

# NEW SPECIES OF *CYATHURA* (CRUSTACEA: ISOPODA: ANTHURIDAE) FROM ESTUARIES OF EASTERN AUSTRALIA

BY GARY C. B. POORE AND HELEN M. LEW TON

Department of Crustacea, Museum of Victoria, Russell Street, Melbourne, Victoria 3000, Australia

## Abstract

*Cyathura aegiceras*, *C. bruguiera* and *C. hakea* spp. nov., the only species of this genus so far known from Australia, are described. *Cyathura aegiceras* and *C. bruguiera* are found in estuaries of central-north Queensland and co-occur. *Cyathura hakea* is common in many estuaries and brackish coastal lakes of New South Wales, from the most eastern estuary and in a freshwater coastal lake in Victoria, and in an estuary draining to Moreton Bay, Queensland.

## Introduction

The anthurid isopod genus *Cyathura* Norman & Stebbing is cosmopolitan, with at least 30 species known (Negoulescu and Wägele, 1984). Most are coastal species and many are estuarine. The eastern American species *C. polita* (Stimpson) and *C. carinata* (Krøyer) from Europe are the only two anthurideans whose biology has been studied (Amanieu, 1969; Burbanck, 1962; Burbanck and Burbanck, 1979).

Two new species are described from estuaries in central-north Queensland (18°S.) and a third from estuaries in southern Queensland, New South Wales and far eastern Victoria between 27°S. and 38°S. The third species is not known from well-sampled estuaries elsewhere in Victoria. Another anthuridean, *Cruranthura peroni* (Poore), also occurs in estuaries in southern Queensland, New South Wales and in Victoria ranges further west to the Gippsland Lakes (Poore, 1981).

Material for this study has come mostly from collections of the Queensland Museum, NSW State Fisheries (NSWSF), the Australian Museum Hawkesbury River Study, 1977-1978 (AMHRS), the Australian Museum Eurobodella Shire Estuary Survey, 1974 (AMESES) and the LaTrobe Valley Water and Sewerage Board, Traralgon (LVWSB). Specimens are lodged in the Australian Museum, Sydney (AM), the Queensland Museum, Brisbane (QM), and the Museum of Victoria, Melbourne (NMV). For an explanation of figure labelling see Poore (1984). Scales on figures are 1 mm.

Specific epithets are generic names of Australian flowering plants, following a pattern established for *Paranthura* by Poore (1984).

## Anthuridae

### *Cyathura* Norman & Stebbing, 1886

**Diagnosis:** Integument often pigmented, often with numerous fine hairs. Eyes usually present, sometimes absent. Antenna 1 flagellum of at most 4 articles, with 3 terminal aesthetascs. Antenna 2 flagellum short, of very few short articles. Mandibles symmetrical, not sexually dimorphic; incisor, lamina dentata and blunt molar present; palp 3-articled, article 3 as long as 2, with a longitudinal row of setae. Maxilliped of 4 articles, endite absent or reduced; article 4 terminal (suture oblique), about one-half length of article 3, with 4-5 mesial setae.

Pereopod 1 subchelate, article 6 swollen, with a tooth on the palm. Pereopods 2 and 3 with articles 6 only very slightly more swollen than posterior pereopods. Pereopods 4-7 with article 5 triangular, its anterior margin free.

Pleon short (about as long as pereonite 7), pleonites 1-5 fused, pleonite 6 free or fused to telson. Pleopod 1 exopod operculiform, endopod without marginal setae. Pleopods 2-5 with endopods each bearing 1 seta. Uropodal endopod short, more or less square or triangular. Telson with 2 basal statocysts, apex with long setae, no long dorsal setae.

Male antenna 1 with short flagellum of 4-5 very short articles, each bearing numerous aesthetascs.

**Types-species:** *Anthura carinata* Krøyer, 1848.



**Remarks:** The genus *Cyathura* has been defined clearly by Barnard (1925) and more recently by Wägele (1981). *Cyathura* shares with *Apanthura* and related genera antenna 1 with three aesthetascs, triangular-trapeziform article 5 on pereopods 4-7 and telson with several apical long setae. Its closest relative is *Mesanthura* with which it shares a broad terminal maxillipedal article, short male antenna 1 flagellum, and no maxillipedal endite.

Wägele (1979) described in detail the homology of the mouthparts of *Cyathura carinata*, the only anthuridean studied in this way.

The male of species of *Cyathura* possesses a retractile flagellum on antenna 1. The flagellum is very short and capable of being telescoped into the terminal article of the peduncle. This phenomenon was discussed in detail by Wägele (1982).

The phylogenetic interrelationships of the species of *Cyathura* have been explored in two recent contributions. Wägele (1982) examined the morphology of the apex of the male appendix masculina but reached few conclusions. Botosaneanu and Stock (1982) divided the genus into two subgenera, *Cyathura* s.s. and *Stygocyathura*, on the basis of several characters, the most significant being the method of articulation of the uropodal exopod. In *Cyathura*, which contains mainly marine species, the exopod is shaped like an "elephant's ear" and its articulation is long. In contrast, in *Stygocyathura*, which contains only stygobiontic Caribbean species, the exopod is linear and its articulation short and transverse. Division of the subgenera is also supported, more or less, by differences in fusion of the telson, palm of pereopod 1, proportions of pereopodal articles, setation and first pleopods. We support this division of the genus and believe that *Stygocyathura* is a monophyletic group which has invaded stygobiontic environments in the Caribbean and Central America. Botosaneanu and Stock (1982) suggested that the New Caledonian species, *Cyathura numeae* Wägele, which lives in a hypogean interstitial environment represents an intermediate form. It is our belief that this species is a true member of the subgenus *Cyathura* and its similarity to the

stygobiontic species is a convergence resulting from adaptation to its peculiar environment. Similar adaptations are shown by the unrelated paranthurid *Cruregens fontanus* Chilton. *Cyathura numeae* is most closely related to two species geographically quite separate, *C. cubana* Negoulescu and *C. aegiceras* sp. nov. This lends support to the idea that *Cyathura* s.s. is a world-wide grouping and *Stygocyathura* is a local monophyletic offshoot.

One of the characters used to differentiate the two new subgenera was the degree of fusion of the telson to pleonite 6. Botosaneanu and Stock (1982) believed that in all species of *Cyathura* s.s. the telson was free; this is not the case in *C. aegiceras* but telson fusion is a widespread phenomenon in the family and probably of little phylogenetic significance.

All Australian species fall within the subgenus *Cyathura* as predicted by Botosaneanu and Stock (1982).

