

# Axiid collections of the Zoological Museum, Copenhagen, with the description of one new genus and six new species (Axiidae, Thalassinidea, Crustacea)

KATSUSHI SAKAI

Accepted 5 August 1991

Sakai, K. 1992. Axiid collections of the Zoological Museum, Copenhagen, with the description of one new genus and six new species (Axiidae, Thalassinidea, Crustacea).—*Zool. Scr.* 21: 157–180.

The collections of the family Axiidae in the Zoological Museum, Copenhagen, were examined: seven genera including one new genus, *Eucalastacus* gen.n. and 14 Indo-Pacific species containing five species, *Eiconaxius farreae*, *E. weberi*, *E. sibogae*, *Axius australiensis* and *Axiopsis serratifrons*; six new species, *Eiconaxius demani* sp.n., *E. mortenseni* sp.n., *Bouvieraxius keiensis* sp.n., *Eucalastacus torbeni* sp.n., *Axiopsis tsushimaensis* sp.n., and *Calocarides vigila* sp.n.; and three uncertain species, *Eutrichocheles* aff. *brocki*, *Eutrichocheles* sp. and *Axiopsis* sp. *Postonocaris*, *Sakaiocaris* and *Callistocaris* are referred, respectively, as junior synonyms of *Bouvieraxius*, *Spongiaxius* and *Ambiaxius*.

Katsushi Sakai, Tokushima Biological Laboratory, Shikoku Women's University (=Shikoku University after April 1992), 771-11 Tokushima, Japan.

## Introduction

The unidentified axiids in the collections of the Zoological Museum, Copenhagen, have been examined. The axiids were collected in the Indo-Pacific region during Dr Th. Mortensen's Expeditions from 1899 to 1930 (the Pacific Expedition in 1913–1916, the Danish Expedition to the Kei Islands in 1922, and the Java–South Africa Expedition in 1929–1930) (Mortensen 1923), and the Galathea Expedition 1950–1952 (Wolff 1964). Five species, seven new species, and two uncertain species are documented from these expeditions. Two new Japanese species, *Eiconaxius mortenseni* sp.n. from Sagami Bay, *Axiopsis tsushimaensis* sp.n. from Fukuoka, Korean Straight, and another species, *Eiconaxius farreae* from Sagami Bay, are recorded, although *Axiopsis tsushimaensis* was defined before as an affinity of *Axiopsis* aff. *serratifrons* sensu Sakai, 1970. From the Indonesian region two new species, *Eiconaxius demani* sp.n., and *Bouvieraxius keiensis* sp.n., one uncertain species, *Eutrichocheles* sp. and three species, *Eiconaxius weberi*, *E. sibogae* and *Axiopsis serratifrons* are recorded. From Sydney, Australia, *Axius australiensis* are recorded, and from New Zealand one new genus and two new species, *Eucalastacus torbeni* gen. et sp.n., and *Calocarides vigila* sp.n. are reported. From the Indian Ocean one new species, *Bouvieraxius keiensis* sp.n. from Mauritius and two other species, *Axiopsis* sp.n. from Kenya and *Eutrichocheles* aff. *brocki* from Kenya are recorded.

The species are included in Axiidae (Sakai & de Saint Laurent 1989). Kensley (1989) separated the two families Calocarididae and Axiidae but the characteristics of Calocarididae are integrated under the level of Axiidae since

in Calocarididae, like in Axiidae, there are epipods on pereopods 1–4, the chela of pereopod 2 is elongate, and the flagellum of the exopod of maxilliped 3 is not bent with acute angle from the proximal segment as in Coralaxiinae, but straight. In Coralaxiinae the epipods on pereopods are absent and the chela of pereopod 2 is rounded. Kensley (1989) established four new genera, *Posthonocaris*, *Sakaiocaris*, *Callistocaris* and *Lophaxius*. However, *Posthonocaris*, *Sakaiocaris* and *Callistocaris* are considered as junior synonyms of *Bouvieraxius*, *Spongiaxius* and *Ambiaxius*, respectively, in accordance with the principle of priority. *Callistocaris* and *Ambiaxius* were designated by the same type species, *Calocaris alcocki* (McArdle, 1900), *Spongiaxius* and *Sakaiocaris* also by the same type species. *Axiopsis brucei* Sakai, 1986, and *Bouvieraxius* and *Posthonocaris* on the different type species, though there is no difference between these two genera on the characteristics.

The following species are described/discussed below:

- Eiconaxius demani* sp.n.
- Eiconaxius mortenseni* sp.n.
- Eiconaxius farreae* Ortman, 1891
- Eiconaxius weberi* (de Man, 1907)
- Eiconaxius sibogae* de Man, 1925
- Axius australiensis* (de Man, 1925)
- Bouvieraxius keiensis* sp.n.
- Eutrichocheles* aff. *brocki* (de Man, 1888)
- Eutrichocheles* sp.n.
- Eucalastacus torbeni* gen. et sp.n.
- Axiopsis serratifrons* (A. Milne Edwards, 1873)
- Axiopsis tsushimaensis* sp.n.
- Axiopsis* sp.
- Calocarides vigila* sp.n.

The following abbreviations are used in this paper: ABL = abdominal length; CL = carapace length including length of rostrum; TL = total body length including rostrum, measured by putting thread on the dorsal surface of the specimen; KIE = the Danish Expedition to Kei Islands in 1922; GE = the Galathea Expedition in 1950–1952; TME or TM = Th. Mortensen's Expedition including the Java–South Africa Expedition in 1929–1930 and the Pacific Expeditions in 1913–1930; ZMUC = The Zoological Museum of the University of Copenhagen. The ratio of abdominal segments 1–6 and telson are shown by comparing segment 1 against each of the following segments 2–6 and telson along median dorsal line.

### Family Axiidae Huxley, 1878

Axiidae Huxley, 1878: 785.

Type genus. *Axius* Leach, 1815.

### *Eiconaxius* Bate, 1888

*Eiconaxius* Bate, 1888: 40; Borradaile 1903: 537; de Man 1925c: 1, 14. *Iconaxiopsis* Alcock, 1901: 193 (Type species *I. laccadivensis*, designated by Borradaile, 1903: 537); Borradaile 1903: 537; Balss 1925: 210. *Iconaxius* Alcock, 1901: 193 (incorrect spelling).

Type species. *Eiconaxius acutifrons* Bate, 1888 (designated by Borradaile, 1903).

### *Eiconaxius demani* sp.n. (Figs 1, 2)

*Axius* (*Eiconaxius*) *parvus*, Bate, 1888; de Man 1925c: 42, pl. 3, fig. 7 (not *A. (E.) parvus* sensu Bate, 1888)

*Type material.* Kei Is., 5°46'S, 132°50'E, 352 m, sand, trawl, KIE St. 52, 7 May 1922: holotype, 1 ♂ (ZMUC), TL = 24.0 mm, CL including rostrum = 8.1 mm; paratype, 1 ovig. ♀ (ZMUC), TL = 27.0, CL = 9.5, eggs = 1.6/1.3 mm, 1.7/1.2 mm, 1.6/1.2 mm in diameter. Kei Is., 5°28'S, 132°36'E, 385 m, corals and sponges, trawl, KIE St. 59, 12 May 1922: paratype, 1 ovig. ♀ (ZMUC), TL = 21.5, CL = 6.8, 16 eggs, 1.3/1.3 mm in diameter.

*Further material.* Arafura Sea, 7°34'S, 132°44'E, 390 m, coral sand and stones, GE St. 500, 25 September 1951: 1 ♂ (ZMUC), TL = 18.0, CL = 6.0; 1 ovig. ♀ (ZMUC), TL = 18, CL = 6.0, eggs = 1.3/1.2 mm in diameter.

*Etymology.* The species name *demani* is dedicated to J. G. de Man, who with great doubt described the present species under Bate's name.

*Description of male holotype.* Rostrum (Fig. 2A) slightly longer than broad, fringed with smooth lateral ridge, tip rounded. Carapace smooth, anterolateral margin unarmed; median gastric carina reaching to near rostral tip, bifurcate into two arcuate divergent ridges in anterior  $\frac{1}{4}$  of carapace; lateral gastric carina continuous with lateral margin of rostrum, finely ridged in anterior  $\frac{1}{4}$ . Cervical groove inconspicuous.

Eye rounded, reaching about halfway level of rostrum, cornea distinctly faceted, ochroid. Antennular peduncle (Figs 1, 2A) reaching middle of segment 4 of antenna; segment 1 unarmed, twice as long as segment 2, segment 2 subequal to length of segment 3. Antennal segment 1 unarmed; dorsodistal spine of segment 2 largely elongate, shorter than antennal acicle, latter elongate, reaching to distal margin of segment 4, segment 3 short, apically pointed, segment 4 subequal to length of segment 2

excluding dorsodistal spine, segment 5 about half the length of segment 4.

Maxilliped 3 (Fig. 2B) with basis bearing sharp postero-distal spine. Ischium more than twice as long as broad, unarmed; mesial crest denticulate. Merus much longer than ischium, less than three times as long as broad, narrowing distally, unarmed. Carpus and propodus subequal, unarmed, dactyl half the length of propodus. Exopod reaching halfway level of merus, with well-developed flagellum.

Pereopods 1 unequal, coxa with stout spine on postero-distal margin, basis unarmed.

Right larger cheliped (Fig. 1) with ischium bearing row of 5 spines on posterior margin. Merus broad but longer than broad, lateral surface inflated, distally with short longitudinal crest, posterior margin with row of spines, sharp spine at some distance from distal end, anterior margin largely arched with carina. Carpus short, about  $\frac{2}{3}$  the length of merus, 1.8 times as long as broad, posterior triangular angle with obtuse spine. Chela robust, about four times as long as carpus; palm longer than broad, anterior margin convex, obtuse at distal extremity; lateral and mesial surfaces convex, smooth, but distally studded with rounded granules with setae around posterodistal areas, distal margin with two obtuse protuberances on posterior half, posterior margin carinate until near distal part of fixed finger. Cutting edge of fixed finger (Fig. 2C) with stout rounded tooth at proximal  $\frac{1}{3}$ , distal to it smooth. Dactyl much shorter than palm, lateral surface convex, cutting edge smooth proximally with low prominence, tip down-curved.

Left smaller cheliped (Fig. 2D) with ischium having 5 spines on posterior margin. Merus broad, 1.3 times as long as broad, lateral surface inflated, distally with short longitudinal crest, posterior margin with row of 9 spines, distal spine sharp near distal end, anterior margin largely rounded. Carpus more than half length of merus, posterior margin triangularly produced with obtuse distal spine. Chela about four times as long as carpus, posterior margin convex on distal half; palm about as long as broad, anterior margin forming triangular tooth at distal extremity, lateral surface smooth, convex, distal margin protruded as distinct triangular prominence or terrace below articulation with dactyl, posterior margin carinate. Fixed finger irregularly denticulate on cutting edge, lateral surface proximally with longitudinal crest extending from distal part of palm to midlength and parallel to cutting edge, tip distinctly curved. Dactyl about 1.5 times as long as palm, cutting edge proximally minutely denticulate, but almost smooth, tip strongly down-curved.

Pereopods 2 (Fig. 1) chelate, coxa with 2 spines on posterodistal margin, basis unarmed. Ischium proximally with small spine on posterior margin. Merus about three times as long as broad, unarmed. Carpus  $\frac{3}{4}$  the length of merus, unarmed. Palm about as long as carpus, fingers deflexed downward, less than half the length of palm, cutting edges unarmed.

Pereopod 3 simple, coxa with two spines on postero-distal margin, basis and ischium similar to those of pereopod 2. Merus slender than that of pereopod 2, more than three times as long as broad, unarmed. Carpus about half the length of merus, propodus 1.3 times as long as

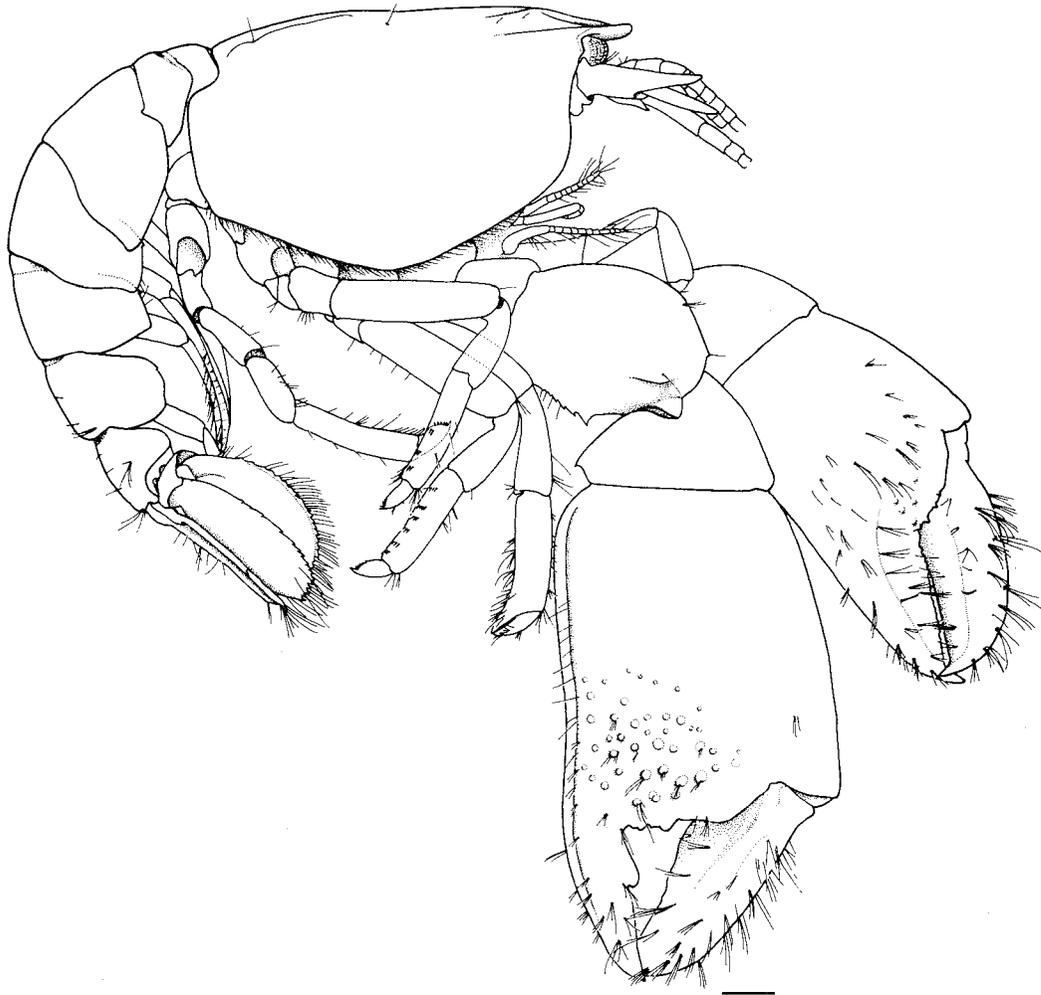


Fig. 1. *Eiconaxius demani* sp.n.—Holotype ♂, KIE St. 52. Scale 1 mm.

carpus, lateral surface posteriorly with seven transverse rows of yellow transparent spines. Dactyl oval, with row of 19 small transparent spines on posterior margin, tip with sharp yellow transparent spine.

Left pereopod 4 missing, right pereopod 4 with coxa bearing mesiodistal spine. Basis unarmed. Ischium with three microscopic spines on posterior margin. Merus four times as long as broad, unarmed. Carpus half meral length. Propodus more than 1.5 times as long as carpus, lateral surface with four transverse rows of yellow transparent spines, triangularly protruded at posterodistal angle. Dactyl oval, posterior margin with row of 10 yellow transparent spines, tip with sharp spine.

Pereopod 5 with coxa triangular on lateral surface. Basis and ischium fused together, shorter than coxa. Merus less than twice the length of basis and ischium combined. Carpus  $\frac{2}{3}$  the length of merus. Propodus twice as long as carpus. Dactyl distally truncate with row of 10 yellow transparent spines, tip with acute spine.

Abdomen smooth, without demarcation between terga and pleura, ratio of lengths of abdominal somites 1–6: 1, 1.8, 1.8, 1.8, 1.5, 1.3. Abdominal somite 6 smooth on posterior margin. Pleuron 1 narrow, rounded ventrally. Pleura 2–3 inclined backward ventrally to acute posteroventral angle. Pleura 4–5 inclined backward ventrally to rectangular posteroventral angle. Pleura 3–5 with anteroventral spine. Pleuron 6 triangular ventrally, unarmed. Pleopod 1 absent in male. Pleopod 2 of male biramous,

with free appendix interna and appendix masculina. Pleopods 3–5 also biramous, with free appendix interna.

Telson (Fig. 2F) twice as long as abdominal somite 6, 1.3 times as long as broad, lateral margins fringed with rim, with 5 spines, tapering backward to distinct postero-medial spine; dorsal surface shallowly concave on middle part, with some tufts of setae parallel to lateral margin. Uropodal endopod and exopod similar in shape, denticulate on lateral margins.

*Description of female paratype.* Features of females similar to those of male holotype. However, distal margin of palm of larger cheliped (Fig. 2E) with denticulate prominence at posterior corner to fixed finger instead of two protuberances in male holotype. Pleopod 1 of female with slender flagellum. Pleopods 2–5 with appendix interna. Twenty large eggs, each measuring 1.7/1.3 to 1.6/1.2 mm in diameter.

