

A new species of *Calantica* from Western Australian waters (Thoracica: Scalpellomorpha: Calanticidae)

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Abstract - A new calanticid species from the tropical waters of Western Australian waters, epizoic on a gorgonian, is described. The presence of 13 capitular plates with apical umbones, arranged in two whorls, narrow peduncular scales and uniaarticulate caudal appendages, as well as the attachment site of the complemental males, warrant this species for inclusion within *Calantica*. Key characters which distinguish the present species from other members of *Calantica* include the form of the scutum and upper latus, and the elongate rostrolatus and carinolatus, which displace the upper latus from the peduncular margin. Therefore, a new species is proposed and is accordingly named *Calantica darwini* sp. nov.

Key words: stalked barnacle, gorgonian, epibiont, Port Hedland, Rowley Shoals.

INTRODUCTION

The genus *Calantica* was first proposed by Gray (1825), but was later synonymised under *Scalpellum* Leach, 1817 by Darwin (1852). Pilsbry (1907) reinstated *Calantica* as a subgenus of *Scalpellum*, elevating it to full generic status the following year (Pilsbry 1908) to encompass six species. Subsequently, Zevina (1978) raised the predominantly Atlantic subgenus *Scillaelepas* to generic rank, leaving predominantly Indo-West Pacific species with *Calantica*. Currently comprising 16 species (Young 2003), it has been 20 years since the last species, *C. moskalevi* Zevina and Galkin, 1989 was assigned to *Calantica*. The present paper describes a new calanticid species from tropical north Western Australian waters, south of the Rowley Shoals.

MATERIALS AND METHODS

Specimens were examined with the aid of microscopy and dissection, and illustrations of the whole animal were made with the aid of a camera lucida and digitally inked using a WACOM Intuos 2 tablet and Adobe Illustrator. Soft parts were cleared, stained with lignin pink and mounted. All measurements are in millimetres. The terminology follows that of Jones (1990, 1992, 1993), Newman (1987, 1991, 1996) and Young (1999). The holotype and four lots of paratypes are deposited in the Western Australian Museum, Perth and one lot of

paratypes is also deposited in The Natural History Museum, London.

The following abbreviations are used: CL, capitular length; CW, capitular width; PL, peduncular length; WAM, Western Australian Museum, Perth; NHM, Natural History Museum, London.

SYSTEMATICS

Infraclass Cirripedia Burmeister, 1834

Superorder Thoracica Darwin, 1854

**Order Scalpelliformes Buckeridge and Newman,
2006**

Suborder Scalpellomorpha Newman, 1987

Family Calanticidae Zevina, 1978

Diagnosis

Scalpelliformes with capitulum protected by six primary calcareous plates or their rudiments, namely rostrum, carina, paired scuta and terga. Secondary plates consist of three pairs of latera, including rostrolatus, upper latus and carinolatus and (except for *Pisiscalpellum*) subcarina, plus various other supplementary capitular plates, to a total of 60+ plates, with as few as nine in reduced forms; umbo of carina apical, sometimes

subcentral; plates arranged in two more or less distinct whorls, those in lower whorl either overlapping, or being overlapped by adjacent plates. Peduncle usually with more or less uniform-sized calcareous scales. Caudal appendages setose, sometimes multi-articulate. Basic mandible with three primary teeth, lower angle pectinate, sometimes smaller secondary teeth form between first and second teeth. Maxillule lacking step-like cutting edge. Small males often associated with larger hermaphrodites or females; males clearly divided into peduncle and capitulum, with six or more small capitular plates.

Remarks

The family Scalpellidae was divided into eight subfamilies by Zevina (1978), based on the number of capitular plates and their degree of development, the position of the umbos, the number of segments in the caudal appendages and the degree of development of the males. The Calanticinae embraced five genera, namely *Calantica* Gray, 1825; *Euscalpellum* Hoek, 1907; *Paracalantica* Utinomi, 1949; *Scillaelepas* Seguenza, 1876; and *Smilium* Gray, 1825. Zevina included *Pollicipes* Leach, 1817 in the Pollicipinae and *Pisiscalpellum* Utinomi, 1958 in the Scalpellopsinae.

