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THE AUSTRALIAN SPECIES OF
ROBERTSONIA (CRUSTACEA,
HARPACTICOIDA), WITH A REVISED
KEY TO THE GENUS

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Figures 1-41.

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SUMMARY

Two species of copepods of the genus *Robertsonia* are described and figured, *R. propinqua* (T. Scott) from saline lakes in south-east Australia and *R. barnesi* sp. nov. from the intertidal zone of north-eastern Queensland. A new key to all known species of the genus is provided.

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INTRODUCTION

As at present constituted (see below), the genus *Robertsonia* contains thirteen species, found in brackish coastal lagoons and in shallow marine waters in many parts of the world (according to the ecological summaries given for each species by Lang 1948, and by the authors of subsequent species as listed in Bodin 1967). The only previous record of an Australian *Robertsonia* is that of *R. monardi* by Nicholls (1945, as *R. paramonardi* n. sp.; I agree with Noodt 1955, p. 64, that there is no valid reason for separating these two species).

In the present paper two more species are recorded from Australia; *R. propinqua* (Scott) is redescribed from South Australia and *R. barnesi* sp. nov. is described from north-eastern Queensland. Type material is in the Australian Museum; all other material of these species, examined by me, is kept in my own collection for purposes of comparison. Abbreviations and methods of study were as in Hamond (1969, 1971); for material and methods, see Hamond (1973).

TAXONOMY

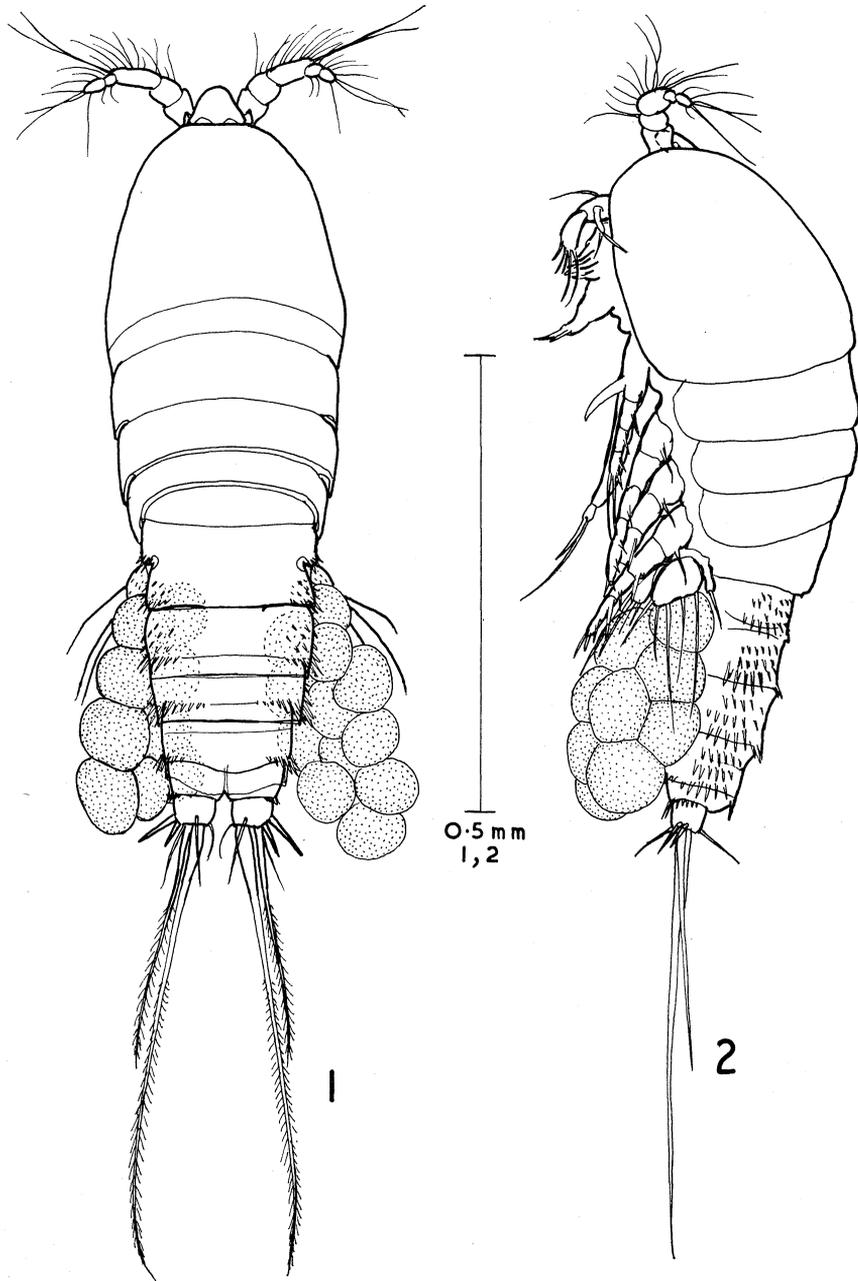
Robertsonia propinqua (T. Scott) (Figs 1-28).

Robertsonia sp. Bayly (1970, p. 125).

Redescription

Adult female. Length 0.81 mm. Body stout, prosome noticeably the widest part of the animal, the abdomen tapering from thorax to tail. Spinules on abdomen unusually large and abundant (figs 3-5), the lateral combs having by far the longest spines as well as the largest numbers of shorter spines. Genital area and spermatophore as in fig. 3; genital double-somite not divided except for an indistinct dorsal division. Operculum very difficult to see, but apparently smooth-edged; the delicately fimbriated rear margin of the pre-anal somite is drawn back over the anal somite on all sides, and extends caudally on the dorsal side more than elsewhere, in order to form a broad pseudoperculum. Furcal ramus broader than long in dorsal view, the rami separated by less than the width of one of them; each ramus carries two outer spines (of which the outermost alone has an aristate tip), three slender simple setae in the dorsal, innermost terminal, and ventral positions respectively, and two large bipinnate furcal setae inserted terminally. Rostrum triangular, with broadly rounded basal corners.

