



Rediscovery and redescription of a sponge-associated axiid shrimp, *Eiconaxius acutifrons* Bate, 1888 (Crustacea: Decapoda: Axiidea)

TOMOYUKI KOMAI¹ & SHINJI TSUCHIDA²

¹Natural History Museum and Institute, Chiba, 955-2 Aoba-cho, Chuo-ku, Chiba, 260-8682 Japan. E-mail: komai@chiba-muse.or.jp.

²Japan Agency for Marine-Earth Science and Technology, 2-15 Natsushima-cho, Yokosuka, Kanagawa, 237-0061.
E-mail: tsuchidas@jamstec.go.jp.

Abstract

A poorly known deep-water axiid shrimp, *Eiconaxius acutifrons* Bate, 1888, the type species of the genus, is redescribed on the basis of the two type specimens (lectotype and paralectotype, designated herein) from the Banda Sea, Indonesia, and three recently collected specimens from the Myojin Knoll, Izu Islands, Japan. Diagnostic characters of this species are reassessed, and the comparison with closely allied congeneric species is made. Previous records referred to *E. acutifrons* are reviewed. It has been confirmed that none of the subsequent records under the name represent the true *E. acutifrons*. We found that *Eiconaxius albatrossae* Kensley, 1996 and *E. faxoni* Sakai, 2011 were based on the same series of material from the eastern Pacific, referred to *E. acutifrons* by Faxon (1895), but the Sakai's (2011) taxon name is unavailable because of the lack of an explicit type fixation.

Key words: Crustacea, Decapoda, Axiidea, Axiidae, *Eiconaxius*, redescription, new record, synonym

Introduction

The deep-water axiid shrimp *Eiconaxius acutifrons* Bate, 1888 was originally described on the basis of two specimens (one male and one ovigerous female) from the Banda Sea, Indonesia, collected during the world voyage of H.M.S. *Challenger* (Bate, 1888). Although Bate (1888) did not designate a type species of his new genus *Eiconaxius*, Borradaile (1903) subsequently selected *E. acutifrons* as the type species of the genus (as a subgenus of *Axius* Leach, 1815). Since the original description some axiids have been recorded under this name from various localities in the Pacific Ocean, viz., Pacific Panama (Faxon 1895), Banda Sea, Indonesia (de Man 1925), and the Gulf of California (Wicksten 1982). Sakai (2011) attempted to review these previous records based only on a survey of literature. Two new specific taxa have been proposed for the specimens reported by Faxon (1895) and De Man (1925), i.e., *E. faxoni* Sakai, 2011 and *E. indonesicus* Sakai, 2011, respectively. However, his diagnostic characters were unconvincing and the validity of the taxa described by Sakai (2011) remains rather obscure.

During the recent cruise to the Izu-Bonin Arc, Japan, conducted by the RV *Kairei* of the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) (cruise KR10-E04), three specimens representing a species of *Eiconaxius* were collected from Myojin Knoll, Izu Islands, by using a slurp gun installed on the ROV *Kaiko7000II*, and these specimens were sent to the senior author for identification. In the attempt to identify these specimens from existing literature, it became apparent that the identities of *E. acutifrons* and *E. indonesicus* are central. In order to clarify the diagnostic features of *E. acutifrons*, we have examined the two syntypes in the collection of the Natural History Museum, London (NHM). We concluded that the specimens from Myojin Knoll represent *E. acutifrons*. In this paper, *E. acutifrons* is redescribed and illustrated in detail based on the type material and the additional specimens from Myojin Knoll. Previous records of *E. acutifrons* are reviewed.

Material and methods

Material used in this study is deposited in the Natural History Museum and Institute, Chiba (CBM), JAMSTEC, the Natural History Museum of Los Angeles County, Los Angeles (LACM) and the Natural History Museum, London (NHM). The carapace length (cl) is measured dorsally from the level of the orbital margin to the midpoint of the posterodorsal margin of the carapace. Higher classification generally follows that of Poore & Collins (2009) (see below).

For comparison, the following material was examined.

Eiconaxius farreae: R/V *Rinkai-maru*, Sagami Bay, off Misaki, 35°11.51'N, 139°28.38'E, 491–580 m, 16 March 2001, dredge (stn 2), 1 male (cl 5.1 mm), 1 ovigerous female (cl 4.7 mm), CBM-ZC 10054; Sagami Bay, W of Arasaki, 35°12.186'N, 139°29.619'E, 351–338 m, mud, 22 January 2003, dredge (stn 3), 3 males (cl 4.3–5.9 mm), 1 female (cl 5.3 mm), 1 ovigerous female (cl 6.4 mm), CBM-ZC 10058.

Taxonomic account

Family Axiidae

Eiconaxius Bate, 1888

Remarks. The classification of *Eiconaxius* is subject to disagreement. Sakai & Ohta (2005) established a monotypic family Eiconaxiidae mainly using typical generic characters of *Eiconaxius*. They claimed that the family “is conspicuously different from all other genera of the family Axiidae”, citing the chelate second pereopod, rounded dactyli with accessory spinules on the third to fifth pereopods, indistinct cervical groove and absence of the male first pleopod. Tsang *et al.* (2008) performed a phylogenetic analysis of thalassinidean taxa using partial nuclear 18S, 28S rDNA and mitochondrial 16S rDNA sequences. Their analysis clearly suggests that *Eiconaxius* is subordinated in other genera of Axiidae. Poore & Collins (2009) argued that all but the shape of the dactyli of the third to fifth pereopods are commonly seen in other axiid genera. They concluded by placing Eiconaxiidae in the synonymy of Axiidae. Komai *et al.* (2010) followed Poore & Collins (2009). On the other hand, Sakai (2011) continues to recognize Eiconaxiidae, and proposed further a new family Eiconaxiopsididae for the newly established genus *Eiconaxiopsis* Sakai, 2011 to accommodate a new species *E. heinrichi* Sakai, 2011 (type species) and *Axius* (*Eiconaxius*) *sibogae* de Man, 1925.

The subspatulate, ovate dactyli of the third and fourth pereopods are diagnostic of all known species of *Eiconaxius* and *Eiconaxiopsis sibogae*, and thus this character could be apomorphic (Poore 1994). As pointed out by Poore & Collins (2009), species of *Platyaxius* Sakai, 1994 have similar shaped dactylus on the fifth pereopod, suggesting a possible relationship between the two genera. On the other hand, *Eiconaxiopsis heinrichi* has normal-shaped, claw-like dactyli of the third to fifth pereopods, like as in all other axiid taxa, and this plesiomorphic character clearly excludes *Eiconaxiopsis heinrichi* from *Eiconaxius sensu lato*. Nevertheless, *Eiconaxiopsis sibogae* is separated from other species of *Eiconaxius* only by the possession of a first pleopod in males, and this makes *Eiconaxiopsis* possibly a paraphyletic assemblage. Considering the present morphological comparison and the phylogenetic analysis by Tsang *et al.* (2008), there is no merit in recognizing Eiconaxiidae and Eiconaxiopsididae. Following Poore & Collins (2009), we propose to synonymize Eiconaxiidae and Eiconaxiopsididae under Axiidae.

