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## **The Australian Monstrilloida (Crustacea: Copepoda) II. *Cymbasoma* Thompson, 1888**

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## Abstract

Monstrilloid copepods collected during the past two decades from zooplankton surveys in reef and coastal areas of Australia were analyzed. A first contribution included the taxonomic analysis of three genera of the Monstrilloida, *Monstrilopsis* Sars, 1921, *Maemonstrilla* Grygier & Ohtsuka, 2008, and the newly described *Australomonstrillopsis* Suárez-Morales & McKinnon, 2014. In this document a taxonomic analysis of the species belonging to the genus *Cymbasoma* Thompson, 1888 is provided. A total of 28 species were found, most of them being undescribed. Seventeen species were described based on females only and eight on male specimens while three species were described from both sexes. Males of Australian species of *Cymbasoma* are distinguished by details of the genital complex, body size and proportions, ornamentation and processes of the cephalic region, number of caudal setae, and the characteristic structure or ornamentation of the genital lappets. Two main groups of males were distinguished on the basis of the number of caudal setae (3 or 4). As for the females, 20 of the 25 new species of *Cymbasoma* have fifth legs with an unarmed inner lobe and three setae on the outer lobe; one of these species (*C. jinigudira* sp. nov.) belongs to the *C. longispinosum* species-group (*sensu* Üstün *et al.* 2014). Another group, consisting of five species, has only two setae on the outer (exopodal) lobe. There were no Australian species of *Cymbasoma* with a single lobe. A species group, named after *C. agoense*, is proposed to include species sharing a globose body and a female fifth leg with a large endopodal lobe and an outer (exopodal) lobe with two setae. The females of the new species of *Cymbasoma* from Australia can be distinguished from their known congeners by unique combinations of characters including the type of body ornamentation, body size and shape, antennule armature and

proportions, the presence of distinctive features of the legs 1–4, the presence/absence of processes on the genital compound somite, and the presence/absence of a constriction of the anal somite. We report the occurrence of two previously described species, *C. agoense* Sekiguchi, 1982 from Japan and *C. bali* Desai & Krishnaswamy, 1962 from India in Australian waters. Considering the addition of the 25 new species here described, the number of nominal species of the genus is now 66. A key to the Australian species of *Cymbasoma* (males and females) and a map showing their occurrence in Australia are also provided.

**Key words:** marine zooplankton, new species, taxonomy, associated Copepoda, reef-associated crustaceans

## Introduction

Monstrilloids are semi-parasitic copepods whose diversity is still being explored while their taxonomy, morphology and relevance are summarized by Suárez-Morales (2011). They are commonly found in plankton samples and they appear to be most abundant and diverse in reef-related habitats (Sale *et al.* 1976; Suárez-Morales 2001a, 2011). The taxonomical status and relations of the Monstrilloida among the other orders of copepods are still under discussion (Huys *et al.* 2007; Suárez-Morales 2011; Suárez-Morales *et al.* 2014). Currently, the order is known to contain over 130 nominal species (Razouls 1996; Suárez-Morales 2011, 2015; Walter 2015). The Australian monstrilloid copepod fauna appears to be highly speciose (Suárez-Morales & McKinnon 2014) but the group has not been studied enough in this region. Hitherto, the genus *Cymbasoma* Thompson, 1888, one of the most diverse within the Monstrilloida, was represented by records of two species, *C. longispinosum* (Bourne, 1890) and *C. thompsonii* (Giesbrecht, 1893) (Dakin & Colefax 1940; Razouls *et al.* 2005–2015), both of which are allegedly widespread. Furthermore, members of this genus were not recorded by Nicholls (1944) in plankton samples from Australia. In this contribution we present a taxonomic analysis of the Australian species of *Cymbasoma* and describe 25 new species based on male and female specimens collected in different coastal and reef-related environments of Australia. We also present records of two known species whose occurrence in Australia represents a significant extension of their known geographic range. Separate keys to the males and females of the Australian species of this genus are also provided.

## Materials and methods

Monstrilloid copepods were sorted from plankton samples collected in ecological studies of Australian coastal and shelf seas during the career of the junior author (ADMckK). Monstrilloids occurred in 76 zooplankton samples taken between November 1982 and November 2009. The source plankton samples were fixed in formaldehyde solution, and once isolated, monstrilloid copepods were transferred to 70% ethanol for taxonomic examination and long-term preservation.

As in the previous taxonomic work on the Australian monstrilloids (Suárez-Morales & McKinnon 2014), taxonomic descriptions of the species of *Cymbasoma* follow the general nomenclature by Huys & Boxshall (1991) and the upgraded descriptive standards proposed by Grygier & Ohtsuka (1995) for monstrilloid copepods. The antennular armature nomenclature follows Grygier & Ohtsuka (1995); setae are indicated as Roman numerals and spiniform elements as Arabic numerals. New micro-characters were recently proposed by Grygier & Ohtsuka (2008) to upgrade the descriptive standards of monstrilloids, particularly in the genus *Maemonstrilla*, but most of them require SEM analysis and others are not practical to check or evaluate with a reduced set of specimens or with only a single specimen available, as was the case for most Australian material of *Cymbasoma* considered here. When more than one specimen were available, we explored the intra-specific variability and thus provide comparative data and illustrations of different specimens. Huys *et al.*'s (2007) nomenclature for the armature of the terminal (fifth) segment of the male antennule was followed and setal homology was assigned based on their position on the segment. The nomenclature of the caudal setae of female and male *Cymbasoma* with three setae (setae II, IV, V) and males with four setae (II, IV, V, VI) followed Huys & Boxshall (1991). Total body lengths were measured from the anterior end of cephalothorax to the posterior end of the anal somite. Armature formulae for legs 1–4 are presented from basis to the most distal ramal segments and as outer margin first. The taxonomic analysis included light staining with methylene blue and semi-permanent mounting of whole specimens or



dissected appendages in glycerine and sealed with acrylic nail varnish or with Entellan®. Drawings were prepared at 400–1000 X magnifications with the aid of a camera lucida mounted on an Olympus CR31 microscope. Type specimens were deposited in the collection of the Museum of Tropical Queensland (MTQ), Townsville, Australia and the Museum of Western Australia, Perth (WAM).

## Systematics

### Order Monstrilloida Sars, 1901

### Family Monstrillidae Dana, 1849

### Genus *Cymbasoma* Thompson, 1888

#### *Cymbasoma bitumidum* sp. nov.

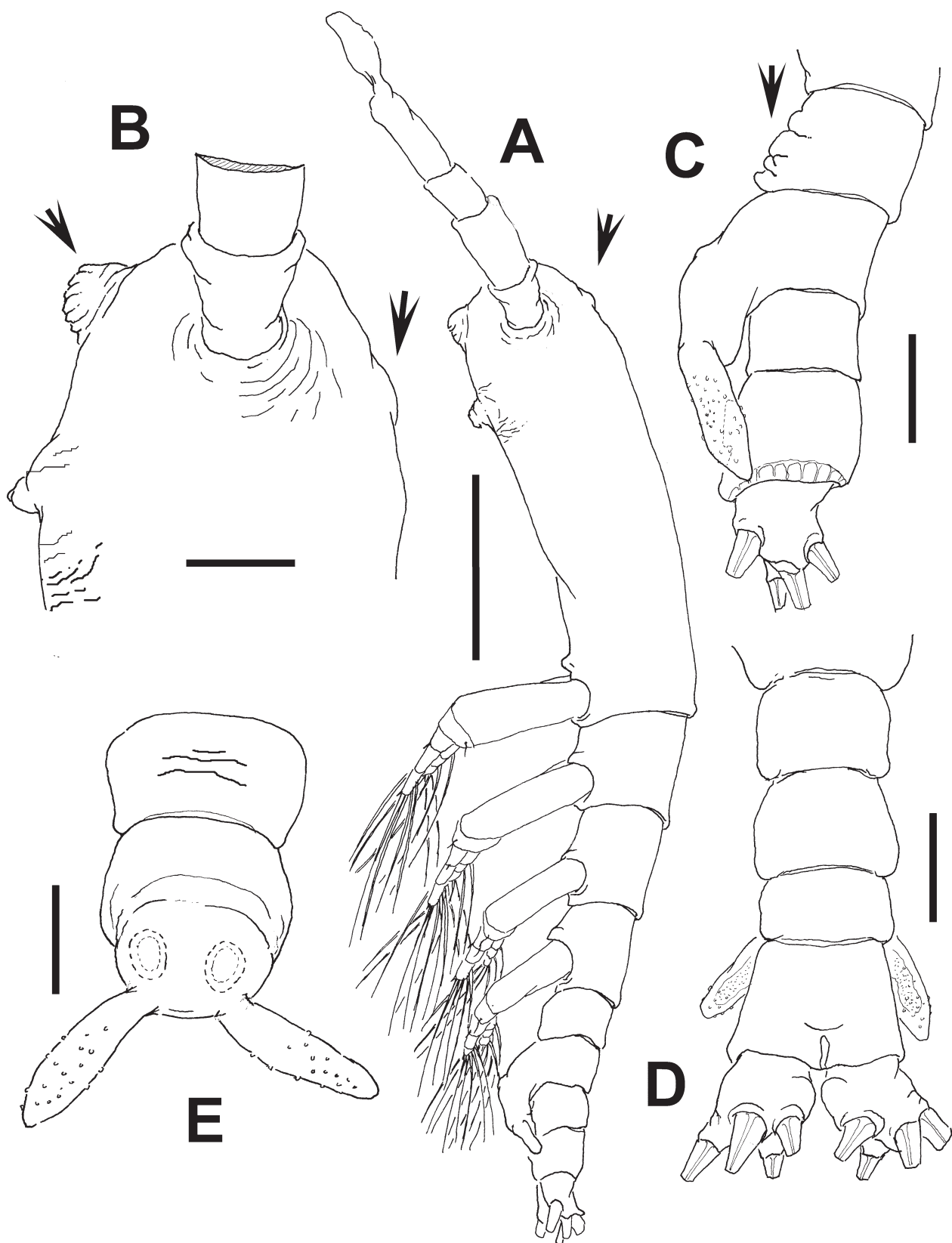
(Figs 1, 2)

**Material examined.** Adult holotype male from Hamelin Pool Channel, Shark Bay (Station 21 of Kimmerer *et al.* 1985), Western Australia (26°19.770' S, 114°03.354' E), partially dissected, ethanol-preserved; dissected parts mounted on 5 slides in glycerine, sealed with Entellan®. Date of collection: 17th June 1983. Slides deposited in the collection of WAM, Australia (cat. WAM C61307).

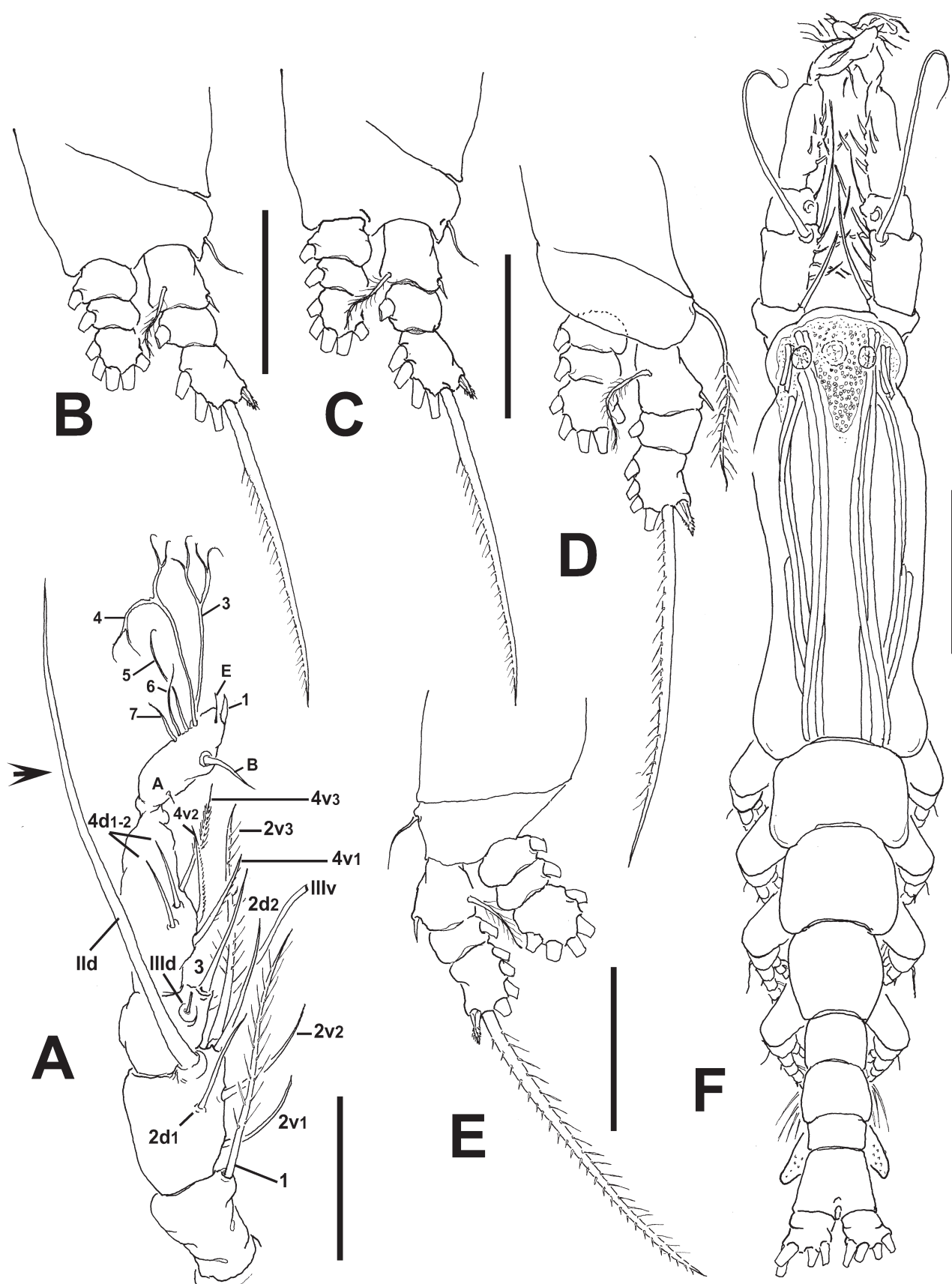
**Description of adult male.** Total body length 1.2 mm. Cephalothorax 0.57 mm long, representing 50% of total body length (Fig. 1A). Midventral oral papilla moderately prominent, positioned at 23% of cephalothorax length (Fig. 1A, B). Cephalic region slightly protuberant bilaterally in dorsal view. Pair of dorsal ocelli present, weakly developed; pigment cups relatively small. Ocelli separated by the length of two eye diameters, faintly pigmented. Ventral ocellus relatively small, about same size and diameter as eyes, not easily discernible. No sensilla observed between antennular bases. Antero-ventral surface of head between antennular bases and oral papilla bearing cuticular medial rounded protuberance ornamented with transverse ridges (arrowed in Fig. 1B). Dorsal surface of cephalic area with low medial rounded protuberance (arrowed in Fig. 1B). Other cuticular processes weak, represented by faint striae set at either side of oral papilla.

Urosome consisting of fifth pedigerous somite, genital somite (carrying genital complex), preanal somite, and anal somite. Fifth pedigerous somite with corrugate ventral surface (arrowed in Fig. 1C). Genital somite as long as fifth pedigerous somite. Genital complex of type II (Suárez-Morales & McKinnon 2014), represented by pair of strongly divergent, narrow, leaf-like genital lappets (Fig. 1E), these being moderately elongated and dorsally directed in lateral view (Fig. 1C), reaching beyond midlength of long anal somite. No medial processes present at flat common basal joint of lappets (Fig. 1E) but lappets ornamented with scattered cuticular papillae. Anal somite about twice as long as preanal somite in dorsal view, comprising 33% of urosome length; no suture visible on ventral or dorsal surfaces, but with cuticular hyaline frill along distolateral margins (Fig. 1C). Caudal rami subquadrate, approximately as long as wide (Fig. 1D), about half the length of anal somite. Each ramus with four setae.

Antennular length 0.48 mm. Antennules relatively long, representing 40% of total body length, and 80% of cephalothorax length. As usual in male monstrilloids, antennule 5-segmented, all segments separated, with segment 5 located distal to geniculation (Fig. 2A). Length ratio of antennular segments, from first to fifth 16.4: 18.4: 13.3: 26.9: 25 (= 100). Setal element 1 on first segment noticeably long, biserially setulated, reaching proximal 1/3 of fourth segment. Antennular elements 2v1-3, 2d1,2, and IId present on second segment, with element 2v3 noticeably long, setiform, reaching proximal margin of fifth segment and element IId remarkably long, stout, reaching well beyond distal end of fifth segment (arrowed in Fig. 2A). Elements IIId, IIIV, and 3 present on third segment (element IIId broken off, but socket present). Fourth segment with elements 4d1,2, 4v1–3 present; setal elements IVd and IVv absent in specimen. Fifth segment with 5 “b”-group setae, elements b2 and b3 dichotomously branched distally; element 61 present in distal position. According to Huys *et al.* (2007) setal nomenclature of the distal segment, elements A–E and 1, 2, 6, and 7 present.



**FIGURE 1.** *Cymbasoma bitumidum* sp. nov., adult male. A) habitus, lateral view, arrow indicates dorsal cephalic protuberance; B) cephalic region, lateral view, arrow indicates ventral corrugate cephalic protuberance; C) urosome, lateral view, arrow indicates ventrally corrugate fifth pedigerous somite; D) urosome, dorsal view; E) genital complex and lappets, ventral view. Scale bars: A = 200  $\mu$ m, B–E = 50  $\mu$ m.



**FIGURE 2.** *Cymbasoma bitumidum* sp. nov., adult male. A) left antennule, dorsal view; B) first leg; C) second leg; D) third leg; E) fourth leg; F) habitus, dorsal view. Scale bars: A = 50  $\mu$ m, B–E = 250  $\mu$ m, F = 200  $\mu$ m.

Incorporated first pedigerous somite and succeeding three pedigerous somites each bearing well-developed biramous legs. Pedigerous somites 2–4, together accounting for 30% of total body length in dorsal view (Fig. 2F). Coxae of each pair unarmed, joined by intercoxal sclerite which is slightly longer than wide. Bases separated from coxae posteriorly by oblique articulation (Fig. 2B–E). Exopods of legs 1–4 longer than endopods. Bases of legs 1–4 with hair-like lateral seta; on leg 3, this seta about 3.2 times longer, sparsely setulated in distal half and slightly thicker than those on the other legs (Fig. 2D). Endopods and exopods of legs 1–4 triarticulated. Ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3. Flexible, slender, sparsely setulated inner seta present on first exopodal segment of legs 1–4. Outer spine on distal exopodal segment of legs 1–4 shorter than segment. Also, outermost apical exopodal setae of legs 1–4 with inner margin sparsely spinulose.

Armature formula of legs as follows:

	basis	exopod	endopod
leg 1	0-1	1-1; 0-1; 1,2,2	0-1; 0-1; 1,2,2
legs 2–4	0-1	1-1; 0-1; 1,2,3	0-1; 0-1; 1,2,2

Female: unknown.

**Etymology.** The specific epithet is derived from the Latin adjective *tumidus* (=swollen) preceded by the particle “bi” (=two) to indicate the two protuberances (ventral and dorsal) of the cephalic region.

**Type locality.** Shark Bay, Western Australia (26°19.770' S, 114°3.354' E). Hamelin Pool is featured by the presence of stromatolites.

**Diagnosis.** *Cymbasoma* with conspicuous corrugate medial protuberance on cephalic area plus low rounded process on dorsal surface of same area. Second antennular segment bearing extremely long seta 2d2 and stout, long element IId. Antennule representing 40% of total body length and 80% of cephalothorax length. Fifth pedigerous somite with coarsely corrugated ventral surface. Genital complex of type II, with rounded distal tips, smooth basal joint between lappets, ornamented with scattered papillae. Spinous hyaline fringe on lateral surface of anal somite. Four caudal setae.

**Remarks.** This male specimen was included in the genus *Cymbasoma* by the presence of two somites between the genital somite and the caudal rami, a key character for males of this genus (Suárez-Morales & Riccardi 1997; Suárez-Morales 2000a). Only in this genus are males with three caudal setae found, but four caudal setae do occur in some species (Sars 1921; Suárez-Morales 2000a). This is one of the four species of male Australian *Cymbasoma* with four caudal setae. Other species sharing this character are: *C. quintanarooense* (Suárez-Morales, 1994), *C. tumorifrons* (Suárez-Morales, 1999), *C. rigidum* Thompson, 1888, *C. longispinosum* Bourne, 1890 (*sensu* Giesbrecht, 1893), *C. bullatum* (Scott, 1909), *C. tropicum* (Wolfenden, 1906), *C. ghardaqanum* (Isaac, 1975), *C. chelemense* Suárez-Morales & Escamilla, 1997, *C. rochai* Suárez-Morales & Dias, 2001, and three more Australian congeners described here. This new species can be distinguished from the closely related *C. chelemense* and its other congeners with four caudal setae by the presence of a conspicuous anterior protuberance with coarsely rugose surface on the cephalic region, which is clearly absent in *C. chelemense* (Suárez-Morales & Escamilla 1997: fig. 2B); and by the structure of the genital complex and in the armature of the antennules (Suárez-Morales & Escamilla 1997: fig. 2C, D). A cephalic protuberance resembling that present in the new species is known also in *C. bullatum* (Suárez-Morales 2001c, 2007), but these two species differ in other important characters. In *C. bullatum* the medial protuberant process is smooth and flanked by two secondary processes (Suárez-Morales 2007: fig. 2C) whereas the process is corrugated and has no adjacent secondary processes in the new species. In *C. bullatum* the genital lappets are relatively shorter, not reaching the proximal half of the anal somite (Suárez-Morales 2007: fig. 2F) whereas these lappets almost reach the distal margin of the anal somite in the new species (Fig. 1C, D). Also, the medial margin between the lappet bases is clearly protruded and rounded in *C. bullatum* (*cf.* Suárez-Morales 2007: fig. 2E) *vs.* a flat, smooth margin in the new species. Another species with a strong cephalic protuberance is *C. rochai*, but in this species the genital lappets are remarkably short, barely reaching the posterior margin of the genital somite, clearly differentiating it from the new species. Also, the medial margin between the lappet bases has a pair of spines in *C. rochai* (*cf.* Suárez-Morales & Dias 2001: fig. 32) which are absent in the new species. *Cymbasoma bitumidum* has some affinities with the male of *C. rigidum*, including a flat, smooth medial margin between the lappets and similar body proportions (Sars 1921), but these species diverge in the structure of

the anal somite; in *C. rigidum* the anal somite has a conspicuous constriction (Sars 1921) which is absent in the new species. In addition, the distal antennular segment is differently shaped and has a distinct armature in these species. In *C. rigidum* the apical element 1 (*sensu* Huys *et al.* 2007) is remarkably long and elements of the “b” group (*sensu* Grygier & Ohtsuka 1995) or group 3–7 (*sensu* Huys *et al.* 2007) are short, unbranched, whereas element 1 is short and setae of the “b” group are long and dichotomously branched in the new species. It is also noted that in some of these species with males bearing four caudal setae one of the antennular elements of the 2v-d group (*sensu* Grygier & Ohtsuka 1995) is remarkably long, such as in *C. longispinosum* (*cf.* Giesbrecht 1893), *C. tropicum* (*cf.* Sewell 1949), *C. chelemense* (*cf.* Suárez-Morales & Escamilla 1997), *C. rochai* (*cf.* Suárez-Morales & Dias 2001), *C. bullatum* (*cf.* Suárez-Morales 2007), and also in the new species (Fig. 1A). Some males, such as *C. bullatum* (*cf.* Suárez-Morales 2007: fig. 2B), *C. rochai* (*cf.* Suárez-Morales & Dias 2001: fig. 26), and *C. chelemense* (*cf.* Suárez-Morales & Escamilla 1997: fig. 4C, D) also share a plumose, long setal element 1.

***Cymbasoma colefaxi* sp. nov.**

(Figs 3, 4)

**Material examined.** Holotype: adult male from Warneet, Western Port Bay, Victoria, Australia (38°13.200' S, 154°189.758' E), partially dissected, ethanol-preserved; dissected parts mounted on 3 slides in glycerine, sealed with Entellan®. Date of collection: 15th May 1983. Slides deposited in the collection of MTQ, Australia (cat. MTQ W34371).

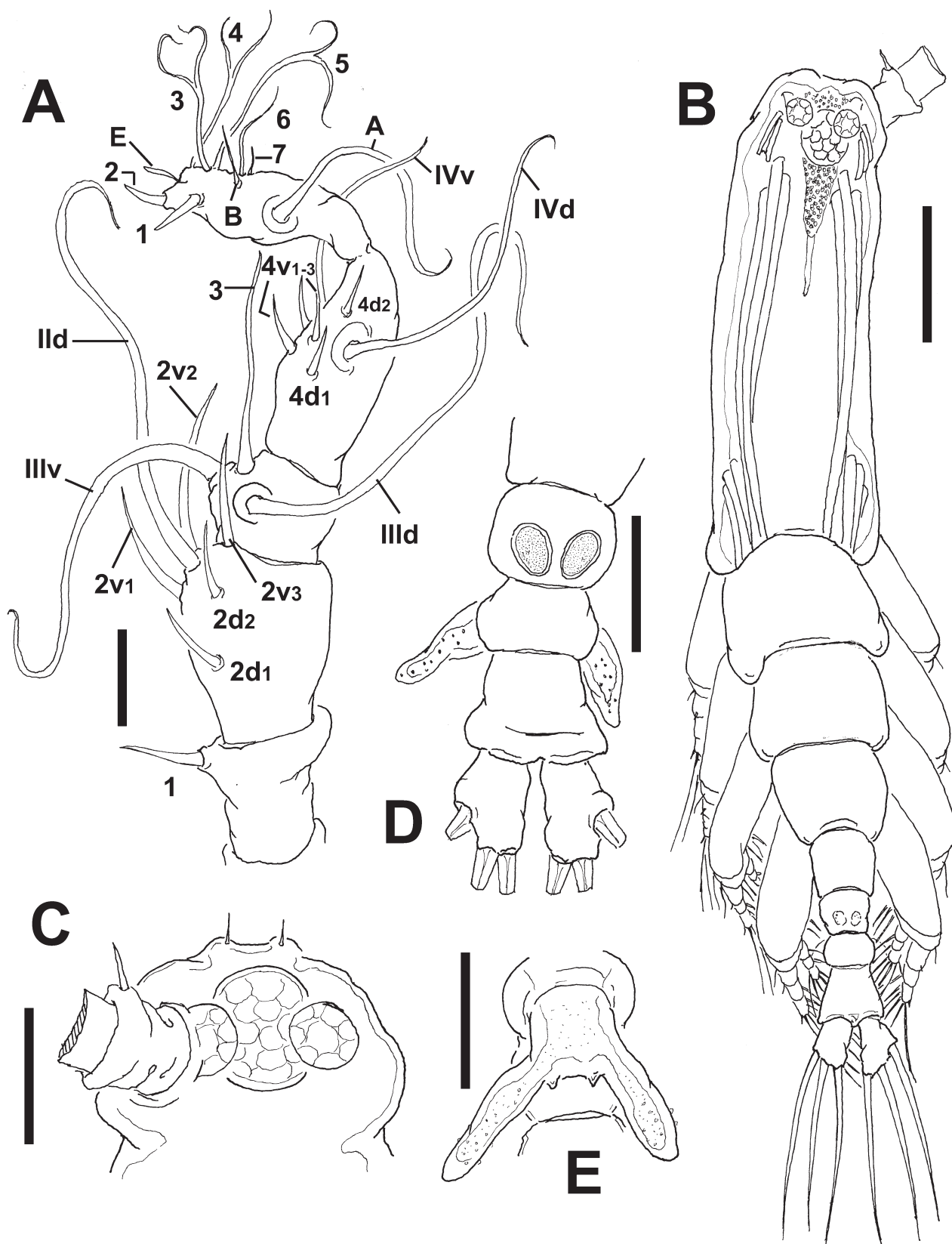
**Description of adult male.** Total body length 0.78 mm. Cephalothorax 0.38 mm long, representing about 50% of total body length (Fig. 3B). Midventral oral papilla weakly developed, positioned at 25% of cephalothorax length (Fig. 4A). Cephalic region slightly protuberant bilaterally in dorsal view. Pair of dorsal ocelli present, weakly developed; pigment cups relatively small. Ocelli separated by the length of one eye diameter, faintly pigmented. Ventral ocellus relatively large, about twice the diameter of eyes. Pair of sensilla between antennular bases. Antero-ventral surface of cephalothorax between antennular bases and oral papilla bearing conspicuous cuticular medial rounded protuberance ornamented with minute papillae (Fig. 4A). Dorsal and ventral surfaces of cephalic area smooth except for faint striae at either side of oral papilla.

Urosome consisting of fifth pedigerous somite, genital somite (carrying genital complex), preanal somite, and anal somite. Genital somite as long as fifth pedigerous somite. Genital complex of type II (Suárez-Morales & McKinnon 2014), represented by pair of moderately divergent, slightly asymmetrical genital lappets, right lappet slightly longer, narrower than left lappet (Fig. 3D, E). Lappets posteriorly directed in lateral view (Fig. 4A), reaching to midlength of anal somite. Pair of spiniform medial processes present at common basal joint of lappets (Fig. 3E). Lappets ornamented with few scattered cuticular papillae. Anal somite about twice as long as preanal somite in dorsal view, comprising 30% of urosome length; no suture visible on ventral or dorsal surfaces, cuticular hyaline frill absent. Caudal rami subrectangular, approximately 1.3 times as long as wide, as long as anal somite (Fig. 3D). Each ramus with three setae.

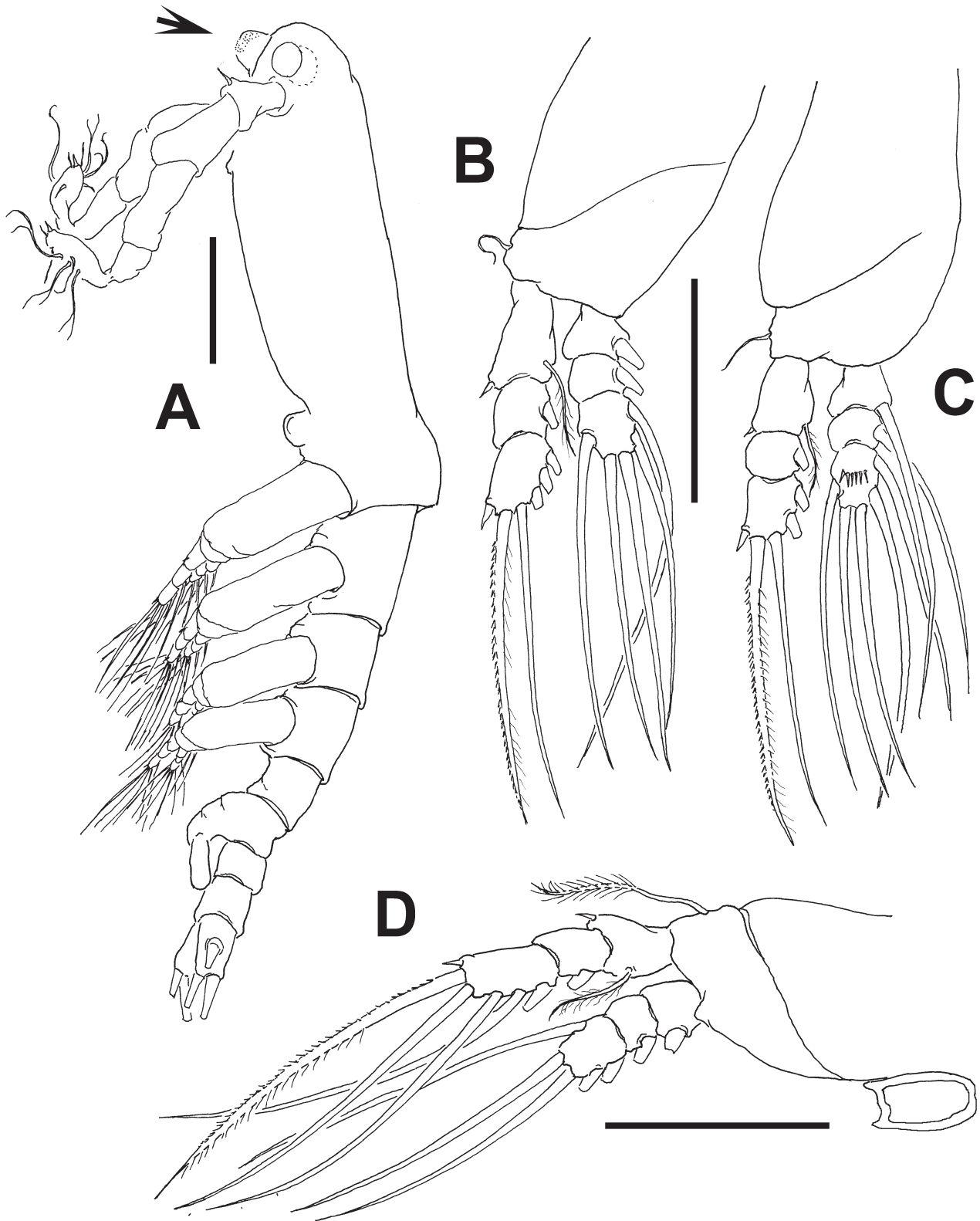
Antennular length 0.31 mm. Antennules relatively long, but shorter than in *C. bitumidum*, representing 35% of total body length, and 66% of cephalothorax length; 5-segmented, all segments separated, with segment 5 located distal to geniculation (Fig. 3A). Length ratio of antennular segments, from first to fifth 14.5: 19.7: 11.3: 29: 25.5 (= 100). Setal element 1 on first segment relatively short, spiniform, reaching proximal 1/3 of second segment. Antennular elements 2v1-3, 2d1,2, and IId present on second segment, with element 2v2 relatively longer than other elements of this group on segment, reaching well beyond proximal margin of fourth segment (Fig. 3A). Element IId flexible, long, reaching distal end of fifth segment. Elements IIId, IIIv, and 3 present on third segment, the latter being slender, setiform, remarkably long, reaching beyond distal margin of fourth segment. Fourth segment with elements 4d1,2, 4v1–3 and IVd present; setal element IVv absent in specimen. Fifth segment with 5 “b”-group setae, elements b1-3 dichotomously branched distally; element 61 present in distal position. According to Huys *et al.* (2007) setal nomenclature of the distal segment, elements A, B, E and 1–7 present.

Incorporated first pedigerous somite and succeeding three pedigerous somites each bearing well-developed biramous legs. Pedigerous somites 2–4, together accounting for 31% of total body length in dorsal view (Fig. 3B). Coxae of each pair unarmed, joined by intercoxal sclerite which is slightly longer than wide. Bases of legs 1–4 separated from coxae posteriorly by oblique articulation; with hair-like lateral basipodal seta (Fig. 4B–D); on leg 3, this seta about 2.5 times longer, sparsely setulated in distal half and slightly thicker than those on the other legs





**FIGURE 3.** *Cymbasoma colefaxi* sp. nov., adult male. A) right antennule, dorsal view; B) habitus, dorsal view, antennules omitted; C) anterior cephalic region, ventral view; D) urosome, dorsal view; E) genital complex and lappets, ventral view. Scale bars: A = 200  $\mu$ m, B = 100  $\mu$ m, C–E = 50  $\mu$ m.



**FIGURE 4.** *Cymbasoma colefaxi* sp. nov., adult male. A) habitus, lateral view, arrow indicates ventral cephalic protuberance; B) second leg; C) first leg; D) third leg. Scale bars: A = 200  $\mu$ m, B–D = 100  $\mu$ m.

(Fig. 4D). Endopods and exopods of legs 1–4 triarticulated, third exopodal segment of leg 1 with row of spinules on medial anterior surface (Fig. 4C). Exopods of legs 1–4 longer than endopods. Ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3. Flexible, slender, sparsely setulated inner seta present



on first exopodal segment of legs 1–4. Outer spine on distal exopodal segment of legs 1–4 shorter than segment. Also, outermost apical exopodal setae of legs 1–4 with inner margin sparsely spinulose.

Armature formula of legs as follows:

	basis	exopod	endopod
leg 1	0-1	I-1; 0-1; I,2,2	0-1; 0-1; 1,2,2
legs 2–4	0-1	I-1; 0-1; I,2,3	0-1; 0-1; 1,2,2

Female: unknown.

**Type locality.** Warneet, Western Port Bay, Victoria, Australia (38°13.200'S, 145°18.758'E).

**Etymology.** The species is named after Alan N. Colefax in honour of his contribution to the seminal volume on Australian marine plankton (Dakin & Colefax 1940).

**Diagnosis.** *Cymbasoma* with conspicuous medial protuberance on cephalic area covered with distal minute papillae. Second antennular segment bearing moderately developed seta 2v3 and remarkably long element 3. Antennule representing 35% of total body length and 66% of cephalothorax length. Fifth pedigerous somite with smooth ventral surface. Genital complex of type II, slightly asymmetrical, with rounded distal tips, basal joint between lappets with pair of spiniform processes, ornamented with few scattered papillae. Three caudal setae.

**Remarks.** This species of *Cymbasoma* can be distinguished from its congeners by its possession of a unique combination of four features: 1) the presence of a ventral cephalic protuberance; 2) a type II genital complex (Suárez-Morales & McKinnon 2014) with a pair of spiniform processes at the medial insertion of the genital lappets; 3) three caudal setae; 4) anal somite without constriction. The only other known species with similar genital lappets, with a basal pair of spines are *C. tenue* Isaac, 1974 (*cf.* Suárez-Morales & Riccardi 1997) and *C. rochai* (*cf.* Suárez-Morales & Dias 2001). The new species differs from *C. tenue* in several important characters; the high rounded cephalic ventral protuberance of the new species is absent in *C. tenue*, with a weakly produced ventral surface between the antennule bases (Suárez-Morales & Riccardi 1997: fig. 2B). The antennular armature shows some additional differences. Element 1 (*sensu* Grygier & Ohtsuka 1995) on the first segment is remarkably short in *C. tenue* (*cf.* Suárez-Morales & Riccardi 1997: fig. 2D) whereas it is clearly longer in the new species. Element 4v1 is long, setiform in *C. tenue* and short, spiniform in the new species. Element 3 is extremely long in the new species, reaching beyond the distal margin of the fourth segment, whereas it barely reaches midlength of the fourth segment in *C. tenue* (*cf.* Suárez-Morales & Riccardi 1997: fig. 2D). In addition, the third endopodal segment of leg 1 has a row of spinules (Fig. 4C) which are absent in *C. tenue* (*cf.* Suárez-Morales & Riccardi 1997: fig. 3A). The new species shares with *C. rochai* the presence of a ventral cephalic protuberance but differs in the number of caudal setae (three in the new species, four in *C. rochai*) (*cf.* Suárez-Morales & Dias 2001: fig. 28) and also in the length of the genital lappets; these are very short in *C. rochai*, barely reaching the posterior margin of the genital somite whereas they reach the middle of the anal somite in the new species. The remarkably long antennular element 3 is also a distinctive character of the new species. As in *C. tenue*, in *C. rochai* this element reaches only about halfway of the fourth segment and element 4v1 is long, setiform, thus diverging from the pattern observed in the new species.

### *Cymbasoma dakini* sp. nov

(Figs 5–8)

**Material examined.** Adult female holotype and two paratype females from Corinella, Western Port Bay, Victoria, Australia (38°23.115' S, 145°25.371' E). Holotype partially, ethanol-preserved; dissected parts mounted on slide in glycerine, sealed with Entellan®. Undissected paratypes (2) each mounted on slides in glycerine, sealed as holotype. Date of collection: 17th June 1985. Slides deposited in the collection of MTQ, Australia (cat. MTQ W34372, MTQ W34373, MTQ W34374, respectively).

**Description of adult female.** Body moderately elongate, slender (Figs 5A, 6A, 7A); body length of holotype female 1.15 mm; size range 1.09–1.15 mm, size average ( $n=3$ )  $1.13 \pm 0.02$  mm. Cephalothorax 0.64–0.67 mm long, representing 62.1–63.2 % of total body length. Midventral oral papilla located at 25% of cephalothorax length. Pair of relatively large ocelli present, pigment cups moderately developed, medially conjoined, weakly pigmented;

ventral cup and lateral cups equally sized (Figs 5E, F, 7C). Cephalic area with flat “forehead”, ornamented with shallow transverse striations (Figs 5C–F, 7C) with pair of sensilla (Fig. 5C). Symmetrical rounded protuberances at both sides of flat forehead. Low ventral rounded protuberance ornamented with transverse striae (arrowed in Figs 7A, B) in one specimen, protuberance not observed in the other specimens (Fig. 5A). Additional cephalic cuticular ornamentation including transverse, shallow cuticular ridges overlying posterior surface of oral region on dorsal surface. Ventral surface with additional features including: 1) transverse striations between the antennular bases and oral papilla, lighter striation on post-oral surface; 2) pair of symmetrical nipple-like processes on anterior ventral surface at each side of oral area (Figs 5C, D, F, 7B).

Urosome consisting of fifth pedigerous somite, genital double-somite and anal somite, together representing 15% of total body length. Relative lengths of urosomites (fifth pedigerous, genital double and free somite) 37.5: 43.5: 19 = 100, respectively. Genital double-somite with smooth dorsal and ventral surfaces (Figs 6A, 7D, 8B); with low ventral process on anterior margin (Figs 7D, 8B). Caudal ramus subrectangular, 1.2 times longer than wide, armed with three subequally long, sparsely setulated caudal setae (Fig. 7E, F). Ovipigerous spines paired, relatively short, 45–50 % of total body length (0.51–0.57 mm) (Figs 5A, 7A). Spines basally separated, slender, straight at their base and along shaft, without distal expansions and tapering apically, one spine slightly shorter; spines 0.35–0.40 mm long in two specimens (Figs 5A, 7A).

Antennule length 0.20–0.23 mm, representing about 15.9–21.2 % of total body length and 30–33.5 % of cephalothorax length in the three specimens examined; 4-segmented. Relative length of distal antennular segment as: 40.2, 42.5, and 48 in each of the three specimens examined. In terms of the pattern described by Grygier & Ohtsuka (1995) for female monstrolloid antennular armature, setae (Roman numerals) and spines (Arabic numerals), stout, spiniform element 1 present on first segment; elements on second segment: 2d1-2, 2v1-3, and II d. Third segment with stout, long element 3 plus elements III d and III v. Segment 4 bearing elements 4d1,2, 4v1-2, element 4v3 not observed; setae IV d, IV v, V d, V v present. Element 5 spiniform, strongly curved inwards. Subterminal elements b1-3 present, unbranched, short; elements 61 and 62 not present in specimens, but apical sockets were observed (Figs 6B, 7G).

Incorporated first pedigerous somite and succeeding three free pedigerous somites each bearing a pair of biramous legs. Pedigerous somites 2–4, together accounting for 23.5, 24.5, 24.2 % of total length in dorsal view in each of the specimens examined. Legs 1–4 slightly increasing in size posteriorly. Intercoxal sclerites of legs 1–4 subrectangular, widest at base, tapering distally, surface and posterior margin smooth (Fig. 6C). Bases of legs 1–4 articulating with large, rectangular coxa along oblique line; with hair-like lateral seta; on leg 3, this seta about 2.2 times longer, slightly setulated from proximal half and slightly thicker than those on the other legs. Endopods and exopods of legs 1–4 triarticulated. Ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3, and inner seta of first exopodal segment, these latter being short, slender, and sparsely setulated. Spine on distal exopodal segment of right leg 4 noticeably short (Fig. 6D). Also, outermost apical exopodal setae of legs 1–4 with inner margin naked, outer margin spinulose.

Armature formula of legs 1–4:

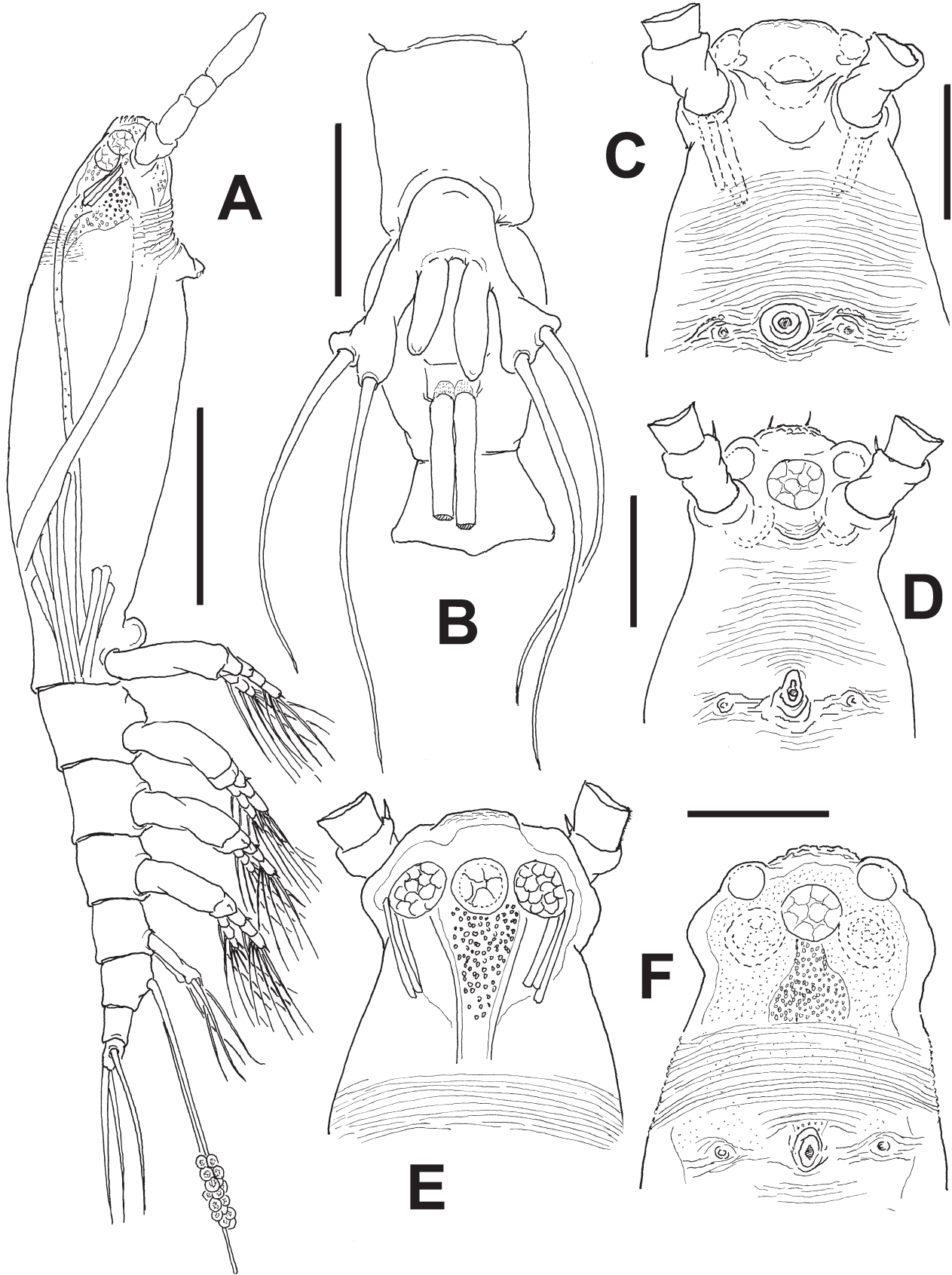
	basis	endopod	exopod
leg 1	1-0	0-1;0-1;1,2,2	1-1;0-1;1,2,2
legs 2–4	1-0	0-1;0-1;1,2,2	1-1;0-1;1,1,2,2

Fifth legs medially conjoined, bilobate, inner (endopodal) lobe elongate, digitiform unarmed, rounded distally, reaching about  $\frac{3}{4}$  the length of outer lobe. Outer (exopodal) lobe elongate, slender, armed with two subequally long setae on distal position (Figs 5B, 7E, 8A). Male: unknown.

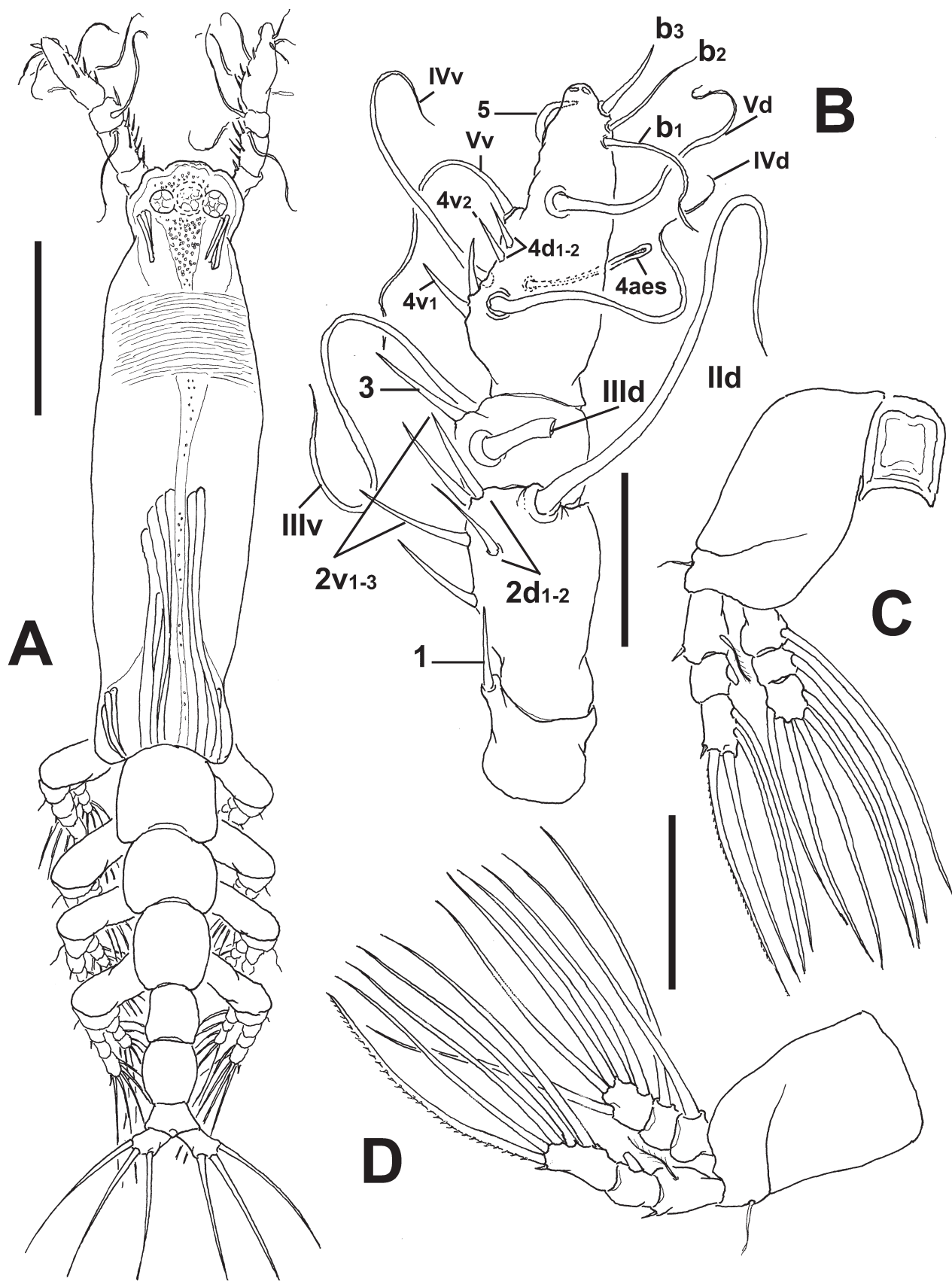
**Type locality.** Corinella, Western Port Bay, Victoria, Australia (38°23.115'S, 145°25.371'E).

**Etymology.** The species is named after William J. Dakin, first author of one of the most influential contributions on Australian marine zooplankton (Dakin & Colefax 1940), which includes the earliest records of Australian monstrolloids.

**Diagnosis.** *Cymbasoma* with third antennular segment representing more than 40% of antennule length, with dorsal and ventral fringes of cuticular striation on cephalic area. Paired cephalic protuberances on both sides of flat forehead area. Fifth leg with two setae on elongate outer lobe, inner lobes digitiform, unarmed, slightly asymmetrical. Anal somite not constricted. Ovipigerous spines representing 45–55% of total body length.

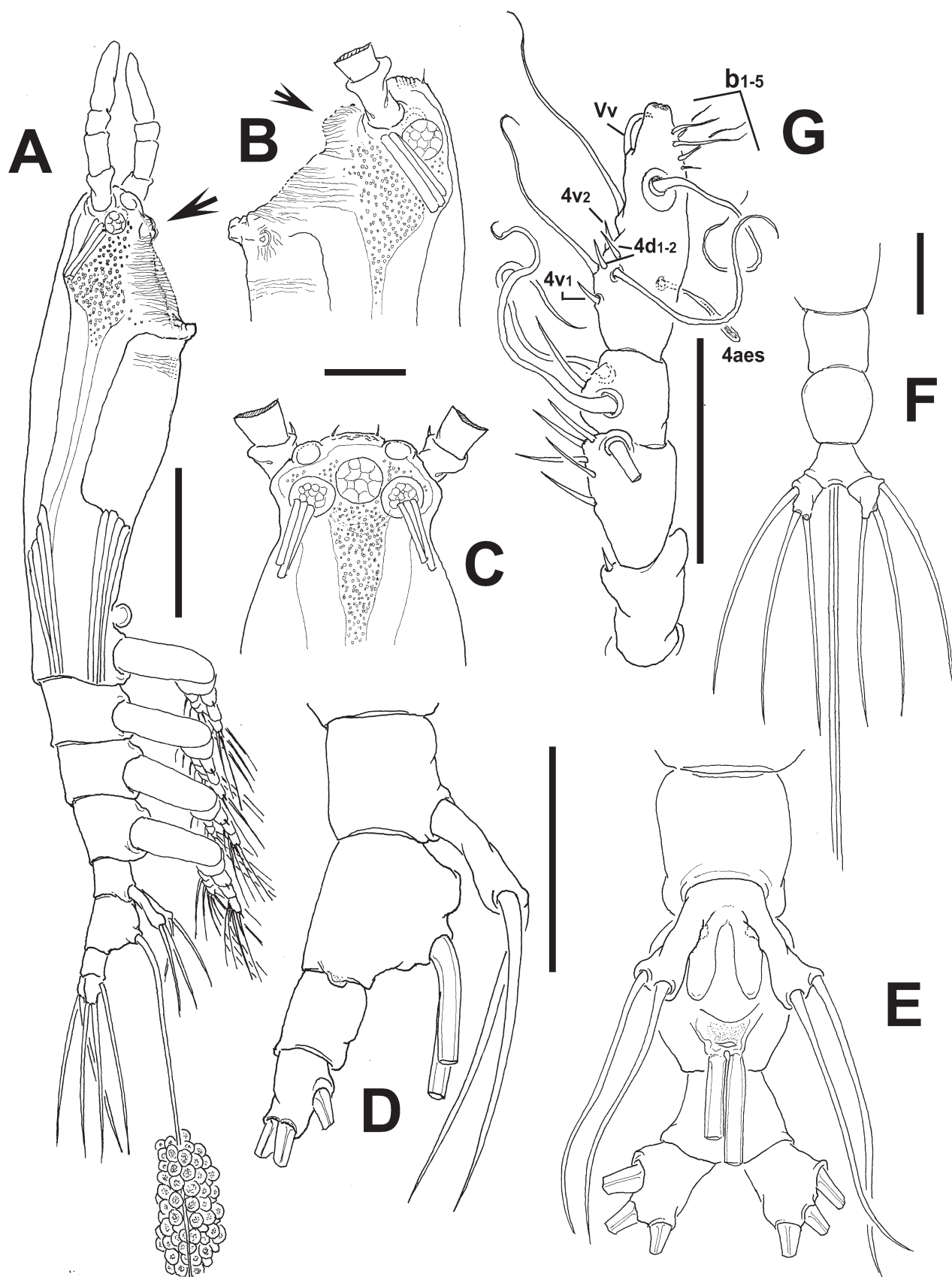


**FIGURE 5.** *Cymbasoma dakini* sp. nov., adult female, specimen A. A) habitus, lateral view; B) genital double-somite, anal somite, and fifth legs, ventral view; C) cephalic region, ventral view; D) same of specimen B; E) cephalic region, dorsal view, specimen A; F) same, specimen C. Scale bars: A = 200 µm, C–F = 100 µm.

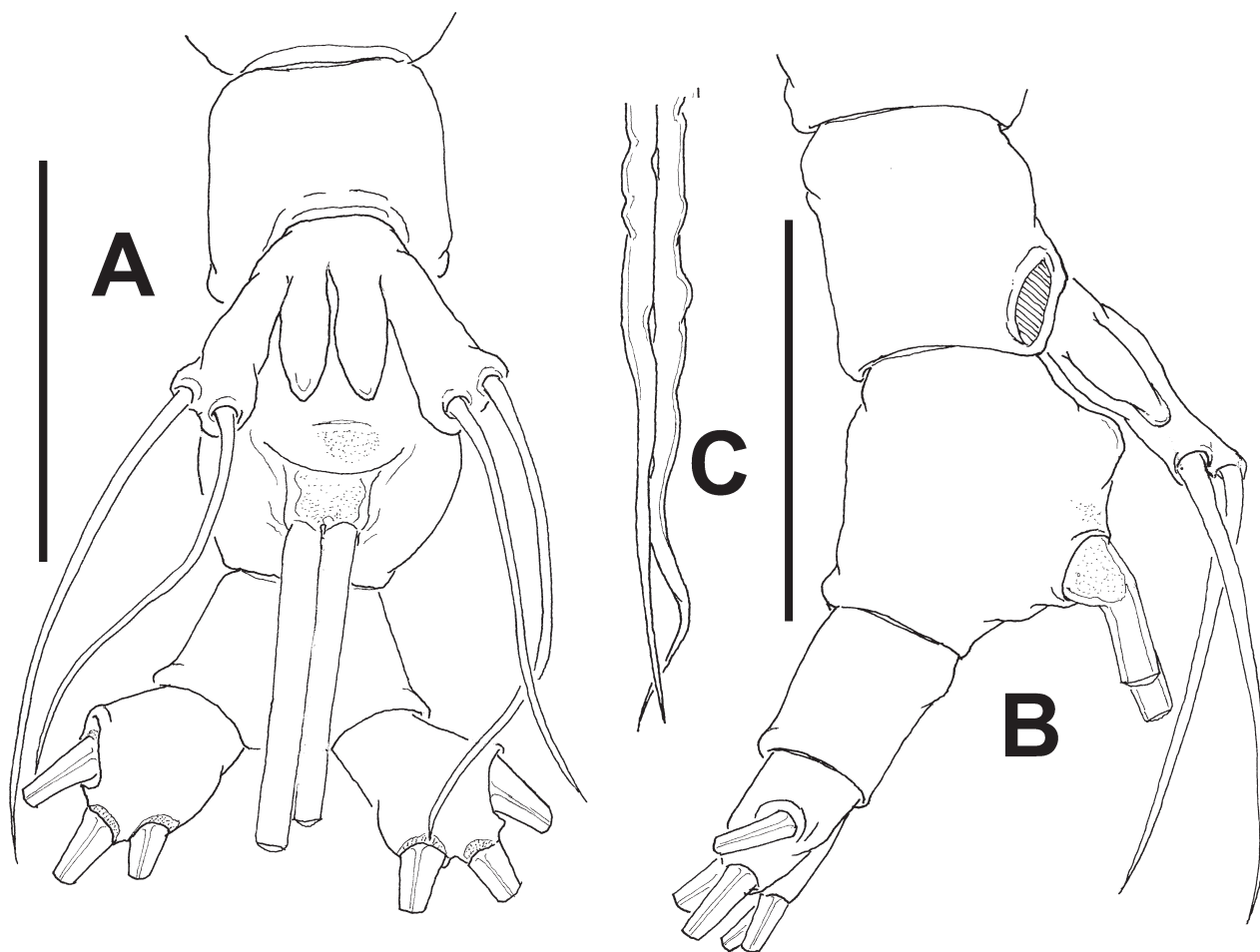


**FIGURE 6.** *Cymbasoma dakini* sp. nov., adult female, specimen A. A) habitus, dorsal view; B) right antennule, dorsal view; C) first leg; D) fourth leg. Scale bars: A, C, D = 100 µm, B = 50 µm.





**FIGURE 7.** *Cymbasoma dakini* sp. nov., adult female, specimen B. A) habitus, lateral view, ventral cephalic protuberance indicated by arrow; B) cephalic region, lateral view, protuberance arrowed; C) same, dorsal view; D) urosome and fifth legs, lateral view; E) same, ventral view; F) same, dorsal view; G) right antennule, dorsal view. Scale bars: A = 200 µm, B–G = 100 µm.



**FIGURE 8.** *Cymbasoma dakini* sp. nov., adult female, specimen C. A) urosome and fifth legs, ventral view; B) same, lateral view; C) distal end of ovigerous spines. Scale bars: A–C = 100  $\mu$ m.

**Remarks.** This species belongs to a group of Australian *Cymbasoma* in which the female fifth leg bears two setae on the outer lobe and a naked inner lobe. This is an unusual character among species of *Cymbasoma*. It is known only in *C. agoense* Sekiguchi, 1982 from Japan and in some of the Australian species included in this work. In some cases like in *C. nicollettae* Suárez-Morales, 2002 or *C. thompsonii* (cf. Sars 1921), the innermost seta is very small, slender and could be overlooked during casual observation, but this is not the case in the Australian species. Two setae on the fifth leg are known also in a few species of *Monstrilla*, like *M. leucopis* Sars, 1921 (Suárez-Morales 2010), *M. helgolandica* Claus, 1863 or *M. hamatapex* Grygier & Ohtsuka, 1995. The new species differs from its congeners sharing this relevant character in having a conspicuous dorsal field of wrinkles on the cephalic area, and a long fifth leg inner lobe, barely reaching the distal margin of the outer lobe. This lobe is relatively short and robust in *C. agoense* (cf. Sekiguchi 1982: fig. 6F) and the body shape and proportions are clearly different in these two species. It differs from the other Australian congeners in the presence of a narrow, long digitiform inner lobe, an unconstricted anal somite, a genital double-somite with rounded lateral margins and a low anteroventral protuberance. The inner lobe of the fifth leg is clearly shorter in *Cymbasoma* sp. (Fig. 70D) and also in *C. lourdesae* sp. nov. (Fig. 24D) and in *C. tharawalorum* sp. nov. (Fig. 65C). The genital double-somite has a different shape in *C. lourdesae* (Fig. 24E) and in *C. tharawalorum* (Fig. 65D). Also, the antennular segments 3–4 are fused in *C. lourdesae* (Fig. 24C) whereas they are separated in the new species *C. dakini*. In *C. tharawalorum* the antennules are distinctly compressed (Fig. 65B), thus differing from the antennule of *C. dakini* sp. nov.

***Cymbasoma galerus* sp. nov.**

(Figs 9, 10)

**Material examined.** Holotype: adult male from Werribee, Port Phillip Bay, Victoria, Australia (37°57.085' S, 144°47.128' E), undissected, mounted on slide in glycerine, sealed with Entellan®. Date of collection: 21st May 1985. Slide deposited in the collection of MTQ, Australia (cat. MTQ W34375).

**Description of adult male.** Total body length 0.75 mm. Cephalothorax 0.38 mm long, representing 50% of total body length (Figs 9A, 10A). Midventral oral papilla weakly developed, located at 26% of cephalothorax length (Figs 9A, 10C). Cephalic region slightly protuberant bilaterally in dorsal view. Pair of dorsal ocelli present, weakly developed; pigment cups medium-sized. Ocelli separated by the length of less than one eye diameter, faintly pigmented. Ventral ocellus about same size and diameter as eyes. No sensilla observed between antennular bases. Forehead area with cap-like rounded protuberance ornamented with deep transverse cuticular ridges (Fig. 10B). Other cuticular processes weak, represented by faint striae on perioral area (Fig. 10C).

Urosome consisting of fifth pedigerous, genital (carrying genital complex), preanal, and anal somites (Fig. 9C, D). Fifth pedigerous somite with smooth ventral surface. Genital somite slightly shorter than fifth pedigerous somite. Genital somite with cuticular striation on dorsal surface. Genital complex of type II (Suárez-Morales & McKinnon 2014), represented by pair of moderately divergent, digitiform genital lappets (Figs 9C, 10F), these being slightly asymmetrical, reaching to midlength of long anal somite. Rounded, protuberant medial process present at common basal joint of lappets (Fig. 10F), lappets ornamented with scattered cuticular papillae only on distal half and along inner margins of lappets. Anal somite about twice as long as preanal somite in dorsal and lateral views, comprising 30% of urosome length; no suture visible on ventral or dorsal surfaces (Figs 9C, D, 10A, F). Caudal rami subrectangular, approximately 1.5 times as long as wide, about as long as anal somite. Each ramus with three caudal setae.

Antennular length 0.27 mm. Antennules relatively long, representing 40% of total body length, and 75% of cephalothorax length; 5-segmented, all segments separated, with segment 5 located distal to geniculation (Fig. 9B). Length ratio of antennular segments, from first to fifth 10.4: 26.1: 11.3: 34.2: 18 (= 100). Setal element 1 on first segment slender, setiform, moderately long, reaching halfway along second segment. Antennular elements 2v1-3, 2d1,2, and IId present on second segment, with element IId reaching distal margin of fifth segment. Setal elements IIId, IIIv, and 3 present on third segment; element 3 slender, curved. Fourth segment with elements 4d1-2, 4v1-3, IVd and IVv. Fifth segment with 5 “b”-group setae, elements b1-3 short, unbranched. According to Huys *et al.* (2007) setal nomenclature of the distal segment, elements A and B and 2–7 present.

Incorporated first pedigerous somite and succeeding three pedigerous somites each bearing well-developed biramous legs. Pedigerous somites 2–4, together accounting for 31% of total body length in dorsal view. Coxae of each pair unarmed, joined by intercoxal sclerite which is slightly longer than wide. Bases of legs 1–4 separated from coxae posteriorly by oblique articulation; with hair-like lateral seta (Fig 10D, E); on leg 3, this seta about 3.2 times longer, sparsely setulated in distal half and slightly thicker than those on the other legs. Endopods and exopods of legs 1–4 triarticulated. Exopods of legs 1–4 longer than endopods. Flexible, slender, inner seta present on first exopodal segment of legs 1–4.

Outer spine on distal exopodal segment of legs 1–4 about 0.3 times as long as segment. Also, outermost apical exopodal setae of legs 1–4 with inner margin smooth, outer margin sparsely spinulose.

Armature formula of legs as follows:

	basis	endopod	exopod
leg 1	1-0	0-1; 0-1; 1,2,2	1-1; 0-1; 1,2,2
legs 2–4	1-0	0-1; 0-1; 1,2,2	1-1; 0-1; 1,2,3

Female: unknown.

