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# Pycnogonids, 'sea-spiders' (Arthropoda, Pycnogonida) selected from the collections of the South Australian Museum with descriptions of new species and review of the genus *Pallenella*.

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**Abstract**

Staples D.A. 2025. Pycnogonids 'sea spiders' (Arthropoda, Pycnogonida) selected from the collections of the South Australian Museum with descriptions of new species and review of the genus *Pallenella*. *Memoirs of Museum Victoria* 84: 1–47.

Twelve new species of Pycnogonida belonging to the genera *Nymphon* (2 species), *Anoplodactylus* (1 species), *Endeis* (1 species), *Callipallene* (1 species), *Parapallene* (1 species) and *Pallenella* (6 species) are described from the collections of the South Australian Museum. Of the nine species of *Pallenella* recorded here, six are new to science. All species assigned to the genus *Pallenella* are reviewed and an updated key to species is presented. For the first time, eight eye lenses are recorded in the genus. Previously described species are discussed, and images of selected type material are provided.

**Keywords**

South Australia, new species, key, review, *Nymphon, Callipallene, Parapallene, Anoplodactylus, Endeis, Pallenella,* eye lenses.

## Introduction

Fourteen species of pycnogonids selected from a larger collection on loan from the South Australian Museum are reviewed. Twelve new species are described of which six belong to the genus *Pallenella*. Of particular significance is the recognition of what appear to be four pairs of eye lenses in species belonging to that genus (plate 9c). The presence of additional "eyes" in a pycnogonid was first recognised by Clark (1963) who described two species in the genus *Stylopallene* with eight eyes arranged in four groups of two. Clark did not discuss the unique presence of additional eyes even though, up to that time, pycnogonids were only known to have one or two pairs, or to be absent completely in several deep-water species. *Stylopallene longicauda* Stock, 1973 was the third species in that genus to be described with four pairs of eyes, a character now regarded as diagnostic of the genus (Staples 2014a). Unlike *Stylopallene*, in which the lenses appear to be independent of each other, the lenses in *Pallenella* are usually conjoined and appear to sit within a single eyecup, supporting the presumption by Lehmann et al. (2017) that the eight lenses (in four duads) in *Stylopallene* are a subdivision of the usual four eyes. In this analysis, seven species are recognised as having four pairs of lenses; these being *P. arangoae* sp. nov., *P. brenneisi* sp. nov., *P. difficile* (Arango 2009)., *P. georgia* sp. nov., *P. octolentium* sp. nov. *P. reflexa* Stock, 1968 and *P. smithi* sp. nov. It is suspected that others have gone unnoticed in earlier descriptions, but the wide geographical distancing of *Pallenella* species recorded with eight eye lenses indicates that they are not composed of a single aberrant cohort. The significance of lens couplets as a diagnostic character in *Pallenella* is unresolved.

The genus *Pallenella* has been extensively revised since 2005 by Staples (2005), Arango and Brenneis (2013) and Brenneis et al. (2020), and species identifications need to be considered in the light of observations made by those authors. The most recent works by Arango and Brenneis (2013) and Brenneis et al. (2020) have shown a high degree of congruence between morphological analyses and molecular studies in most species, but data have not been sufficiently integrated in all cases to enable distinction between species based on morphology alone. In the absence of robust morphological differentiation the construction of a key based on published information has, in some instances, become problematical. Brenneis and Arango relied heavily on colour and markings in live material to distinguish species, and whilst these characters are of interest and very useful species indicators in live specimens, colour and markings are of limited use in preserved specimens where, for the most part, they are lost.

*Pallenella* is predominantly confined to southern Australia where they share arborescent bryozoans as their host substrate, in particular, bryozoans belonging to the family Catenicellidae, (genera *Scuticella, Orthoscuticella* and *Catenicella*). It is likely that some of these associations are obligate, and that chela finger morphology is adapted to feeding on a particular type of zooid.

## Materials and methods

Leg span is based on twice the sum of individual segments excluding the propodal claw and auxiliary claws of the third leg plus the width of the trunk. The term "crop" follows the definition provided by Stock (1952) and references the distal widened part of the cephalon that transitions into the neck. The primary propodal heel spines are described herein as arranged linearly or grouped: either randomly or into a pattern. These primary spines are usually accompanied by several lesser spines.

Specimens were loaned by the South Australian Museum, Adelaide (SAMA) (earlier loan material is designated SAM) and the Western Australian Museum (WAM).

## Systematic account

### Family Nymphonidae Wilson, 1878

### Genus *Nymphon* Fabricius, 1794

***Nymphon natans*** sp. nov.

Figure1a–j. Plate 1a–d

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*Material examined*. Holotype. Gravid female (SAMA E9438). Edithburgh Jetty, free-swimming, flood (tide) current, at night, 2–5 m, K.L. Gowlett-Holmes, 23 May 1987.

*Diagnosis*. Neck long, about three times own width; lateral processes widely spaced, about 1.7 times longer than basal width, second lateral processes with anterior ventrolateral protuberances. Palps five-segmented. Chela fingers of about equal length, longer than palm, slender, strongly bowed, crossing at tip, each finger with 18–20 teeth. Oviger bases in contact with first lateral processes, claw with seven well-defined sharp teeth on inner margin. Auxiliary claws about two-thirds length of main claw.

*Description*. Holotype, female. Leg span about 46.0 mm. Cephalon slightly longer than remainder of trunk, length of neck about three times own width (Plate1b). Lateral processes about 1.7 times longer than basal width, processes 1 and 2 separated by 2.4 times their basal width, separation between processes 2 and 3 about 2.7 times basal width, and processes 3 and 4 distanced by about their own diameter. Second lateral processes with anterior ventrolateral protuberance (plate 1b, fig. 1c).

Eye tubercle placed in line with oviger bases, height slightly less than basal width, two prominent dorsal papillae, dorsal surface between papillae almost level, four large eyes.

Proboscis cylindrical, about 2.5 times as long as wide, slightly constricted at about two-thirds length and inflated distally, distally rounded and fringed with tiny, sparse setae, lips slender, slightly projecting, jaws recessed.

Chelifore scape little shorter than proboscis; chela fingers of equal length (fig. 1d), slender, longer than palm, strongly bowed, crossing at tip, base of immoveable finger with pad on outer surface, bearing many long setae, each finger with 18–20 teeth separated by about own width, larger teeth much longer than width of finger, proximal teeth smaller, teeth on immoveable finger nearly erect, those on moveable finger curved.

Palp (fig. 1e) five segmented, segment 1 shortest, segment 2 longest, segment 4 next longest, segment 3 longer than segment 5, distal three segments with long setae particularly along inner margin, length of some setae greater than twice segment width.

Oviger (fig. 1f) ten segmented, bases in contact with first lateral processes, segment 5 longest, segment 4 next longest, with a probable glandular swelling, segments 5–10 decreasing in length distally; compound spine formula, segments 7–10, 13:10:10: 9, spine height little more than half segment width, proximal two spines smaller, distal-most spine on each segment offset, each spine with six pair of small lateral teeth, claw half-length of segment 10, with seven well-defined sharp teeth on inner margin.

Anal tubercle missing, broken off at base.

Legs (fig. 1h), setae and spination sparse, femur and tibia 1 with longer dorsodistal seta. Lateral line of thickened cuticle extending throughout length. Second coxa 2.7-times length of coxa 1, tibia 2 longest segment, tibia 1 longer than femur, femur filled with tiny oocytes, tibiae more slender than femur, tarsus (fig. 1i) about half length of propodus, propodus hardly curved, heel and primary spines absent, sole with about 15 slender main spines arranged in a single row, each interspaced by one or two lesser spines, distal spines longest and more robust; propodal claw short, slightly longer than one-fifth length of propodus, auxiliary claws about two-thirds length of main claw, without teeth or crenulations. Gonopores ventrodistal, second coxae, all legs.

*Measurements of holotype (mm)*. Length trunk (frontal margin of cephalic segment to tip of fourth lateral processes), 4.53; width across second lateral processes, 1.72; scape 1.05; proboscis length (ventral); 1.12, diameter (at mid-length), 0.45. Palp: seg. 1, 0.18; seg 2, 0.75; seg. 3, 0.45; seg 4, 0.53; seg. 5, 0.31. Oviger seg. 1, 0.16; seg. 2, 0.31: seg. 3, 0.39; seg. 4, 1.12; seg. 5, 1.31; seg. 6, 0.66; seg. 7, 0.37; seg. 8, 0.29; seg. 9, 0.24; seg. 10, 0.23; claw, 0.12. Leg: coxa 1, 0.61; coxa 2, 1.65; coxa 3, 0.65; femur, 4.75; tibia 1, 5.28; tibia 2, 6.47; tarsus, 0.95; propodus, 1.83; claw, 0.35; aux claws 0.25.

*Etymology*. Latin: *natans,* (swimming, floating), alluding to the finding of the holotype free swimming in a flood tide.

*Remarks*. The legs are mostly detached and fragmented. This species belongs to a group of *Nymphon* defined by widely-spaced lateral processes and a conspicuously long, slender neck. Other shared characters are auxiliary claws shorter than the main claw, bases of ovigers in contact with the first lateral processes, the oviger claw with well-defined teeth and a tarsus shorter than the propodus. In this group, only *N. spiniventris* Stock, 1953 from the Basilan Straits shares the presence of ventrolateral protuberances on the anterior margin of the second lateral processes. Although quite evident in ventral view, these protuberances are mostly obscured in dorsal view and easily overlooked. Based on Stock's figure (Stock, 1953, Fig. 5), they are more conspicuous in *N. spiniventris* and have a proximal

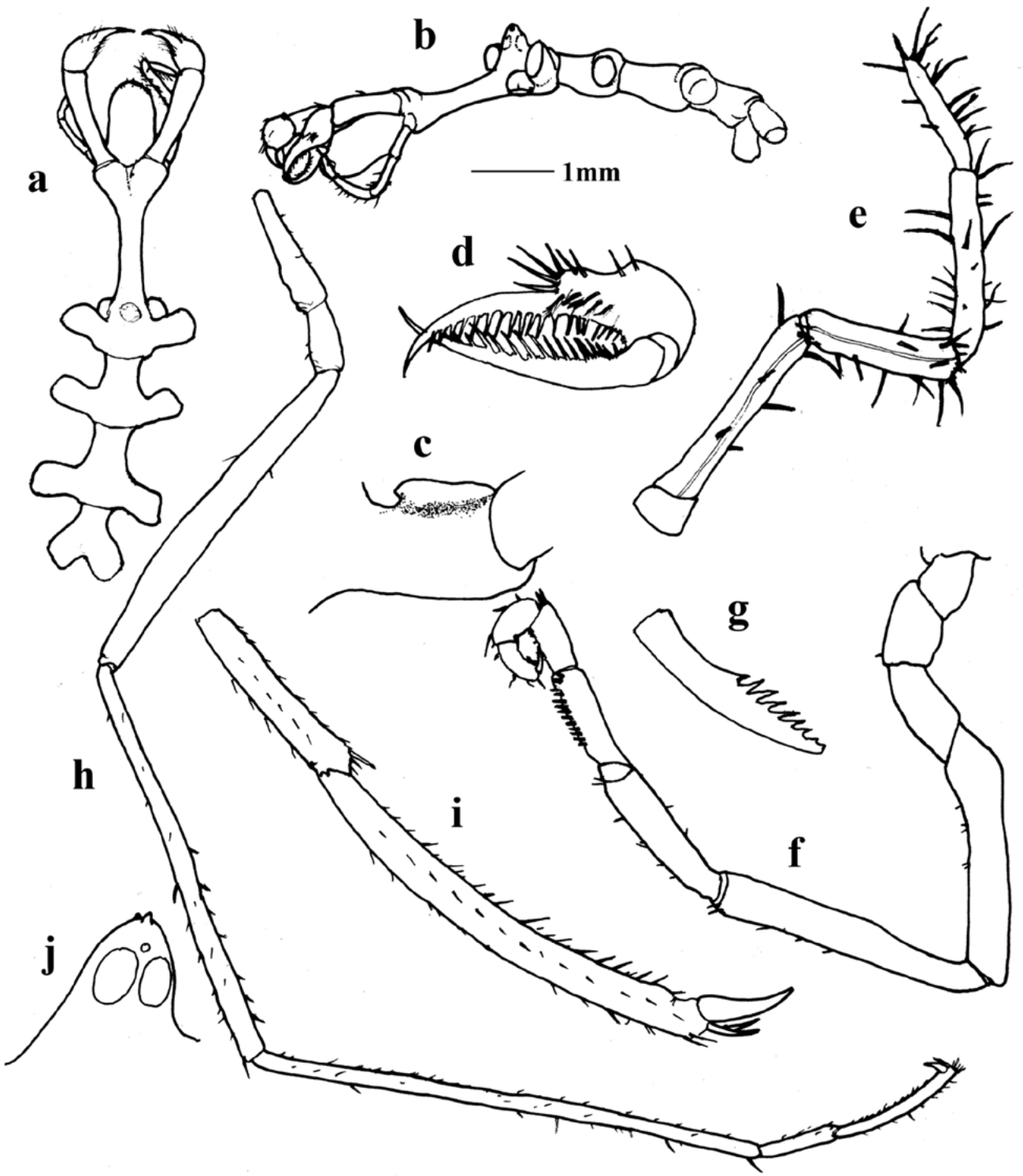


Figure 1. *Nymphon natans* sp. nov., female, holotype (SAMA E9438): a, b, trunk, dorsal and lateral view; c, left side second lateral process showing ventrolateral protuberance; d, right chela; e, left palp; f, g, right oviger and claw; h, i third leg and tarsus and propodus; j, eye tubercle, lateral, left side.

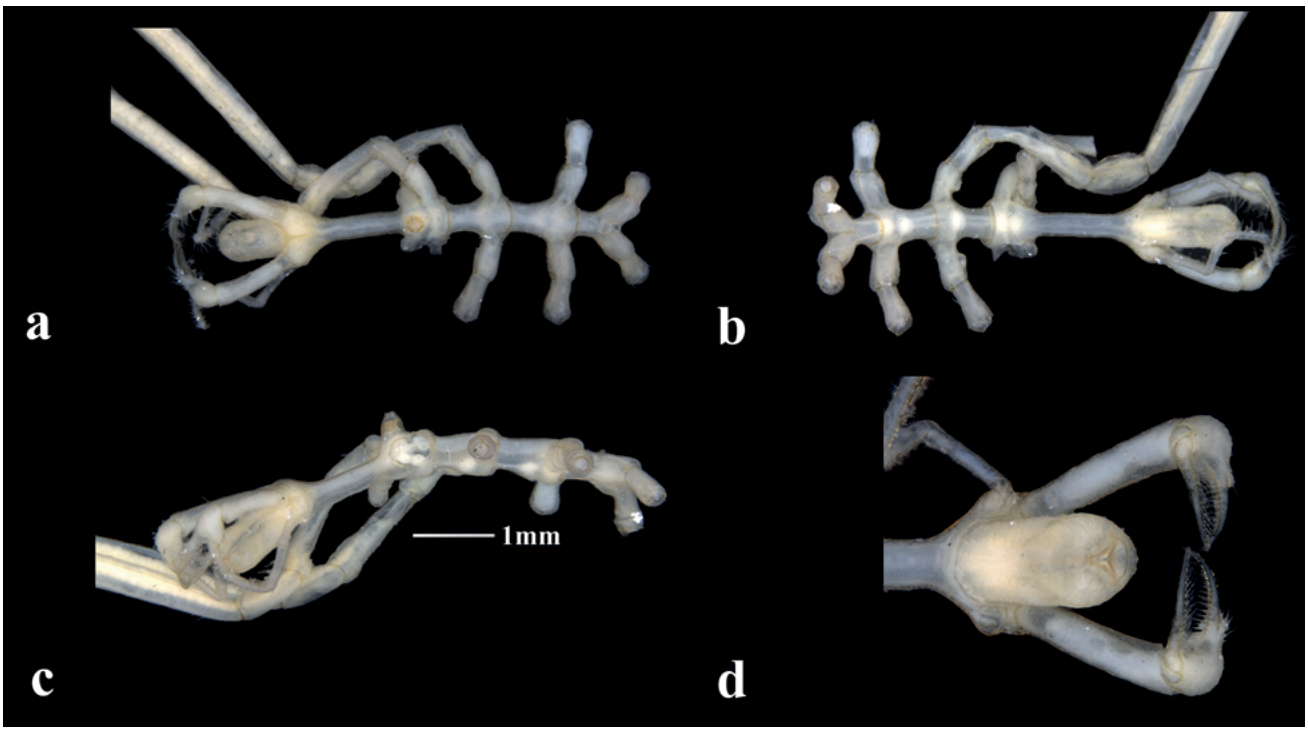


Plate 1. *Nymphon natans* sp. nov., female, holotype (SAMA E9438): a–c, trunk dorsal, ventral and lateral; d, proboscis and chelae ventral.

tooth-like process which he described as a "spiniform process". A similar process is seen only on the left-side protuberance of this specimen, but it is only evident when viewed from a particular perspective. *Nymphon spiniventris* shares a similar long neck and wide spacing of the third and fourth lateral processes with this species, but otherwise differs conspicuously in the following respects: the first and second lateral processes of *N. natans* are more widely spaced, the tarsus is much longer relative to the propodus, the propodus is less curved and both chela fingers of *N. natans* bear many more teeth (*N. natans*, 18–20 teeth versus *N. spiniventris* 9–10 teeth). The oviger compound spines of *N. natans* are of uniform shape, whereas those of *N. spiniventris* show a characteristic dimorphism, some with five pairs of lateral teeth and others with 15–22 pairs of fine denticulations (Stock 1953, Fig. 6e, f). The new species agrees most closely with the holotype of *N. andamanense* Calman, 1923 from the Anderman Sea with which it shares the proportions of the neck and the wide separation of trunk lateral processes 3 and 4. The principal characters that distinguish *N. natans* sp. nov. from *N. andamanense* are the presence of ventro-anterior protuberances on the second lateral processes (absent in *N. andamanense*), the much wider interval between first and second lateral processes, the proportionately shorter coxa 2 and longer tarsus. It is worth noting however, that the differences between *N. andamanense* and *N. spiniventris* appear to be few, and apart from the "spiniform processes", differences appear to be limited to minor variations in proportions. I am grateful to Jan Beccaloni of the Museum of Natural History London who re-examined Calman's type material and was able to confirm the absence of the protuberances in *N. andamanense* adding support to the independent status of that species. *Nymphon setimanus* Barnard, 1946 is another species that could be confused with this specimen. Barnard's (1946) brief description of *N. setimanus* was unaccompanied by figures and his later (1954) more detailed description was only accompanied by a single illustration of part of a chela (Barnard, 1954, Fig. 8). Stock (1965) later provided detailed figures based on a specimen from Madagascar which generally reaffirmed Barnard's (1954) description (Stock, 1965, Figs 13–17). At that time, *N. setimanus* was recorded from several South African localities and perhaps from the South Arabian coast by Calman (1938) under the name *N. andamanense* although, he noted that his specimens were intermediate between *N. andamanense* and *N. maculatum* Carpenter, 1910 from the Red Sea. Müller (1989) later reported on several specimens from the Gulf of Aden which he assigned to *N. setimanus* (Müller 1989), and he agreed with Stock (1965) that Calman's specimens probably belong to *N. setimanus*. Contrary to Müller's statement that his specimens agree well with the material described in the literature, there appears to be little resemblance to the earlier descriptions by Barnard and Stock. Barnard (1954) described *N. setimanus* as having the lateral processes separated by "rather less than their own width" and the bases of the ovigers as "occupying one-third to nearly one-half of the neck" but Müller (1989 Figs 35-41) illustrated specimens with lateral processes separated by 2 to 3 times their diameters and oviger bases which clearly occupy much less than one-third to nearly one-half of a much longer neck. Except for the number of oviger spines and teeth on the

claw, Stock's (1965) Madagascar specimen agreed perfectly with Barnard's description. It is quite evident that Muller's Gulf of Aden specimens are not *N. setimanus*. Müller's specimens share the wide spacing of the first and second lateral processes with this species but differ notably in the absence of a protuberance on the second lateral process, in having a proportionately shorter tibia 2 and a much shorter tarsus. Müller's figures of *N. setimanus* agree more closely with Calman's (1923) description of *N. andamanense* from which they seem to be distinguished only by the distance between the first and second lateral processes. Preserved specimens of both *N. setimanus* and *N. maculatum* retained pigmentation of the trunk and appendages (Stock, 1965). There is no evidence of pigmentation in this specimen. The geographically closest species which could be confused with the new species, is *N. molleri* Clark, 1963 recorded from Spencer Gulf, South Australia to Cape Byron, New South Wales and northern Tasmania. *Nymphon molleri* is distinguished by a much longer cephalon relative to the remainder of the trunk, a greater number of oviger claw teeth, a distinctly shorter tarsus, and oviger compound spines that have up to ten pairs of lateral teeth.

***Nymphon sigmoides*** sp. nov.

Figure 2a–i. Plate 2a–d

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*Material examined*. Holotype. Male (SAMA E9437). Sir Joseph Banks Group, between Lusby Rocks and Partney I., under rocks on bryozoan, 8 m, K. Gowlett, 1 Feb 1985.

*Diagnosis*. Length of neck about three times width. Lateral processes widely spaced, length of lateral processes about twice basal width. Eye tubercle low, rounded. Palps 5-segmented. Proboscis elongate, mid-region slightly swollen. Chelae fingers about as long as palm, distal one-third delicate, thin, strongly curved upwards and slightly recurved, teeth widely spaced. Oviger bases merged with the anterior surface of the first lateral processes, terminal claw with three teeth along inner margin. Tarsus slightly less than one-third length of propodus, auxiliary claws slightly less than half length of main claw.

*Description*. Holotype, male. Leg span about 12.0 mm. Cephalon shorter than remainder of trunk, 1 or 2 short setae at bases of chelifores; length of neck about three times width. Length of lateral processes about twice basal width, one or two short and fine distal setae may be present; processes 1 and 2 separated by about 3.5 times basal width, processes 2 and 3 separated by 2.3 times basal width processes 3 and 4 separated by about 1.5 times own diameter.

Eye tubercle low, rounded, two dorsal papillae, four eyes.

Proboscis elongate, attached obliquely to the anteroventral surface of the cephalon, vaguely upturned, mid-region slightly inflated with few inconspicuous spinules; length almost 3.0 times maximum width, jaws recessed (plate 2 c).

Chelifore scape lowly arched (plate 2b), arthrodial membrane at base broad, allowing near vertical orientation, two strong spines on outer surface, distal most spine longer than proximal spine, single dorsodistal seta accompanied by several shorter setae; chela palm elongate, with three slender spines on dorsal surface; fingers (measured to bases of distal upcurved parts) about as long as palm, distal one-third delicate, thin, sigmoid-shaped, strongly curved upwards and slightly recurved distally (fig. 2i); teeth widely-spaced, simple and of similar structure on both fingers, slightly curved inwards towards palm, moveable finger with nine teeth, immoveable finger with eight teeth, in both cases proximal two teeth small, distal two teeth tiny.

Palp (fig. 2h) 5-segmented, segment 1 short, segment 2 longest, with strong dorsodistal seta, segment 4 longer than either segment 3 or 5, setae sparse.

Oviger bases contiguous with the anterior surface of the first lateral processes (plate 2a), segment 1 attached ventrally, segment 5 longest, 1.5 times length segment 4, widest distally, several long setae throughout length, terminal claw with three teeth along inner margin; compound spine formula, segments 7–10, difficult to interpret but in the order of 9:7:6:7, spines with four or five pairs of small lateral teeth.

Anal tubercle obliquely erect, height about twice width, several inconspicuous spinules, no evidence of basal segmentation (fig. 2b).

Legs slender, (fig. 2d, plate 2d) first coxa with about six fine setae around dorsodistal surface, second coxa 1.6 times length coxa1, about twice as long as coxa 3, tibia 2 longest segment, tibia 1 longer than femur, femur and tibia 1 with single, long, dorsodistal spine; length tarsus slightly less than one-third length of propodus, with single strong ventrodistal spine and a less robust dorsodistal spine, propodus gently curved, sole with five widely-spaced spines, distal two spines smaller; main claw less than half length propodus, auxiliary claws slightly less than half length of main claw. Gonopores tiny, difficult to discern, ventrodistal, probably legs 3 and 4 only.

*Measurements of holotype (mm)*. Trunk length (frontal margin of cephalic segment to tip of fourth lateral processes), 1.87; width across second lateral processes, 0.76; scape, 0.61; palm 0.34; fingers 0.33; proboscis length (lateral), 0.43: greatest diameter proboscis, 0.17; anal tubercle length, 0.16. Palp: seg. 1, 0.07; seg 2, 0.38: seg. 3, 0.31 seg. 4, 0.34; seg. 5, 0.23. Oviger: seg. 1, 0.07; seg. 2, 0.12: seg. 3, 0.16; seg. 4, 0.32; seg. 5, 0.51; seg. 6, 0.28; seg. 7, 0.18; seg. 8, 0.13; seg. 9, 0.09; seg. 10, 0.10; claw. 0.05. Leg: coxa 1, 0.27; coxa 2, 0.44; coxa 3, 0.18; femur, 1.12; tibia 1, 1.26; tibia 2, 1.80; tarsus, 0.18 propodus, 0.51; claw, 0.22; aux claws 0.12.

*Etymology*. Named for the likeness of the chela fingertips to a sigmoid curve.

*Remarks*. Unpublished records also place this species at nearby Upper Spencer Gulf, South Australia. *Nymphon sigmoides* sp. nov. belongs to a small group of species that share the presence of auxiliary claws, a long neck, a tarsus less than half length of propodus and slender sigmoid-shaped chelifore fingertips. Of those species, *N. sigmoides* is most-closely aligned with the larger *N. fortunatum* Stock, 1997 from New Caledonia. This species is however, distinguished by having chela teeth of equal length on both fingers (much shorter teeth on moveable finger

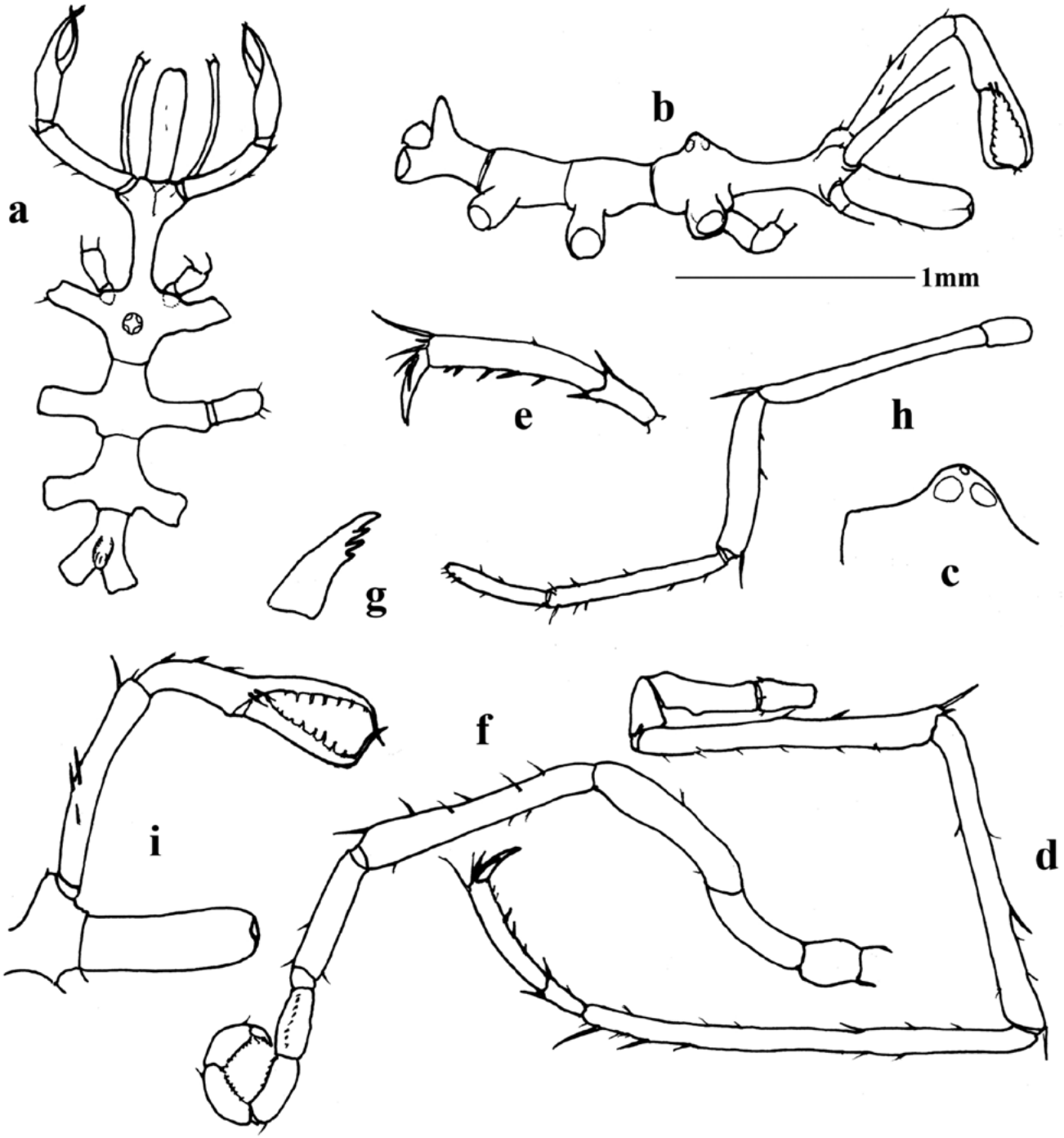


Figure 2. *Nymphon sigmoides* sp. nov., male, holotype (SAMA E9437): a, b, trunk, dorsal and lateral view; c, eye tubercle, right side; d, e, leg 3 and tarsus and propodus; f, g, left oviger and claw. h, left palp; i, chela and proboscis.

