

The Parthenopinae of Guam (Crustacea: Decapoda: Brachyura: Parthenopidae)

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Abstract—Eight species of parthenopid crabs of the subfamily Parthenopinae are recorded from Guam. A new species of *Aulacolambrus* Paul'son 1875, is described. Two other species, *Aulacolambrus hoplonotus* (Adams & White 1849) and *Rhinolambrus rudis* (Rathbun 1916) are new records. The poorly known *Lambrus pugilator* A. Milne-Edwards 1873, not found since its original description is now reported from Guam and is referred to a new genus, *Certolambrus*. *Heterocrypta petrosa* Klunzinger 1906, a new record for Guam, is shown to be generically distinct from *Heterocrypta* Stimpson 1871b, and placed in a new genus, *Furtipodia*, together with a new species, *F. gemma*. *Cryptopodia investigatoris* Alcock 1895, and *Heterocrypta bivallata* Flipse 1930, are synonyms of *Cryptopodia contracta* Stimpson 1857; *Cryptopodia angusta* Rathbun 1916, is a junior synonym of *Heterocrypta transitans* Ortmann 1893; and *Heterocrypta transitans* is transferred to *Cryptopodia*. A new genus and new species, *Neikolambrus polemistes*, which shares characteristics of both *Rhinolambrus* and *Pseudolambrus*, is also described.

Introduction

Guam is the largest island in Micronesia. The southernmost most island of the Mariana Archipelago, it is approximately 541 sq. km and is formed by the union of two volcanoes. The central and the northern regions are mainly limestone with several volcanic formations. The northern coast cliffs drop precipitately into the sea, averaging 90 to 180 m in height. The southern regions are volcanic in origin with an elongated mountain ridge bisecting the inland valleys and coastline. Straddling the edge of the Asian Plate with the Pacific Plate thrusting below it, the Mariana Trench (ca. 10,000 km in depth) is located to the east of the island. The western shoreline faces the Philippine Sea whereas the eastern coast faces the Pacific Ocean. With a warm climate year round and an extensive coastline of about 125 km in length, it is not surprising that its marine fauna is very diverse.

However, studies on the brachyuran fauna of the islands are sporadic and members of the family Parthenopidae have not formally been reported as yet. Takeda et al. (1994) reported *Daira perlata* (Herbst 1790) from the Northern Mariana Islands and placed it in the Parthenopidae; but this species is now placed in the family Dairidae Ng & Rodríguez 1986 (see Guinot 1967 1978, Ng & Rodríguez 1986). Recently, Gustav Paulay sent us several recent collections of parthenopids from Guam. Opportunity is taken here to record the parthenopid species from Guam as well as to examine the generic affinities of some species. The present study will eventually be part of a larger revision of the Parthenopidae.

The family Parthenopidae currently contains four subfamilies, viz. Parthenopinae MacLeay 1838, Daldorfiinae Ng & Rodríguez 1986, Cryptopodinae Stimpson 1871a, and Lambrachaeinae Stevcic 1994 (see Ng et al. 2001). The Cryptopodinae, however, can only be reliably separated from the Parthenopinae by its members possessing an expanded lateral carapace margin that hide the ambulatory legs. With due consideration of all the known parthenopid genera from the Atlantic and Pacific, it was found that this character alone is not reliable (unpublished data) and we here regard it as synonymous with the Parthenopinae. The generic system used for Parthenopidae is currently subjected to many differences in opinion. Flipse (1930) used a subgeneric system, others opted to be conservative (Manning & Holthuis 1981), and yet others argued that many of Flipse's subgenera can be raised to full generic rank (Ng & Rodríguez 1986, Tan et al. 1999, Ng et al. 2001). In this study, we follow Ng & Rodríguez (1986) in recognizing Flipse's subgenera as genera.

The present paper deals with just the Parthenopinae, and treats eight species, with three genera (*Furtipodia*, *Certolambrus* and *Neikolambrus*) and three species (*Aulacolambrus hystricosus*, *Furtipodia gemma* and *Neikolambrus polemistes*) described as new. Four species, belonging to the subfamily Daldorfiinae, are also represented in the material from Guam, viz. *Daldorfia horrida* (Linnaeus 1758), *D. leprosa* (Nobili 1905), *Parthenopoides cariei* Bouvier 1914, and *Parthenope* (*Parthenomerus*) *efflorescens* Alcock 1895, all of these being new records for the island. These four species are not dealt here as they will be treated separately in a worldwide revision of the Daldorfiinae (Tan & Ng in preparation). *Lambracheus ramifer* Alcock 1895, the sole species in the Lambrachaeinae Stevcic 1994, is also present in Guam, but will be treated in a detailed study of this species by Ng & McLay (2003).

Methods

Terminology of parthenopid morphology generally follows that of Flipse (1930) with some modifications. In particular, the grooves on the dorsal surface of the carapace need to be redefined. Behind the supraorbital region there is a distinct groove separating it from the protogastric region and is referred to as gastro-orbital groove. A long groove can sometimes be found separating the

hepatic, epibranchial, and occasionally the mesobranchial regions, from the gastric regions and is here termed the gastrobranchial groove. The anterior half of this groove, which is also the origin of the gastro-orbital groove, separates the exorbital region from the hepatic region. Behind the hepatic region, the hepatobranchial groove (= cervical groove of Flipse 1930) separates it from the branchial region. The term cervical groove is not used here, as it may not be entirely synonymous with the true cervical groove in other decapods. The posterior portion of both the hepatobranchial groove and the gastrobranchial groove are joined at the lateral side of the metagastric region. The branchiocardiac groove (the “sulcus semilunaris” of Flipse 1930) distinguishes the boundary between the branchial and cardiac regions. Ventrally, Flipse’s (1930) “groove b” is now renamed the subhepatobranchial groove. Also different from Flipse (1930) are the following: frontal projection (for rostrum); supraorbital suture (for the α suture); and last epibranchial tooth (for the epibranchial spine). The term anterolateral margin is replaced by the epibranchial margin. The posterolateral margin is divided into two and is here separated into the meso- and metabranchial margins. In addition, the ventral comb is here divided into two parts, with the anterior portion called the pterygostomial ridge and the posterior portion the subepibranchial ridge. The transverse comb is now referred to as the transverse sub-branchial spines; and the push button abdominal locking mechanism is now called the press button mechanism. The term teeth, is reserved for protrusions on the carapace and appendage margins. Other protrusions on other parts of a specimen are referred to as tubercles.

The publication dates of White’s works follow Clark & Presswell (2001). All measurements taken are at the widest point of the carapace, which is usually between the tips of the last epibranchial teeth, and the longest length of the specimen, which is measured from the tip of the frontal projection to the posterior margin of the carapace. Abbreviations used in this study are: G1 - first male gonopod; G2 - second male gonopod. Specimens are deposited in the Florida Museum of Natural History, University of Florida (UF); National Museum of Natural History, Smithsonian Institution, Washington D.C. (USNM), Muséum national d’Histoire naturelle, Paris (MNHN); Natural History Museum, London (NHM); Zoölogisch Museum, University of Amsterdam (ZMA); Senckenberg Museum, Frankfurt am Main (SMF); Natural History Museum and Institute, Chiba, Japan (CBM); Australian Museum, Sydney (AM); Zoologisk Museum, University of Copenhagen (ZMUC); Zoological Reference Collection, Raffles Museum of Biodiversity Research, National University of Singapore (ZRC); and Zoological Survey of India, Calcutta (ZSI).

Taxonomy

Genus *Aulacolambrus* Paul'son 1895

Aulacolambrus hoplonotus (Adams & White 1849)

(Fig. 1a)

Lambrus hoplonotus Adams & White 1849: 35, pl. 7 fig. 3.

Lambrus hoplonotus — White 1861: pl. 2. — A. Milne-Edwards 1872: 258. — Miers 1879: 22. — Haswell 1880: 450. — Haswell 1882: 33. — Ortmann 1894: 6 (list).

Lambrus (Aulacolambrus) hoplonotus — Miers 1886: 98. — Alcock 1895: 273. — Laurie 1906: 389. — Lenz 1910: 543. — Laurie 1915: 435 (in part). — Bouvier 1915: 227. — Flipse 1930: 40, 44.

Parthenope (Aulacolambrus) hoplonotus — Rathbun 1910: 320. — Rathbun 1911: 257. — Sakai 1972: 32. — Sakai 1976: 280.

Aulacolambrus hoplonotus — Tan et al. 1999: 198, fig. 4. — Ng et al., 2001: 14 (list).

Material examined: Guam. 1 male (30.1 by 15.7 mm) (ZRC 2002.201), North Apra Harbour, lagoon off breakwater, 3 m, night, buried in sand, coll. G. Paulay, 29 January 1992. — 2 females (20.9 by 11.0; 34.1 by 17.6 mm) (ZRC 2002.202), Piti Lagoon, 3-8 m, night, on silty sand, coll. G. Paulay 18 August 1998. — 1 male (25.0 by 13.7 mm) (UF), Piti moat, near shore, buried in sand, night, coll. G. Paulay, 5 July 1997. — 1 male (12.7 by 7.1 mm), 2 females (14.0 by 8.0 mm) (16.9 by 9.1 mm) (UF), Piti moat, 0.5-3 m, in sand, night, coll. J. Starmer 1996. — 4 males (10.4-25.2 by 6.4-12.7 mm), 1 female (17.2 by 9.0 mm) (ZRC 2002.203), Pago Bay, outside University of Guam marine laboratory, coll. P. K. L. Ng & C.-H. Wang, 15-18 April 2000.

Remarks: Members of this genus are easily recognized by the shape of the carapace, which is subcircular, and the relatively prominent last epibranchial tooth, which is at least twice the size than the tooth on the epibranchial margin anterior to it. The position of the last epibranchial tooth also differs from most other parthenopid genera, and is placed more posteriorly and almost in line with those of the posterior margin. This is in part, due to the relatively short posterolateral margin as compared to the anterolateral margin. In addition, the longitudinally very short epistome, presence of two lateral epistomal projections and an excavated pterygostomial region are also diagnostic of *Aulacolambrus* species.

Originally described from the 'Eastern Seas', *A. hoplonotus* is easily distinguished from congeners by several characters, the most prominent being the strongly tuberculated and rather long last epibranchial teeth that have smaller teeth on the lateral margins. In most other *Aulacolambrus* species known, the last epibranchial teeth are shorter, lack smaller teeth on the lateral margin and less tuberculated. A notable exception is *A. curvispinus* (Miers 1879) which also has a

relatively long last epibranchial tooth, but this tooth is unarmed laterally and not tuberculate. We have examined the holotype of *A. curvispinus* (a male 34.5 by 19.9 mm, NHM 1847.21, from Java Seas), and have found that its dorsal carapace surface is also less tuberculate than that of *A. hoplonotus*.

Aulacolambrus hystricosus, new species
(Figs. 1b, 2)

Material examined: Holotype: female (4.7 by 4.1 mm) (UF 2101), Guam, Double Reef, fore reef, on sand flat, 10 m, coll. J. Starmer, 10 December 1998. Paratypes: 1 male (3.0 by 3.1 mm) (ZRC 2002.204), same data as holotype. — 1 female (6.1 by 4.9 mm) (ZRC 2002.205), Guam, Piti Bay, reef flat, 2-4 feet (0.6-1.2 m), in sand, coll. H. T. Conley, 27 April 1994.

