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# THE CIROLANIDAE (CRUSTACEA: ISOPODA) OF AUSTRALIA: NEW SPECIES AND A NEW GENUS FROM SOUTHEASTERN AUSTRALIA

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## SUMMARY

New species of the isopod family Cirolanidae are described and figured. These include *Eurydice acuticauda*, *E. spenceri*, *Cirolana bathynella*, *C. halei*, *C. triloba*, *C. furcata*, *C. similis*, *C. victoriae* and a new genus and species *Orphelana perplexa*. Their systematic position within the respective genera is discussed. All species except *C. victoriae* and *E. spenceri* are known to be from subtidal habitats.

## INTRODUCTION

Since the work of Hale (1925; 1940) there has not been a single publication dealing specifically with Australian cirolanid isopods. Naylor (1966) listed three species for Port Phillip Bay and Nordenstam (1946) recorded a further species from Cape Jaubert. This present work is the third in a series that deals exclusively with the family Cirolanidae from Australian seas. The first (Bruce, 1980), dealt with a collection from the Great Barrier Reef, whilst the second dealt with a single genus of sand beach cirolanids from Queensland (Bruce, *in press*).

The new species described were obtained from the following collections. The Australian Museum Shelf Benthic Survey (SBS), off Sydney, NSW, Australian Museum Hunter District Water Board Survey (HDWBS), the Crib Point Benthic Survey (CPBS), the Western Port Bay Environmental Survey (WBES), and the Port Phillip Bay Environmental Study (PPBES). The collections made from the last three surveys are housed in the National Museum of Victoria. Details of the times and methods used in these collections can be obtained from Poore, *et al* (1975). Additional material was obtained from the South Australian Museum (SAM), and the Stockholm Museum of Natural History (SM(NH)). All of the collections from which these new species were taken contain other named species, which will be dealt with in future publications.

Type material has been deposited at the Australian Museum, Sydney (AM), the National Museum of Victoria, Melbourne (NMV), the South Australian Museum, Adelaide (SAM), Queensland Museum (QM) and the Swedish Museum (SM(NH)).

## FAMILY CIROLANIDAE

Genus **Eurydice** Leach**Eurydice acuticauda** sp.nov. (Figs. 1, 2)

**MATERIAL:** Western Port Bay, Vic., WBES stns: 1726 (1 specimen), 1727 (1), 1733(1), 1739(4), 1743(2), 1746(1); Western Port Bay, Crib Point, CPBS stns: A2(1), C6(2), 24N(5), 25N(6), 300(1), 31S(1), 31E(1), 31N(1), 32E(1), 32S(2), 400(2), 41N(1); Port Phillip Bay, Vic., PPBES stns: 945(3), 968(3), 974(2), 986(4). NSW Shelf, Hunter District, HDWBS stns: off Belmont Beach 33°02'36''S, 151°40'56''E, 19m, 20.5.1975, (1 specimen) and 20 m, 20.9.1975, (1); off Burwood Beach, 32°57'31''S, 151°44'43''E, 22 m, 31.10.1975, (1) and 20 m, 28.1.1976, (2); off McMasters Beach, Gosford, 33°30'S, 151°125'E, 20 m, 22.11.1975 (1).

**TYPES:** Holotype ♂, NMV Reg. No. J654

Paratypes 2♂ and 6♀ NMV Reg. No. J655-659.

Paratypes AM Reg. No. P23053 — 23056, P23156

Paratypes SAM Reg. No. C3865

Paratypes QM Reg. No. W8036

**TYPE LOCALITY:** Western Port Bay, Victoria, WBES stn. 1739, 26.11.73. Paratypes from NSW, and Western Port Bay.

**DESCRIPTION OF MALE:** Mouthparts as for the genus. Body elongate, straight sided. Eyes moderately large, red or black.

Antennule with all articles (Fig. 1 (h)) short, approximately sub-equal in length; flagellum short composed of three articles, proximal article as long as peduncle, provided with numerous aesthetascs. Antenna (Fig. 1(g)) long, peduncle extending to middle of pereonite 1; peduncular article 3 as long as combined length of articles 1 and 2 and about half as long as article 4; flagellum extremely long, extending to or just beyond apex of telson, flagellar articles elongate, each with plicate process (Fig. 2(b)) at distal end.

Coxae with posterior margins only slightly produced (Fig. 1(a)), those of pereonites 5-7 with or without slight points.

Pereopod 1 (Fig. 1(f)) short, with few setae; prominent spine present on anterior distal angle of ischium; posterior borders of merus, carpus and propodus with 4, 1 and 3 spines respectively, distal spine of the propodus opposes dactyl (Fig. 1(e)) which has a well developed secondary unguis. Pereopods 2 and 3 similar to pereopod 1 but less robust. Pereopod 7 (Fig. 1(d)) large, anterior margin of all articles except basis with numerous setae, ischium with 2 prominent spines on anterior distal angle, merus with 2 groups of spines on the margins, and a further group on each distal angle, as has the carpus; propodus with two single spines and single terminal spine. Posterior margins with fewer setae, each article except basis with two groups of spines and a third group at the distal angle. Pereopod 6 similar to pereopod 7, but slightly longer, pereopods 4 and 5 shorter.

Pleonite 1 largely concealed. Pleopods as for the genus, appendix masculina (Fig. 2(c), (d), (e)) extending beyond inner ramus by 0.2 of its length, slightly recurved, apex coming to a blunt point.

Telson about as long as broad, posterior margin (Fig. 2(a)) forming an acute angle, provided with 12 plumose setae, each set within a notch. Uropods (Fig. 1(c)) not extending beyond posterior margin of telson, peduncle armed with row of about 12 stout

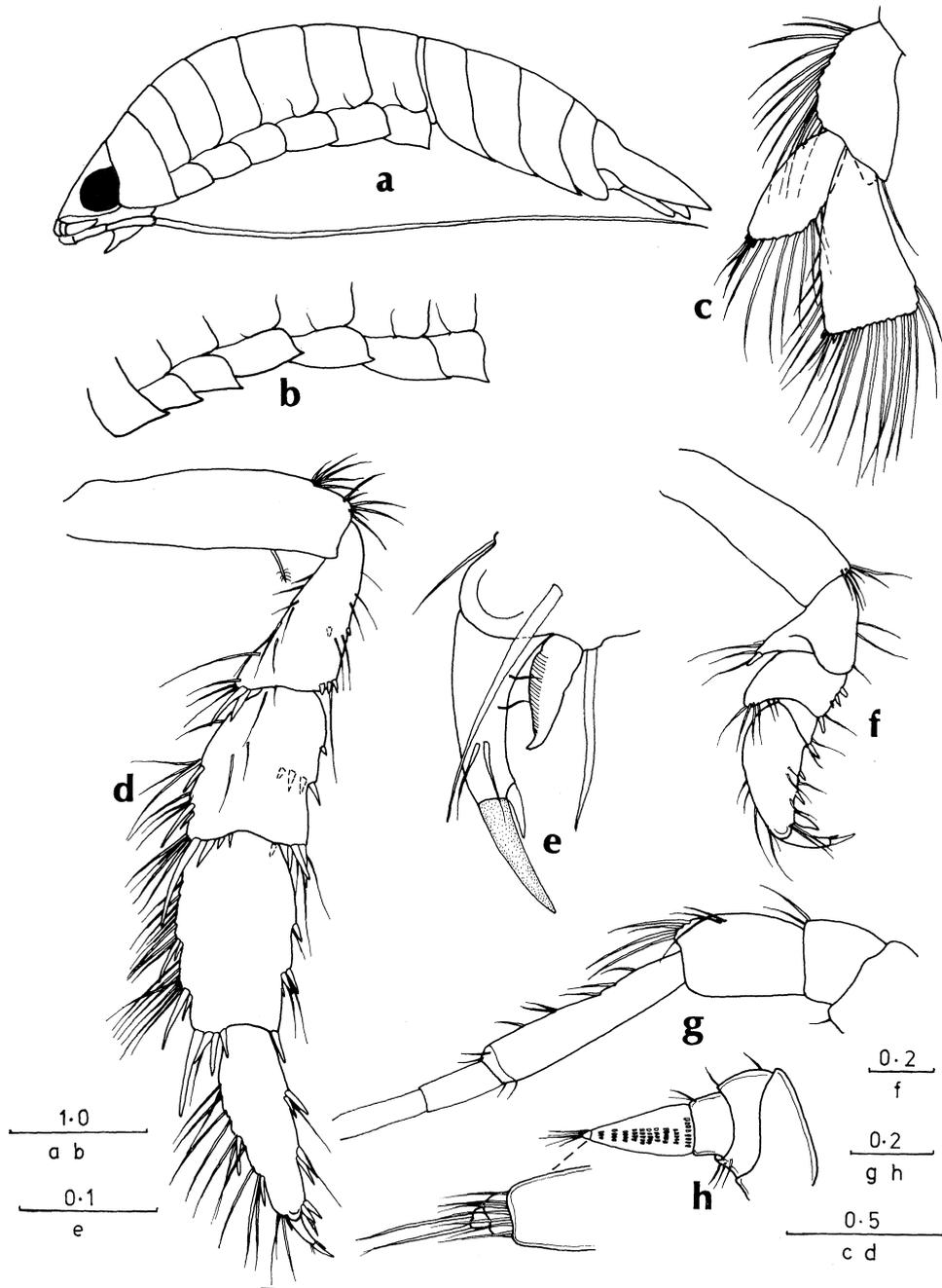


Figure 1. *Eurydice acuticauda* sp. nov. (a) lateral view, holotype (b) coxae of ♀, PPB (c)-(h) ♂ paratype (c) uropod (d) pereopod 7 (e) dactyl of pereopod 1 (f) pereopod 1 (g) antennal peduncle (h) antennule. Scale line, mm.

setae and a single spine; exopod sub-ovate, about half as long as endopod, posterior margin with 8 long plumose setae, outer distal angle with two small spines and a group of about 6 setae; outer margin with 3 small setae. Endopod with posterior margin truncate, armed with about 13 plumose setae; lateral margin with 5 plumose setae; outer distal angle with 2 small spines between which lie a group of simple setae.

**FEMALE:** The female has a shorter pleon, and more ovate vaulted body shape. The coxae of the pereonites are with or without acute points on the postolateral margins (Fig. 1(b)). The antennae are slightly shorter, and lack the plicate process. Otherwise, the female differs only in lacking the sexual characters.

**SIZE:** Largest female 6.5 mm, largest male 5.5 mm.

**COLOUR:** Reddish brown with black chromatophores in alcohol.

**REMARKS:** This species can be readily separated from all other species by the telson which is totally lacking in spines and forms a point, the only other species in which this occurs is *E. humilis* Stebbing, 1910, which possesses a very narrow hind margin. The appendix masculina, the well developed secondary unguis of pereopod 1 and the short uropodal exopod also serve to distinguish this species.

**Variation.** This species shows a certain degree of variability, both sexual and geographical. The presence or absence of points on the coxae has long been considered an important character in the taxonomy of *Eurydice* species. That these are poorly developed in the males, while the females possess them is a variation not previously noted for the genus. Furthermore there is variation in the degree of development of these coxal points, some being conspicuous, others less so. This variation in coxal point development is not correlated to locality, nor to size. Only in the New South Wales material do they appear constant. It is also unusual that eye colour varies, though this apparently does occur in other species of Cirolanidae.

More striking differences are present in the specimens from Port Phillip Bay, though these differences are largely confined to the males. The antennae of Port Phillip Bay males lack the plicate process and both sexes have shorter flagellar articles (Fig. 2(g)) than that of the type material (Fig. 2(f)). The appendix masculina is blunt (Fig. 2(d)) rather than pointed (Fig. 2(c)), but is not shorter than that of type specimen. Also, the relative length of the penes vary, those of the type being almost twice as long as the Port Phillip Bay material of similar size.

Recent work on species of *Eurydice* (Bowman, 1977; Bruce, 1980; Bruce & Jones, 1978) and on *Excirrolana chiltoni* (Richardson, 1905) (Bruce & Jones, *in press*) suggests that over a geographical area variation in morphology of various characters, including the appendix masculina is acceptable within a single species. The differences in form shown by *E. acuticauda* sp. nov. are primarily ones of degree, rather than of form, and at present the author considers best to treat them as one species, at least until the distribution of the variations shown is better known.

**ETYMOLOGY:** The specific name is derived from the combination of the latin words *cauda* (= tail) and *acutus* (= sharp).

