (2007) A revision of the family Typhlotanaidae Sieg, 1984 (Crustacea: Tanaidacea) with the remarks on the Nototanaidae Sieg, 1976. *Zootaxa* 1598: 1–141.
- Błażewicz-Paszkowycz M, Poore GCB (2008) Observations on phylogenetic relationship in Paratanaoidea (Tanaidacea: Tanaidomorpha). *Advances in Crustacean Phylogenetics. International Symposium*, 7–11. X. 2008, Rostock, Germany: 68–69.
- Dana JD (1849) *Conspectus Crustaceorum*. Conspectus of the Crustacea of the Exploring Expedition. *American Journal of Science and Arts, Series 2*, 8: 424–428.
- Lang K (1949) Contribution to the systematics and synonymies of the Tanaidacea. *Arkiv för Zoologie* 42: 1–14.
- Lang K (1971) Taxonomische und phylogenetische Untersuchungen über die Tanaidaceen. 6. Revision der Gattung *Paranarthrura* Hansen, 1913, und Aufstellung von zwei neuen Familien, vier neuen Gattungen und zwei neuen Arten. *Arkiv för Zoologie, Series 2*, 23: 361–401.
- Larsen K, Shimomura M (2007) Tanaidacea (Crustacea: Peracarida) from Japan. II. Tanaidomorpha from the East China Sea, the West Pacific Ocean and the Nansei Islands. *Zootaxa* 1464: 1–43 .
- Larsen K, Wilson GDF (2002) Tanaidacean phylogeny, the first step: the superfamily Paratanaoidea. *Journal of Zoological Systematics and Evolutionary Research* 40: 205–222.
- Larsen K, Heard RW (2001) A new tanaidacean subfamily, Bathytanaidinae (Crustacea: Paratanaoidae), from the Australian continental shelf and slope. *Zootaxa* 19: 1–22.
- Larsen K (2003) Proposed new standardized anatomical terminology for the Tanaidacea (Peracarida). *Journal of Crustacean Biology* 23: 644–661.
- Sars GO (1882) Revision af grupper: Isopoda Chelifera med karakteristik af nye herhen hørende arter og slægter. *Archiv for Mathematik og Naturvidenskab* 7: 1–54
- Shino SM (1952) A new genus and two new species of the order Tanaidacea found at Seto. *Publications of the Seto Marine Biological Laboratory* II (2), article 4, 14–27.
- Sieg J (1976) Zum natürlichen System der Dikonophora Lang (Crustacea, Tanaidacea). *Zeitschrift für zoologischer Systematik und Evolutionsforschung* 14: 177–198.
- Sieg J (1980) Sind die Dikonophora eine polyphyletische Gruppe? *Zoologischer Anzeiger* 205: 401–416.
- Sieg J (1982) Über ein “connecting link” in der Phylogenie der Tanaidomorpha (Tanaidacea). *Crustaceana* 43 (1): 65–77.

Brucerolis gen. n., and *Acutiserolis* Brandt, 1988, deep-water southern genera of isopods (Crustacea, Isopoda, Serolidae)

Gary C.B. Poore^{1,†}, Melissa J. Storey^{1,2,‡}

1 Museum Victoria, GPO Box 666E, Melbourne, Victoria 3001 Australia **2** Museum Victoria and Zoology Department, The University of Melbourne, Vic. 3010, Australia (present address: CSIRO Publishing, Collingwood, Vic. 3066, Australia)

† [urn:lsid:zoobank.org:author:C004D784-E842-42B3-BFD3-317D359F8975](https://doi.org/10.3897/zookeys.18.129)

‡ [urn:lsid:zoobank.org:author:12DFCE9E-455F-4BC5-B201-D48668D6D23C](https://doi.org/10.3897/zookeys.18.129)

Corresponding author: Gary C.B. Poore (gpoore@museum.vic.gov.au)

Academic editor: Niel Bruce | Received 19 December 2008 | Accepted 19 January 2009 | Published 24 August 2009

[urn:lsid:zoobank.org:pub:3C3956F9-1565-4C0F-B3E7-9FECD0DE6CEF](https://doi.org/10.3897/zookeys.18.129)

Citation: Poore GCB, Storey MJ (2009) *Brucerolis* gen. n., and *Acutiserolis* Brandt, 1988, deep-water southern genera of isopods (Crustacea, Isopoda, Serolidae). In: Bruce N (Ed) Advances in the taxonomy and biogeography of Crustacea in the Southern Hemisphere. ZooKeys 18: 143–160. doi: 10.3897/zookeys.18.129

Abstract

Acutiserolis Brandt is rediagnosed (coxal dorsal plates 2–5 slot into each other with no aperture between; coxal plate 6 has a blunt process on its anterior margin slotting into a groove on coxa 5 and isolating an oval aperture; with prominent middorsal pereonal and pleonal spines; pleotelson with a sharp middorsal keel, upturned posteriorly; and sharply defined longitudinal sublateral keels ending acutely) and confined to the type species, *Serolis spinosa* Kussakin, 1967, and two species of *Cuspidoserolis* Brandt, 1988 **syn. n.** *Brucerolis* gen. n., (type species *Brucerolis nowra* sp. n.) is erected for species previously assigned to *Acutiserolis* but from which it differs in having the coxal dorsal plates 2–6 interacting only by means of key-like lobes, coxal plate 6 exceeding the pleotelson by at least the pleotelson length, middorsal spines being absent or obscure, and the pleotelson lacking ridges and keels. Four other species are included: *Brucerolis bromleyana* (Willemoes-Suhm, 1876); *B. cidaris* (Poore & Brandt, 1997); *B. macdonnellae* (Menzies, 1962); and possibly *B. maryannae* (Menzies, 1962).

Keywords

Crustacea, Isopoda, Serolidae, *Acutiserolis*, *Brucerolis*, *Cuspidoserolis*, new genus, new species, synonymy, Southern Ocean, Australia

Introduction

Brandt (1988) described the new genus *Acutiserolis* Brandt, 1988 and nominated *Serolis spinosa* Kussakin, 1967 as type species. She included *Serolis bromleyana* Willemöes-Suhm, 1876, *S. macdonnellae* Menzies, 1962, *S. maryannae* Menzies, 1962, and *S. neaera* Beddard, 1884a as other members.

During preparation of descriptions of numerous new species of “*Acutiserolis*” with extremely long, attenuating, posteriorly directed coxae and epimera, Niel Bruce suggested to us that substantial differences existed between these and the type species of *Acutiserolis*, *S. spinosa*. Brandt (1988) did not examine the type material of *S. spinosa* during her revision, nor did others who have adopted her revision (e.g., Wägele 1994; Poore and Brandt 1997; Held 2000). Topotypical specimens of *Acutiserolis spinosa* have been recently collected by New Zealand’s National Institute of Water and Atmosphere (NIWA) in the Ross Sea, Antarctica. These were made available to us by Niel Bruce and the differences between this and the other species are clearly apparent.

In this contribution, *Acutiserolis* and a new genus and species, *Brucerolis nowra*, are diagnosed. A supplementary description and illustrations of *A. spinosa* are presented. The diagnosis is modelled on the characters used for example by Wägele (1994) and Poore and Brandt (1997). In a subsequent paper we describe five more species of *Brucerolis* (Storey and Poore in press) from southeastern Australia.

The mouthparts, pereopods and pleopods of the two genera are very much alike, differing only slightly in proportions. Salient features that distinguish *Brucerolis* from *Acutiserolis* and from other genera are included in the generic diagnoses. The diagnoses and descriptions were prepared using a DELTA database (Dallwitz et al. 1993). Type material is lodged in Museum Victoria, Melbourne (NMV) and the National Institute of Water and Atmosphere, Wellington, New Zealand (NIWA).

Acutiserolis Brandt, 1988

Acutiserolis Brandt, 1988: 21.– Brandt 1991: 131, 138–139.

Serolis (*Acutiserolis*).– Wägele 1994: 53, 59.

Not *Acutiserolis*.– Poore and Brandt 1997: 152 (= *Brucerolis* gen. nov.)

Cuspidoiserolis Brandt, 1988: 23.– Brandt 1991: 131, 138–139. – Wägele 1994: 52, 59–60 (type species: *Serolis luethjei* Wägele 1986 by original designation) syn. n.

Type species. *Serolis spinosa* Kussakin, 1967 by original designation.

Diagnosis. Body deeply incised between extremely long, attenuating, posteriorly directed coxal and epimeral plates; middorsal line dominated by strong middorsal spine (prominent in lateral view) on posterior margin of head, pereonites 2–4 and pleonites 1–3. Pereonite 6 to pleonite 1 fused middorsally and midventrally. Eyes contiguous with head margin posteriorly, 3 times as long as wide, with concave mesial margin. Coxal dorsal plates 2–4 delimited from tergite by suture; coxal dorsal plates 2–5 with

proximal anterior margins straight, slotting into grooves on preceding coxae, with no aperture between; coxa 6 with blunt process on anterior margin slotting into groove on coxa 5 and isolating an oval aperture. Pleotelson with sharp middorsal keel, upturned posteriorly; dorsal surface with sublateral sharply defined longitudinal keels ending acutely, and obscure irregularities along a submarginal posterolateral ridge. Pereonal sternite 1 with defined blunt medial lobe anteriorly and saddle posteriorly; ventral coxal plates 2–4 meeting in midline, with pair of contiguous teeth on anteromesial corners of sternites 2, smaller pair on sternites 3; pleonal sternites 1–3 with acute posterior ridged margin. Antenna 2 article 5 about 10 times as long as wide. Mandible, incisor smooth, chitinised, hoof-like; left lacinia mobilis expanded, half as wide as mandibular incisor; right lacinia mobilis diverging, with obsolete apical dentition; spine simple; mandibular palp, article 2 with row of setae confined distally along mesial margin. Maxilla 1 inner lobe a simple expanded plate, outer lobe with ~11 robust terminal setae. Maxilla 2 inner lobe broad, distally richly setose, middle and lateral lobes each with 2 apical setae. Maxilliped, endite with 2 strong distal robust setae; maxillipedal palp of 3 articles; palp article 2 distally dilated, distomesially lobed, with shallow indentation on mesial margin separating two clusters of setae; epipod more or less semicircular. Pereopod 1, palm of propodus with alternating flagellate cylindrical setae and flagellate plate-like setae. Pereopod 2 of male subchelate; palm of propodus with robust setae surrounding an oval palm; dactylus with small terminal unguis. Pereopod 7 of male sexually differentiated, propodus broader than in female, with felt of fine scale setae, dactylus simple, curved. Pleopod 4 endopod simply triangular, not bilobed. Uropod biramous, inserting sublaterally at about midpoint of pleotelson. Oostegites of female present on pereopods 1–4.

Included species (all originally described in *Serolis*).

Acutiserolis spinosa (Kussakin 1967) – Ross Sea, Antarctica, 500–900 m

A. gerlachei (Monod, 1925) comb. n. – Bellingshausen Sea, Antarctica, 400 m (Monod 1926).

A. johnsoni (Hale 1952) comb. n. – Eastern Antarctica, 540–2267 m (Kussakin 1967).

A. luethjei (Wägele 1986) new combination – Weddell Sea, 189–481 m.

Remarks. The most significant features of *Acutiserolis* are: coxal dorsal plates 2–5 slot into each other with no aperture between; coxal plate 6 has a blunt process on its anterior margin slotting into a groove on coxa 5 and isolating an oval aperture; prominent middorsal pereonal and pleonal spines; pleotelson with a sharp middorsal keel, upturned posteriorly; and sharply defined longitudinal sublateral pleotelson keels ending acutely.

Brandt (1988) relied on the extreme length of the coxal plates and pleonal epimera to characterise *Acutiserolis* but in our opinion this was unwarranted. Coxal plate 6 of *Acutiserolis spinosa* exceeds the pleotelson by one-third its length whereas in the remaining species included, the overlap of coxa 6 is at least as great as the pleotelson length and usually much greater. *Acutiserolis spinosa* is more similar to species of *Cuspidoserolis* Brandt, 1988 in this and other features than to the other species in-

cluded by Brandt (1988) and Wägele (1994) in *Acutiserolis*. Brandt (1988) agreed that the two genera were similar in having long coxal dorsal plates and pleonal epimera although none overlap the pleotelson in *Cuspidoserolis*. The distinguishing feature of *Cuspidoserolis*, according to Brandt, is the elongate spine on the posterior margin of the head but this is found also in *A. spinosa* (fig. 1). She treated the two genera as sister taxa sharing a middorsal spine on the head in a phylogenetic analysis (Brandt, 1991) but this is not true of the species we remove to *Bruceerolis*. The type species of *Cuspidoserolis*, *Serolis luethjei* Wägele, 1986, differs from *A. spinosa* only in having a more rugose surface and more compact coxal plates and epimera. It shares prominent middorsal spines, ridges on pereonite 1, medial and sublateral keels on the pleotelson, and similar male pereopods 2 and 7. Brandt (1988) also included in *Cuspidoserolis*, *Serolis gerlachei* Monod, 1925 (illustrated by Monod 1926) and *S. johnsoni* Hale, 1952. They too have a long middorsal posterior spine on head, coxal plates contiguous proximally, middorsal pleotelson keel and similar sublateral keels on the pleotelson. All three differ from *A. spinosa* only in having coxal plate 6 not reaching beyond the end of the pleotelson. Other authors have remarked on these similarities: Hale (1952) remarked on similarities between his *S. johnsoni* and *S. gerlachei*; Kussakin (1967) likened *S. spinosa* to *S. johnsoni*. Brandt remarked on the extreme length of the pleotelson of *Cuspidoserolis*, being about as long as wide, but this is true too of all species of *Acutiserolis* and *Bruceerolis*.

In his phylogenetic analysis of the family, Wägele (1994) placed *Cuspidoserolis* and what he called *Serolis* (*Acutiserolis*) in sister-clades. The clade containing *Cuspidoserolis* was characterised by a sexually dimorphic pereopod 7, the male having broader and finely setose articles than the female. However, this is true too of *Acutiserolis* and *Bruceerolis*. The apomorphies of the sister clade (dealing with male pereopod 2, pleopod 4 and coxal plates) are equally unconvincing. Held's molecular analysis placed two species of *Cuspidoserolis* (*C. luethjei* and *C. johnsoni*) close together and close to "*Acutiserolis bromleyana*".

We conclude that *Cuspidoserolis* is a junior synonym of *Acutiserolis* which now includes its type species plus the three species of *Cuspidoserolis*. We assign other species previously included in *Acutiserolis* to *Bruceerolis*.

***Acutiserolis spinosa* (Kussakin, 1967)**

Figs 1a-f; 2–4

Serolis spinosa Kussakin 1967(1968): 247–249, figs 15, 16.

Acutiserolis spinosa.— Brandt 1988: 21.

Serolis (*Acutiserolis*) *spinosa*.— Wägele 1994: 53.