Description: Carapace subcircular, wider than long, angle at last epibranchial tooth acute; last epibranchial tooth large, placed posteriorly near posterior margin. Gastric, cardiac, and branchial regions distinct, inflated; hepatic region slightly inflated; metagastric region not discernable; metabranchial region indistinct. Supraorbital region protruding dorsally, separated from protogastric region by wide gastro-orbital groove. Protogastric and mesogastric regions inflated, separated by narrow, shallow groove, surfaces tuberculate. Gastrobranchial groove deep. Hepatic region with two spines, marginal spine larger. Cardiac region separated from branchial region by relatively broad branchiocardiac groove. Frontal projection prominent, subquadrate with prominent median tooth, anterior margin irregular, base of frontal projection with long narrow tooth on each side. Interorbital region narrow, slightly depressed. Supraorbital region inflated; supraorbital margin with deep V-shaped notch, separated by supraorbital suture into lateral and mesial margins, both margins dentate, with two teeth, lateral teeth larger than mesial teeth. Protogastric region inflated, tuberculate; mesogastric region inflated, tuberculate, not well separated from protogastric region; metagastric region reduced, indistinct. Hepatic region narrow, slightly inflated, lower than protogastric and mesobranchial regions; dorsal surface with two spines, outer spine long, curving at tip, inner spine short. Mesobranchial region inflated, dorsal surface with well-spaced short spines. Metabranchial region slightly depressed. Cardiac region inflated, with a prominent median tubercle, tubercle short, separated from metagastric region by narrow, shallow groove. Intestinal region narrow, poorly defined, not inflated, tuberculate. Anterolateral margin dentate, with about eight irregular, broadly triangular teeth; first tooth large, prominent, directed dorsally; lateral tooth acute, broad, large, margins usually with a smaller tooth near base. Posterolateral margin short, about half length of anterolateral margin, concave, with two well

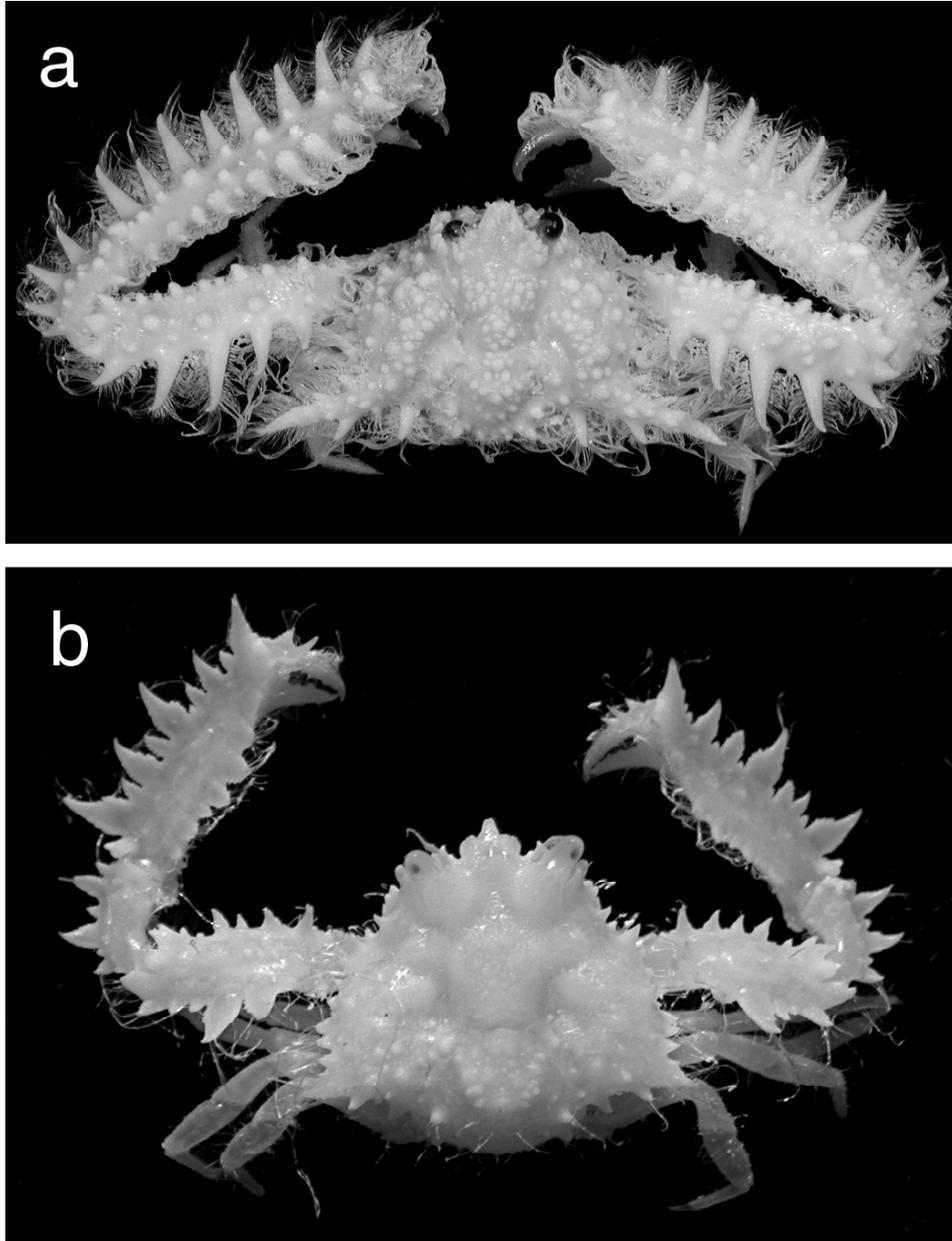


Figure 1. Dorsal view of: **a**, *Aulacolambrus hoplonotus* (Adams & White 1849), 1 male (30.1 by 15.7 mm) (ZRC), Guam. **b**, *Aulacolambrus hystricosus*, new species, holotype, female (4.7 by 4.1 mm) (UF 2101).

spaced teeth. Posterior margin convex, with a prominent tubercle on each side; median part with four small tubercles.

Inter-antennular region narrow, smooth. Epistome surface at right angles to oral cavity, longitudinally narrow; surface smooth, median area depressed; epistomal projection present beneath antennular article one, sub-pentagonal in shape. Eyes well developed. Suborbital margin broadly U-shaped, with a short median spine. Pterygostomial ridge low, setose, setae long, covering pterygostomial region; anterior portion without any projections; anterior edge of ridge with a large triangular tubercle. Pterygostomial region excavated, hidden under long setae.

Antennular article two almost straight when folded, parallel with central median axis of carapace. Antennal article two smooth, long, about same length as antennular article one, anterior margin filling orbital hiatus. Antennal article three slightly shorter than antennal article two; inner margin with two short tubercles. Antennal article four about half length of antennal article three.

Third maxilliped not totally covering oral field when closed. Ischium subquadrate, surface slightly tuberculate; inner margin dentate, teeth short, blunt. Merus subquadrate, anterior two-thirds bent at ca. 90° to ischium; antero-external part auriculiform; anterior inner corner with broadly W-shaped notch at junction with carpus. Carpus surface smooth, slightly bulbous, upper margin with long setae. Propodus partially hidden behind triangular mesial projection, upper margin with long setae. Dactylus not hidden behind merus when appressed, margins with long setae. Exopod relatively broad, less than half width of ischium, outer margin with long setae, setae covering pterygostomial region.

Anterior thoracic sternites one, two and three not visible, probably fused to sternite four. Sternite four with shallow depression medially; slightly inflated, edges with small tubercles. Sternite five with persistent press button. Sternal sutures all interrupted. Sternite eight with longitudinal median groove.

Chelipeds sub-equal. Basis-ischium fused, suture line visible; ischium inner margin dentate, two most proximal teeth, largest, long and sharp. Merus inner margin arched, with about six well-spaced teeth; distal margin with three large teeth; distal two-thirds of outer margin dentate, teeth large, proximal most two teeth largest; teeth adjacent to each other; lower margin with a row of low tubercles; dorsal surface slightly convex, with a row of tubercles, all short except for proximal most tubercle; proximal most tubercle long, narrow, sharp; inner surface narrow, tuberculate; lower surface smooth. Carpus outer margin with six teeth, alternating in size, proximal tooth large; inner margin smooth except for a group of small tubercles distally. Manus cross-section triangular; inner and outer margins dentate, with irregular sized teeth, teeth generally large, closely spaced; lower margin with a row of low tubercles; upper surface smooth except for some small tubercles; inner surface smooth; lower surface with diagonal row of tubercles. Fingers relatively long, strongly curving, forming small gap when fully closed. Dactylus longer than fixed finger, upper surface with two long spines.

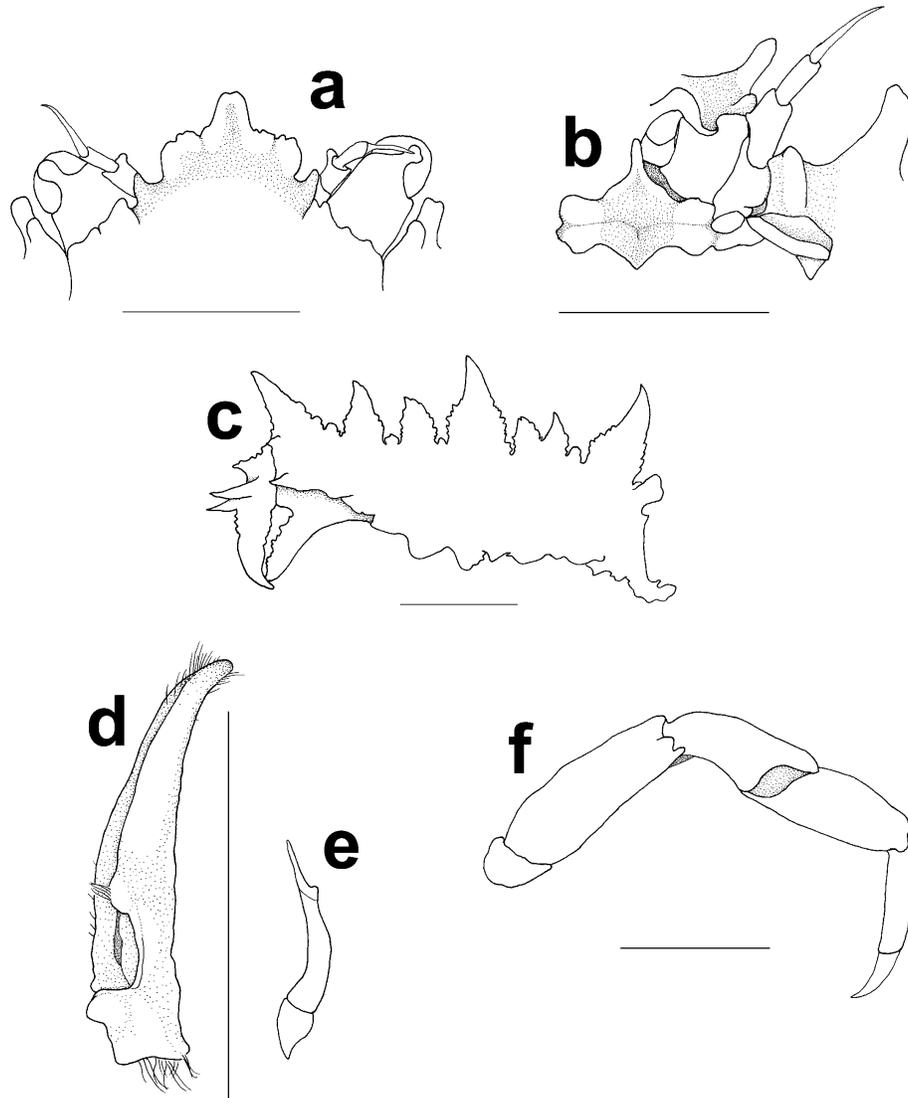


Figure 2. *Aulacolambrus hystricosus*, new species, holotype, female (4.7 by 4.1 mm) (UF 2101), Guam: **a**, frontal projection; **b**, epistome, left antennule and antenna; **c**, outline of right cheliped manus and movable finger; **d**, left G1; **e**, left G2; **f**, right P5. Scale bar = 1 mm.