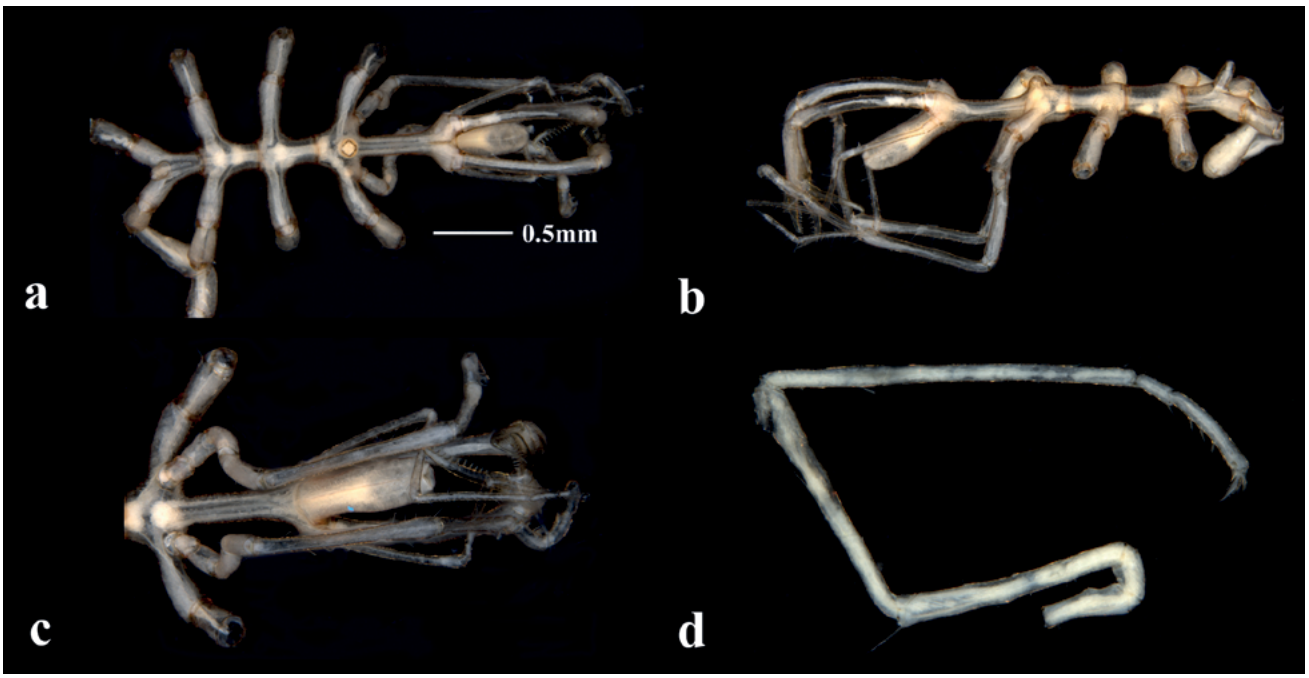


Plate 2. *Nymphon sigmoides* sp. nov., male, holotype (SAMA E9437): a, b, trunk dorsal and lateral view; c, cephalon ventral; d, leg 3.

in *N. fortunatum*), the straight first tibia (contorted in *N. fortunatum*) and a much shorter male coxa 2 (about 1.6-times as long as coxa 1 in *N. sigmoides* versus greater than three-times in *N. fortunatum*). Based on Stock's figure (Stock, 1997, Fig 5a), the lateral processes of *N. fortunatum* appear to be more widely separated, particularly processes 3 and 4. Unfortunately, Stock did not comment on the contorted first tibia of *N. fortunatum* which is presumed here to be a characteristic of all legs. All setae are much shorter and far fewer than illustrated by Stock for *N. fortunatum*. This specimen shows evidence of a mid-dorsal spine having been broken off each chelifore scape.

**Family Phoxichilidiidae Sars 1891**

**Genus *Anoplodactylus*** Wilson, 1878

***Anoplodactylus godfreyensis*** n. sp.

Figure 3a–h. Plate 3a–d

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*Material examined*. Holotype, male (SAMA E9447). ARA92, Southeast Cape Thomas, between Godfrey Islands, very soft rock, reef, algae, sand 3–7 m, W. Zeidler, K. Gowlett-Holmes, 16 Feb 1989.

Paratypes. Five females, three males, two juveniles (SAMA E9448). Same collection data as holotype.

*Diagnosis*. Trunk without tubercles, neck strongly raised, over-reaching anterior margin of proboscis, proboscis widest at about one-third length. Eye tubercle placed near anterior margin of cephalon, slightly taller than basal width. Palp buds not evident. Chela fingers gaping, strongly curved, teeth absent. Legs without prominent processes or tubercles, propodal lamina absent, main claw long, reaching to base of heel when folded, auxiliary claws absent.

*Description*. Holotype, male. Leg span about 11.0 mm. Trunk without tubercles, segmentation line between segments 3 and 4 absent, lateral processes each with several tiny, almost indiscernible, dorsodistal setae, processes 1 and 2 separated by about one-third basal width, processes 2 and 3 separated by less than one-quarter basal width and segments 3 and 4 separated by a lesser distance. Anterior margin of cephalon cleft, divided by median cuticular line extending to base of eye tubercle, neck strongly raised, overreaching proximal margin of proboscis.

Eye tubercle placed close to anterior margin of cephalon, slightly taller than basal width, tapered to rounded tip, four eyes, tiny lateral sense organs placed about level with top of eyes.

Proboscis carried horizontally, length slightly less than 2.5 times maximum width, widest at about one-third length, divided by three longitudinal cuticular lines each extending full length of ventral and lateral surfaces, proximal ventral surface directed downward to about one-third length, then narrowing before expanding to bulbous distal part (fig. 3c., plate 3B), lips protruding, forming narrow triradial flanges around mouth opening.

Chelifore scapes, diverging from narrowly separated bases, each scape expanded distally, few dorsodistal setae; chelae directed inwards, fingers smooth, strongly curved, gaping, touching at tips (fig. 3e).

Palp buds not evident.

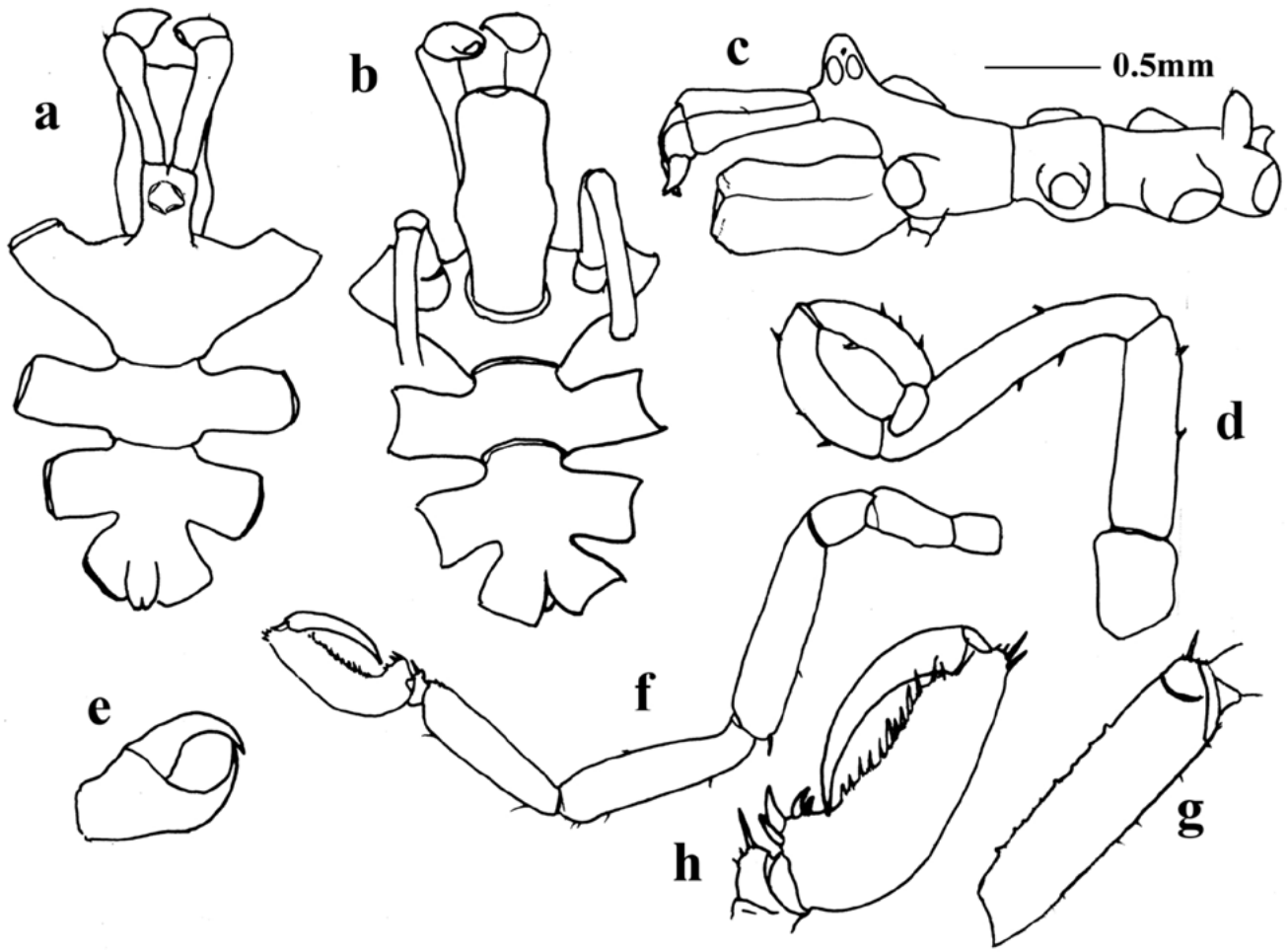


Figure 3. *Anoplodactylus godfreyensis* sp. nov., male, holotype (SAMA E9447): a–c, trunk, dorsal, ventral, and lateral view; d, left oviger; e, right chela (freehand); f–h, leg 4, propodus and femur.

Oviger (fig. 3d) six-segmented, implanted on ventral surface of first lateral processes, segment 3 longest, segments 3–6 decreasing in length, segments 4 and 5 with single, robust inwardly-curved simple spine on inner margins, spine on segment 5 placed at about one-third length, spine on segment 4 placed distally, segments 2–6 with several short setae on inner and outer surfaces, segment 6 with a cluster of about six slender setae on inner surface.

Anal tubercle upright, short, height about 1.5 times basal width.

Legs (fig. 3f, plate 3d) without prominent processes or tubercles, setae random, sparse; second coxa 1.8 times length of coxa 1, coxae 1 and 3 about equal length, coxa 2 with low dorsal papilla proximal to mid-point; femur longest segment, a little longer than first tibia which is longer than tibia 2, femur dorsal surface with single row of about seven cement glands opening through short ducts (fig. 3g), single long dorsodistal seta; propodal heel well developed, four heel spines, proximal two spines largest, inline, distal pair side-by-side, ten sole spines plus distal setae, no lamina, main claw, slender, reaching to base of heel when folded, auxiliary claws not present. Gonopore not evident.

Female. Apart from the absence of ovigers, and other sexually dimorphic characters, there are no appreciable differences between the sexes. Alar processes absent.

*Measurements of holotype (mm).* Trunk length (frontal margin of cephalic segment to tip of fourth lateral processes), 1.83; width across second lateral processes, 1.04; scape 0.51: proboscis length (lateral), 0.98; proboscis greatest diameter; 0.40. Oviger: seg. 1, 0.21; seg. 2, 0.48: seg. 3, 0.67; seg. 4, 0.35; seg. 5; 0.25; seg. 6, 0.14. Third leg: coxa 1, 0.32; coxa 2, 0.57; coxa 3, 0.31; femur, 1.08; tibia 1, 0.98; tibia 2, 0.85; tarsus, 0.11; propodus, 0.72; claw, 0.50.

*Etymology.* Named after the type locality, Godfrey Islands, South Australia.

*Remarks*. At first glance this species has much in common with *A. bourboni* Muller, 1990 from Réunion Island with which it

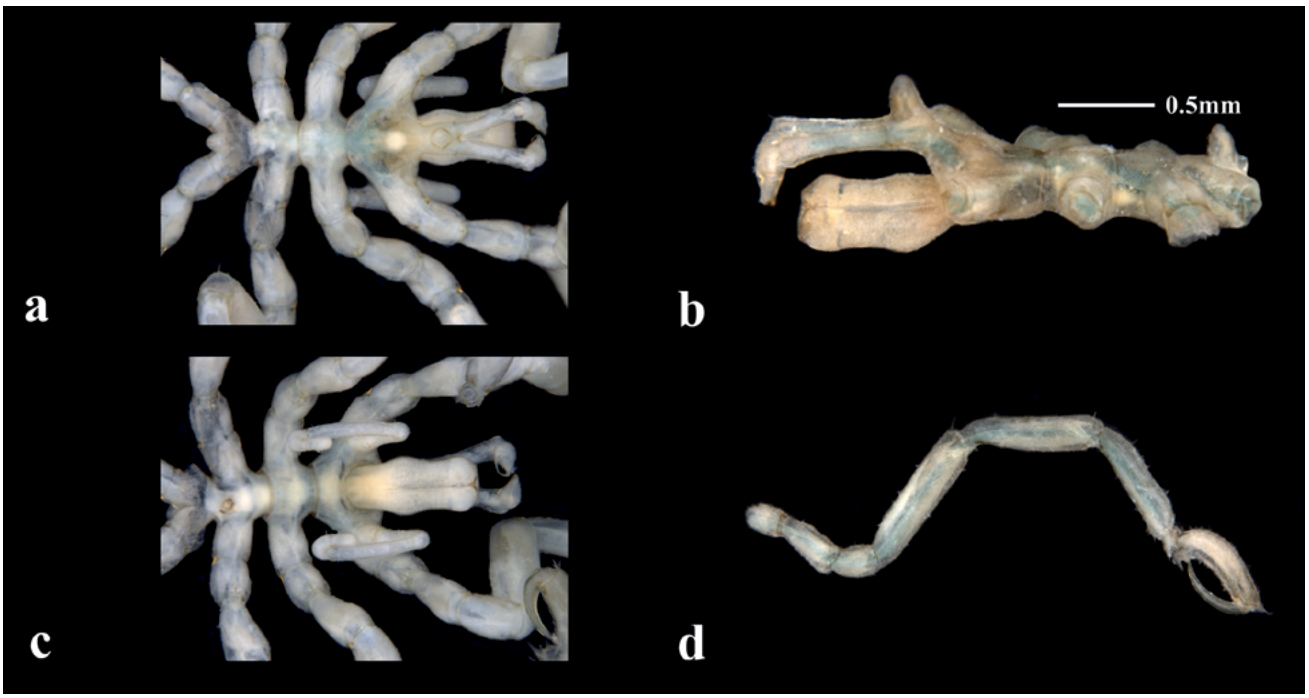


Plate 3. *Anoplodactylus godfreyensis* sp. nov., male, holotype (SAMA E9447): a–c, trunk dorsal, lateral and ventral; d. leg 4.

shares a similar arrangement of femoral cement gland ducts. That species differs principally in having auxiliary claws, taller eye and anal tubercles, and possession of a propodal lamina. The proportions of the oviger are also considerably different. No other species of *Anoplodactylus* shares in combination, a narrow neck that overreaches the base of the proboscis, the absence of auxiliary claws, the absence of prominent tubercles on the lateral processes, the absence of a propodal lamina and smooth chela fingers. In some specimens, remnants of green gut contents remain. Darker pigmentation on sections of the leg segments suggests the presence of markings in life.

**Family Endeidae Norman, 1908**

**Genus *Endeis* Philippi, 1843**

***Endeis saxa*** sp. nov.

Figure 4a–i. Plate 4a–f

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*Material examined*. Holotype, egg-bearing male (SAMA E9440). Coffin Bay, under rocks at low tide, S. Edmonds, 6 Jan 1966.

Paratypes. Four males (one egg-bearing), nine females (three gravid) (SAMA E9441). Same collection data as holotype.

*Diagnosis*. Lateral processes separated by about 1.7 times basal width. Eye tubercle conical. Palps not present. Anal tubercle tall, erect, height greater than 2.5 times basal width, twice length of fourth lateral processes. Length of proboscis about equal to half-trunk length. Femur with single row of about 25 lateral cement gland pores on posterior surface. Propodal heel low, three to five strong spines followed by several smaller spines, auxiliary claws about half-length main claw.

*Description*. Holotype, male. Leg span about 19.0 mm**.** Arthrodial membrane on all segments much darker than adjoining cuticle. Cephalon with two distinct, teardrop-shaped collars on anterior margin, outer surface of collars slightly bulging, several minute spines present; two tiny spine-tipped tubercles on the median surface proximal to the bases of the collars (fig. 4a, b). All surfaces with sparse and hardly perceptible spinules. Length lateral process about 1.5 times basal diameter, first pair inclined upwards and forward, processes 2 and 3 separated by about 1.7 times basal width. Each lateral process with tiny, dorsodistal tubercle.

Eye tubercle placed in line with anterior margin of first lateral processes, conical, strongly tapered distally, four eyes, two lateral papillae placed about level with top of eyes.

Proboscis swollen prior to mid-region, many distal spinules, length (measured ventrally) almost three-times maximum width and about equal to half-trunk length,

Oviger 7-segmented, placed between and in contact with collar and first lateral processes (fig. 4a, c), bases directed downward, segment 2 longest, few simple spines, segment 7 short, rounded, partly recessed into distal part of segment 6 (fig. 4e), segment 7 with several very short, blunt terminal spines, segment 6 not excessively inflated, without lobe, inner surface with two tiny compound spines, each with trifurcate tip.

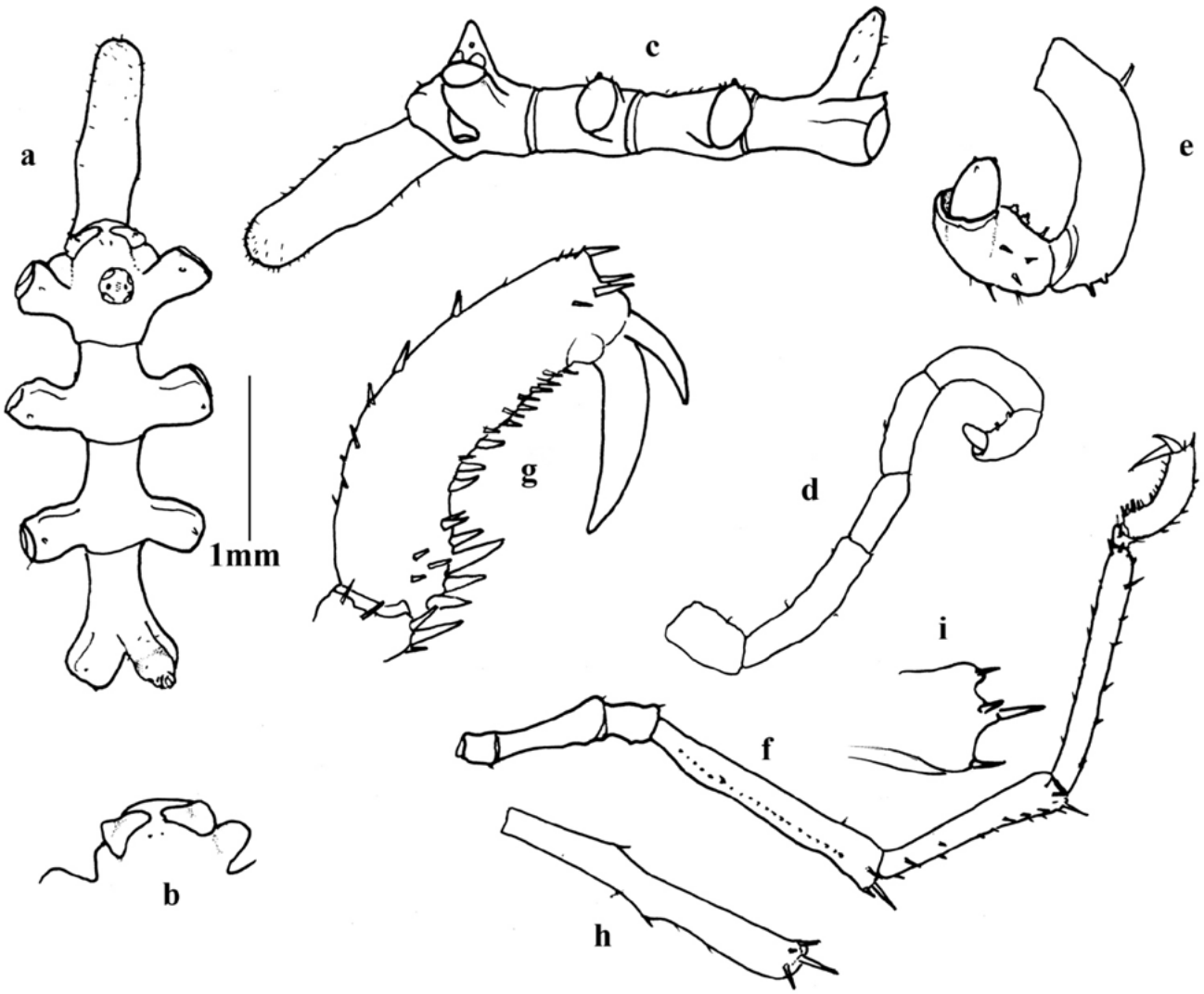


Figure 4. *Endeis saxa* sp. nov., male, holotype (SAMA E9440): a, c, trunk, dorsal and lateral; b, cephalon collars; d, e, oviger and segments 5–7; f, g. leg 4 and propodus; h, i, femur, dorsal view and dorsodistal area.

Anal tubercle upright, slightly bulbous before tapering to tip, much longer than fourth lateral process, height greater than 2.5 times basal width, few tiny distal spines, pair of small but robust tubercles either side of anal opening.

Legs (fig. 4f) slender, spines short, sparse. Coxa 1 with tiny dorsomedian tubercle matching that on lateral process and accompanied by several short spines, coxae 2 and 3 with spine-tipped ventrodistal swelling, coxa 2 about three-times length coxa 1, with low dorsal papilla at about mid-length; femur longest segment, slightly enlarged distally, mild distortion in mid-region, particularly evident in dorsal view (fig. 4h), single tiny spine on each of the raised lateral surfaces, dorsodistal surface bearing one strong median spine and a smaller, more-proximal spine at its base, spine-tipped processes present either side of the main median spine (fig 4i), smaller spines also present around distal margin, about 25 femoral cement glands on posterolateral surface, mostly in a single row (fig. 4f), glands appear to open on a low swelling; tibia 1 shorter than either femur or tibia 2, widest distally, with strong dorsodistal spine, tibia 2 next longest, marginally shorter than femur, with longer fine subterminal spine about twice length of other spines; tarsus with one strong ventrodistal spine flanked by several smaller spines; propodal heel low, four to five main linear spines, third spine longest, followed by two smaller spines and several fine lateral spines, propodus curved, sole with five or six small, but robust, median spines accompanied by slender lateral spines, auxiliary claws about half-length main claw. Cuticular lateral line present on all longer segments. Small ventrodistal gonopore present legs 2, 3 and 4.

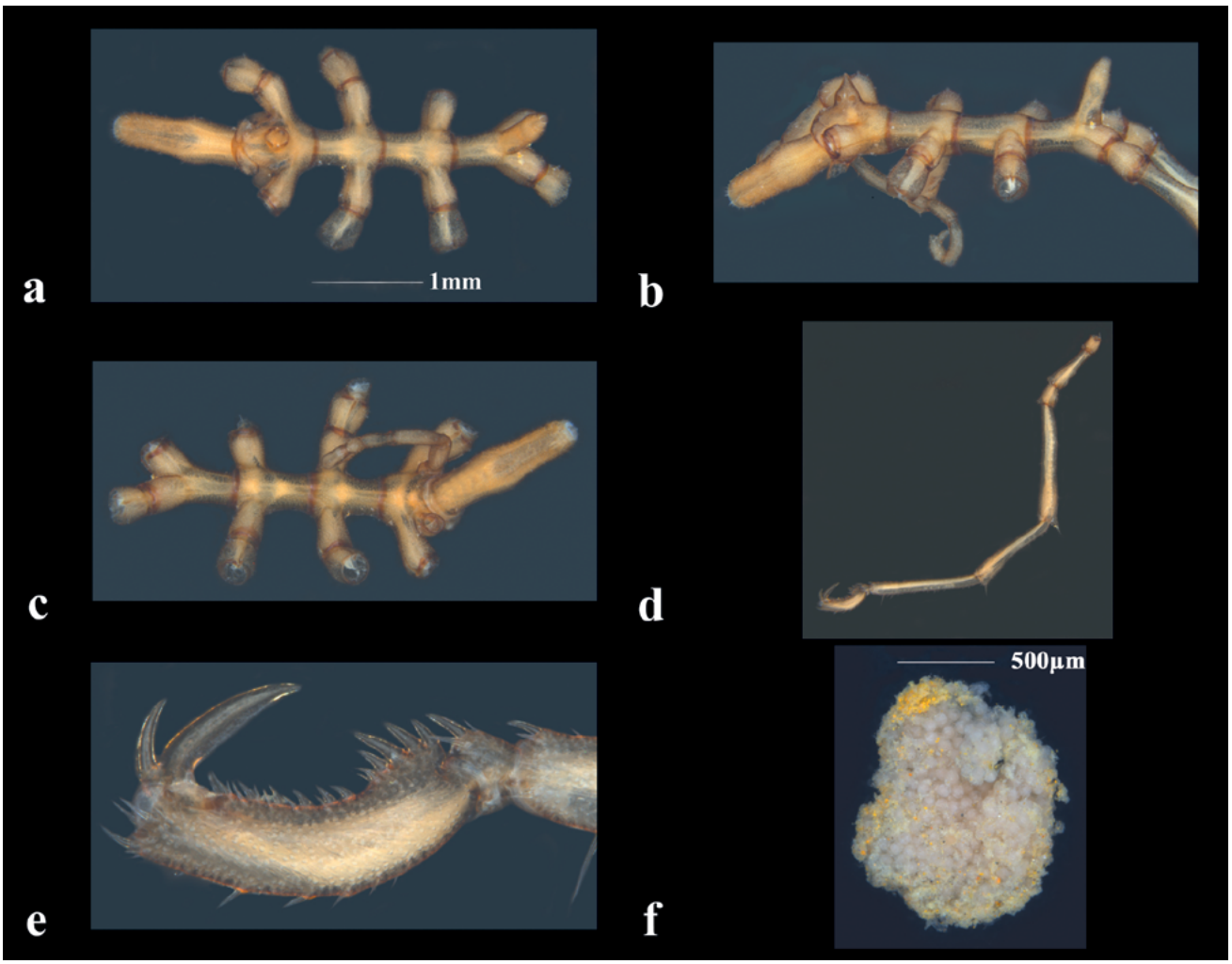


Plate 4. *Endeis saxa* sp. nov., male, holotype (SAMA E9440): a–c, trunk dorsal, lateral and ventral; d, leg 4; e, propodus; f, egg mass.

Female larger and more robust than male, ovigers absent. Gonopores ventrodistal, coxa 2, all legs.

*Measurements of holotype (mm).* Trunk length (frontal margin of cephalic segment to tip of fourth lateral processes), 2.75; width across second lateral processes, 1.20; proboscis length (ventral), 1.37; proboscis greatest diameter; 0.42; anal tubercle length 0.59; length fourth lateral processes 0.29; oviger: seg. 1, 0.24; seg. 2, 0.57: seg. 3, 0.26; seg. 4, 0.36; seg. 5; 0.36; seg. 6, 0.25; seg. 7, 0.10; fourth leg: coxa 1, 0.30; coxa 2, 0.96; coxa 3, 0.40; femur, 2.32; tibia 1, 1.83; tibia 2, 2.24; tarsus, 0.12; propodus, 0.91; claw, 0.47, aux claws 0.24.

*Etymology*. From the Latin *saxa*, (rocks), referencing collection of the specimen from under rocks.

*Remarks*. The finding of this specimen "beneath rocks" is unusual in a genus where specimens are most often encountered amongst algae. In a few instances, the proboscis is extended, revealing a wide arthrodial membrane that adds about 10% to the extent of the proboscis. Based on the material at hand, the proboscis is capable of a near vertical, downward orientation. Femoral cement glands are present on all legs. The holotype carries eggs in a ball on each oviger (plate 4f) rather than in a single mass wrapped around both ovigers as described for *E. straughani* Clark, 1970 (Staples 1982). The propodal spine arrangement varies slightly between specimens.

Only the predominantly Atlantic Ocean and Mediterranean species *E. spinosa* (Montagu, 1808), shares a similar prominent anal tubercle with this species. In *E. spinosa* however, the anal tubercle is shorter (little more than twice basal width versus almost three times in *E. saxa*). Based on Child's figures of *E. spinosa* (Child 1992, Fig. 26A–C), other differences can be summarized as follows: the proboscis of *E. spinosa* is more slender (length almost 4-times maximum width versus 3.3-times in *E. saxa*), the lateral processes of *E. spinosa* are more widely spaced, the tubercles on the lateral processes are far more prominent, and the femoral cement glands in *E. spinosa* are located on the ventral surface opposed to the lateral surface in *E. saxa*).

**Family Callipallenidae Hilton, 1942**

**Genus Callipallene Flynn, 1929**

***Callipallene distortia*** sp. nov.

Figure 5a–i. Plate 5a–h

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*Callipallene micracantha* Staples 2005: 168, fig. 5C–E.

*Material examined*. Holotype. Male (SAMA E9452). Tasmania, 48 nm north-east of East Sister Is., (39°04'S, 148° 39'E), depth 432 m, Epibenthic Sled, sandy bottom, W. Zeidler, CSIRO Soela stn 21, 13 October 1984.

Paratypes. Two males, one female (gravid), three juveniles (SAMA E9453). Same collection details as holotype.

*Diagnosis*. Neck well-defined, length about equal to width. Eye tubercle with apical cone. Chelifore scapes not quite reaching proboscis tip, chela fingers of equal length, crossing at tips, gap at base of fingers, immoveable finger with about twelve well-developed teeth, moveable finger without defined teeth. Anal tubercle short, erect. Femur longer than tibia 1, widest distally and bearing several short spines, two low ventral spine-tipped swellings at about one-third and two-thirds length, far more conspicuous in the female; heel low, four or five heel spines, auxiliary claws about half length of main claw.

*Description*. Holotype, male. Leg span, about 16.0 mm. Trunk completely segmented. Neck short but well-defined, length about equal to width in dorsal view (fig. 5a; plate 5a); crop wide, anterior width greater than three-times width of neck, two or three small spines present at base of each chelifore implant. Length of lateral processes about 1.4 times basal width, 1–4 dorsodistal spinules variable present.