#### Key to eastern Australian species of *Cyathura*

1. Telson tapering; pereopod 2 with article 6 rectangular and straight ..... *C. aegiceras*
- Telson with convex lateral margins, widest at midpoint; pereopod 2 with article 6 linear and curved ..... 2
2. Uropodal endopod about as long as wide; exopod widest at midpoint; body about 10 × as long as wide ..... *C. hakea*
- Uropodal endopod almost twice as long as wide; exopod widest distally; body about 15 × as long as wide ..... *C. bruguiera*

#### *Cyathura aegiceras* sp. nov.

Figures 1-3

**Material examined:** 3 females, 3.4-4.4 mm; 4 juveniles, 2.7-5.0 mm:

**Holotype:** female, 4.4 mm, QMW10033 (with one slide). Qld, Murray River, north of Cardwell (18°16'S., 146°01'E.), P. Davie, May 1978.

**Paratypes:** Qld, type locality, QMW10039 (1), QMW10600(1), QMW10603(2), NMVJ 4168(1).

**Other material:** Qld, Daintree River, D. Hammond, Jun 1981, QMW10029(1).

**Description:** *Female.* About 7 × as wide. Integument smooth, with few scattered fine setae;



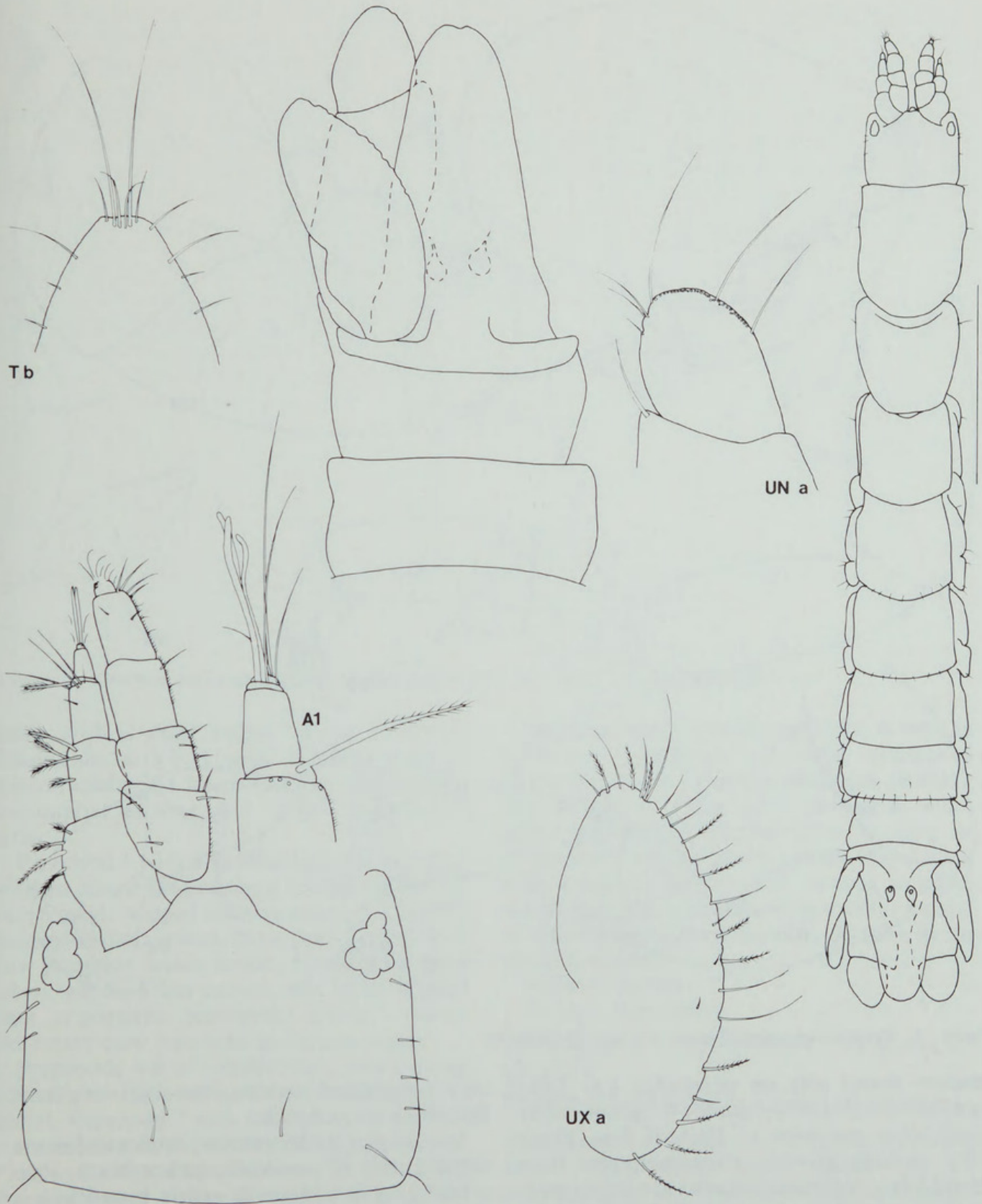


Figure 1. *Cyathura aegiceras*. Female, 4.4 mm, QMW10033; a, female, 3.4 mm, QMW10600; b, juvenile, 3.7 mm, QMW10600.

