

Thalassinidean Shrimps (Crustacea : Decapoda) from the Ogasawara Islands, Japan

Tomoyuki Komai and Hiroyuki Tachikawa

Natural History Museum and Institute, Chiba
955-2 Aoba-cho, Chuo-ku, Chiba, 260-8682 Japan

E-mail: komai@chiba-muse.or.jp

Coastal Branch of Natural History Museum and Institute, Chiba, 123 Yoshio, Katsuura, 299-5242 Japan

E-mail: tachikawa@chiba-muse.or.jp

Abstract Six thalassinidean species (Crustacea: Decapoda) are reported from the oceanic Ogasawara Islands, Japan, one of which is new to science. There are two species of Axiidae: *Axiopsis serratifrons* (A. Milne-Edwards, 1873), *Planaxius brevifrons* gen. et sp. nov.; one species of Callianideidae: *Callianidea typa* H. Milne Edwards, 1837; and three species of Callianassidae, of which two are here assigned to two new genera, *Paratrypaea* gen. nov. and *Rayllianassa* gen. nov., respectively: *Callianassa jocularix* de Man, 1905, *Paratrypaea bouvieri* (Nobili, 1904) comb. nov. and *Rayllianassa amboinensis* (de Man, 1888) comb. nov. *Callianassa jocularix* and *R. amboinensis* are new to the Japanese fauna. *Callianassa rectangularis* Ngoc-Ho, 1991, is removed from the synonymy of *P. bouvieri*, and is also reassigned to *Paratrypaea* gen. nov. Detailed descriptions accompanied by illustrations are given for the new axiid, *P. brevifrons*, and the three callianassids, *C. jocularix*, *P. bouvieri* and *R. amboinensis*, in order to fully document their diagnostic characters. Taxonomic positions of the new taxa are discussed.

Key words: Crustacea, Decapoda, Thalassinidea, new genera, new species, Ogasawara Islands, Japan

The thalassinidean fauna of the Ogasawara Islands, oceanic islands located at about 1000 km south of Tokyo, Japanese mainland, is poorly known. Melin (1939) described a new taxon *Callianidea planocula* Melin, 1939 (Callianideidae), based on a female specimen collected at Port Lloyd (now Futami Bay) on Chichi-jima Island, which is now placed in the synonymy of *Callianidea typa* H. Milne Edwards, 1837 (cf. Sakai, 1992a; Poore, 1997). Later, Ooishi (1970) again recorded *C. planocula* from Futami Bay on Chichi-jima Island, and recently Itani (2007) mentioned the occurrence of *Callianassa bouvieri* Nobili, 1904 (Callianassidae) in these islands.

The material examined in the present study came from two major sources, viz., a collection made by the second author between 1992 and 1996 and a collection made during a research cruise of TRV *Shin'yo-maru* of the Tokyo University of Fisheries (presently Tokyo University of Marine Science and Technology) in 1997, in which the senior author participated. The former collection contains samples from the intertidal to subtidal zones, and the latter contains samples from the sublittoral zone made by dredge. These were supplemented by collections preserved in the Natural History Museum and Institute, Chiba. Six species have

been identified: two of the Axiidae, one of the Callianideidae, and three of the Callianassidae. One axiid is new to science, and two callianassids are new records to the Japanese fauna. Two new genera are proposed for two recorded species heretofore assigned to *Callianassa* Leach, 1814.

Specimens examined in this study are deposited in the Coastal Branch of Natural History Museum and Institute, Chiba, Katsuura (CMNH), the Muséum national d'Histoire naturelle, Paris (MNHN), and the Natural History Museum and Institute, Chiba (CBM). The principal measurement given in the text is carapace length (cl) measured from the tip of the rostrum or rostral lobe to the posterior border of the carapace. Figured specimens and appendages were stained with a solution of methylene blue in order to enhance the visibility of the surface structures during observations. Detailed descriptions based on specimens examined and illustrations are provided for the three callianassid species, as well as the new axiid taxon.

For comparative purposes, the following material was examined.

Callianassa subterranea (Montagu, 1818). MNHN-Th 111, 4 males (cl 4.8–6.1 mm), 3 females (cl 4.9–6.8 mm), Grande Vasière, near Concarneau, France, April 1972,

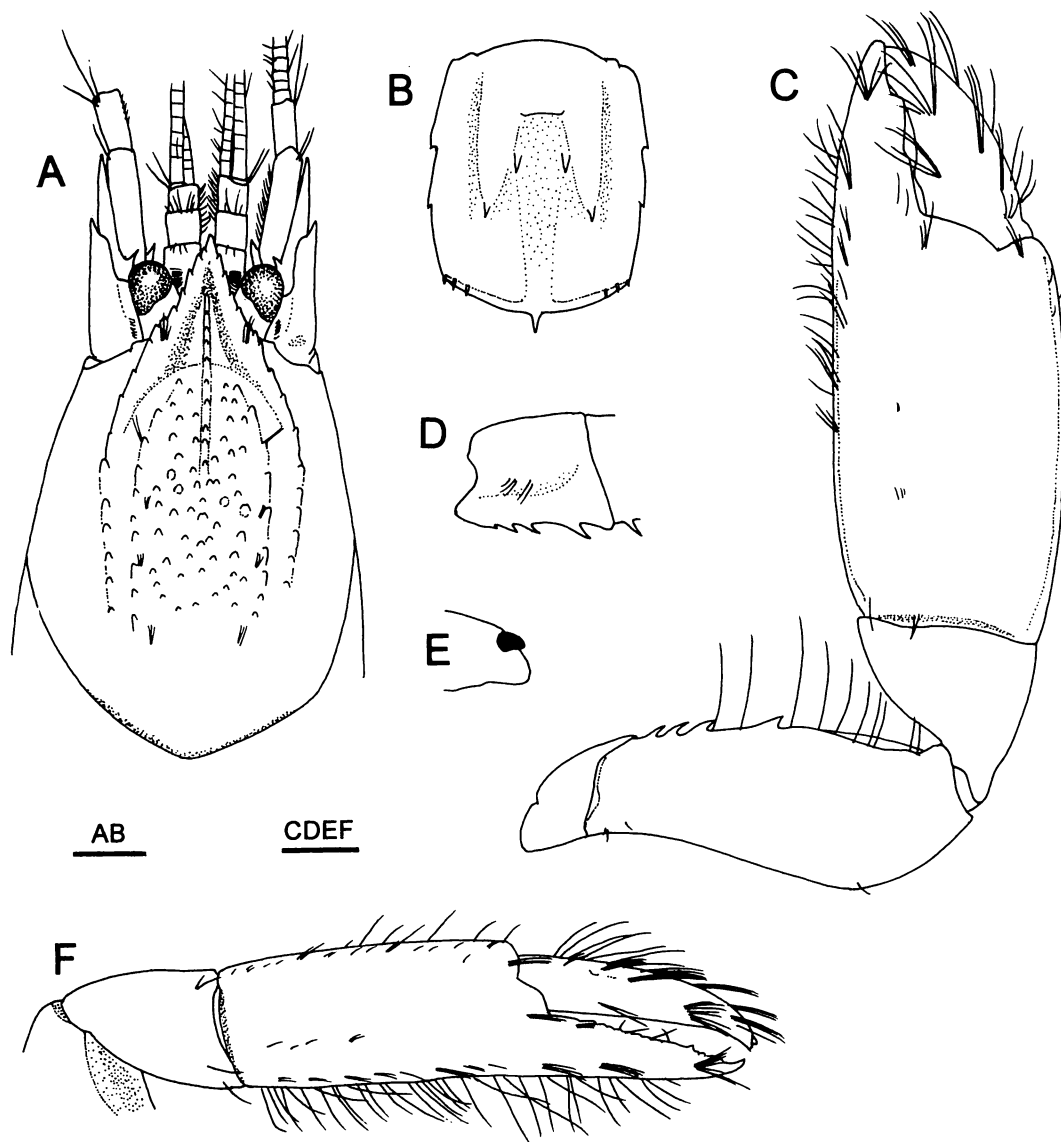


Fig. 1. *Axiopsis serratifrons* (A. Milne-Edwards, 1873). Female (cl 10.8 mm; CMNH-ZC 2232), Washington Beach, Chichi-jima Island, Ogasawara Islands. A, anterior part of carapace and cephalic appendages, dorsal view; B, telson, dorsal view (setae omitted); C, major left cheliped, lateral view; D, same, ischium, ventral view; E, same, distal part of dactylus, mesial view; F, carpus and chela of minor right cheliped, lateral view. Scales: 1 mm for A-D, F; 0.5 mm for E.

coll. Glémarec; MNHN-Th 367, 1 male (cl 8.0 mm), Alboran Sea, Spain, RV *Calypso*, stn 1, 35° 50' N, 03° 19' W, 500 m, 3 September 1958.

Paratrypaea rectangularis (Ngoc-Ho, 1991) comb. nov. MNHN-Th 1069, holotype, male (cl 4.5 mm), Surprise Atoll, 18° 19' S, 163° 04' E, 36 m, coll. B. Richer de Forges.

Pestarella tyrrhena (Petagna, 1792). MNHN-Th 677, 2 males (cl 12.5, 12.5 mm), 2 females (cl 10.0, 12.5 mm), Wimereux, 1905, coll. R. P. Dolfus.