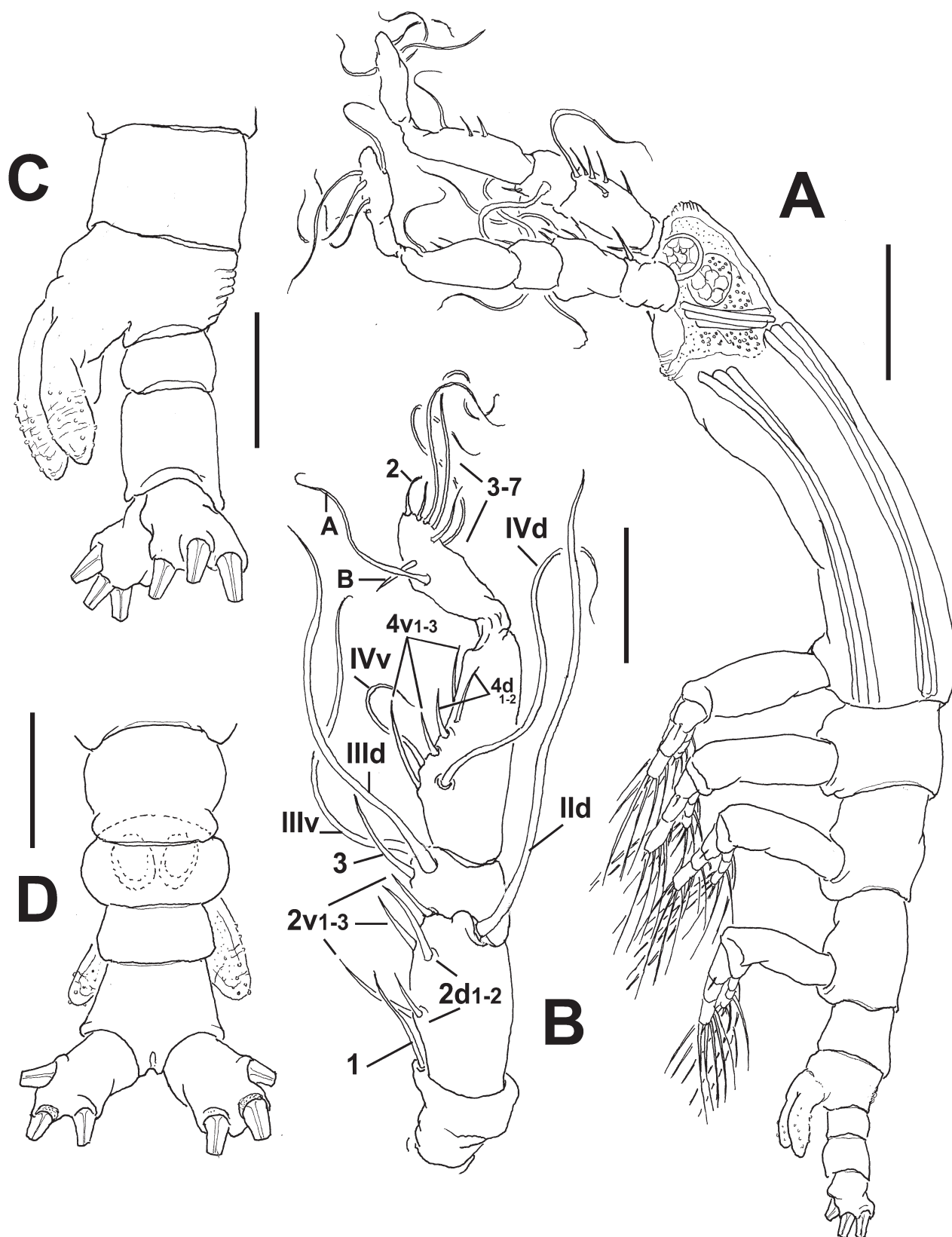
**Type locality.** Werribee, Port Phillip Bay, Victoria, Australia (37°57.085' S, 144°47.128' E).

**Etymology.** The species name, a noun in apposition from the Latin, meaning a hat or cap refers to the frontal cap-shaped protuberance that is distinctive of this species.

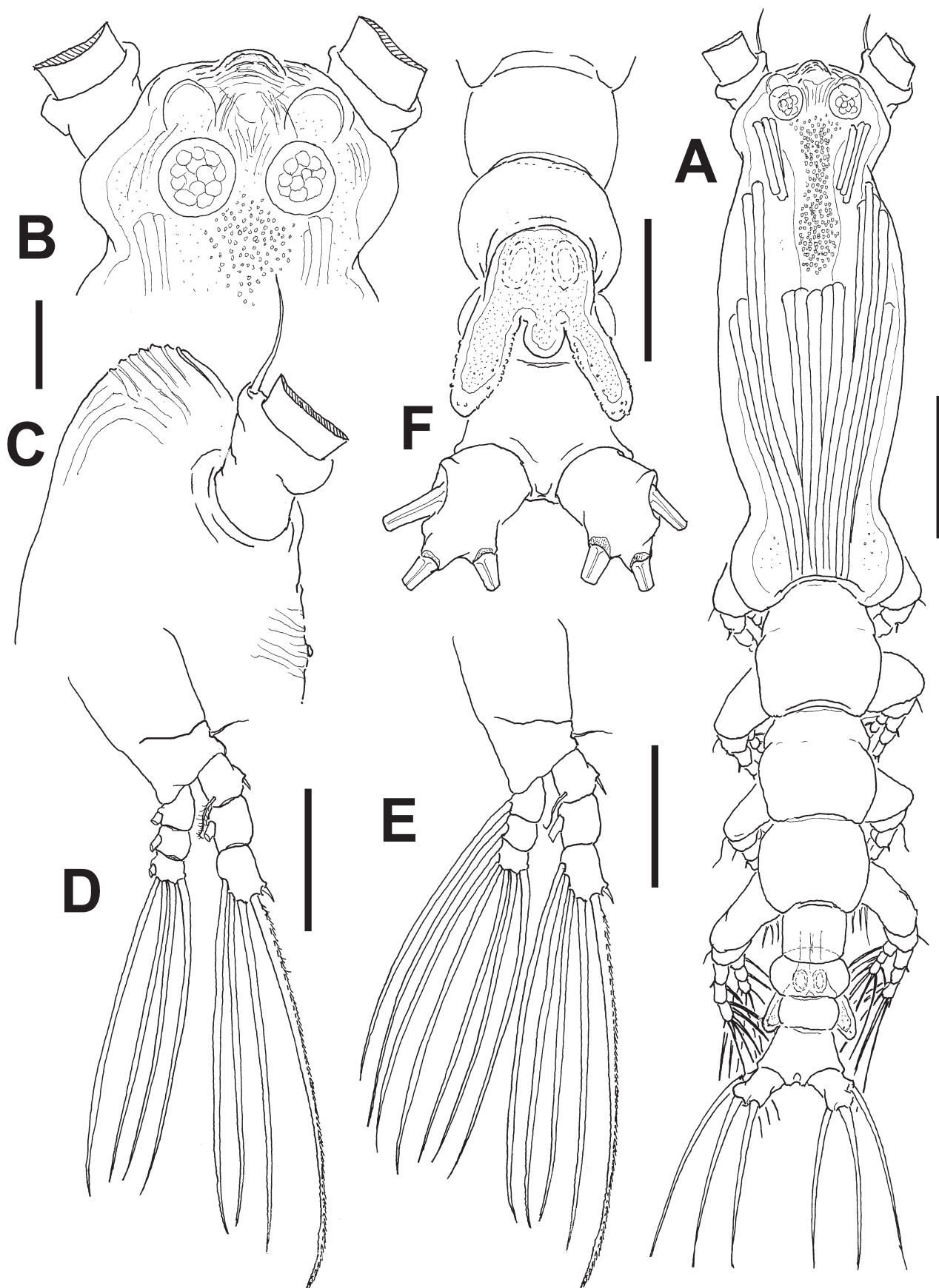
**Diagnosis.** *Cymbasoma* with conspicuous cap-like medial protuberance on cephalic area ornamented with transverse ridges. Oral papilla weakly developed. Antennule representing 40% of total body length and 75% of



cephalothorax length. Fifth pedigerous somite with smooth ventral surface. Genital complex of type II, with thumb-like, slightly asymmetrical lappets, inner margins and distal tips of lappets with cuticular papillae. Basal joint between lappets produced into rounded protuberance. Three caudal setae.



**FIGURE 9.** *Cymbasoma galerus* sp. nov., adult male. A) habitus, lateral view; B) right antennule, dorsal view; C) urosome and genital lappets, lateral view; D) same, dorsal view. Scale bars: A = 100  $\mu$ m, B–D= 50  $\mu$ m.



**FIGURE 10.** *Cymbasoma galerus* sp. nov., adult male. A) habitus, dorsal view, antennules omitted; B) cephalic region, dorsal view; C) same, lateral view; D) first leg; E) second leg; F) urosome and genital complex, ventral view. Scale bars: A= 100µm, B–F= 50 µm.

**Remarks.** This species has a unique combination of characters including a frontal striated protuberance, a genital somite with corrugate dorsal surface, a genital complex with thumb-like asymmetrical lappets ornamented with papillae and a strong medial rounded protuberance at the insertion of the lappets. There are other species with a relatively strong rounded medial protuberance on the male genital complex: *C. tropicum* (cf. Martin Thompson & Easterson 1983), *C. quadridens* Davis, 1947 (cf. Suárez-Morales & Pilz 2008), *C. gracile* Gurney, 1927, *C. bullatum* (cf. Suárez-Morales 2007), and the Australian *C. annulocolle* **sp. nov.** (Fig. 17A, D, F). The new species differs from these other species in the asymmetry of the lappets, which are symmetrical in the other species. Also, most of them lack a strong frontal protuberance; a frontal process is present in *C. annulocolle*, but it is weaker and differently shaped (Figs 15C, 17C) than in the new species *C. galerus* (Fig. 10C). In addition, a cephalic protuberant process is present in *C. rochai* but it occupies a ventral position (Suárez-Morales & Dias 2001) rather than a frontal one as in the new species. Also, in both *C. rochai* (cf. Suárez-Morales & Dias 2001) and *C. tropicum* (cf. Martin Thompson & Easterson 1983) four caudal setae are present vs. three such setae in the new species. Most importantly, in both *C. quadridens* (cf. Suárez-Morales & Pilz 2008) and in *C. annulocolle* the inner margins of lappets are ornamented with a row of spinules, whereas in the new species the inner margin is smooth except for a few scattered papillae. As for *C. gracile*, the available comparative data are limited (Gurney 1927), but the lappets are symmetrical, smooth and the anal somite has a constriction and a suture (Gurney 1927: fig. D), thus diverging from the asymmetrical lappets ornamented with papillae and the non-constricted anal somite of the new species. Following Suárez-Morales' (2000a) key to the males of *Cymbasoma* the Australian new species keys down to *C. thompsonii* (Giesbrecht, 1893). These species differ in the structure of the genital complex, with weakly divergent, distally rounded lappets with a flat medial margin in *C. thompsonii* vs. a conspicuous medial process between strongly divergent, distally tapering lappets in the new species.

***Cymbasoma rafaelmartinezi* sp. nov.**

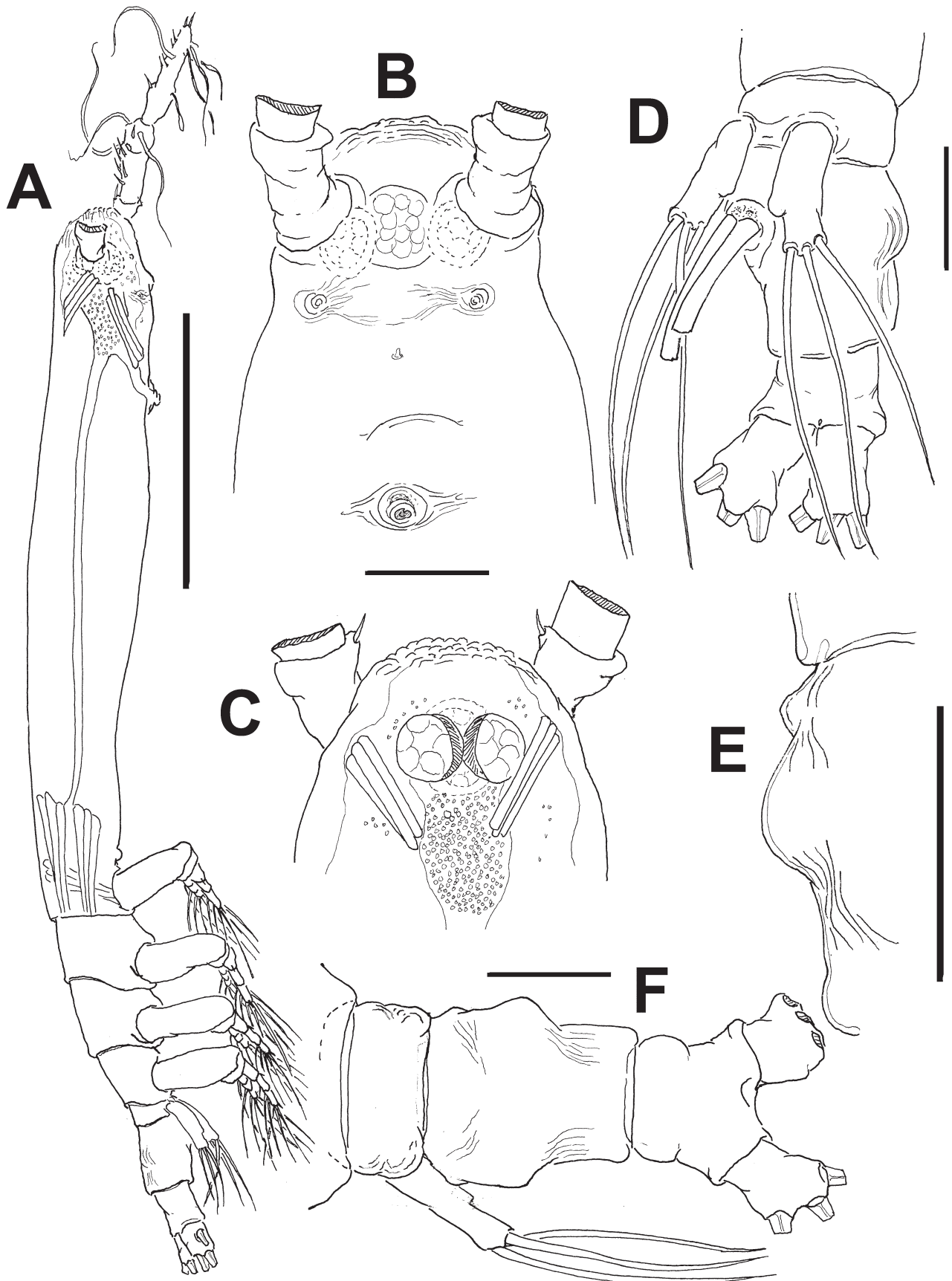
(Figs 11, 12)

**Material examined.** Holotype: adult female from near Warneet (Station R of Kimmerer & McKinnon, 1985), Western Port Bay, Victoria, Australia (38°26.792' S, 145°18.496' E), dissected, ethanol-preserved; dissected parts mounted on slides in glycerine, sealed with Entellan®. Date of collection: 9th March 1984. Slides deposited in the collection of MTQ, Australia (cat. MTQ W34376).

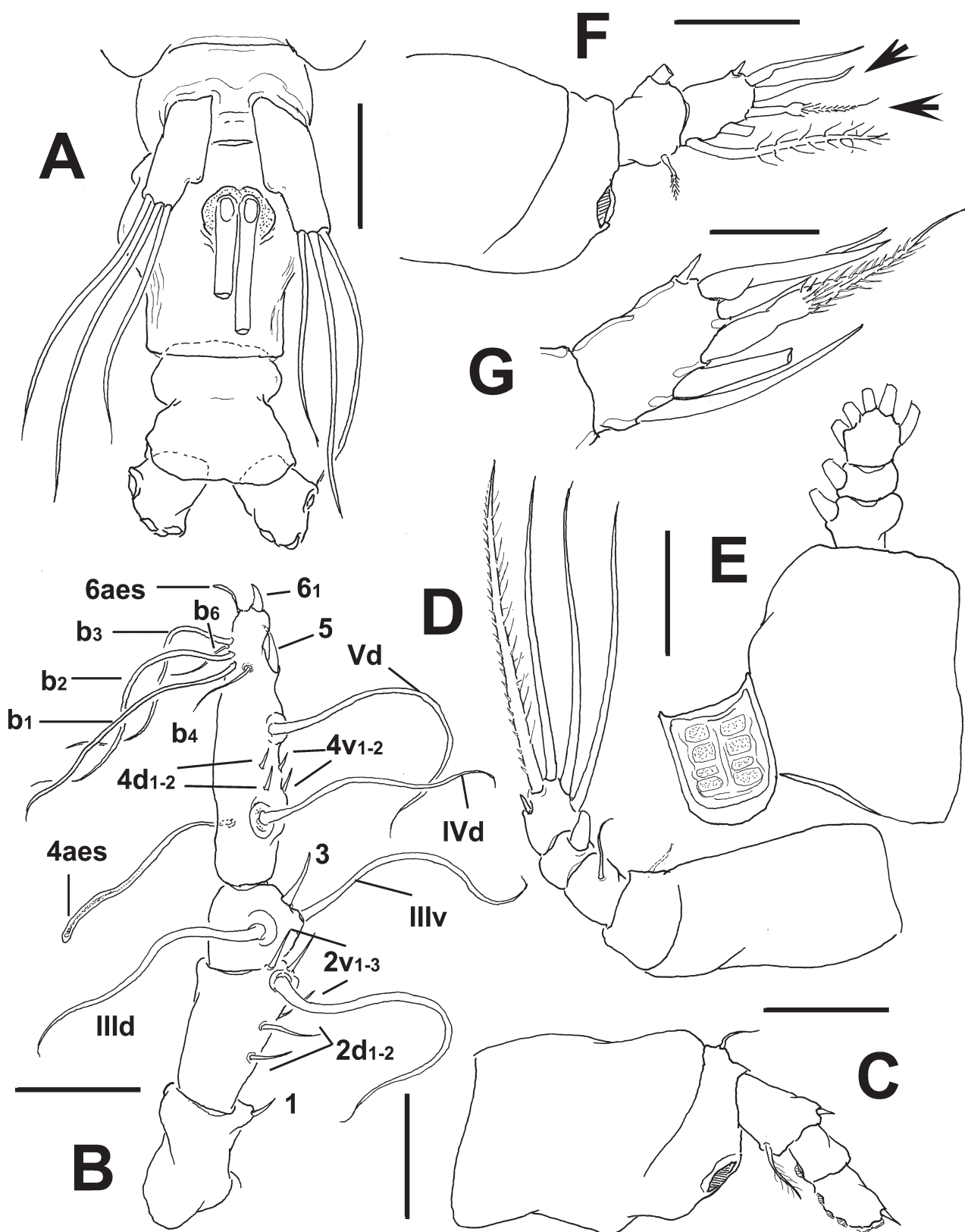
**Description of adult female.** Body noticeably elongate, slender; body length of holotype female 1.88 mm. Cephalothorax approximately 1.31 mm long, representing 68% of total body length. Midventral oral papilla moderately protuberant, located at 25% of cephalothorax length. Pair of relatively large ocelli present, pigment cups moderately developed, medially conjoined, intensely pigmented at inner margins only; ventral cup larger than lateral cups (Fig. 11B). Cephalic area with weakly produced "forehead", ornamented with pattern of transverse striations (Figs 11B, C) with no frontal sensilla. Ventral surface with 1) pair of symmetrical nipple-like processes on anterior ventral surface; 2) papilla-like single sensilla on middle position between nipple-like processes and oral area (Fig. 11B); 3) low rounded protuberance anterior to oral papilla; 4) reduced field of light transverse striations surrounding oral area.

Urosome consisting of fifth pedigerous somite, genital double-somite and anal somite, together representing 12.7% of total body length. Relative lengths of urosomites (fifth pedigerous, genital double and free anal somites) 13.3: 50: 36.7 = 100, respectively (Fig. 11F). Genital double-somite longest of urosome, with smooth ventral surface, dorso-lateral surface with few longitudinal striae (Fig. 11E, F); anterior half of somite with two rounded lateral expansions, proximalmost smaller, distalmost somewhat angulate. Ovigerous spines paired, relatively short, basally separated, slender, straight at their base and along shaft, broken off proximally in examined specimen. Anal somite with medial constriction visible in dorsal and ventral views (Figs 11D, F, 12A). Caudal ramus subrectangular, 1.3 times longer than wide, armed with three subequally long, sparsely setulated caudal setae, broken off from proximal part in specimen examined.

Antennule length 0.40 mm, representing about 20 % of total body length and 30% of cephalothorax length; 4-segmented. Only one (left) antennule present in examined specimen, other one (right) broken off at first segment (Fig. 11A). Relative length of distal antennular segment 45.7% of antennular length. In terms of pattern described by Grygier & Ohtsuka (1995) for female monstrilloid antennular armature, short, spiniform element 1 present on first segment; elements on second segment: 2d1-2, 2v1-3, and IId. Third segment with element 3 being



**FIGURE 11.** *Cymbasoma rafaelmartinezi* sp. nov., adult female. A) habitus, lateral view; B) cephalic area showing cuticular ornamentation, ventral view; C) same, dorsal view; D) urosome, semi-lateral view; E) detail of lateral margin of genital double-somite; F) urosome, dorsal view. Scale bars: A = 500 µm, B–F = 100 µm.



**FIGURE 12.** *Cymbasoma rafaelmartinezi* sp. nov., adult female. A) urosome showing fifth legs, ventral view; B) right antennule, dorsal view; C) second leg, endopodal ramus; D) first leg, exopodal ramus; E) fourth leg, endopodal ramus; F) fourth leg, showing bi-segmented exopodal ramus and modified, dwarfed setal elements (arrowed); G) fourth leg, detail of distal exopodal segment. Scale bars: A–F = 100 µm, G = 50 µm.



short, spiniform, elements III<sub>d</sub> and III<sub>v</sub> of normal aspect. Segment 4 bearing elements 4d1,2, 4v1-2, element 4v3 not observed; elements IV<sub>d</sub>, V<sub>d</sub> and 4a<sub>es</sub> present. Element 5 spiniform, strong, curved. Subterminal elements b1-4, 6 present; elements b1-3 long, unbranched. Apical elements 6l and 6a<sub>es</sub> present in specimen (Fig. 12B).

Incorporated first pedigerous somite and succeeding three free pedigerous somites each bearing a pair of biramous legs. Pedigerous somites 2–4, together accounting for 19% of total body length. Legs 1–4 partly damaged. Intercoxal sclerites of legs 1–4 subrectangular, surface with patches of minute spinules, posterior margin smooth (Fig. 12E). Bases of legs articulating with large, rectangular coxae along oblique line; on legs 2–3 with hair-like lateral seta, but not found on leg 1 and 3 (probably broken off). Endopods and exopods of legs 1–4 triarticulated except for leg 4 with 2-segmented exopod bearing unusual armature including short outer spine and basally expanded setae (Fig. 12F, G) and one modified subdistal seta with bulbous process (Fig. 12G). Other ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3, and inner seta of first exopodal segment, these latter being short, slender, and sparsely setulated (Fig. 12 C, D). Outermost apical exopodal setae of legs 1–4 with inner margin setulose, outer margin spinulose.

Armature formula of legs 1–4:

	basis	endopod	exopod
leg 1	1*-0	0-1;0-1;1,2,2*	I-1;0-1;I,2,2
legs 2-3	1-0	0-1;0-1;1,2,2	I-1;0-1;I,1,2,2
leg 4	1-0	0-1; 0-1; 1,2,2*	I-1; I,1,2,2

\*broken off in specimen examined.

Fifth legs basally separated, represented by elongate, subrectangular outer lobe armed with three distal setae. Inner lobe represented by marginal notch of inner margin of outer lobe, unarmed, reaching about  $\frac{3}{4}$  the length of outer lobe (Figs 11D, 12A).

Male: unknown.

**Type locality.** Station R of Kimmerer & McKinnon (1985), Western Port Bay, Victoria, Australia (38°26.792' S, 145°18.496' E).

**Etymology.** The species name is dedicated to Prof. Rafael Martínez, former teacher of Biology at El Colegio del Tepeyac, who inspired the first author's (ES-M) early interest in natural sciences.

**Diagnosis.** *Cymbasoma* with long cephalothorax, representing 68% of total body length, third antennular segment representing more than 45% of antennule length, with ventral protuberance on cephalic area between antennule bases and oral papilla. Genital double-somite with small proximal and larger medial protuberances. Anal somite with medial constriction. Fourth leg with short, 2-segmented exopod and modified, dwarfed distal setae (this diagnostic character should be confirmed in other specimens of this species). Fifth leg with elongate, subrectangular outer lobe with three distal setae, inner lobe represented by weak inner expansion of outer lobe, unarmed.

**Remarks.** This species has a remarkably elongate, slender cephalothorax which represents almost 70% of the total body length. This character is shared with only a few other species of the genus including some species of the *C. longispinosum* -group, like *C. chelemense* (cf. Suárez-Morales & Escamilla 1997) and *C. morii* Sekiguchi, 1982 (cf. Grygier 1994), but also *C. frondipes* (Isaac, 1975), *C. gigas* Scott, 1909 (cf. Suárez-Morales 2001c), *C. gracile* and *C. reticulatum* (cf. Giesbrecht, 1893). It differs from species of the *C. longispinosum* species-group by the presence of ovigerous spines that are separate at their bases as opposed to proximally fused spines as is always the case in this group. Also, the inner lobe is usually well defined in all species of the *longispinosum*-group (see Üstün *et al.* 2014).

The fifth leg, with the inner lobe very weakly developed, represented by a marginal expansion of the outer lobe, is similar to that of *C. reticulatum*, *C. bali* Desai & Krishnaswamy, 1962, and *C. striifrons* Chang, 2012. In two of these species the three setae of the fifth leg outer lobe are equally long and wide (Giesbrecht 1893; Desai & Krishnaswamy 1962: fig. 10), whereas the innermost seta is shortest in *C. striifrons* (Chang 2012). In *C. bali* the exopodal setae of the fifth leg are subapical (Desai & Krishnaswamy 1962) and they are apically inserted in the new species. In addition, the body proportions are different in *C. bali* and the new species. In addition, *C. reticulatum* can readily be distinguished among other species of the genus by its reticulated cephalosome and

antennules, a character absent in the new species. Also, the shape of the genital double-somite is different in these species with that of *C. reticulatum*, *C. bali*, and *C. striifrons* having the lateral margins moderately produced, rounded (Giesbrecht 1893; Desai & Krishnaswamy 1962; Chang 2012), whereas in the new species the anterior half has two lateral processes (see Fig. 11E) and the posterior half has straight margins. The dorsal surface bears striae in both *C. striifrons* (Chang 2012) and the new species. The most striking character of *C. rafaelmartinezi* **sp. nov.** is the 2-segmented exopodal ramus of the third leg, which is usually three-segmented in monstilloids; and with distinctive armature comprising a short, naked apical spiniform seta in contrast to the usual very long setulated or spinulated seta; one subdistal seta is modified, with its proximal half forming two linear lobes and the distal half being whip-like and spinulate. This kind of modified seta has not been described in any other species of the genus.

***Cymbasoma annulocolle* sp. nov.**

(Figs 13–19)

**Material examined.** Adult female holotype, adult male allotype, two paratype females (one of them undissected) from Werribee, Port Phillip Bay, Victoria, Australia (37°57.085' S, 144°47.128' E) and paratype male from Davies Reef, Queensland, Australia (18° 48.78' S, 147° 39.30' E), partially dissected, ethanol-preserved; dissected parts mounted on slides in glycerine, sealed with Entellan®. Date of collection: 21st May 1985 and 21st September 1989, respectively. Slides deposited in the collection of MTQ, Australia (cat. MTQ W34377, MTQ W34378, MTQ 34379, MTQ 34380, MTQ W34381, respectively).

**Description of adult female.** Body noticeably elongate, slender (Fig. 13A, D); body length of holotype female 1.65 mm. Cephalothorax approximately 1.0 mm long, representing 65% of total body length. Midventral oral papilla moderately protuberant, located at 20% of cephalothorax length. Pair of relatively large ocelli present, pigment cups moderately developed, medially conjoined, lightly pigmented; ventral cup larger than lateral cups (Fig. 13D). Cephalic area laterally expanded, wider than cephalothorax. Frontal area ornamented with pattern of transverse striations (Fig. 13C) with no frontal sensilla. Anterior 1/3 of cephalothorax ornamented with transverse striae arranged in tight regular ring-like pattern on ventral, lateral and dorsal surfaces (Fig. 13A, B, C). Ventral surface with 1) pair of symmetrical, small nipple-like processes on anterior ventral surface located near bases of antennules, with no adjacent striae (Fig. 13C); 2) second, larger nipple-like processes with concentric pattern of striae.

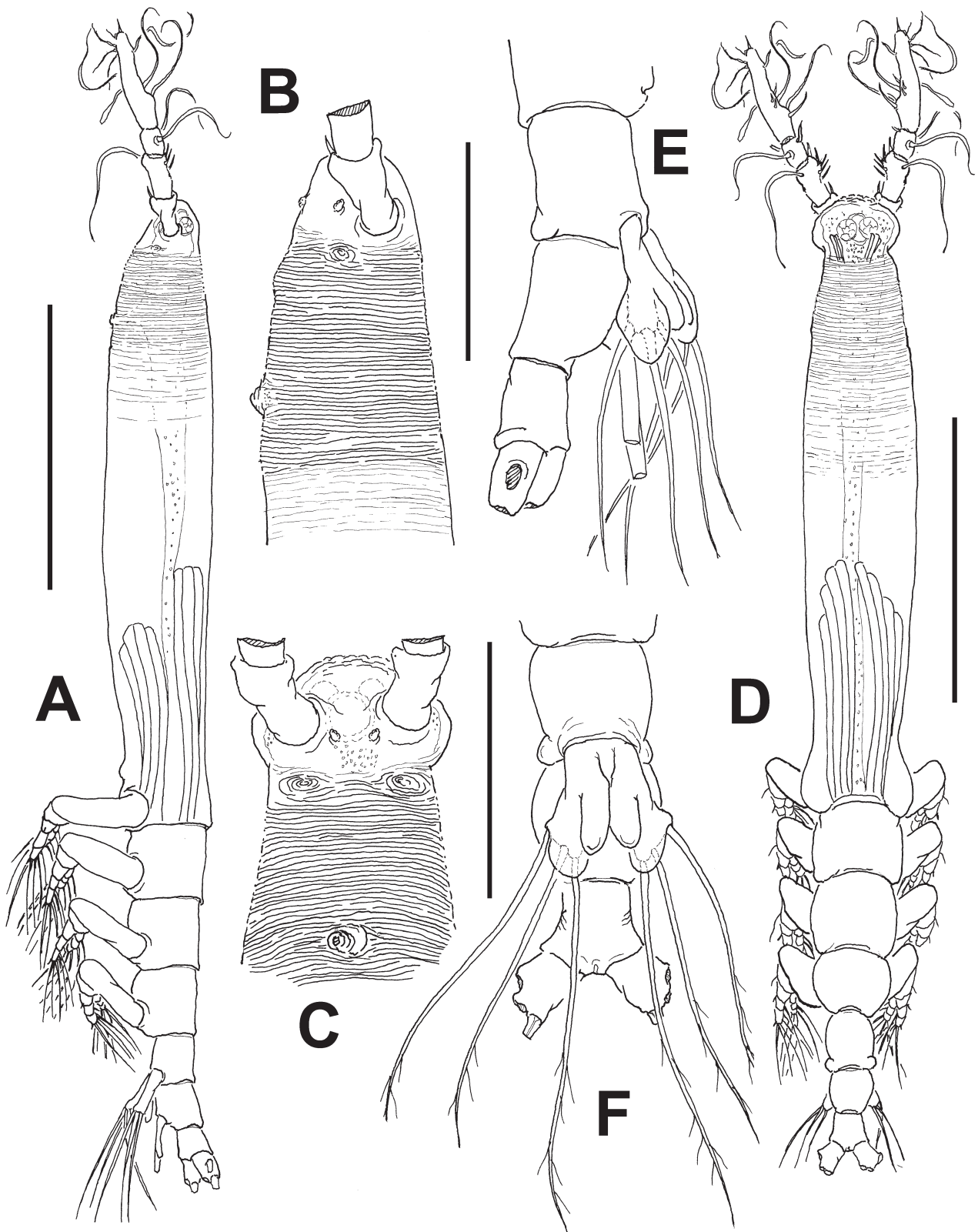
Urosome consisting of fifth pedigerous somite, genital double-somite and anal somite, together representing 15% of total body length. Relative lengths of urosomites (fifth pedigerous, genital double and free anal somites) 40.6: 31.2: 28.2 = 100, respectively (Fig. 13E, D). Posterior half of fifth pedigerous somite with weak rounded lateral expansions. Genital double-somite longest of urosome, with smooth ventral and dorsal surfaces, lateral margins moderately swollen in dorsal view. Ovigerous spines paired, broken in examined specimen. Spines basally separated, slender, straight at their base (Fig. 13A). Anal somite without medial constriction. Caudal ramus subquadrate, about as long as wide, armed with three caudal setae, broken off from proximal part in specimen examined (Fig. 13F).

Antennule length 0.36 mm, representing about 22% of total body length and 34% of cephalothorax length; 4-segmented. Relative length of distal antennular segment 52.3%. In terms of pattern described by Grygier & Ohtsuka (1995) for female monstilloid antennular armature, short, spiniform element 1 present on first segment; elements on second segment: 2d1-2, 2v1-3, and IId. Third segment with element 3 being long, spiniform, elements IIId and IIIV setiform, of normal aspect. Segment 4 bearing elements 4d1,2, 4v1-3, elements 4v1,3 being longest of group; setae IVd, IVv, Vd, Vv, and element 4aes present. Subterminal elements b1-3, 6 present, unbranched; element 61 present, 62 absent in specimen, but socket was observed (Fig. 14A).

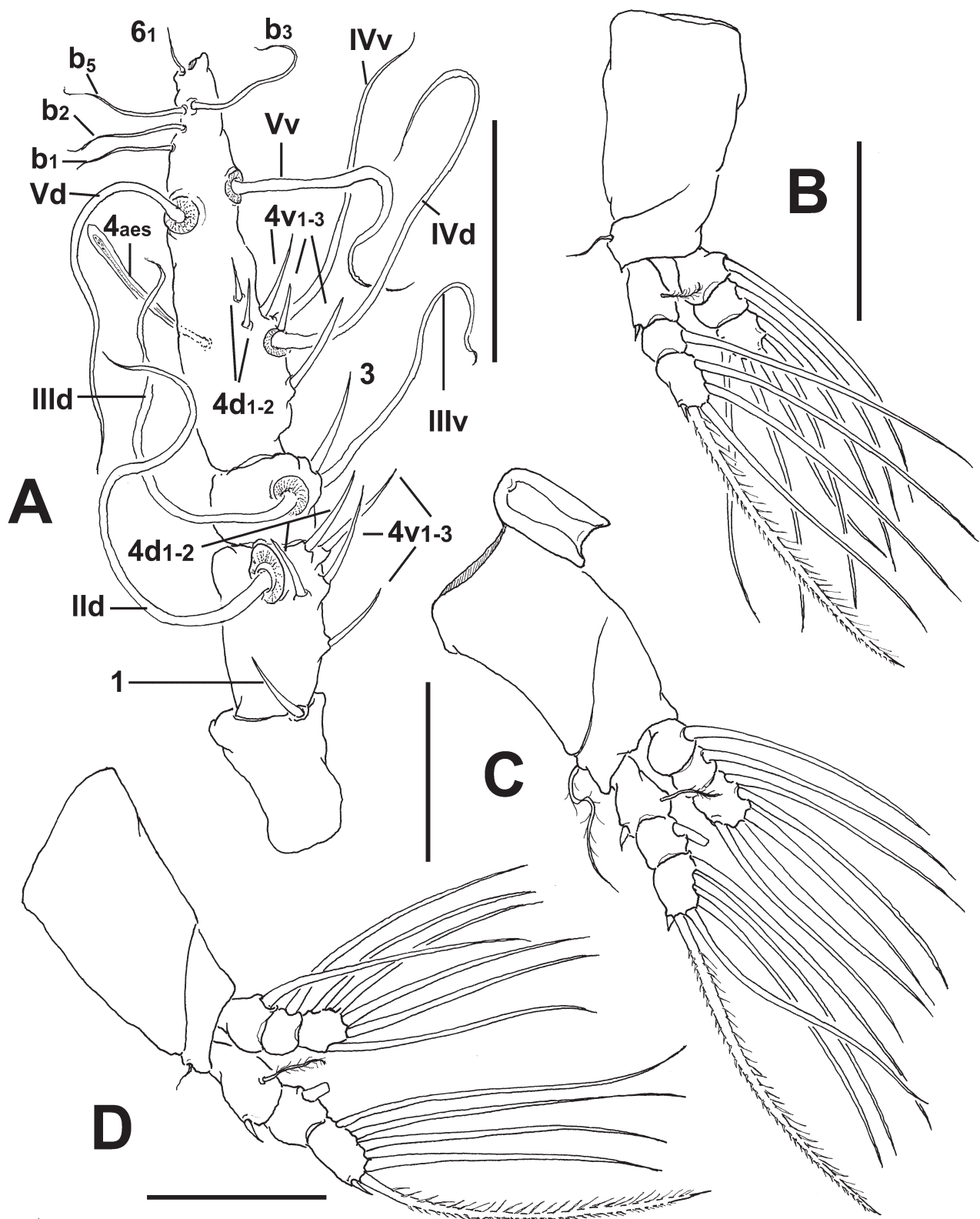
Incorporated first pedigerous somite and succeeding three free pedigerous somites each bearing a pair of biramous legs. Pedigerous somites 2–4, together accounting for 22% of total body length. Intercoxal sclerites of legs 1–4 subrectangular, surface and posterior margin smooth (Fig. 14C). Bases of legs articulating with large, rectangular coxae along oblique line; with hair-like lateral seta (Figs. 14B–D); on leg 3, this seta about five times longer, sparsely setulated and thicker than those on other legs (Fig. 14C). Endopods and exopods of legs 1–4 triarticulated. Ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3, and



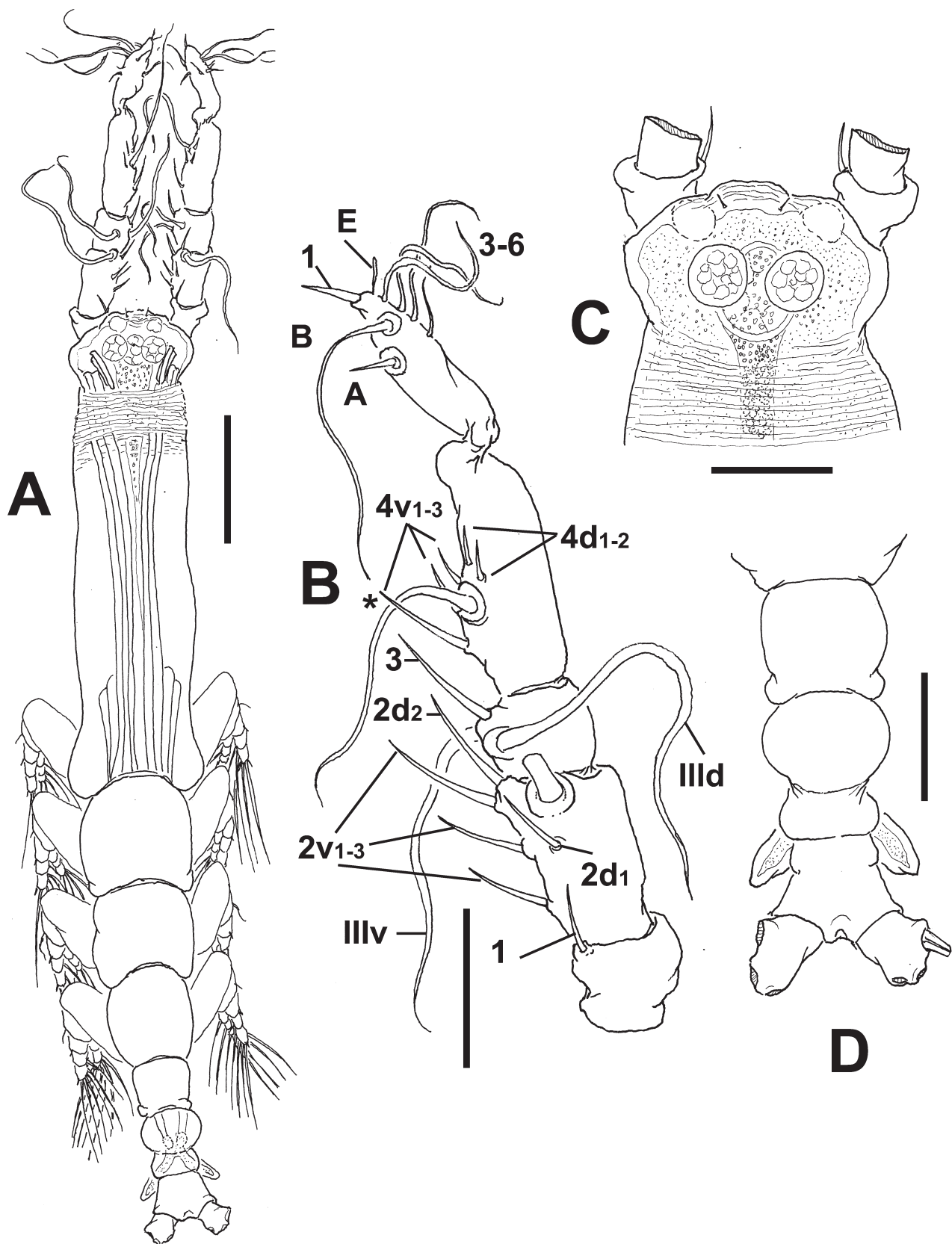
inner seta of first exopodal segment, these latter being short, slender, and sparsely setulated. Outermost distal spines on third exopodal segment of legs 1–4 short, 0.25 times as long as segment. Outermost apical exopodal setae of legs 1–4 with inner margin setulose, outer margin spinulose.



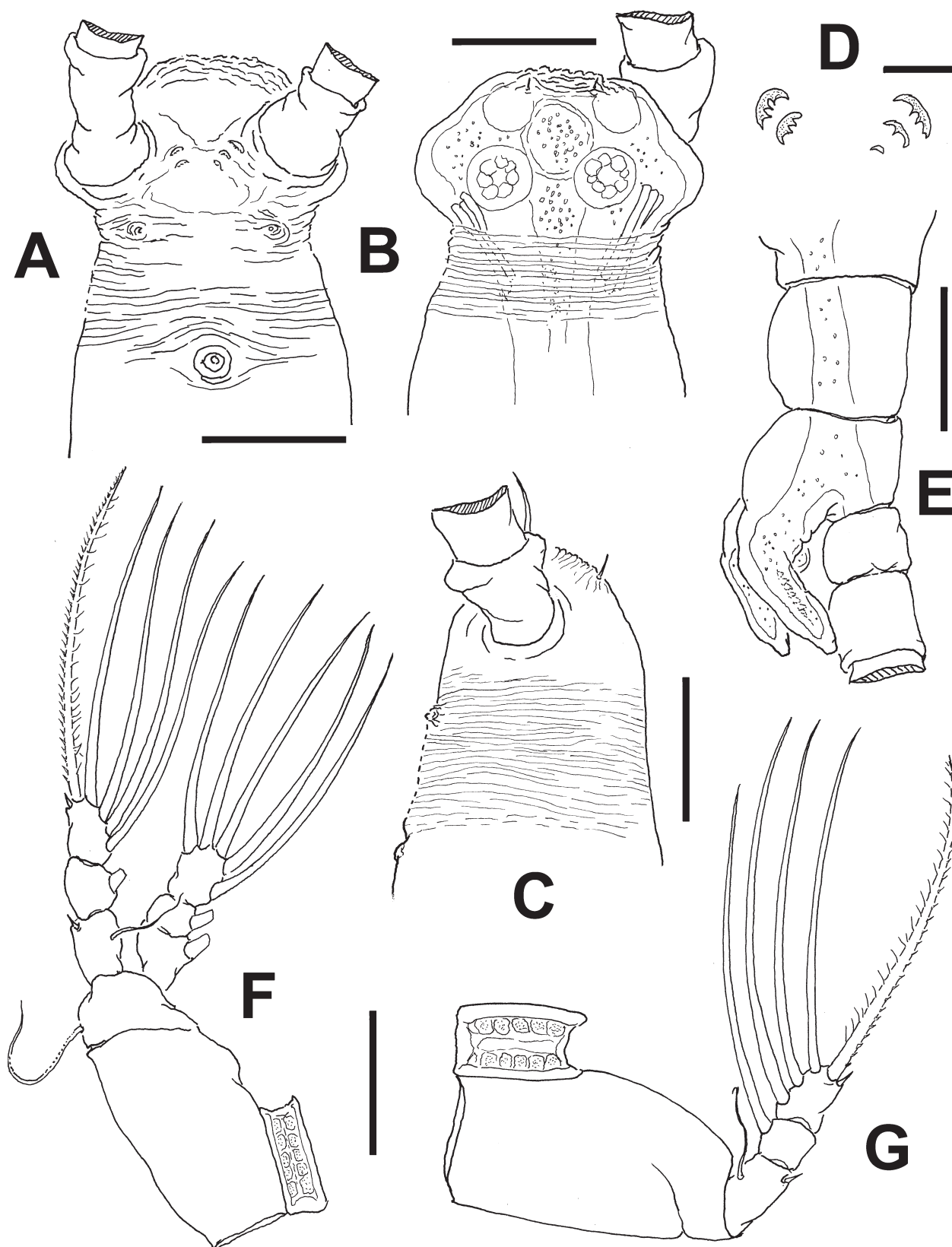
**FIGURE 13.** *Cymbasoma annulocolle* sp. nov., adult female from Werribee. A) habitus, lateral view; B) cephalic region, lateral view; C) same, ventral view; D) habitus, dorsal view; E) urosome and fifth legs, ventral view. Scale bars: A, D = 500  $\mu$ m, B, C, E, F = 200  $\mu$ m.



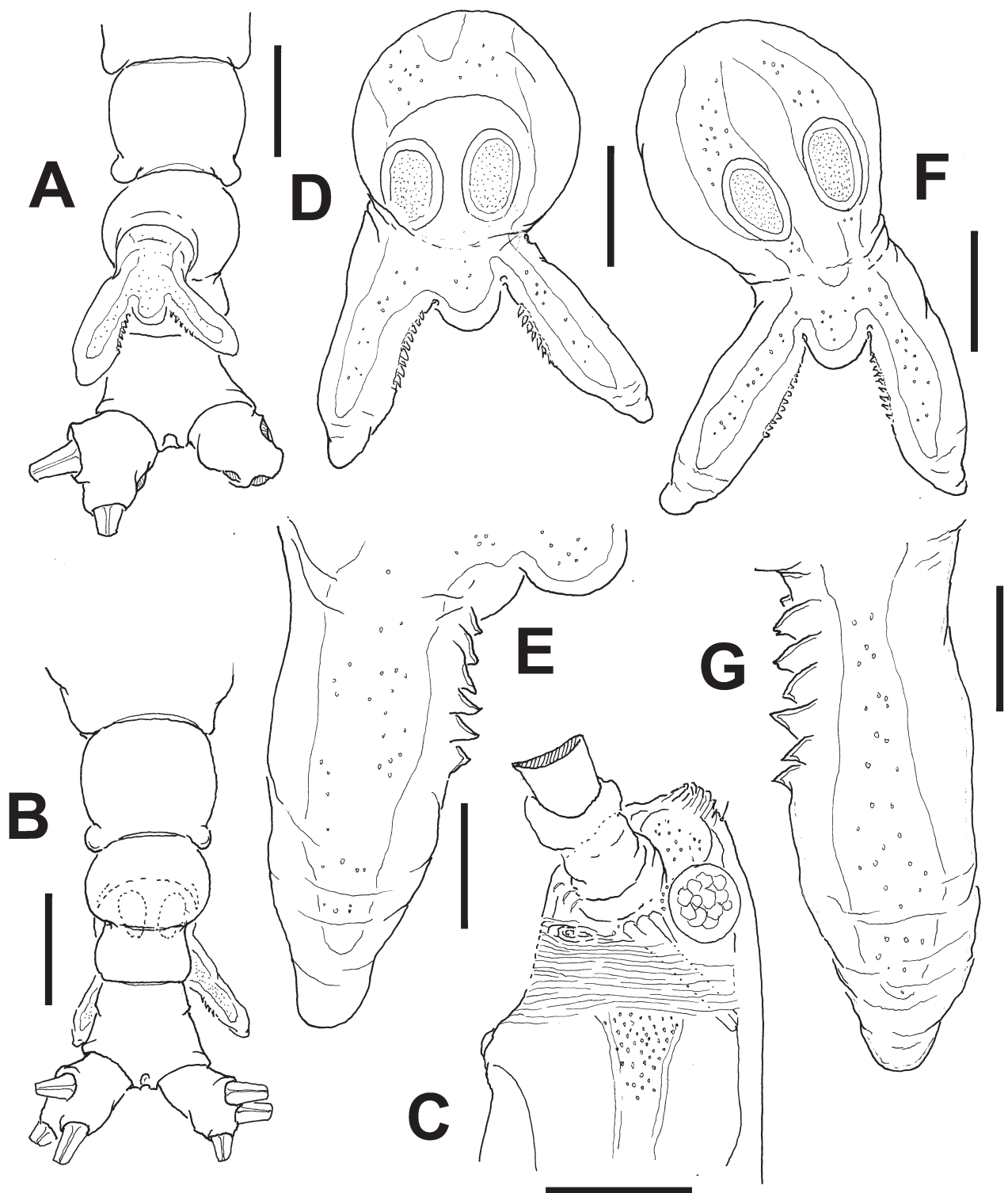
**FIGURE 14.** *Cymbasoma annulocolle* sp. nov., adult female. A) left antennule, dorsal view; B) first leg; C) third leg; D) fourth leg. Scale bars: A–D = 100  $\mu$ m.



**FIGURE 15.** *Cymbasoma annulocolle* sp. nov., adult male from Werribee, specimen A. A) habitus, dorsal view; B) right antennule, dorsal view; C) cephalic region, dorsal view, specimen A; D) urosome dorsal view. Scale bars: A = 200  $\mu$ m, B–D = 100  $\mu$ m.

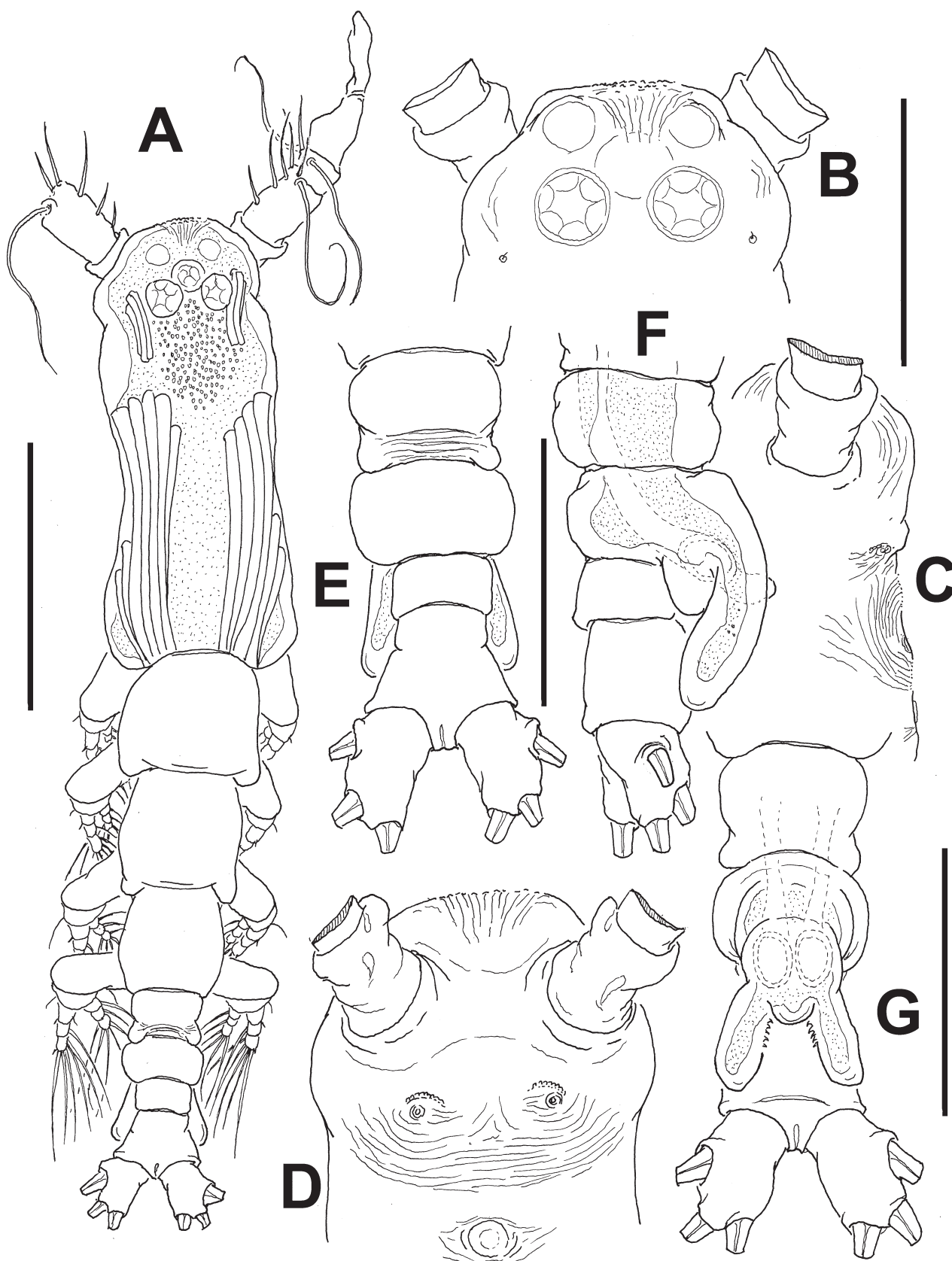


**FIGURE 16.** *Cymbasoma annulocolle* sp. nov., adult males from Werribee. A) cephalic region, ventral view, specimen B; B) same, dorsal view; C) same, lateral view; D) detail of antero-ventral processes between antennule bases, ventral view; E) urosome and genital complex, lateral view; F) second leg; G) first leg with coxal sclerite. Scale bars: A–C, E–G = 100 µm, D = 20 µm.

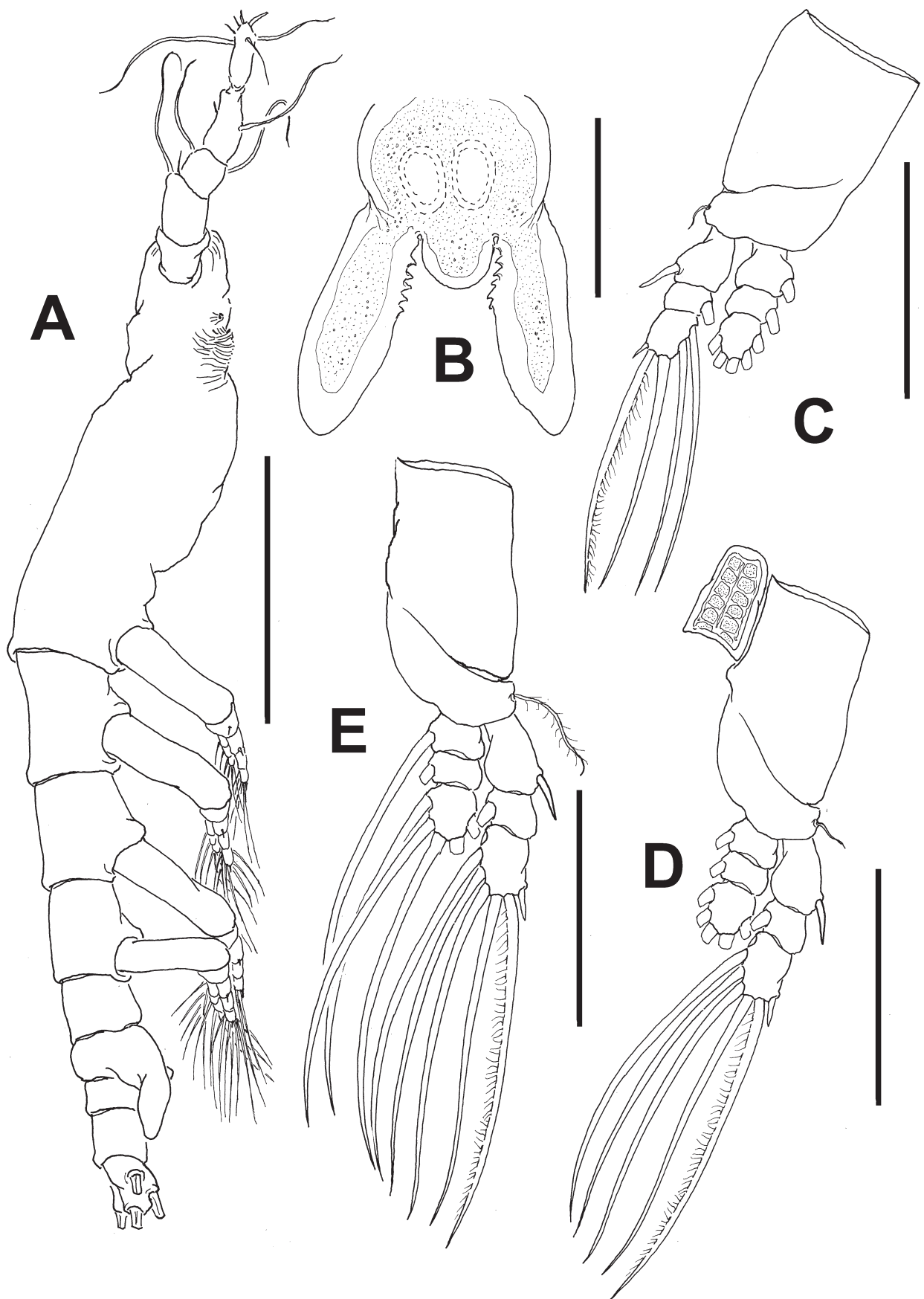


**FIGURE 17.** *Cymbasoma annulocolle* sp. nov., adult males from Werribee. A) urosome and genital complex, ventral view; B) same, dorsal view; C) cephalic region, lateral view, specimen B; D) specimen A, detail of genital complex, ventral view; E) detail of ornamentation of genital lappets, specimen A; F) specimen B, detail of genital complex, ventral; G) detail of ornamentation of genital lappets, specimen B. Scale bars: A–C = 100  $\mu$ m, D, F = 50  $\mu$ m, E, G = 20  $\mu$ m.





**FIGURE 18.** *Cymbasoma annulocolle* sp. nov., adult male, specimen from Davies Reef. A) habitus, dorsal view; B) cephalic region, dorsal view; C) same, lateral view; D) same, ventral view; E) urosome dorsal view; F) same, lateral view. Scale bars: A = 200  $\mu$ m, B–G = 100  $\mu$ m.



**FIGURE 19.** *Cymbasoma annulocolle* **sp. nov.**, adult male, specimen from Davies Reef. A) habitus, lateral view; B) genital lappets, ventral view; C) first leg; D) second leg with coxal plate; E) third leg. Scale bars: A = 200  $\mu$ m, B–E = 50  $\mu$ m.



Armature formula of legs 1–4:

	basis	endopod	exopod
leg 1	1-0	0-1;0-1;1,2,2	1-1;0-1;1,2,2
legs 2–4	1-0	0-1;0-1;1,2,2	1-1;0-1;1,1,2,2

Fifth legs medially conjoined, bilobate, outer (exopodal) lobe distally expanded. Outer lobe armed with three subdistal setae (Fig. 13E, F). Inner lobe with similar digitiform shape, shorter than outer lobe, unarmed, reaching about  $\frac{3}{4}$  the length of outer lobe.

**Description of male.** Total body length of allotype male from Werribee = 1.24 mm. Size range of male specimens = 0.64 (Davies Reef) – 1.44 mm (Werribee); average ( $n=4$ ) 1.23 mm. Cephalothorax 0.34–0.73 mm long, representing 51% of total body length (Figs 15A, 18A, 19A). Midventral oral papilla weakly developed, located at 24% of cephalothorax length. Cephalic region moderately (Fig. 15A) or weakly (Fig. 18A) protuberant bilaterally in dorsal view, with fringe of striae surrounding the cephalic region as in female (males of Werribee) or restricted to ventral area (Fig. 18D), in both groups limited to anterior  $\frac{1}{5}$  of cephalothorax (Figs. 16A–C). Pair of dorsal ocelli present, weakly developed; pigment cups medium-sized. Ocelli separated by the length of less than one eye diameter, faintly pigmented. Pair of sensilla between antennular bases present (Werribee) or absent (Davies Reef). Forehead area as in female, ornamented with transverse (Fig. 16A, B) or parallel (Fig. 18B) cuticular ridges. Other cuticular processes include: 1) three pairs of cuticular crescent-shaped processes between antennule bases (Fig. 16D), absent in specimen from Davies Reef (Fig. 18D); 2) nipple-like processes surrounded by concentric and transverse striae.

Urosome consisting of fifth pedigerous, genital somite (carrying genital complex), preanal somite, and anal somite. Fifth pedigerous somite with smooth ventral surface, with rounded postero-lateral processes as in female in both specimens from Werribee (Figs 15D, 17B) and Davies Reef, which has transverse wrinkles in distal half of somite (Fig. 18E). Genital somite slightly shorter than fifth pedigerous somite. Genital somite with smooth dorsal surface and expanded lateral margins. Preanal somite short, smooth, without constriction. Genital complex of type II (Suárez-Morales & McKinnon 2014), represented by pair of moderately divergent, digitiform genital lappets. Lappets reach beyond midlength of anal somite, ornamented with row of 6–10 sharp dentiform processes along inner margins (Figs 17A, B, D–G; 18E, F, G; 19B). Rounded, protuberant medial process present at common basal joint of lappets (Figs. 17, 18). Anal somite about twice as long as preanal somite in dorsal and lateral views, comprising 26% of urosome length; weak lateral constriction visible in dorsal aspect (Fig 17B, 18E). Caudal rami subquadrate, approximately 1.1 times as long as wide, about as long as anal somite. Each ramus with three setae.

Antennular length 0.49 mm (male from Werribee) and 0.21 mm (male from Davies Reef). Antennules relatively short, representing 34% of total body length, and 66% of cephalothorax length; 5-segmented, all segments separated, with segment 5 located distal to geniculation (Figs. 15B, 18A). Setal element 1 on first segment slender, spiniform, moderately long, reaching proximal  $\frac{1}{3}$  of second segment. Antennular elements 2v1–3, 2d1,2 long, slender as in female; element IId present on second segment. Setal elements IIId, IIIv, and long element 3 present on third segment. Fourth segment with elements 4d1,2, 4v1–3 present; element 4v3 being longest of group. Fifth segment with 4 “b”-group setae, elements b1–3 slender, unbranched; element 6l present in distal position. According to Huys *et al.* (2007) setal nomenclature of distal segment, elements A, B, and E and 1, 3–6 present (Fig. 15B).

Incorporated first pedigerous somite and succeeding three pedigerous somites each bearing well-developed biramous legs. Pedigerous somites 2–4, together accounting for 31% of total body length in dorsal view. Legs 1–4 as in female except for surface of coxal plates ornamented with spinulose patches (Figs 16F, G, 19 C–D).

**Type locality.** Werribee, Port Phillip Bay, Victoria, Australia (37°57.085' S, 144°47.128' E).

**Etymology.** The species name, an adjective in apposition, results from the combination of two Latin terms, *annulus* (= ring) and *collum* (= neck); the name refers to the appearance of the post-cephalic (“neck”) region of the cephalothorax, with deep transverse, parallel ring-like striae.

**Diagnosis.** *Cymbasoma* with long cephalothorax, representing 65% of total body length, third antennular segment representing more than 52% of antennule length, with two pairs of nipple-like processes on ventral surface of cephalic region. Cephalothorax with extense, complete fringe of striation covering about  $\frac{1}{3}$  of cephalothorax. Genital double-somite with lateral margins expanded and with rounded postero-lateral processes.

Anal somite without medial constriction. Fifth leg with elongate, thumb-like outer lobe with three subdistal setae, inner lobe also thumb-like, smaller than outer lobe, unarmed. Male with relatively reduced fringe of striae around cephalic region. Genital complex of Type II; genital lappets ornamented with 6–10 sharp dentiform processes along inner margins and with rounded process at common basal joint of lappets.

**Remarks.** The female of this species can be distinguished by its possession of a wide fringe of cuticular striae covering about 1/3 of the cephalothorax. The striae are weaker posteriorly but cover all around the anterior 40% of the cephalothorax (Fig. 13B). The cephalothorax is elongate, representing up to 65% of the total body length, a character shared with species of the *C. longispinosum*-group, but differs in the structure of the ovigerous spines, which are basally separated in the new species (Fig. 13E) but proximally fused in species of the *C. longispinosum*-group (Üstün *et al.* 2014). A similar pattern of cephalic striation is present in *C. striifrons* (*cf.* Chang 2012) and also in the Australian *C. markhasevae* **sp. nov.** (Fig. 32A–C), but the body is different in these species. In *C. striifrons* it is clearly shorter and more robust than in the new species. In *C. markhasevae* **sp. nov.** the body proportions are similar to *C. annulocolle* but the fifth pedigerous somite and the genital double-somite differ in these species; in the former the fifth pedigerous somite has straight lateral margins and lacks the postero-lateral rounded processes present in the latter. The genital double-somite is clearly wider and shorter in *C. markhasevae* **sp. nov.** than in the new species; this somite is slightly longer than the fifth pedigerous somite whereas it is clearly shorter in *C. markhasevae* (Fig. 32D). The antero-ventral process of the genital double-somite is weakly developed in the new species but it is clearly stronger in *C. markhasevae* (Fig. 32E).

In addition, the coverage and width of the striation area is clearly more extensive in the new species than in *C. striifrons*, which has a narrow fringe (Chang 2012) and in *C. markhasevae*, in which the fringe ends abruptly at the post-oral area and no posterior fainter wrinkles are discernible as in the new species. Also, the armature of the fifth leg outer (exopodal) lobe of the new species is distinctive for its long innermost seta, which is the longest of the three; this is a character not observed in other similar species in which the innermost seta is usually shorter or as long as the other two on this lobe.

Another species of *Cymbasoma* with a similar striation pattern stretching around the cephalothorax is *C. striatus* (Isaac, 1974) (Suárez-Morales 2000b) but in contrast to the new species its fifth leg has only one lobe, the endopodal lobe being absent. The new species shares with the Australian *C. bidentatum* **sp. nov.** (Fig. 20F) and *C. markhasevae* (Fig. 32G) an inner lobe of the fifth leg that is elongate, narrow, and arising proximally from the same base as the outer lobe. These species differ in several other features as explained in the respective comparative sections below.

The male of this species can be distinguished from its known congeners by the presence of a row of 6–10 spines along the inner margin of the genital lappets. Such ornamentation is present only in *C. quadridens* in which the spines are smaller and fewer (4–6) and the lappets are relatively shorter and wider than in the new species (Suárez-Morales & Pilz 2008: fig. 7B, C). In addition, the new species (*C. annulocolle*) has a wrinkled frontal surface *vs.* a smooth surface in *C. quadridens* (Suárez-Morales & Pilz 2008: figs 5D, 7A). The Australian *C. pseudoquadridens* **sp. nov.** has also spines on the lappets but these are clearly larger and stronger and only up to four in number (Fig. 23E), thus diverging from the pattern observed in the new species. Also, the fringe of striae present in the new species is absent from both *C. quadridens* (*cf.* Davis 1947; Suárez-Morales & Pilz 2008: fig. 5A) and *C. pseudoquadridens* (Fig. 32A). The new species differs from the closely related *C. quadridens* or *C. tenue* by having an inner serra-like ornamentation on each lappet, with 6–10 dentiform processes *vs.* only one proximal spiniform process in *C. tenue*; differences with respect to *C. quadridens* (Davis 1947; Suárez-Morales & Pilz 2008) were discussed above.