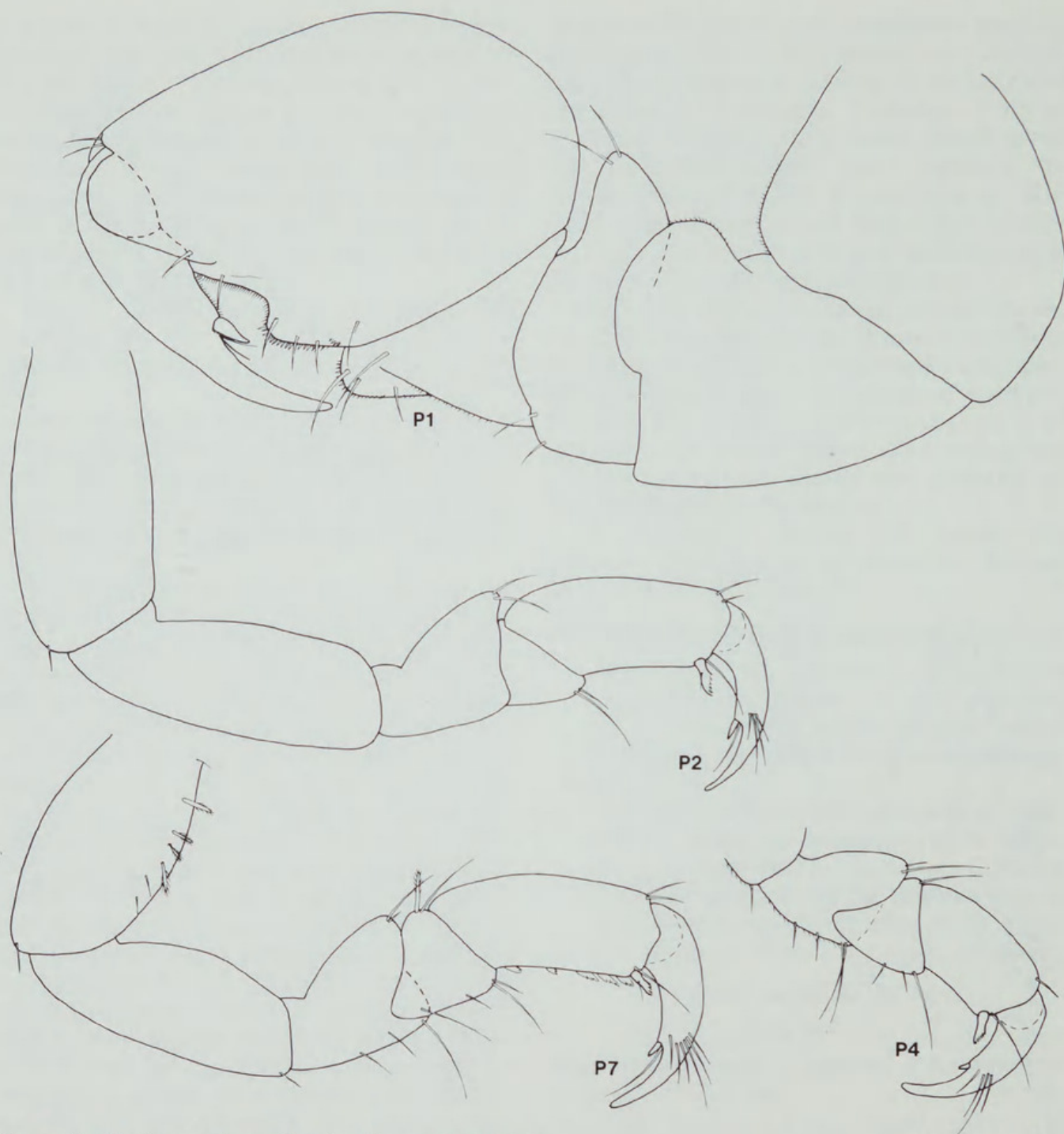


Figure 2. *Cyathura aegiceras*. Female, 4.4 mm, QMW10033.

shallow dorsal pits on pereonites 4-6. Dorso-lateral margins of pereonites 4-7 produced as small lobes posterior to base of legs. Head  $0.8\times$  as long as wide; rostrum shorter than lateral lobes, truncate. Antenna 1 reaching mid-way along article 5 of antenna 2; flagellum of 4 articles of which the second is the longest; with 3 terminal aesthetascs. Antenna 2 flagellum of

very compressed articles, one-sixth length of last article of peduncle.

Mandibular molar narrow, truncate; lamina dentata with 12 saw-teeth; incisor blunt. Palp article 2 twice as long as article 1; article 3 is  $1.5\times$  as long as article 1; first and second articles each with 1 seta, third with 5 terminal pectinate setae. Maxilliped covered with few fine



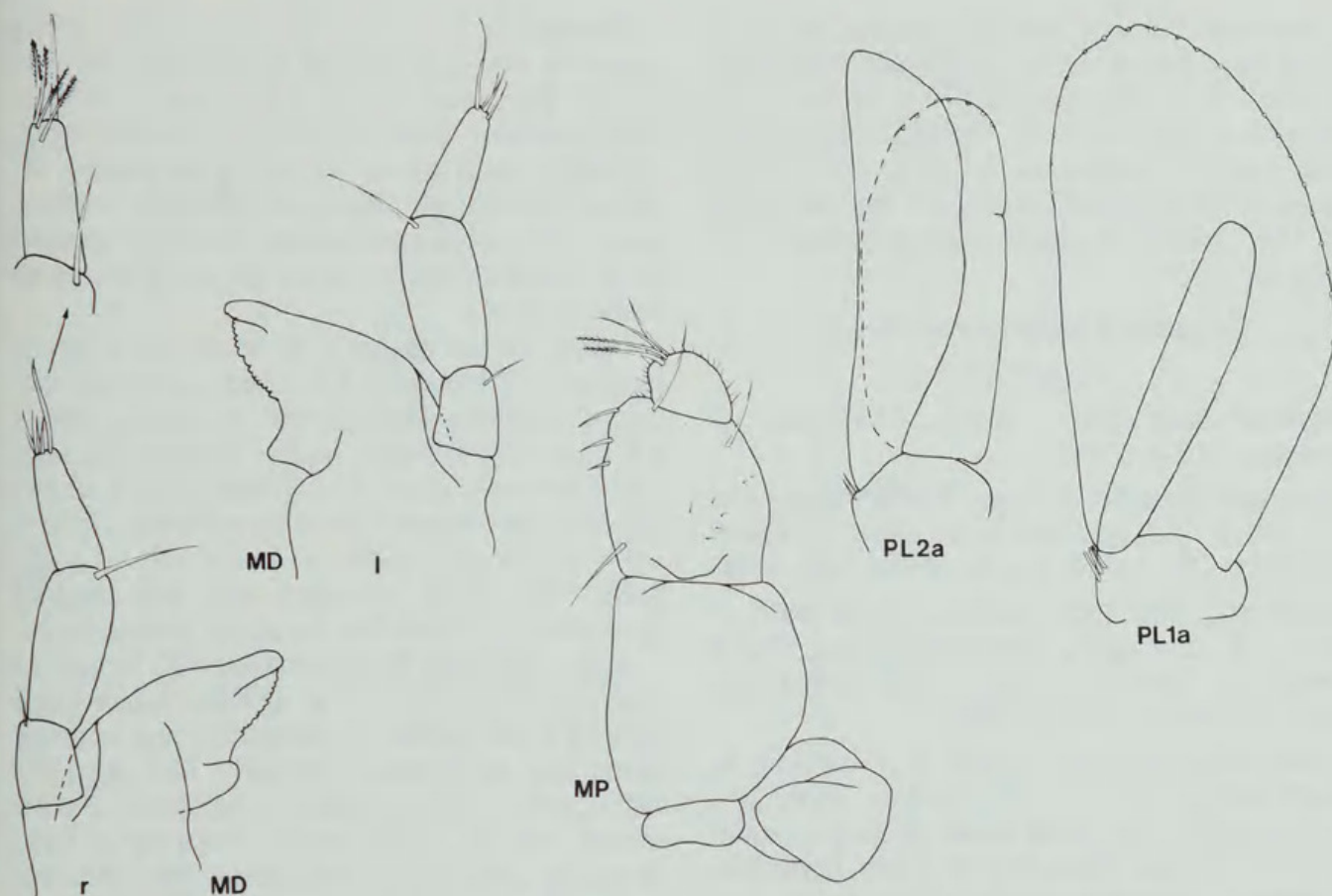


Figure 3. *Cyathura aegiceras*. Female, 4.4 mm, QMW10033; a, female, 3.4 mm, QMW10603.