Antennule (fig. 11) with five segments, of which the third bears the aesthetasc, and the most distal segment has two unilaterally pinnate setae on its front surface and five small forked setae on its rear surface, all other antennular setae being simple. Antenna (fig. 13) with one long spinulose kinked spine subterminally, three unornamented kinked spines and a straight spine in a terminal group, and two more straight spines together with some spinules on the inner side; arising from about the same level on the allobasis are a seta and the two-segmented exopod, whose basal segment has a lateral seta and whose distal segment carries one lateral and three terminal setae. Mandible (fig. 14) with both rami well developed; maxillules (fig. 15) and maxillae (fig. 16) not remarkable; maxillipede (fig. 17) with two setae on the basis, and with an inwardly-directed spur on the claw.



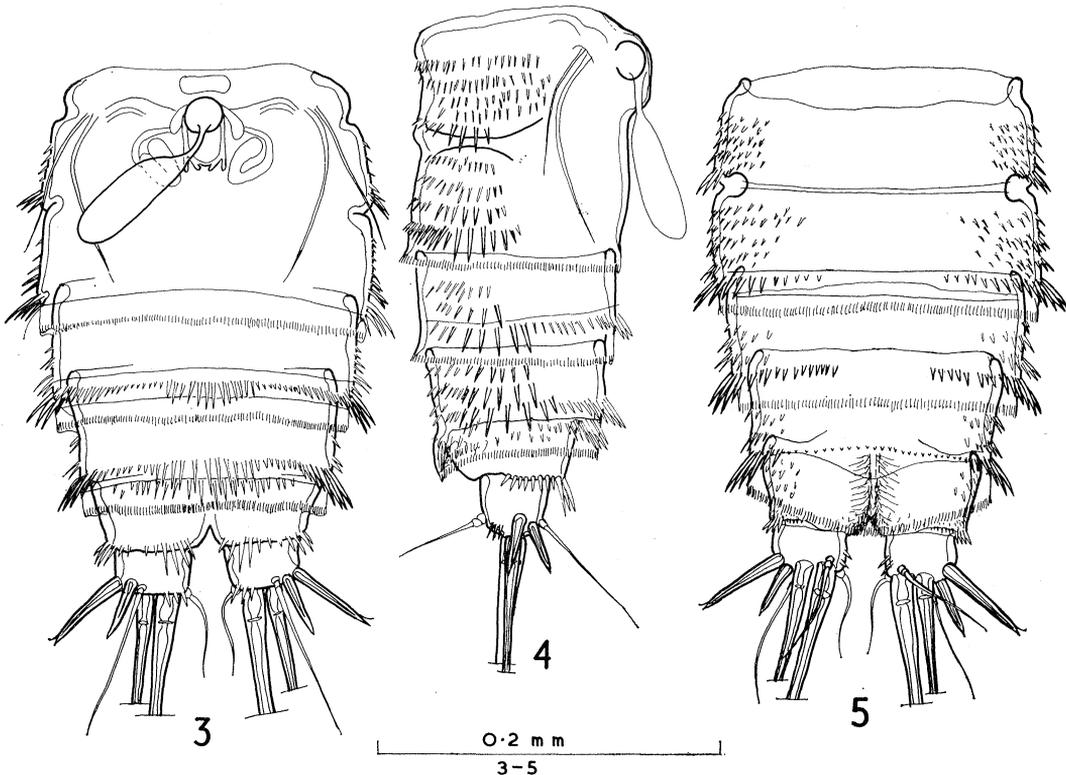
Figs 1, 2. *R. propinqua*, ♀. 1, dorsal view; 2, lateral view.

P₁ (fig. 20) with both rami three-segmented; the middle exopod segment has an inner seta, and the terminal segment has four spines and a terminal seta. Swimming legs (figs 21–23) with both rami three-segmented; in P₄ the endopod is very much shorter in relation to the exopod, than it is in P₂ or P₃. Setal formula:

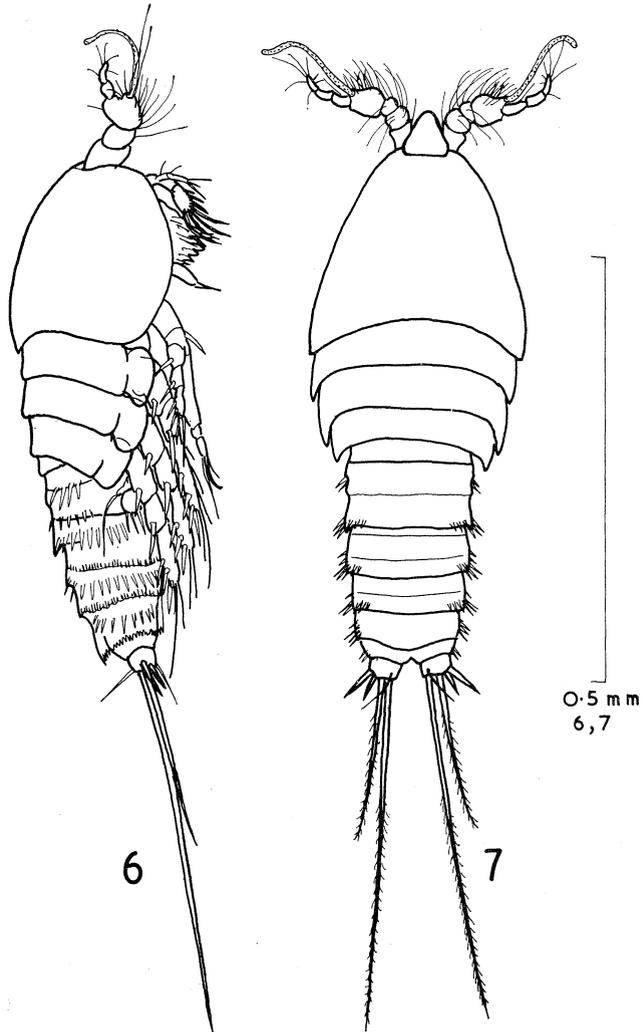
P ₂ (Fig. 21)		P ₃ (Fig. 22)		P ₄ (Fig. 23)	
exp	enp	exp	enp	exp	enp
I.I.223	I.I.12I	I.I.223	I.I.32I	I.I.323	I.I.22I