One of the criteria to link males and females of a species is to find them in the same sample/locality, which is partially the case for the male and the female of this species, but a male was found in a different area. A second factor is to evaluate if they share non-sexually related characters; in *C. annulocolle* both sexes have 1) a distinctive ornamentation of the cephalothorax, with a band of striae, and 2) a pair of rounded posterolateral process on the fifth pedigerous somite. These two characters are not present in other species in the same sample/area. Furthermore, they also share a similar ornamentation pattern of antennular segments 1–4. So, these comparative and distributional analyses lead us to match both genders instead of erecting a new taxon for the males of this species.

***Cymbasoma bidentatum* sp. nov.**

(Figs 20, 21)

**Material examined.** Holotype: adult female from Warneet inlet, Western Port Bay, Victoria, Australia (38°27.432' S, 145°17.951' E), ethanol-preserved; dissected parts mounted on two slides in glycerine, sealed with Entellan®. Date of collection: 20th March 1985. Paratype adult female from same locality and date, partially dissected, mounted on two slides in glycerine, sealed with Entellan®. Slides deposited in the collection of MTQ, Australia (cat. MTQ W34382, MTQ W34383, respectively).

**Description of adult female.** Body moderately robust; body length of holotype female 0.93 mm. Cephalothorax approximately 0.55 mm long, representing nearly 61% of total body length. Midventral oral papilla protuberant, located at 25% of cephalothorax length. Pair of relatively small ocelli present, pigment cups weakly developed, separated by one eye diameter, lightly pigmented; ventral cup larger than lateral cups (Fig. 20A). Cephalic region not laterally protuberant. Frontal area ornamented with pattern of shallow longitudinal striations (Figs 20B, C) no frontal sensilla were observed. Dorsal surface of cephalothorax smooth, ventral surface ornamented with transverse striae between antennule bases and oral area. Additional ornamentation of ventral surface including: 1) low medial protuberance on ventral surface posterior to antennule bases, ornamented with striae (arrowed in Fig. 20B); 2) pair of symmetrical, nipple-like processes on anterior ventral surface located at both sides of oral papilla.

Urosome consisting of fifth pedigerous somite, genital double-somite and anal somite, together representing 14% of total body length. Relative lengths of urosomites (fifth pedigerous, genital double and free anal somites) as: 31: 45.9: 23.1 = 100, respectively (Fig. 20D, E). Lateral margins of fifth pedigerous somite moderately expanded. Genital double-somite longest of urosome, with smooth dorsal surface, anteroventral surface corrugated anterior to insertion of ovigerous spines (Fig. 20E). Anterior half of double-somite expanded, with moderately developed lateral processes and paired subtriangular protuberances on middle posterodorsal margin (arrowed in Fig. 20D). Ovigerous spines paired, separated at base, relatively short, 50% of total body length (Fig. 20A). Spines slender, straight at their base and along shaft, with weak distal expansions and tapering apically (Fig. 20G), both spines equally long; spines 0.48 mm long (Fig. 20A). Anal somite without medial constriction. Caudal ramus subquadrate, about as long as wide, armed with three caudal setae (Fig. 20D, E, G).

Antennule length 0.21 mm, representing about 22% of total body length and 35% of cephalothorax length, 4-segmented, segments 3 and 4 separated. First segment with thumb-like protuberance on outer margin (arrowed in Fig. 21C). Relative length of distal antennular segment 46.3%. In terms of pattern described by Grygier & Ohtsuka (1995) for female monstrellid antennular armature, short, spiniform element 1 present on first segment; elements on second segment: 2d1-2, 2v1-3, and IId. Third segment with slender element 3, setae IIId and IIIV of normal aspect. Segment 4 bearing elements 4d1,2, 4v1-2, element 4v2 being longest of group. Setae IVd, IVv, Vd, Vv, and element 4aes present. Element 5 short, slender. Subterminal elements b1-5 present, unbranched, elements 61-2 and 6 aes present (Fig. 21B).

Incorporated first pedigerous somite and succeeding three free pedigerous somites each bearing a pair of biramous legs. Pedigerous somites 2–4, together accounting for 23% of total body length. Legs 1–4 slightly increasing in size posteriorly. Intercoxal sclerites of legs 1–4 subrectangular, surface and posterior margin smooth. Bases of legs articulating with large, rectangular coxae along oblique line; with hair-like lateral seta; on leg 3, this seta about 3.5 times longer, thicker than those on other legs (Fig. 21E). Endopods and exopods of legs 1–4 triarticulated. Ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3, and inner seta of first exopodal segment, these latter being short, slender. Outermost distal spines on third exopodal segment of legs 1–4 short, 0.2 times as long as segment. Outermost apical exopodal setae of legs 1–4 with inner margin naked, outer margin spinulose.

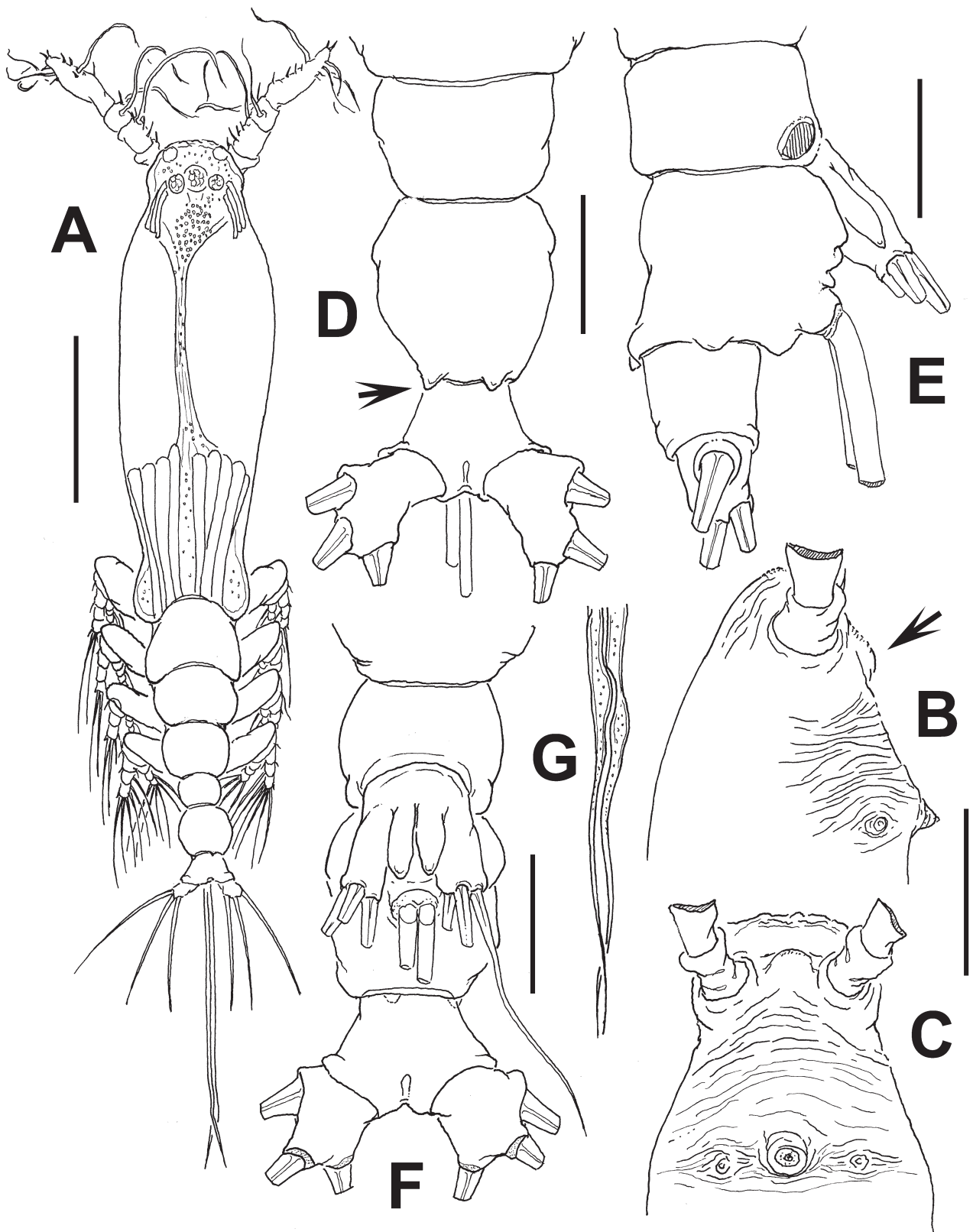
Armature formula of legs 1–4:

	basis	endopod	exopod
leg 1	1-0	0-1;0-1;1,2,2	I-1;0-1;I,2,2
legs 2–4	1-0	0-1;0-1;1,2,2	I-1;0-1;I,1,2,2

Fifth legs medially conjoined, bilobate, outer (exopodal) lobe cylindrical, distally blunt. Outer lobe armed with three equally long apical setae (Fig. 21G). Inner lobe digitiform, shorter than outer lobe, reaching about  $\frac{3}{4}$  the length of exopodal lobe, unarmed (Fig. 21F).

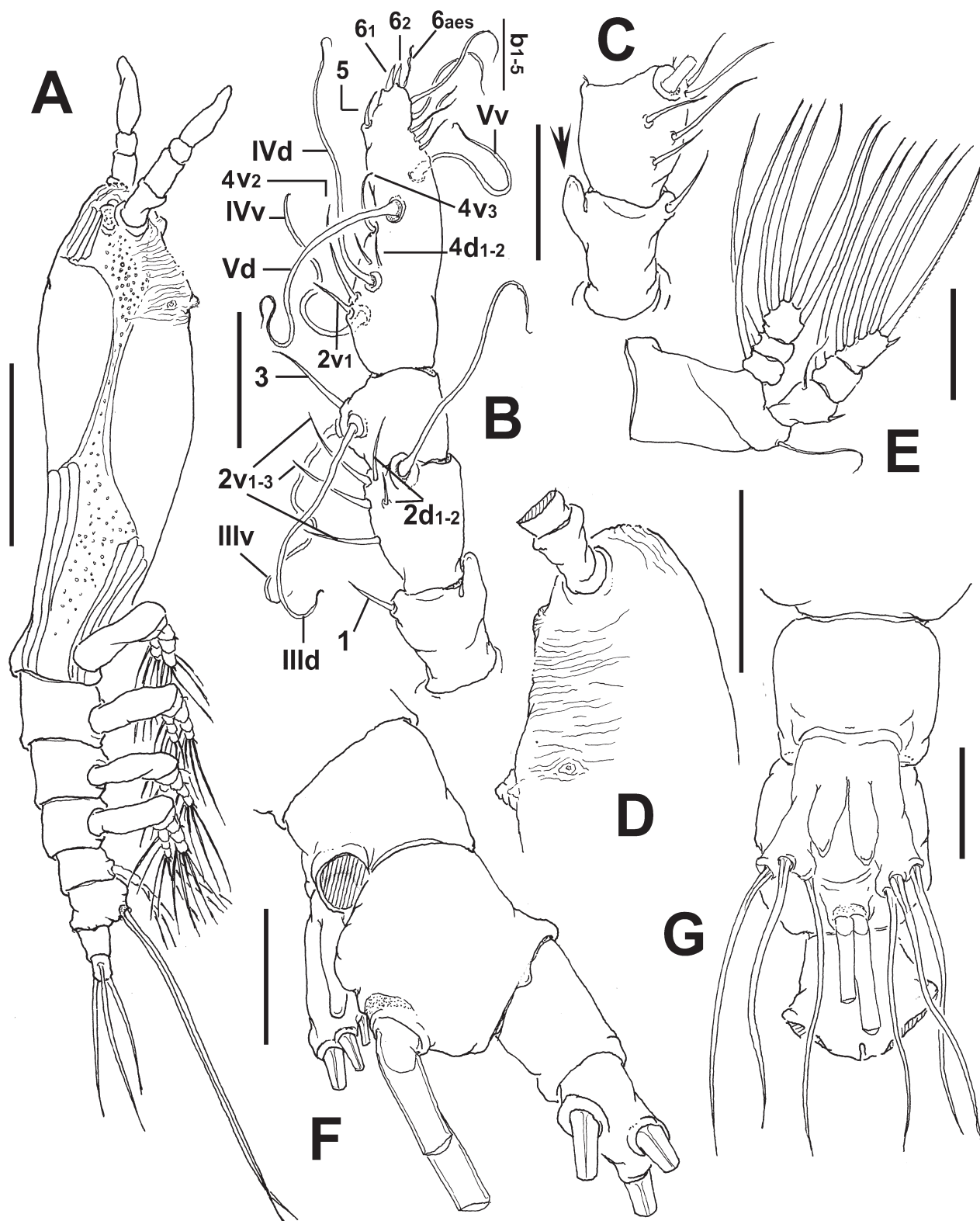
Male: unknown.

**Type locality.** Warneet inlet, Western Port Bay, Victoria, Australia (38°27.432'S, 145°17.951'E).



**FIGURE 20.** *Cymbasoma bidentatum* **sp. nov.**, adult female. A) habitus, dorsal view; B) cephalic region, lateral view; C) same, dorsal view; D) urosome, dorsal view, triangular posterior processes arrowed; E) same, lateral view; F) same, showing fifth legs, ventral view; G) distal section of ovigerous spines. Scale bars: A = 200 µm, B–G = 100 µm.





**FIGURE 21.** *Cymbasoma bidentatum* sp. nov., adult female. A) habitus, lateral view; B) right antennule, dorsal view; C) detail of process on first antennular segment (arrowed); D) cephalic region, lateral view; E) third leg; F) urosome, lateral view, right fifth leg omitted to show anteroventral process on genital double-somite; G) same, showing fifth legs, ventral view. Scale bars: A = 200  $\mu$ m, B,C = 50  $\mu$ m, D–G = 100  $\mu$ m.

**Etymology.** The species name, an adjective derived from the Latin *dentatum* (= with teeth) with the addition of the prefix *bi-* (=two), refers to the two tooth-like processes on the anterior half and along the posterior margin of the female genital double-somite.



**Diagnosis.** *Cymbasoma* with relatively robust cephalothorax, representing 61% of total body length, third antennular segment representing more than 46% of antennule length, with low medial process on ventral surface of cephalic region. Cephalothorax with smooth dorsal surface. First antennular segment with outer thumb-like process. Genital double-somite with lateral processes on proximal half and pair of tooth-like processes on posterior margin. Somite with corrugated anteroventral surface. Anal somite without medial constriction. Fifth leg with elongate, thumb-like outer lobe with three subdistal setae with equally long setae, inner lobe digitiform, smaller than outer lobe, unarmed.

**Remarks.** This species has affinities with other *Cymbasoma* species with a fifth leg bearing an outer lobe armed with three subequally long setae and an elongate, digitiform inner lobe arising basally. These include *C. rigidum* from which the new species differs in the length of the innermost seta of the fifth leg outer lobe, which is clearly the shortest and thinnest in species of this group (see Bourne 1890, *non* Sars, 1921). The new species also resembles *C. germanicum* (Timm, 1893) (Suárez-Morales 2006), *C. gracile* (cf. Gurney 1927), and *C. davisii* (Suárez-Morales & Pilz, 2008) (Suárez-Morales & Pilz 2008). The fifth leg pattern is most similar to that of *C. gracile* (cf. Gurney 1927) but *C. bidentatum* **sp. nov.** differs in the body shape and proportions. In *C. gracile* the cephalothorax is long, slender, representing 67% of the total body length, whereas it is 61% in the new species which is clearly more robust. Also, in *C. gracile* the antennule has segments 3–4 fused (Gurney 1927: fig. C) and they are clearly separated in the new species. The fifth leg of *C. bidentatum* **sp. nov.** is similar to that of *C. germanicum* (cf. Suárez-Morales 2006: fig. 4b), but these species differ in the shape of the genital somite, with an expanded, rounded proximal half and a constricted posterior half in *C. germanicum* (cf. Suárez-Morales 2006: fig. 4d) and a uniformly globose shape in the new species. The new species has a low ventral wrinkled process on the cephalic region (arrowed in Fig. 20B) which is absent in *C. germanicum*, with a smooth surface in the same area (Suárez-Morales 2006: fig. 1b). In *C. davisii* the fifth leg inner lobe is remarkably narrow, slender and arises medially from the inner margin of the outer lobe and the innermost seta is shorter than the two outer setae (Suárez-Morales & Pilz 2008: fig. 3A), thus diverging from the pattern observed in the new species. Also, the genital double-somite is different in these species; in *C. davisii* the anterior half is expanded, with straight margins and the posterior half is narrower but has also straight margins (Suárez-Morales & Pilz 2008: fig. 3A, B) vs. a rounded, globose genital double-somite in the new species. Overall, the most distinctive characters of the new species include a thumb-like protuberance on the distal outer margin of the first antennular segment (arrowed in Fig. 21C) but most importantly, the presence of two anterior lateral processes and two spiniform processes on the posterior margin of the genital double-somite and a corrugate ventral surface of the same somite, visible in lateral view. This combination of characters is absent in *C. gracile* (cf. Gurney 1927), *C. germanicum* (cf. Suárez-Morales 2006), *C. davisii* (cf. Suárez-Morales & Pilz 2008), and other species of the genus. It can easily be distinguished from the Australian *C. annulocolle* and *C. markhasevae* in the lack of a fringe of striae covering part of the cephalothorax.

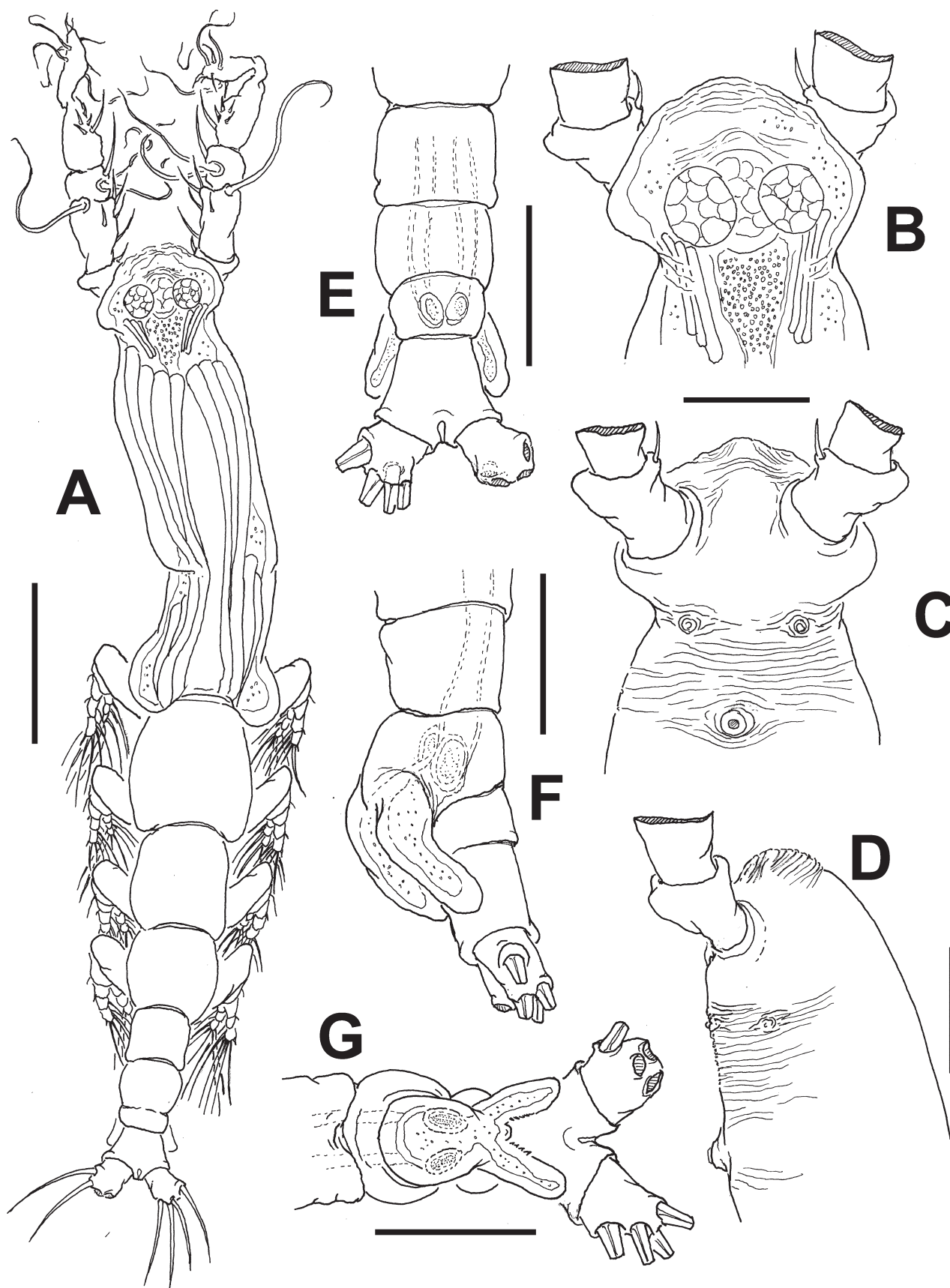
***Cymbasoma pseudoquadridens* sp. nov.**

(Figs 22, 23)

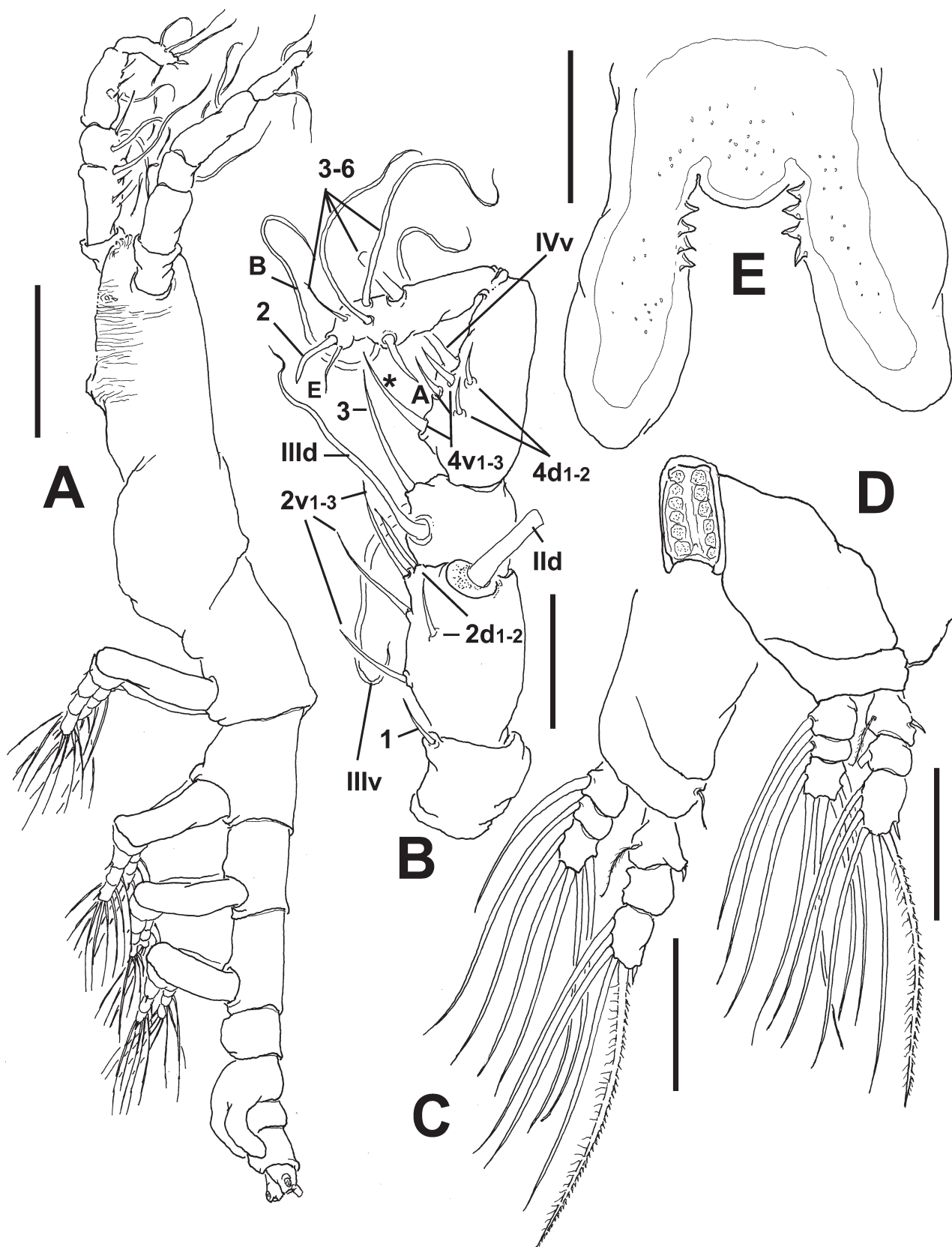
**Material examined.** Holotype: adult male from Werribee, Port Phillip Bay, Victoria, Australia (37°57.085' S, 144°47.128' E), partially dissected, ethanol-preserved; dissected parts mounted on slide in glycerine, sealed with Entellan®. Date of collection: 13 June 1985. Vial and slides deposited in the collection of MTQ, Australia (cat. MTQ W34384).

**Description of male.** Total body length 1.24 mm. Cephalothorax 0.63 mm long, representing 51% of total body length (Figs 22A, 23A). Midventral oral papilla weakly developed, located at 24% of cephalothorax length (Fig. 22D, 23A). Cephalic region protuberant bilaterally in dorsal view (Fig. 22B), with frontal field of striae. Cephalic region with field of striae limited to ventral surface between nipple-like processes and pre-oral region (Fig. 22C, D). Pair of dorsal ocelli present; pigment cups medium-sized. Ocelli separated by the length of less than one eye diameter, faintly pigmented. Ventral ocellus slightly larger than eyes. Frontal sensilla absent. Other cuticular processes include pair of nipple-like processes surrounded by short transverse striae.

Urosome consisting of fifth pedigerous, genital somite (carrying genital complex), preanal somite, and anal somite. Fifth pedigerous somite with smooth ventral surface, with no postero-lateral processes. Genital somite slightly shorter than fifth pedigerous somite. Genital somite with smooth dorsal surface and straight lateral



**FIGURE 22.** *Cymbasoma pseudoquadridens* sp. nov., adult male. A) habitus, dorsal view; B) cephalic region, dorsal view; C) same, ventral view; D) same, lateral view; E) urosome, dorsal view; F) same, showing genital complex, lateral view; G) same, ventral view. Scale bars: A = 200 µm, B–G = 100 µm.



**FIGURE 23.** *Cymbasoma pseudoquadridens* sp. nov., adult male. A) habitus, lateral view; B. right antennule, dorsal view; C) first leg; D) third leg with coxal plate; E) detail of ornamentation of genital lappets, ventral view. Scale bars: A = 200 µm, B, E = 50 µm, C, D = 100 µm.

margins. Preanal somite short, with smooth dorsal and ventral surfaces. Genital complex of type II (Suárez-Morales & McKinnon 2014), represented by pair of moderately divergent, robust thumb-like genital lappets (Fig. 22G), lappets symmetrical, reaching midlength of anal somite. Inner margin of lappets ornamented with row of 4 strong, sharp dentiform processes along proximal inner margins (Fig. 23E). Rounded, weakly protuberant medial process present at common basal joint of lappets. Anal somite about twice as long as preanal somite in dorsal and lateral views, comprising 24% of urosome length; anal somite not constricted (Fig 22E). Caudal rami subquadrate, approximately 1.1 times as long as wide, about as long as anal somite. Each ramus with four caudal setae.

Antennular length 0.43 mm. Antennules relatively short, representing 35% of total body length, and 64% of cephalothorax length; 5-segmented, all segments separated, with segment 5 located distal to geniculation (Fig. 23B). Setal element 1 on first segment slender, spiniform, short. Antennular elements 2v1-3, 2d1,2 long, slender; element 1ld present on second segment. Setal elements 1lld, 1llv, and long element 3 present on third segment. Fourth segment with elements 4d1,2, 4v1-3 present; element 4v1 being longest of group (asterisk in Fig. 23B); except for seta IVv, all other setae absent in specimen. Fifth segment with 4 “b”-group setae, elements b1-3 slender, long, unbranched; element 61 present in distal position. According to Huys *et al.* (2007) setal nomenclature of distal segment, elements A, B, and E and 1, 2-6 present; element 2 stout, spiniform, curved.

Incorporated first pedigerous somite and succeeding three pedigerous somites each bearing well-developed biramous legs. Pedigerous somites 2-4, together accounting for 30% of total body length in dorsal view. Legs 1-4 as in *C. bitumidum* except for surface of coxal plates ornamented with spinulose patches (Fig. 23C, D).

**Type locality.** Werribee, Port Phillip Bay, Victoria, Australia (37°57.085' S, 144°47.128' E).

**Etymology.** The species name refers to the resemblance of this copepod to *C. quadridens*, a species originally described by Davis (1947) as having four tooth-like processes on the genital lappets, like the new species.

**Diagnosis.** *Cymbasoma* with ventral field of striae on cephalic region plus transverse frontal wrinkles. Antennular fifth segment with long, stout apical element 1 (*sensu* Huys *et al.* 2007). Genital complex of Type II; genital lappets reaching beyond half length of anal somite, ornamented with 4 strong, sharp dentiform processes along proximal inner margins and with low rounded process at common basal joint of lappets. Anal somite not constricted.

**Remarks.** This is another species of *Cymbasoma* whose male bears four caudal setae. It differs from its congeners sharing this character in the lack of a ventral protuberance, which is present in *C. bullatum* (Suárez-Morales, 2007), *C. rochai* (Suárez-Morales & Dias, 2001) and the Australian *C. bitumidum* **sp. nov.** The main distinctive character of this species is the structure and ornamentation of its genital lappets. It has four strong spines on the inner proximal margin of the lappets; only a few species have this kind of ornamentation. The Australian *C. annulocolle* has a serrated row of 6-10 small spiniform processes (Fig. 17E, G), thus differing from the pattern observed in the new species. Also, it has three caudal setae *vs.* four such setae in the new species and has a fringe of striae around the cephalic region, a character absent in the new species. Another species with a row of spines along the inner margin of the lappets is *C. quadridens* Davis, 1947, but the lappets are relatively shorter and more robust than in the new species and spines are clearly smaller and weaker (Suárez-Morales & Pilz 2008). Also, *C. quadridens* has three caudal setae *vs.* four in the new species. The antennule apical element 2 is about twice as long as that depicted by Davis (1947) and Suárez-Morales & Pilz (2008) for *C. quadridens*. The lappets of *C. mcaliceii* Suárez-Morales, 1996 have a corrugate inner margin (Suárez-Morales 1996: fig. 2E) which clearly diverges from the strong spines present in the new species.

***Cymbasoma lourdesae* sp. nov.**  
(Figs 24, 25)

**Material examined.** Adult female holotype and adult female paratype from Rhyll, Western Port Bay, Victoria, Australia (38°26.792' S, 145°18.496' E), partially dissected, parts mounted on slides in glycerine, sealed with Entellan®. Date of collection: 10th May 1983. Slides deposited in the collection of MTQ, Australia (cat. MTQ W34385, MTQ W34386).

**Description of adult female.** Body moderately robust (Figs 24A, 25A, B); body length of holotype female 0.98 mm. Paratype female = 0.93 mm. Cephalothorax approximately 0.56 mm long, representing 59% of total body length. Midventral oral papilla protuberant, located at 31% of cephalothorax length. Pair of relatively small ocelli present, pigment cups weakly developed, separated by one eye diameter, lightly pigmented; ventral cup slightly



larger than lateral cups. Frontal area ornamented with pattern of shallow transverse striations (Fig. 25D); two pairs of frontal sensilla were observed (Fig. 24C). Dorsal surface of cephalothorax smooth except for scattered transverse striae arranged in curved pattern; ventral surface ornamented with few transverse striae between antennule bases and oral area (Fig. 25C). Additional ornamentation of ventral surface including: 1) medial field of cuticular papillae posterior to antennule bases, with striae at both sides (Fig. 24B, arrowed in Fig. 25D); 2) pair of symmetrical, weakly developed nipple-like processes on anterior ventral surface located at both sides of oral papilla.

Urosome consisting of fifth pedigerous somite, genital double-somite and anal somite, together representing 14% of total body length. Relative lengths of urosomites (fifth pedigerous, genital double and free anal somites) 38.5: 41.4: 20.1 = 100, respectively (Fig. 25E). Lateral margins of fifth pedigerous somite straight (Fig. 25F). Genital double-somite longest of urosome, with smooth dorsal and ventral surfaces except for transverse wrinkles along posterior margins (Figs 24D, 25F). Lateral margins of somite expanded into globose shape. Ventral surface of somite protuberant, with posterior margin produced ventrally, protruding from succeeding anal somite in lateral view (arrowed in Fig. 24E). Ovigerous spines paired, separated at base, relatively short, 43 % of total body length (Fig. 24G). Spines slender, straight at their base and along shaft, with weak subterminal expansions and tapering apically; spines equally long, about 45% of total body length (0.4 mm) (Figs 24A, 25A, B). Anal somite without medial constriction (Figs 24D, F, 25F). Caudal rami divergent, subquadrate, about as long as wide, armed with three caudal setae (Figs 24F, 25F).

Antennule length 0.22 mm, representing about 23.5% of total body length and 39% of cephalothorax length, 4-segmented, segments 3 and 4 partially fused. Relative length of distal antennular segment 53%. In terms of pattern described by Grygier & Ohtsuka (1995) for female monstrolloid antennular armature, short, spiniform element 1 present on first segment; elements on second segment: 2d1-2, 2v1-3, and IId. Third segment with element 3 being slender, setiform, elements IIIId and IIIv of normal aspect. Segment 4 bearing short, spiniform elements 4d1,2, 4v1-2, element 4v3 not observed; setae IVd, IVv, Vd, Vm present. Element 5 absent. Subterminal elements b1-3, 5, 6 present, b1-3 dichotomously branched. Elements 6I and 6aEs present (Fig. 24C).

Incorporated first pedigerous somite and succeeding three free pedigerous somites each bearing a pair of biramous legs. Pedigerous somites 2–4, together accounting for 26% of total body length. Legs 1–4 as in *C. pseudoquadridens* except for smooth intercoxal sclerites.

Fifth legs medially conjoined, bilobate, outer (exopodal) lobe cylindrical, distally truncate. Lobe with low inner protuberances on middle inner margin, armed two equally long apical setae (Figs 24D, 25F). Inner lobe thumb-like, shorter than outer lobe, reaching about half the length of exopodal lobe, unarmed.

Male: unknown.

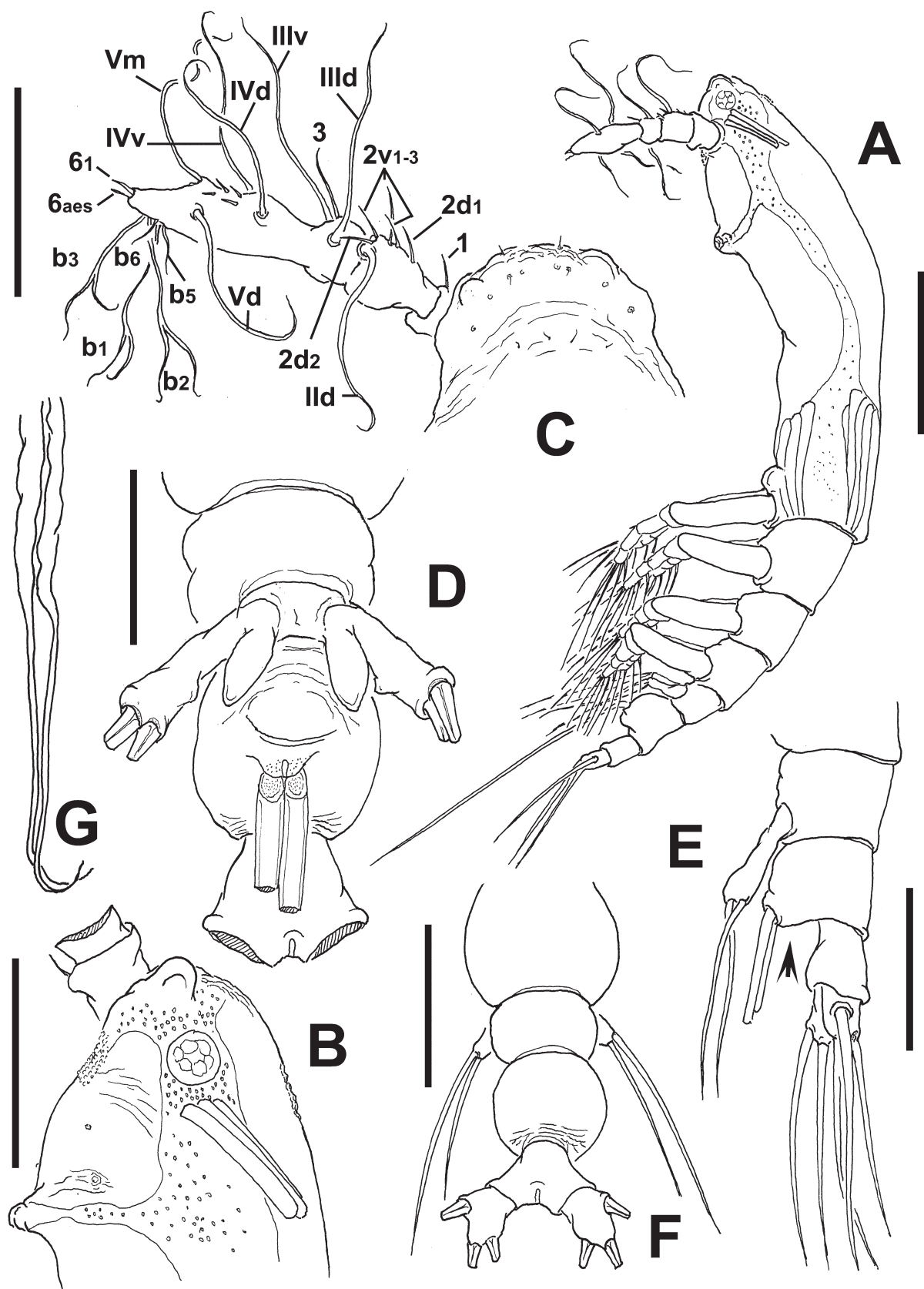
**Type locality.** Rhyll, Western Port Bay, Victoria, Australia (38°26.792' S, 145°18.496' E).

**Etymology.** The species is dedicated to Lourdes Vásquez-Yeomans, a researcher at El Colegio de la Frontera Sur, for her long work in the study of the tropical marine zooplankton and ichthyoplankton.

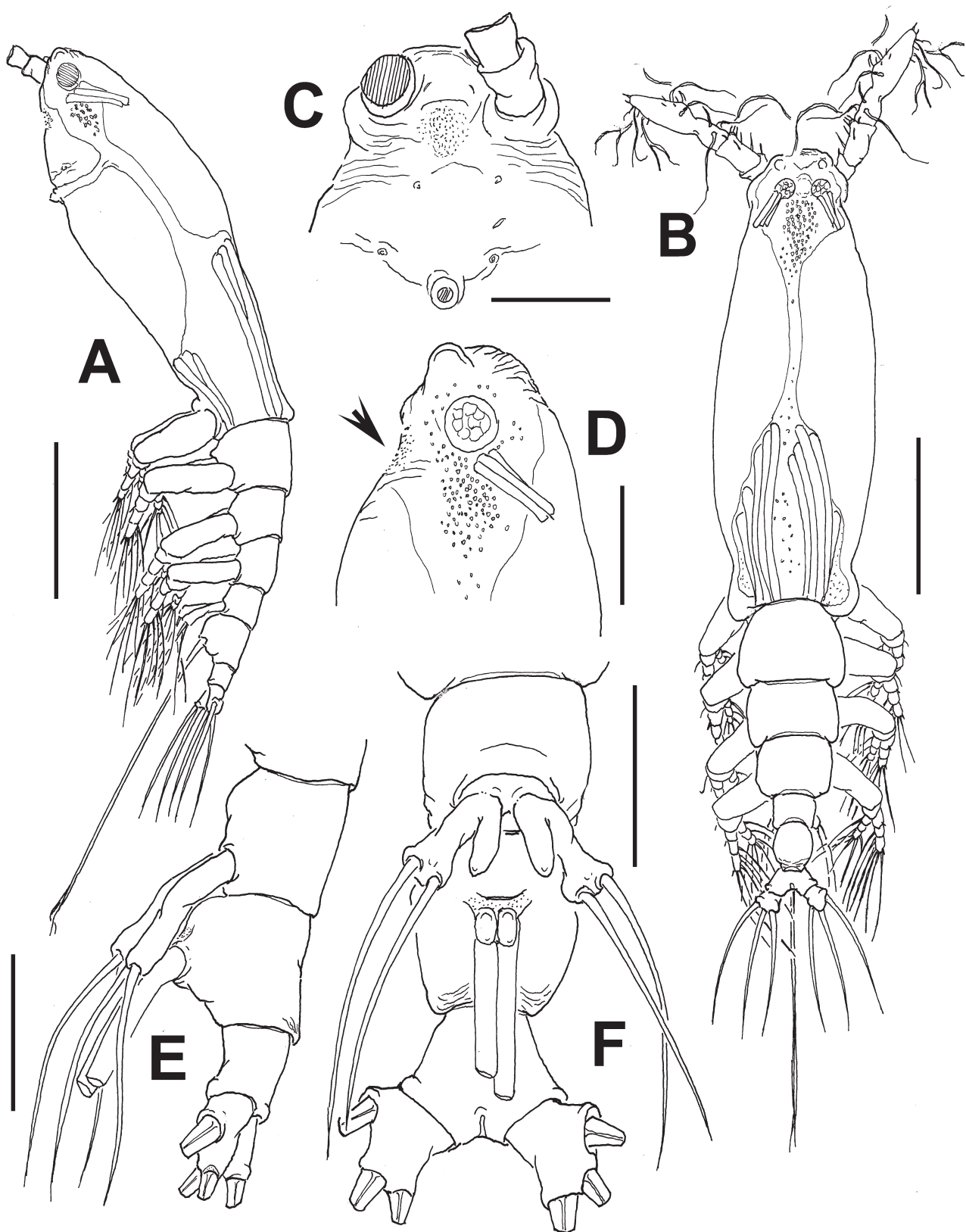
**Diagnosis.** *Cymbasoma* with cephalothorax, representing 59% of total body length, third and fourth antennular segments fused. Ventral field of papilla-like processes on cephalic area between antennule bases and oral papilla. Genital double-somite with moderately expanded margins, with wrinkles on posterior ventral margin. Anal somite not constricted. Fifth leg with elongate, cylindrical outer lobe with two distal setae; inner lobe well-defined, arising basally and reaching about half the length of outer lobe, unarmed.

**Remarks.** This is another species with only two distal setae on the outer lobe of the fifth leg. It differs from its Australian congeners sharing this peculiar character (*C. dakini* sp. nov., *C. agoense*, *C. tharawalorum* sp. nov.) in the length of the inner lobe, which is shorter than in *C. dakini*, not reaching the distal margin of the outer lobe. The shape of the genital double-somite is also different in these species; the new species has a globose shape (Figs 24D, F, 25F) thus diverging from the moderately produced genital double-somite in *C. dakini*. Also, some details of the antennular armature are useful to distinguish these species; in *C. dakini* element 5 on the fourth segment is strong, spiniform, curved (Fig. 6B) whereas it is absent in the new species. On the same segment, the elements of group “b”, b1-3 are short, unbranched in *C. dakini* (Fig. 6B) but they are long and dichotomously branched in the new species. Most importantly, the antennule of the new species has segments 3–4 fused, thus diverging from the clearly separated antennular segments 3–4 in *C. dakini*. Also, the new species has a field of papilla-like elements on the ventral surface of the cephalic area (Fig. 25C, D), a character absent in the other species. The new species differs from both *C. tharawalorum* in the body shape; the latter species is clearly more robust. The shape of the





**FIGURE 24.** *Cymbasoma lourdesae* sp. nov., adult female. A) habitus, lateral view; B) cephalic region, lateral view, first segments of left antennule omitted to observe frontal ornamentation; C) same, dorsal view and right antennule showing armature; D) part of urosome showing fifth legs, ventral view; E) urosome, lateral view showing flat, ventrally produced posterior margin of genital double-somite (arrowed); F) urosome, dorsal view; G) distal end of ovigerous spines. Scale bars: A, B = 200  $\mu$ m, C, E–G = 100  $\mu$ m, D = 50  $\mu$ m.



**FIGURE 25.** *Cymbasoma lourdesae* sp. nov., adult male. A) habitus, lateral view; B) same, dorsal view; C) cephalic region, ventral view; D) same, lateral view, arrow indicating ventral field of minute papillae; E) urosome showing fifth legs, lateral view; same, ventral view. Scale bars: A, B = 200  $\mu$ m, C–F = 50  $\mu$ m.

double genital somite differs in these two species; it is strongly globose in the new species and in *C. tharawalorum* only the proximal half is expanded and bears lateral striae, and the posterior half is straight (Fig. 65D, E). The shape and relative size of the antennules are also different in these species; it is short, with the last segment representing less than 40% of the antennule length vs. 53% in the new species. In *C. tharawalorum* the fifth leg inner lobe is small, globose and inserted medially (Fig. 65C) whereas it arises proximally and it is oblong in the new species. It differs in several characters from *C. agoense*, that also has two setae on the outer lobe; in *C. agoense* the outer lobe is strong, wide (Sekiguchi 1982: fig. 6F; Fig. 56E), thus contrasting with the elongate outer lobe of the new species; a similar difference is observed for the inner lobe. The body of *C. agoense* is short, robust (Sekiguchi 1982: fig. 6A; Fig. 56A) and clearly differs from that of the new species. In addition, the globose genital double-somite of the new species diverges from the quadrate somite present in *C. agoense* (Sekiguchi 1982: fig. 6A; Fig. 56D). The antennule armature includes some additional differences; setae of the “b” group are long and distally branched in the new species vs. relatively short, unbranched “b” setae in *C. agoense*; also, the two apical spiniform elements 61-2 are remarkably long in *C. agoense* (Sekiguchi 1982: fig. 6C) whereas they are clearly shorter in the new species.

### ***Cymbasoma bali* Desai & Krishnaswamy, 1962**

(Figs 26–31)

**Material examined.** Three adult females from near Queenscliff, Port Phillip, Victoria, Australia (38°16.085' S, 144°40.081' E; Station Q of Kimmerer & McKinnon 1985); one adult female from Davies Reef, Queensland, Australia (18° 48.78' S, 147° 39.30' E), 2 specimens partially dissected; dissected parts mounted on slide in glycerine, sealed with Entellan®. Date of collection: 26th February 1984 and 20th June 1989, respectively. Slides deposited in the collection of MTQ, Australia (cat. MTQ W34388, MTQ W34389, MTQ W34390, MTQ W34387, respectively).

**Description of adult female.** Body moderately robust; body length of four females 1.3 (Davies Reef), 1.94, 1.76, and 1.85 mm (Queenscliff). Average length ( $n=4$ ) 1.71 mm. Cephalothorax approximately 1.03 mm long, representing 60–61% of total body length. Midventral oral papilla noticeably protuberant, located at 19–20% of cephalothorax length. Pair of relatively large ocelli present, pigment cups well developed, medially conjoined, separated by less than half an eye diameter, intensely pigmented at inner edges; ventral cup as large as lateral cups (Figs. 26B, C). Cephalic area not laterally protuberant. Frontal area ornamented with pattern of shallow transverse striations (Fig. 26C, D) and single pair of short frontal sensilla (Fig. 26C). Dorsal surface of cephalothorax smooth (Fig. 28A: Queenscliff) or with field of faint transverse wrinkles on anterior position at same level of oral papilla (Fig. 26B: Davies Reef). Ventral surface ornamented with few transverse striae between antennule bases and oral area (Fig. 26C). Additional ornamentation of ventral surface including: 1) one (Fig. 26D) or two (Fig. 28B) pairs of small, cuticular crescent-shaped processes between antennule bases, with peripheral striae; 2) single pair of minute papilla-like processes between nipple-like processes and oral area (Fig. 28B); these processes absent in specimen from sta. 34 (Fig. 26D); 3) pair of symmetrical nipple-like processes on anterior ventral surface located at both sides of oral papilla, processes connected medially by field of transverse striae (Figs. 27C, 30B, C, 31A–C).

Urosome consisting of fifth pedigerous somite, genital double-somite and anal somite, together representing 14–15% of total body length. Relative lengths of urosomites (fifth pedigerous, genital double and free anal somites) 33.8: 38.4–45.0: 23–27.8 = 100, respectively (Figs. 26E, F, 30D–F). Lateral margins of fifth pedigerous somite weakly produced laterally, with or without wrinkles. Genital double-somite longest of urosome, with smooth dorsal and ventral surfaces except for longitudinal wrinkles on lateral margins of posterior half of somite (Fig. 26E, F) and few transverse wrinkles on the posterior half of same somite (Fig. 30D, F). Anterior half of somite moderately swollen; antero-ventral surface of somite moderately expanded (Figs. 27B, 30E). Ovigerous spines paired, separated at base, broken in specimen from sta. 34. Spines slender, about 38–45% of total body length, straight at their base and along shaft, distally tapering into acute points (Fig. 28E, F). Anal somite without medial constriction (Figs. 26E, F, 30D–F). Caudal rami weakly divergent, subrectangular, about 1.3 times as long as wide, armed with three caudal setae.

Antennule length 0.32–0.36 mm, representing about 21.0–21.5% of total body length and 29–35% of cephalothorax length, 4-segmented. Relative length of distal antennular segment 44.8–50 %. In terms of pattern described by Grygier & Ohtsuka (1995) for female monstilloid antennular armature, short, curved spiniform element 1 present on first segment; elements on second segment: 2d1-2, 2v1-3, and IId; element 2v2 longest of

group. Third segment with elements 3, III<sub>d</sub> and III<sub>v</sub> of normal aspect. Segment 4 bearing elements 4d<sub>1,2</sub>, 4v<sub>1-2</sub>, element 4v<sub>3</sub> not observed in any of the specimens examined; elements of this group equally long. Setae IV<sub>d</sub>, IV<sub>v</sub>, V<sub>d</sub>, V<sub>v</sub>, V<sub>m</sub>, and element 4a<sub>es</sub> present. Element 5 absent. Subterminal elements b<sub>1-3</sub>, 5 present, slender, unbranched. Elements 6<sub>1-2</sub> and 6 a<sub>es</sub> present (Figs. 27A, 30A).

Incorporated first pedigerous somite and succeeding three free pedigerous somites each bearing a pair of biramous legs. Pedigerous somites 2–4 together accounting for 20% of total body length. Legs 1–4 slightly increasing in size posteriorly. Intercoxal sclerites of legs 1–4 subrectangular, surface and posterior margin smooth. Bases of legs articulating with large, rectangular coxa along oblique line; with hair-like lateral seta (Figs. 27D–F, 29A–D); on leg 3, this seta about 2–3 times longer, thicker than those on other legs (Figs. 27F, arrowed in Fig. 29C). Endopods and exopods of legs 1–4 triarticulated. Ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3, and inner seta of first exopodal segment, these latter being short, slender. Outermost distal spines on third exopodal segment of legs 1–4 short, 0.25 times as long as segment. Outermost apical setae on third exopodal segment of legs 1–4 with inner margin sparsely setulose, outer margin spinulose.

Armature formula of legs 1–4:

	basis	endopod	exopod
leg 1	1-0	0-1;0-1;1,2,2	1-1;0-1;1,2,2
legs 2–4	1-0	0-1;0-1;1,2,2	1-1;0-1;1,1,2,2

Fifth legs medially conjoined at base, bilobate, outer lobe cylindrical, distally truncate and moderately expanded distally. Inner lobe thumb-shaped, noticeably shorter than outer lobe, unarmed, arising proximally from exopodal lobe and reaching about half its length (Figs. 26F, 28C, 30D, 31D, E). Exopodal lobe armed with three distal setae, innermost seta slightly shorter than the other two.

Male. Not present in the samples examined, described by Desai & Krishnaswamy (1962) from the type locality, Mumbai (Bombay Harbour), India.

**Type locality.** Mumbai Harbour, India.

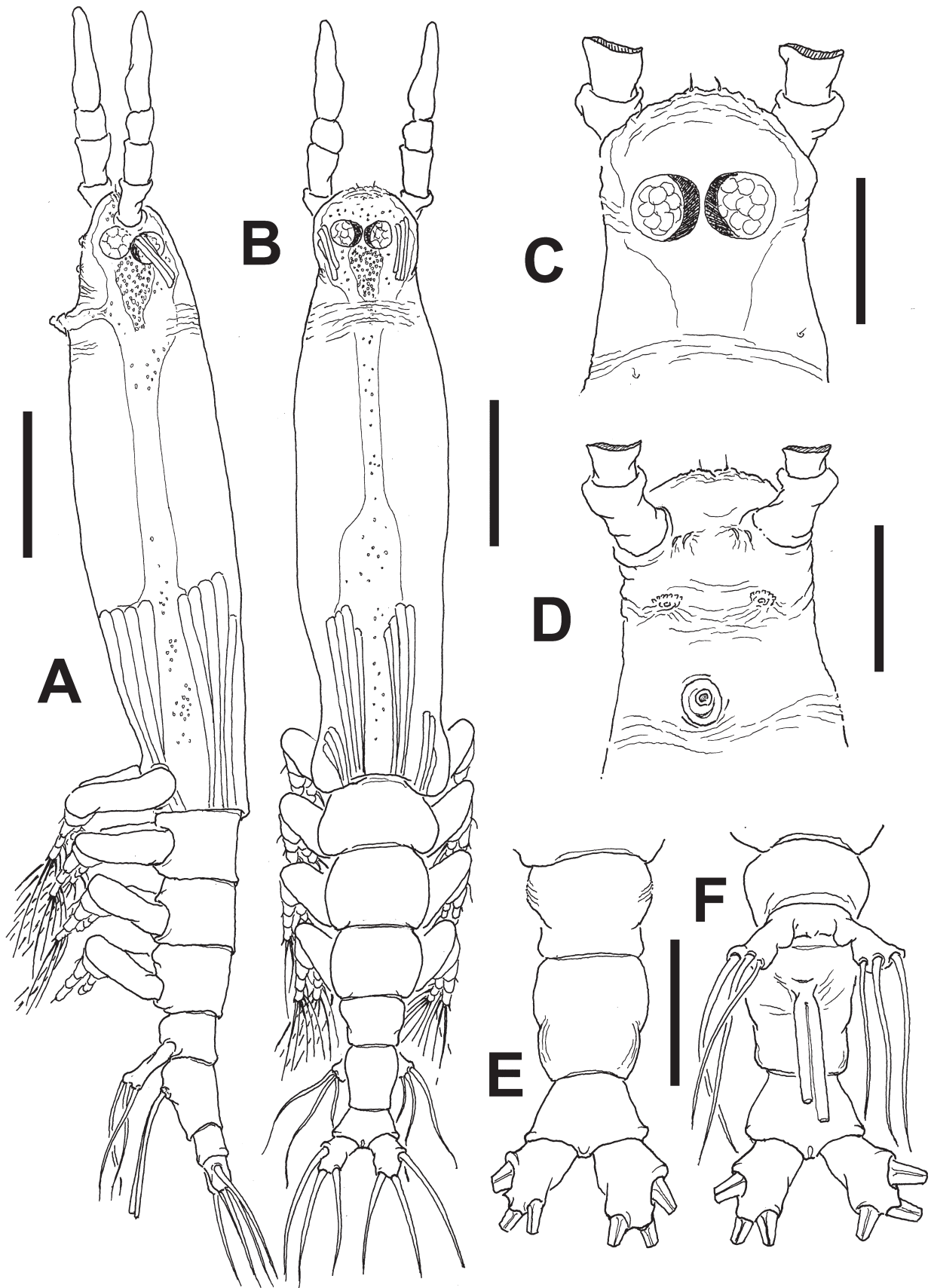
**New localities.** Queenscliff, Victoria and Davies Reef, Queensland, Australia.

**Remarks.** The specimens from Australia (Queenscliff, Victoria and Davies Reef, Queensland) were identified as *C. bali*, a species originally described from off the Bombay Harbour by Desai & Krishnaswamy (1962). The species has not been observed since its original description and additional morphological data are presented in this contribution. The Australian specimens share with *C. bali* the structure and armature of the fifth leg, similar body proportions with the cephalic area narrower than the post-oral region, the same shape of the fifth pedigerous and genital double-somite, and even a remarkably protuberant oral papilla (see Desai & Krishnaswamy 1962: figs 1, 2). They also share a slender antennule and despite the fact that the original description lacks several details of the armature, the proportional length of the fourth antennular segment and the size of the discernible setal elements (Desai & Krishnaswamy 1962: fig. 6) support the notion that the Australian and the Indian specimens belong to the same species.

The fifth leg of this species, with its inner lobe weakly developed, represented by a low rounded protuberance arising from the middle margin of the outer lobe, resembles that of the Australian *C. rafaelmartinezi* **sp. nov.**, but also *C. reticulatum*, *C. striifrons*, and partially to *C. thompsonii*. It has some morphological resemblance with *C. alvaroi* Suárez-Morales & Carrillo, 2013 (Suárez-Morales *et al.* 2013a), both share similar body proportions, a reduced inner lobe on the female fifth leg and a relatively long genital double-somite. The conspicuous frontal process in *C. alvaroi* (Suárez-Morales *et al.* 2013a: fig. 6A) is useful to easily separate it from *C. bali*, in which such process is absent.

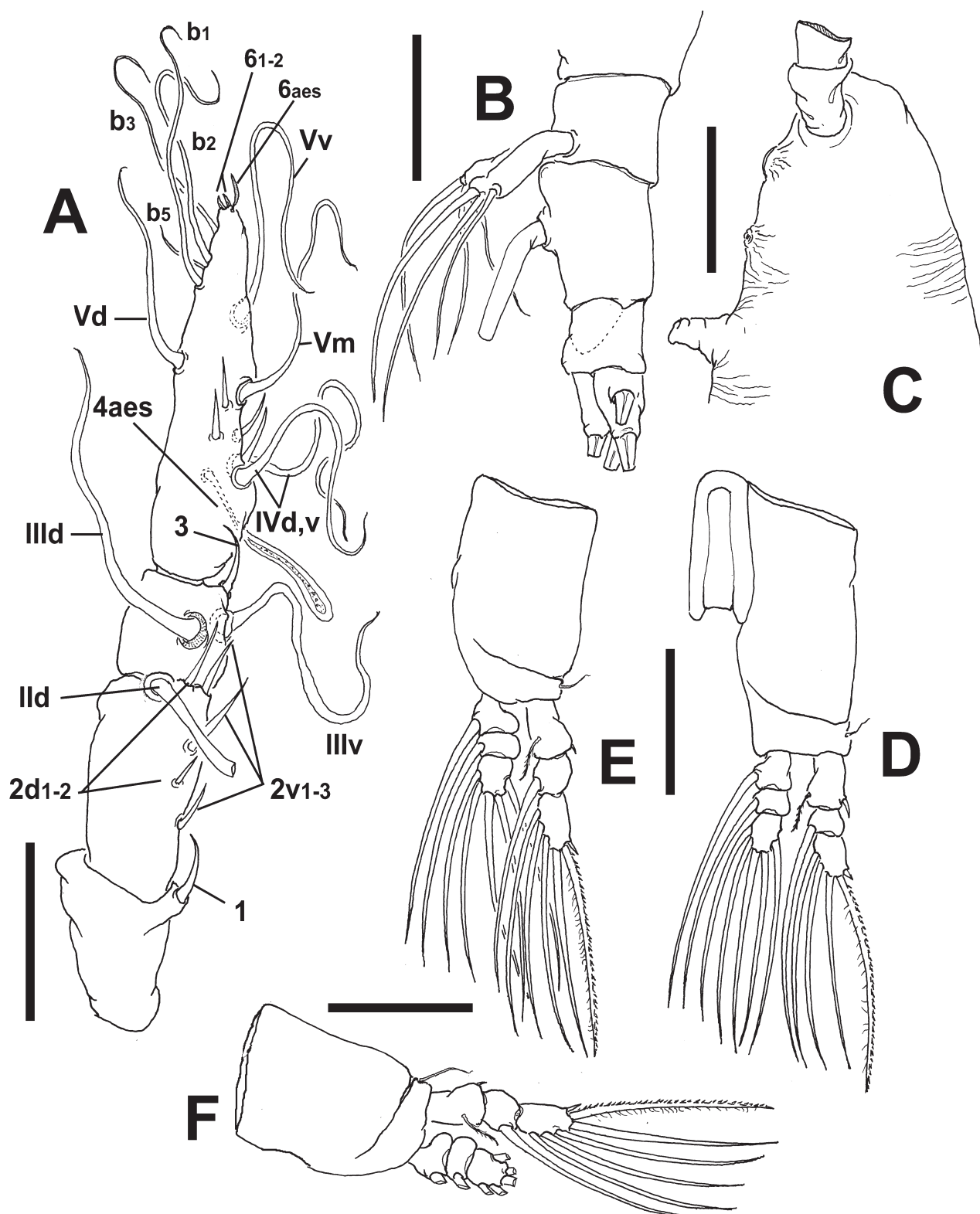
The body proportions of *C. bali* both from Bombay and Australia differ from the Australian *C. rafaelmartinezi*, which has a long, slender cephalothorax and poorly pigmented eyes, thus diverging from the moderately elongate body and strongly pigmented eyes present in *C. bali*. The specimens from Davies Reef and Queenscliff show some subtle differences including the presence, in the specimens from the latter station, of a pair of minute papilla-like processes on the ventral surface between the nipple-like processes and the oral area (Fig. 31A, B); these are absent in the specimen collected at Davies Reef. Also, the three specimens of *C. bali* from Queenscliff lack the few dorsal wrinkles on the cephalic surface described for the specimen from Davies Reef. Otherwise, these two groups of specimens are identical and are thus deemed to represent the same species.



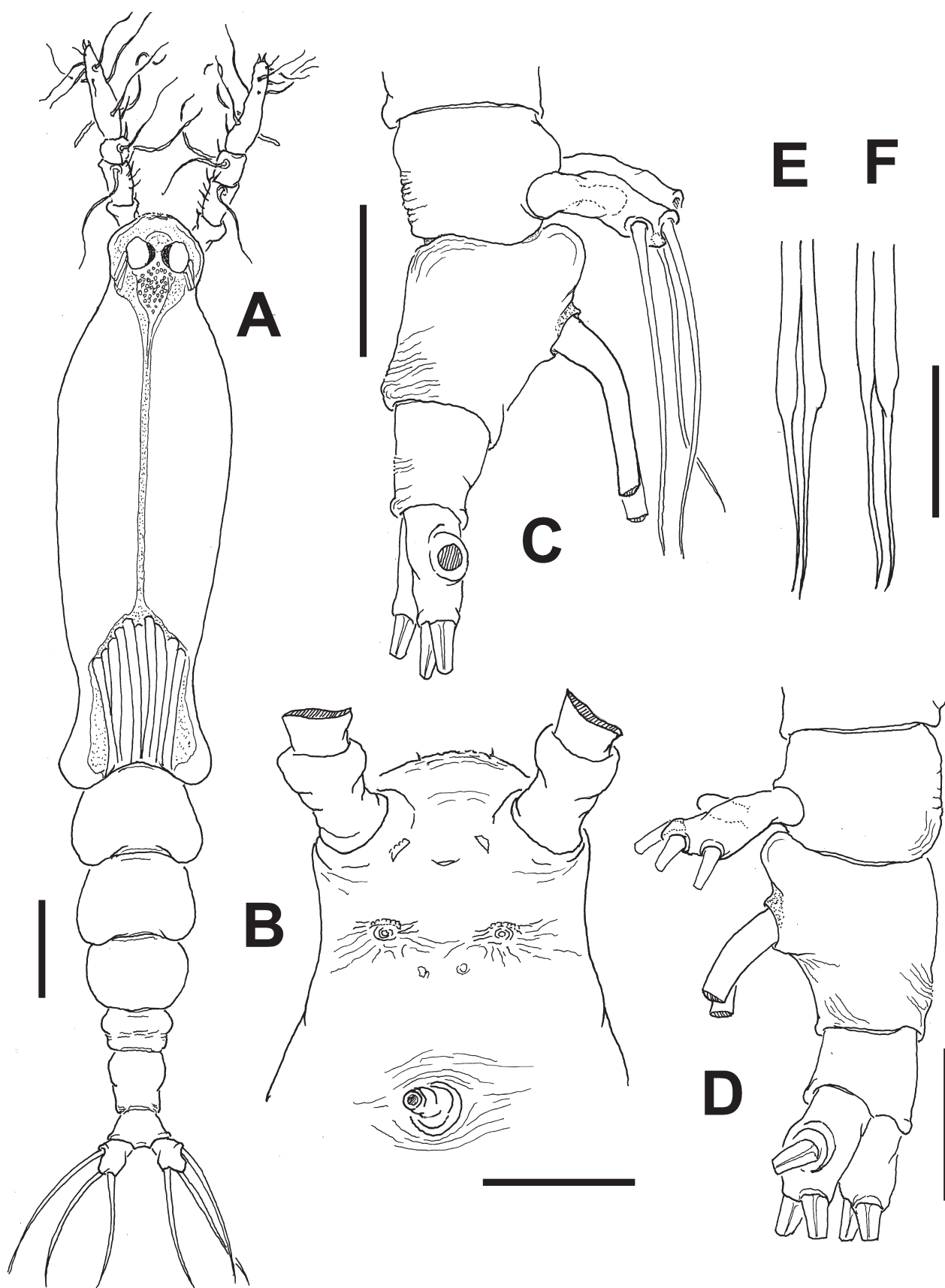


**FIGURE 26.** *Cymbasoma bali* Desai & Krishnaswamy, 1962, adult female, specimen A. A) habitus, lateral view; B) same, dorsal view; C) cephalic region, dorsal view; D) same, ventral view; E) urosome, dorsal view; F) same, ventral view showing fifth legs. Scale bars: A, B = 200  $\mu$ m, C–F = 100  $\mu$ m.