Eye tubercle with short apical, slightly forward-leaning cone, two lateral papillae at base of cone, four eyes.

Proboscis implanted obliquely onto ventrodistal surface of cephalon, ventral length about 1.8 times maximum width, distally angulate (plate 5d, h), few scattered setae. Jaws and lips protruding.

Chelifore scape reaching to about proboscis tip, few surface spines, two strong spines on inner lateral surface and distal margin. Chela palm with many setae along dorsal surface. Fingers of equal length, crossing at tips, moveable finger closing to outer side, immoveable finger with single row of about twelve short, well-developed sharp teeth, moveable finger cutting margin unclear, but may be lowly crenulate. Immoveable finger with proximal indentation creating a gap at base of fingers (fig. 5d).

Oviger (fig. 5e) ten-segmented, distal apophysis segment 5 prominent, height about equal to width of segment, 1–2 setae present, no spinules evident on lateral surface of segment, compound spines are of the form illustrated by Clark (1963, fig. 11E), compound spine formula, segments 7–10, 10:8:8:8, distal-most spine on segments 7–9 largest, more strongly curved and with a variable arrangement of lateral teeth as in *C. micracantha* (see Staples 2005, Fig. 5C).

Anal tubercle short, erect, few distolateral seta, basal articulation absent.

Legs (figs. 5f, plate 5e). Coxa1 fringed dorsodistally with well-developed spines, coxa 2 almost three times length of coxa 1, few spines; femur and tibia 1 widest distally, femur longer than tibia 1, bearing two ventral spine-tipped low swellings, at about one-third and two-thirds length; tibiae particularly spinous with many short spines interspaced by occasional longer spines but none particularly prominent (fig. 5f), cuticular surface minutely irregular, tibia 2 longest and of consistent width throughout, propodus (fig. 5g) evenly curved, main claw almost touching tip of distal-most heel spine when closed, about fifteen sole spines, all spines slender, pointed, smooth, heel low, four to five primary spines variably arranged, but with at least one pair of side-by-side spines present, proximal-most spine curved, smallest, auxiliary claws about one half-length of main claw, without crenulations. Gonopores small, ventrodistal, second coxa, legs 2–4. Cement glands not evident.

*Measurements of holotype (mm)*. Trunk length (frontal margin of cephalic segment to tip of fourth lateral processes), 2.47; width across second lateral processes, 1.05; proboscis length (ventral) 0.78; greatest diameter proboscis 0.43; scape length 0.47; anal tubercle length, 0.08. Oviger: seg. 1, 0.08; seg. 2, 0.27: seg. 3, 0.31; seg. 4, 0.58; seg. 5, 1.03; seg. 6, 0.19; seg. 7, 0.27; seg. 8, 0.24; seg. 9, 0.23; seg. 10, 0.19. Third leg: coxa 1, 0.29; coxa 2, 0.83; coxa 3, 0.32; femur, 1.77; tibia 1, 1.69; tibia 2, 2.34; tarsus, 0.14; propodus, 0.66; claw, 0.36; aux claws, 0.17.

Female. Slightly larger than male (leg span about 19.0). Femur of this gravid female greatly swollen, two prominent spine-tipped ventral swellings (fig. 5i, plate 5f). Coxa 2 shorter than male, about 2.1 times length coxa 1 (versus 2.9 times). Gonopores larger than male, ventrodistal, coxa 2 all legs. Heel spines variably paired as with male (fig 5h).

*Remarks*. Leg spines are easily dislodged. A single row of what appear to be about eight transverse cement gland slits like those described by Stock (1954, Fig. 33) in *Anoplodactylus pycnosoma* Helfer, 1938, are evident in the image of the posterior lateral surface of legs 3 and 4 (plate 5b). These slits were not however, apparent in the actual specimen when viewed through a light microscope. Low, ventral spine-tipped swellings on the male femora are more pronounced on some legs. Swellings on the female leg are more prominent, particularly on the gravid adult. The heel spine arrangement is variable but one or two pair of side-by-side spines are always present. Interestingly, Döhrn (1881) described the heel of the *C. emaciata* holotype as having 4–5 basal spines, two of which also stand side by side.

These South Australian specimens are best compared to *C. emaciata*, *C. novaezealandiae* and *C. micracantha*. *Callipallene micracantha* Stock, 1954 and *C. novaezealandiae* (Thomson, 1884) were designated as subspecies of *C. emaciata* and *C. brevirostris* (Johnston, 1837) before being raised to full species status by Bamber (2005: 331). This proposed new species is readily distinguished from *C. emaciata* by the presence of a defined neck (almost absent in *C. emaciata*), a distally angulate proboscis (distally rounded

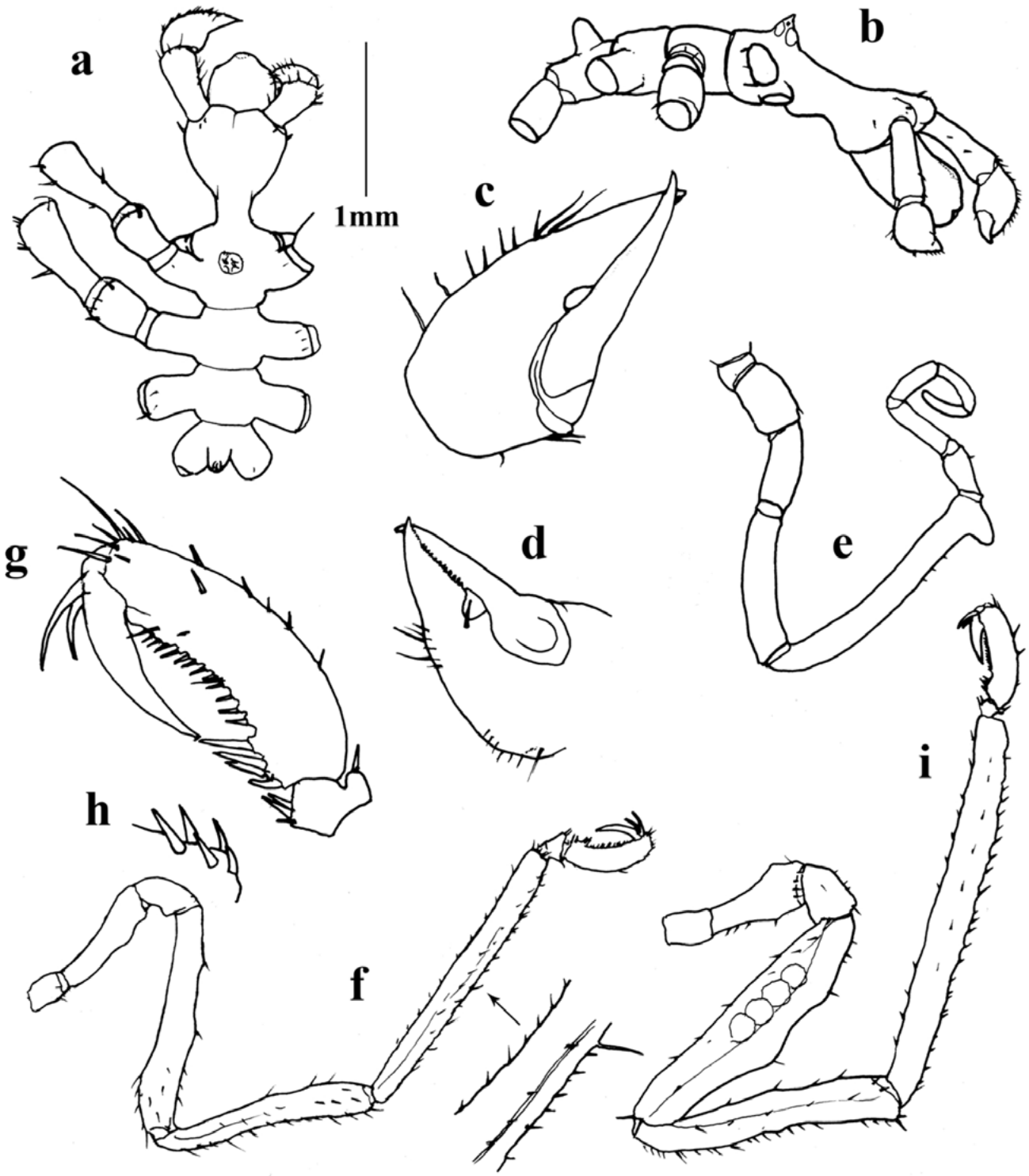


Figure 5. *Callipallene distortia* sp. nov., male, holotype (SAMA E9452): a, b trunk dorsal and lateral; c, d, left chela, outer and inner side; e, left oviger; f, leg 3 male; g, male propodus; Paratype, female; h, alternative heel spine arrangement; i, leg 3.

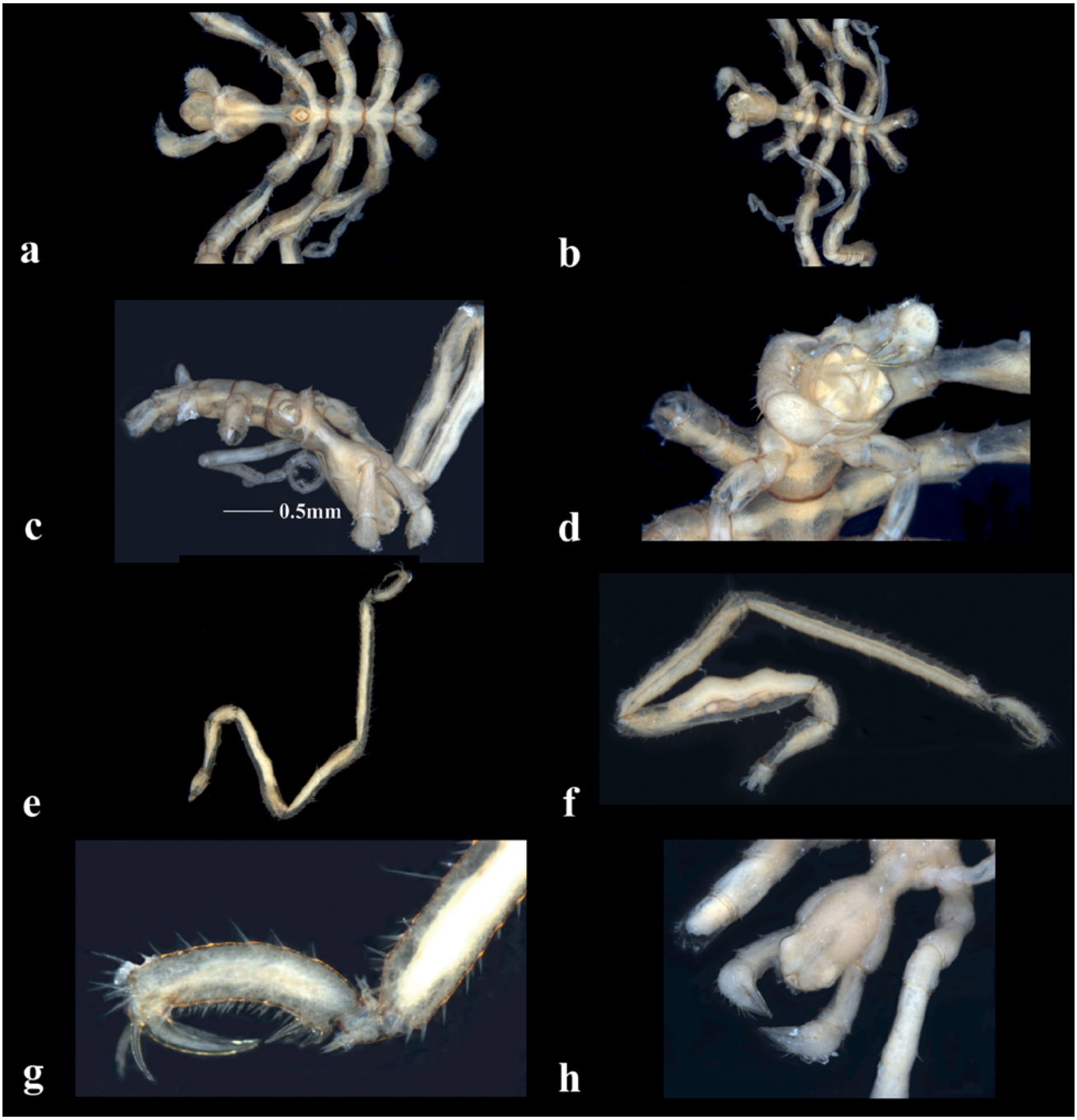


Plate 5. *Callipallene distortia* sp. nov., male, holotype (SAMA E9452): a–c, trunk dorsal, ventral and lateral; d, anterior view; e, leg 3. Paratypes: (SAMA E9453): f, female leg 3; g, male propodus leg 3; h, juvenile male proboscis ventral.

in *C. emaciata*), smooth heel spines and auxiliary claws, (crenulated tips of the tarsus and primary heel spines and rugosities or serrations on the auxiliary claws in *C. emaciata*) and spine-tipped swellings on the surfaces of the femur and first tibia that contribute to a distorted appearance (absent in *C. emaciata*).

Child (1990) recorded several specimens from Heron Island which he designated species intermediate and which agreed in almost all respects with Stock's (1954) figures of an unnamed subspecies of *C. emaciata* from Three Kings Islands, New Zealand. Based primarily on the absence of any striking features, and the absence of adequate material, Child refrained

from naming his specimens. Unfortunately, Child did not provide figures or comment on proboscis shape or sexual dimorphism, but presumably the legs of the Heron Island specimens shared the distorted appearance of the femur and first tibia which Stock regarded as "perhaps the most striking feature of his subspecies". As far as I am aware, the low swellings that gave rise to the distorted appearance of the femora and tibiae have never been regarded as a characteristic of *C. emaciata sensu stricto* and it is not clear therefore why Stock did not place more importance on their presence. These specimens and Stock's unnamed subspecies (and Child's 'species intermediate'), appear to have much in common, distinguished only by the shape of the proboscis which Stock described as "conical in its distal part", but which is nevertheless, a significant distinction. The only published record of *C. emaciata* from Australian waters was by Bamber (2008: 137, Fig. 4) who assigned a single male specimen (subsequently lost) and one subadult from Moreton Bay, Queensland to *C. emaciata* but based on his figures and brief description, his specimens bear very little resemblance to Stock's New Zealand subspecies. Bamber quite rightly observed that the attribution of so many records of this species from such disparate geographical areas is highly improbable.

The type locality of *C. novaezealandiae* is Otago Harbour, South Island, New Zealand. The present material differs from *C. novaezealandiae* in several respects, but perhaps most conspicuously, by the shape of the proboscis. Thomson (1884) described the proboscis of *C. novaezealandiae* as "stout and nearly cylindrical in form" and "narrowing abruptly to the rounded extremity" whereas the proboscis of this specimen is distinctly angulate. Other differences are found in the shape of the femora which in *C. novaezealandiae* are slender and without any distortion, as opposed to spine-tipped swellings found on the on the femora of specimens examined in this collection. Also, both fingers of the chelae in C. *novaezealandiae* bear a row of small denticles on their inner surface, versus well defined teeth on the immoveable finger only, in these specimens. The species was subsequently recorded from New Zealand by Stock (1954) who assigned two males and three females collected from three localities to *C. brevirostris* ssp *novaezealandiae*. Based on Stock's measurements, the second coxa of the female *C. novaezealandiae* is over four-times the length of coxa 1 compared to a little more than two-times longer in this female paratype. Stock based his description of the male on what appear to be a combination of two morphologically dissimilar specimens and provided dorsal views only of the trunk, presumably to compliment Thompson's ventral view. Disappointingly, Stock dismissed differences in the length of the neck to a "slight variation" and did not comment on differences in the shape of the eye tubercle which he described as lowly conical, versus short and blunt in the holotype. Thomson figured the holotype of *C. novaezealandiae* in ventral view only, showing no segmentation of trunk segments 3 and 4. Stock presumably attributed the absence of segmentation to immaturity, but the presence of incomplete segmentation is now a well-known characteristic of many adult species. Records of *C. novaezealandiae* are predominantly from New Zealand, Australia, western Pacific Islands, Japan and western Indian Ocean but with so many specimens being in close morphological agreement, I am confident that Bamber's (2008) sentiments concerning the improbability of accurate species identification of *C. emaciata*, should equally apply to records of *C. novaezealandiae*, particularly those justified on supposed morphological variables. The growth-related variables observed by Stock (1952) are not evident in the three juvenile specimens in this collection. Australian records are predominantly from the southeast of the continent but Arango's (2009) unlikely record of a female from Ningaloo Reef would extend the Australian range of the species into tropical waters. Child (1975) provisionally recorded a single female from south Australian waters.

These specimens share the spine tipped swellings on the ventral surface of the femur and first tibia, and the angulate distal corners of the proboscis with *C. micracantha*. Stock's measurements indicate that tibia 1 of the holotype is longer than the femur but his figure (Stock 1954, 19f) shows that the femur is longer, which matches these specimens. The obvious difference between these specimens and *C. micracantha* is in the shape of the neck which is well-defined and clearly independent of the crop whereas Stock described the crop of *C. micracantha* as "not distinctly marked from the rest of the neck" (Stock, 1954, fig. 20a). Other differences can be summarized as follows: (1) the eye tubercle of this specimen is distinctly conical at the tip compared to Stock's description of it being truncated with a small median tubercle in *C. micracantha*, (2) the immoveable finger of this specimen has one row of teeth as opposed to two rows in *C. micracantha,* (3) the inner margin of oviger segment 5 in these specimens lacks the lateral spinules found in *C. micracantha* and, (4) the propodus is more compact and more strongly curved, (compare plate 5g herein with Stock, 1954, fig. 19G). Stock did not mention the heel spine arrangement, and simply described the propodus as having four basal spines, without mention of the characteristic pairing arrangement evident in these specimens. Stock made a point of the oviger implantation in *C. micracantha* being large, but there is nothing remarkable with these specimens. Dorsal spinules on the lateral processes appear to be less robust than those depicted by Stock. Clark (1963 Fig. 12A–H) figured and briefly described a male specimen from Twofold Bay, New South Wales but the long auxiliary claws, long second coxa, (> 4-times the length of coxa 1) and rather straight-sided femora and first tibia, serve to distinguish that specimen from the present material.

**Genus *Parapallene*** Carpenter, 1892.

***Parapallene elongata* sp. nov.**

Figure 6a–j. Plate 6a–f

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*Material examined*. Holotype. Female (SAMA E9454). 5 km., west of Port Noarlunga, 27 m., J. Ottaway, 28 Mar 1980.

*Diagnosis*. Habitus slender. Neck long. Eye tubercle conical. Lateral processes widely spaced, with narrow, inconspicuous dorsodistal rim. Longer segments of legs without processes or

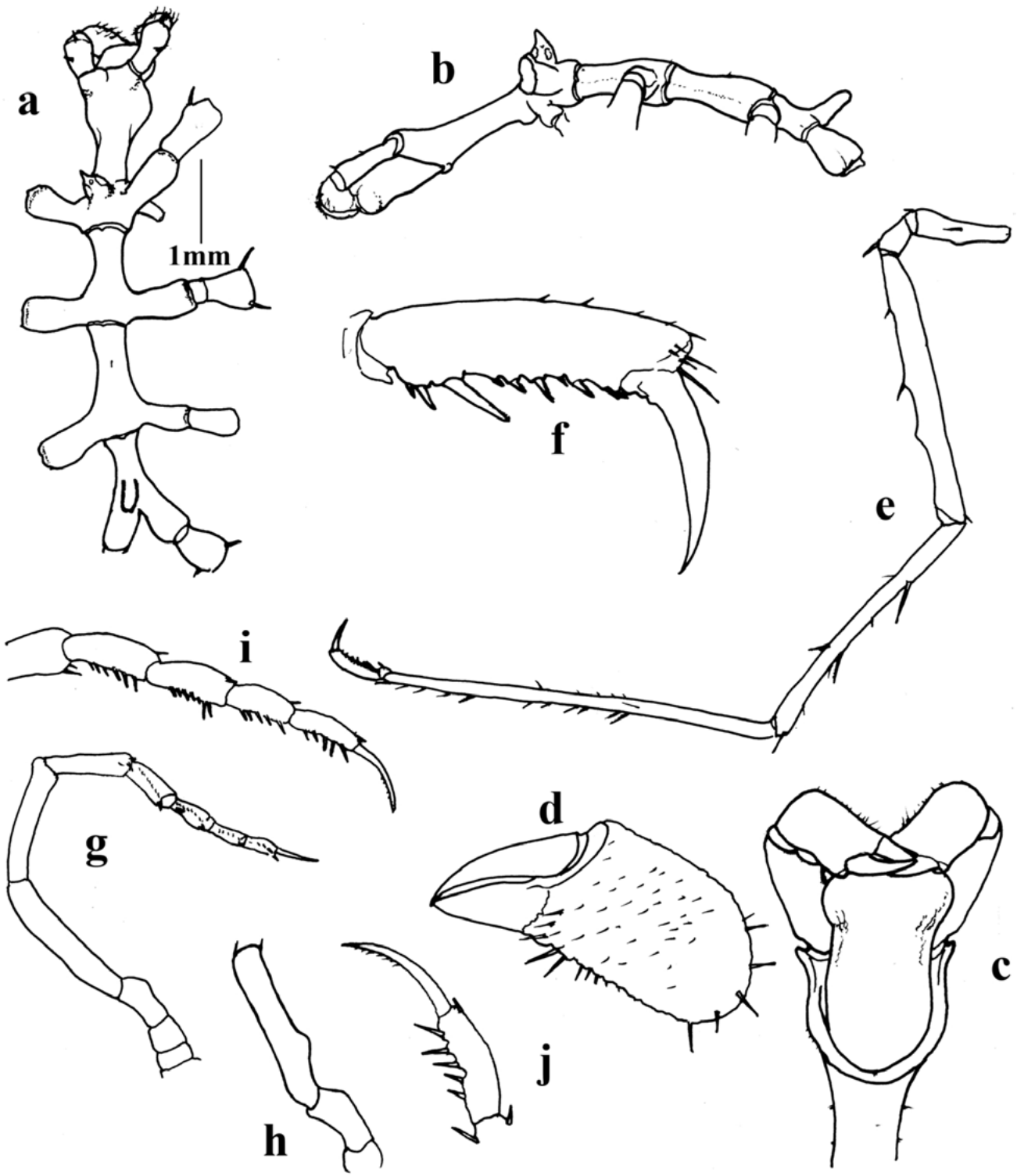


Figure 6. *Parapallene elongata* sp. nov., female, holotype (SAMA E9454): a, b, trunk dorsal and lateral; c, proboscis and chelae, ventral; d, right chela; e, detached leg; f, propodus, leg 2; g, right oviger (inner); h, segment 4, (outer); i, segments 7–10; j, segment 10 and terminal claw.

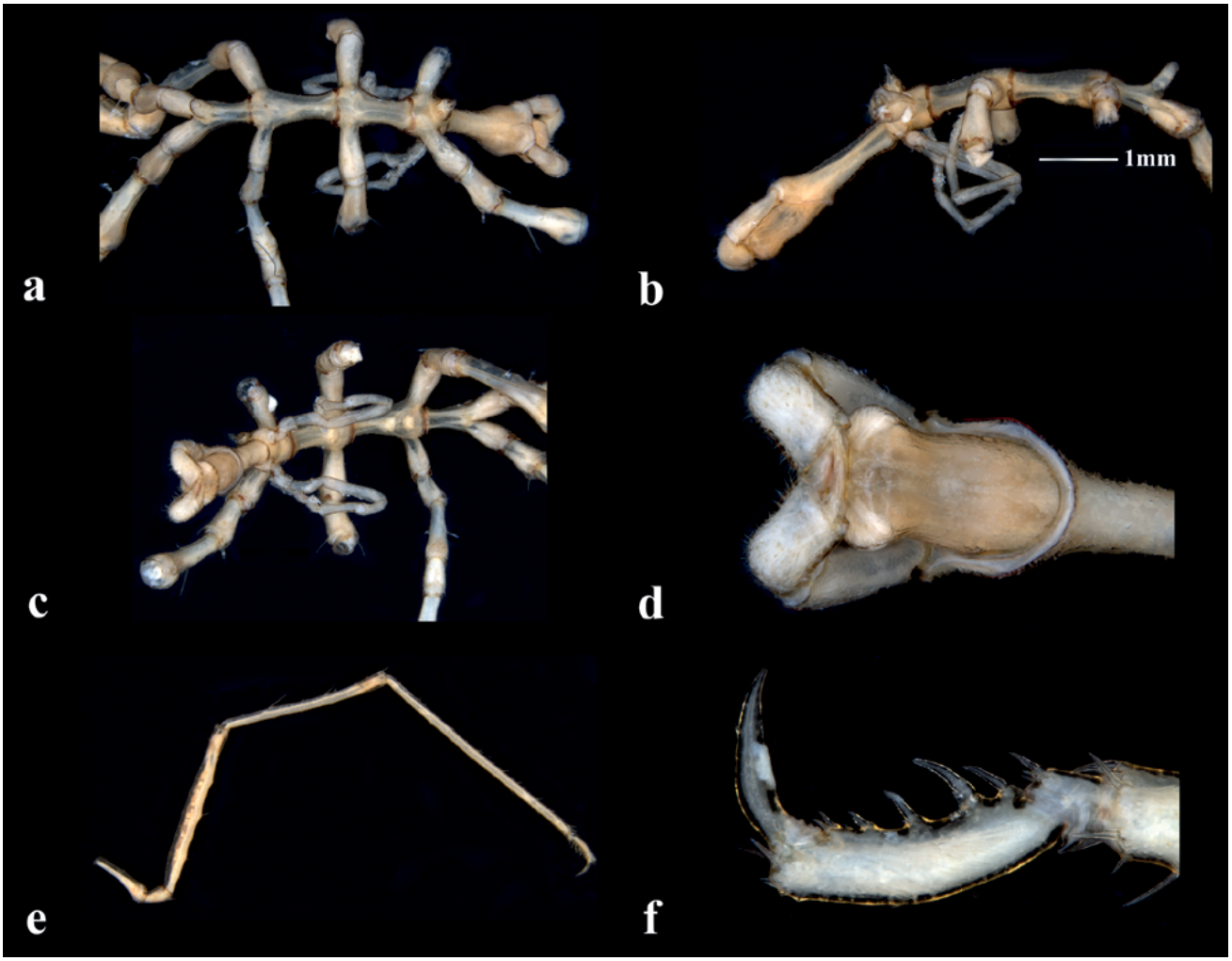


Plate 6. *Parapallene elongata* sp. nov., female, holotype (SAMA E9454): a–c, trunk; dorsal, lateral and ventral; d, proboscis and chelae ventral; e, detached leg; f, propodus.

tubercles. Propodus almost straight, two strong heel spines, sole spines sparse, many leg spines serrated, auxiliary claws absent.

*Description*. Holotype, female. Leg span about 25 mm. Trunk segmented, slender, elongate (fig. 6a, plate 6a), cephalon distinctly shorter than remainder of trunk, single minute dorsal spine on third trunk segment. Proboscis sits within a pronounced cuticular rim on the anterior-ventral margin of the cephalon (fig. 6c, plate 6d.), base of proboscis and neck minutely papillose ventrally (plate 6d), each neck papilla with minute apical seta, neck length about 2.5 times basal width, no proximal cuticular division or fold is seen in dorsal view. Lateral processes 2 and 3 separated by about 3.5 times basal width, length almost 3 times basal width, each with inconspicuous, dorsodistal rim bearing several tiny setae, rim raised to a tiny central point (plate 6b). Faint lateral cuticular line extends length of lateral processes and along lateral margins of trunk.

Eye tubercle taller than basal width, apical half conical, pointed in lateral view, bifurcate when viewed from anterior; four eyes of equal size, lenses convex, lateral sense organs conspicuous, positioned at base of conical part and above eyes (plate 6b).

Proboscis short, inserted obliquely into cephalon, distally trilobate, each lobe bearing several tiny setae.

Chelifore scape without protuberances or tubercles, strong notch on outer proximal edge, best seen ventrally (fig. 6c, plate 6d), 3–4 strong seta on inner margin and several smaller dorsodistal setae; chela palm with many setae, fingers smooth, moveable finger closing to outside.

Oviger ten segmented (fig. 6g–i), segment 4 longest, with strong dorsolateral cone on outer surface, at about one-third length (fig. 6h), segment 5 next longest, segment 6 with one, strong, simple spine and one lesser spine on distal inner margin and another more proximal spine. Terminal claw with

about seven teeth on distal half. Oviger strigilis spines simple, spine formula, segments 7–10, 9:7:5:5.

Anal tubercle almost vertical, length about twice width, without spines, uniformly inflated throughout length, rounded distally, gaping at tip, unsegmented at base.

Legs (fig. 6e, plate 6b, e). Coxa 1 with two, long, distolateral spines, coxa 2 almost three times length of coxa 1, widest distally, with strong mediolateral spines; femur slightly longer than tibia 1, ventral surface irregular, with three spine-tipped swellings, femur and tibia 1 without dorsodistal tubercle, tibia 1 with two long, fine dorsal setae and one shorter dorsodistal seta, tibia 2 longest segment, many dorsal spines on distal two-thirds, most larger spines on femur and tibiae serrated, propodus hardly curved (fig. 6f), with 2 to 3 heel spines, distal-most spine largest, serrated, 3 to 7 sole spines, variably serrated, claw slender, auxiliary claws absent. Gonopores large, ventral, coxa 2 all legs.

Measurements of holotype (mm). Trunk length (frontal margin of cephalic segment to tip of fourth lateral processes), 5.25; width across second lateral processes, 1.82; proboscis length (ventral), 1.31; length of scape 0.59; anal tubercle length, 0.49. Oviger: seg. 1, 0.16; seg. 2, 0.19: seg. 3, 04; seg. 4, 1.05; seg. 5, 0.82; seg. 6, 0.63; seg. 7, 0.35; seg. 8, 0.31; seg. 9, 0.26; seg. 10, 0.21; claw. 0.313. Third leg: coxa 1, 0.41; coxa 2, 1.17; coxa 3, 0.55; femur, 2.69; tibia 1, 2.31; tibia 2, 3.47; tarsus, 0.18; propodus, 0.84; claw, 0.53.