Taxonomic Account

Family Axiidae

Genus *Axiopsis* Borradaile, 1903

Axiopsis serratifrons (A. Milne-Edwards, 1873) (Fig. 1)

Axia serratifrons A. Milne-Edwards, 1873: 11, pl. 2, fig. 6
[type locality: Sandwich Islands (= Hawaii) and Upol].

Axius spinipes de Man, 1888: 464, pl. 19, fig. 6 [type locality: Noordwachter Island, Java Sea].

Axius affinis de Man, 1888: 469, pl. 20, fig. 1 [type locality: Amboina].

Axiopsis (Axiopsis) serratifrons - de Man, 1925: 68 (key), 72, pl. 6, figs. 12-12i

Axiopsis serratifrons - Kensley, 1981: 1253, figs. 1-5; Sakai and de Saint Laurent, 1989: 76, fig. 4; Nomura *et al.*, 1996: 13; Kensley, 2003: 366, pls. 2, 8; Ngoc-Ho, 2005: 53, fig. 3.

Material examined. Chichi-jima Island: CMNH-ZC 2231, 1 male (cl 10.8 mm), Miyano-hama, 1 m, 24 April 1994, coll. H. Tachikawa; CMNH-ZC 2232, 1 female (cl 13.2 mm), Washington Beach, 30 November 2001, coll. H. Tachikawa.

Comparative material. Syntype: MNHN-Th 147, male (cl 10.0 mm), Hawaii. Other material: CBM-ZC 3176, 3 males (cl 9.1-12.9 mm), 1 female (cl 12.4 mm), Kume-jima Island, Ryukyu Islands, intertidal, coral reef, 13-15 June 1995, coll. T. Komai.

Coloration in life. The coloration in life is different between the male and female specimens. Male specimen: Body generally chocolate brown. Carapace with large white blotch posterolaterally. Pleon with white spots at articulations between somites laterally; anterior part of first pleuron and posterior parts of second to fourth somites also white. Cornea black. Antennular and antennal flagella banded with brown and white. Chelipeds and second pereopods generally dark brown, fingers white. Third and fourth pereopods generally brown, dactyli whitish. Fifth pereopod entirely whitish.

Female specimen: Body generally pinkish brown. White patches at articulations between somites on lateral surface of pleon. Cornea black. Antennular and antennal flagella whitish. Chelipeds darker pinkish brown, fingers of chelipeds white.

Distribution. Currently considered Pantropical: Pacific coast of Mexico, Hawaii, Palmyra Island, Fanning Island, Gilbert Islands, Caroline Islands, Bikini Atoll, Samoa, Palau, Noordwachter Island, Indonesia, Papua New Guinea, New Caledonia, Ryukyu Islands, Maldives, Aldabra Atoll, Chagos Archipelago, Red Sea, Madagascar, Mombasa, South Africa, Belize, Colombia, Florida, Bermuda, and Ascension Island; intertidal to subtidal (Kensley, 1981; Sakai and de Saint Laurent, 1989; Nomura *et al.*, 1996; Hendrickx, 2002). However, a thorough study is needed to determine if the geographically separated populations really belong to a single species.

Remarks. The situation surrounding the name-

bearing type of this species is rather complicated. A. Milne-Edwards (1873) mentioned specimens from Hawaii (as Sandwich Islands) and Upolu, obtained from the Museum Godeffroy, clearly indicating that there were more than one specimen, although he did not select holotype. De Man (1925) actually examined "cotype" from Upolu, originally coming from the Museum Godeffroy and then deposited in the Museum at Hamburg. Subsequent authors, however, have specifically cited the type locality of *Axiopsis serratifrons* as Hawaii (e.g., Kensley, 1981; Sakai and de Saint Laurent, 1989; Ngoc-Ho, 2005), although no lectotype designation was made. The type from Hawaii in the collection of MNHN, examined during this study, is therefore syntype.

Axiopsis serratifrons is known as a highly variable and widely distributed species (Kensley, 1981; Ngoc-Ho, 2005). The present two specimens from the Ogasawara Islands were compared with the syntype (MNHN-Th 147) and specimens from Kume-jima Island, Ryukyu Islands, studied by Nomura *et al.* (1996) (CBM-ZC 3176). The specimens from the Ogasawara Islands agree well with the syntype of *A. serratifrons* in most diagnostic aspects, including the triangular rostrum (Fig. 1A), the presence of numerous scattered tubercles on the median part of the gastric region of the carapace (Fig. 1A), the subquadrate telson (Fig. 1B), the shape and armament of the chelipeds (Fig. 1C, D, F). Ngoc-Ho (2005) noted that the palm of the major cheliped of the syntype are non-carinate on both dorsal and ventral margins in the syntype, but we have found that the dorsal margin is actually carinate over the entire length and the ventral margin is carinate at the base of the fixed finger in the syntype. The chelipeds of the present male specimen are subequal, but this might be due to loss and regeneration of a major cheliped. The two Ogasawara specimens are different from one another in that the scattered tubercles on the gastric region of the carapace are fewer in the male specimen than in the female specimen, and that the dorsal margin of the merus of either cheliped is armed with a subdistal spine in the male specimen but unarmed in the female specimen. The coloration in life is also different between the two specimens as described above. The specimens from Kume-jima Island differ from the holotype and the present Ogasawara specimens in having squamiform tubercles on the lateral and mesial surfaces of the palm of the major cheliped.

Kensley (2003) described a new species, *Axiopsis pica*, from Guam, Mariana Islands, which is morphologically very similar to *A. serratifrons*. Subsequently,

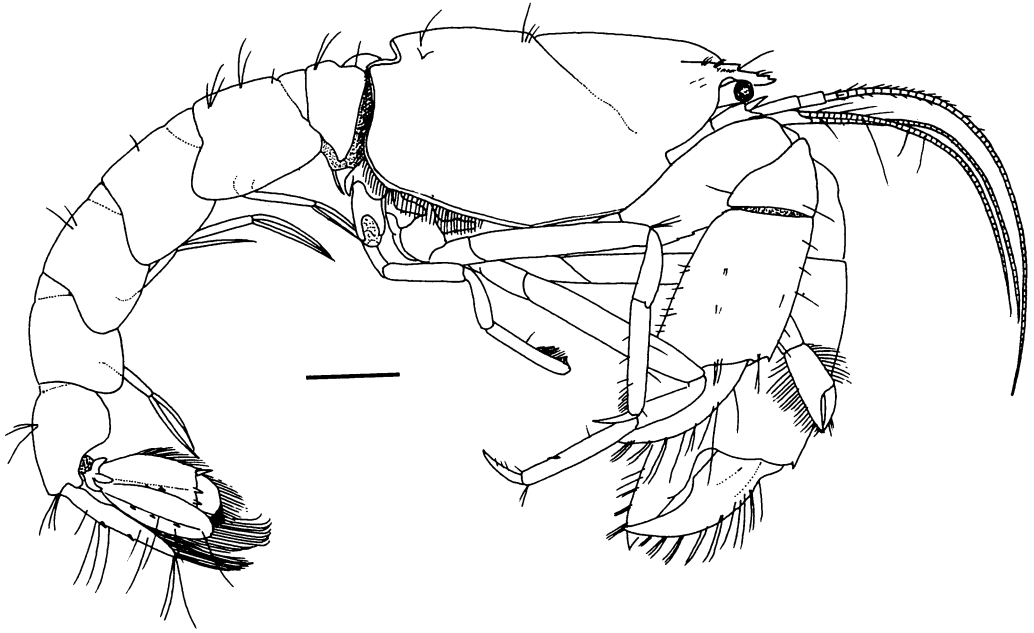


Fig. 2. *Planaxius brevifrons* gen. et sp. nov. Paratype, female (cl 4.3 mm; CBM-ZC 9415), off Chichi-jima Island, Ogasawara Islands. Entire animal in lateral view. Scale: 1 mm.

Ngoc-Ho (2005) reported *A. pica* from Tuamotu Archipelago, French Polynesia. Both Kensley (2003) and Ngoc-Ho (2005) cited morphological differences in discriminating the two taxa, but the variations observed in the specimens studied here seem to discount the diagnostic significance of every character. It is likely that *A. serratifrons* is a complex of more than one species.

There is a subterminal corneous spine on the dorsal surface of each dactylus of the chelipeds in *A. serratifrons* (Fig. 1E), like in *A. tsushimaensis* Sakai, 1992 and *A. consobrina* (de Man, 1905) (Komai *et al.*, 2002; Ngoc-Ho, 2005). In other species of *Axiopsis*, the presence of such a corneous spine on the dactylus of the minor chelipeds needs to be verified. It is interesting to mention that in species of *Calocarides* Wollebaek, 1908, a genus closely allied to *Axiopsis*, such a corneous spine is absent from dactyli of the chelipeds.

Planaxius gen. nov.

Type species. *Planaxius brevifrons* sp. nov. Present designation, by monotypy. Gender: masculine.