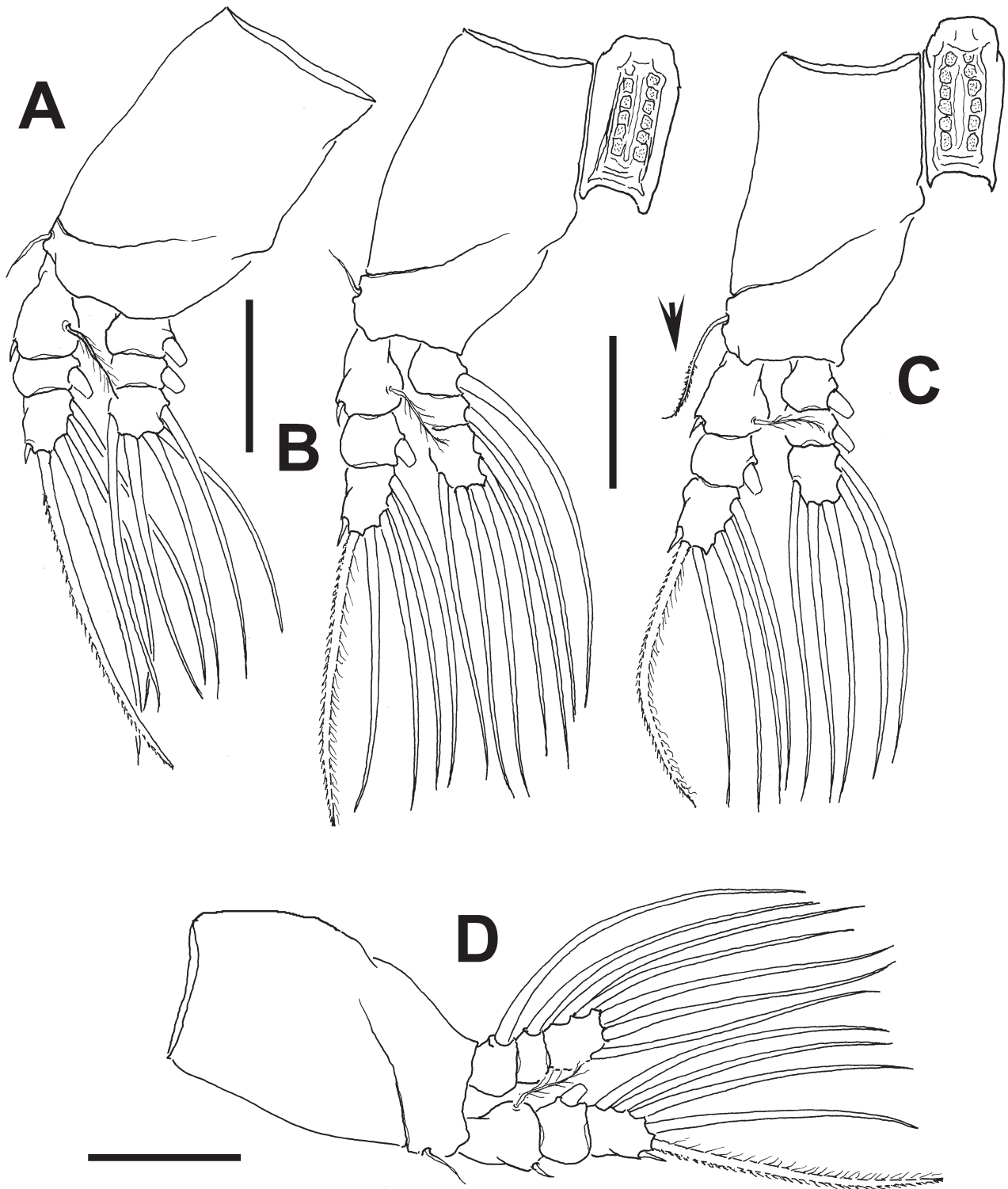




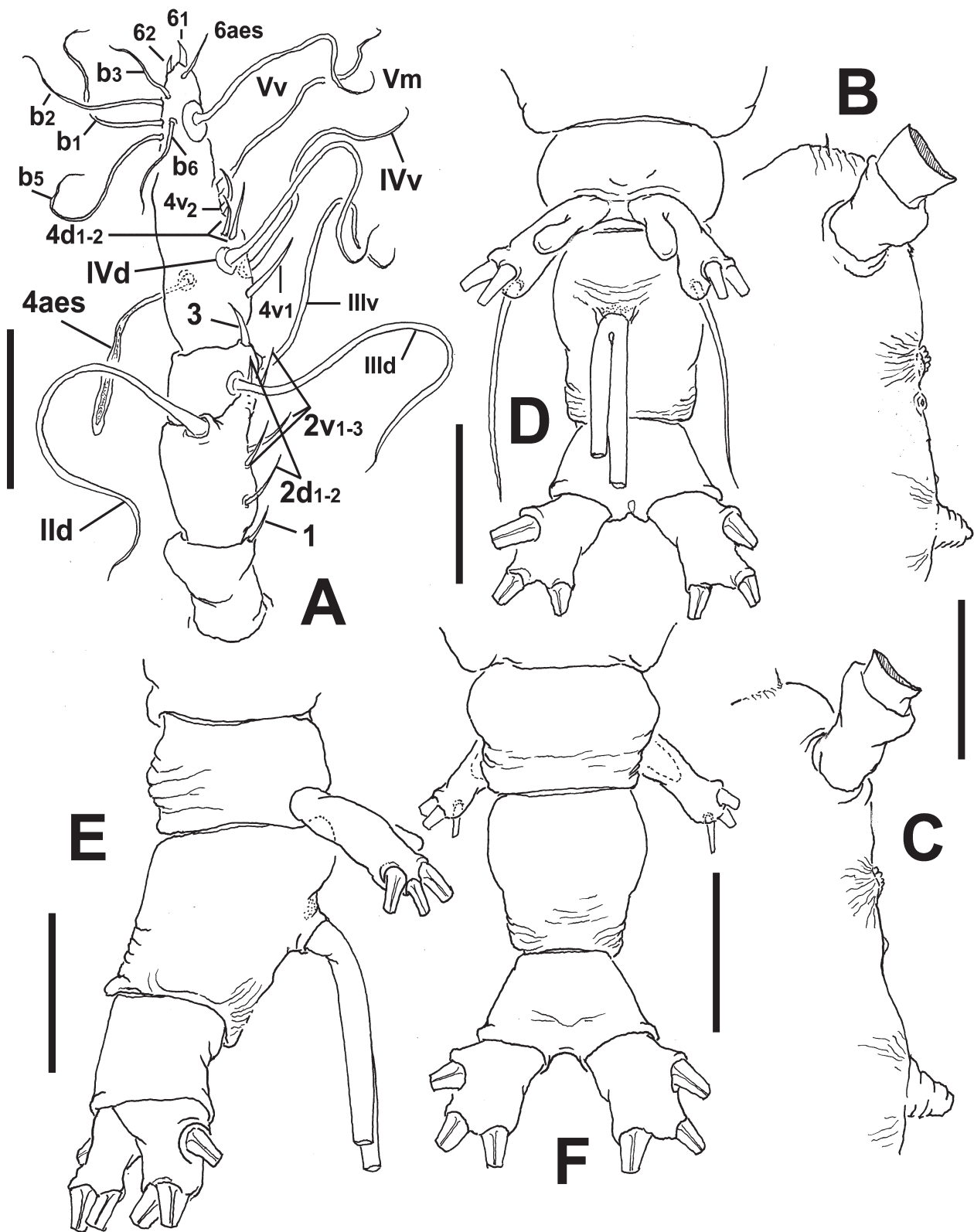
**FIGURE 27.** *Cymbasoma bali* Desai & Krishnaswamy, 1962, adult female, specimen A. A) left antennule, dorsal view; B) urosome, lateral view; C) cephalic region, lateral view; D) first leg; E) second leg; F) third leg. Scale bars: A = 50  $\mu$ m, B–F = 100  $\mu$ m.



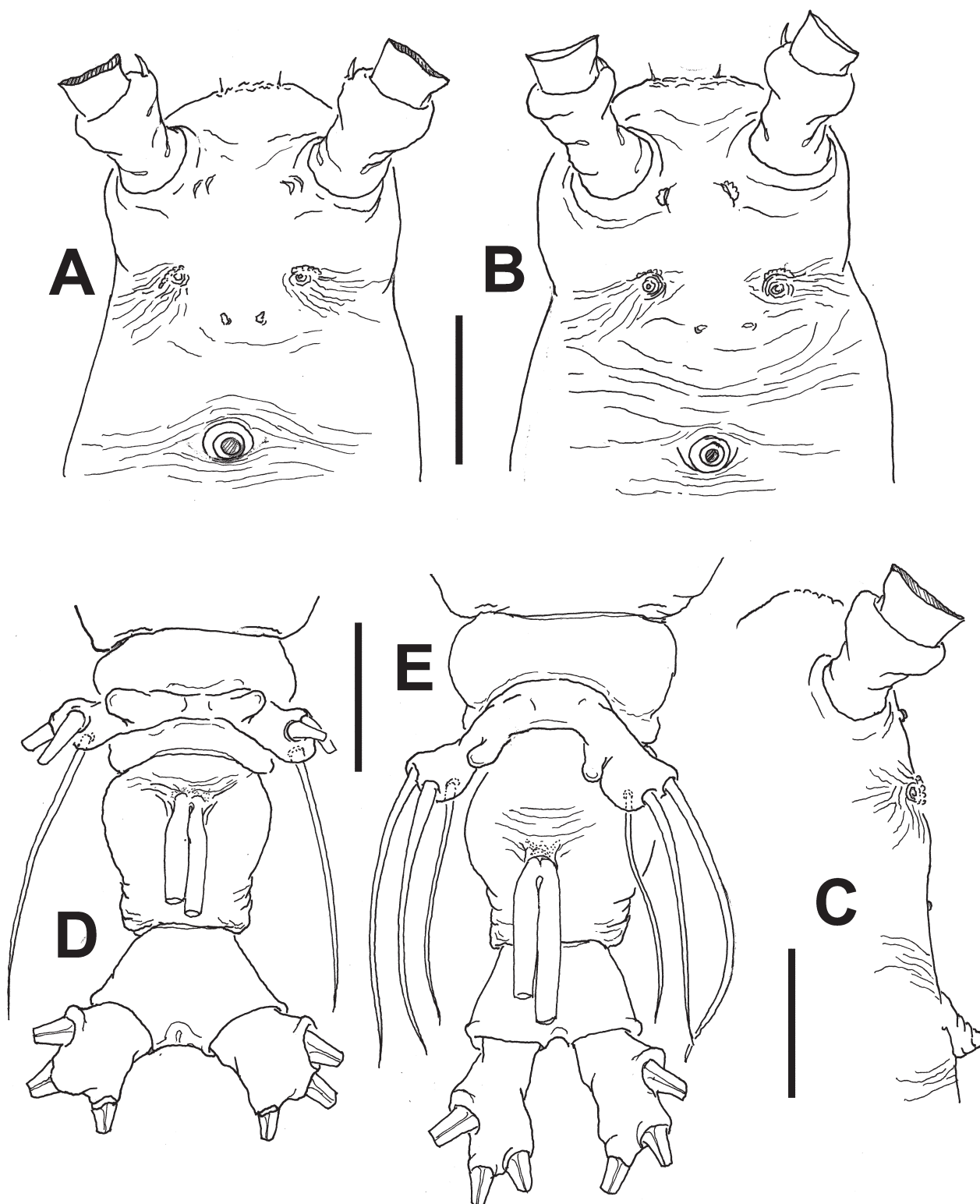
**FIGURE 28.** *Cymbasoma bali* Desai & Krishnaswamy, 1962, adult female, specimen B. A) habitus, dorsal view; B) cephalic region, ventral view; C) urosome, lateral view; D) same, lateral view, specimen C; E, F) distal section of ovigerous spines of two different individuals (B and C). Scale bars: A = 200  $\mu$ m, B–F = 100  $\mu$ m.



**FIGURE 29.** *Cymbasoma bali* Desai & Krishnaswamy, 1962, adult female, specimen B. A) first leg; B) second leg; C) third leg; D) fourth leg. Scale bars: A–D = 100  $\mu$ m.



**FIGURE 30.** *Cymbasoma bali* Desai & Krishnaswamy, 1962, adult females, specimens B and C. A) left antennule, specimen B; B) cephalic region, lateral view; C) same of specimen C; D) urosome and fifth legs, ventral view, specimen C; E) same, lateral view; F) same, dorsal view. Scale bars: A–F = 100  $\mu$ m.



**FIGURE 31.** *Cymbasoma bali* Desai & Krishnaswamy, 1962, adult female. A) cephalic region, ventral view, specimen D; B) same, specimen C; C) cephalic region, lateral view, specimen D; D) urosome and fifth legs, ventral view, specimen A; E) same, specimen C. Scale bars: A–E = 100  $\mu$ m.

Based on the resemblance of this species with the illustrated record of females of *C. thompsonii* from Australia (Dakin & Colefax 1940: fig. 205Ea–c), with the same body proportions (including the shape of the fifth pedigerous and genital double-somite, fifth leg structure and armature, plus the same length of the ovigerous spines as in *C. bali* (Desai & Krishnaswamy 1962: fig. 1)), it is suggested that Dakin & Colefax's (1940) record of *C. thompsonii*



is assignable to *C. bali*. The finding of this species in Australian waters represents the first record of this species after its original description more than 50 years ago and means an important range extension of its known distribution.

***Cymbasoma markhasevae* sp. nov.**

(Figs 32, 33)

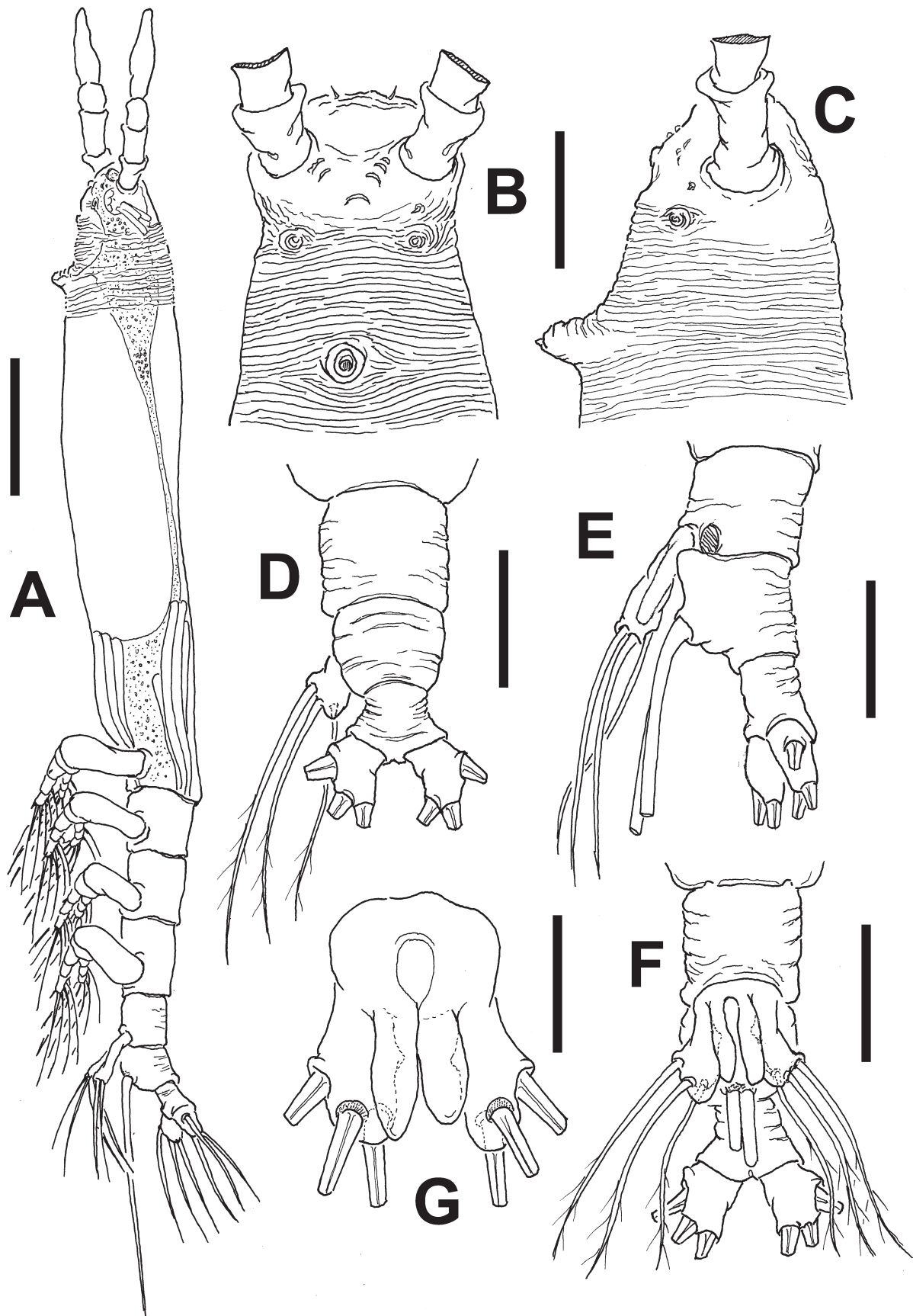
**Material examined.** Holotype: adult female from Warneet, Western Port Bay, Victoria, Australia (38°13.289' S, 145°18.554' E), partially dissected, ethanol-preserved; dissected parts mounted on slides in glycerine, sealed with Entellan®. Date of collection: 29th February 1984. Slides deposited in the collection of MTQ, Australia (cat. MTQ W34391).

**Description of adult female.** Body slender; total length of holotype female 1.41 mm. Cephalothorax approximately 0.92 mm long, representing 66% of total body length. Midventral oral papilla protuberant, located at 19% of cephalothorax length (Fig. 32C). Pair of relatively large ocelli present, pigment cups well developed, medially conjoined, separated by less than half an eye diameter, weakly pigmented; ventral cup as large as lateral cups. Frontal area ornamented with pattern of shallow transverse striations (Fig. 32B, C) and single pair of frontal sensilla (Fig. 32B). Anterior part of cephalothorax with fringe of transverse striae stretching around body from region of oral papillae and post-oral area. Ventral surface ornamented with few transverse striae between antennule bases and oral area. Additional ornamentation of ventral surface including: 1) three pairs of small, cuticular crescent-shaped processes between antennule bases, with no adjacent striae (Fig. 32B); 2) medial crescent-shaped process, larger than anterior paired processes; 3) pair of symmetrical nipple-like processes on anterior ventral surface located anterior to oral papilla, processes with concentric wrinkles and connected medially by transverse striae.

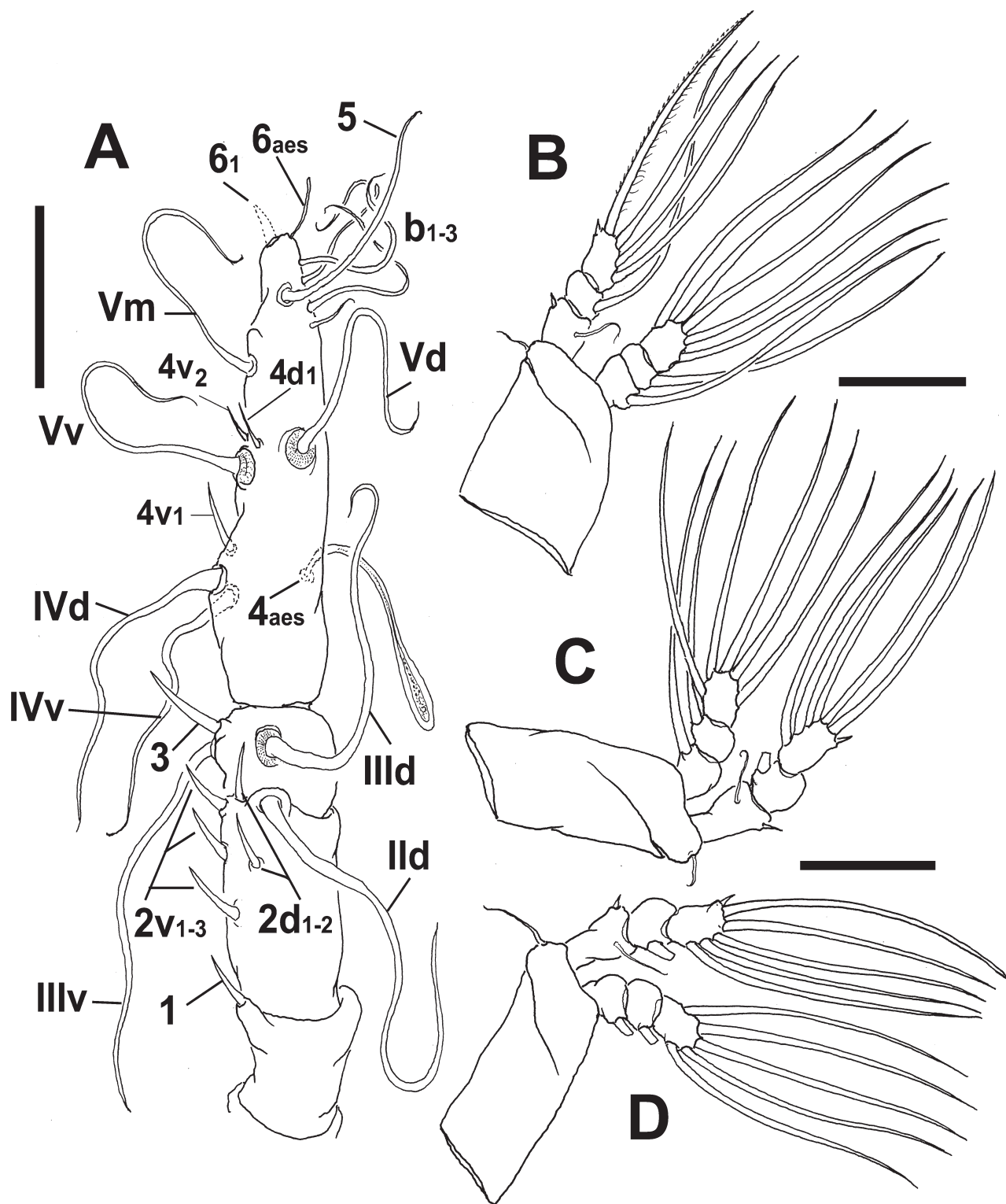
Urosome consisting of fifth pedigerous somite, genital double-somite and anal somite, together representing 13% of total body length. Relative lengths of urosomites (fifth pedigerous, genital double and free anal somites) 43.2: 33.3: 23.5 = 100, respectively (Fig. 32D, E). Lateral margins of fifth pedigerous somite straight. Fifth pedigerous somite longest of urosome, with straight lateral margins and wrinkles on dorsal and ventral surfaces (Fig. 32D, E). Genital double-somite relatively short, anterior half of somite moderately expanded, slightly tapering posteriorly, with transverse wrinkles on dorsal surface. Antero-ventral surface of somite protuberant (Fig. 32E). Ovigerous spines paired, separated at base, relatively short, 25% of total body length (0.35 mm). Spines slender, straight at their base and along shaft, distally acute. Anal somite medially constricted, with deep striae on lateral surface (Fig. 32D). Caudal rami weakly divergent, subrectangular, about 1.2 times as long as wide, armed with three caudal setae (Fig. 32D, F).

Antennule length 0.27 mm, representing about 19.4% of total body length and 28.4% of cephalothorax length, 4-segmented. Relative length of distal antennular segment 52.3%. In terms of pattern described by Grygier & Ohtsuka (1995) for female monstilloid antennular armature, short, spiniform element 1 present on first segment; elements on second segment: 2d1-2, 2v1-3, and IId. Third segment with strong spiniform element 3; IIId and IIIv of normal aspect. Segment 4 bearing elements 4d1, 4v1-2, other element on group not observed; setae IVd, IVv, Vd, Vv, Vm, and 4aes present. Element 5 long, setiform. Subterminal elements b1-4 present, unbranched, elements 61-2 not present in specimens, but socket was observed on position of 61 (Fig. 33A).

Incorporated first pedigerous somite and succeeding three free pedigerous somites each bearing a pair of biramous legs. Pedigerous somites 2-4, together accounting for 20% of total body length. Legs 1-4 slightly increasing in size posteriorly. Intercoxal sclerites of legs 1-4 subrectangular, surface and posterior margin smooth. Bases of legs 1-4 articulating with large, rectangular coxa along oblique line; with hair-like lateral seta (Figs. 33B-D); on leg 3, this seta about 2.5 times longer, thicker than those on other legs (Fig. 33D). Endopods and exopods of legs 1-4 triarticulated. Ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3, and inner seta of first exopodal segment, these latter being short, slender. Outermost distal spines on third exopodal segment of legs 1-4 short, 0.25 times as long as segment. Outermost apical setae on third exopodal segment of legs 1-4 with inner margin sparsely setulose, outer margin spinulose.



**FIGURE 32.** *Cymbasoma markhasevae* sp. nov., adult female. A) habitus, lateral view; B) cephalic region, ventral view; C) same, lateral view; D) urosome, dorsal view; E) same, lateral view, left fifth leg omitted to observe anteroventral protuberance; F) same, ventral view; G) fifth legs, ventral view. Scale bars: A = 200  $\mu$ m, B–F = 100  $\mu$ m, G = 50  $\mu$ m.



**FIGURE 33.** *Cymbasoma markhasevae* sp. nov., adult female. A) right antennule, dorsal view; B) first leg; C) second leg; D) third leg. Scale bars: A= 50  $\mu$ m, B–D = 100  $\mu$ m.

Armature formula of legs 1–4:

	basis	endopod	exopod
leg 1	1-0	0-1;0-1;1,2,2	1-1;0-1;1,2,2
legs 2–4	1-0	0-1;0-1;1,2,2	1-1;0-1;1,1,2,2

Fifth legs medially conjoined, bilobate, outer (exopodal) lobe cylindrical, relatively short, with distal rounded process. Inner lobe arising basally, thumb-like, almost reaching distal margin of exopodal lobe. Exopodal lobe armed with three subapical setae, innermost seta slightly shorter than the other two (Fig. 32 E, F).

Male: unknown.

**Type locality.** Warneet, Western Port Bay, Victoria, Australia (38°13.289' S, 145°18.554' E).

**Etymology.** The species is dedicated to Elena (Lena) Markhaseva, Zoological Institute of the Russian Academy of Sciences, for her contributions to the taxonomic knowledge of the planktonic Copepoda.

**Diagnosis.** *Cymbasoma* with long cephalothorax, representing 66% of total body length, third antennular segment representing more than 52% of antennule length, with two pairs of crescent-like processes on ventral surface of cephalic region; additional medial crescent process. Cephalothorax with reduced but complete fringe of striation covering about 1/5 of cephalothorax. Genital double-somite shorter than fifth pedigerous somite, with tapering posterior half; urosomites with deep dorsal striae. Anal somite with medial constriction. Fifth leg with elongate, outer lobe with three setae, two distal and one subdistal, inner lobe arising basally, narrow, almost reaching distal end of outer lobe, unarmed.

**Remarks.** This species shares with other Australian female *Cymbasoma* (*C. bidentatum*, *C. annulocolle*) a fifth leg with a slender, elongate inner lobe arising proximally from the same base as the outer lobe that is armed with three subequal setae. Because of the presence of a fringe of striae partially covering the anterior section of the cephalothorax, it appears to be most closely related to *C. annulocolle*, because cephalic striation is absent in *C. bidentatum*. Some of the differences encountered in the genital double-somite between these species (*i.e.* relative size and presence of posterolateral processes and a lower anteroventral process) are presented in the remarks section of *C. annulocolle*. Some additional, subtle differences can be found in the antennular armature; elements 2v1-3 and 2d1-2 are clearly longer in *C. annulocolle* (Fig. 14A) than in the new species (Fig. 33A). The cephalothoracic ornamentation is different in these two species; the new species *C. markhasevae* has a set of three pairs of crescent-shaped processes between the antennule bases (Fig. 32B); these processes are absent in *C. annulocolle*, which in turn has a pair of papilla-like processes (Fig. 13C). In addition, the urosome, including the fifth pedigerous somite, the genital double-somite, and the anal somite have lateral and dorsal striae, whereas the surface of the urosomites is smooth in *C. annulocolle* except for a few lateral wrinkles on the anal somite (Fig. 13F). As explained in the comparative discussions of *C. annulocolle* below, the shape and proportions of the fifth pedigerous and genital double-somites is different in these species. In *C. markhasevae* the fifth pedigerous somite has straight lateral margins and lacks the postero-lateral rounded processes present in *C. annulocolle*. The genital double-somite is clearly wider and shorter in *C. markhasevae* than in *C. annulocolle*; this somite is slightly longer than the fifth pedigerous somite whereas it is clearly shorter than the fifth pedigerous somite in *C. markhasevae* (Fig. 32D). The antero-ventral process of the genital double-somite is weakly developed in the new species and it is clearly stronger in *C. markhasevae* (Fig. 32E).

### *Cymbasoma apicale* sp. nov.

(Figs 34, 35)

**Material examined.** Holotype: adult female from near St Kilda, Port Phillip Bay, Victoria, Australia (37°53.466' S, 144°55.687' E; Station K of Kimmerer & McKinnon 1985), partially dissected, ethanol-preserved; dissected parts mounted on slide in glycerine, sealed with Entellan®. Date of collection: 23rd January 1984. Slides deposited in the collection of MTQ, Australia (cat. MTQ W34392).

**Description of adult female.** Body robust, relatively wide in dorsal view (Fig. 34A, B); body length of holotype female 1.82 mm. Cephalothorax approximately 0.9 mm long, representing about 50% of total body length. Midventral oral papilla moderately protuberant, located at 30% of cephalothorax length. Pair of relatively large ocelli present, pigment cups well developed, medially conjoined, intensely pigmented at inner half; ventral cup larger than lateral cups (Fig. 34A). Cephalic area wide, with rounded, slightly produced "forehead". Cephalic frontal area wide, ornamented with pattern of transverse striations (Fig. 34C), pair of short sensilla present and single medial globose protuberance (marked as #1 in Fig. 35A). Dorsal surface of cephalothorax smooth except for field of shallow reticulation overlying ocellar area (Fig. 34C), ventral surface with field of transverse cuticular wrinkles at preoral area. Ventral surface also with 1) pair of symmetrical, crescent-shaped processes on anterior ventral surface located near bases of antennules, with no adjacent striae (marked as #2 in Fig. 35A); 2) pair of nipple-like processes with concentric pattern of striae.



Urosome consisting of fifth pedigerous somite, genital double-somite and anal somite, together representing 17% of total body length. Relative lengths of urosomites (fifth pedigerous, genital double- and free anal somites) 25.7: 48.5: 25.8 = 100, respectively. Lateral margins of fifth pedigerous somite straight, with transverse wrinkles on dorsal and lateral surfaces. Genital double-somite longest of urosome, with ventral and dorsal surfaces ornamented with wrinkles (Fig. 34D, E, 35B, C), anterior half swollen, posterior half with straight margins. Oviparous spines paired, basally separated, slender, straight at their bases (Fig. 34D), relatively short (0.63 mm), approximately 33% of total body length. Anal somite without clear medial constriction but with deep transverse wrinkles along lateral margins, reaching ventral surface (Fig. 35B). Caudal ramus subrectangular, about 1.6 times as long as wide, armed with three caudal setae.

Antennule length 0.38 mm, representing about 21% of total body length and 36% of cephalothorax length, 4-segmented. Relative length of distal antennular segment 46.5%. In terms of pattern described by Grygier & Ohtsuka (1995) for female monstrellid antennular armature, moderately long, slender element 1 present on first segment; elements on second segment: 2d1-2, 2v1-3, and IId. Elements 2v1-2 remarkably long, the latter reaching proximal 1/3 of fourth antennular segment (Fig. 35D). Third segment with element 3 being long, spiniform, elements IIId and IIIV setiform, of normal aspect. Segment 4 bearing short elements 4d1,2 and 4v1-2, the former long, the latter short, hook-like; element 4v3 not observed. Setae IVd, Vd, Vv, Vm present. Element 5 present, straight, spiniform. Subterminal elements b1-3 present, distally branched, elements b6 and b5 slender. Elements 61 and 62 present, the latter being remarkably long (Fig. 35D).

Incorporated first pedigerous somite and succeeding three free pedigerous somites each bearing a pair of biramous legs. Pedigerous somites 2–4, together accounting for 27% of total body length. Intercoxal sclerites of legs 1–4 subrectangular, surface and posterior margin smooth. Bases of legs 1–4 with hair-like lateral seta (Fig. 35 E, F); on leg 3, this seta about three times longer, thicker than those on other legs (Fig. 35F). Endopods and exopods of legs 1–4 triarticulated. Ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3, and inner seta of first exopodal segment, these latter being short, slender. Outermost distal spines on third exopodal segment of legs 1–4 short, 0.2 times as long as segment. Outermost apical exopodal setae of legs 1–4 with inner margin setulose, outer margin spinulose.

Armature formula of legs 1–4:

	basis	endopod	exopod
leg 1	1-0	0-1;0-1;1,2,2	1-1;0-1;1,2,2
legs 2–4	1-0	0-1;0-1;1,2,2	1-1;0-1;1,1,2,2

Fifth legs medially conjoined, bilobate, outer (exopodal) lobe subrectangular, distally truncate. Outer lobe armed with three subdistal setae (Fig. 34D). Inner lobe thumb-shaped, noticeably shorter than outer lobe, unarmed, arising subdistally from exopodal lobe and reaching its distal margin (Fig. 34E, 35C).

Male: unknown.

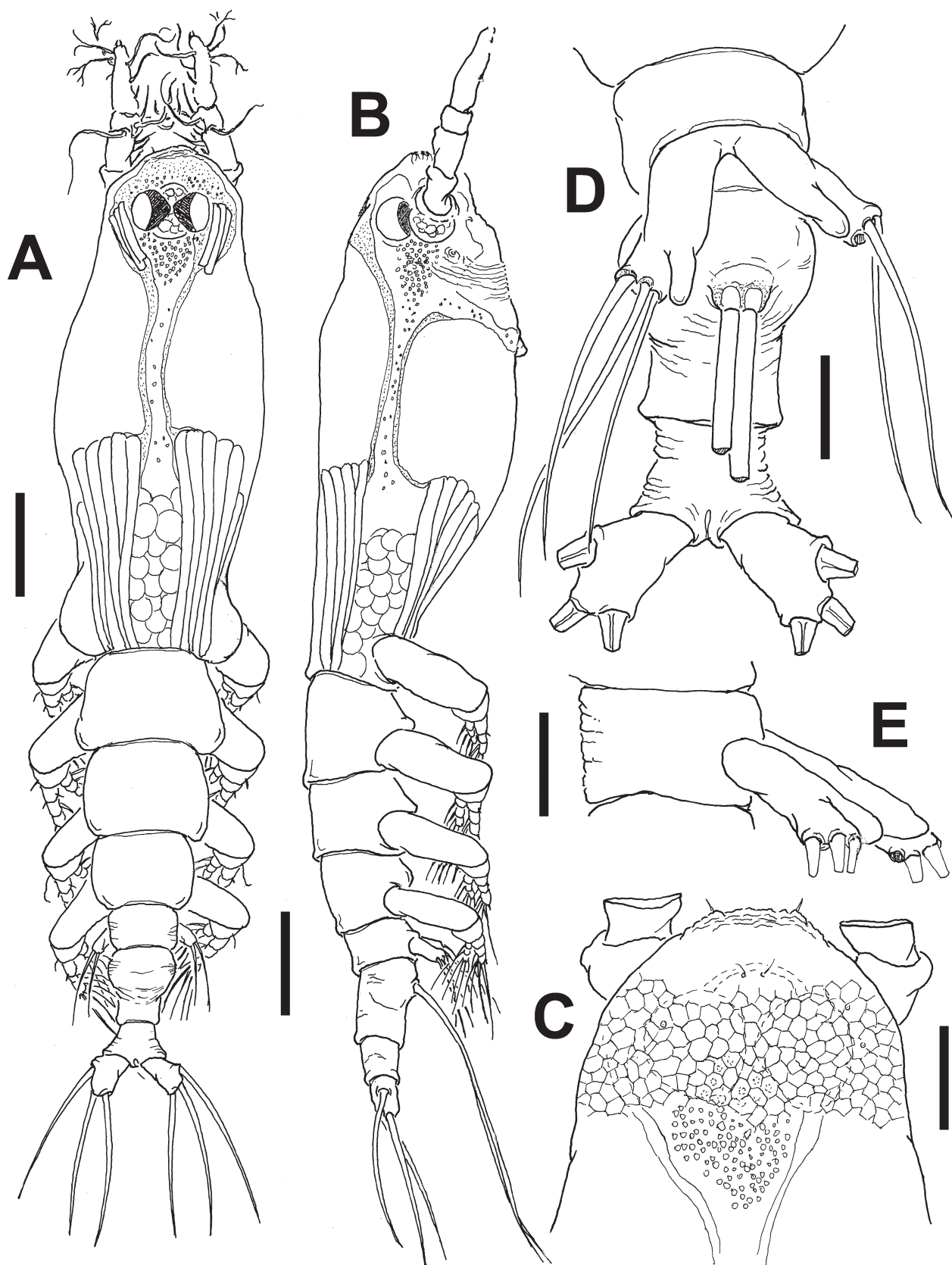
**Type locality.** Port Phillip Bay, Victoria, Australia (37°53.466' S, 144°55.687' E).

**Etymology.** The specific name, an adjective derived from the Latin *apicalis* (= apical), refers to the position of the inner lobe of the female fifth leg, which arises very near the apex of the outer lobe.

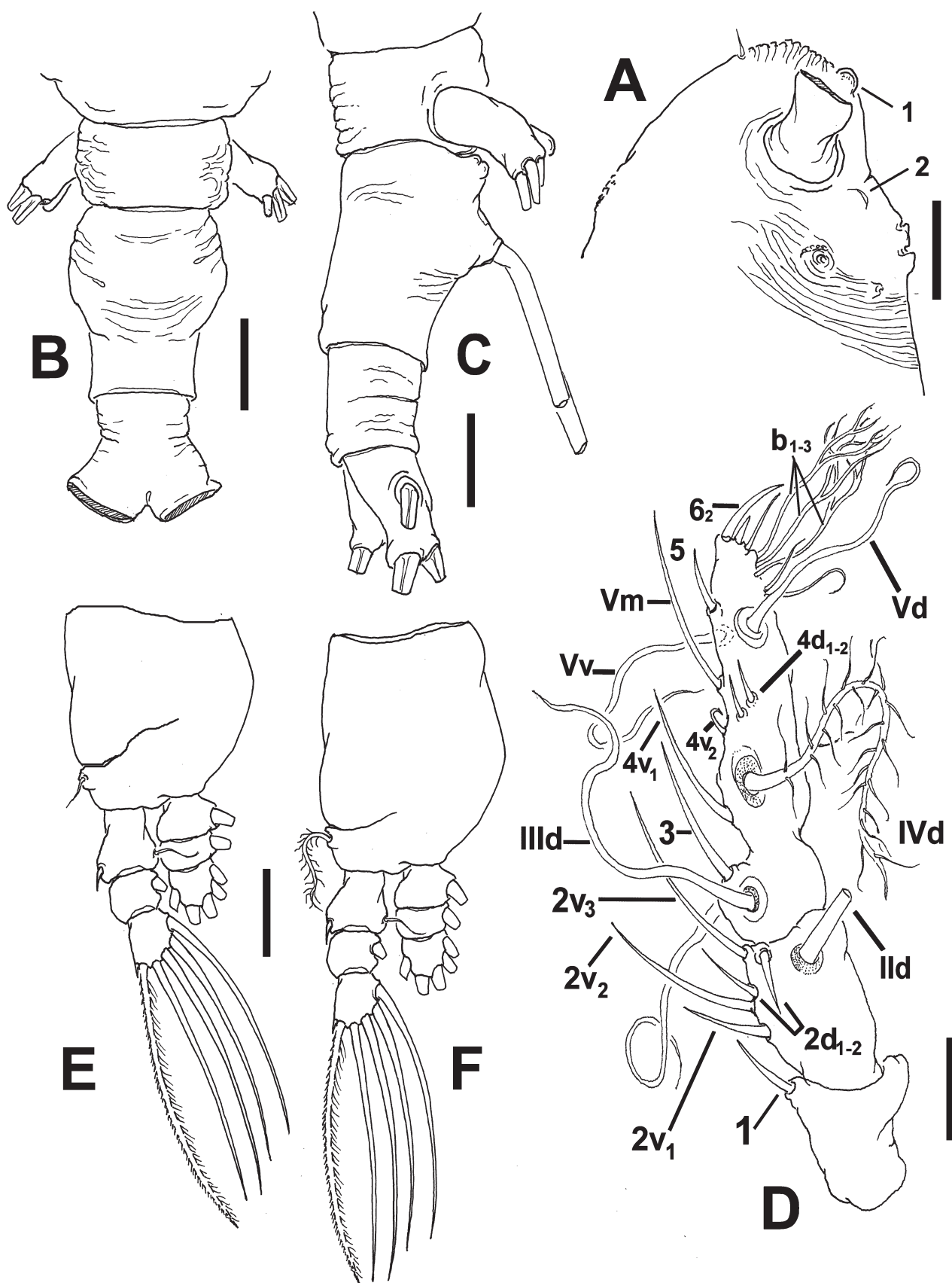
**Diagnosis.** *Cymbasoma* with relatively short cephalothorax, representing 50% of total body length, third antennular segment representing 42% of antennule length, with elements 2v2-3 and 62 remarkably long. Cephalic region with pair of crescent-like processes on ventral surface and small medial ball-like protuberance in same position. Eyes well-developed, intensely pigmented at inner half. Cephalothorax with dorsal field of reticulation covering part of cephalic region. Genital double-somite longest of urosome, with rounded proximal half, distal half with straight margins. Anal somite with corrugate lateral margins. Fifth leg with elongate, outer lobe with three distal setae, inner lobe distinctly arising subdistally, narrow, short, reaching distal end of outer lobe, unarmed. Oviparous spines short, 33% of total body length.

**Remarks.** This species has a fifth leg with a short, thumb-like inner lobe arising from the distal half of the outer exopodal lobe and reaching its distal end, thus diverging from the pattern of other Australian species of *Cymbasoma* with a long, digitiform lobe arising basally, like *C. annulocolle*, *C. bidentatum* and *C. markhasevae*. It most closely resembles *C. davisii* from Florida (Suárez-Morales & Pilz 2008) which shares with the new species the





**FIGURE 34.** *Cymbasoma apicale* sp. nov., adult female. A) habitus, dorsal view; B) same, lateral view; C) cephalic area showing field of cuticular reticulation, dorsal view; D) urosome, ventral view; E) detail of fifth pedigerous somite and fifth legs, lateral view. Scale bars: A, B = 200 µm, C–E = 100 µm.



**FIGURE 35.** *Cymbasoma apicale* sp. nov., adult female. A) cephalic region, lateral view showing medial single (1) and smaller paired (2) ventral processes; B) fifth pedigerous, genital double and anal somites showing dorsal ornamentation; C) urosome, lateral view; D) right antennule, dorsal view; E) second leg; F) third leg. Scale bars: A–F = 100  $\mu$ m.

same type of fifth leg, a ventral field of transverse wrinkles on the preoral area, and a similar body shape and proportions except for a narrower cephalic area (both dorsally and laterally) in the new species. The preoral area of *C. davisii* is strongly concave even in different specimens (Suárez-Morales & Pilz 2008), whereas it is ventrally produced in the *C. apicale* **sp. nov.** (Fig. 34B). Also, in the new species the anterior dorsal part of the cephalic area has a reticulated field (Fig. 34C), a character that is absent in *C. davisii* (Suárez-Morales & Pilz 2008: fig. 1A). The antennular setae of group “b” (*sensu* Grygier & Ohtsuka 1995) are simple in *C. davisii* (Suárez-Morales & Pilz 2008: fig. 1C) but distally branched in the new species (Fig. 34A). Also, in the new species the eyes are strongly pigmented, thus differing from the unpigmented eyes of *C. davisii* (Suárez-Morales & Pilz 2008: fig. 4C–E). The shape of the genital double-somite is also different in these two species; its proximal half is subquadrate, with straight lateral margins in *C. davisii* (Suárez-Morales & Pilz 2008: fig. 3B) and rounded in the new species (Figs 34D, 35B). The three exopodal setae of the fifth leg are all distal in the new species whereas only the middle seta is apical and the other two are subapical in *C. davisii* (Suárez-Morales & Pilz 2008: fig. 3A). *Cymbasoma apicale* **sp. nov.** has some affinities with the European *C. germanicum*, as redescribed by Suárez-Morales (2006). Both species have the same body shape and proportions, similar shape and ornamentation of the genital double-somite, and a constricted anal somite. They differ in the length of the inner lobe of the fifth leg, which is longer in *C. germanicum* (Suárez-Morales 2006: fig. 4b), arising from the proximal 1/3 of the outer lobe. The genital double-somite of *C. germanicum* has a plate-like lateral process on the posterior margin (Suárez-Morales 2006: fig. 2b); this process is absent in the new species. The anal somite of *C. germanicum* lacks the deep wrinkles (Suárez-Morales 2006: fig. 4d) shown by the new species on the lateral surface (Figs 34D, 35B). Also, the eyes are not pigmented in *C. germanicum* (Suárez-Morales 2006) and they are strongly pigmented in the new species. It differs from *C. spinapex* Isaac, 1974 in the body shape, with a longer, more slender cephalothorax (Isaac 1974) *vs.* a more shorter, relatively robust cephalothorax in the new species; also *C. spinapex* has a fifth leg outer lobe with the middle seta being shortest, *vs.* all setae being equally long in the new species. *Cymbasoma tropicum* has a similar fifth leg, with an inner lobe arising from the distal half of the outer lobe (Martin Thompson & Easterson 1983: fig. 1j), but the inner lobe is clearly narrower in the new species (Fig. 34D). Finally, the anal somite is smooth and the cephalothorax is long and slender in *C. tropicum* (Martin Thompson & Easterson 1983: fig. 1a, b, d), thus contrasting with the relatively short, robust cephalothorax of the new species.

### ***Cymbasoma constrictum* sp. nov.**

(Figs 36, 37)

**Material examined.** Holotype: Adult female from Davies Reef, Queensland, Australia (18° 48.78' S, 147° 39.30' E), partially dissected, ethanol-preserved; dissected parts mounted 2 slides in glycerine, sealed with Entellan®. Date of collection: 3rd February 1989. Slides deposited in the collection of MTQ, Australia (cat. MTQ W34393).

**Description of adult female.** Body robust, relatively wide in dorsal view, cephalothorax globose in lateral view; body length of holotype female = 1.31 mm. Cephalothorax approximately 0.76 mm long, representing 58% of total body length. Midventral oral papilla not particularly protuberant, located at 27% of cephalothorax length. Pair of relatively large ocelli present, pigment cups well developed, medially conjoined, intensely pigmented at inner half; ventral and lateral cups with similar diameter (Fig. 36A). Cephalic area wide, with slightly produced “forehead” (Fig. 36C), frontal area ornamented with pattern of transverse and concentric striations (Fig. 36C), frontal sensilla absent. Dorsal surface of cephalothorax smooth except for field of transverse striae and field of reticulation overlying ocellar area (Fig. 36C), ventral surface with transverse cuticular wrinkles at preoral area. Ventral surface also with: 1) pair of symmetrical, crescent-shaped processes on anterior ventral surface located near bases of antennules, with adjacent striae (Fig. 37A); 2) pair of nipple-like processes with concentric pattern of striae; 3) pair of minute papilla-like processes between nipple-like processes and oral area (Fig. 37A).

Urosome consisting of fifth pedigerous somite, genital double-somite and anal somite, together representing 18% of total body length. Relative lengths of urosomites (fifth pedigerous, genital double- and free anal somite) 24: 37: 39 = 100, respectively (Figs. 37E). Lateral margins of fifth pedigerous somite moderately produced, rounded, with field of transverse wrinkles on dorsal surface covering posterior half of somite (Fig. 37E). Genital double-somite slightly shorter than anal somite, with ventral and dorsal surfaces ornamented with wrinkles (Fig. 37E, F), anterior half swollen, with strong constriction at posterior 2/3 of somite; posterior half with protruding margins.

Ovigerous spines paired, basally separated, slender, straight at their bases, relatively long, 62% of total body length (0.81 mm) (Fig. 36B, G). Anal somite longest of urosome, with strong medial constriction and faint longitudinal wrinkles at constriction area (Fig. 37E, F). Caudal ramus subrectangular, about 1.6 times as long as wide, armed with three caudal setae.

Antennule length 0.29 mm, representing about 23% of total body length and 39% of cephalothorax length, 4-segmented. Relative length of distal antennular segment 43.5%. In terms of pattern described by Grygier & Ohtsuka (1995) for female monstilloid antennular armature, short, spiniform element 1 present on first segment; elements on second segment: 2d1-2, 2v1-3, and IId. Third segment with element 3 being strong, spiniform, elements IIId and IIIv setiform, of normal aspect. Segment 4 bearing elements 4d1,2, 4v1, elements 4v2-3 not observed; setae IVd, IVv, Vv, Vm, and aesthetasc 4aes present. Element 5 absent. Subterminal elements b1-3 and b6 present, unbranched, elements 61 not observed, probably broken off; element 62 present, small (Fig. 37B).

Incorporated first pedigerous somite and succeeding three free pedigerous somites each bearing a pair of biramous legs. Pedigerous somites 2–4 together accounting for 22% of total body length. Intercostal sclerites of legs 1–4 subrectangular, with patches of minute spinules (Fig. 37C, D), posterior margin smooth. Bases of legs 1–4 articulating with large, rectangular coxa along oblique line; with hair-like lateral seta; on leg 3, this seta about twice as long as and noticeably thicker than those on other legs (Fig. 37 D). Endopods and exopods of legs 1–4 triarticulated. Ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3, and inner seta of first exopodal segment, these latter being short, slender. Outer spines on first exopodal segments of legs 1–4 remarkably reduced in size. Outermost distal spines on third exopodal segment of legs 1–4 short, 0.2 times as long as segment. Outermost apical exopodal setae of legs 1–4 with inner margin setulose, outer margin spinulose.

Armature formula of legs 1–4:

	basis	endopod	exopod
leg 1	1-0	0-1;0-1;1,2,2	1-1;0-1;1,2,2
legs 2–4	1-0	0-1;0-1;1,2,2	1-1;0-1;1,1,2,2

Fifth legs medially separate, bilobate, outer (exopodal) lobe subrectangular, distally truncate, and armed with three terminal, subequally long setae (Fig. 37F). Inner lobe thumb-shaped, noticeably shorter than outer lobe, unarmed, arising from exopodal lobe but not reaching its distal margin (Fig. 36F).

Male: unknown.

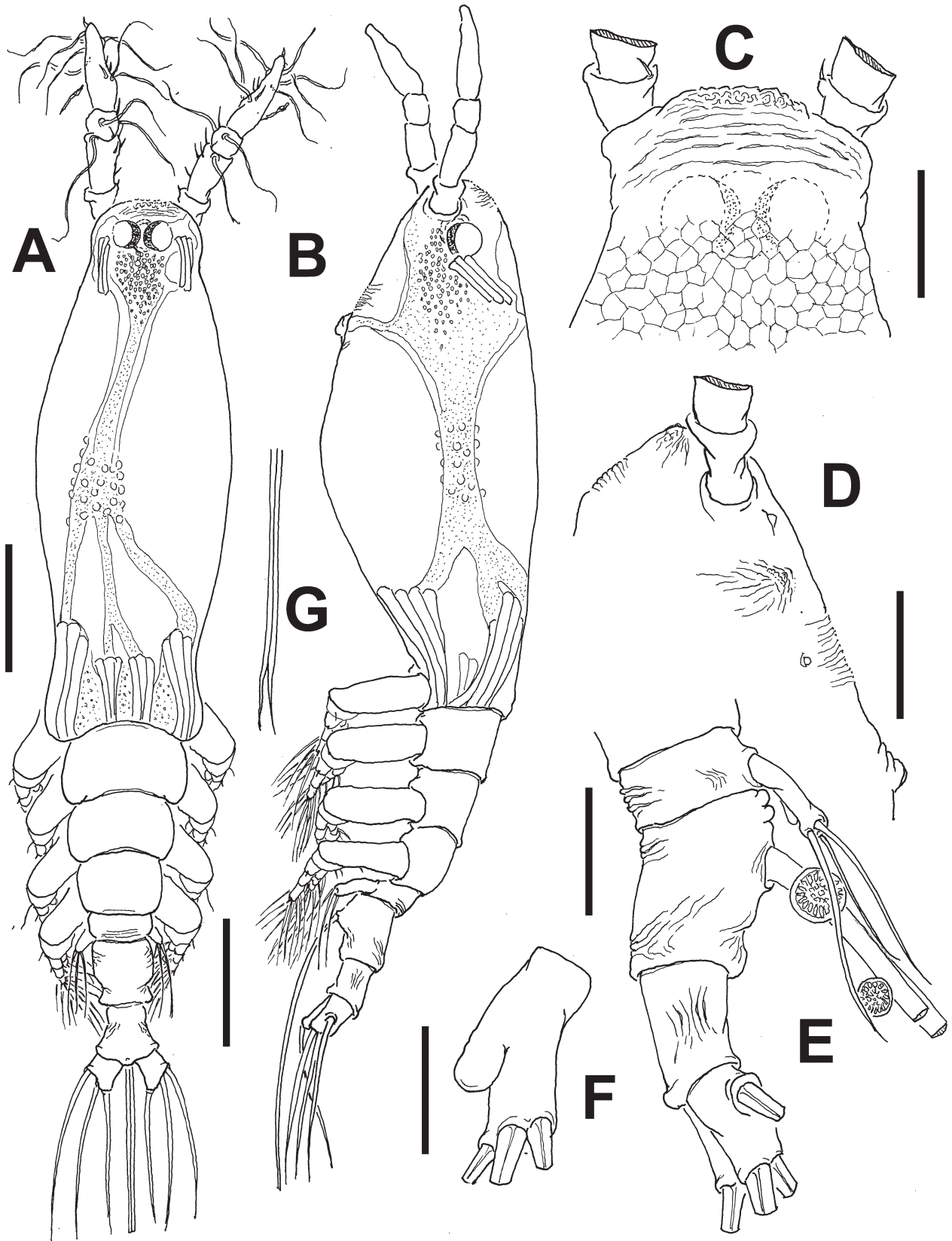
**Type locality.** Davies Reef, Queensland, Australia (19°7.340' S, 146°53.024' E).

**Etymology.** The species name, an adjective derived from the Latin *constrictus* (= drawn together), refers to the strongly constricted anal and genital double-somites of this species.

**Diagnosis.** *Cymbasoma* with relatively long cephalothorax, representing almost 60% of total body length, third antennular segment representing approximately 47% of antennule length, with pair of crescent-like processes on ventral surface of cephalothoracic region. Eyes well-developed, intensely pigmented at inner half. Cephalothorax with dorsal field of reticulations covering part of cephalothorax. Fifth pedigerous somite with deep transverse striae in posterior half. Genital double-somite with constricted margins in distal half, proximal half rounded. Anal somite remarkably long, slightly longer than genital double-somite, with deep medial constriction. Fifth leg with elongate, outer lobe with three distal setae, inner lobe distinctly arising medially, narrow, not reaching distal end of outer lobe, unarmed. Ovigerous spines long, 62% of total body length.

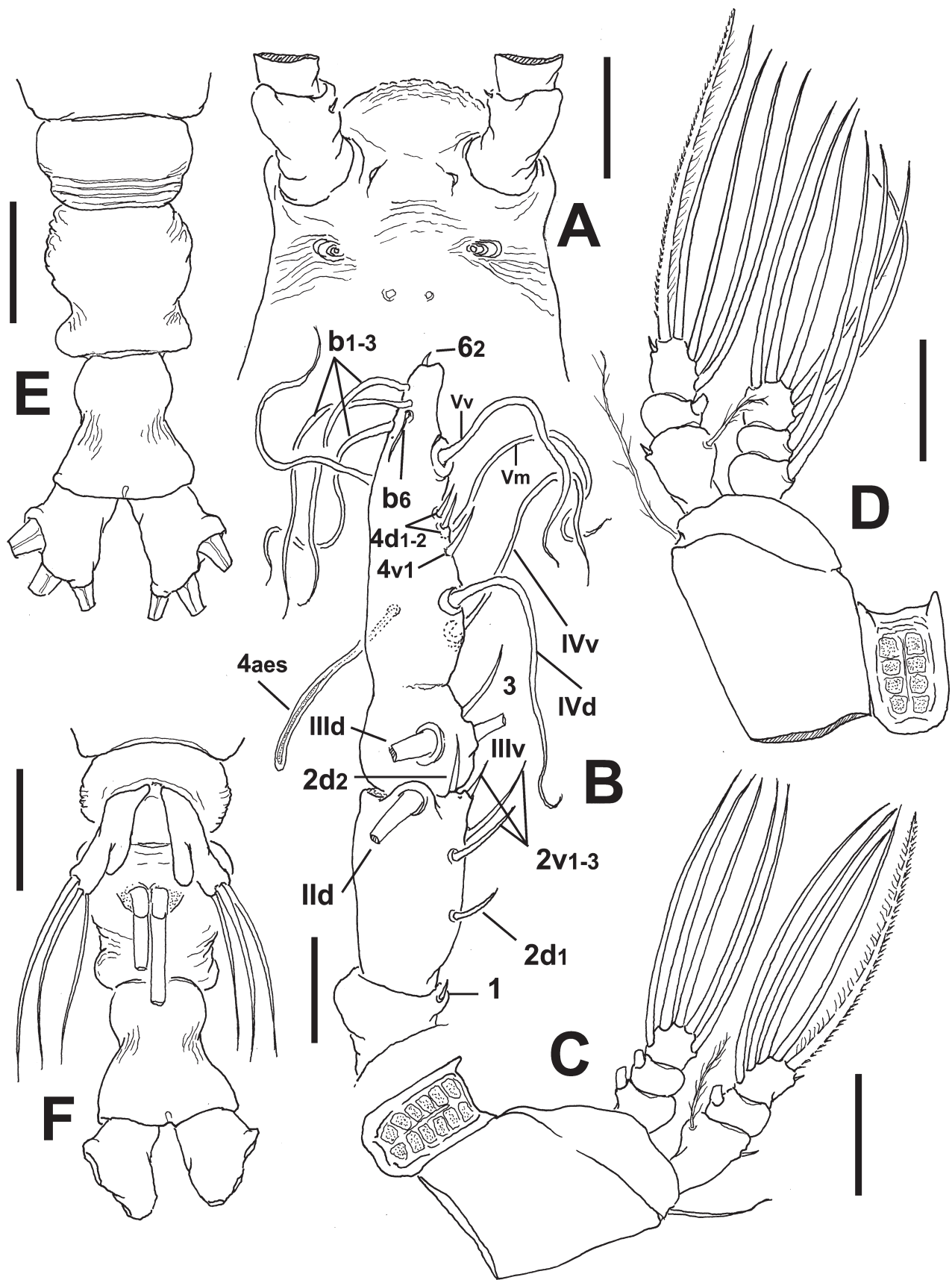
**Remarks.** This species most closely resembles the Australian *C. apicale*. Both share similar body shapes and proportions, a reticulated field on the dorsal surface of the cephalic area, a bilobate fifth leg with a short inner lobe and the outer lobe bearing three subequally long setae, ovigerous spines proximally separated, and intensely pigmented eyes. They differ in several characters including the preoral margin is more strongly produced ventrally (lateral view) in the new species (Fig. 36B) than in *C. apicale* (Fig. 34A). In addition, the cephalic region is clearly wider in *C. apicale* (Fig. 34A) than in *C. constrictum* **sp. nov.** (Fig. 36A) and the cephalothorax is shorter in the former. In the new species, the fifth pedigerous somite has a distinctive set of deep, symmetrical, transverse striae that is absent in *C. apicale*, which has only a few faint lateral wrinkles on this somite (Fig. 35B). The fifth leg inner lobe is different in both species; it arises subdistally from the inner margin of the exopodal lobe in *C. apicale*, reaching its distal end (Fig. 34D), whereas in the new species the inner lobe arises on the middle of the inner





**FIGURE 36.** *Cymbasoma constrictum* sp. nov., adult female. A) habitus, dorsal view; B) same, lateral view; C) cephalic region, dorsal view; D) same, lateral view; E) urosome, lateral view; F) fifth legs, ventral view. Scale bars: A, B = 200  $\mu$ m, C–E = 100  $\mu$ m, F = 50  $\mu$ m.





**FIGURE 37.** *Cymbasoma constrictum* sp. nov., adult female. A) cephalic region, ventral view; B) left antennule, dorsal view; C) first leg; D) third leg; E) urosome, dorsal view; F) same, with fifth legs, ventral view. Scale bars: A, C–F = 100 µm, B = 50 µm.

margin of the outer lobe and does not reach its distal end (Fig. 36F). Both the genital double- and the anal somite are strongly constricted in the new species (Fig. 37E), thus differing from the different shape of these somites in *C. apicale*. The most distinctive character of *C. constrictum* **sp. nov.** is its long anal somite in the female, being slightly longer than the genital double-somite; this character has not been observed in any other female *Cymbasoma*. Only two other species have an anal somite that is almost as long as the genital double-somite, *C. striifrons* (cf. Chang 2012: fig. 2A) and the Australian *C. paraconstrictum* **sp. nov.**, but it is not longer, as in the new species. A strongly constricted genital double-somite is also exhibited by *C. germanicum* (cf. Suárez-Morales 2006: figs. 4b, d), but it differs from *C. constrictum* in having an anal somite that is shorter than the genital double-somite. In *C. germanicum* the fifth leg inner lobe is long, reaching the distal end of the outer lobe (Suárez-Morales 2006: fig. 4b), whereas in the new species it barely reaches beyond halfway down of the inner margin of the outer lobe.

***Cymbasoma lenticula* sp. nov.**

(Figs 38–41)

**Material examined.** Holotype: adult female from Western Port Bay (Station G1 of Kimmerer & McKinnon 1985), Victoria, Australia (38°31.306' S, 145°4.858' E), partially dissected, mounted on 2 slides in glycerine, sealed with Entellan®. Date of collection: 29th November 1983. Slides deposited in the collection of MTQ, Australia (cat. MTQ W34394). Allotype adult male from Warneet, Western Port Bay, Victoria, Australia (38°13.200' S, 145°18.758' E), partially dissected, mounted on 2 slides in glycerine, sealed with Entellan®. Date of collection: 12th June 1984. Vial and slides deposited in the collection of MTQ, Australia (cat. MTQ W34395).

**Description of adult female.** Body relatively slender (Fig. 38A); body length of holotype female 1.22 mm. Cephalothorax approximately 0.71 mm long, representing 58% of total body length. Midventral oral papilla moderately protuberant, located at 26% of cephalothorax length. Pair of relatively small ocelli present, pigment cups medially separated, unpigmented; ventral cup slightly larger than lateral cups (Fig. 38B). Anteriormost cephalic area narrower than rest of cephalothorax, with slightly produced "forehead". Cephalic frontal area with pattern of transverse striations flanked by pair of rounded lens-like anteriorly directed protuberances (Fig. 38B, D, E), frontal sensilla absent. Single low medial protuberance present on ventral surface between antennule bases and nipple-like processes (Fig. 38C). Dorsal surface of cephalothorax smooth except for field of wrinkles (arrowed in Fig. 38C), ventral surface with field of transverse cuticular wrinkles at perioral area (Fig. 38D). Ventral surface also with 1) pair of symmetrical, crescent-shaped processes on anterior ventral surface located near bases of antennules, with no adjacent striae (Fig. 38D); 2) pair of nipple-like processes with concentric and transverse striae.

Urosome consisting of fifth pedigerous somite, genital double-somite and anal somite, together representing 16.5% of total body length. Relative lengths of urosomites (fifth pedigerous, genital double and free anal somites) 26.8: 38.3: 34.9 = 100, respectively (Figs. 38F, G). Lateral margins of fifth pedigerous somite straight, with deep lateral corrugation. Genital double-somite longest of urosome, with lateral margins corrugated (Fig. 38G), anterior half swollen, tapering posteriorly into straight margins (Fig. 39A); anteroventral process remarkably strong, reaching insertion of fifth leg (Fig. 38F, H). Ovipigerous spines paired, basally separated, slender, straight, broken off in specimen. Anal somite almost as long as genital double-somite, with medial constriction and faint suture (Fig. 38G). Caudal ramus short, subquadrate, about 1.2 times as long as wide, armed with three caudal setae.

Antennule length 0.25 mm, representing about 21% of total body length and 34% of cephalothorax length, 4-segmented. Relative length of distal antennular segment 51%. In terms of pattern by Grygier & Ohtsuka (1995), element 1 present on first segment; on second segment: long, slender elements 2d1-2, 2v1-3, and IId. Third segment with element 3 being stout, spiniform, elements IIId and IIIV setiform, of normal aspect. Segment 4 bearing elements 4d1,2, 4v1-3; setae IVd, Vd, Vv, Vm (short, spiniform), and 4aes present. Element 5 spiniform, curved. Subterminal elements b1-3,5 present, unbranched, element 62 present, other apical elements not observed, probably broken off (Fig. 39B).

Incorporated first pedigerous somite and succeeding three free pedigerous somites each bearing a pair of biramous legs. Pedigerous somites 2–4, together accounting for 23% of total body length. Legs 1–4 slightly increasing in size posteriorly. Intercoxal sclerites of legs 1–4 subrectangular, with patches of spinules, posterior margin straight, smooth. Bases of legs 1–4 articulating with large, rectangular coxa along oblique line; with hair-like lateral seta (Fig. 39 C–E); on leg 3, this seta about 2.5 times longer, thicker than those on other legs (Fig. 39E).

Endopods and exopods of legs 1–4 triarticulated. Ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3, and inner seta of first exopodal segment, these latter being short, slender. Outermost distal spines on third exopodal segment of legs 1–4 short, 0.25 times as long as segment. Outermost apical exopodal setae of legs 1–4 with inner margin setulose, outer margin spinulose.

Armature formula of legs 1–4:

	basis	endopod	exopod
leg 1	1-0	0-1;0-1;1,2,2	1-1;0-1;1,2,2
legs 2–4	1-0	0-1;0-1;1,2,2	1-1;0-1;1,1,2,2

Fifth legs medially separate, bilobate, outer (exopodal) lobe elongate, distally truncate.

Outer lobe armed with three subdistal setae, innermost seta being shorter and narrower than other two (Fig. 39A). Inner lobe thumb-shaped, noticeably shorter than outer lobe, unarmed, arising proximally from exopodal lobe, not reaching half its length (Fig. 39A).

**Description of male.** Total body length 1.47 mm. Cephalothorax 0.68 mm long, representing 46% of total body length (Fig. 40A, B). Midventral oral papilla moderately developed, located at 27% of cephalothorax length (Figs 40B, 41D). Cephalic region protuberant bilaterally in dorsal and ventral views (Fig. 41A, B). Cephalic frontal area as in female, with pattern of few transverse striations flanked by pair of rounded, lens-like anteriorly directed protuberances (asterisks in Figs. 41A); frontal sensilla absent. Pair of dorsal ocelli present, weakly developed; pigment cups medium-sized. Ocelli faintly pigmented. Forehead area moderately produced anteriorly. Ventral protuberant process as in female, but slightly smaller (asterisk in Fig. 41D). Other cuticular ventral processes including pair of crescent-shaped minute processes (Fig. 41C) and nipple-like processes, the latter with adjacent wrinkles.

Fifth pedigerous somite with smooth dorsal surface (Fig. 41G). Genital somite with striated dorsal surface. Genital complex of type II (Suárez-Morales & McKinnon 2014), represented by pair of mammiliform, moderately divergent genital lappets with a few spinules on proximal inner margin (Fig. 41F, H); lappets symmetrical and smooth, reaching to halfway of anal somite. Rounded, small protuberant medial process present at common basal joint of lappets (Fig. 41H). Anal somite as in female, weakly constricted, with suture, about 1.5 times as long as preanal somite (Fig. 41F). Caudal rami as long as anal somite, subrectangular, 1.6 times as long as wide (Fig. 41F). Each ramus with three setae.