*Etymology*. The specific name relates to the attenuated habitus of the specimen and widely spaced lateral processes.

*Remarks*. There are four superficially similar species of *Parapallene* that share an elongated neck, the absence of auxiliary claws, and the absence of prominent processes or tubercles on the lateral processes and legs. These species are *P. algoae* Barnard 1946 South Africa, *P. longipes* Calman, 1938, East and South Africa, *P. australiensis* (Hoek, 1881) southern and eastern Australia, and *P. hospitalis* Loman, 1908 Java Sea, Indonesia. None of those species share the simple oviger strigilis spines with these specimens. Geographically this species is closest to *P. australiensis* from which it can otherwise be distinguished by the more widely-spaced lateral processes (segments 2 and 3 separated by 3.5-times width, versus about 2-times in *P. australiensis*), cephalon distinctly shorter than remainder of trunk (versus as-long in *P. australiensis*) and a longer neck (3.5 times base width, versus 2-times in *P. australiensis*).

Complete illustrations and measurements of the trunk and legs of *Parapallene algoae* have never been provided to enable direct comparison with that species. Both *P. algoae* and *P. longipes* are known from southern Africa and the ovigers share a total of 67 finely serrated and lanceolate spines. In his key, Stock (1991) recorded the neck length of *P. longipes* as 6-times the basal diameter but based on Calman's figure of the *P. longipes* holotype (Calman 1938, Fig. 5A), the length of the neck is 4 to 5 times the basal width; much the same as *P. algoae*. The only differences seem to be in the proportions of the femur and first tibia. According to Barnard (1954: 112) the first tibia of *P. algoae* is distinctly shorter than the femur, whereas the first tibia and femur of *P. longipes* are subequal (Calman, 1938:156). Based on the figures provided by Barnard (1954, Fig.12) and Calman (1938: Fig 5A) there appears to be a significant difference in the lengths of the necks, otherwise, in the absence of a complete description of *P. algoae*, there is very little to justify the independent status of these species. Stock (1956) noted the lack of a fold of the exoskeleton at the base of the neck in *P. algoae* as a further difference, but this collar has almost certainly been induced after collection of the specimen.

Staples (2014b) noted that *P. hospitalis* is probably misplaced in this genus. *Parapallene hospitalis* differs significantly from the other species being compared here by having a distally rounded proboscis, an immoveable chela finger terminating in a strong tooth and a "*Pallenella*-type" oviger claw with short teeth on both margins. *Parapallene hospitalis* can be further distinguished by compound oviger spines and possession of cement glands on the femur and first tibia.

Using Stock's (1991) key to the genus *Parapallene*, this proposed new species can be followed down to couplet 9 where it keys out with *P. famelica* Flynn, 1929 (non-Clark, 1963) but from which it can most readily be distinguished by the simple oviger spines and the absence of prominent dorsodistal tubercles on the femur and first tibia.

### *Parapallene challengeri* Calman 1937

Plate 7a–f

*Parapallene challengeri*. —Calman 1937: 532-534, figs. 1–6. —Clark 1963: 31 [key]. —Stock 1991:193 [key]. —Staples 1997: 1057, fig. 21.4f.— Arango 2009: 8, fig. 8B.

*Material examined*. One gravid female (SAMA E9436). South Australia, Edithburgh Jetty, Yorke Peninsula, 3–4 M, on weed at night, K.L. Gowlett-Holmes, 4 Mar 1995.

*Remarks*. Owing to a mix-up of specimens, the location of the female holotype is uncertain, it being either Challenger station 162 Bass Strait, or station 163 Twofold Bay, New South Wales (NSW) (Calman 1937). There is no evidence of a "fold of cuticle" on the neck of this specimen as described by Calman but the compression of his specimen for the purpose of illustration would have distorted the length of the neck and perhaps, the relative widths between the lateral processes. The scapes bear many setae, particularly along the inner margins but are without tubercles or processes. Lateral processes 3 and 4 in this specimen are separated by about 1.5 times their own diameter, whereas Calman describes the lateral processes as being separated by not more than their own diameter. This specimen is close to that recorded by Arango (2009, Fig. 8B) from Western Australia which had lateral processes more widely spaced and with a longer neck compared to Calman's holotype. Calman's description of the oviger was brief and unfigured, but the spine formulae are close (holotype 6:5:5:5, this specimen 6:5:5:6). The first coxa bears one or two distal spines. Coxa 2 has a small mid-dorsal papilla placed distal to mid-length and a strong spine on the lateral surfaces. There are several strong spines around the distal margin and a large ventrodistal gonopore is present on all legs (plate 7e). A conspicuous but short, spiniferous tubercle is present on the ventrodistal surface of the third coxae.

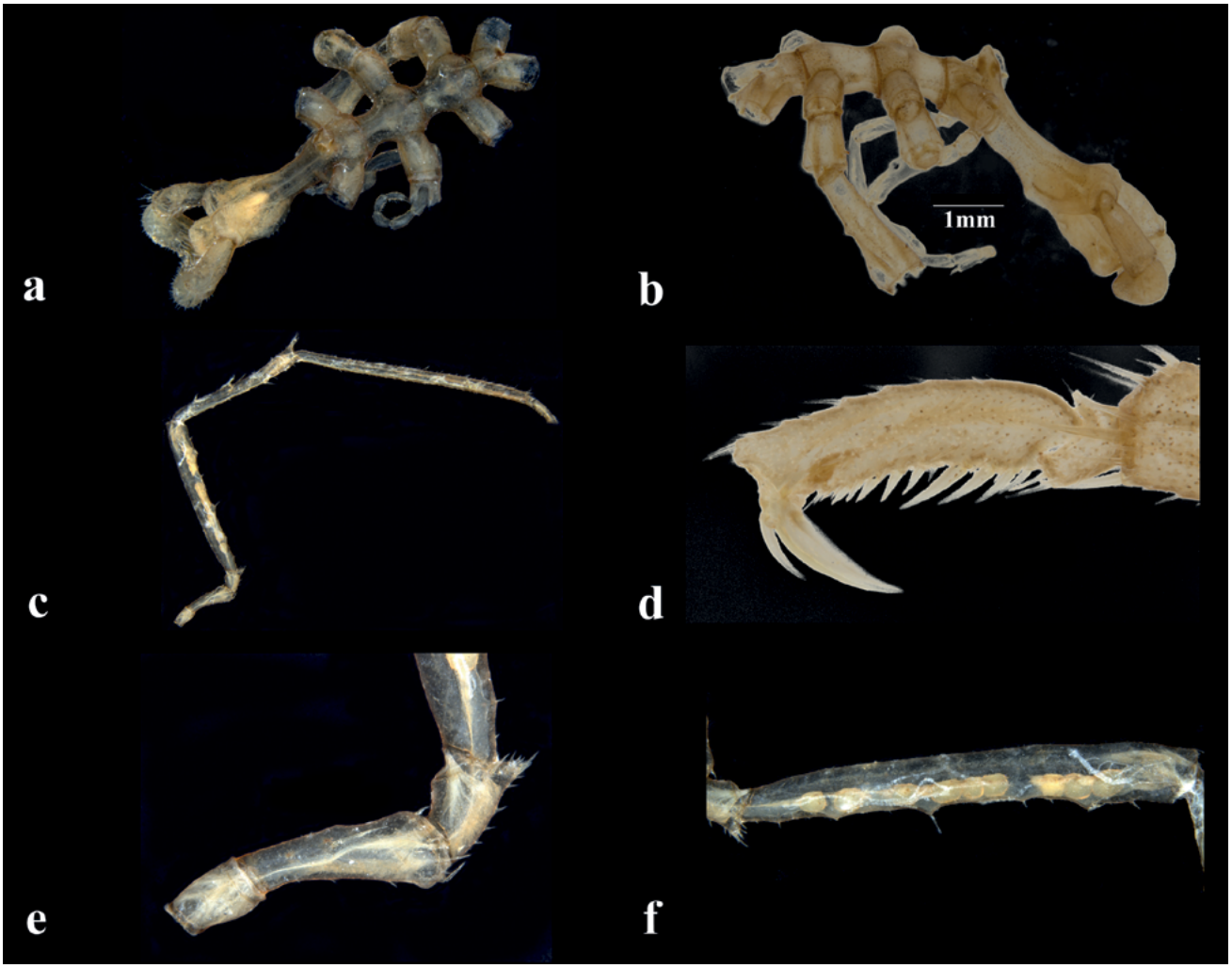


Plate 7. *P. challengeri*, female (SAMA E9436): a, b, trunk dorsal and lateral views; c, leg 3; d, propodus and tarsus leg 3; e, coxae leg 3; f, femur leg 3.

There is evidence to suggest that several spines on the lateral surfaces of each of the longer segments of the legs have been broken off. The dorsodistal surface of the femur is without a prominent tubercle but is rather swollen and with one or two strong setae. The ventral surface (plate 7f) is considerably more irregular than illustrated by Calman (1937, Fig. 5) and possibly represents what Arango (2009) described as spine-tipped "bumps or knobs". Most spines on the femur and tibiae are finely serrated, the cuticular surfaces of both tibiae are without distortions, tibia 1 has a prominent spine-tipped dorsodistal tubercle. Most legs of this specimen have the distal segments missing, perhaps indicating forceable removable from the host substrate. Of those legs with the propodus remaining, the number of heel spines vary from 3 to 4 and sole spines vary from 3 to 6. The distal-most sole spines are crowded and smaller. The largest sole spine is about half the size of the largest heel spine and all larger spines are inter-spaced by smaller spines. Heel and sole spines are finely toothed or crenulate on the distal surface. The main claw and auxiliary claws are smooth. The anal tubercle is missing from this specimen. From the closely related *P. australiensis* (Hoek, 1881), *P. challengeri* is immediately distinguished by the presence of auxiliary claws.

*Distribution*. Records range from Twofold Bay, NSW to Albany Point, WA at depths ranging from 24–220 m.

### Genus *Pallenella* Schimkewitsch, 1909

*Discussion*. Brenneis et al. (2020) identified two Tasmanian forms which they designated *P.* cf. *chevron,* and *P.* cf. *ambigua*. Both forms shared ambiguous characteristics and in the absence of molecular data for *P. ambigua* and *P. chevron* it was not possible to arrive at unequivocable species determinations for those specimens. The status of *P.* cf. *ambigua* remains under

investigation pending additional material. The points of difference between *P. chevron* and *P.* cf. *chevron* have not been clearly established. The pattern of red lines in *P.*cf *chevron* were discussed in detail and were described as an "invariable" feature of the Tasmanian specimens although, the pattern was also observed to be slightly deviating. The authors also had difficulty separating *P. baroni* and *P. chevron* due to overlapping ranges of diagnostic characters and placed greater attention to comparing *P. baroni* with *P.* cf. *chevron*. The variation in the length-to-height proportions of the chela amongst the collection was cited as a striking feature of *P.* cf. *chevron* and in some cases, specimens featured a "palm almost as elongated as in *P. baroni*". The authors documented extensive intraspecific variations within the *P. baroni* collection some of which were consistent with ontogenetic and allometric changes but insufficient attention was devoted to the identification of characters that distinguish *P. baroni* from its congeners. *Pallenella baroni* seems to share a closer relationship with the *P. chevron* holotype than it does with *P.* cf. *chevron*. Brenneis et al. (2020, in key) noted that the leg length of *P.* cf. *chevron* can be >18 mm, which is considerably longer than the leg lengths of either the *P. chevron* or *P. baroni* holotypes (*P. chevron* 13.02 mm and *P. baroni* 14.2 mm) and although the oviger spine count of *P.* cf. *chevron* was not recorded, the difference in the spine count of *P. baroni* (49 spines) and the *P. chevron* holotype (45 spines) is not significant. The oviger claw in both *P. baroni* and *P. chevron* (and *P.* cf. *chevron*) share a rounded tip. Differences in live colour markings appears to be the only reliable characteristic that distinguishes *P. chevron* from *P. baroni*. The dark crust covering the distal proboscis and chelae of *P. baroni* is not regarded as diagnostic. The authors found that the presence of a "small protruding bump" half-way along the cutting edge of the moveable finger of *P. baroni* (Brenneis 2020 Fig. 10D) is a variable character, but suffice to say, a bump is not evident on the cutting edge of the *P. chevron* holotype (plate 20d). Based on Brenneis et al. (2020 Figs10A–A"', 11B–B") the pre-ocular cephalon mound of *P.* cf. *chevron* and *P. baroni* is more prominent (but not acute), than appears to be the case in the *P. chevron* holotype (fig. 20b herein) and may be a point of difference, but not easily defined in a key. Based on Staples' figures of *P. chevron* (Staples 2007, Fig. 2G, H) and the images of *P.* cf. *chevron* (Brenneis et al. 2020, Fig. 11C), the moveable finger is more strongly curved and the gap at the base of the fingers is wider in *P.* cf. *chevron*. The descriptions of the propodal heel spination of *P. baroni* and *P.* cf. *chevron* agree closely, particularly the presence of a smaller pair of distal spines. Presumably the paired spines sit side-by-side rather than in a linear arrangement as clearly illustrated by Staples (2007, Fig. 2J) but unfortunately, the images provided by Brenneis et al. (2020)_do clarify the arrangement. At a time of diminishing taxonomic expertise and a greater reliance on molecular analyses, the unambiguous identification of voucher specimens is critical when selecting a particular specimen for molecular analysis but the unresolved variability noted in the *P. baroni* collection challenges that objective considerably. The morphological boundaries that define *P. baroni* are unclear. To construct a key here, the arrangement of the propodal heel spines and the presence or absence of a raised section, or "bump", on the cutting edge of the chela moveable finger have been selected on a provisional basis to distinguish *P. chevron* and *P. baroni*. Additional images of the *P. chevron* holotype are attached to assist with comparison (plate 20a–f).

The possibility of hybridization within this genus should not be arbitrarily dismissed. Aside from the sharing of arborescent bryozoans as host substrates, sexual characteristics such as the placement and number of genital pores, oviger shape, and probable mating position, are remarkably consistent amongst congeners and suggest a low barrier to crossbreeding within the genus.

Arango, (2009) assigned a single female from Albany Western Australia to *P. chevron* but the distinctive chevron markings were not evident. That specimen had 38 oviger spines opposed to 45 spines in the holotype.

The number of eye lenses is easily over-looked and consequently it is not appropriate to use the lenses as a diagnostic character until all species recorded with four lenses have been re-examined. In the meantime, the number of lenses (either four or eight) confirmed by this analysis are recorded in the key to assist with discussion and identification rather than for use as a reliable systematic character generally. Hopefully, future workers can fill in the gaps. Where the number of lenses is not recorded, four lenses are assumed to be present pending review. For the key, the anal tubercle is regarded as being horizontal if it is not inclined upwards.

Live colour observations (where known) are recorded in the key.

**Key to species of *Pallenella***

**Group 1** Anal tubercle horizontal. Chela palm more or less oval shaped, outer surface inflated, fingers, orientated forward in line with palm, moderately slender, outer margins gently and evenly curved, tapering to blunt tips, length immoveable finger >1.5 times width at base. Cephalon pre-ocular mound never prominent, longitudinal cuticular division of cephalon present or absent. Heel well-developed or low, spines linear or grouped.

1. Propodal heel well-developed, 4–10 primary spines grouped or linear. Oviger spine count 27–41 ..... 2

– Propodal heel low, 3–4 primary spines linear, increasing in size distally, followed by smaller pair. Oviger spine count 45–54 ..... 6

2. Propodal heel, spines grouped, 7–10 primary spines, propodal sole curved, diverging at transition of heel to propodal sole. Cephalon longitudinal cuticular division present or not present ..... 3

– Propodal heel spines linear, 3–6 primary spines, sole diverging sharply or weakly at base of heel lobe on chela moveable finger present or absent ..... 4

3 Cephalon longitudinal cuticular division present, distinct. Chela cutting edges uneven, few gaps showing when fingers closed. Oviger spine count 27–29. Propodal heel sloping into sole, 7–10 primary spines, several secondary spines. Live colouring uniformly red, orange ..... ***P. brevicephala*** (Staples, 2008)

– Cephalon longitudinal cuticular division absent ..... 5

4 Chela moveable finger cutting edge with mid-point lobe. Oviger spine count 37. Leg surface smooth; propodus length almost 5-times maximum width, heel prominent, spines grouped, random, propodal claw slender, equally curved both margins. Proboscis with dorsal swellings at about one-third and two-thirds length of swollen part, distal-most swelling strongly inflated dorsally due to blister-like bubble before narrowing to a lengthy terminal part. (8 eye lenses) ..... ***P. difficile*** (Arango, 2009)

– Chela moveable finger cutting edge without lobe or irregularities. Oviger spine count 38. Leg surface irregular, undulate, propodal heel spines arranged in 'V' pattern, first spine longest, claw length about 3.5 times maximum width, inner margin almost straight, curved at tip only, outer margin inflated, evenly curved. Margins of proboscis proximal part almost parallel, very slightly inflated. (8 eye lenses) ..... ***P. reflexa*** (Stock, 1968)

5 Propodal heel with 4 primary spines, sole almost straight, diverging sharply from heel, claw length about 3.5-times maximum width, outer margin inflated, inner margin almost straight, curved at tip only. Proboscis with marked constriction distal to mid-point, swollen distally before tapering to tip. Chela finger margins smooth, cutting edges, separated by narrow gap for most of length. Oviger spine count 30. Live colouring uniformly bright yellow ..... ***P. constricta*** (Arango and Brenneis, 2013)

– Propodal heel with about 6 primary spines, sole weakly curved, divergence from base of heel weak, claw length about 5-times maximum width, slender, curved outer margin slightly inflated. Proboscis without constrictions, slightly dilating distally before tapering to tip. Chela fingers touching at tips only, cutting edges mostly smooth, but slightly raised in proximal half of moveable finger. Oviger spine count 41. (8 eye lenses). ..... ***P. georgia*** sp. nov.

6 Chela moveable finger cutting edge with small mid-point bump. Oviger spine count 54, claw longitudinally folded, narrow at tip. Proboscis inflated, bullet-shaped, without constrictions. Propodus compact, length about 2.5-times width, heel 4 primary spines plus distal pair of short, side-by-side spines, first spine short, fourth primary spine longest, sole diverging at base of heel, claw outer margin inflated, inner margin almost straight, tip curved, pointed. Preocular longitudinal division line may be indistinct. Leg span about 40 mm. Live colouring yellow ..... ***P. flava*** (Arango and Brenneis, 2013)

– Chela moveable finger cutting edge smooth or with small bump. Oviger spine count 45–49, claw with rounded tip, scoop-shaped. Proboscis slender, bullet-shaped, without constrictions. Propodus length 3.5–4.0-times width, sole divergence from heel slight. Leg span, 27–30 mm ..... 7

7 Smaller distal-most paired heel spines arranged linearly. Chela moveable finger cutting edges smooth, without irregularities. Oviger spine count 45. Live colouring predominantly yellow/orange with conspicuous red chevrons on the trunk dorsal surface ..... ***P. chevron*** (Staples, 2007)

– Smaller distal-most heel spines paired. Chela moveable finger with small protruding bump half way along cutting edge. Oviger spine count 49. Live colouring yellow, body markings absent ..... ***P. baroni*** Brenneis et al., (2020)

**Group 2.** Anal tubercle horizontal. Chela palm conspicuously bulbous, fingers robust, short, length of immoveable finger <1.5 times width at base, almost straight, with low dorsal swelling; moveable finger outer edge strongly curved, typically with a distinct elbow-like bend at about one-third length, hook-like. Cephalon pre-ocular mound low or distinctly elevated, (but not acute), with or without longitudinal cuticular division. Propodal heel low or prominent.

1 Femur and tibiae each divided by two conspicuous constrictions. Oviger spine count 27. Live colouring orange, brown but perhaps variable. (4 eye lenses) ..... ***P. pachycheira*** (Haswell, 1885)

– Femur and tibiae without constrictions, or irregularities ..... 2

2 Pre-ocular surface evenly rounded, inflated or bulbous, longitudinal cuticular division absent. Propodal heel raised, graduating into sole or prominent and isolated, ~12 grouped spines, sole diverging at transition of heel to propodal sole ..... 3

– Pre-ocular surface distinctly elevated or low, longitudinal cuticular division present. Propodal heel low, 2–5 linear spines, sole weaky curved ..... 4

3 Propodal heel raised, distal surface graduating into sole. Pre-ocular surface inflated, evenly rounded. Oviger spine count 45. Propodal claw slender, both margins curved equally. (8 eye lenses) ..... ***P. brenneisi*** sp. nov.

– Propodal heel prominent, isolated from sole by absence of intermediate spines. Pre-ocular surface bulbous. Oviger spine count 63. Propodal claw outer surface rounded, inflated, inner surface almost straight, only curved distally. (8 eye lenses) ..... ***P. octolentium*** sp. nov.

4 Pre-ocular surface distinctly elevated 4–5 heel spines ..... 5

– Pre-ocular surface low, evenly rounded, 2–4 heel spines ..... 6

5 Chela moveable finger with evenly curved outer margin, immoveable finger particularly short, strongly rounded, both fingers with rounded tips, cutting edges with opposing lobes and indentations, no conspicuous gaps showing when closed, immoveable finger very short, strongly rounded. Oviger spine count 44. Propodal claw slender, both margins equally curved. 4–5 heel spines. (8 eye lenses) ..... ***P. watsonae*** (Staples, 2008)

6 Moveable finger with mid-point lobe on cutting edge, proximal gap present when fingers closed. Pre-ocular surface distinctly elevated, 3-4 primary heel spines. Oviger spine count 51. Propodal claw outer margin inflated, inner margin straight, curved only at tip. Live colouring: trunk red with yellow lateral processes, leg segments two shades of red with distal bright yellow distal bands ..... ***P. harrisi*** (Arango and Brenneis, 2013)

– Pre-ocular surface low, evenly rounded. Chela moveable finger with low lobe on cutting edge, proximal gap between fingers when closed. 2–3 primary heel spines. Propodal claw slender, both margins equally curved. Cuticular longitudinal division of cephalon present but perhaps restricted to anterior margin ..... 7

7 Length of lateral processes about 1.7 times basal width. Oviger spine count ~ 54. Male coxa 2 almost three times length coxa1, propodus curved, claw with both margins curved similarly. (8 eye lenses) ..... ***P. smithi*** sp. nov.

– Length of lateral processes about 1.4 times basal width. Oviger spine count ~ 44. Male coxa 2, 2.2 times length coxa 1, propodus almost straight, claw with outer margin slightly inflated, more rounded than inner surface. (4 eye lenses ..... ***P. ambigua*** (Stock, 1956)

**Group 3**. Anal tubercle inclined. Chela immoveable finger almost in line with palm, pointed at tip, moveable finger evenly curved. Elevation of cephalon pre-ocular surface absent, longitudinal cuticular division absent. Legs smooth, tiny setae present but without spinules, propodal heel low or prominent, primary spines arranged linearly, sole diverging or not diverging at base of heel.

1 Propodal heel low, sole almost straight, not diverging from base of heel, claw broad, outer margin conspicuously inflated, inner margin almost straight, curved at tip only. Cephalon pre-ocular mound absent. Chela fingers about half length of palm, palm elongate ..... 2

– Propodal heel prominent, sole diverging at base of heel, claw slender, pointed, both margins curved similarly. Cephalon pre-ocular mound low. Chela fingers about 1/3 length of palm, palm inflated ..... 3

2 Leg span ~54 mm. Legs with tiny, scattered, fine setae, coxa 2 (male), 4.3 times length of coxa 1, propodus 3.8 times as long as width measured at base of heel, heel hardly evident, with 3 primary spines, sole straight. Proboscis slightly inflated distally before tapering. outer margin moveable finger evenly curved, immoveable finger almost continuous with palm, straight, pointed, indentation near base of cutting edge, narrow gap between cutting edges when fingers closed. Oviger spine count 48, claw with partial longitudinal fold, narrow at tip. Species is notable because of its slender *Nymphon*/*Parapallene*–like habitus ..... ***P. arangoae*** sp. nov.

- Leg span ~38 mm. Legs glabrous, with row of tiny, sparse spinules, coxa 2 (female), 3 times length of coxa 1, propodus about 3.2 times as long as width measured at base of heel, heel very low, with 3–4 primary spines. Proboscis slightly inflated distally before tapering. Chela palm inflated, cutting edges of both fingers recessed at bases exposing proximal gap when closed. Oviger spine count ~68. Live colouring yellow ..... ***P. tasmania*** (Arango and Brenneis, 2013)

3 Leg span ~42 mm. Legs almost glabrous, few small setae, propodus about 3.2 times as long as width, heel prominent, six primary spines, slightly curved. Chela palm inflated, fingers short, immoveable finger compressed distally, pointed, cutting edge with shallow proximal indentation. Oviger spine count ~60. Coxa 2 (female) 3.5 times length of coxa 1. Live colouring: semi-transparent pale green, irregular patterns on appendages ..... ***P. laevis*** (Hoek, 1881)

**Group 4**. Anal tubercle inclined. Both chela fingers compressed near tip, cutting edges almost linear or conspicuously irregular, immoveable finger, continuous with palm, moveable finger evenly curved (without distinct elbow-like bend as in group 2). Pre-ocular median surface acutely conical, longitudinal cuticular division complete or partial. Legs with slightly roughened spiky appearance, short, sharp spines placed on raised basal papillae or sockets, propodus weakly curved, heel low, primary spines arranged linearly, claw equally curved both margins or outer surface marginally inflated with inner surface mostly level, curved inwardly at tip.

1 Chela finger cutting edges conspicuously irregular. Propodal heel with 5 primary spines plus two smaller spines, claw curved equally both margins. Oviger spine count 43. (8 eye lenses) ..... ***P. nuyts*** sp. nov.

– Chela finger cutting edges basically linear or slightly irregular claw equally curved both margins ..... 2

2 Proboscis with slight mid-dilation. Chela moveable finger slightly shorter than immoveable finger, cutting edges almost straight, slightly raised halfway along moveable finger. Propodus greatest length about 3.5-times width measured at base of heel ..... 3

– Proboscis with faint mid-constriction. Chela fingers of equal length, cutting edges slightly uneven. Propodus greatest length about 3-times width measured at base of heel ..... 4

3 Oviger spine count 30. Outer proximal surface of immoveable finger slightly swollen, before narrowing to tip. Longitudinal pre-ocular cuticular division line extends to mid-region of cephalon. Propodal heel with 4 primary spines. Leg span ~17 mm (subadult holotype). Live colouring: red bands on body and appendages ..... ***P. karenae*** (Arango and Brenneis, 2020)

– Oviger spine count 35. Longitudinal cuticular division of cephalon restricted to anterior margin. Propodal heel with 6 primary spines. Leg span ~28 mm. Live colouring: orange, legs with yellow-tinted bands ..... ***P. gracilis*** (Arango and Brenneis, 2013)

4 Proboscis with slight constrictions at one-third and two-thirds length. Moveable finger longest, cutting edge with two low inflated parts, immoveable finger outer surface almost continuous with palm, cutting surface straight. Oviger spine count 39. Propodal heel with 3–6 primary spines. Leg span ~23 mm. (4 eye lenses) ..... ***P. inflata*** (Staples, 2005)

***Pallenella inflata*** (Staples, 2005).

*Pseudopallene inflata* (Staples, 2005): 164 Fig. 3—Staples 2008, 129 Fig. 2E–F — Brenneis et al. 2020: 859, Fig 9.

Plate 8a–f

*Material examined*. One male carrying protonymphon and three juveniles] (SAMA E9439). Cape Colbert, Port Lincoln, 34° 44′S, 135° 59′E, 2–7 m, W. Zeidler and K.L. Gowlett-Holmes, 4 Mar 1987.

*Remarks*. Exuviae of protonymphon and juveniles are entangled amongst threads on the ovigers of this specimen (plate 8e). Three juveniles remain attached, the largest of which has one developing fourth leg which may be regenerating (plate 8f), otherwise all legs are segmented and equally developed. There is little to add to the original description of this species and to subsequent observations by Staples (2008) and Brenneis et al. (2020). Examination of this male reveals the presence of microscopic setae on the lateral processes, but trunk mid-dorsal setae are not evident. The dorsal inflation of the trunk segments may be marginally lower than in the holotype. Coxa 1 is fringed with short, sharp spinules. The legs are finely papillose. There are four, five or six primary spines on the propodal heel. Four eye lenses are present. The tiny oviger claw is difficult to orientate and its shape is not clear, but it appears to be of a similar shape to that of the male previously collected from the Investigator Group (Staples 2008). The total oviger spine count of this Port

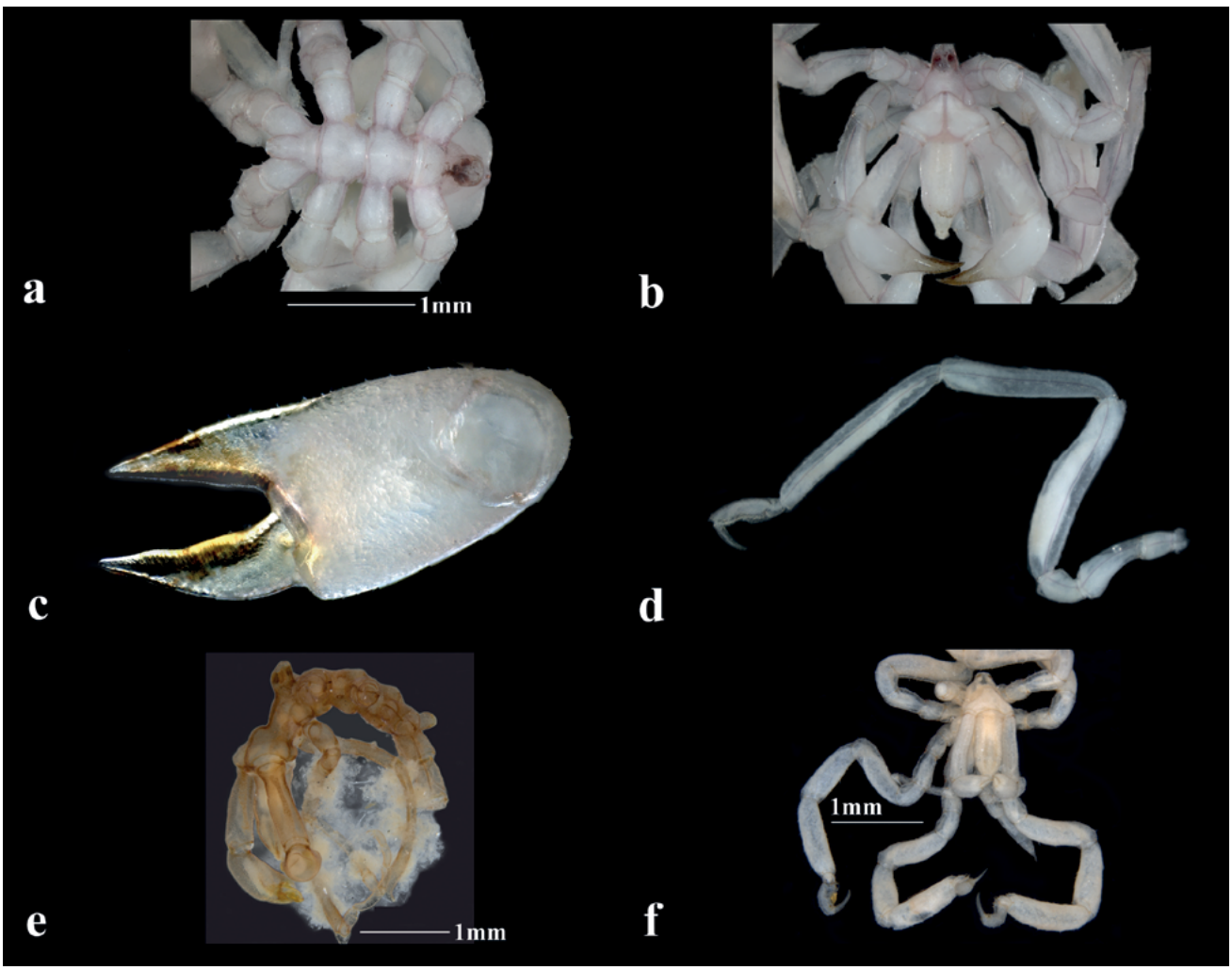


Plate 8. *Pallenella inflata*, female holotype (SAM E3417): a, b, trunk dorsal and anterior view; c, right chela; d, leg 4. Male, ovigerous (SAMA E9439): e, lateral view: f, juvenile, anterior view.