*Remarks.* The present specimens are remarkably similar to de Man's male (of length 21.5 mm taken from Kermadec, 560 m). They agree in the shape of rostrum, pereopods 1–2, and pleura 3–5 with an anterolateral spine, however differing from Bate's type female [with ova, measuring 12 mm, collected from Kermadec, 520 fathoms (= 951.6 m) deep]. Bate (1888: 44) noted that 'there were seven ova attached to the specimen, . . . [ova] measured about 1 mm in length . . . the left or larger hand without

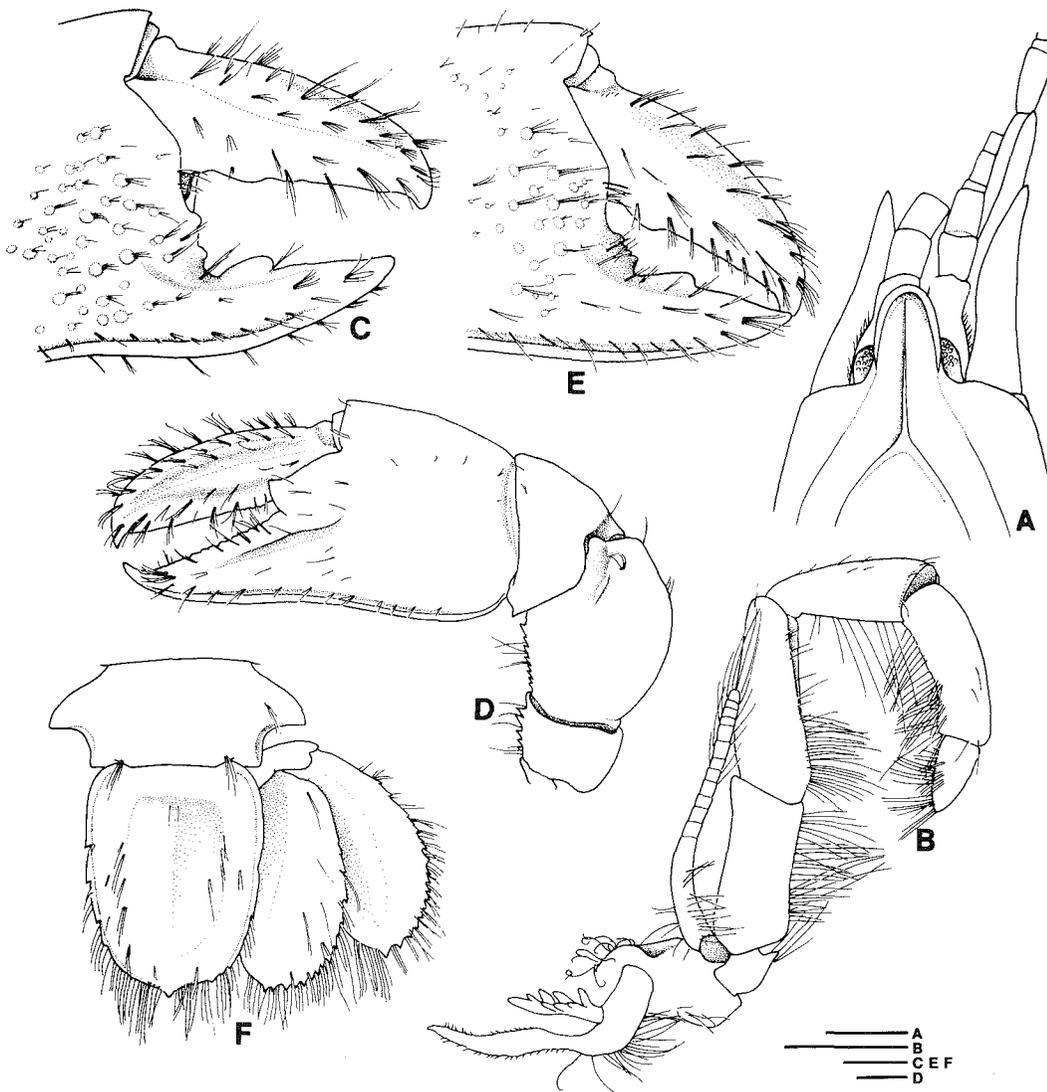


Fig. 2. *Eiconaxius demani* sp.n.—A. Anterior part of carapace, dorsal aspect.—B. Maxilliped 3, lateral aspect.—C. Distal part of larger cheliped in holotype male, lateral aspect.—D. Smaller cheliped, lateral aspect.—E. Distal part of smaller cheliped in paratype female.—F. Abdominal somite 6 and tail-fan.—A–D, F. Holotype ♂, KIE St. 52.—E. Paratype ♀, KIE St. 52. Scale 1 mm.

any teeth on the impinging margins of the dactylos, and pollex or projecting process of the propodos'. The present specimens have more and much larger eggs than Bate's female; the present females bear 16 (KIE St. 59)–20 eggs (KIE St. 52), each measuring 1.7/1.3; 1.7/1.2; 1.6/1.2; 1.3/1.3; 1.3/1.2 mm in diameter. Moreover, the cutting edge of the fixed finger in the larger cheliped is provided with a stout, anteriorly directed tooth at the proximal third.

For these reasons I regard the present specimens as being different from Bate's type of *E. parvus*, but identical with de Man's male.

*Distribution.* Kei Islands to Arafura Sea, 352–390 m.

### *Eiconaxius mortenseni* sp.n. (Figs 3, 4)

*Type material.* Misaki, Sagami Bay, Japan, 200 fathoms (366 m), TME, 30 June 1914: holotype, 1 ovig. ♀ (ZMUC), TL = 16.0 mm, CL = 5.5, 2 eggs remaining; paratype, 1 ovig. ♀ (ZMUC), TL = 19.0, CL = 6.1, 13 eggs. Sagami Bay, Japan, 732 m, TME, 2 July 1914: paratype, 1 ovig. ♀ (ZMUC), TL = 19.2, CL = 6.2, 15 eggs.

*Etymology.* The species name is given after the great Danish scientist, Dr Th. Mortensen, who collected this new species from Sagami Bay during his exploring expedition to the Pacific.

*Description of female holotype.* Rostrum (Fig. 4A, B) broad, slightly longer than broad, fringed with thick smooth lateral ridge; tip rounded. Lateral gastric carina continuous with margin of rostrum, extending posteriorly to anterior  $\frac{1}{4}$  of carapace; median gastric carina smooth, ridged short backward from near rostral tip until halfway level of lateral carina, broadened at posterior end, then fused with dorsal surface. Carapace smooth, unarmed on anterolateral margin, cervical groove inconspicuous.

Eye subglobose, reaching midway of rostrum, cornea distinctly faceted. Antennular peduncle reaching to distal  $\frac{1}{4}$  of segment 4 of antenna, segment 1 unarmed, segments 2 and 3 short. Antennal segment 1 unarmed, dorsodistal spine of segment 2 elongate and blade-shaped, shorter than end of segment 4, antennal acicle also blade-shaped, reaching level of distal margin of segment 5; segment 3 pointed, segment 4 elongate, segment 5 half the length of segment 4.

Maxilliped 3 with coxa and basis with posterodistal spine. Ischium unarmed on posterior margin, mesial crest with row of denticles. Merus narrower but longer than ischium, posterior margin unarmed, carpus about as long as merus, slightly longer than propodus, dactyl about half the length of propodus.

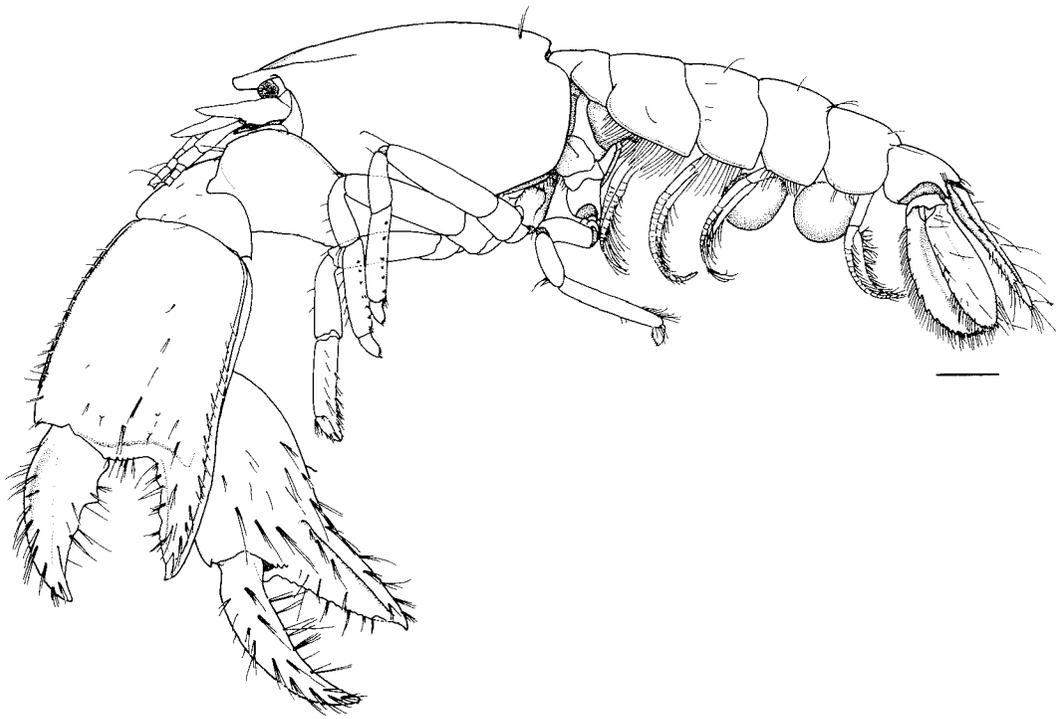


Fig. 3. *Eiconaxius mortenseni* sp.n. holotype ♀, TME. Scale 1 mm.

Pereopods 1 (Fig. 3) unequal in length. Coxa with posterodistal spine, basis unarmed. Ischium with three spines on posterior margin, with three tubercles on anterior margin.

Left, larger cheliped (Fig. 4C). Merus 1.3 times as long as broad, lateral surface inflated, posterior margin straight with denticles, anterior margin largely rounded, carinate, with a few denticles, terminating in small spine. Carpus about half meral length, half as long as broad, posterior margin triangularly produced with obtuse spine. Chela 5.5 times as long as carpus. Palm 1.4 times as long as broad, lateral surface with a few bundles of setae, carinate on anterior margin, distally with 2 small spines; posterior margin smooth, carinate, slightly inflated distally onto fixed finger; distal margin largely rounded. Fixed finger (Fig. 4D) half the length of palm, cutting edge with two obtuse prominences in proximal half, distal to it denticulate, tip obtuse, slightly curved. Dactyl much longer than fixed finger, cutting edge with large triangular tooth in proximal  $\frac{1}{3}$ .

Right smaller cheliped (Fig. 4E) with merus 1.3 times as long as broad, lateral surface inflated, posterior margin serrated, with sharp distal and subdistal spines; anterior margin carinate, largely rounded with 4 well-spaced denticles. Carpus about half meral length,  $\frac{2}{3}$  times as long as broad, posterior angle with spine. Chela about five times as long as carpus. Palm about as long as broad, lateral surface smooth, carinate along anterior and posterior margins, anterior margin terminating in distal spine, distal margin with triangular prominence with acute spine below articulation. Fixed finger excluding proximal prominence shorter than palm, lateral surface proximally with longitudinal carina parallel to cutting edge, latter denticulate, distally curved. Dactyl distinctly longer than palm, much shorter than fixed finger, cutting edge denticulate, distally curved.

Pereopod 2 (Fig. 3) chelate. Coxa with posterodistal

spine. Basis and ischium unarmed. Merus about 3.5 times as long as broad, unarmed. Carpus  $\frac{2}{3}$  meral length, palm about as long as carpus, fingers deflexed downwardly, about  $\frac{1}{3}$  length of palm.

Pereopod 3 simple. Coxa with posterodistal spine, with genital pore. Basis and ischium unarmed. Merus four times as long as broad, carpus half meral length, propodus  $\frac{2}{3}$  the length of carpus, lateral surface with 6 rows of spinules along posterior margin, with spinules at posterodistal angle. Dactyl oval, with 7 yellow, transparent spinules on posterior margin, tip with sharp apical spine.

Pereopod 4 simple. Coxa obtuse at posterodistal angle. Basis and ischium unarmed. Merus 4.5 times as long as broad, and carpus half the length of merus. Propodus  $\frac{2}{3}$  the length of carpus, lateral surface with 6 transverse rows of spinules along posterior margin, with row of spinules at posterodistal angle. Dactyl oval, otherwise as in pereopod 3.

Pereopod 5 simple. Coxa, basis, ischium unarmed. Merus longer than previous segments, as long as carpus. Propodus 1.7 times as long as carpus, dactyl oval, with 6–7 spinules on posterior margin, tip with sharp distal spine.

Abdomen smooth without demarcation between terga and pleura, ratio of lengths of abdominal somites 1–6: 1, 1.2, 1.2, 1.2, 1.1, 1.0. Pleuron 1 narrow, distally rounded. Pleuron 2 broadened, inclined backward to rectangular posteroventral angle between ventral and posterior margin, with marginal setae. Pleura 3–4 sloping down backward on ventral margin to rectangular angle, with marginal setae. Pleuron 5 rounded ventrally marginal setae. Pleura 3–5 with anteroventral spine. Pleuron 6 rounded on ventral margin, unarmed. Pleopod 1 of females slender, consisting of proximal segment and segmented flagellum. Pleopods 2–5 biramous, with free appendix interna.

Telson (Fig. 4F) twice as long as abdominal somite 6, 1.3 times as long as broad, dorsal surface with longitudi-

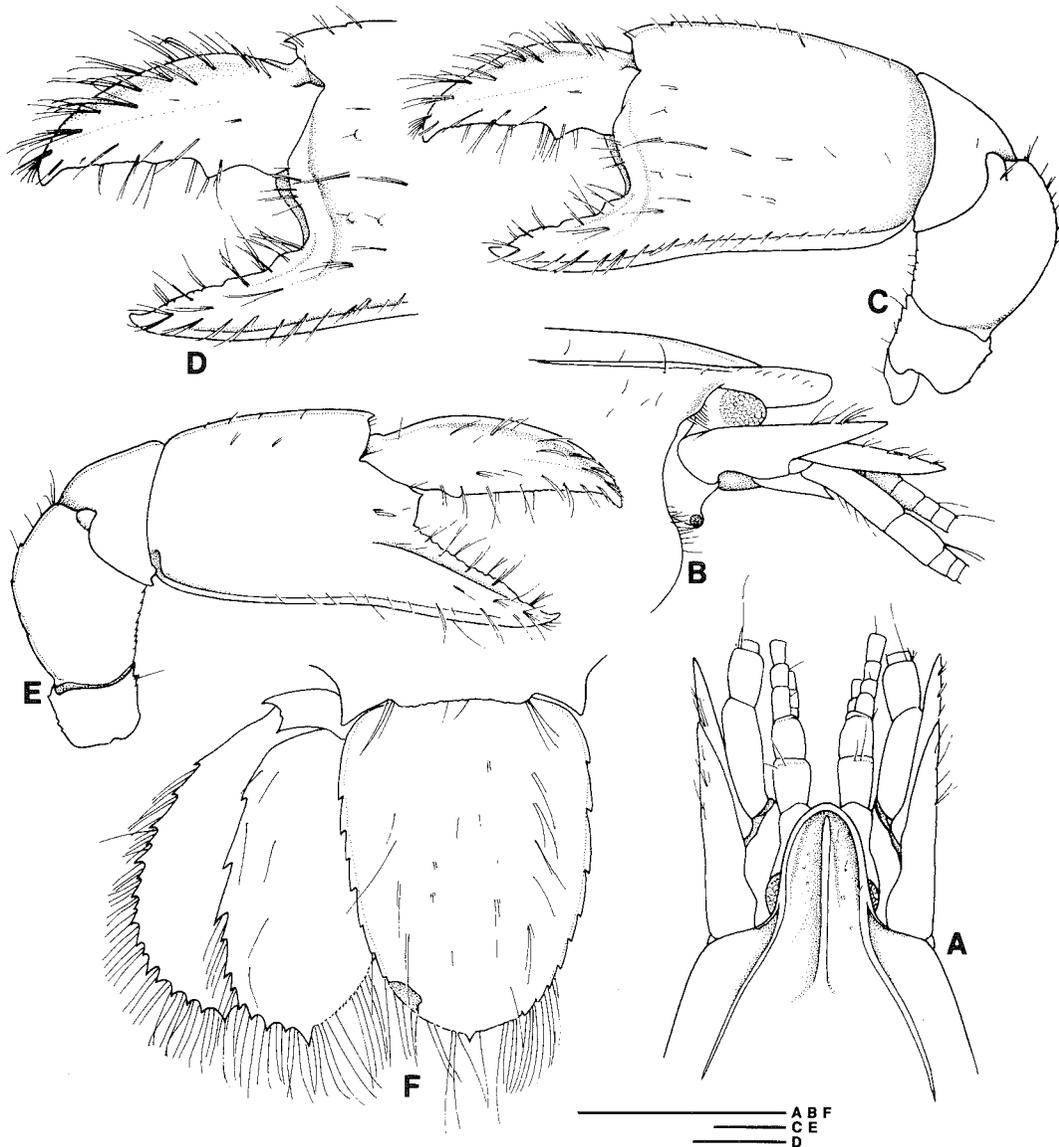


Fig. 4. *Eiconaxius mortenseni* sp.n. holotype ♀, TME.—A. Anterior part of carapace.—B. Same, lateral aspect.—C. Larger cheliped, lateral aspect.—D. Distal part of larger cheliped, lateral aspect.—E. Smaller cheliped.—F. Tail-fan. Scale 1 mm.

nal row of setae parallel to lateral margin, lateral margins serrated, largely converging to posterior median spine. Uropodal endopod and exopod lanceolate, serrated on lateral margins.

**Remarks.** This new species is similar to *Eiconaxius demani* in the shape of the telson and the rostrum, which is rounded at its tip; however, it is clearly distinguished from *E. demani* by the following features. In *E. demani* the median gastric carina posteriorly bifurcates to divergent ridges, the cutting edge of the fixed finger of the larger cheliped is provided with a stout rounded tooth at the proximal  $\frac{1}{3}$ , and that of the dactyl is unarmed, and the pleura are not setose on the ventral margins, while in *E. mortenseni* the median gastric carina is only broadened posteriorly, fusing with the dorsal surface, the cutting edge of the fixed finger of the larger cheliped is without a stout tooth, and that of the dactyl has a large triangular tooth at the proximal  $\frac{1}{3}$ .

As far as the Japanese species of the genus *Eiconaxius* are concerned, *E. farreae* was until now the only known species from Sagami Bay.