Material examined. Ross Sea, Antarctica (65.4755°S, 161.0480°E–65.4828°S, 161.0458°E), 760–750 m, 7 Mar 2004, (NIWA stn TAN0402/269), NIWA 23526 (figured male, 34 mm; ovigerous female, 30 mm; 2 juvenile males, 25 and 29 mm;

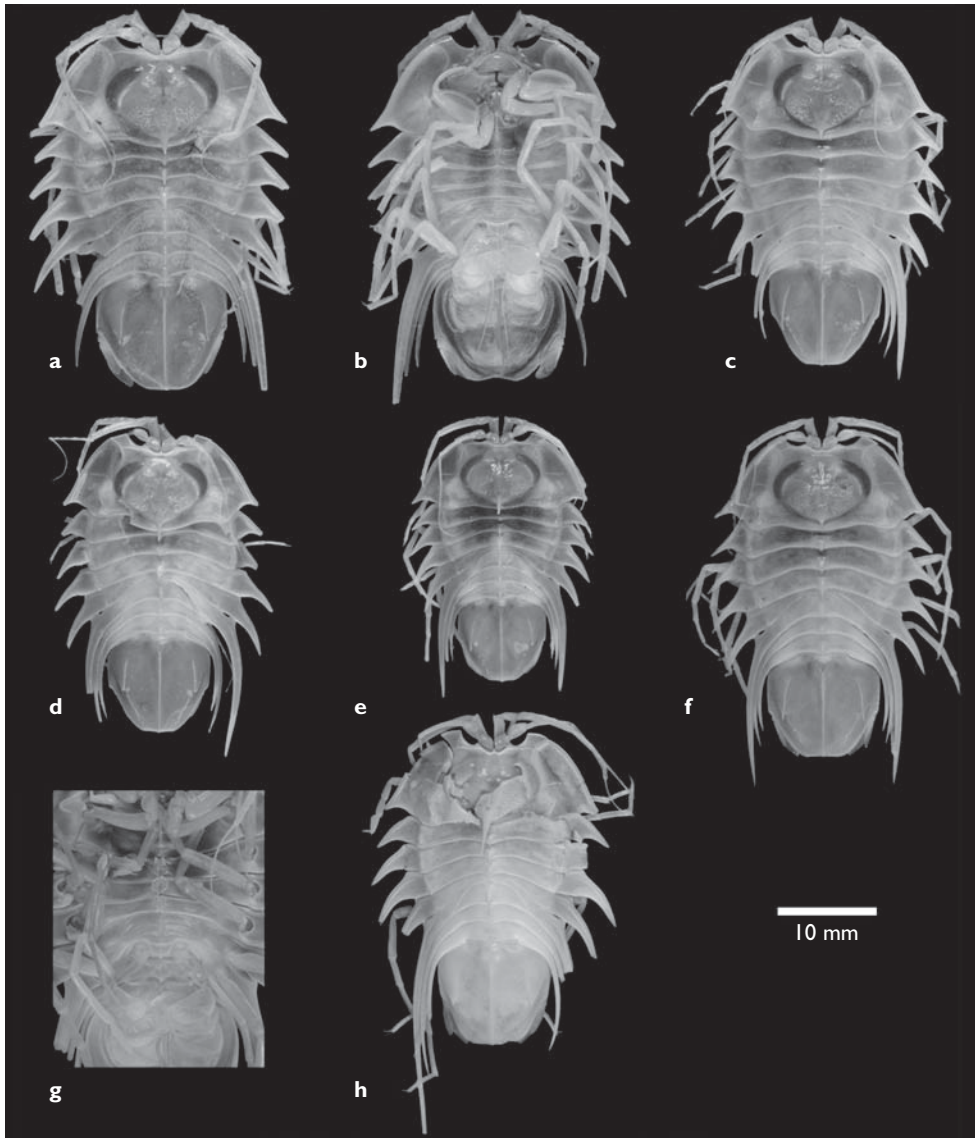


Figure 1. Photographs of preserved material. *Acutiserolis spinosa* (Kussakin, 1967). **a, b** figured male (34 mm) **c** ovigerous female (32 mm) **d** ovigerous female (30 mm) **e** juvenile male (29 mm) **f** ovigerous female (31 mm). **a, b, d, e** from NIWA 23526 **c** from NMV J58091 **f** from NIWA 24311. *Acutiserolis* sp. **g, h** male (31 mm), NIWA 31205. Scale bar referable to all except **g**.

juvenile female, 28 mm), NIWA 24311 (ovigerous female, 31 mm), NMV J58091 (ovigerous female, 32 mm).

Type material. Region of Scott Island, East Antarctica, 500–900 m (*Ob* stn 377), Zoological Institute, St Petersburg, Russia, 1/46416 (holotype, male, 32 mm), plus 2 female paratypes (none examined).

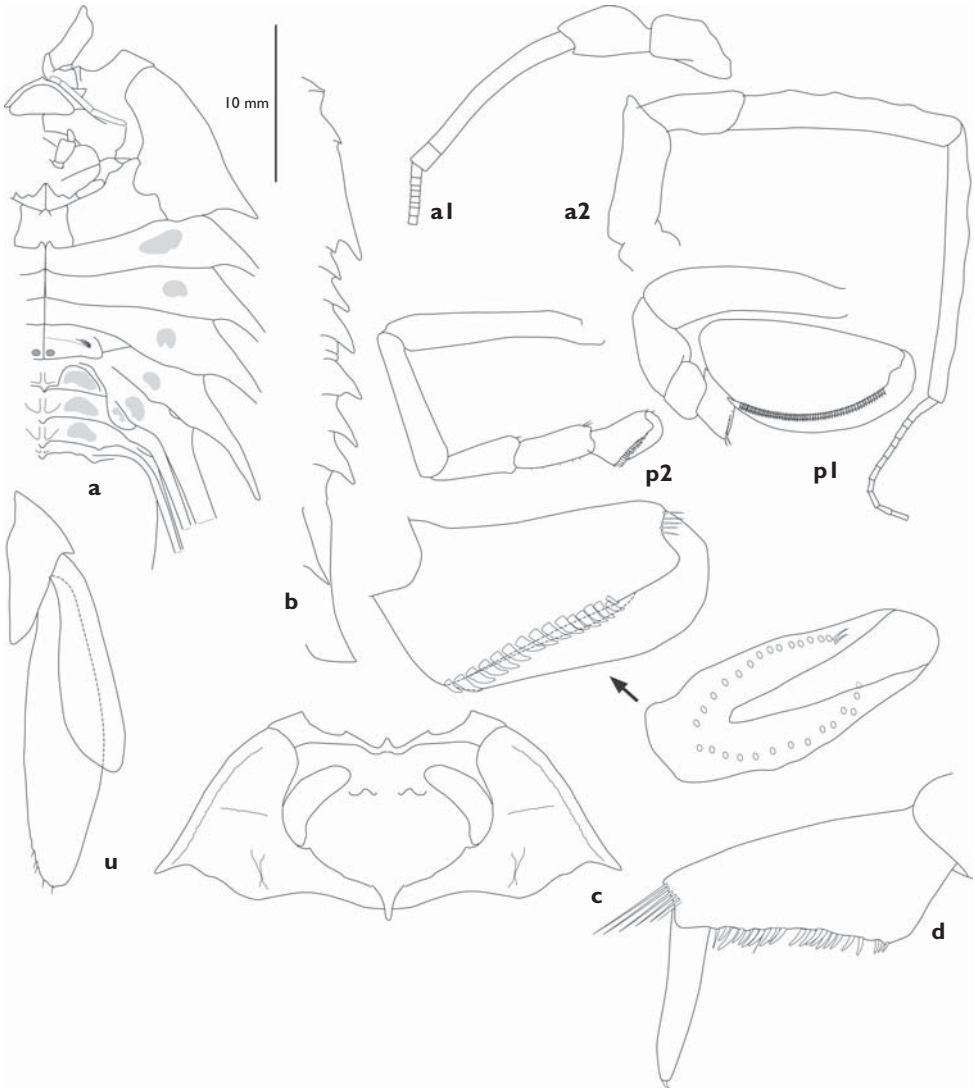


Figure 2. *Acutiserolis spinosa* (Kussakin, 1967), male (34 mm) from NIWA 23526. **a** ventral view **b** lateral profile **c** head **a1, a2** antennae 1, 2 **p1, p2** pereopods 1, 2 with detail of propodus and dactylus in lateral and face views; **u**, uropod. *Acutiserolis* sp., male (31 mm), NIWA 31205 **d** propodus and dactylus of pereopod 2.

Description. Body length of figured male 34 mm. Body 1.2 times as long as greatest width (at coxae 3). Dorsal surface smooth. Head, anterolateral margins convex and continuous with anterior margin of pereonite 1; maximum width between anterolateral corners 1.1 times as wide as span between lateral margins of eyes; head without paired processes on transverse ridge at bases of antennae 1, with pair of bilobed tubercles between anterior part of eyes, with acute median posterior tubercle extending past pereonite 1, with obscure lobes lateral to median posterior tubercle. Pereonite 1

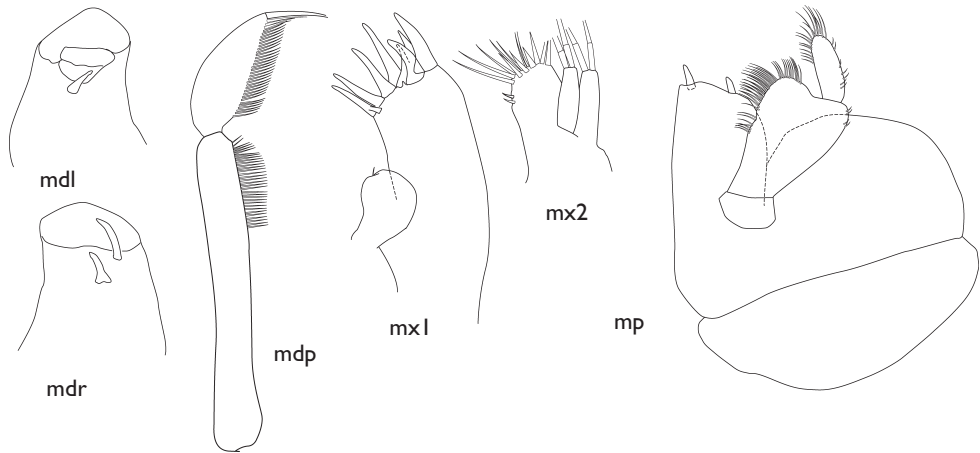


Figure 3. *Acutiserolis spinosa* (Kussakin, 1967), male (34 mm) from NIWA 23526. **mdl, mdr** mandible incisor, lacinia mobilis and spine, left and right **mdp** mandibular palp, distal articles **mx1, mx2** maxillae 1, 2 **mp** maxilliped.

of male, lateral margin gently sinuous, 1, lateral margin upturned over anterior half, with sharply-crested submarginal ridge parallel to margin, dorsal surface with oblique transverse ridge reaching near margin. Coxal dorsal plate 2 of male 0.5 times as long as half pereonal tergite 2 width (following plates increasing in length); plate 4 of male as long as half pereonal tergite 4 width; plate 6 of male extending beyond tip of pleotelson by 0.3 times middorsal length of pleotelson; pleonal epimeron 2 of male 0.9 times length of pleotelson; pleonal epimeron 3 of male 0.8 times length of pleotelson; pleonal epimera 2 and 3 with acute apices.

Antenna 1 peduncle articles 3+4 as long as article 2 (anterior margin); flagellum with about 54 articles, at least 3 times as long as peduncle article 3+4 (in male), reaching anterior margin on pereonite 4. Antenna 2 peduncle article 5 1.25 times as long as article 4; flagellum of 18 articles, at least 1.2 times as long as peduncle article 5.

Pereopod 1 propodus 2.2 times as long as greatest width. Pereopod 2 palm dorsal length 2.2 times greatest width, straight, sharply angled at free proximal margin, with 28 spiniform setae surrounding an oval palm. Pereopod 5 of male basis 5 times as long as greatest width, with a keel on the extensor margin, more prominent proximally; merus without setae; carpus 5.5 times as long as greatest width; propodus 6.5 times as long as greatest width; dactylus curved, 0.3 times as long as propodus. Pereopod 6 of male merus sparsely setose, carpus 7 times as long as greatest width; propodus 10 times as long as greatest width; dactylus curved, 0.25 times as long as propodus. Pereopod 7 of male carpus 4 times as long as greatest width (at distal end); propodus 4.5 times as long as greatest width, propodus tapering from base, lower margin gently convex; dactylus curved, 0.15 times as long as propodus.

Pleopod 2 endopod with evenly tapering distal angle bearing appendix masculina; appendix masculina 3.8 times as long as straight margin of endopod. Uropodal rami with rounded apices; exopod 0.7 length of endopod.

Female. Pereonite 1, lateral margin of female as in male. Coxal dorsal plate 2 of female 0.5 times as long as half pereonite 2 width; plate 4 of female 0.7 times as long as half pereonite 4 width (following plates increasing in length); plate 6 of female extending beyond tip of pleotelson by 0.3 times middorsal length of pleotelson.

Distribution. Ross Sea, Antarctica; 500–900 m.

Remarks. The new material is clearly referable to Kussakin's species but illustrates some variability, mostly attributed to differences between sexes. Males, in different

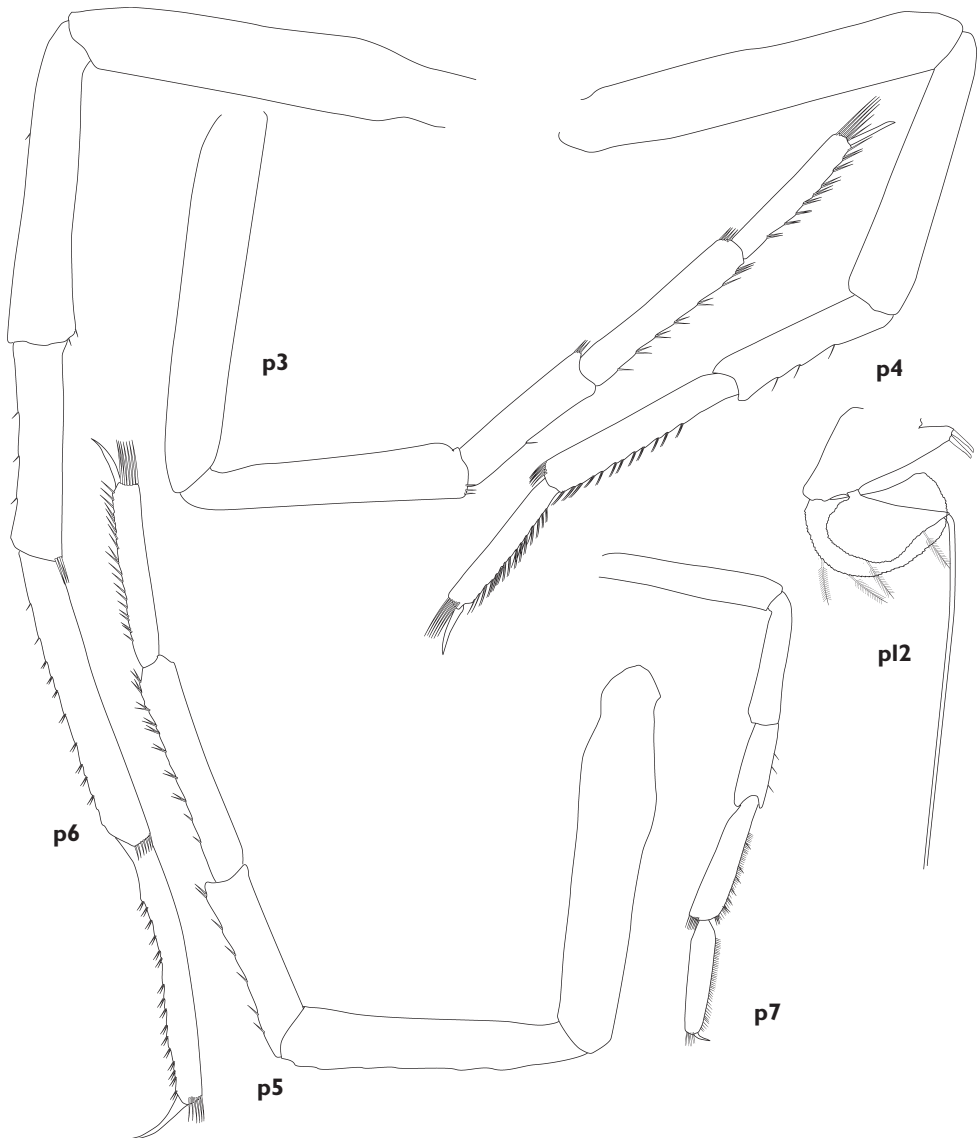


Figure 4. *Acutiserolis spinosa* (Kussakin, 1967), male (34 mm) from NIWA 23526. **p3-p7** pereopods 3–7 **pl2** pleopod 2.

stages of development, range in size from 25 to 34 mm long (figs 1a, b, e). All possess differentiated pereopods 2 and 7 and the smallest lacks an appendix masculina. In the 29-mm specimen, the appendix masculina is only half the length of that in the 34-mm specimen. In all males, the posterolateral oblique rugosity on the pleotelson is poorly developed. The head spine of males reaches about half the length of pereonite 2. The 28-mm female has oostegite buds whereas the others, 30–32 mm, are ovigerous. Dorsal coxal plates are slightly shorter in females. In females, the posterolateral oblique rugosity on the pleotelson is a more well-defined ridge than in the male. In two of the females (figs 1c, d), the posterior spine on the head barely reaches the posterior margin of pereonite 1 whereas in the other (fig. 1d) it reaches the posterior margin of pereonite 2.