Lincoln specimen and the holotype from Althorpe Island are much the same (41 spines compared to 39 spines in the *P. inflata* holotype). The subadult specimen identified as *P. inflata* by Brenneis et al. (2020) (DNA voucher specimen TAS35) formed part of the same phylogenetic analysis as *P. cf. chevron* (DNA voucher EN18), and *P.* cf. *ambigua* (DNA voucher EN10 and 11). These three voucher specimens were collected from Eaglehawk Neck. It is most unfortunate that the authors included subadult material in their morphological analysis. The subadult *P. inflata* (TAS35) voucher specimen appears to have greater morphological similarity to the subadult *P. karenae* holotype than it does to the adult *P. inflata* holotype. The *P. karenae* holotype is larger than the adult *P. inflata* holotype (leg length 11.72mm versus 8.5mm) but of similar size to the subadult *P. inflata* DNA voucher specimen from Eaglehawk Neck (leg length 11.57 mm). The authors attributed the size differences to a variance between populations and lead them to conclude that size alone is unsuitable for segregation of the two species, but whether such a conclusion can be reached in the absence of molecular support for the relationship between the adult *P. inflata* holotype and the subadult *P* cf. *inflata* is problematic. The similar leg spans of the subadult *P. karenae* and subadult *P. inflata* voucher specimen suggests a similar growth stage. The description of a "more pointed" oviger claw in the voucher specimen fits more closely with the "slender and tapering" description of *P. karenae* than it does with the rounded (scoop-shaped) claw of the *P. inflata* holotype from Althorpe Island South Australia. Staples (2008) described the male oviger claw of *P. inflata* from the Investigator Group South Australia as a "little more pointed" than that of the female holotype, but the figure of the oviger claw of the Fortesque Bay specimen (Brenneis et al. 2020, Fig. 9G) shows an oviger claw that is clearly acute. The total oviger spine count of the *P. karenae* holotype and the *P. inflata* DNA voucher specimen is the same (30 spines) compared to 39 spines in the female *P. inflata* holotype and 43 spines in the male. In both *P. karenae* and the *P. inflata* DNA voucher specimen, the immoveable finger is marginally longer than the moveable finger, compared to marginally shorter in the *P. inflata* holotype. The authors did not comment on the wedge-shaped incision in the cutting edge of the moveable finger of the *P. inflata* voucher specimen (Brenneis et al. 2020, Fig. 9C), or state whether both chelae were the same, but in any event, the incision on the moveable finger is not evident in either the *P. inflata* or *P. karenae* holotypes. The authors cited a "comparatively high number of teeth" along both margins of the oviger claw in the *P. inflata* voucher specimen (Brenneis et al., 2020, Fig. 9G, in caption) to further distinguish that specimen from *P. karenae* but in the same paper, they noted that the number of teeth along the oviger claw margins of another species, *P. baroni*, was a variable character (Brenneis et al. 2020). This suggests the same variability could extend to other species also and may not be a reliable diagnostic character. The relationship between the South Australian *P. inflata* holotype and the Tasmanian material needs greater scrutiny. Using the key provided by Brenneis et al. (2020), *P. karenae* and *P. inflata* can be followed down to couplet 9 where they are distinguished by rather nebulous characters. Unfortunately, the extent of dorsal inflation of the trunk described in the key as "moderate or strong" is subjective, and the citing of minute mid-dorsal setae on the trunk as a diagnostic character of *P. karenae* is questionable, particularly when those setae seem to be best diagnosed by scanning electron microscope (Brenneis et al., 2020, Fig. 8). Whilst the presence of setae of this size is an interesting observation, they could easily have been overlooked in the original description of *P. inflata*. Significantly, the description of *P. karenae* is based on a solitary subadult female, and in a genus where ontogenetic changes are well documented, the inclusion of a subadult specimen in a key to "adult" *Pallenella* species is problematic. It is unfortunate that the authors did not discuss morphological differences that separated *P. karenae* from its congeners rather than rely on colour differences and comparison with an undescribed specimen preliminarily placed in the "*variabilis*" complex (Brenneis et al., 2013). Specifically, *P. karenae* needs to be clearly distinguished from *P. inflata* and *P. gracilis*. Whilst the independence of these Eaglehawk Neck specimens based on morphological grounds is unclear, their independence does appear to be genetically well-supported (Brenneis et al. 2020: Fig. 3). Images of the *P. inflata* holotype (SAM E3417) are provided to assist with comparisons (plate 8a–f). The holotype retains a pink hue in alcohol, perhaps a remnant of red markings prior to preservation (plate 8a, b).

***Pallenella brenneisi* sp. nov.**

Figure 7a–g. Plate 9a–h.

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*Material examined*. Holotype. Gravid female (SAMA E9447). Coffin Bay, Gallipoli Beach, between Farm Beach and The Frenchman, (34° 28´S, 135° 19´E), on orange flexible bryozoan, 8m, N. Holmes, 24 Apr 1994.

Paratype. One gravid female (SAMA E9450) same collection details.

*Diagnosis*. Anal tubercle horizontal. Lateral processes narrowly, but distinctly separated. Trunk segments mildly inflated dorsally, pre-ocular surface of cephalon inflated, rounded, without median elevation or defined cuticular division, base of eye tubercle forms a continuum with the base of the swollen crop, neck not defined in lateral view, short in dorsal view. Eight eye lenses. Chela robust, moveable finger strongly curved, cutting edges heavily chitinized. Legs without irregularities, covered in tiny spine-tipped papillae, tibiae 2 much wider than propodus, propodal heel prominent, well-defined, sloping to diverging sole, about thirteen primary heel spines accompanied by many smaller lateral spines, about ten sole spines also with many smaller lateral spines, claw slender, equally curved both margins.

*Description*. Holotype, female. Leg span about 25.0 mm. Trunk (fig. 7a, b) fully segmented, glabrous, segments mildly inflated dorsodistally, cephalon smooth, crop inflated, pre-ocular surface inflated, without median mound or mid-dorsal cuticular division, neck minimal in dorsal view, not defined in lateral view, anterior margin of eye tubercle forms a continuum with base of swollen crop (plate 9b). Lateral processes narrowly but distinctly separated, each about 1.5 times longer than basal width.

Eye tubercle wider than tall, two dorsal papillae, eight eye lenses (plate. 9a, c).

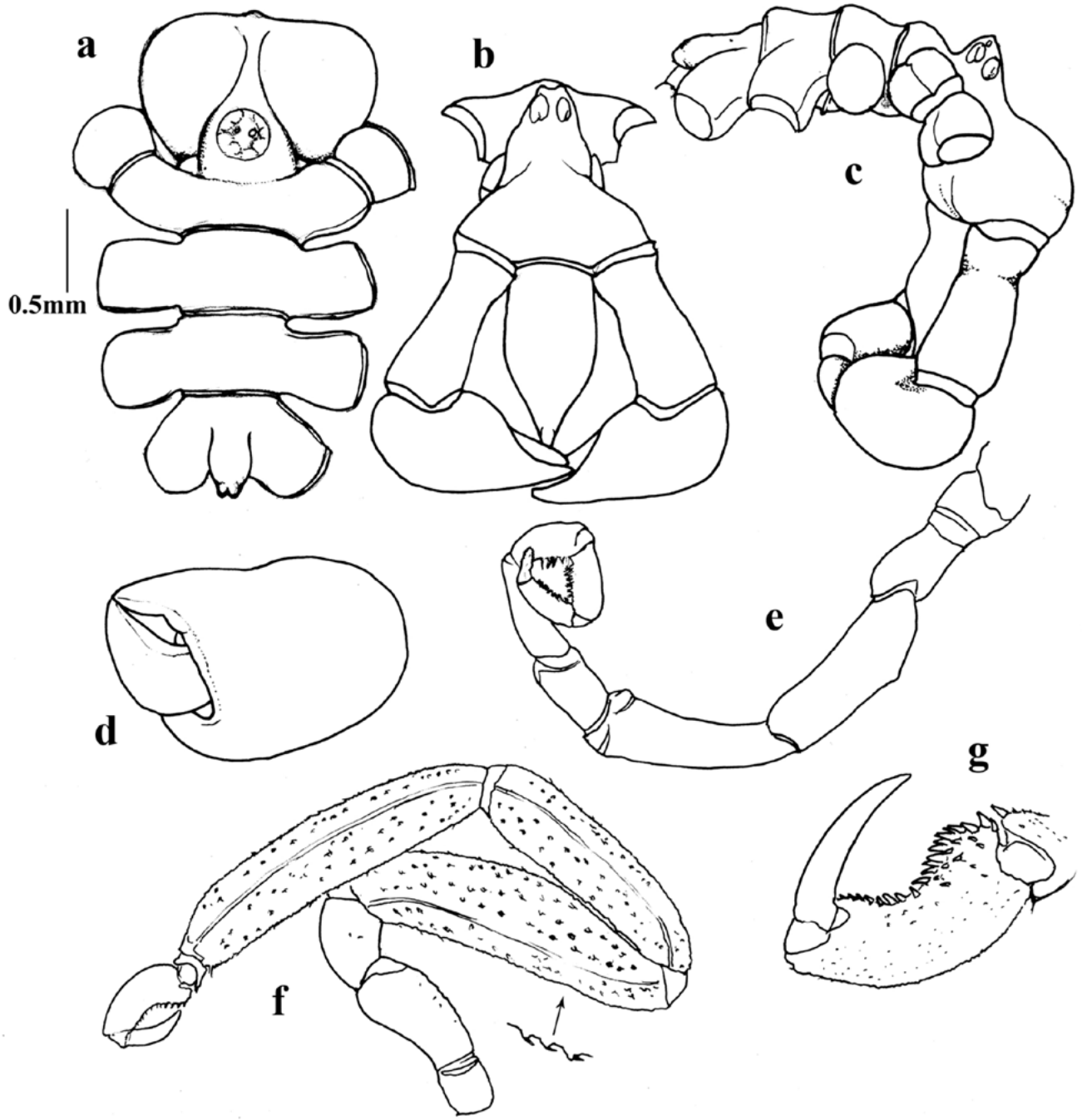


Figure 7. *Pallenella brenneisi* sp. nov., female, holotype (SAMA E9447): a–c, trunk, dorsal, anterior and lateral; d, left chela; e, right oviger. Paratype (SAMA E9450) f, leg 3; g, propodus of detached leg.

Proboscis with no constrictions in dorsal view, margins slightly inflated before narrowing to tip, prominent swelling evident in mid-ventral region best seen in lateral view (plate 9b), length about twice maximum width, distal one-third narrowing to tip, jaws well-defined, relatively long when compared to most species, very short fringing setae.

Chelifore scape glabrous with proximal constriction (plate 9b), chelae robust, palm swollen, minute setae around margins, fingers of equal length, about one-half length of palm, gaping for most of length when closed, fingertips blunt, closing scissor-like, with moveable finger to inner side, outer surface of immoveable finger with slight proximal swelling and barely curved, moveable finger strongly curved, without conspicuous gaps or protuberances (plate 9d).

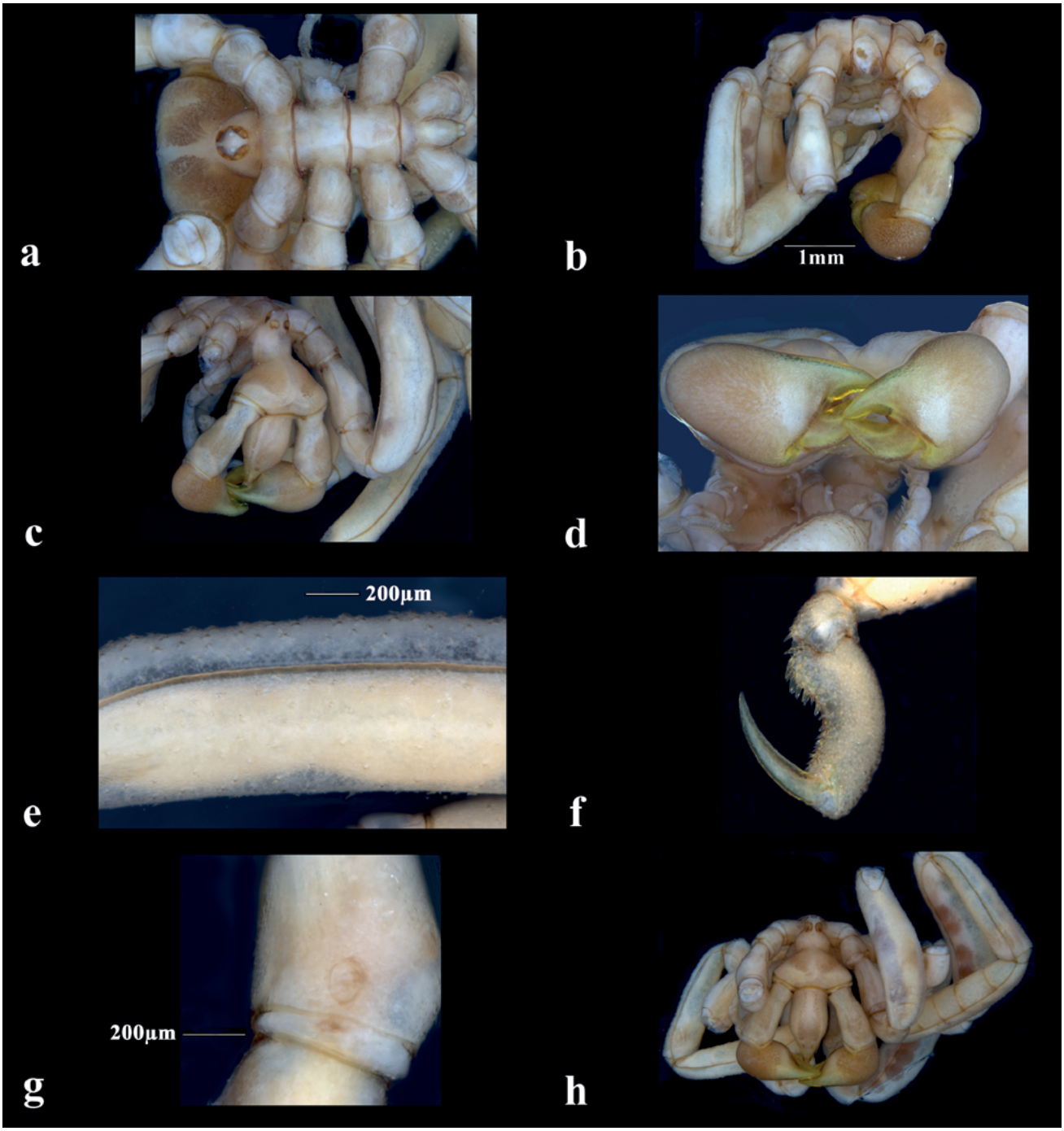


Plate 9. *Pallenella brenneisi* sp. nov., female holotype (SAMA E9447): a–c, trunk dorsal, lateral view and anterior views; d, chelae; e. section of leg surface showing spination: f, propodus leg 3; g, gonopore. Paratype, female SAMA E9450: h, anterior view, showing leg markings.

Oviger bases not in contact with first pair of lateral processes, directed backwards beneath first lateral processes (plate 9b, c), segment 5 longest, segment 4 next longest, with small cone at less than half segment length, terminal claw rounded distally, with short blunt teeth along both distal margins. Compound spine formula, segments 7–10, 17:10: 9: 9 (45 spines).

Anal tubercle horizontal, not reaching distal margin of fourth lateral processes, barrel-shaped, strongly constricted distally, margins of anal slit prominent, conspicuously gaping (plate 9a).

Legs without irregularities, covered in tiny spine-bearing papillae, each papilla with either an apical or outwardly facing dorsolateral spinule (plate 9e). Coxa 2 about 2.9 times length coxa 1 and about 2.3 times coxa 3, femora swollen with oocytes for most of length, narrowing distally to same width as first tibiae, tibia 2 longest segment and much wider than propodus, tarsus short, ventral surface with 2–3 longer distal spines, dense covering of smaller more proximal spines, propodus evenly curved dorsally (plate 9f), heel raised, distal surface sloping to sole, random grouping of about twelve robust heel spines of about equal size, many smaller lateral spines; sole with a marked point of divergence at base of heel, almost straight, about nineteen short, but robust spines, claw slender, both margins equally curved, reaching to proximal half of heel when closed. Cuticular lateral line extending from coxa 2 to tarsus. Gonopores conspicuous (plate 9g), ventrodistal, coxae 2, all legs.

*Measurements of holotype (mm).* Trunk length (frontal margin of cephalic segment to tip of fourth lateral processes), 3.47; width across 2nd lateral processes; 1.77; proboscis length (dorsal), 1.43; greatest diameter proboscis, 0.67; anal tubercle length. 0.45. Oviger (segs 2–10): seg. 2, 0.17: seg. 3, 0.35; seg. 4, 0.63; seg. 5, 0.75; seg. 6, 0.24; seg. 7, 0.48; seg. 8, 0.24; seg. 9, 0.32: seg. 10, 0.25; claw, 0.16**.** Leg 3 coxa 1, 0.42; coxa 2, 1.20; coxa 3, 0.53; femur, 2.94; tibia 1, 2.36; tibia 2, 3.30; tarsus 0.10; propodus, 0.77; claw, 0.63.

*Etymology***.** Named for Georg Brenneis in recognition of his outstanding contributions to the advancement of pycnogonid physiology, particularly his significant contribution to the taxonomic knowledge of the genus *Pallenella*.

*Remarks*. Some legs of the paratype exhibit up to four, mostly reddish, transverse bands that appear to be shadows of internal diverticula rather than remnants of surface markings. These are most evident in ventral view (plate 9h). The heels of the paratype are slightly more prominent than those of holotype.

This species shares the presence of eight eye lenses, clustered heel spines, and a significant divergence of the propodal heel and sole with *P. octolentium* sp. nov. It is distinguished from that species by a lower propodal heel that slopes into the sole (heel is stand-alone and clearly separated from the sole by the absence of spines in *P. octolentium*), the narrower propodal claw with inner and outer margins about equally curved (claw wide, outer margin inflated in *P. octolentium*), the presence of dense spine-tipped papillae on the leg surfaces (leg surfaces smooth in *P. octolentium*) and having a lesser number of oviger compound spines (*P. brenneisi* 45 spines versus ~63 in *P. octolentium*). *Pallenella brenneisi* also shares characters with *P. brevicephela* but differs from that species in having a less prominent pre-ocular dorsal surface with a less defined median division line, a greater number of oviger strigilis spines (*P. brevicephala* holotype 29 spines *brenneisi* 45 spines) and more robust chelae with shorter more strongly curved fingers.

***Pallenella octolentium* sp. nov.**

Figure 8a–h. Plate 10a–f

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*Material examined*. Holotype. Female, gravid (SAMA E9445). Great Australian Bight, (31° 40′S, 130° 00′E), 45–50 m, Pipe Dredge, ORV Franklin, stn GAB009, Y. Bone, P. Bock, S. Hageman, 14 Jul 1995.

*Diagnosis*. Pre-ocular cephalon surface bulbous, rounded, without cuticular division. Trunk segments not inflated dorsally. Neck defined by a constriction only. Eight eye lenses. Lateral processes separated by about half basal diameter. Oviger claw rounded at tip, scoop shaped. Legs without irregularities, tibia 2 much wider than tarsus. Propodal heel prominent, with a random group of strong, closely spaced spines, clearly delineated from the sole by distinct gap between heel spines and sole spines. Chela palm swollen, fingers robust, cutting edge of moveable finger with conspicuous elevation on cutting edge at mid-length.

*Description*. Holotype, female. Leg span about 29.0 mm. Trunk glabrous, segments not inflated dorsally. Lateral processes 2 and 3 separated by about half basal width, processes 3 and 4, narrowly separated, processes 1 and 4 shortest, length about equal to basal width, length lateral processes 2 and 3 about 1.25 times basal width. Cephalon bulbous, without cuticular division, individual swellings over bases of chelifores subsumed into the pre-ocular surface, small median secondary protuberance, which may not be a diagnostic character, is present on the dorsoposterior surface (Fig. 8b, plate 10c). In lateral view, the anterior face of eye tubercle slopes downwards at about 45° rising abruptly at the base of the crop (Fig. 8c, plate 10b).

Eye tubercle height less than width, eyes of equal size, eight lenses, two dorsal papillae.

Proboscis length about twice greatest width, inflated in mid-region, narrowing marginally to another very slightly inflated part before tapering to terminal jaws, setiferous fringe present (plate 10c).

Chelifore scape slightly shorter than proboscis length, proximal constriction present. Chela longer than scape, palm bulbous, fingers curved, shorter than palm, moveable finger not quite reaching tip of immoveable finger, crossing at tips with the moveable finger closing to the outer side of immoveable finger, moveable finger with prominent node on cutting edge at about half length, immoveable finger smooth, cutting edges of both fingers heavily sclerotized (plate 10d).

Oviger bases level with anterior margin of first lateral processes, compound spine formula, segments 7–10, 19:15:15:14 (63 spines), spines slender, curved, segment 4 with small cone on posterior surface at about one-third length, claw greater than half length of segment 10, rounded at tip, fringed with blunt teeth on both margins.

Anal tubercle horizontal short, barrel shaped.

Legs without irregularities (plate 10e), spines fine and sparse, only apparent under high magnification. Coxa 2 about 2.5 times length of coxa 1, longer segments smooth, with inflated appearance, tibia 2 longest segment, width greater than twice that of propodus, femur longer than tibia 1, swollen with oocytes,

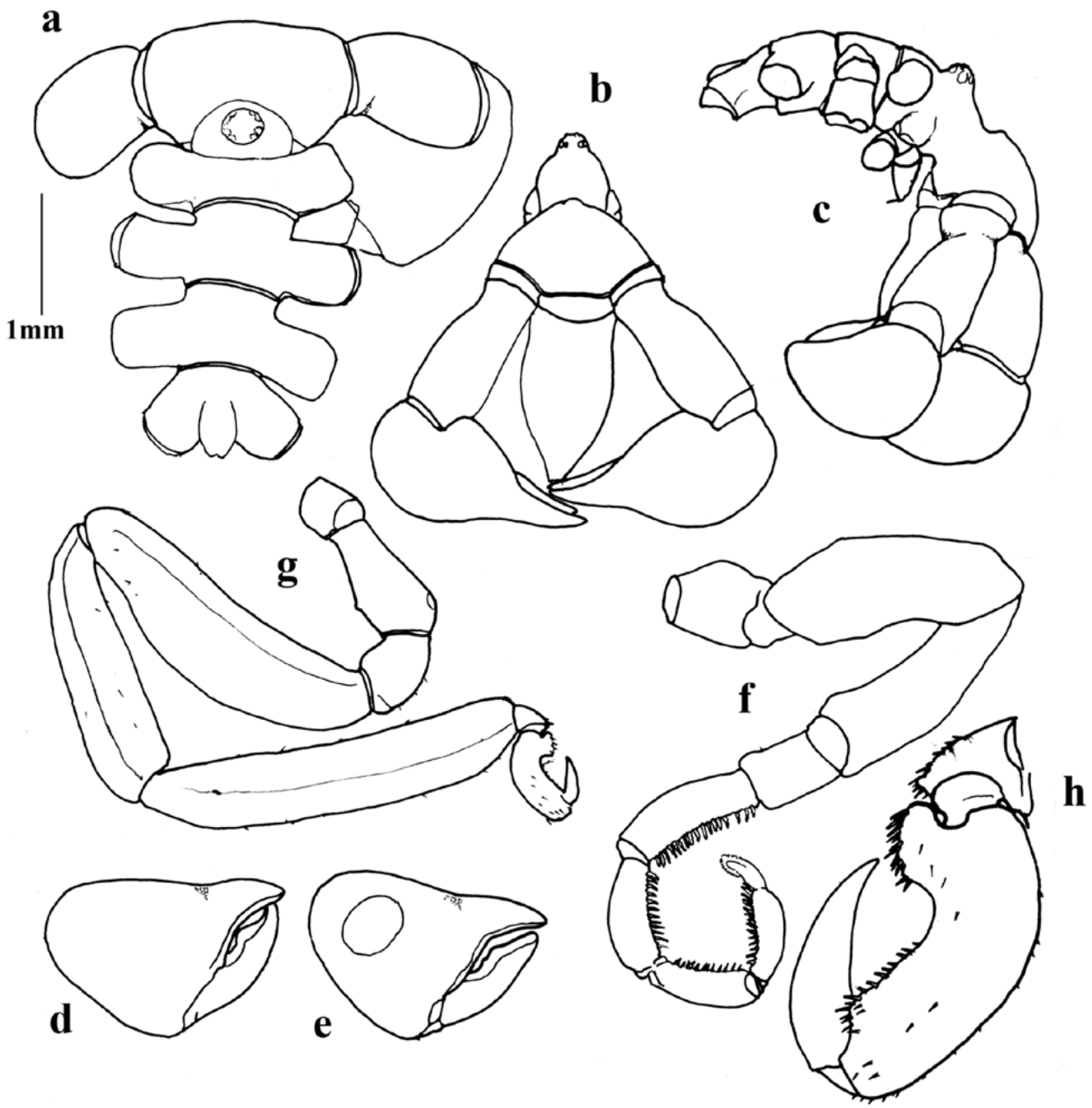


Figure 8 *Pallenella octolentium* sp. nov., female holotype (SAMA E9445). a–c, trunk, dorsal, anterior and lateral; d, e, right chela, inner and outer views; f, right oviger; g, leg 3, h, tarsus and propodus.

propodus curved, heel defined, prominent, isolated by absence of spines between heel and proximal sole spines (Fig. 8h, plate 10f), heel with random grouping of about twelve strong spines of equal size accompanied by many lesser spines, sole lined with about ten lesser spines in more than one row and many shorter lateral spines, claw strong, outer margin evenly curved, inflated, wide at base, inner margin straight, curved near tip only, length about 3.5 times base width, reaching to mid-point of heel when closed. Gonopores large, ventrodistal, all legs.