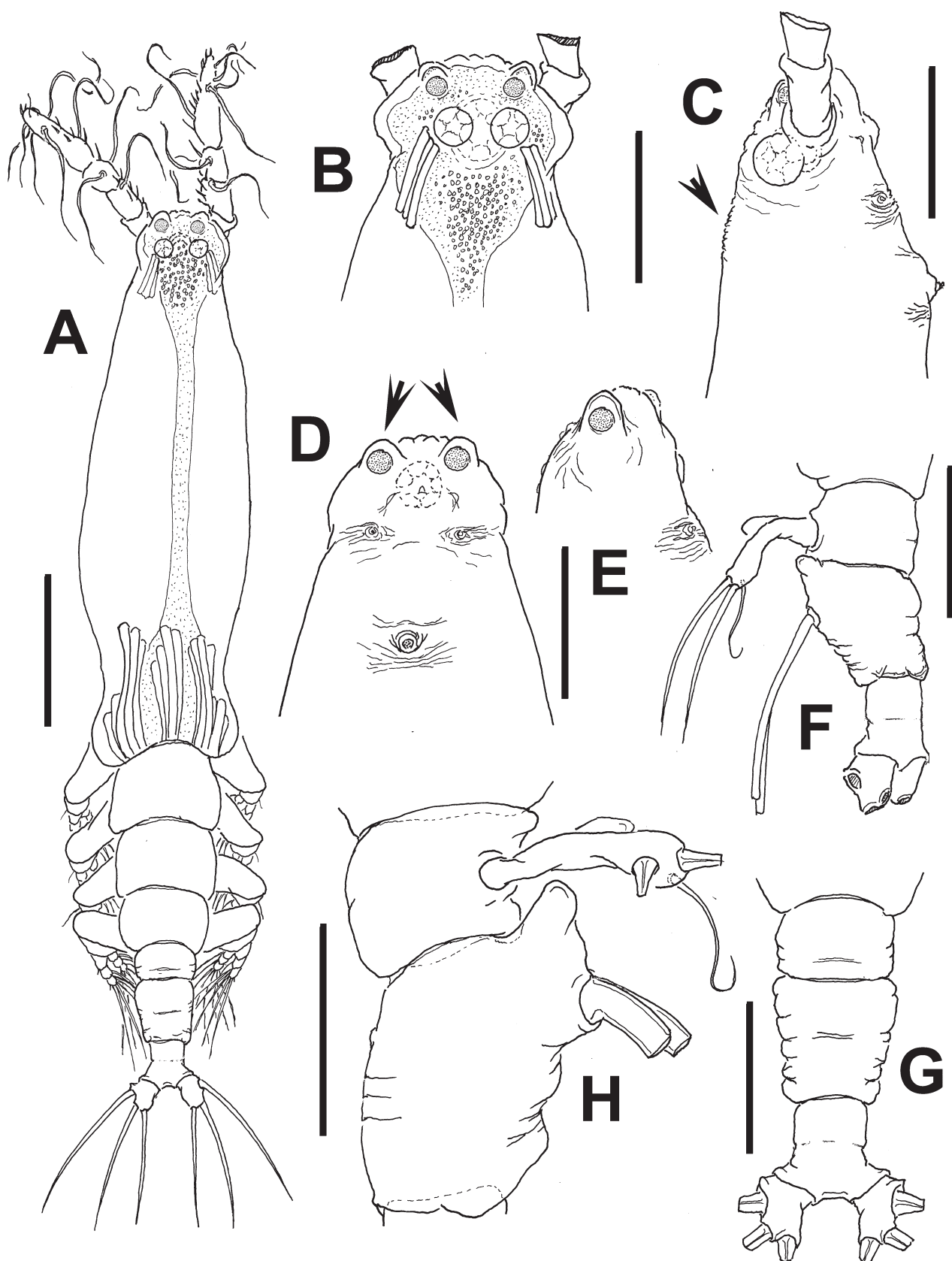
Antennular length 0.27 mm. Antennules representing 30% of total body length, and 56% of cephalothorax length. Antennule 5-segmented, all segments separated, with segment 5 distal to geniculation (Fig. 41E). Setal element 1 on first segment short, spiniform, as in female. Antennular elements 2v1-3, 2d1,2, and IIId present on second segment. Setal elements IIIId, IIIv, and 3 present on third segment; element 3 slender, weakly curved. Fourth segment with elements 4d1-2, 4v1-3, element 4v1 being longest of group. Fifth segment with 3 “b”-group setae, elements b1-3 long, distally unbranched, as in female. According to Huys *et al.* (2007) setal nomenclature of the distal segment, elements A, B, E and 3–5 present.

Pedigerous somites 2–4 noticeably elongate, together accounting for 38% of total body length in dorsal view. Coxae of each pair unarmed, joined by intercoxal sclerite which is slightly longer than wide and ornamented with spinulose patches, as in female. Legs 1–4 as in female except for naked outer margin of apical outermost seta on third exopodal segments of legs 1–4 (Fig. 40 C–E).

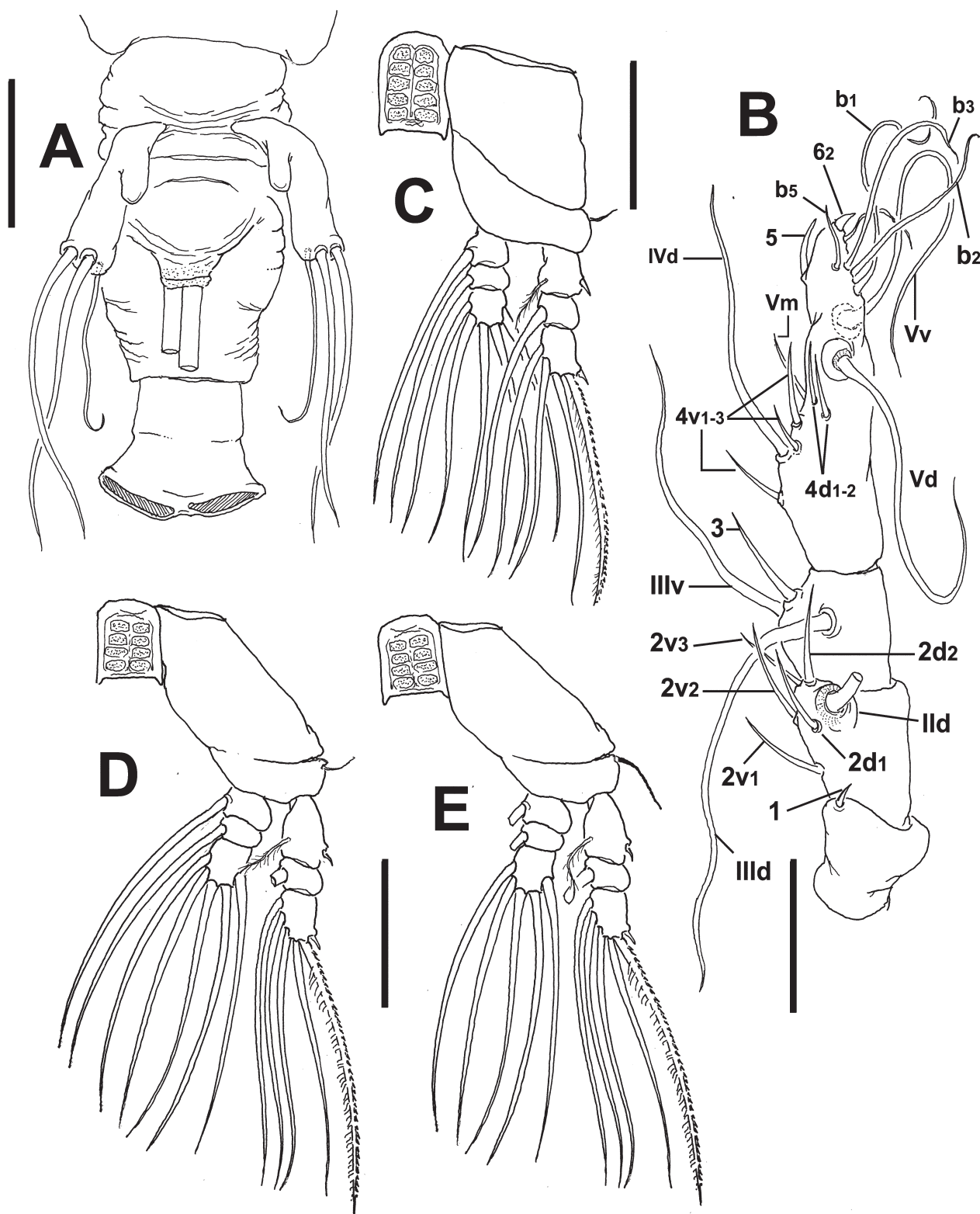
**Type locality.** Western Port Bay, Victoria, Australia (38°31.306' S, 145°4.858' E).

**Etymology.** From the Latin noun *lenticula* (= small lens); the name in apposition refers to the paired lens-shaped structures on the cephalic region in both sexes of this species.

**Diagnosis.** *Cymbasoma* with cephalic area with two rounded, anteriorly projected lens-like processes flanking corrugate frontal area. Low medial cephalic protuberance on ventral surface between rounded processes and nipple-like processes. Genital double-somite with strongly developed antero-ventral protuberance, lateral margins corrugated. Anal somite almost as long as genital double-somite, with weak constriction and faint suture. Fifth leg with short inner lobe arising proximally, not reaching to half of inner margin of exopodal lobe; innermost exopodal seta shorter and thinner than the other two. Male with similar lens-like processes on cephalic region, anal somite with weak suture, genital complex of type II with mammiliform genital lappets and small medial rounded process at insertion of lappets.

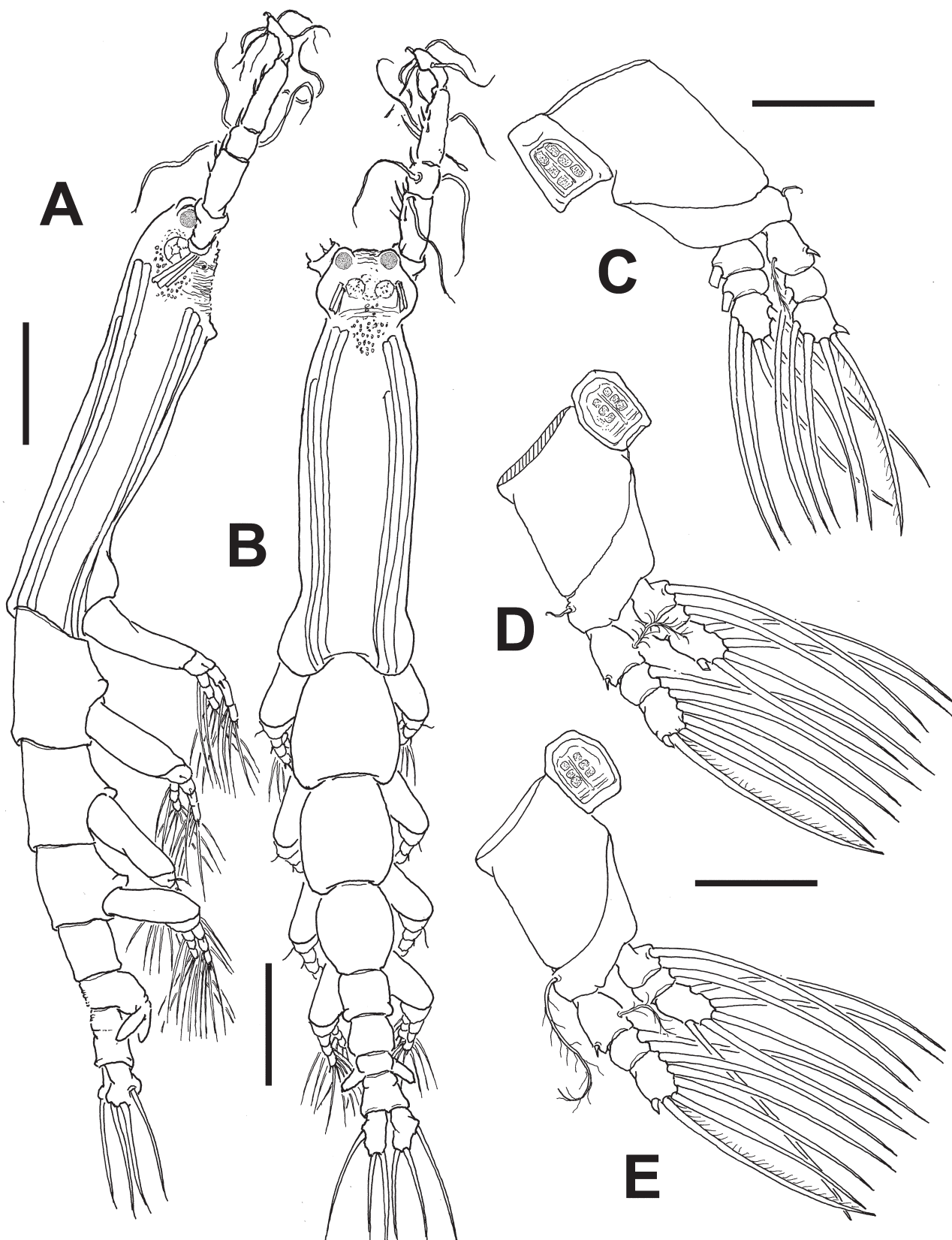


**FIGURE 38.** *Cymbasoma lenticula* sp. nov., adult female. A) habitus, dorsal view; B) cephalic region, dorsal view; C) same, lateral view, dorsal striae arrowed; D) same, ventral view, protuberant lens-like processes arrowed; E) same, semi-lateral view; F) urosome with fifth legs, lateral view; G) same, dorsal view; H) detail of anteroventral protuberance of genital double-somite, lateral view. Scale bars: A = 200 µm, B = 100 µm, H = 50 µm.

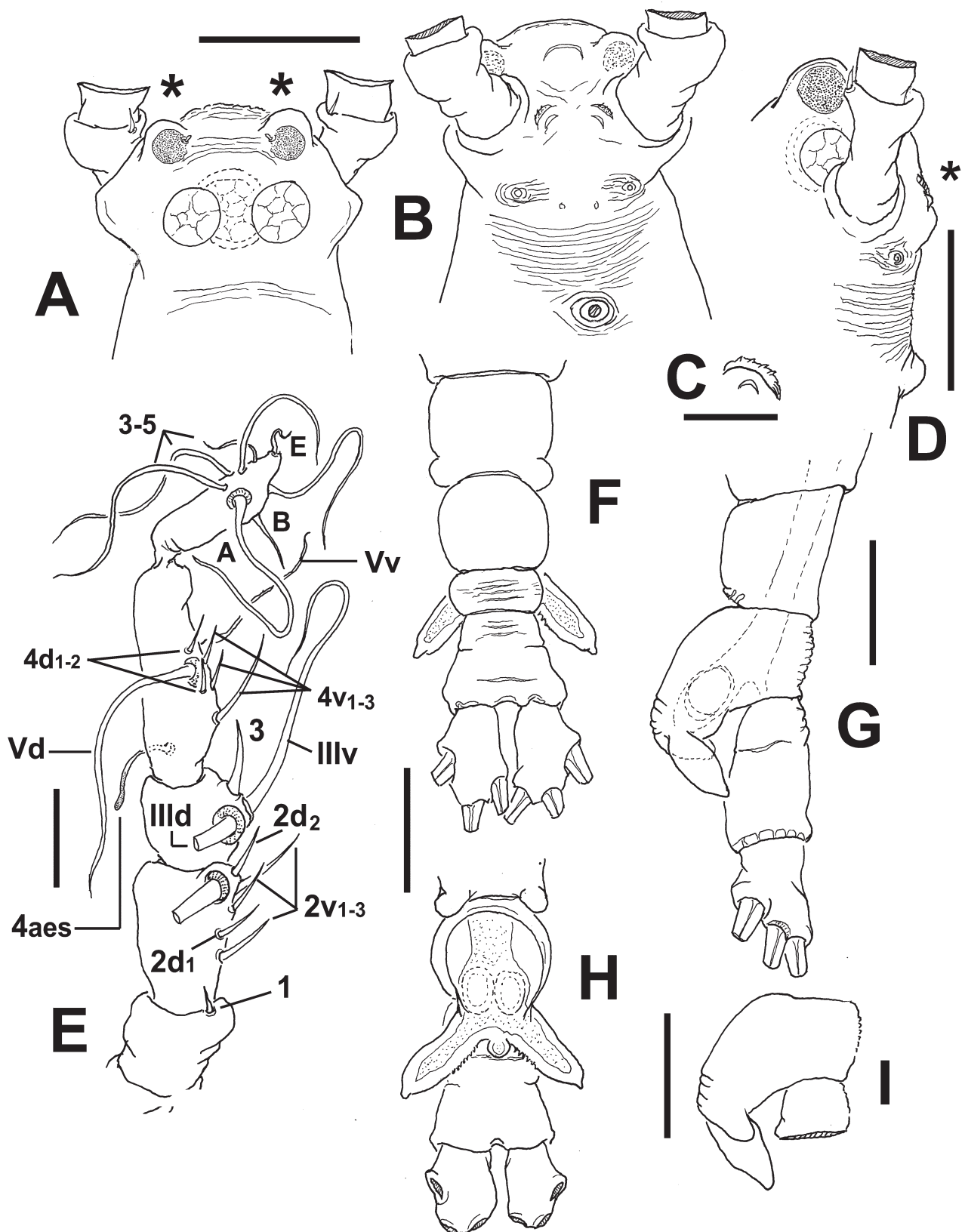


**FIGURE 39.** *Cymbasoma lenticula* sp. nov., adult female. A) urosome and fifth legs, ventral view; B) right antennule, dorsal view; C) first leg with coxal sclerite; D) second leg with coxal sclerite; E) third leg with coxal sclerite. Scale bars: A, C–E = 100  $\mu$ m, B = 50  $\mu$ m.





**FIGURE 40.** *Cymbasoma lenticula* sp. nov., adult male. A) habitus, lateral view; B) same, dorsal view; C) first leg with coxal plate; D) second leg with coxal plate; E) third leg with coxal plate. Scale bars: A, B = 200  $\mu$ m, C–E = 100  $\mu$ m.



**FIGURE 41.** *Cymbasoma lenticula* sp. nov., adult male. A) cephalic region, dorsal view; B) same, ventral view; C) crescent-like processes between antennule bases; D) cephalic region, lateral view showing low ventral protuberance; E) left antennule, dorsal view; F) urosome, dorsal view; G) same, lateral view; H) same, dorsal view showing genital complex; I) genital complex, lateral view. Scale bars: A, B, D, F–I = 100 µm, C, E = 50 µm.

**Remarks.** Male and female specimens were assigned to the same species on two of the criteria to match both sexes of the same species, their co-occurrence in the same sample/area (Western Port Bay, Victoria) and their sharing of peculiar, distinctive morphological features (Grygier & Ohtsuka 2008; Suárez-Morales 2011, 2015). The male and female specimens of *C. lenticula* **sp. nov.** possess the peculiar lens-like cephalic processes, a low ventral protuberance on the cephalic region (Figs. 38C, 41D), a constricted anal somite (Figs. 38G, 41F, H), identical legs including ornamented intercoxal sclerites, and similar details of the antennular armature, including a remarkably small element 1 and unbranched “b” setae on the last segment. This species can be distinguished from its known congeners by a combination of characters including, 1) a short, well-defined female fifth leg inner lobe arising proximally and not reaching to half of the inner margin of the outer lobe; this structure of the fifth leg has not been observed in other species of the genus; 2) female fifth leg innermost exopodal seta shorter and thinner than the other two; 3) anal somite with a weak constriction; 4) two rounded lens-like processes flanking wrinkled frontal area in the cephalic area in both the male and the female; 5) strongly developed anteroventral process on the female genital double-somite. In the new species the fifth leg inner lobe is relatively shorter and the outer lobe longer (Fig. 39A) than in *C. constrictum* (Fig. 37F). The proportional length of the anal somite with respect to the genital double-somite is similar to that in *C. striifrons* (Chang 2012: fig. 2A), but these two species differ in several other characters. In the new species the anal somite is constricted, a character absent in *C. striifrons*; also, the fringe of striae present on the body of *C. striifrons* (Chang 2012: fig. 1A) is absent in the *C. lenticula* **sp. nov.** The antennules are relatively longer in the new species (21% of total length) than they are in *C. striifrons* (16%) while the distal antennular segment is remarkably short in the latter (Chang 2012: fig. 2B), thus diverging from the pattern observed in the antennules of the new species (Fig. 37B). Also, the fifth leg inner lobe is poorly developed in *C. striifrons* (Chang 2012: fig. 2C) and short, but well-defined in the new species. Yet another species with a short fifth leg inner lobe arising proximally and not reaching to half of the outer lobe is *C. rigidum* Thompson, 1888, from off the Nicobar Islands as reported by Sewell (1949). However, this species probably does not belong to *Cymbasoma* since Sewell’s (1949) illustrations show an additional, completely separated somite between the genital double- and the anal somites plus three caudal setae, an unlikely combination in the genus. It is probable that a small fourth caudal seta was overlooked by Sewell (1949). If this is confirmed, the Nicobar material would closely resemble Sars’ (1921) record and illustrations of a female *C. rigidum*, showing a deeply constricted anal somite and four caudal setae. Sewell’s specimens should be re-examined because they seem to differ from the original description by Thompson (1888) showing a non-constricted anal somite and three caudal setae. The male differs from the other males by the presence of the distinctive lens-like processes, the elongated pedigerous somites 2–4, three caudal setae, and genital lappets with an inner row of small spines. It shares with *C. bullatum* a similar genital complex but in *C. bullatum* the genital lappets are smooth and the medial rounded protuberance between the lappets is relatively larger than in the new species. It differs from the male of *C. annulocolle* in several subtle characters, including the lack of a fringe of striae, and the smaller, ball-shaped medial process at the insertion of genital lappets (Fig. 38H), which diverges from the wide, rounded medial process in *C. annulocolle* (Fig. 17D, F). The antennular elements 1 and 3 and also all those of the 2v-d group on the second segment are clearly longer in *C. annulocolle* (Fig. 15B) than in *C. lenticula* (Fig. 41E).

***Cymbasoma buckleyi* sp. nov.**

(Figs 42, 43)

**Material examined.** Holotype: adult female from Warneet, Western Port Bay, Victoria, Australia (38°13.200’ S, 145°18.758’ E), partially dissected, ethanol-preserved; dissected parts mounted on 2 slides in glycerine, sealed with Entellan®. Date of collection: 12th June 1984. Vial and slides deposited in the collection of MTQ, Australia (cat. MTQ W34396).

**Description of adult female.** Body relatively robust, with cephalothoracic margins expanded in dorsal view (Figs 42A, 43A); body length of holotype female 1.24 mm. Cephalothorax approximately 0.73 mm long, representing 60% of total body length. Midventral oral papilla weakly protuberant, located at 28% of cephalothorax length. Pair of relatively small ocelli present, pigment cups moderately developed, separated by 1.2 times an eye diameter, weakly pigmented; ventral cup about as large as lateral cups (Fig. 43A). Cephalic area relatively wide, with slightly produced “forehead” ornamented with transverse wrinkles (Fig. 42B, C), frontal

sensilla absent (Fig. 42B). Dorsal surface of cephalothorax smooth except for shallow longitudinal wrinkles posterior to ocellar area (Fig. 42B, C). Ventral surface ornamented with 1) medial rounded protuberance between bases of antennules, ornamented with transverse wrinkles; 2) two pairs of weakly developed papilla-like processes; 3) perioral transverse wrinkles.

Urosome consisting of fifth pedigerous somite, genital double-somite and anal somite, together representing 15% of total body length. Relative lengths of urosomites (fifth pedigerous, genital double- and free anal somites) 36.6: 37: 26.4 = 100, respectively (Fig. 42E, F). Fifth pedigerous somite with straight lateral margins, dorsal and ventral surfaces smooth. Genital double-somite longest of urosome, ventrally produced, forming evenly rounded surface instead of usual anteroventral process (Fig. 42F). Somite with lateral margins expanded into globose shape; with ventral surface ornamented with few transverse wrinkles at insertion of ovigerous spines (Figs 42E, 43A). Ovigerous spines paired, basally separated, slender, straight at their bases (Fig. 42A, E), relatively short, 20% of total body length (0.25 mm). Anal somite shortest of urosome not constricted; dorsal and ventral surfaces smooth (Fig. 42E, F). Caudal ramus subrectangular, about 1.3 times as long as wide, armed with three caudal setae, ramus about as long as anal somite.

Antennule length 0.26 mm, representing about 21% of total body length and 35% of cephalothorax length; 4-segmented, segments 3–4 almost completely fused. Relative length of distal antennular segment 46%. In terms of pattern described by Grygier & Ohtsuka (1995) for female monstilloid antennular armature, element 1 absent on both antennules (arrowed position in Fig. 42D); elements on second segment: 2d1-2, 2v1-3, and IIId. Third segment with element 3 being long, slender, spiniform, reaching proximal 1/3 of succeeding second segment; elements IIIId and IIIv setiform, of normal aspect. Segment 4 bearing elements 4d1,2, 4v1-3, element 4v1 longest of group; setae IVd, Vd, Vv, Vm present. Element 5 spiniform, short, curved. Subterminal elements b1–4 present, former three distally branched, elements 61 and 62 present in specimens (Fig. 42D).

Incorporated first pedigerous somite and succeeding three free pedigerous somites each bearing a pair of biramous legs. Pedigerous somites 2–4, together accounting for 24.5% of total body length. Intercoxal sclerites of legs 1–4 subrectangular; surface with patches of minute spinules; posterior margin smooth, slightly curved. Bases of legs 1–4 articulating with large, rectangular coxa along oblique line; with hair-like lateral seta (Fig. 43B–E); on leg 3, this seta sparsely setulose, about four times longer, thicker than those on other legs (Fig. 43D). Endopods and exopods of legs 1–4 triarticulated. Ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3, and inner seta of first exopodal segment, these latter being noticeably long, reaching proximal half of third exopodal segment; setae slender, slightly setulose. Outermost distal spines on third exopodal segment of legs 1–4 short, 0.25 times as long as segment. Outermost apical exopodal setae of legs 1–4 with inner margin setulose, outer margin naked.

Armature formula of legs 1–4:

	basis	endopod	exopod
leg 1	1-0	0-1;0-1;1,2,2	1-1;0-1;1,2,2
legs 2–4	1-0	0-1;0-1;1,2,2	1-1;0-1;1,1,2,2

Fifth legs medially conjoined, bilobate, outer (exopodal) lobe elongate, cylindrical, distally truncate. Outer lobe armed with three apical setae, innermost seta noticeably shorter and narrower than other two (Fig. 42E). Inner lobe mammiliform, unarmed, shorter than outer lobe, arising proximally from exopodal lobe and reaching about ¾ its length (Fig. 42E).

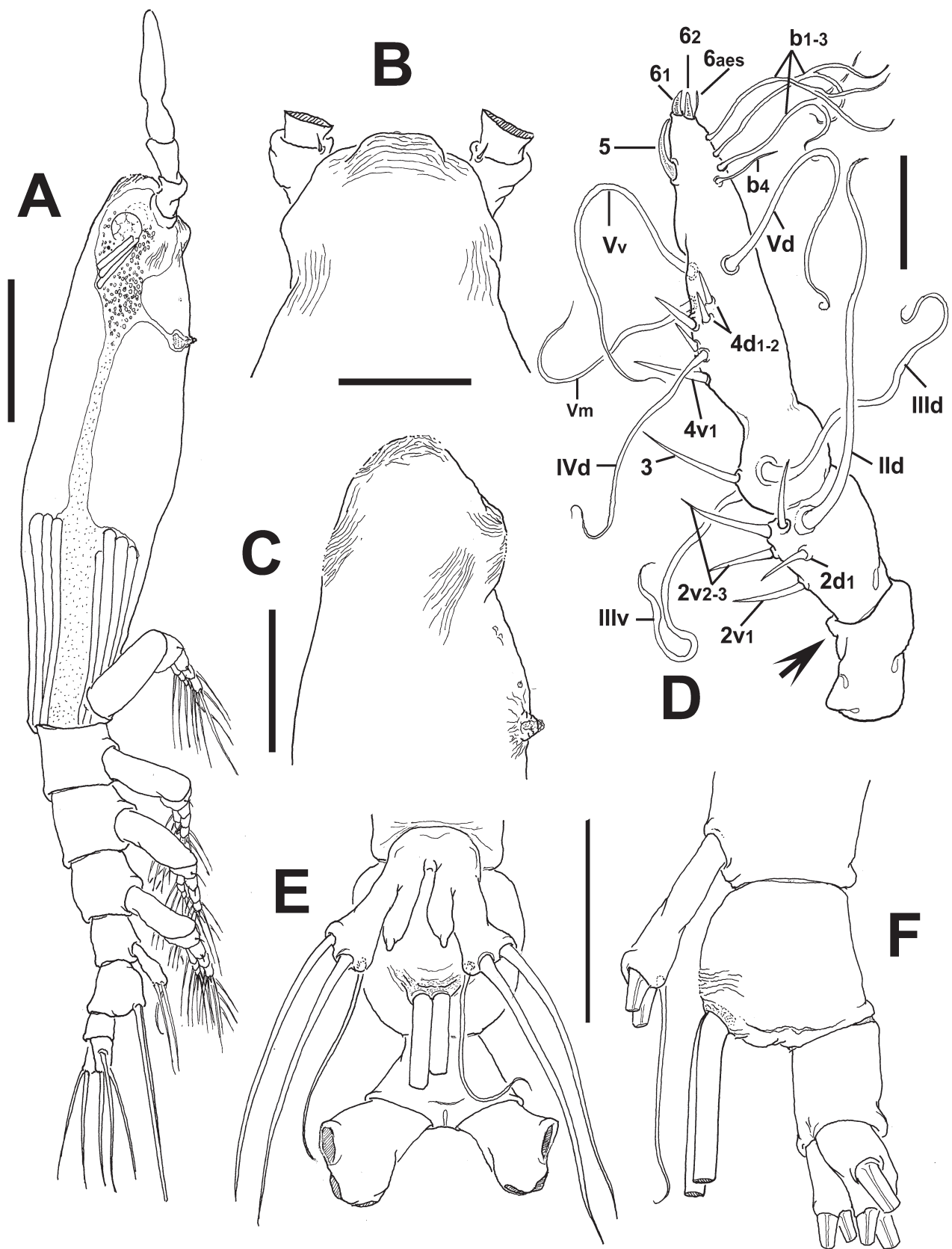
Male: unknown.

**Type locality.** Warneet, Western Port Bay, Victoria, Australia (38°13.200' S, 145°18.758' E).

**Etymology.** The species was named after the escaped English convict William Buckley who prior to European settlement lived with aboriginal tribes of the area where the species was collected.

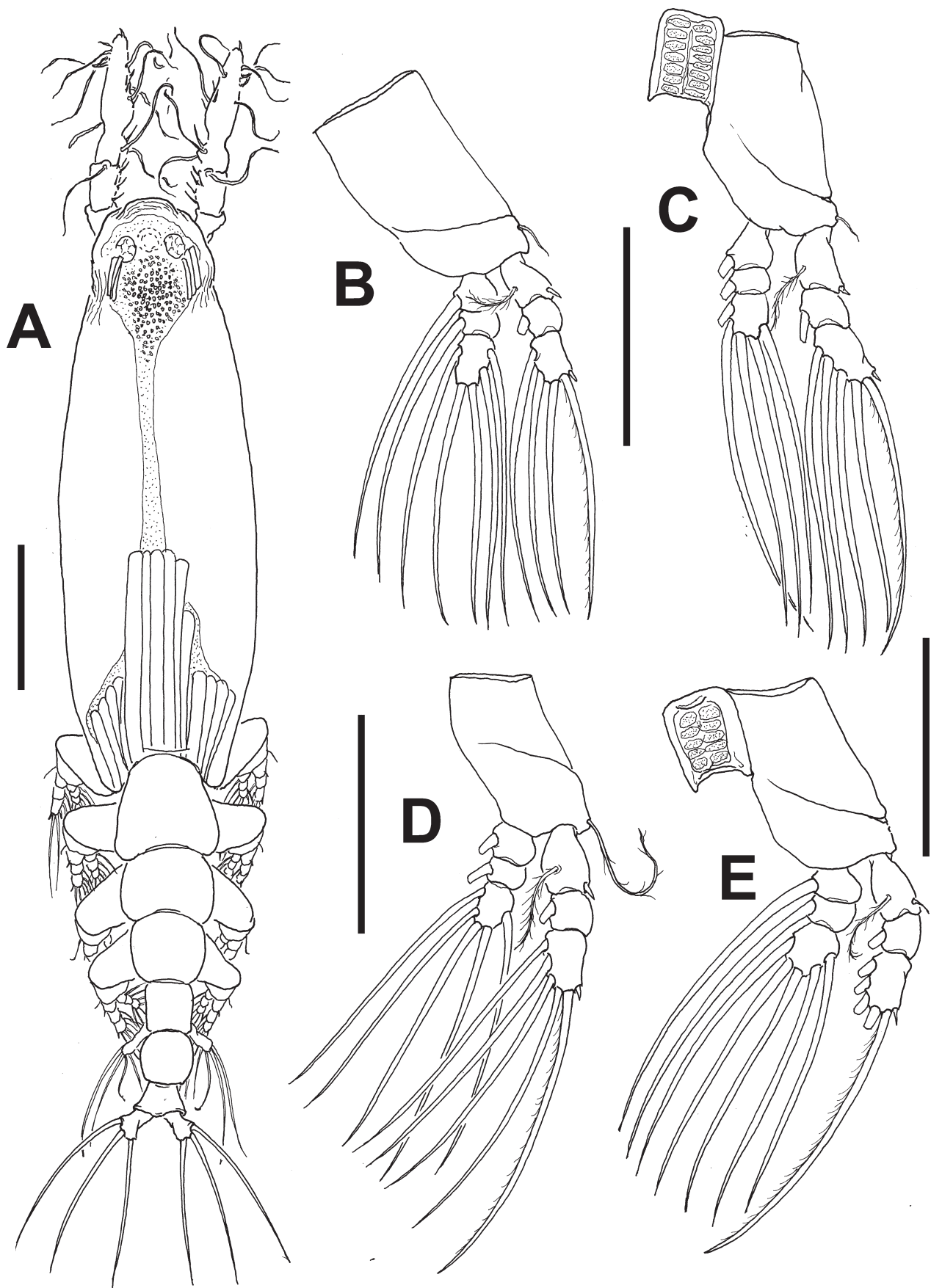
**Diagnosis.** *Cymbasoma* with third and fourth antennular segments partially fused, fourth antennular segment representing more than 45% of antennule length. Cephalic area with frontal, dorsal and ventral fields of cuticular wrinkles. Medial cephalic protuberance ornamented with transverse wrinkles on ventral surface. Antennules with element 1 absent. Legs 1–4 with noticeably long inner seta on first exopodal segment. Genital double-somite without anteroventral process but ventrally produced into widely rounded surface in lateral view; globose in dorsal view. Fifth leg with outer lobe armed with three setae, innermost being shorter and thinner than

the other; inner lobe distinctively mammiliform, unarmed. Ovigerous spines short, representing 20% of total body length.



**FIGURE 42.** *Cymbasoma buckleyi* sp. nov., adult female. A) habitus, lateral view; B) cephalic region, dorsal view; C) same, lateral view; D) right antennule, dorsal view; E) urosome and fifth legs, ventral view; F) same, lateral view. Scale bars: A = 200  $\mu$ m, B, C–F = 100  $\mu$ m; D= 50  $\mu$ m.





**FIGURE 43.** *Cymbasoma buckleyi* sp. nov., adult female. A) habitus, dorsal view; B) first leg; C) second leg with coxal plate; D) third leg; E) fourth leg with coxal plate. Scale bars: A = 200  $\mu$ m, B–E = 100  $\mu$ m.

**Remarks.** Together with *C. nicolettae* from the Mediterranean (Suárez-Morales 2002), this is the only known species of *Cymbasoma* with a mammiliform fifth leg inner lobe. Both species also share a corrugated frontal area, antennules with fused segments 3–4, a globose genital double-somite and a short and thin innermost seta on the fifth leg outer lobe (Suárez-Morales 2002). They differ in several characters, namely in the new species the body is wider, more robust than in *C. nicolettae* (Suárez-Morales 2002: figs. 1, 2); in *C. nicolettae* the frontal area of the cephalic region is flat and lacks a ventral protuberance between the antennular bases and the oral papilla (Suárez-Morales 2002: fig. 4) vs. a produced forehead and a large rounded, wrinkled ventral cephalic process in the new species. The relative antennule length is different in these species; it is remarkably long and represents 28.4% of the total body length in *C. nicolettae* (Suárez-Morales 2002: fig. 1) vs. 22% in the new species. In addition, the innermost seta of the fifth leg exopodal lobe is relatively shorter in *C. nicolettae* being as long as the lobe (Suárez-Morales 2002: fig. 8) whereas it is about 1.5 times longer in the new species.

This species is also related to other Australian *Cymbasoma* with a fifth leg bearing an elongate inner lobe that arises basally from the outer lobe but can readily be distinguished from them by the mammiliform fifth leg inner lobe. In addition, it differs by the protuberant, rounded shape of the genital double-somite (lateral view), thus diverging from those species with an anteroventral process, including *C. bali*, *C. markhasevae*, *C. apicale*, or *C. lenticula*.

### ***Cymbasoma astrolabe* sp.nov.**

(Figs 44, 45)

**Material examined.** Holotype: adult female from Warneet, Western Port Bay, Victoria, Australia (38°13.200' S, 145°18.758' E), partially dissected, ethanol-preserved; dissected parts mounted on 2 slides in glycerine, sealed with Entellan®. Date of collection: 12th June 1984. Slides deposited in the collection of MTQ, Australia (cat. MTQ W34397).

**Description of adult female.** Body elongate, slender (Fig. 44A, B); body length of holotype female 1.87 mm. Cephalothorax approximately 1.2 mm long, slender, representing 64% of total body length. Midventral oral papilla moderately protuberant, located at 21% of cephalothorax length. Pair of medium-sized ocelli present, pigment cups moderately developed, medially separated, pigmented only at inner section; ventral cup as large as lateral cups (Fig. 44A). Cephalic area narrower than post-oral region in dorsal view, with straight lateral margins and slightly produced "forehead". Cephalic frontal area with medial depression flanked by pair of sensilla and few longitudinal wrinkles, otherwise smooth (Fig. 45B). Anterior and middle areas of cephalothorax ornamented with wide fringe of transverse striae arranged in tight pattern including ventral, lateral and dorsal surfaces (Fig. 44A, B); striae covering surface from post-oral region down to 60% of cephalothorax length. Ventral surface with additional cuticular elements: 1) pair of symmetrical, small nipple-like processes on anterior ventral surface located posterior to bases of antennules, with few adjacent transverse striae; 2) curved, "U"-shaped row of 12 spiniform elements adjacent to nipple-like processes (Fig. 44C, arrowed in Fig. 45B); 3) secondary pair of minute nipple-like processes in medial position (Fig. 45B).

Urosome consisting of fifth pedigerous somite, genital double-somite and anal somite, together representing 12.5% of total body length. Relative lengths of urosomites (fifth pedigerous, genital double- and free anal somites) 28.7:50.1: 21.2 = 100, respectively (Fig. 44D). Fifth pedigerous somite with slightly expanded lateral margins, dorsal surface with transverse wrinkles. Genital double-somite longest of urosome; ventral surface with field of transverse wrinkles near base of ovigerous spines; dorsal surface corrugated; lateral margins moderately swollen in dorsal view with postero-lateral rounded processes (arrowed in Fig. 44F). Ovigerous spines paired, basally separated, slender, straight at their bases, distally acute; spines measuring 0.63 mm, about 34% of total body length (Fig. 44B). Anal somite short, about half as long as genital double-somite, without medial constriction; dorsal and lateral surfaces weakly corrugated (Fig. 44F). Caudal ramus subquadrate, about 1.2 times as long as wide, armed with three caudal setae.

Antennule length 0.31 mm, relatively short, representing about 17% of total body length and 25% of cephalothorax length; 4-segmented. Relative length of distal antennular segment 45%. In terms of pattern described by Grygier & Ohtsuka (1995) for female monstilloid antennular armature, spiniform element 1 present on first segment; elements on second segment 2d1-2, 2v1-3, and IId. Third segment with element 3 being short, spiniform, elements IIId and IIIv setiform, of normal aspect. Segment 4 bearing elements 4d1,2, 4v1-2, element

4d1 not observed; element 4v3 longest of group. Setae IVd, IVv, Vd, Vv, Vm, and 4aes present. Element 5 absent. Subterminal elements b1-3 and b 4 present, unbranched, apical elements 61-2 and 6aes present in specimens (Fig. 45A).

Incorporated first pedigerous somite and succeeding three free pedigerous somites each bearing a pair of biramous legs. Pedigerous somites 2–4, together accounting for 22% of total body length. Intercoxal sclerites of legs 1–4 subrectangular; surface with pattern of finely spinulose subquadrate units; posterior margin smooth (Fig. 45C–E). Bases of legs 1–4 with hair-like lateral seta; on leg 3, this seta 4.5 times as long as in other legs (Fig. 45E). Endopods and exopods of legs 1–4 triarticulated. Ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3, and inner seta of first exopodal segment, these latter being slender, sparsely setulated. Outermost distal spines on third exopodal segment of legs 1–4 short, 0.2 times as long as segment. Outermost apical exopodal setae of legs 1–4 with inner margin setulose, outer margin spinulose.

Armature formula of legs 1–4:

	basis	endopod	exopod
leg 1	1-0	0-1;0-1;1,2,2	1-1;0-1;1,2,2
legs 2–4	1-0	0-1;0-1;1,2,2	1-1;0-1;1,1,2,2

Fifth legs medially conjoined, bilobate, outer (exopodal) lobe cylindrical, distally expanded. Outer lobe armed with two distal and one subdistal setae, subequal in length, innermost seta slightly narrower (Fig. 44E). Inner lobe wide, thumb-like, unarmed, shorter than outer lobe, reaching to about  $\frac{3}{4}$  the length of outer lobe (Fig. 44E, D).

Male: unknown.

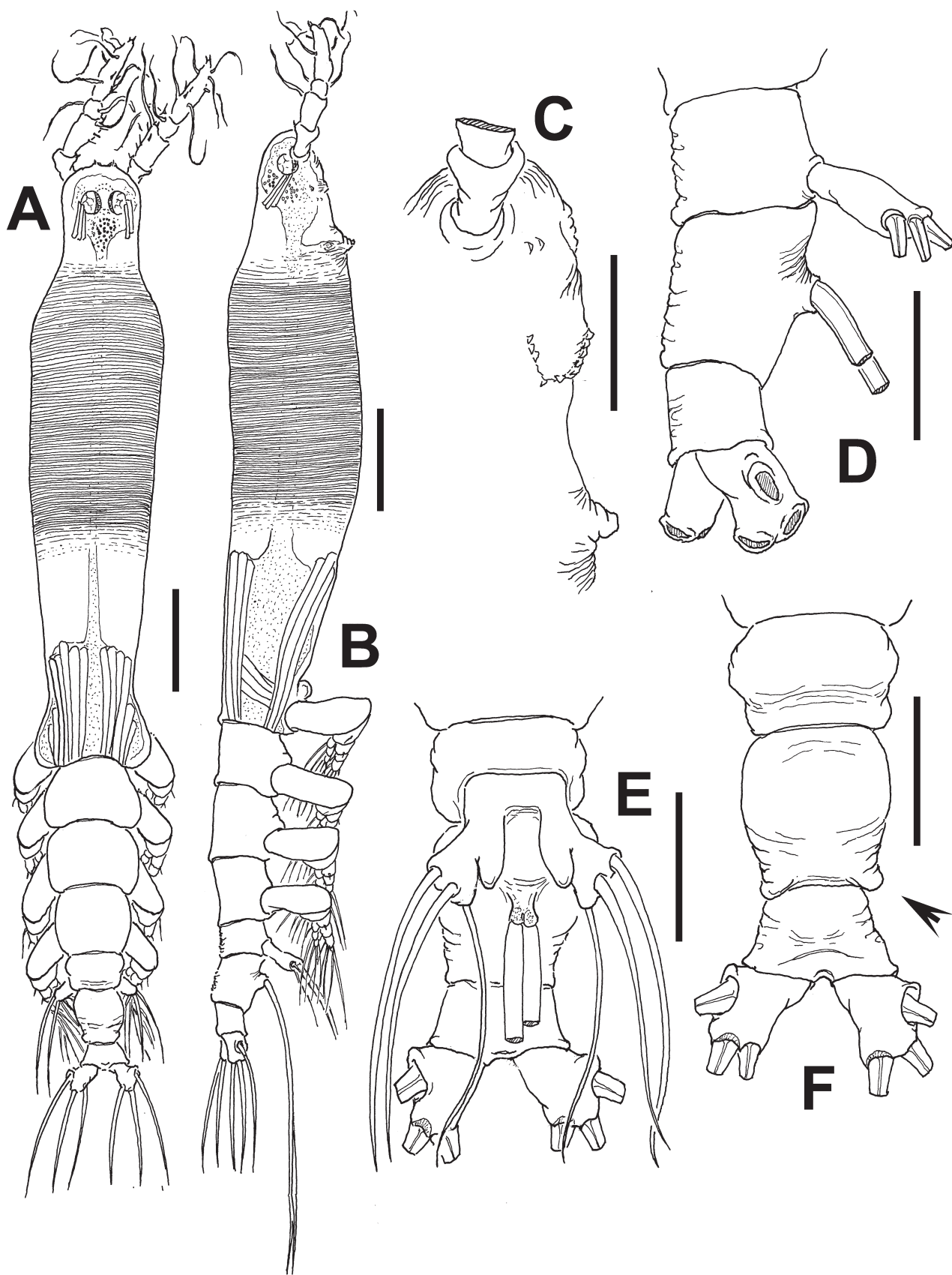
**Type locality.** Warneet, Western Port Bay, Victoria, Australia (38°13.200' S, 145°18.758' E).

**Etymology.** Name in apposition, after the corvette *Astrolabe* commanded by Jules Dumont d'Urville, who visited Western Port in 1826.

**Diagnosis.** *Cymbasoma* with antennules representing about 17% of total body length and 25% of cephalothorax length; fourth antennular segment representing 45% of antennule length. Cephalothorax with wide fringe of transverse striations in tight pattern covering about half the cephalothorax length from post-oral region to about 60% of way back along cephalothorax surface. Cephalic area with medial frontal depression flanked by sensilla; distinctive U-shaped curved row of spiniform cuticular processes adjacent to nipple-like processes. Legs 1–4 with spinulose intercoxal sclerites. Genital double-somite not ventrally protuberant in lateral view; weakly globose in dorsal view. Fifth leg with outer lobe armed with three subequally long setae; inner lobe arising from inner middle margin of exopodal lobe, unarmed. Ovipigerous spines representing 34% of total body length.

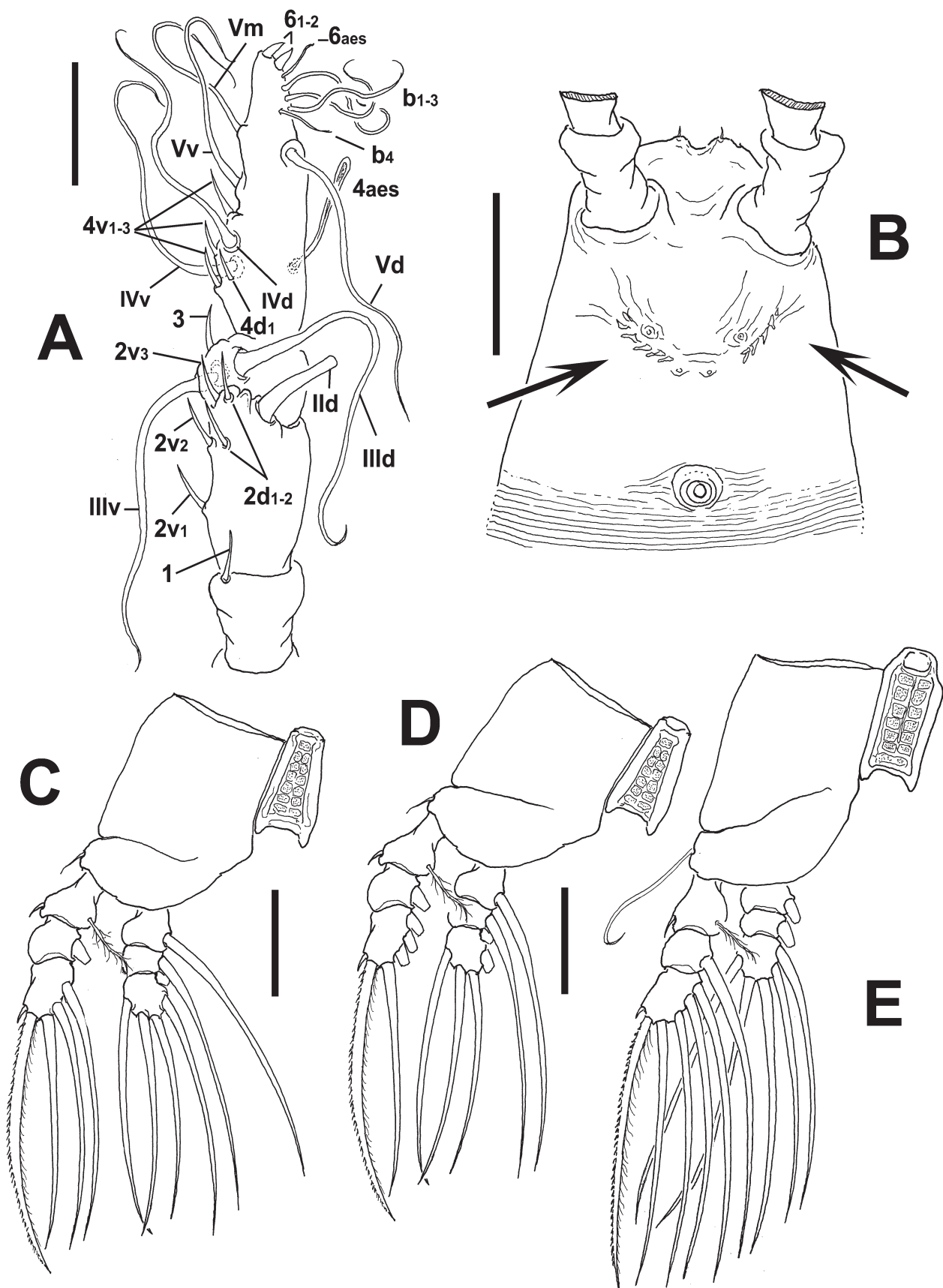
**Remarks.** This species can readily be distinguished from its congeners by a unique combination of characters including the presence of a medial frontal depression, a wide fringe of striae around almost half of the cephalothorax, a ventral row of spiniform elements arranged in a “U”-shaped pattern between the antennular bases and the oral papilla, a genital double-somite with produced posterior corners, and corrugated dorsal surface on the fifth pedigerous and genital double-somites.

Considering the first character, there are only a few other species in the genus that display a fringe of striae around the cephalothorax, i.e. *C. striifrons*, *C. striatus*, and the Australian *C. markhasevae* and *C. annulocolle*. The coverage, width and details of the striated area clearly differ in the new species with respect to these other species; in the new species the striation is absent from the anteriormost section of the cephalic area, starts post-orally and covers more than 43% of the cephalothorax (Fig. 44A). *Cymbasoma striifrons* has a narrow fringe (Chang 2012: fig. 1A, B), covering about 20% of the cephalothorax while in *C. markhasevae* the fringe is even shorter (13%); in both cases the fringe ends abruptly at the post-oral area. In *C. annulocolle* the fringe coverage is up to 31% (Fig. 13A, B, D) and starts at the insertion of the antennules (Fig. 13B). In the latter, the shape of the cephalic region is also different being wide and laterally protuberant while displaying straight lateral margins in the new species. Another congener with a similar striation pattern stretching around the cephalothorax is *C. striatus* (Isaac, 1974) (Suárez-Morales 2000b) but its fifth leg has only one lobe, thus diverging from the new species which exhibits a bilobate fifth leg. Both *C. annulocolle* and *C. markhasevae* have an elongate, narrow inner lobe; the new species, however, has a relatively shorter and more robust inner lobe. Another striking character of this species, not previously described in any other *Cymbasoma*, is the peculiar wide “U”-shaped set of ventral spiniform processes adjacent to the usual nipple-like processes.



**FIGURE 44.** *Cymbasoma astrolabe* sp. nov., adult female. A) habitus, dorsal view; B) same, lateral view; C) cephalic region with detail of cuticular processes; D) urosome, lateral view; E) urosome and fifth legs, ventral view; F) same, dorsal view showing rounded protuberances on posterior corners of genital double-somite (arrowed). Scale bars: A, B = 200 µm, C–F = 100 µm.





**FIGURE 45.** *Cymbasoma astrolabe* sp. nov., adult female. A) right antennule, dorsal view; B) cephalic region showing row of spiniform cuticular processes (arrowed), ventral view; C) first leg with coxal plate; D) second leg with coxal plate; E) third leg with coxal plate. Scale bars: A, C–E = 50  $\mu$ m, B = 100  $\mu$ m.



***Cymbasoma marioeduardoi* sp. nov.**

(Figs 46, 47)

**Material examined.** Holotype: adult male from Western Port Bay (Station G2 of Kimmerer & McKinnon 1985), Victoria, Australia (38°35.344' S, 144°59.687' E), partially dissected, ethanol-preserved; dissected parts mounted on 2 slides in glycerine, sealed with Entellan®. Date of collection: 24th November 1982. Slides deposited in the collection of MTQ, Australia (cat. MTQ W34398).

**Description of adult male.** Total body length 1.21 mm. Cephalothorax 0.58 mm long, representing 48% of total body length (Fig. 46A). Midventral oral papilla weakly developed, located at 21% of cephalothorax length (Figs 46A, B, 47A). Cephalic region protuberant bilaterally in dorsal view, with frontal area flat, bearing pair of short sensilla (Fig. 47A). Pair of relatively small dorsal ocelli present, weakly developed; pigment cups small. Ocelli separated by the length of less than one eye diameter, faintly pigmented. Ventral ocellus lightly larger than eyes. Other cuticular processes include: 1) medial rounded protuberance arising between antennular bases (arrowed in Fig. 46B), with smooth surface; 2) pair of nipple-like processes adjacent to medial protuberance, each with field of transverse striae stretching to oral area.

Urosome consisting of fifth pedigerous, genital somite (carrying genital complex), preanal somite, and anal somite. Fifth pedigerous somite with medial notch on ventral surface, straight lateral margins (Fig. 46D). Genital somite slightly shorter than fifth pedigerous somite, with wrinkles on dorsal surface and moderately expanded lateral margins. Preanal somite short, smooth, not constricted. Genital complex represented by pair of moderately divergent, wide-based, subtriangular genital lappets (Fig. 46D, E, F, G), these being slightly asymmetrical. Lappets relatively short, barely reaching beyond posterior margin of preanal somite, with row of five minute spiniform processes along inner margin of left lappet; right lappet with sinuous proximal inner margin (Fig. 46G). Thumb-like medial process present at common basal joint of lappets, process distally bifurcate, with medial notch (Fig. 46G). Anal somite about twice as long as preanal somite in dorsal and lateral views, comprising 28% of urosome length; ventral surface distinctively protuberant forming two symmetrical globose processes visible in dorsal, lateral and ventral views (Fig. 46C, E, F).

Caudal rami subquadrate, approximately 1.2 times as long as wide (Fig. 46C), about 0.7 times as long as anal somite; each ramus with distinctive globose protuberance at insertion of lateral seta. Each ramus with three setae.

Antennular length 0.32 mm. Antennules relatively short, representing 27% of total body length, and 55% of cephalothorax length; 5-segmented, all segments separated, with segment 5 located distal to geniculation (Fig. 47B). Length ratio of antennular segments, from first to fifth 18.1: 21.9: 10.8: 28: 21.2 (= 100). Setal element 1 on first segment absent in both antennules (position arrowed in Fig. 47B). Antennular elements 2v1-3, 2d1,2 remarkably long, slender; element IId present on second segment. Setal elements IIIId, IIIv, and 3 present on third segment; latter element remarkably long, slender, almost reaching distal margin of fourth segment. Fourth segment with elements 4d1, 4v1-2 present; setal elements IVd and IVv present in specimen. Fifth segment with 5 “b”-group setae, elements b1-3 dichotomously branched distally. According to Huys *et al.* (2007) setal nomenclature of the distal segment, elements A, B and 1-6 present. Apical elements 1 and 2 spiniform, remarkably long, curved, equally long (Fig. 47B).

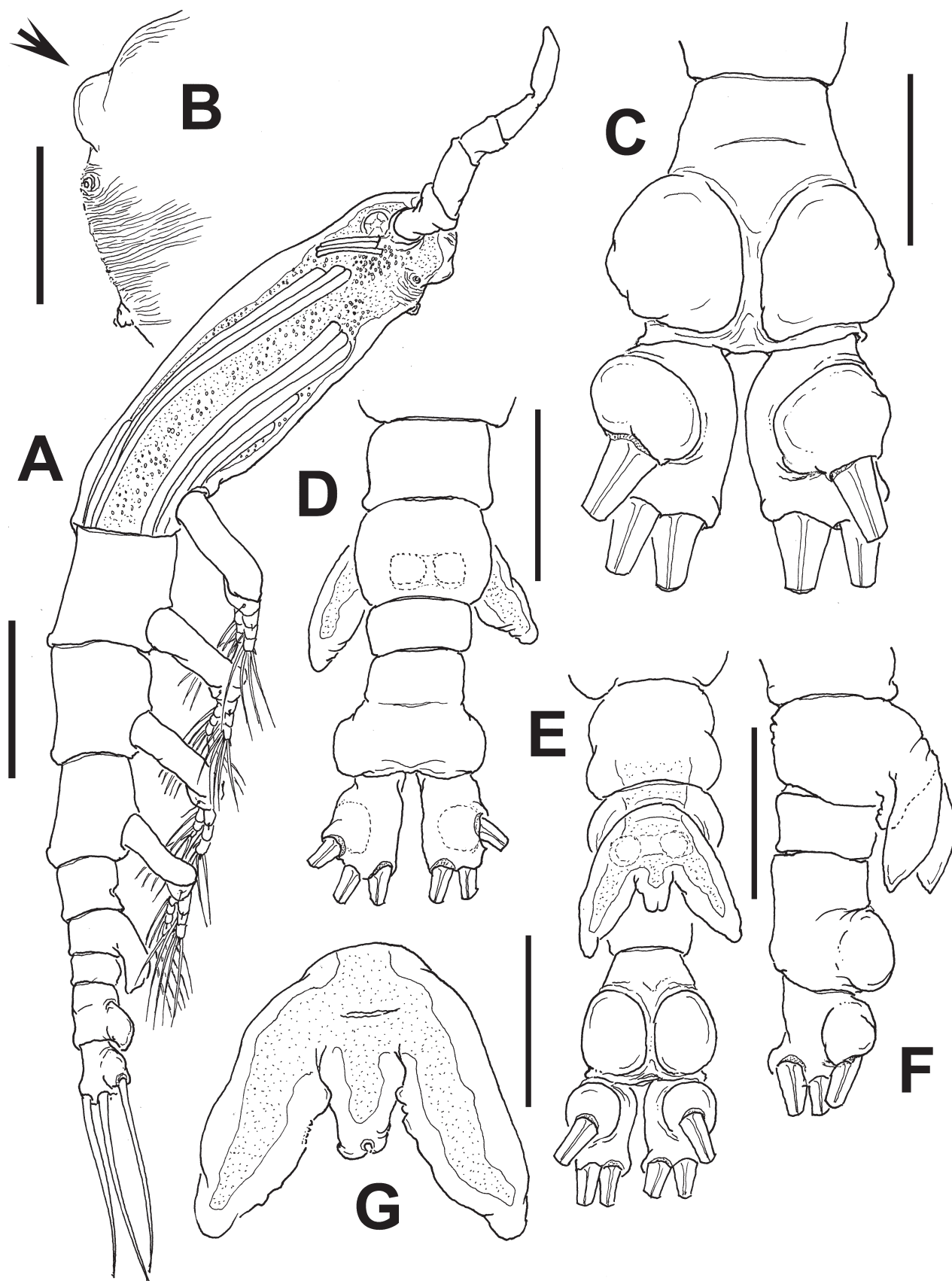
Incorporated first pedigerous somite and succeeding three pedigerous somites each bearing well-developed biramous legs. Pedigerous somites 2-4, together accounting for 32% of total body length in dorsal view. Intercoxal sclerites of legs 1-4 subrectangular, surface with pattern of finely spinulose subquadrate fields, posterior margin smooth. Bases of legs 1-4 with hair-like lateral seta (Fig. 47C-E); on leg 3, this seta about 3.3 times longer (Fig. 47E). Endopods and exopods of legs 1-4 triarticulated. Ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3. Inner seta of first exopodal segment absent, segment with spiniform process on distal margin (Fig. 47F). Outermost distal spines on third exopodal segment of legs 1-4 short in leg 1, 0.2 times as long as segment; element longer in legs 2-4, half as long as segment. Outermost apical exopodal setae of legs 1-4 with inner margin setulose, outer margin naked.

Female: unknown.

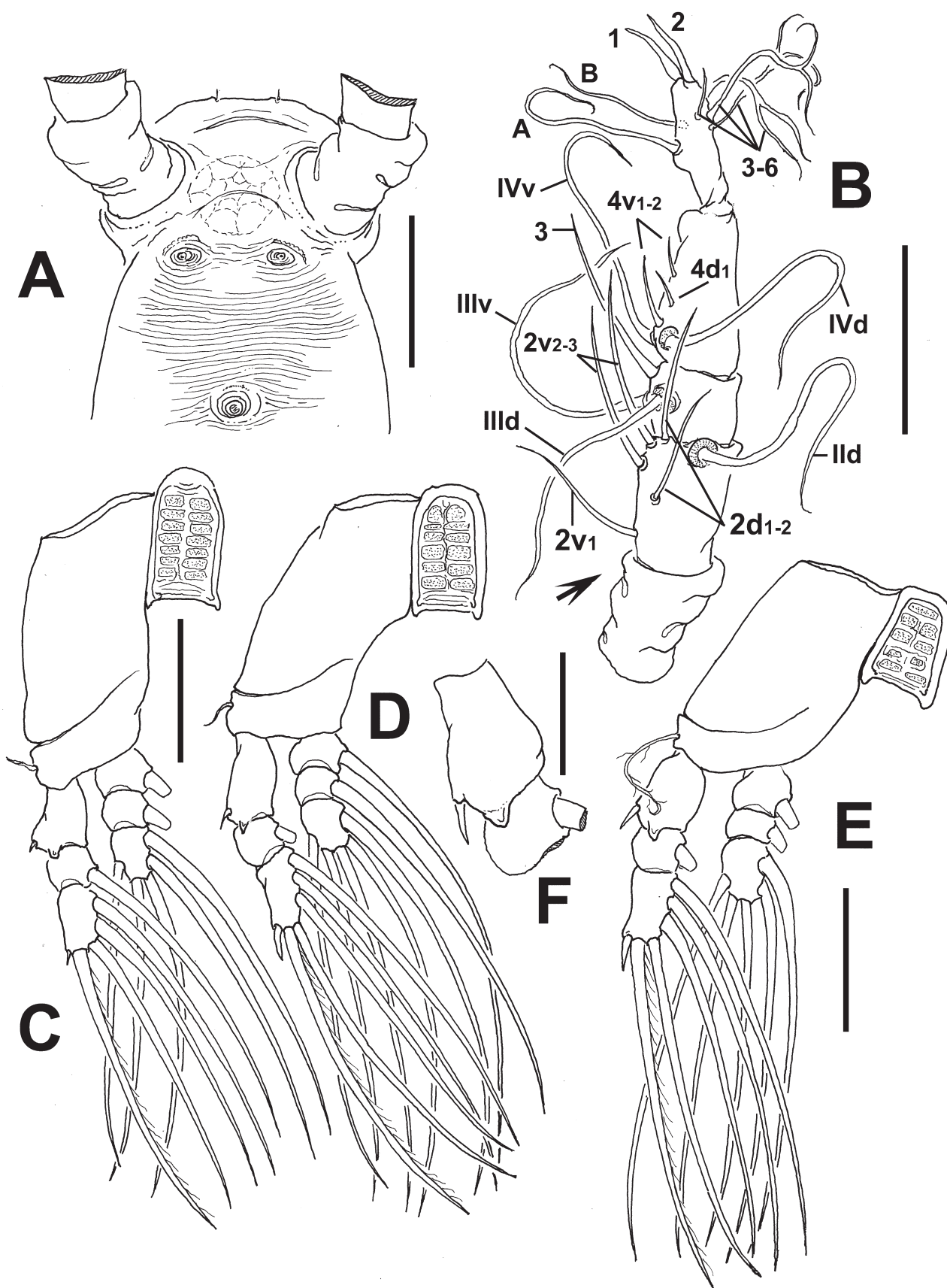
**Type locality.** Western Port Bay, Victoria, Australia (38°35.344' S, 144°59.687' E).

**Etymology.** The species is warmly dedicated to Mario Eduardo Suárez Gasca, son of the first author (ES-M).

**Diagnosis.** *Cymbasoma* with cephalothorax representing less than 50% of total body length; midventral oral papilla located at 21% of cephalothorax length. Cephalic region with anterior medial protuberance. Fifth



**FIGURE 46.** *Cymbasoma marioeduardoi* sp. nov., adult male. A) habitus, lateral view; B) cephalic region, detail of ventral protuberance; C) anal somite and caudal rami showing distinctive protuberances, ventral view; D) urosome, dorsal view; E) same, ventral view; F) same, lateral view; G) genital complex with lappets, ventral view. Scale bars: A = 200  $\mu$ m, B, C, G = 50  $\mu$ m, D–F = 100  $\mu$ m.



**FIGURE 47.** *Cymbasoma marioeduardoi* sp. nov., adult female. A) cephalic region, ventral view; B) right antennule, dorsal view; C) first leg with coxal plate; D) second leg with coxal plate; E) third leg with coxal plate; F) detail of first exopodal segment of fourth leg showing distal tooth-like process. Scale bars: A, F = 50  $\mu$ m, B–E = 100  $\mu$ m.

antennular segment with apical elements 1 and 2 (*sensu* Huys *et al* 2007) spiniform, remarkably long, equally long. Genital double-somite with moderately expanded lateral margins. Anal somite with pair of large, distinctive ventral protuberances visible also on dorsal view. Caudal rami each with conspicuous globular process at insertion of outer seta. Genital complex of Type II; genital lappets wide, subtriangular, asymmetrical; right lappet ornamented with minute dentiform processes; left lappet with sinuous proximal inner margin. Bifurcate process at common basal joint of lappets.

**Remarks.** This species is easily recognizable by several unique characters not present in any other known species of *Cymbasoma*. The conspicuous ventral protuberances on both the anal somite and the caudal rami are probably the most striking feature of this species. Among the Monstrilloida, a modified caudal ramus has been observed in the genus *Australomonstrillopsis*, displaying medial and distal lobes, but in the anal somite is not modified in this genus. Also, the genital complex, which is type II (Suárez-Morales & McKinnon 2014), is remarkable for the distinctive medial process between the genital lappets, which is subtriangular with a distal notch; this condition is clearly different from the flat margin or sharply rounded processes found in other species of *Cymbasoma*. Also, the long, apical elements 1 and 2 (*sensu* Huys *et al.* 2007) on the last antennular segment are also very unusual. In most species these elements are short and in other cases only one of them is elongate, as in *C. williamsoni* Khan, 1976 (Khan 1976: fig. 3B), *C. tumorifrons* (*cf.* Suárez-Morales 1999), *C. tropicum* (*cf.* Sewell 1949), *C. gracile* (*cf.* Gurney 1927), *C. spinapex* (*cf.* Isaac 1974), and *C. quintanarooense* (*cf.* Suárez-Morales 2000a).