**DISTRIBUTION:** Port Phillip Bay, Victoria from 3 to 15 m, in fine sand, and sand shell grit bottom; Western Port Victoria, and off Burwood and Belmont Beaches, Hunter River district and off McMasters Beach, Gosford, N.S.W., between 18 m and 22 m, in fine sand.

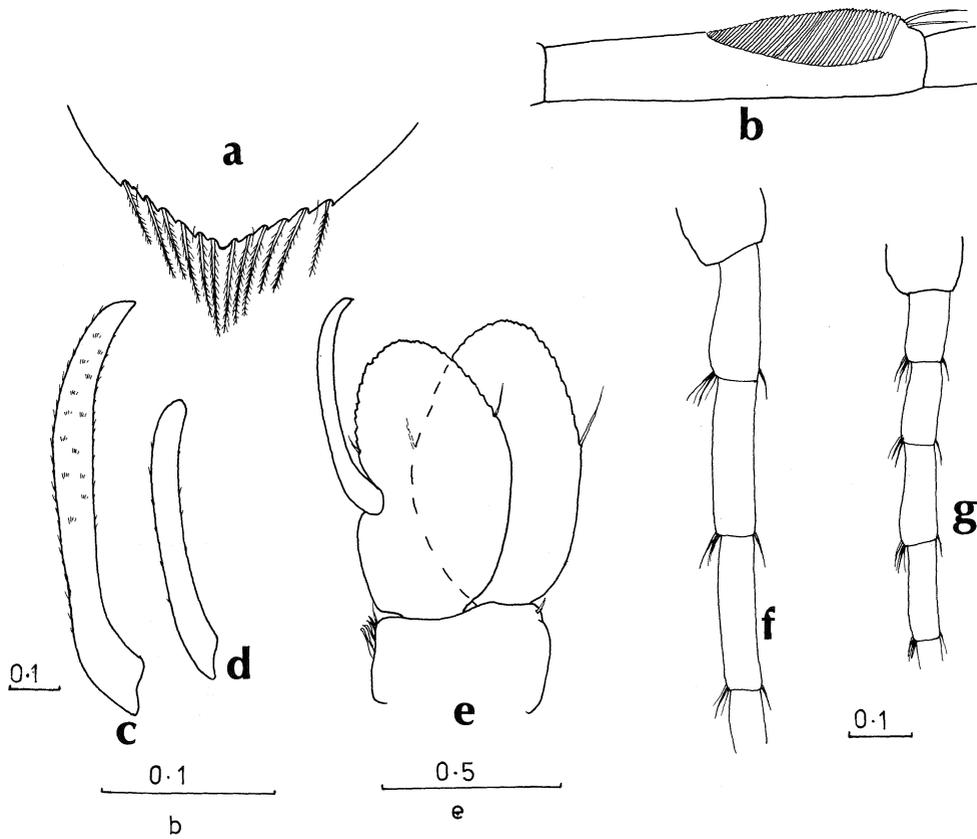


Figure 2. *Eurydice acuticauda* sp. nov. All figs from paratypes. (a) apex of telson (b) flagellar article of antenna, ♂ (c) appendix masculina, PPB. (d) appendix masculina, WP (e) ♂ pleopod 2, PPB, flagellar articles of antenna, (f) ♀ PPB (g) ♀ WP. Scale line, mm.

**Eurydice spenceri** sp. nov. (Fig. 3)

**MATERIAL:** Label data: No. 22, Spencer Gulf, Syd. Australian. 1856. SM(NH) Reg. No. Isopodo 5718. (2♂, 9♀).

**TYPES:** Holotype ♂, SM(NH) Reg. No. 3168  
Paratypes 8 ♀♀, SM(NH) Reg. No. 5718  
Paratypes 1 ♂, 1 ♀, SAM Reg. No. C3866

**TYPE LOCALITY:** Spencer Gulf, South Australia, 1856.

**DESCRIPTION OF MALE:** Body elongate, straight sided. Eyes black. Mouthparts not differing significantly from others of the genus.

Antennule (Fig. 3(h) ) with all peduncular articles short, approximately sub-equal in length; flagellum composed of three articles, proximal article as long as peduncle. Antenna (Fig. 3(i) ) with peduncular article 3 about 0.66 as long as article 4 and twice length of article 2; flagellum extending to pleon, articles without plicate process.

Coxae 5-7 with posterior margins produced to form small point. Pleonite 1 largely concealed by pereonite 7. Paired penes present on posterior surface of sternite 7.

Pereopod 1 (Fig. 3(d) ) short, with a few setae. Anterior distal angles of ischium and merus with 2 and 4 setae respectively; posterior borders with few setae on ischium and 5 spines on merus; propodus bears 4 spines on posterior margin, terminal spine opposing dactyl (Fig. 3(e) ), anterior margin with two setae. Pereopods 2 and 3 similar to pereopod 1, but more slender. Pereopod 7 (Fig. 3(c) ) with ischium, carpus and propodus sub-equal in length, merus slightly shorter. Margins of merus, carpus and propodus with numerous spines, arranged in groups and amongst which are scattered numerous setae. Pereopod 6 similar to 7, but slightly longer.

Pleopods as for the genus. Pleopod 2 with appendix masculina (Fig. 3(g) ) extending beyond inner ramus by 0.25 of its length, distal portion spatulate in shape.

Telson slightly longer than broad, posterior margin with 16 plumose setae symmetrically placed about prominent median tooth; lateral teeth also prominent; anterior dorsal surface with distinct depression. Uropods (Fig. 3(f) ) not reaching posterior margin of telson; peduncle with 14 plumose along external margin; exopod slender, ovate, about 0.3 as long as endopod which has distinctly truncate posterior margin. Distal margin of endopod with 10 plumose setae, external margin with 3; exterior distal angle with 2 small spines between which lie a group of simple setae.

**FEMALE:** Pleon tends to be shorter, and body shape more ovate. The antennal flagellum is shorter. Otherwise, the female closely resembles the male.

**SIZE:** Largest male, 6.5 mm, smallest, 5.0 mm; largest female 8.0 mm, smallest 6.0 mm.

**COLOUR:** Pale cream in alcohol, with an almost total absence of chromatophores, probably due to bleaching of the long preserved specimens.

**REMARKS:** This species, in common with the two other members of the genus known from Australia *E. orientalis* Hansen, 1890, and *E. acuticauda* sp. nov., lacks spines on the hind margin of the telson. It can be separated from *E. acuticauda* by the more excavate hind margin of the telson and the spatulate appendix masculina. Other differences include the greater number of spines on the posterior pereopods and the lack of a prominent spine on the anterior angle of the merus of pereopod 1. *Eurydice*

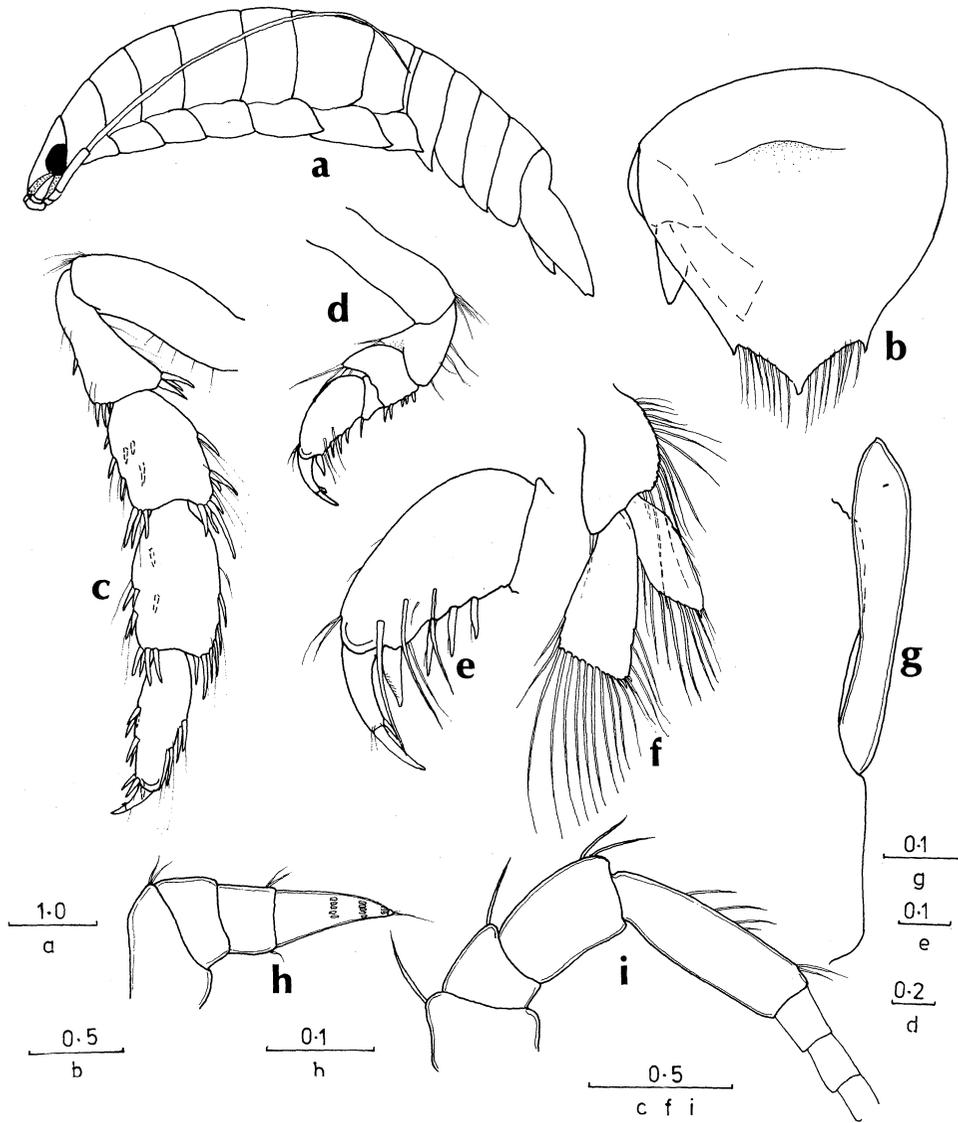


Figure 3. *Eurydice spenceri* sp. nov. (a) holotype, lateral view (b)-(i) ♂ paratype (b) telson (c) pereopod 7 (d) pereopod 1 (e) propodus, pereopod 1 (f) uropod (g) appendix masculina (h) antennule (i) antennal peduncle. Scale line, mm.

*orientalis* is readily distinguished by the truncate posterior margin of the telson.

ETYMOLOGY: The specific epithet is taken from the type locality, Spencer Gulf.

DISTRIBUTION: Known only from the type locality, from where it was taken in 1856.

### **Orphelana** gen. nov.

DIAGNOSIS: Cirolanidae with antennule peduncle 3-articulate, antennal peduncle 5-articulate, all articles short. Frontal lamina triangular, nearly obsolete. Maxilliped palp with lateral margins smoothly curved, with only a few small setae, endite with single coupling hook and terminal spine. Mandible with cutting edge narrow, obscurely tridentate, spine row with cuspidate spines; mandibular palp short, not reaching cutting edge. Maxillule with anterior distal spines of gnathal surface forming a distinct cluster set apart from the remainder, inner lobe with 3 plumose spines. Pereopods 5-7 natatory, with numerous setae. Uropod with inner margin of peduncle produced. Pleopod 1 with peduncle as long as broad, endopod shorter than exopod and 0.3 as wide, distal margin only setose, pleopod 2 with appendix masculina arising 0.3 along the inner margin of endopod; exopods of pleopods 3-5 with complete suture; endopod of pleopod 5 only glabrous. Pleonites with epimera all free, not overlapped.

RELATIONSHIPS: The mouthparts clearly distinguish this genus from others in the family. No other genus shows a similar arrangement of spines on the gnathal surface of the maxillule endite in combination with an irregular cutting edge to the mandible and a short mandibular palp. The form of the antennae, antennules and pleopods show a close similarity to those of the genus *Conilorpheus* Stebbing, 1905. Only the first and second pleopods have been figured for this genus and these correspond closely to those of *Orphelana* gen. nov. The pereopods of the genera are dissimilar as those of *Conilorpheus* are all ambulatory while the posterior pereopods of *Orphelana* are natatory.