Diagnosis. Axiidae (cf. Poore, 1994). Gonochoristic. Carapace (Fig. 3A, B) strongly compressed laterally (Fig. 3A, B), with conspicuous supraocular spine (Fig. 3D); postcervical median carina absent; rostrum distinctly lower than anterior carapace; rostral margins with pairs of small teeth; anterior carapace elevated

medially, without distinct carina; submedian carinae absent; lateral carina continuous with rostral margin, unarmed. First pleonal pleuron subacute (Fig. 2); second to fifth pleura rounded (Fig. 2). Cornea (Fig. 3C, D) rounded, darkly pigmented, functional; ocular peduncle excluding cornea shorter than cornea. Antennal acicle (Fig. 3D) well developed, prominent, simple. First pereopods (Figs. 2, 4A, C) slightly unequal in length, generally similar in structure, but different in stoutness; dorsal margin of each dactylus and palm devoid of conspicuous spines or teeth. Gill formula summarized in Table 1. Small, lamellate pleurobranchs present on fifth to seventh thoracic somites; 1 arthrobranch on second maxilliped, and 2 arthrobranchs on each third maxilliped to fourth pereopods; epipods present on third maxilliped to

Table 1. Gill formula of *Planaxius brevifrons* gen. et sp. nov.

	Thoracic somites							
	1	2	3	4	5	6	7	8
	Maxillipeds				Pereopods			
	1	2	3	1	2	3	4	5
Pleurobranchs	0	0	0	0	1	1	1	0
Arthrobranchs	0	1	2	2	2	2	2	2
Podobranchs	0	0	r	r	r	r	r	0
Epipods	1	1	1	1	1	1	1	0
Exopods	1	1	1	0	0	0	0	0

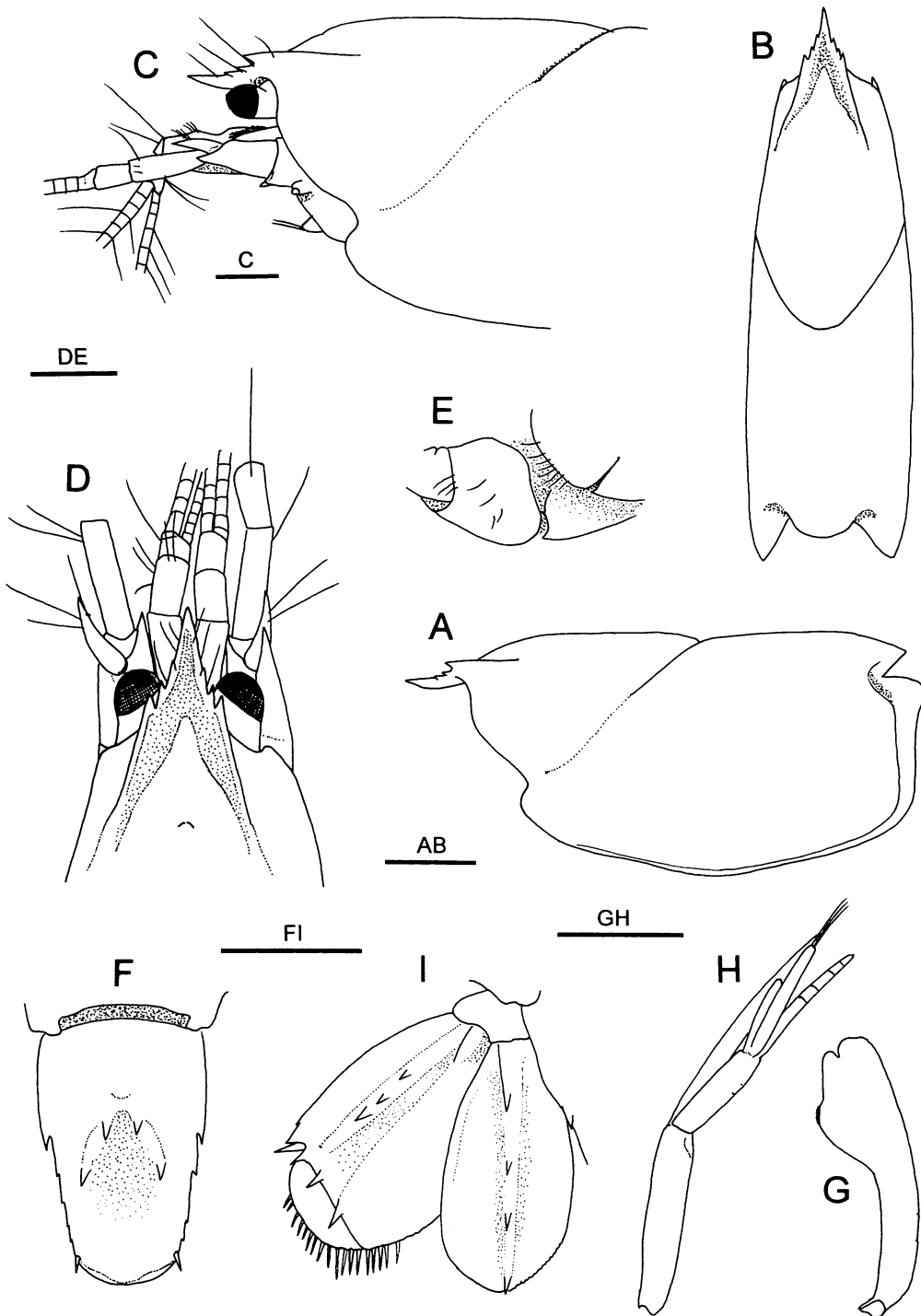


Fig. 3. *Planaxius brevifrons* gen. et sp. nov. A-F, I, holotype, female (cl 5.5 mm; CBM-ZC 9412), off Kirime, Minabe, Kii Peninsula; G, H, paratype, male (cl 4.8 mm; CBM-ZC 9415), off Chichi-jima Island, Ogasawara Islands. A, carapace, lateral view; B, same, dorsal view; C, anterior part of carapace and cephalic appendages, lateral view; D, same, dorsal view; E, right acuminate flange of seventh thoracic sternite and coxa of third pereopod, ventromesial view; F, telson, dorsal view (setae omitted); G, left first pleopod, mesial view; H, left second pleopod, mesial view; I, left uropod, perpendicular dorsal view, setae omitted. Scales: 1 mm for A, B, F, I; 0.5 mm for C-E, G, H.

fourth pereopods; podobranchs on third maxilliped to third pereopods (Fig. 5K-M) slender, non-lamellate, that on fourth pereopod rudimentary bud. First pleopod of male (Fig. 3G) modified as gonopod, strongly compressed laterally, unsegmented, distal part noticeably expanded, spatulate. Second pleopod of male slightly modified (Fig. 3H), with appendices interna and masculina articulated at about midlength of endopod, latter distinctly longer than former, but ornamentation rather simple.

Remarks. According to the key by Poore (1994), the type species of the new genus keys out to *Bouvieraxius* Sakai and de Saint Laurent, 1989 because of the following characters: rostrum with two lateral spines; supraocular spines on carapace well differentiated; cornea rounded, darkly pigmented; antennal scaphocerite simple, acuminate; pereopodal epipods present; male first pleopod present, showing modification; appendices internae present on second to fifth pleopods. However, the new species differs from *Bouvieraxius* in several major respects, warranting a full generic status. The anterior part of the carapace is provided with only lateral carinae continuing from the rostral margin in *Planaxius*, but in *Bouvieraxius* there are five longitudinal carinae (median, two submedian and two lateral) on the anterior part of the carapace. The appendix masculina of the male second pleopod is longer than the appendix interna in both *Planaxius* and *Bouvieraxius*, but in the new genus it is not strongly modified. In *Bouvieraxius*, the appendix masculina is usually greatly elongate and flattened, armed with scattered spiniform setae on the surfaces (cf. Sakai and de Saint Laurent, 1989; Sakai, 1992b). Furthermore, the strongly compressed cephalothorax distinguishes the new genus from *Bouvieraxius*. *Levantocaris* Galil and Clark, 1993, a monotypic genus containing only the type species *L. hornungae* Galil and Clark, 1993, is also similar to the new genus, particularly in the lack of submedian carinae on the anterior part of the carapace (Galil and Clark, 1993; Ngoc-Ho, 2003). Nevertheless, the new genus can be differentiated from *Levantocaris* by the lack of a median carina on the anterior carapace, the presence of supraocular spines on the carapace, the normally developed, darkly pigmented cornea, the spinose propodi and dactyli of the third and fourth pereopods, and the elongate appendix masculina reaching the tips of the rami of the second pleopod. In *Levantocaris*, the carapace has a median carina but lacks supraocular spines; the cornea is somewhat flattened and non-pigmented; the propodi and dactyli of the third and fourth pereopods are unarmed; and the appendix masculina is normally short,

falling far short of the tips of the rami.

Since Poore (1994), four new genera have been described in the Axiidae, i.e., *Platyaxius* Sakai, 1994, *Marianaxius* Kensley, 1996, *Manaxius* Kensley, 2003, and *Litoraxius* Komai and Tachikawa, 2007 (Kensley, 1996; 2003; Sakai, 1994; Komai and Tachikawa, 2007). Among these, *Manaxius* was reduced to a synonym of *Calaxius* Sakai and de Saint Laurent, 1989 (Clark *et al.*, 2007). *Platyaxius* can be immediately distinguished from *Planaxius* gen. nov. by the presence of five carinae on the anterior carapace and the lack of supraocular spines and the absence of first pleopod in male (Sakai, 1994). *Marianaxius*, represented only by the type species *M. kroppi* Kensley, 1996, shows some superficial resemblance to *Planaxius* in the lack of submedian carinae on the anterior part of the carapace, but the lack of the appendices internae on the second to fifth pleopods immediately distinguishes *Marianaxius* from *Planaxius* (Kensley, 1996). Furthermore, in *Marianaxius*, the male first pleopod does not show any modification as a gonopod. *Litoraxius*, also monotypic with *L. boshu* Komai and Tachikawa, 2007, shares the modified first pleopod in the male, otherwise differs by many characters. *Planaxius* differs from *Litoraxius* primarily in the presence of pleurobranchs on the thoracic somites. Furthermore, in *Litoraxius*, the anterior part of the carapace is provided with five carinae; the chelipeds (first pereopods) are markedly dissimilar. In *Planaxius*, the chelipeds are subequal and similar from the right to left.