Kussakin's illustration (1968: fig. 15) of the male holotype shows a slightly longer coxal plate 6 than in the male figured here.

Acutiserolis sp.

Figs 1g, h; 2d

Material examined. E of South Island, New Zealand (45.0170°S, 177.4617°E to 45.0095°S, 177.4532°E), 2039–1995 m, 6 May 2003 (NIWA stn TAN0307/98), NIWA 31205 (male, 31 mm).

Remarks. A single male collected at a much lower latitude than *A. spinosa* is similar to the Ross Sea specimens. Key features of the coxal plates, middorsal and pleotelson sculpture, and armature of coxal ventral plates 2 and 3 and pleonal sternites are for all practical purposes indistinguishable. However, the spine on the head is considerably longer than in *A. spinosa*, reaching to the posterior margin of pereonite 3. Coxal plate 6 exceeds the pleotelson by slightly more than its length, further than in *A. spinosa*. Pleonal epimera 2 and 3 are similarly longer. While the male pereopod 2 propodus of the two species has similar numbers of robust palmar setae, the propodus of the New Zealand specimen is more elongated than in *A. spinosa* (fig. 2d). In the absence of a larger sample and specimens from intermediate localities we are reluctant to describe this as a new species.

Brucerolis gen. n.

urn:lsid:zoobank.org:act:FC4BEA04-0350-49E1-8FA3-01AF4DBB7186

Type species. *Brucerolis nowra*, sp. n. here designated.

Diagnosis. Body deeply incised between extremely long, attenuating, posteriorly directed coxal and epimeral plates; middorsal line without midposterior processes, not elevated in lateral view, or with short triangular middorsal processes on posterior margin of head, pereonites 2–4 and pleonites 1–3, evident in lateral view. Pereonite 6 to pleonite 1 fused middorsally and midventrally. Eyes contiguous with head margin posteriorly, twice as long as wide, reniform. Coxal dorsal plates 2–4 delimited from tergite

by suture; coxal dorsal plates 2–6 with anterior blunt process slotting into groove on preceding coxae, isolating an oval aperture between coxae; coxal plate 5 with an intermediate anterior process meeting a similar posterior process on coxal plate 4, so subdividing intercoxal aperture. Pleotelson with horizontal obscure middorsal keel; dorsal surface with flattened plate-like ridges laterally, with rounded ends. Pereonal sternite 1 with sharp medial ridge anteriorly and saddle posteriorly; ventral coxal plates 2–4 meeting in midline, without pair of contiguous teeth on anteromesial corners of sternites 2, smaller pair on sternites 3; pleonal sternites 1–3 with acute posterior ridged margin. Antenna 2 article 5 about 10 times as long as wide. Mandible, incisor smooth, chitinised, hoof-like; left lacinia mobilis expanded, half as wide as mandibular incisor; right lacinia mobilis diverging, with obsolete apical dentition; spine simple; mandibular palp, article 2 with row of setae confined distally along mesial margin. Maxilla 1 inner lobe a simple expanded plate, outer lobe with ~11 robust terminal setae. Maxilla 2 inner lobe broad, distally richly setose, middle and lateral lobes each with 2 apical setae. Maxilliped, endite with 2 strong distal robust setae; maxillipedal palp of 3 articles; palp article 2 distally dilated, distomesially lobed, with shallow indentation on mesial margin separating two clusters of setae; epipod more or less semicircular. Pereopod 1, palm of propodus with alternating flagellate cylindrical setae and flagellate plate-like setae. Pereopod 2 of male subchelate; palm of propodus with U-shaped row of robust setae; dactylus with small terminal unguis. Pereopod 7 of male sexually differentiated, propodus broader than in female, with felt of fine scale setae, dactylus simple, curved. Pleopod 4 endopod simply triangular, not bilobed. Uropod biramous, inserting sublaterally at about midpoint of pleotelson. Oostegites of female present on pereopods 1–4.

Included species (see too Remarks below).

Brucerolis bromleyana (Willemöes-Suhm, 1876) (ex. *Serolis*) comb. n. – Southern Ocean (Indian Ocean sector), 3614 m depth.

B. cidaris (Poore & Brandt, 1997) (ex. *Acutiserolis*) comb. n. – Coral Sea, 891–1491 m depth.

B. macdonnellae (Menzies, 1962) (ex. *Serolis* (*Serolis*)) comb. n. – South Atlantic, 2741 m depth.

?*B. maryannae* (Menzies, 1962) (ex. *Serolis* (*Serolis*)) comb. n. – South Atlantic, 3839 m depth.

B. nowra sp. n. – south-eastern Tasman Sea, 450–1750 m depth.

Etymology. Named for Niel Bruce, Museum of Tropical Queensland, Townsville, formerly of National Institute of Water and Atmosphere, Wellington, in recognition of his extensive contribution to isopod taxonomy and his friendship.

Remarks. *Acutiserolis* is diagnosed above and *Cuspidoiserolis* is placed in synonymy. *Brucerolis* differs from *Acutiserolis* in having the coxal dorsal plates 2–6 interacting only by means of key-like lobes, coxal plate 6 exceeding the pleotelson by at least the pleotelson length, middorsal spines absent or obscure, and the pleotelson lacking ridges and keels. All are clearly distinctive autapomorphies different from *Acutiserolis* and *Cuspidoiserolis*.

Brandt (1988) listed five species and Wägele (1994) seven in *Acutiserolis*; another has been described since (Poore and Brandt 1997). All except the type species

are excluded from *Acutiserolis* above and are candidates for inclusion in the new genus, *Brucerolis*.

Serolis bromleyana Willemöes-Suhm, 1876 and *Acutiserolis cidaris* Poore and Brandt, 1997, both illustrated in detail by Poore and Brandt (1997), conform well to the generic definition of *Brucerolis* and are here transferred to join the type species. The illustrations of *Serolis (Serolis) macdonnellae* Menzies, 1962 show the coxal keys, pereonite 1 and pleotelson in sufficient detail to be confident that this too belongs to *Brucerolis*. *Serolis (Serolis) maryannae* Menzies, 1962 has the general habitus, pleotelson sculpture, elongate bifid pleonal epimera, and acute coxal dorsal plates of *Brucerolis* and pereonite 1 like *B. bromleyana*, but coxal keys were not shown in the illustration. If this is an oversight by Menzies or a juvenile feature, the 18.8-mm female would be the smallest individual of the genus known. The species is a possible member of *Brucerolis*. All others listed previously in *Acutiserolis* are not.

Serolis gracilis Beddard, 1884 and *S. neaera* Beddard, 1884 are similar to each other (Beddard, 1884b) and superficially to species of *Brucerolis*, sharing acute tapering coxae, elongate coxa 6, prominent interacting coxal keys and notched article 2 of the maxillipedal palp, but there are several important differences. The anterolateral margin of the head is concave in species of *Brucerolis*, but in *Serolis gracilis* and *S. neaera* the anterior margin of the head is strongly convex and the anterolateral corners of the head extend much further laterally than the eyes. The pleotelson of *S. gracilis* and *S. neaera* are as in *Acanthoserolis* Brandt, 1988 (type species: *Serolis polaris* Richardson, 1911) with a proximal, acute spine middorsally and a median transverse ridge produced into acute spines middorsally and midlaterally, and uropods that insert on the pleotelson terminally and point mesially. We examined *S. schythei* Lütken, 1858 (included in *Acanthoserolis* by Brandt and Wägele and similar to *S. polaris*) from the collections of Museum Victoria. Both species lack elongate coxal plates and share a bilobed endopod on pleopod 4. Beddard's (1884b) descriptions and figures and our own examination of material of *Serolis gracilis* and *S. neaera* demonstrate many differences from *Acutiserolis*, *Brucerolis* and *Acanthoserolis*. *Serolis neaera* and *S. gracilis* have a dense mat of plumose setae on the male pereopod 2 whereas the three genera are scarcely setose. The endopod of pleopod 4 is bilobed in *Serolis paradoxa* Fabricius, 1775, *Acanthoserolis schythei*, *A. polaris*, *Serolis neaera* (Nordenstam, 1933) and *S. gracilis* (Beddard, 1884b), earlier observations confirmed by us. The endopod of pleopod 4 is not bilobed in *Acutiserolis* or *Brucerolis*.

Moreira (1977) discussed the resemblance of his species, *S. insignis*, included in *Acanthoserolis* by Wägele (1994), to *Serolis gracilis*. These two and *S. neaera* are clearly related but their generic placement remains problematic.

Serolis margaretae Menzies, 1962 was included in *Acutiserolis* by Brandt (1991) and Wägele (1994). We agree with Poore and Brandt's (1997) conclusion that the very small (8.4 mm and smaller) type specimens without elongate coxal plates and epimera could not be assigned to *Acutiserolis*. Nor do they conform to *Brucerolis*.

Held's (Held 2000; Held and Wägele 2000; Held 2001) observations on the relationships of *Acutiserolis* derived from molecular analyses (using the species *A. bromleyana*) refer to *Brucerolis*.

***Brucerolis nowra* sp. n.**

urn:lsid:zoobank.org:act:08D13D62-2FEA-4806-91FF-D3E40CB76E11

Figs 5–8

Material examined. Holotype. Australia, NSW, off Nowra ($34^{\circ}58.24'S$ - $34^{\circ}56.24'S$, $151^{\circ}23.12'E$ - $151^{\circ}29.06'E$), 1750 m, Museum Victoria party on RV *Franklin*, 16 Jul 1986, epibenthic sled (stn SLOPE 15), NMV J58261 (male, 31 mm).

Paratypes. Type locality, NMV J55674 (male, 26 mm; ovigerous female, 27 mm), NMV J19213 (15 males, 25–29 mm, 11 juveniles, 15–22 mm), NIWA 49331 (2 males, 2 juveniles). Off Nowra ($34^{\circ}57.36'S$ - $34^{\circ}52.48'S$, $151^{\circ}16.12'E$ - $151^{\circ}18.36'E$), 1402 m, Museum Victoria party on RV *Franklin*, 16 July 1986, epibenthic sled (stn SLOPE 11), NMV J15723 (male, 27 mm; ovigerous female, 25 mm; juvenile female,

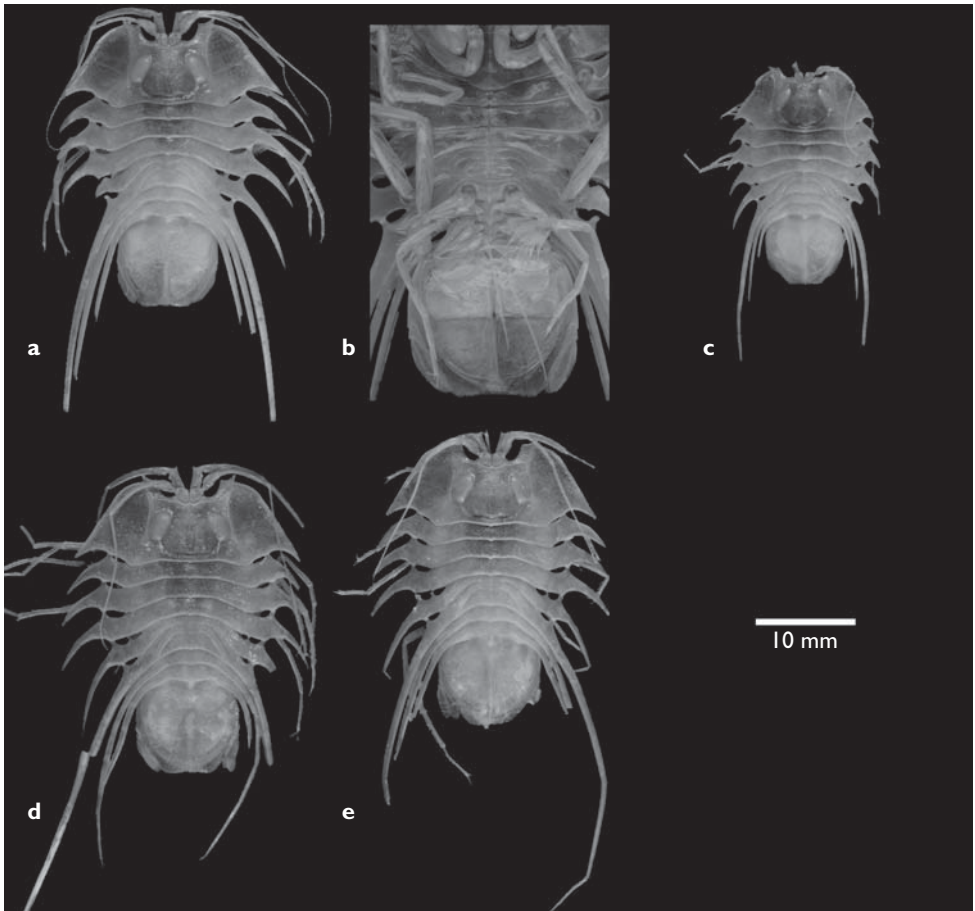


Figure 5. Photographs of preserved material. *Brucerolis nowra*, sp. n. **a, b** male (26 mm) NMV J15723 **c** paratype juvenile female (20 mm) NMV J15723 **d** holotype male (31 mm) NMV J58261 **e** paratype male (26 mm) NMV J55674. Scale bar referable to all except b.

20 mm). 52 km ENE of Nowra ($34^{\circ}43.33'S$ - $34^{\circ}43.44'S$, $151^{\circ}13.10'E$ - $151^{\circ}12.13'E$), 450 m, Museum Victoria party on RV *Franklin*, 22 Oct 1988, epibenthic sled (stn SLOPE 57), NMV J19210 (damaged ovigerous female, 24 mm).

Description. Body length 31 mm (holotype). Body as long as greatest width (at coxae 3). Middorsal line with short triangular middorsal processes on posterior mar-

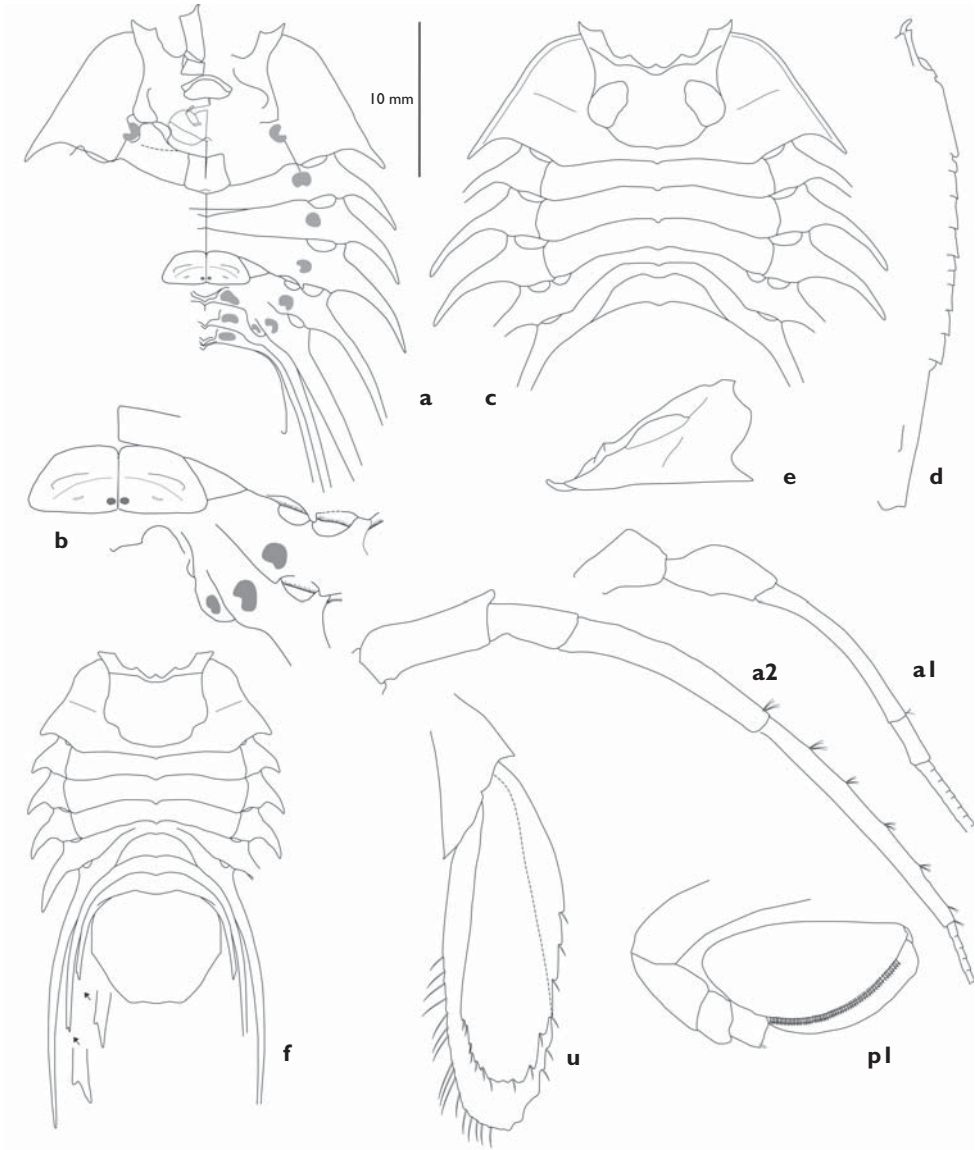


Figure 6. *Brucerolis nowra*, sp. n., holotype male (31 mm) NMV J58261. **a, b** ventral views **c** dorsal view **d** lateral profile **e** lateral view of head **a1, a2** antennae 1, 2 **pl** pereopods 1 **u** uropod. Paratype juvenile female (20 mm) NMV J15723. **f**, dorsal view (partial reconstruction from two sides).