Ambulatory legs relatively slender, second pair longest. Merus, carpus, propodus and dactylus margins entire, with setae of various length. Dactylus tips corneous.

Female abdominal segments all free, triangular. Telson triangular, width slightly longer than length, tip rounded, base of lateral margins slightly convex.

Male paratype abdomen T-shaped, segments three, four and five fused, suture lines not visible; segment six rectangular; telson triangular, tip rounded.

G1 stout, slightly flattened dorso-ventrally, tapering towards tip; tip rounded, with numerous setae. G2 short, about half length of G1; distal portion about one-third length of basal segment; tapering towards sharp tip.

Etymology: 'Hystricosus' is Latin for prickly or thorny, alluding to the sharp spines on the dorsal surface of the carapace, characteristic of this *Aulacolambrus* species.

Remarks: The spines on the carapace dorsal surface and the shape and arrangement of the teeth on the upper and outer margins of the cheliped manus easily distinguishes this species from all congeners. No other *Aulacolambrus* species has small, well-spaced sharp spines on the mesobranchial region. Even more prominent are the spines on the hepatic regions, of which the tip is slightly curved. In all other *Aulacolambrus* species, the carapace is usually tuberculate.

Aulacolambrus hystricosus is the only species in the genus with broad, large, closely spaced spines of various sizes on the upper and outer margin of the cheliped manus. Congeners have spines on the upper and outer margin of manus well spaced, or in some species, alternating large and small sized spines. *Aulacolambrus hystricosus* also has three diagnostic characters. Firstly, *A. hystricosus*, lacks an anterior pterygostomial projection a unique feature in the genus. In all other known *Aulacolambrus* species, there is a projection at the base of the subhepatic region that partially covers the anterior portion of the excavated pterygostomial region. Secondly, the sternal press buttons are considerably reduced and can only be seen clearly under high magnification. In all other *Aulacolambrus* species, the press buttons in both male and female specimens are large and easily seen. This may be due in part to the very small adult size of the species. Thirdly, the length of the second antennal segment is also relatively longer than other *Aulacolambrus* species, probably because of its relatively narrower epistomal region.

Despite the relatively small size of the specimens that were examined, the gonopods of the male paratype are fully developed and are mature. The female abdomen of *A. hystricosus* does not fully cover the entire sternum and this does not indicate immaturity. In almost all *Aulacolambrus* species (even the much larger ones), the female abdomen does not cover the entire sternum even at maturity and appears to be characteristic of this genus (unpublished data).

Certolambrus, new genus

Diagnosis: Carapace subtriangular, dorsal surface with large spines on gastric, mesobranchial and cardiac regions. Hepatic tooth large, about same size as anterolateral teeth. Anterolateral margin convex, with about five equal sized teeth; teeth large, continuous basally, somewhat flattened at base, forming crest. Lateral tooth, small, not strongly produced; about in line with posterior margin. Posterolateral margin with three to four teeth, anteriormost two usually largest.

Epistome smooth, without any projections under first antennular article. Pterygostomial region not excavated. Pterygostomial ridge tuberculate, without long setae covering pterygostomial region. Chelipeds heterochelous. Surface of ambulatory legs surfaces smooth, slightly pubescent; upper and lower margins of merus lined with small spines; dactylus with long corneous spine.

Type species: *Lambrus pugilator* A. Milne-Edwards 1873, by present designation.

Etymology: The genus name is an arbitrary combination of the Latin word ‘certo’ meaning rivalry, alluding to the large size of the chelipeds, indicative of a quarrelsome temperament; with the common suffix ‘Lambrus’ used for many parthenopid genera. Gender of genus masculine.

Remarks: *Certolambrus*, new genus, bears superficial similarities to *Aulacolambrus* due to the posteriorly placed last epibranchial tooth, which is roughly in line with the posterior margin. There are, however, substantial differences between them, especially in the epistomal and the pterygostomial regions. There are no epistomal projections under the antennular article one in *Certolambrus*, whereas there is always a pair in *Aulacolambrus*. The pterygostomial region is unexcavated in *Certolambrus*, but is distinctly excavated in *Aulacolambrus*. The pterygostomial ridge in *Certolambrus* is glabrous, but in *Aulacolambrus*, there is a row of long setae that also covers the excavated pterygostomial region.

The hepatic and epibranchial teeth of *Certolambrus* are all proportionately larger than those of *Aulacolambrus*. As such, there are more teeth on the epibranchial margin in *Certolambrus* than in *Aulacolambrus*. In addition, the epibranchial teeth of *Certolambrus* are closely spaced and somewhat flattened basally. This makes the edges of the epibranchial margin appear cristate. This has not been observed in *Aulacolambrus* as the epibranchial teeth are more widely spaced and there is no discernible crest. The hepatic tooth is also considerably larger in *Certolambrus* than *Aulacolambrus* and thus, more conspicuous. In addition, *Aulacolambrus* lacks a well-defined hepatic margin and the hepatic tooth is reduced; and the carapace of *Certolambrus* is relatively flatter than that of *Aulacolambrus*.

Certolambrus pugilator (A. Milne-Edwards 1873)
(Fig. 3, 8a)

Lambrus pugilator A. Milne-Edwards 1873: 79.

Platylambrus ursus Ward 1939: 2, figs. 1, 2.

Material examined: Guam. 3 males (3.1 by 2.7 mm; 4.1 by 3.7 mm; 6.4 by 5.2 mm), 1 female (5.5 by 4.7 mm) (UF 9), Agat Bay, north of Alutom Island, fore-reef, in deep coral rubble, ca. 5 m depth, coll. H. T. Conley, 10 January 2001. — 1 female (4.4 by 3.5 mm) (ZRC 2002.206), right side of Cocos Island, rubble field, ca. 18 m, coll. L. Kirkendale, 23 April 1999. — 1 male (5.0 by 4.5 mm) (ZRC 2002.207), west of Cocos Island, ca. 24-27 m depth, coll. A. Traucht,

12 June 1998. **Singapore.** 1 female (5.9 by 4.9 mm) (ZRC 2002.208), Pulau Semakau, on coral rock, coll. Salam, 18 August 1994. **Japan.** 1 female (8.9 by 7.4 mm) (CBM-ZC 4570), Ryukyus, Okinawa Islands, Kume-Jima Island, Ahra Beach, coll. K. Nomura, 14 June 1995. **New Caledonia.** 1 female (8.6 by 6.9 mm) (MNHN), Grand Récif Sud, stn 409, 18 m, 22°42'S 167°24'E, coll. 24 January 1985. — 1 male (6.1 by 5.2 mm) (MNHN), Koumac, Grand Récif de Koumac, outer fringe, 12 m depth, coll. 7 October 1993. **Western Samoa.** 1 rehydrated female (7.4 by 5.9 mm) (MNHN B 45725), Upolu (holotype of *Lambrus pugilator* A. Milne-Edwards 1873).

Diagnosis: As for generic diagnosis.

Remarks: *Platylambrus ursus* Ward 1939, described from Savaii Island in Samoa is clearly conspecific with this species. Although the type has not been examined, the description and photograph by Ward (1939) leaves no doubt about its identity. Furthermore, *Pla. ursus* is also from Western Samoa like *Cer. pugilator*, albeit from a different island.

This species has not been reported since it was described from Western Samoa. It is here recorded for the first time from Guam, Singapore, Japan and New Caledonia.

Furtipodia, new genus

Diagnosis: Carapace triangular, wider than long; hepatic and anterolateral margin in straight line; lateral tooth region rounded; posterior lateral branchial region expanded, completely covering ambulatory legs when not fully extended; posterolateral margin slightly convex; posterior margin not extended beyond base of abdomen. Dorsal surface eroded or tuberculate; protogastric, mesobranchial and cardiac regions inflated, gastric and mesobranchial regions always higher than cardiac region. Antennal article two below posterior border of antennular article one; antennal article two about same length as antennular article one; antennal article four above anterior margin of antennular article. Chelipeds strongly heterochelous. Female telson broadly pentagonal, apex constricted laterally.

Type species: *Furtipodia gemma*, new species, by present designation.

Etymology: The genus is derived from the Latin word 'furtivus', meaning concealed, in combination with the suffix derived from the Greek word 'podos' meaning foot. This is alluding to the ambulatory legs, which could be tucked underneath the lateral margins of the carapace. Gender of genus feminine.

Remarks: *Furtipodia* is very similar in appearance to *Heterocrypta* Stimpson 1871b, and *Cryptopodia* H. Milne Edwards 1834-1837. Chiong & Ng (1998: 161) briefly noted that *Heterocrypta* should be restricted to the American species whereas Indo-Pacific *Heterocrypta* species should be transferred to another new genus. They, however, did not elaborate. As part of a larger study on

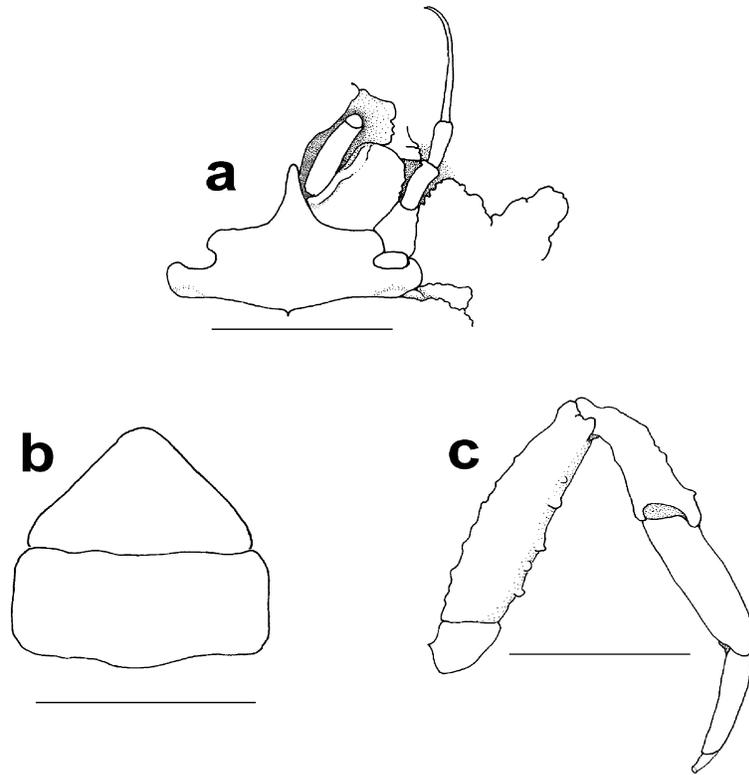


Figure 3. *Certolambrus pugilator* (A. Milne-Edwards 1873), female (5.5 by 4.7 mm) (UF 9), Guam: **a**, epistome, left antennule and antenna; **b**, female telson and sixth abdominal segment; **c**, right P5. Scale bar = 1 mm.

the parthenopids of the Indo-Pacific, we have examined a good series of American and Atlantic *Heterocrypta* species [including *H. granulata* (Gibbes 1850), type species of *Heterocrypta*], and representatives of all Indo-Pacific *Heterocrypta* species. While we agree that the Indo-Pacific species of “*Heterocrypta*” are not congeneric with *Heterocrypta* s. str., not all of them need a new genus. To date, four *Heterocrypta* Indo-Pacific species have been described viz. *H. transitans* Ortmann 1893, *H. investigatoris* Alcock 1895, *H. petrosa* Klunzinger 1906, and *H. bivallata* Flipse 1930. All four species are generically distinct from *Heterocrypta* sensu stricto and should be transferred out of this genus. We have examined specimens of *H. transitans* from Japan (type locality), as well as material of *H. investigatoris* and *H. bivallata* (see below), and we have little doubt that they should be referred to *Cryptopodia* instead. This is because, despite their somewhat more elevated gastric and branchial regions, and rather more angular carapaces, all their other salient characters agree with *Cryptopodia* as defined by Chiong & Ng (1998) (see later). *Cryptopodia angusta*

Rathbun 1916, described very briefly from Hong Kong and without any comparisons, was not dealt with by Chiong & Ng (1998). Examination of the holotype (a female 15.0 by 11.4 mm, USNM 48249) has revealed that it is actually conspecific with *Cry. transitans* and is hereby synonymised. The type locality is from the China Sea, near Hong Kong and is within the known distribution of *Cry. contracta* and *Cry. transitans*. However, *H. petrosa* is generically distinct from these three species and is here referred to a new genus, *Furtipodia*.