Etymology. The generic name is derived from a combination of the Latin words, *planus* (= flat) and the generic name *Axius*, in reference to the strongly compressed body of the new species.

***Planaxius brevifrons* sp. nov.**

(Figs. 2-6)

Material examined. Holotype. CBM-ZC 9412, female (cl 5.5 mm), off Kirime, Minabe, Kii Peninsula, 80-100 m, rock entangled by gill net, February 1998, coll. T. Komai.

Paratypes. Kii Peninsula: CBM-ZC 9413, 1 male (cl 4.4 mm), same data as holotype; CBM-ZC 9414, 1 female (cl 6.1 mm), similar locality, 70-80 m, rock entangled by gill net, 5 March 1996, coll. M. Marumura. Ogasawara Islands, Chichi-jima Island: CBM-ZC 9415, 1 male (cl 4.8 mm), 1 female (cl 4.3 mm), TRV *Shin'yo-maru*, 1997 research cruise to Ogasawara Islands, stn 9, 27°06.51' N, 142°10.85' E, 65-63 m, coral sand and rocks, dredge, 16 October 1997, coll. T. Komai; CBM-ZC 9416, 1 male (cl 4.0 mm), same cruise, stn 11, 27°06.47' N, 142°10.51' E, 53-47 m, coral sand and rocks,

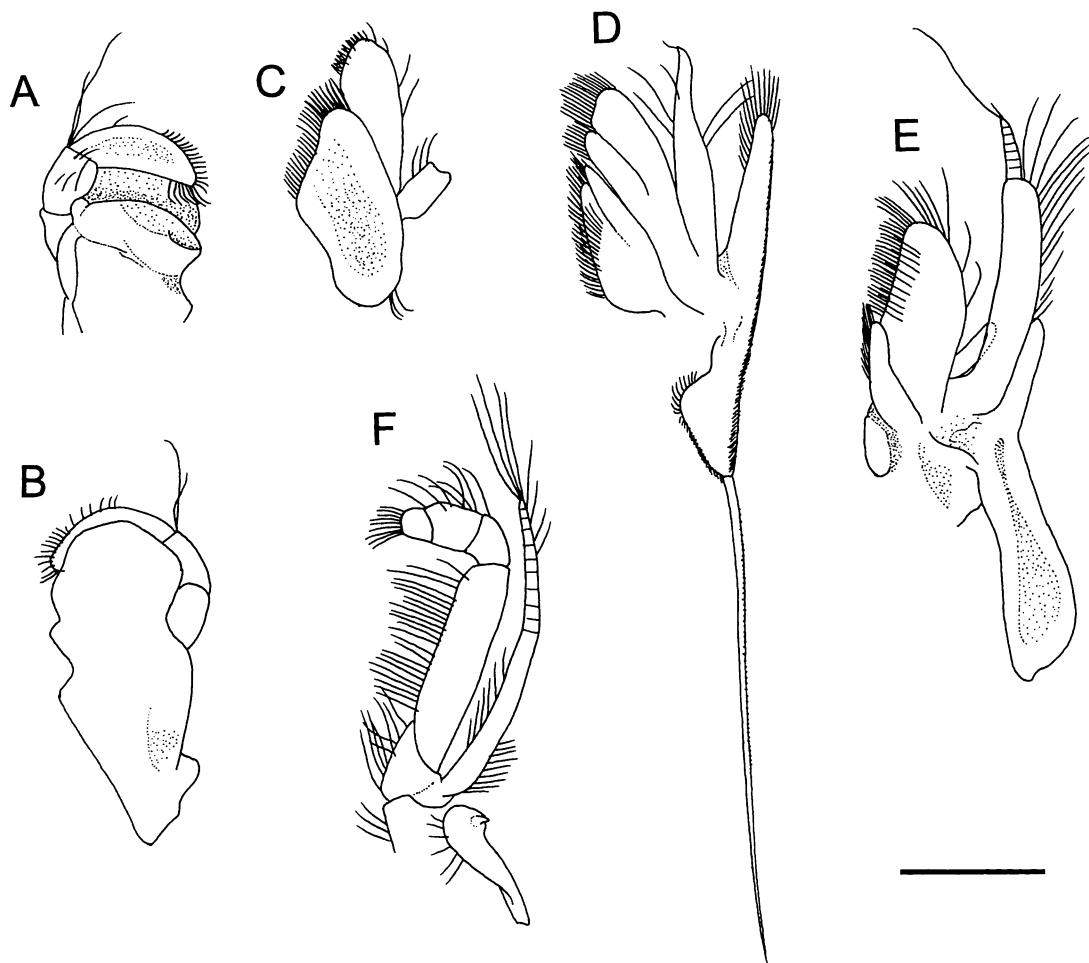


Fig. 4. *Planaxius brevifrons* gen. et sp. nov., holotype, female (cl 5.5 mm; CBM-ZC 9412), off Kirime, Minabe, Kii Peninsula. Left mouthparts. A, mandible, inner view; B, same, outer view; C, maxillule, outer view (endopod broken off); D, maxilla, outer view; E, first maxilliped, outer view; F, second maxilliped, outer view. Scale: 0.5 mm.

dredge, 16 October 1997, coll. T. Komai.

Description. Body (Fig. 2) moderately stout in lateral view, but cephalothorax strongly compressed laterally (Fig. 3A, B). Integument moderately firm.

Rostrum (Fig. 3A-D) short, about 0.15 times as long as carapace, lower than level of gastric region of carapace, directed forward, triangular in dorsal view, sharply pointed apically; dorsal surface shallowly concave; lateral margins weakly upturned, with 3 pairs of small spines, posteriormost pair supraocular; ventral surface rounded. Carapace (Fig. 3A, B) generally smooth on surface; gastric region convex, with only lateral carinae continuing to rostral lateral margins; no spine or tubercles on lateral carinae; gastric region with trace of median tubercle; anterolateral margin slightly convex, anterolateral sinuous moderately deep

; cervical groove distinct, at least dorsally, unarmed; posterodorsal part rounded; cardiac notch conspicuous; submarginal carinae narrow, smooth.

Seventh thoracic sternite deeply depressed on midline, thoracic shield produced to form acuminate flange to either side (Fig. 3E); no conspicuous carina set between articulations of fourth pereopods.

Pleon (Fig. 2) with 1 or 2 pairs of setal tufts of varying lengths on each somite. First pleuron narrowed, subacute ventrally; second to fifth pleura rounded. Sixth pleonal somite weakly flared laterally, broader than long, with rounded anteroventral margin and blunt projection at posterolateral margin. Telson (Fig. 3F) longer than wide, lateral margin with 1 distinct tooth at about midlength followed by row of 3 or 4 tiny denticles; posterior margin weakly convex, with 1