Buckeridge (1983), in a revision of New Zealand and Australian fossil barnacles based on capitular plate architecture, placed *Calantica* and *Smilium*, together with *Pollicipes*, *Pisiscalpellum*, *Capitulum* Oken, 1815 and the fossil genera *Zeugmatolepas* Withers, 1913 and *Titanolepas* Withers, 1913 in the Calanticinae. Buckeridge also recognised *Scillaelepas* as a subgenus of *Calantica* but placed *Euscalpellum* in the Scalpellinae.

The subfamily Calanticinae was subsequently raised to full familial status by Newman (1987, 1991, 1996), embracing nine extant genera (*Aurivillialepas* Newman, 1980; *Calantica* Gray, 1825 [includes *Protomitella* Broch, 1922, cf. Foster 1978: 39]; *Euscalpellum* Hoek, 1907; *Gruvelialepas* Newman, 1980; *Newmanilepas* Zevina and Yakhontov, 1987; *Paracalantica* Utinomi, 1949; *Pisiscalpellum* Utinomi, 1958; *Scillaelepas* Seguenza, 1876; and *Smilium* Gray, 1825) and five fossil genera (*Cretiscalpellum* Withers, 1922; *Titanolepas* Withers, 1913; *Pachyscalpellum* Buckeridge, 1991: 56; *Virgiscalpellum* Withers, 1935; and *Zeascalpellum* Buckeridge, 1983). Jones (1998) described a new calanticid genus, *Crosnieriella*.

Calantica Gray, 1825

Calantica Gray, 1825: 101.

Diagnosis

Scalpellids in which hermaphrodites develop, in addition to 6 primary plates, a subcarina,

sometimes a subrostrum, and a number of paired latera. Plates generally triangular, umbos apical. Upper latus without a distinct carinal margin. Filamentary processes absent. Caudal appendages uniarticulate, setose. Complemental males may be attached to integument between scuta, below adductor muscle.

Type species

Calantica homii Gray, 1825 [junior synonym of *Calantica villosa* (Leach, 1824)], by monotypy.

Remarks

Calantica has a basic plan of 13 capitular plates, with a total of 60+ to as few as 11 plates (both extremes occur in *C. spinosa* (Quoy and Gaimard, 1834). *Smilium* also has a basic plan of 13 capitular plates, with a total of up to 15 (*S. horridum* Pilsbry, 1912) and as few as nine plates (*S. hypocrites* (Barnard, 1924), but the upper latus has a distinct carinal margin. *Crosnieriella* has a basic plan of 19 capitular plates (*C. acanthosubarinae* Jones, 1998). *Crosnieriella* shares some characters with *Calantica*, but is most similar to *Smilium*. However, the apomorphic replication of the plates at the carinal end of the capitulum distinguishes *Crosnieriella*.

Calantica darwini sp. nov.

Figures 1–2

Material examined

Holotype

Australia: Western Australia: hermaphrodite, Soela station SO4B/82/71, 18°30.1'S 118°36.2'E to 18°31.6'S, 118°37'E, 196 km N. of Port Hedland, 136–146 m, 19 August 1982, J. Marshall, attached to gorgonian coral (WAM C42382).

Paratypes

Australia: Western Australia: 1 hermaphrodite, ovigerous, collected with holotype (WAM C42383); 1 hermaphrodite with 1 complemental male, collected with holotype (WAM C42384); 1 hermaphrodite, abnormal capitulum, with 1 complemental male, collected with holotype (WAM C42385); 5 hermaphrodites, collected with holotype (WAM C33688); 4 hermaphrodites, collected with holotype (NHM 2009.312 - 315).

Etymology

The species is named in honour of Charles Darwin for his impact on and contribution to cirripediology specifically and biological sciences as a whole.