The genus *Eurydice* also shows some similarity to *Orphelana*. The form of the pleopods are similar with elongate protopods, the appendix masculina not arising basally on the inner ramus of pleopod 2, and the exopods of pleopod 3-5 each with a distinct suture. Pereopods 5-7 are natatory, flattened and provided with numerous setae, as are the posterior pereopods of most species of *Eurydice*. *Orphelana* is readily separated from the genus *Eurydice* by the form of the uropods, in having a sessile clypeus, the antennal peduncle 5-segmented, and by differences in mouthpart morphology.

At present no discussion is offered on the absence of maxillae. These could not be located prior to dissection of the mouthparts, nor during dissection, and appears to be genuinely absent. However, whether this would be true for all specimens has yet to be confirmed.

ETYMOLOGY: The name is derived from *Orpheus*, the lover of *Eurydice* in Greek mythology, and the ending *-lana*. Gender is feminine.

### **Orphelana perplexa** sp. nov. (Figs 4-6)

MATERIAL: Holotype, 11 mm, NMV Reg. No. J660.

TYPE LOCALITY: Crib Point, Western Port, Victoria. CPBS Stn. 300, 15 m. 24.8.1967.

DESCRIPTION OF MALE: Body little more than 2.5 times as long as broad; integument thin, each segment with one or two transverse impressed lines (Fig. 4(a)). Cephalon (Fig. 4(b)) about twice as wide as long, deeply immersed in first pereonite, eyes absent. Frontal lamina (Fig. 4(c)) small and triangular, clypeus sessile, lateral margins backwardly directed.

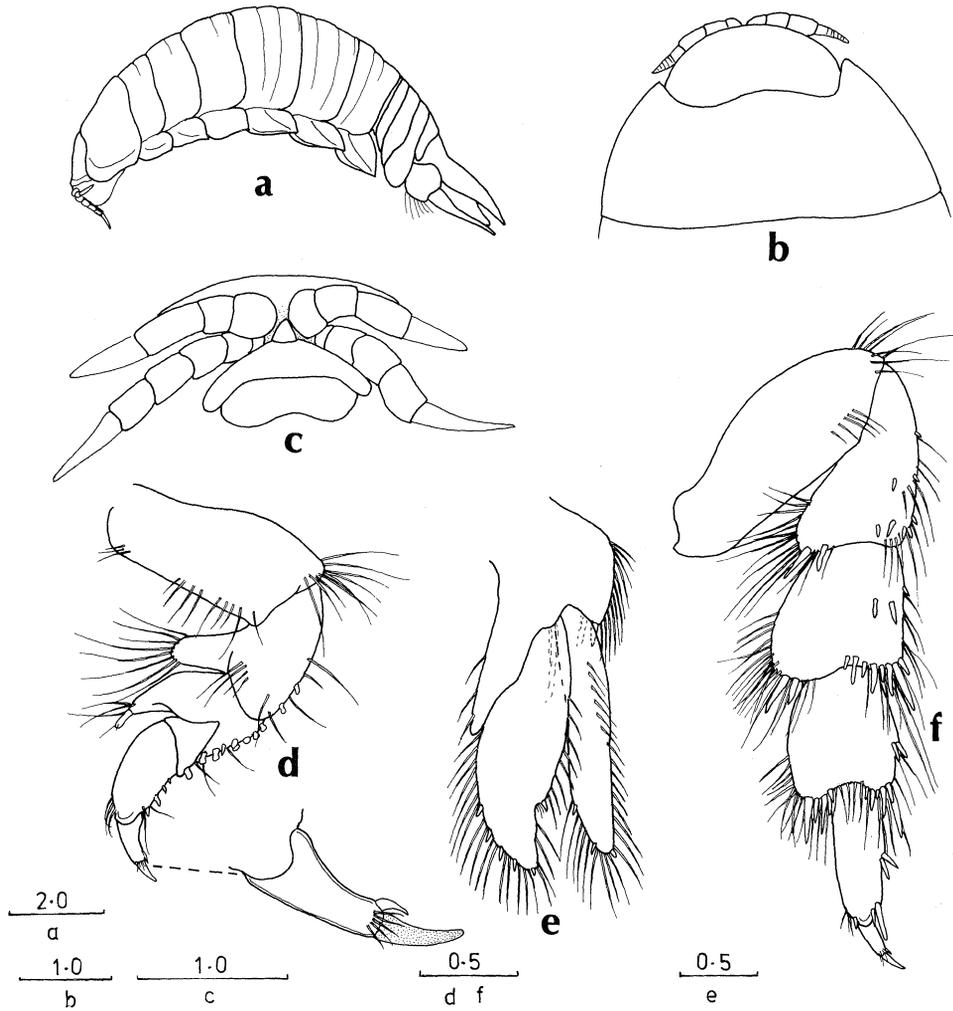


Figure 4. *Orphelana perplexa* sp. nov. Holotype (a) lateral view (b) dorsal view of cephalon and pereonite 1 (c) ventral view of clypeal region (d) pereopod 1 (e) uropod (f) pereopod 7. Scale line, mm.

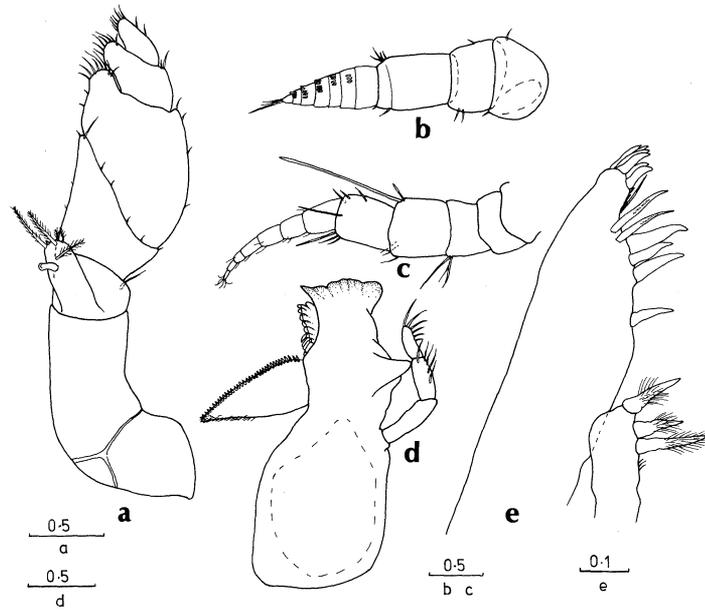


Figure 5. *Orphelana perplexa* sp. nov. Holotype (a) maxilliped (b) antennule (c) antenna (d) mandible (e) maxillule. Scale line, mm.

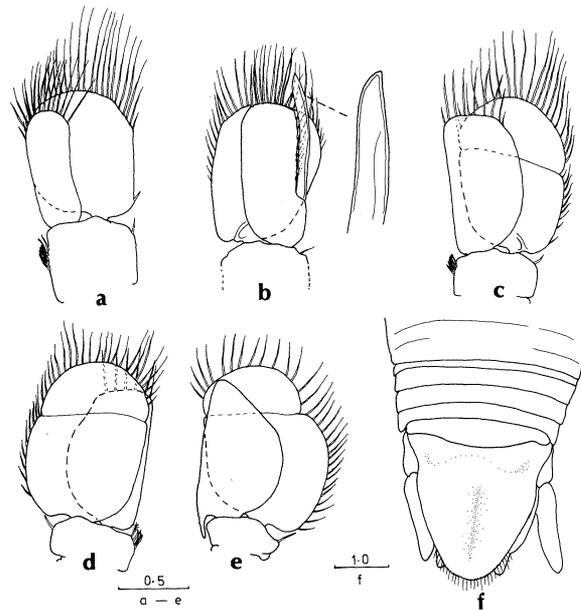


Figure 6. *Orphelana perplexa* sp. nov. Holotype (a)-(e) pleopods 1-5 respectively (f) pleon and telson. Scale line, mm.

Pereonite 1 little more than twice as long as pereonite 2, pereonites 5 and 6 longest. Coxae 2 and 3 (Fig. 4(a) ) with feeble longitudinal carina, coxae 5-7 with oblique carina, only moderately produced. Pleonites 1-5 visible, epimera 2-5 not overlapped, lateral margin of pleonite 4 expanded.

Antennule (Fig. 5(b) ) short, peduncular article 3 as long as combined lengths of articles 1 and 2; flagellum short, not reaching pereonite 1 (Fig. 4(a), (b) ), composed of 7 articles all but first and last with aesthetascs. Antenna (Fig. 5(c) ) with all peduncular articles short, articles 1-3 sub-equal in length as are articles 4 and 5, which are each about twice as long as peduncular article 3; article 4 with prominent long spine on the anterior distal angle. Flagellum short, consisting of 7 articles, which become progressively shorter distally.

Mouthparts. Mandible (Fig. 5(d) ) with narrow cutting edge, spine row with about 14 blunt cusp-like spines; molar about twice as long as greatest width tapering distally, armed with about 36 teeth; palp short, article 1 slightly longer than article 2 which has 5 setae on lateral margin as has article 3. Maxillule (Fig. 5(e) ) elongate with about 14 spines on gnathal surface, the distal 7 being closely grouped and set apart from the remainder. Maxilla apparently absent. Maxilliped (Fig. 5(a) ) with very few setae, lateral margins not produced, inner margins of palp segments 3 and 4 slightly produced, with few setae. Endite with single coupling hook apical spine, 3 long and 2 short plumose setae.

Pereopod 1 (Fig. 4(d) ) short, robust, basis with row of setae anterior margin and a group of setae on posterior distal angle; ischium with anterior margin produced with about 8 setae, posterior margin with 2 spines and 3 setae; merus with anterior margin produced, bearing a conspicuous spine at apex, 5 blunt spines on posterior margin; carpus short, posterior margin with single spine; propodus with 4 spines on posterior margin, dactyl with well developed slender secondary unguis. Pereopod 7 (Fig. 4(f) ) broad and flat, anterior margin of merus and carpus provided with numerous setae; inner margin with fewer setae but more numerous spines. Merus and carpus in length and each about 0.6 the length of the ischium; propodus shorter than ischium but longer than merus or carpus.

Pleopods 1 and 2 (Fig. 6(a), (b) ) with peduncle as long as broad, inner margin with 6 coupling hooks. Endopod of pleopod 1 about 0.3 as wide as exopod, both rami with only the distal margin setose. Pleopod 2 with sabre-like appendix masculina arising 0.3 of way along inner margin and extending beyond endopod by 0.25 its length. Pleopods 3-5 (Fig. 6(c)-(e) ) with prominent suture across exopod. Endopods of pleopods 3 and 4 with subtruncate distal margin, with 9 and 6 setae respectively; endopod of pleopod 5 glabrous.

Telson (Fig. 6(f) ) as long as greatest width, posterior margin gently rounded, without spines, dorsal surface with slight longitudinal depression, and slight lateral depression at anterior end. Uropods (Fig. 4(e) ) not reaching beyond telson (Fig. 6(f) ) with peduncle very broad in lateral aspect (Fig. 4(a) ), outer margin with fringe of setae and a spine, inner margin produced along half the length of endopod. Exopod slender, 5 times as long as greatest width, tapering towards apex; inner margin with 2 spines and 7 setae, distal 0.8 of outer margin with a fringe of setae; and apical spine is present. Endopod elongate, about 3.5 times as long as greatest width, inner margin with continuous fringe of setae and 5 spines, outer margin with conspicuous indentation near apex in which lies a single spine; remainder of outer margin with 9 setae.

FEMALE: Unknown.

SIZE: 11.0 mm.

COLOUR: Tan in alcohol.

ETYMOLOGY: The specific epithet is derived from the Latin word *perplexus* (= confused).

DISTRIBUTION: Known only from the type locality.

***Cirolana bathynella* sp. nov.** (Figs. 7 & 8)

MATERIAL: From the South Australian Museum collection. 2 ♀♀, 47 mm x 13 mm and 45 mm x 12 mm, Tasmania. No other data.

TYPES: Holotype ♀, SAM, Reg. No. C 3829.  
Paratype ♀, SAM, Reg. No. C. 3830.

TYPE LOCALITY: Tasmania.

DESCRIPTION OF FEMALE: Body smooth, elongate, slightly more than 3.5 times as long as greatest width; cephalon with anterior margin smoothly rounded, eyes narrow and elongate, slightly broader posteriorly (Fig. 7 (a) ). Clypeus broader anteriorly, anterior margin raised (Fig. 7(c) ), frontal lamina set into clypeus, posterior portion raised into a horn like projection, anterior margins narrows to an acute point.