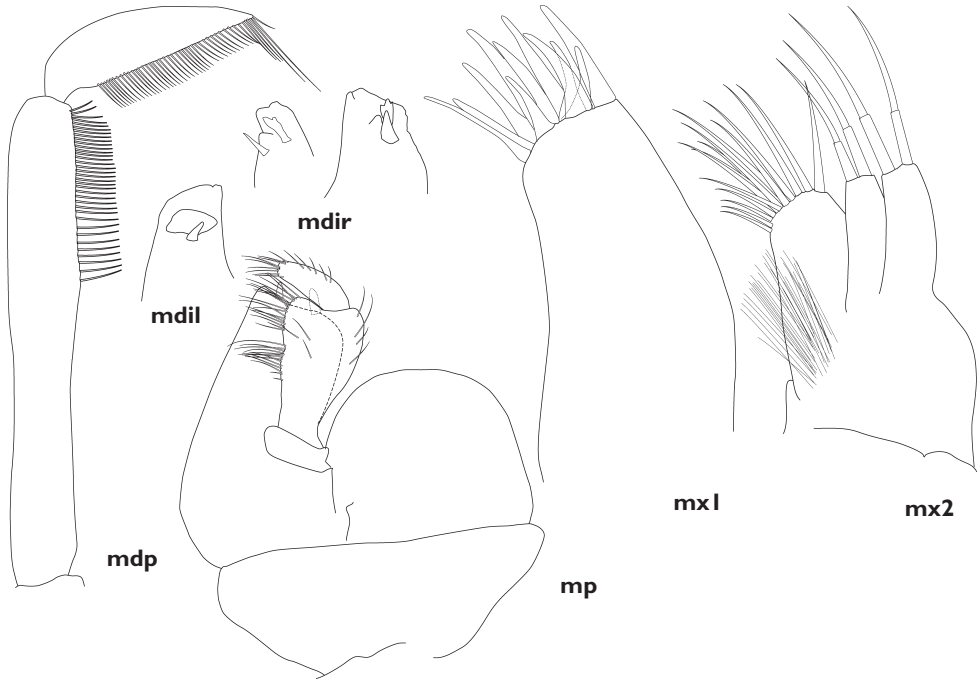


Figure 7. *Brucerolis nowra*, sp. n., holotype male (31 mm) NMV J58261. **mdl**, **mdr** mandible incisor, lacinia mobilis and spine, left and right **mdp** mandibular palp, distal articles **mx1**, **mx2** maxillae 1, 2 **mp** maxilliped.

gin of head, pereonites 2–4 and pleonites 1–3, evident in lateral view; dorsal surface punctate. Head, anterolateral margins concave, lateral corners acute and strongly projecting anteriorly and dorsally; maximum width between anterolateral corners 1.1 times as wide as span between lateral margins of eyes; head without paired processes on transverse ridge at bases of antennae 1, with obsolete paired tubercles between eyes, without median posterior tubercle, with obscure lobes lateral to median posterior tubercle. Pereonite 1 of male, lateral margin convex anteriorly, straight over most of length, lateral margin upturned over anterior half, with sharply-crested submarginal ridge parallel to margin, dorsal surface with oblique-transverse ridge reaching near margin, otherwise unornamented. Coxal dorsal plate 2 of male 0.8 times as long as half pereonal tergite 2 width (following plates increasing in length); plate 4 of male as long as half pereonal tergite 4 width; plate 6 of male extending beyond tip of pleotelson by 2.3 times middorsal length of pleotelson, the pair diverging over entire length, curving evenly; pleonal epimeron 2 of male 1.5 times length of pleotelson; pleonal epimeron 3 of male length of pleotelson; pleonal epimera 2 and 3 with assymmetrically emarginate apices. Ventral coxal plates 2–4 with transverse ridges on mesial, anterior and posterior margins outlining a transverse depression.

Antenna 1 peduncle articles 3+4 2.1 times as long as article 2 (anterior margin); flagellum with about 45 articles, 3.5 times as long as articles 3+4, reaching back to

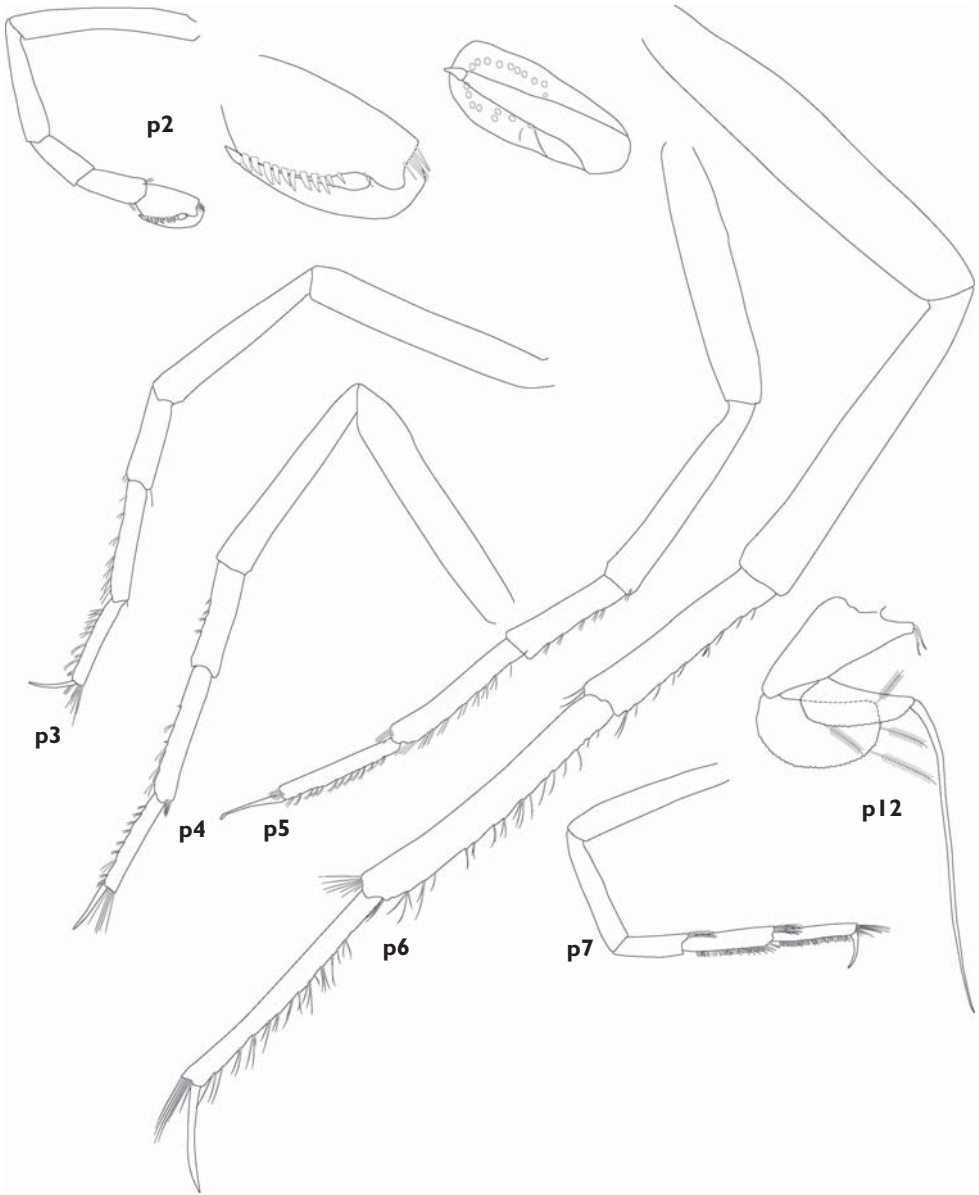


Figure 8. *Brucerolis nowna*, sp. n., holotype male (31 mm) NMV J58261. **p2–p7** pereopods 2–7 (pereopod 2 palm in lateral and face detail) **p12** pleopod 2.

pleonite 2. Antenna 2 peduncle article 5 1.3 times as long as article 4; flagellum of 14 articles, 1.3 times as long as peduncle article 5.

Pereopod 1 propodus 2.1 times as long as greatest width. Pereopod 2 palm dorsal length 1.8 times greatest width, gently continuous, with free proximal margin, with 18 spiniform setae arranged in an oval over the proximal two-thirds of the palm. Pere-

opod 5 of male basis 5.2 times as long as greatest width, of even width; merus with marginal setae; carpus 6 times as long as greatest width; propodus 7 times as long as greatest width; dactylus curved, half as long as propodus. Pereopod 6 of male merus setose, carpus 8 times as long as greatest width; propodus 11 times as long as greatest width; dactylus curved, 0.4 times as long as propodus. Pereopod 7 of male carpus 4.4 times as long as greatest width (near distal end); propodus 6.5 times as long as greatest width, propodus tapering from near base, lower margin straight; dactylus curved, 0.45 times as long as propodus.

Pleopod 2 endopod with convex distal margin, sharply tapering to base of appendix masculina; appendix masculina 3.6 times as long as straight margin of endopod. Uropodal rami with rounded apices; exopod 0.8 length of endopod.

Female. Pereonite 1, lateral margin of female sinuous anteriorly, straight posteriorly. Coxal dorsal plate 2 of female 0.5 times as long as half pereonal tergite 2 width; plate 4 of female 0.8 times as long as half pereonal tergite 4 width (following plates increasing in length); plate 6 of female extending beyond tip of pleotelson by 1.1 times middorsal length of pleotelson (in juvenile female), the pair diverging and then converging slightly apically, curving evenly.

Etymology. Nowra, a coastal town near the type locality; noun in apposition.

Distribution. Off southern NSW, Australia, south-eastern Tasman Sea; 450–1750 m.

Remarks. Coxal plates and epimera tend to become relatively longer in larger animals. Females are distinguished from males by the absence of modified pereopods 2 and 7 and in the sinuous lateral margin of pereonite 1. *Brucerolis nowra* is distinguished by the strongly upturned and produced anterolateral lobes on the head (fig. 6e) from others in the genus (already described and yet to be described by us in another work) where these lobes are obsolete or not upturned.

Acknowledgements

We thank Niel Bruce, Museum of Tropical Queensland, Queensland Museum, formerly of National Institute of Water and Atmosphere, Wellington, for comments on our early work on these animals and for the loan of material. The Australian material was collected during exploratory cruises on RV *Franklin* supported by the former Marine Sciences and Technologies Scheme and the Australian Research Council.

References

- Beddard FE (1884a) Preliminary notice of the Isopoda collected during the voyage of H.M.S. 'Challenger' – Part I. *Serolis*. Proceedings of the Zoological Society of London 23: 330–341.
- Beddard FE (1884b) Report on the Isopoda collected by H.M.S. *Challenger* during the years 1873–76. Part I. – The genus *Serolis*. Report on the Scientific Results of the Voyage of HMS Challenger during the years 1873–76 Zoology 11: 1–85, pls I–X.

- Brandt A (1988) Antarctic Serolidae and Cirolanidae (Crustacea: Isopoda): new genera, new species, and redescription. Koeltz Scientific Books, Königstein, 143 pp.
- Brandt A (1991) Zur Besiedlungsgeschichte des antarktischen Schelfes am Beispiel der Isopoda (Crustacea, Malacostraca). *Berichte zur Polarforschung* 98: 1–240.
- Dallwitz MJ, Paine TA, Zurcher EJ (1993) *Users Guide to the DELTA System: a General System for Processing Taxonomic Descriptions*. 4th Edition CSIRO Division of Entomology, Canberra.
- Fabricius JC (1775) *Systema Entomologiae, sistens Insectorum Classes, Ordines, Genera, Species, adjectis Synonymis, Locis, Descriptionibus, Observationibus*. Kortii, Flensburgi et Lipsiae.
- Hale HM (1952) Isopoda. Families Cymothoidae and Serolidae. British, Australian and New Zealand Antarctic Research Expedition, 1929–1931 Reports-Series B (Zoology and Botany) 6: 21–36.
- Held C (2000) Phylogeny and biogeography of serolid isopods (Crustacea, Isopoda, Serolidae) and the use of ribosomal expansion segments in molecular systematics. *Molecular Phylogenetics and Evolution* 15: 165–178.
- Held C (2001) No evidence for slow-down of molecular substitution rates at subzero temperatures in Antarctic serolid isopods (Crustacea, Isopoda, Serolidae). *Polar Biology* 24: 497–501.
- Held C, Wägele J-W (2000) Temperature and extinction: molecular evidence for extinction and radiation events in Antarctic Serolidae (Crustacea, Isopoda). *Zoology (Jena)* 103 Supplement III: 102.
- Kussakin OG (1967) Fauna of Isopoda and Tanaidacea in the coastal zones of the Antarctic and Subantarctic waters. [Translation from Russian by the Israel Program for Scientific Translations, Jerusalem, 1968.]. *Biological Reports of the Soviet Antarctic Expedition (1955–1958)* 3: 220–389.
- Lütken CF (1858) Beskrivelse av en ny *Serolis*-Art, *Serolis schythei* Ltk. *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening i Kjobenhavn*: 98, pl 91.
- Menzies RJ (1962) The isopods of abyssal depths in the Atlantic Ocean. *Vema Research Series* 1: 79–206.
- Monod T (1925) Isopodes et Amphipodes de l'Expédition Antarctique Belge, 2e note préliminaire. *Bulletin du Muséum National d'Histoire Naturelle, Paris* 4: 269–299.
- Monod T (1926) Tanaidacés, Isopodes et Amphipodes. Résultats du Voyage du SY Belgica en 1897–99, Expédition Antarctique Belge *Rapports Scientifiques Zoologie*: 1–67.
- Moreira PS (1977) Crustacea Isopoda collected during the oc/s 'Almirante Saldanha' cruises in southern South America. Additions to the species of *Serolis* (Flabellifera, Serolidae). *Boletim do Instituto Oceanográfico, Sao Paulo* 26: 257–271.
- Nordenstam A (1933) Marine Isopoda of the families Serolidae, Idotheidae, Pseudidotheidae, Arcturidae, Parasellidae and Stenetriidae mainly from the South Atlantic. Further Zoological Results of the Swedish Antarctic Expedition, 1901–1903 3: 1–284, 282 pls, errata.
- Poore GCB, Brandt A (1997) Crustacea Isopoda Serolidae: *Acutiserolis cidaris* and *Caecoserolis novaecaledoniae*, two new species from the Coral Sea. In: Crosnier, A. (ed.), *Résultats des Campagnes MUSORSTOM*, vol. 18. *Mémoires du Muséum National d'Histoire Naturelle, Paris* 176: 151–168.
- Richardson H (1911) Isopodes du Sandwich du Sud. *Anales de la Sociedad Científica Argentina, Buenos Aires* 21: 395–400.