Diagnosis

Capitulum of 13 calcareous plates. Lower plates

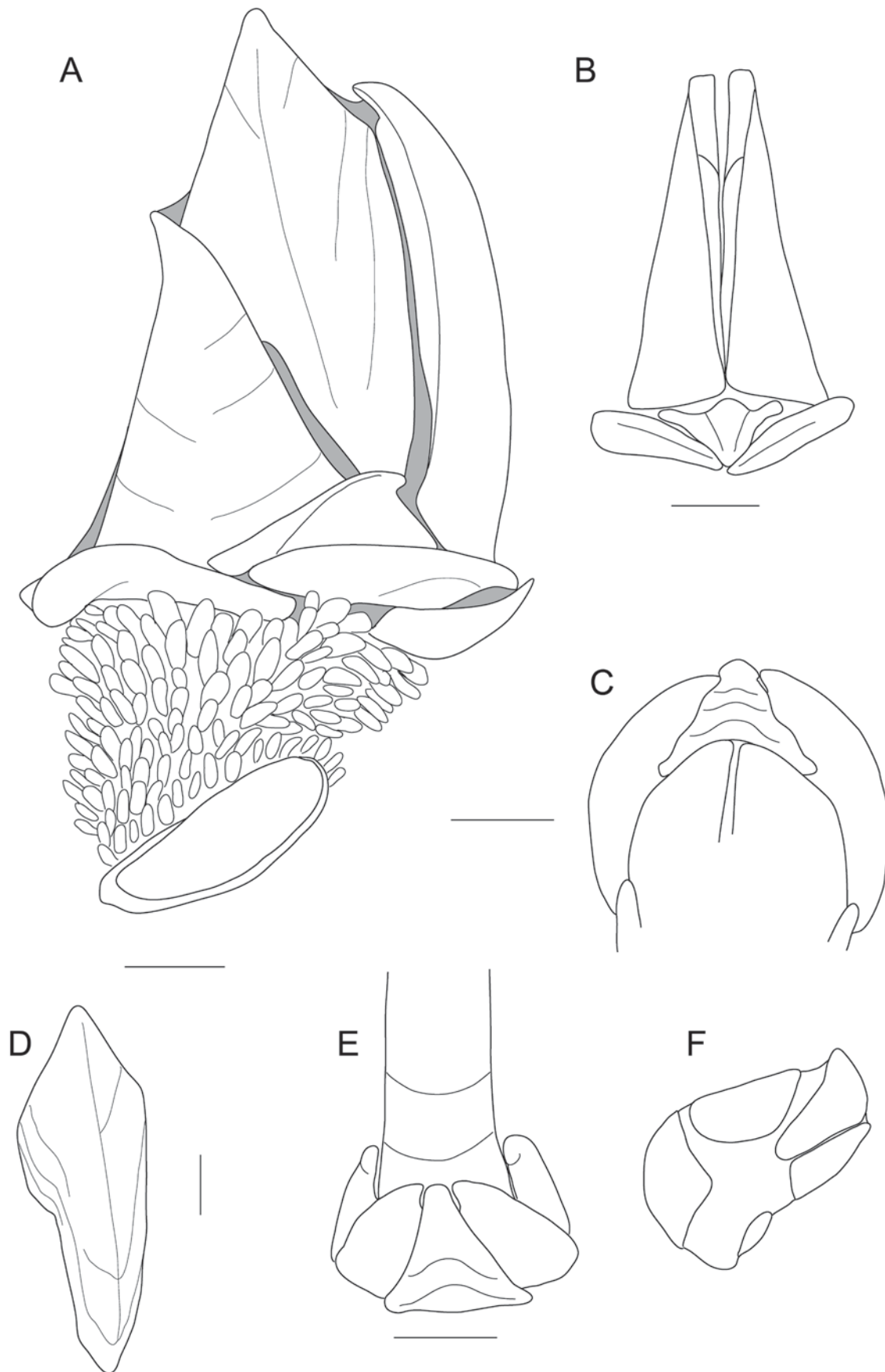


Figure 1 *Calantica darwini* sp. nov.: A-B, holotype (C42382); C, E, F, paratypes (C42385); D, paratype (C42384): A, lateral view; B, rostral view; C, rostral view from above; D, tergum; E, carinal view; F, complementary male. Scale bars: A-E = 0.5 mm; F = 0.1 mm