### *Cymbasoma jinigudira* sp. nov.

(Figs 48–51)

**Material examined.** Holotype: adult female from North West Cape, Western Australia (21°47.18' S, 114°7.3' E), partially dissected, ethanol-preserved; dissected parts mounted on 2 slides in glycerine, sealed with Entellan®. Date of collection: 20th October 1997. Slides deposited in the collection of the Museum of Western Australia (cat. WAM C61308). Allotype adult male from Davies Reef, Queensland, Australia (19°7.340' S, 146°53.024' E), partially dissected, ethanol-preserved; dissected parts mounted on 2 slides in glycerine, sealed with Entellan®. Date of collection: 3rd February 1989. Slides deposited in the collection of MTQ, Australia (cat. MTQ W34399).

**Description of female.** Body remarkably elongate, slender (Fig. 48A); body length of holotype female 2.82 mm. Cephalothorax approximately 1.95 mm long, representing about 70% of total body length. Midventral oral papilla located at 17% of cephalothorax length. Pair of relatively large ocelli present, pigment cups moderately developed, medially separated, weakly pigmented; ventral cup slightly smaller than lateral cups (Fig. 48B). Cephalic area with conspicuous area of deep, longitudinally arranged, cuticular ridges on “forehead” (Fig. 48B, C) between the antennular bases; field of light reticulation overlying ocellar region. Sensillae not observed on frontal area. Additional cephalic cuticular ornamentation including field of longitudinal cuticular wrinkles posterior to reticulation on dorsal surface (Fig. 48B). Ventral surface with small medial process (asterisk in Fig. 48D) and pair of nipple-like cuticular process posterior to antennule bases with extended field of adjacent wrinkles. Other ventral cuticular ornamentation including perioral wrinkles (Fig. 48C).

Urosome consisting of fifth pedigerous somite, genital double-somite, anal somite, and caudal ramus, together representing 11% of total body length. Relative lengths of fifth pedigerous somite, genital double-somite, and free urosomite 41.1: 44.4: 14.5 = 100, respectively (Fig. 49B, C). Fifth pedigerous somite with postero-lateral corners forming rounded protuberances (arrowed in Fig. 49D). Genital double-somite with dorsal surface bearing transverse pattern of deep cuticular wrinkles on proximal half (Fig. 49B, C); with straight ventral margin in lateral view, posterior margin with rounded protuberance (arrowed in Fig. 49B). Caudal ramus subquadrate, 1.1 times as long as wide, armed with three subequally, long, sparsely setulated caudal setae. Ovipigerous spines paired, long, about 1.5 times total body length (2.9 mm), basally conjoined and branch out to form individual spines at level of posterior margin of caudal ramus (Fig. 49B). Spines 4.1 mm long, slender, straight at their bases and along shaft, both with distally swollen sections and then tapering apically, one spine slightly shorter (Fig. 49E).

Antennule length 0.46 mm, representing about 17% of total body length and 24 % of cephalothorax length; 4-segmented. Terminal antennular segment representing 49.6% of antennule length (Fig. 49A). In terms of pattern described by Grygier & Ohtsuka (1995) for female monstrilloid antennular armature, spiniform, curved, slender



element 1 present on first segment; elements on second segment 2d1-2, 2v1-3, these being unusually long, slender, plus element IIId. Third segment with long, slightly curved element 3 plus elements IIIId and IIIv. Segment 4 bearing elements 4d1,2 and 4v1-3; elements of 4v group well developed, twice as long as elements of “4d” group. Setae IVd, IVv, Vd, Vv, Vm, and 4aes present. Element 5 absent. Subterminal elements b1-3 dichotomously branched; apical elements 6aes and 62 present (Fig. 49A).

Incorporated first pedigerous somite and succeeding three free pedigerous somites each bearing a pair of biramous legs. Pedigerous somites 2–4, together accounting for 22% of total length in dorsal view. Intercoxal sclerites of legs 1–4 subrectangular, widest at base, tapering distally, surface and posterior margin smooth. Bases of legs 1–4 with hair-like lateral seta (Fig. 48E, F); on leg 3, this seta about 3.2 times longer, sparsely setulated from proximal half and slightly thicker than those on the other legs (Fig. 48F). Endopods and exopods of legs 1–4 triarticulated. Ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3, and inner seta of first exopodal segment, these latter being relatively long and sparsely setulated (Fig. 48E, F). Outermost apical exopodal setae of legs 1–4 with inner margin setulose, outer margin spinulose.

Armature formula of legs 1–4:

	basis	endopod	exopod
leg 1	1-0	0-1;0-1;1,2,2	I-1;0-1;I,2,2
legs 2–4	1-0	0-1;0-1;1,2,2	I-1;0-1;I,1,2,2

Fifth legs medially separated, bilobate. Outer (exopodal) lobe subrectangular, relatively short; armed with three setae, one subdistal, two inserted distally. Innermost seta relatively slender, shortest, about half the length of the other two. Inner (endopodal) lobe reduced, represented by small rounded process arising from middle inner margin of main lobe (Fig. 49D).

**Description of adult male.** Total body length 1.24 mm. Cephalothorax 0.61 mm long, representing 50% of total body length (Figs 50A, 51A). Midventral oral papilla moderately protuberant, located at 29% of cephalothorax length (Fig. 50A–C). Cephalic region slightly protuberant bilaterally in dorsal view, with smooth dorsal surface except for few longitudinal wrinkles (arrowed in Fig. 50C). Ventral surface between nipple-like processes and post-oral region with few wrinkles (Fig. 50B). Pair of dorsal ocelli present, well developed; pigment cups medium-sized. Ocelli medially conjoined, strongly pigmented at inner section. Ventral ocellus slightly larger than eyes (Fig. 50D). Pair of frontal sensilla between antennular bases. Forehead area ornamented with field of minute cuticular papillae (Fig. 50B, D). Other cuticular processes on ventral surface include: 1) nipple-like processes with adjacent transverse striae; 2) pair of minute cuticular papilla-like processes posterior to nipple-like processes.

Urosome consisting of fifth pedigerous somite, genital somite (carrying genital complex), preanal somite, and anal somite. Fifth pedigerous somite with smooth ventral and dorsal surfaces, with expanded anterior half (Fig. 50F). Genital somite clearly shorter than fifth pedigerous somite, with protuberant, rounded lateral margins; dorsal surface smooth, with rows of papilla-like cuticular processes in anterior ventral half near origin of genital complex (Fig. 50E). Preanal somite short, dorsal and ventral surfaces smooth. Genital complex of type II (Suárez-Morales & McKinnon 2014), represented by pair of divergent, digitiform genital lappets, these being symmetrical, straight. Lappets relatively short, reaching halfway down anal somite, inner and outer margins of lappets smooth (Fig. 50E). Rounded, protuberant medial process present at common basal joint of lappets. Anal somite longest of urosome, about twice as long as preanal somite in dorsal and lateral views, comprising 34% of urosome length; somite without lateral constriction but with pair of dorsal spiniform processes along posterior margin (arrowed in Fig. 50F). Caudal rami subquadrate, approximately 1.2 times as long as wide, about as long as anal somite. Each ramus with four setae.

Antennular length 0.44 mm. Antennules relatively long, representing 36% of total body length and 69% of cephalothorax length; 5-segmented, all segments separated, with segment 5 located distal to geniculation (Fig. 51B). Length ratio of antennular segments, from first to fifth 10.9: 29: 10.2: 28.6: 21.3 (= 100). Setal element 1 on first segment slender, setiform, remarkably long, reaching proximal half of second segment. Antennular elements 2v1-3, 2d1,2 long, slender; element IIId present on second segment. Setal elements IIIId, IIIv, and 3 present on third segment, latter element remarkably long, reaching middle margin of fourth segment. Fourth segment with elements 4d1,2, 4v1–3 present, element 4v1 longest of group, about twice as long as other “2v-d” spines; other setal



elements on fourth segment absent in specimen. Fifth segment with 5 “b”-group setae (*sensu* Grygier & Ohtsuka, 1995), elements b2 and b3 dichotomously branched distally; element 61 present in distal position. According to Huys *et al.* (2007) setal nomenclature of the distal segment, elements A–C present, only element 2 present in apical position. Subdistal elements 3–7 present, unbranched.

Incorporated first pedigerous somite and succeeding three pedigerous somites each bearing well-developed biramous legs. Pedigerous somites 2–4, together accounting for 32.5% of total body length in dorsal view. Legs 1–4 as in other species of the *C. longispinosum* species-group (Üstün *et al.* 2014), except for surface of coxal plates ornamented with spinulose patches (Fig. 51C, D).

**Type locality.** North West Cape, Western Australia (21°47.180' S, 114°7.300' E).

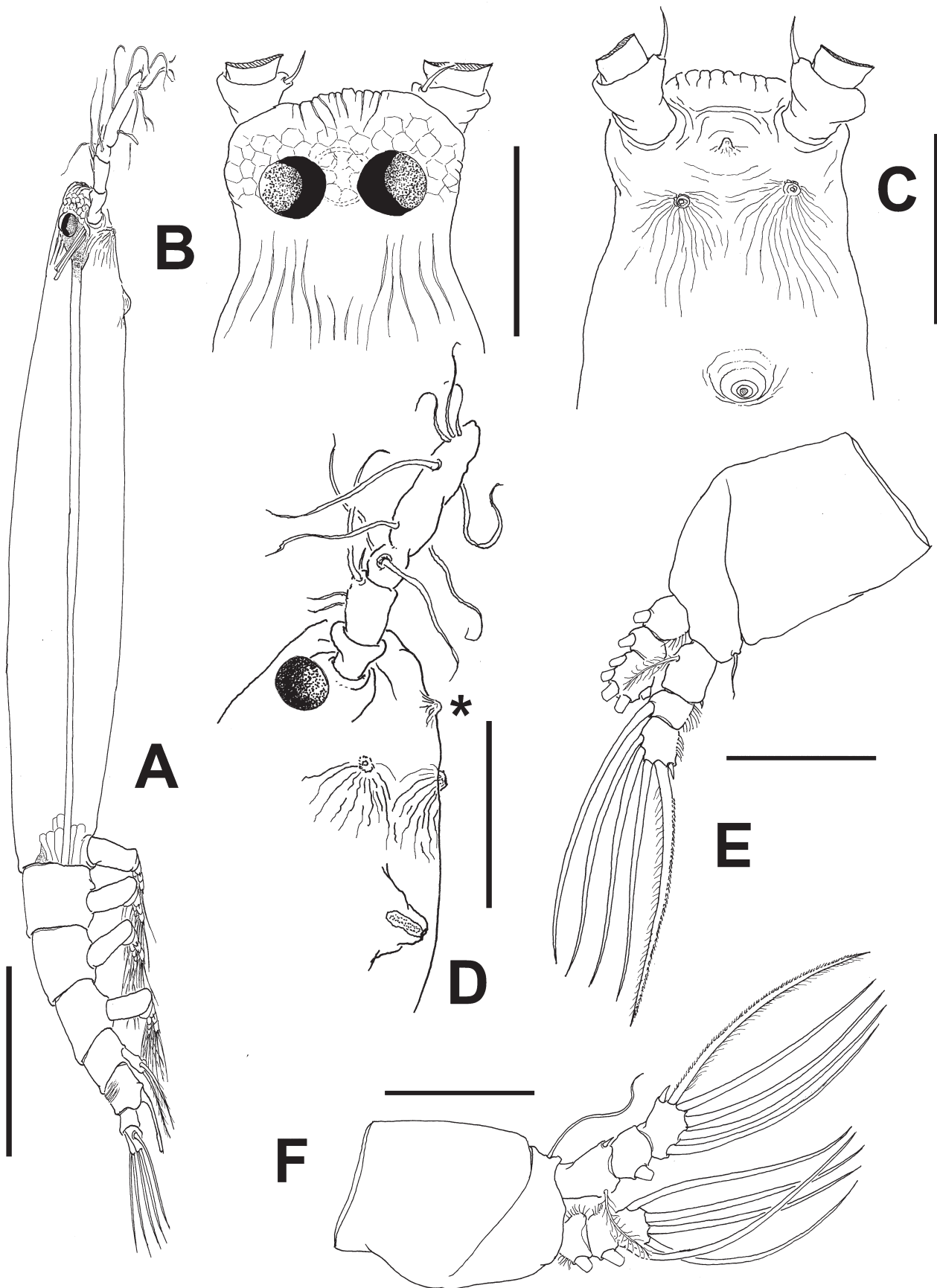
**Etymology.** The species name, a noun in apposition, refers to the coast-frequenting Jinigudira aboriginal people of the area around North West Cape, Western Australia.

**Diagnosis.** *Cymbasoma* of the *longispinosum* species-group with cephalothorax representing 70% of total body length; midventral oral papilla located at 17% of cephalothorax length. Cephalic region with forehead bearing deep longitudinal corrugations, light reticulation overlying area of eyes. Fifth pedigerous somite with postero-lateral corners forming rounded protuberances. Genital double-somite with dorsal transverse wrinkles in proximal half; ventral margin straight, flat in lateral view; distal margin with rounded protuberance. Ovigerous spines fused at base, 1.3 times as long as body. Fifth leg with outer lobe armed with three setae, innermost noticeably shorter, slender; inner lobe globose, small, arising from inner middle margin of exopodal lobe, unarmed. Male with intensely pigmented eyes, anal somite with dorsal spinous processes on posterior margin, genital complex of Type II, with smooth, divergent genital lappets; rounded medial process at insertion of lappets. Four caudal setae.

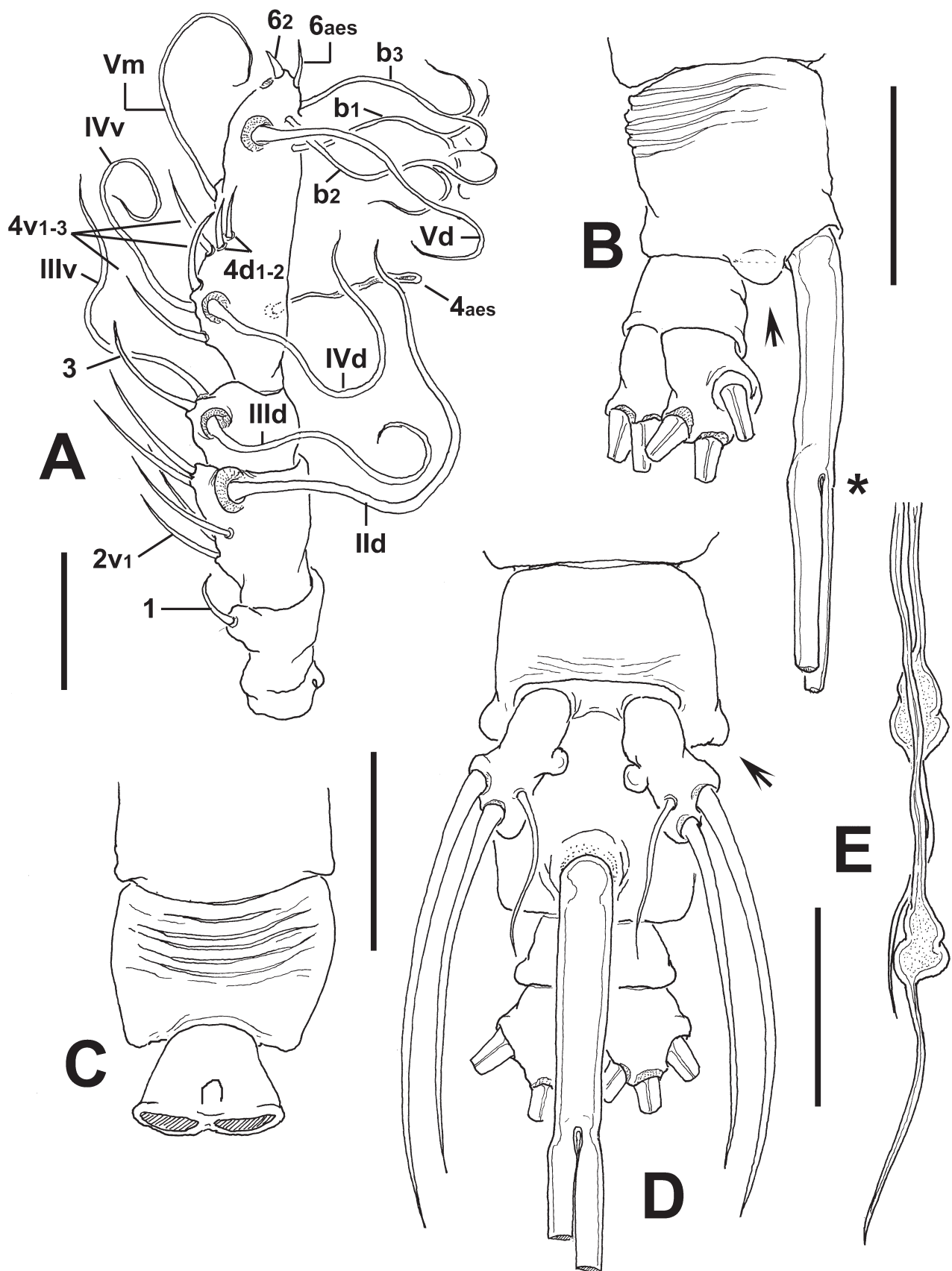
**Remarks.** This species from Australia was assigned to the *Cymbasoma longispinosum* species-group (Grygier 1994; Suárez-Morales 2011; Üstün *et al.* 2014) because of the following combination of characters: 1) a long cephalothorax representing more than 65% of the total body length, 2) a quadrate genital double-somite, with its posterior margin wider than the anterior margin of the anal somite, 3) proximally fused ovigerous spines, and 4) a bilobate fifth leg with three exopodal setae, the innermost being smaller and thinner than the others. The nominal *C. longispinosum* has been recorded in various geographical areas and at different latitudes including the Mediterranean, Norway, the Southern Pacific, the Eastern Tropical Atlantic, the Red Sea, India, Brazil, and the Black Sea (Üstün *et al.* 2014). There is a record of a male of this species from the Australian coast off New South Wales (Dakin & Colefax 1940). The group is currently known to contain at least five species showing subtle but consistent differences (Üstün *et al.* 2014).

The new species, *C. jinigudira* differs from the other members of this group by a combination of characters; with the peculiar arrangement of the forehead ridges, with longitudinal, parallel deep ridges, only shared with *C. sinopense* Üstün, Terbiyik & Suárez-Morales, 2014 (Üstün *et al.* 2014: fig. 2A). Frontal ornamentation is absent in *C. morii* (Grygier 1994: figs. 1C, D) in *C. janetae* Mageed, 2010 (Mageed 2010: fig. A), and in *C. cf. longispinosum* from Brazil (Leite *et al.* 2010: fig. 2C). In *C. chelemense* and *C. californiense* the frontal ornamentation is represented by a swirl-like pattern or simple transverse striae (*cf.* Üstün *et al.* 2014: table 1). This character is probably more informative than previously thought when comparing species in this group. The presence of a distinctive shell-like ventral process between the antennular bases is unique to *C. sinopense* (Üstün *et al.* 2014: fig. 2B); it is absent in the new species (Fig. 48C). In *C. jinigudira* from Australia, the cephalothorax represents 70% of the total body length. This value is similar to that found in *C. morii* (66–73%) (Martin Thompson 1973; Grygier 1994), *C. janetae* (70%) (Mageed 2010: fig. 1A) and *C. sinopense* (70%) (Üstün *et al.* 2014). The other species of the group have a proportional cephalothorax length lower than 68% (Üstün *et al.* 2014, table 1), including the specimen illustrated by Bourne (1890) in the original description of *C. longispinosum*.

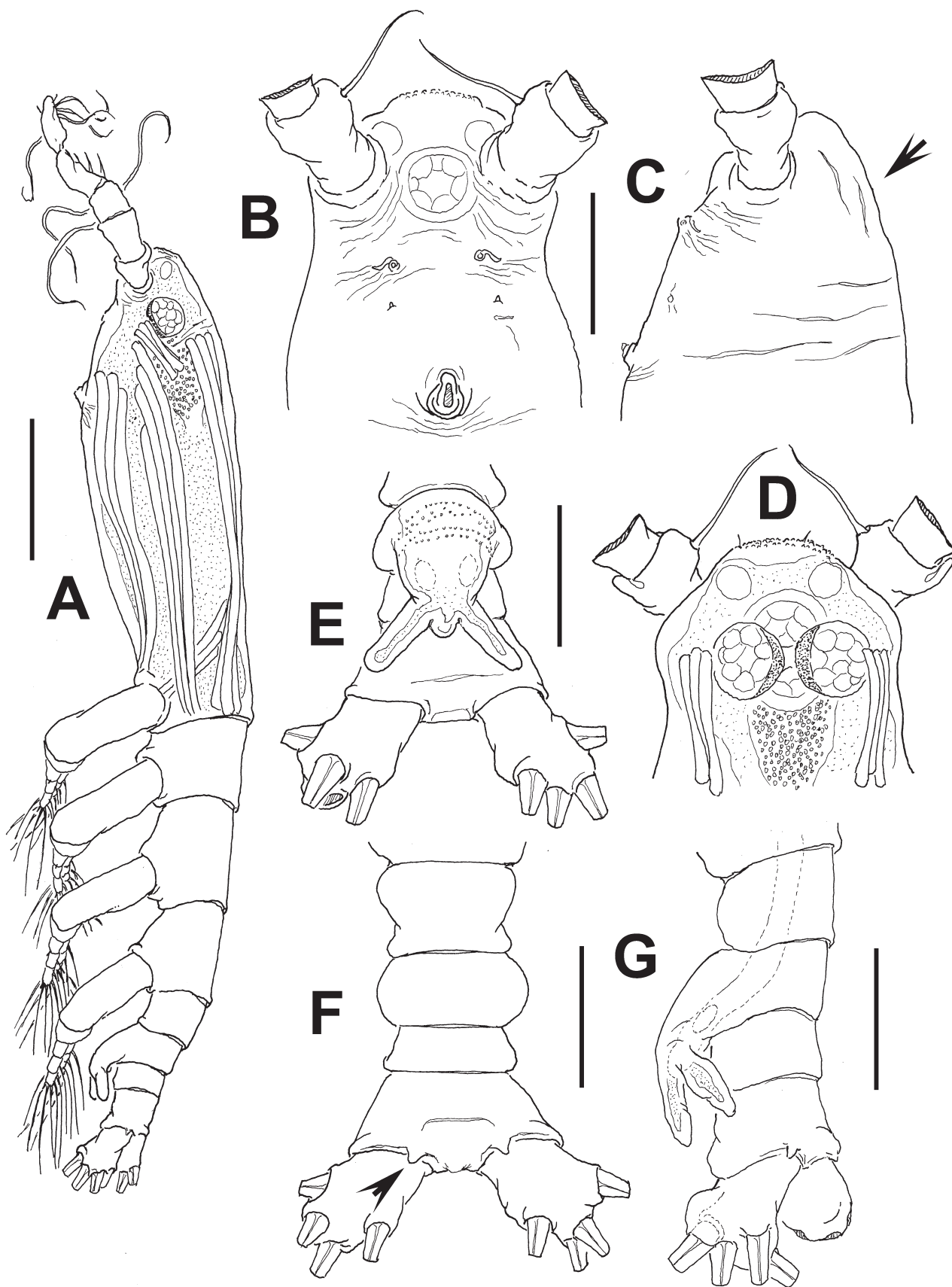
The last antennular segment (46% of the antennule length) and also the relative length of the antennule with respect to the body (less than 15%) are shorter in *C. sinopense* than in the new species (49% and 17%, respectively). The armature of the fifth leg shows some additional characters for comparison: (1) *C. sinopense* has the longest inner seta with respect to the length of the outer lobe of the leg (length ratio = 3.6) among the species of the group (Üstün *et al.* 2014: fig. 2D, table 1), including the new species (length ratio = 1.1, Fig. 49D) and (2) *C. sinopense* has a relatively large, well-developed inner lobe (see Üstün *et al.* 2014: fig. 2D), whereas this lobe is poorly developed in the new species and is represented by a small rounded lobe arising from the middle inner margin of the outer lobe, as occurs in *C. cf. longispinosum* from Brazil (Leite *et al.* 2010: fig. 2H). The point of bifurcation of the ovigerous spines at the level of the distal margin of the caudal rami (Fig. 49B) is a character



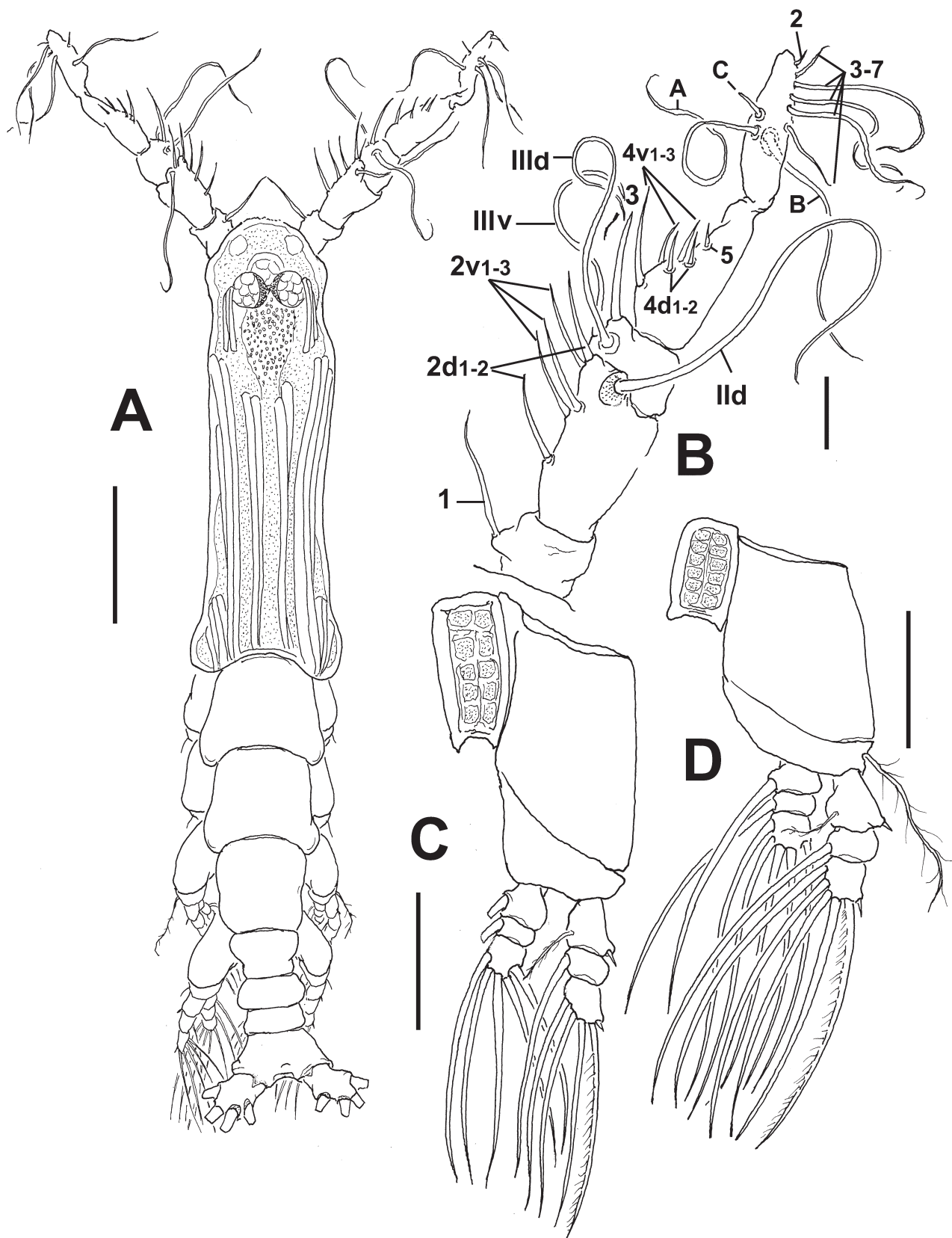
**FIGURE 48.** *Cymbasoma jinigudira* sp. nov., adult female. A) habitus, lateral view; B) cephalic region, dorsal view; C) same, ventral view; D) cephalic region, semi-lateral view, showing small medial ventral process (asterisk); E) first leg; F) third leg. Scale bars: A = 500  $\mu$ m, B–D = 0.25  $\mu$ m, D, E = 100  $\mu$ m.



**FIGURE 49.** *Cymbasoma jinigudira* sp. nov., adult female. A) right antennule, dorsal view; B) urosome showing protuberance of posterior margin of genital double-somite (arrowed), lateral view; C) genital double and anal somites, dorsal view; D) urosome, ventral view, arrow indicates protuberance on fifth pedigerous somite; E) distal section of ovigerous spines. Scale bars: A = 50 µm, B, C = 25 µm, D, E = 100 µm.



**FIGURE 50.** *Cymbasoma jinigudira* sp. nov., adult male. A) habitus, lateral view; B) cephalic region, ventral view; C) same, lateral view; D) same, dorsal view; E) urosome and genital complex, ventral view; F) same, dorsal view showing spiniform process on posterior margin of anal somite (arrowed); G) same, lateral view. Scale bars: A= 200  $\mu$ m, B–G= 100  $\mu$ m.



**FIGURE 51.** *Cymbasoma jinigudira* sp. nov., adult male. A) habitus, ventral view; B) right antennule, dorsal view; C) first leg with coxal sclerite; D) third leg with coxal sclerite. Scale bars: A = 200 µm, B = 50 µm, C,D = 100 µm.



shared by *C. morii*, *C. chelemense*, *C. californiense*, and *C. sinopense* but it differs from *C. janetae* (Mageed 2010), *C. longispinosum* (Bourne 1890) (original illustrations), and also from *C. longispinosum* from Norway (Sars 1921) and *C. cf. longispinosum* from Brazil (Leite *et al.* 2010: fig. 2H). The bifurcation point is located well beyond the distal margin of the caudal rami in the former two species while not reaching its distal margin in the latter two. This character alone would suggest that Sars' (1921) illustrations of *C. longispinosum* are not of the same species illustrated by Bourne (1890). In addition, the shape of the fifth leg inner lobe and the length of the innermost exopodal seta are also different. Consequently, it is probable that the specimens from Norway represent an undescribed species of the *C. longispinosum* species-group. A similar situation has been demonstrated for a species of *Monstrilopsis* from Norwegian fjords that was identified by Sars (1921) as *M. dubia* T. Scott, 1904 but in reality represented an undescribed species (Suárez-Morales & Ivanenko 2004). The point of bifurcation of the ovigerous spines of *C. jinigudira* appears to display an intermediate condition, being positioned slightly beyond the distal margin of the caudal rami. Also, in the new species the genital double-somite has posterolateral rounded expansions visible in dorsal view and a rounded protuberance at the insertion of the ovigerous spines (visible in lateral position) (arrowed in Fig. 49B). These processes are absent in the other species of the *longispinosum* group.

*Cymbasoma jinigudira* **sp. nov.** is another of the four species of four Australian *Cymbasoma* species that possess four caudal setae in the male. It can be distinguished from these congeners by the presence of a conspicuous set of spiniform processes on the posterior margin of the anal somite (dorsal position), which has not been observed in any other male of the genus. The male of the new species lacks an anterior protuberance on the cephalic region, thus diverging from *C. bullatum* and *C. rochai*. In *C. jinigudira* the urosome is relatively short, the genital and anal somites are almost equally long, the anal somite lacks a constriction and is 1.7 times wider than long, thus contrasting with the usual condition (*i.e.* longer than wide) in the other species of the genus (Suárez-Morales 2000a). The genital lappets are smooth and relatively short, barely reaching the proximal half of the anal somite, and the genital complex is ornamented with rows of papilla-like processes at its base (Fig. 50F), a character not previously observed in other species of the genus. The male of the new species closely resembles that of *C. tropicum* in that 1) the medial margin of the lappet bases has a rounded process, 2) the body proportions (*i.e.* length of cephalothorax with respect to the urosome, relative length of the antennules) is similar, 3) the caudal ramus has four setae, and 4) the anal somite is wider than long (Martin Thompson & Easterson 1983). Both species differ in the shape of the body, being clearly more robust in the new species, and in the presence of the spiniform processes on the anal somite. In addition, distinct differences can be discerned in the armature of the antennule. In *C. tropicum* element 1 (*sensu* Grygier & Ohtsuka 1995) is short and spiniform (Martin Thompson & Easterson 1983: fig. 2g) whereas it is remarkably long and setiform in the new species. Also, element 3 on the third segment is short in *C. tropicum*, reaching the proximal 1/3 of the fourth segment (Sewell 1949; Martin Thompson & Easterson 1983), whereas it is clearly longer in the new species, reaching well beyond halfway up the fourth segment. There are some differences between the specimens of *C. tropicum* from the Nicobar Islands and the Maldives (Sewell 1949) and those from the Arabian Sea (Martin Thompson & Easterson 1983), particularly in the structure of the genital complex. The Arabian specimens could represent a distinct species.

The previous Australian record of *C. longispinosum*, based on a male specimen (Dakin & Colefax 1940, figs. 205Da-d), could be referable to *C. jinigudira* **sp. nov.** The structure of the genital complex with a medial rounded protuberance as depicted by Dakin & Colefax (1940: fig. 205Dd) and some additional characters discernible from their illustrations, like the large, wide anal somite and the presence of four caudal setae are reminiscent of the male of *C. jinigudira*. In addition, all males believed to represent species of the *C. longispinosum* species group in the literature, based either by their co-occurrence with conspecific females or by explicit designation (Giesbrecht 1893; Sars 1921; Martin Thompson 1973; Leite *et al.* 2010) have four caudal setae and a similar genital complex, so these characters inclined us to attribute Dakin & Colefax's (1940) male specimen to *C. jinigudira* despite the fact that it was collected at the opposite side of the country. Pending further investigations it is here tentatively assigned to this species.

### ***Cymbasoma fergusoni* sp. nov.**

(Figs 52, 53)

**Material examined.** Holotype: adult female from North West Cape, Western Australia (21°47.180' S, 114°7.300' E), partially dissected, ethanol-preserved; dissected parts mounted on slide in glycerine, sealed with Entellan®.

Date of collection: 20th October 1997. Slides deposited in the collection of the Museum of Western Australia (cat. WAM C61742).

**Description of adult female.** Body elongate, slender (Fig. 52A); body length of holotype female 1.58 mm. Cephalothorax approximately 0.98 mm long, representing 63% of total body length. Midventral oral papilla moderately protuberant, located at 19% of cephalothorax length. Pair of medium-sized ocelli present, pigment cups moderately developed, medially separated, weakly pigmented; ventral cup larger than lateral cups. Cephalic area with straight lateral margins and produced "forehead". Frontal area with medial protuberance flanked by lower rounded processes ornamented with transverse wrinkles (Fig. 53B). Dorsal surface with small wart-like processes at level of antennular bases (arrowed in Fig. 53A). Ventral surface with additional cuticular elements: 1) pair of symmetrical, small crescent-shaped cuticular processes on anterior ventral surface located posterior to bases of antennules, with no adjacent striae; 2) nipple-like processes with adjacent transverse wrinkles; 3) pair of minute nipple-like processes in medial position (Fig. 53B) above oral papilla; 4) perioral transverse wrinkles.

Urosome consisting of fifth pedigerous somite, genital double-somite and anal somite, together representing 15% of total body length. Relative lengths of urosomites (fifth pedigerous, genital double- and free anal somite) 25.1:49.3: 25.6 = 100, respectively (Fig. 53F, G). Fifth pedigerous somite with slightly expanded lateral margins; dorsal surface with deep transverse striae (Fig. 53E). Genital double-somite longest of urosome; ventral surface with field of transverse wrinkles adjacent to bases of ovigerous spines; dorsal surface with wrinkles in posterior half only (Fig. 53D); anterior half swollen in dorsal view; with antero-lateral rounded processes visible in dorsal view (arrowed in Figs 52F, 53D); antero-ventral process strong, forming thumb-like protuberance (Fig. 53C); ventral surface of posterior half with notch visible in lateral view (arrowed in Fig. 53C). Ovigerous spines paired, basally separated; slender, straight at their base, distally acute; spines short, about 23% of total body length (0.22 mm) (Fig. 52A). Anal somite with medial constriction represented by incomplete suture in dorsal view, otherwise, dorsal and ventral surfaces smooth (Fig. 53F). Caudal ramus subquadrate, about 1.2 times as long as wide, armed with three caudal setae.

Antennule length 0.34 mm, relatively short, representing about 22% of total body length and 33% of cephalothorax length; 4-segmented, segments 3 and 4 fused. Relative length of distal antennular segment 46%. Short spiniform element 1 present on first segment; elements on second segment 2d1-2, 2v1-3, and IId. Elements 2d1-2 modified, curved, with rugose surface (Fig. 52B). Third segment with short, spiniform element 3, elements IIId and IIIV setiform, of normal aspect. Segment 4 bearing elements 4v1-2; elements 4d1,2 and 4v3 not observed. Setae IVd, IVv, Vd, Vv, Vm, and 4aes present. Element 5 absent. Subterminal elements b1-2 present; short, unbranched, apical elements 6aes; 6l-2 present in specimen.

Incorporated first pedigerous somite and succeeding three free pedigerous somites each bearing a pair of biramous legs. Pedigerous somites 2–4, together accounting for 21% of total body length. Intercoxal sclerites of legs 1–4 subrectangular, posterior margin smooth. Bases of legs 1–4 with hair-like lateral seta (Fig. 52C, D); on leg 3, this seta about 3.4 times longer, sparsely setulated and thicker than those on other legs (Fig. 52E). Endopods and exopods of legs 1–4 triarticulated. Ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3, and inner seta of first exopodal segment, these latter being slender, sparsely setulated. Outermost distal spines on third exopodal segment of legs 1–4 being half as long as segment. Outermost apical exopodal setae of legs 1–4 with inner margin naked, outer margin spinulose; outer spine of leg 1 first exopodal segment with short peduncle (Fig. 52C). Outer margins of first and second endopodal segments of legs 1–4 protuberant (Fig. 52C, D).

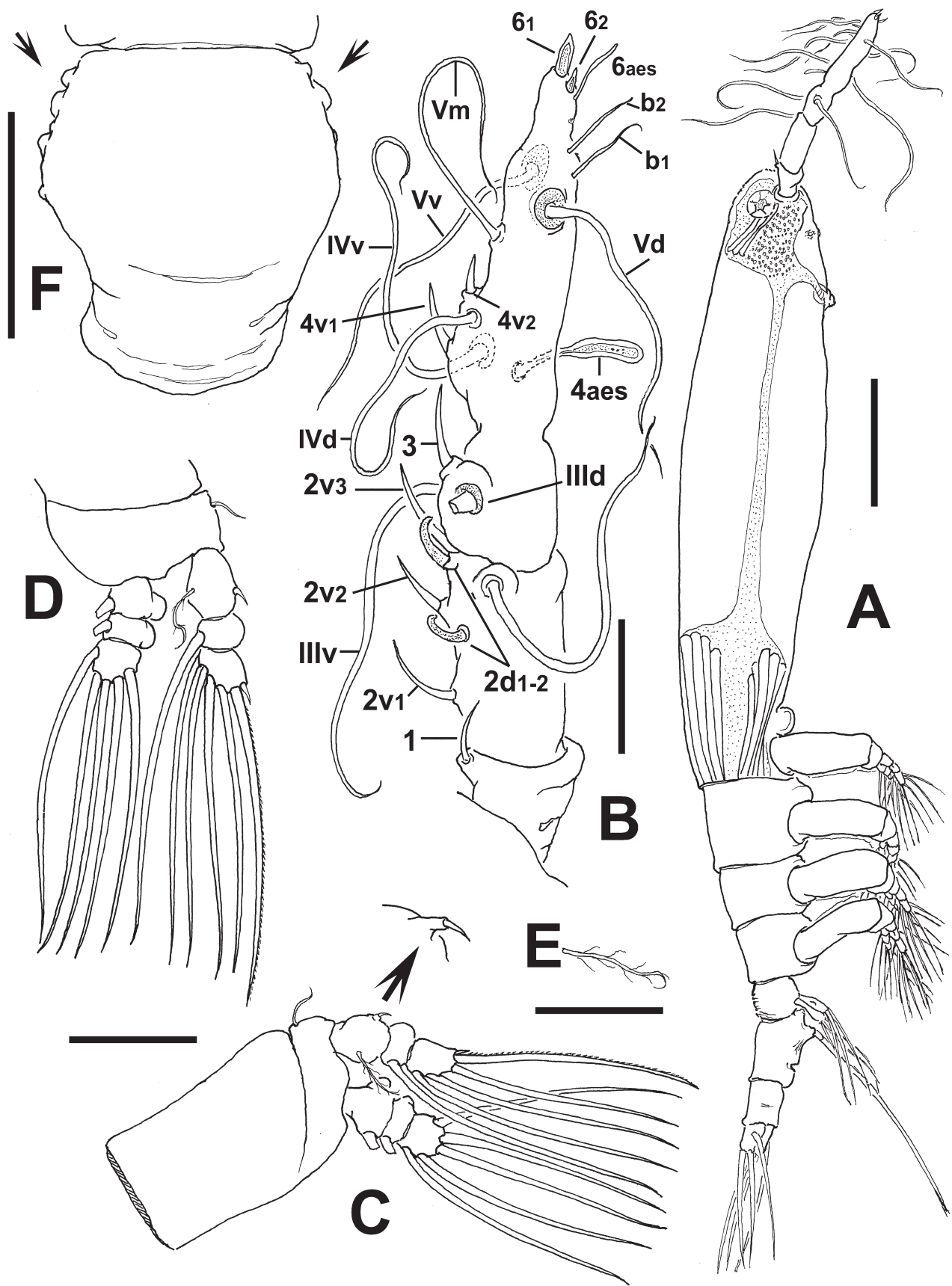
Armature formula of legs 1–4:

	basis	endopod	endopod
leg 1	1-0	0-1;0-1;1,2,2	I-1;0-1;I,2,2
legs 2–4	1-0	0-1;0-1;1,2,2	I-1;0-1;I,1,2,2

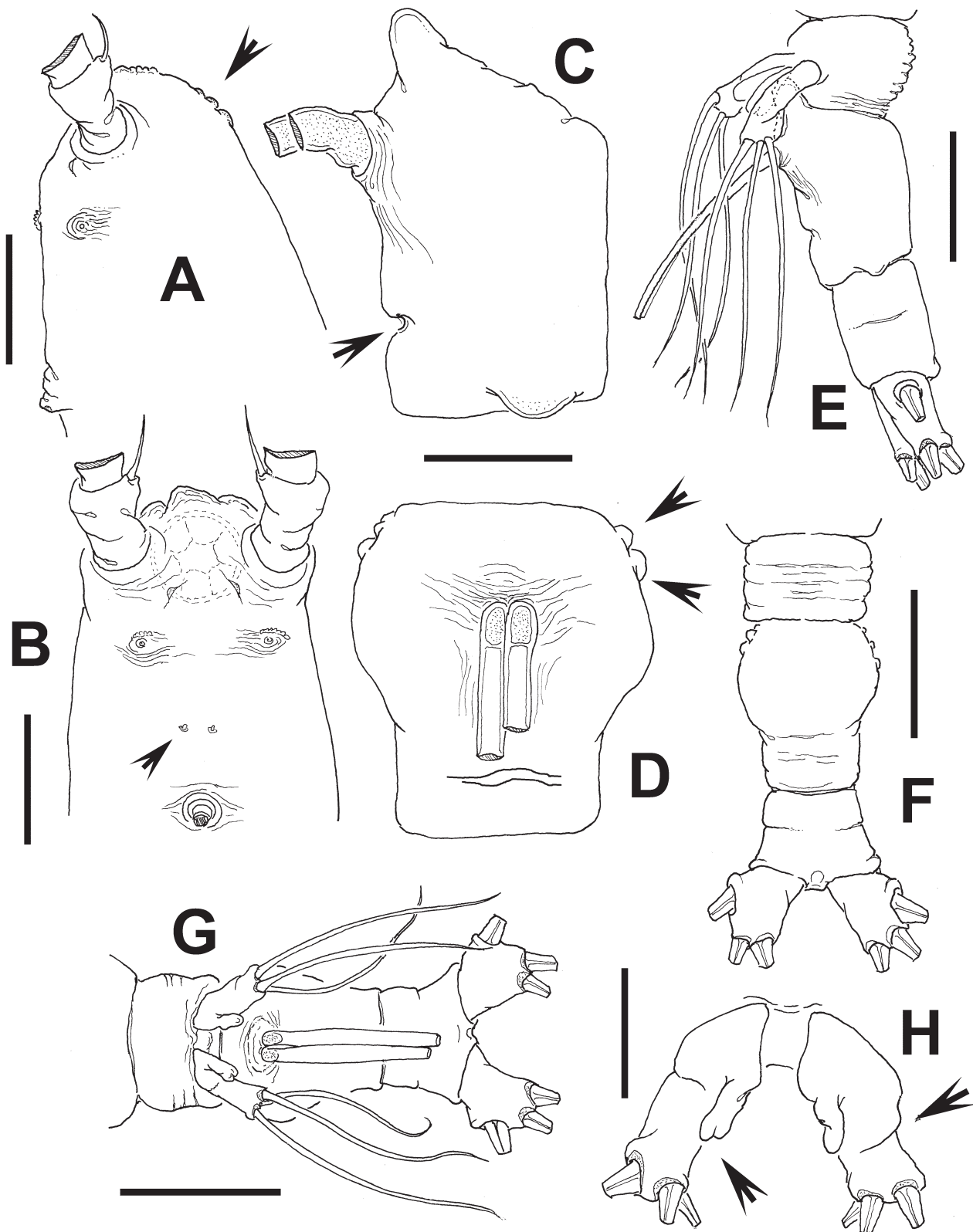
Fifth legs medially separate, bilobate; outer (exopodal) lobe short, cylindrical, distally truncate. Outer lobe armed with three distal setae, innermost slightly shorter than other two (Fig. 53G). Inner lobe digitiform, arising from base of exopodal lobe, unarmed, shorter, reaching to about half the length of outer lobe; right inner lobe distally bifurcate, left lobe with medial twist (arrows in Fig. 53H).

Male: unknown.

**Type locality.** North West Cape, Western Australia (21°47.180' S, 114°7.300' E).



**FIGURE 52.** *Cymbasoma fergusoni* sp. nov., adult female. A) habitus, lateral view; B) right antennule, dorsal view; C) first leg showing pedunculated outer spine on first exopodal segment (arrow); D) second leg; E) basipodal seta of third leg; F) genital double-somite showing rounded marginal processes on anterior half (arrows). Scale bars: A = 200  $\mu$ m, B = 50  $\mu$ m, C–F = 100  $\mu$ m.



**FIGURE 53.** *Cymbasoma fergusoni* sp. nov., adult female. A) cephalic region, lateral view; B) same, ventral view; C) genital double-somite showing anteroventral process and ventral notch (arrowed), lateral view; D) same, ventral view, rounded protuberances on anterior half of genital double-somite arrowed; E) urosome and fifth legs, lateral view; F) same, dorsal view; G) same, ventral view; H) fifth legs, ventral view showing distally bifid inner lobe and suture on outer lobe (arrows). Scale bars: A, B, E–G = 100  $\mu$ m, C, D, H = 50  $\mu$ m.



**Etymology.** This species is named for the RV *Cape Ferguson*, which has conducted marine research on behalf of the Australian Institute of Marine Science throughout northern Australia since 2000.

**Diagnosis.** *Cymbasoma* with frontal area bearing medial protuberance flanked by lower rounded processes ornamented with transverse wrinkles. Antennules representing about 22% of total body length and 33% of cephalothorax length; third and fourth antennular segments fused, second segment with modified elements 2d1-2. Genital double-somite with anterior half swollen in dorsal view and with antero-lateral wart-like processes visible in dorsal view; antero-ventral process strong, forming thumb-like protuberance; ventral surface of posterior half with notch. Fifth leg with short outer lobe armed with three distal setae, innermost being shorter; inner lobe arising proximally, unarmed. Right inner lobe distally bifurcate. Ovipigerous spines short, representing 23% of total body length.

**Remarks.** *Cymbasoma fergusoni* sp. nov. belongs to the group of Australian *Cymbasoma* displaying a narrow, elongate fifth leg inner lobe and three exopodal setae. The main characters that are distinctive of this species include the unique tumor-like processes on the anterolateral margins of the cephalothorax and the prominent, thumb-like anteroventral process of the genital double-somite. This kind of processes has not been observed in other congeners so far. Also, it has a medial protuberance in the frontal area; a similar process has been described in the Costarrican species *C. alvaroi* (Suárez-Morales *et al.* 2013); however, in *C. fergusoni* this process is flanked by two other smaller protuberances, thus differing from *C. alvaroi* in which these secondary processes are absent (Suárez-Morales *et al.* 2013a: fig. 6A). Also, the Costarrican species lacks processes on the genital double-somite and striae on the fifth pedigerous somite, both characters are present in *C. fergusoni*. In addition, the fifth leg inner lobe is short, barely reaching to halfway down the outer lobe length. Both lobes are slightly bent inwards and slightly asymmetrical, with one of them being distally bifurcate, a character not previously observed in any other species of the genus.

### ***Cymbasoma solanderi* sp. nov.**

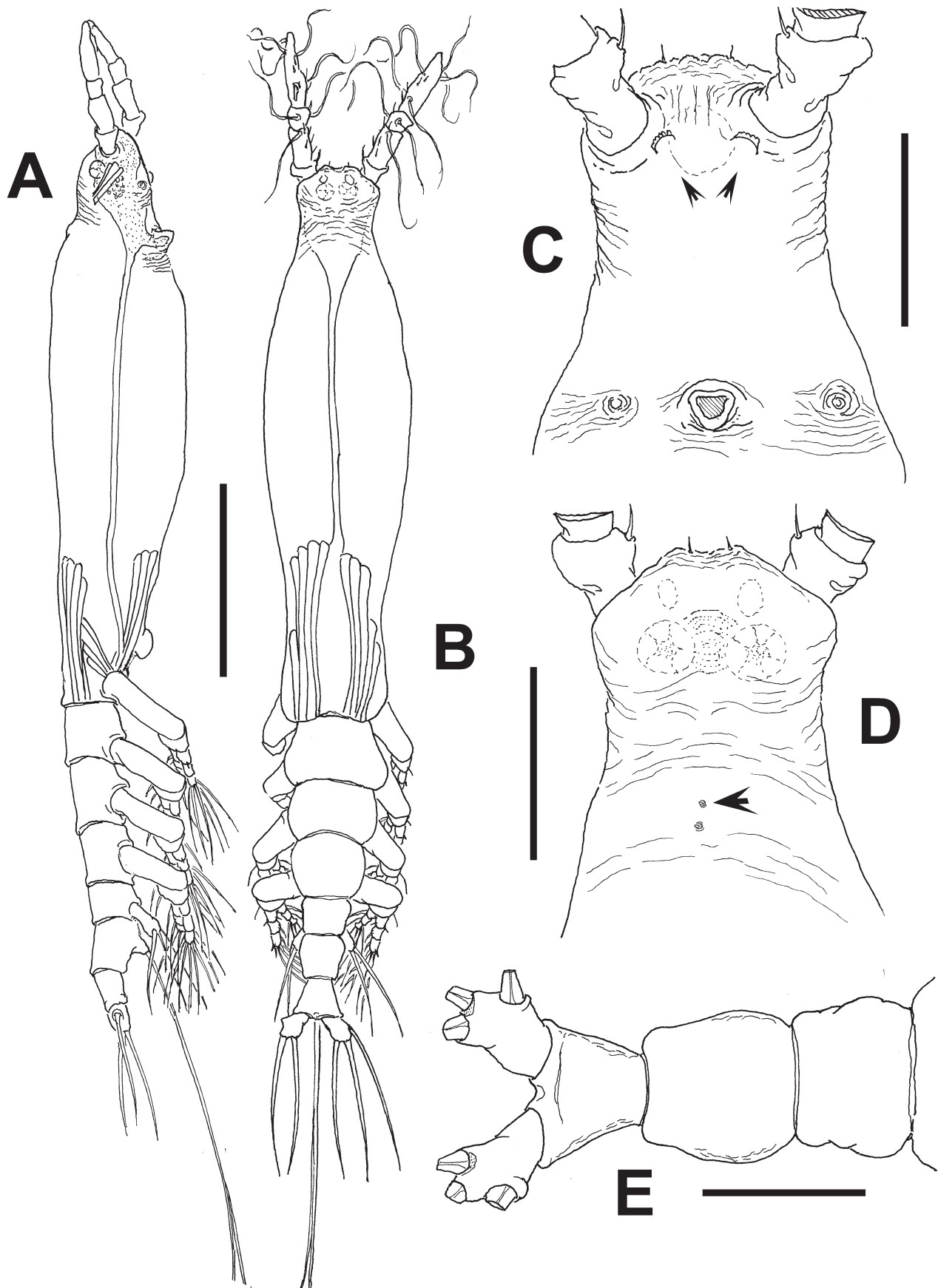
(Figs 54, 55)

**Material examined.** Holotype: adult female from Scott Reef, Western Australia (14°02.500' S, 121°52.800' E), partially dissected, ethanol-preserved; dissected parts mounted on 2 slides in glycerine, sealed with Entellan®. Date of collection: 6th June 2009. Slides deposited in the collection of the Museum of Western Australia (cat. WAM C61309).

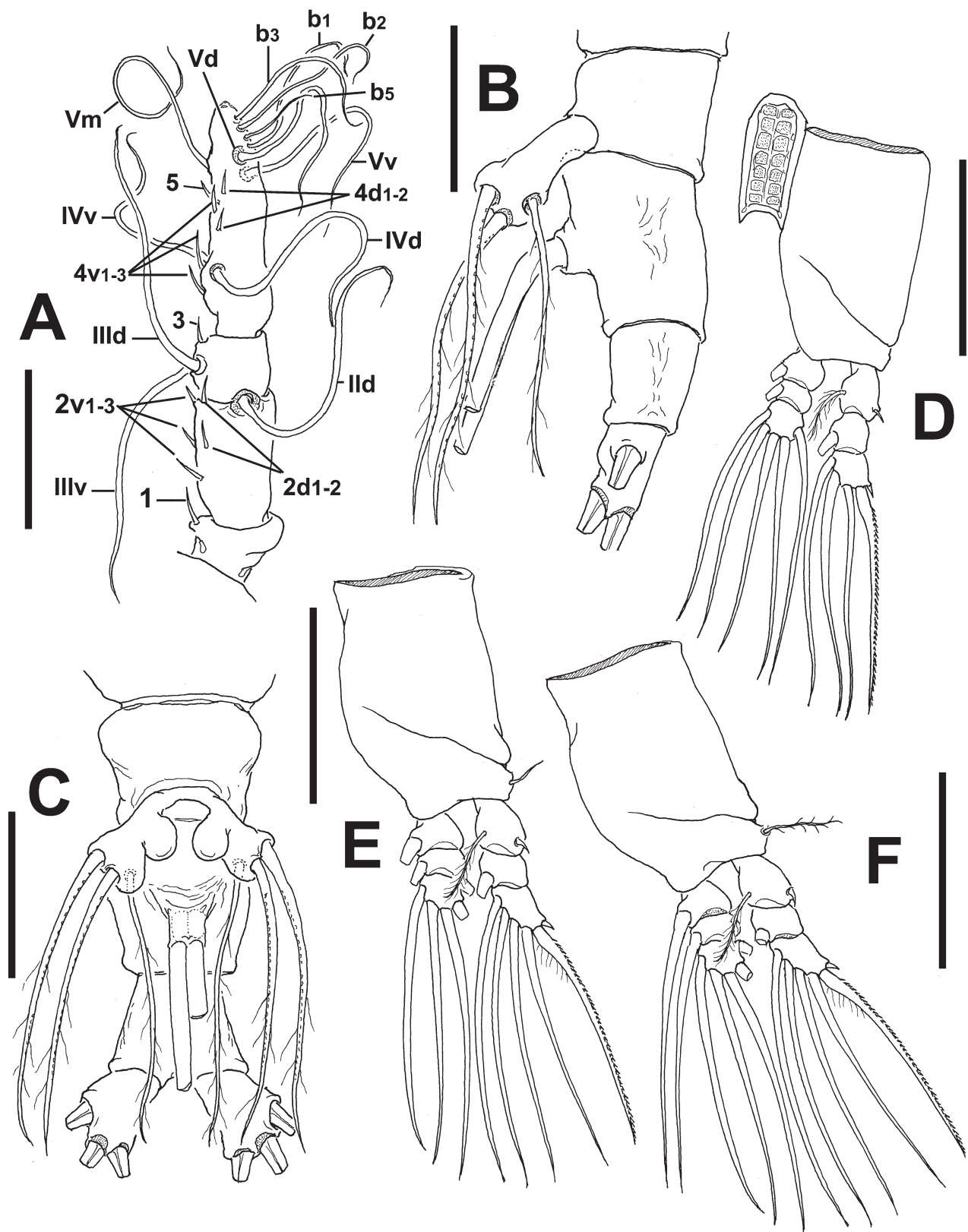
**Description of adult female.** Body elongate, slender (Fig. 54A, B); body length of holotype female 1.77 mm. Cephalothorax approximately 1.16 mm long, representing 66% of total body length. Midventral oral papilla protuberant, located at 18% of cephalothorax length, papilla flanked by nipple-like processes (Fig. 54C). Pair of medium-sized ocelli present, pigment cups moderately developed, medially separated, weakly pigmented; ventral cup about as large as lateral cups (Fig. 54C, D). Cephalic area narrower than post oral region, with straight lateral margins and moderately produced "forehead". Frontal area with slight medial depression flanked by pair of sensilla and field of transverse wrinkles (Fig. 54D). Dorsal surface with field of faint transverse wrinkles overlying area posterior to ocelli and two small sensilla in medial position (arrowed in Fig. 54D). Ventral surface with additional cuticular elements: 1) pair of symmetrical, crescent-shaped cuticular processes on anterior ventral surface between bases of antennules, with no adjacent striae (arrows in Fig. 54C); 2) nipple-like processes with adjacent transverse and concentric wrinkles, processes located at each side of oral papilla; 3) perioral transverse wrinkles.

Urosome consisting of fifth pedigerous somite, genital double-somite and anal somite, together representing 14% of total body length. Relative lengths of urosomites (fifth pedigerous, genital double- and free anal somite) 31.7:42.8: 25.5 = 100, respectively (Fig. 54E). Fifth pedigerous somite with slightly expanded lateral margins, dorsal and ventral surfaces smooth. Genital double-somite longest of urosome, lateral surface with few longitudinal wrinkles, dorsal and ventral surfaces smooth (Figs 54E, 55B). Anterior half of genital double-somite moderately swollen in dorsal view, with weak antero-ventral protuberance (Fig. 55B). Ovipigerous spines paired, basally separated, slender, straight at their bases, distally acute; spines about 40% of total body length (0.76 mm long) (Fig. 54A, B). Anal somite relatively narrow, elongate, with few wrinkles on lateral surface, lacking medial constriction; dorsal and ventral surfaces smooth (Fig. 54E). Caudal ramus subrectangular, about 1.6 times as long as wide, armed with three subequally long caudal setae.





**FIGURE 54.** *Cymbasoma solanderi* sp. nov., adult female. A) habitus, lateral view; B) same, dorsal view; C) cephalic region, ventral view; D) same, dorsal view; E) urosome, dorsal view. Scale bars: A, B = 400  $\mu$ m, C, D = 200  $\mu$ m, E = 100  $\mu$ m.



**FIGURE 55.** *Cymbasoma solanderi* sp. nov., adult female. A) right antennule, dorsal view; B) urosome and fifth legs, lateral view; C) same, ventral view; D) first leg with coxal plate; E) second leg; F) third leg. Scale bars: A–C = 100  $\mu$ m, D–F = 200  $\mu$ m.

Antennule length 0.26 mm, relatively short, representing about 15% of total body length and 23% of cephalothorax length; 4-segmented, segments 3 and 4 separated. Relative length of distal antennular segment 49%. Short spiniform element 1 present on first segment; elements on second segment noticeably short, reduced elements 2d1-2 and 2v1-3, plus normal element IIId. Third segment with remarkably short spiniform element 3, elements IIIId and IIIv setiform, of normal aspect. Segment 4 bearing elements 4d1,2, 4v1-2; setae IVd, IVv, Vd, Vv, Vm present; 4aes not observed. Element 5 short, spiniform. Subterminal elements b1-3 and b5 present, unbranched; apical elements 6l1-2 and 6aes not present in specimens, but sockets were observed (Fig. 55A).

Incorporated first pedigerous somite and succeeding three free pedigerous somites each bearing a pair of biramous legs. Pedigerous somites 2–4, together accounting for 21% of total body length. Intercoxal sclerites of legs 1–4 subrectangular, narrow, surface with pattern of finely spinulose subquadrate patches, posterior margin curved, smooth. Bases of legs 1–4 with hair-like lateral seta (Figs. 55D–F); on leg 3, this seta about 2.2 times longer than those on other legs (Fig. 55F). Endopods and exopods of legs 1–4 triarticulated. Ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3, and inner seta of first exopodal segment, these latter being slender, sparsely setulated (Fig. 55D–F). Outermost distal spines on third exopodal segment of legs 1–4 being 0.3 times as long as segment. Outermost apical exopodal setae of legs 1–4 with inner margin setulated at proximal 1/5 only, naked otherwise; outer margin spinulose.

Armature formula of legs 1–4:

	basis	endopod	exopod
leg 1	1-0	0-1;0-1;1,2,2	1-1;0-1;1,2,2
legs 2–4	1-0	0-1;0-1;1,2,2	1-1;0-1;1,1,2,2

Fifth legs medially conjoined, bilobate; outer (exopodal) lobe short, its distal end barely reaching insertion of ovigerous spines (Fig. 55B, C); subrectangular, distally expanded, armed with two distal and one subdistal inner setae, latter seta slightly narrower but as long as other two (Fig. 55C). Inner lobe relatively large, strongly globose, arising from proximal half of exopodal lobe, unarmed (Fig. 55C).

Male: unknown.

**Type locality.** Scott Reef, Western Australia (14°2.500' S, 121°52.800' E).

**Etymology.** This species is named for the RV *Solander*, which has conducted marine research on behalf of the Australian Institute of Marine Science in NW Australia since 2007 and, and was in turn named for Dr. Daniel Solander, naturalist on James Cook's 1768 voyage to Australia on the *Endeavour*.

**Diagnosis.** *Cymbasoma* with frontal area bearing weak medial depression flanked by sensilla and with transverse wrinkles. Antennules representing about 15% of total body length and 23% of cephalothorax length; third and fourth antennular segments separate, second segment with noticeably short, reduced elements 2d1-2 and 2v1-3. Genital double-somite with anterior half moderately swollen in dorsal view, with few longitudinal wrinkles on lateral margin. Antero-ventral process weak. Anal somite relatively narrow, elongate, slightly shorter than genital double-somite, with few wrinkles on lateral surface. Fifth leg with short, robust outer lobe armed with two distal and one subdistal setae, innermost seta being narrower but about as long as other two setae; inner lobe relatively large, globose, arising from proximal half of exopodal lobe, unarmed. Ovigerous spines representing 40% of total body length.

**Remarks.** The female of *C. solanderi* sp. nov. shares with the Australian *C. constrictum* and *C. lentilum* but also with *C. striifrons* (cf. Chang 2012) a remarkably long anal somite, which is almost as long as the genital double-somite, and a short fifth leg inner lobe. It also shares with *C. lenticula* a protuberant anteroventral process on the genital double-somite. The new species *C. solanderi* differs from these other two species in having a strongly globose fifth leg inner lobe vs. a digitiform, narrower lobe in both *C. constrictum* and *C. lenticula* and a poorly developed lobe in *C. striifrons* (Chang 2012: fig. 2C). A wide, globose fifth leg inner lobe is known in other species of *Cymbasoma* including *C. sinopense* (cf. Üstün *et al.* 2014), *C. morii* (Martin Thompson 1973; Grygier 1994), *C. chelemense* (cf. Suárez-Morales & Escamilla 1997) and *C. californiense* (Suárez-Morales & Palomares-García 1999). These four species are members of the *C. longispinosum*-group and clearly differ from *C. solanderi* in several other characters including the shape and ornamentation of the genital double-somite, the proximal fusion of the ovigerous spines and the relative length of the cephalothorax. *Cymbasoma solanderi* does not belong to the *C. longispinosum* species-group. The length of the fifth leg is another character that can be helpful in recognizing

this species. In the new species the outer lobe does not reach the point of insertion of the ovigerous spines while in most Australian species it reaches this level or beyond it. Only in *C. bali* (Fig. 28D; Desai & Krishnaswamy 1962: fig. 5) and in *C. jinigudira* the outer lobe is as short as in the new species; it can readily be distinguished from *C. bali* by the shape and size of the inner lobe of the fifth leg. It is reduced to a small protuberance in *C. bali* (Desai & Krishnaswamy 1962: fig. 10), thus diverging from the relatively large, strongly globose lobe displayed by the new species. Also, the antennular elements of the 2v-d group (*sensu* Grygier & Ohtsuka 1995) are long and normally developed in *C. bali* (Desai & Krishnaswamy 1962: fig. 6) as well as in most species of the genus, however, are remarkably short in the new species. In addition, it differs from *C. jinigudira* in the size and armature of the fifth leg. The inner lobe is clearly smaller in *C. jinigudira* and it has also a short, narrow innermost exopodal seta (Fig. 49D), thus diverging from the pattern observed in the new species.