- Storey MJ, Poore GCB (in press) New species of *Brucerolis* (Crustacea: Isopoda: Serolidae) from seas around New Zealand and Australia. *Memoirs of Museum Victoria*, 66.
- Wägele J-W (1994) Notes on Antarctic and South American Serolidae (Crustacea, Isopoda) with remarks on the phylogenetic biogeography and a description of new genera. *Zoologische Jahrbücher Abteilung für Systematik* 121: 3–69.
- Wägele JW (1986) *Serolis luethjei* n. sp., a new isopod crustacean from the Weddell Sea. *Polar Biology* 5: 145–152.
- Willemöes-Suhm Rv (1876) Preliminary report to Professor Wyville Thomson, F.R.S., Director of the Civilian Scientific Staff, on Crustacea observed during the cruise of H.M.S. “Challenger” in the Southern Sea. *Proceedings of the Royal Society of London* 24: 585–592.

Longiflagrum amphibium, a new estuarine apseudomorph tanaid (Crustacea, Peracarida) from north-western Australia

Anna Stępień[†], Magdalena Błażewicz-Paszkowycz[‡]

Department of Polar Biology and Oceanobiology, University of Łódź, Łódź, Poland

[†] [urn:lsid:zoobank.org:author:A1A1CBED-2F4D-4968-8321-EFB42765EF1E](https://doi.org/urn:lsid:zoobank.org:author:A1A1CBED-2F4D-4968-8321-EFB42765EF1E)

[‡] [urn:lsid:zoobank.org:author:59C602A9-67E0-4373-AAAC-EFA2F9252748](https://doi.org/urn:lsid:zoobank.org:author:59C602A9-67E0-4373-AAAC-EFA2F9252748)

Corresponding author: *Magdalena Błażewicz-Paszkowycz* (magdab@biol.uni.lodz.pl)

Academic editor: *Niel Bruce* | Received 05 April 2008 | Accepted 12 May 2009 | Published 24 August 2009

[urn:lsid:zoobank.org:pub:93905706-B88D-40D0-92D0-1C38D2124DB7](https://doi.org/urn:lsid:zoobank.org:pub:93905706-B88D-40D0-92D0-1C38D2124DB7)

Citation: Stępień A, Błażewicz-Paszkowycz M (2009) *Longiflagrum amphibium*, a new estuarine apseudomorph tanaid (Crustacea, Peracarida) from north-western Australia. In: Bruce N (Ed) Advances in the taxonomy and biogeography of Crustacea in the Southern Hemisphere. ZooKeys 18: 161–170. doi: 10.3897/zookeys.18.154

Abstract

Australian tanaidacean material collected during spring 1993 and 1994 and autumn 1994 and 1995 in vicinity of Port Hedland and Oyster Island (NW Australia) included over 800 of specimens of a new species of apseudomorph, *Longiflagrum amphibium* **sp. n.** The species is the fifth to be described in this genus, and it was found in the intertidal zone, as the other species have been. The new species is distinguished from the other members of the genus by having the shortest flagella in the antennule and by its oval pleopod basis.

Keywords

Longiflagrum, Tanaidacea, Apseudomorpha, NW Australia, intertidal zone

Introduction

The genus *Longiflagrum* was removed from the heterogeneous genus *Apseudes* Leach, 1814 by Guțu (1995) and placed in the family Parapseudidae mainly based on the lack of an apophysis on the coxa of pereopod 1. A further supporting character was the presence of a transverse dorsal row of minute setae on pleonite 1 which is borne by a

few parapseudid genera, e.g. *Discapseudes* Băcescu & Guțu, 1975, *Pseudoapseudes* Guțu, 1981, *Saltipedis* Guțu, 1995 and *Ctenapseudes* Bamber, Ariyananda & Silva, 1996.

According to Guțu (1995, 1996), *Longiflagrum* is characterized by the equal length of the antennule flagella, by the presence of long setae on article 2 of antennae, at least ten articles in the antennular flagellum, by the broadened carpus of the first pereopod 1, and the wide rami of the pleopods. It currently includes five species including the new one described in the present paper. The characters pinpointed by Guțu (1995) define the genus well and can be accepted with two qualifications. One is the width of the pleopod rami, which can be quite narrow as in the case of *L. caeruleus* (Boesch, 1973); the other is that the flagellum in the antennule can have less than ten articles (*L. koyonense* Angsupanich, 2004).

All five *Longiflagrum* species occur in shallow coastal habitats such as the tidal zone, eelgrass-beds and estuaries where salinity fluctuates in the wide range from 5 up to 34 psu (Boesch 1973; Angsupanich 2004) and they are often recorded as a frequent and abundant element of the soft-bottom ecosystem community (Boesch 1973).

Material and methods

The series of over 800 specimens determined as *Longiflagrum amphibium* sp. n. were collected four times in the Australian spring 1993 and 1994 and autumn 1994 and 1995 in the intertidal zone of Port Hedland (South and North side of Stingray Creek: 20° 20.04' S, 118° 35.230' E – 20° 19.31' S, 118° 35.20' E; Burgess Point: 20° 19.28' S, 118° 35.09' E; Stanley Point 20° 19.13' S, 118° 34.03' E; South of West Creek: 20° 19.35' S, 118° 33.26' E and Oyster Inlet: 20° 20.00' S, 118° 28.00' E – 20° 20.31' S, 118° 28.20' E. The material was collected by Halpern, Glick and Maunsell Consulting Company (West Australia).

The type material is deposited in the Museum of Victoria, Melbourne, Australia.

The terminology follows Larsen (2003) and Bamber (2005).

Systematics

Order Tanaidacea Dana, 1849

Suborder Apseudomorpha Sieg, 1980

Superfamily Apseudoidea Leach, 1814

Family Parapseuididae Guțu, 1981

Genus *Longiflagrum* Guțu, 1995

Type species: *Apseudes estuarius* Boesch, 1973.

Species included: *L. caeruleus* (Boesch, 1973); *L. estuarius* (Boesch, 1973), *L. koyonense* (Angsupanich, 2004), *L. nasutus* (Nunomura, 2005), *L. amphibium* sp. n.

***Longiflagrum amphibium* sp. n.**

urn:lsid:zoobank.org:act:DD2B8E15-0FB5-49AD-8F9A-94ABF9E19D3E

Figs 1–3

Material examined: All material from Port Headland, Western Australia *Holotype*, female (J59757), Stn Porthed 131 T2, Oyster Inlet (south), 20°20'S, 118°28'E, intertidal, 19 Mar, 1994, coll. Halpern, Glick and Maunsell. *Allotype*, male (J59758), Stn. Porthed 132 T2. *Paratypes*, 5 females (J65137), Stn. Porthed 132 T2; 5 females, 2 males, 1 manca (J 65136); Stn Porthed 131 T2, 11 specimens (J 65139), Stn Porthed 136 T2; 5 specimens (J65137) Stn Porthed 132 T2; all the same locality and data as holotype.

Etymology: The name reflects the attitude of the new species to the intertidal zone.

Diagnosis: Antennular flagella with 8 articles. Antennal flagellum with six articles, article 5 twice as long as wide. Pereopod 1 propodus as long as wide, with four spiniform setae on ventral margin that are 3–4 times as long as wide; pereopod 1 exopod with six setae on distal article. Pereopods 4–6 propodus short, 1.5 times as long as wide. Pleopod basis wide, oval, pleopod endopod twice as long as wide.

Description of female with rudimentary oostegites: (Fig 1 A, B), body 7.4 mm long, 4.3 times as long as wide. Carapace 18% of body length, with rostrum pointed, bent down. Pereonite 1 0.4 times as long as wide, subequal to pereonite 3; pereonite 2 shorter than pereonite 1, 0.3 times as long as wide; pereonites 4 and 5 the longest, both 0.6 times as long as wide; pereonite 6 subequal to pereonite 2. Pleon 25% of total body length; pleonite-1 with dorsal row of minute setae; pleotelson as long as combined length of three pleonites.

Antennule (Fig. 2A) peduncle article 1 2.5 times as long as wide; article 2 half length of article 1, both articles with numerous simple and plumose setae; articles 3 and 4 much shorter, about 0.2 times as long as article 2; flagella subequal, shorter than peduncle, both with eight articles and with numerous, simple setae on both flagella; aesthetascs in number 2, 3, 2 on articles 3, 5 and 7 respectively of main flagellum.

Antenna (Fig. 2B) peduncle article 2 with tooth-like projection and three minute plumose setae; article-3 about twice as long as wide, with six long setae on inner margin; articles 3 and 4 subequal, both as long as wide; article 5 twice as long as wide. Flagellum with six articles. Peduncle articles 3–5 and flagellum first article with long setae on inner margin. Squama with 14 simple setae.

Mouthparts. Left mandible (Fig. 2C) incisor with four spiniform setae; *lacinia mobilis* as big as incisor with four spiniform setae; setiferous lobe with one simple and five long, distally bifurcated/trifurcated setae; molar (Fig. 2C') wide, with some serrated spiniform setae on edge and with row of fine spiniform setae on crushing surface.

Maxillule (Fig. 2F) outer endite with eight spiniform setae distally and two simple setae subdistally, both margins with numerous, minute setae. Inner endite with five thick setose setae. Palp (Fig 2F') with two articles and six distal setae.

Maxilla (Fig. 2E) outer lobe of moveable endite with two setae subdistally and row of serrated setae distally; inner lobe with about ten serrate setae; outer lobe of fixed

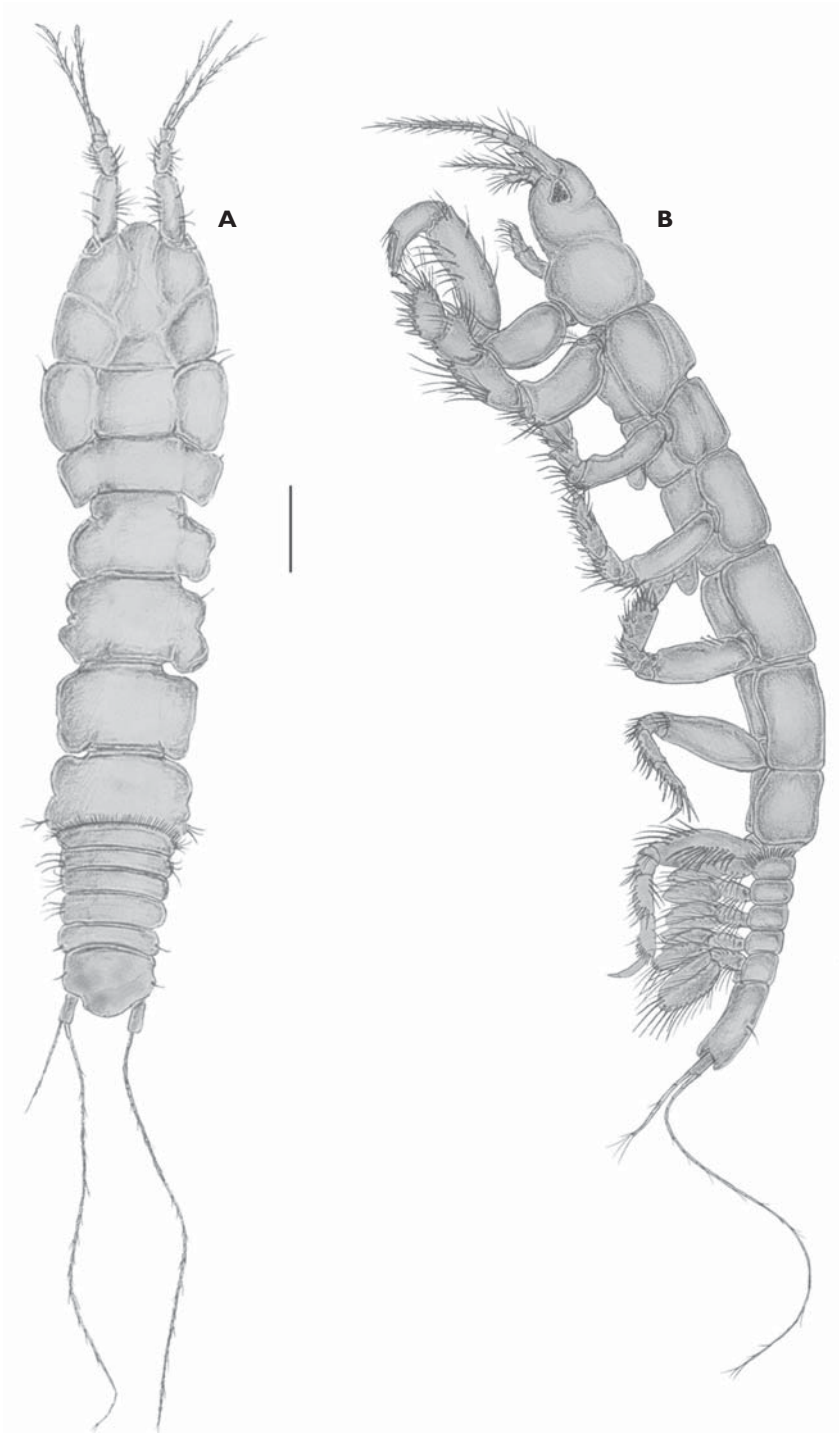


Figure 1. *Longiflagrum amphibium* sp. n. Holotype female. **A** body dorsal view **B** body lateral view. Scale line = 1 mm.

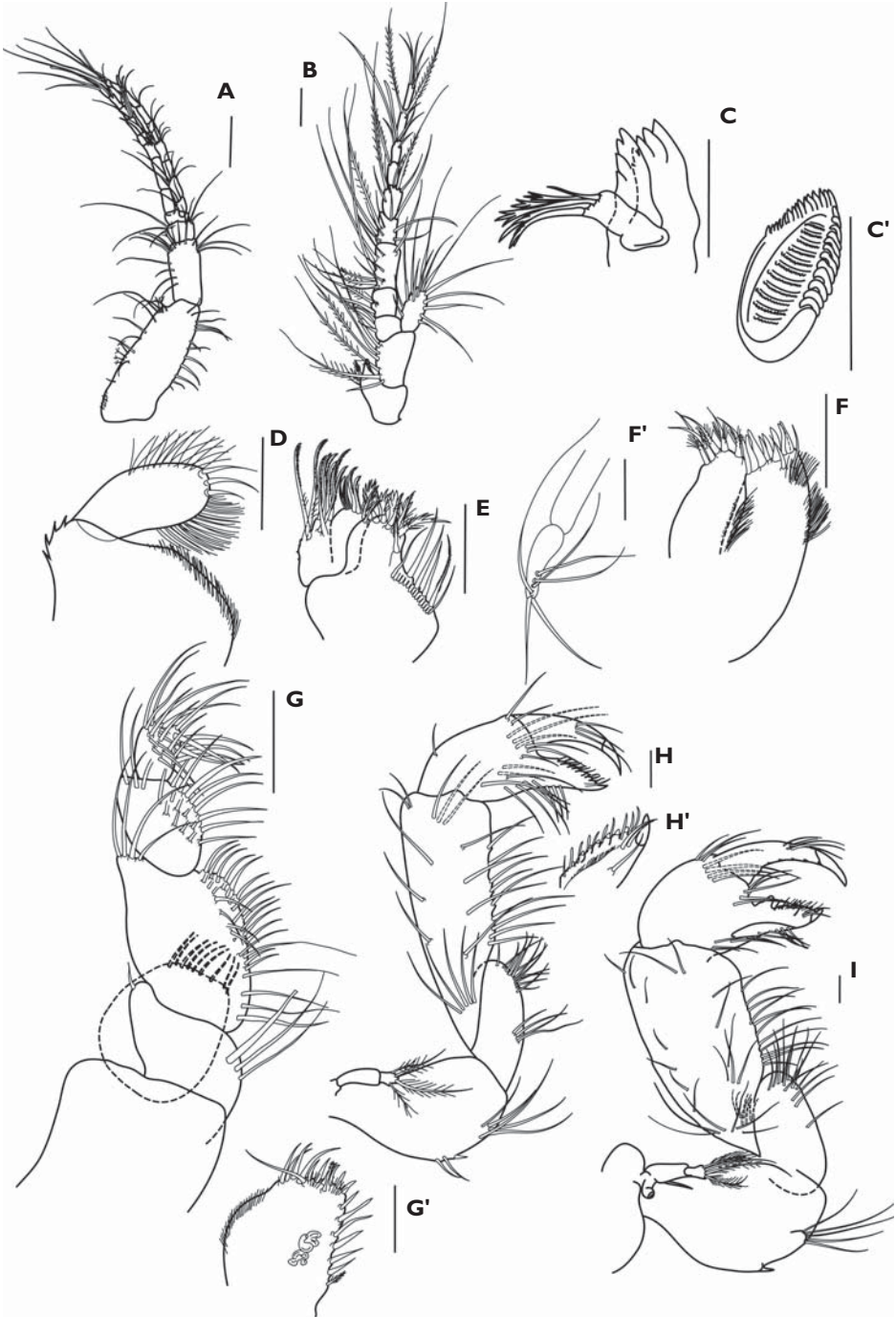


Figure 2. *Longiflagrum amphibium* sp. n. Paratype female. **A** antennule **B** antenna **C** mandible **C'** *pars molaris* **D** labium **E** maxilla **F** maxillule **F'** palp of maxillule **G** maxiliped **G'** maxilipedal endite **H** cheliped **H'** detail of fixed finer. Male **I** cheliped. Scale line = 0.1 mm for A, B, D, F, G', H, I and 0.01 mm for C, C', E, G.

endite with five leaf-like setae and three thick setose setae; inner lobe of fixed endite with four strong serrate setae and row of plumose setae subdistally.