**Distribution.** Sagami Bay, Japan, 366–732 m.

### *Eiconaxius farreae* Ortmann, 1891 (Fig. 5)

*Eiconaxius farreae* Ortmann, 1891: 49, pl. 1, fig. 4.

*Axius (Eiconaxius) farreae* de Man, 1925a: 125, text-figs 3–3d.

**Material.** Sagami Bay, Japan, 732 m, TME, 1–4 July 1914: 5♂ (ZMUC), TL = 20.0, CL = 7.0; TL = 19.0, CL = 6.2; TL = 18.5, CL = 6.2; TL = 16.2, CL = 5.5; TL = 11.5, CL = 4.0: 1 ovig. ♀ (ZMUC), TL = 21.0, CL = 7.1, 5 eggs, 1.5/1.6 mm in diameter.

**Description.** Rostrum (Fig. 5A, B) 1.5 times as long as broad at base, with 5 obtuse lateral spines; median gastric carina carinate in anterior  $\frac{1}{5}$  way of carapace, reaching to near rostral tip. Gastric region lacking lateral and submedian carinae. Cervical groove inconspicuous. Pereopods 1 unequal in shape. In larger cheliped (Fig. 5C), merus roughly denticulate on posterior margin, with 5 well-

spaced spines on anterior margin, distal spine at distal angle. Palm with distinct distal spine on anterior extremity, cutting edge of fixed finger with obtuse prominence at midlength, distal to it minutely denticulate, tip curved upward. Cutting edge of dactyl with low prominence at midlength, tip down-curved. Smaller cheliped (Fig. 5D) similar to larger cheliped, cutting edge of fixed finger proximally with sharp triangular tooth, distal to it denticulate, tip curved upward; cutting edge of dactyl is denticulate, tip down-curved.

Abdominal somite 6 (Fig. 5E) serrated on posterior margin.

*Remarks.* The present specimens collected from Sagami Bay are clearly referable to this species; the rostrum, the median gastric carina, the cutting edges of the fixed finger of peropods 1 are characteristic as described by Ortmann (1891: 49).

*Distribution.* Tokyo Bay to Goto Islands, Japan, 77–732 m.

### *Eiconaxius weberi* (de Man, 1907)

*Iconaxius Weberi* de Man, 1907: 127.

*Axius (Eiconaxius) weberi*; de Man 1925c: 17, 44, pls 3–4, fig. 8.

*Material.* Java Sea, 7°35'S, 114°42'E, 200 m, mud without concretions, TM Java–South Africa Expedition St. 16, 10 April 1929: 1♀ (ZMUC), TL = 17 mm, CL = 5.5 mm.

*Remarks.* The present specimen from the Java Sea is identified as *E. weberi* because the lateral margin of the rostrum is serrate; the median carina of the carapace is posteriorly bifurcate into two ridges; in the larger cheliped the cutting edge of the fixed finger is provided with a distinct tooth at middle, that of the dactyl proximally with a prominence and distal to it largely concave, and in the smaller cheliped that of the fixed finger serrate.

*Distribution.* Great Kei Island to Malay Archipelago, 200–984 m.

### *Eiconaxius sibogae* de Man, 1925 (Fig. 6)

*Axius (Eiconaxius) Sibogae* de Man, 1925b: 218; de Man, 1925c: 15, 34, pl. 2, figs 4–4l.

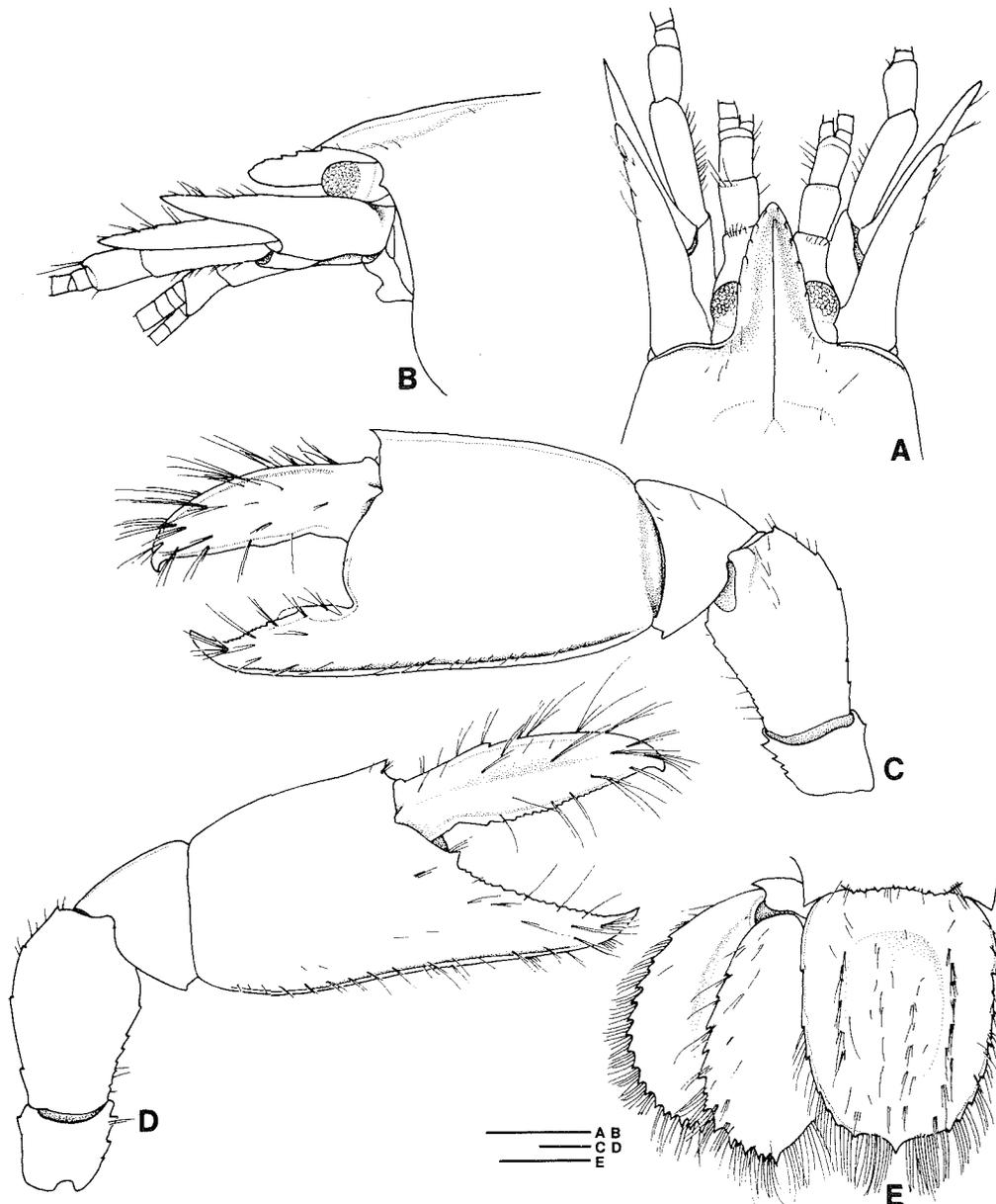


Fig. 5. *Eiconaxius farreae* Ortmann, 1891, ♂, TME.—A. Anterior part of carapace.—B. Same, lateral aspect.—C. Larger cheliped, lateral aspect.—D. Smaller cheliped, lateral aspect.—E. Tail-fan. Scale 1 mm.

*Eiconaxius sibogae*; Sakai & de Saint Laurent 1989: 23.

*Material.* Banda Sea, 5°47'S, 132°51'E, 348 m, mud, trawl, KIE St. 51, 7 May 1922: 2♀ (ZMUC), TL = 19.0 mm, CL = 6.2 mm, bearing both chelipeds; TL = 19.0, CL = 6.2 without both chelipeds.

*Description of larger cheliped.* Larger cheliped (Fig. 6C) with ischium bearing subdistal spine on posterior margin. Merus 1.3 times as long as broad, lateral surface convex, posterior margin straight with minute serration, with triangular spine at distal end; anterior margin largely rounded. Carpus less than half the meral length, twice as long as broad, with obtuse spine on posterior angle. Chela about six times as long as carpus, palm 1.3 times as long as broad; lateral surface carinate along posterior margin, distal margin convex medially, concave at posterior corner, then continuous with cutting edge of fixed finger. Fixed finger half the length of palm, cutting edge with tubercle proximally, smooth in proximal half, armed with row of rounded teeth in distal half, those teeth reducing distally in size. Dactyl curved at tip, cutting edge with two

obtuse teeth in proximal  $\frac{2}{3}$ , proximal tooth much larger than distal.

Smaller cheliped (Fig. 6D) as it has already been described by de Man.

*Remarks.* The larger cheliped of *E. sibogae* has not been described before. The specimens are similar to de Man's small ones from the Sulu Sea, measuring 11.4 and 12.2 mm; the medina gastric carina (Fig. 6A) is bifurcate posteriorly into two divergent ridges; the uropodal endopod (Fig. 6E) forms posterolaterally a serrate lobe between the posterior and mesial margins; however, they differ from de Man's specimens as follows. In the present specimens the antennular peduncle (Fig. 6B) reaches midlength of segment 4, and the antennal acicle reaches beyond the antennular peduncle, but in de Man's specimens, the antennular peduncle overreaches the antennal peduncle by segment 5, and the antennal acicle reaches to the distal extremity of the antennal peduncle. It seems that *E. sibogae* varies in those characters.

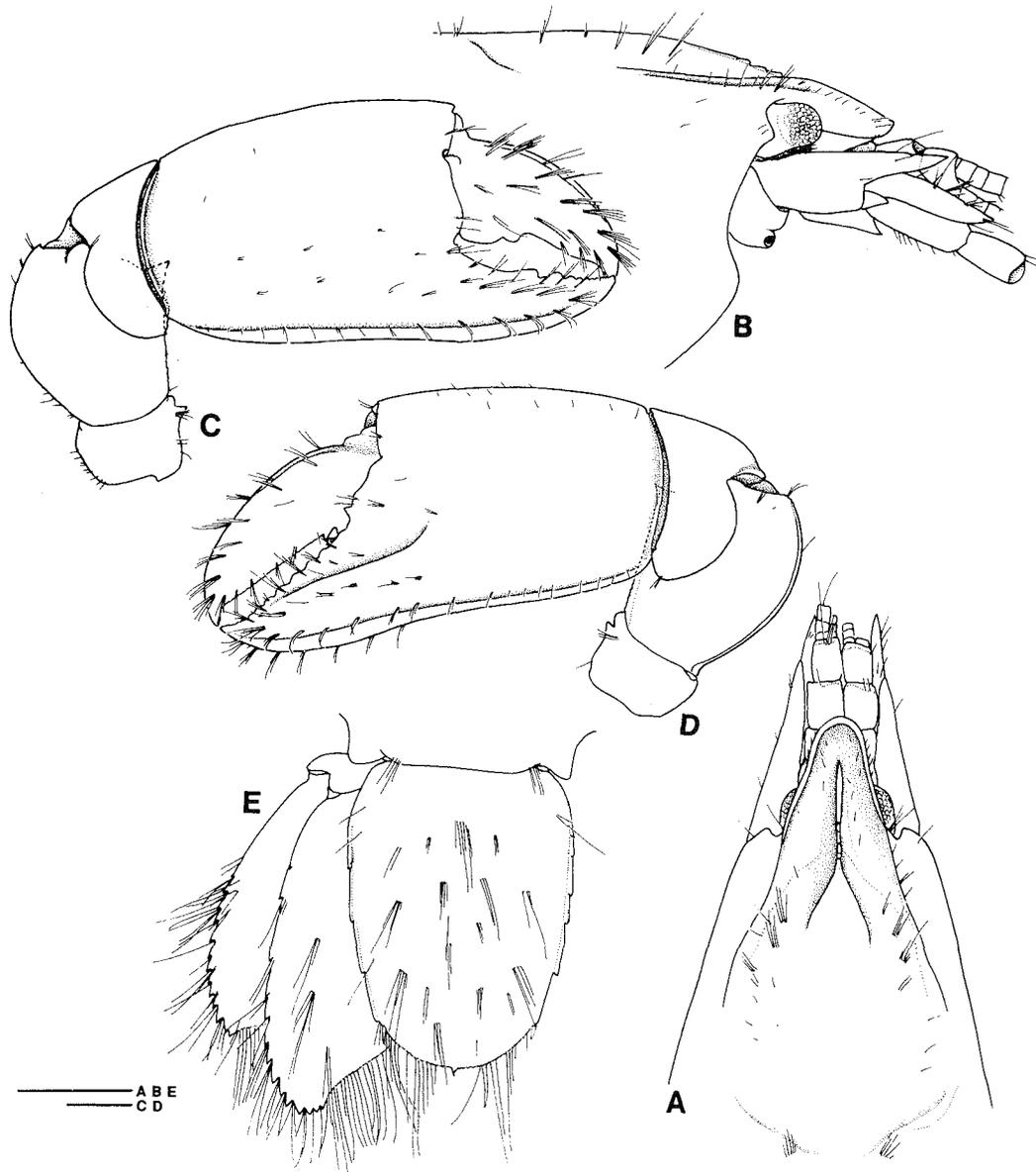


Fig. 6. *Eiconaxius sibogae* de Man, 1925.—A. Anterior part of carapace.—B. Same, lateral aspect.—C. Larger cheliped, lateral aspect.—D. Smaller cheliped, lateral aspect.—E. Tail-fan.—A–D. ♀, KIE.—E. Other ♀, KIE. Scale 1 mm.

*Distribution.* Sulu Sea, 522 m and Banda Sea, 348 m.

### *Axius* Leach, 1815

*Axius* Leach, 1815: 343; Borradaile 1903: 537.  
*Axia* H. Milne Edwards, 1837: 310.

Type species. *A. stirrhynchus* Leach, 1815 (by monotypy).

### *Axius australiensis* (de Man, 1925)

*Axiopsis* (*Axiopsis*) *australiensis* de Man, 1925a: 127, text-fig. 4–4j; de Man 1925c: 69; Poore & Griffin 1979: 226, text-fig. 2.

*Material.* Broken Bay near Sydney, Australia, shore-collecting and dredgings in shallow depths, TME, 20 October 1914: 1♀ (ZMUC), TL=32.0 mm, CL=10.0 mm.

*Remarks.* The rostrum (Fig. 7B) is broad, triangular, with tubercles on the lateral margin and three gastric carinae provided with tubercles as shown by de Man (1925a: fig.

4, 4a) and Poore & Griffin (1979: fig. 2b). The ischium of maxilliped 3 (Fig. 7C) is minutely denticulate on the posterior margin. The pleuron of abdominal somite 2 is broadened antero-posteriorly (Fig. 7A).

The present species is remarkably similar to *A. stirrhynchus* and *A. serratus* in that the lateral margins of the telson (Fig. 7D) are slightly convergent posteriorly, not bulging out anteriorly as in the species of *Axiopsis*.

*Distribution.* Central New South Wales and Central Victoria, Australia, intertidal zone.

### *Bouvieraxius* Sakai & de Saint Laurent, 1989

*Bouvieraxius* Sakai & de Saint Laurent, 1989: 45.  
*Posthonocaris* Kensley, 1989: 964.

Type species. *Axius longipes* Bouvier, 1905 (designated by Sakai & de Saint Laurent 1989).

*Remarks.* *Posthonocaris* Kensley (December 1989) is invalidated as a junior synonym of *Bouvieraxius* Sakai &

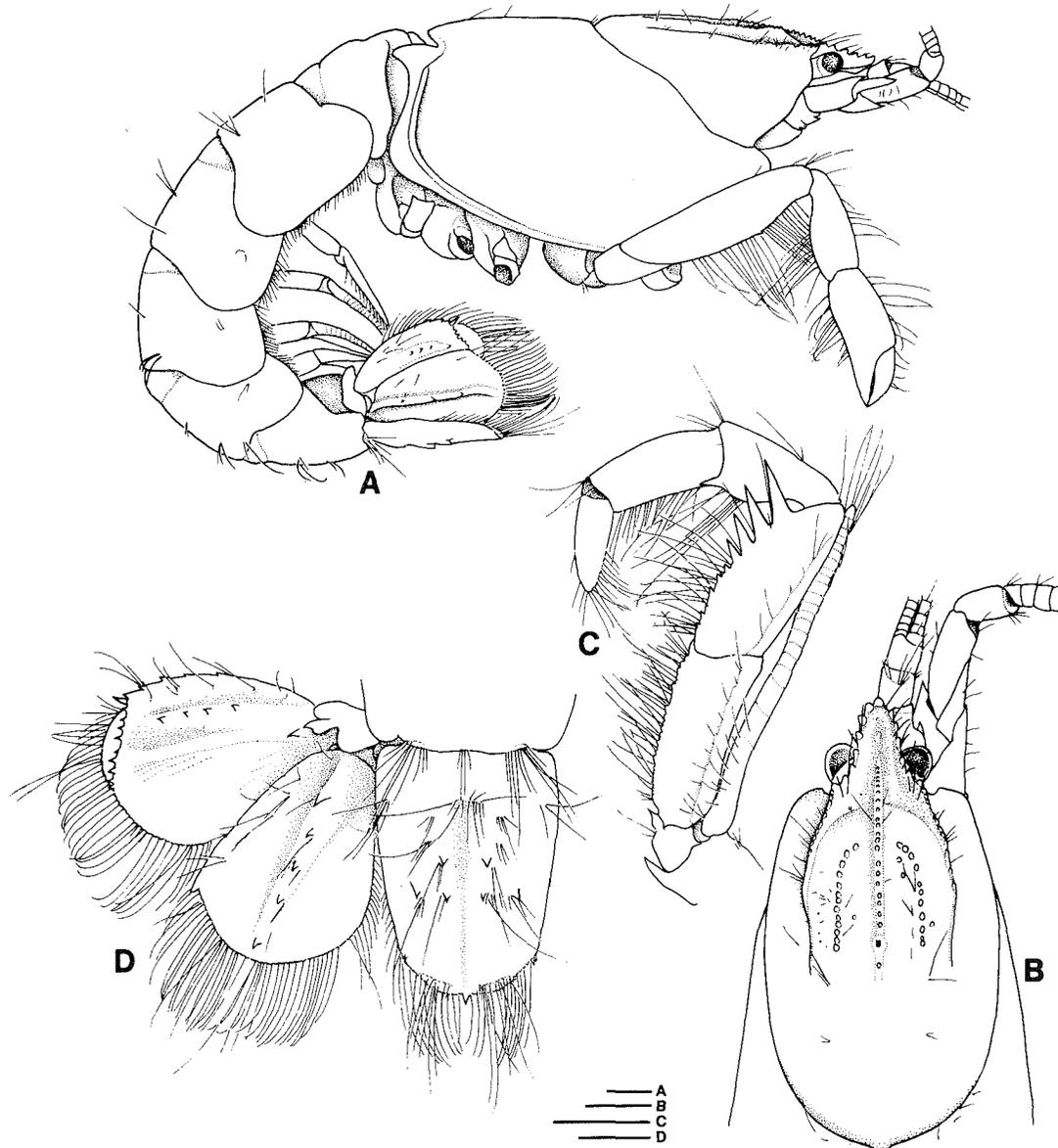


Fig. 7. *Axius australiensis* (de Man, 1925), ♀, TME.—A. Whole body.—B. Anterior part of carapace, dorsal aspect.—C. Maxilliped 3, lateral aspect.—D. Tail-fan. Scale 1 mm.

de Saint Laurent (October 1989) in accordance with Article 23(d) in the International Code of Nomenclature. *Bouvieraxius* was established for *Axiopsis longipes* and *Axius rudis*, with *A. longipes* as the type species, and *Posthonocaris* was based on the same two species, though *A. rudis* was designated as the type species. Kensley (1989: 964) mentioned that 'pleopod 2 of male or hermaphrodite with distal setose portion of endopod somewhat reduced, appendices masculina and interna articulating at about midlength of endopod, appendix masculina elongate, setose, reaching well beyond apices of endopod and exopod'. On the other hand, Sakai & de Saint Laurent (1989: 45) gave the definition of *Bouvieraxius* as 'Pl2 of males bifurcate; endopod consisting of two segments, proximal segment distally attached by a small appendix interna and an elongate, setose reaching well beyond apices of endopod and exopod'. However, male's pleopod 2 of *A. rudis* shows fundamentally no difference from that of *A. longipes*. As described on the present specimen of *B. rudis*, the endopod of male's pleopod 2 is simple, when observed in anterior aspect (Fig. 9D), however 2-segmented in posterior aspect (Fig. 9C). As far as the feature of male's pleopod 2 is concerned, there is no difference between *Bouvieraxius* and *Posthonocaris*.