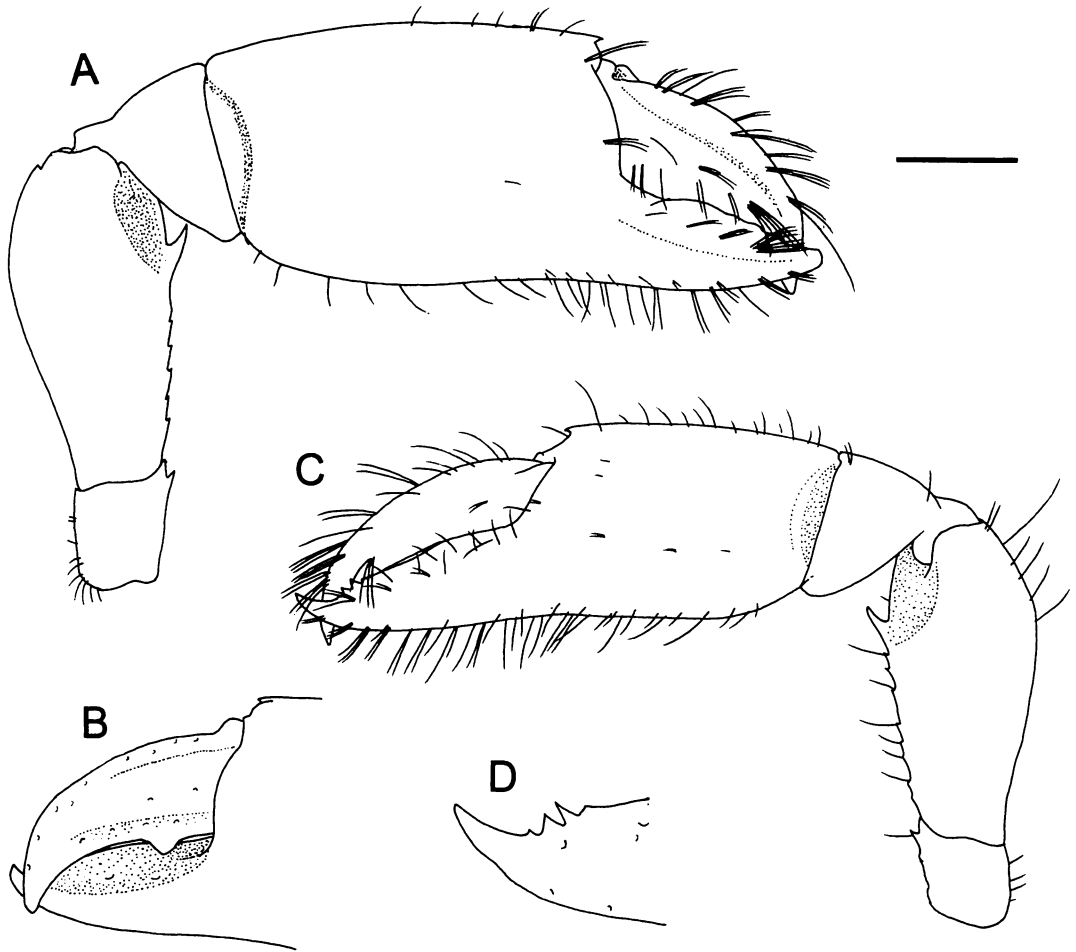


Fig. 5. *Planaxius brevifrons* gen. et sp. nov., holotype, female (cl 5.5 mm; CBM-ZC 9412), off Kirime, Minabe, Kii Peninsula. A, major right cheliped, lateral view; B, same, fixed finger and dactylus, mesial view; C, minor left cheliped, lateral view; D, same, distal part of fixed finger, lateral view. Scales: 1 mm for A-C; 0.5 mm for D.

movable spine at each posterolateral angle, medially unarmed; dorsal surface bearing 2 pairs of sharp teeth.

Eyestalk (Figs. 3C, D) short, subcylindrical, directed anterolaterally, slightly overreaching midlength of rostrum. Cornea terminal, globose, not dilated.

Antennular peduncle (Fig. 3C, D) overreaching rostrum by nearly full length of distal two segments; flagella approximately as long as carapace (Fig. 2), dorsal flagellum with sparse long setae.

Antennal peduncle (Fig. 3C, D) overreaching antennular peduncle by length of fifth segment. First segment bearing weakly produced nephridiopore proximoventrally. Second segment stout, with conspicuous dorsolateral distal spine reaching midlength of scaphocerite. Third segment with small spine at

ventrodistal mesial angle. Fourth and fifth segments moderately stout, cylindrical, fifth segment about 0.6 times as long as fourth segment. Antennal acicle relatively large, acuminate, slightly curved mesially, reaching nearly to midlength of fourth segment of peduncle. Antennal flagellum (Fig. 2) longer than carapace, with sparse short setae.

Mouthparts as illustrated (Fig. 4). Mandible (Fig. 4A, B) strongly calcified, outer surface convex; molar process thickened; palp consisting of 3 articles. Maxillule (Fig. 4C) generally elongate; coxal endite with cluster of stout setae at rounded distomesial margin; basal endite with double row of corneous spines on truncate mesial margin; endopod broken off. Maxilla (Fig. 4D) with coxal endite divided in 2 greatly unequal lobes, both lobes tapering distally; basal

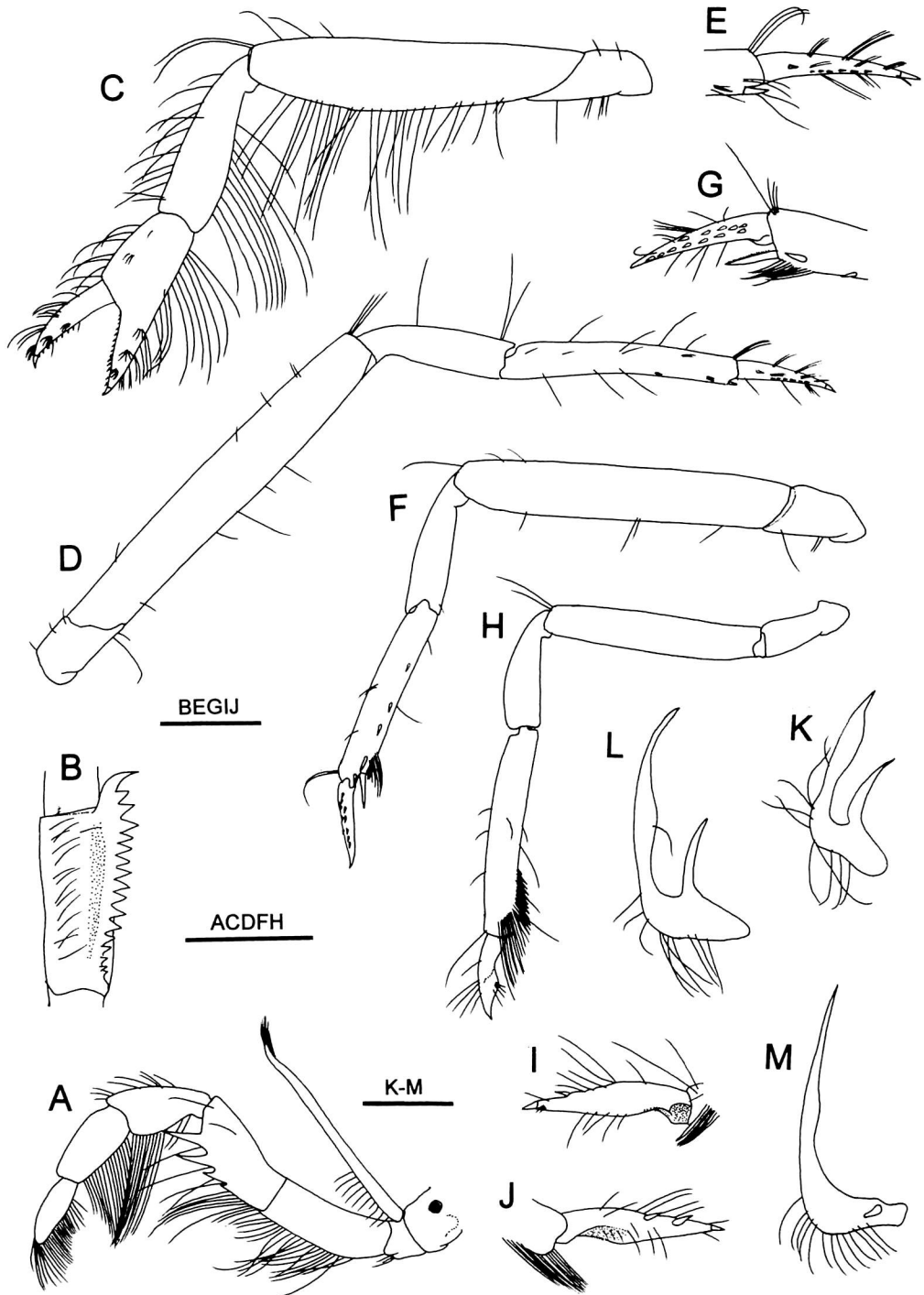


Fig. 6. *Planaxius brevifrons* gen. et sp. nov. A-J, holotype, female (cl 5.5 mm; CBM-ZC 9412), off Kirime, Minabe, Kii Peninsula; K-M, paratype, female (cl 6.1 mm; CBM-ZC 9414), same locality. A, left third maxilliped, lateral view; B, same, ischium, dorsal view (setae partially omitted); C, left second pereopod, lateral view; D, right third pereopod, lateral view; E, same, dactylus, lateral view; F, left fourth pereopod, lateral view; G, same, dactylus, lateral view; H, left fifth pereopod, lateral view; I, same, dactylus, obliquely lateral view; J, same, mesial view; K-M, epipod of third maxilliped, third pereopod and fourth pereopod, respectively. Scales: 1 mm for A, C, D, F, H; 0.5 mm for B, E, G, I, J, K-M.

endite also 2-lobed, distal lobe broader than proximal lobe; endopod large, rather abruptly tapering distally in distal half; scaphognathite moderately narrow, posterior lobe with elongate stout seta arising at posterior end. First maxilliped (Fig. 4E) with coxal endite divided in 2 greatly unequal lobe, both with flattened mesial surface; basal endite suboval; articulation between coxal and basal endites strongly oblique; endopod short, strongly flattened; exopod elongate, consisting of 2 articles, distal article further annulated; epipod large, bi-lobed, posterior lobe greatly elongate. Second maxilliped (Fig. 4F) with endopod consisting of 6 segments; dactylus short, subquadrate; merus-ischium fused segment elongate; exopod extending beyond distal margin of carpus; epipod slender, podobranch greatly reduced to minute bud. Third maxilliped (Fig. 6A) with moderately slender endopod; ischium (Fig. 6B) with strong, distally elevated crista dentata on mesial surface, bearing 15-17 spines, distalmost spine larger than other spines, posterior spines becoming smaller proximally; merus with 3 or 4 ventral spines becoming larger distally; carpus unarmed; propodus subequal in length to carpus; dactylus shorter than propodus; all segments of endopod bearing long plumose setae, especially on mesial and ventral surfaces; exopod reaching distal margin of carpus.