A note with regards to the taxonomy of *Cryptopodia bivallata* and *Heterocrypta investigatoris* is necessary. Examination of the holotype male of *Cry. bivallata* (17.0 by 12.2 mm, ZMA De 103.054) shows that it is actually conspecific with the poorly known *Cry. contracta* Stimpson 1857. *Cryptopodia contracta* was retained in *Cryptopodia* by Chiong & Ng (1998) albeit with some doubts because they did not have any specimens available for study. They commented that its "... carapace shape also does not resemble those of *Cryptopodia* species. Instead, it has a closer resemblance to the Indo-Pacific species of *Heterocrypta* Stimpson 1871" (Chiong & Ng 1998: 205). *Cryptopodia contracta* was described from the South China Sea (ca. 23°N of the equator), but the original description is very brief (Stimpson 1857: 220). The subsequent illustration of this species by Stimpson (1907: 30, pl. IV, Fig. 6, 6a) is very small, unclear and the type is no longer extant (see Chiong & Ng 1998: 205). Shen et al. (1982: 144, fig. 3:7, pl. II:10) and Chen & Xu (1991: 84, Fig. 28) recorded *Heterocrypta investigatoris* from the Gulf of Tongking (Beibu Gulf) and Nansha Islands (= Spratly Islands) respectively. However, based on their illustration and as well as examination of material from the Gulf of Tongking (1 male, ZRC 2002.209; 1 female, ZRC 2002.210), the specimens strongly resemble *Cryptopodia contracta* and we are certain that they are conspecific. With regards to the identity of *H. investigatoris*, examination of photographs of the *H. investigatoris* types in the ZSI (2 males, 2 females, ZSI 16-19/10, Malabar Coast) (taken by D. Yeo at our request in 1998), with the figure and description by Alcock (1895: 284) revealed that it is indistinguishable from *Cry. contracta* from the South China Sea. This was confirmed by comparing specimens we have from the Indian Ocean [Gulf of Aden: 3 males, 3 females, 2 ovigerous females, 3 juv. (SMF); Kenya, Mombasa: 1 ovigerous female 16.3 by 11.4 mm (ZMUC); Mozambique: 1 carapace, 12.9 by 9.0 mm, (ZMUC)] with *Cry. contracta*. In view of the proposed synonymy of the above three taxa, a neotype for *Cryptopodia contracta* Stimpson 1857, is clearly necessary. We hereby designate the male specimen (17.5 by 11.0 mm, ZRC 2002.209) from the Gulf of Tongking, as the neotype for the species.

Furtipodia differs from *Heterocrypta* s. str. by having a relatively longer third antennal article (vs. distinctly shorter); a tight fit of the first and third antennal article appressed tightly with the suborbital region (vs. loosely fitting); lack of distinct gastric and branchial ridges (vs. present); absence of a V-shaped notch on the suborbital margin (vs. present); a more expanded lateral carapace

margin (vs. less expanded); the presence of a sub-frontal spine (vs. absent); and a subprismatic cross-section of the cheliped (vs. strongly prismatic).

Furtipodia also bears some superficial resemblance to the Indo-Pacific genus *Cryptopodia* sensu Chiong & Ng (1998). Both genera have a lateroventral cavity of the carapace, which conceals the ambulatory legs when they are not fully extended; a somewhat dome-shaped lateral expansion on the ventral side; the outer margin of the cheliped merus with a distal wing-like expansion; and the chelipeds being strongly heterochelous. However, there are three characters that differentiate *Furtipodia* from *Cryptopodia*. Firstly, the cardiac region of *Furtipodia* is lower than the gastric region. In *Cryptopodia*, the cardiac region is usually at the same level or higher than the gastric region. Secondly, *Furtipodia* lacks a dorsal triangular depression on the gastric region, whereas the depression is always present in *Cryptopodia*. This is due to the presence of a hepatobranchial groove separating the hepatic and branchial regions in *Furtipodia*. This groove is absent in *Cryptopodia* and therefore, *Cryptopodia* species possess an interrupted branchial ridge. This branchial ridge is interrupted in *Furtipodia*. Thirdly, the shape of the mature female abdomen of *Furtipodia* is different from *Cryptopodia*. The telson of *Furtipodia* is broadly pentagonal whereas it is triangular in *Cryptopodia* (Fig. 4). Even more obvious is the shape of the sixth abdominal segment in mature female specimens. This segment is usually broader than the telson in *Cryptopodia*, but in *Furtipodia*, it is about the same width as that of the telson. The shape of the female telson and the sixth abdominal segment is consistent for both species of *Furtipodia*. Other minor characters that differentiate *Furtipodia* from *Cryptopodia* include a considerably shorter and blunter frontal projection (vs. long and triangular); presence of a short blunt tooth on the sub-frontal region between the antennules (vs. absent); and the posterior margin not extending beyond anterior abdominal segments (vs. extending beyond anterior abdominal segments).

Chiong & Ng (1998) erected *Celatopesia* for American species originally described under *Cryptopodia*. Despite some very superficial similarities, *Celatopesia* can be easily distinguished from *Furtipodia* by the shape of the third maxilliped (triangular vs. subquadrate) and the absence of the lateroventral cavity of the carapace (vs. present).

Furtipodia gemma, new species
(Figs. 4a, 5a, b, 6)

Material examined: Holotype: 1 female (14.8 by 10.4 mm) (ZRC 2002.211), Guam, Pago Bay, fore-reef, in sand channels, about 3 m, night, coll. L. Kirkendale, 26 September 1999. Paratype: 1 female (15.4 by 10.5 mm) (UF 8), Guam, Dadi Beach, reef flat, 0.5 m depth, in clam shell, coll. J. Starmer, 6 June 1995. Non-type: 1 female (20.3 by 14.0 mm) (ZRC 2002.212), Hawaii, Oahu, coll. J. Park 1999.

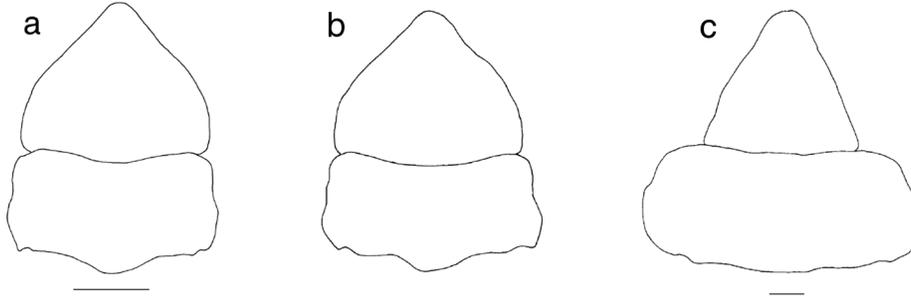


Figure 4. Outline of the telson and the sixth abdominal segment: **a**, *Furtipodia gemma*, new species, holotype, female (14.8 by 10.4 mm) (ZRC), Guam; **b**, *Furtipodia petrosa* Klunzinger 1906, female (18.9 by 12.7 mm) (ZRC), Guam; **c**, *Cryptopodia fornicata* (Fabricius 1781), female (49.8 by 32.3 mm) (ZRC), Thailand, Phuket, Pichai fish port, from Andaman Sea, N. K. Ng et al., 17-20 January 2000. Scale bar = 1 mm.

Description: Carapace broadly triangular, wider than long, anterolateral and posterolateral margins not clearly demarcated, junction rounded; surface uneven, with several large tubercles on gastric, branchial and cardiac regions. Protogastric, mesogastric, metagastric, hepatic, mesobranchial, metabranchial, cardiac and intestinal regions distinct; protogastric, hepatic, mesobranchial and cardiac regions inflated, mesogastric and metabranchial regions less inflated, metagastric and intestinal regions not inflated. Protogastric region separated from hepatic region by very thin anterior portion of the cervical groove; hepatic region separated from branchial region by broad hepatobranchial groove. Hepatic groove region depressed. Cardiac region separated from branchial region by relatively broad branchiocardiac groove. Frontal projection short, deflexed. Interorbital region with longitudinal depression, terminating at protogastric region. Supraorbital region raised, lobiform, no discernible external orbital tooth; lateral portion with one suture. Protogastric region inflated, with two large tubercles, more inflated than mesogastric region; mesogastric region separated from protogastric region by short narrow groove; metagastric region not inflated, groove separating it from mesogastric region very shallow. Hepatic region narrow, slightly inflated, less than protogastric and mesobranchial regions, tapering distally. Mesobranchial region inflated, higher than metabranchial; divided into two longitudinal parts, lateral portion with a large tubercle, mesial portion with three large tubercles in a slight curved line. Metabranchial without any tubercles. Cardiac region inflated, with a large median tubercle, separated from metagastric region by very shallow groove; posterior portion gradually depressed into intestinal region. Intestinal region not inflated. Anterolateral margin dentate, with about 12 irregular teeth, anterior one smaller and shorter, becoming larger and longer posteriorly; lateral tooth not clearly defined, angle between anterolateral and posterolateral margin rounded, dentate, teeth relatively short. Posterolateral margin with several short, blunt, broad teeth.

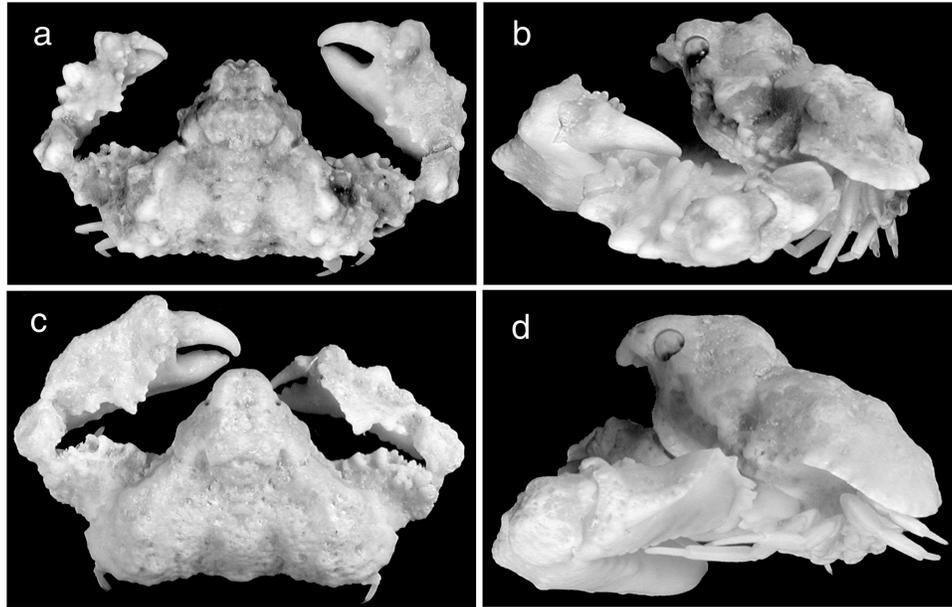


Figure 5. *Furtipodia gemma*, new species, holotype, female (14.8 by 10.4 mm) (ZRC), Guam: **a**, dorsal view; **b**, side view. — *Furtipodia petrosa* Klunzinger 1906, female (18.9 by 12.7 mm) (ZRC), Guam: **c**, dorsal view; **d**, side view. Scale bar = 1 mm.