In P₄ (and to a slightly less extent in P₃) the second inner seta of the distal exopod segment is thickened, and heavily pectinate near its tip on the adaxial side only.

P₅ (fig. 19) with both rami about equal in length; exopod with six setae, of which the inner apical seta is much the longest; basiendopod with five setae, of which the innermost but one has a forked tip. The two apical exopod setae are completely smooth, all other setae on both rami being minutely bipinnate throughout their length except for a smooth basal portion. Both rami have prominent hyaline fields, shown dotted.



Figs 3-5. *R. propinqua*, ♀, abdomen. 3, ventral view; 4, lateral view; 5, dorsal view.



Figs 6, 7. *R. propinqua*, ♂. 6, lateral view; 7, dorsal view.

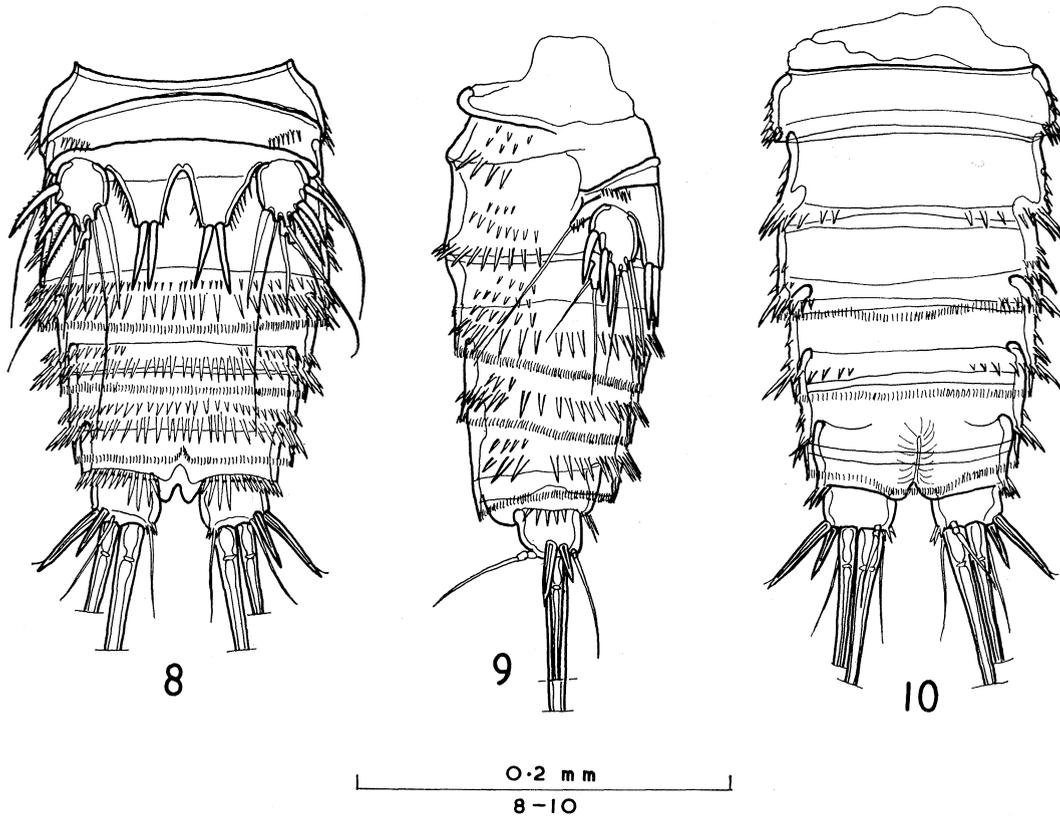
Adult male

Length 0.67 mm, with a more noticeable "waist", and a far more heavily ornamented abdomen, than the female; the spines on the abdomen tend to form girdles which are incomplete dorsally (figs 6–10). Antennule (fig. 12) with seven segments; the fourth segment bears a large aesthetasc, and two stout setae covered with spinules near their tips; a smaller aesthetasc arises from the front of the third segment. The distal segment carries three forked setae on its front surface; simple setae are found on all the segments.