Eiconaxius acutifrons Bate, 1888

(Figs 1–6)

Eiconaxius acutifrons Bate, 1888: 40, fig. 4, pl. 5, fig. 2d, g, h, i, k, l; Sakai & de Saint Laurent 1989: 16 (in part); Kensley 1996: 475 (list); Sakai, 2011: 270.

Axius (*Eiconaxius*) *acutifrons*: Borradaile 1903: 538 (list).

Iconaxius acutifrons. — Balss 1925: 209 (list; in part).

Not *Axius acutifrons*. — Faxon 1895: 103, pl. 28, fig. 2. = *Eiconaxius albatrossae* Kensley, 1996.

Not *Axius* (*Eiconaxius*) *acutifrons*. — De Man 1925: 37, pl. 3, fig. 5–5e. = *Eiconaxius indonesicus* Sakai, 2011.

Not *Axius acutifrons*. — Wicksten, 1982: 246, fig. 1; 1989: 313 (list). = *Eiconaxius baja* Kensley, 1996.
Not *Eiconaxius acutifrons*. — Hendrickx 1995: 157 (list).

Material examined. Lectotype (designated herein): male (cl 5.0 mm), Banda Sea, Indonesia, H. M. S. Challenger, stn 194A, 04°31.0'S, 129°57.20'E, 658 m, volcanic mud, 29 September 1874, NHM 1888.22.

Paralectotype: 1 ovigerous female (cl 6.9 mm), same data as lectotype.

Non-type: 1 male (cl 4.4 mm), Myojin Knoll, northern Izu Islands, 32°05.952'N, 139°52.050'E, 1074 m, RV *Kairei*, KR10-E02 cruise, ROV *Kaiko 7000II*, dive 486, 17 September 2010, JAMSTEC 083387; 2 males (cl 3.6, 3.9 mm), same data, JAMSTEC 83398, 83713.

Description. Lectotype (male). Rostrum (Fig. 1A, B) narrowly triangular in dorsal view (about 1.9 times longer than basal width), apically narrowly rounded, directed forwards, reaching midlength of second segment of antennular peduncle; lateral margins each with 3 tiny obtuse teeth; apex upturned. Carapace (Fig. 1A, B) with gastric region slightly convex, slightly sloping down to rostrum; cervical groove absent; median carina low, entire, not markedly broadened posteriorly, nor bifurcated; submedian carina absent; lateral carinae diverging posteriorly, reaching to about anterior one-third of carapace length.

Abdomen (Fig. 1C) slightly depressed dorsoventrally. First abdominal somite with pleuron poorly defined ventrally. Second and third pleura produced posteroventrally into sharp tooth; fourth pleuron produced into subacute tooth ventrally, with tiny sharp tooth anteroventrally; fifth pleuron generally rounded, with tiny tooth on ventral margin. Sixth somite subequal to fifth somite, posterodorsal margin weakly denticulate; pleuron bluntly triangular; posterolateral process acuminate. Telson (Fig. 2A) with greatest width at anterior 0.2; lateral margin bearing 6 (left) or 5 (right) tiny teeth, posteriormost tooth located at posterolateral angle; no movable spine at posterolateral angle; posterior margin nearly straight, bearing small median tooth.

Eye (Fig. 1A, B) not reaching midlength of rostrum, subglobose; cornea not faceted. Antennular peduncle (Fig. 1A, B) moderately stout; distal two segments subequal in length to first segment. Antennal peduncle (Fig. 1A, B) moderately stout; distolateral prolongation of second segment acute, slightly overreaching distal margin of third segment of antennular peduncle; third segment with small tooth at ventromesial distal angle; antennal acicle large, acuminate, reaching beyond distal margin of fifth segment of antennal peduncle.

Third maxilliped similar to that of paralectotype.

Major (right) cheliped (Fig. 1D, E) massive. Ischium with 3 tiny to minute spiniform denticles on ventral margin; dorsal margin unarmed. Merus strongly compressed laterally; dorsal margin arcuate, bearing 3 minute denticles in distal half (distalmost denticle terminal in position), otherwise nearly smooth; ventromesial margin sharply carinate, with 2 tiny subterminal denticles followed by 5 minute denticles; laterodistal projection rounded. Carpus cup-shaped, much higher than long, ventral angle with minute denticle. Chela slightly longer than carapace (including rostrum). Palm 1.1 times longer than high; dorsal margin sharply carinate, terminating distally in small acute tooth, further bearing 2 tiny denticles in distal 0.4; lateral surface convex, glabrous, with some scattered low tubercles in distal 0.3; ventrolateral carina sharp, extending nearly to tip of fixed finger, margin upturned; mesial surface also with some scattered low tubercles in anterior 0.3. Fixed finger nearly straight but distally slightly upturned; opposable margin with 1 prominent triangular tooth at midlength and row of several minute denticles in distal half, and with small, shallow hiatus proximally. Dactylus 0.9 times as long as palm, terminating in slightly curved calcareous claw, dorsal margin sharply carinate, unarmed; lateral surface slightly elevated along midline, shallowly sulcate along dorsal carina; opposable margin with 1 large blunt cusp proximally, otherwise unarmed, no prominent notch or excavation distal to cusp.

Minor (left) cheliped (Fig. 1F) subequal in length to major cheliped. Ischium with 2 tiny denticles on dorsal and ventral margins respectively. Merus strongly compressed laterally; dorsal margin generally convex, sharply carinate, bearing 3 minute denticles distal to midlength; ventromesial margin sharply carinate, with 2 minute denticles and 1 small subterminal tooth; laterodistal projection subacute. Carpus cup shaped, much higher than long, ventral angle unarmed. Chela subequal in length to carapace (including rostrum); ventral margin gently sinuous. Palm slightly becoming higher distally, nearly as long as high; dorsal margin sharply carinate, bearing 1 minute denticle subdistally and 1 tiny spiniform tooth distally; lateral surface convex, smooth; ventrolateral carina sharp, extending nearly to tip of fixed finger; mesial surface smooth. Fingers forming deep excavation defined by sharp longitudinal carina on mesial side. Fixed finger almost straight but distally slightly upturned, with row of small, triangular or rounded teeth over entire length; dactylar articulating margin with 2-spined cusp laterally; lateral face flanked by blunt upper ridge along cutting edge and ventrolateral carina concave. Dactylus about 1.5 times as long

as palm, terminating in slightly curved calcareous claw, dorsal margin sharply carinate; lateral surface with blunt longitudinal carina on midline; cutting edge unarmed.