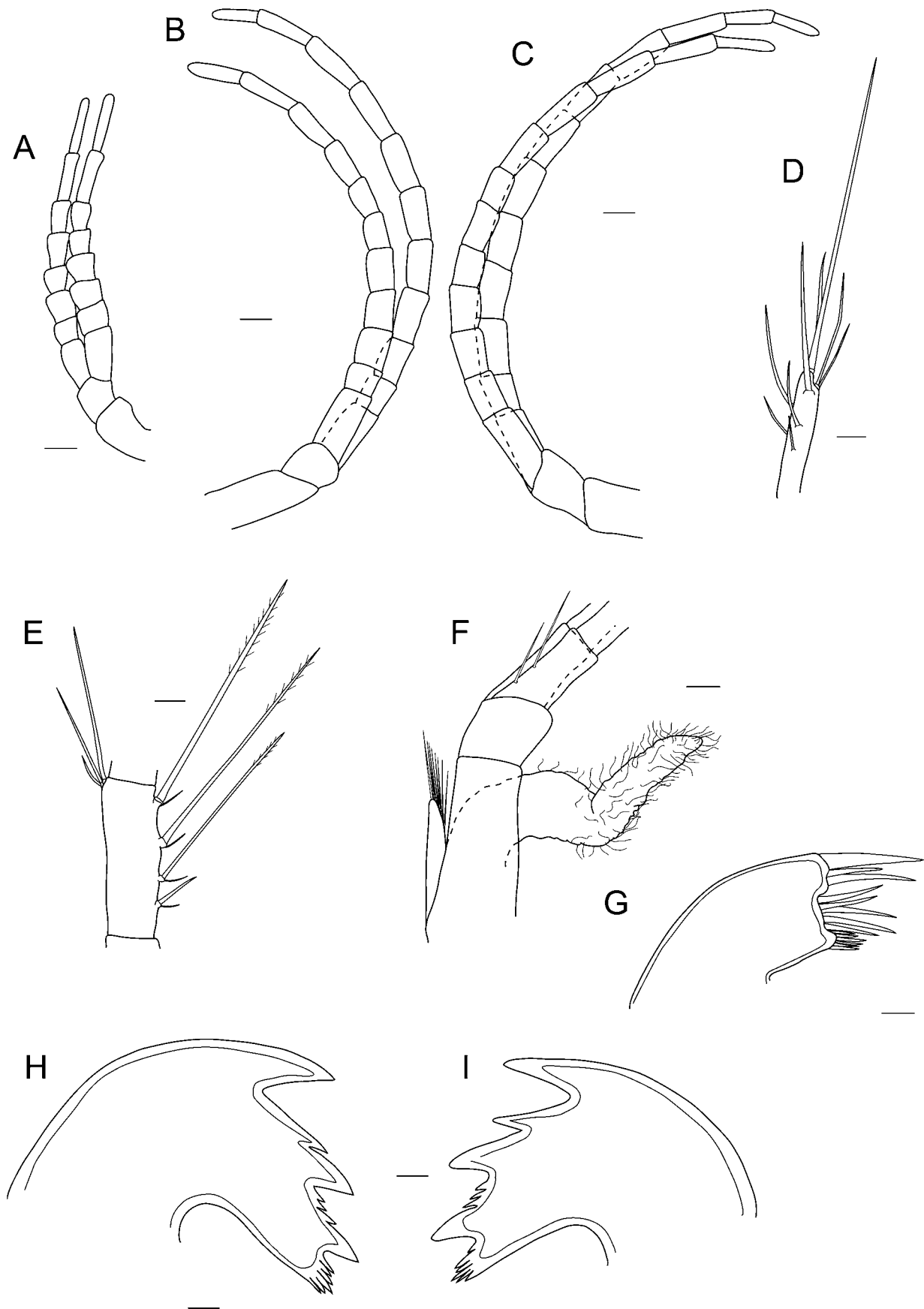


Figure 2 *Calantica darwini* sp. nov. holotype (C42382): A-C, cirrus I-III respectively; D, terminal segment of cirrus I; E, medial segment of cirrus VI; F, pedicel of cirrus VI; G, left maxillule; H, I, left and right mandibles. Minor setation omitted from mouthparts. Scale bars: A-C = 0.1 mm; D, E, G-I = 0.025 mm; F = 0.05 mm.