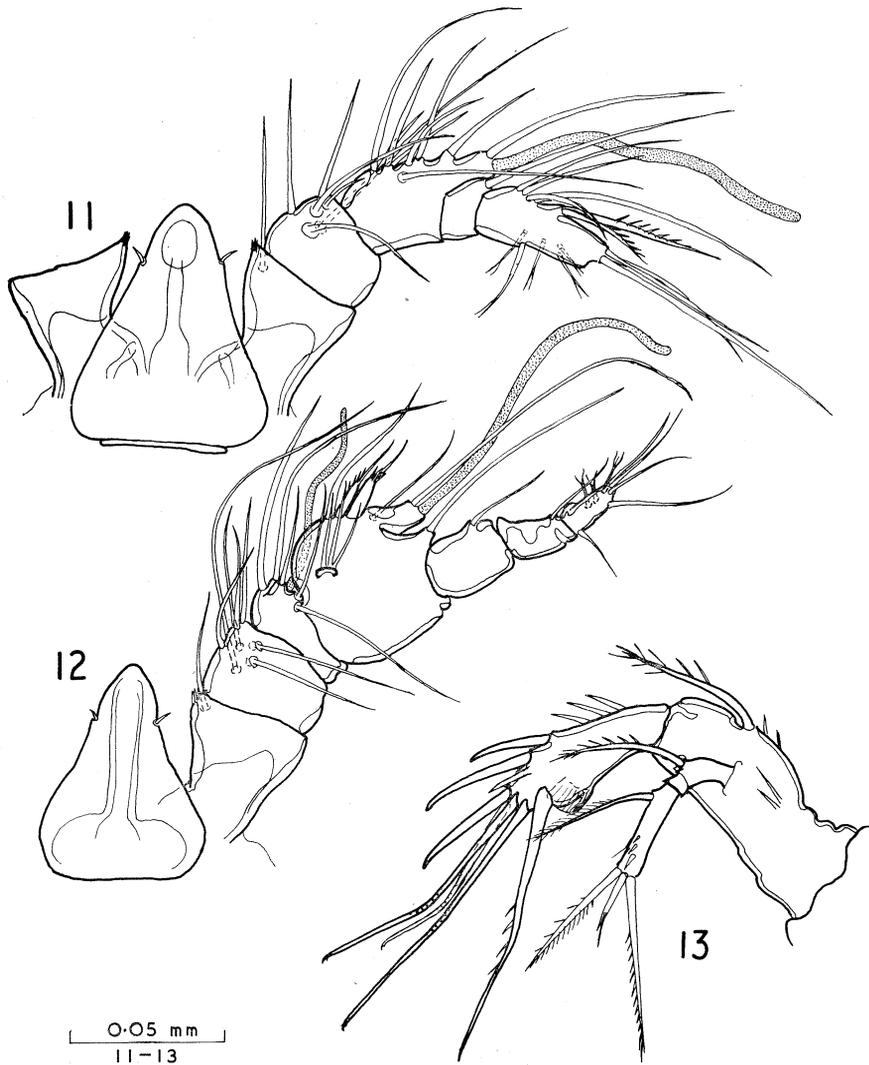
P1 (fig. 24) with a basal spine which is slightly curved outwards (instead of being straight, as in the female) and just adaxially to it a chitinous knob with lengthwise striations (fig. 25). P2 (fig. 26) with the endopod modified as usual (figs 27, 28). P5 (fig. 18) with two aristate and bipinnate spines on the basiopod, and with six setae (of which the outer three are spiniform) on the exopod; both rami are about the same length, and each has a hyaline field, the exopodal field being much the smaller. P6 in the form of a narrow plate, with a prominence from which arise three setae.

Distribution

This species was found in small numbers in localities 10B (December), 12 (March), and 13 (March, September) of Bayly and Williams (1966, fig. 1); ovigerous females were found only at 10B, but for such a scarce species the negative data probably reflect paucity of observation rather than seasonality of reproduction. For salinity tolerances, see Bayly (1970: 124-5).



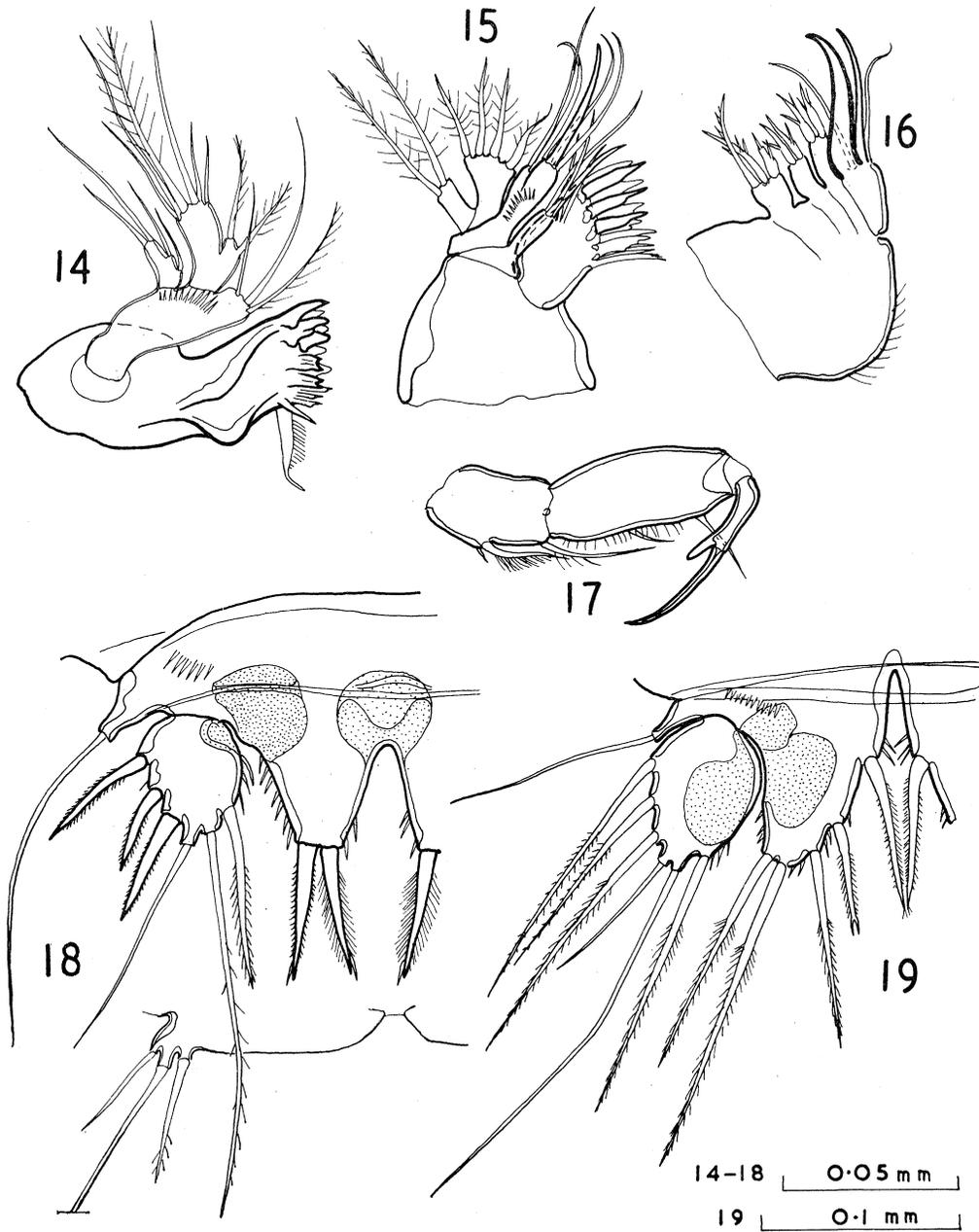
Figs. 8-10 *R. propinqua*, ♂, abdomen. 8, ventral view; 9, lateral view; 10, dorsal view.