Second to fourth pereopods of similar length, moderately stout. Second pereopod (Fig. 2B) unarmed on ischium to carpus; chela about 1.4 times longer than carpus, with scattered tufts of setae; fixed finger deflexed, with row of minute corneous spinules on cutting edge; dactylus about 0.5 times as long as palm, setose, also with row of minute corneous spinules on cutting edge. Third pereopod (Fig. 2C) unarmed on ischium to carpus; propodus about 1.5 times longer than carpus, with 9 sets of spinules on lateral surface ventrally (each set consisting of a single spinule or paired spinules) and single spinule at ventrodistal margin; dactylus strongly compressed laterally, suboval, terminating in clearly demarcated claw, with about 9 accessory spinules on flexor margin and 2 submarginal spinules proximally. Fourth pereopod (Fig. 2D) similar to third pereopod; propodus with 5 sets of spinules (each set consisting of 2 or 3 transverse row of spinules); dactylus 10 accessory spinules on flexor margin. Fifth pereopods shorter than preceding ones; propodus with grooming apparatus consisting of oblique row of stiff setae and slender spinules on distal part; dactylus with 10 accessory spinules on flexor margin.

First pleopod absent. Second pleopods not preserved. Third to fifth pleopods slender, biramous, each with appendix interna. Uropodal exopod (Fig. 2E) with lateral margin serrated with 15 minute to tiny acute teeth on lateral to posterior margin (posteriormost tooth strongest), mesial margin regularly convex; endopod with lateral margin serrated with 8 tiny acute teeth (posteriormost tooth strongest).

Paralectotype (female). Generally similar to lectotype except for sexual characters. Rostrum (Fig. 3A) relatively broader than in lectotype (about 1.4 times longer than wide); lateral margins only faintly denticulate. Abdomen (Fig. 3C) proportionally broader than in males. Telson with 4 tiny teeth on lateral margin. Third maxilliped (Fig. 3D) moderately slender for genus; basis with 1 tiny spine on ventral margin distally; ischium bearing row of tiny denticles on mesial crest (crista dentate); propodus subequal in length to carpus; dactylus distinctly shorter than propodus; exopod flagellar, reaching midlength of merus; epipod curved, marginally minutely denticulate; podobranch about three-fourths length of epipod, simple. Major cheliped (Fig. 3E) with merus bearing 1 minute denticle distally on dorsal margin, ventral margin serrated with 11 minute denticles; palm with 5 minute denticles on distal half of dorsal margin, lateral surface smooth; cusps on opposable margins of fingers much weaker than those in lectotype. Minor cheliped (Fig. 3F) with ischium bearing 2 small denticles; merus with 3 tiny denticles on ventral margin; fixed finger with less acute and less conspicuous teeth on opposable margin. Uropodal exopod with lateral margin serrated with about 20 minute teeth; endopod with lateral margin serrated with 12 tiny acute teeth.

Myojin Knoll material. Generally similar to lectotype (Figs 4, 5). Rostrum with 3–4 low teeth on lateral margin (these teeth sharply pointed in 2 small specimens) (Fig. 4C, D). Sixth abdominal somite with 4 denticles on posterodorsal margin (Fig. 4G). Telson with 5–7 small teeth on lateral margin (Fig. 4G). Third maxilliped as figured; ischium with crista dentata consisting of row of minute, sharply pointed denticles (Fig. 5B). Major cheliped (Fig. 5C) with ischium bearing 0–1 denticle on dorsal margin and 0–2 denticles on ventral margin; merus with 1 or 2 minute denticles on dorsal margin, ventral margin with 0–2 minute denticles; palm with 3–5 denticles on dorsal margin (in small specimen, these denticles acute, conspicuous). Minor cheliped (Fig. 5D) with merus bearing 2 dorsal and 3 ventral denticles; palm with 1 minute denticle on dorsal margin; fixed finger with row of acute to subacute teeth on opposable margin. Male second pleopod with appendix masculina slightly shorter than appendix interna, bearing several stiff setae (Fig. 4F). Uropodal exopod with lateral margin serrated with 11–14 tiny acute teeth; endopod with lateral margin serrated with 6–8 teeth.

Variation. As is apparent from the above description, the armature of the ventral margin of the merus of the major cheliped is variable, although this variation seems to be size-related. The numbers of denticles are as follows: 11 in the largest, female paralectotype (cl 6.9 mm), seven in the male lectotype (cl 5.0 mm), two in the non-type male from the Myojin Knoll (JAMSTEC 083387; cl 4.4 mm), and one in the male from the Myojin Knoll (JAMSTEC 83398; cl 3.9 mm). The third specimen from the Myojin Knoll (JAMSTEC 83713; cl 3.6 mm) has both chelipeds removed for DNA extraction by the second author, and thus the count of the denticles could not be recorded. The number of serrations on the lateral margin of the uropodal exopod shows similar pattern of size-related variation (six to up to 20).

Furthermore, the palm of the major cheliped is provided with low, tiny tubercles on the lateral and mesial surfaces in the male lectotype, whereas the surfaces of the palm are nearly smooth in the other specimens, including the female paralectotype. The rostrum is relatively broader in the female paralectotype than in the male specimens; and teeth on the opposable margin of the fixed finger of the minor cheliped are more acute in the male specimens than in the female paralectotype. It is still unclear whether these differences are attributable to sexual dimorphism.