slightly overlapping upper plates. Apex of scutum curving away from tergum. Upper latus with slight articular furrow, excluded from peduncular margin by rostrolatus and carinolatus. Rostrolatus rectangular, elongate, 5 times wider than high, occupying 0.55–0.70 capitular width, projecting laterally from capitulum, forming small shelf. Carinolatus rectangular, 4 times wider than high, occupying approximately 0.5 capitular width. Subcarina recurved distally. Peduncular scales peg-like, protruding from cuticle in dense rows. Mandible with 3–4 teeth, lower angle pectinate. Maxillule with protuberant superior and inferior angles.

Description

Hermaphrodite capitulum subtriangular, basic plan of 13 approximate plates. Plates thin, translucent, indistinctly sculptured. Umbones of all plates apical. Apices of lower whorl plates just covering bases of those of upper whorl. Cuticle smooth.

Scutum triangular, shorter than carina, apex curving outwards from tergum; basal margin convex, tergal and scutal margins equal length, 1.5 length of basal margin; internally adductor muscle scar prominent. Tergum highest capitular plate, elongated diamond shape; occludent margin straight, carinal margin evenly convex, scutal margin straight except for small triangular indentation in upper third; weak apico-basal ridge present. Carina transversely bowed, regularly arched for 2/3 length, curve more pronounced in apical third; apex bent towards tergum; internally concave; basal portion rounded. Rostrum smallest capitular plate, triangular, inserted above rostrolater, projecting out from capitulum; upper surface with low medial ridge. Upper latus triangular, basal margin longest, slightly sinuous; apex curving towards carina, not projecting from capitulum; articular furrow arising from articulation with carinolatus; displaced from basal whorl by rostrolatus and carinolatus. Rostrolatus subrectangular, much wider than high, projecting from capitulum to form small shelf, occupying 0.55–0.70 capitular width; apex curving under rostrum, meeting that of opposite rostrolatus. Carinolatus subtriangular much wider than high, occupying approximately 0.5 capitular width. Subcarina triangular, apex recurved, just overlying basal portion of carina and apices of carinolater.

Peduncle short, 0.3 capitular length, with elongate peg like calcareous scales sometimes projecting from cuticle.

Labrum strongly bullate, covered with fine setae, denticulate teeth absent. Mandibular palp short, narrow, bearing serrulate setae. Mandible with three primary teeth; smaller, secondary tooth

forming just above second primary tooth, upper surface of third tooth serrated; inferior angle strongly denticulate. Maxillule with superior angle projecting, bearing three large seta, remaining setae arranged in pairs, slightly shorter, less robust; inferior angle projecting, bearing dense comb of short, robust setae. Maxilla subtriangular, buccal margin concave; setae serrulate, setae on external margin up to twice length of those on buccal margin.

Chaetotaxy ctenopod. Cirral formula as follows (* denotes broken rami):

		I	II	III	IV	V	VI	c.a.
Holotype	L	8,8	12,11	12,12	8 ⁺ ,14	13,14	12,13	1
	R	8,8	11,11	12,11 ⁺	12,12	13,12	13,13	1
Paratype (C42383)	L	11,8	12,11	9 ⁺ ,9 ⁺	13,15	11,12	12,8 ⁺	1
	R	10,10	14,13	11,12	8 ⁺ ,13	13,12	13,11	1

Gap between cirri I and II absent. Cirrus I with rami subequal in length; basal segments approximately square, densely setose on internal side; distal segments elongate, 3 times higher than wide, setae preset only near distal margin; terminal segment with distal tuft of short setae, plus 1–2 setae more than 2 x length of segment; setae simple and serrulate. Cirrus II with basal segments roughly square, setation similar to that of cirrus I; distal segments becoming elongate, 4 pairs of simple setae on anterior faces. Cirri III–VI similar, segments elongate, 3 times higher than wide, bearing 4–5 pairs of serrulate and simple setae on anterior faces, small setae between pairs; tuft of short setae at posterodistal angles, maximum length not much more than length of subsequent segment; proximal segment of anterior ramus bearing 1–2 well-spaced, long setae on posterior margin. Caudal appendages uniarticulate, leaf-like, with numerous apical setae, height less than height of proximal segment of pedicel. Penis less than half length of cirrus VI, clothed in setae.