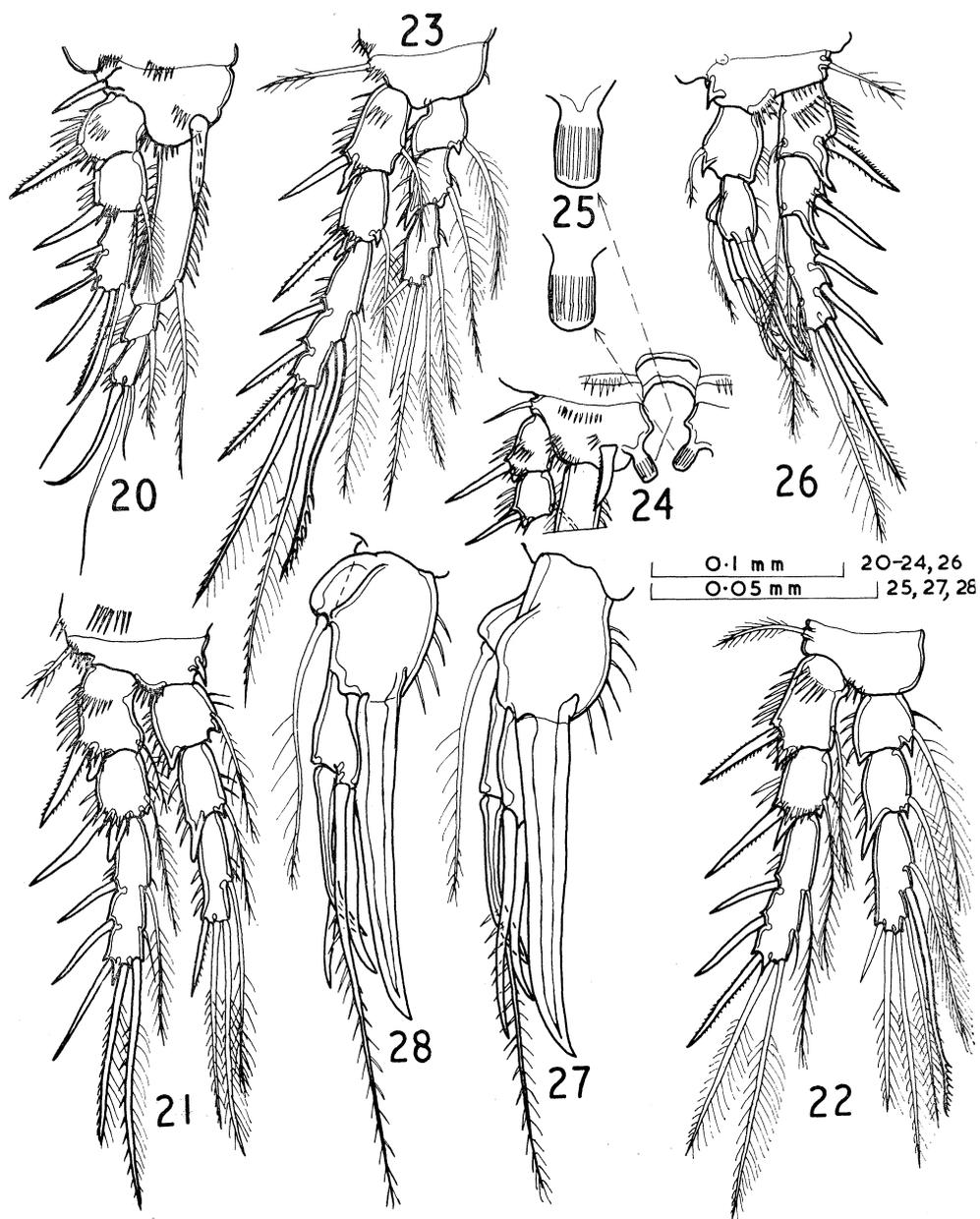
Figs 11-13. *R. propinqua*. 11, R + A1 of ♀; 12, R + A1 of ♂; 13, A2.

Variability

Two females (one of them abnormal) and a male from locality 10B, and another male from locality 13, have been dissected; all four were adult. The abnormality consisted of a setal formula of 121 for P4enp3 on one side only, the other side being normal. P6 in fig. 18 was of the male from locality 13, the other figures all being of the male and the normal female from locality 10B.



Figs 14-19. *R. propinqua*. 14, Md; 15, Mxl; 16, Mx; 17, Mxp; 18, P₅ + P₆ of ♂; 19, P₅ of ♀.