Inter-antennular region with large prominent tooth, continuous with frontal margin. Epistome surface irregular, lateral and dorso-median region slightly pitted; posterior portion smooth, with small round deep depression medially. Eyes well developed. Suborbital margin entire, without a V-shaped notch. Subhepatic groove with four subcircular pits; four smooth, round tubercles present, second tubercle largest. Pterygostomial ridge, smooth, with three large low tubercles. Pterygostomial region slightly depressed posteriorly; surface pitted. Shallow cleft separating pterygostomial ridge from sub-branchial ridge. Sub-branchial ridge immediately adjacent to anterolateral margin, anterior portion with four tubercles, anterior most largest, round, subsequent tubercles becoming smaller, irregular; posterior portion dentate, teeth small, irregular. Lateral portion of sub-mesobranchial region expanded, excavated, forming depression; lateral portion smooth, mesial portion pitted.

Antennules folded at ca. 45° angle. Antennular article one surface pitted; slightly raised medially. Antennular article two surface smooth. Antennal article two sub-pentagonal, surface slightly pitted. Antennal article three sub-quadrate, about same length as antennal article two, anterior margin filling posterior margin of orbit. Antennal article four about half length of third antennal article.

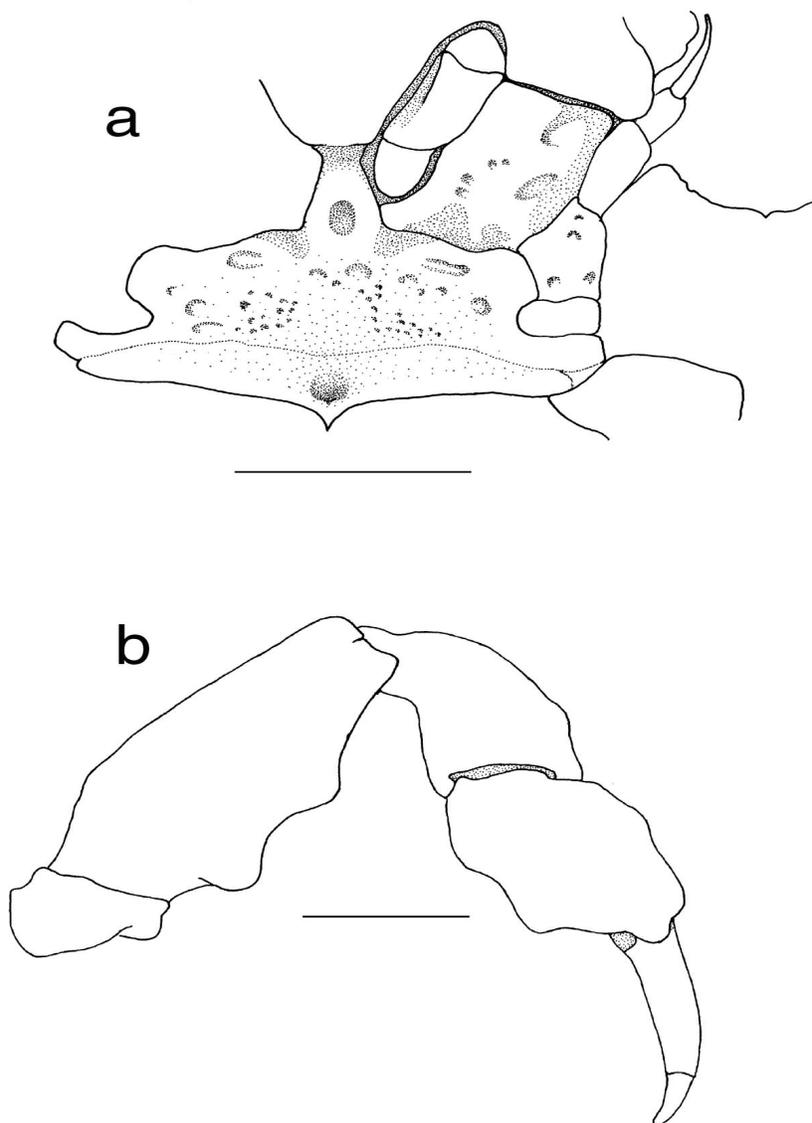


Figure 6. *Furtipodia gemma*, new species, holotype, female (14.8 by 10.4 mm) (ZRC), Guam: **a**, epistome, left antennule, and left antennae; **b**, right P5. Scale bar = 1 mm.

Third maxilliped surfaces pitted. Ischium sub-rectangular, with medial longitudinal row of deep pits; posterior lateral portion with a broad smooth tubercle; lateral margin with four rounded protuberances. Merus sub-hexagonal, with several deep pits, median pit most prominent; posterior lateral corner with

broad, low, smooth, tubercle; lateral angle covering tip of exopod; no notch at junction of merus and carpus. Carpus surface smooth, distal tip with blunt protuberance. Propodus partially hidden behind merus; upper margin with short cristae. Dactylus completely hidden behind merus. Exopod relatively broad, about half width of ischium; surface irregular, inner portion with a longitudinal row of pits; lateral margin lined with row of irregular tubercles, tapering, slightly concave distally.

Anterior thoracic sternites surface irregular, pitted. Sternites one to four completely fused, no sutures visible. Sternite five with persistent press button. Sutures between sternites four/five and five/six interrupted; sutures between sternite six/seven and seven/eight not interrupted. Sternite eight with deep longitudinal median groove.

Chelipeds strongly heterochelous. Right chela larger than left. Coxa surface pitted. Basis-ischium fused, suture line visible, surface slightly pitted; ischium inner margin with median smooth tubercle. Merus prismatic in cross-section, dorsal surface slightly convex; outer margin expanded with lamelliform cristae distally, forming wing-like structure; distal half of lamelliform cristae with three notches, proximal notch shallowest, becoming deeper distally; inner margin convex, dentate, proximal half with four teeth, teeth large; distal half teeth irregular, first two larger than the rest; dorsal surface with two dorsal meral tubercles, distal tubercle slightly larger and taller than proximal tubercle. Carpus surface irregular; inner margin with four small teeth; outer margin with three tubercles, median one largest. Manus cross-section longitudinally ovate. Fingers of crusher (right cheliped) forming large gape when fingers fully closed; outer surface smooth, with a diagonal row of broad, very low tubercles; outer margin with two broad triangular teeth proximally, one rounded tooth distally; inner surface smooth, with a diagonal lamelliform strongly convex cristae, margin dentate, median tooth largest; fingers relatively short, strongly curving; fixed finger with two very low molariform teeth distally. Left cheliped coxa, basis-ischium, merus, carpus as for right cheliped; manus about half size of right cheliped, cross section prismatic; outer margin with two broad triangular teeth proximally, one rounded tooth distally, teeth lamelliform and much higher than right manus; fingers with cutting edges, without gape when fully closed, slightly compressed laterally.

Ambulatory legs slender; first leg longest. Merus glabrous, upper margin cristate, cristae short and broad; first, second leg lower margin entire, except for small low proximal tooth; third leg lower margin with two low proximal teeth; fourth leg with two prominent broad, triangular proximal teeth. Carpus upper and lower margins smooth, glabrous. Propodus glabrous; first, second and third leg upper and lower margins smooth; fourth leg lower margin with two broad teeth. Dactylus about same length as propodus; generally glabrous, except for occasional short setae, tip corneous.

All female abdominal segments free. Press button present on sternite five; fits into socket on posterolateral corners of sixth abdominal segment, coaptated

by assemblage. Telson subpentagonal, slightly longer than wide, tip tapered, lateral margins near tip slightly concave.

Etymology: The species name is the Latin word for ‘bud’, alluding to the rounded projections on the gastric, branchial and cardiac regions of the carapace, which looks like an unopened flower bud. The name is used as a noun in apposition.

Remarks: *Furtipodia gemma*, new species, is very similar to *F. petrosa* but can be differentiated from it by the presence of tall tubercles on the protogastric and branchial regions (Fig. 2d). Although the tubercles are also present on *F. petrosa*, they are considerably shorter (Fig. 2b). The texture of the dorsal surface of the carapace is also different. In *F. petrosa*, the surface is more eroded, but on the protogastric and mesobranchial regions, some parts are smooth due to the fusion of adjacent tubercles. This type of texture is not seen in *F. gemma*.

No males of this species are known at this stage. However, direct comparisons of female specimens of *F. gemma* with *F. petrosa* reveal that both are clearly distinct species. None of the differences observed can be attributed to variation. Neither can the differences be attributed to sexual dimorphism. Males of *F. petrosa* are known and they do not differ from females in any non-sexual characters (see discussion for next species). The female specimen from Hawaii, although larger than the two specimens from Guam, is identical to them in almost all respects.

Furtipodia petrosa (Klunzinger 1906), new combination
(Figs. 4b, 5c, d)

Heterocrypta petrosa Klunzinger 1906: 53, pl. 2, fig. 9. — Lenz 1910: 543.

Daldorfia horrida — Hoover 1998: 271, photo (b). Not *Cancer horridus* Linnaeus 1758.

Material examined: Guam. 1 female (18.9 by 12.7 mm) (ZRC 2002.213), Gun Beach, in channels, rubble, about 3 m, night, coll. J. Starmer, 5 December 1998. — 1 male (21.0 by 13.9 mm) (UF 8), Dadi Beach, reef flat, 0.5 m depth, in clam shell, coll. J. Starmer, 6 June 1995. **Yemen.** 1 male (10.5 by 7.4 mm) (SMF 26922), Socotra Island, near Hawlaf, shallow sublittoral, sand and rocks substratum, 0-3 m, coll. M. Apel, 14 April 1999. **Seychelles.** 1 female (12.7 by 8.5 mm) (MNHN), station 20, coll. REVES 2, 6 September 1980. **Australia.** 1 male (33.7 by 21.3 mm) (AM P 3770), Queensland, Hope Island, 15°28'S 145°15'E, coll. A. R. McCulloch, 1905. **New Caledonia.** 1 male (9.0 by 6.2 mm) (MNHN), Îles Chesterfield, Stn. DW 9, 62 m depth, 20°53'S 161°35.32'E, coll. CORAIL 2, 20 July 1988.

Remarks: This species was originally described from the Red Sea, but Klunzinger (1906: 53) himself commented that the specimen that he had figured was missing. This was confirmed by Hans-Jörg Niederhöfer of the Staatliches Museum für Naturkunde, Stuttgart, where most of Klunzinger's specimens are presently kept. The type(s) are thus clearly lost. Although *F. petrosa* is very

similar to *F. gemma*, the excellent drawing of *F. petrosa* leaves little doubt that we are dealing with two separate species. In addition, we have examined a male specimen (SMF 26922) from Socotra Island near the Red Sea, which agrees very well with Klunzinger's (1906) account and figure, and support the present arguments for distinguishing *F. petrosa* and *F. gemma*.

Furtipodia petrosa has been reported from Sri Lanka (Lenz 1910) and probably Hawaii. Hoover (1998: 271, picture 'b') had identified a specimen photographed from Hawaii as *Daldorfia horrida* but his species is almost certainly *F. petrosa*. While the photographed specimen was not collected (J. Hoover, pers. comm.), it is clear that the gastric region figured is not as high as that of *F. gemma*. The carapace is also more eroded than that of *F. gemma*. At this moment, we have only one specimen of this genus from Hawaii, which we have identified as *F. gemma* and not *F. petrosa*. However, it is quite possible that both species are sympatric, perhaps even syntopic. There were originally two *Furtipodia* specimens from Guam, one male and one female, both collected together at the same time from under a clam shell at Dadi Beach by J. Starmer in 6 June 1995. Originally thought to be a pair of the same species, a closer examination showed, rather surprisingly, that the male specimen is *F. petrosa* but the female is *F. gemma*! Initially, the differences in morphology were attributed to sexually dimorphism, which sometimes occur in this family (e.g. *Pseudolambrus beaumonti* Alcock 1895; see Ng & Rahayu 2000), but comparisons of male and female specimens of *F. petrosa* confirm that there are no significant carapace differences. The differences observed on female specimens from Guam are therefore, almost certainly inter-specific and not intra-specific.