Pereonite 1 longer than 2, pereonites 2-7 becoming progressively longer posteriorly (Fig. 7(a) ). Pereonite 1 with lateral groove; coxae 2-3 short, 4-7 produced posteriorly, those of pereonite 7 enclosing pleonites 1 and 2, each with a diagonal carina. Pleon with all segments visible, postolateral margins of pleonite 3, encompassing pleonites 4 and 5 (Fig. 7(a), (b) ).

Antennule (Fig. 7(h) ) extending to anterior margin of pereonite 1, peduncular article 3 twice as long as article 1, flagellum composed of about 24 articles, the first being the longest. Antenna (Fig. 7(i) ) with peduncular article 1 very short, articles 2 and 3 sub-equal in length as are articles 4 and 5; flagellum extends to posterior margin pereonite 5.

Mouthparts. Not markedly different from other members of the genus. Maxilliped (Fig. 8(a) ) broad, abundantly supplied with setae, endite with 2 coupling hooks and a row of about 6 plumose setae. Maxillule (Figs. 7 (g), 8(c) ) with 12 stout and one slender spine on gnathal surface of exopod. Maxilla (Fig. 8(b) ) with about 10 setae on palp and about 20 on outer lobe; endite with 11 plumose and about 14 simple setae.

Pereopods all ambulatory. Pereopod 1 (fig. 7(f) ) short, robust, with few spines or setae; propodus with 4 spines on posterior margin. Pereopod 7 (Fig. 8(h) ) with few setae, a group of spines present at each distal angle of ischium, merus and carpus as well as additional spines on the hind margins.

Pleopods with peduncle broader than long, those of pleopods 1 and 2 (Fig. 8(i) ) with 8 plumose coupling hooks and 12 plumose setae; outer margin with small lobe. Pleopod 1 (Fig. 8(e) ) with exopod as broad as endopod, but narrowing rapidly to form a subacute tip; endopod straight sided. Pleopod 3 (Fig. 8(f) ) and 4 with fringe of marginal setae on exopod, endopod only partially setose. Pleopod 5 with endopod glabrous. Inner margins of endopods of pleopods 3 and 4 with partial suture.

Telson (Fig. 7(b) ), as broad as long, slight constriction anteriorly; posterior margin broad, feebly crenulate, with setae but no spines. Dorsal surface domed with shallow median depression. Uropod with peduncle produced into an acute lobe extending a little less than halfway along inner margin of endopod. Exopod narrow about 3.5 times as long as broad, fringe of setae along entire length of outer margin and distal half of inner margin which also has 3 spines; endopod without spines, inner and hind margin setose; extends beyond endopod, posterior margin somewhat truncate.

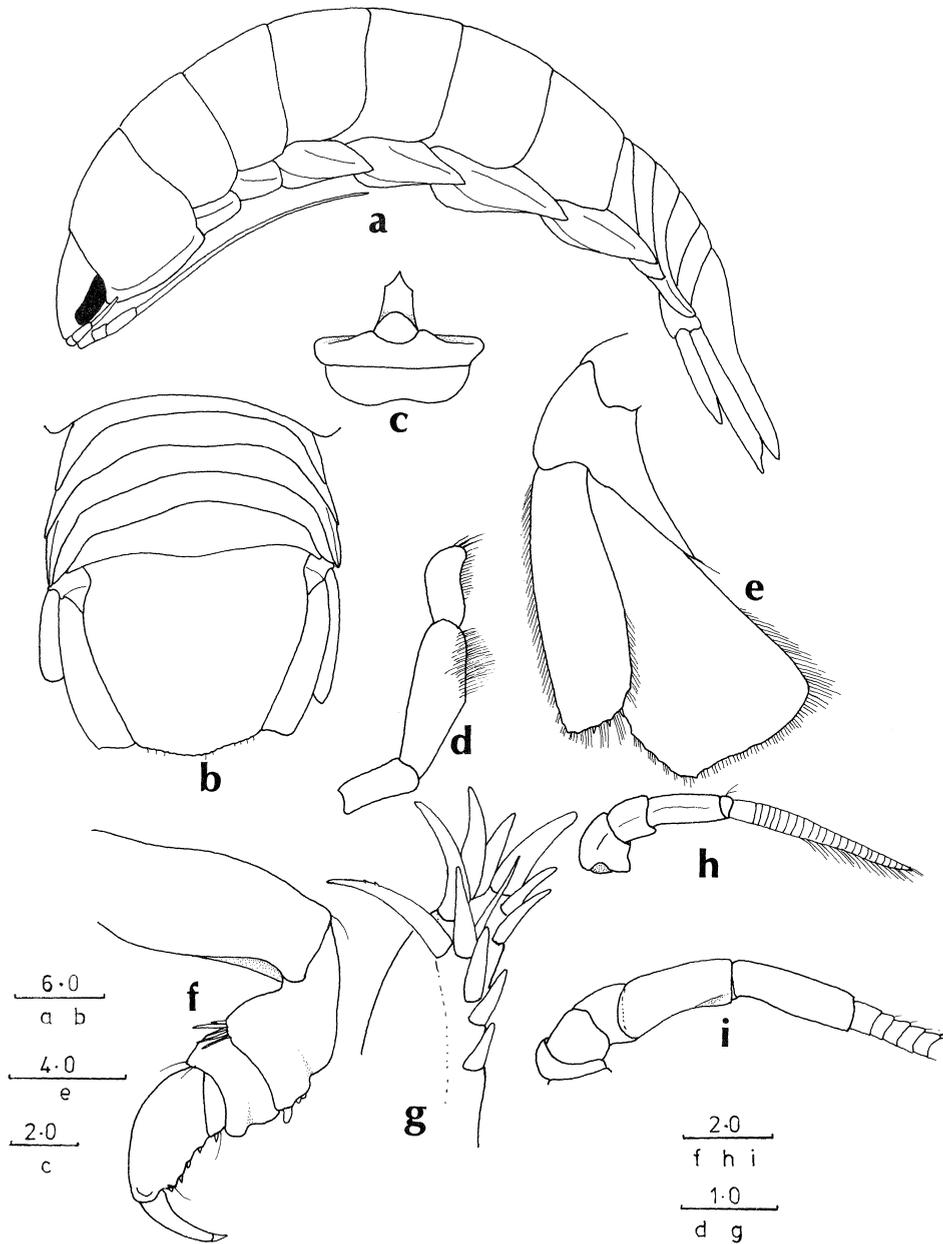


Figure 7. *Cirolana bathynella* sp. nov. (a)-(c) holotype (d)-(i) paratype (a) lateral view (b) pleon and telson (c) frontal lamina, clypeus and labrum (d) mandibular palp (e) uropod (f) pereopod 1 (g) gnathal surface of maxillule (h) antennule (i) antennal peduncle. Scale line, mm.

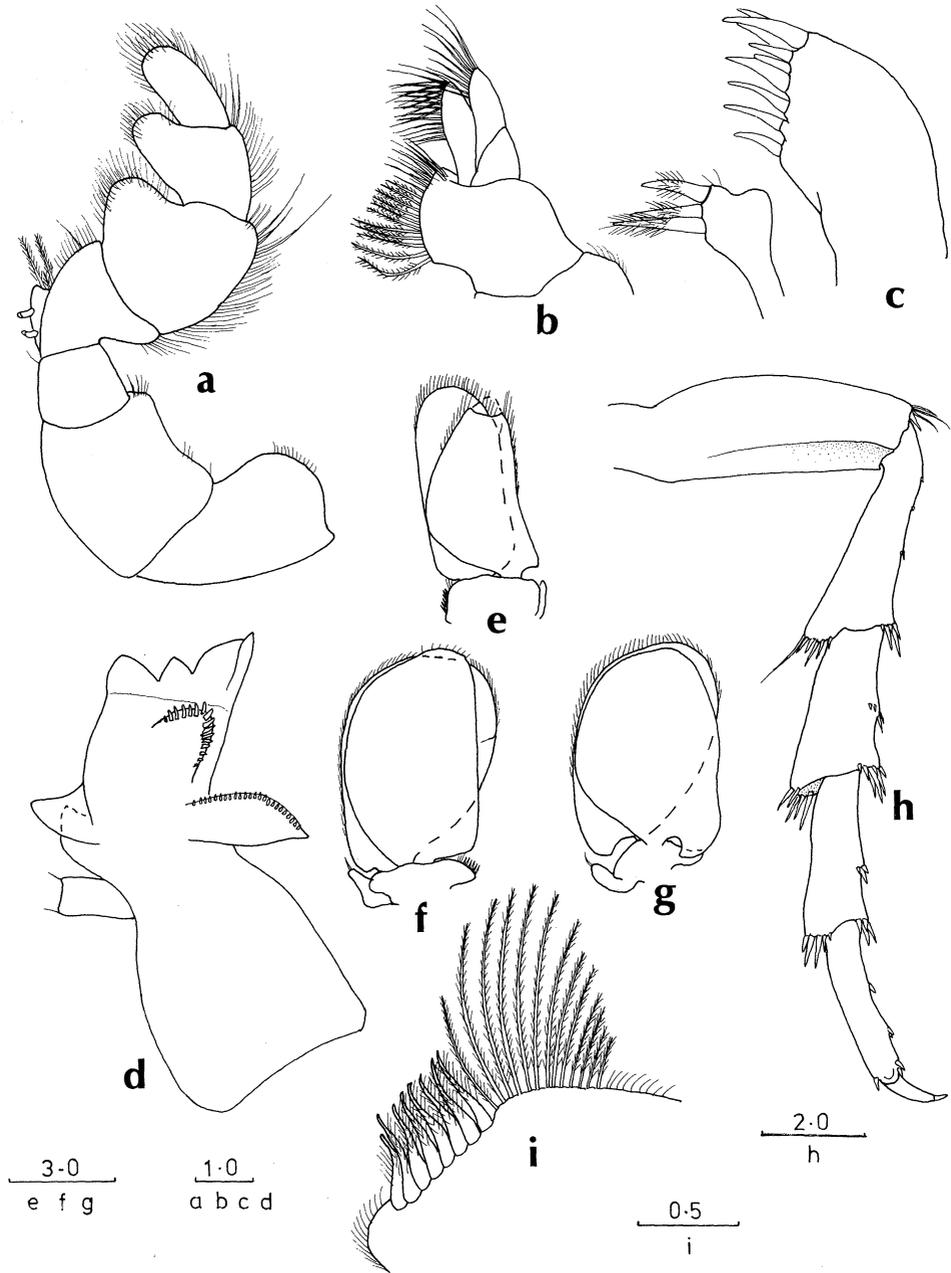


Figure 8. *Cirolana bathynella* sp. nov. All figs from paratype. (a) maxilliped (b) maxilla (c) maxillule (d) mandible (e) pleopod 1 (f) pleopod 3 (g) pleopod 5 (h) pereopod 7 (i) medial margin of peduncle of pleopod 1. Scale line, mm.

MALE: Unknown.

SIZE: Largest female 47 mm x 13 mm.

REMARKS: The large size of this species together with details of the antero-clypeal region, telson, uropods and pleopods immediately separate this from other species of the genus.

There are two species with which *C. bathynella* shares several characters, *C. quadripustulata* Hurley, 1957, and *Parabathynomus natalensis* Barnard, 1924, (Kensley, 1978). In all three species the telson, uropods, pleon, antennae, antennules and eyes are similar in form. Apart from the dorsal processes *C. quadripustulata* has more numerous spines on the uropods, and 4 spines on the inner lobe of the maxillule. *Parabathynomus* can be distinguished by the presence of branchial tufts on the uropods and by the produced merus of pereopod 1. Were it not for the lack of branchial tufts, *Cirolana bathynella* sp. nov. could be placed in the genus *Parabathynomus* which emphasises the closeness of that genus of *Cirolana*. Although the females are non ovigerous, it seems unlikely that they would develop branchial tufts as pereopod 7 suggests they are fully developed.

The setation of pleopods 3 and 4 is unusual for the genus. In the genus *Cirolana* it is normal for all rami but the endopod of pleopod 5, to be setigerous. In this species the endopods of pleopods 3 and 4 are almost entirely without setae. The large number of coupling hooks on the protopods of pleopods 1 and 2 is also distinctive. Most species of the genus possess 3 or 4 as opposed to 8 in *C. bathynella*. Until the male of the species is known, it seems best to place it in the genus *Cirolana* but occupying an isolated position close to *C. quadripustulata* and the genus *Parabathynomus*.