Epipods on third maxilliped to third pereopod (Fig. 6K-M) slender, foliaceous, becoming noticeably longer posteriorly, that on fourth pereopod flagellum-like; podobranchs on third maxilliped to third pereopod all simple, slender, tapering distally, each shorter than distal part of epipod, that on fourth pereopod tiny bud.

Chelipeds (first pereopods) slightly unequal. Major cheliped (Fig. 5A) heaviest, chela approximately as long as carapace. Ischium with small spine subdistally on ventral margin. Merus moderately deep; dorsal margin sharply carinate, weakly sinuous, with tiny denticle subdistally; lateral surface weakly convex, with shallow convexity distoventrally accommodating proximal margin of carpus; mesial surface flat; ventral margin with strong subdistal spine followed by row of minute denticles. Carpus very short, cup-like, unarmed. Chela large, approximately as long as carapace; palm about 1.5 times longer than wide; dorsal margin rounded in proximal 0.8, weakly carinate in distal 0.2, terminating distally in tiny spine, otherwise unarmed; lateral and mesial surfaces smooth; ventral margin including fixed finger slightly sinuous, bluntly carinate, with row of sparse setal tufts extending nearly to tip of fixed finger. Fixed finger triangular, terminating in acute or subacute tip, cutting edge

sharp, with trace of teeth. Dactylus about 0.8 times as long as palm, terminating in acute or subacute tip, dorsal margin with row of setal tufts, lateral surface slightly elevated in midline, cutting edge with small tooth subproximally (Fig. 5B); no hiatus between fingers.

Minor cheliped (Fig. 5C) generally similar to major cheliped in structure, but somewhat more slender. Ischium with row of small spines on ventral margin. Merus with dorsal margin sharply carinate, sinuous, unarmed or armed with 1 small subdistal spine. Chela 0.8-0.9 times as long as major chela; palm about 1.5 times longer than wide; dorsal margin sharply carinate over entire length, terminating in tiny spine distally; lateral surface weakly convex, smooth, with few very short setae; mesial surface also smooth; ventral margin including fixed finger bluntly carinate, slightly sinuous, with row of tufts of setae; fixed finger elongate triangular, terminating in acute tip, cutting edge with short row of acute teeth subterminally (Fig. 5D); dactylus approximately as long as palm, terminating in acute tip, dorsal margin unarmed but with row of setal tufts, cutting edge unarmed.

Second pereopod (Fig. 6C) chelate, relatively slender, combined length of ischium and merus subequal to combined length of carpus and chela; ischium, merus and carpus unarmed; chela subequal in length to carpus, 2.8-2.9 times longer than wide; fingers each terminating in small corneous claw, cutting edges each with row of corneous spinules; dactylus slightly longer than palm; setation as figured. Third pereopod (Fig. 6D) relatively slender, longer than second pereopod; ischium, merus and carpus unarmed; carpus about 0.6 times as long as propodus; propodus slightly tapering distally, with 2 or 3 corneous spinules including one at ventrodistal margin; dactylus (Fig. 6E) about 0.4 times as long as propodus, terminating in small corneous claw, row of 6-8 corneous spinules adjacent to ventral margin; setation as figured. Fourth pereopod (Fig. 6F) generally similar to third pereopod in structure, but slightly shorter than that; propodus armed with 5 or 6 corneous spinules on lateral face adjacent to ventral margin, ventrodistal margin with 1 elongate, setulose spine followed by cluster of stiff setae; dactylus (Fig. 6G) 0.4-0.5 times as long as propodus, slightly twisted, terminating in sharp corneous claw, armed with several corneous spinules arranged in two rows on lateral surface. Fifth pereopod (Fig. 6H) slightly shorter than fourth pereopod; merus and carpus unarmed, carpus 0.5-0.6 times as long as propodus; propodus unarmed, but with grooming apparatus consisting of cluster of stiff

setae and short oblique row of long setae extending to lateral surface; dactylus (Fig. 6I, J) strongly twisted, lanceolate, about 0.3 times as long as propodus, 2 corneous spinules on mesial surface adjacent to dorsal margin, terminating in small, sharp claw, ventral margin with shallow concavity subproximally, inner margin of concavity with short row of minute corneous spinules.

First pleopod of male (Fig. 3G) consisting of 2 completely fused protopod and ramus; distal part, corresponding to ramus, noticeably expanded, spatulate, with cluster of adhesive hooks on slightly produced proximomesial margin and small but distinct V-shaped notch on subtruncate distal margin. First pleopod of female also uniramous, uniarticulate. Second pleopod of male (Fig. 3H) with appendix interna and appendix masculina articulating at about mid-length of endopod; appendix masculina somewhat elongate, slender, not extending beyond tip of endopod or exopod, bearing 3 setae apically; appendix interna about 0.6 length of appendix masculina; endopod and exopod subequal in length. Third to fifth pleopods each with appendix interna.

Uropodal exopod (Fig. 3I) with slightly convex lateral margin armed with 1-3 minute teeth and terminating in small teeth posteriorly; 1 slender movable spine just mesial to posterolateral tooth; transverse suture distinct, armed with 3 teeth; dorsal surface with 2 sharp longitudinal carinae, lateral carina with 3 spines; row of spiniform setae on posterior margin extending onto posteromesial margin. Endopod (Fig. 3I) ovate, lateral margin unarmed; dorsal surface with sharp middorsal carina, with 4 teeth, distalmost tooth submarginal, but slightly beyond posterior margin, and with short row of spiniform setae on posteromesial margin.

Coloration in life. Unavailable.

Distribution. Kii Peninsula, Honshu mainland of Japan, and Ogasawara Islands; 47-100 m.

Remarks. Although precise habitats of the specimens examined are unknown, all specimens came from hard substrates.

Etymology. The specific name is derived from the Latin *brevis* (meaning short) and *frons* (meaning front), in reference to the proportionally short frontal region of the new species. It is considered to be a noun in apposition.

Family Callianideidae

Genus *Callianidea* H. Milne Edwards, 1837

Callianidea typa H. Milne Edwards, 1837

Callianidea typa H. Milne Edwards, 1837: 320, pl. 20, figs.

8-14 [type locality: New Ireland, eastern Papua New Guinea]; Sakai, 1992a: 12, figs. 3-5; Dworschak, 1992: 218, fig. 17; Poupin, 1994: 7, fig. 3, pl. 1b; Poore, 1997: 349, figs. 1-3, 4A, B.

? *Callianidea mucronata* Kossmann, 1880: 80 [type locality: Red Sea].

? *Callianassa secura* Lanchester, 1901: 555, pl. 34, fig. 2 [type locality: Kota Bharu, Kelantan, Malaysia].

Callianidea planocula Melin, 1939: 5; Ooishi, 1970: 89, pl. 11, fig. 10.

Material examined. Chichi-jima Island: CMNH-ZC 2233, 1 ovigerous female (cl 5.4 mm), Tengu-no-hana, intertidal, 29 August 1992, coll. H. Tachikawa; CMNH-ZC 2234, 1 male (cl 5.7 mm), Miyano-hama, intertidal, 11 April 1994, coll. H. Tachikawa; CMNH-ZC 2235, 1 male (cl 10.2 mm), Byobu-dani, intertidal, under rock, 2 May 1994, coll. H. Tachikawa; CMNH-ZC 2236, 1 male (cl 8.0 mm), Matsuyama, intertidal, 18 April 1995, coll. H. Tachikawa; CMNH-ZC 2237, 3 males (cl 7.3-9.0 mm), same locality, intertidal, 1 May 1995, coll. H. Tachikawa; CMNH-ZC 2238, 2 males (cl 8.9, 9.7 mm), same locality, intertidal, 3 May 1996, coll. H. Tachikawa.

Comparative material. Holotype: MNHN-Th 495, male (cl 13.3 mm), New Ireland, Papua New Guinea, coll. Quoy and Gaimard. Non-types: CBM-ZC 3164, 2 males (cl 5.9, 8.1 mm), Ahra beach, Kume-jima Island, Okinawa Islands, Ryukyus, coral reef, intertidal, 13 June 1005, coll. T. Komai; CBM-ZC 5791, 1 female (cl 10.0 mm), near Tokashiki Port, Tokashiki Island, Kerama Group, reef, intertidal, 19 May 1998, coll. T. Komai. Thailand: CBM-ZC 6326, 1 male (cl 7.4 mm), Ao Tang Khen, Phuket, boulder area, intertidal, 12 October 1990, coll. T. Komai.

Coloration in life. Entirely whitish.

Distribution. Indo-West Pacific: Japan, Taiwan, Philippines, Mariana Islands, Wake Island, Tahiti, Tuamotu, Samoa, Papua New Guinea, Indonesia, Maldives, Comoro Islands, Gulf of Aden, Red Sea, Aldabra, Madagascar, Tanzania; intertidal or shallow subtidal (Poore, 1997).