#### *Bouvieraxius keiensis* sp.n. (Figs 8, 9)

*Type material.* Kei Is., 5°37'S 132°23'E, 245 m, sand, trawl, KIE St. 49, 3 May 1922: holotype, 1♂ (ZMUC), TL = 65.5, R (broken at distal half) = 2.0, CL including rostrum = 20.0; allotype, 1♀ (ZMUC), TL = 56.2, R (broken at distal half) = 2.0, CL including rostrum = 17.2.

*Further material.* Off Black River, Tombeau Bay, Mauritius, 40 fathoms (73 m), sand and coral, TM Java-South Africa Expedition, St. 38, 8 October 1929: 1♀ (ZMUC), TL = 33.0 mm, R = 1.8 mm, CL = 10.3 mm.

*Etymology.* The species name is derived from the name of island, 'Kei', where the type specimens were collected, and a suffix, 'ensis', meaning the geographical place.

*Description of holotype male.* Carapace smooth. Rostrum narrow, broken at tip, dorsal surface concave medially, lateral margin carinate with two teeth, reaching to midway of gastric region. Median carina smooth, extending from proximal part of rostrum to cervical groove, submedian carina with 4–5 teeth. Anterolateral margin with tubercle at level between antenna and epistom. Post-cervical region damaged behind cervical groove, dorsally convex in anterior part, but not carinate.

Eye subglobose, medially contiguous, overreaching proximal tooth of rostrum, cornea brown in alcohol specimen. Antennular peduncle unarmed, reaching to proximal part of antennal segment 5, segment 1 longer than segments 2 and 3 combined. Antennal segment 1 with 2 mesiodistal spines; dorsodistal spine of segment 2 well developed, directed anteriorly to short of midway of segment 4, antennal acicle well developed, extending over midway of segment 4, segment 3 with apical spine, segment 4 longer than segment 2 excluding dorsodistal spine, segment 5 about half length of segment 4.

Maxilliped 3 with coxa and basis bearing sharp ventrodistal spine; ischium with 3 spines on posterior margin, mesial crest denticulate, distally overreaching joint between ischium and merus, merus about as long as ischium,

with 3 small proximal and 3 sharp distal spines on posterior margin, carpus shorter than merus, with postero-distal spine, propodus shorter than carpus, unarmed, becomes slender distally, dactyl shorter than propodus.

Pereopods 1 subequal.

Left cheliped with coxa having sharp posterior spine, and with 2 mesiodistal spines; basis unarmed. Ischium with 3 posterior spines. Merus slightly less than twice as long as broad, anterior margin with 4 subdistal spines, posterior margin with 5 distinctive spines. Carpus triangular, about half length of merus. Chela about three times as long as carpus. Palm 1.7 times as long as broad, granulate on lateral and mesial surfaces, anterior margin granulate, and with small distally directed terminal spine, distal margin slightly sinuous, unarmed, posterior margin convex around at level of distal margin, carinate with denticles. Dactyl  $\frac{3}{4}$  length of palm, anterior margin carinate with fine denticles, cutting edge proximally with thick molar tooth, distal to it largely concave in middle part, shallowly concave and serrate in distal third, and tip incurved; cutting edge of fixed finger denticulate.

Right cheliped with coxa absent of posterior spine, with two mesiodistal spines; basis unarmed. Ischium with five spines on posterior margin. Merus and carpus same as in left cheliped. Chela 3.5 times as long as broad. Palm same as in right cheliped. Dactyl slightly longer than palm, anterior margin carinate with denticles, and cutting edge proximally with triangular tooth, concave and dentate in distal third, tip largely incurved; cutting edge of fixed finger denticulate.

Pereopod 2 of right side with coxa having sharp posterior spine. Basis and ischium unarmed. Merus with 3 spines including distal one on posterior margin. Carpus slender, 1.7 times as long as merus. Chela slightly longer than carpus; fingers  $\frac{3}{4}$  length of palm. Pereopod 2 on left side wanting.

Pereopods 3–5 wanting.

Abdomen unarmed; ratio of dorsal length of abdominal someites 1–6 and telson: 1, 1.2, 1.2; 1.3, 1.3, 1.5, 1.5, without demarcations between terga and pleura. Pleura 2 broadened with rounded posteroventral margin; pleura 6 with median marginal tooth on ventral margin.

Pleopod 1 (Fig. 9A) slender, biarticulate, distal segment foliaceous, rounded distally.

Pleopod 2 (Fig. 9B) biramous, endopod 2-segmented on posterior surface (Fig. 9C), articulating midway with elongate appendix masculina and short appendix interna, but non-articulating on anterior surface (Fig. 9D); appendix interna about  $\frac{1}{3}$  the length of appendix masculina, appendix masculina (Fig. 9D) non-articulating, longitudinally sulcate on posterior surface, but 2-segmented by median transverse suture on anterior surface. Pleopods 3–5 lacking appendices interna.

Telson rectangular, lateral margin proximally bulging out with spine and more posteriorly with 2 spines and elongate movable spine at posterolateral angle; dorsal surface with medially sulcate, with two pairs of spines, posterior margin with median spine. Uropodal exopod with 3 spines including posterolateral one and movable posterolateral spine on lateral margin; dorsal surface with outer rib having 3 teeth; transverse suture denticulate. Uropodal endopod reaching to level of posterior

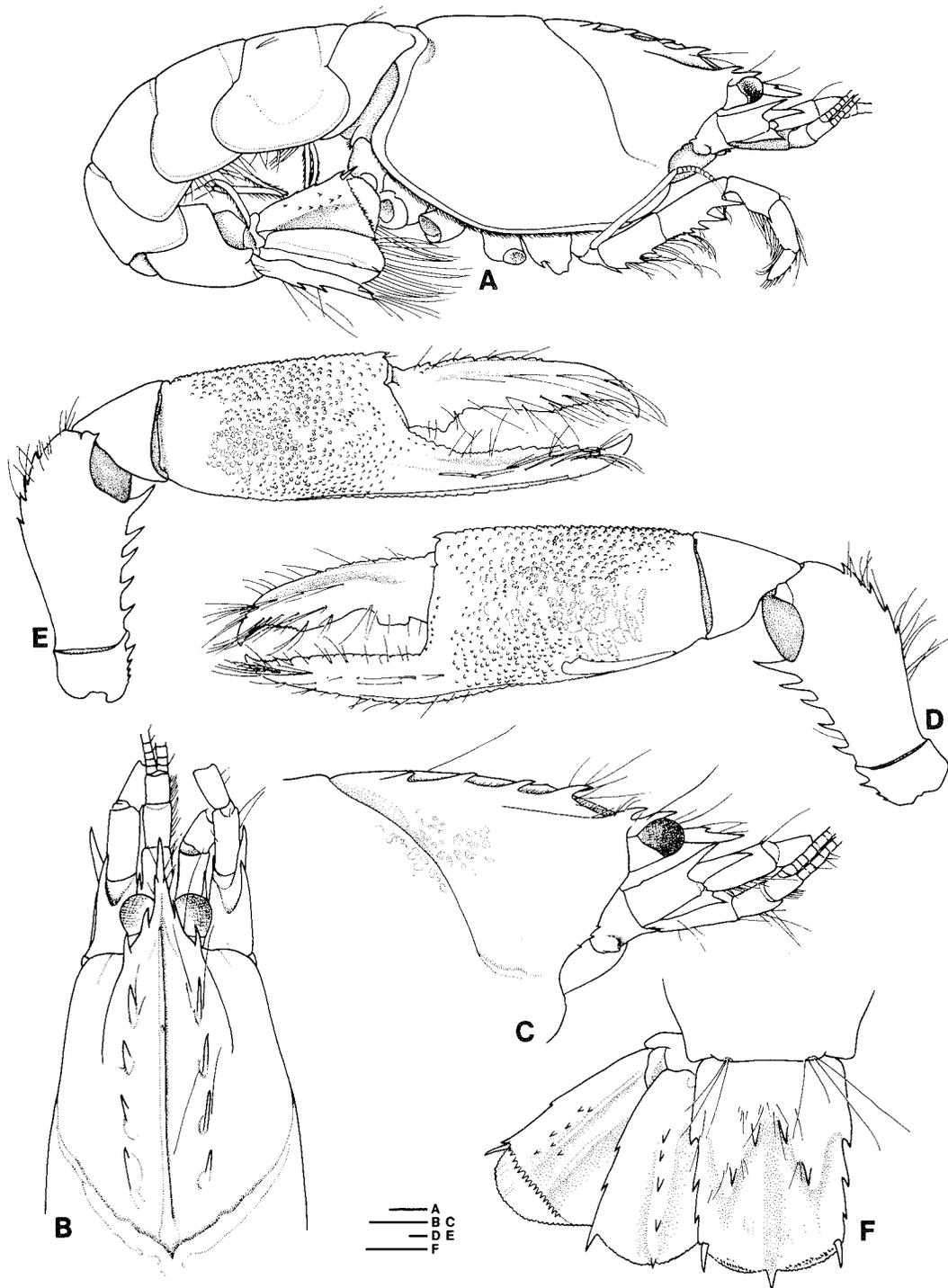


Fig. 8. *Bouvieraxius keiensis* sp.n.—A. Whole body.—B. Anterior part of carapace, dorsal aspect.—C. Same, lateral aspect.—D. Left, larger pereopod 1 of male, lateral aspect.—E. Right, smaller pereopod 1, lateral aspect.—F. Tail-fan.—A–C. ♀, TME St. 38.—D–E. Holotype, ♂, KIE St. 49.—F. Allotype, ♀, KIE St. 49. Scale 1 mm.

margin of telson, with 3 spines on lateral margin and five spines on midrib.

*Description of allotype female.* Allotype female almost same as in male. Pereopods 1 absent. Pleopod 1 (Fig. 9E) consisting of proximal segment and segmented flagellum. Pleopod 2 (Fig. 9F) biramous, without appendix interna. Pleopods 3–5 lacking appendices interna.

*Remarks.* *Bouvieraxius keiensis* sp.n., from Kei Islands and Mauritius resembles *B. rudis* from Hawaii (Rathbun

1906: 896) and New Caledonia (Sakia & de Saint Laurent 1989: 46) in the chela of pereopods 1 which is granulate on surface and bears a dorsodistal spine on the palm. However, the present material is described as new, because the submedian gastric carina is armed with different number of spines; in the present species from Kei Islands and Mauritius the submedian gastric carina is provided with 4–5 spines, while in those from Hawaii (Rathbun 1906: 894) and New Caledonia (Sakai & de Saint Laurent 1989: 46) with 3 spines. Furthermore, the present specimens from Kei Islands and Mauritius have 2 mesiodistal

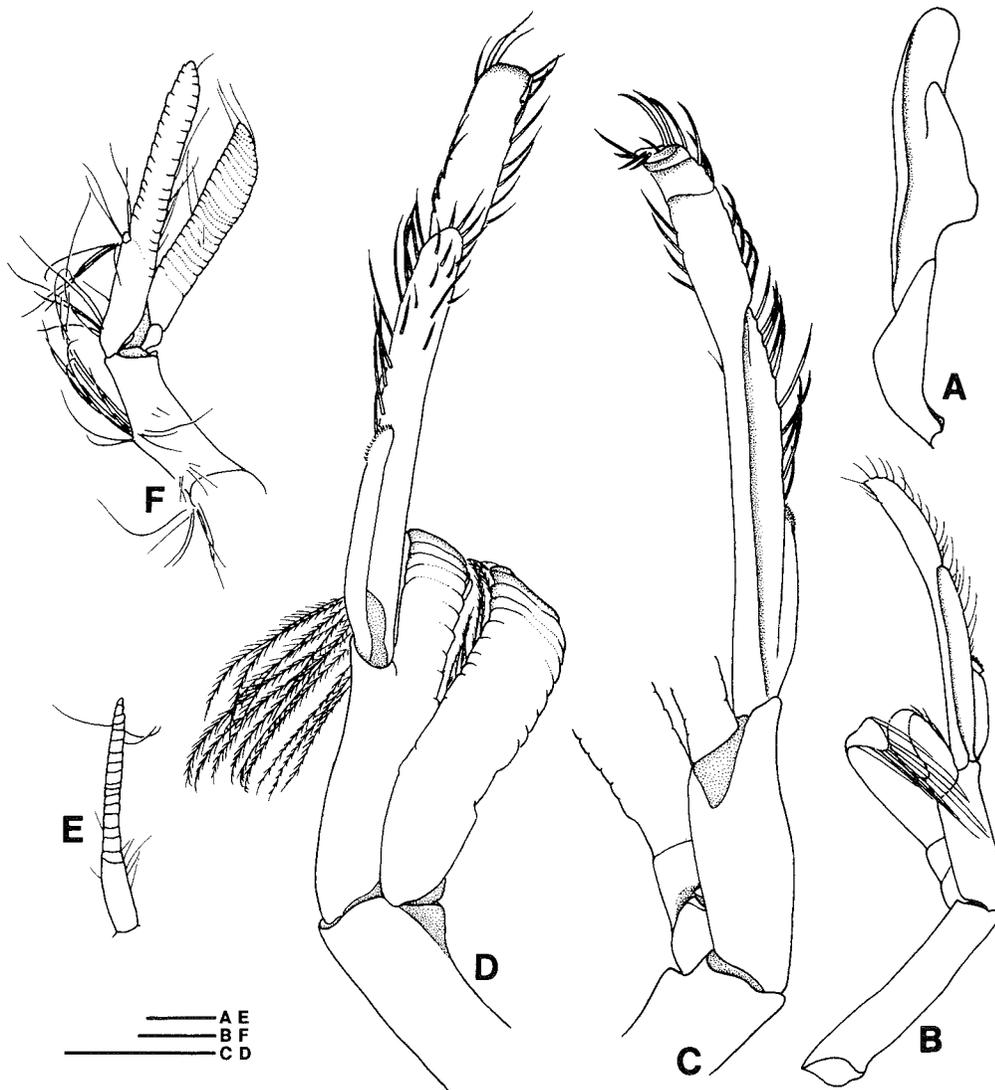


Fig. 9. *Bouvieraxius keiensis* sp.n.—A. Male pleopod 1, posterior aspect.—B. Male pleopod 2, posterior aspect.—C. Same, enlarged.—D. Male pleopod 2, enlarged, anterior aspect.—E. Female pleopod 1, posterior aspect.—F. Female pleopod 2, posterior aspect.—A–D. Holotype, ♂, KIE St. 49.—E–F. Allotype, ♀, KIE St. 49. Scale 1 mm.

spines on antennal segment 1, while the female specimen from New Caledonia has 4–5.

In the larger male holotype from Kei Islands the dactyl of the left larger cheliped has proximally a molar tooth on the cutting edge; the right smaller cheliped has a large triangular tooth near the base (Fig. 8E). The present females from Kei Islands and Mauritius are defect of pereopod 1, so it is impossible to compare the female's dactyls of two species. However, the dactyl of *B. rudis* is similar to that of the smaller cheliped of the present male specimen. In the male and female from Kei Islands the rostrum is broken at the tip, so the number of lateral rostral spines is inaccurate. However, as the female from Mauritius bears three pairs of lateral rostral species, it seems that two specimens from Kei Islands have also three pairs of lateral rostral spines, though a pair of distal spines on the defected parts of rostrum is wanting. In the male and female specimens from Kei Islands, the antero-lateral margin of carapace bears a small tooth at the level between antenna 2 and epistome, while in the female from Mauritius it has three denticles.