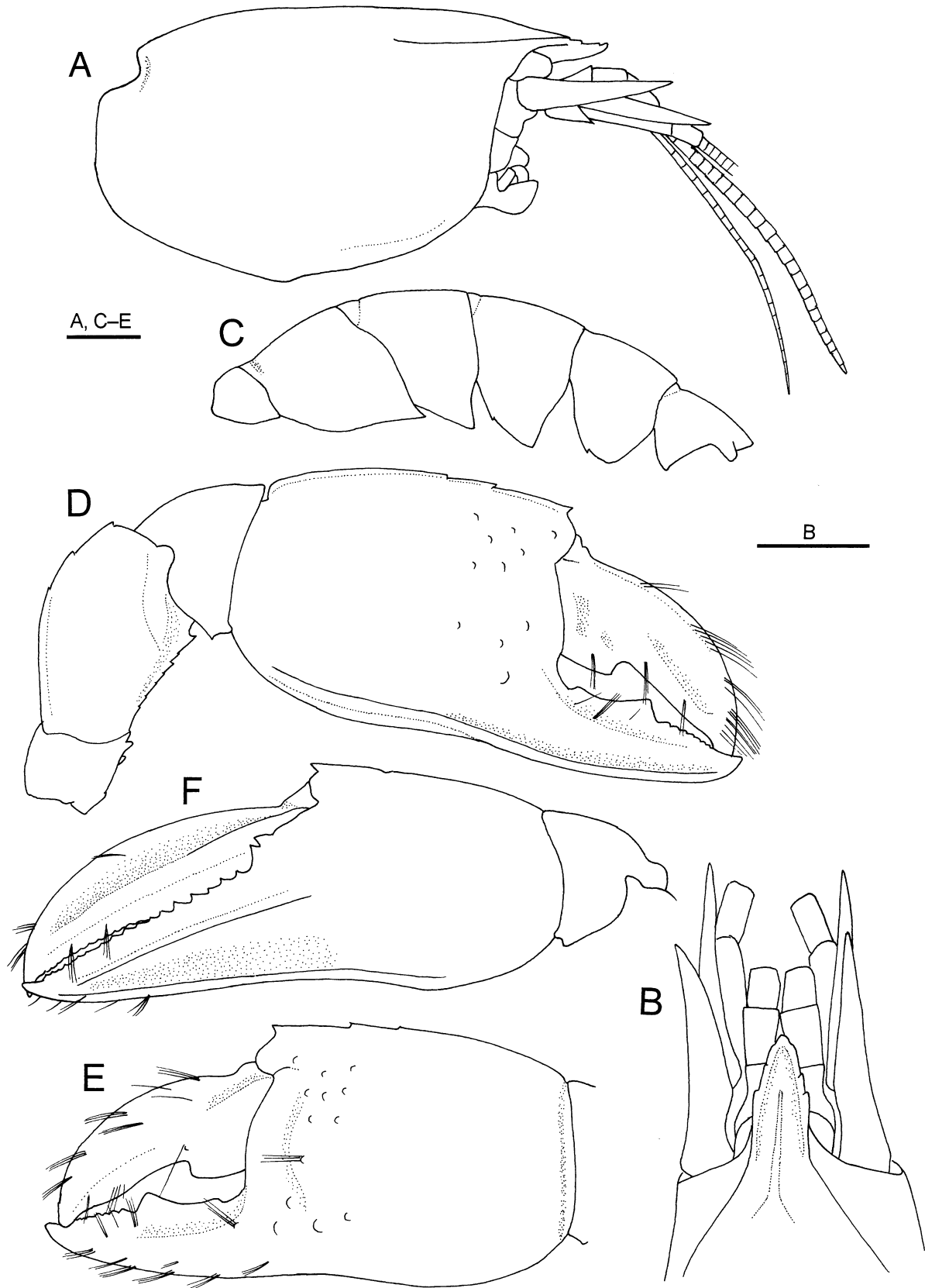


FIGURE 1. *Eiconaxius acutifrons* Bate, 1888, lectotype, male (cl 5.0 mm), NHM 1888:22. A, carapace and cephalic appendages, right side, lateral view; B, anterior part of carapace and cephalic appendages, dorsal view (antennular and antennal flagella omitted); C, abdomen, left side, lateral view; D, right major cheliped, lateral view; E, same, chela, mesial view; F, chela and carpus of left minor cheliped, lateral view. Scale bar: 1 mm.

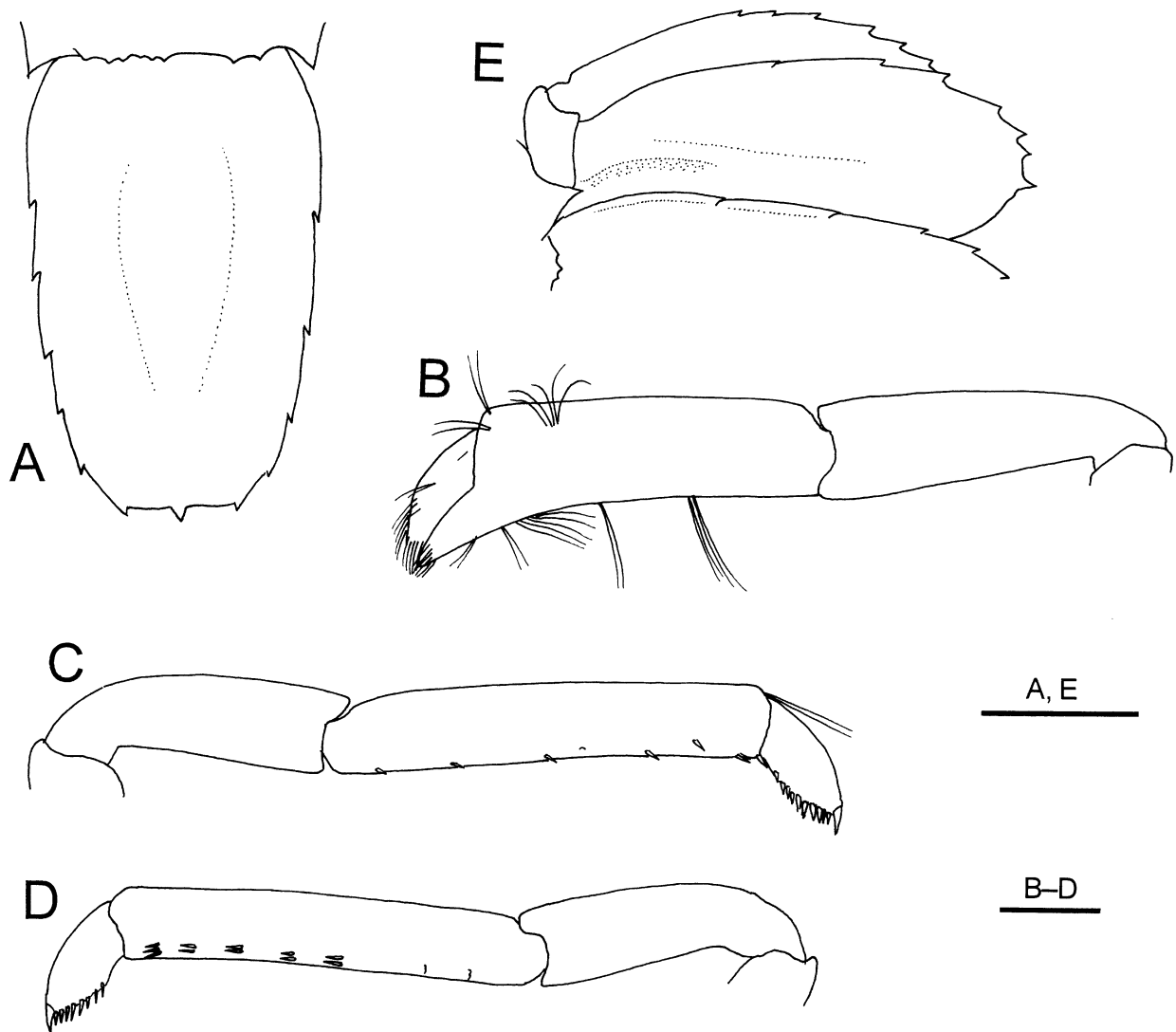


FIGURE 2. *Eiconaxius acutifrons* Bate, 1888, lectotype, male (cl 5.0 mm), NHM 1888:22. A, telson, dorsal view; B, chela and carpus of left second pereopod, lateral view; C, carpus to dactylus of right third pereopod, lateral view; D, carpus to dactylus of left fourth pereopods, lateral view. Scale bars: 1 mm for A, E; 0.5 mm for B–D.