Complemental males attached to cuticle of occludent margin of scutum. Capitulum with 6 plates: rostrum, paired scuta and terga and carina. Scutum trapezoidal, approximately same size as tergum. Tergum subtriangular, scutal margin concave in apical third. Rostrum diamond shape, almost twice size of scutum. Carina triangular, higher than wide.

Dimensions

		CL	CW	PL
Holotype	C42382	2.97	2.34	1.18
Paratypes	C42383	3.30	2.79	1.47
	C42384	2.86	2.57	0.81
	C42385	3.07	2.49	0.95

Distribution

This species is presently known only from the tropical waters of northwestern Western Australia, where it has been found to be epizoic on gorgonian coral.

Discussion

The current species is referable to the genus *Calantica* owing to the basic arrangement of 13 capitular plates in two more or less consecutive whorls and the peg-like peduncular scales. The upper latus is occluded from the peduncle by the carinolatus and rostrolatus as is the case in *Smilium* and *Euscalpellum*. However, these latter genera possess a distinctly trapezoidal upper latus with a distinct carinal margin, as opposed to the triangular upper latus in the present specimens (Zevina 1981; Foster 1979). In *Scillaelepas*, *Gruvelialepas* and *Aurivillialepas*, the lower whorl of capitular plates markedly overlap each other and those of the first whorl (Newman 1980). This has resulted in the formation of articular furrows and ridges. In the new species described herein, the second whorl of plates barely overlaps those of the first whorl and only the upper latus has an articular furrow, although this is weakly developed. In *Calantica*, the males attach internally to the occludent margin of the scutum, not externally to the rostrum or peduncle as in the latter genera. The genus *Crosnieriella*, whose capitulum has a basic plan of 19 plates, has a pair of filamentary appendages present on the prosoma, a character not seen in any other calanticid genus (Jones 1998).

The normal arrangement of plates in *C. darwini* is six primary plates plus three pairs of latera and a subcarina, giving a total of 13 plates. Calanticids are known to have a variable number of capitular plates within species, e.g. *Calantica spinosa* (Quoy and Gaimard, 1834) and *Crosnieriella acanthosubarinae* Jones, 1998. In the material described herein, a few individuals of *C. darwini* show a reduction in the number of capitular plates. The pattern of reduction appears to be asymmetric and affects only the paired latera. One specimen lacked all three latera on the right side (WAM C42385), while another (WAM C33688) lacked the right carinolatera. None of the specimens examined developed more than 13 plates.

The small size, elongated rostrolatera and carinolatera, and the bent carinal apex easily separate the new species from the majority of the species of *Calantica*. *Calantica darwini* is most closely related to *Calantica pusilla* Utinomi, 1970. Both are small species, epizoic on gorgonians. However, *C. darwini* is readily distinguished by the small shelf formed by the elongated rostrolatera and carinolatera that excludes the upper latus from the peduncular margin. In *C. pusilla*, the rostrum

is relatively smaller and inserted between the rostrolatera, as opposed to above in *C. darwini*. The carina is evenly arched in *C. pusilla*, without the pronounced apical curve exhibited in *C. darwini*. The apex of the scutum of *C. pusilla* is erect or recurved towards the tergum, rather than recurved away from the tergum as in *C. darwini*. Utinomi (1970) described the mouthparts of *C. pusilla* as being "typical of the genera" and thus a comparison cannot be drawn with those of *C. darwini*.

Of the present material, one of the paratypes (C42383) was found to be ovigerous even though there was no complementary male present, suggesting that the eggs were fertilised by a nearby neighbour or possibly through self-fertilisation. The eggs are relatively large compared to the adult (~0.4 mm) and only about 15 were present. The length of calanticid penises, whilst variable, is normally shorter than cirrus VI and there is some uncertainty over its functionality (Jones 1998).

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