Labium (Fig. 2D) lobe with minute setation on inner margin and four spines on outer margin.

Palp with numerous, long, minute setae on both margins and three simple setae distally.

Maxilliped (Fig. 2G) basis as long as wide, naked; palp article 1 with one small distal, seta on outer margin and three simple, long setae on inner margin; article 2 about twice as long as wide, with four long setae distally on outer margin and numerous short and long setae on inner margin; article 3 with three simple setae distally on outer margin and numerous simple setae on inner margin; article-4 with numerous simple setae along inner and distal margin and at middle. Endite (Fig. 2G') with five long setae, and six short spiniform setae distally; inner margin with seven setae and four coupling-hooks.

Cheliped (Fig. 2H) basis narrow proximally, about 1.5 times as long as merus, with two simple setae and spiniform seta ventrally and bunch of five simple setae distoventrally; merus about 0.4 times as long as carpus, with two groups of simple setae ventrally; carpus elongate, 3.5 times as long as wide, with numerous simple setae proximally, ventrally and distally, dorsal margin with row of three (four) setae; propodus subequal in length to dactylus and unguis combined, with one seta dorsally and numerous inner and outer setae near dactylus and ventrally; fixed finger with row of minute spines and serrate setae (Fig. 2H'); dactylus with three simple setae dorsally. Exopod 3 articulated, distal article with four feather setae.

Pereopod 1 (Fig. 3A) coxa present, basis wide, narrowed proximally, 3.5 times as long as wide, with spiniform seta and two long setae distoventrally; ischium with five simple setae distoventrally; merus wide, 1.2 times as long as wide with spiniform seta distoventrally and one distodorsally and numerous simple setae on distal half of ventral margin and in mesial row; carpus half as long as wide (expanded dorsal part), with two spiniform setae distoventrally and spiniform seta distodorsally and numerous simple setae on both margins; propodus 1.2 times as long as wide, with four stout spiniform setae ventrally and two spiniform setae distodorsally, which are three to four times as long as wide, and with numerous simple setae on both margin; dactylus and unguis 0.6 times as long as propodus, with one minute seta ventrally. Exopod with three articles, distal article with six plumose setae.

Pereopod 2 (Fig. 3B) coxa naked; basis elongate twice as long as wide, with three simple setae distoventrally (one longer, two shorter); ischium about 0.6 times as long as merus, with three long, and one short simple seta; merus about 0.7 times as long as carpus, with eight simple setae ventrally and group of five simple setae at middle; carpus 1.2 times as long as propodus, with three spiniform setae distoventrally (one small) and numerous simple setae describe the diagonal row; propodus with row of three spiniform and six simple setae ventrally and two spiniform and six simple setae dorsally; dactylus and unguis about as long as propodus, unguis 0.2 times as long as dactylus.

Pereopod 3 (Fig. 3C) similar to pereopod 2, but merus additionally with spiniform seta ventrally, and carpus with seven spiniform setae distoventrally and distodorsally.

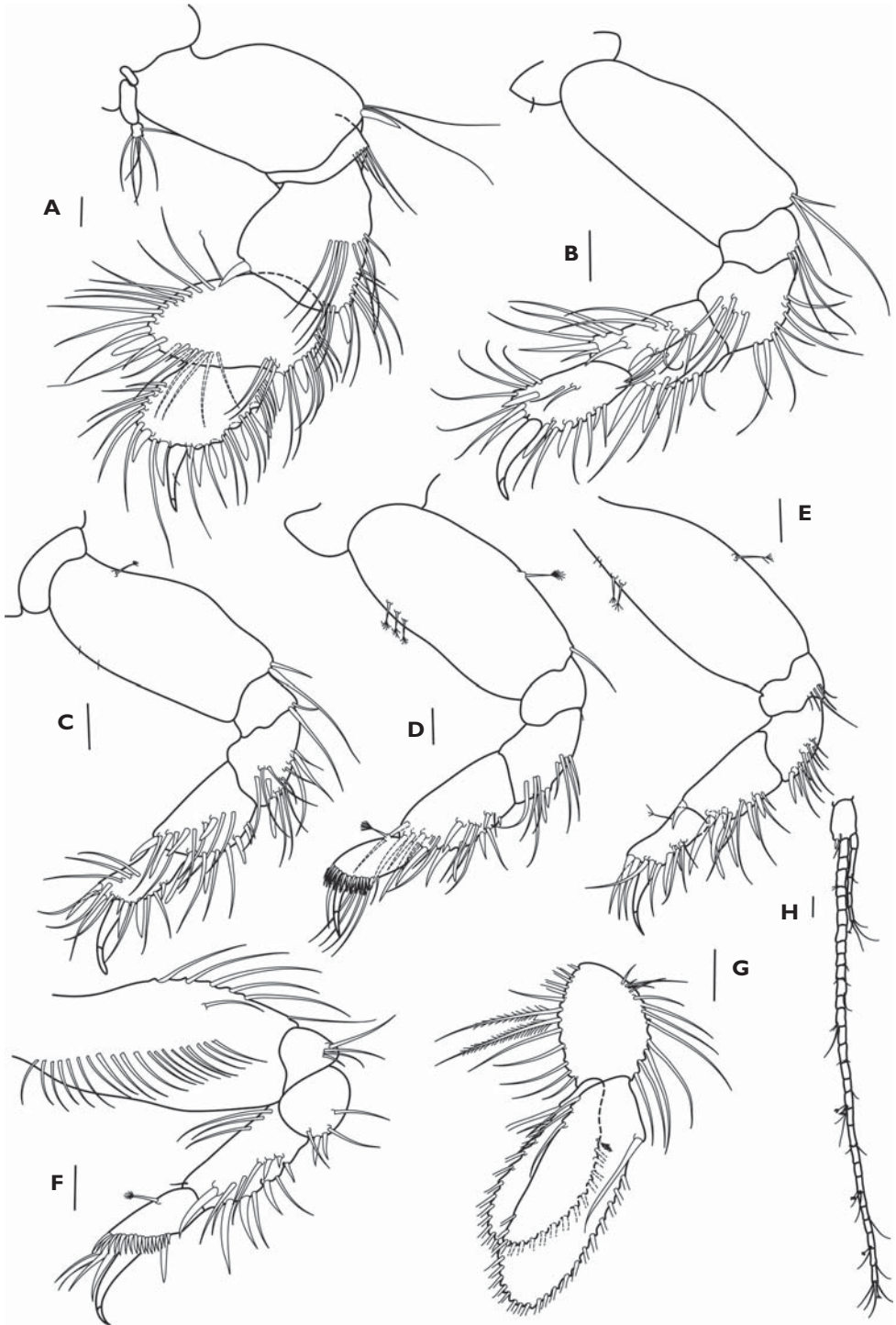


Figure 3. *Longiflagrum amphibium* sp. n. Paratype female. **A** pereopod-1 **B** pereopod-2 **C** pereopod-3 **D** pereopod-4 **E** pereopod-5 **F** pereopod-6 **G** pleopod **H** uropod. Scale line = 0.1 mm

Pereopod 4 (Fig. 3D) basis elongate, subequal in length to ischium, merus and carpus combined, about twice long as wide, with one simple setae distoventrally, three middorsal and one midventral plumose setae; ischium 0.4 times as long as merus, naked; merus 0.7 times as long as carpus, with eight simple setae and two spiniform setae ventrally; carpus 1.5 times as long as propodus, with eight simple and seven spiniform setae ventrally; propodus with one plumose setae dorsally, four simple setae distally and row of short, serrated setae along distal margin; dactylus about 2.5 times as long as unguis.

Pereopod 5 (Fig. 3E) basis elongate, subequal in length to ischium, merus and carpus combined, about twice as long as wide, with two middorsal and one midventral plumose setae; ischium 0.3 times as long as merus, with five short simple setae; merus 0.8 times as long as carpus, with seven simple and three spiniform setae distoventrally; carpus 1.2 times as long as propodus with six simple and five spiniform setae distoventrally and one spiniform seta distodorsally; propodus subequal in length to merus, with plumose seta dorsally, three simple and two spiniform setae ventrally, three simple and two spiniform setae distally; dactylus and unguis combined about as long as propodus.

Pereopod 6 (Fig. 3F) basis elongate, subequal in length to ischium, merus and carpus combined, about twice as long as wide, with seven simple setae ventrally and row of numerous simple setae running from dorsally to middle part of article; ischium triangular, with four simple setae distoventrally; merus 0.6 times as long as carpus, with one simple seta ventrally, two simple and two spiniform setae distoventrally; carpus 1.7 times as long as propodus, with six simple and seven spiniform setae ventrally, three long, simple setae distoproximally; propodus with one plumose seta dorsally and row of numerous, short serrate setae along distal and distoventral margin, one spiniform seta midventrally and four simple setae distally; dactylus and unguis combined little longer than propodus.

Pleopods (Fig. 3G) in five pairs, all similar, basal article 1.8 times as long as wide, with numerous plumose setae along both margins; exopod with numerous plumose setae along outer and distal and innerdistal margin and three setae distoproximally; endopod with numerous simple setae along all margins and one short, feather seta on inner margin. Exopod 0.8 as long as endopod.

Uropod (Fig. 3H) basal article with one small spine and one simple seta. Endopod with 29 articles and sparse short simple and plumose setae. Exopod with five articles, 0.2 times as long as endopod.

Male. Similar to female except for chelipeds (Fig. 2I), which are much robust, especially carpus less than twice as long as wide; fixed finger with additional large tooth near dactylus insertion. Antennule similar to female.

Remarks. Of the five species now in the genus *Longiflagrum*, *L. amphibium* sp. n. has the shortest antennular flagella, with only eight-articles. The Pacific species, *L. caeruleus*, *L. estuarius* and *L. nasutus* have more than ten articles in both flagella (16/15, 14/12 and 15/11, respectively), while the Indonesian *L. koyonense* has eight to nine in the inner flagellum and 12–13 in the outer one. A trend in reduction in

the number of antennal flagellum articles can be noticed as well, with eleven articles in *L. caeruleus*, nine in *L. estuarius*, seven in both *L. koyonense* and *L. nasutus* and only six in *L. amphibium*.

L. amphibium has wide (almost oval) bases of the pleopods. This article is usually narrow and rectangular or at least square in the other species.

Apart from the shape of the pleopod bases and the articulation of the antennule and antenna, *L. amphibium* is most similar to *L. koyonense*, although that species has a sparsely setose dorsal side to the cheliped carpus and more (14) setae in the squama. Also *L. koyonense* has a relatively short (1.5 times as long as wide) fifth article in the antennal peduncle, which is twice as long as wide in all other species except for *L. caeruleus* in which this article is only as long as wide.

Males of *Longiflagrum* are recognizable by the shape of the chela. The new species is the only one without a proximal spiniform seta on the ventral margin of the cheliped dactylus. This structure is very prominent in *L. koyonense*, *L. nasustus*, *L. estuarius*, and small, but clear in *L. caeruleus*.

Distribution. The species is known only from the type locality (Port Hedland, NW Australia), from the tidal depth.

Key to both sexes of the species of *Longiflagrum*

- 1 Antennule outer flagellum with eight articles *L. amphibium* sp. n.
- Antennule outer flagellum with more than 10 articles 2
- 2 Flagellum of the antenna with more than 10 articles 3
- Flagellum of the antenna with less than 10 articles 4
- 3 Antenna article 5 short (as long as wide); spiniform setae of the propodus of pereopod 1 large (more than five times as long as wide) *L. caeruleus*
- Antenna article 5 long (twice as long as wide); spiniform setae of the propodus of pereopod-1 short (about three times as long as wide) *L. estuarius*
- 4 Pereopods 3–4 carpus short (about 1.5 times as long as wide) .. *L. koyonense*
- Pereopods 3–4 carpus long (about three times as long as wide) *L. nasutus*

Acknowledgements

We are very grateful to Joanne Taylor (Museum Victoria, Melbourne) for her fastidious registration of the material.

The research has been financed by EU Marie Curie Grant, OIF 040613-DIPOT.

References

- Angsupanich S (2004) A new species of *Longiflagrum* (Tanaidacea, Parapseudidae) from Songkhla Lagoon, Thailand. *Crustaceana* 77 (7): 849–860.
- Bacescu M and Gutu M (1975) A new genus (*Discapseudes* n. g.) and three new species of Apseudidae (Crustacea, Tanaidacea) from the northeastern coast of South America. *Zoologische Mededelingen* 49 (11): 95–113.
- Bamber RN, Ariyananda T and Silva EIL (1996) A new genus and species of apseudomorph tanaidacean from Sri Lanka. *Asian Marine Biology* 13: 133–140.
- Bamber RN (2005) The tanaidaceans (Arthropoda: Crustacea: Peracarida: Tanaidacea) of Esperance, Western Australia, Australia. In: Wells FE, Walker DI and Kendrick GA (Eds) *The Marine Flora and Fauna of Esperance, Western Australia*. Western Australian Museum, Perth, 613–728.
- Boesch DF (1973) Three new tanaids (Crustacea, Tanaidacea) from southern Queensland. *Pacific Science* 27: 168–188.
- Dana JD (1849) *Conspectus Crustaceorum*. Conspectus of the Crustacea of the Exploring Expedition. *American Journal of Science and Arts, Series 2*, 8: 424–428.
- Gutu M (1981) A new contribution to the systematics and phylogeny of the suborder Monokonophora (Crustacea, Tanaidacea). *Travaux du Muséum National d'Histoire Naturelle "Grigore Antipa"* 23: 81–108.
- Gutu M (1995) A new subfamily and three new genera of Apseudomorpha (Crustacea, Tanaidacea). *Travaux du Muséum National d'Histoire naturelle "Grigore Antipa"* 35: 17–28.
- Gutu M (1996) The synoptic table and key to superspecific taxa of recent Apseudomorpha (Crustacea, Tanaidacea). *Travaux du Muséum National d'Histoire naturelle "Grigore Antipa"* 36: 135–146.
- Larsen K (2003) Proposed new standardized anatomical terminology for the Tanaidacea (Peracarida). *Journal of Crustacean Biology* 23: 644–661.
- Leach WE (1814) Crustaceology. In: Brewster D, *Edinburgh Encyclopaedia*. Parker E, Philadelphia, 383–437
- Nunomura N (2005) A new species of the genus *Apseudes* (Tanaidacea: Apseudidae) Okinawa, southern Japan. *Contributions from the Toyama Science Museum* 313: 25–31.
- Sieg J (1980) Sind die Dikonophora eine polyphyletische Gruppe? *Zoologischer Anzeiger* 205 (5–6): 401–416.