ETYMOLOGY: The specific name is derived from the Greek word *bathos* (= deep) and alludes to its affinity to *Parabathynomus*.

DISTRIBUTION: From off the Tasmanian coast.

***Cirolana halei* sp. nov.** (Figs. 9 & 10)

MATERIAL: N.S.W. shelf, Hunter District, HDWBS stns: off Stockton Beach, 32°53'55''S, 151° 47' 13''E, 15 m, 30.11.1975, (2 specimens); off Burwood Beach, 32° 57' 31''S, 151°44' 43''E, 24 m, 22.8.1975, (1). Off North Head, Sydney, SBS stn: 151°18'E, 33°49'S, 32 m, 25.5.1972(16).

TYPES: Holotype. ♂, AM Reg. No. P28695.

Paratypes. 2 ♀ specimens AM Reg. No. P23051 and 23052.

Paratypes. 4 NMV Reg. No. J684.

Paratypes. 4 SAM Reg. No. C3869.

TYPE LOCALITY: Off Stockton Beach, N. of Hunter River, N.S.W. 15 m, 30.11.1975.

DESCRIPTION OF MALE: Body smooth, about 3 times as long as broad (Fig. 9(a)). Cephalon with small rostral point, frontal lamina (Fig. 9(c)) broad, straight sided, pentagonal in shape.

Pereonite 1, 0.5 as long again as pereonite 2; pereonites 2 and 3 sub-equal in length and shorter than pereonites 4-7, which are also sub-equal in length. Each coxa (Fig. 9(b)) with a carina, posterior margin of coxae 5-7 produced to a gently tapered point. Pleon short, pleonite 1 almost entirely concealed, epimera of segment 3 produced but not overlapping pleonite 4; pleonite 5 with lateral margin encompassed by pleonite 4.

Antennule (Fig. 9(g) ) with 2-articulate peduncle, article 2 longer than 1; flagellum with 6 articles, extending to anterior margin of pereopite 1. Antenna (Fig. 9(f) ) with first 3 peduncular articles short, article 3 slightly longer than 2; articles 4 and 5 sub-equal in length. Flagellum extending to posterior margin of pereonite 2.

Mouthparts. (Fig. 10(a)-(d) ) not differing notably from other members of the genus. Maxilliped (Fig. 10(a) ) with 6 and 3 setae on outer margins of palp articles 3 and 4 respectively; endite with two coupling hooks. Mandible (Fig. 10(d) ) with moderately narrow cutting edge; palp with articles 1 and 2 subequal in length.

Pereopods all ambulatory, 1-3 robust, 4-7 less so. Pereopod 1 (Fig. 9(d) ) robust, ischium with a single blunt and one acute spine on posterior distal angle; merus with 4 blunt spines and propodus with 2 acute spines one of which opposes the dactyl. Merus, carpus and propodus with dense fringe of setae along posterior margins. Dactyl with well developed secondary unguis. Pereopod 7 (Fig. 9(e) ) with very few setae. Anterior margin of basis formed into a keel-like ridge; ischium, merus and carpus with spines at distal angles; posterior margins of merus, carpus and propodus with numerous spines. Ischium and propodus subequal in length and longer than the carpus which is longer than the merus.

Pleopods (Fig. 10(e) (h) ) with marginal setae on all rami except the endopod of pleopod 5 (fig. 10(h) ). Pleopod 1 (Fig. 10(e) ) with endopod 0.66 as wide and a little shorter than exopod, tapering in distally. Pleopod 2 with appendix masculina rising basally (Fig. 10(f) ) and extending beyond inner ramus by 0.5 its length. Pleopods 3-5 with complete suture across exopod; pleopods 1-3 with 4 coupling hooks each.

Telson (Fig. 9(h) ) with sides slightly concave, dorsal surface raised, but does not form a distinct ridge; posterior margin subtruncate, armed with 8 robust spines and short setae. Uropod with single spine on external margin of peduncle and 2 spines on ventral posterior margin; endopod broad, inner margin with 5 stout spines, apex bifid, outer margin with 2 spines and a brush tipped seta, both margins with setae; exopod narrower, shorter than endopod, apex bifid; outer margin with 3 spines and a few short setae, inner margin with 3 large spines and about 8 setae.

FEMALE: As for the male, but lacking appendix masculina and the setae on pereopod 1.

SIZE: Largest female 6.0 mm. Male 5.0 mm.

COLOUR: Pale tan to cream with numerous black chromatophores.

REMARKS: This species can be identified by the combination of the following characters: the frontal lamina, the antennule, telson and uropods, pleopods 1 and 2 and the male pereopod 1. There are two species, *Neocirolana obesa* Hale 1925 and *Cirolana cranchii* var. *australiense* Hale, 1925, which show a certain similarity to this species. *N. obesa* can be distinguished by having a narrower cutting edge of the mandible, a distinct frontal lamina, a shorter antennule and by the production of pleon segment 3 to reach to the hind margin of the pleon. This last feature also separates *C. cranchii australiense* from *C. halei*. *C. cranchii australiense* is further distinguished by having more numerous spines on the uropodal rami and in having the endopod of pleopod 1 straight sided.

ETYMOLOGY: This species is named in honour of Herbert M. Hale who pioneered the study of this family in Australia.

DISTRIBUTION: Off Hunter District and Sydney coasts, from 15 m to 32 m, from fine sand.

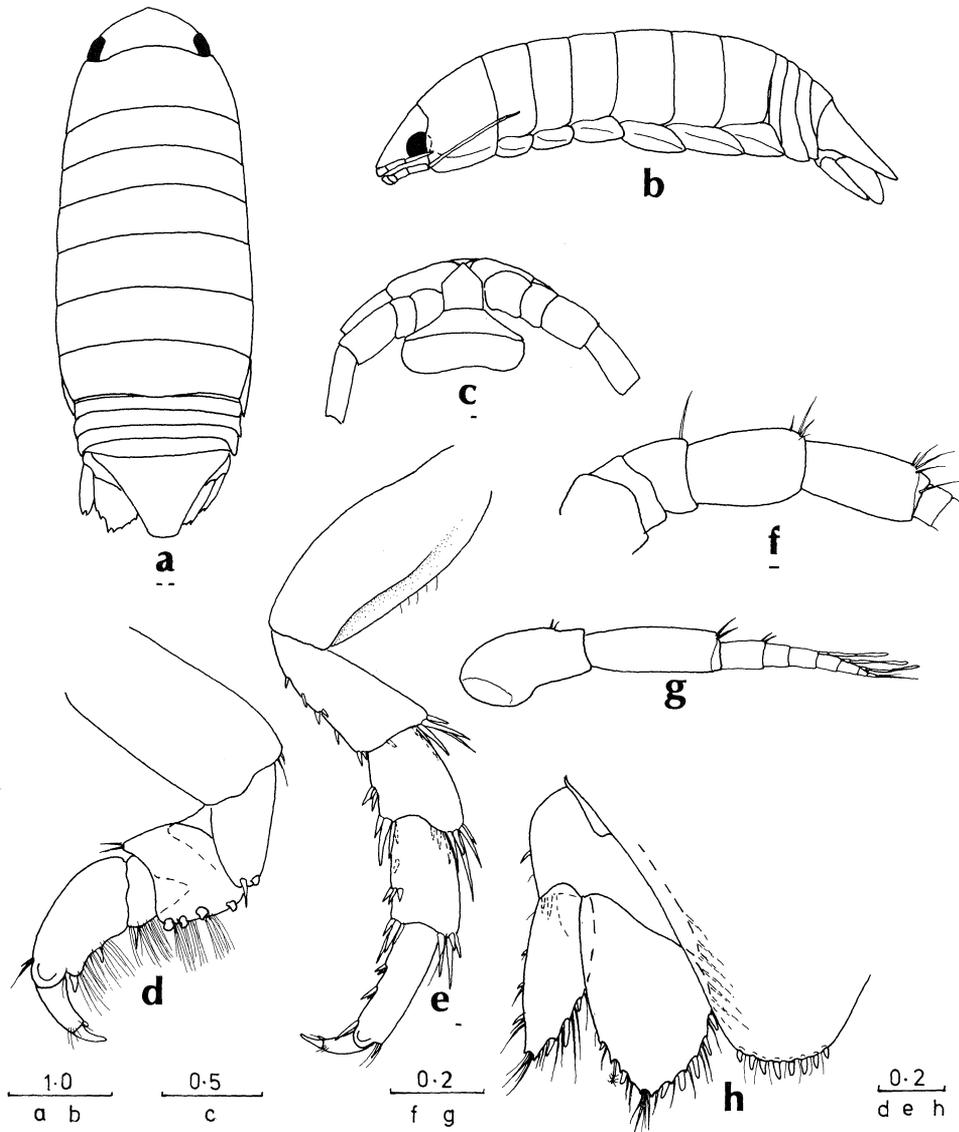


Figure 9. *Cirolana halei* sp. nov. (a)-(c) holotype (d)-(h) paratype (a) dorsal view (b) lateral view (c) clypeal region (d) pereopod 1 (e) pereopod 7 (f) antennal peduncle (g) antennule (h) telson and uropod. Scale line, mm.

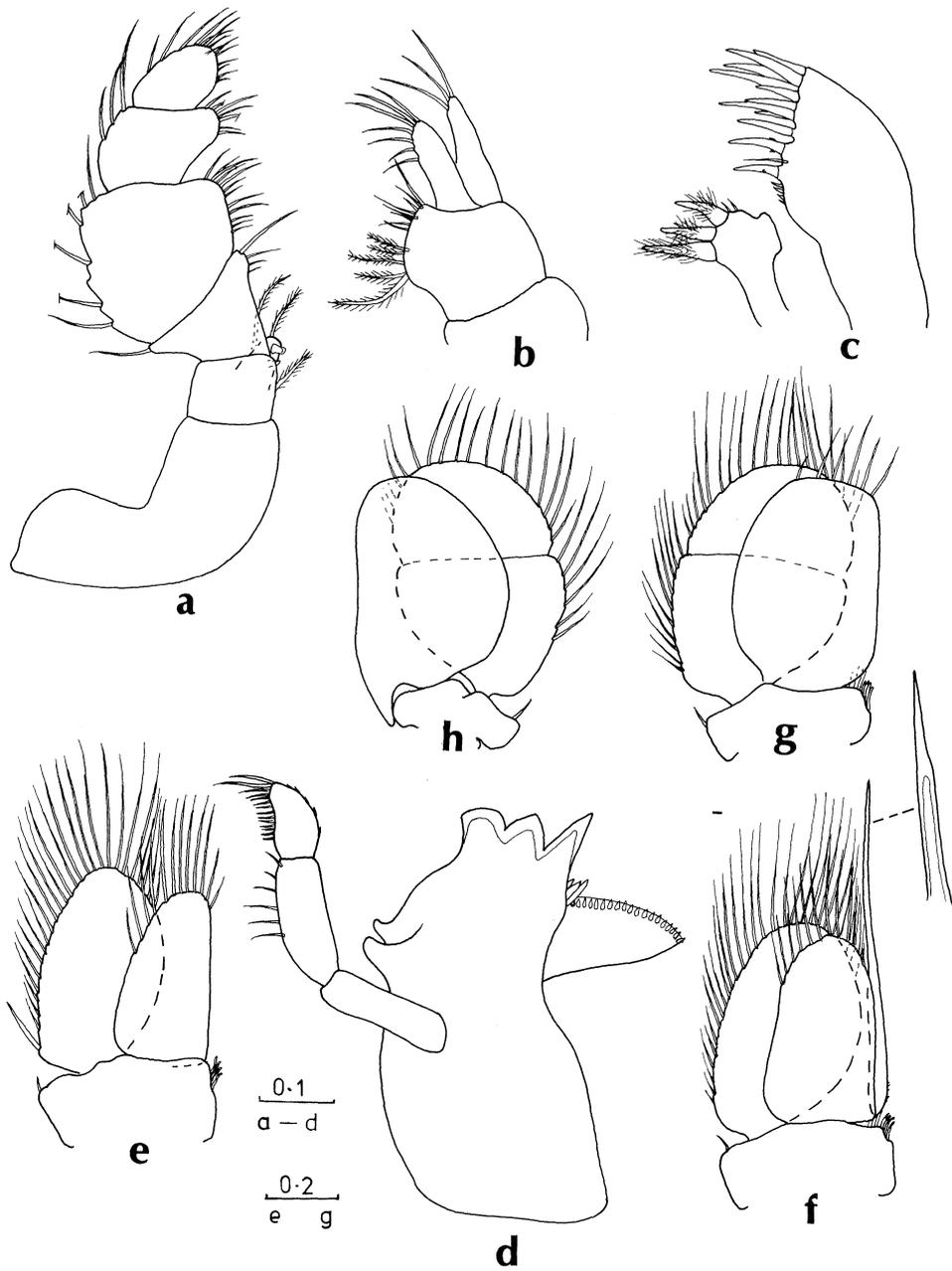


Figure 10. *Cirolana halei* sp. nov. All figs. paratype. (a) maxilliped (b) maxilla (c) maxillule (d) mandible (e) pleopod 1 (f) pleopod 2 (g) pleopod 4 (h) pleopod 5. Scale line, mm.