*Measurements of holotype (mm).* Trunk length (frontal margin of cephalic segment to tip of fourth lateral processes), 3.74; width across second lateral processes, 1.87; proboscis length (dorsal), 1.96; greatest diameter proboscis, 0.98; scape length 1.47; anal

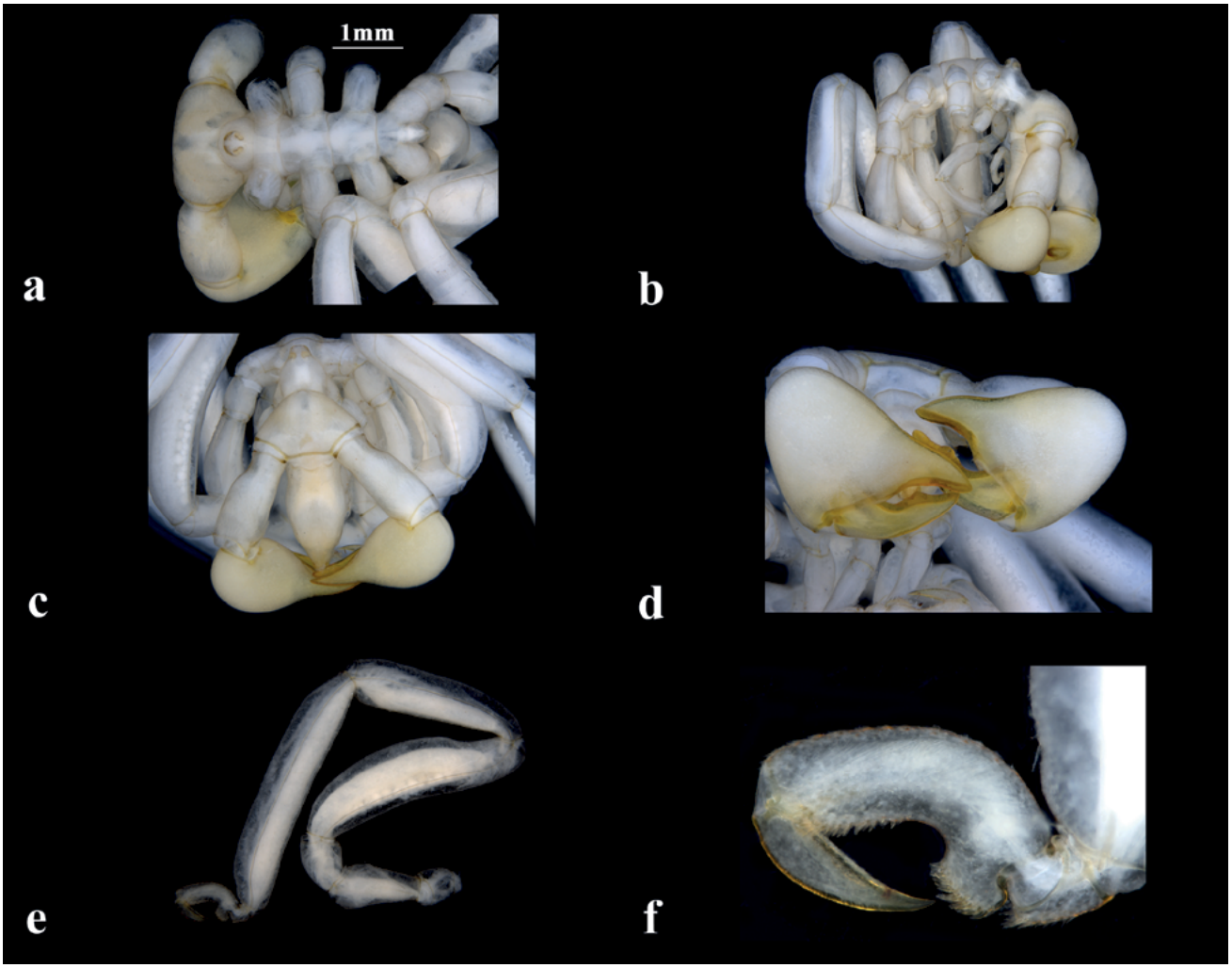


Plate 10. *Pallenella octolentium* sp. nov., female, holotype (SAMA E9445): a–c trunk, dorsal, lateral and anterior views; d, chelae; e, leg 3; f, propodus leg 3.

tubercle length, 0.36. Oviger (segs 3–4): seg. 3, 0.36; seg. 4, 1.07; seg. 5, 0.94; seg. 6, 0.25; seg. 7, 0.57; seg. 8, 0.45; seg. 9, 0.41; seg. 10, 0.38; claw, 0.22**.** Leg 3: coxa 1, 0.49; coxa 2, 1.24; coxa 3, 0.77; femur, 3.39; tibia 1, 2.75; tibia 2, 3.75; tarsus, 0.10; propodus, 0.91; claw, 0.53.

*Remarks*. No other adult in this genus shares such a well-defined heel as this species. Based on the similarity between the propodal heel of this specimen and Clark's illustration of a "further propodus" in his description of *P. dubia* Clark, 1963 (Clark, 1963 Fig. 18B), it is tempting to resurrect *P. dubia* from its present status of *species inquirenda* to accommodate this specimen. However, Clark's material clearly consisted of juvenile forms and there are too many unknowns to make this a practical alternative. *Pallenella brenneisi* sp. nov. shares the robust chela fingers and the absence of a median division of the pre-ocular surface with this species but it has far fewer oviger spines (*P. octolentium*, 63 spines, versus *P. brenneisi*, 45 spines). Only two other species have >60 oviger spines; these are *P. tasmania* (68 spines) and *P. laevis* (66 spines), but both these species have slender and tapered chelae fingers compared to the robust fingers of this species. Additional images of the *P. laevis* holotype are included here to assist with comparison (plate 18a–d).

### *Pallenella arangoae* sp. nov.

Figure 9a–h. Plate 11a–h

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*Material examined*. Holotype. Ovigerous male (SAMA E9455). S.E. of Esperance, Western Australia, 34° 39′S, 122° 26′E, 190 m, epibenthic sled. O.R.V. Franklin, stn GAB 097, S. Hageman, P. Bock, Y. Bone, 24 Jul 1995.

*Diagnosis*. A slender, delicate species with well-defined neck. Pre-ocular surface low, without median swelling, cuticular

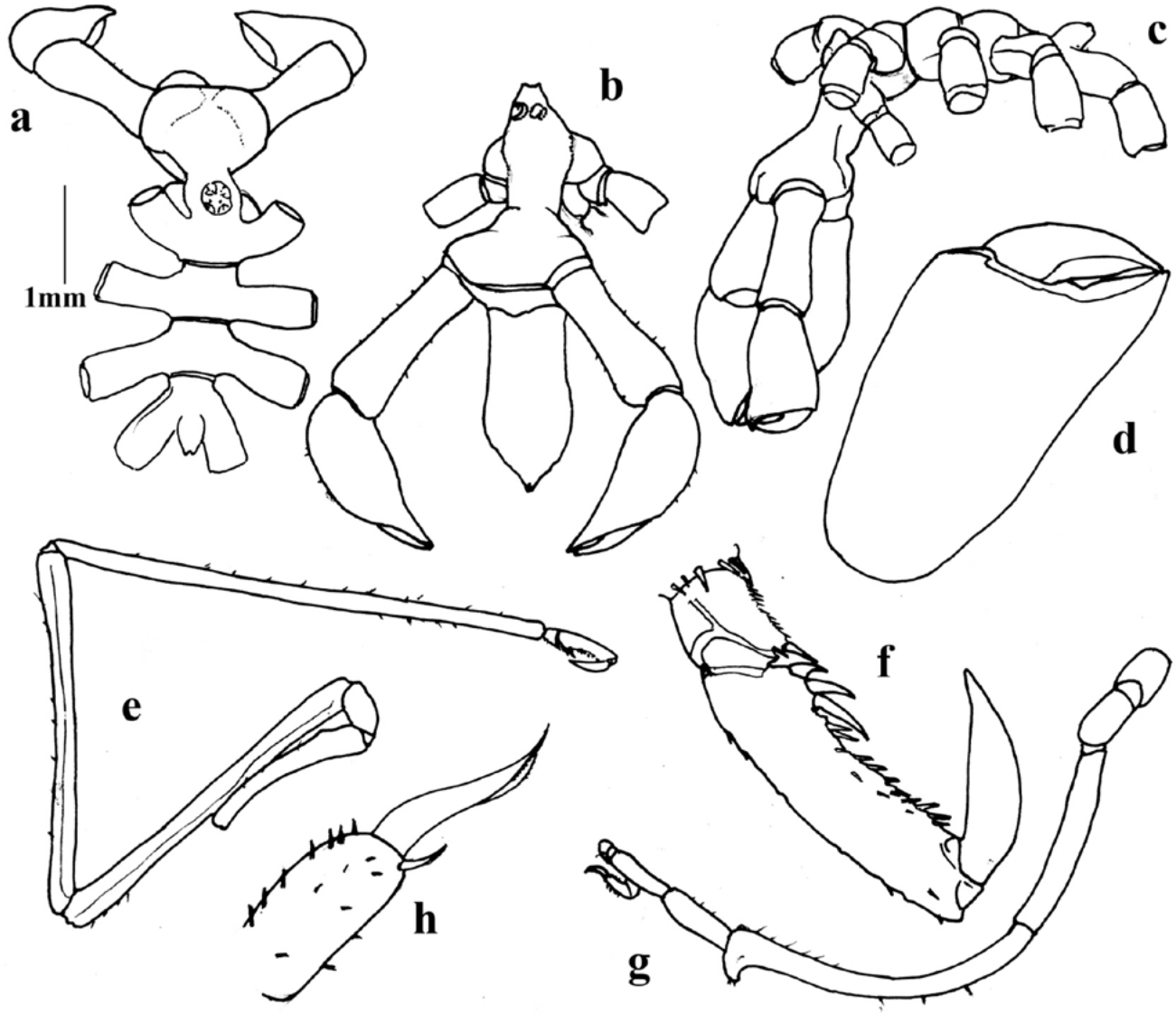


Figure 9. *Pallenella arangoae* sp. nov., male, holotype (SAMA E9455). a–c, trunk, dorsal, anterior and lateral views; d, left chela; e, g, leg 3 and propodus; g, h, right oviger and claw (freehand sketch).

longitudinal division absent. Chela palm slender, fingers short. Four eyes, each with two lenses. Coxa 2, long, slender, > 4 times coxa 1. Propodus almost straight, heel inconspicuous, three strong spines, distal-most spine largest, terminal claw broad, outer edge inflated.

*Description*. Leg span about 54.0 mm. Trunk segments rounded dorsally, lowly inflated, first lateral processes conspicuously arched upwards and forward, *Colossendeis*-like, (plate 11c, d.), separation of first and second lateral processes slightly less than basal widths, length of second lateral process about 2.2 times basal width, several tiny dorsal and lateral setae. Neck well-defined, length little more than width, bases not in contact with first lateral processes, pre-ocular surface low, without longitudinal cuticular division, or median mound, cephalon with low swellings at bases of scapes, with several inconspicuous spinules.

Eye tubercle anterior surface sloping from a posterior apex (plate 11e), two dorsolateral papillae above posterior eyes, four eyes, each with two indistinct lenses, lightly pigmented.

Proboscis length about 2.2-times maximum width, distal one-third slightly bulbous, before narrowing to short glabrous tip (fig.9b, plate 11c), basal arthrodial membrane wide when extended.

Chelifore scape with hardly discernible spinules on margins, and possibly over entire surface, proximal half of fingers lined with similar spinules along outer edges, chela palm elongate, finger cutting edges smooth, gaping for most of length when finger tips touching; immoveable finger with

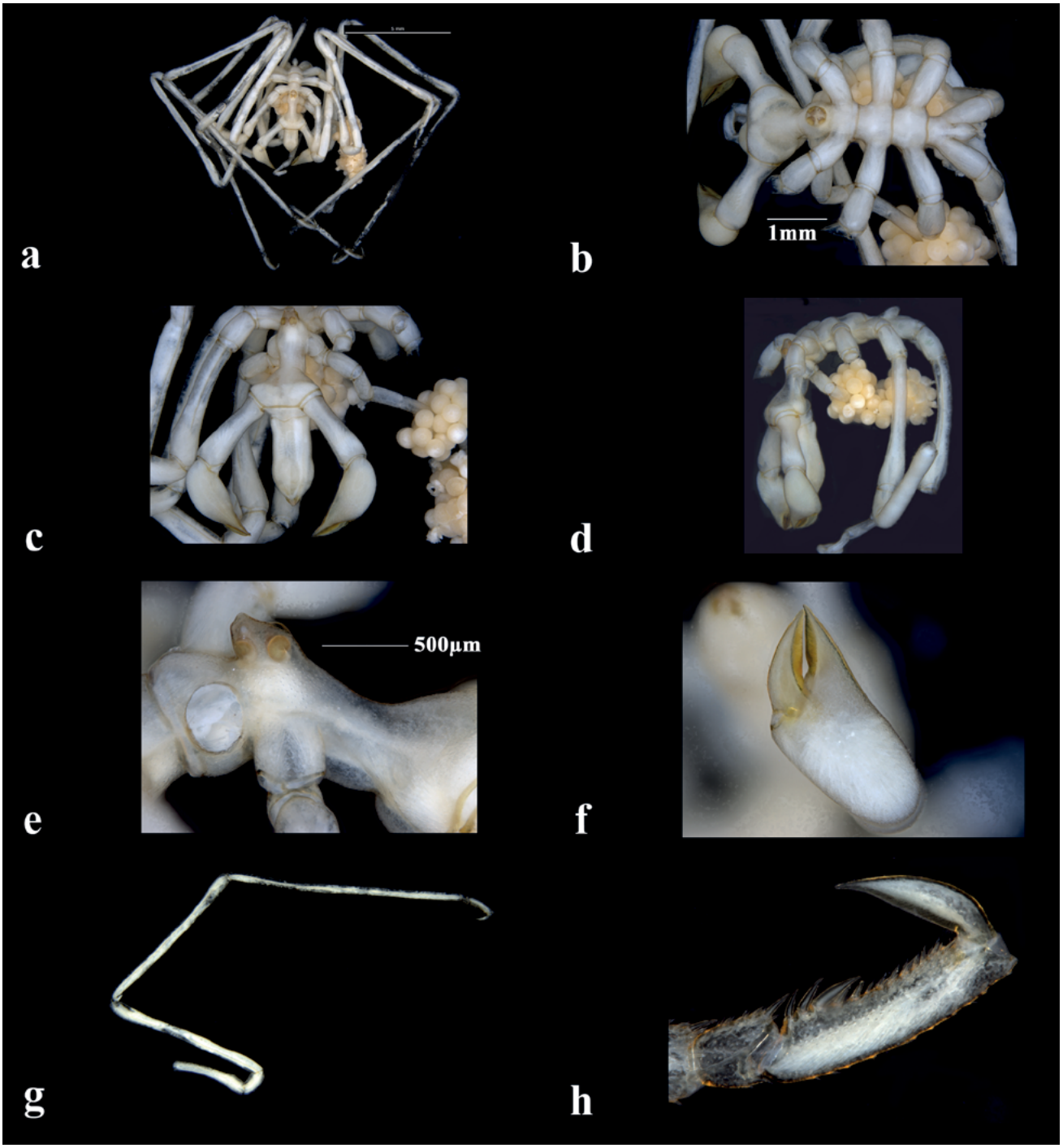


Plate 11. *Pallenella arangoae* sp. nov., male, holotype (SAMA E9455): a, whole specimen; b–d, trunk, dorsal, anterior and lateral views; e, ocular tubercle lateral; f, left chela; g, leg 3; h, propodus.

defined proximal indentation at base (fig. 9d, plate 11f), moveable finger slightly shorter, fingers greater than half length of palm, outer margin of moveable finger evenly curved, immoveable finger almost linear with palm.

Oviger (fig. 9g) ten-segmented, segment 5 longest, curved, widest distally, many surface spinules, distal apophysis with few dorsal spinules, segment 4 next longest, segments 7–10 with many strong, simple, short spines on all surfaces,

compound spine formula, segments 7–10, 20:9:11:8 (48 spines), proximal and distal spines offset from median row, segment 10 with large spine overreaching base of terminal claw, claw long, slender, and appears to have deep median furrow but difficult to interpret, distally twisted outwards to pointed tip, tiny, sharp teeth on both distal margins (fig. 9h, freehand sketch).

Anal tubercle inclined upwards at low angle (Plate 11d), short, inflated, few minute setae on surface, distal gape conspicuous.

Legs (figs 9f, e) without irregularities, surface with tiny, fine scattered setae. Second coxa 4.3 times length of coxa 1, widening distally, with low dorsodistal papilla, femur and first tibia widened distally, tibia 2 longest segment, tibia 1 longer than femur, tarsus with one strong ventrodistal spine and many much-shorter, more anterior spines, propodus slender, almost straight, heel inconspicuous, three robust heel spines followed by two lesser spines and about six sole spines accompanied by many minor lateral spines, terminal claw wide, not quite reaching to heel when closed, with inflated outer margin, inner margin almost straight, curved at tip only, terminating in a sharp point. Gonopores cones low, present on the ventrodistal surface of coxae 2 of all legs but no openings are apparent.

*Measurements of holotype (mm).* Trunk length (frontal margin of cephalic segment to tip of fourth lateral processes), 4.83; width across second lateral processes, 2.14; proboscis length (dorsal), 1.45; greatest diameter proboscis, 0.77; scape length; 1.38. Anal tubercle length, 0.49. Oviger (segs 3–10): seg. 3, 0.55; seg. 4, 1.79; seg. 5, 2.83; seg. 6, 0.73; seg. 7, 0.71; seg. 8, 0.40; seg. 9, 0.40; seg. 10, 0.32; claw, 0.28**.** Leg 3: coxa 1, 0.69; coxa 2, 3.0; coxa 3, 0.65; femur, 5.90; tibia 1, 6.04; tibia 2, 8.61; tarsus, 0.18; propodus, 1.10; claw, 0.59.

*Etymology***.** The proposed specific name recognizes the significant contribution by Claudia Arango to pycnogonid taxonomy generally, and as editor of PycnoBase: the World Pycnogonida Database.

*Remarks*. Two bracelets of about sixty eggs, are attached to segment 5 of each oviger. The shape of the terminal claw requires confirmation.

The attenuated habitus of this specimen is more like that of a species of *Nymphon*, and no other species shares such a long second coxa with this species. These characters alone, are sufficient to separate it from its congeners but in some respects, it is like the more-robust *P. tasmania* (Arango et al., 2013) with which it shares a very similar proboscis and propodus shape. From *P. tasmania*, this species otherwise differs notably, in having much longer lateral processes (length 2.3 times basal width versus 1.5 times in *P. tasmania*), a much lower oviger spine count, 49 spines compared to 68 spines in *P. tasmania* and a longer, well-defined neck versus a short, marked constriction in *P. tasmania*. It appears to share the oviger claw shape with *P. flava* and has the same number of compound spines (54) but differs conspicuously in general habitus and in almost all other respects.

***Pallenella difficile*** (Arango, 2009).

Figure 10a–d. Plate 12a–h.

*Pseudopallene difficile* Arango, 2009: 9–11, Fig. 4.
*Meridionale difficile* Staples 2014b: 346 [in list].
*Pallenella difficile* Brenneis et al, 2020: 854 [in key].

*Material examined*. Holotype. Ovigerous male (WAM T92361). Western Australia, Houtman Abrolhos, CSIRO station 092-029, 28.9714°S, 113.8320°E to 28.9744°S, 113.8350°E, Sherman Sled, hard bottom, 86 m, 3 Dec 2005.

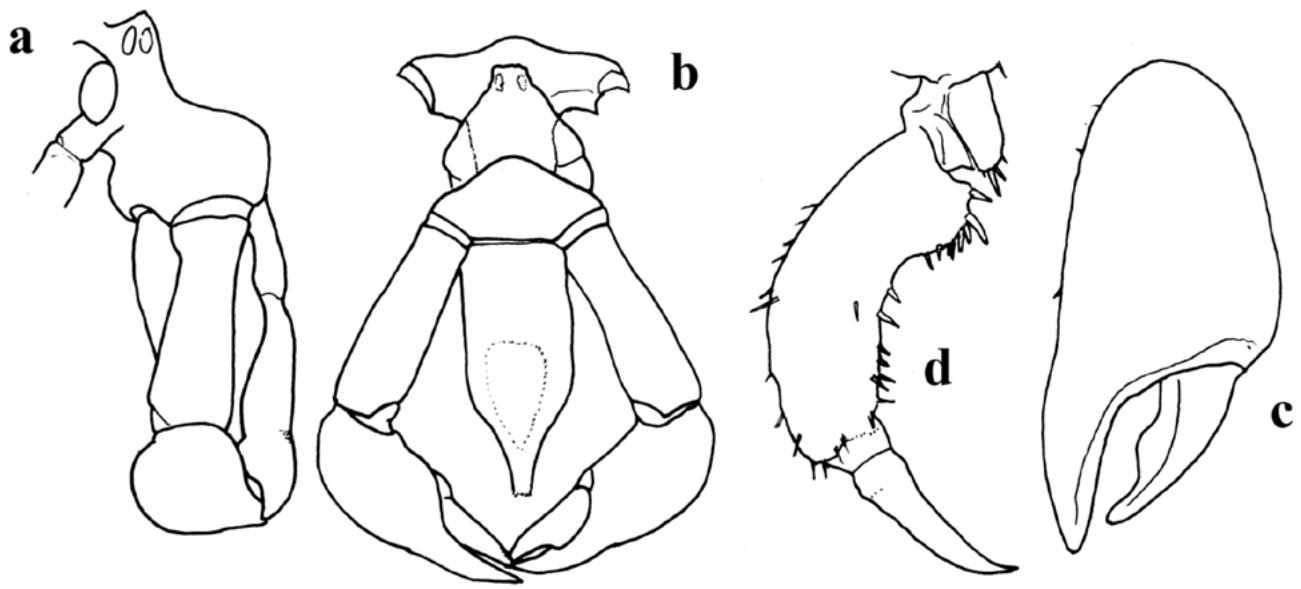


Figure 10. *Pallenella difficile* Arango (2009), male, holotype WAM T92361. a, b, cephalon lateral and anterior views; c, propodus of detached leg; d, left chela.

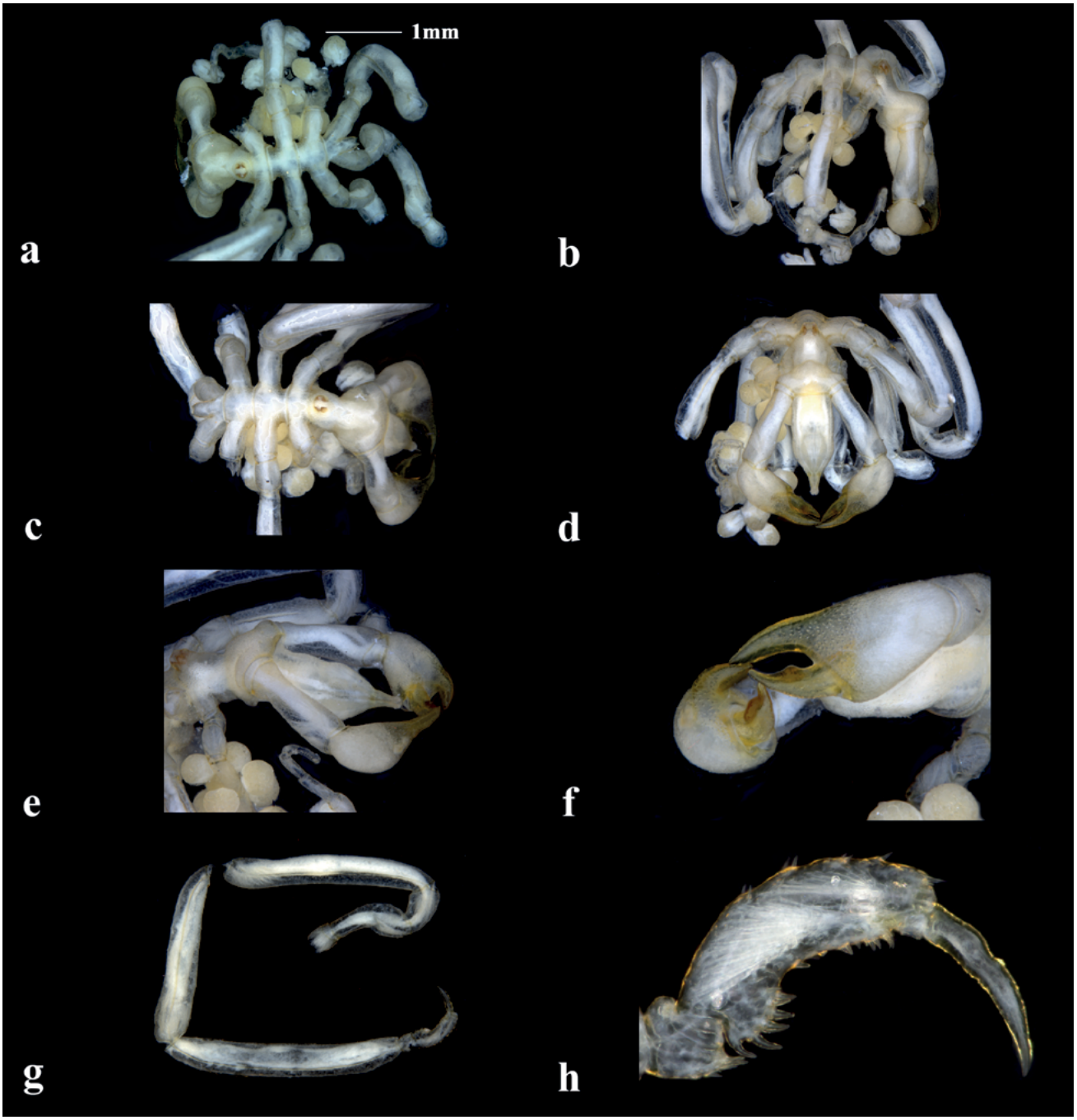


Plate 12. *Pallenella difficile* Arango (2009), male, holotype (WAM T92361): a–b, trunk dorsal and lateral views; c, trunk dorsal, alternative view; d, trunk anterior view; e; proboscis and chelae; f, chelae; g, detached leg; h, propodus.

*Diagnosis*. Pre-ocular surface of cephalon rounded, longitudinal cuticular division absent. Proboscis with dorsal mid-constriction, most evident in lateral view, dorsodistal surface particularly bulbous before tapering to rather elongate jaw region, jaws with setiferous fringe. Neck short in dorsal view, not defined in lateral view. Chela slender, not strongly curved, immoveable finger cutting edge smooth, moveable finger with strong median protuberance. Legs without irregularities, propodal heel well-developed, with group of about eight prominent spines, claw slender, curved similarly along both margins. Eight indistinct eye lenses.

*Remarks*. A few additional comments are made to compliment the original description. The proboscis has a strong dorsal constriction at about one-third its overall length dividing two inflated parts before tapering to a rather elongate terminal part and jaws (plate 12b, d). The ventral surface of the proboscis is without an obvious constriction. The dorsodistal-most inflated part is accentuated by a dorsomedian blister-like swelling. This swelling is found in several other species also and is most apparent in lateral view where dissimilarities in the dorsal and ventral surfaces are evident. The jaws are surrounded by a setiferous fringe. In lateral view, the anterior margin of the eye tubercle slopes to the base of the crop without evidence of a defined neck (fig.10a, plate 12b). The legs are without peculiarities or irregularities. The original diagnosis of this species described the propodal heel as not prominent and with four strong spines (Arango 2009: 9) but the propodus of the holotype agrees more so with figure 5B in that paper, which shows a prominent heel with a random group of about ten spines. Only two legs (both detached) have the propodus intact and in both cases the claw has an irregular shape (fig.10d, plate 12h). The claw and propodus are connected by a wide membrane. Two lenses are evident in some eyes while others are less distinct (Plate 12d). Eight eye lenses are recorded here for the species.

***Pallenella nuyts*** sp. nov.

Figure 11a–h. Plate 13a–f

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*Material examined*. Holotype. Male (SAMA E9446). Nuyts Archipelago, two nm South of Carnan reefs, 20–30 m, 32° 41′S, 133° 16′E, rocky reef, L. Hobbs, 22 Jan 1991.

*Diagnosis*. Trunk segments inflated dorsodistally. Pre-ocular surface of cephalon with an acute median mound divided by cuticular line that extends beyond apex of crop, neck short. Four eyes, each with single lens. Chela fingers moderately robust, moveable finger evenly curved. Leg segments slender, heel low, merging into sole, five linear spines. Oviger claw pointed. Anal tubercle inclined, only a little taller than basal width, cleft at tip.

*Description*. Holotype, leg span about 23.0 mm. Trunk smooth, dorsoposterior surface of trunk segments inflated (plate 13b). Lateral processes 3 and 4 separated by little less than half width, length of each process about 1.5 times base width. Pre-ocular surface of cephalon with acute median mound divided by cuticular line (fig. 11b), neck sloping downwards from base of eye tubercle, rising sharply to inflated crop.

Eye tubercle height about equal to width, the number of eye lenses is unclear, but eight indistinct lenses appear to be present, two dorsal papillae.

Proboscis dilated at about one third and two thirds overall length, distal-most inflated part covered in microscopic setae and with rather inconspicuous blister-like, dorsomedian swelling, oral surface surrounded by dense setiferous fringe (plate13c).

Chelifore fingers of equal length, both fingers slightly compressed towards tips, proximal half of immoveable finger with swollen outer surface, moveable finger mostly evenly curved, cutting edges of both fingers heavily chitinized, immoveable finger with low proximal protuberance, moveable finger with strong indentation in mid-region creating a conspicuous gap, tiny setae extend along the dorsal margin of the palm and proximal half of both fingers (fig. 13f, plate 13f).

Ovigers typical of males, bases originating immediately in front of first lateral processes but not in contact, directed ventrally, segment 5 longest with tall distal apophysis, compound spine formula, segments 7–10, 14:11:9:9 (43 spines). Claw about half-length segment 10, narrow, lateral teeth blunt at tips.

Anal tubercle inclined upwards at about 45 degrees, short, inflated, only a little taller than basal width, strongly cleft at tip.

Legs spinous, spines mostly tiny but robust, with few longer spines, spines placed on small papillae resulting in slightly roughened appearance under magnification. Coxa 1 with several tiny dorsodistal spinules, second coxa little more than three times length of coxa 1, coxa 3 with small dorsal swelling and many short ventral spines, tibia 2 longest, femur marginally longer than tibia 1, widest distally, gently bowed upwards, tarsus with two strong ventrodistal spines of similar size, propodal heel low, merging into sole, five primary spines, linear, increasing in height distally, followed by two, lesser side-by-side spines, sole almost straight, about eleven sole spines accompanied by many small lateral spines, claw reaching to base of heel when closed, outer margin of claw only slightly swollen than inner margin. Gonopores ventrodistal, legs 3 and 4.

*Measurements of holotype (mm)*. Trunk length (frontal margin of cephalic segment to tip of fourth lateral processes), 3.12; width across second lateral processes, 1.43; proboscis length (ventral), 1.02; greatest diameter proboscis, 0.22; scape length; 0.96; anal tubercle length, 0.16. Oviger (segs 2–10): seg 2. 0.34; seg. 3, 0.22; seg. 4, 1.02; seg. 5, 1.18; seg. 6, 0.26; seg. 7, 0.32; seg. 8, 0.28; seg. 9, 0.24; seg. 10, 0.22; claw, 0.12**.** Leg 3: coxa 1, 0.36; coxa 2, 1.16; coxa 3, 0.47; femur, 2.49; tibia 1, 2.43; tibia 2, 3.10; tarsus, 0.14; propodus, 0.69; claw, 0.55.

*Etymology*. Named after the type locality, Nuyts Archipelago, South Australia.