Remarks. Poore (1997) noted that specimens from various Indo-Pacific localities, which are referable to *Callianidea typa*, showed substantial variation in some characters. The present specimens from Ogasawara Islands were compared with the holotype from Papua New Guinea in the collections of MNHN, as well as to those from the Ryukyu Islands of southern Japan, and Phuket, Thailand. The Japanese specimens agree very well with the holotype. The synonymy of *Callianidea planocula* Melin, 1939, a taxon described from the Ogasawara Islands, is supported, although the type

material of Melin's (1939) taxon was not reexamined. On the other hand, the specimen from Phuket, which agrees closely with the description of Poore (1997), differs from the holotype and the present Japanese specimens in some minor points. The propodus of the third pereopod is relatively wider in the holotype and the Japanese specimens than in the specimen from Phuket. The dactylus of the fifth pereopod seems to be less twisted in the Japanese specimens than in the specimen from Phuket. Furthermore, the endopod of the uropod is armed with a small subterminal spine on the dorsal surface in the holotype and the Japanese specimens, but such a spine is absent in the specimen from Phuket; Poore (1997) also did not mention or illustrate such a spine either. It is quite possible that several species are mixed under *C. typa*, but before reaching a final conclusion, it is necessary to examine a large series of specimens from various localities, including the types of the nominal taxa currently placed in synonymy.

Family Callianassidae
Subfamily Callianassinae

Remarks. Higher-level classification of the family Callianassidae is in a state of flux, as summarized by Lin *et al.* (2007). Currently, the following 12 genera, synonymized with *Callianassa* by Sakai (1999, 2005), are known: *Biffarius* Manning and Felder, 1991; *Cheramus* Bate, 1888; *Gilvossius* Manning and Felder, 1991; *Necallianassa* Heard and Manning, 1998; *Neotrypaea* Manning and Felder, 1991; *Nihonotrypaea* Manning and Tamaki, 1998; *Notiux* Manning and Felder, 1991; *Pestarella* Ngoc-Ho, 2003; *Poti* Rodrigues and Manning, 1992; *Pseudobiffarius* Heard and Manning, 2000; *Scallasis* Bate, 1888; and *Trypaea* Dana, 1852. During this study, we have personally examined several species of *Callianassa* s.l. Morphological diversity of various appendages, including mouthparts, was found to be considerably rich, although these structures have not been fully described for many species. Examples of the three species treated in this study will be found in the following account. The observed morphological diversity led us to follow Manning and Felder (1991a) and Tudge *et al.* (2000) in concluding that *Callianassa* s.l. could be divided into more than one genus. In this study, we propose *Paratrypaea* gen. nov. for *Callianassa bowieri* and *C. rectangularis*, and *Rayllianassa* gen. nov. for *C. amboinensis*.

Genus *Callianassa* Leach, 1814
***Callianassa jocularis* de Man, 1905**
(Figs. 7-9)

Callianassa jocularis de Man, 1905: 610 [type locality: Labuan, Tring Bay, Indonesia, 18-27 m]; Poore and Griffin, 1979: 266, fig. 28; Ngoc-Ho, 1991: 287, fig. 3; 1994: 51; Sakai, 1999: 35 (key), 47; Tudge *et al.*, 2000: 143; Sakai, 2005: 88.

Callianassa (Cheramus) jocularis - de Man, 1928: 26, 98, 130, pl. 12, fig. 19, 19a-m, pl. 13, fig. 19a, d-m.

Material examined. Chichi-jima Island: CMNH-ZC 2239, 2 males (cl 2.5, 3.9 mm), 1 ovigerous female (cl 5.5 mm), Byobu-dani, 25 m, 20 April 1995, SCUBA diving, coll. H. Tachikawa.

Other material. New Caledonia. MNHN-Th 1076, 1 male (cl 5.0 mm), stn 760, east of Lagon, 21° 14.85' S, 165° 43.3' E, 43 m, 7 January 1987, coll. B. Richer de Forges; MNHN-Th 1078, 1 male (cl 4.5 mm), 3 females (cl 3.5, 4.5 mm), same data; MNHN-Th 1094, 3 females (cl 5.1-5.5 mm), Quen Island, Prony Bay, stn 137, 22° 20' S, 166° 51' E, 37 m, 23 August 1984, coll. B. Richer de Forges; MNHN-Th 1096, 1 male (cl 6.0 mm), 3 females (cl 4.5-4.6 mm), similar locality, stn 139, 22° 22' S, 166° 51' E, 45 m, coll. B. Richer de Forges.

Description. Carapace (Fig. 7A-D) about 0.25 of total body length; rostrum spiniform, overreaching midlength of eye-stalks; anterolateral projections obtuse; anterolateral concavity rather shallow, without distinct notch or cleft; dorsal oval well defined, smooth, cervical groove across about posterior 0.2 of carapace length; linea thalassinica extending nearly to posterolateral margin of carapace.

Length ratio of first to sixth pleonal somites measured along midline 0.6 : 1.0 : 0.6 : 0.4 : 0.7 : 0.8 (Fig. 7E). First pleonal somite narrowing anteriorly in dorsal view; pleuron faintly delimited. Second somite with posterolateral margin of pleuron weakly produced, bearing few tufts of long setae. Third to fifth pleura each with prominent tuft of plumose setae; fifth pleuron also with row of short setae on ventral margin posteriorly; posteroventral margin of each pleuron slightly produced posteriorly, rounded. Sixth somite (Fig. 7F) wider than long, subtrapezoidal in dorsal view, having shallow lateral notches on posterior one-third, lacking ventrolateral projection; lateral margins generally convex; ventral margin with row of very short setae. Telson (Fig. 7F) trapezoidal, slightly longer than wide; dorsal surface nearly flat; lateral and posterolateral margins unarmed; posterior margin slightly convex, with tiny median denticle.

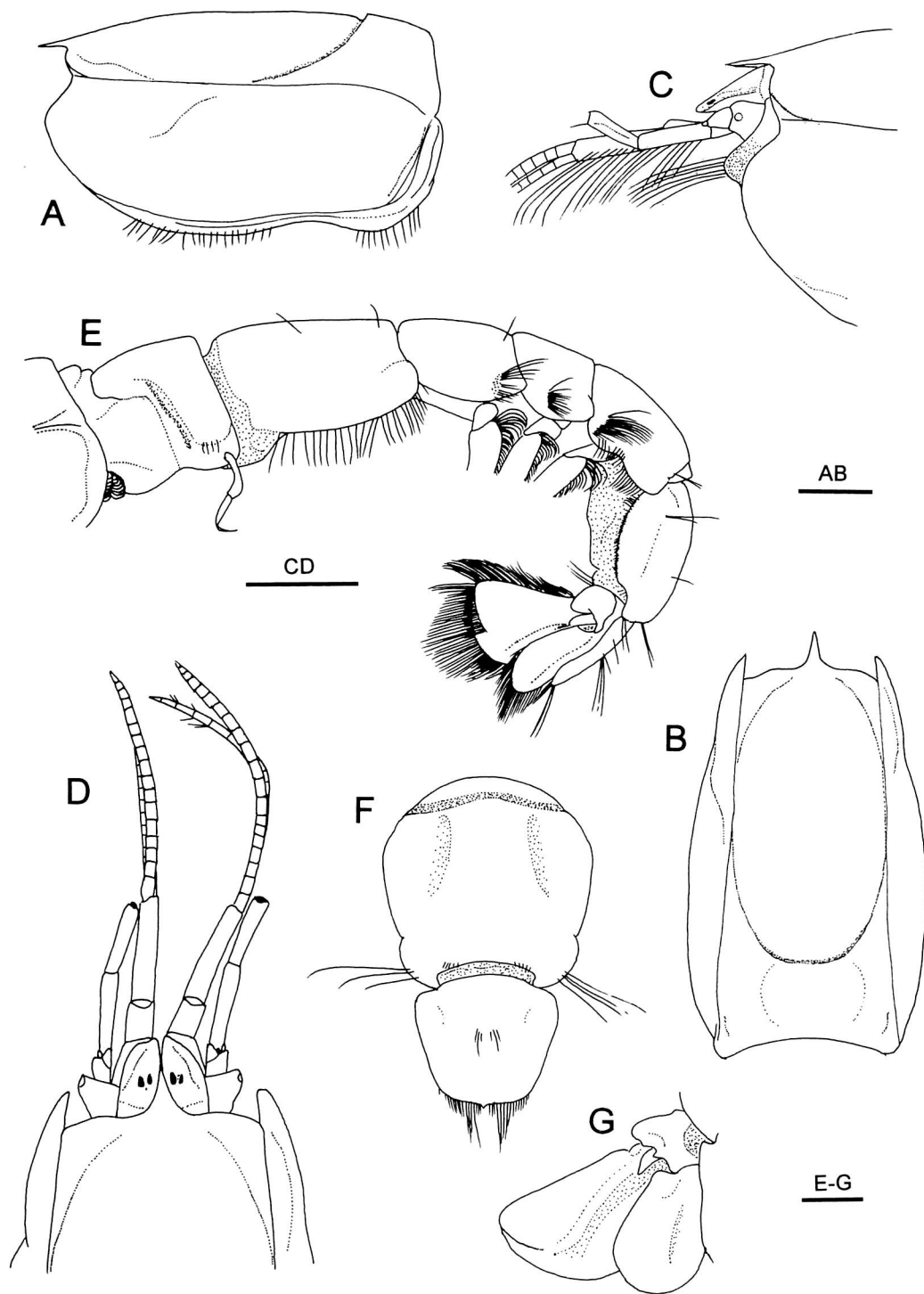


Fig. 7. *Callianassa jocularix* de Man, 1905. Ovigerous female (cl 5.5 mm; CMNH-ZC 2239), Byobu-dani, Chichi-jima Island, Ogasawara Islands. A, carapace, lateral view; B, same, dorsal view; C, anterior part of carapace and cephalic appendages, lateral view (antennular flagella partially omitted, antennal flagella missing); D, same, dorsal view; E, pleon, lateral view (second pleopod omitted, third to fifth pleopods partially omitted); F, sixth pleonal somite and telson, dorsal view; G, left uropod, perpendicular dorsal view (setae omitted). Scales: 1 mm.