hairs, with a short endite; article 1 vaguely discernible; article 3 with 4 mesial setae, 1 mesio-facial and 1 latero-facial; article 4 about one-quarter as long as 3, with 4 disto-mesial setae.

Pereopod 1 with a swollen article 6; article 5 with an obtuse posterodistal tooth; palm of article 6 axial, stepped midway along and bearing numerous short spines. Pereopods 2 and 3 with few posterior setae; article 5 not posteriorly lobed; article 6 not curved, not more swollen than in posterior pereopods; article 7 with a secondary claw one-third as long as unguis.

Pereopods 4-6 of similar size, setose along posterior margin and with a secondary claw on dactyl. Pereopod 7 with a longer article 6 than more anterior limbs, without a secondary claw. Pleopod 1 exopod operculiform, with about 25 marginal setae; endopod two-thirds length of exopod, without setae. Pleopod 2 endopod longer than exopod; exopod with a partial suture, with 7-10 setae; endopod without setae.

Pleon about  $1.5\times$  as long as wide, as long as pereonite 7; pleonites 1-5 fused, pleonite 6 fused to telson. Uropodal endopod reaching beyond end of telson,  $1.5\times$  as long as wide, widest proximally; exopod  $2.2\times$  as long as wide, dorsal margin gently convex, distal apex acute-rounded. Telson  $1.8\times$  as long as wide, widest proximally and tapering evenly, 3 pairs of dorsal-lateral setae distally, 3 pairs in an apical concavity.

*Male:* Unknown.

*Colour:* Pale yellow.

*Distribution:* Central-north Queensland, estuaries.

*Etymology:* *Aegiceras* is a genus of mangrove.

*Remarks:* All species of the subgenus *Cyathura* are morphologically quite similar but *C. aegiceras* exhibits two unique features. Pleonite 6 is fused to the telson and pereopod 2 has a relatively short article 7 (it is usually longer and curved). Its tapering telson is similar to that of



*C. numeae* Wägele, but this smaller species is blind and found in an hypogean interstitial habitat. A similar species from an estuarine mangrove habitat is *C. cubana* Negouescu. Like *Cyathura aegiceras*, *C. cubana* is a broad species with compact pereopod 2 but the telson of this species is parallel-sided rather than tapered.

***Cyathura bruguiera* sp. nov.**

Figures 4, 5

**Material examined:** 5 males, 1 female, 14 juveniles; 3.1–8.5 mm:

**Holotype:** juvenile, 8.5 mm, QMW10040 (with one slide). Qld, Murray River, north of Cardwell (18°16'S., 146°01'E.), P. Davie, May 1978.

**Paratypes:** Qld, type locality, QMW10605 (1 male, 8 juveniles), QMW10034(2), QMW10035(2), QMW10036(1), QMW10037(2), QMW10038(1), NMVJ4170(2).

**Description:** *Juvenile.* About 15× as long as wide. Integument smooth; shallow dorsal pits on pereonites 4–6. Head about as long as wide; rostrum shorter than lateral lobes, truncate. Antenna 1 reaching midway along article 4 of antenna 2; flagellum of 4 articles, with 3 terminal aesthetascs. Antenna 2 flagellum of several very short articles, one-third length of last article of peduncle.

Mandibular molar narrow, truncate; lamina dentata with 16 saw-teeth; incisor blunt. Palp article 2 twice as long as article 1; article 3 1.5× as long as article 1; all articles with fine hairs, second with 3 setae, third with a terminal comb of 7 spaced pectinate setae. Maxilliped covered with fine hairs, with a broad short endite; article 3 with 5 mesial setae, 1 mesio-facial and 1 antero-facial; article 4 about half as long as 3, with 4 mesial setae.

Pereopod 1 with a swollen but strongly tapering article 6; article 5 with an acute but not prominent posterodistal tooth; palm of article 6 axial, a tooth midway along and a marginal row of about 10 setae. Pereopods 2 and 3 posteriorly setose and bearing fine hairs; article 5 moderately posteriorly lobed; articles 6 curved, only slightly more swollen than in posterior pereopods; article 7 with a secondary claw almost half as long as unguis.

Pereopods 4–6 of similar size, setose along posterior margins; lacking a secondary claw on dactyl. Pereopod 7 with longer article 6 than more anterior limbs. Pleopod 1 exopod operculiform, with about 40 marginal setae; endopod two-thirds length of exopod, without setae. Pleopod 2 rami equal in length; exopod with a partial suture, about 15 setae; endopod without setae.

Pleon about as long as wide, as long as pereonite 7; pleonites 1–5 fused. Uropodal endopod reaching beyond end of telson, about 1.8× as long as wide, widest proximally; exopod 1.9× as long as wide; dorsal margin widest distally, ventral apex obtusely rounded. Telson 2.4× as long as wide, widest at about mid-point, few short marginal and submarginal setae distally, 3 pairs in an apical concavity.

**Male:** Differing from juveniles and female in antenna 1; flagellum of 5 articles, telescoping into terminal article of peduncle, and bearing numerous aesthetascs ventrally and distally. Pereopods all more elongate, pereopod 1 with mesial row of short setae. Pleopod 2 with appendix masculina reaching little beyond endopod.

**Colour:** Variable but colour on pleon, head and antennae are most persistent elements.

**Distribution:** Central-north Queensland, estuaries.

**Etymology:** *Bruguiera* is a genus of mangrove.

**Remarks:** *Cyathura bruguiera* is an elongate species separated from *C. aegiceras* with which it co-occurs by the convex lateral margins of the telson and more elongate article 6 of pereopod 2, typical of most of its cogenors.