***Cirolana triloba* sp. nov.** (Figs. 11 & 12)

MATERIAL: NSW shelf, off Malabar, Sydney, SBS stns: 151°19'E, 33°57'S, 66 m, 19.5.1972 (2 specimens) and 71 m (4); 151°17'E, 33°58'S, 66 m, 30.1.1974 (1).

TYPES: Holotype. AM Reg. No. P. 28696  
Paratypes. AM Reg. No. P 22881 (♂ and ♀), P 22882 (♀) and P 28697 (2 ♀♀).  
Paratype. NMV Reg. No. J686

TYPE LOCALITY: Off Malabar, Sydney, N.S.W., 71 m, 19.5.1972.

DESCRIPTION OF MALE: Body robust, surface coarse, a little more than 2.5 times as long as broad. Cephalon with an indistinct tubercle on dorsal surface. Clypeus (Fig. 11(c)) narrow; frontal lamina (Fig. 11(c)) broad with anterior projection meeting a small process separating the antennules.

Pereonite 1 more than twice the length of pereonite 2 (Fig. 11(a)); pereonites 3-6 sub-equal in length and slightly longer than pereonites 2 and 7; pereonites 3-7 with impressed line on posterior portion, those on pereonites 6 and 7 being more prominent (Fig. 11(b)); lateral margin of pereonite 1 with one complete and one partial longitudinal line. Coxae 2 and 3 not produced, each with a longitudinal carina, coxae 4-7 produced, each with an oblique carina. Pleonite 1 almost entirely concealed by pereonite 7, pleonite 4 with 4 inconspicuous tubercles, pleonite 5 with 3 conspicuous tubercles; lateral margin of pleonite 3 produced to the posterior of pleon, partially overlapping pleonite 4 which in turn encompasses the lateral margin of pleonite 5.

Antennule peduncle (Fig. 11(f)) 2-articulate, no clear suture visible on the first article; flagellum of 6 articles, article 1 longest. Antenna (Fig. 11(g)) with peduncular articles 1-3 short, article 5 longer than 4; flagellum extends to posterior margin of pereonite 4.

Mouthparts. (Fig. 12(a)-(d)) typical of the genus. Maxilliped broad, endite with 2 coupling hooks (Fig. 12(a)). Cutting edge of mandible not narrow (Fig. 12(c)).

Pereopods all robust and ambulatory; pereopods 1-3 shorter and more robust than 4-7. Pereopod 1 (Fig. 11(h)) with stout basis; ischium and merus with anterior margins only slightly produced posterior margin of ischium and carpus with 1 and 5 large blunt spines respectively, propodus with 3 acute spines; posterior margins of carpus, merus and propodus with dense fringe of setae. Dactyl (Fig. 11(h), detail) with well developed robust secondary unguis. Pereopod 7 virtually without setae (Fig. 11(j)), anterior margin of basis slightly produced, anterodistal angles of ischium, merus and carpus with group of spines, posterior margins of ischium, merus and carpus with numerous spines. Merus and carpus sub-equal in length and shorter than propodus which is shorter than ischium. Dactyl with secondary unguis.

Pleopods with marginal setae on all rami but the endopod of pleopod 5. Complete suture on pleopods 3 (Fig. 12(g)) to 5. Endopod of pleopod 1, narrow tapering towards apex (Fig. 12(e)). Pleopod 2 (Fig. 12(f)) with appendix masculina arising basally, twice the length of the endopod, apex narrowing to a point.

Telson with posterior margin truncate (Fig. 11(a)) armed with 6 spines and as many short setae. There is a median irregularly tuberculate ridge (Fig. 11(b)) running 0.66 the length of the telson. Uropod with endopod broad, inner margin serrate, each notch provided with a stout spine; apex bifid, outer margin with 2 spines and one brush tipped seta; exopod about 0.66 as wide and slightly shorter than endopod, inner and outer margins each with 3 stout spines, those on outer margin being smaller. Uropods do not

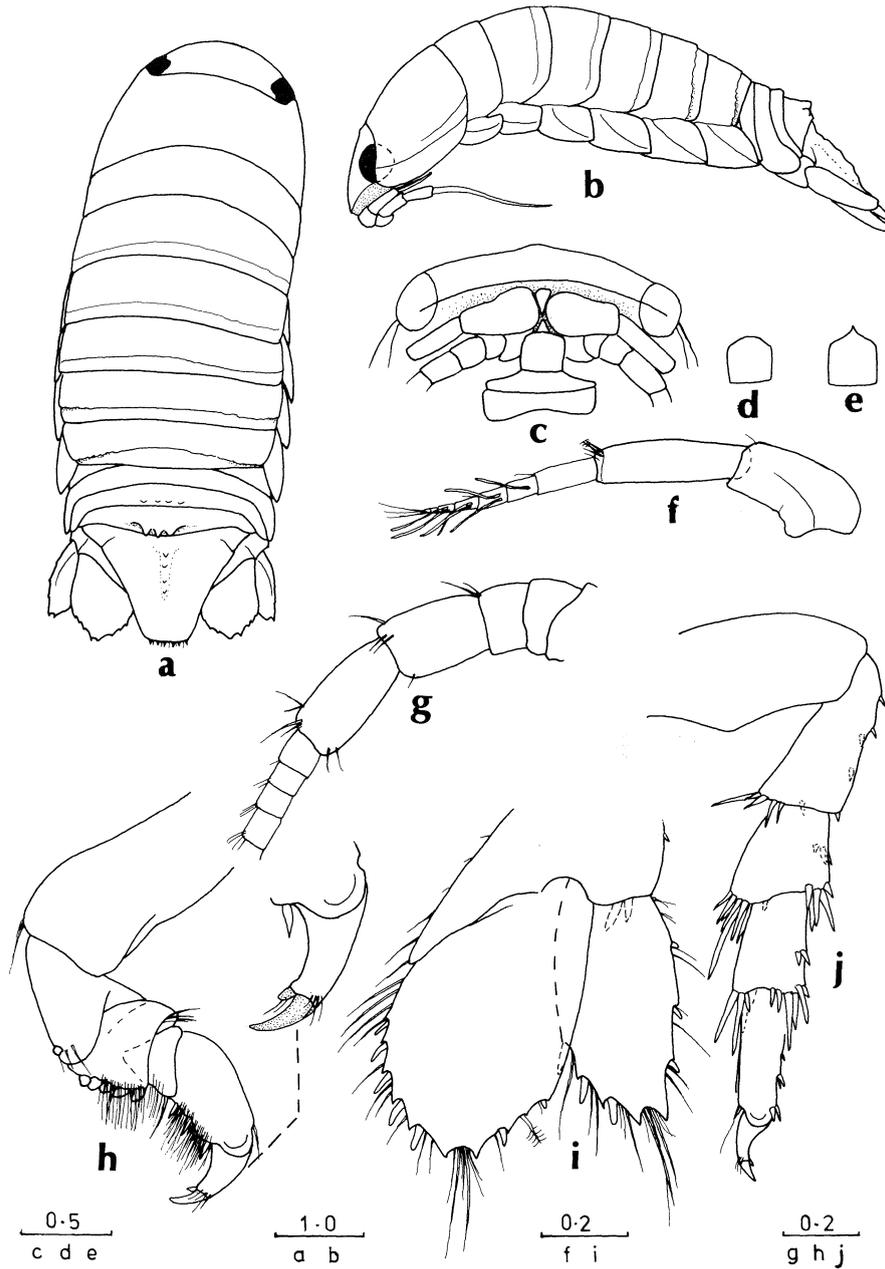


Figure 11. *Cirolana triloba* sp. nov. (a)-(c) holotype (d)-(j) paratype (a) dorsal view (b) lateral view (c) clypeal region (d), (e) variations, frontal lamina, type series (f) antennule (g) peduncle of antenna (h) pereopod 1 (i) uropod (j) pereopod 7. Scale line, mm.

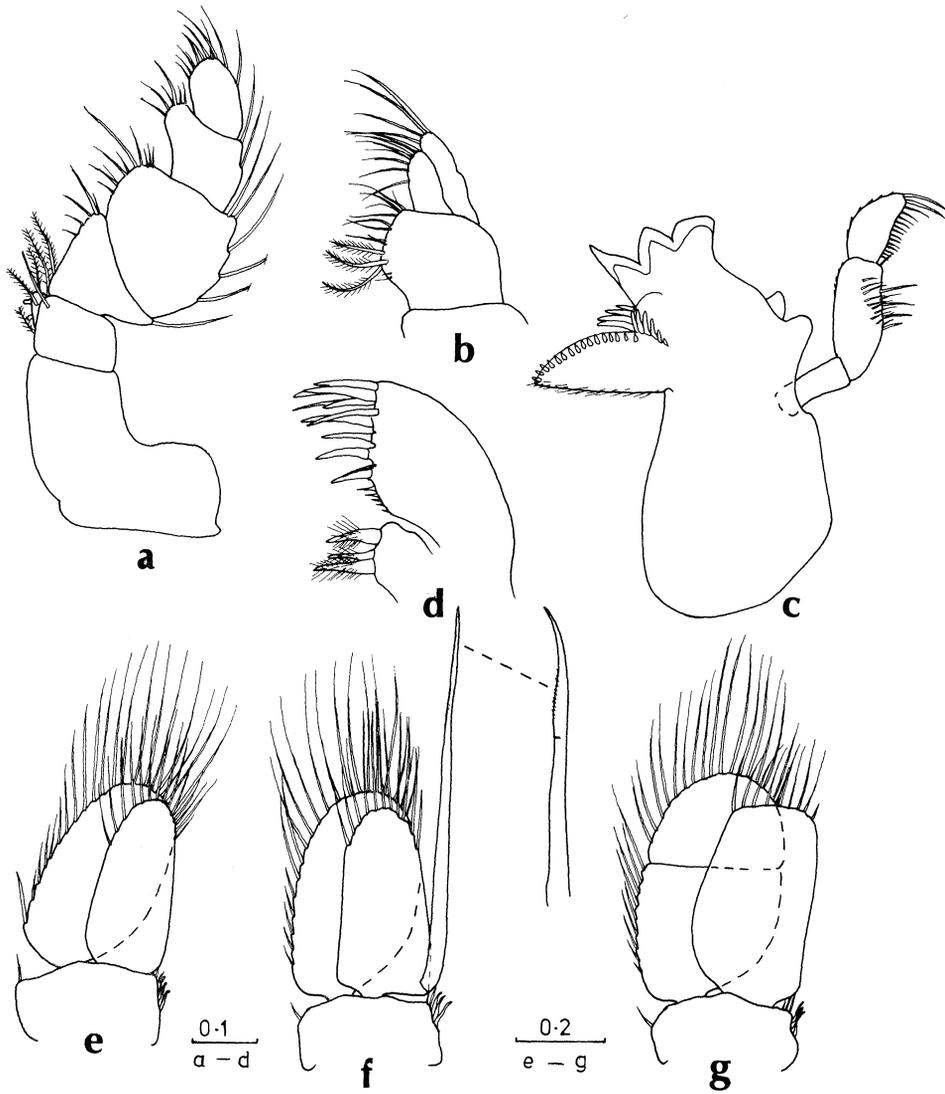


Figure 12. *Cirolana triloba* sp. nov. All figs. from paratype (a) maxilliped (b) maxilla (c) mandible (d) maxillule (e) pleopod 1 (f) pleopod 2 (g) pleopod 4. Scale line, mm.