The present species is hermaphroditic as every individual bears genital pores on pereopods 3 and 5, though

pleopods 1 and 2 are with gonochoristic form as shown in the description. Pleopods 3–5 of both males and females are lacking in appendices interna.

*Distribution.* Kei Islands, 245 m and Mauritius, 73 m.

### *Eutrichocheles* Wood Mason, 1876

*Eutrichocheles* Wood Mason, 1876: 264.

*Paraxiopsis* s. str. de Man, 1905: 597 (type species. *P. brocki* de Man, 1888); de Man 1925c: 2, 71, 101; Gurney 1942: 240.

Type species. *Cancer modestus* Herbst, 1796 (designated by Wood Mason 1876).

*Remarks.* *Paraxiopsis brocki*, type species of *Paraxiopsis*, resembles *E. modestus*, type species of *Eutrichocheles* in both bearing a bifurcate antennal acicle.

### *Eutrichocheles* aff. *brocki* (de Man, 1888)

*Axius Brocki* de Man, 1888: 475, pl. 20, fig. 3.

*Eutrichocheles brocki*; Sakai & de Saint Laurent 1989: 52.

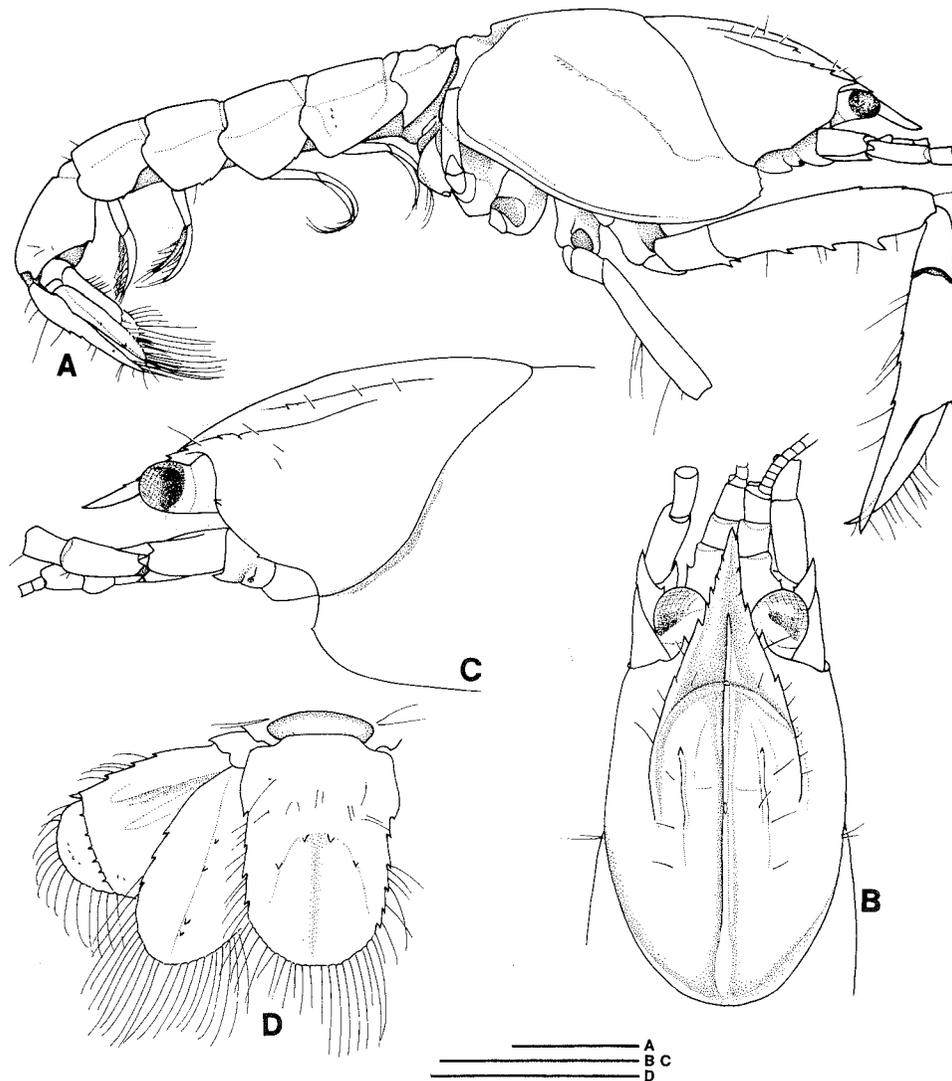


Fig. 10. *Eutrichocheles* sp., ♂, GE St. 381-I.—A. Whole body.—B. Anterior part of carapace.—C. Same, lateral aspect.—D. Tail-fan. Scale 1 mm.

**Material.** Off Mombasa, 4°06'S, 39°43'E, 40 m, coralline sand and gravel with shells and little mud, GE St. 259, 22 March 1951: 1 specimen without carapace (ZMUC), 7.5 mm.

**Distribution.** Off Mombasa, 40 m.

**Remarks.** Any small specimen missing the carapace is difficult to identify, so it is tentatively referred to *E. brocki* by the following features.

Abdominal somite 2 is broad, with the pleuron truncate on the ventral margin, demarcating the tergum by a longitudinal carina. The telson is subquadrate, slightly longer than broad; the dorsal surface is provided with a pair of diagonal ridges with 4 sharp spines centrally, the lateral margin bulging out anteriorly with a conical spine, and with a pair of 2 articulating spines at the posterodistal angle; the posterior margin is rounded without a median spine. The uropodal exopod with 4 conical spines on the lateral margin, with a sharp movable spine at the posterolateral angle, and a transverse suture with spinules; the uropodal endopod with 3 small spines on the lateral margin, distal to them with a sharp spine at the posterolateral angle, and a median rib carinate with five spines.

However, this specimen differs from *E. brocki* in that the tail-fan is less spinous dorsally, the telson is without a median spine on the posterior margin, pleura 3–5 have no marginal spine, and pleopods 3–4 each with appendix interna.

#### *Eutrichocheles* sp. (Fig. 10)

**Material.** Gulf of Thailand, 7°00'N, 103°18'E, 55 m, mud, a little sand and shell, GE St. 381-I, 8 June 1951: 1♂ (ZMUC), TL=9.5 mm, CL=3.8 mm; 1♀ (ZMUC), TL=8.0, CL=2.2.

**Description.** Male juvenile. Rostrum (Fig. 10B, C) large, triangular, lateral margins divergent backward with 3 (right side) to 5 (left) spines, tip acute. Carapace compressed, smooth; anterolateral margin with few small spines, one spine behind eye, one behind antennal peduncle, 1–4 others on pterygostomial region. Cervical groove entire. Gastric region anteriorly sloping down to tip of rostrum, lateral carina with two sharp spines, anteriorly continuous with lateral margin of rostrum; submedian carina carinate with anterior spine; median carina distinct, extending from base of rostrum to cervical groove, with median tubercle.

Eye subglobose, reaching halfway of rostrum; cornea faintly brown. Antennular peduncle reaching to end of segment 4 of antenna; segment 1 with lateral spine; segments 2–3 short. Antennal segment 1 unarmed, dorso-distal spine of segment 2 short; antennal acicle short,

bifurcate with small proximal spine on mesial margin; segment 3 subequal to length of segment 2, segment 5 half the length of segment 4.

Maxilliped 3 with coxa and basis having posterodistal spine; ischium with 4 spines on posterior margin; merus slightly shorter than ischium, with 7 teeth on posterior margin, 2 distal teeth being more distinct than the others, mesial crest well developed with row of 18 teeth; carpus with posterodistal spine; propodus slightly shorter than carpus; dactyl shorter than propodus.

Left pereopod 1 missing. Right smaller pereopod 1 (Fig. 10A) with coxa and basis unarmed. Ischium with subdistal spine on posterior margin. Merus about four times as long as broad, posterior margin with three anteriorly directed spines, anterior margin with two subterminal spines. Carpus short, unarmed. Chela about four times as long as carpus, palm more than twice as long as broad, anterior margin terminating in distally directed spine; fingers narrow, elongate, about as long as palm, cutting edges with small teeth.

Ratio of lengths of abdominal somites 1–6: 1, 1.8, 1.7, 1.3, 1.3, 2.0. Pleura 1–5 demarcating terga by obscure convex line; pleuron 1 narrow, triangular, unarmed; pleuron 2 broadened, sloping down posteroventrally to ventral obtuse angle, anterior margin roundedly pronounced, but posterior margin truncate; pleura 3–4 triangular, with spine on anterior margin; pleuron 5 rounded ventrally, with ventral spine; pleuron 6 triangular, with ventral spine. Pleopod 1 absent in male. Pleopods 2–5 biramous, lacking appendix interna.

Telson (Fig. 10D) broader than long, longer than abdominal somite 6, lateral margin bulging out anteriorly with spine, and posteriorly straight with 3–4 spines; posterior margin oval, without median spine. Uropodal exopod with 4 non-articulating spines on lateral margin and sharp articulating spine at posterolateral angle, 2 longitudinal ribs of surface unarmed, transverse suture with some well-spaced spines. Uropodal endopod foliaceous, with 3 spines on lateral margin, median rib with 2 spines.

**Remarks.** The present juvenile specimen is determined as a species of *Eutrichocheles* because the antennal acicle is bifurcate. This species is similar to *E. brocki* in the following features: the rostrum is triangular; in the gastric region the lateral carina is continuous with the lateral margin of the rostrum, with two distinct spines, the submedian carina with an anterior spine; the antennal peduncle reaches to the end of segment 4 of the antenna; demarcation between pleura and terga carinate; the lateral margins of telson and the uropodal exopod and endopod armed with some spines; the smaller pereopod 1 is slender, the palm terminating in an anterodistal spine. However, it differs from *E. brocki* in the rostrum being much elongated; and the telson is not provided with a median spine on the posterior margin.

**Distribution.** Gulf of Thailand, 55 m.

### *Eucalastacus* gen.n.

Type species. *Eucalastacus torbeni* gen. et sp.n. (by monotypy; gender, masculine).

**Diagnosis.** Gonochoristic, but with hermaphroditic forms. Anterolateral margin of carapace unarmed. Rostrum narrow, styliform; gastric region with median, submedian and lateral carinae; post-cervical carina absent. Eyes mesially contiguous; cornea scarcely differentiated, lacking pigment. Pereopods 1 symmetrical, fingers gaping basically. Pleopod 1 of male biarticulate, distal segment spatulate; pleopod 1 of female uniramous, biarticulate. Pleopod 2 of male with endopod lacking distal segment, appendix masculina slender, setose, articulating, appendix interna small, articulating at its base. Pleopod 2 of female with elongate exopod and endopod, appendix interna articulating at midlength of endopod. Uropodal exopod without transverse suture. Genital pore on both pereopods 3 and 5. Telson longer than broad, with 2 rows of submedian non-articulating spines on dorsal surface.

**Remarks.** The genus is gonochoristic, but with hermaphroditic forms as shown by Kensley in *Posthonocharis* (synonym of *Bouvieraxius*) and *Sakaiocaris* (synonym of *Spongiaxius*), but differs from *Bouvieraxius* and *Spongiaxius* in having no transverse suture on the uropodal exopod.

The new genus is similar to *Calocaris* and *Lophaxius* in that the male endopod of pleopod 2 is simple, lacking a distal segment; the appendix masculina is slender, setose, articulating; the appendix interna is small, articulating at its base; however, the distal segment of pleopod 1 is spatulate as in *Spongiaxius* and *Bouvieraxius*.

### *Eucalastacus torbeni* gen. et sp.n. (Figs 11–13)

**Type material.** Milford Sound, New Zealand, 44°37'S, 167°52'E, 290 m, sandy mud, GE St. 608, 18 January 1952: holotype, 1♀ (ZMUC), TL=31 mm, R=3 mm, CL=11.7 mm. Wellington–Auckland, 37°31'S, 174°59'E, 341 m, sandy mud, GE St. 640, 26 January 1952: paratype, 1♂ (ZMUC), TL=17.0, R=1.5, CL=6.0.

**Etymology.** The species name is dedicated to Dr Torben Wolff, Deputy Leader of the Galathea Expedition.

**Description of female or hermaphroditic holotype.** Rostrum (Fig. 12A, B) narrow, styliform, with 3 lateral spines; tip acute. Carapace compressed, smooth, unarmed on anterolateral margin. Cervical groove dorsally distinct, but lacking anterolaterally. Gastric region anteriorly arched to rostrum, lateral carina with strong anterior spine, extending to lateral margin of rostrum with disruption, smooth in anterior half; submedian carina smooth in anterior half, anteriorly deflexed toward median line; median carina unarmed, extending from base of rostrum to cervical groove. Post-cervical region dorsally convex in anterior part, but not carinate.

Eye quadrate (Fig. 12B), convex laterally, contiguous mesially, less than  $\frac{1}{4}$  the length of rostrum; cornea scarcely differentiated, unpigmented, rounded on lateral surface. Antennular peduncle reaching to halfway level of segment 4 of antenna; segment 1 longer than segment 2 and 3 combined; dorsolateral flagellum 11.8 mm long, ventromesial flagellum 15.5 mm long. Antennal segment 1 with mesiodistal spine; dorsodistal spine of segment 2 well developed, directed anteriorly to end of segment 4; antennal acicle well developed, about as long as dorsodistal spine of segment 2; segment 3 apically pointed; segment 4 subequal to length of segment 2 excluding

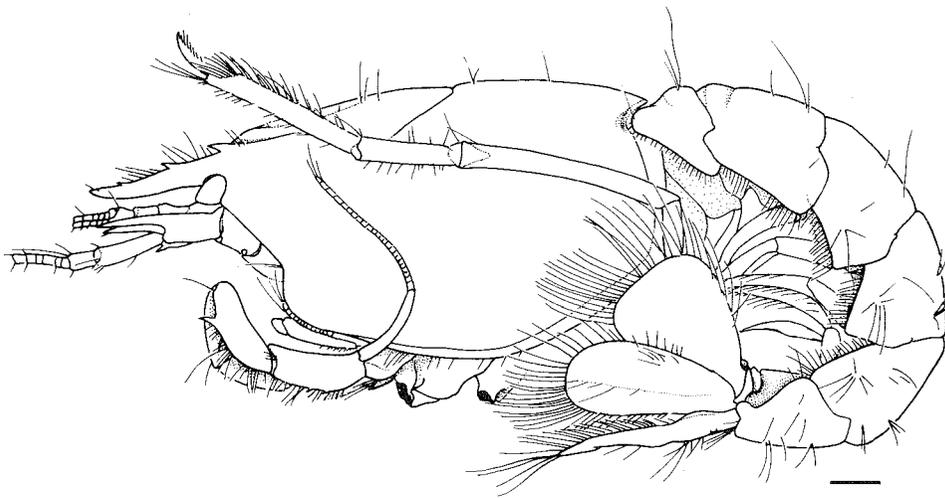


Fig. 11. *Eucalastacus torbeni* gen. et sp.n., holotype ♀, GE St. 608. Scale 1 mm.

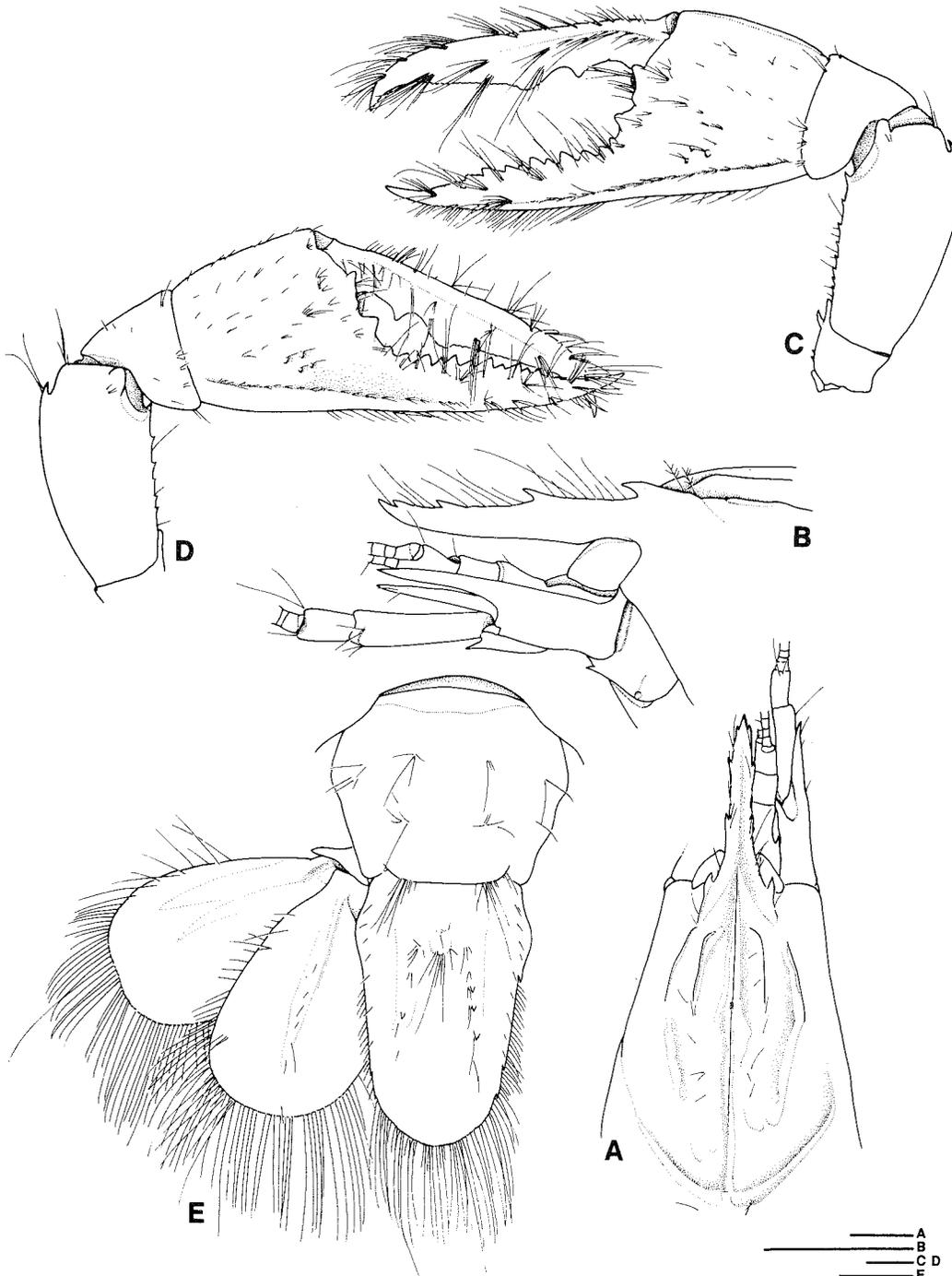


Fig. 12. *Eucalastacus torbeni* gen. et sp.n., holotype ♀, GE St. 608.—A. Anterior part of carapace, dorsal aspect.—B. Same, enlarged, lateral aspect.—C. Larger cheliped, lateral aspect.—D. Smaller cheliped, lateral aspect.—E. Abdominal somite 6 and tail-fan. Scale 1 mm.