Figs 20-28. *R. propinqua*. 20-23, P1 to P4 of ♀; 24, base of ♂ P1; 25, chitinous knobs on a larger scale; 26, P2 of ♂; 27 and 28, P2enps from both sides of the male, to show details.

Remarks

The original description (Scott, 1894) is of an animal unquestionably close to that from South Australia; however, the segmentation of the antennule is incorrectly shown. As reproduced in Lang (1948), the figures of Scott and of other authors have lost some of their clarity, while conveying also an impression of variability; for either reason (or both) I was inclined to regard the South Australian material as belonging to an undescribed species (see Bayly 1970: 125), until the gap was bridged by the excellent redescription (in Spanish) of *R. propinqua* by Pallares (1970). Assuming that the West African, Argentinian, and South Australian material are conspecific, then *R. propinqua* is probably a circumtropical species; whether more than one species is concealed under this name cannot be stated at present.

Robertsonia barnesi nov. sp. (Figs 29-41).*Description*

Female (holotype). Body much slenderer than in *R. propinqua*. In dorsal view the prosome is only slightly broader than the abdomen. Rostrum (fig. 31) triangular, with sigmoidally curved sides. Abdomen (fig. 29) with the somitic cuticle (but not the intersomitic membranes) closely and minutely punctate; combs of spines few and small, restricted to the dorsal and lateral aspects of the rear edges of the somites. In fig. 29 the ventral and ventrolateral spinules are shown dotted, owing to their being seen through the substance of the abdomen. Genital double-somite with a distinct suture all round. Operculum very hard to see, with a thin, shallowly curved, smooth edge. Furcal ramus broader than long, interramal distance less than the width of a ramus. Numbering from innermost to outermost, the terminal furcal setae run 2431 in order of increasing length (1 signifying the shortest), but 1432 in order of increasing thickness; none is specially modified.

Antennule (fig. 32) with five segments, of which the third bears the aesthetasc; all the setae on it are simple and smooth, except for two on the distal segment, the larger of which bears paired spinules and the other is sparsely bipinnate.

Antenna (fig. 33) with an allobasis from which arises a three-segmented exopod, whose setal formula is 1.0.120.

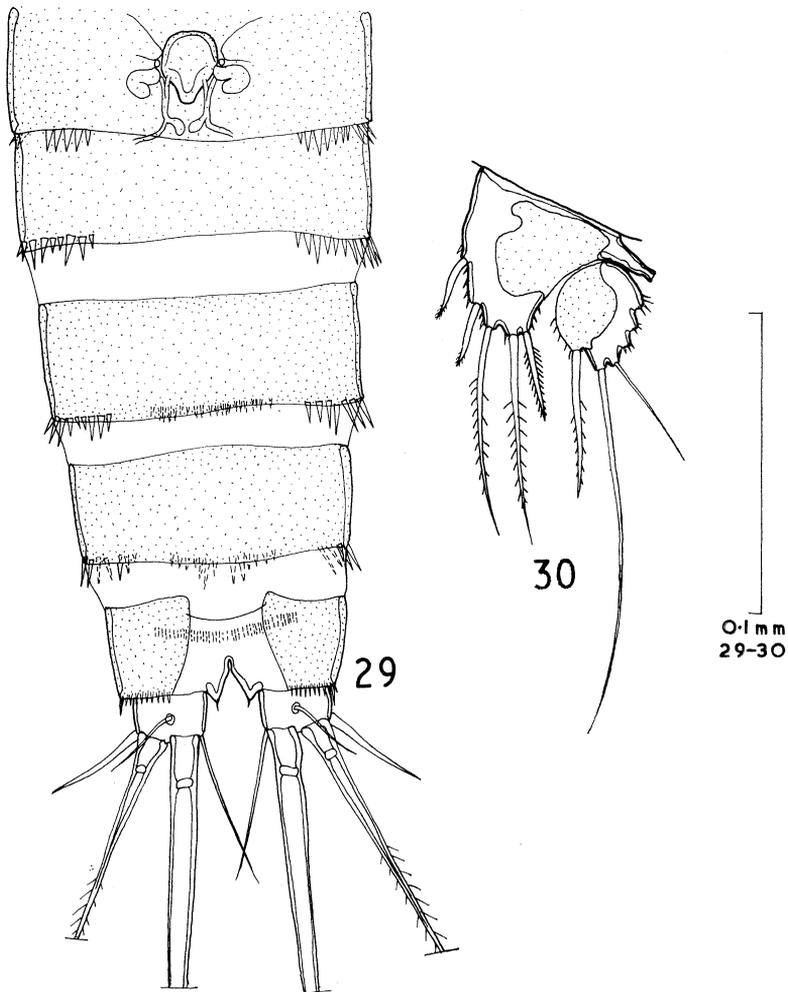
Mandible (fig. 34) with exopod and endopod, each of one segment.

Both maxillules (fig. 35) unfortunately have the distal part folded over, so that I was unable to make out the structure of the rami.

Maxilla (fig. 36) with three endites; maxillipede (fig. 37) not remarkable in any way.