Leipanthura casuarina, new genus and species of anthurid isopod from Australian coral reefs without a “five-petalled” tail (Isopoda, Cymothoidea, Anthuroidea)

Gary C.B. Poore

Museum Victoria, GPO Box 666E, Melbourne, Victoria 3001 Australia

urn:lsid:zoobank.org:author:C004D784-E842-42B3-BFD3-317D359F8975

Corresponding author: *Gary C.B. Poore* (gpoore@museum.vic.gov.au)

Academic editor: *Niel Bruce* | Received 11 May 2008 | Accepted 21 May 2009 | Published 24 August 2009

urn:lsid:zoobank.org:pub:636265D7-DB86-4FDE-987B-A0BB59E78327

Citation: Poore GCB (2009) *Leipanthura casuarina*, new genus and species of anthurid isopod from Australian coral reefs without a “five-petalled” tail (Isopoda, Cymothoidea, Anthuroidea). In: Bruce N (Ed) Advances in the taxonomy and biogeography of Crustacea in the Southern Hemisphere. ZooKeys 18: 171–180. doi: 10.3897/zookeys.18.198

Abstract

A new minute anthurid isopod, 2.7 mm long, is described. It is notable in having a uropod with almost cylindrical terminal rami, lacking the typical anthurid uropodal structure in which the flattened exopod is attached to the peduncle dorsolaterally and more proximal to the terminal endopod. The species has all the other features of Anthuroidea (cylindrical body, mandibular spine row absent or evident as lamina dentata, maxilla 2 fused with the lower lip as a hypopharynx) and many features of the family Anthuridae (paired statocysts, fused pleonites, compact mandible, pereopods 2 and 3 propodus with single palmar robust seta) and is placed in this family as a new genus and species, *Leipanthura casuarina*, close to *Anthura*, *Exallanthura* and *Ptilanthura*. *Leipanthura casuarina* is also unusual in lacking pereopod 7 in the adult.

Keywords

Crustacea; Isopoda; Cymothoidea; Anthuroidea; Anthuridae; *Leipanthura*; new genus; new species; coral reef; Australia

Introduction

The Anthuroidea Leach, 1814 are a distinctive group of mostly marine isopods. All have a characteristic uropodal structure in which the flat exopod is attached to the

peduncle dorsolaterally and proximal to the terminal endopod such that Leach likened the “tail” (pleotelson and two uropods) of the type species to a five-petalled flower. In addition, all species have a cylindrical body without dorsal coxal plates, the mandibular spine row absent or evident as lamina dentata, and maxilla 2 fused with the lower lip as a hypopharynx. While most literature deals with them as members of the suborder Anthuridea Monod, 1922, a recent revision places them as a superfamily within Cy-mothoidea Wägele, 1989 (Brandt and Poore 2003). The superfamily was revised (as Anthuridea) by Poore (2001). In that work, more than 500 species were listed in 57 genera in six families following a cladistic analysis of family and generic relationships. Schotte et al. (2008 onwards) also listed the species.

The discovery of three tiny individuals of a new species with anthuroid features but lacking the characteristic uropodal structure, necessitates a reappraisal of superfamily and family definitions. While it is tempting to treat the new species as a new family (or superfamily!), it has so many characteristics of the family Anthuridae Leach, 1814 that only a new genus can be justified.

The family diagnosis, differentiating Anthuridae from the other five anthuroid families, repeats that of Poore (2001) but adds characters dealing with pereopod 7 and the uropod. The generic diagnosis follows the format used by Poore (2001) for anthuroid genera. Pereopods, antennae and mouthparts were drawn in situ after ensuring the limbs sat in one plane. Mouthparts were confirmed from a dissection of the paratype. Material is deposited in the Museum of Tropical Queensland, Queensland Museum, Townsville (QM) and Western Australian Museum, Perth (WAM).

Anthuridae Leach, 1814

Diagnosis. Body 10–15 times as long as wide, non-males occasionally more elongate; pereonite 7 wider than long, much shorter than pereonite 6. Pleonites 1–5 together not more than twice as long as wide, fused; without marginal plumose setae on pleonal epimera or posterior borders of pleonites 4 and 5. Antenna 2 flagellum of fewer than 10 articles, shorter than peduncle. Mouthparts not produced anteriorly. Mandible compact and with weakly-toothed transverse incisor. Maxillipedal endite reaching palp article 3, or absent or obsolete; palp broad (c. twice as long as wide), with 5 free articles or with 2 or more articles fused. Pereopods 2 and 3 carpus not or weakly produced distally on lower margin; propodus palm with 1 distal robust seta only. Pereopods 4–7 propodus palm with 1 distal robust seta. Pereopod 7, if present, having propodus without distal serrate setae. Pleopod 1 exopod operculiform alone. Statocysts paired.

Remarks. This family diagnosis is slightly modified from that of Poore (2001) who adjusted earlier concepts, e.g., of Wägele (1981), by removing some genera to Expanthuridae Poore, 2001. The significant change in this new diagnosis is to accommodate the absence of pereopod 7.

The new genus, *Leipanthura*, could be identified in a first couplet of a key to genera of Anthuridae as follows:

- 1 Uropodal exopod terminal, cylindrical *Leipanthura*
- Uropodal exopod subterminal, dorsal, leaf-like all other genera (see key in Poore, 2001)

Alternatively, it would be necessary to replace the final couplets of Poore’s (2001: 105) key to genera of Anthuridae to accommodate *Leipanthura* as follows:

- 22 Mandibular palp of 3 articles 23
- Mandibular palp of 1 article 24
- 23 Uropodal exopod terminal, cylindrical *Leipanthura*
- Uropodal exopod subterminal, dorsal, leaf-like *Anthura*
- 24 Pereopod 7 present *Ptilanthura*
- Pereopod 7 absent *Exallanthura*

***Leipanthura*, gen. n.**

urn:lsid:zoobank.org:act:1F8291EA-3BDB-4118-AD7B-97B2DEDC9427

Diagnosis. Body irregularly darkly pigmented. Pleonites 1–5 together longer than greatest width, fused, suture between pleonites 1 and 2 visible only laterally; pleotelson without indication of posterior margin of pleonite 6. Antenna 2 flagellum of 6 articles, longer than article 5 of peduncle. Maxillipedal endite absent; palp articles 1–5 fused. Pereopod 1 propodus cylindrical, not in contact with merus. Pereopods 4–6 carpus with upper margin nearly as long as lower margin, distal margin transverse and without distal lobe, without robust setae on lower margin or on distal angle. Pereopod 7 absent. Uropodal exopod cylindrical, articulating distally in same horizontal plane as endopod.

Type species. *Leipanthura casuarina*, new species, here designated.

Etymology. *Anthura*, from Greek *anthos*, a flower, and *oura*, a tail, describes the telson and uropods of *Anthura gracilis* “... which, when alive, much resemble a five-petaled flower ...” (Leach 1814). Greek *leipo*, meaning to be without, reflects the absence of the anthuroid tail in this monotypic genus.

Remarks. Several features place this enigmatic new genus well within the family Anthuridae. The overall narrow body form, arrangement of pereonites, short antennal flagella, compact mouthparts, simple pereopods with few robust setae, fused pleonites, operculiform first pleopodal exopods, and pleotelson with paired statocysts are typically anthurid. The species is notable within Anthuridae for the absence of pereopod 7 in an adult female. The observation that the holotype bears oostegites confirms that this is a neotenous characteristic (all isopods hatch without pereopods 7, this stage being called the manca). The condition is seen in one other anthurid, *Exallanthura* Kensley, 1980, four genera of Paranthuridae Menzies & Glynn, 1968 (Poore 1984 2001) and *Curassanthura* Kensley, 1981 in Leptanthuridae Poore, 2001 (Wägele 1982). *Exallanthura* also shares with *Leipanthura* a completely fused maxillipedal palp but differs in having a well developed anterodorsal uropodal exopod, more

swollen pereopod 1 propodus and a mandibular palp of one article. The only species, *Exallanthura sexpes* Kensley, 1980, is known from only two individuals that may be manca; as is commonly the case with specimens of anthurids they lack features that would identify them as fully developed males (multiarticulate antenna 1) or females (oostegites). *Prilanthura* Harger, 1878 has a similar uropod, mandibular palp, maxilliped and pereopod 1 to *Exallanthura* but examples possess pereopod 7 (Kensley 1996).

Leipanthura shares fused maxillipedal palp articles with one other genus, *Anthura* Leach, 1814, which is a monotypic genus also with pigmented integument. *Anthura gracilis* Montagu, 1808 has a typical anthuroid uropod, swollen pereopod 1 propodus with a toothed palm, and long pleotelson (Wägele 1980).

The flattened uropodal peduncle and its almost cylindrical rami that characterise the new genus are unique within Anthuroidea and must be regarded as a reversal to the form seen in Gnathiidae, the probable sister taxon of Anthuroidea (Brandt and Poore 2003; Cohen and Poore 1994). Placing the genus outside Anthuroidea demands numerous convergences in many other characters.

***Leipanthura casuarina* sp. n.**

urn:lsid:zoobank.org:act:467A32DD-1206-4516-A8C6-03E22BC51EE7

Figs 1–4

Material examined. Holotype. Australia, Queensland, Great Barrier Reef, Lizard I., Casuarina Beach, 14.6839°S, 145.4453°E, N.L. Bruce, 15 April 2008 (CReefs stn CGLI31B), dead coral heads, QM W13791 (ovigerous female, 2.5 mm).

Paratype. Collected with holotype, QM W31120 (juvenile, 2.6 mm, plus 1 microslide).

Non-type. Australia, Western Australia, Ningaloo Reef, off Frazer I., 22.65830°S, 113.61809°E, L. Hughes and C. Bagnato, 25 May 2009 (CReefs stn NR09-60B), reef slope, coral heads, 6.8 m, WAM C40642 (juvenile, 2.7 mm).

Etymology. Casuarina, from the type locality and continuing the convention initiated by Poore and Lew Ton (1985) of naming Australian anthuroids after Australian plant genera (noun in apposition).

Description of holotype. Total length, 2.5 mm. Body with well-spaced patches of brown pigment all over (see fig. 4); 14 times as long as wide. Head longer than wide, smooth, with short, broad rostral projection; eyes lateral, of about a dozen ommatidia. Pereonites smooth, of equal width, pereonites 2–5 of similar lengths, pereonite 6, 0.8 length of pereonite 5, pereonite 7, 0.4 length of pereonite 6. Fused pleonites 1–5 smooth, pleonite 1 indicated ventrolaterally as a slight notch on deep pleural flange, others with minute lateral seta, pleonite 5 posterolaterally lobed around base of pleotelson and uropods; pleotelson half as long as pleonites 1–5, as long as width at base, evenly convex dorsally, tapering to broadly semicircular apex with pair of distal setae, with pair of large statocysts clearly visible.

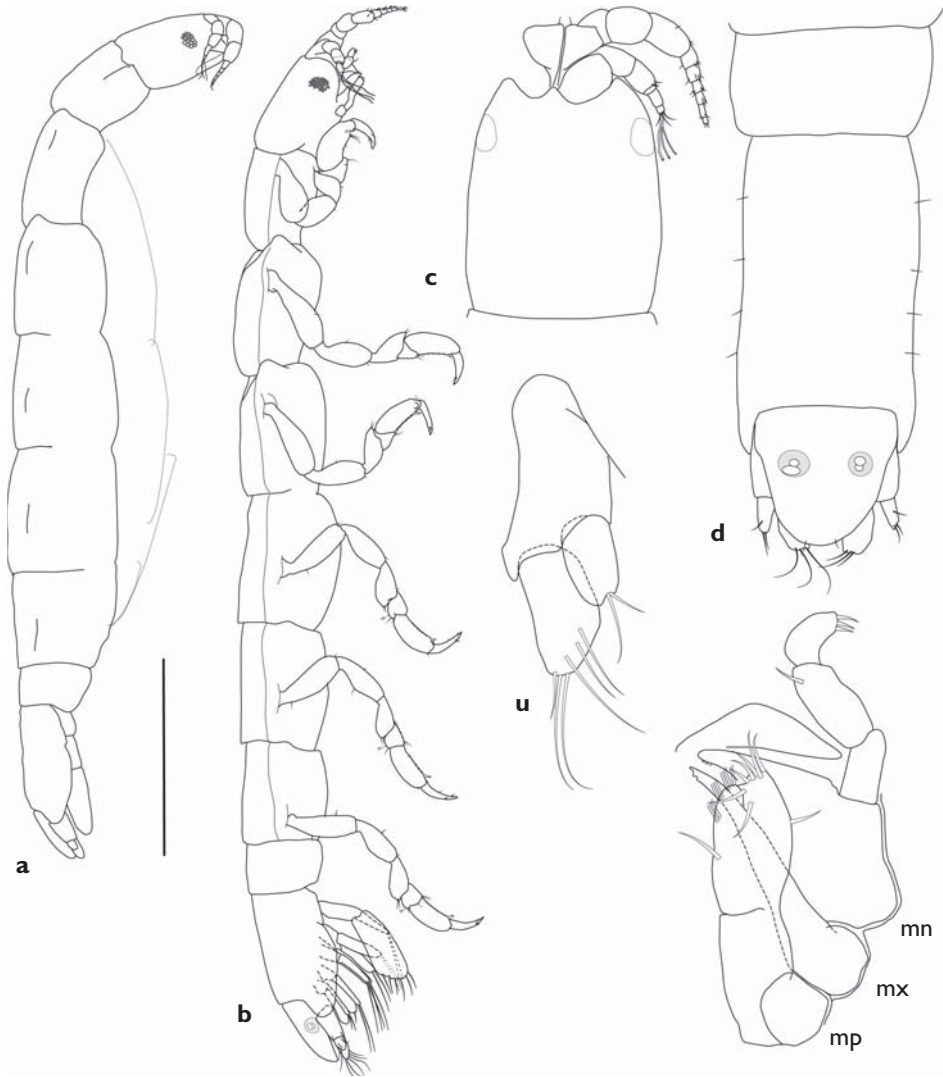


Figure 1. *Leipanthura casuarina* sp. n. **a** holotype female (right lateral view, pereopods not shown, oostegites indicated, pleopod 1 in operculate position) **b** paratype juvenile (right lateral view, pereopods shown, pleopods exposed) **c** head and right antennae 1 and 2, holotype female (dorsal view); **e** pleon and pleotelson, holotype female (dorsal view, uropods in situ) **u** left uropod, paratype juvenile (ventral view); left mouthparts, holotype female, in situ (**md** mandible **mx** maxilla 1 **mp** maxilliped). Scale bar = 0.5 mm, refers to **a** and **b** only.

Antenna 1 peduncle with stout article 1, shorter and progressively narrower articles 2 and 3; flagellum about as long as last peduncle article, of short article 1, longer article 2 and article 3 with 3 aesthetascs and 3 setae. Antenna 2 peduncle longer than peduncle of antenna 1, articles 4 and 5 longer than wide; flagellum of 6 minute articles.

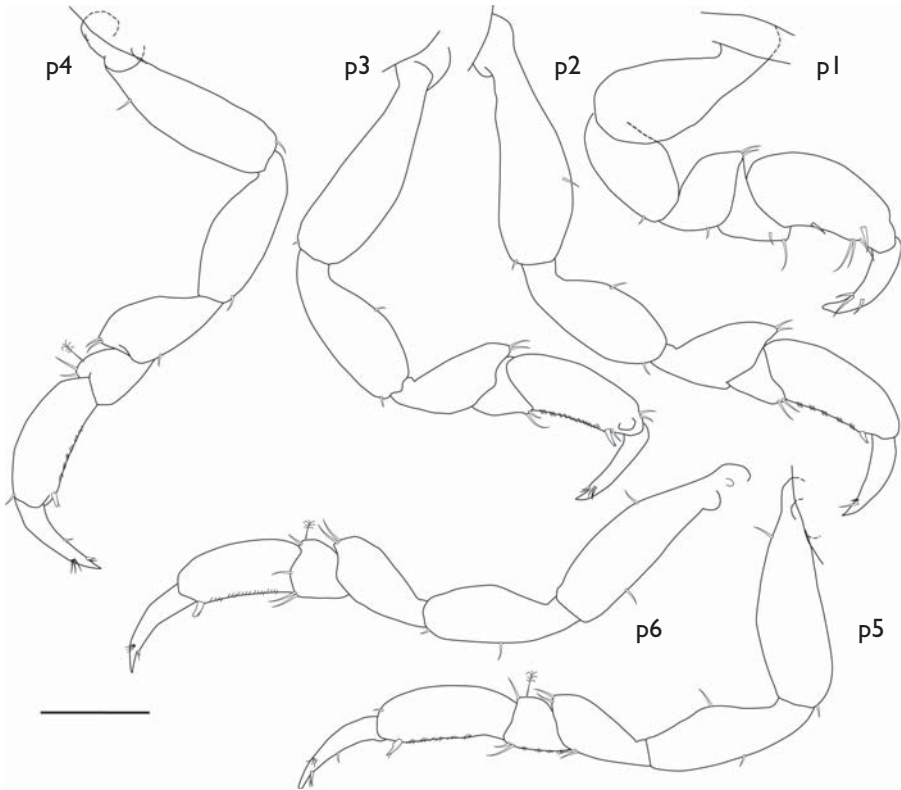


Figure 2. *Leipanthura casuarina* sp. n., paratype juvenile. **p1-p6**, pereopods 1-6 (drawn in situ to same scale). Scale bar = 0.1 mm.