This species is reported for the first time from Guam, Australia, New Caledonia and Hawaii.

Neikolambrus, new genus

Diagnosis: Carapace broadly subtriangular, slightly wider than long, dorsal surface tuberculate; with one spine on gastric and cardiac regions; two spines on branchial region; hepatic and epibranchial margin not in straight line; hepatic region separated from epibranchial margin by deep notch; region between epibranchial and meso- and metabranchial margins convex. Posterior lateral regions of carapace not expanded to cover ambulatory legs; posterior margin not extended beyond base of abdomen. Last epibranchial tooth immediately adjacent to first posterolateral tooth; not in line with posterior margin. Hepatic tooth slightly larger than first anterolateral tooth. Epibranchial margin convex, with about seven equally sized teeth, inclusive of last epibranchial tooth; teeth fairly large, closely spaced, not forming crista. Meso- and metabranchial margins straight, with three to four teeth, first tooth largest, adjacent to last epibranchial tooth. Antennal article two anterior margin at about midpoint of antennular article one; antennal article three about half length of antennular article one;

antennal article four above anterior margin of antennular article one. Epistome smooth, without any projections under first antennular article. Pterygostomial region not excavated. Pterygostomial ridge low, rounded, tuberculate, without long setae covering pterygostomial region. Chelipeds strongly heterochelous. Ambulatory legs surfaces smooth; merus with a few long setae, upper and lower margin with well-spaced stout spines; carpus upper margin with one spine; propodus slightly pubescent distally; dactylus pubescent, tip corneous. Female telson subtriangular, broader than long, apex not constricted laterally.

Type species: *Neikolambrus polemistes*, new species, by present designation.

Etymology: The genus name is an arbitrary combination of the Greek work ‘neikos’ meaning quarrel and the common suffix ‘lambrus’ for parthenopids. Alluding to the assumption that the large chela probably makes it potentially quarrelsome. Gender of genus masculine.

Remarks: This new species superficially resembles species of *Rhinolambrus*, but the overall shape of *Neikolambrus polemistes* is sufficiently different to warrant the establishment of a new genus for it. In *Neikolambrus*, the carapace is usually broader than long, but it is about equal or longer than broad in *Rhinolambrus*; with the meso- and metabranchial margins straight (concave in *Rhinolambrus*). The number and position of the teeth on the meso- and metabranchial margin are also quite different from *Rhinolambrus*. In *Neikolambrus*, there are two teeth on the mesobranchial margin, and a considerably smaller metabranchial tooth that is partially hidden under the second mesobranchial tooth. The two teeth are widely spaced and the metabranchial tooth is only slightly smaller than the mesobranchial tooth. In *Rhinolambrus*, there is only one tooth on each of the meso- and metabranchial margins.

Neikolambrus, like *Pseudolambrus*, has slightly flattened epibranchial teeth, and have teeth on the upper margin of the ambulatory leg merus that is similar in shape and distribution. However, the shape of the epibranchial teeth of *Neikolambrus* is quite different from *Pseudolambrus*. In *Neikolambrus*, these teeth are all separated by V-shaped gaps, whereas the teeth of *Pseudolambrus* are all very closely spaced and do not have V-shaped gaps. Instead, the gaps between the epibranchial teeth in *Pseudolambrus* are very narrow, just enough to separate the individual teeth. In some large *Pseudolambrus* specimens, the epibranchial teeth are so closely-spaced that no gaps can be seen between adjacent teeth. The hepatic tooth of *Neikolambrus* also differs from *Pseudolambrus* in that it is well separated from the first epibranchial tooth due to a rather deep and wide hepatobranchial groove. In *Pseudolambrus*, the hepatobranchial groove is not as deep and wide and the hepatic tooth is usually very close to the first epibranchial tooth. In some species (e.g. *P. calappoides* Adams & White 1849), the hepatic tooth is also expanded, so much so that its posterior edge sometimes overlaps the first epibranchial tooth. In addition, the position of the last epibranchial tooth of *Neikolambrus* is different from that of *Pseudolambrus*. It is not in line with that

of the posterior margin in *Neikolambrus*, but slightly anterior to it. The last epibranchial tooth of *Pseudolambrus* is in line with the posterior margin.

Neikolambrus polemistes, new species
(Fig. 7, 8b)

Material examined: Holotype, ovigerous female (11.2 by 9.7 mm) (ZRC 2002.214), Guam, Tumou Bay fore reef, 27-30 m, among coral rubble, coll. H. T. Conley, 12 September 1999. Non-type: 1 male (7.9 by 7.8 mm) (MNHN), New Caledonia, Îles Chesterfield, station DW 144, 19°27.73'S 159°23.28'E, ca. 50 m depth, coll. CORAIL 2 Expedition, 30 August 1988.

Description: Carapace broadly subtriangular, dorsal surface tuberculate; angle between anterolateral and posterolateral margins convex, boundary not distinct. Gastric, cardiac, and branchial regions distinct and inflated, hepatic region slightly inflated; intestinal region not inflated; hepatobranchial notch distinct. Frontal projection deflexed 90° downwards, with relatively deep median groove; lateral margin truncate; tip constricted, trifid. Supraorbital region strongly inflated, separated from protogastric region by narrow, shallow gastro-orbital groove; supraorbital groove deep. Gastrobranchial groove deep, short. Protogastric region slightly inflated, tuberculate; mesogastric inflated, with a large, round, median tubercle; metagastric region separated from mesogastric region by broad groove, surface tuberculate. Cardiac region inflated, tuberculate, tubercles low, separated from metagastric by broad groove. Intestinal region depressed, very narrow. Hepato-orbital groove shallow, hepatic region not clearly separated from orbital region. Hepatic region not inflated, slightly tuberculate; hepatic margin strongly angled, slightly less than 90°. Hepatobranchial groove deep, clearly separating hepatic region from branchial region; hepatobranchial notch deep, V-shaped, clearly separating hepatic margin from epibranchial margin. Epibranchial region strongly inflated, broad, dorsal surface with several large tubercles, broad. Mesobranchial region narrow, slightly inflated. Metabranchial region very narrow, depressed. Epibranchial margin strongly convex, with about eight teeth; teeth triangular, edges denticulate. Mesobranchial margin short, less than one-third epibranchial margin length; with two teeth, teeth triangular, acute; first tooth practically under posterior portion of epibranchial region, about half size of second tooth. Metabranchial margin length slightly less than mesobranchial margin length; with a small tooth, tooth partially hidden behind second mesobranchial tooth. Posterior margin convex, with four teeth, teeth triangular, one lateral tooth on each side, two median teeth placed close together.

Epistome surface smooth; anterior margin ridged, lateral and posterior margin not ridged; posterior portion above posterior margin slightly depressed. Suborbital margin dentate, teeth triangular, notch absent; inner margin sparsely setose, setae long. Subhepatic groove narrow, shallow, not well defined.

Pterygostomial ridge broad, low, tuberculate. Pterygostomial region slightly inflated, tuberculate; separated from subbranchial region by diagonal row of low tubercles. Subepibranchial ridge low, tuberculate, tubercles granulate.

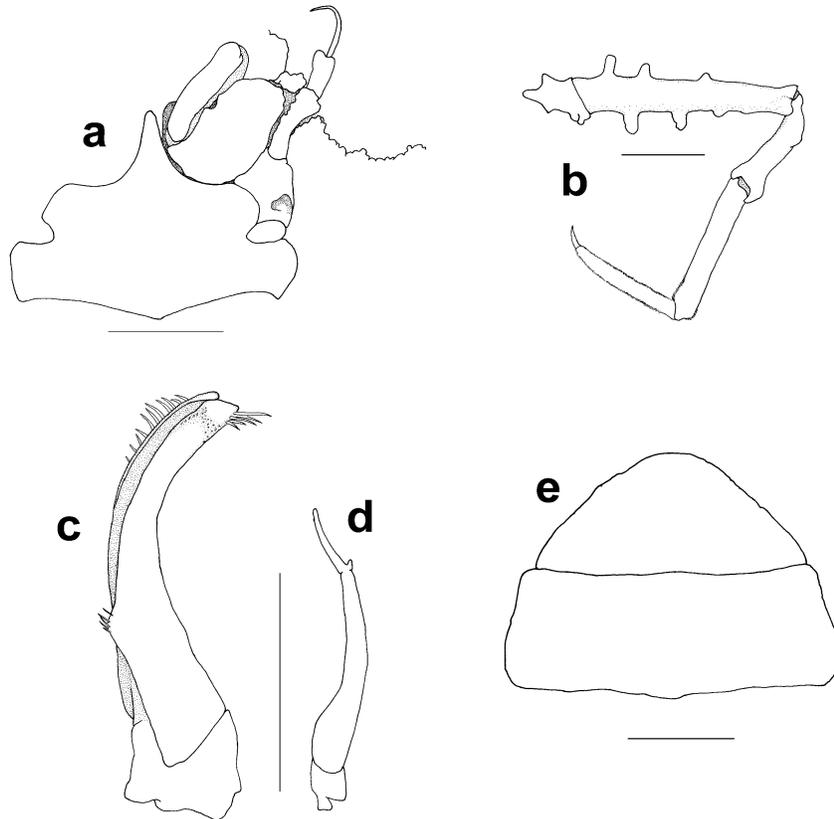


Figure 7. *Neikolambrus polemistes*, new species, holotype, ovigerous female (11.2 by 9.7 mm) (ZRC): **a**, epistome, left antennule and antenna; **b**, right P5; **e**, telson and sixth abdominal segment. — Non-type, male (7.9 by 7.8 mm) (MNHN), New Caledonia: **c**, left G1; **d**, left G2. Scale bar = 1 mm.

Antennules folded at ca. 45° angle. Antennular article one surface tuberculate, median portion slightly inflated; inner margin ridged. Antennal article two subpentagonal, surface tuberculate, about same length as antennular article one; not filling suborbital margin. Antennal article three quadrate, surface tuberculate, about same length and width as antennal article two; outer anterior margin with long setae. Antennal article four about same shape, length and width as antennal article three; with long setae. Flagellum long, longer than combined length of antennal articles two, three and four.

Third maxilliped totally covering oral field when closed. Ischium subrectangular, surface heavily tuberculate, with one longitudinal groove medially, groove not continuous, interrupted by two to three tubercles; anterior inner margin with low sub-semicircular shaped protruding into merus; posterior corner of lateral margin with a large blunt tooth projection, about half width of exopod; mesial margin slightly convex, dentate, teeth short, blunt. Merus subpentagonal, surface tuberculate; anterior lateral corner auriculiform, partially covering tip of exopod; anterior margin with long setae; notch present at junction of merus and carpus, notch broadly W-shaped. Carpus anterior margin with long setae, surface with a few shorter setae; not hidden behind merus. Propodus upper margin with a few long setae; not hidden by merus. Dactylus short, tip with long setae; not hidden behind merus nor ischium. Exopod slightly less than half width of ischium; surface generally smooth, except for a few small tubercles; lateral margin with about five tubercles, posterior three larger than anterior two.

Anterior thoracic sternites one, two and three not clearly visible. Sternite four surface tuberculate, tubercles large and clustered. Sternite five with persistent press button. Sternite sutures four/five, five/six and six/seven interrupted, suture seven/eight not interrupted. Sternite eight with a longitudinal median groove.