***Cyathura hakea* sp. nov.**

Figures 6–8

anthurid.—Timms, 1973: 10ff.—Williams, 1980: 155, fig. 62.1.

**Material examined:** 62 males, 180 females, 203 juveniles; 4.1–18.1 mm:

**Holotype:** juvenile, 10.7 mm, AMP33592 (with one slide). NSW, Georges River, Milperra (33°56'S., 150°58'E.), NSWFS stn 28, 29 Nov 1972.



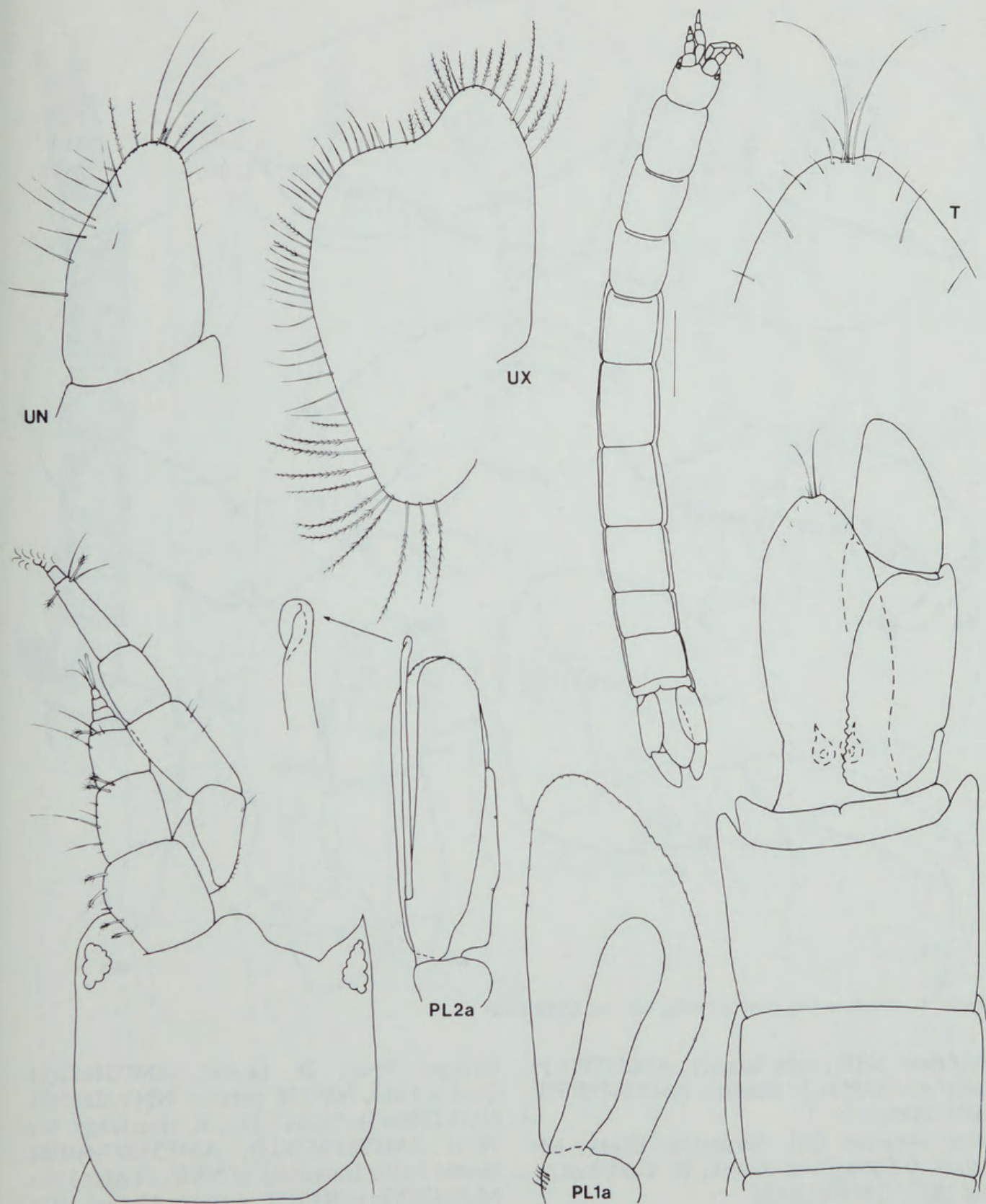


Figure 4. *Cyathura bruguiera*. Juvenile, 8.5 mm, QMW10040; a, male, QMW10605.