*Remarks*. The remains of egg bracelets are still attached to the ovigers. This specimen can best be compared with three other very similar species; *P. inflata*, *P. karenae* and *P. gracilis*. These species share an inclined anal tubercle, chela fingers that narrow conspicuously towards the pointed tips and legs with a roughened surface due the many tiny spines being placed on small papillae or sockets, and a weakly defined propodal heel. Whilst these species appear to share an acute conical pre-ocular surface, the shape of the pre-ocular surface of *P. gracilis* is rather ambiguous. Arango and Brenneis (2013) described the adult male *P. gracilis* holotype with a raised mid-dorsal mound and a fine longitudinal line limited to the anterior margin, but in the same paper (Table 3.) the authors state that pre-ocular mid-dorsal mound is absent. Subsequently, Brenneis et al. (2020) state that *P. gracilis* shares an acute pre-ocular mid-dorsal mound with *P. karenae*. Both the *P. karenae* holotype and the specimen discussed in the 2020 paper were sub-adult,

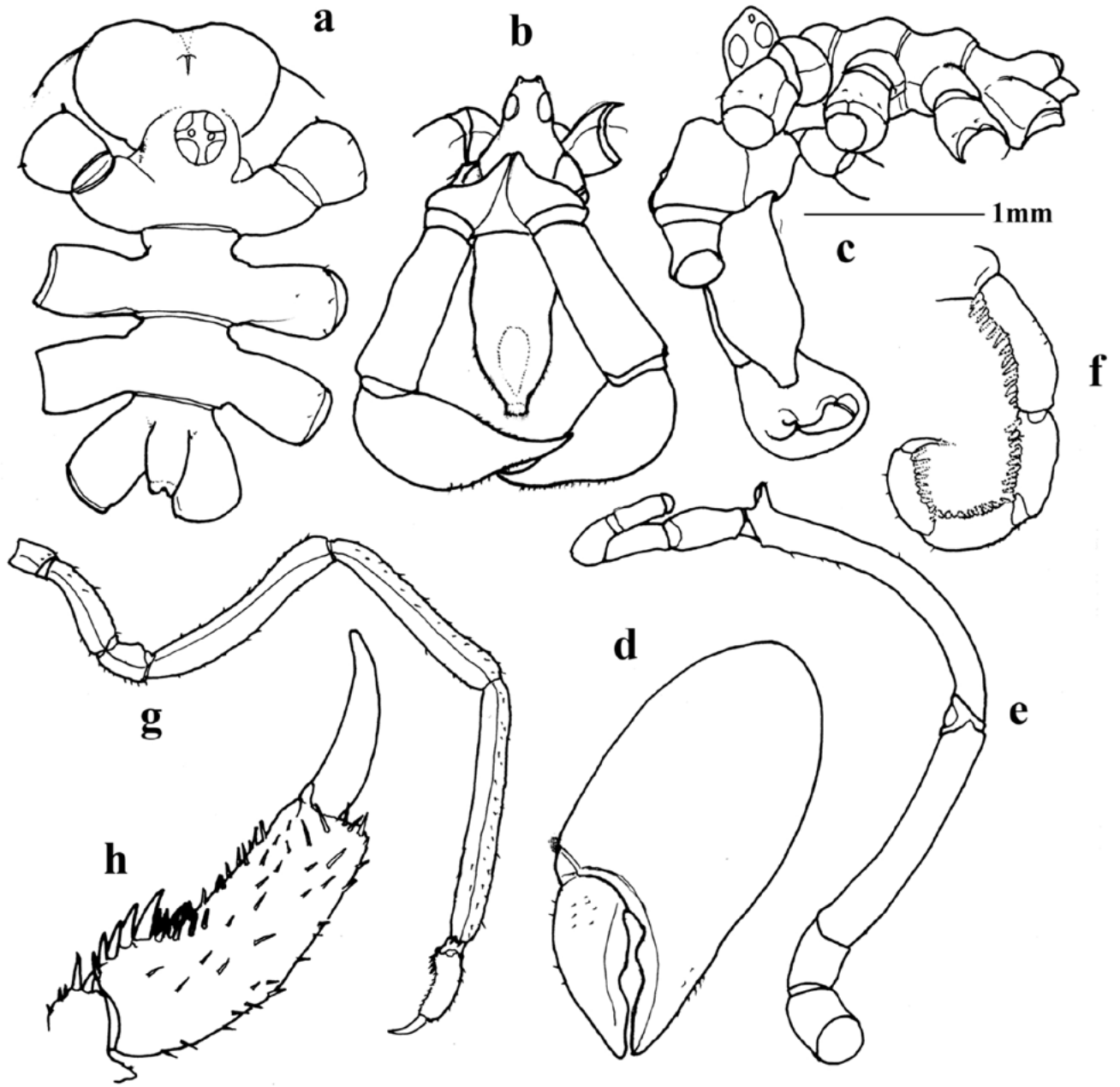


Figure 11. *Pallenella nuyts* sp. nov., male, holotype (SAMA E9446). a, b trunk, dorsal and lateral views: c anterior view; d, right chela; e, left oviger; f. strigilis segments 7–10; g, leg 3; h, propodus.

raising the possibility that development of the pre-ocular mound is age-related. For this analysis, the tip of the pre-ocular mid-dorsal mound in *P. gracilis* is regarded as being acute and the longitudinal cuticular line is only seen in anterior view. The absence of an extended longitudinal division line on the pre-ocular surface of the adult *P. gracilis* distinguishes that species, *inter alia*, from *P. inflata* and *P. karenae*. With a leg span of about 23mm this specimen is much smaller than *P. gracilis* (leg span about 30mm) but larger than either *P. inflata* or *P. karenae* which have leg spans of 16–17 mm. *Pallenella nuyts* is the only species amongst this group where the cutting edges of the chela fingers are conspicuously uneven.

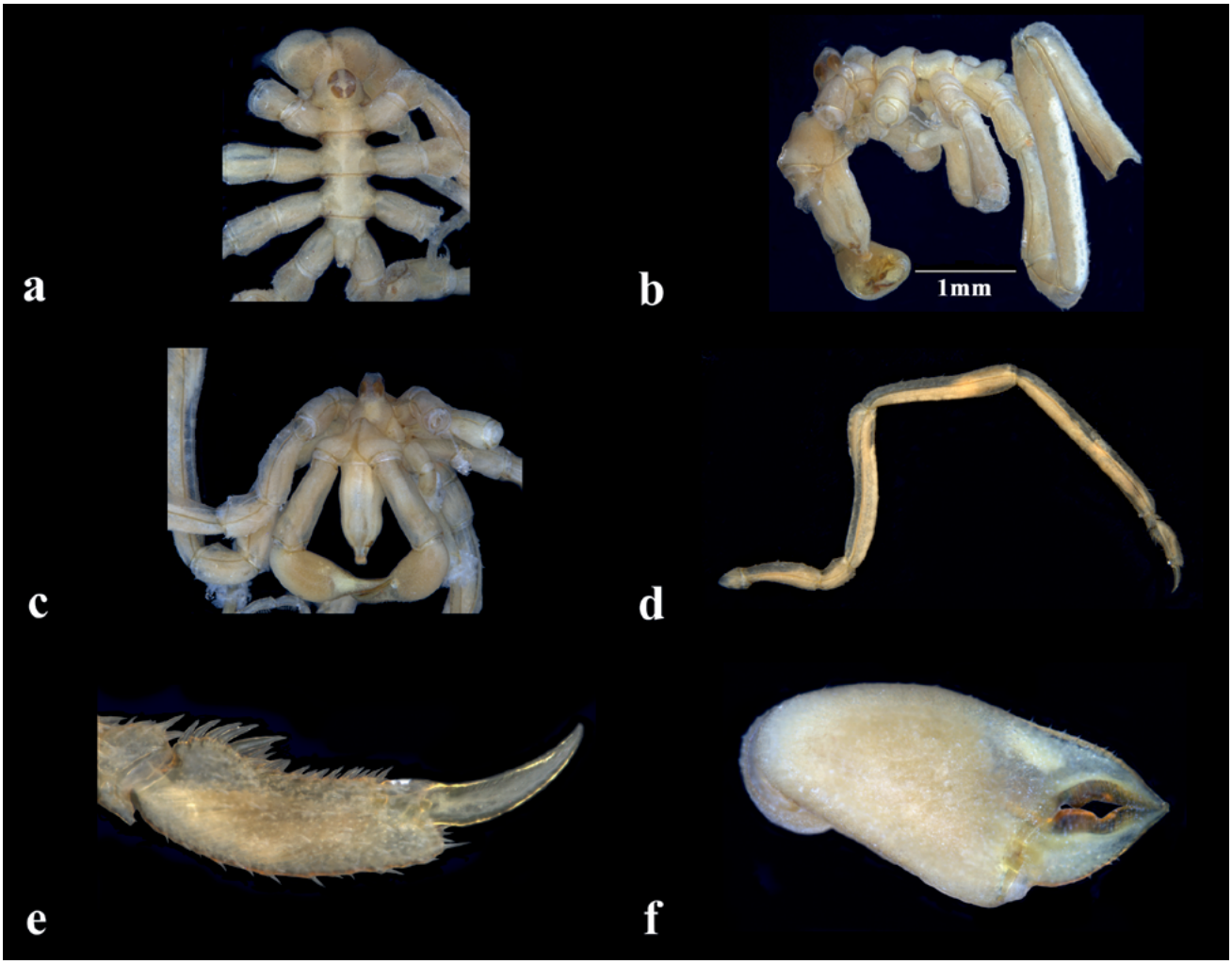


Plate 13. *Pallenella nuyts* sp. nov. male, holotype (SAMA E9446): a–c, trunk, dorsal, lateral and anterior views; d, leg 3; e, propodus; f. right chela.

***Pallenella smithi*** sp. nov.

Figure 12a–h. Plate 14a–f

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*Material examined*. Holotype. Male, egg-bearing (SAM E9451). Backstairs Passage (35° 35′S, 137° 55′E), 41 m, Dr. Verco, 19 Jan 1896.

*Diagnosis*. Pre-ocular cephalon dorsal surface low, rounded, hardly raised, longitudinal cuticular division best-defined on anterior surface, neck short. Eyes rather small for genus, eight lenses. Anal tubercle horizontal. Chela palm conspicuously inflated, fingers robust, shorter than palm, moveable finger slightly shorter than immoveable finger, strongly curved, cutting margins heavily chitinized, touching near tips, gap widening proximally, moveable finger cutting edge recessed proximally. Propodal heel low, with three or four strong spines, sole gently curved, spines random and abundant, claw evenly curved along both margins, reaching to middle heel spine when closed. Second coxa three-times the length of coxa 1.

*Description*. Leg span about 39 mm. Trunk (plate 14a) smooth, lateral processes 1 and 2 separated by about half own diameter, spacing between subsequent processes diminishing posteriorly, length of lateral processes more than 1.5 times basal width. Pre-ocular surface of cephalon low, rounded, mid-region hardly raised in anterior view, longitudinal cuticular line most evident on anterior surface, fading distally, neck well-defined, shorter than width.

Eye tubercle height about equal to basal width, eight eye lenses, sense organs prominent.

Proboscis (plate 14b) with shallow constrictions at about one-third and two-thirds length, distal-most inflated part with obscure dorsomedian swelling, jaws fringed with setae partly hidden by dark staining, basal arthrodial membrane extended and broad in this specimen.

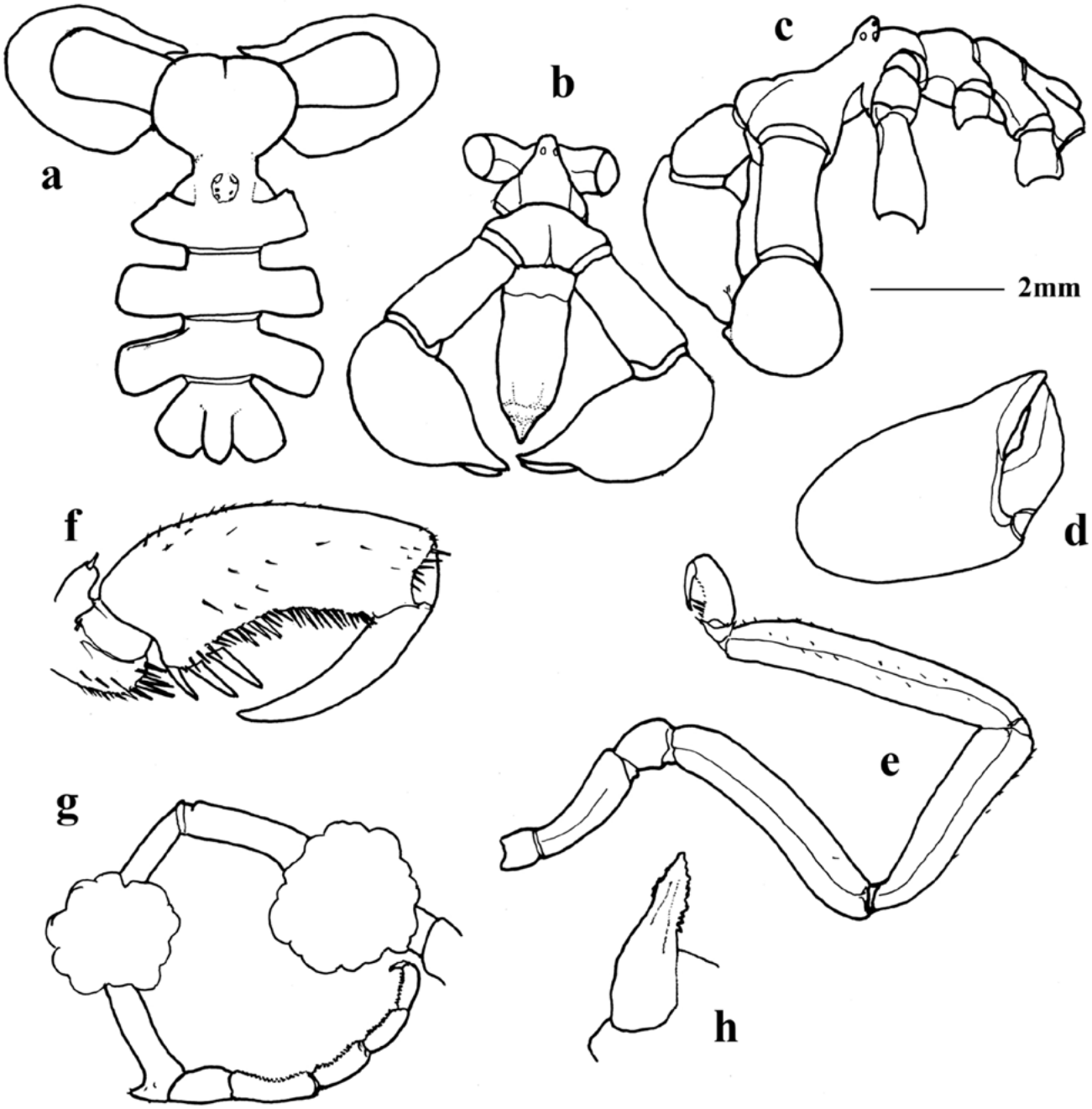


Figure 12. *Pallenella smithi* sp. nov., male, holotype (SAMA E9451): a–c, trunk, dorsal, anterior (proboscis extended) and lateral view; d, right chela; e, f, leg 3 and propodus; g, h, right oviger and claw.

Chela (plate 14d) palm bulbous, tips of chela fingers dark, fingers much shorter than palm, immoveable finger slightly longer, outer margin of moveable finger strongly curved, fingers touching near tips, gaping for most of length when closed, spacing increasing proximally, cutting edges both fingers heavily chitinized, without protuberances on inner or outer margins, moveable finger cutting edge strongly recesses at base.

Oviger bases originating immediately in front of first lateral processes but not in contact, directed ventrally, oviger typical of male, segment 5 longest, distal apophysis bearing about eight tiny surface spines, segment 4 next longest, compound spine formula, segments 7–10, 16:14:13:11 (54 spines), distal-most and proximal-most spines off-set, terminal claw little more than half length of segment 10, slightly angled

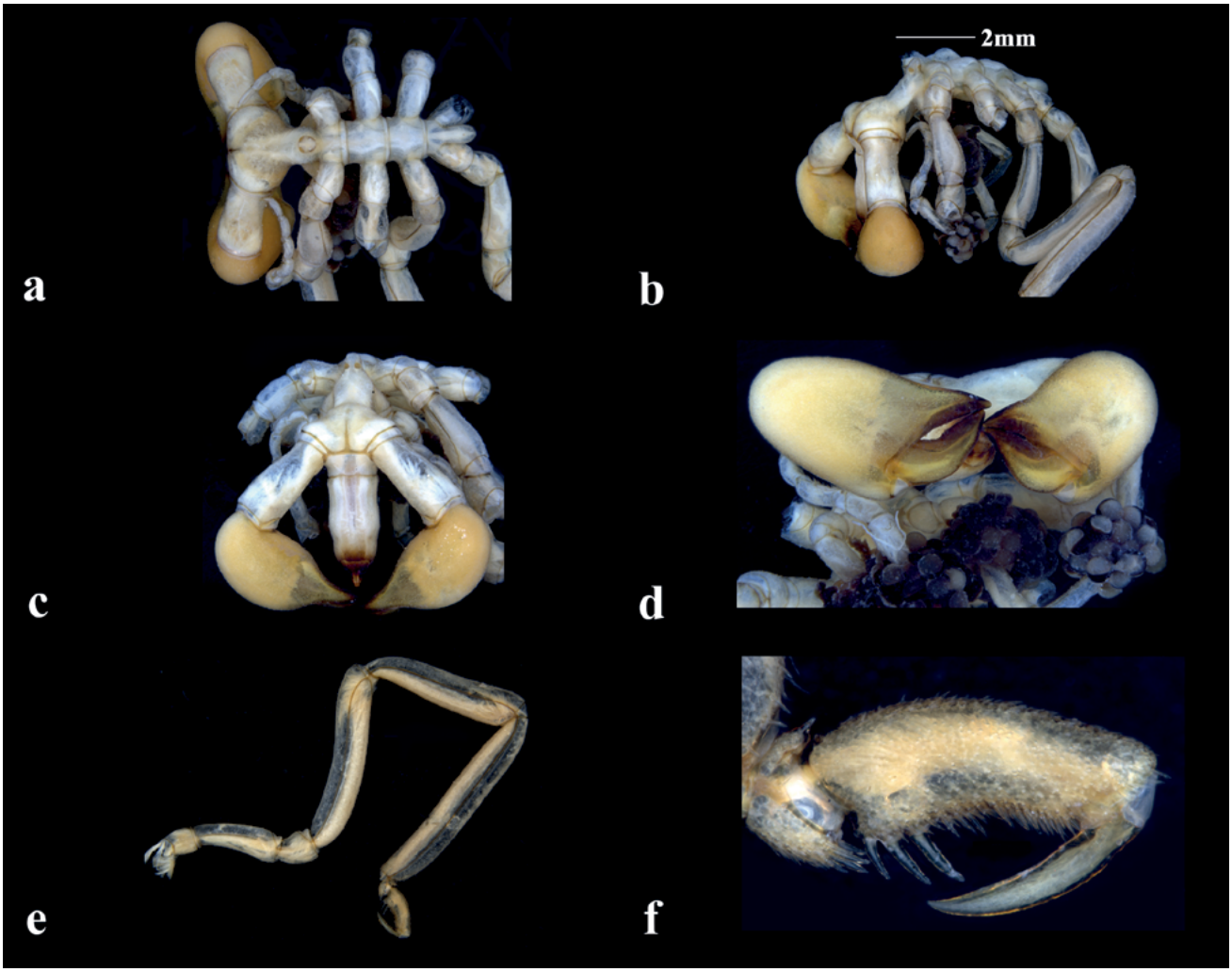


Plate 14. *Pallenella smithi* sp. nov. male, holotype (SAMA E9451): a–c, trunk, dorsal, lateral and anterior views showing extended proboscis with stained tip; d, chelae; e, leg 3; f, propodus.

outwards, narrow, pointed, both distal margins serrated but difficult to interpret, possibly worn.

Anal tubercle horizontal, inflated, not quite reaching ends of first coxae.

Legs (fig. 12e, plate 14e) with thickened lateral cuticular line running full length to tarsus. Coxa 2, almost three times length of coxa 1, with small inconspicuous subterminal cone on dorsal surface, tibia 2 longest segment, femur slightly curved, longer than tibia 1, tarsus with distal group of about four sharp spines on ventral surface and many scattered smaller spines, propodal heel low, three strong linear spines, proximal-most spine shortest, sole weakly curved, with random and crowded field of sharp spines, claw curved similarly along both margins, reaching to middle heel spine when closed. Gonopores ventral, coxa 2, legs 3 and 4.

*Measurements of holotype (mm).* Trunk length (frontal margin of cephalic segment to tip of fourth lateral processes), 5.80; width across second lateral processes, 2.67; proboscis length (dorsal), 2.01; greatest diameter proboscis, 0.95; scape length; 1.66; anal tubercle length, 1.08. Oviger (segs 4–10): seg. 4, 2.43; seg. 5, 2.55 (across chord of arc); seg. 6, 0.53; seg. 7, 0.63; seg. 8, 0.46; seg. 9, 0.44; seg. 10, 0.39; claw, 0.18**.** Leg 3 (anterior side): coxa 1, 0.68; coxa 2, 1.92, coxa 3, 0.61; femur, 4.07; tibia 1, 3.74; tibia 2, 4.90; tarsus, 0.09; propodus, 1.11; claw, 0.76.

*Etymology.* This species is named for the late Dr Brian J. Smith, Senior Curator, Division of Zoology, Museum of Victoria who actively encouraged and mentored researchers to work on the museum collections.

*Remarks.* A single group of eggs is held on each of oviger segments 4 and 5. Most eggs are of uniformly dark colouring, but some are bi-coloured (plate 14d). The longitudinal division of the cephalon is most evident on the anterior margin and fades towards the mid-region of the crop (plate 14a). However, the

extent of the longitudinal cuticular line can be ambiguous as shown in plate 14a, b). The proboscis has shallow constrictions at about one-third and two-thirds its length and is strongly stained distally, obscuring the presence of setae that may be lining the jaws. In part, the staining, highlights the presence of a dorsomedian swelling on the anterior surface (plate 14c).

This species belongs to a group of five that share robust chela fingers, a strongly curved moveable finger, a horizontal anal tubercle, a low propodal heel with spines arranged linearly and a weakly-curved sole. The other four species in this group are *P. ambigua, P. harrisi, P. pachycheira* and *P. watsonae*. Two species are immediately recognized by distinctive characters *P. pachycheira* by strong annular constrictions at about one-third and two-thirds the lengths of the longer segments of the legs (plate 16d) and *P. watsonae* by the short, chela fingers with rounded tips and extremely large protuberances on the cutting edges (plate 21a, b). Brenneis et al. (2020) designated several specimens from Eaglehawk Neck, Tasmania as *P.* cf. *ambigua*. *Pallenella* cf. *ambigua* was recovered as the genetically closest congener to *P. harrisi* but the authors cautioned that morphological and genetic analyses of both species remain under investigation. The type locality of *P. harrisi* is Bass Point, NSW and whilst it is easiest to distinguish live specimens by colour markings, morphological differences are less apparent. The authors observed strong morphological similarities with *P.* cf. *ambigua* (and the *P. ambigua* holotype) but noted that the *P. harrisi* specimens have a proportionately shorter scape, a more inflated chela palm and exceed *P.* cf. *ambigua* in chela height and robustness of the fingers (Brenneis et al. 2020). Considering morphological uncertainties, the authors chose not to distinguish *P.* cf. *ambigua* and *P. harrisi* in their key which can be followed down to couplet 11. Based on available images, the proboscis of *P.* cf. *ambigua* (Brenneis et al. 2020: plate 13B) also appears to be wider, and with a less tapered tip than either the *P. ambigua* holotype (plate 19c herein) or *P. harrisi* (Brenneis et al. 2020, plate 13B´). Apparent differences in proboscis shape aside, the pre-ocular surface of *P. harrisi* is distinctly divided by what appears to be a conspicuous median cuticular division extending to at least the somewhat cleft apex of the pre-ocular surface (see Arango and Brenneis 2013, Fig. 13C) as opposed to the *P. ambigua* holotype which has a low, evenly rounded pre-ocular surface with the cuticular division restricted to the anterior surface. The spine counts of the *P. harrisi* holotype is 51, and the *P. ambigua* holotype is 44, which further supports their independent status. The oviger spine count of *P.* cf. *ambigua* was not recorded. It is interesting to observe that the chela moveable finger of *P. harrisi* is described with a mid-point lobe on the cutting edge and Stock (1956) described the moveable finger of *P. ambigua* as having an insignificant, central, rounded protrusion on the inner side, but in neither case was this figured by the authors. Additional images of the *P. ambigua* holotype are provided for comparison (plate 19a–f).

A compelling argument for assigning this specimen to *P. harrisi* could be mounted based on the sharing of a bulbous chela palm and the similarity in the number of oviger spines (*P. harrisi*, 51 spines versus *P. smithi* sp. nov., 54 spines). There are however, a number of differences that support their independent status: (1) the propodus of *P. harrisi* is more elongate and has a broader claw, with a more rounded and swollen outer surface (compare Arango and Brenneis 2013, fig. 13D with plate 14f), (2) the proboscides are dissimilar (compare Brenneis et al. (2020, fig. 13B') with plate 14c herein, (3) no mid-point lobe or protuberance is present on the cutting edge of the moveable finger (in outer or inner view) of this specimen, (4) the pre-ocular surface mound of *P. harrisi* appears to be elevated and more acute, compared to the rounded surface of *P. smithi* (compare Arango and Brenneis 2013 fig. 13C with plate 14b herein). There is no record of the distinctive colour form of *P. harrisi* south of Montague Island on the south coast of NSW and it is reasonable to assume that in the absence of notes on the label, this South Australian specimen lacked the striking colours and body markings of the NSW specimens. Of course, that species may be present in other colour forms. This male agrees with the *P. ambigua* male holotype in the shape of the proboscis and chela (compare plate 19c, d; with *P. smithi* plate 14c, d herein). There are however, a number of differences that distinguish the species and which can be summarized as follows: (1) the total number of oviger compound spines in *P. smithi* is greater (54 spines versus 44 spines in *P. ambigua*), (2) the propodus of *P. smithi* is more strongly curved and with longer, more slender heel spines (compare plate 14f with *P. ambigua* plate 19F), (3) the propodal claw of *P. smithi* is more slender and with inner and outer margins equally curved, versus outer margin more strongly curved and inner margins straight for most of its length in *P. ambigua*, (5) based on Stock's measurements, coxa 2 of *P. ambigua* is slightly more than twice the length of coxa 1 (2.1 times) versus coxa 2 of *P. smithi* is closer to three times (2.8 times) the length of coxa 1. Considering more recent observations, Bamber's (2005) record of *P. ambigua* from Esperance Bay will require confirmation.

***Pallenella georgia*** sp. nov.

Figure 13a–h. Plate 15a–h

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*Material examined*. Holotype. Ovigerous male (SAMA E9443). Boston I., Kangaroo Reef, off Maria Point, 34° 42´S, 135° 56´E, large boulders, reef rubble, kelp, sparse *Posidonia,* 3–8 m, W. Zeidler and K. Gowlett-Holmes, 17 Feb 1988.

Paratype. One ovigerous male (SAMA E9444). Same collection details as holotype.

*Diagnosis*. Cephalon pre-ocular surface flat, cuticular division absent. Neck short, defined in dorsal and lateral views. Trunk segments not inflated dorsally, lateral processes 3 and 4 separated by about half basal diameter. Chela fingers slender, pointed, cutting edges with proximal raised areas but without defined lobes. Eight eye lenses. Heel prominent, primary spines linear, with one or two lesser, but nevertheless strong, spines on the margins; sole with about twelve spines plus many smaller marginal spines. Legs slender. Anal tubercle horizontal.

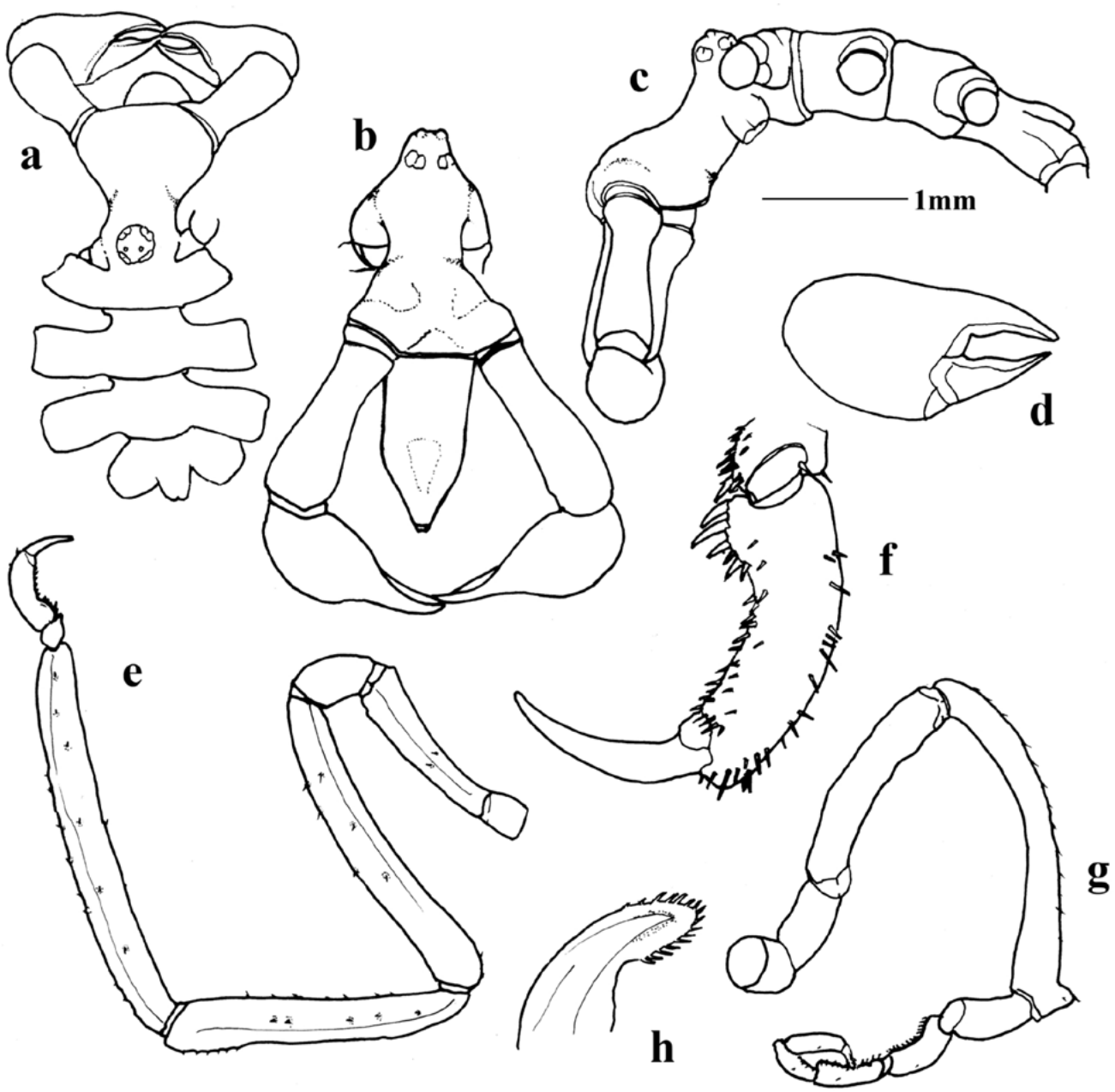


Figure 13. *Pallenella georgia* sp. nov., male, holotype (SAMA E9443): a, b trunk, dorsal and anterior; d, right chela; g, h, right oviger and claw. Paratype, male: c, trunk lateral; e, f, leg 3 tarsus and propodus.