Coloration in life. Body and appendages entirely whitish translucent. Eyestalk orange at base of cornea; cornea opaque.

Distribution and habitat. Banda Sea, Indonesia, 658 m (Bate 1888), and Myojin Knoll, Izu Islands, Japan, 1074 m (this study). The newly collected specimens represent the second record of this species, as well as a new record for Japanese waters.

Ecology. The newly collected specimens were found to be associated with farreid sponge (Hexactinellida) collected at the inside slope of the Myojin Knoll Caldera located about 400 m from hydrothermal vent fields (Fig. 6A). Two colonies of the sponge were collected, of which one and two shrimps (both males) were found inside the internal cavity respectively.

Remarks. Species of *Eiconaxius* Bate, 1888 are known to be associated with deep-water hexactinellid sponges (e.g., Ortmann 1891; Faxon 1893, 1896; Bouvier 1925; de Man 1925; Kensley 1996; Komai 2011). Valid species and their geographical ranges are summarized in Table 1. The genus is widely distributed in the Indo-Pacific, Gulf of Mexico and the Caribbean Sea, but the known range of each species is restricted to a rather narrow area. Species of the genus are morphologically similar (Kensley 1996). Differences between species are generally minor, and assessment of variation is sometimes difficult because of the paucity of material. In fact, most species are still represented only by type material and few by subsequently reported specimens (see Sakai 2011). Kensley (1996) summarized characters of possible diagnostic significance.

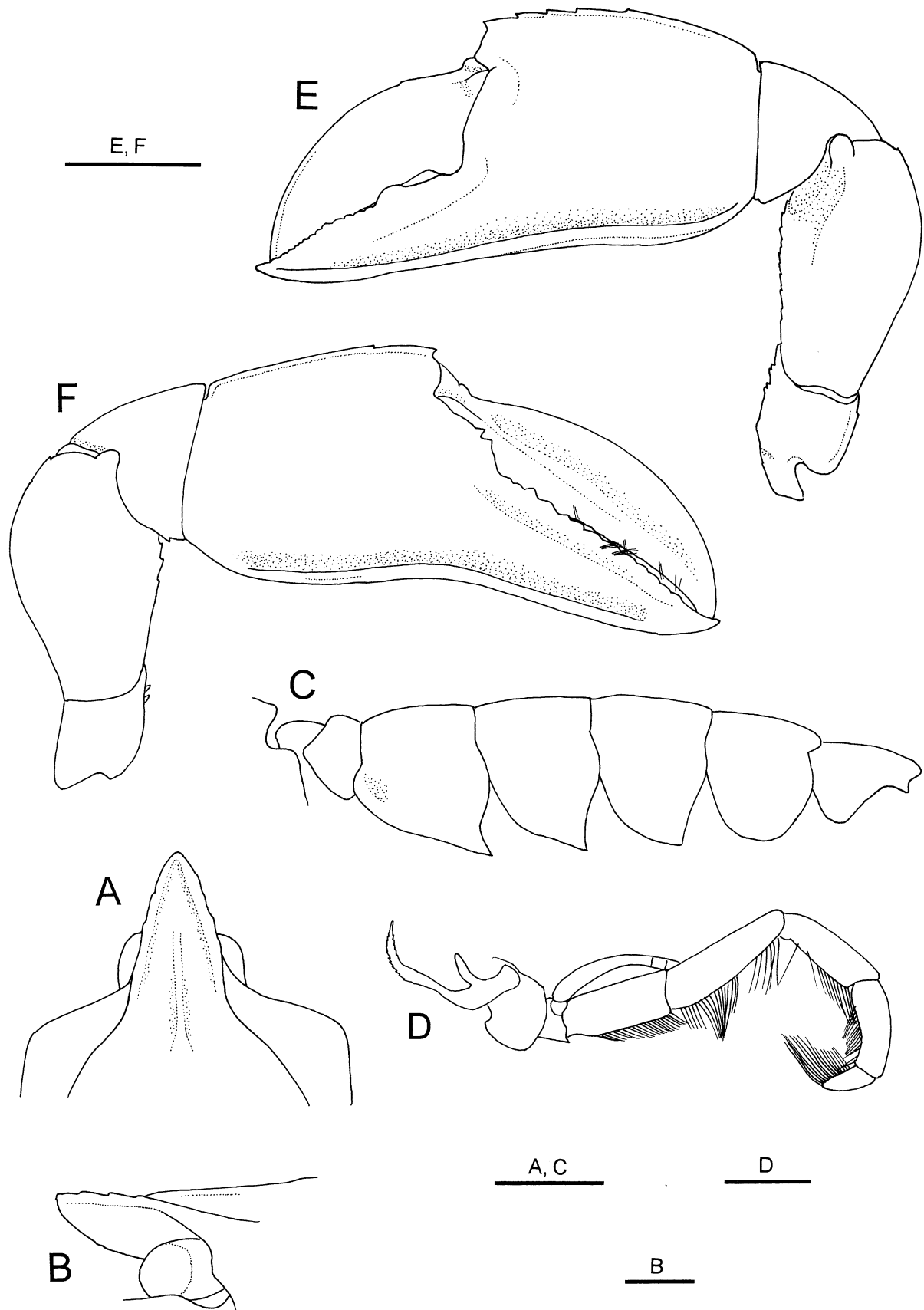


FIGURE 3. *Eiconaxius acutifrons* Bate, 1888, paralectotype, ovigerous female (cl 6.9 mm), NHM 1888:22. A, anterior part of carapace and eyes, dorsal view; B, same, lateral view; C, right third maxilliped, lateral view; E, left major cheliped, lateral view; F, right minor cheliped, lateral view. Scale bars: 2 mm for C, E, F; 1 mm for A, D; 0.5 mm for B.