P1 (fig. 38) with both rami three-segmented. The first endopod segment is as long as the whole of the exopod, of whose segments only the middle one has an inner seta. On both sides of the animal the inner seta of the first endopod segment is missing, but its socket is unmistakably present. Swimming legs with both rami three-segmented, the endopods becoming shorter in proportion to their respective exopods towards the tail of the animal. Setal formula as follows:

P2 (fig. 39)		P3 (fig. 40)		P4 (fig. 41)	
exp	enp	exp	enp	exp	enp
1.1.223	1.1.121	1.1.223	1.1.321	1.1.2(?3)23	1.1.221



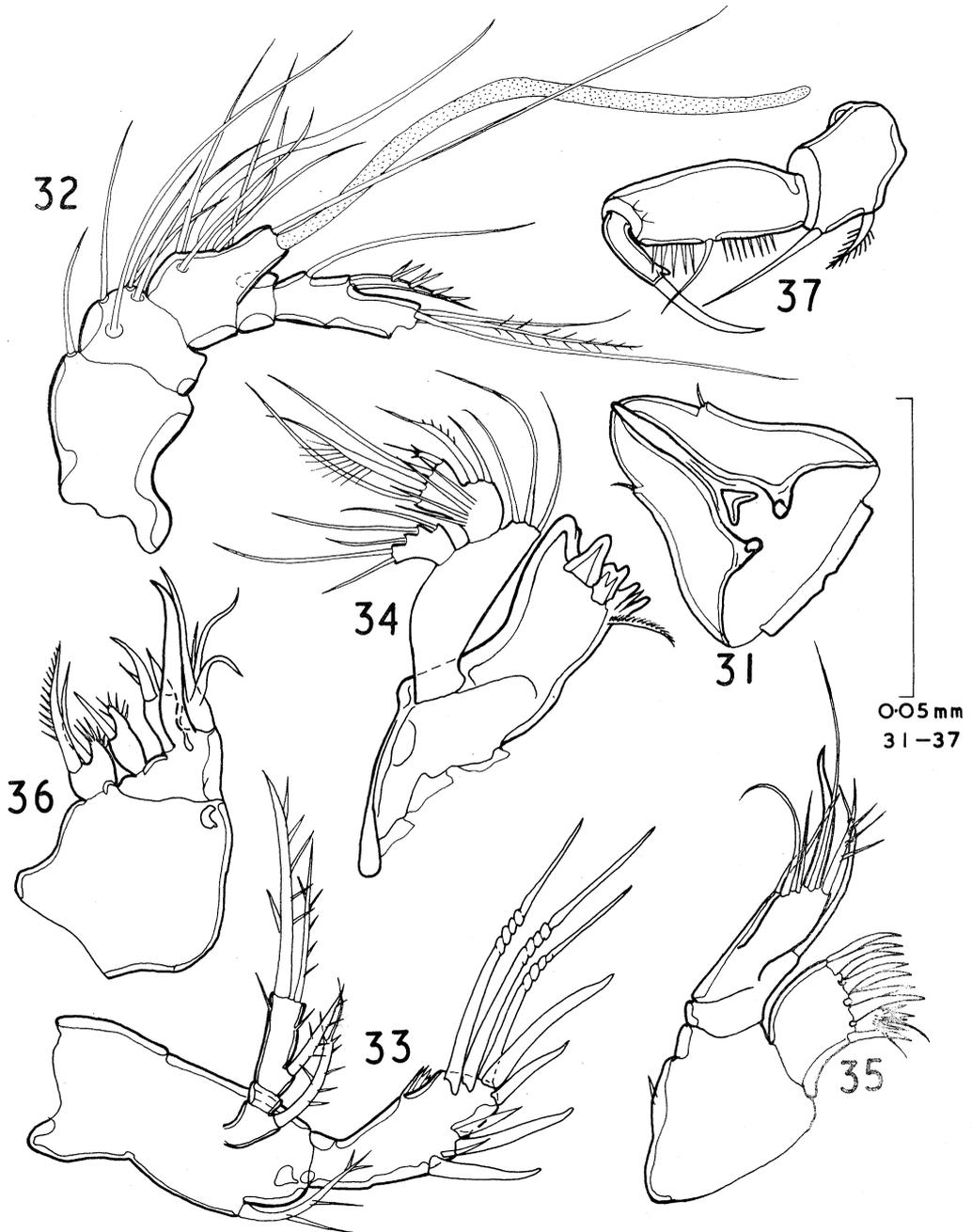
Figs 29, 30. *R. barnesi*. 29, dorsal view of abdomen; 30, P5.

On both sides of the animal the inner edge of P₄exp₃ has a small kink in the integument, below the two large setae, denoting the possible origin of a third (very much smaller) inner seta; however, I cannot see clearly whether it is in fact present.

P₅ (fig. 30) with discrete rami, each with a large hyaline field; the exopod bears 6 setae, of which the three outermost are missing on both sides of the animal, and the basiendopod has 5 setae.