*Description*. Leg span about 29.0 mm. Trunk (plate 15a) glabrous, lateral processes 3 and 4 separated by half own diameter or less, length one-third longer than basal width. Cephalon smooth, pre-ocular surface not mounded, without median cuticular division; neck short, defined in dorsal and lateral views, length slightly less than width (plate 15g).

Eye tubercle low, width greater than height, eight lenses, two dorsal papillae (plate 15h).

Proboscis length 2.3 times greatest width, margins of proximal half almost parallel, slightly dilating distally before narrowing to tip, jaws lined with tiny setae. The distal-most inflated part of the proboscis is accentuated by a dorsomedian blister-like swelling (fig. 13b).

Chela fingers slender, pointed, moveable finger marginally shortest, chitinous cutting edges, translucent, striated, margin of cutting edge of moveable finger slightly raised proximally,

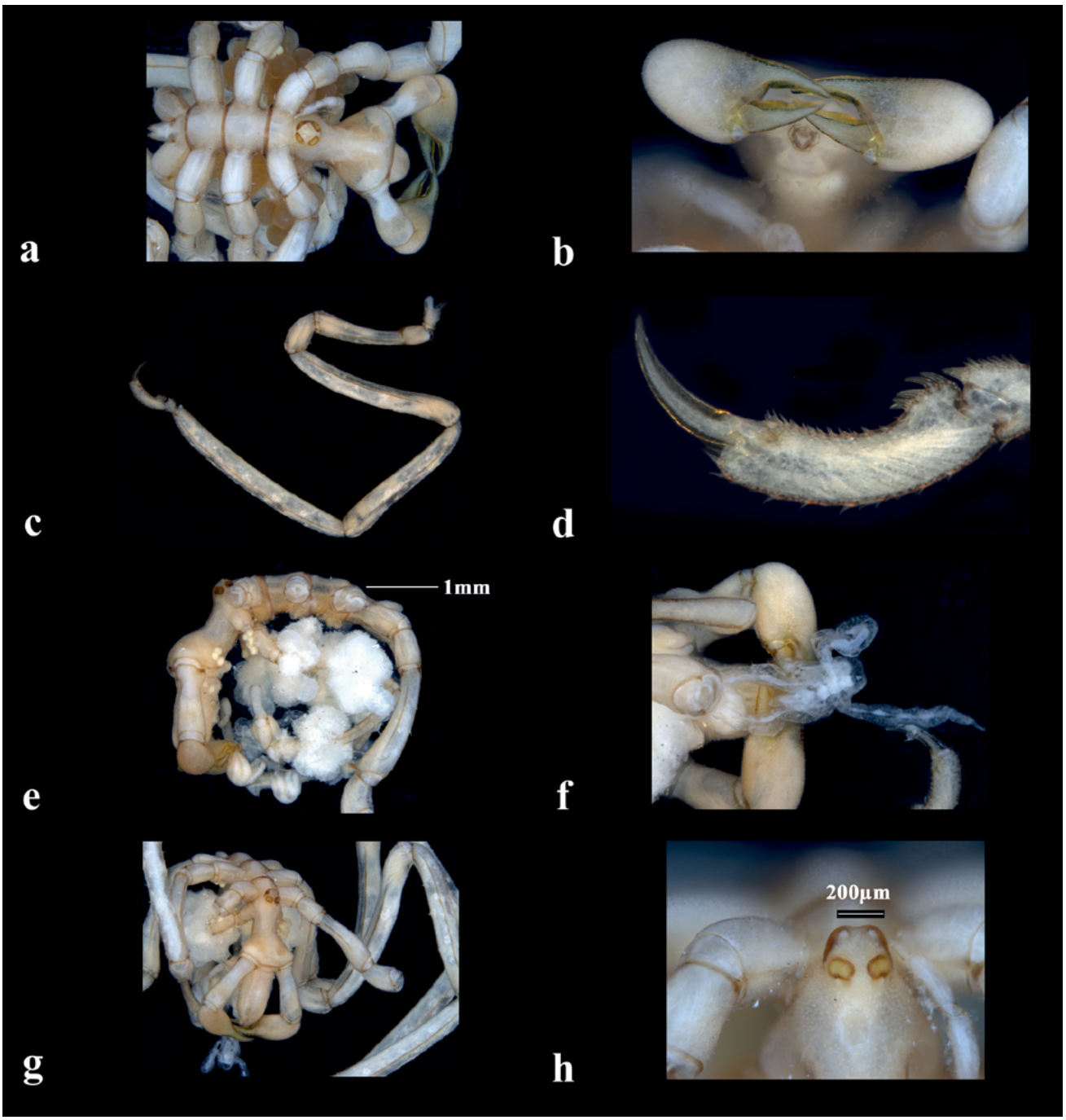


Plate 15. *Pallenella georgia* sp. nov., male, holotype (SAMA E9443): a, trunk, dorsal; b, chelae; c, leg 3; d, propodus. Paratype (SAMA E9444): e, trunk lateral showing egg mass; f. attached protonymphon; g, anterior view; h, eye tubercle anterior view.

gap between cutting edges increasing proximally creating a wide gap at bases when closed (plate 15b).

Oviger typical of males in the genus, segment 5 longest with distal apophysis, compound spine formula, segments 7–10, 14:10:9:8 (41 spines), proximal and distal spines offset from median row, terminal claw rounded at tip, fringed by well-defined, sharp teeth on both distal margins.

Anal tubercle horizontal short, inflated.

Legs sparsely spinous, spines tiny, each placed centrally on rounded mound surrounded by pale cuticle (plate 15c). Coxa 2

dorsal surface finely rugose, length about 3.5 times coxa 1, femur weakly bowed, tarsus with single, prominent ventrodistal spine flanked and preceded by many lesser spines, propodus rather slender, length about 3.3 times width measured at base of heel, curved, heel well-developed, about six primary spines arranged linearly, second spine largest, distal three spines smaller, one or two similar lateral spines, sole slender, gently curved, about fifteen spines, claw slender, both margins almost evenly curved, reaching to about mid-heel when closed. Gonopores ventrodistal, second coxae legs 3 and 4.

*Measurements of holotype (mm)*. Trunk length (frontal margin of cephalic segment to tip of fourth lateral process), 3.34; width across second lateral processes, 1.71; proboscis length (dorsal), 1.10; greatest diameter proboscis, 0.47; scape length; 0.98; anal tubercle length, 0.28. Oviger (segs 2–10): seg 2. 0.36; seg. 3, 0.40; seg. 4, 0.98; seg. 5, 1.49; seg. 6, 0.34; seg. 7, 0.44; seg. 8, 0.32; seg. 9, 0.32; seg. 10, 0.30; claw, 0.20**.** Leg 3: coxa 1, 0.47; coxa 2, 1.63; coxa 3, 0.61; femur, 3.22; tibia 1, 2.83; tibia 2, 3.77; tarsus, 0.06; propodus, 0.75; claw, 0.51.

*Etymology*. Named for my granddaughter, Georgia Hope.

*Remarks*. Both specimens carry eggs attached to oviger segments 3, 4 and 5. Those on the paratype are white and similar to cotton wool balls accompanied by protonymphon (plate 15e, g) whereas those of the holotype brown and smooth (plate 15a). A number epibionts of unknown origin are present ventrally on both specimens (plate 15e). A fringe of minute setae on the proboscis is best seen by back-lighting but may cover the entire distal surface.

This species belongs to a group of six that share: (1) the absence of a mid-dorsal cuticular division, (2) a pre-ocular surface that is either low or absent, (3) chelifore fingers that are slender and pointed, and (4) a horizontal anal tubercle. These species are: P. *baroni, P. chevron, P. constricta, P. difficile, P. flava* and *P. chevron*. Only *P. constricta* in this group shares a combination of a pronounced propodal heel and linear spines with this species. From *P. constricta*, this species is distinguished most notably by the shape of the proboscis (*P. constricta* with strong mid-constriction and bulbous distal part versus sides almost parallel with slight distal inflation in this species), in the number of oviger compound spines (30 in *P. constricta* versus 41 in this species) and in the shape of the propodal claw (*P. constricta* claw broad, inner margin straight with curved tip, versus claw slender with both margins curved similarly in this species).

***Pallenella pachycheira*** (Haswell, 1885)

Postscript: This reference is often cited incorrectly as Haswell, 1884. The paper was based on records for the year 1884 but published in 1885 (confirmed by Biodiversity Heritage Library and Museums Victoria Library).

Plate 16a–d

Possibly, non *Pallenella pachycheira* Brenneis et al. 2020 (earlier lit. and syn).

One male, (SAMA E9442) South Australia, Coffin Bay, between Farm Beach and The Frenchman, under rocks on encrusting bryozoan, 6m., K. Gowlett, 17 Jan 1988.

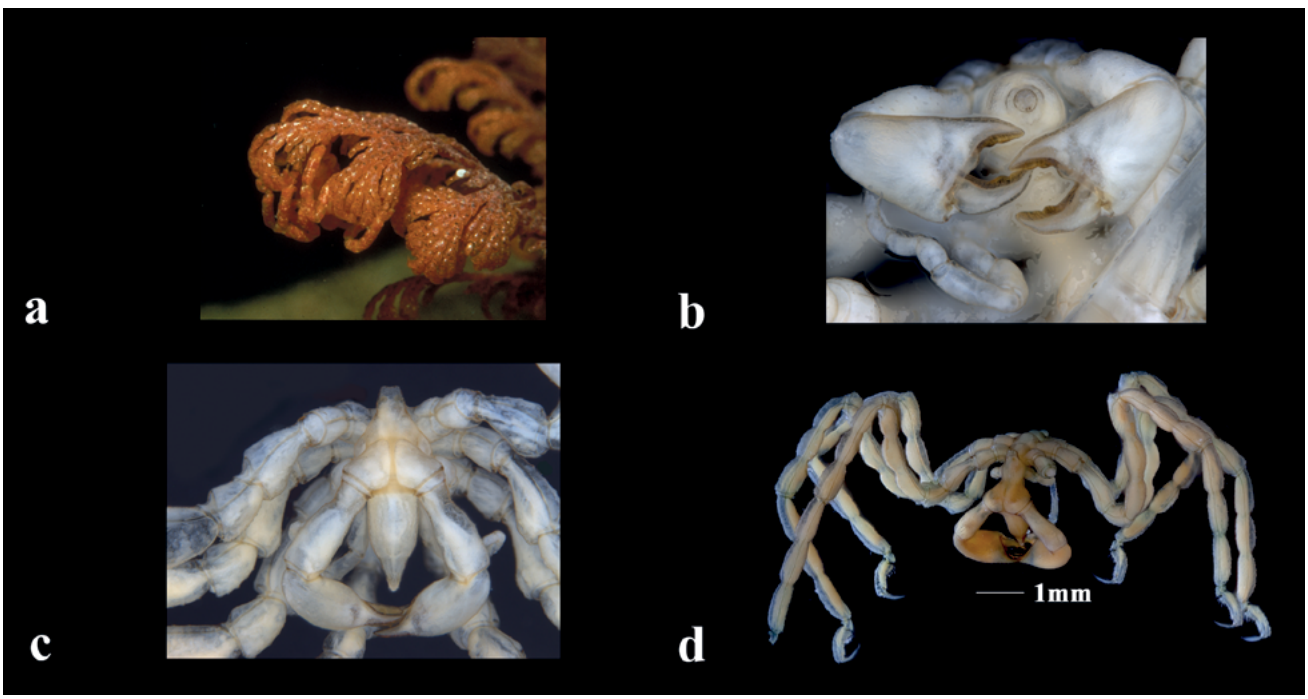


Plate 16. *Pallenella pachycheira* (Haswell, 1885). Unregistered specimens from Victorian waters: a, specimen amongst folds of bryozoan zooids (photo D. Staples); b, chelae; c. proboscis anterior view; d, whole specimen (photo Blair Patullo, Museums Victoria).

*Remarks*. The most common colouring of this species along the southern Australian mainland appears to match the be orange-brown, colour of the host bryozoan, but Arango and Brenneis (2013) recorded a yellow form with orange banding from Eaglehawk Neck Tasmania. Brenneis et al. (2020) again recorded the species from Eaglehawk Neck without commenting on colouring and markings but were able to confirm the genetic alignment of their two collection lots (Arango and Brenneis, 2013). Unpublished records also place this colour form in central Bass Strait, Tasmania. Personal observations of other colour forms and variation in the size of mature specimens, suggest that more than one species has been assigned to *P. pachycheira*. This

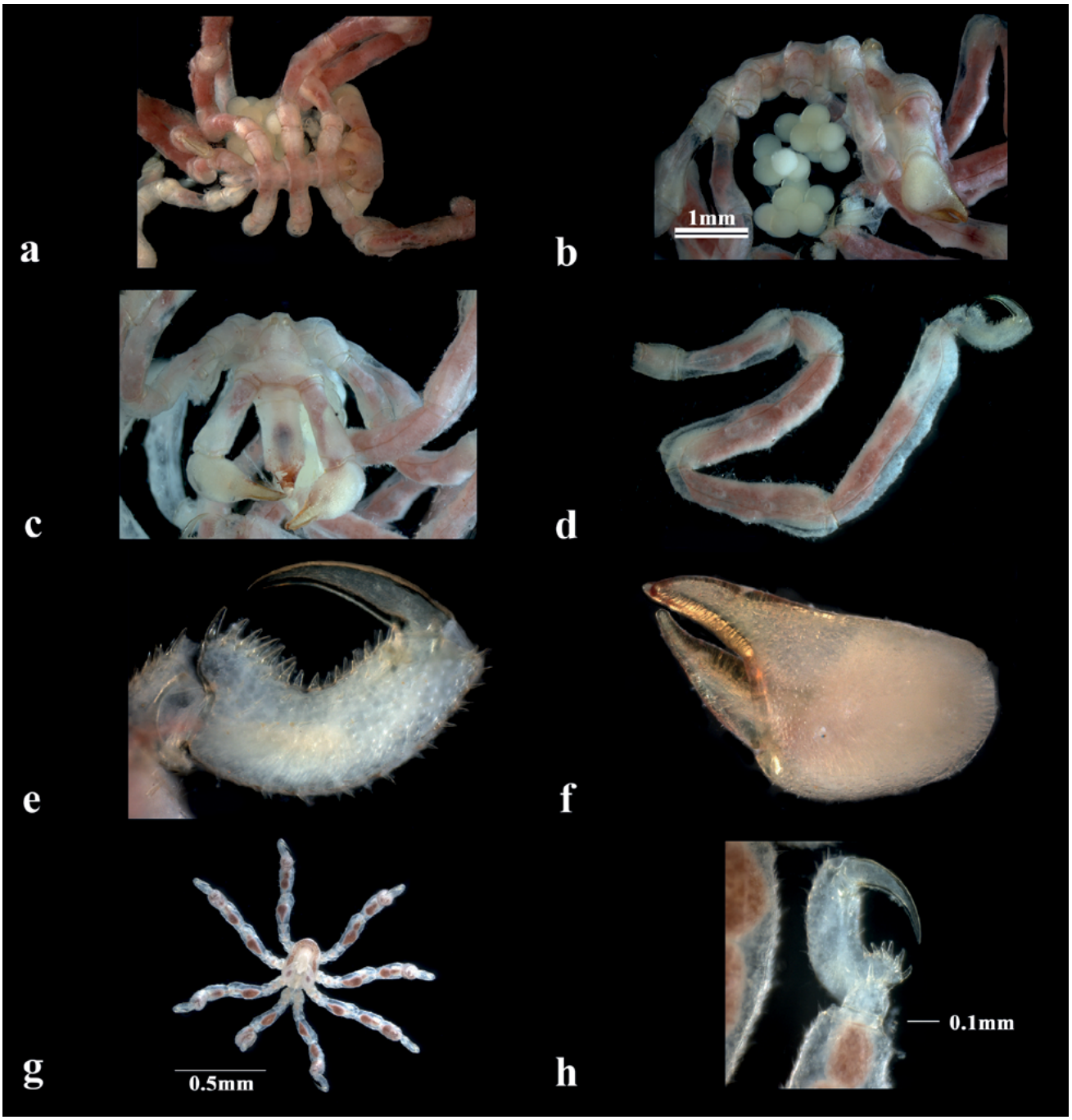


Plate 17. *Pallenella reflexa* (Stock, 1968), male, holotype (SAM E3418): a–c, trunk dorsal, lateral and anterior views; d, leg 3; e, propodus; f, left chela; g, juvenile ventral view; h, juvenile propodus.

South Australian specimen is largely consistent with Flynn's (1919) redescription of Haswell's holotype collected from New South Wales and typical of the form most often encountered along the Australian south-east coastline generally. Unfortunately, Flynn did not refigure the chela of the holotype but based on Haswell's figure (Haswell 1885, plate 57:6) the fingers of the present material and those described by Arango and Brenneis (2013) are far more strongly curved. For the time being this is attributed to differences in artistic interpretation. In agreement with the holotype, each finger of this specimen bears a single rounded projection on the inner central edge as opposed being present on the cutting edge of the moveable finger only, in the Tasmanian specimen. The "very short" proboscis of the holotype described by Flynn is consistent with this material whereas the proboscis of the Tasmanian specimen appears to be more slender and longer. Based on images and figures of the holotype and this specimen, the length of basal inflated part of the proboscis is about 1.4 times the width compared to about 2.7 times in the Tasmanian specimen. Differences in the shape of the propodus are also evident. This specimen has four eyes each with a single lens and shows signs of residual colour but no pattern markings.

Additional images of *P. pachycheira* collected from along the southern Australian mainland are included here for comparison (plate 16a–d).

The annular constrictions of the legs mimic bryozoan zooids and when combined with matching colouring of the host bryozoan, they are extremely difficult to detect in situ (plate 16a).

The legs of *P. reflexa* also share an irregular surface with *P. pachycheira* except that the constrictions of *P. reflexa* are subtle and take the form of undulations (plate 17d). *Pallenella reflexa* has eight eye lenses. Images of the Great Australian Bight specimen, Staples, (2005) are included here (SAM E3418, plate 17a–h).

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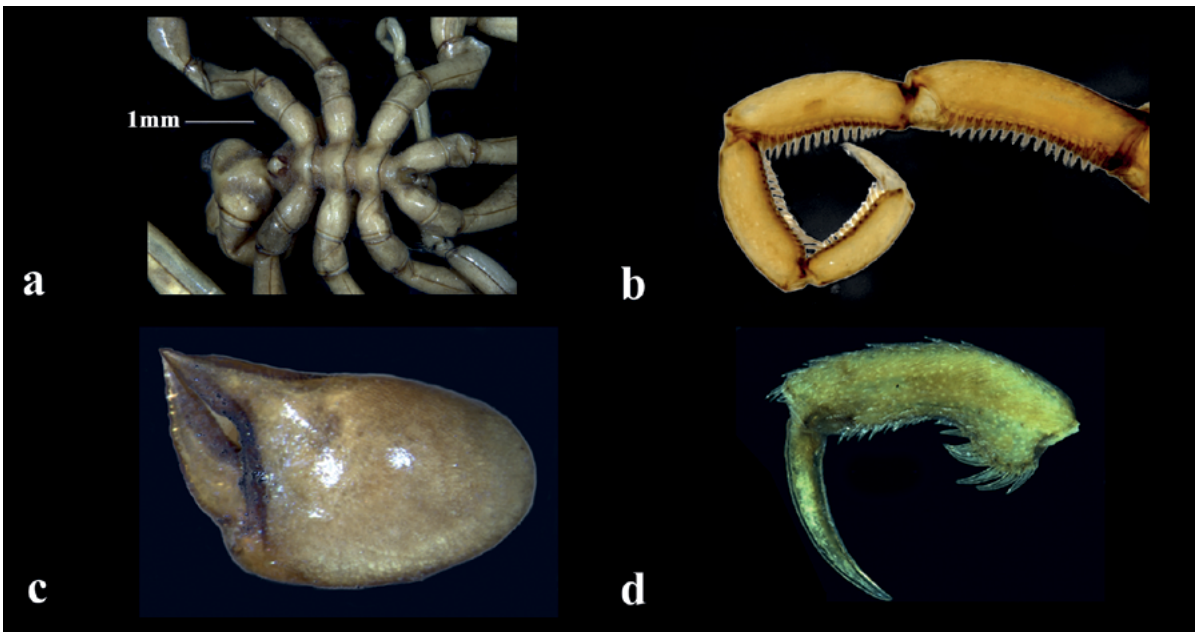


Plate 18. *Pallenella laevis* (Hoek, 1881) female, holotype (BMNH 1881.38): a. trunk dorsal; b, oviger; c, left chela; d, propodus leg 3.

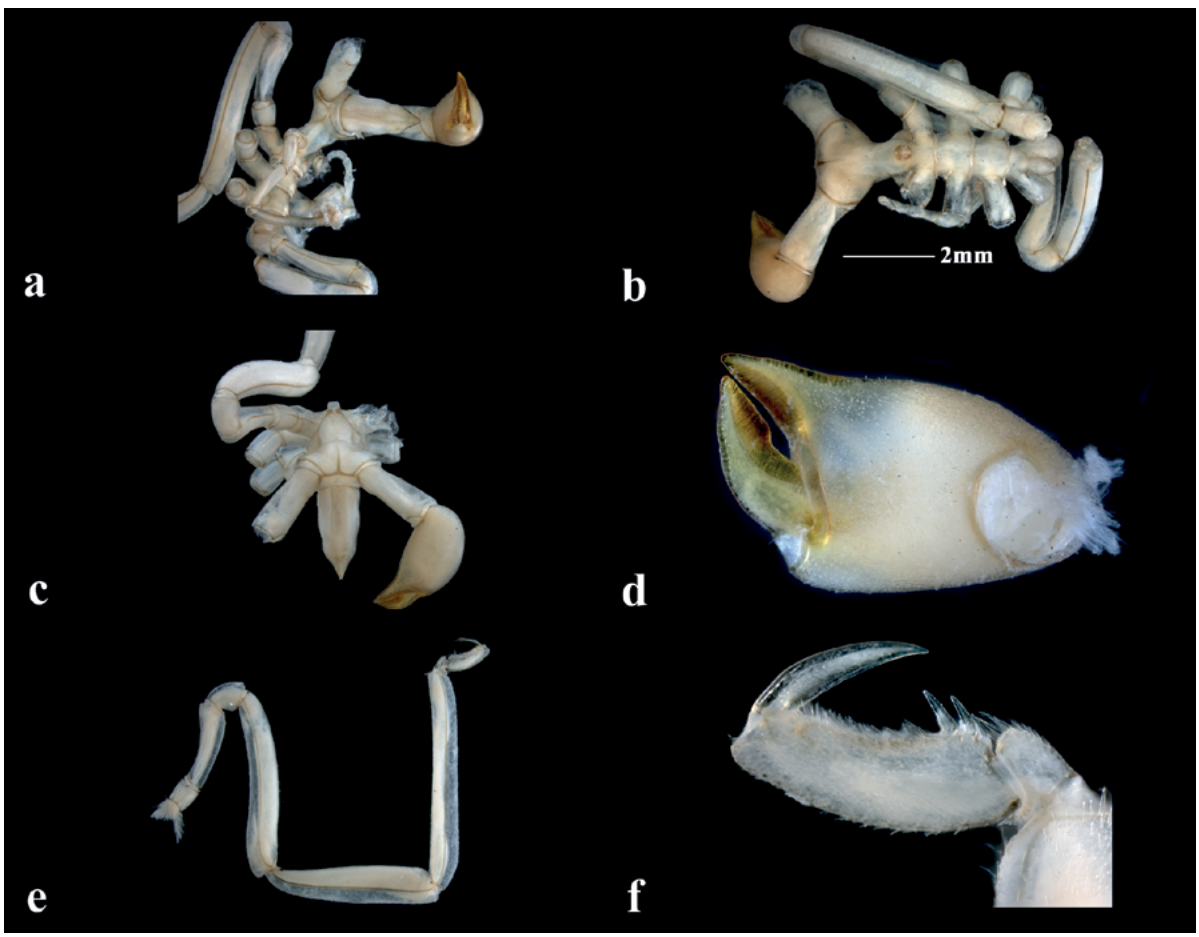


Plate 19. *Pallenella ambigua* (Stock, 1956), male, holotype (Museum Hamburg K 17 680): a–c trunk ventrolateral, dorsal and anterior views; d, right chelae; e, leg 3; f. tarsus and propodus.

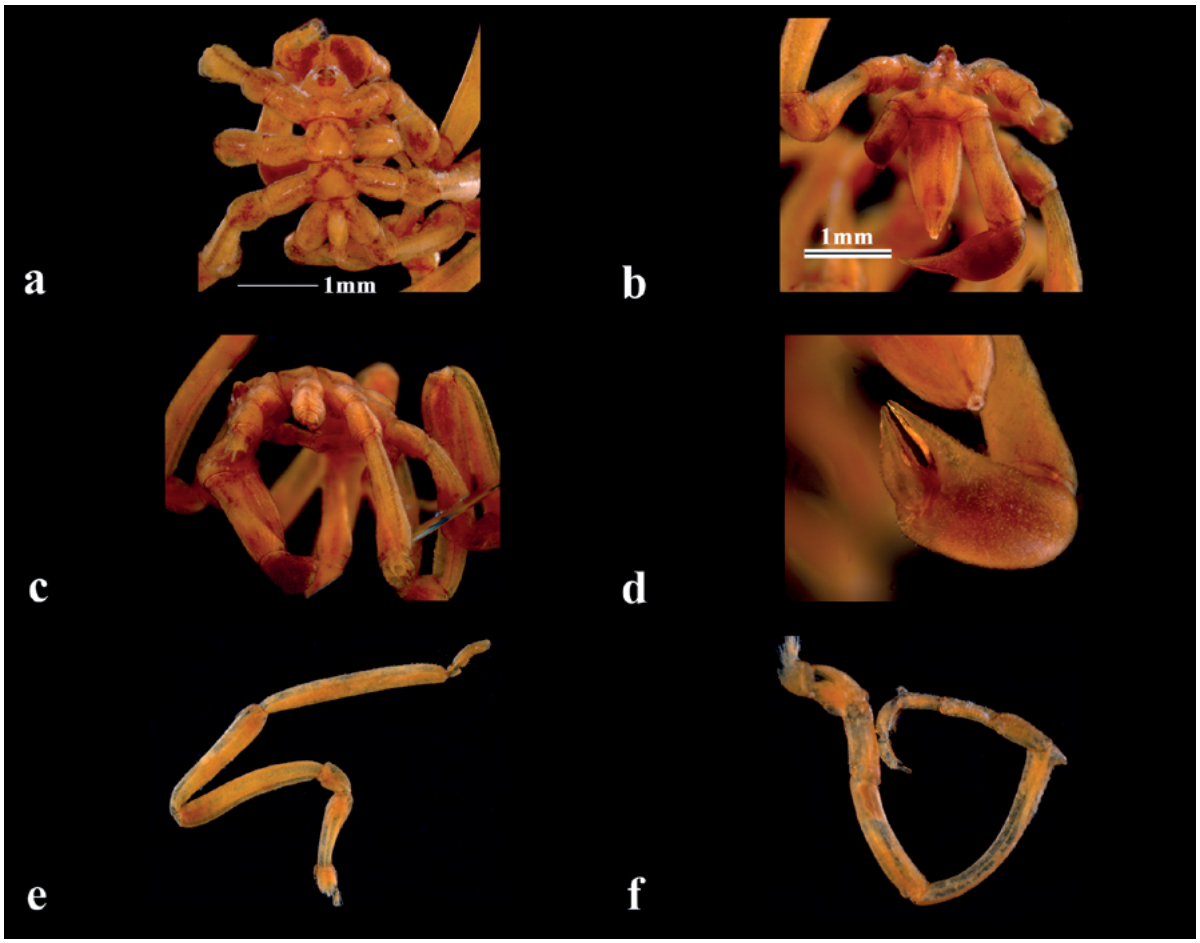


Plate 20. *Pallenella chevron* (Staples, 2007) male, holotype (SAM E3681): a–c trunk, dorsal, anterior and lateral views; d, left chela; e, leg 2 (terminal claw missing); f, oviger.

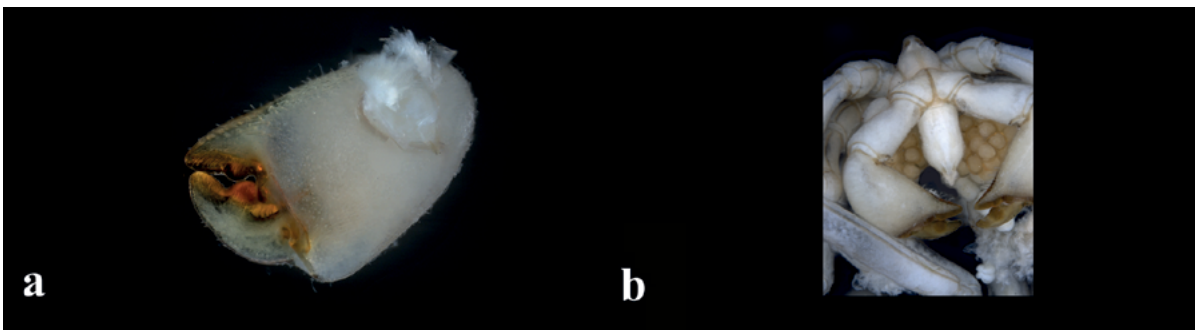


Plate 21. *Pallenella watsonae* (Staples, 2005), male, holotype (SAM E3414): a; right chela, inner view; b, trunk anterior view.