### ***Cymbasoma agoense* Sekiguchi, 1982**

(Figs 56, 57)

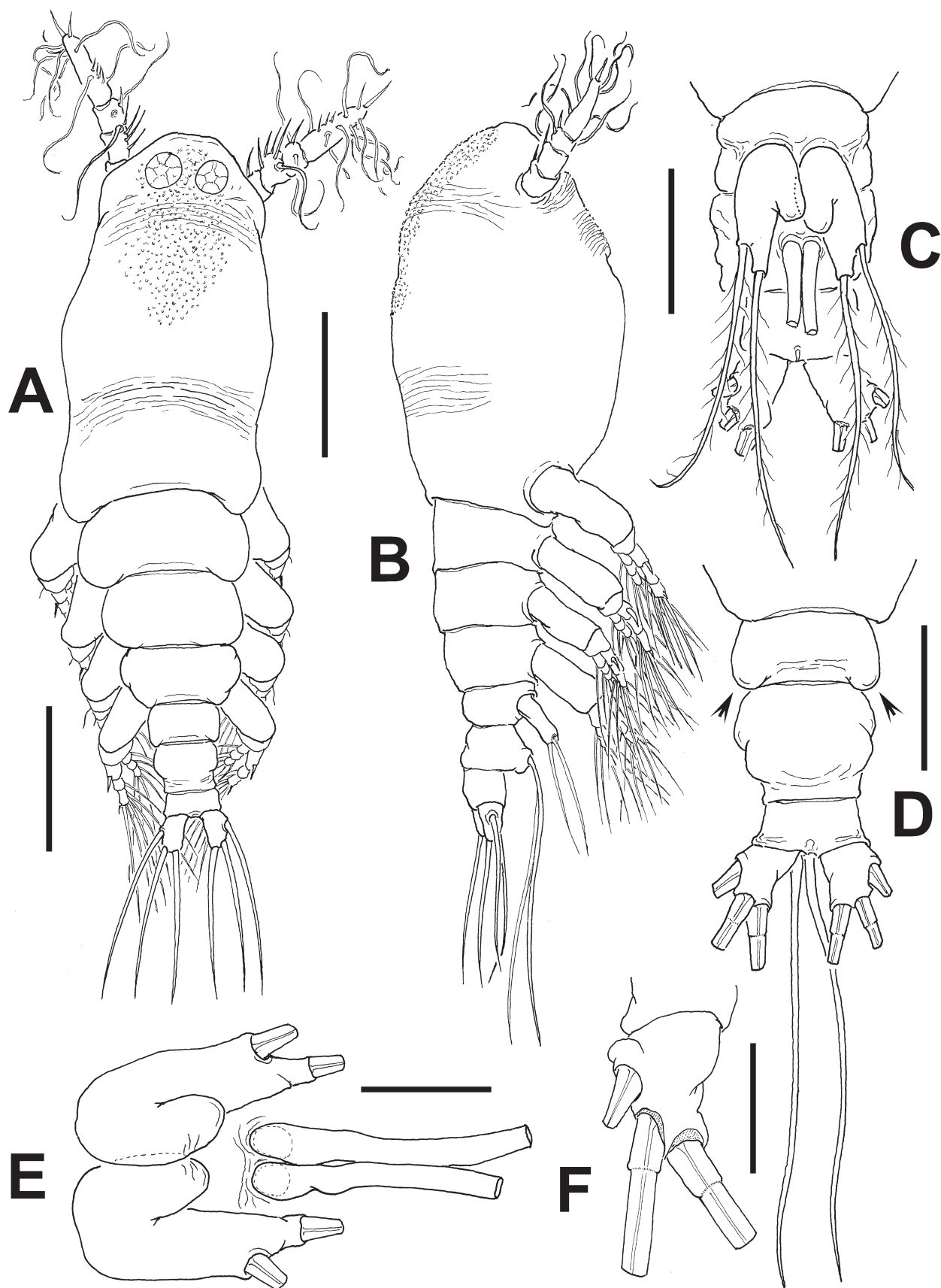
**Material examined.** Adult female from Davies Reef, Queensland, Australia (19°7.340' S, 146°53.024' E), partially dissected, ethanol-preserved; dissected parts mounted on slide in glycerine, sealed with Entellan®. Date of collection: 12th December 1989. Slide deposited in the collection of MTQ, Australia (cat. MTQ W34400).

**Description of adult female.** Body noticeably robust, relatively wide in dorsal view, globose in lateral view; body length of holotype female 0.97 mm. Cephalothorax approximately 0.52 mm long, representing 53% of total body length. Midventral oral papilla not protuberant, located at 30% of cephalothorax length. Pair of relatively large ocelli present, pigment cups medially conjoined, weakly pigmented; ventral cup as large as lateral cups (Fig. 56A). Cephalic area wide, with moderately produced "forehead". Cephalic frontal area wide. Dorsal surface of cephalothorax smooth except for large field of minute wart-like cuticular processes overlying ocelli area and stretching to medial dorsal surface; wrinkled areas posterior to eye region and in distal 1/3 of cephalothorax (Fig. 56A, B). Ventral surface with field of transverse cuticular wrinkles between antennular bases and preoral area. Ventral surface also with pair of nipple-like processes connected medially by transverse striae (Fig. 57B).

Urosome consisting of fifth pedigerous somite, genital double-somite and anal somite, together representing 16% of total body length. Relative lengths of urosomites (fifth pedigerous, genital double- and free anal somites) 30.9: 47.3: 21.8 = 100, respectively (Figs. 56D). Lateral margins of fifth pedigerous somite straight, with few transverse wrinkles on dorsal surfaces and postero-lateral corners produced into rounded protuberances (arrowed in Fig. 56D). Genital double-somite longest of urosome, with dorsal surface ornamented with few wrinkles (Fig. 56D); anterior half swollen, posterior half with straight margins. Ovigerous spines paired, basally separated, slender, straight at their bases (Fig. 56C), relatively short (0.41 mm), 43% of total body length. Anal somite short, without medial constriction. Caudal ramus subquadrate, about as long as wide, armed with three caudal setae, distal two proximally thickened (Fig. 56D, F).

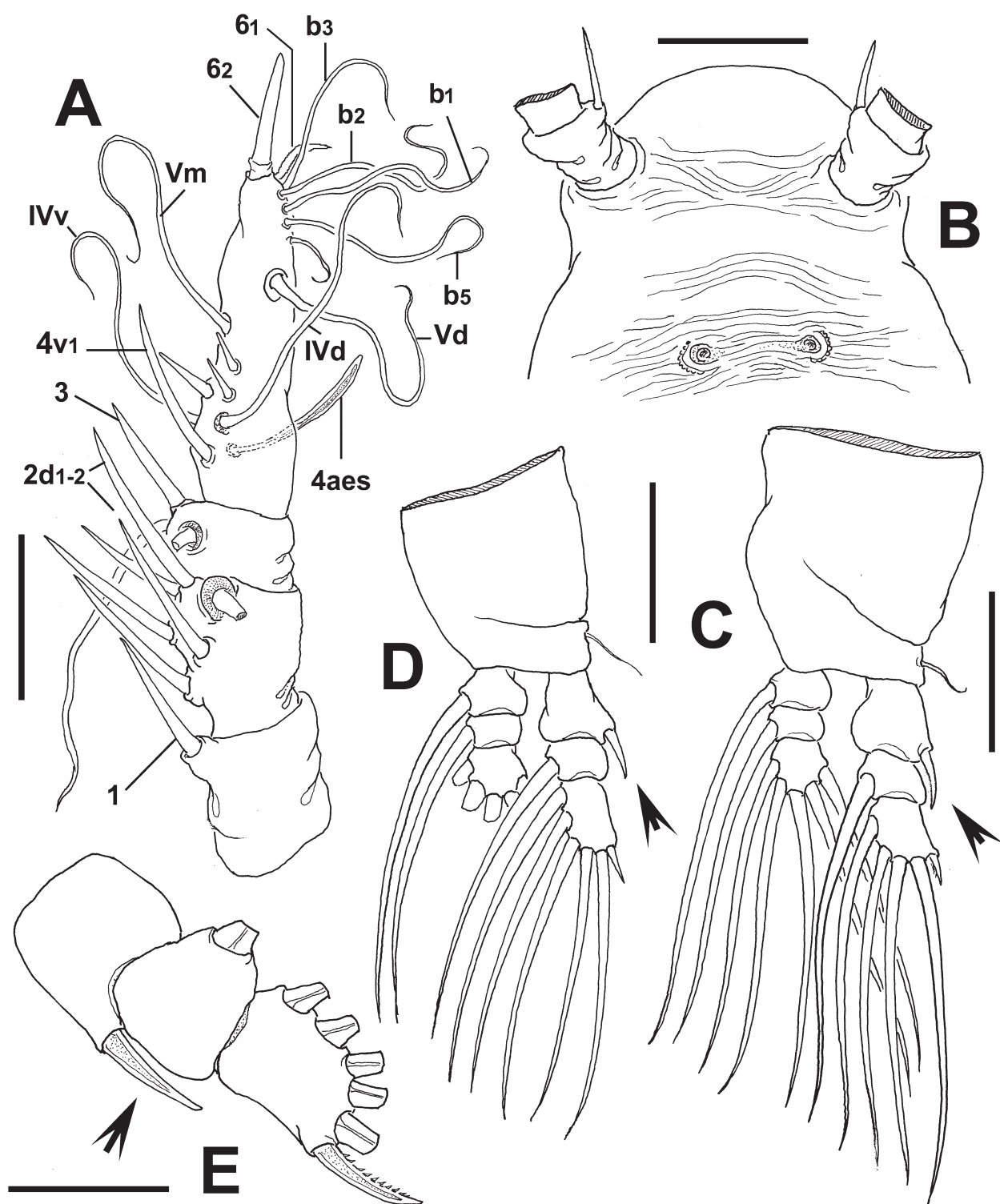
Antennule length 0.21 mm, representing about 22% of total body length and 41% of cephalothorax length; 4-segmented. Relative length of distal antennular segment 48.7%. Remarkably long, spiniform element 1 present on first segment; elements on second segment 2d1-2, 2v1-3, all these being noticeably strong and long, plus setiform element IIId. Third segment with element 3 strong, stout, spiniform; elements IIIId and IIIv setiform, of normal aspect. Segment 4 bearing elements 4d1,2, 4v1-2, element 4v3 not observed, element 4v1 extremely long; setae IVd, IVv, Vd, Vm, and 4aes present. Element 5 absent. Subterminal elements b1-5 present, unbranched, apical surface with extremely long, stout element 62 (Fig. 57A).

Incorporated first pedigerous somite and succeeding three free pedigerous somites each bearing a pair of biramous legs. Pedigerous somites 2–4, together accounting for 31% of total body length. Bases of legs 1–4 with hair-like lateral seta (Fig. 57C, D); on leg 3, this seta about three times longer, thicker than those on other legs. Endopods and exopods of legs 1–4 triarticulated. Ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3, and inner seta of first exopodal segment, these latter being short, slender. Outer distal spines on first exopodal segment of legs 1–4 noticeably long, reaching beyond distal margin of second exopodal segment (arrowed in Fig. 57C, D); outermost distal spine of third exopodal segment 0.6 times as long as segment, with inner margin spinulose (Fig. 57E). Outermost apical exopodal setae of legs 1–4 with inner and outer margins naked.



**FIGURE 56.** *Cymbasoma agoense* Sekiguchi, 1982, adult female. A) habitus, dorsal view; B) same, lateral view; C) urosome and fifth legs, ventral view; D) urosome, dorsal view; E) fifth leg and insertion of ovigerous spines, ventral view; F) caudal rami with enlarged proximal section, dorso-lateral view. Scale bars: A, B = 200  $\mu$ m, C, D = 100  $\mu$ m, E = 50  $\mu$ m.





**FIGURE 57.** *Cymbasoma agoense* Sekiguchi, 1982, adult female. A) right antennule, dorsal view; B) cephalic region, ventral view; C) first leg; D) second leg; E) detail of enlarged outer spine on first exopodal segment of fourth leg. Scale bars: A, E = 50  $\mu$ m, B–D = 100  $\mu$ m.

Armature formula of legs 1–4:

	basis	endopod	exopod
leg 1	1-0	0-1;0-1;1,2,2	1-1;0-1;1,2,2
legs 2–4	1-0	0-1;0-1;1,2,2	1-1;0-1;1,1,2,2

Fifth legs medially separate, bilobate, outer lobe subrectangular, tapering distally, armed with two setae, one apical, one subapical (Fig. 56C). Inner lobe represented by large, wide thumb-shaped protuberance arising from proximal margin of exopodal lobe, unarmed (Fig. 56E).

Male: unknown.

**Type locality.** Ago Bay, Japan (Sekiguchi 1982).

**New locality.** Davies Reef, Queensland, Australia.

**Diagnosis.** *Cymbasoma* with body noticeably robust, short, relatively wide in dorsal view, globose in lateral view. Dorsal surface of cephalothorax with field of minute wart-like cuticular processes overlying ocelli area and stretching to medial dorsal surface. Antennules representing about 22% of total body length and 41% of cephalothorax length; second antennular segment with noticeably long, strong spiniform elements 2d1-2 and 2v1-3. Fifth pedigerous somite with postero-lateral corners produced into rounded protuberances. Genital double-somite subquadrate, with anterior half swollen in dorsal view. Legs 1–4 with enlarged spines on exopodal segments 1 and 3. Fifth leg with outer lobe bearing two setae; inner lobe large, wide, arising from proximal half of exopodal lobe, unarmed. Terminal caudal setae proximally thickened. Ovigerous spines representing 43% of total body length.

**Remarks.** This species clearly belongs to the *C. agoense* species-group, now comprising *C. agoense*, and the Australian *C. dakini*, *C. lourdesae*, and *C. tharawalorum*, all of which display two setae on the fifth leg outer lobe. We attribute our specimen to *C. agoense*, the first described species of *Cymbasoma* with this peculiar character (Sekiguchi 1982) and provide additional data not included in the original description, like the details of the antennular armature; this is also relevant because it is the most representative species of the *agoense* species group. This species can readily be distinguished from other members of this group but also from most other females of *Cymbasoma* by the characteristic globose shape of the body, particularly when observed in lateral view. Within *Cymbasoma* this characteristic has so far been observed only in *C. agoense*, previously known exclusively from Japan. A similar strongly globose cephalothorax has been observed only among species of *Monstrilla* like *M. hamatapex* and *M. obesa* Isaac, 1975. The Australian specimen was identified as *C. agoense* because it shares with the type material (original description by Sekiguchi 1982) not only the body shape but also the distinctive fifth leg. In particular, the wide exopodal lobe armed with two setae (one apical and one subapical) differs from the usual pattern observed in the other members of the *C. agoense* group, all of which have both setae terminally inserted. The wide, robust inner lobe is another character that is present in both the Japanese (Sekiguchi 1982: fig. 6F) and the Australian specimens. In addition, both have an almost identical antennular structure and armature, including long, spiniform elements 2v1-3, 2d1-2 and 4v, and the presence of only four elements of the 4v-d group on the fourth segment (Sekiguchi 1982: fig. 6C). It should be noted that most elements are relatively longer in our specimen (Fig. 57A). Element 1 on the first segment is slightly shorter in *C. agoense* from Japan than in our specimen, which has a very strong and long spine. Element 5 is present as a stout, spiniform element in *C. agoense* from Japan (Sekiguchi 1982: fig. 6C) while it is absent (probably broken off) in our specimen. The strong spiniform apical elements 61-2 are long and slender in Japanese *C. agoense* vs. a stronger, basally wide element 62 occupying the entire apex of the segment in the Australian specimen. The body is more robust and wider in our specimen than in *C. agoense* from Japan. Finally, the pedigerous somites 2–4 are 2.5, 2.1, 2.2 times wider than long, respectively, in the Australian specimen, whereas according to the corresponding figures of these somites the width: length ratios are 1.1, 1.4, 1.3, respectively, in *C. agoense* (Sekiguchi 1982: fig. 6A); thus the body is relatively longer and more slender in the Japanese *C. agoense*.

Aside from the conspicuous differences in the body shape and the structure of the female fifth leg, the Australian *C. agoense* can be distinguished from the other species of the *agoense* group by its dorsal field of papilla-like cuticular ornamentations on the cephalic region (see Fig. 56A), which differs from the reduced set of wrinkles in *C. lourdesae*, the fringe of spinules around the body of *C. tharawalorum* and the fringe of wrinkles in *C. dakini*. Also, the antennular armature has some interesting features in *C. agoense* from Australia, i.e. element 1 is remarkably long and stout, and apical element 62 is remarkably long and strong, its base covering most of the apical surface of the antennule, and is accompanied by a shorter apical element 61 (Fig. 57A). Sekiguchi (1982: fig. 6C) depicted elements 61-2 as two subequally long, relatively slender apical elements in the Japanese specimen (vs. a relatively smaller element 61 in the Australian specimen). A large apical element has been observed only on the antennules of *C. striatus* (Suárez-Morales 2000b: fig. 3) but the two species can be separated by the structure of the fifth leg, having a single lobe (endopodal lobe absent) in *C. striatus* vs. a bilobate condition in *C. agoense*.

*Cymbasoma quintanarooense* has a discontinuous fringe covering only part of the dorsal surface of the cephalothorax (Suárez-Morales & Escamilla 2001), but has also a unilobate fifth leg. *Cymbasoma nicolettae* shares the discontinuous striation fringe covering part of the ventral surface of the cephalothorax (Suárez-Morales 2002) but differs from the new species in the number of exopodal setae (3) on the fifth leg and the shape of the inner lobes which are mammiliform in *C. nicolettae* and robust in *C. agoense*. The antennular segments 3–4 are separated in *C. agoense* and completely fused in *C. nicolettae* (Suárez-Morales 2002).

***Cymbasoma leighrandalli* sp. nov.**

(Figs 58, 59)

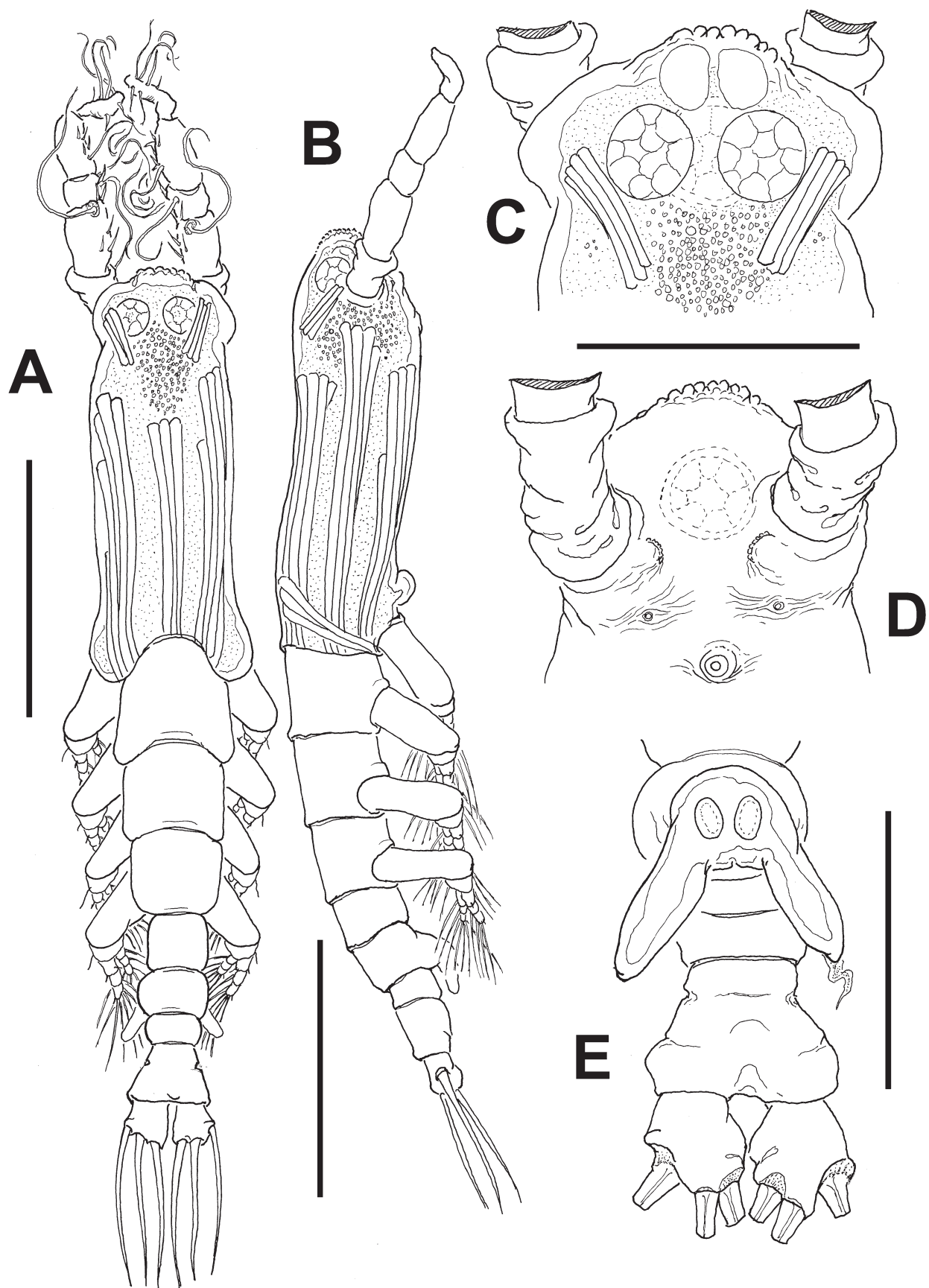
**Material examined.** Holotype: adult male from Ross Creek, Townsville, Queensland, Australia (19°16.500' S, 146°48.500' E), partially dissected, ethanol-preserved; dissected parts mounted on slide in glycerine, sealed with Entellan®. Date of collection: 15th May 1983. Slide deposited in the collection of MTQ, Australia (cat. MTQ W34401).

**Description of adult male.** Total body length 0.66 mm. Cephalothorax 0.28 mm long, representing 44% of total body length (Fig. 58A, B). Midventral oral papilla weakly developed, located at 22% of cephalothorax length (Fig. 58B). Cephalic region moderately protuberant bilaterally in dorsal view. Pair of large dorsal ocelli present, moderately developed; pigment cups relatively large. Ocelli separated by the length of less than half an eye diameter, faintly pigmented. Ventral ocellus as large as lateral cups (Fig. 58C). No frontal sensilla between antennular bases. Forehead produced forming lumpy medial crest flanked by few wrinkles (Figs 58C, D, arrowed in 59B). Ventral surface of head between antennular bases and oral papilla smooth. Dorsal surface of cephalic area smooth. Ventral surface with additional cuticular elements: 1) pair of symmetrical, crescent-shaped cuticular processes on anterior ventral surface between bases of antennules, with few adjacent striae (Fig. 58D); 2) nipple-like processes with adjacent transverse wrinkles; 3) few perioral transverse wrinkles.

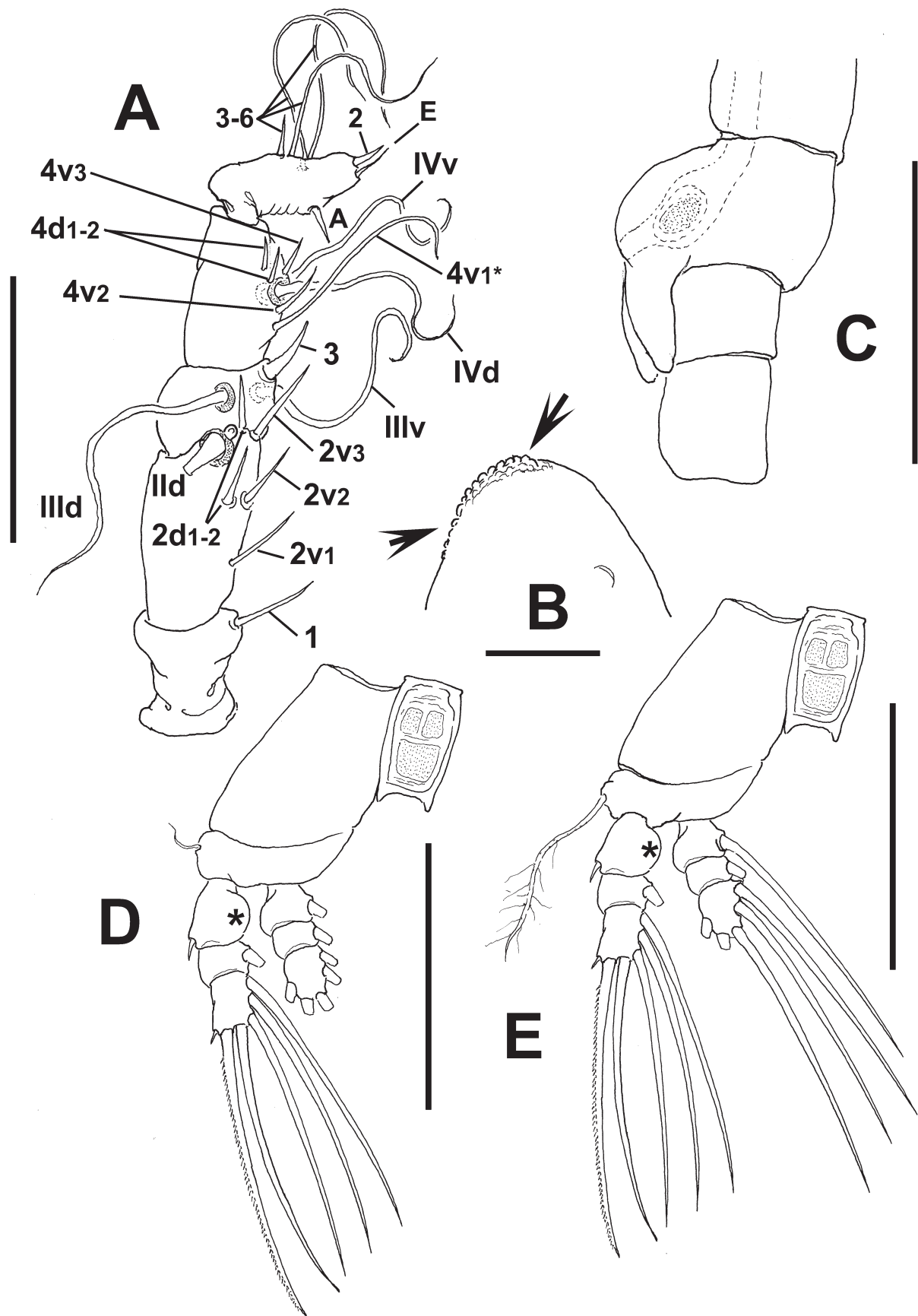
Urosome consisting of fifth pedigerous somite, genital somite (carrying genital complex), preanal somite, and anal somite. Genital somite longer than fifth pedigerous somite. Genital complex of type II, represented by pair of moderately divergent, slightly asymmetrical genital lappets (Fig. 58E), right lappet slightly longer than left lappet. Lappets posteriorly directed in lateral view, relatively short, reaching posterior margin of preanal somite (Fig. 59C). Common basal joint of lappets flat, with small medial notch (Fig. 58E). Lappet surface smooth. Anal somite noticeably long, about 2.6 times as long as preanal somite in dorsal view, comprising 33% of urosome length; constriction at proximal 1/3 of somite visible in ventral aspect, cuticular hyaline frill absent. Caudal rami subquadrate, approximately 1.1 times as long as wide, about 0.7 times as long as anal somite. Each ramus with three setae.

Antennular length 0.19 mm. Antennules representing 30% of total body length, and 70% of cephalothorax length; 5-segmented, all segments separated, with segment 5 located distal to geniculation (Fig. 59A). Length ratio of antennular segments, from first to fifth 15:25.3:12.3: 21.8: 25.6 (= 100). Setal element 1 on first segment relatively long, setiform, reaching proximal 1/3 of second segment. Antennular elements 2v1-3, 2d1,2 stiff, spiniform; element IIId present on second segment. Elements IIIId, IIIv, and strong, spiniform element 3 present on third segment, the latter reaching 1/3 of fourth segment. Fourth segment with elements 4d1,2, 4v1– 3 present; element 4v1 setiform (asterisk in Fig. 59A). Setae IVd, IVv present. Fifth segment with 4 “b”-group setae, elements b1-3 long, unbranched; element 6l present in distal position. According to Huys *et al.* (2007) setal nomenclature of the distal segment, elements A, E and 2–6 present.

Incorporated first pedigerous somite and succeeding three pedigerous somites each bearing well-developed biramous legs. Pedigerous somites 2–4, together accounting for 31% of total body length in dorsal view. Coxae of each pair unarmed, joined by intercoxal sclerite ornamented with spinulose patches. Exopods of legs 1–4 longer than endopods. Bases of legs 1–4 with hair-like lateral basipodal seta (Fig. 59D, E); on leg 3, this seta about 4.5 times longer, sparsely setulated from distal half and slightly thicker than those on the other legs (Fig. 59E). Endopods and exopods of legs 1–4 triarticulated. Ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3. Flexible, slender, sparsely setulated inner seta present on first exopodal segment of legs 1–4. Also, outermost apical exopodal setae of legs 1–4 with outer margin sparsely spinulose, inner margin naked. Inner seta on first exopodal segment of legs 1–4 absent (asterisks in Fig. 59D, E).



**FIGURE 58.** *Cymbasoma leighrandalli* sp. nov., adult male. A) habitus, dorsal view; B) same, lateral view; C) cephalic region, dorsal view; D) same, ventral view; E) urosome and genital complex, ventral view. Scale bars: A,B = 200  $\mu$ m, C–E = 100  $\mu$ m.



**FIGURE 59.** *Cymbasoma leighrandalli* **sp. nov.**, adult male. A) left antennule, dorsal view; B) detail of corrugate field on frontal area of cephalic region (arrows), lateral view; C) urosomites and genital complex, lateral view; D) second leg with coxal plate; E) third leg with coxal plate. Scale bars: A, C–E = 100 µm, B = 50 µm.



Armature formula of legs as follows:

	basis	endopod	exopod
leg 1	0-1	0-1; 0-1; 1,2,2	I-0; 0-1; I,2,2
legs 2–4	0-1	0-1; 0-1; 1,2,2	I-0; 0-1; I,2,3

Female: unknown.

**Type locality.** Ross Creek, Townsville, Queensland, Australia (19°16.5' S, 146°48.5' E).

**Etymology.** This species is dedicated to Leigh Randall McKinnon, son of the second author (DM).

**Diagnosis.** *Cymbasoma* with conspicuous medial protuberance on cephalic area with lumpy surface. First antennular segment with long, stout spiniform element 1; second segment with stout spiniform elements 2d1,2 and 2v2-3. Element 2v3 setiform, long. Antennule representing 30% of total body length and 70% of cephalothorax length. Genital complex of type II, slightly asymmetrical, tapering distally, with rounded tips, basal joint between lappets flat, with medial notch. Anal somite 2.6 times as long as preanal somite, with proximal constriction. Three caudal setae.

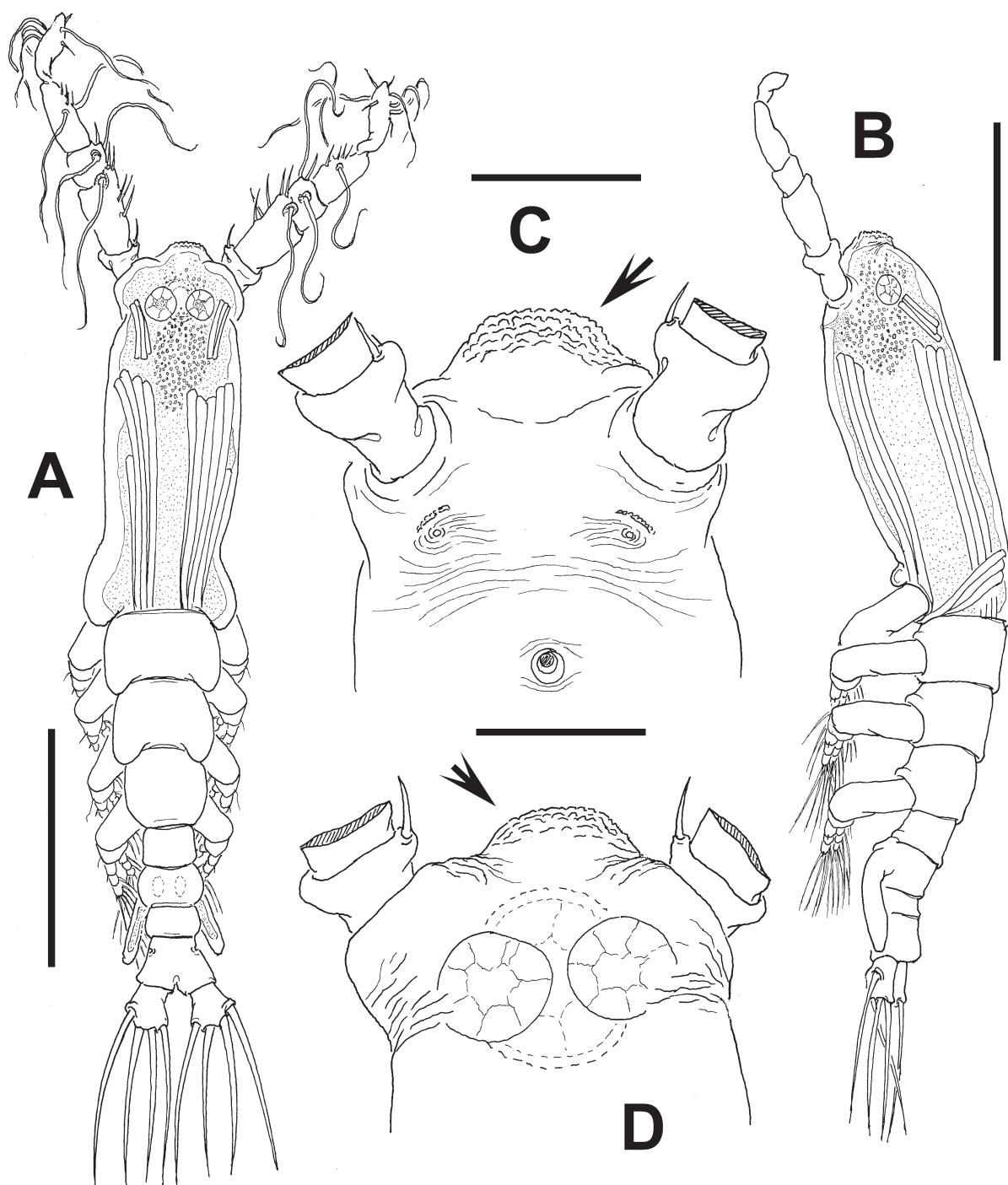
**Remarks.** The male of *C. leighrandalli* **sp. nov.** differs from the other Australian *Cymbasoma* by having smooth genital lappets and a flat margin with a notch between the lappets. The other species have a rounded medial process, basal spines or rows of large or small spinules along the inner margin, as in *C. quadridens* (cf. Suárez-Morales & Pilz 2008), and the Australian *C. colefaxi*, *C. annulocolle*, and *C. pseudoquadridens*. A flat medial margin between lappets is present in other congeners like *C. rigidum*, *C. longispinosum*, *C. thompsonii* (cf. Sars 1921), *C. chelemense* (cf. Suárez-Morales & Escamilla 1997), and *C. quintanarooense* (cf. Suárez-Morales 2000). Among this group of species, only *C. rigidum* has a constricted anal somite (Sars 1921). These two species share other characters including similar body proportions, a long anal somite being about twice as long as the preanal somite, and a similar structure and length of both genital lappets. Comparison with Sars's (1921) redescription of *C. rigidum* reveal differences in several other important characters such as the oral papilla which is weakly developed and located at 22% of the cephalothorax length in the new species whereas it is normally developed and situated more posteriorly, at 33% of the cephalothorax length in *C. rigidum*. In *C. leighrandalli* the distal antennular segment is short, robust and has a short apical element 2 (*sensu* Huys *et al.* 2007), whereas the same segment is slender and has a remarkably long apical element 2 *C. rigidum* (cf. Sars 1921). *Cymbasoma rigidum* (cf. Sars 1921) lacks a corrugate frontal process, a character present in the new species (Fig. 58C). The constriction of the anal somite is medial in *C. rigidum* (cf. Sars 1921) whereas it is located on the proximal 1/3 of the somite in *C. leighrandalli* (Fig. 58E). Also, four caudal setae are present in *C. rigidum* and three in the new species.

### *Cymbasoma clairejoanae* **sp. nov.**

(Figs 60, 61)

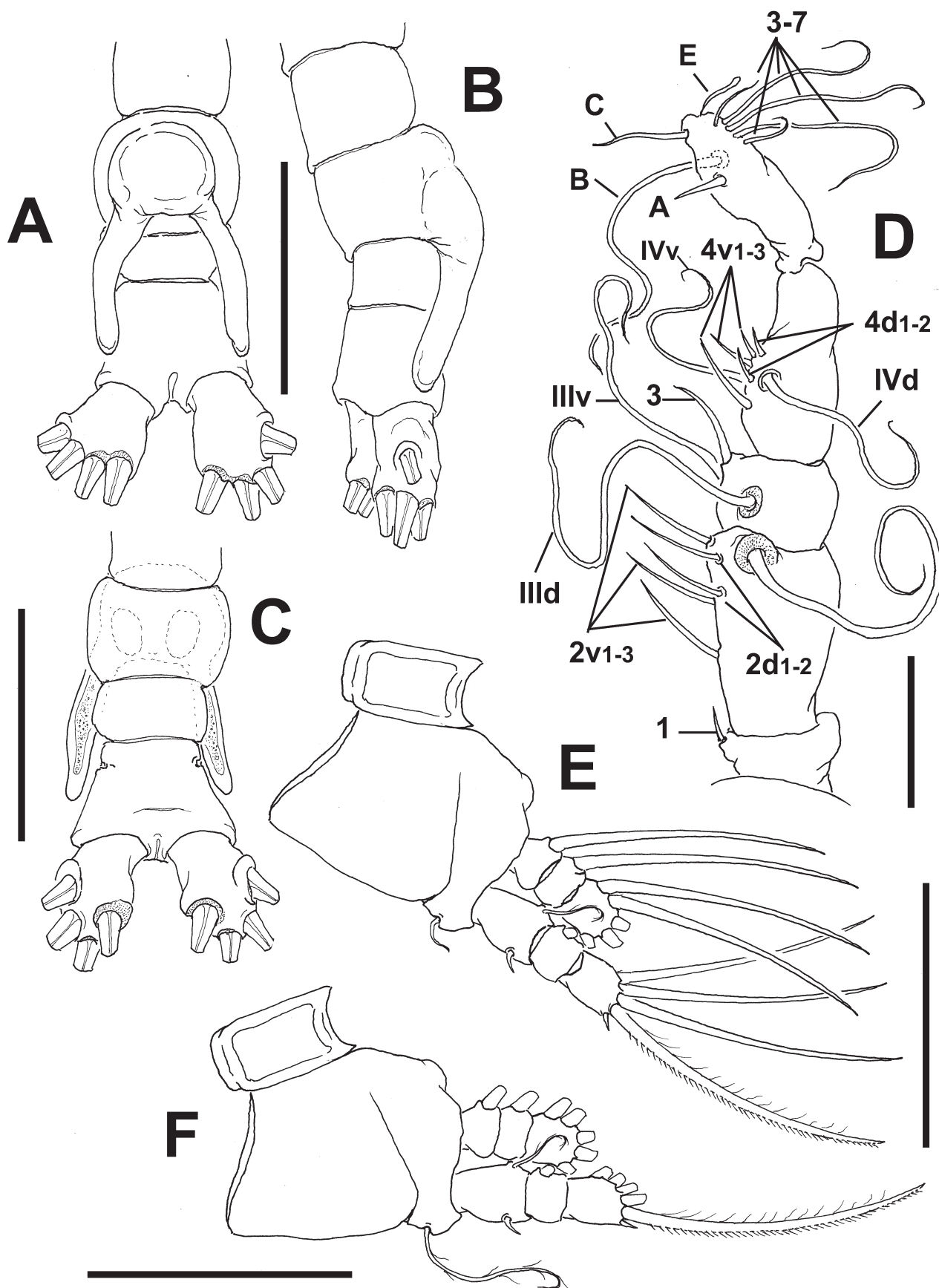
**Material examined.** Holotype: adult male from Ross Creek, Townsville, Queensland, Australia (19°16.500' S, 146°48.500' E), partially dissected, ethanol-preserved; dissected parts mounted on 2 slides in glycerine, sealed with Entellan®. Date of collection: 19th October 1995. Slides deposited in the collection of MTQ, Australia (cat. MTQ W34402).

**Description of adult male.** Total body length 0.63 mm. Cephalothorax 0.28 mm long, representing 44% of total body length (Fig. 60A, B). Midventral oral papilla weakly developed, located at 27% of cephalothorax length (Fig. 60C). Cephalic region protuberant bilaterally in dorsal view. Pair of dorsal ocelli present, moderately developed; pigment cups relatively large. Ocelli separated by the length of less than half an eye diameter, faintly pigmented. Ventral ocellus noticeably larger than lateral cups (Fig. 60D). No sensilla observed between antennular bases. Forehead area strongly produced forming lumpy medial crest flanked by few wrinkles (arrowed in Fig. 60C, D). Antero-ventral surface of head between antennular bases and oral papilla with no protuberances. Dorsal surface of cephalic area smooth. Ventral surface with additional cuticular elements: 1) pair of symmetrical, crescent-shaped cuticular processes on anterior ventral surface between bases of antennules, with few adjacent striae (Fig. 60C); 2) nipple-like processes with adjacent transverse wrinkles; 3) few perioral transverse wrinkles.



**FIGURE 60.** *Cymbasoma clairejoanae* sp. nov., adult male. A) habitus, dorsal view; B) same, lateral view; C) cephalic region, ventral view showing protuberant frontal process (arrow); D) same, dorsal view. Scale bars: A, B =200  $\mu$ m, C, D = 50  $\mu$ m.

Urosome consisting of fifth pedigerous somite, genital somite (carrying genital complex), preanal somite, and anal somite. Genital somite longer than fifth pedigerous somite. Genital complex of type II, represented by pair of moderately divergent, symmetrical slender, digitiform genital lappets resembling an inverted “U” (Fig. 61A, B). Lappets posteriorly directed in lateral view (Fig. 61B), relatively long, almost reaching posterior margin of anal somite. Common basal joint of lappets flat, smooth (Fig. 61A). Lappet surface smooth. Anal somite noticeably long, about twice as long as preanal somite in dorsal view, comprising 33% of urosome length; constriction in proximal 1/3 of anal somite visible in ventral aspect, cuticular hyaline frill absent. Caudal rami subquadrate, approximately 1.1 times as long as wide, about 0.7 times as long as anal somite (Fig. 61C). Each ramus with four caudal setae.



**FIGURE 61.** *Cymbasoma clairejoanae* sp. nov., adult male. A) urosome and genital complex, ventral view; B) same, lateral view; C) same, dorsal view; D) right antennule, dorsal view; E) first leg with smooth coxal plate; F) third leg with coxal plate. Scale bars: A–C, E, F = 100 μm, D = 50 μm.

Antennular length 0.23 mm. Antennules relatively long, representing 36% of total body length, and 72% of cephalothorax length; 5-segmented, all segments separated, with segment 5 located distal to geniculation. Length ratio of antennular segments, from first to fifth 11.4:27.8:12: 26.6: 22.2 (= 100). Setal element 1 on first segment short, spiniform. Antennular elements 2v1-3, 2d1,2 and IId present on second segment. Elements IIId, IIv, and slender, curved spiniform element 3 present on third segment. Fourth segment with elements 4d1,2, 4v1– 3, element 4v1 being longest of group. Setae IVd and IVv present in specimen. Fifth segment with 5 “b”-group setae, elements b1-3 unbranched; element 6aes present in apical position. According to Huys *et al.* (2007) setal nomenclature of the distal segment, elements A–C, E and 3–7 present (Fig. 61D).

Incorporated first pedigerous somite and succeeding three pedigerous somites each bearing well-developed biramous legs. Pedigerous somites 2–4, together accounting for 29% of total body length in dorsal view. Exopods of legs 1–4 longer than endopods. Bases of legs 1–4 with hair-like lateral basipodal seta (Fig61E, F); on leg 3, this seta about 4.5 times longer, sparsely setulated and slightly thicker than those on the other legs (Fig. 61F). Endopods and exopods of legs 1–4 triarticulated. Ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3. Flexible, slender, sparsely setulated inner seta present on first exopodal segment of legs 1–4. Outer spine on distal exopodal segment of legs 1–4 shorter than segment. Also, outermost apical exopodal setae of legs 1–4 with inner margin lightly setulose, outer margin spinulose.

Armature formula of legs 1–4 as follows:

	basis	endopod	exopod
leg 1	0-1	0-1; 0-1; 1,2,2	I-1; 0-1; I,2,2
legs 2–4	0-1	0-1; 0-1; 1,2,2	I-1; 0-1; I,2,3

Female: unknown.

**Type locality.** Ross Creek, Townsville, Queensland, Australia (19°16.5' S, 146°48.5' E).

**Etymology.** The species is named for Claire Joan Joan Grant (née McKinnon), daughter of the second author (DM).

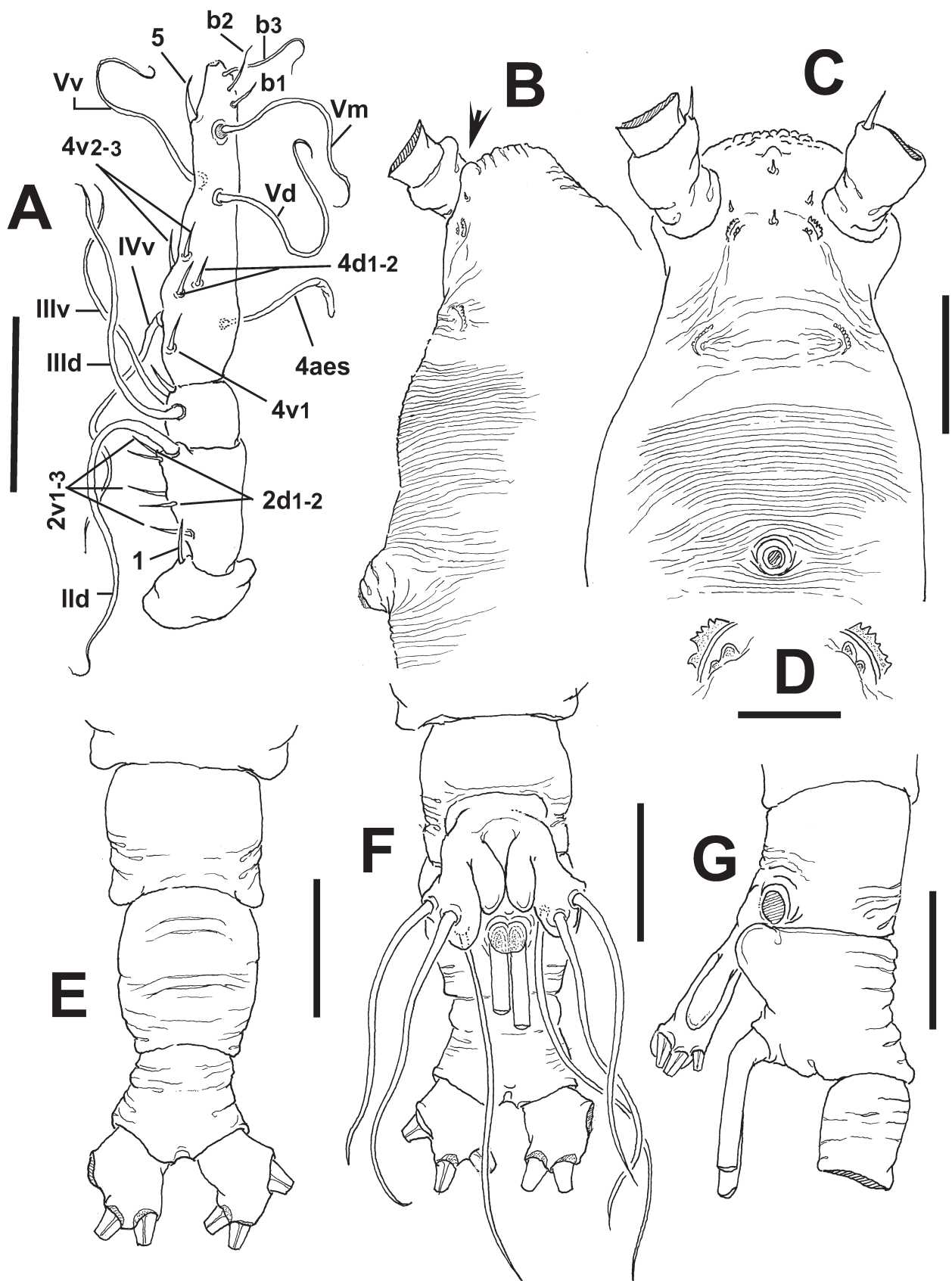
**Diagnosis.** *Cymbasoma* with conspicuous medial protuberance on cephalic area with lumpy surface. First antennular segment with short spiniform element 1; second segment with normal elements 2d1,2 and 2v1-3. Antennule relatively long, representing 36% of total body length and 72% of cephalothorax length. Genital complex of type II, symmetrical, digitiform, with rounded distal tips, basal joint between lappets flat, smooth. Genital lappets long, almost reaching posterior margin of anal somite. Anal somite twice as long as preanal somite, with proximal constriction. Caudal rami with four setae.

**Remarks.** *Cymbasoma clairejoanae* **sp. nov.** is represented by the only Australian male *Cymbasoma* with four caudal setae, a strongly protuberant frontal area, and a constricted anal somite. It can readily be distinguished from its known congeners by the structure of the genital lappets which are long, slender, digitiform, and almost reaching the posterior margin of the anal somite. The margin between the insertions of the genital lappets is flat and wide, thus the complex appears as an inverted “U”-shaped structure. A similar genital complex is known only in *C. pallidum* Isaac, 1974, which exhibits slightly curved, narrow, long genital lappets. The new species *C. clairejoanae* differs from *C. pallidum* in the presence of four caudal seta vs. three in *C. pallidum* (Isaac 1974) and also in the presence of a corrugate frontal protuberance, which is very conspicuous in the new species (Fig. 60C, D) but absent from the flat frontal surface in *C. pallidum* (*cf.* Isaac 1974). Also, the anal somite of *C. pallidum* lacks a constriction which is clearly present in *C. clairejoanae*.

### *Cymbasoma tranteri* **sp. nov.**

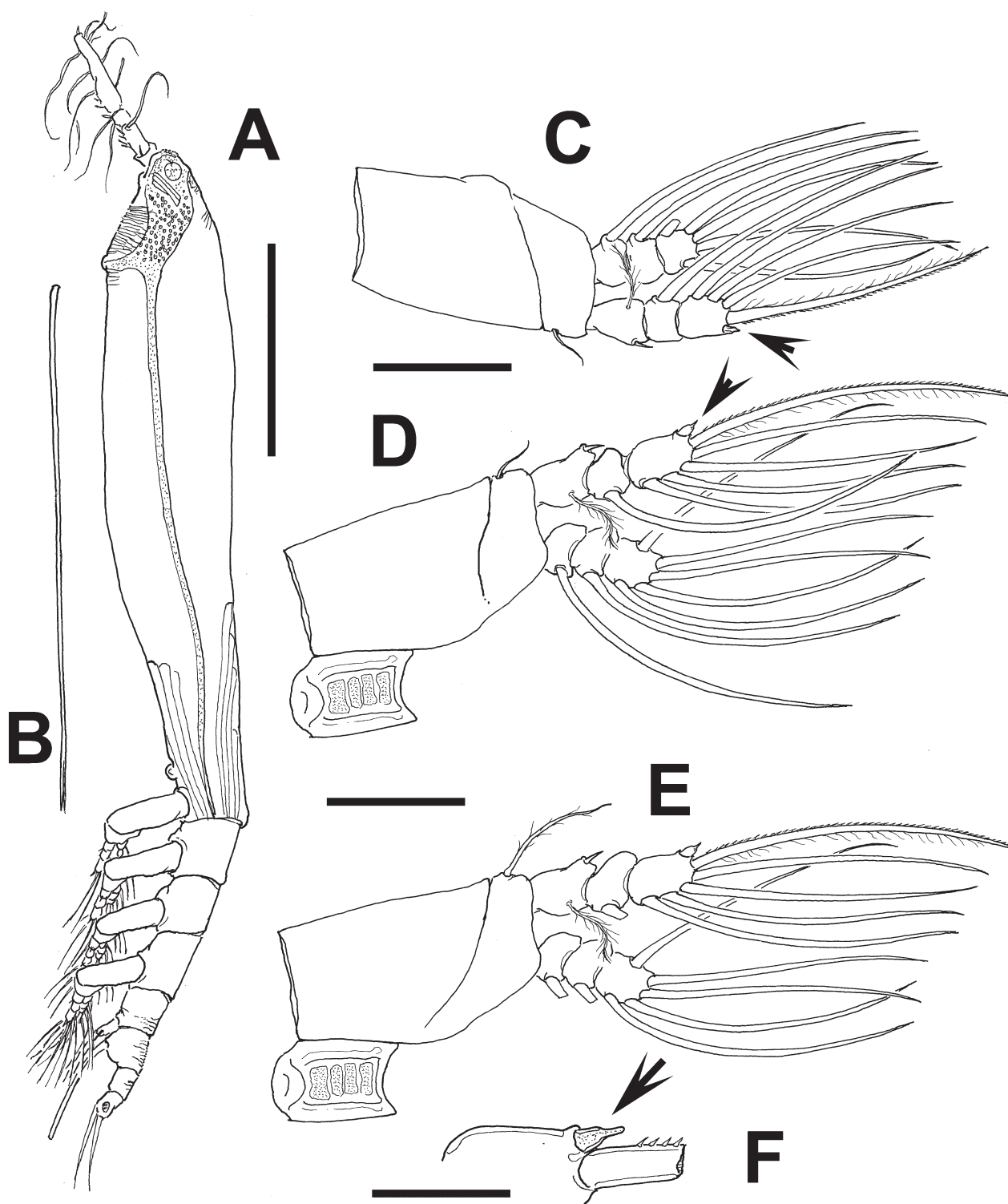
(Figs 62, 63)

**Material examined.** Holotype: Adult female from Port Hacking, New South Wales, Australia (34°4.670' S, 151°9.100' E), partially dissected, ethanol-preserved; dissected parts mounted on slide in glycerine, sealed with Entellan®. Date of collection: 30th October 1986. Slide deposited in the collection of MTQ, Australia (cat. MTQ W34403).



**FIGURE 62.** *Cymbasoma tranteri* sp. nov., adult female. A) right antennule, dorsal view; B) cephalic region with arrow indicating medial process between antennule bases, left antennule omitted, lateral view; C) same, ventral view; D) detail of minute cuticular processes on ventral surface between antennule bases; E) urosome, dorsal view; F) same, ventral view; G) same, lateral view. Scale bars: A–C, E–G = 100 µm, D = 50 µm.





**FIGURE 63.** *Cymbasoma tranteri* sp. nov., adult female. A) habitus, lateral view; B) ovigerous spines; C) first leg; D) second leg with coxal plate; E) third leg with coxal plate; F) detail of mammiliform outer spine on third exopodal segment of legs. Arrows in figures C, D indicate position of mammiliform spines. Scale bars: A = 500 µm, C–E = 100 µm, F = 50 µm.

**Description of adult female.** Body elongate, slender (Fig. 63A); total length of holotype female 2.23 mm. Cephalothorax approximately 1.48 mm long, representing 68% of total body length. Midventral oral papilla moderately protuberant, located at 15% of cephalothorax length. Pair of relatively large ocelli present, pigment cups well developed, medially conjoined, separated by less than half an eye diameter, weakly pigmented; ventral cup as large as lateral cups. Frontal area ornamented with deep transverse striations (Fig. 62B, C) and medial

rounded protuberance (arrowed in Fig. 62B); frontal sensilla absent. Anterior part of cephalothorax with field of transverse wrinkles limited to the ventral surface between the nipple-like processes and post-oral area. Additional ornamentation of ventral surface including: 1) four sensillum-like elements, one in medial position posterior to small rounded protuberance, the other three adjacent to nipple like processes; 2) two pairs of small, cuticular crescent-shaped processes between antennular bases, with few adjacent striae (Fig. 62D); 3) pair of symmetrical nipple-like processes on anterior ventral surface located anterior to oral papilla, processes connected medially by transverse striae.

Urosome consisting of fifth pedigerous somite, genital double-somite and anal somite, together representing 12% of total body length. Relative lengths of urosomites (fifth pedigerous, genital double- and free anal somite) 32.6: 40: 27.4 = 100, respectively (Fig. 62E–G). Fifth pedigerous somite shorter than genital double-somite, with straight lateral margins, posterolateral corners forming rounded protuberances; somite with wrinkles on dorsal and ventral surfaces (Fig. 62E). Genital somite longest of urosome, medial margin of somite moderately expanded, with transverse wrinkles on dorsal surface (Fig. 62E). Antero-ventral surface of somite with strong, rounded protuberance (Fig. 62G). Ovipigerous spines paired, separated at base, relatively long (1.14 mm), 52% of total body length (Fig. 63B). Spines slender, straight at their bases and along shaft, distally acute, equally long. Anal somite with weak medial constriction and with striae on dorsal and ventral surfaces. Caudal rami not divergent, subrectangular, about 1.3 times as long as wide, armed with three caudal setae.

Antennule length 0.36 mm, representing about 16.2% of total body length and 23.4% of cephalothorax length; 4-segmented. Relative length of distal antennular segment 57%. Short, spiniform element 1 present on first segment; elements on second segment: 2d1-2, 2v1-3, and IId. Third segment with short spiniform element 3; IIId and IIIv of normal aspect. Segment 4 bearing short, spiniform elements 4d1,2, 4v1-3; setae IVv, Vd, Vv, Vm, and 4aes present. Element 5 spiniform, curved. Subterminal elements b1-3 present, short, unbranched. Apical elements 61 and 62 not present in specimens, but sockets were observed (Fig. 62A).

Incorporated first pedigerous somite and succeeding three free pedigerous somites each bearing a pair of biramous legs. Pedigerous somites 2–4, together accounting for 17% of total body length. Intercoxal sclerites of legs 1–4 subrectangular, surface and posterior margin smooth. Bases of legs 1–4 with hair-like lateral seta (Fig. 63C–E); on leg 3, this seta about three times longer, thicker than those on other legs (Fig. 63E). Endopods and exopods of legs 1–4 triarticulated. Ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3, and inner seta of first exopodal segment, these latter being short, slender. Outermost distal spines on third exopodal segment of legs 1–4 short, 0.25 times as long as segment; spines modified, mammiliform (arrowed in Fig. 63C, D, F). Outermost apical setae on third exopodal segment of legs 1–4 with inner margin sparsely setulose, outer margin spinulose.

Armature formula of legs 1–4:

	basis	endopod	exopod
leg 1	1-0	0-1;0-1;1,2,2	1-1;0-1;1,2,2
legs 2–4	1-0	0-1;0-1;1,2,2	1-1;0-1;1,1,2,2

Fifth legs medially conjoined, bilobate, outer (exopodal) lobe cylindrical, with distal rounded process. Inner lobe arising basally, thumb-like, reaching midlength of exopodal lobe. Outer lobe armed with three subapical setae, innermost seta longest (Fig. 62F).

Male: unknown.

**Type locality.** Port Hacking, New South Wales, Australia (34°4.670' S, 151°9.100' E).

**Etymology.** This species is named for David Tranter, in recognition of his contributions to the study of Australian marine zooplankton.

**Diagnosis.** *Cymbasoma* with slender body and ventral field of wrinkles on cephalic area. Ventral surface of cephalic area with four sensillum-like elements, one in medial position posterior to small rounded protuberance, the other three adjacent to nipple-like processes. Antennule short, representing about 16.2 % of total body length and 23% of cephalothorax length. Third antennular segment remarkably long, representing 57% of antennule length. Oral papilla moderately protuberant. Legs 1–4 with first and second endopodal segments with inner margin not protuberant; outermost distal spines on third exopodal segment of legs 1–4 short, modified, mammiliform. Fifth pedigerous and genital double-somite with wrinkles on dorsal surface and produced posterolateral corners; genital

double-somite longest of urosome. Fifth leg with three subdistal setae on elongate outer lobe, innermost seta longest. Inner lobe thumb-like, unarmed. Anal somite not medially constricted. Ovigerous spines representing 52% of total body length.

**Remarks.** This new species, *C. tranteri*, can be distinguished from its Australian congeners that have a fifth leg inner lobe being shorter than the outer lobe by details of the armature of the outer lobe. In *C. tranteri* the exopodal lobe has three subdistal setae of which the innermost is longest whereas in the other species the outer lobe bears two or three distal setae, the innermost being the shortest. *Cymbasoma tranteri* also has a remarkably long fourth antennular segment, representing up to 57% of the total length of the antennule, a character not found in any other known congener. For instance, the length of this segment among the species of the *longispinosum*-group ranges between 46 and 50%. Two other species, *C. reticulatum* and *C. gracilis*, also have a long terminal segment, the relative length of which is 52% (*cf.* Giesbrecht 1893; Gurney 1927). Another distinctive apomorphy of *C. tranteri* is the peculiar mammiliform shape of the outermost spine of the third exopodal segment of legs 1–4 (Fig. 63C–F), a character not previously observed in any other known *Cymbasoma*.

***Cymbasoma tharawalorum* sp. nov.**

(Figs 64, 65)

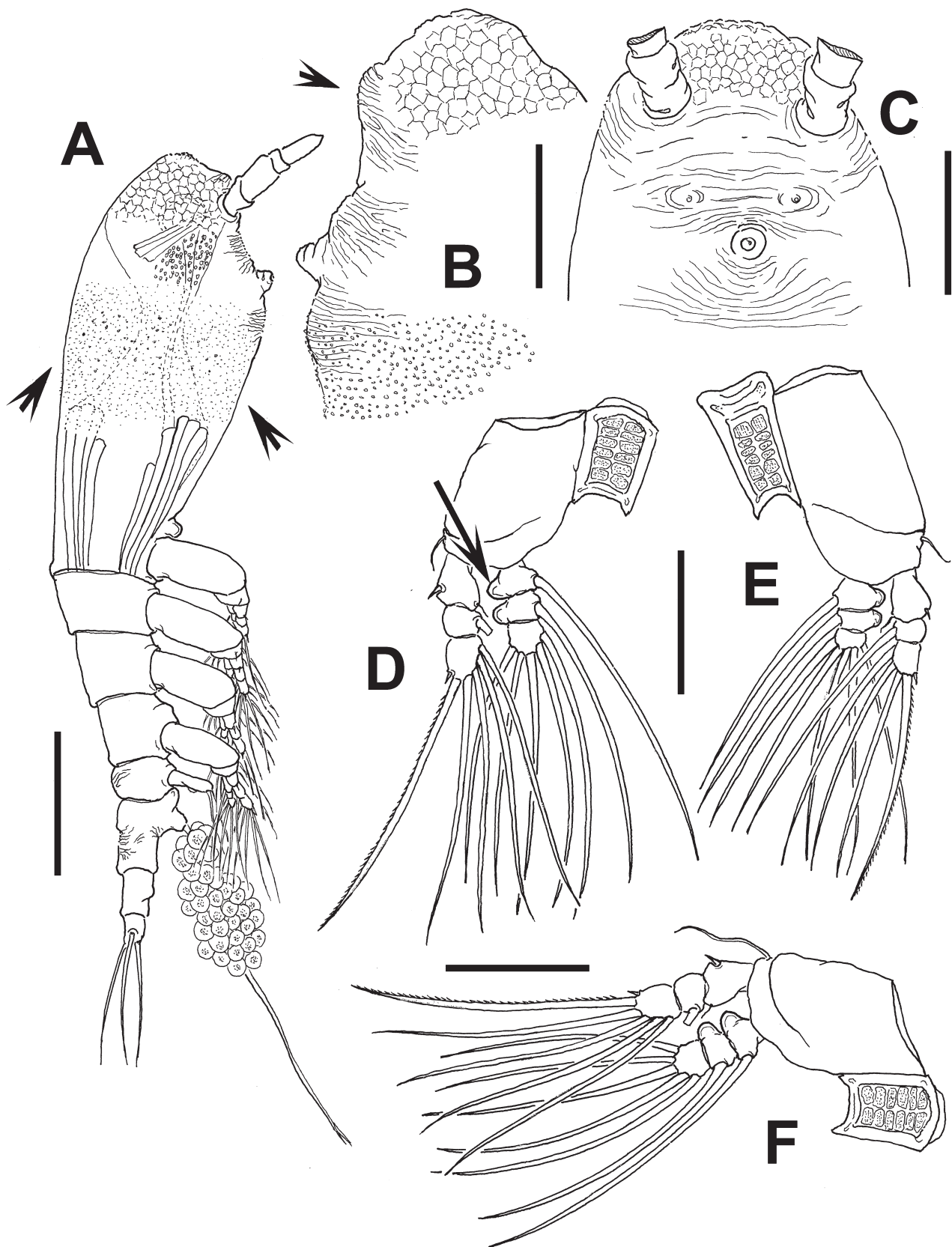
**Material examined.** Holotype: adult female from Port Hacking, New South Wales, Australia (34°4.670' S, 151°9.100' E), partially dissected, ethanol-preserved; dissected parts mounted on 2 slides in glycerine, sealed with Entellan®. Date of collection: 30th October 1986. Slides deposited in the collection of MTQ, Australia (cat. MTQ W34404).

**Description of adult female.** Body robust, relatively short (Figs 64A, 65A); cephalothorax with expanded anterior half, widest at midlength. Body length of holotype female 1.07 mm. Cephalothorax 0.56 mm long, representing approximately 57% of total body length. Midventral oral papilla protuberant, located at 26% of cephalothorax length. Pair of relatively small ocelli present, pigment cups moderately developed, medially separated, weakly pigmented on reduced inner area; ventral cup larger than lateral cups (Fig. 65A). Cephalic area with “forehead” with low crest ornamented with shallow transverse striations (Fig. 64B, C), frontal sensilla absent. Field of shallow reticulation covering anteriormost surface of cephalic area (Fig. 64B, C) and fringe of minute papilla-like cuticular processes partially covering anterior half of cephalothorax (Figs 64A, 65A). Ventral rounded low protuberance ornamented with transverse striae arising between antennular bases (arrowed in Fig. 64B). Ventral surface with additional features including: 1) transverse striations in perioral area; 2) pair of symmetrical nipple-like processes on anterior ventral surface at each side of oral area (Fig. 64C).

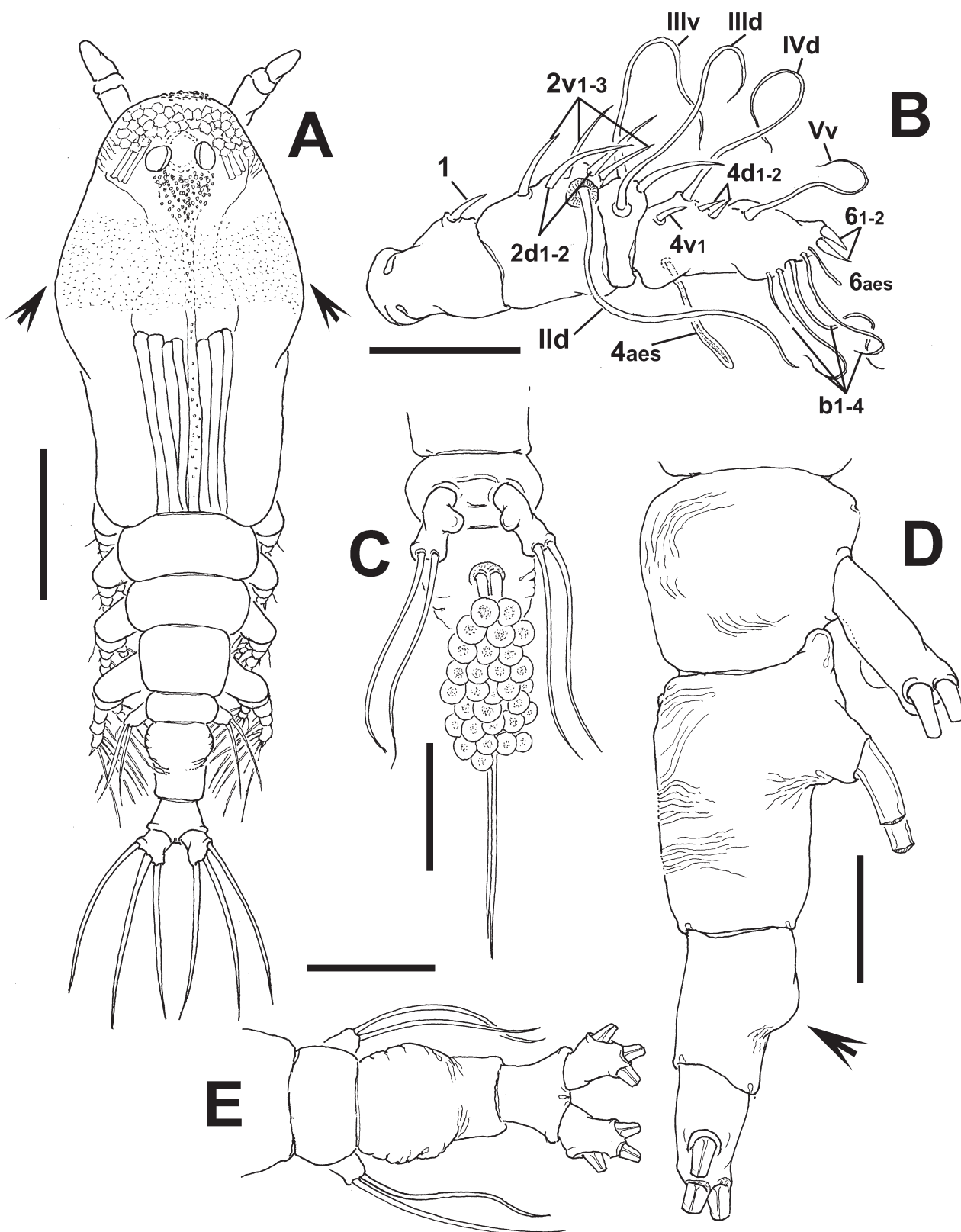
Urosome consisting of fifth pedigerous somite, genital double-somite and anal somite, together measuring 0.23 mm and representing 23% of total body length. Relative lengths of urosomites (fifth pedigerous, genital double- and free somites) 33.5: 42.8: 23.7 = 100, respectively (Fig. 65D, E). Fifth pedigerous somite with few wrinkles on dorsal and lateral surfaces. Genital double-somite with wrinkles on dorsal, lateral, and ventral surfaces (Fig. 65D, E); somite with strong ventral process on anterior margin (Fig. 65D). Anal somite with ventral protuberance (arrowed in Fig. 65D). Caudal ramus subrectangular, 1.6 times longer than wide, armed with three subequally long, sparsely setulated caudal setae. Ovigerous spines paired, relatively short, 45% of total body length (0.44 mm) (Fig. 64A). Spines basally separated, slender, straight at their bases and along shaft, without distal expansions and tapering apically, one spine slightly shorter; spines 0.44 mm long.