Male

Unknown

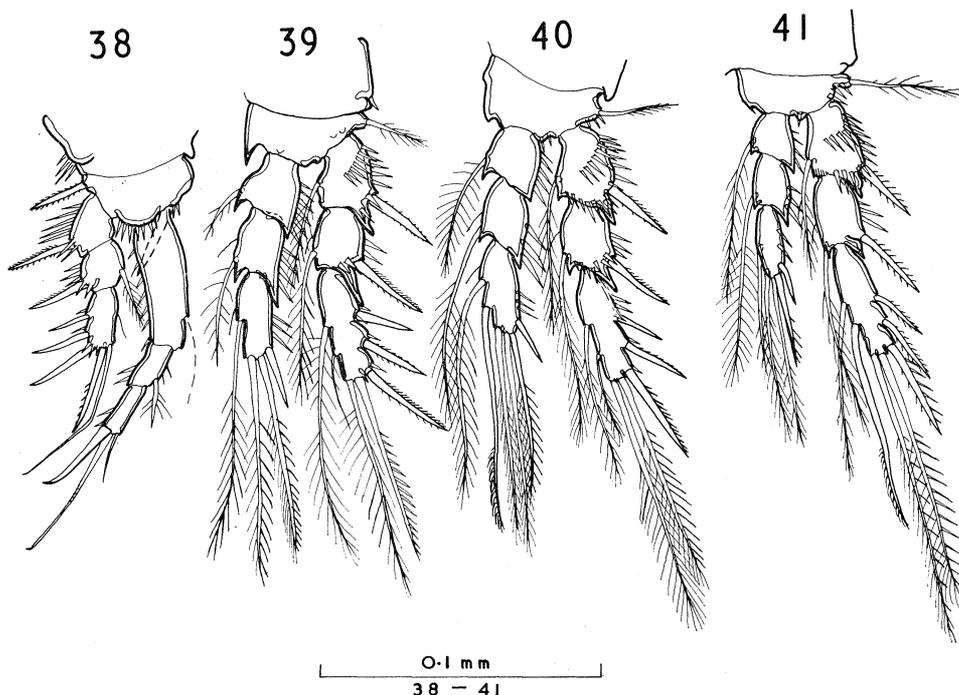


Figs 31-37. *R. barnesi*. 31, R; 32, A1; 33, A2; 34, Md; 35, Mxl; 36, Mx; 37, Mxp.

Revised key to the species of **Robertsonia***Notes*

This is based mainly on the females, but is also applicable to the males, where known; I can find no reason to keep *R. knoxi brasiliensis* apart from typical *R. knoxi*. *R. tenuis* ssp. *kieliensis* Becker (1970) has a clearly bipinnate inner seta on exp1 of P2-P4, all of which lack this seta in normal *R. tenuis*, with which *kieliensis* otherwise entirely agrees.

1. P1enp, first and second segments subequal *R. tenuis*
P1, enp1 distinctly longer than enp2 2
2. P2-P4, exp1 with inner seta 3
P2-P4, exp1 without inner seta 5
3. P1, enp1 does not reach to end of exp *R. knoxi*
P1, enp1 reaches at least to end of exp 4
4. Abdomen heavily ornamented with numerous rows and groups of spines *R. propinqua*
Abdomen sparsely ornamented, with a few small combs of spines *R. barnesi*
5. P3exp3 with one inner seta 8
P3exp3 with two inner setae 11
6. P3enp1 without an inner seta *R. flavidula*
P3enp1 with an inner seta 7
7. P2exp3 with one inner seta 8
P2exp3 with two inner setae 9
8. P1, enp1 straight sided, less than four times as long as broad; P1, enp2 and enp3 each much longer than broad; P5exp reaches, in the male to just beyond, and in the female to well beyond, the tip of the benp *R. mourei*
P1, enp1 curved so that the outer side is concave, at least five times as long as broad; P1, enp2 and enp3 each much shorter than broad; P5exp reaches, in the male not as far as, and in the female about level with, the tip of the benp .. *R. hamata*
9. P1, enp1 much shorter than exp *R. celtica*
P1, enp1 much longer than exp 10
10. A1 with six segments; P1enp1, inner seta inserted at about two thirds the length of the segment; furcal seta not swollen basally *R. monardi*
A1 with five segments; P1enp1, inner seta inserts almost at distal end of segment; largest furcal seta with a cylindrical basal swelling *R. adduensis*
11. P1, enp1 reaches hardly to end of exp 2 *R. diademata*
P1, enp1 reaches at least as far as end of exp3 12
12. P1, enp3 not longer than enp2 *R. angolensis*
P1, enp3 about twice as long as enp2 *R. irrasa*



Figs 38-41. *R. barnesi*. 38, P1 (dashed lines indicate inner basal spine hidden behind enp1, and the missing inner seta of enp1); 39, P2; 40, P3; 41, P4.

Holotype

Female, length 0.7 mm (A M P. 18688), found in a gastropod shell tenanted by the hermit crab *Dardanus megistos* (Herbst), found at L.W.S.T. about 200 yards north of the landing-stage at Green Island, Cairns, Queensland, on 20.7.1970; it was not ovigerous.

Remarks

The very sparse abdominal ornamentation is somewhat unusual in this genus, most of whose species have very spiny abdomens rather like that of *R. propinqua*. I have great pleasure in dedicating this interesting species to Dr J. H. Barnes, M.B.E., physician and ardent amateur marine biologist, of Cairns, to whom I was indebted for information during my stay there.

DISCUSSION

To accommodate *R. barnesi* nov. sp., as well as several others (listed by Bodin, 1967) described since the monograph by Lang (1948), a new key is necessary (see below); no emendation to Lang's generic diagnosis is required.

The genus *Teissierella* Monard (1935) is a synonym of *Robertsonia* Brady (1880), because the type-species *T. celtica* Monard is now regarded as *Robertsonia celtica* (Monard) (see Lang, 1948; Roe, 1958). Sewell's (1940: 287) distinction between these two supposed genera, based on the number of eggbags, has been shown by Lang (1948) to be invalid. Several authors have used the generic name *Teissierella* for certain species which do not belong to *Robertsonia*, and whose status lies outside the scope of this paper.

ACKNOWLEDGMENTS

I am most grateful to Dr I. A. E. Bayly, Monash University, for sending me the samples containing *R. propinqua*; to Dr J. C. Yaldwyn, Dominion Museum, Wellington, N.Z., for the identification of *Dardanus megistos*; to the Department of Primary Industries, Brisbane, for a permit to collect on Green Island; to Mr and Mrs Miller for their cordial hospitality on the island; and to Dr Barnes for helpful discussions.

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ADDENDUM

Since writing the above I have seen the paper by A. Candeias (1959: Contribution to the knowledge of the Harpacticoid (Crustacea, Copepoda) from the littoral of Angola: *Publ. cult. Co. Diam. Ang. Lisboa*, no. 45: 77-104), containing a redescription of *R. propinqua*. The few small differences between Candeias' material and mine, to judge from his excellent drawings, may have been due to ecological differences (reflected in the proportions of certain limb-segments), to rough handling during and after collection, or to difficulties in observation; a much deeper study of the range of variation in different populations of this species is necessary to assess the possible taxonomic importance of these differences.