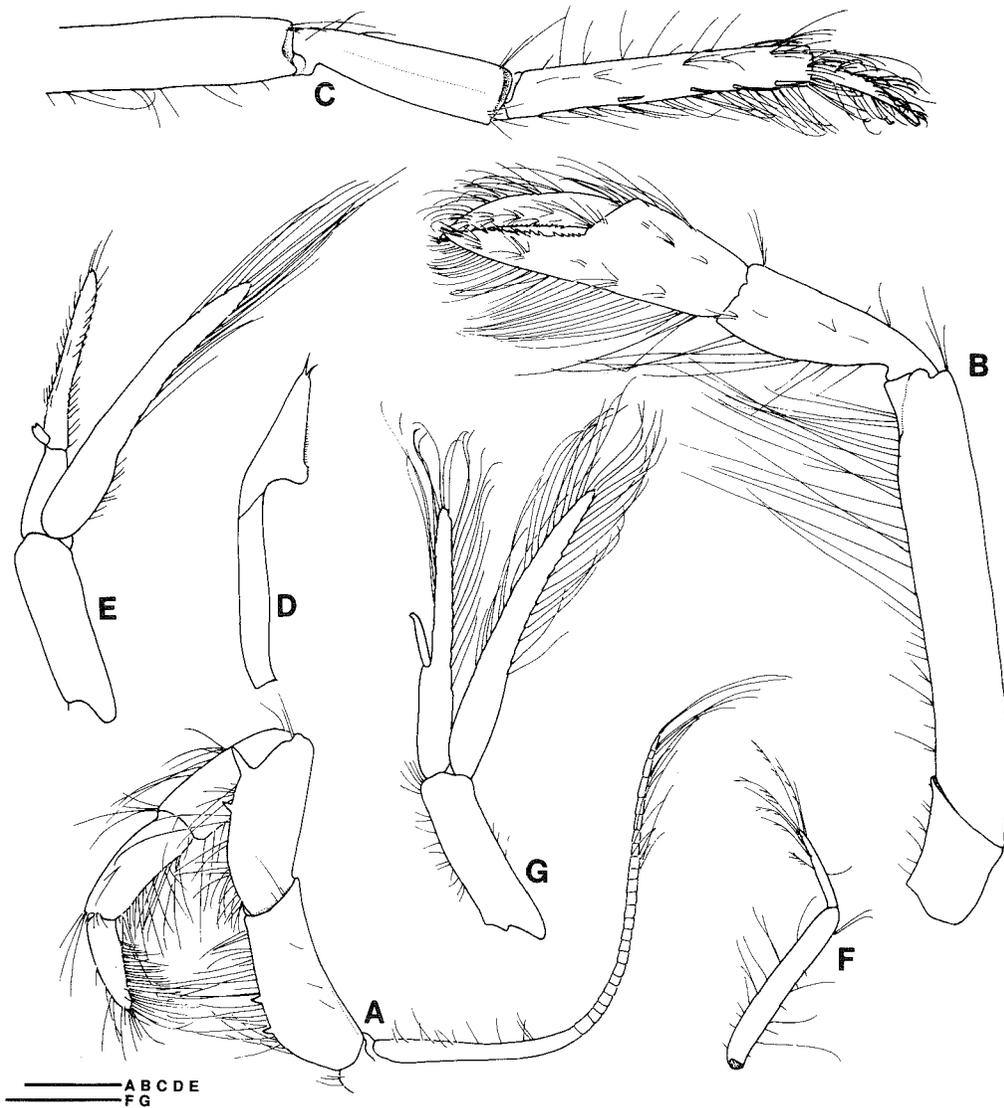


Fig. 13. *Eucalastacus torbeni* gen. et sp.n.—A. Maxilliped 3, lateral aspect.—B. Pereopod 2, lateral aspect.—C. Carpus, propodus and dactyl of pereopod 3, lateral aspect.—D. Male pleopod 1, lateral aspect.—E. Male pleopod 2, lateral aspect.—F. Female pereopod 1, lateral aspect.—G. Female pereopod 2, lateral aspect.—A–C, F–G. Holotype ♀, GE St. 608.—D–E. Paratype ♂, GE St. 640. Scale 1 mm.

dorsodistal spine; segment 5 about  $\frac{1}{3}$  the length of segment 4; flagellum measuring 23 mm.

Maxilliped 3 (Fig. 13A) with coxa and basis unarmed; ischium with 2 small spines on posterior margin, mesial crest denticulate; merus about as long as ischium, with 2 spines on posterior margin, distal spine distinct, the other small; carpus slightly shorter than merus, unarmed; propodus about as long as carpus, dactyl  $\frac{3}{4}$  the length of propodus.

Pereopods 1 subequal.

Left cheliped (Fig. 12C) with coxa and basis unarmed. Ischium with 3 spines on posterior margin, distal one sharp, distinct, others small. Merus about twice as long as broad; anterior margin with 1 sharp subdistal spine; posterior margin with 8 spines, distal one distinct, others small, irregularly arranged. Carpus triangular,  $\frac{2}{3}$  the length of merus, unarmed. Chela more than four times as long as carpus. Palm slightly broader than long, increasing in width distally; anterior margin smooth, divergent distally, posterior margin proximally broadened, laterally carinate with tufts of setae in proximal  $\frac{2}{3}$ , mesially not carinate, but with row of setae; lateral surface with 3

denticles near posterior margin; distal margin with 2 conspicuous teeth, upper tooth broad, convex posteriorly, lower tooth triangular; mesial surface centrally with 13 teeth above posterior margin, with triangular spine on distal margin. Dactyl slender, twice as long as palm, cutting edge widely gaping basally, proximally with 2 concavities separated medially by triangular tooth, minutely denticulate in distal  $\frac{3}{5}$ , tip incurved. Fixed finger slender, with row of 10 distally directed triangular teeth on cutting edge.

Right cheliped (Fig. 12D) almost the same as left cheliped, but differs in number of spines or teeth. Ischium with 4 spines and merus with 6 spines on posterior margin; fixed finger with 11 teeth on cutting edge.

Pereopod 2 (Fig. 13B) with coxa, basis, ischium unarmed. Merus about 5.5 times as long as broad.

Carpus half the length of merus, chela 1.5 times as long as carpus, cutting edges with row of distally directed fine teeth.

Pereopod 3 (Fig. 13C) with coxa bearing genital pore, unarmed. Basis and ischium unarmed. Merus four times as long as ischium, unarmed. Carpus about half the length

of merus. Propodus 1.5 times as long as carpus, posterolaterally with 4 slender spines. Dactyl about  $\frac{2}{3}$  the length of propodus.

Pereopod 4 with coxa, basis and ischium unarmed. Merus more than twice as long as ischium. Carpus half meral length. Propodus 1.5 times as long as carpus, posterolateral surface distally with tuft of setae. Dactyl  $\frac{2}{5}$  the length of propodus.

Pereopod 5 with coxa having genital pore. Basis and ischium unarmed. Merus twice as long as ischium. Carpus half meral length. Propodus twice as long as carpus, lateral surface distally with row of setae. Dactyl  $\frac{2}{5}$  times as long as propodus.

Abdomen (Fig. 11) unarmed; ratio of lengths of abdominal somites 1–6 and telson: 1, 2, 2, 1.8, 1.8, 1.8, and 2.5. Pleuron 1 narrow, obtuse ventrally; pleuron 2 broadened, ventral margins inclined backward to rectangular posteroventral angle; pleura 3–5 with acute triangle ventrally, unarmed; pleuron 6 rounded on ventral margin, unarmed. Pleopod 1 of females (Fig. 13F) small, slender, biarticulate, distal segment half the length of proximal segment. Pleopods 2–5 (Fig. 13G) similar in shape, biramous, slender, endopods only with free appendix interna.

Telson (Fig. 12E) about 1.5 times as long as broad, lateral margin slightly bulging out anteriorly with spine on right side, but unarmed on left, convergent posteriorly, with 2 spines on right side, unarmed on left; dorsal surface with transverse row of setae at about proximal  $\frac{1}{3}$ , submedially with paired longitudinal convexities with 3 spines on right one, one spine on left. Uropod endopod reaching to posterior margin of telson, unarmed; posterior margin rounded, dorsal surface with smooth median rib. Uropodal exopod unarmed, without transverse suture; dorsal surface with smooth two ribs.

*Description of male or hermaphroditic paratype.* Eye rounded on lateral surface, with cornea scarcely differentiated, lacking pigments. Pereopods 3 and 5 with coxa having genital pore. Pleopod 1 (Fig. 13D) biarticulate; distal segment spatulate, with proximomesial clump of small hooks. Pleopod 2 (Fig. 13E), exopod distinct, and endopod lacking distal segment, appendix masculina slender, setose, with small appendix interna. Pleopods 3–5 with small free appendix interna.

*Remarks.* The present species is gonochoristic, but with hermaphroditic form as the genital pores on both the coxae of pereopods 3 and 5 exist; two form of pleopods 1–2 are represented; in the larger specimen of female pleopod 2 is provided with appendix interna, but in the smaller specimen of male pleopod 2 bears both the appendices masculina and interna.

The present species is similar to *Calastacus laevis* de Saint Laurent, 1972 in the shape of the tail-fan, the post-cervical region is not provided with a median carina, and pleopod 2 has a small appendix interna. It differs, however, in that *E. torbeni* is gonochoristic, the uropodal exopod lacks a transverse suture, pleopod 1 of male shows a simple spatulate form, and pleopod 2 of male with a simple appendix masculina. However, *C. laevis* is hermaphroditic, the uropodal exopod has a transverse suture, pleopod 1 has broad distal segment which is

divided into two lobes by a median suture, and pleopod 2 of male with a biarticulate appendix masculina (de Saint Laurent 1972: 347).

*Distribution.* Tasmania Sea, New Zealand, 290–341 m.

### *Axiopsis Borradaile, 1903*

*Axiopsis Borradaile*, 1903: 538; de Man 1925c: 66.

Type species. *Axius affinis* de Man, 1888 (by original designation).

### *Axiopsis serratifrons* (A. Milne Edwards, 1873)

*Axia serratifrons* A. Milne Edwards, 1873: 263, pl. 13, fig. 6, 6a.  
*Axiopsis serratifrons*; Sakai & de Saint Laurent 1989: 76.

*Material.* North Doe Roa, Kei Islands, 25 m, sand, trawl, KIE St. 40, 25 April 1922: 1 ♂ (ZMUC), TL=13.2 mm, CL=10.0 mm; 1 ovig. ♀ (ZMUC), TL=38, CL=13.2.

*Remarks.* This species is usually found on the coral reefs.

*Distribution.* Hawaii to the Red Sea and South Africa, and Bermuda, Florida and Ascension Island (Manning & Chace 1990: 31).

### *Axiopsis tsushimaensis* sp.n. (Figs 14, 15)

*Axiopsis* (*Axiopsis*) aff. *serratifrons* sensu Sakai 1970: 37.

*Type material.* Fukuoka, Korea Strait, 34°11'N, 130°2'E, 56 fathoms (102 m), TME, 18 May 1914: holotype 1 juvenile (ZMUC), TL=18.0, CL=5.8.

*Etymology.* The species name is derived from the type locality of the species, *A. aff. serratifrons*, the Tsushima Islands in the Korean Strait.

*Description.* Rostrum (Fig. 15A) triangular, with 4 lateral spines, tip acute. Carapace smooth, pterygostomian region with spine. Cervical groove distinct. Gastric region slightly sloping anteriorly to rostrum, lateral carina continuous with lateral margin of rostrum, with row of 8–9 spines, submedially with row of 8–9 spines and 12–13 spines, median carina with 12 spines and median tubercle, surface between gastric carinae with 1–4 spines.

Eye subglobose, reaching to level of middle of rostrum, cornea yellow. Antennular peduncle reaching to end of segment 4 of antenna, segment 1 swollen on proximal half of lateral margin with spine, subequal to segments 2 and 3 combined. Antennal segment 1 unarmed, dorsodistal spine of segment 2 sharp, reaching proximal  $\frac{1}{3}$  of antennal acicle, antennal acicle spinous, unarmed proximally on mesial margin, reaching to distal part of segment 4, segment 3 apically pointed, segment 4 elongate, shorter than segment 2 including dorsodistal spine, segment 5 about half the length of segment 4.

Maxilliped 3 with coxa and basis each with posterodistal spine. Ischium serrate on posterior margin (Fig. 14), with mesial dentate crest. Merus with 5 spines on posterior margin, distal 2 distinct. Carpus with subterminal spine on posterior margin.

Left larger pereopod missing.

Right, smaller pereopod 1 slender. Coxa with small posterodistal spine. Basis unarmed. Ischium (Fig. 15D) with 6 spines on posterior margin. Merus about three

times as long as broad, with 8 spines on posterior margin, distal distinct spine at distal  $\frac{1}{3}$ ; anterior margin with subterminal spine. Carpus  $\frac{2}{3}$  meral length, unarmed. Chela more than three times as long as carpus, palm more than twice as long as broad, distal margin with 2 spinules; fixed finger more than half the length of propodus, cutting edge notched in proximal  $\frac{1}{3}$ , distal to it convex with teeth until apical tip. Dactyl  $\frac{3}{4}$  the length of palm, cutting edge notched proximally, then with large prominence for proximal half, distally slightly concave until distal end.

Pereopod 2 with coxa bearing posterodistal spine. Basis unarmed. Ischium with 3 spines on posterior margin, distal spine elongate. Merus with 4 spines on posterior margin, anterior margin unarmed. Carpus half meral length, unarmed. Chela longer than carpus, unarmed. Pereopods 3 or 5 with genital pore undeveloped.

Pleura (Fig. 14) smooth; pleuron 1 narrow, with spine on ventral end. Pleuron 2 antero-posteriorly convex, unarmed. Pleura 3–5 truncate, with anteroventral spine; pleuron 6 triangular with apical spine. Pleopod 1 developed as minute papilla. Pleopods 2–5 biramous with endopod and exopod, with free appendix interna.

Telson (Fig. 15C) 1.3 times as long as broad, lateral margin bulging out anteriorly with spine, posteriorly with 2 fixed and 2 articulating spines; posterior margin with median spine and pair of 3 articulating spines at posterodistal angle; dorsal surface with 2 pairs of spines centrally. Uropodal exopod with 4 fixed spines on lateral margin, single articulating spine at posterolateral angle, dorsal surface with 2 longitudinal ribs, lateral rib with 3 spines, mesial rib smooth. Uropodal endopod with 3 spines on lateral margin, distal spine at posterolateral angle, with median row of 5 spines on surface.

**Remarks.** This species is the same as *Axiopsis* aff. *serratifrons* sensu Sakai, 1970 from around the Tsushima Islands, the Korean Strait, since the present specimen was collected from the same area of the Korean Strait. Maxilliped 3 has serrations on the posterior margin, the pterygostomial region has a spine, and the telson has a median spine on the posterior margin.

In regard to the armature on the gastric region and

telson this species appears to be related to *A. consobrina*. However, in the present species the antennal acicle is simple and elongate, while in *A. consobrina* as well as *A. serratifrons* it is not simple but bifurcate proximally with a mesial spine; the eye is thicker than in *A. consobrina*. In *A. serratifrons* the gastric region is provided with more numerous spines on the areas between the longitudinal gastric carinae, and the antennal acicle is much longer than in the present species.

**Distribution.** Korean Strait, Japan, 70–102 m.

#### *Axiopsis* sp. (Fig. 16)

**Material.** Off Mombasa, Kenya, 4°06'S, 39°43'E, 40 m, GE St. 259, 22 March 1951: 1 juvenile (ZMUC), TL=9.0 mm, CL=2.1 mm. Off Mombasa, Kenya, 4°06'S, 39°43'E, 40 m, GE St. 259, 22 March 1951: 1 damaged juvenile without carapace, abdomen and telson = 6.0 mm.

**Description of juvenile.** Rostrum (Fig. 16A, B) broad, probably triangular, but tip regenerated as conical protrusion, dorsal surface concave, with six sharp lateral spines. Carapace compressed, smooth, anterolateral margin unarmed. Cervical groove entire. Gastric region anteriorly arched to rostrum, lateral carina continuous with lateral margin of rostrum, with 5–6 small spines, submedian carina with row of 4–7 spines, median carina distinct, extending from base of rostrum to near cervical groove, with seven spines.

Eye (Fig. 16B) robust, subglobose, cornea faintly brown. Antennular peduncle reaching to end of segment 5 of antenna, segment 1 bearing lateral spine, segments 2 and 3 short. Antennal segment 1 unarmed, dorsodistal spine of segment 2 short triangular with pointed tip, antennal acicle thick, unarmed, extending near distal margin of segment 4, segment 3 apically pointed, segment 4 about as long as segment 2, segment 5 half the length of segment 4.