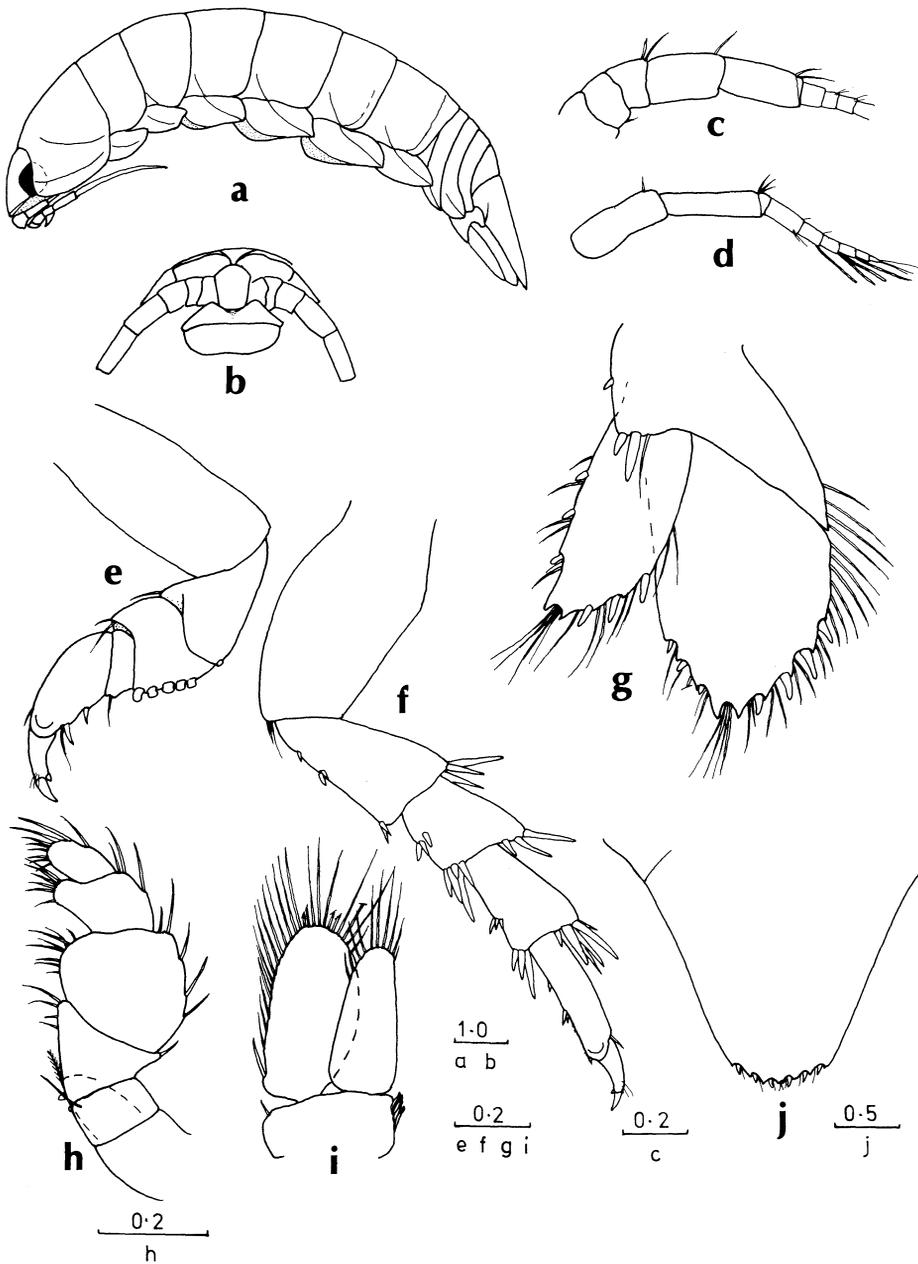


Figure 13. *Cirolana furcata* sp. nov. All figs from holotype. (a) lateral view (b) clypeal region (c) antennal peduncle (d) antennule (e) pereopod (f) pereopod 7 (g) uropod (h) maxilliped (i) pleopod 1 (j) telson. Scale line, mm.

extend beyond apex of telson.

**FEMALE:** Generally similar to male. Sculpting of pleon and telson present, but less conspicuous. The fringe of setae on pereopod one and the male sexual characters are absent.

**SIZE:** Largest male 6.5 mm; female 6.0 mm.

**COLOUR:** Tan to cream in alcohol.

**REMARKS:** This species can be separated from all others of the genus by the ornamentation of the pleon and telson.

**ETYMOLOGY:** The specific name is derived from the latin word *lobatus* (= lobed).

**DISTRIBUTION:** Known only from off Malabar, NSW at depths from 66 m to 71 m, fine sand and gravel sand bottom.

***Cirolana furcata* sp. nov.** (Fig. 13)

**MATERIAL:** NSW shelf, off North Head, Sydney, SBS stn: 51°18'E, 33° 49'S, 32.9 m, 23.5.1978, (1 ♀ and 1 manca).

**TYPES.** Holotype. AM Reg. No. P 28694.

Paratype. manca AM Reg. No. P 22874

**TYPE LOCALITY:** Off North head, Sydney, N.S.W. 32 m, 23.5.1972.

This species and the next two are in most characters extremely close to *C. triloba* sp. nov. and the descriptions given will deal mainly with the differences. Where not mentioned, a character can be assumed to be the same as, or not differing significantly from *C. triloba*.

**DESCRIPTION OF FEMALE:** Cephalon without tubercule. Pereonites 1-5 without transverse impressed lines (Fig. 13(a) ). Frontal lamina slightly broader anteriorly, anterior margin obscurely 3-sided; clypeus formed into two projecting triangular process, one on each side of frontal lamina (Fig. 13(b) ).

Antennule peduncle with articles 1 and 2 fused (Fig. 13(d) ), article 3 longer than fused articles 1 and 2. Antenna (Fig. 13(c) ) with first 3 peduncular articles short, articles 4 and 5 sub-equal in length; flagellum extends to posterior of pereonite 2.

Mouthparts. As for the preceding species except for outer margin of maxilliped palp articles (Fig. 13(h) ) which have fewer and shorter setae.

Pereopod 1 (Fig. 13(e) ) with two acute spines on posterior margin of propodus.

Pleopods as for the preceding species.

Telson (Fig. 13(j) ) with subtruncate hind margin with 6 stout spines and central pair of simple setae. Dorsal surface is domed, but without any sculpture. Uropods (Fig. 13(g) ) with endopod armed with 4 and 3 spines on outer and inner margins respectively; endopod with 3 spines each on inner and outer margins. Both rami with bifid apex.

**MALE:** Unknown.

**SIZE:** 10 mm.

**COLOUR:** Cream in alcohol.

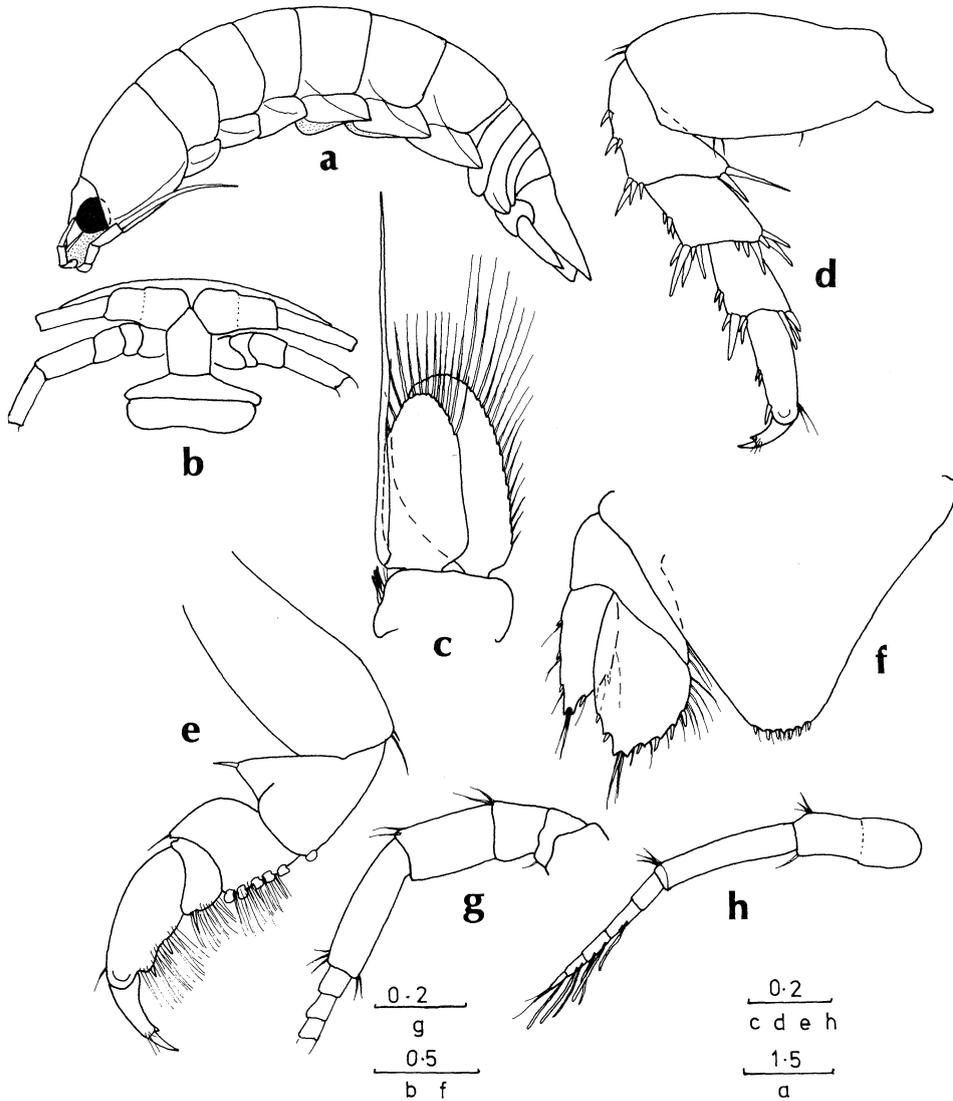


Figure 14. *Cirolana similis* sp. nov. All figs holotype. (a) lateral view (b) clypeal region (c) pleopod 2 (d) pereopod 4 (e) pereopod 1 (f) telson and uropod (g) antennal peduncle (h) antennule. Scale line, mm.

REMARKS: This species shows a close resemblance to the previous species from which it can easily be distinguished by the unique clypeus present on both specimens which also separates it from all other *Cirolana* species.

ETYMOLOGY: The specific epithet is taken from the Latin word *furcatus* (= cloven or branched), and alludes to the shape of the clypeus.

DISTRIBUTION: Known only from the type locality.

***Cirolana similis* sp. nov.** (Fig. 14)

MATERIAL: NSW shelf, off North Head, Sydney, SBS stn: 51° 19'E, 33° 57'S, 32 m, 1973 (1♂, 15♀).

TYPES: Holotype. AM Reg. No. P 28698  
 Paratypes. AM Reg. No. P 22883  
 Paratypes. NMV Reg. No. J685  
 Paratypes. SAM Reg. No. C3870

TYPE LOCALITY: Off Malabar, Sydney, N.S.W. 32 m, 1973.

DESCRIPTION OF MALE: Pereonites without impressed lines or sculpture. Dorsal surface of cephalon with a single distinct tubercule (Fig. 14(a) ). Clypeus narrow, frontal lamina about twice as long as broad, pentagonal in shape (Fig. 14(b) ).

Antennule (Fig. 14(h) ) with articles 1 and 2 fused, suture just visible; article 3 longer than combined lengths of articles 1 and 2. Antenna (Fig. 14(g) ) with articles 1-3 short; article 3 half as long again as article 4.

Mouthparts. Not differing notably from those of *C. triloba*.

Pereopods much the same as in the previous two species. Pereopod 1 (Fig. 14(e) ) with dense fringe of setae on posterior margin of merus, carpus and propodus; two spines only on posterior margin of propodus.

Pleopods as for *C. triloba*. Pleopod 2 (Fig. 14(c) ) with appendix masculina twice the length of inner ramus.

Telson (Fig. 14(f) ) with 6 spines on posterior margin. Uropods similar to preceding two species. Outer margin of endopod with 2 spines. Uropods extend a short way beyond telson.

FEMALE: Lacks the male sexual characters and the setae of pereopod 1. Cephalic tubercule less conspicuous, but present. Otherwise as for the male.

SIZE: Largest female 10 mm.

COLOUR: Cream in alcohol.