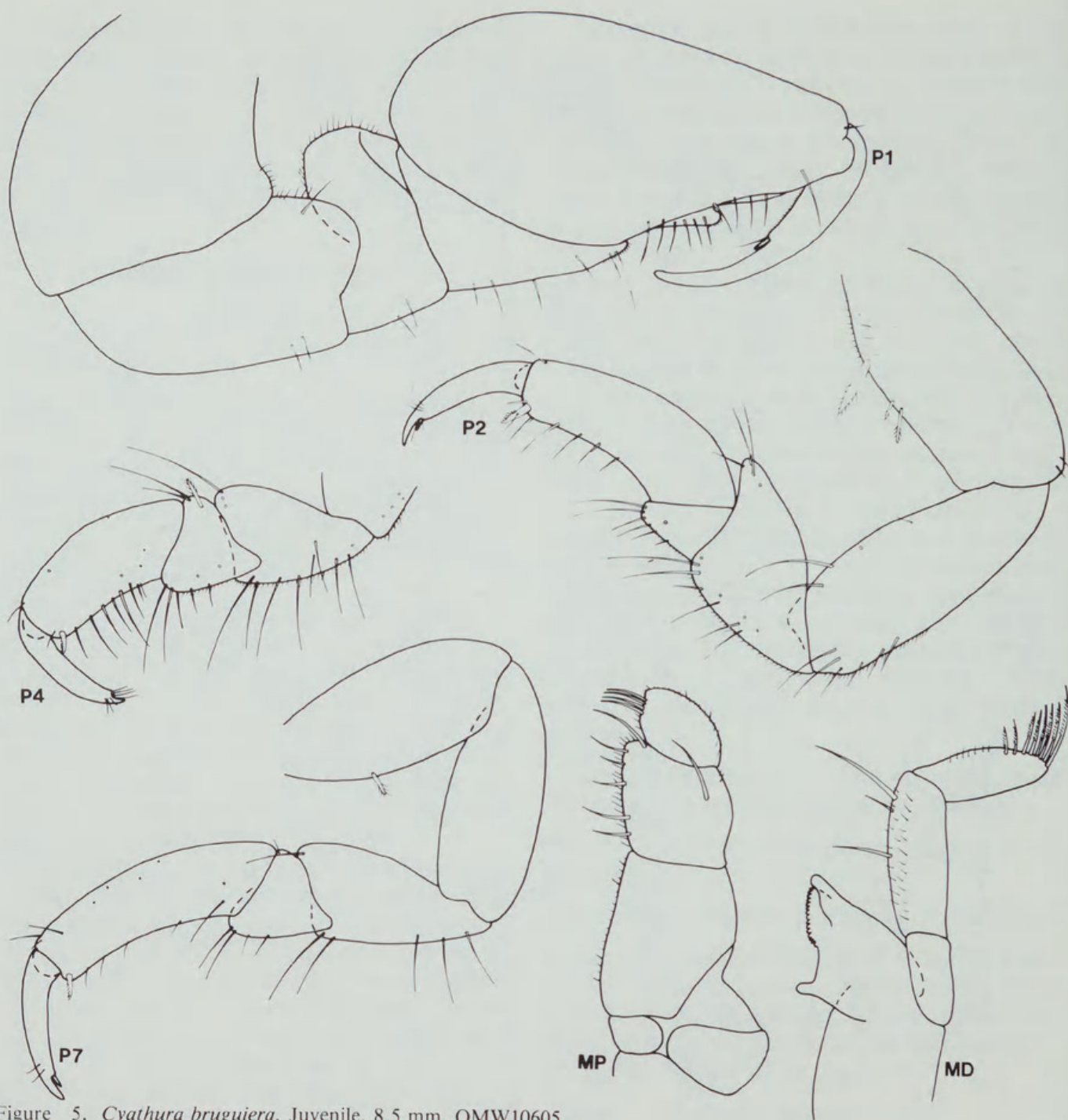


Figure 5. *Cyathura bruguiera*. Juvenile, 8.5 mm, QMW10605.

*Paratypes*: NSW, type locality, AMP33593 (1 male), AMP33594 (1 female), AMP24976(37), NMVJ2889(5).

*Other material*. Qld. Serpentine Creek, left branch, 0.5 km from mouth, B. Campbell, 1 Aug 1972, QMW4230(2).

NSW. Georges River Estuary, 21 NSWFS stations, Oct-Nov 1972: AMP24724-8 (37 specimens); AMP24958-60, P24962-74(243).

Georges River, D. Dexter, AMP31042(1). Queens Lake, NSWFS stations: NMVJ2885(3), NMVJ2886(3). Myall Lake, P. Hutchings, Sep 1975: AMP25194-8(14), AMP33597-601(5). Smiths Lake: University of NSW, 11 Mar 1980, NMVJ2876(1); NSWFS station, 17 Dec 1979, NMVJ2887(1). Lake Macquarie: NSWFS station, NMVJ2879-84(36); K. Robinson, 17 Jul 1979, NMVJ2875(3). Tuggerah Lake, B. J.



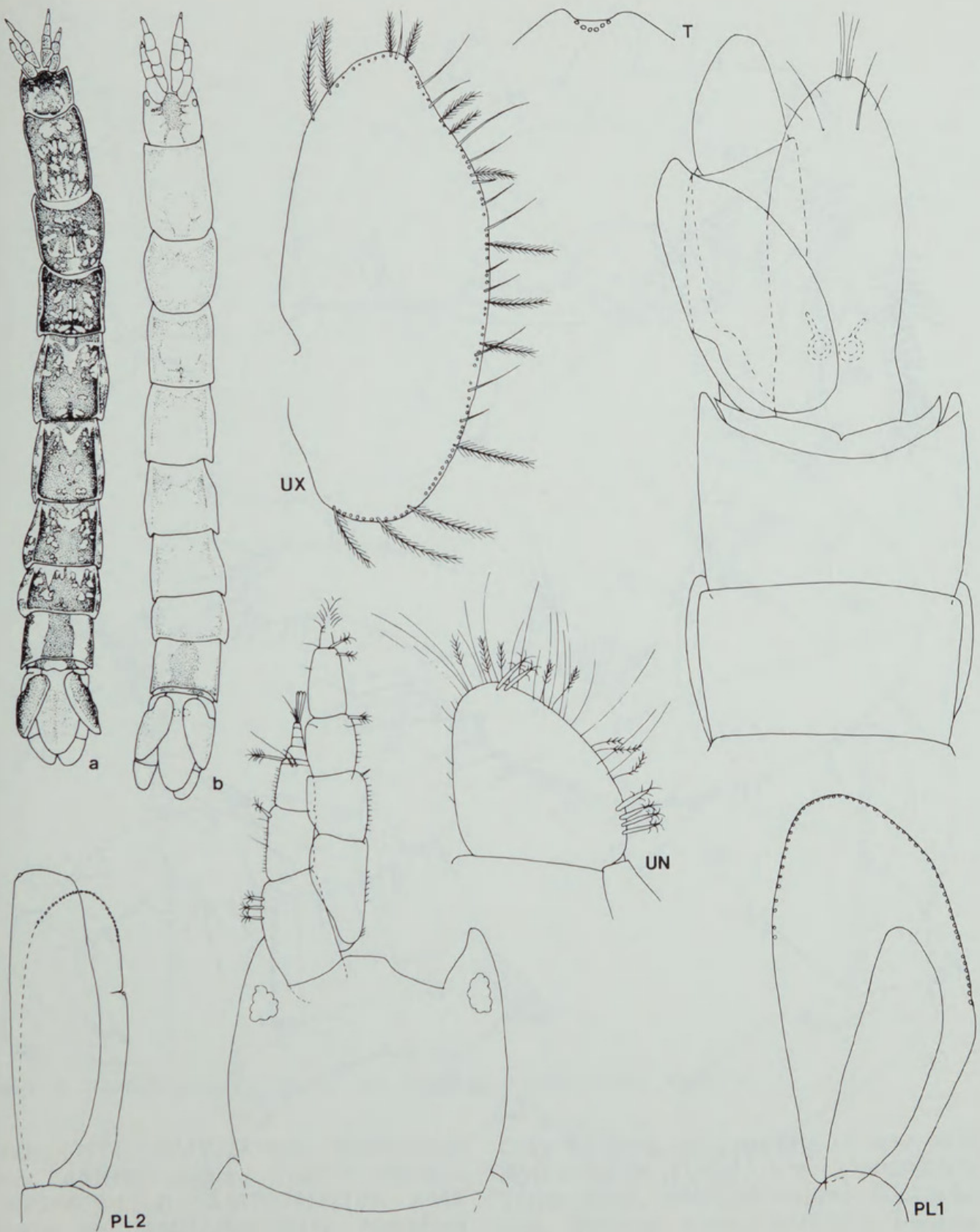


Figure 6. *Cyathura hakea*. Juvenile, 10.7 mm, AMP33592; a, male, 10.4 mm, AMP33593; b, juvenile, 10.3 mm, AMP24974.