Upper lip domed anteriorly. Mandible with incisor barely toothed, lamina dentata with 3 teeth (molar process not seen); palp of 3 articles, article 2 longer than 1, article 3 half as long as 2, with 3 short distal setae. Maxilla 1 outer lobe with 2 or 3 subdistal teeth (inner lobe not seen). Maxillipedal of fused articles with 1 mesial seta, 1 lateral seta, 2 subterminal facial setae, and 5 setae on lateral apical lobe (fused article 5); epipod rounded.

Pereopod 1 subchelate, with stout proximal articles bearing few setae; carpus cupping propodus, with short square free distal margin, with 2 setae on lower margin; propodus slightly swollen but proximally not overlapping carpus on upper margin, palm axial, concave, with 2 distal setae, another longer seta more distally and laterally; dactylus closing on palm, unguis about one-third its length. Pereopod 2 more slender than first, 1.3 times as long (measured through main axes of articles), proximal articles bearing few setae; merus overlapping carpus and base of propodus on upper margin; carpus triangular, with 2 setae on lower margin; propodus slightly tapering and curved, about 2.5 times as long as wide, palm concave, with palmar comb setae and 1 distal flagellated robust seta; dactylus slightly curved, unguis microscopically dentate. Pereopod 3 similar to pereopod 2, dactylus straighter. Pere-

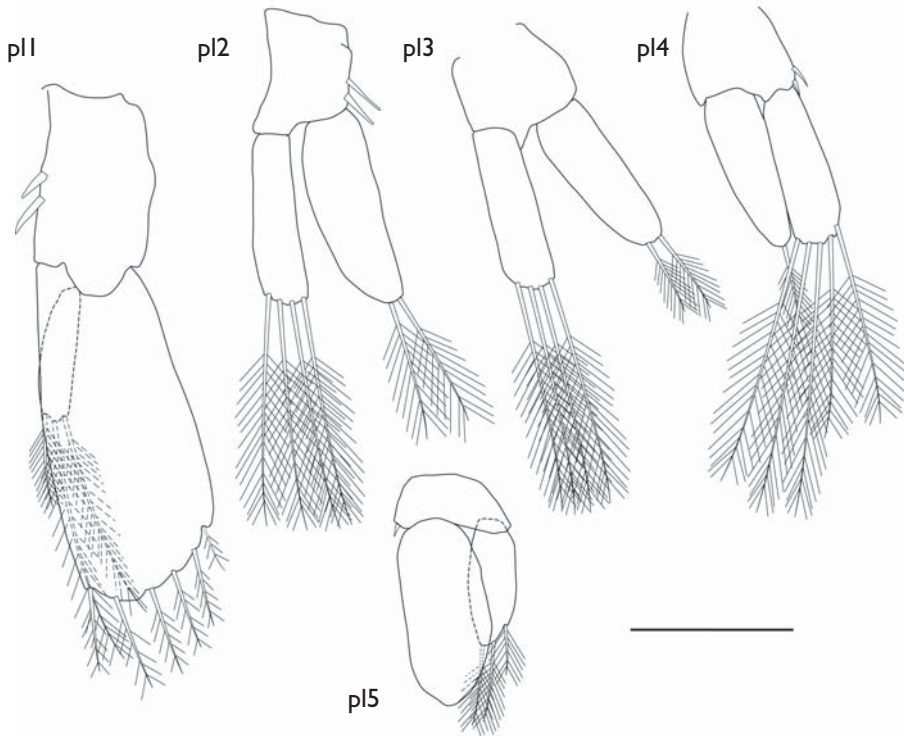


Figure 3. *Leipanthura casuarina* sp. n., paratype juvenile. **pl1–pl5**, pleopods 1–5 (drawn to same scale). Scale bar = 0.1 mm.

opods 4–6 similar in form and length to each other, about as long as pereopods 2 and 3, proximal articles with few setae; merus with convex upper margin; carpus with free upper margin about 0.7 length of lower margin, with setae on distal angles; propodus curved, about 2.5 times as long as width, palm with 1 flagellated robust seta distally; dactylus curved, unguis one-quarter length.



Figure 4. *Leipanthura casuarina* sp. n., alcohol-preserved non-type specimen, WAM C40642. Photograph and image preparation by Ken Walker, Museum Victoria, 18 June 2009. Scale bar = 0.25 mm.

Pleopod 1 scarcely thickened, not indurate, exopod overlapping endopod and all other pleopods and base of uropods; endopod one-third as wide and half as long as exopod, with 3 distal setae; exopod 2.1 times as long as wide, with 6 distal marginal setae. Pleopods 2–5 progressively shorter, between 0.58 (pl2) and 0.44 (pl5) as long as pleopod 1; pleopods 2–4 with tapering endopods (2, 2, 1 apical setae) and more rectangular exopods (4, 4, 4 apical setae); pleopod 5 endopod oval, broad (without apical setae) and shorter oval exopod (3 apical setae).

Uropodal peduncle widest distally, mesially expanded, with oblique distal margin; endopod suboval in dorsal view, wider than deep, with 3 apical setae mesially and 3 setae ventrolaterally; exopod cylindrical, about half as long as endopod, with 1 lateral seta and 2 dorsal apical setae.

Oostegites on pereopods 2–5.

Remarks. The illustration of the female (fig. 1a) shows pleopod 1 in its operculate position; that of the juvenile (fig. 1b) with the pleopods open. Apart from the absence of oostegites, the juvenile paratype seems indistinguishable from the female.

The specimen from Ningaloo Reef, WA, on the opposite side of Australia from the type locality, was not dissected (fig. 4) but differed in ways that could be interpreted as being of taxonomic value only after looking at more than the three specimens available now. General proportions and shapes were similar. Nevertheless, the distal palmar setae on pereopods 2–6 were noticeably trifold (flagellated and simple in type specimens) and the numbers of setae differed. The WA specimen possessed four setae on the mandibular palp article 3 (not three), three apical setae on the uropodal endopod (not two), and three setae ventrolaterally on the uropodal exopod (not two).

The species, at 2.7 mm long, is one of the smallest anthuroids known, considerably narrower than some expanathurids of similar lengths (Poore and Lew Ton 2002).

Acknowledgements

I thank Niel Bruce, Museum of Tropical Queensland, Townsville, for drawing this interesting species to my attention and providing the material. Special thanks too to Ken Walker, Museum Victoria, for taking the photograph using a Leica MZ16 microscope, Leica DF500 digital camera, and Automontage® software. This material from Lizard Island and Ningaloo Reef was collected under the auspices of the CReefs project organised by the Australian Institute of Marine Science (AIMS). The CReefs Australia Project is generously sponsored by BHP Billiton in partnership with The Great Barrier Reef Foundation, the Australian Institute of Marine Science and the Alfred P. Sloan Foundation; CReefs is a field program of the Census of Marine Life.

References

- Brandt A, Poore GCB (2003) Higher classification of the flabelliferan and related Isopoda based on a reappraisal of relationships. *Invertebrate Systematics* 17: 893–923.
- Cohen BF, Poore GCB (1994) Phylogeny and biogeography of the Gnathiidae (Crustacea: Isopoda) with descriptions of new genera and species, most from south-eastern Australia. *Memoirs of the Museum of Victoria* 54: 271–397.
- Harger O (1878) Descriptions of new genera and species of Isopoda, from New England and adjacent regions. *American Journal of Sciences and Arts* 15: 373–379.
- Kensley B (1980) Anthuridean isopod crustaceans from the International Indian Ocean Expedition, 1960–1965, in the Smithsonian Collections. *Smithsonian Contributions to Zoology* 304: 1–37.
- Kensley B (1981) Amsterdam Expeditions to the West Indian Islands Report 10. *Curassanthura halma*, a new genus and species of interstitial isopod from Curaçao, West Indies (Crustacea: Isopoda: Paranthuridae). *Bijdragen tot de Dierkunde* 51: 131–134.
- Kensley B (1996) The genus *Ptilanthura* in the western Atlantic: evidence for primary males and description of a new species (Isopoda: Anthuridae). *Journal of Crustacean Biology* 16: 763–781.
- Leach WE (1814) Crustaceology. *Brewster's Edinburgh Encyclopedia* 7: 383–437, pl. 221.
- Menzies RJ, Glynn PW (1968) Studies on the fauna of Curaçao and other Caribbean Islands No. 27. The common marine isopod Crustacea of Puerto Rico. A handbook for marine biologists. *Uitgaven van de Natuurwetenschappelijke Studiekring voor Suriname en der Nederlandse Antillen* 51: 1–133.
- Monod T (1922) Sur un essai de classification rationnelle des isopodes. *Bulletin de la Société Zoologique de France* 47: 134–140.
- Montagu G (1808) Description of several marine animals found on the south coast of Devonshire. *Transactions of the Linnean Society of London* 9: 81–144.
- Poore GCB (1984) *Colanthura*, *Califanthura*, *Cruranthura* and *Cruregens*, related genera of the Paranthuridae. *Journal of Natural History*, 18: 697–715.
- Poore GCB (2001) Families and genera of Isopoda Anthuridea. In: Kensley, B. and Brusca, R.C. *Isopod systematics and evolution*. Balkema: Rotterdam. *Crustacean Issues* 13: 63–173.
- Poore GCB, Lew Ton HM (1985) *Apanthura*, *Apanthuretta* and *Apanthuropsis* gen. n. (Crustacea: Isopoda: Anthuridae) from south-eastern Australia. *Memoirs of the Museum of Victoria* 46: 103–151.
- Poore GCB, Lew Ton HM (2002) Expanthuridae (Crustacea: Isopoda) from the Australian region. *Zootaxa* 82: 1–60.
- Schotte M, Boyko CB, Bruce NL, Markham JC, Poore GCB, Taiti S, Wilson GDF (Eds) (2008 onwards) *World List of Marine Freshwater and Terrestrial Isopod Crustaceans*. Available online at <http://www.marinespecies.org/isopoda/>. Accessed on 23 April 2009/.
- Wägele J-W (1989) Evolution und phylogenetisches System der Isopoda. *Stand der Forschung und neue Erkenntnisse*. *Zoologica (Stuttgart)* 140: 1–262.

- Wägele JW (1980) Anthuridea (Crustacea, Isopoda) aus dem Tyrrhenischen Meer. *Zoologica Scripta* 9: 53–66.
- Wägele JW (1981) Zur phylogenie der Anthuridea (Crustacea, Isopoda) mit Beiträgen zur Lebensweise, Morphologie, Anatomie und Taxonomie. *Zoologica (Stuttgart)* 132: 1–127.
- Wägele JW (1982) The hypogean Paranthuridae *Cruregens* Chilton and *Curassanthura* Kensley (Crustacea, Isopoda), with remarks on their morphology and adaptations. *Bijdragen tot de Dierkunde* 52: 49–59.

Corrigenda: Kihara TC & Huys R (2009) A new genus of Ectinosomatidae (Copepoda, Harpacticoida) from sublittoral sediments in Ubatuba, São Paulo State (Brazil), an updated key to genera and notes on *Noodtiella* Wells, 1965. ZooKeys 17: 57–88

Terue Cristina Kihara¹, Rony Huys²

¹ Departamento de Zoologia, Instituto de Biociências, Universidade de São Paulo, Rua do Matão, trav. 14, n° 321, 05508-900 São Paulo, Brazil ² Department of Zoology, Natural History Museum, Cromwell Road, SW7 5BD, London, UK

Corresponding author: Rony Huys (rjh@nhm.ac.uk)

Academic editor: Danielle Defaye | Received 18 August 2009 | Accepted 21 August 2009 | Published 24 August 2009

Citation: Kihara TC, Huys R (2009) Kihara TC & Huys R (2009) A new genus of Ectinosomatidae (Copepoda, Harpacticoida) from sublittoral sediments in Ubatuba, São Paulo State (Brazil), an updated key to genera and notes on *Noodtiella* Wells, 1965. In: Bruce N (Ed) Advances in the taxonomy and biogeography of Crustacea in the Southern Hemisphere. ZooKeys 17: 57–88. ZooKeys 18: 181–182. doi: 10.3897/zookeys.18.249

In a recent review of unresolved nomenclatural issues in the Harpacticoida, Huys (2009: 33 – published 06 August 2009) proposed a new generic name *Glabrotelson* for the orphaned grouping equivalent to McLachlan & Moore’s (1978) concept of *Hastigerella* Nicholls, 1935. The provisions of ICZN Arts 13.1.2, 13.3 and 16.1 were met by providing a bibliographic reference to a diagnosis (Huys et al. 1996: 188), fixing a type species (*Hastigerella mehuinensis* Mielke, 1986) and explicitly indicating the generic name *Glabrotelson* as intentionally new, respectively. Kihara and Huys (2009: 80 – published 05 August 2009) reiterated Huys’ (2009) justification for this course of action and stated that *Glabrotelson* was a “new name” intended by Huys, which constitutes an “explicit indication of novelty” (ICZN Art. 16.1). They also mentioned the type species (ICZN Art. 13.3) and cited the new name in the generic key which in itself is sufficient to satisfy the requirements of ICZN Art. 13.1.2. Hence, being available from Kihara and Huys (2009), *Glabrotelson* Huys in Kihara & Huys (2009) takes priority over *Glabrotelson* Huys, 2009 syn. et hom. n.

Unlike stated in Kihara and Huys (2009: 62, line 9) the gender of *Chaulionyx* is masculine, not feminine.

A number of previously established binomina cited in Kihara and Huys (2009) fail to show agreement in gender between the species-group name and generic name and consequently require amendment:

Page 74, line 5 from bottom: *K. spinosa* Hicks & Schriever, 1983; read: *K. spinosum* (Hicks & Schriever, 1983).

Page 74, lines 4–5 from bottom: *K. triarticulatus*; read: *K. triarticulatum*.

Page 75, line 4: *B. foliatus*; read: *B. foliata*.

Page 75, line 2 from bottom: *N. gracile*; read: *N. gracilis*.

Page 76, last line: *N. gracile*; read: *N. gracilis*.

Page 79, line 14: *gracile*; read: *gracilis*.

Page 80, line 7: *T. typicus*; read: *T. typica*.

Page 80, line 10: *T. medius*; read: *T. media*.

Page 80, line 20: *Ectinosoma tenuissima*; read: *Ectinosoma tenuissimum*.

Acknowledgement

We are very grateful to Dr Miguel A. Alonso-Zarazaga (Museo Nacional de Ciencias Naturales, Madrid) for drawing our attention to these errors.

References

- Huys R (2009) Unresolved cases of type fixation, synonymy and homonymy in harpacticoid copepod nomenclature (Crustacea: Copepoda). *Zootaxa* 2183: 1–99.
- Huys R, Gee JM, Moore CG, Hamond R (1996) Marine and brackish water harpacticoid copepods. Part 1. In: Barnes RSK, Crothers JH (Eds), *Synopses of the British Fauna (New Series)*, 51: I–VIII, 1–352. Field Studies Council, Shrewsbury.
- McLachlan A, Moore CG (1978) Three new species of Harpacticoida (Crustacea, Copepoda) from sandy beaches in Algoa Bay, South Africa, with keys to genera *Arenosetella*, *Hastigerella*, *Leptastacus* and *Psammastacus*. *Annals of the South African Museum* 76(4): 191–211.
- Mielke W (1986) Copépodos de la meiofauna de Chile, con descripción de dos nuevas especies. *Revista Chilena de Historia natural* 59: 73–86.