Maxilliped 3 with ischium bearing 3 spines on posterior margin, mesial denticulate crest present, merus shorter than ischium, with 4–5 teeth on posterior margin, 2 distal teeth sharp, distinct, other proximal teeth small, carpus

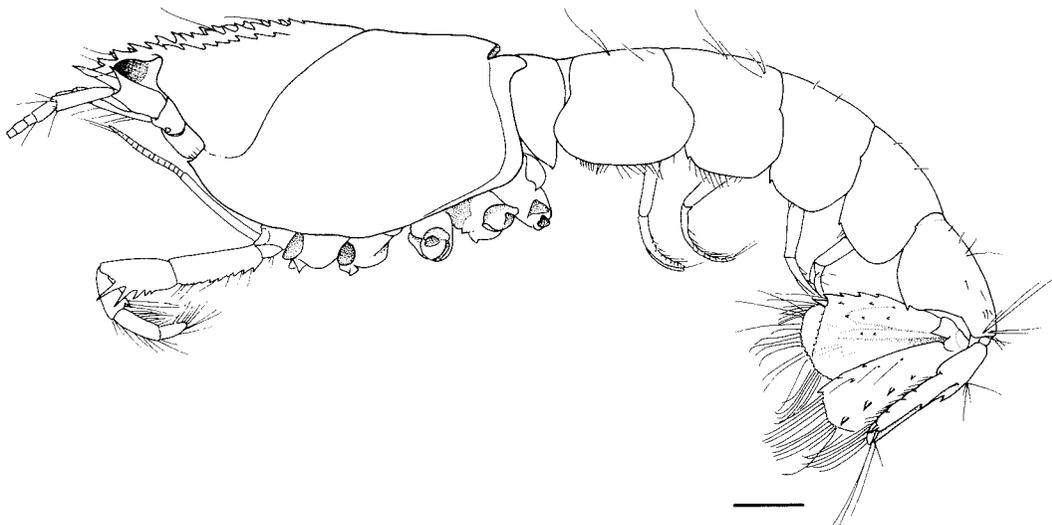


Fig. 14. *Axiopsis tsushimaensis* sp.n., juvenile ♀, Fukuoka, Korea Strait. Anterior part of carapace. Scale 1 mm.

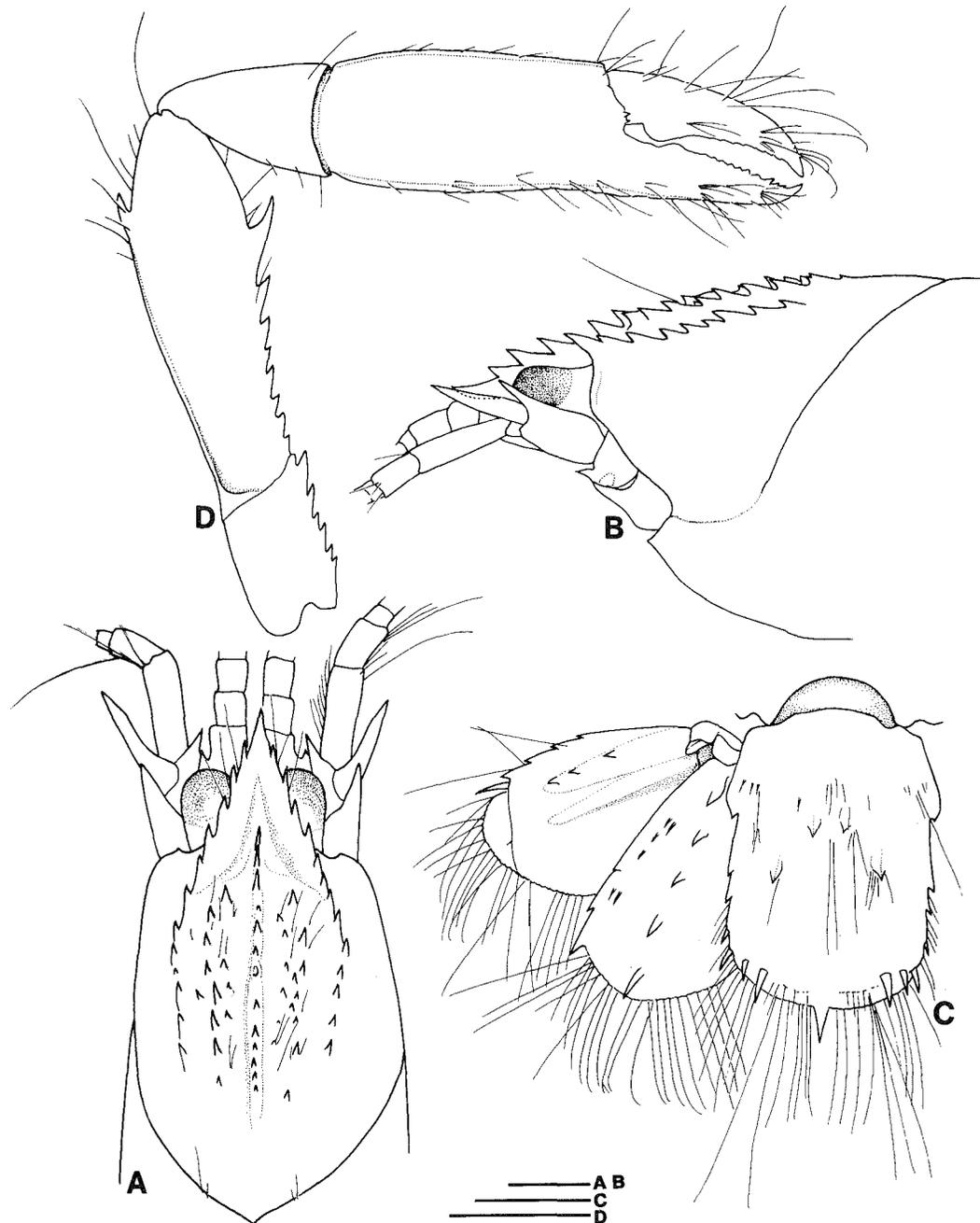


Fig. 15. *Axiopsis tsushimaensis* sp.n., juvenile ♀, Fukuoka, Korea Strait.—A. Anterior part of carapace.—B. Same, lateral aspect.—C. Tail-fan, dorsal aspect.—D. Smaller cheliped, lateral aspect. Scale 1 mm.

with subdistal spine on posterior margin, propodus longer than carpus, and dactyl about  $\frac{2}{3}$  the length of propodus.

Pereopod 1 of left side small, regenerated; wanting on right, coxa with subdistal spine on posterior margin.

Pereopod 2 (Fig. 16C) chelate. Coxa with subdistal spine on posterior margin. Basis with posterodistal spine, ischium with two spines on posterior margin, unarmed on anterior margin; carpus about half meral length, unarmed. Chela about 1.5 times as long as carpus, dactyl shorter than palm.

Pereopod 3 simple, coxa with subterminal spine on posterior margin. Basis and ischium unarmed, merus about three times as long as ischium, unarmed, carpus about  $\frac{2}{3}$  the length of merus, lateral surface smooth, dactyl about half the length of propodus.

Pereopods 4 and 5 wanting.

Ratio of lengths of abdominal somites 1–6 (Fig. 16D): 1, 1.6, 1.3, 1.2, 1.6, 1.6. Pleuron 1 narrow, triangular with obtuse tip; pleuron 2 broad, antero-posteriorly convex, sloping down backward ventrally to obtuse posteroventral angle. Pleura 3–5 largely rounded with small anteroventral spine; pleuron 6 triangular with apical spine. Pleopod 1 absent, pleopods 2–5 biramous, lacking appendix interna.

Telson (Fig. 16E) oblong, about as long as abdominal somite 6, lateral margin anteriorly bulging out with spine, and more posteriorly with 2 spines; posterior margin with sharp median spine, and pair of 2 movable spines at posterolateral angle; dorsal surface medially sulcate with pair of 2 spines. Uropodal exopod oval on distal margin, 5 spines on lateral margin, and with elongate movable spine at posterolateral angle; dorsal surface with outer rib

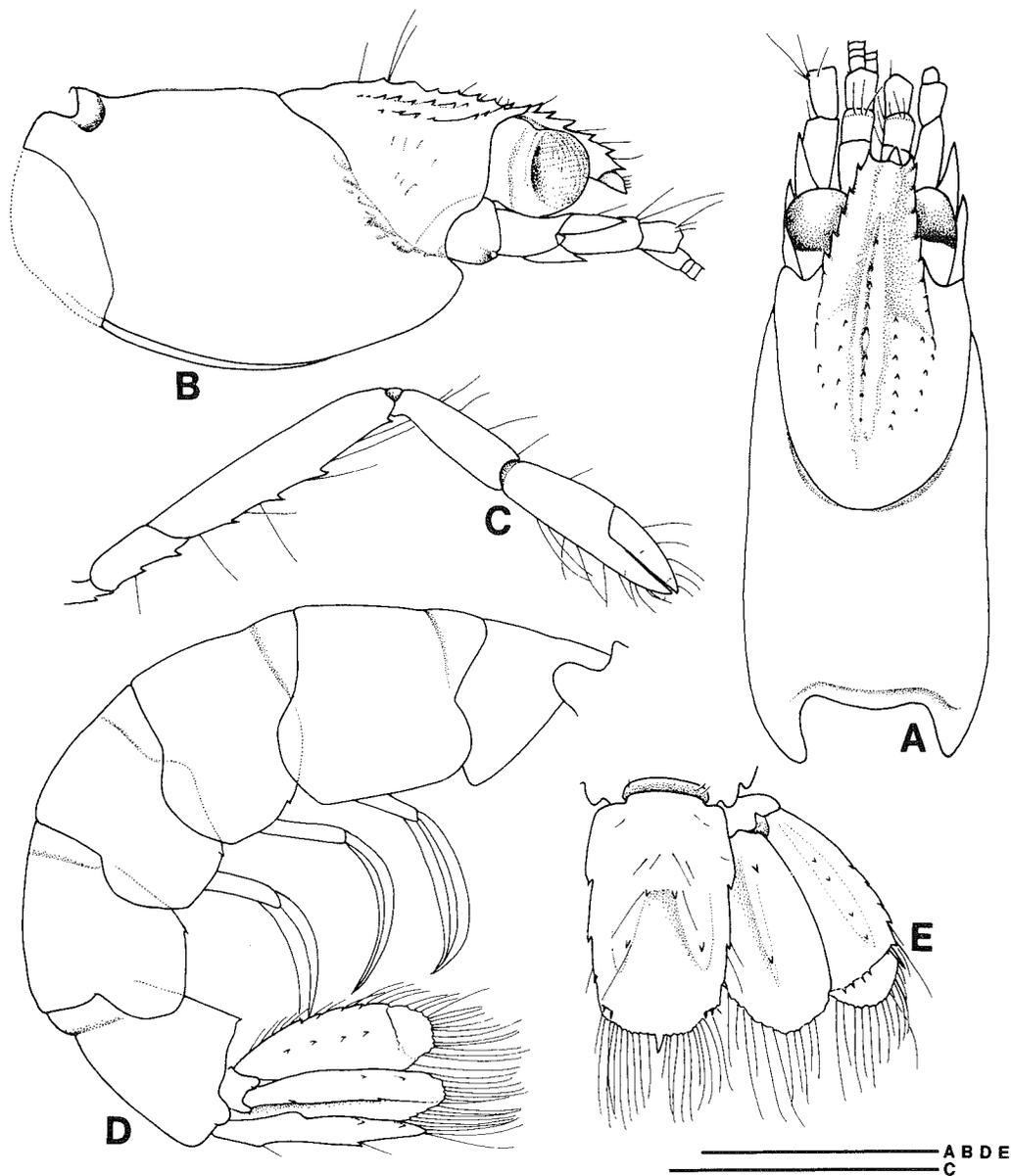


Fig. 16. *Axiopsis* sp.n., holotype juvenile, GE St. 259.—A.—Carapace.—B. Same, lateral aspect.—C. Pereopod 2, lateral aspect.—D. Abdomen and tail-fan.—E. Tail-fan, dorsal aspect. Scale 1 mm.

bearing four spines; transverse suture with a few spines. Uropodal endopod oval, about as long as endopod and telson, with 2 spines on mid-rib.

**Remarks.** Two juveniles are partially damaged, lacking a pair of pereopods 1; however, the features are similar to *A. serratifrons* both in the broadened pleura of abdominal somites and in the rostrum with marginal serration. However, it differs in the following features; the rostrum is largely sloping down to the tip, with six sharp lateral spines, though the tip is torn away, but partially regenerated. The gastric region is provided with distinct median carina with serration, and with a row of rough serration on the submedian carina, but it is not distributed by denticles as in *A. serratifrons*. The antennal peduncle is about as long as the antennular peduncle, though in *A. serratifrons* the antennal peduncle reaches to level of distal end of segment 4.

**Distribution.** Off Mombasa, Kenya, 40 m.

### *Calocarides* Wollebaek, 1908

*Calocarides* Wollebaek, 1908: 23; de Man 1925c: 71; Bouvier 1940: 97; Sakai & de Saint Laurent 1989: 78.

Type species. *Euconaxius coronata* Trybom, 1904 (designated by Sakai & de Saint Laurent 1989).

### *Calocarides* *vigila* sp.n. (Figs 17, 18)

**Type material.** Hawke Bay, New Zealand, 39°36'S, 177°42'E, 126 m, sandy clay with concretions, GE St. 631, 25 January 1952: holotype, 1♂ (ZMUC), TL=28 mm, CL including rostrum=8.5 mm. Hawke Bay, 39°32'S, 177°48'E, 74 m, sandy clay, GE St. 632, 25 January 1952: paratype, 1 juvenile (ZMUC), TL=19, CL=6.3.

**Further material.** Hawke Bay, 39°15'S, 178°00'E, 83 m, clay, GE St. 633, 25 January 1952: 2 juvenile specimens (ZMUC), TL=17, CL=5.2; TL=15, CL=4.5. Cook Strait, 40°44'S, 174°34'E, 146 m, clay and sand, GE St. 577, 21 December 1951: 3 juveniles (ZMUC), TL=17, CL=5.5; TL=14, CL=4.2; TL=13, CL=3.8; TL=14, CL=4.2; 1 damaged specimen (ZMUC) without carapace, ABL with telson, 8.0 mm. Cook Strait, 40°31'S, 173°20'E, 60 m, clay and sand, GE St. 576, 21 December 1951: 1 juvenile (ZMUC), TL=10, CL=3.0. Milford Sound, New Zealand, 44°35'S, 167°49'E, 123 m, mud with sand and clay, GE St. 618, 19 January 1952: 1♂ (ZMUC), TL=17, CL=5.3.

*Etymology.* This species name is derived from the Latin, *vigil*, meaning 'alert' or 'awake', suggesting the appearance of specimens which are alarmed at their enemies by stretching out their chelipeds widely.

*Description of male holotype* (Figs 17A–C, 18A–G). Rostrum (Fig. 17B, C) tapering, triangular, with 4 lateral spines, tip acute. Carapace smooth, unarmed on antero-lateral margin. Cervical groove entire. Gastric region slightly sloping down to rostrum, lateral carina continuous with lateral margin of rostrum without disruption, with 6 spines, submedian carina with 7–8 spines; median carina with 12 spinules, approximating from base of rostrum posteriorly to cervical groove. Post-cervical carina absent.

Eye subglobose, thick, exceeding midlength of rostrum; cornea faintly brown in alcohol. Antennular peduncle reaching to halfway level of segment 4 of antenna; segment 1 with lateral spine at distal third, about 1.7 times as long as segments 2 and 3 combined; segments 2 and 3 short, about equal in length. Antennal segment 1 armed with sharp spine on ventrodiscal margin; dorsodiscal spine of segment 2 well developed, triangular in shape; antennal acicle elongate, overreaching distal margin of segment 4; ventrodiscal spine of segment 3 sharply pointed; segment 4 elongate, about twice as long as segment 2 excluding dorsodiscal spine; segment 5 about  $\frac{1}{3}$  the length of segment 4.

Maxilliped 3 (Fig. 18A) with coxa provided with sharp posterodistal spine; basis also with triangular posterodistal spine; ischium with 9 teeth on posterior margin, denticulate mesial crest widely separated from posterior margin; merus slightly shorter than ischium, with 5 teeth on posterior margin, increasing in size distally, the 2 distal ones sharp; carpus about  $\frac{2}{3}$  the length of merus, with subdistal spine on posterior margin; propodus about as long as carpus; dactyl about half the length of propodus. Exopod consisting of proximal segment and segmented flagellum, reaching to distal part of merus.

Pereopods 1 unequal. Right, larger cheliped with coxa bearing small middle spine on posterior margin; basis unarmed; ischium (Fig. 18C) with 5 spines on posterior margin. Merus about 2.3 times as long as broad; anterior margin with subdistal spine; posterior margin with nine teeth. Carpus (Fig. 18B) triangular, about  $\frac{2}{3}$  the length of merus, unarmed. Chela about 4.5 times as long as carpus. Palm 1.3 times as long as broad; anterior margin carinate with 16 denticles; posterior surface smooth, broadened, tapering distally, with denticles on lateral and mesial margins; lateral surface scantily setose, scattered with some tubercles, with row of tubercles near distal margin, extending to proximal part of fixed finger, distal margin with some denticles. Dactyl slender, 1.3 times as long as palm, cutting edge largely gaping proximally, then forming low denticulate triangular cusp, tip curved; fixed finger distinctly shorter than dactyl, cutting edge proximally concave, distally denticulate, seven rounded teeth in proximal  $\frac{2}{3}$ , and finely denticulate distally.

Left, smaller cheliped (Fig. 18D) with coxa provided with middle spine on posterior margin; basis unarmed; ischium with 6 spines on posterior margin, distal spine sharp. Merus about 3.5 times as long as broad, anterior margin with subterminal spine, posterior margin armed

with 12 spines. Carpus about  $\frac{2}{3}$  the length of merus, unarmed. Chela more than three times as long as carpus, finely ridged with serration on anterior and posterior margins. Dactyl slender, more than 1.5 times as long as palm, anterior margin with six distinct spines in proximal half, cutting edge provided with row of sharp denticles. Fixed finger also slender, cutting edge with row of sharp distally directed denticles.

Pereopods 2 (Fig. 18E) with coxa and basis bearing posterodistal spine. Ischium with 5 spines on posterior margin. Merus about five times as long as broad, posterior margin with four spines including distal one. Carpus about half the length of merus, posterior margin with subterminal spine. Chela about 1.5 times as long as carpus, dactyl less than 1.5 the length of palm, unarmed.