REMARKS: This species can be separated from *C. triloba* by the total lack of sculpture of the pleon and telson, by the difference in frontal lamina, and by the lack of impressed lines on the pereon segments. The clypeus, frontal lamina and cephalic tubercule separate this species from *C. furcata* sp. nov. and *C. halei* sp. nov.

ETYMOLOGY: The epithet, is the Latin word *similis* (= like) which alludes to the species' resemblance to *C. triloba*, and *C. halei*.

DISTRIBUTION: Known only from the type locality.

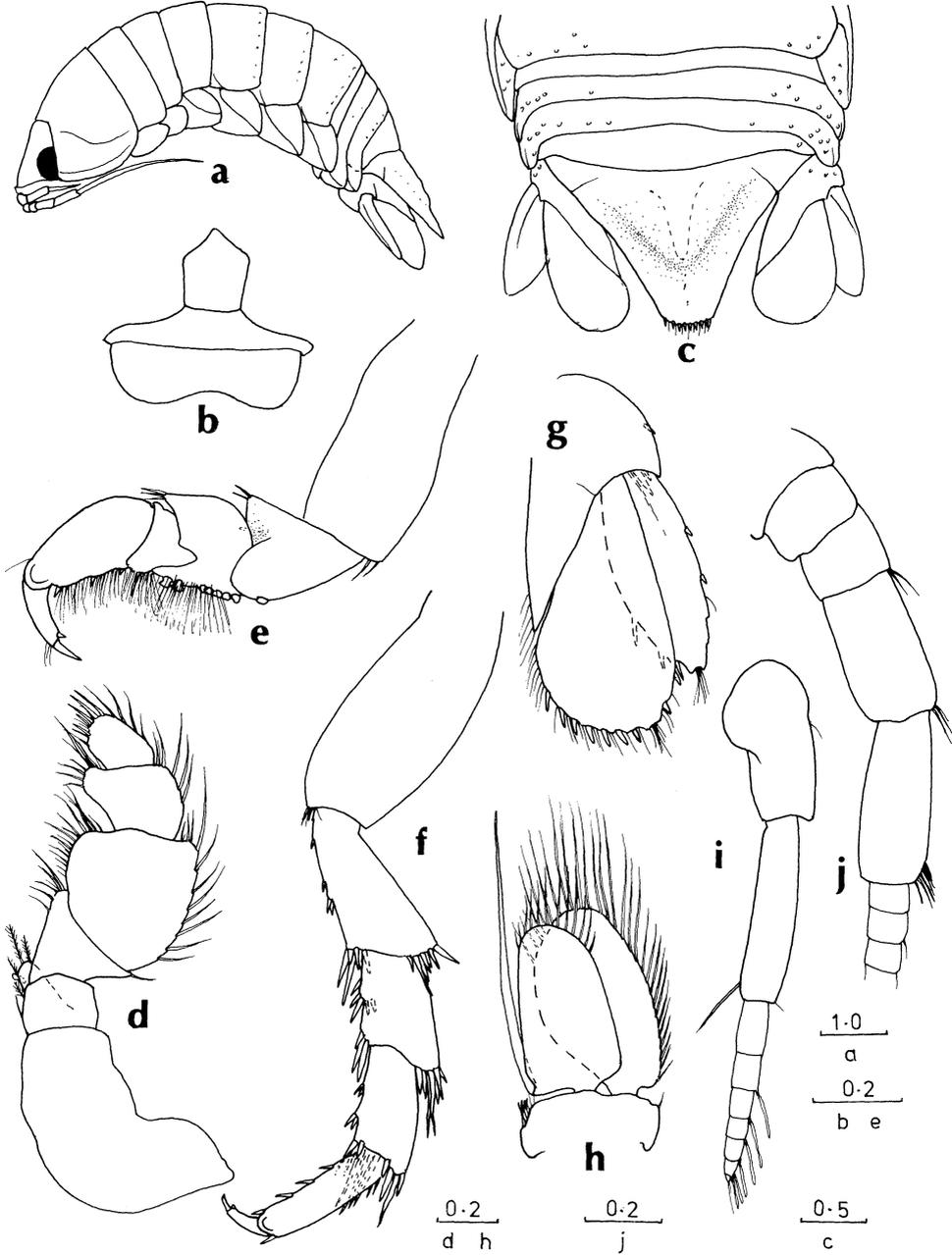


Figure 15. *Cirolana victoriae* sp. nov. Holotype. (a) lateral view (b) frontal lamina, clypeus and labrum (c) pleon and telson (d) maxilliped (e) pereopod 1 (f) pereopod 7 (g) uropod (h) pleopod 2 (i) antennule (j) antenna. Scale line, mm.

***Cirolana victoriae* sp. nov.** (Fig. 15)

MATERIAL: O. A. Sayce Collection, P. 25.7.11. Shoreham, Western Port, Victoria, 31.3.1902. Coll. S. W. Fulton. No other data.

TYPES: Holotype.♂; NMV Reg. No. J661

TYPE LOCALITY. Western Port, Victoria, 31.3.1902.

DESCRIPTION OF MALE: Pereonites without impressed lines, but dorsal surfaces coarsely pitted. Interocular carina present. Frontal lamina pentagonal (Fig. 15(b)).

Antennule biarticulate, article 2 distinctly longer than article 1; flagellum short, composed of 7 articles.

Mouthparts. As for the preceding species, except maxilliped (Fig. 15(d)) with rather more setae on external margins of maxilliped palp than in *C. triloba*.

Pereopods basically similar to previous three species. Pereopod 1 (Fig. 15(e)) with 3 spines on palm of propodus. Pereopod 7 (Fig. 15(f)) with numerous spines on distal margins of merus and carpus; propodus with 3 spines along posterior margin.

Pleopods same as *C. triloba*.

Telson with dorsal region raised into an irregular ridge, not distinct in dorsal view (Fig. 15(c)), posterior margin with 8 spines. Uropods (Fig. 15(g)) with apices not as markedly bifid as in preceding species; endopod rounded, 7 spines on inner margin, 2 on outer; exopod with 3 spines on inner margin, 4 on exterior margin.

FEMALE: Unknown.

SIZE: 7.1 mm.

COLOUR: Cream, without chromatophores in alcohol.

REMARKS: This species can be separated from *C. triloba* by the lack of pleonal tubercles, shape of the frontal lamina and the far more rounded uropods. This last character also separates *C. victoriae* sp. nov. from *C. halei*, *C. furcata* and *C. similis*.

ETYMOLOGY: The specific name derives from Victoria, the state from which the specimen was taken.

DISTRIBUTION: Known only from the type locality.

## DISCUSSION

The systematics of *Eurydice acuticadua* sp. nov., *E. spenceri* sp. nov., *Orphelana* gen. nov., and *Cirolana bathynella* sp. nov. have been discussed under the remarks for each species. Of the other *Cirolana* species described, *C. halei*, *C. triloba*, *C. furcata*, *C. similis* and *C. victoriae* appear to form a distinct group allied to *Neocirolana* on the one hand and the *C. cranchii/C. australiense* group on the other.

The species *C. halei*, *C. triloba*, *C. similis* and *C. victoriae* all have a setose merus, carpus and propodus on pereopod 1 of the male. This character has apparently not been recorded in any other members of the genus except for *C. cranchii* var. *australiense* and was figured but not mentioned by Hale (1925). When Naylor (1961) later elevated this variety to species rank, no mention was made of this character. Furthermore, this character has not been described for *C. cranchii* (Hansen, 1890; Monod, 1976, Nordenstam, 1946) in Europe nor *C. parva* Hansen, 1890, (Monod, 1930; 1933;

Richardson, 1905). It seems quite probable therefore that the animal described by Hale as var. *australiense* is both distinct from *Cirolana parva* and *Cirolana cranchii*, but at the same time is not the animal described by Naylor (1962). These seven species seem to form a natural group within the genus *Cirolana*.

The other point worthy of mention is the number and arrangements of the antennal peduncle articles. It is clear that in the species which have a biarticulate antennular peduncle that there has been a coalescence of the first and second articles. If one accepts that the small terminal article mentioned by Jones (1976 p.211) is a true article then numerous species of *Cirolana* would have to be considered as having a 4-articulate antennule peduncles. Amongst the species of *Cirolana* there is a complete range of fusion of the first articles from freely articulating, to non articulated but with a suture present, and then to total fusion of the first two articles.

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#### REFERENCES

- Barnard, K. H. 1924. Description of a new genus and species of Isopod crustacean belonging to the family Bathynomidae, procured in the South African Marine Survey. *Rep. Fish. mar. biol. Surv. Un. S. Afr.* 4 special rep. 2: 1-4.
- Bowman, T. E. 1977. Isopod crustaceans (except Anthuriidae) collected on the Presidential Cruise of 1938. *Proc. Biol. Soc. Wash.* 89: 653-666.
- Bruce, N. L. 1980. The Cirolanidae (Crustacea: Isopoda) of Australia. Heron Island and the Capricorn Group. *Bull. Mar. Sci.* 30: 108-130.
- The Cirolanidae (Crustacea: Isopoda) of Australia: The genus *Pseudolana* Bruce 1979, from Queensland coasts. *Pac. Sci.* (in press).
- Bruce, N. L. & Jones, D. A. 1978. The systematics of some Red Sea Isopoda (Family Cirolanidae) with descriptions of two new species. *J. Zool., Lond.* 185: 395-413.
- The systematics of some cirolanid isopods from Southern Japan. *J. nat. Hist.* (in press).
- Hale, H. M. 1925. Review of Australian isopods of the cymothoid group. Part I. *Trans. R. Soc. S. Aust.* 49: 128-185.
- 1940. Report on the cymothoid Isopoda collected by the F.I.S. "Endeavour" on the coasts of Queensland, New South Wales, Victoria, Tasmania and South Australia. *Trans. R. Soc. S. Aust.* 64: 288-304. Pl. XVIII.
- Hansen, H. J. 1890. Cirolanidae et familiae nonnullae propinque Musei hauniensis. *Vidensk. Selsk. Skr.* 6. *Roekke, naturis og. math.*, Afd. 5(3): 239-425. Pls. 1-10.
- Hurley, D. E. 1957. Some Amphipoda, Isopoda and Tanaidacea from Cook Strait. *Zool. Pub. Victoria Uni. Coll.* 21: 1-20.
- Jones, D. A. 1976. The systematics and ecology of some isopods of the genus *Cirolana* (Cirolanidae) from the Indian Ocean. *J. Zool., Lond.*, 178: 209-222.

- Kensley, B. 1978. Redescription of *Parabathynomus natalensis* Barnard. (Crustacea, Isopoda, Cirolanidae). *Ann. S. Afr. Mus.* 75: 25-31.
- Leach, W. E. 1818. Cymothoades. in *Dict. Sci. Nat.* 31: 1-22. Paris.
- Monod, T. 1930. Contribution a l'etude des "Cirolanidae". *Ann. Sci. Nat., Zool.* (10) 13: 129-183.
- 1933. Mission Robert Ph. Dollfus en Egypte: Tanaidacea et Isopoda. *Mem. Ins. Egypte*, 21: 161-264.
- 1976. Remarques sur quelques Cirolanidae (Crustaces: Isopodes). *Bull. Mus. natn. Hist. nat., Paris*, 3e ser 358, *Zool.* 251: 133-161.
- Naylor, E. 1961. Some Isopoda from the Chatham Islands, including two species of *Cirolana* new to New Zealand waters. *Trans. R. Soc. N.Z., Zool.* 1: 7-17.
- 1966. Port Phillip Survey 1957-1963. Isopoda. *Mem. nat. Mus., Melbourne* 27: 183-198, 377-384.
- Nordenstam, A. 1946. Marine Isopoda from Professor Dr Sixten Bock's Pacific Expedition 1917-1918. *Ark. fur Zoologi*, 337A(7): 1-31.
- Poore, G. C. R., Rainer, S. F., Spies, R. B. and Ward, E. 1975. The Zoobenthos Programme in Port Phillip Bay, 1969-73. *Fish Wildl. Pap., Vict.* 7: 1-78.
- Richardson, H. 1905. A monograph on the isopods of North America. *Bull. U.S. natn. Mus.* 54: Pp. Liii, 727.
- Stebbing, T. R. R. 1910. Isopoda from the Indian Ocean and British East Africa. The Percy Sladen Trust Expedition to the Indian Ocean in 1905 under the leadership of M. J. Stanley Gardiner, vol. III (6). *Trans. Linn. Soc. Lond., 2nd ser. Zool.* 14: 83-122.