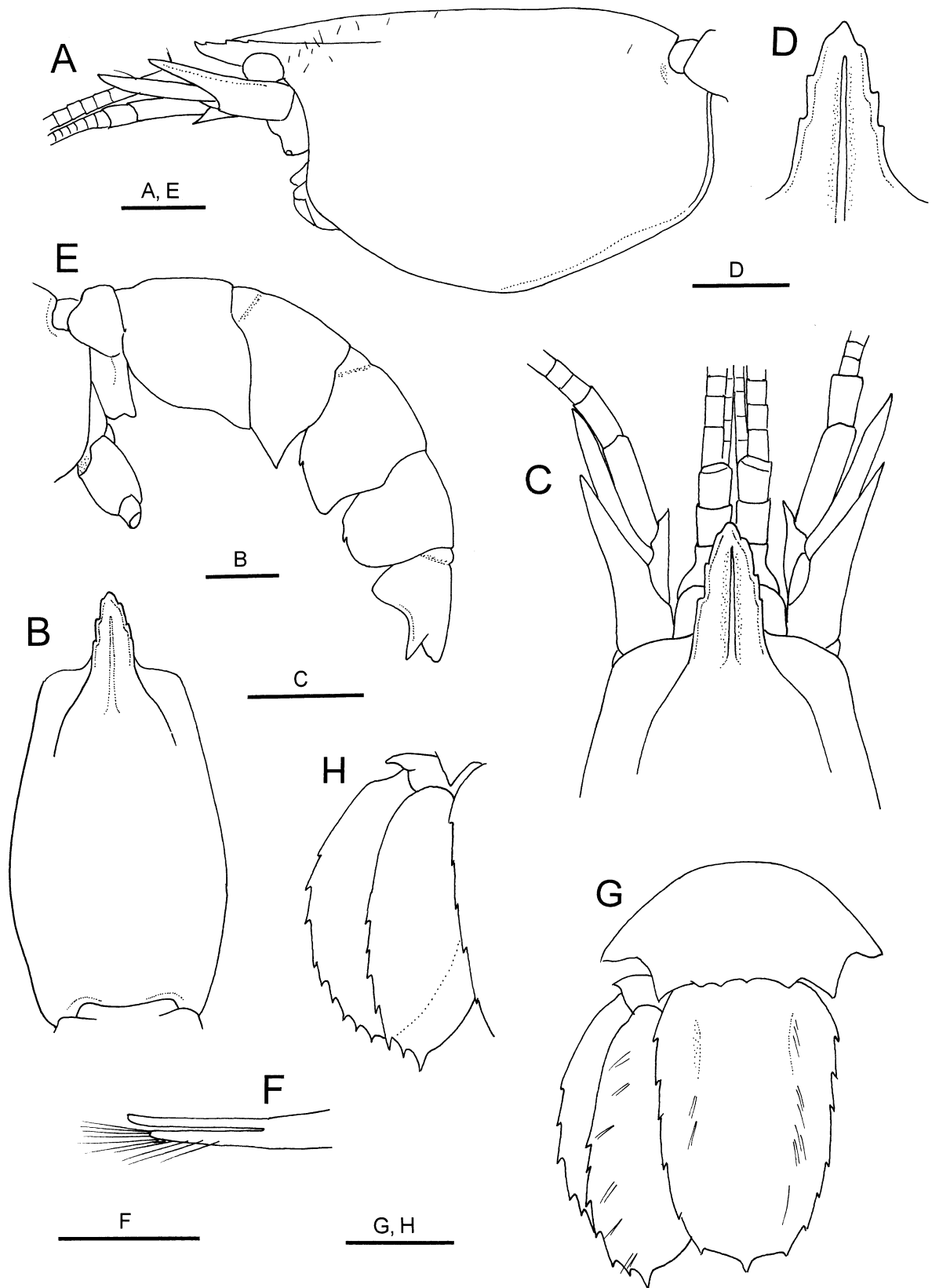


FIGURE 4. *Eiconaxius acutifrons* Bate, 1888, non-type, male (cl 4.5 mm), JAMSTEC 083387. A, carapace and cephalic appendages, lateral view; B, carapace, dorsal view; C, anterior part of carapace and cephalic appendages, dorsal view; D, rostrum, dorsal view; E, abdomen, lateral view; F, appendices interna and masculina of left second pleopod, dorsolateral view; G, sixth abdominal somite, telson and left uropod, dorsal view; H, left uropod, dorsal (perpendicular) view. Scale bars: 1 mm for A–C, E, G, H; 0.5 mm for D, F.