Chelipeds strongly heterochelous. Basis-ischium fused, suture line visible; basis surface smooth; ischium surface strongly tuberculate, tubercles large. Merus upper surface uneven, with diagonal low ridge, proximal end of ridge with a large triangular tooth; inner margin with about five triangular teeth, each tooth broad at base, granulate; outer margin with three triangular teeth, one distal two proximal, proximal teeth separated from distal tooth by wide space; inner surface tuberculate, tubercles large, well spaced, tubercles granulate; lower margin with a row of large, round granulate tubercles; lower surface slightly depressed medially, tuberculate, tubercles granulate. Carpus upper surface slightly uneven; outer margin with three to four angled projections; inner margin with a prominent triangular, granulate tooth; lower surface tuberculate, tubercles granulate. Right manus much larger than left manus; cross section slightly sub-triangular due to strong ridge on inner surface; outer surface with a diagonal row of tubercles, proximal tubercle smallest, becoming larger distally, tubercles granulate; upper margin with two prominent triangular teeth, one proximal, one median, slightly deflexed; inner surface separated into upper and lower surface by strong diagonal ridge; ridge dentate, teeth large, granulate; upper portion of inner surface uneven, lower portion smooth; lower margin dentate, teeth blunt, granulate; movable finger forming a gap with fixed finger when closed; fixed finger with a large, sub-rectangular molariform tooth. Left manus cross section triangular; outer surface with a diagonal row of tubercles, proximal tubercle smallest, becoming larger distally, tubercles granulate; upper margin with three prominent triangular teeth, one proximal, one median, and one distal, slightly deflexed, distal one more so than the others; upper surface uneven, with a few low round tubercles

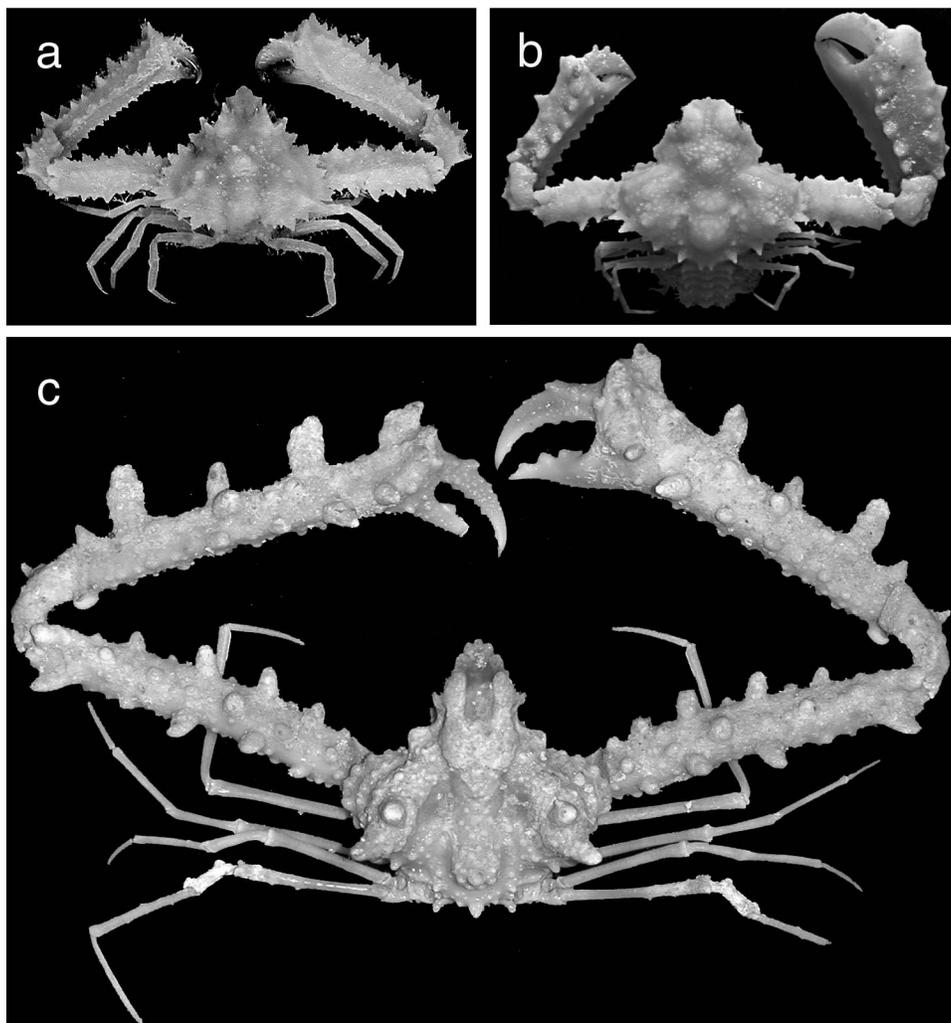


Figure 8. Dorsal view of: **a**, *Certolambrus pugilator* (A. Milne-Edwards 1873), male (6.4 by 5.2 mm) (UF 9), Guam. — **b**, *Neikolambrus polemistes*, new species, holotype, ovigerous female (11.2 by 9.7 mm) (ZRC), Guam. — **c**, *Rhinolambrus rudis* (Rathbun 1916), male (30.7 by 30.7 mm) (ZRC), Guam.

near upper margin, distal most tubercle strongest; inner margin dentate, teeth large, granulate; inner surface smooth except for a few small tubercles; lower margin dentate, teeth blunt, granulate; movable finger not forming a gap with fixed finger when closed; upper margin of movable finger with a row of irregular sized teeth, proximal most tooth largest.

Ambulatory legs slender, cylindrical, slightly compressed laterally, second pair longest. Merus upper margin with three tall, well-spaced cylindrical teeth, tip rounded; proximal most projection tallest; lower margin with three to four similar projections. Carpus upper margin with low, triangular teeth on proximal and distal ends; distal most tooth overlapping onto proximal upper margin of propodus. Propodus upper and lower margins entire, surfaces slightly pubescent; becoming more dense distally. Surface of dactylus pubescent, tip clear, corneous.

Female abdominal segments all free; segments two, three and four about same length; segment five slightly longer than segment four; segment six about one and a half times longer than segment five; segment five broadest. Segments two to six with a large, tall granulate projection on lateral margins. Segments two and three with spine-like median projection; projection on segment three slightly broader than segment two. Segment four and five with two spine-like projections, projections granulate, tip blunt. Segment six with broad, large median protrusion, granulate. Telson triangular, median portion slightly inflated, tuberculate, slightly broader than long, tip rounded.

Male abdomen not strongly T-shaped, subrectangular; segments three, four and five fused, suture lines not visible; segments two and three with a lateral projection on each side and a median projection, projections long, triangular, granulate; segments four and five lateral projections shorter than segments two and three, median portion with two short conical spine-like projections; segment six rectangular, posterior margin with two short lateral projections, median portion with a broad, subcircular projection; telson triangular, tip rounded, medial portion slightly inflated and tuberculate.

G1 stout, strongly curving outwards distally, compressed dorso-ventrally; inner margin distal one-third with evenly spaced long setae; tip inner portion lobed; tip outer portion lobed with a small median hooked protrusion; lateral corner with dense congregation of long setae of various length. G2 about two-thirds length of G1; distal portion about one-third of basal portion, base of distal portion with small protrusion; tapering towards tip.

Etymology: The species name, 'polemistes', is Greek for warrior, alluding to the large major chela, which has the appearance of a boxing glove. The name is used as a noun in apposition.

Remarks: The mature male specimen from New Caledonia, although smaller than the holotype female, agrees with it in all non-sexual characters. The strongly deflexed frontal projection of *N. polemistes* is diagnostic. The frontal projection is deflexed almost 90° downwards and is reminiscent of the condition seen in *Rhinolambrus deflexifrons* (Miers 1879). We have examined the holotype female of *R. deflexifrons* from Sri Lanka (carapace width 11.9 mm, front broken, NHM 1815.14), a male (11.2 by 12.7 mm) and a female (6.1 by 7.2 mm) specimen from the Seychelles (MNHN), and several differences are immediately discernible between these two species. In *R. deflexifrons*, the hepato-orbital notch is wide and the hepatobranchial groove deep; while in but in *N. polemistes*, the hepato-orbital notch is narrow and the hepatobranchial groove is shallow. The

frontal projections of both species are strongly deflexed, but the shape is totally different; in *N. polemistes*, there is no median constriction of the lateral margin, but this constriction is very prominent in *R. deflexifrons*.

It has been difficult to ascertain the position of the last epibranchial tooth and the mesobranchial teeth. In the larger female holotype, the first mesobranchial tooth appears to be part of the epibranchial teeth. This is due to its position, which is under the posterior portion of the epibranchial region. However, upon examining the smaller male specimen, it is clear that the same tooth is actually part of the mesobranchial region and there are two reasons for this. Firstly, the groove separating the epibranchial region from the mesobranchial region is shallow and not distinct. Secondly, it appears that the anterior portion of the mesobranchial extends somewhat beneath the epibranchial region in larger specimens. This could be due to a disproportionate increase in size of the epibranchial and mesobranchial regions during growth.

Rhinolambrus A. Milne-Edwards 1878

Rhinolambrus rudis (Rathbun 1916)

(Fig. 8c)

Parthenope (Rhinolambrus) rudis Rathbun 1916: 556. — Flipse 1930: 28 (key).
— Estampador 1937: 557. — Sakai 1972: 32; 1976: 274 (text-fig. 151).

Material examined: Guam. 1 male (30.7 by 30.7 mm) (ZRC 2002.215), Cocos Barrier Reef, 1.5 m, night, coll. J. Starmer, August 1995. — 1 female (19.1 by 19.7 mm) (ZRC 2002.216), Cocos Lagoon, Val's Reef, 2-3 m, in *Padina* meadow, coll. J. Starmer, 27 March 1995. — 1 male (18.9 by 18.7 mm) (UF), Tepungan Channel tunnels, 5 m, on sand, coll. J. Starmer, 7 August 1998.

Remarks: This is an easily identifiable species due to the presence of four lobiform projections on the outer margin of the cheliped manus. Three of these lobiform projections are large, whereas the second proximal one is always about half size or smaller than the rest. On the upper surface of the cheliped there is a row of round tubercles, of which the median one is larger than the rest and prominent. The ambulatory legs are cylindrical in cross-section, very long and slender, with all the dactylus pubescent. The tubercles on the carapace surface are also long and prominent. There are two long tubercles on the mesobranchial region, none on the metabranchial region and one on the cardiac region. On the posterior margin, there is also a relatively long tubercle. The front is considerably produced and the interorbital region has a very deep groove.

Originally described from the Philippines, this species is reported for the first time from Guam.

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References

- Adams, A. & A. White 1849. Crustacea. In: A. Adams (ed), The Zoology of the Voyage of the H.M.S. Samarang; Under the Command of Captain Sir Edward Belcher, C.B., F.R.A.S., F.G.S. During the Years 1843-1846: 33-66, pls. 7-13. Reeve, Benham & Reeve, London.
- Alcock, A. 1895. The Brachyura Oxyrhyncha. Materials for a Carcinological Fauna of India, No. 1. Journal of the Asiatic Society of Bengal 64 (Part 2, no. 2): 157-291, pls. 3-5.
- Bouvier, E.-L. 1914. Sur la faune carcinologique de l'île Maurice. Comptes rendus des séances de l'Académie des Sciences 159: 698-705.
- Bouvier, E.-L. 1915. Décapodes marcheurs (Reptantia) et Stomatopodes recueillis à l'île Maurice par M. Paul Carié. Bulletin Scientifique de la France et de la Belgique (7)48(3): 178-318, fig. 1-42, pls. 4-7.
- Chen, H. & Z. Xu. 1991. Study on the crabs of the Nansha Islands, China. Studies on the Marine Organisms of the Nansha Islands and Surrounding Seas, Beijing 3: 48-106. (In Chinese with an English abstract).
- Clark, P. F. & B. Presswell, 2001. Adam White: The Crustacean years. Raffles Bulletin of Zoology 49: 149-166.
- Chiong, W. L. & P. K. L. Ng. 1998. A revision of the buckler crabs of the genus *Cryptopodia* H. Milne Edward, 1834 (Crustacea: Decapoda: Brachyura: Parthenopidae). Raffles Bulletin of Zoology 46: 157-216.
- Estampador, E. P. 1937. A check list of Philippine Crustacean Decapods. Philippines Journal of Science 62: 465-559.
- Flipse, H. J. 1930. Oxyrhyncha: Parthenopidae. Die Decapoda Brachyura der Siboga-Expedition, VI. Siboga-Expeditie 39c2(112): 1-96.
- Gibbes, L. R. 1850. On the carcinological collections of the United States, and an enumeration of species contained in them, with notes on the most remarkable, and descriptions of new species. Proceedings of the American Association for the Advancement of Science 3: 167-201.