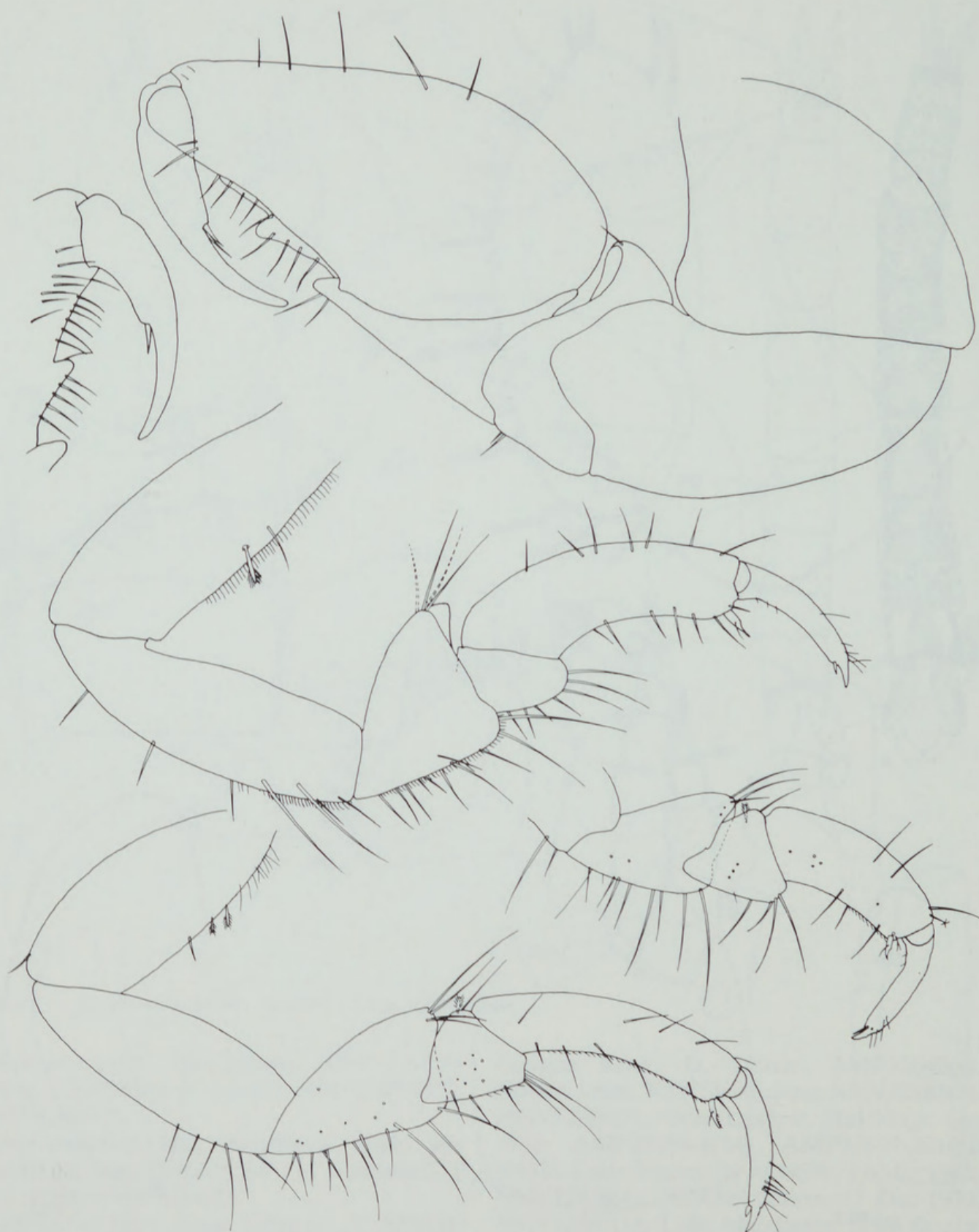


Figure 7. *Cyathura hakea*. Juvenile, 10.7 mm, AMP33592; a, male, 10.4 mm, AMP33593.