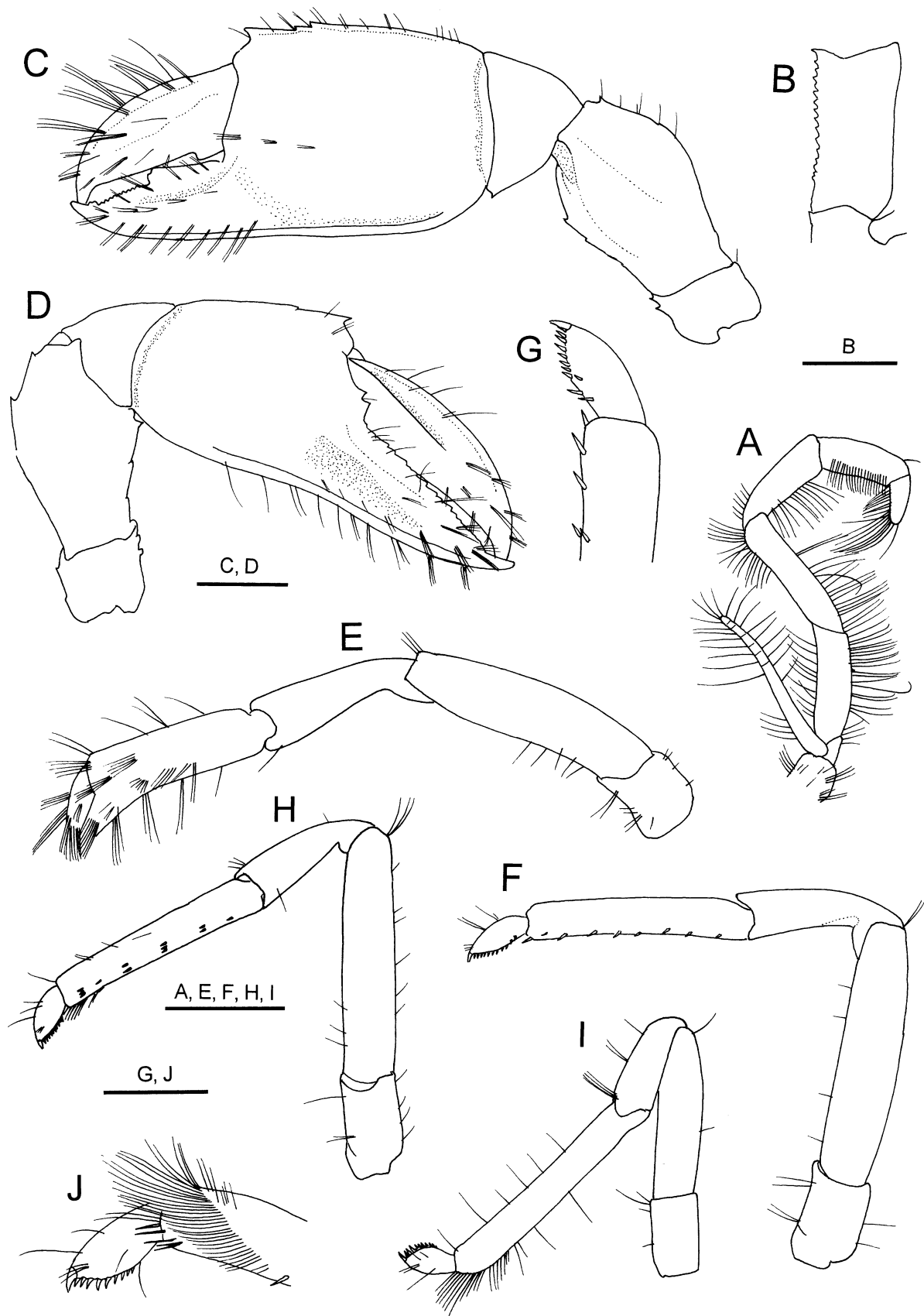


FIGURE 5. *Eiconaxius acutifrons* Bate, 1888, non-type, male (cl 4.5 mm), JAMSTEC 083387. A, right third maxilliped; B, same, ischium, dorsal view; C, left major cheliped, lateral view; D, right minor cheliped; E, left second pereopod, lateral view; F, left third pereopod, lateral view; G, same, distal part of propodus and dactylus; H, left fourth pereopod, lateral view; I, left fifth pereopod, lateral view; J, same, distal part of propodus and dactylus. Scale bars: 1 mm for A, C–F, H, I; 0.5 mm for B, G, J.



FIGURE 6. *Eiconaxius acutifrons* Bate, 1888. A, host sponge (Farreidae gen. sp.) of additional male specimens from Myojin Knoll, Izu Islands, Japan; B, host sponge (Farreidae gen. sp.) and one individual in life; C, male (cl 4.5 mm), JAMSTEC 083387, showing coloration in life.

The newly collected specimens from the Myojin Knoll, Japan, agree well with the type material except for the size-related variation in the number of ventral serrations on the merus of the major cheliped, as noted above.

The reexamination of the type material has revealed that Bate's (1888) illustration is not altogether accurate. In particular, the rostrum of the male specimen (here designated as the lectotype) was figured as more elongate than in reality and with spinose lateral margins. Diagnostic characters of *E. acutifrons*, reassessed here, include: rostrum relatively narrow (1.4–1.9 times longer than wide), lanceolate; lateral margin of rostrum slightly to distinctly dentate; rostral median carina smooth, not bifurcate or hardly broadened posteriorly on gastric region of carapace; second and third abdominal pleura distinctly produced into an acute tooth, fourth pleuron also subacutely pointed ventrally; dactylus of major chela with cusp at midlength and fixed finger with opposing proximal cusp; and palm of major cheliped with minute denticles on dorsal margin, whereas that of minor cheliped unarmed or with one minute denticle. These characters are also shared by *E. consobrinus* and *E. kermadeci* compared below.

Eiconaxius consobrinus can be distinguished from *E. acutifrons* by the different structure of the chelipeds (de Man 1925). In *E. consobrinus*, the opposable margin of the fixed finger of the major cheliped has a deep notch just proximal to the prominent cusp arising at the midlength; the dactylar articulating margin of the palm of the minor cheliped is unarmed; and the dactylus of the minor cheliped is 1.1 times as long as the palm. On the other hand, in *E. acutifrons*, there is no prominent notch just proximal to the middle cusp on the opposable margin of the major cheliped; the dactylar articulating margin of the palm of the minor cheliped bears a bi-spined cusp on the lateral side; and the dactylus of the minor cheliped is about 1.5 times as long as the palm.

Eiconaxius kermadeci can be differentiated from *E. acutifrons* by the more distinctly delimited lateral rostral carinae, and the different configuration of the major chela. In *E. kermadeci*, there is a prominent hiatus between the fingers of the major chela, and the proximal part of the cutting edge of the fixed finger is armed with several strong teeth (Bate 1888). As shown above, in *E. acutifrons*, there is no such a hiatus between fingers of the major chela and no strong proximal teeth on the cutting edge of the fixed finger.

TABLE 1. List of the species of *Eiconaxius* Bate, 1888 and *Eiconaxiopsis* Sakai, 2011

Species	Distribution	Source
<i>Eiconaxius acutifrons</i> Bate, 1888	Indonesia and Japan; 595–1074 m	Bate (1888); this study
<i>Eiconaxius agassizi</i> Bouvier, 1905	West Indies to Gulf of Mexico; 523–1548 m	Bouvier (1905, 1925)
<i>Eiconaxius albatrossae</i> Kensley, 1996	Pacific Panama; 851–1016 m	Faxon (1893; as <i>E. acutifrons</i>); Kensley (1996)
<i>Eiconaxius andamanensis</i> (Alcock, 1901)	Bay of Bengal; 428–522 m	Alcock (1901)
<i>Eiconaxius antillensis</i> Bouvier, 1905	Antilles and Gulf of Mexico; 518–536 m	Bouvier (1905, 1925); Sakai (2011)
<i>Eiconaxius asper</i> Rathbun, 1906	Hawaii; 752–950 m	Rathbun (1906)
<i>Eiconaxius baja</i> Kensley, 1996	Baja California; 1252 m	Kensley (1996)
<i>Eiconaxius bandaensis</i> Sakai, 2011	Banda Sea, Indonesia; 348 m	Sakai (2011)
<i>Eiconaxius borradalei</i> Bouvier, 1905	Caribbean Sea; 172–243 m	Bouvier (1905, 1925)
<i>Eiconaxius caribbaeus</i> Faxon, 1896	Gulf of Mexico to Caribbean Sea; 158–426 m	Faxon (1896); Bouvier (1925); Sakai (2011)
<i>Eiconaxius carinatus</i> (Bouvier, 1925)	Gulf of Mexico to Caribbean Sea, and Brazil; 158–536 m	Bouvier (1925); Bouvier (1925); Sakai (2011)
<i>Eiconaxius consobrinus</i> de Man, 1907	Indonesia; 1224 m	de Man (1907, 1925)
<i>Eiconaxius cristagalli</i> (Faxon, 1893)	Pacific Panama, Galapagos Islahds; 717–1378 m	Faxon (1893, 1895)
<i>Eiconaxius demani</i> Sakai, 1992	Indonesia; 352–560 m	Sakai (1992)
<i>Eiconaxius farrae</i> Ortmann, 1891	Japan; 77–732 m	Ortmann (1891); Sakai (1992); Komai (2011)
<i>Eiconaxius hakuhou</i> Sakai & Ohta, 2005	Sulu Sea, Philippines, 1981–2019 m	Sakai & Ohta (2005)
<i>Eiconaxius indicus</i> de Man, 1907	Philippines, and Indonesia; 688–2019 m	de Man (1907, 1925); Sakai & Ohta (2005)
<i>Eiconaxius indonesicus</i> Sakai, 2011	Indonesia; 595 m	Sakai (2011)
<i>Eiconaxius kensleyi</i> Komai, Lin & Chan, 2010	Taiwan; 439 m	Komai <i>et al.</i> (2010)
<i>Eiconaxius kimbla</i> Kensley, 1996	Moreton Bay, Australia; 140–148 m	Kensley (1996)
<i>Eiconaxius laccadivensis</i> Alcock & Anderson, 1894	Arabian Sea; 1285 m	Alcock & Anderson (1894)
<i>Eiconaxius mallacoota</i> Poore & Collins, 2009	Victoria, Australia; 930–1000 m	Poore & Collins (2009)
<i>Eiconaxius mortenseni</i> Sakai, 1992	Japan; 366–732 m	Sakai (1992); Komai (2011)
<i>Eiconaxius parvus</i> Bate, 1888	Kermadec Islands, New Zealand; 520–950 m	Bate (1888)
<i>Eiconaxius rotundifrons</i> Bouvier, 1905	Gulf of Mexico to Caribbean Sea; 277–2506 m	Bouvier (1905, 1925)
<i>Eiconaxius rubritrostris</i> Komai, Lin & Chan, 2010	Taiwan; 638–824 m	Komai <i>et al.</i> (2010)
<i>Eiconaxius singularis</i> Zarenkov, 1983	Seamount Marcus-Necker, Central Pacific; 100–1350 m	Zarenkov (1983)
<i>Eiconaxius spinigerus</i> (MacGilchrist, 1905)	Bay of Bengal; 1755 m	MacGilchrist (1905)
<i>Eiconaxius weberi</i> de Man, 1907	Indonesia; 200–984 m	de Man (1907, 1925)
<i>Eiconaxiopsis heinrichi</i> Sakai, 2011	Sumatra, Indonesia; 677 m	Sakai (2011)
<i>Eiconaxiopsis sibogae</i> (de Man, 1925)	Sulu Sea, Philippines; 348–522 m	de Man (1925)