- Guinot, D. 1967. Recherches préliminaires sur les groupements naturels chez les Crustacés Décapodes Brachyours. III. A propos des affinités des genres *Dairoides* Stebbing et *Daira* de Haan. Bulletin du Muséum national d'Histoire naturelle 2^e Série 39(3), 1967: 540-563, figs. 1-36.
- Guinot, D. 1978. Principes d'une classification évolutive des Crustacea Décapodes Brachyours. Bulletin Biologique de la France et de la Belgique, nouvelle série 112(3): 211-292.
- Haswell, W. A. 1880. On the Australian Brachyura Oxyrhyncha. Proceedings of the Linnean Society of New South Wales 4: 431-458, pls. 25-27.
- Haswell, W. A. 1882. Catalogue of the Australian Stalk- and Sessile-eyed Crustacea. Pp. xxiv+324, figs. i-viii, pls. 1-4. Australian Museum, Sydney.
- Herbst, J. F. W. 1790. Versuch einer Naturgeschichte der Krabben und Krebse, nebst einer systematischen Beschreibung ihrer verschiedenen Arten 1(8): 239-274, pls. 18-21. Berlin and Stralsund.
- Hoover, J. P. 1998. Hawai'i's Sea Creatures. Pp. xviii+366. Mutual Publishing, Honolulu.
- Klunzinger, C. B. 1906. Die die Spitz- und Spitzmundkrabben (Oxyrhyncha und Oxystomata) des Roten Meeres. Pp. vi+91, 2 pls. Stuttgart.
- Laurie, R. D. 1906. Report of the Brachyura collected by Professor Herdman, at Ceylon, in 1902. In: W. A. Herdman (Ed.), Report to the Government of Ceylon on the Pearl Oyster Fisheries of the Gulf of Manaar, part 5 (Suppl. Rep., no. 40): 349-432, figs. 1-12, pls. 1-2.
- Laurie, R. D. 1915. Reports on the Marine Biology of the Sudanese Red Sea – XXI. On the Brachyura. Journal of Linnean Society, Zoology, London 31: 407-475, pls. 42-45, 5 text-figures.
- Lenz, H. 1910. Crustaceen von Madagaskar, Ostafrika und Ceylon. In: Reise in Ostafrika in den Jahren 1903-1905, mit Mittlen der Hermann und Elise geb. Heckmann Wentzel-Stiftung ausgeführt von Professor Dr. Alfred Voeltzkow. Wissenschaftliche Ergebnisse. Zweiter Band. Systematische Arbeiten, Stuttgart: 539-576, 4 text-figs.
- Linnaeus, C. 1758. Systema Naturae per Regna Tria Naturae, Secundum Classes, Ordines, Genera, Species, cum Characteribus, Differentiis, Synonymis, Locis. Edition 10. Pp. iii+824. Holmiae, Stockholm.
- Manning, R. B. & L. B. Holthuis 1981. West African brachyuran crabs (Crustacea: Decapoda). Smithsonian Contributions to Zoology 306: 1-379.
- Miers, E. J. 1879. Descriptions of new or little-known species of Maioid Crustacea (Oxyrhyncha) in the collection of the British Museum. Annals & Magazine of Natural History (5)4: 1-28, pls. 4, 5.
- Miers, E. J. 1886. Report on the Brachyura collected by H.M.S. Challenger during the years 1873-76. In: Report on the Scientific Results of the Voyage of H.M.S. Challenger during the Years 1873-76, Zoology, 17: xli+362, pls. 1-29.

- Milne-Edwards, A. 1872. Recherches sur la faune carcinologique de la Nouvelle-Calédonie. Nouvelles Archives du Muséum d'Histoire naturelle 8: 229-267, pls. 10-14.
- Milne-Edwards, A. 1873. Description de quelques Crustacés. Nouveaux ou peu connus provenant du Musée de M. C. Godeffroy. Journal des Museum Godeffroy 1(4): 77-88, pl. 12-13.
- Milne-Edwards, A. 1878. Études sur les xiphosures et les crustacés podophthalmiques. In: Mission scientifique au Mexique et dans l'Amérique centrale. Recherches Zoologique pour servir à l'histoire de la fauna de l'Amérique centrale et du Mexique. Cinquième partie. Livraison 4: 121-184, pls. 21-27, 29, 30.
- Milne Edwards, H. 1834-1837. Histoire naturelle des Crustacés, comprenant l'anatomie, la physiologie et, la classification de ces animaux. 1, 1834: xxxv+468; 2, 1837: 532, atlas.
- Ng, P. K. L. & C. L. McLay. 2003. On the systematic position of *Lambrachaeus* Alcock, 1895 (Decapoda, Brachyura). Crustaceana, in press.
- Ng, P. K. L. & D. L. Rahayu, 2000. On a small collection of Parthenopidae from Indonesia, with description of a new species of *Pseudolambrus* (Crustacea: Decapoda: Brachyura). Proceedings of the Biological Society of Washington 113: 782-791.
- Ng, P. K. L. & G. Rodríguez. 1986. New records of *Mimilambrus wileyi* Williams, 1979 (Crustacea: Decapoda: Brachyura), with notes on the systematics of the Mimilambridae Williams, 1979 and Parthenopoidea MacLeay, 1838 sensu Guinot, 1978. Proceedings of the Biological Society of Washington 99: 88-99.
- Ng, P. K. L., C.-H. Wang, P.-H. Ho & H.-T. Shih. 2001. An annotated checklist of brachyuran crabs from Taiwan (Crustacea: Decapoda). National Taiwan Museum Special Publication Series No. 11: 1-86.
- Nobili, G. 1905. Diagnoses préliminaires de 34 espèces et variétés nouvelles, et de 2 genres nouveaux de Décapodes de la Mer Rouge. Bulletin du Muséum d'Histoire Naturelle, Paris 11: 393-411.
- Ortmann, A. 1893. Die Decapoden-Krebse des Strassburger Museums, mit besonderer Berücksichtigung der von Herrn Dr. Döderlein bei Japan und bei den Liu-Kiu-Inseln gesammelten und zur Zeit im Strassburger Museum aufbewahrten Formen. VII. Theil. Abtheilung: Brachyura (Brachyura genuina Boas) II. Unterabtheilung: Cancroidea, 2. Section: Cancrinea, 1. Gruppe: Cyclometopa. Zoologische Jahrbücher 7: 411-495, pl. 17.
- Ortmann, A. 1894. Crustaceen. In: R. Semon. Zoologische Forschungsreisen in Australien und dem Malayischen archipel, Vol. 5: Systematic und Thiergeographie. Denkschriften der Medicinisch-Naturwissenschaftlichen Gesellschaft zu Jena 8: 3-80, pls. 1-3.
- Paul'son, O. 1875. Studies on Crustacea of the Red Sea with notes regarding other areas. Part 1. Podophthalmata and Edriophthalmata (Cumacea) with 21

- tables. Pp. 144, pls. 1-21. Kiev. English translation, 1961, Israel Program for Scientific Translations, Jerusalem, 164 pp.
- Rathbun, M. J. 1910. V. Brachyura. The Danish Expedition to Siam 1899-1900. Det Kongelige Danske Videnskabernes Selskabs Skrifter, 7 Raekke, Naturvidenskabelig og Matematisk Afdeling, 4: 301-368, pls. 1-2, 1 map.
- Rathbun, M. J. 1911. No. XI. Marine Brachyura. In: The Percy Sladen Trust Expedition to the Indian Ocean in 1905, under the Leadership of J. Stanley Gardiner, volume 3. Transactions of the Linnean Society of London (Zoology) series 2, 14: 191-261, figs. 1, 2, pl. 15-20.
- Rathbun, M. J. 1916. New species of crabs of the families Inachidae and Parthenopidae. Proceedings of the United States National Museum 50: 527-559.
- Sakai, T. 1972. On seven rare species of crabs of the family Parthenopidae (Decapod Crustaceans) from Japan. Proceedings of the Japanese Society of Systematic Zoology 8: 32-33.
- Sakai, T. 1976. Crabs of Japan and the Adjacent Seas. Kodansha Ltd., Tokyo. 3 vol. Vol. 1 [English text]: i-xxix + 1-773, figs. 1-379, maps. 1-3; vol. 2 [Japanese text]: 1-461, figs. 1-2; vol. 3 [plates]: 1-61, pls. 1-251.
- Shen C., A., Dai & H., Chen. 1982. New and Rare Species of Parthenopidae (Crustacea: Brachyura) from China Seas. Acta Zootax. Sinica 7(2): 139-149, pls. 1-2. (In Chinese with an English abstract)
- Stevcic, Z. 1994. Contributions to the re-classification of the family Majidae. Periodicum Biologorum 96(4): 419-420.
- Stimpson, W. 1857. Notices of new species of Crustacea of western North American; being an abstract from a paper to be published in the Journal of the Society. Proceedings of the Boston Society of Natural History 6: 220.
- Stimpson, W. 1871a. Preliminary report on the Crustacea dredged in the Gulf Stream in the Straits of Florida, by L. P. de Pourtales, Assist. U. S. Coast Survey, Part I: Brachyura. Bulletin of the Museum of Comparative Zoölogy at Harvard College, in Cambridge 2(2): 109-160.
- Stimpson, W. 1871b. Notes on North American Crustacea in the Museum of the Smithsonian Institution, No. III. Annals of the Lyceum of Natural History of New York 10(4-5): 92-136.
- Stimpson, W. 1907. Report on the Crustacea (Brachyura and Anomura) collected by the North Pacific Exploring Expedition, 1853-1856. Smithsonian Miscellaneous Collection 49(1717): 1-240, pls. 1-26.
- Takeda, M., Y. Fukui, K. Wada & A. Asakura.. 1994. Brachyura (Crustacea: Decapoda) from the Northern Mariana Islands, Micronesia. In A. Asakura & T. Furuki (eds), Biological Expedition to the Northern Mariana Islands, Micronesia. Natural History Research, Special Issue No. 1: 285-290.
- Tan, S.-H., J.-F. Huang & P. K. L. Ng. 1999. Crabs of the family Parthenopidae of Taiwan (Crustacea: Decapoda). Zoological Sciences 38(2): 196-206.
- Tan, S. H. & P. K. L. Ng. 2002. Revision of the genus *Daldorfia* Rathbun, 1904, with an appraisal of the subfamily Daldorfiinae Ng & Rodríguez, 1986

(Crustacea: Decapoda: Brachyura: Parthenopidae). Mèmoires du Muséum national d'Histoire Naturelle, Paris, in preparation.

Ward, M. 1939. The Brachyura of the Second Templeton Crocker-American Museum Expedition of the Pacific Ocean. American Museum Novitates 1049: 1-15, figs. 1-18.

White, A. 1861. Tabular view of the orders and leading families of Myriapoda, Arachnada, Crustacea (arranged by A. White), Annelida & Entozoa (by W. Baird). Engraved by J. W. Lowry. Pls. 1-4, London, Society for Promoting Christian Knowledge.

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