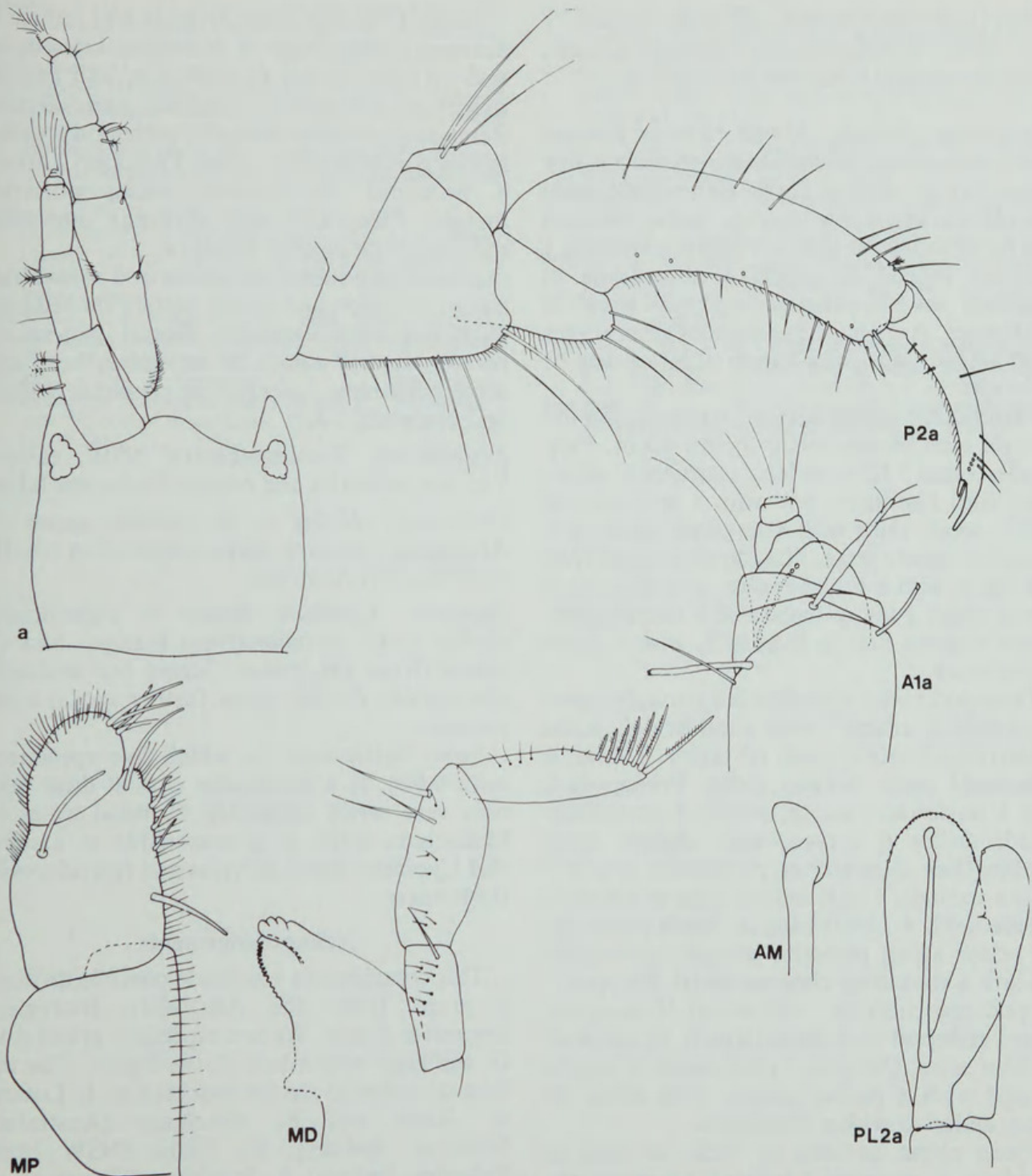


Figure 8. *Cyathura hakea*. Juvenile, 10.7 mm, AMP33592; a, male, 10.4 mm, AMP33593.

Powls, 1974, NMVJ2874(4). Hawkesbury River, AMHRS stations from 7 transects: AMP28609-12(4), AMP27958(10), AMP 29760-6 (9), AMP29768-78(11). Narrabeen Lagoon, D. Dexter, AMP31004(1). Lane Cove River, AMP27937(1). Buffalo Creek, Lane

Cove River, B. W. Jenkins: 12 Sept 1978, AMP27957(1); 1 Apr 1979, AMP28602(7). Tuross River, AMESES station: AMP24941 (11). Wallaga Lake, AMESES stations: AMP24955-7(3). Merimbula, NSW SF stations: NMVJ2877(2), NMVJ2878(2).



Vic. Lake Barracoota, LVWSB station, 1 Nov 1980: NMVJ2888(5); Mallacoota Inlet, LVWSB station, 1978: NMVJ2870-3(9).

*Description: Female.* About  $10\times$  as long as wide. Integument smooth, with numerous fine setae all over; shallow dorsal pits on pereonites 4-6. Head about as long as wide; rostrum shorter than lateral lobes, truncate. Antenna 1 reaching to end of article 4 of antenna 2; flagellum of 5 articles, with 3 terminal aesthetascs. Antenna 2 flagellum of several very short articles, one-third length of last article of peduncle.

Mandibular molar narrow, truncate; lamina dentata with 16 saw-teeth; incisor blunt. Palp articles 2 and 3  $1.5\times$  as long as article 1; all articles with fine hairs, first with 1 seta, second with 3 setae, third with a terminal comb of 7 spaced pectinate setae. Maxilliped covered with fine hairs; with a broad endite; article 3 with 4 mesial setae, 2 mesio-facial and 1 latero-facial; article 4 about half as long as 3, with 5 disto-mesial setae.

Pereopod 1 with a swollen but strongly tapering article 6; article 5 with a moderately acute posterodistal tooth; palm of article 6 axial, a prominent tooth midway along. Pereopods 2 and 3 posteriorly setose; article 5 posteriorly lobed; article 6 curved, only slightly more swollen than in posterior pereopods; article 7 with a secondary claw half as long as unguis.

Pereopods 4-7 increasing in length posteriorly, setose along posterior margin; pereopods 4-6 lack a secondary claw on dactyl. Pleopod 1 exopod operculiform, with about 50 marginal setae; endopod two-thirds length of exopod, without setae. Pleopod 2 rami equal in length; exopod with a partial suture, with about 30 setae; endopod with a single seta.

Pleon about as long as wide, as long as pereonite 7; pleonites 1-5 fused. Uropodal endopod reaching beyond end of telson, about as long as wide, wider proximally; exopod  $2.3\times$  as long as wide, dorsal margin gently convex, distal apex obtusely rounded. Telson  $2.5\times$  as long as wide, depressed, then distally upturned; densely covered with fine hairs dorsally, 3 pairs of dorsal setae distally, 3 pairs in an apical concavity.

*Male:* Differing from juvenile and female in antenna 1: flagellum of 5 articles, telescoping into terminal article of peduncle, and bearing numerous aesthetascs ventrally and distally. Pereopods all more elongate, pereopod 1 with a mesial row of 40 short setae. Pereopod 2 article 4 produced distolaterally along posterior margin. Pleopod 2 with appendix masculina reaching little beyond endopod.

*Colour:* Variable but lateral and mid-dorsal colour on pleon and dorsal pattern on head are most persistent elements. Dorsal pattern on pereon, ventral colour on antennae, head and some pereonites, laterally on proximal articles on pereopods 1-3.

*Distribution:* Southern-central NSW, eastern Victoria, estuaries and coastal freshwater lakes.

*Etymology:* *Hakea* is an endemic genus of Australian flowering plant, common in coastal south-eastern Australia.

*Remarks:* *Cyathura hakea* is superficially similar to *C. carinata* (from Europe) and *C. indica* (from the Indian Ocean) but available descriptions do not allow further useful comparisons.

Lake Barracoota, in which five specimens were taken, is a freshwater coastal dune lake only very rarely connected by flood water to Mallacoota Inlet. It is reasonable to assume that *Cyathura hakea* survives and reproduces in fresh water.

### Acknowledgements

This contribution was made possible through a grant from the Australian Biological Resources Study. We are especially grateful to G. Milledge who inked all the figures. For the loan of material we are indebted to J. Lowry, A. Jones and P. Hutchings (Australian Museum, Sydney), P. Gibbs (NSW State Fisheries, Sydney), K. Robinson (University of NSW), D. Dexter (University of Sydney), P. Davie (Queensland Museum, Brisbane) and S. McCauley (LaTrobe Valley Water and Sewerage Board, Traralgon).

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