Four species of *Eiconaxius* have been recorded the northwestern Pacific: *E. farreae*, *E. kensleyi*, *E. mortenseni*, and *E. rubrirostris* (Ortmann 1891, Sakai 1992, Komai et al. 2010, Komai 2011). Of these, *E. farreae* is similar to *E. acutifrons* in the median carina on the carapace hardly bifurcate posteriorly and the relatively narrow, lanceolate rostrum. Nevertheless, *E. farreae* differs from *E. acutifrons* in the less produced and less acuminate posteroventral angles of the second and third abdominal pleura and the usually unarmed dorsal margin of the palm of the major cheliped. The lateral margins of the rostrum are more strongly upturned in *E. farreae* than in *E. acutifrons*.

Sakai (2011: 271) incorrectly cited the character of the male second pleopod in his diagnosis of *E. acutifrons* as “Male Plp 2 biramous, endopod with appendix interna, but without appendix masculina. [From Bate, 1888, pl. 5, fig. 2q].” According to Bate (1888: captions to the plate 5), the illustrated pleopod was the third pleopod, normally lacking an appendix masculina. In the descriptive text of the pleopods in the account of *E. acutifrons*, Bate (1888: 42) stated that “In the male these branches are smaller and less important, and the inner, instead of carrying one, supports two stylambliides.” This statement clearly indicates that the male second pleopod bore two appendices, i.e., appendices interna and masculina. No second pleopods of the male lectotype are now preserved, but the three additional male specimens all carry appendix masculina on the second pleopod.

Eiconaxius indonesicus was established by Sakai (2011) for specimens previously referred to *E. acutifrons* from Indonesia (De Man 1925), although he did not actually examine the types of *E. acutifrons* or De Man’s (1925) specimens. Sakai (2011) cited the shape of the rostrum and armature of the major chela in differentiating *E. indonesicus* from *E. acutifrons*. Comparison between the present material of *E. acutifrons* and the extensive description of de Man (1925) reveals the following morphological differences: the rostrum is broader in de Man’s (1925) specimens than in the types and additional specimens of *E. acutifrons*; the rostral apex forms a distinct point in de Man’s (1925) specimens, whereas there is no distinct point in the types and additional specimens of *E. acutifrons*; and the concavity distal to the proximal cusp on the opposable margin of the dactylus of the major cheliped is more prominent in de Man’s (1925) specimen than in the type specimens and additional specimens of *E. acutifrons*. On the other hand, no significant difference in the spination of the dorsal margin of the major cheliped is seen between the type specimens of *E. acutifrons* and the specimens of de Man (1925). Because of the above-mentioned differences, we suppose at present that the taxon *E. indonesicus* might be a valid species.

Kensley (1996) described a new species, *E. albatrossae*, on the basis of specimens from Pacific Panama, referred by Faxon (1895) to *E. acutifrons*. The type series consists of the following specimens: a single male from the *Albatross* station 3359 is the holotype; two males and four ovigerous females from the *Albatross* station 3358, and three males and two ovigerous females from *Albatross* station 3359 are paratypes (Kensley 1996: 475). Sakai (2011) proposed a new taxon *E. faxoni* for the same series of specimens, though he did not explicitly fix holotype or syntype(s). Consequently, Sakai’s taxon name is unavailable according to Article 16.4 and 72.3 of the ICZN (1999). *Eiconaxius albatrossae* is also similar to *E. acutifrons*, but the two species can be differentiated by the following characters (Kensley 1996): the rostrum is relatively broader in *E. albatrossae* than in *E. acutifrons*; the median gastric carina is distinctly bifurcated posteriorly in *E. albatrossae*, but not bifurcated in *E. acutifrons*; the pleura of the second to fourth abdominal pleura are more strongly produced in *E. albatrossae* than in *E. acutifrons*; the lateral margin of the telson bears more numerous teeth in *E. albatrossae* than in *E. acutifrons* (11 versus five to seven); and denticles on the dorsal margin of the palm of the major cheliped are more conspicuous in *E. albatrossae* than in *E. acutifrons*.

During this study, we have also reexamined two specimens from California (deposited in the LACM, one male and one female, 32°25’N, 119°60’W to 32°050’N, 119°65’E, 1200 m, 6 September 1978, coll. P. Gregory), identified as *E. acutifrons* by Wicksten (1982), and found that they actually represent *E. baja* Kensley, 1996. *Eiconaxius baja* is immediately recognized by the strongly upturned rostrum and the presence of strong setose tubercles on the lateral surface of the palms of chelipeds (Kensley 1996).

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