Antennule relatively short, length 0.17 mm, representing about 16.5 % of total body length and 30% of cephalothorax length; 4-segmented, segments 3 and 4 compressed. Relative length of short distal antennular segment 42.5%. In terms of pattern described by Grygier & Ohtsuka (1995) for female monstilloid antennular armature: spiniform element 1 present on first segment; elements on second segment: 2d1-2, 2v1-3, and IIId. Third segment with long spiniform, curved element 3, and setiform elements IIId, and IIIv. Segment 4 bearing elements 4d1,2, 4v1; elements 4v2-3 not observed; setae IVd, Vv and 4aes present. Element 5 absent. Subterminal elements b1-4 present, unbranched, apical elements 61-2 and 6aes present in specimen (Fig. 65B).

Incorporated first pedigerous somite and succeeding three free pedigerous somites each bearing a pair of biramous legs. Pedigerous somites 2–4, together accounting for 24 % of total length in dorsal view in each of the specimens examined. Legs 1–4 slightly decreasing in size posteriorly. Intercoxal sclerites of legs 1–4 subrectangular, widest at base, slightly tapering distally, surface with finely spinulose patches (Fig. 64D–F). Bases



**FIGURE 64.** *Cymbasoma tharawalorum* sp. nov., adult female. A) habitus, lateral view; B) cephalic region, lateral view; C) same, ventral view; D) second leg with coxal plate, arrow indicates expanded outer margin of first and second endopodal segments; E) first leg with coxal plate; F) third leg with coxal plate. Scale bars: A = 200 µm, B–F = 100 µm.



**FIGURE 65.** *Cymbasoma tharawalorum* sp. nov., adult female. A) habitus, dorsal view; B) right antennule, dorsal view; C) urosome, ventral view; D) same, enlarged, lateral view, arrow indicates ventral expansion of anal somite; E) urosome, dorsal view. Scale bars: A = 200 µm, B, C, E = 100 µm, D = 50 µm.



of legs 1–4 with hair-like lateral seta; on leg 3, this seta about 2.5 times longer and slightly thicker than those on the other legs (Fig. 64F). Endopods and exopods of legs 1–4 triarticulated; first and second endopodal segments of legs 1–4 with outer margin protuberant (arrowed in Fig. 64D). Ramal setae all biserially plumose except minute spiniform outer seta on exopodal segments 1 and 3, and inner seta of first exopodal segment, these latter being remarkably short, slender (Fig. 64D, E). Spine on distal exopodal segment of right leg 4 noticeably short, 0.25 times as long as segment. Also, outermost apical exopodal setae of legs 1–4 with inner margin naked, outer margin spinulose.

Armature formula of legs 1–4:

	basis	endopod	exopod
leg 1	1-0	0-1;0-1;1,2,2	1-1;0-1;1,2,2
legs 2–4	1-0	0-1;0-1;1,2,2	1-1;0-1;1,2,2

Fifth legs medially separated, bilobate, outer (exopodal) lobe elongate, distally truncate, reaching about 1/3 length of genital double-somite, armed with two subequally long setae on distal position. Inner lobe represented by small, rounded process inserted at middle inner margin of main lobe.

Male: unknown.

**Type locality.** Port Hacking, New South Wales, Australia (34°4.670' S, 151°9.100' E).

**Etymology.** The species is named in recognition of the Tharawal people, traditional owners of the Port Hacking area.

**Diagnosis.** *Cymbasoma* with expanded, robust cephalothorax with reticulation on cephalic area and fringe of minute papilla-like processes, covering part of anterior half of cephalothorax. Antennule short, representing about 16.5 % of total body length and 30% of cephalothorax length. Third antennular segment representing more than 40% of antennule length. Oral papilla protuberant. Legs 1–4 with first and second endopodal segments with inner margin protuberant. Fifth pedigerous and genital double-somite with wrinkles. Fifth leg with two distal setae on elongate outer lobe, inner lobe small, rounded, unarmed. Anal somite with ventral protuberance. Ovigerous spines representing 45% of total body length.

**Remarks.** *Cymbasoma tharawalorum* **sp. nov.** is assignable to the *agoense* group and is easily recognizable by a combination of characters including a short, globose inner lobe inserted medially along the inner margin of the outer (exopodal) lobe of the fifth leg. The other species of the group have either an elongate, digitiform inner lobe (*C. dakini*, *C. lourdesae*) or a strong, thumb-like lobe arising proximally (*C. agoense*). The cephalic cuticular ornamentation is also distinctive; it has a reticulation field on the anterior part of the frontal surface and a wide fringe of papilla-like elements covering 1/3 of the cephalothorax (Figs. 65A). The antennule has some additional distinctive characters including relatively short third and fourth segments; the latter representing less than 40% of the total length of the antennule, thus diverging from the other species in which the last segment is longer (more than 50% of the antennule length). *Cymbasoma tharawalorum* differs from *C. agoense* in the shape and structure of the fifth leg inner lobe; both setae on the outer lobe are distal in the new species whereas one is distal and one is subdistal in *C. agoense* (Sekiguchi 1982: fig. 6F). They differ also in the body proportions, with pedigers 2–3 being short in *C. tharawalorum*, but clearly longer in *C. agoense*. In addition, the fifth pedigerous somite is almost as long as the subquadrate genital double-somite (Sekiguchi 1982: fig. 6A). In the new species the fifth pediger is about 2.5 times shorter than the genital double-somite, which is rounded at its anterior half and has straight margins in its posterior half.

### *Cymbasoma paraconstrictum* **sp. nov.**

(Figs 66, 67)

**Material examined.** Holotype: Adult female from Garden Island, Western Australia (32°10.48' S, 115°40.72' E), partially dissected, ethanol-preserved; dissected parts mounted on slide in glycerine, sealed with Entellan®. Date of collection: 19th September 2012. Slides deposited in the collection of the Museum of Western Australia (cat. WAM C61310).

**Description of adult female.** Body moderately robust, particularly in dorsal position, widest at proximal 1/3

of cephalothorax (Fig. 66A); body relatively slender in lateral view (Fig. 66B). Total length of holotype female 1.1 mm. Cephalothorax approximately 0.59 mm long, representing 55% of total body length. Midventral oral papilla moderately protuberant, located at 33% of cephalothorax length. Pair of relatively small ocelli present, pigment cups medially separated by about one eye diameter, weakly pigmented; ventral cup larger than lateral cups. Frontal area smooth except for a few shallow wrinkles; frontal sensilla absent (Fig. 66C). Anterior part of cephalothorax with dorsal field of transverse and oblique wrinkles and low, small medial dorsal protuberance (Fig. 66C (arrow), 66D). Additional ornamentation of ventral surface including pair of nipple-like processes on ventral surface located anterior to oral papilla, processes with adjacent field of transverse and curved wrinkles (Fig. 67C).

Urosome consisting of fifth pedigerous somite, genital double-somite, and anal somite, together representing 19% of total body length. Relative lengths of urosomites (fifth pedigerous, genital double- and free anal somites) 26.5: 41.2: 32.3 = 100, respectively (Figs. 66F). Fifth pedigerous somite shortest of urosome, with smooth dorsal and ventral surfaces. Genital double-somite longest of urosome; anterior half expanded, smooth; with constriction; posterior half expanded forming rounded lateral protuberances (Fig. 67A, B). Ovigerous spines paired, separated at base, relatively short, 45% of total body length (0.44 mm). Spines slender, straight at their bases and along shaft, distally acute, subequally long (Fig. 66A, B). Anal somite constricted medially, anterior half with rounded margins; posterior half with divergent margins; dorsal and ventral surfaces smooth (Fig. 67A, B). Caudal rami divergent, subrectangular, about 1.3 times as long as wide, armed with three subequally long caudal setae.

Antennule short, thick; length 0.16 mm, representing about 17% of total body length and 32% of cephalothorax length; 4-segmented. Relative length of remarkably short distal antennular segment 34.7%. Short, curved spiniform element 1 present on first segment; elements on second segment: 2d1-2, 2v1-3, and IId. Third segment with short, spiniform element 3; IIIId and IIIv of normal aspect. Segment 4 bearing long, spiniform element 4v1, other elements of group not observed. Setae IVd, IVv, Vd, Vv, and 4aes present. Element 5 absent. Subterminal elements b1-3 present, long, unbranched. Apical elements 61-2 and 6aes present in specimen (Fig. 66E).

Incorporated first pedigerous somite and succeeding three free pedigerous somites each bearing a pair of biramous legs. Pedigerous somites 2–4, together accounting for 26% of total body length. Intercoxal sclerites of legs 1–4 subrectangular, surface and posterior margin smooth. Bases of legs 1–4 articulating with large, rectangular coxa along oblique line; with hair-like lateral seta (Fig. 67D–F); on leg 3, this seta sparsely setulated, about three times longer, thicker than those on other legs (Fig. 67F). Endopods and exopods of legs 1–4 triarticulated. Ramal setae all biserially plumose except spiniform outer seta on exopodal segments 1 and 3, and inner seta of first exopodal segment, these latter being short, slender. Outermost distal spines on third exopodal segment of legs 1–4 short, 0.25 times as long as segment. Outermost apical setae on third exopodal segment of legs 1–4 with inner margin sparsely setulose, outer margin spinulose.

Armature formula of legs 1–4:

	basis	endopod	exopod
leg 1	1-0	0-1;0-1;1,2,2	I-1;0-1;1,2,2
legs 2–4	1-0	0-1;0-1;1,2,2	I-1;0-1;1,1,2,2

Fifth legs medially conjoined, bilobate. Outer (exopodal) lobe cylindrical, distally truncate, barely reaching beyond posterior margin of fifth pedigerous somite; armed with three apical subequally long setae (Fig. 67A, B). Inner lobe arising from middle inner margin of outer lobe, thumb-like, almost reaching midlength of exopodal lobe (Fig. 67G).

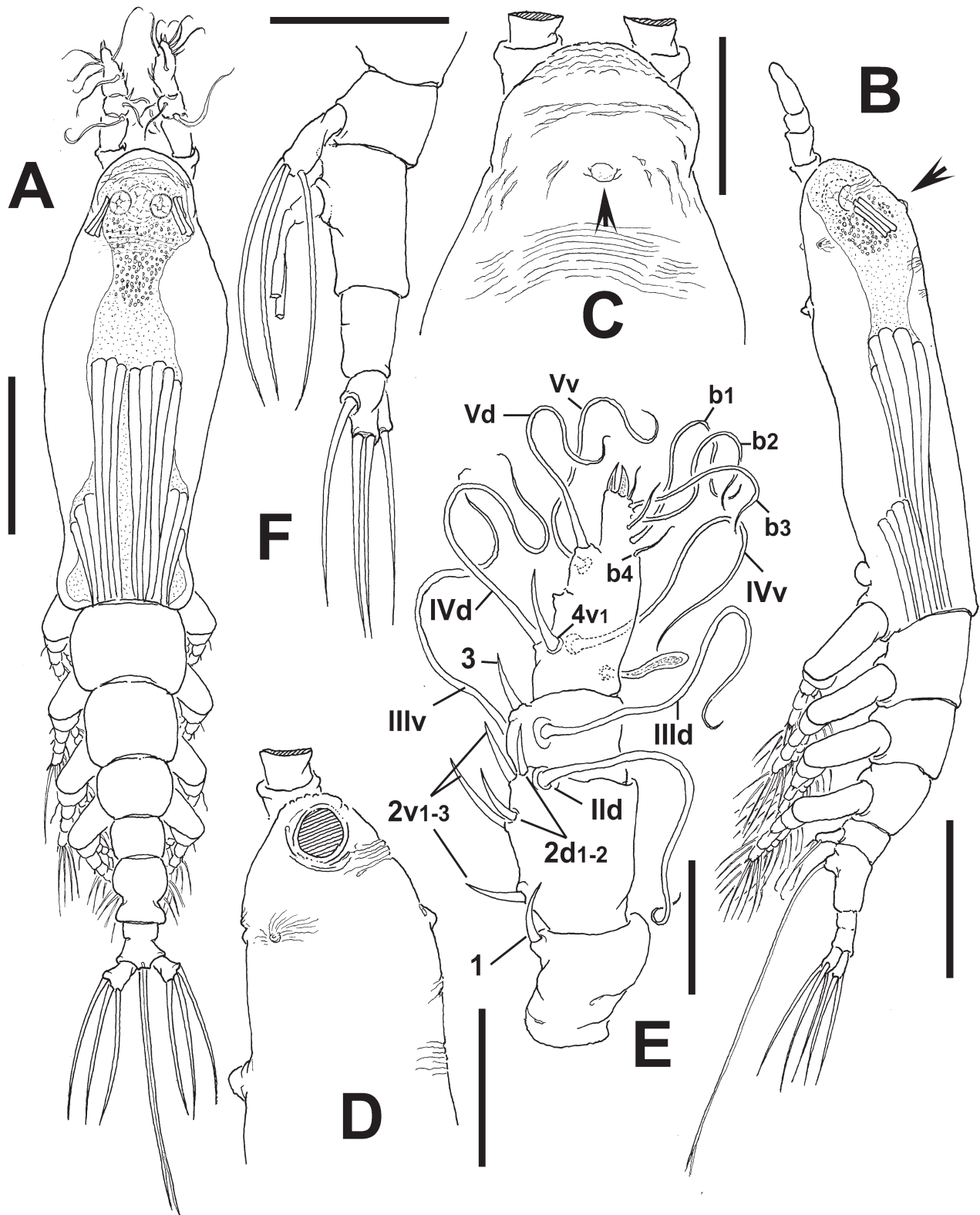
Male: unknown.

**Type locality.** Garden Island, Western Australia (32°10.48' S, 115°40.72' E).

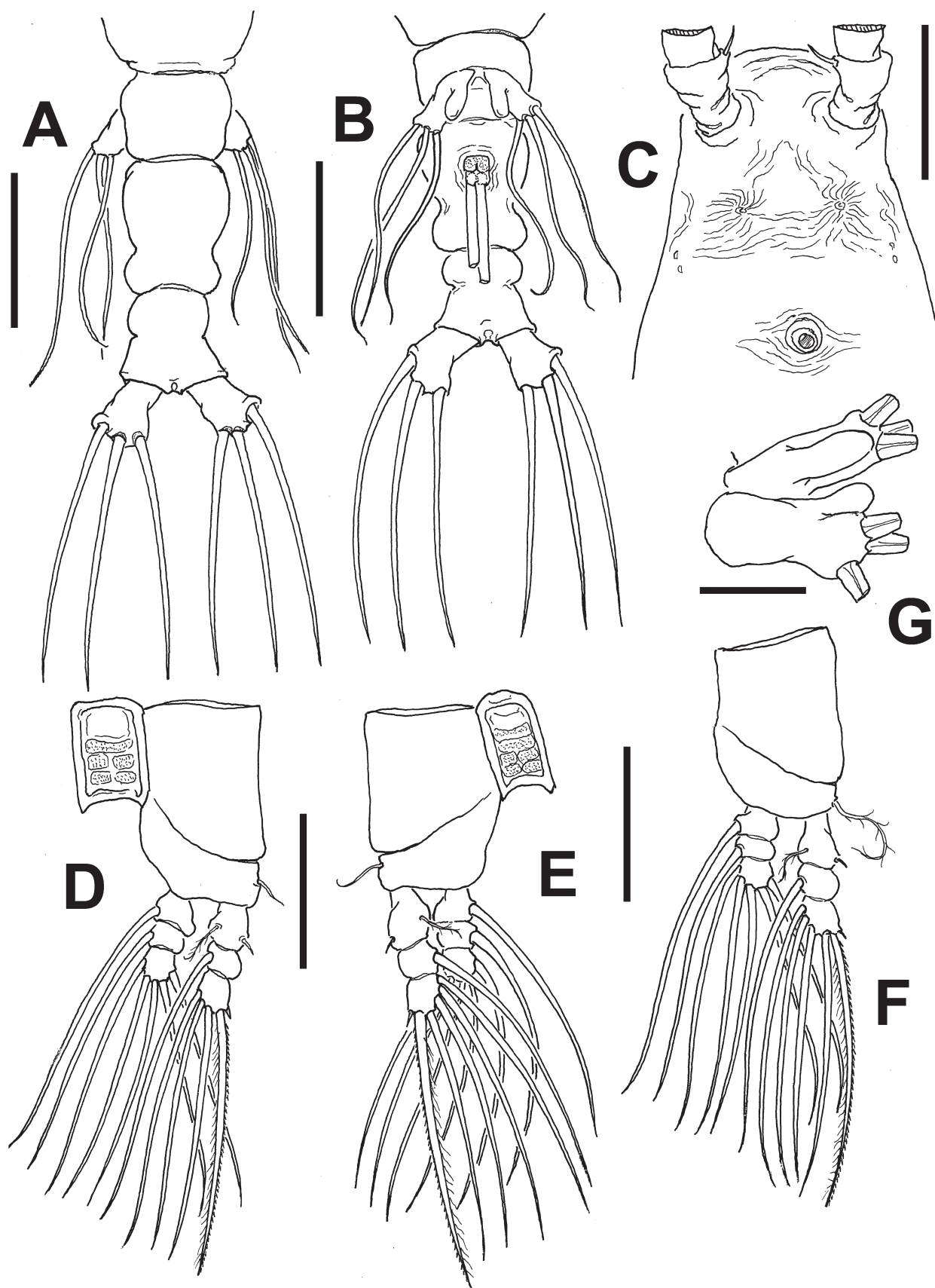
**Etymology.** The specific name, using the prefix “para” (= near) denotes the resemblance of this species to another Australian species (*C. constrictum*), both species have constricted anal and genital double-somites.

**Diagnosis.** *Cymbasoma* with relatively robust cephalothorax, widest at level of oral papilla. Dorsal protuberance and field of transverse wrinkles on cephalic area. Antennule short, representing about 17 % of total body length and 32% of cephalothorax length. Third antennular segment remarkably short, representing only 34.7% of antennule length. Oral papilla moderately protuberant. Legs 1–4 with first and second endopodal

segments with inner margin not protuberant; outermost distal spines on third exopodal segment of legs 1–4 short, modified, mammiliform. Urosomites smooth, genital double-somite longest, constricted. Anal somite strongly constricted medially, anterior half with rounded margins. Fifth leg with three distal subequally long setae on short outer lobe. Inner lobe thumb-like, unarmed. Ovigerous spines representing 45% of total body length.



**FIGURE 66.** *Cymbasoma paraconstrictum* sp. nov., adult female. A) habitus, dorsal view; B) same, lateral view, arrow indicates small dorsal protuberance; C) cephalic region, dorsal view, dorsal medial protuberance arrowed; D) same, lateral view; E) right antennule, dorsal view; F) urosome, lateral view. Scale bars: A, B = 200  $\mu$ m, C, D, F = 100  $\mu$ m, E = 50  $\mu$ m.



**FIGURE 67.** *Cymbasoma paraconstrictum* sp. nov., adult female. A) urosome, dorsal view; B) same with fifth legs, ventral view; C) cephalic region, ventral view; D) first leg with coxal plate; E) second leg with coxal plate; F) third leg. Scale bars: A–F = 100 µm, G = 50 µm.



**Remarks.** This species most closely resembles the Australian *C. constrictum* in the body proportions, the general structure and armature of the fifth leg, its constricted genital double-somite, and in its long, medially constricted anal somite. The shape of the cephalothorax differs in both species; in *C. constrictum* the ventral margin is clearly globose in lateral view (Fig. 36B) and it is straight in the new species (Fig. 66B). The new species has a dorsal cephalic protuberance (arrowed in Fig. 66B, C) which is absent in *C. constrictum*. In addition, the eyes are large and strongly pigmented (medially) in *C. constrictum* (Fig. 36A), thus differing from the relatively smaller, unpigmented eyes in the new species (Fig. 66A). The antennule structure is also different in these two species, segments 3–4 being fused in *C. constrictum* (Fig. 37B) and clearly separated in the new species. In addition, the last antennular segment is remarkably short in *C. constrictum* whereas it is robust in the new species (34.7% of total antennule length (Fig. 66E) vs. 45% in *C. constrictum*). *Cymbasoma constrictum* can readily be distinguished by the elongate anal somite which is clearly longer than the genital double-somite. Only in *C. striifrons* (Chang 2012) and in the new species (Fig. 67A) the anal somite is almost as long as the genital double-somite. In addition, the fifth pedigerous somite of *C. constrictum* has a set of strong transverse striae across the somite (Fig. 37E) which is absent from the otherwise smooth dorsal surface in the new species. Also, in *C. constrictum* the constrictions of both the genital double- and anal somites are ornamented with wrinkles (Fig. 37E, F), whereas they are smooth in the new species. A strongly constricted genital double-somite combined with a weakly constricted anal somite is known in *C. germanicum* (Suárez-Morales 2006: figs. 4b, d), but the anal somite is clearly shorter than the genital double-somite. In addition, the fifth leg inner lobe is digitiform and relatively longer in *C. germanicum*, reaching the distal end of the outer lobe (Suárez-Morales 2006: fig. 4b). In the new species the inner lobe is short, barely reaching beyond half of the inner margin of the outer lobe.

***Cymbasoma strzeleckii* sp. nov.**

(Figs 68, 69)

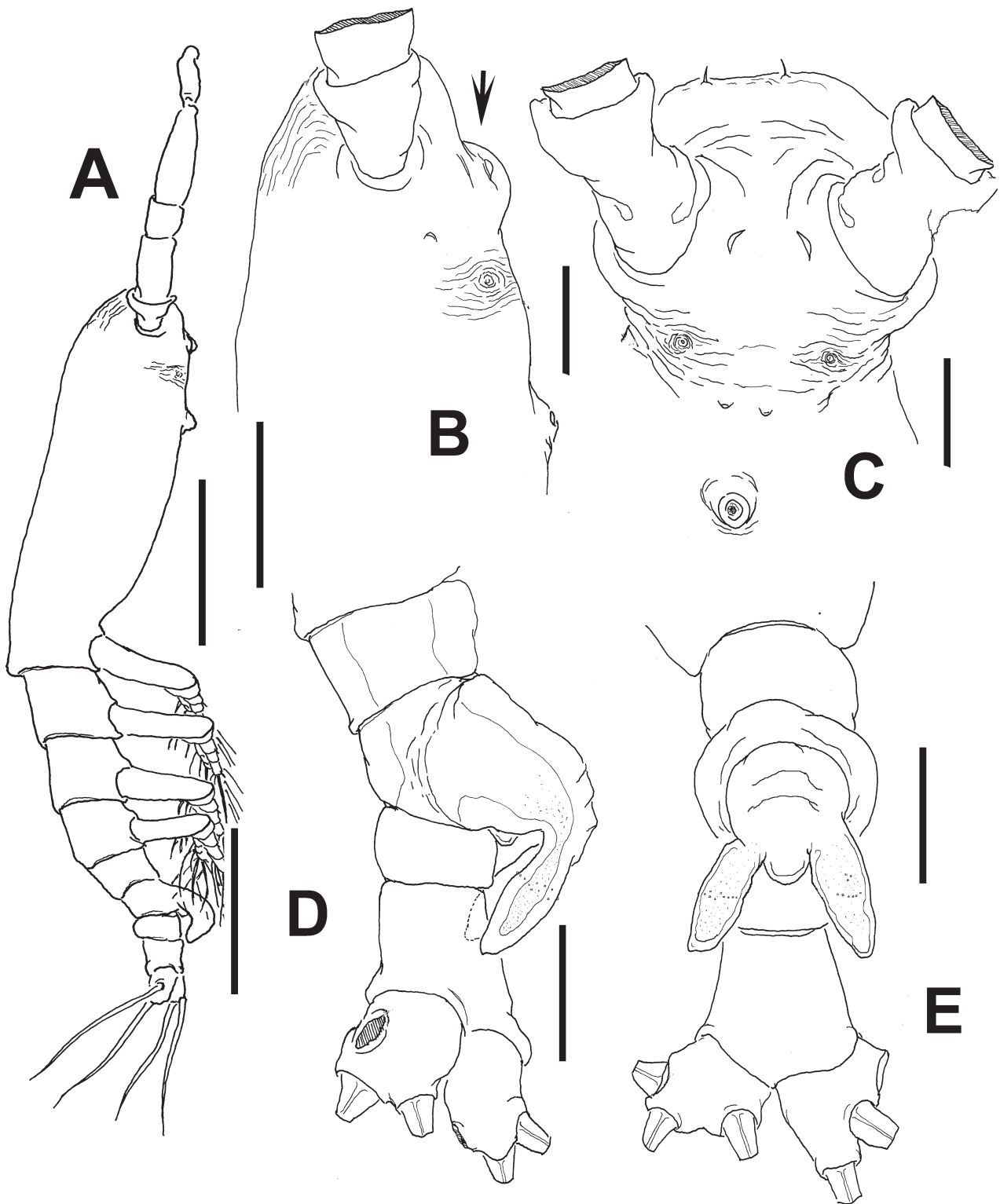
**Material examined.** Holotype: adult male from Rhyll, Western Port Bay, Victoria, Australia (38°27.792' S, 145°18.496' E), partially dissected, ethanol-preserved; dissected parts mounted on slide in glycerine, sealed with Entellan®. Date of collection: 10th March 1984. Slide deposited in the collection of MTQ, Australia (cat. MTQ W34405).

**Description of adult male.** Total body length 0.85 mm. Cephalothorax 0.42 mm long, representing 49% of total body length (Fig. 68A). Midventral oral papilla well developed, located at 31% of cephalothorax length (Fig. 68A, B). Cephalic region slightly protuberant bilaterally in dorsal and ventral views (Fig. 68C). Pair of dorsal ocelli present, weakly developed; pigment cups medium-sized. Ocelli faintly pigmented. Pair of frontal sensilla between antennular bases. Forehead area moderately produced anteriorly (Fig. 68C); ventral process arising between the antennular bases (arrowed in Fig. 68B). Other cuticular ventral processes including pair of crescent-shaped minute processes and nipple-like processes, the latter with adjacent wrinkles.

Urosome consisting of fifth pedigerous somite, genital somite (carrying genital complex), preanal somite, and anal somite. Fifth pedigerous somite with smooth ventral surface. Genital somite slightly shorter than fifth pedigerous somite. Genital complex of type II, represented by pair of robust, moderately divergent genital lappets (Fig. 68E), these being slightly asymmetrical, reaching to halfway down the long anal somite (Fig. 68D). Rounded, protuberant medial process present at common basal joint of lappets, lappets smooth. Anal somite about twice as long as preanal somite in dorsal and lateral views, comprising 30% of urosome length; no suture visible on ventral or dorsal surfaces (Fig. 68D, E). Caudal rami small, subquadrate, approximately 1.1 times as long as wide, about as long as anal somite. Each ramus with three setae.

Antennular length 0.31 mm. Antennules relatively long, representing 44% of total body length, and 80% of cephalothorax length; 5-segmented, all segments separated, with segment 5 located distal to geniculation (Fig. 69A). Length ratio of antennular segments, from first to fifth 10.4: 26.1: 11.3: 34.2: 18 (= 100). Setal element 1 on first segment remarkably short and slender, spiniform. Antennular elements 2v1-3, 2d1,2, and IId present on second segment. Setal elements IIId, IIv, and 3 present on third segment; element 3 slender, curved. Fourth segment with elements 4d1-2, 4v1-3. Fifth segment with 5 “b”-group setae, elements b1-3 long, distally branched. According to Huys *et al.* (2007) setal nomenclature of the distal segment, elements A–C and 1–6 present; element 1 being remarkably long, spiniform.

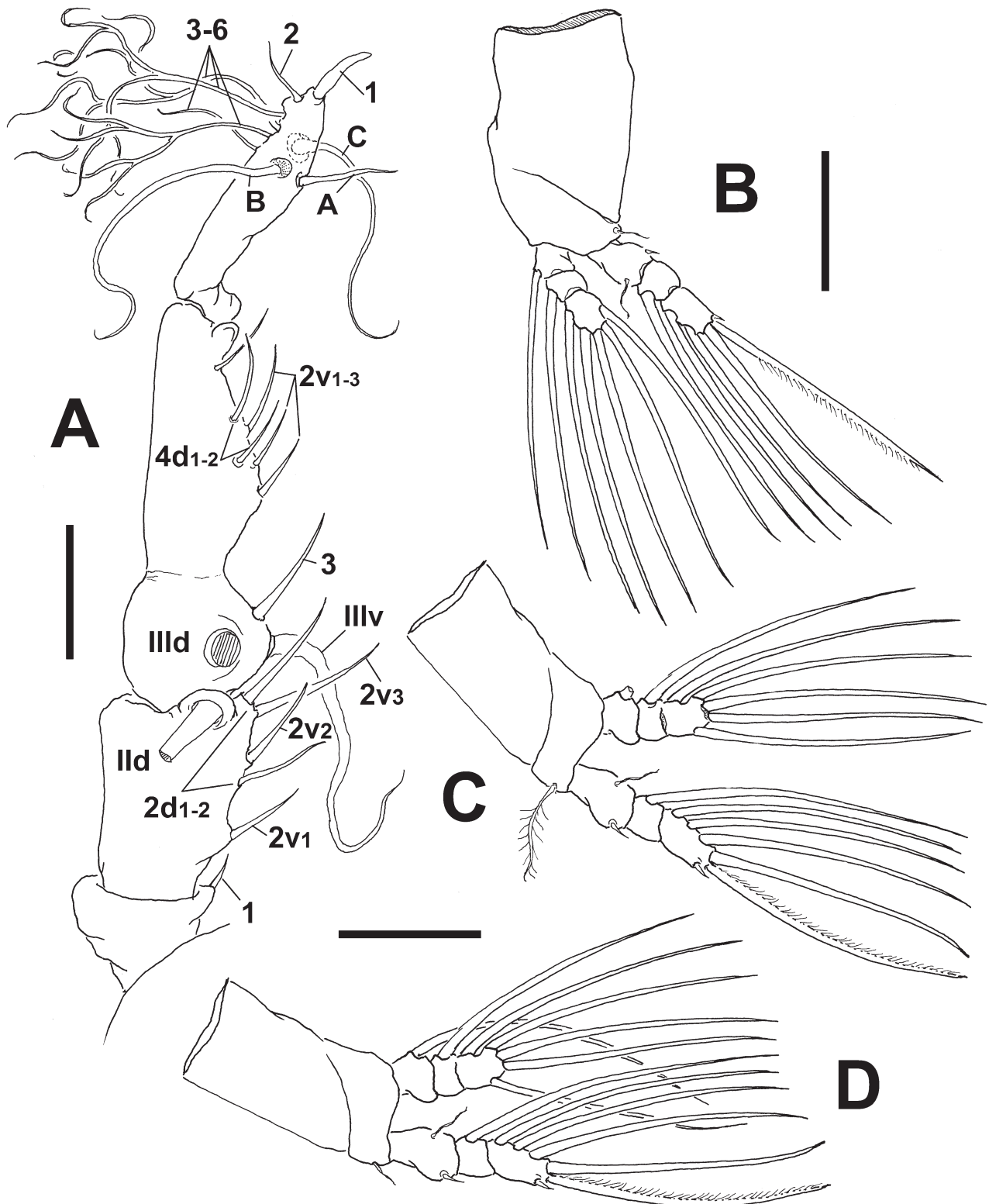




**FIGURE 68.** *Cymbasoma strzeleckii* sp. nov., adult male. A) habitus, lateral view; B) cephalic region, lateral view, ventral cephalic protuberance arrowed; C) same, ventral view; D) urosome and genital complex, lateral view; E) same, ventral view. Scale bars: A = 200µm, B–E = 50 µm.

Pedigerous somites 2–4, together accounting for 28% of total body length in dorsal view. Coxae of each pair unarmed, joined by intercoxal sclerite which is slightly longer than wide. Bases of legs 1–4 separated from coxae posteriorly by oblique articulation; with hair-like lateral seta (Fig. 69B–D); on leg 3, this seta about 3.5 times longer, than in other legs (Fig. 69C). Exopods of legs 1–4 longer than endopods. Ramal setae all biserially plumose

except spiniform outer seta on exopodal segments 1 and 3. Flexible, slender, inner seta present on first exopodal segment of legs 1–4. Outer spine on distal exopodal segment of legs 1–4 about 0.3 times as long as segment. Also, outermost apical exopodal setae of legs 1–4 with inner margin smooth, outer margin sparsely spinulose.



**FIGURE 69.** *Cymbasoma strzeleckii* sp. nov., adult male. A) left antennule, dorsal view; B) first leg; C) second leg; D) third leg. Scale bars: A–D = 50  $\mu$ m.

Armature formula of legs as follows:

	basis	endopod exopod
leg 1	0-1	0-1; 0-1; 1,2,2 I-1; 0-1; 1,2,2
legs 2–4	0-1	0-1; 0-1; 1,2,2 I-1; 0-1; 1,2,3

Female: unknown.

**Type locality.** Rhyll, Western Port Bay, Victoria, Australia (38°26.792' S, 145°18.496' E).

**Etymology.** This species is named in honour of Sir Pawel Edmund Strzelecki, a Polish explorer who reached Western Port Bay in 1840.

**Diagnosis.** *Cymbasoma* with conspicuous medial ventral protuberance on cephalic area; protuberance smooth. Oral papilla well developed. Antennule representing 44% of total body length and 80% of cephalothorax length. Fifth pedigerous somite with smooth ventral surface. Genital complex of type II, with thumb-like, slightly asymmetrical lappets, inner margins and distal tips of lappets smooth. Basal joint between lappets produced into rounded protuberance. Three caudal setae. Element 1 on first antennular segment short. Element 1 on distal antennular segment long, spiniform.

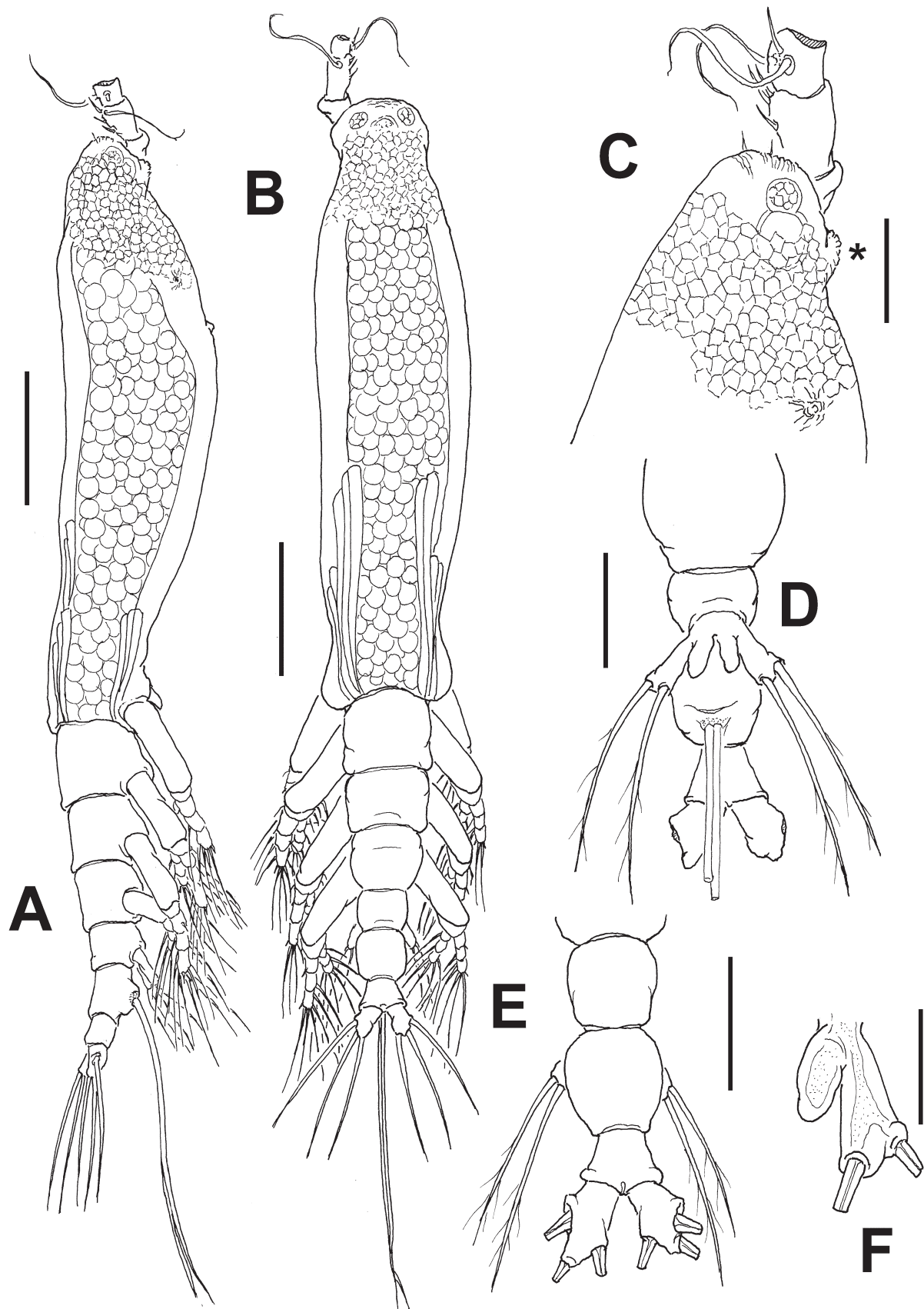
**Remarks.** *Cymbasoma strzeleckii* **sp. nov.** has a unique combination of characters including a frontal smooth protuberance, a genital somite with smooth dorsal surface, a genital complex with moderately divergent, smooth thumb-like lappets and a strong medial rounded protuberance at the insertion of the lappets. There are six other species with a relatively strong, rounded medial protuberance of the male genital complex and lappets resembling those of the new species, namely *C. tropicum* (cf. Martin Thompson & Easterson 1983), *C. quadridens* (cf. Suárez-Morales & Pilz 2008), *C. gracile* (cf. Gurney 1927), *C. bullatum* (cf. Suárez-Morales 2007), and the Australian *C. galerus* and *C. annulocolle*. *Cymbasoma strzeleckii* differs from these species in the presence of a smooth ventral cephalic protuberance. A similar cephalic ventral protuberant process is present in *C. rochai* (Suárez-Morales & Dias 2001), but in both *C. rochai* (cf. Suárez-Morales & Dias 2001) and *C. tropicum* (cf. Martin Thompson & Easterson 1983) four caudal setae are present thus differing from the of new species, with three caudal setae. In *C. quadridens*, *C. annulocolle* and *C. galerus* the lappets are ornamented with spinules or papillae, whereas in the new species these structures are smooth. As for *C. gracile*, the available comparative data are limited (Gurney 1927), but it shares with *C. strzeleckii* the smooth lappets and the presence of three caudal setae; however, in *C. gracile* the anal somite has a constriction and a suture (Gurney 1927: fig. D), thus differing from the non-constricted anal somite of the new species. Additionally, these species can also be distinguished using details of the antennular armature. Element 1 (*sensu* Grygier & Ohtsuka, 1995) on the first segment is very small in the new species; although being similarly spiniform it is clearly longer in *C. tropicum* (Martin Thompson & Easterson 1983: fig. 2g), *C. quadridens* (Suárez-Morales & Pilz 2008: fig. 5C), *C. annulocolle* (Fig. 15B), and *C. galerus* (Fig. 9B). The element is very long, setiform and setulated in *C. rochai* (Suárez-Morales & Dias 2001: fig. 26) and *C. bullatum* (Suárez-Morales 2007: fig. 2A,B); the condition in *C. gracile* is unknown since the element was not illustrated (Gurney 1927: fig. E).

### *Cymbasoma* sp.

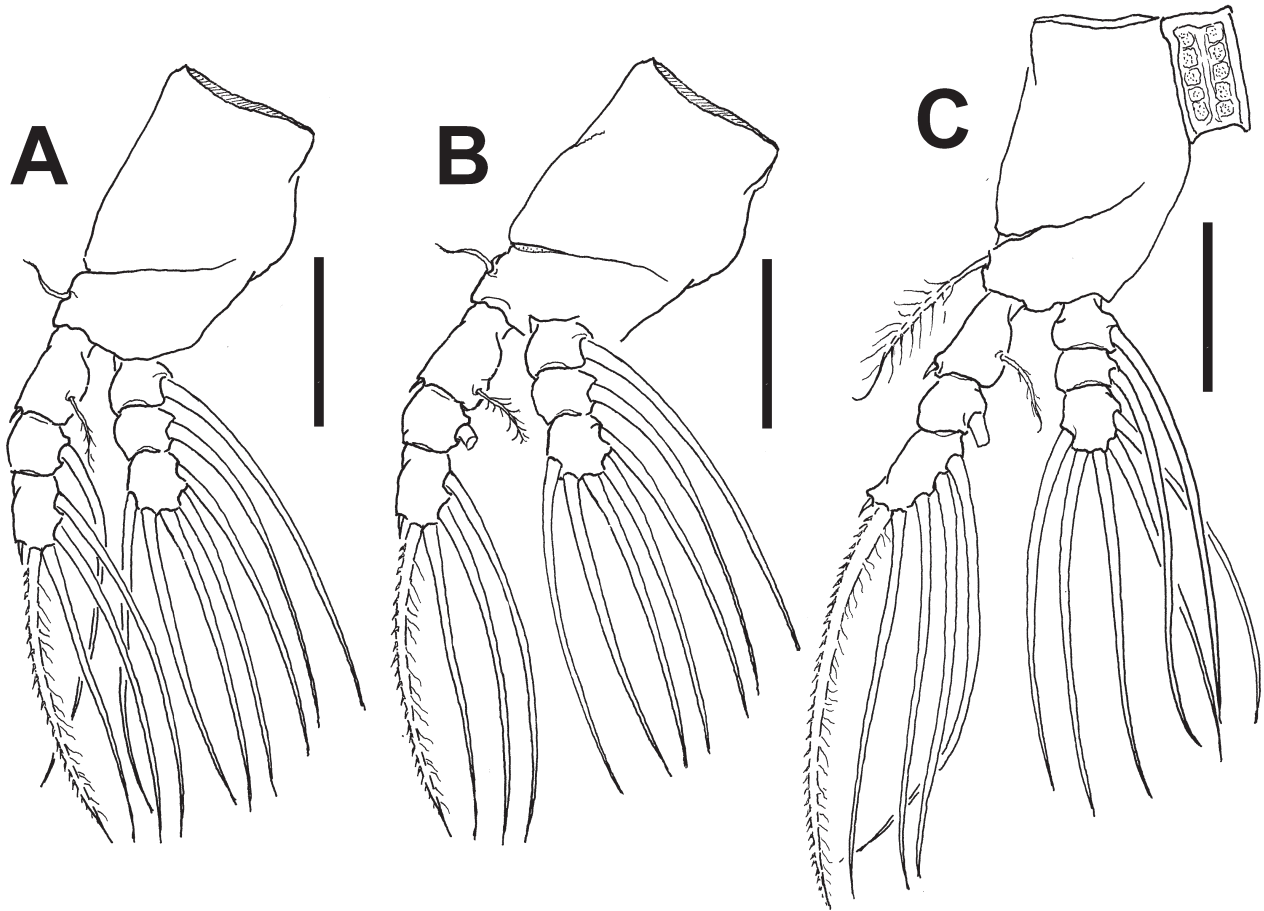
(Figs 70, 71)

**Material examined.** Damaged adult female (lacking antennules) from Rhyll, Western Port Bay, Victoria, Australia (38°26.792' S, 145°18.496' E), partially dissected, ethanol-preserved; dissected parts mounted on slide in glycerine, sealed with Entellan®. Date of collection: 19th May 1985. Slide deposited in the collection of MTQ, Australia (cat. MTQ W34406).

**Description of adult female.** Body slender, with elongate cephalothorax (Fig. 70A, B); body length 1.35 mm. Cephalothorax approximately 0.89 mm long, representing 66% of total body length. Midventral oral papilla weakly protuberant, located at 31% of cephalothorax length. Pair of relatively small ocelli present, pigment cups moderately developed, separated by 1.3 times an eye diameter, weakly pigmented; ventral cup about 1.5 times as long as lateral cups (Fig. 70C). Cephalic area as wide as cephalothorax, with flat "forehead" ornamented with



**FIGURE 70.** *Cymbasoma* sp., adult female. A) habitus, lateral view; B) same, dorsal view; C) cephalic region, lateral view, ventral medial protuberance marked by asterisk; D) urosome, ventral view; E) same, dorsal view; F) detail of fifth leg. Scale bars: A, B = 200 µm, C–E = 100 µm, F = 50 µm.



**FIGURE 71.** *Cymbasoma* sp., adult female. A) first leg; B) second leg; F) third leg with coxal plate. Scale bars: A–C = 100  $\mu$ m.

transverse wrinkles (Fig. 70C); pair of frontal sensilla present. Dorsal surface of cephalothorax smooth except for fringe of cephalic reticulation between ocelli and preoral area (Fig. 70C). Ventral surface ornamented with 1) medial corrugate protuberance posterior to bases of antennules (asterisk in Fig. 70C); 2) pair of nipple-like processes with few transverse wrinkles.

Urosome consisting of fifth pedigerous somite, genital double-somite and anal somite, together measuring 0.18 mm and representing 14% of total body length. Fifth pedigerous somite with slightly expanded lateral margins, dorsal and ventral surfaces smooth. Genital double-somite longest of urosome, ventrally protuberant, with lateral margins expanded into globose shape; ventral surface ornamented with few transverse wrinkles at insertion of ovigerous spines (Fig. 70D). Ovigerous spines paired, basally separated, slender, straight at their bases (Fig. 70D), relatively short (0.39 mm long), 29% of total body length. Anal somite shortest of urosome, with no constriction; dorsal and ventral surfaces smooth (Fig. 70E). Caudal ramus subrectangular, about 1.3 times as long as wide, armed with three caudal setae, ramus slightly longer than anal somite.

Antennules broken off in examined specimen, only the first two segments of the left antennule remaining; armature details not analyzed. Pedigerous somites 2–4, together accounting for 23% of total body length. Intercoxal sclerites of legs 1–4 subrectangular, surface with patches of minute spinules, posterior margin smooth, slightly curved. Bases of legs 1–4 with hair-like lateral seta (Fig. 71A–C); on leg 3, this seta sparsely setulose, about four times longer, thicker than those on other legs (Fig. 71A). Endopods and exopods of legs 1–4 triarticulated. Outermost distal spines on third exopodal segment of legs 1–4 short, 0.2 times as long as segment. Outermost apical exopodal setae of legs 1–4 with inner margin setulose, outer margin spinulose.



#### Armature formula of legs 1–4:

	basis	endopod	exopod
leg 1	1-0	0-1;0-1;1,2,2	1-1;0-1;1,2,2
legs 2–4	1-0	0-1;0-1;1,2,2	1-1;0-1;1,1,2,2

Fifth legs medially conjoined, bilobate; outer (exopodal) lobe elongate, cylindrical, distally truncate; armed with two equally long apical setae (Fig. 70D, F). Inner lobe arising basally, short, unarmed, reaching about half length of exopodal lobe.

Male: unknown.

**Locality.** Western Port Bay, Victoria, Australia (38°35.344' S, 144°59.687' E).

**Remarks.** The absence of antennules prevented a full description of this species. It appears to belong to the group of Australian *Cymbasoma* species that have an outer lobe of the fifth leg armed with two setae, *i.e.* the *agoense* group. It has certain affinities with members of this group and possibly represents another undescribed species; however, we prefer to retain this species as “sp.” until a complete set of morphological data becomes available.

## Discussion

Two types of female fifth legs are known among species of *Cymbasoma*. In the typical condition the fifth leg is bilobate with the inner one being of different size and shape but always unarmed, and the outer lobe bearing two or three setae. In the second type of fifth legs the inner lobe is not expressed while the outer lobe is armed with three setae, like in *C. tumorifrons* (*cf.* Suárez-Morales 1999), *C. bowmani* Suárez-Morales & Gasca, 1998, *C. boxshalli* Suárez-Morales 2001b, *C. cocoense* Suárez-Morales & Morales-Ramírez, 2009, *C. guerrense* Suárez-Morales, 2009 (in Suárez-Morales & Morales-Ramírez 2009). Except for the former species, *C. tumorifrons* known from the Mediterranean (Suárez-Morales & Álvarez-Silva 2001), this leg 5 morphology is known in American species only. The absence of females with this type of fifth legs in Australia is noteworthy.

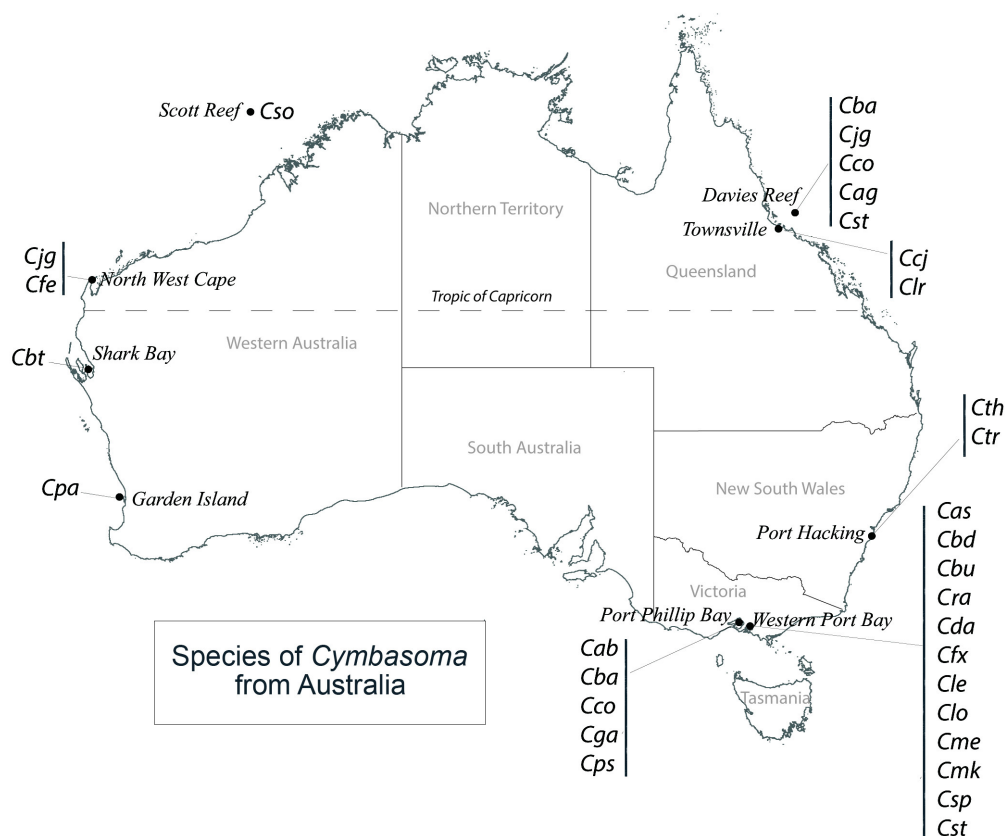
Of the 41 species contained in *Cymbasoma* (Suárez-Morales 2011, 2015) 22 (54%) are known only from females and 9 (22%) from males; in only 10 (24%) species are both sexes known, though doubts remain in some of these cases. The information provided in this work, with the addition of 25 new species allows an increase of more than 50% of the known diversity of the genus, which now includes 66 species. The resulting figures of those known from females or males only and from both sexes remain as: 36 (excluding *Cymbasoma* sp. from Australia) (54%), 17 (26%), and 13 (20%), respectively. The genus is now the most speciose within the Monstrilloida, followed by *Monstrilla* (*ca.* 60 species), *Monstrillopsis* (*ca.* 15), *Maemonstrilla* (7), and the monotypic *Australomonstrillopsis* (Suárez-Morales 2011; Suárez-Morales & McKinnon 2014). It is noteworthy to emphasize here that a third contribution on the Australian Monstrilloida is an ongoing project that is expected to result in new additions to the diversity of *Monstrilla*.

It is possible to match conspecific males and females of monstrilloid species (Grygier & Ohtsuka 2008; Suárez-Morales 2011), using distinctive morphological features shared between the sexes (Suárez-Morales & Escamilla 1997). All the males recorded from Australia have distinctive characters not connected to sex-related modifications (*i.e.* genital complex, modified fifth antennular segment) that are likely to be expressed in the corresponding females. Hence, aside the fact that these male specimens represent undescribed, clearly distinguishable species when compared with the other known males, their descriptions represent a significant advance in the knowledge of the Australian monstrilloid fauna. Their descriptions will allow the detection and matching of the corresponding females from future sampling efforts in the region.

**Ecological comments.** The nauplii and most copepodid stages of monstrilloid copepods are endoparasites of polychaete worms and prosobranch and bivalve molluscs (Boxshall & Halsey 2004; Suárez-Morales *et al.* 2010, 2013b), but very little is known of their host specificity. The availability of suitable host species for the infective stages is obviously critical to determining the distribution of the free-living adults, but until we have a better understanding of the identity of host species we can only speculate on the factors determining species distributions. The present collections of *Cymbasoma* come from both temperate and tropical regions of Australia (Fig. 72), but

what is particularly striking is the rich fauna (17 species) from Victoria. Though our records are confounded by differential collecting efforts, it appears that the adjacent embayments of Port Phillip and Western Port bays each have a distinct fauna; five species of *Cymbasoma* occurring in Port Phillip Bay and 12 species in Western Port Bay. Kimmerer & McKinnon (1985) found considerable differences in the zooplankton of these embayments, with Cladocera being absent from Western Port and the abundance of the calanoid *Paracalanus indicus* being greatly reduced. Overall, there zooplankton diversity was lower in Western Port Bay than in Port Phillip Bay, with *Acartia* species assuming dominance. Kimmerer & McKinnon (1985) hypothesized that this difference was attributable to the higher suspended particulate load in Western Port, in combination with predation effects. These differences were attributed to Western Port Bay being shallower than Port Phillip Bay, which is characterized by extensive mud flats and seagrass beds. Such habitats may support richer communities of the potential hosts of the juvenile stages of monstrilloid copepods.

As we noted in our account of the genera *Monstrillopsis*, *Maemonstrilla* and *Australomonstrillopsis* (Suárez - Morales & McKinnon 2014), there is every indication of a very rich monstrilloid fauna in Australia. Our finding of 28 species of *Cymbasoma*, 25 of which being new, is the largest single work on monstrilloid copepods to date. Some species appear to be widely distributed, since we have recorded (1) *Cymbasoma bali* from Port Phillip Bay in Victoria and from Davies Reef, a platform reef on the Great Barrier Reef, Queensland; (2) *C. jinigudira* from North West Cape, Western Australia and from Davies Reef; and (3) *C. annulocolle* from Port Phillip Bay and from Davies Reef (Fig 72). Most of the new species of Australian *Cymbasoma* species described here are based on single individuals recovered from plankton collections taken for ecological surveys of different coastal environments, though in one case (*C. annulocolle* sampled from Werribee, Victoria), we recovered 16 individuals from a single sample.



**FIGURE 72.** The occurrence of the monstrilloid copepod genus *Cymbasoma* in Australia. **Cab**, *C. apicale*; **Cas**, *C. astrolabe*; **Cba**, *C. bali*; **Cbd**, *C. bidentatum*; **Cbt**, *C. bitumidum*; **Cbu**, *C. buckleyi*; **Ccj**, *C. clairejoanae*; **Cco**, *C. annulocolle*; **Cra**, *C. rafaelmartinezi*; **Cda**, *C. dakini*; **Cfe**, *C. fergusonii*; **Cfx**, *C. colefaxi*; **Cga**, *C. galerus*; **Cjg**, *C. jinigudira*; **Cle**, *C. lenticula*; **Clo**, *C. lourdesae*; **Clr**, *C. leighrandalli*; **Cmk**, *C. markhasevae*; **Csp**, *Cymbasoma* sp.; **Cme**, *C. marioeduardoi*; **Cst**, *C. constrictum*; **Cpa**, *C. paraconstrictum*; **Cps**, *C. pseudoquadridens*; **Cso**, *C. solanderi*; **Cst**, *C. strzelecki*; **Cth**, *C. tharawalorum*; **Ctr**, *C. tranteri*.

## Key to the Australian species of *Cymbasoma* (females)

- 1A. Fifth leg with outer (exopodal) lobe armed with two setae. . . . . 2
- 1B. Fifth leg with outer (exopodal) lobe armed with three setae (the innermost sometimes shorter or narrower than the other two). . . . . 6
- 2A. Body remarkably robust, globose, cephalothorax about 50% of total body length; inner lobe of fifth leg short, ball-like or plate-like, robust; cephalothorax ornamented with dorsal patch or fringe of papillae-like elements . . . . . 3
- 2B. Body relatively slender, cephalothorax representing more than 60 % of total body length; inner lobe of fifth leg digitiform; cephalothorax ornamented otherwise, with ventral field of transverse striae, a few ventral wrinkles or reticulated field. . . . . 4
- 3A. Antero-ventral process of genital double-somite strongly developed, forming high thumb-like process visible in lateral view; terminal antennular segment shorter than the length of the other segments combined; caudal setae proximally swollen; inner lobe of fifth leg wide, plate-like . . . . . *C. agoense* Sekiguchi, 1982
- 3B. Antero-ventral process of genital double-somite absent, surface smooth in lateral view; terminal antennular segment longer than the length of the other segments combined; caudal setae not swollen proximally; inner lobe of fifth leg reduced, ball-like . . . . . *C. tharawalorum* sp. nov.
- 4A. Cephalic region with ventral protuberant process, ornamented with reticulated field or with field of deep, tight pattern of transverse striae. . . . . 5
- 4B. Cephalic region with no ventral protuberances, ornamentation weak, represented by a few scattered wrinkles . . . . . *C. lourdesae* sp. nov.
- 5A. Inner lobe of fifth leg slender, relatively long, almost reaching to distal margin of outer lobe; oral papilla protuberant; ventral surface of cephalic region ornamented with field of tightly arranged transverse striae . . . . . *C. dakini* sp. nov.
- 5B. Inner lobe of fifth leg short, barely reaching to middle margin of outer lobe; oral papilla poorly developed, not protuberant; cephalic region ornamented with fringe of reticulation . . . . . *Cymbasoma* sp.
- 6A. Ovigerous spines proximally fused; genital double-somite quadrate, with deep dorsal striae; innermost seta of the fifth leg less than half the length of the outer setae . . . . . *C. jinigudira* sp. nov.
- 6B. Ovigerous spines separated at base; genital double-somite shaped and ornamented otherwise; innermost seta of the fifth leg slightly shorter or as long as the outer setae . . . . . 7
- 7A. Cephalothorax with band of transverse striations running around surface . . . . . 8
- 7B. Cephalothorax with different ornamentation . . . . . 10
- 8A. Band of striations covering more than 30% of cephalothorax; genital double-somite with rounded posterolateral processes . . . . . 9
- 8B. Band of striations covering less than 15% of cephalothorax, restricted to anterior cephalic region; genital double-somite with tapered distal half, processes absent . . . . . *C. markhasevae* sp. nov.
- 9A. Cephalothorax with band of striations covering ventral surface from bases of antennules to post-oral region, overall coverage being at least 45%; frontal margin smooth, with medial depression; ventral surface with “U”-shaped row of spinous processes . . . . . *C. astrolabe* sp. nov.
- 9B. Cephalothorax with band of striations covering ventral surface from bases of antennules to post-oral region, overall coverage being around 30%; frontal margin wrinkled, otherwise flat; ventral surface with usual ornamentation but no spinous processes . . . . . *C. annulocolle* sp. nov.
- 10A. Both anal somite and genital double-somite constricted, anal somite almost as long as or longer than genital double-somite . . . . . 11
- 10B. Anal and genital double-somite not constricted, anal somite clearly shorter than genital double-somite . . . . . 12
- 11A. Anal somite longer than genital double-somite; fifth pedigerous somite with dorsal field of deep transverse striations in posterior half; cephalothorax expanded in lateral view; antennular segments 3–4 fused . . . . . *C. constrictum* sp. nov.
- 11B. Anal somite slightly shorter than genital double-somite; fifth pedigerous somite with smooth dorsal surface; cephalothorax straight in lateral view; antennular segments 3–4 separated. . . . . *C. paraconstrictum* sp. nov.
- 12A. Genital double-somite with smooth posterior margin . . . . . 13
- 12B. Genital double-somite with two dentiform processes on posterior margin. . . . . *C. bidentatum* sp. nov.
- 13A. Fifth leg with inner lobe arising basally or at proximal 1/3 of inner margin of outer lobe . . . . . 15
- 13B. Fifth leg with inner lobe arising at halflength or subdistally with respect to the outer lobe. . . . . 14
- 14A. Fifth leg inner lobe rounded, at midlength of inner margin of outer lobe; dorsal surface of cephalic region with field of weak transverse wrinkles; anal somite with smooth dorsal and ventral surfaces, and smooth lateral margins . . . . . *C. bali* Desai & Krishnaswamy, 1962
- 14B. Fifth leg inner lobe short, digitiform, arising subdistally from inner margin of outer lobe; dorsal surface of cephalic region with field of light reticulations; anal somite with corrugated lateral margins and striae on ventral surface . . . . . *C. apicale* sp. nov.
- 15A. Fifth leg inner lobe digitiform, well-defined; legs 1–4 with 3-segmented exopods, legs 1–4 setae with normal aspect . . . . . 16
- 15B. Fifth leg inner lobe not digitiform, represented by mere expansion of the inner margin of outer lobe; exopods of fourth leg 2-segmented, with dwarfed distal setae . . . . . *C. rafaelmartinezi* sp. nov.
- 16A. Fifth leg inner lobe mammiliform. . . . . *C. buckleyi* sp. nov.
- 16B. Fifth leg inner lobe not mammiliform. . . . . 17
- 17A. Fifth leg inner lobe short, reaching at most to halfway down the outer lobe . . . . . 18
- 17B. Fifth leg inner lobe not particularly short, reaching beyond halfway the length of the outer lobe . . . . . 19
- 18A. Frontal area with weak, not protuberant lens-like frontal processes; genital double-somite with small rounded processes along lateral margins of proximal half; fifth leg inner lobes short, reaching to halfway down the outer lobe, asymmetrical, one of them curved, the other bifurcate; antennules with segments 3–4 fused . . . . . *C. fergusoni* sp. nov.

- 18B. Frontal area with protuberant lens-like frontal processes; genital double-somite with smooth corrugate margins but no rounded processes along lateral margins of proximal half of somite; fifth leg inner lobes short, not reaching to halfway down the outer lobe, symmetrical; antennules with segments 3–4 separate . . . . . *C. lenticula* **sp. nov.**
- 19A. Cephalic region with ventral field of transverse striae between oral papilla and insertion of antennules; nipple-like processes located midway between oral papilla and insertion of antennules; anal somite with corrugate lateral margins . . . . . *C. tranteri* **sp. nov.**
- 19B. Cephalic region with smooth ventral surface; nipple-like processes located at same level, next to oral papilla; anal somite with smooth lateral margins . . . . . *C. solanderi* **sp. nov.**

## Key to the Australian species of *Cymbasoma* (males)

- 1A. Caudal ramus with three caudal setae . . . . . 4
- 1B. Caudal ramus with four caudal setae . . . . . 2
- 2A. Cephalic region with ventral protuberance; anal somite lacking spiniform processes . . . . . 3
- 2B. Cephalic region with no ventral protuberances; anal somite with dorsal spiniform processes on posterior margin . . . . . *C. jinigudira* **sp. nov.**
- 3A. Medial insertion of genital lappets flat, smooth; fifth pedigerous somite ventrally corrugated; dorsal surface of cephalic region with rounded protuberance; antennular element 3 remarkably long . . . . . *C. bitumidum* **sp. nov.**
- 3B. Medial insertion of genital lappets with conspicuous rounded process; fifth pedigerous somite ventrally smooth; dorsal surface of cephalic region without protuberances; antennular element 3 not particularly long . . . . . *C. strzeleckii* **sp. nov.**
- 4A. Cephalic region with ventral protuberance . . . . . 5
- 4B. Cephalic region lacking ventral protuberances . . . . . 6
- 5A. Medial insertion of genital lappets with bifurcate process; anal somite with paired strong ventral protuberances . . . . . *C. marioeduardoi* **sp. nov.**
- 5B. Medial insertion of genital lappets flat, ornamented with two spiniform processes; anal somite lacking protuberances . . . . . *C. colefaxi* **sp. nov.**
- 6A. Medial insertion of genital lappets with rounded protuberance . . . . . 7
- 6B. Medial insertion of genital lappets flat, lacking protuberances . . . . . 8
- 7A. Genital lappets with inner margin ornamented with spiniform teeth; cap-like process absent from frontal surface . . . . . 9
- 7B. Genital lappets with inner margin smooth, cap-like process on frontal surface of cephalic region . . . . . *C. galerus* **sp. nov.**
- 8A. Genital lappets narrow, digitiform, elongated . . . . . *C. clairejoanae* **sp. nov.**
- 8B. Genital lappets robust, relatively short . . . . . *C. leighrandalli* **sp. nov.**
- 9A. Cephalic region with pair of strongly protuberant lens-like processes; genital somite with corrugate dorsal surface; genital lappets tapering distally . . . . . *C. lenticula* **sp. nov.**
- 9B. Cephalic region without protuberant lens-like processes; genital somite with smooth dorsal surface; genital lappets robust, wide, not tapering distally . . . . . 10
- 10A. Genital lappets with few (4) strong acute teeth on proximal inner margin; anal somite with smooth lateral margins, not constricted; fifth pedigerous somite with straight lateral margins, lacking rounded posterolateral processes . . . . . *C. pseudoquadridens* **sp. nov.**
- 10B. Genital lappets with 7–10 relatively small acute teeth on proximal inner margin; anal somite constricted; fifth pedigerous somite with rounded posterolateral processes . . . . . *C. annulocolle* **sp. nov.**

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