Pereopod 3 (Fig. 18F) with coxa, basis and ischium unarmed. Merus elongate, 3.8 times as long as ischium. Carpus about half the length of merus. Propodus slightly longer than carpus, posterior margin with row of setae. Dactyl about half the length of propodus.

Pereopod 4 with coxa, basis and ischium unarmed. Merus more than twice as long as ischium. Carpus half meral length. Propodus much longer than carpus. Dactyl about half the length of propodus. Pereopods 5 with coxa bearing genital pore.

Abdomen smooth, ratio of lengths of abdominal somites 1–6: 1, 1.5, 1.4, 1.2, 1.2, 1.8. Pleuron 1 narrow, rounded on ventral margin. Pleuron 2 broadened, antero-posteriorly convex. Pleura 3–4 rounded ventrally, with antroventral spine. Pleuron 5 truncate ventrally, with small spine on anterior margin. Pleuron 6 broadly rounded, with ventral spine. Pleopod 1 of male absent. Pleopod 2 (Fig. 18G) biramous, lanceolate, endopod with free appendix masculina and appendix interna, appendix masculina apically with three setae, about half the length of appendix interna. Pleopods 3–5 also biramous, endopod with appendix interna.

Telson (description of young, GE St. 577) (Fig. 17D) oblong, about 1.5 times as long as broad, about 1.2 times as long as abdominal somite 6 and slightly shorter than uropodal endopod; lateral margins bulging out anteriorly with spine, more distally with 3–4 fixed spines and one articulating spine, and with a pair of 3 articulating spines at posterolateral angle; posterior margin semicircular with median spine; dorsal surface medially sulcate and with two pairs of non-articulating spines. Uropodal endopod with 4 spines on midrib. Uropodal exopod with 4–6 spines on lateral margin and with elongate articulating spine at posterolateral angle; distal transverse suture with small spines, dorsal surface with 2 smooth ribs.

*Remarks.* The present new species from New Zealand is very similar to *Calocarides tenuicornis* (de Man, 1905) (reported from the Bali Sea, Indonesia (7°46'S, 114°30.5'E), 330 m deep) in the rostrum, the antennal acicle, maxilliped 3, pereopod 1 and the tail-fan. It differs, however, in the following respects: the present species is much more spinous in the rostrum, the carapace, maxilliped 3 and pereopod 1 than in *C. tenuicornis*; the rostrum is armed with 4 lateral spines, the lateral carina of the carapace with 6 spines, the submedian with 7–8 spines, and the median with 12 spines. Maxilliped 3

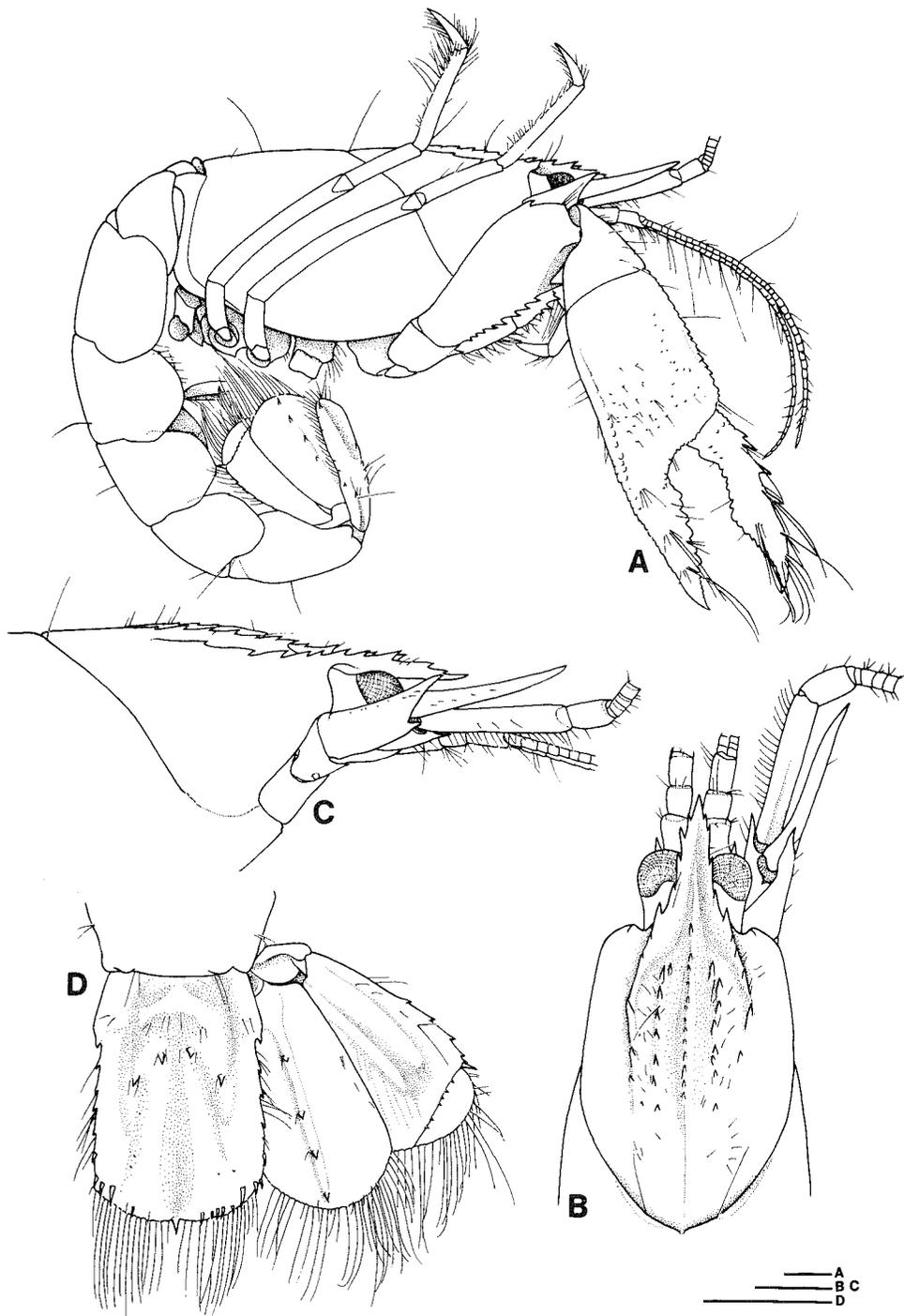


Fig. 17. *Calocarides vigila* sp.n.—A. Whole body.—B. Anterior part of carapace.—C. Same, lateral aspect.—D. Tail-fan.—A—C. Holotype ♂, GE St. 631.—D. Paratype, GE St. 577. Scale 1 mm.

with ischium bearing 9 spines on posterior margin, and the merus with 5 spines on posterior margin. In the right, larger cheliped ischium has 5 spines and merus 9 spines on posterior margin and the dactyl is much longer than the palm. On the other hand, in *C. tenuicornis*, described on the non-ovigerous female measuring 2.1 mm in total length (de Man, 1925c: 84) and being about the same size as the type specimen of *C. vigila*, rostrum is armed with 2 spines, the lateral carina of the carapace with 4, the submedian with 3, and the median with 4 spines, the anterolateral margin of the carapace with a small antennal spine, ischium in maxilliped 3 has 4 spines on the posterior margin and merus 4 spines; in the right, larger cheliped

ischium has 2 spines and merus has 4 on the posterior margin, and the dactyl is shorter in length than the palm.

The present species is also similar to the East-Pacific species, *C. quinqueseriatus* (Rathbun, 1902) and the Atlantic species *C. cornatus* (Trybom, 1904); in *C. quinqueseriatus* and *C. cornatus* the dactyl of the larger cheliped is distinctly shorter than the palm, and the lateral surface of the chela is tuberculous, while in *C. vigila* the dactyl of the larger cheliped is longer than the palm, and the lateral surface of the chela in both chelipeds is scantily tuberculate.

No female was available.

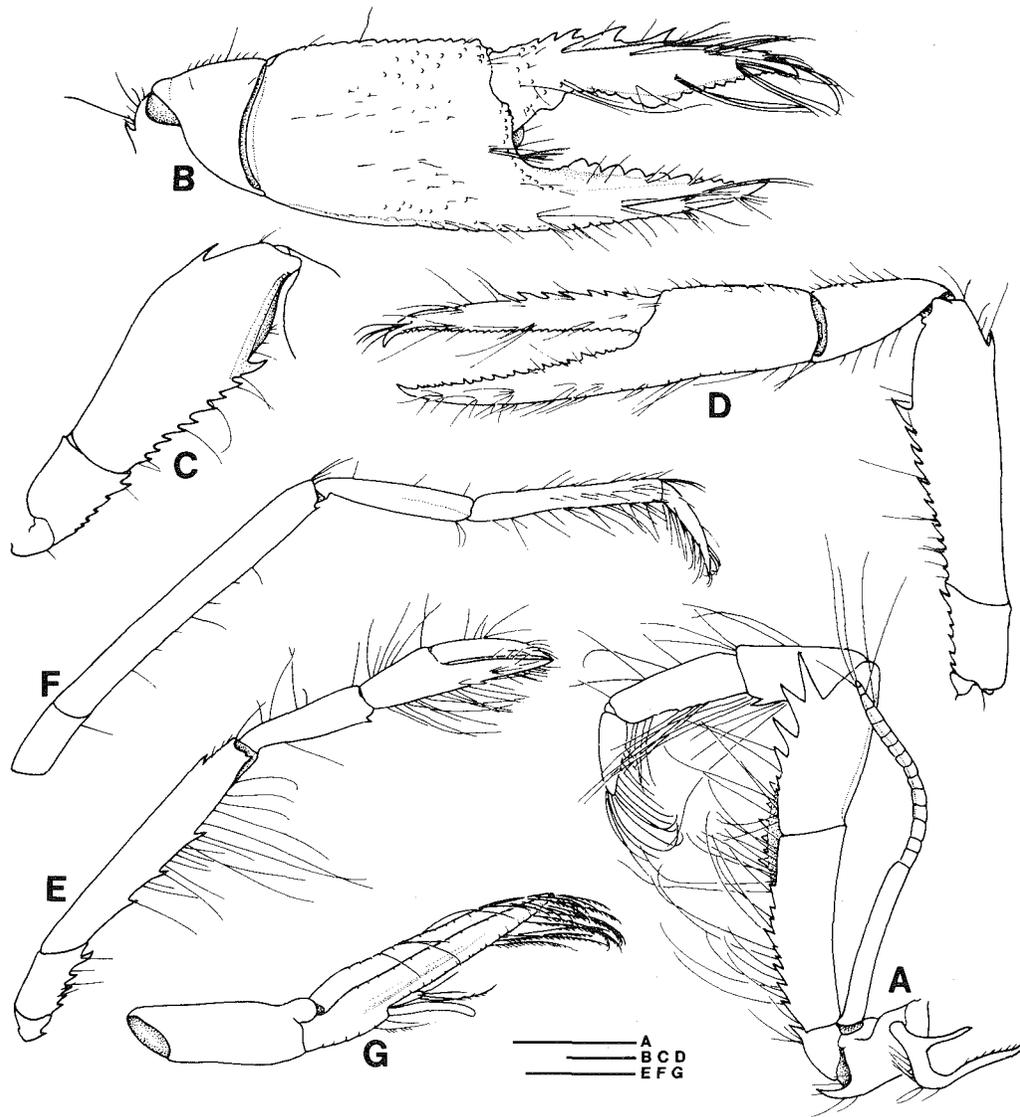


Fig. 18. *Calocarides vigila* sp.n. holotype ♂, GE St. 631.—A. Maxilliped 3, lateral aspect.—B. Carpus and chela of larger cheliped, lateral aspect.—C. Ischium and merus of larger cheliped, lateral aspect.—D. Smaller cheliped, lateral aspect.—E. Pereopod 2, lateral aspect.—F. Pereopod 3, lateral aspect.—G. Male pleopod 2, mesial aspect. Scale 1 mm.

*Distribution.* Hawke Bay and Cook Strait, New Zealand, 60–146 m.

### Acknowledgements

I am very grateful to Dr Torben Wolff of the Zoological Museum, Copenhagen, who allowed me to examine the fine collections, and for reviewing my manuscript with great care. I also thank Dr Claus Nielsen of the Copenhagen Museum for a preliminary review of the manuscript.

### References

- Alcock, A. 1901. *A descriptive catalogue of the Indian deep-sea Crustacea Macrura and Anomala, in the Indian Museum. Being a revised account of the deep-sea species collected by the Royal Indian Marine Survey Ship Investigator.* Trustees of the Indian Museum, Calcutta.
- Balss, H. 1925. *Macrura der Deutschen Tiefsee-Expedition. 1. Palinura, Astacura und Thalassinidea.*—*Ergebn. Dtsch. Tiefsee-Exp.* 20: 189–216.
- Bate, C. S. 1888. Report on the Crustacea Macrura collected by *H. M. S. Challenger* during the years 1873–1876.—*Rep. Voy. Challenger Zool.* 24: 1–942.
- Borradaile, L. A. 1903. On the classification of the Thalassinidea.—*Ann. Mag. nat. Hist. London* 12: 534–551, 638.
- Bouvier, E. L. 1905. Sur les Thalassinidés recueillis par le 'Blake' dans la mer des Antilles et de Golfe du Mexique.—*C. R. Acad. Sci. Paris* 141: 802–806.
- Bouvier, E. L. 1940. Décapodes Marcheurs.—*Faune de France* 37: 1–404.
- Gurney, R. 1942. *Larvae of Decapod Crustacea.* The Ray Society, London.
- Herbst, J. F. 1796. *Versuch einer Naturgeschichte der Krabben und Krebse.* Berlin und Stralsund 2(6 et seq.). [In Rathbun, M. J. (1897): A revision of the nomenclature of the Brachyura. *Proc. biol. Soc. Wash.* 11: 153–167.]
- Huxley, T. H. 1878. On the classification and the distribution of the cray-fishes.—*Proc. zool. Soc. London* 1878: 752–788.
- Kensley, B. 1989. New genera in the Thalassinidea families Calocarididae and Axiidae.—*Proc. biol. Soc. Wash.* 102: 960–967.
- Leach, W. E. 1815. A tabular view of the external characters of four classes of animals, which Linné arranged under Insecta, with the distribution of the genera composing three of these classes into orders.—*Trans. Linn. Soc. London, Zool.* 11: 306–400.
- Man, J. G. de 1888. Bericht über die im Indischen Archipel von Dr J. Brock gesammelten Decapoden und Stomatopoden.—*Arch. Naturgesch.* 53: 215–600.
- Man, J. G. de 1905. Diagnoses of new species of Macrurous Decapod Crustacea from the 'Siboga-Expedition'.—*Tijdschr. ned. dierk. Ver. en.* (2)9(3–4): 587–614.
- Man, J. G. de 1907. Diagnoses of new species of Macrurous Decapod Crustacea from the 'Siboga-Expedition'.—*Notes Leyden Mus.* 29: 127–147.
- Man, J. G. de 1925a. Über neue oder wenig bekannte Axiidae.—*Mitt. zool. Mus. Berlin* 12: 117–140.
- Man, J. G. de 1925b. *Axius (Eiconaxius) sibogae* sp.n.—*Zoöl. Meded. Leiden* 8: 218–219.
- Man, J. G. de 1925c. The Decapoda of the Siboga-Expedition. VI. The

- Axiidae collected by the Siboga-Exped.—*Siboga Exped. 39a(5)*: 1–128.
- Milne Edwards, A. 1873. Description de quelques Crustacés nouveaux ou peu connus provenant du Musée de M. C. Godeffroy.—*J. Mus. Godeffroy 1*: 253–264.
- Milne Edwards, H. 1837. *Histoire naturelle des Crustacés, comprenant l'Anatomie, la Physiologie et la Classification de ces Animaux, Paris 2*: 1–531.
- Mortensen, Th. 1923. The Danish expedition to the Kei Islands 1922.—*Vidensk. dreddr dansk naturh. Foren. 76*: 55–99.
- Ortmann, A. 1891. Die Decapoden-Krebse des Straßburger Museums. 3. Die Abtheilungen der Reptantia Boas: Homarides, Loricata und Thalassinidea.—*Zool. Jb. Syst. 6*: 1–58. 1.
- Poore, G. C. B. & Griffin, D. J. G. 1979. The Thalassinidea (Crustacea: Decapoda) of Australia.—*Rec. Australian Mus. 32*: 217–321.
- Rathbun, M. J. 1902. Descriptions of new decapod crustaceans from the west coast of North America.—*Proc. U.S. nat. Mus. 24*: 885–905.
- Rathbun, M. J. 1906. The Brachyura and Macrura of the Hawaiian Islands.—*Bull. U.S. Fish Comm. 23*: 827–930.
- Saint Laurent, M. de 1972. Un Thalassinide nouveau du golfe de Gascogne, *Calastacus laevis* sp. nov. Remarques sur le genre *Calastacus* Faxon (Crustacea Decapoda Axiidae).—*Bull. Mus. Hist. nat. Paris (3e) 29*: 347–356.
- Sakai, K. 1970. A small collection of Thalassinids from the waters around Tsushima Islands, Japan, including a new species of *Callianassa* (Crustacea, Anomura).—*Publ. Seto Mar. Biol. Lab. 18*: 37–47.
- Sakai, K. & Saint Laurent, M. de 1989. A check list of Axiidae (Decapoda, Crustacea, Thalassinidea, Anomura), with remarks and in addition descriptions of one new subfamily, eleven new genera and two new species.—*Naturalists, Tokushima 3*: 1–104.
- Trybom, F. 1904. Two new species of the genus *Euconaxius*.—*Ark. Zool. 1*: 383–393.
- Wolff, T. 1964. The Galathea Expedition 1950–52. List of benthic station from 0 to 400 metres, near-surface stations, and land stations.—*Vidensk. Meddr dansk naturh. Foren. 127*: 1–258.
- Wollebæk, A. 1908. Remarks on Decapod Crustaceans of the North Atlantic and the Norwegian Fjords (I & II).—*Bergens Mus. Aarb. 12*: 1–74.
- Wood Mason, J. 1876. On the *Astacus modestus* of Herbst.—*Ann. Mag. nat. Hist. London 17*: 264.