Eye-stalks (Fig. 7C, D) contiguous, flattened, each reaching distal margin of first segment of antennular peduncle, terminating in tiny, blunt distomesial projection; lateral margin generally convex; cornea subterminal and dorsal, consisting of 2 darkly pigmented spots.

Antennular peduncle (Fig. 7C, D) subequal in length to antennal peduncle; first segment short, partially concealed by eye-stalk in dorsal view; second segment shorter than first segment; third segment subequal in length to proximal two segments combined, not stouter than second segment, subcylindrical; second and third segments with row of long setae on ventral surfaces; antennular flagella both distinctly longer than peduncle; dorsal flagellum thicker than ventral flagellum; ventral flagellum subequal in length to dorsal flagellum, without setal row on ventral margin. Antennal peduncle (Fig. 7C, D) reaching distal margin of third segment of antennular peduncle; distal two segments subcylindrical; scaphocerite rudimentary, subtriangular; flagellum missing in specimens examined.

Epistome with prominent tuft of long setae (Fig. 7C).

Maxilla (Fig. 8A, B) with unsegmented endopod abruptly tapering in slender terminal lobe; outer surface of endopod with numerous long setae subdistally; scaphognathite moderately large, anterior lobe slightly falling short of distal margin of basal endite; coxal endite consisting of two greatly unequal lobes, anterior lobe narrow rectangular, posterior lobe triangular, latter with plate on outer surface basally; basal endite large, with fine setae marginally and submarginally, divided in two strongly unequal lobes. First maxilliped (Fig. 8C, D) with endopod reduced to rounded, rudimentary bud, still visible in outer view; coxal endite flattened mesially, weakly divided in two lobes; basal endite elongate oval; exopod noticeably curved mesially, non-segmented, reaching distal margin of basal endite, with submarginal tuft of several long setae on outer surface mesially; epipod faintly bilobed, distal lobe triangular, proximal lobe with somewhat elongate tip. Second maxilliped (Fig. 8E) with slender endopod; dactylus longer than wide; exopod short, reaching midlength of merus, not visible in outer view; epipod broken; podobranch absent. Third maxilliped (Fig. 8F - H) without exopod; ischium-merus not operculiform, length about 4.3 of width at articulation between ischium and merus; ischium widened proximally, about 1.50 times longer than wide, crista dentata consisting of sinuous row of long, slender spines on midline; merus 0.6-0.7 times as

long as ischium, about 1.4 times longer than wide, slightly narrowed distally, unarmed on distolateral margin; carpus subtriangular, slightly longer than wide, distinctly shorter than merus; propodus more than twice longer than wide, distinctly longer than carpus, tapering distally; dactylus slender, digitiform, much shorter than propodus.

Chelipeds (first pereopods) strongly unequal and dissimilar. Major cheliped (Fig. 9A, B) large, but rather strongly compressed laterally. Ischium relatively slender, becoming abruptly wider at midlength, dorsal margin strongly sinuous, unarmed; lateral surface convex; ventral margin unarmed. Merus slender, less than half of carpus in width, longer than carpus; dorsal margin slightly convex, with 1 small, curved spine subproximally; lateral surface with distinct carina extending onto ventral projection, ventral part forming shallow concavity to accommodate proximovenral margin of carpus; mesial surface nearly flat; ventral margin faintly tuberculate in distal half, with prominent hook-like projection subproximally. Carpus subrectangular, wider than long; dorsal margin slightly concave, ventral margin broadly convex; mesial surface shallowly concave in proximal part, weakly convex medially, dorsal and ventral margins upturned, sharply carinate. Chela subtriangular in general contour. Palm approximately as long as wide; dorsal and ventral margins (including fixed finger) sharply carinate; lateral surface smooth, convex, with few very short setae distally; mesial surface convex, with blunt distomedial projection at base of dactylus; ventral margin (including fixed finger) nearly straight. Fixed finger subequal in length to palm, slightly curved, terminating in acute tip; cutting edge without conspicuous teeth; ventral margin with row of setae; mesial surface shallowly excavate along cutting edge side. Dactylus longer than palm, weakly curving, terminating in acute tip, crossing with fixed finger when closed; dorsal margin rounded; surfaces with scattered tufts of short setae; cutting edge sinuous, unarmed; mesial surface slightly elevated along midline.

Minor cheliped (Fig. 9C) very slender, slightly shorter than major cheliped. Ischium becoming slightly wider distally, slightly longer than merus, margins unarmed. Merus about 0.6 times as long as carpus; dorsal and ventral margins slightly convex, unarmed; lateral surface slightly but regularly convex. Carpus about 5.0 times longer than wide, unarmed. Palm about 1.2 times longer than wide; dorsal and ventral margins rounded, each with row setae; lateral and mesial surfaces weakly convex, smooth. Fixed finger terminating

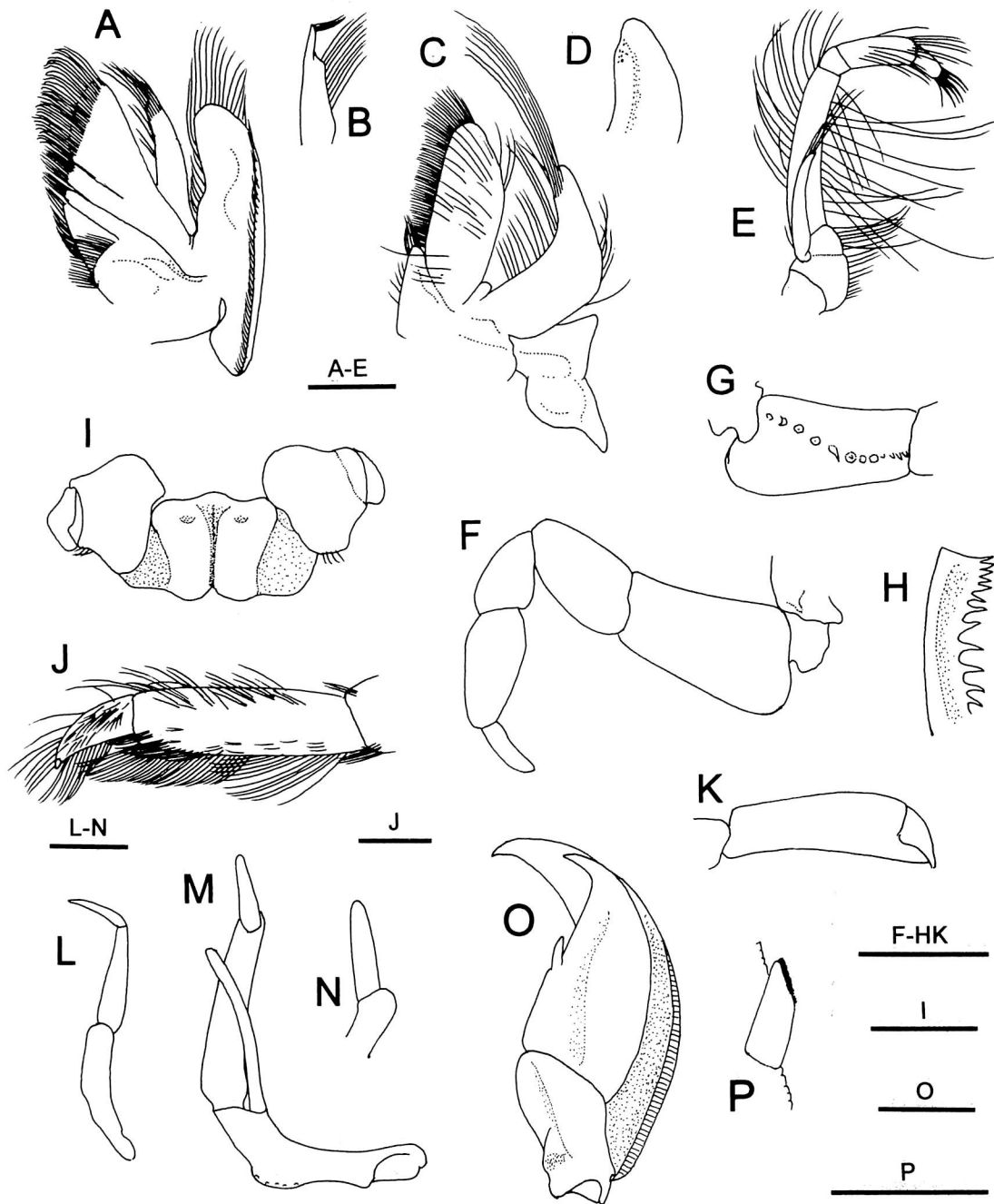


Fig. 8. *Callianassa joculatrix* de Man, 1905. Oviparous female (cl 5.5 mm; CMNH-ZC 2239), Byobu-dani, Chichi-jima Island, Ogasawara Islands. A, left maxilla, outer view; B, endopod of maxilla, inner view; C, left first maxilliped, outer view; D, distal part of exopod of first maxilliped, outer view (setae omitted); E, left second maxilliped, inner view; F, left third maxilliped, lateral view (setae omitted); G, ischium of third maxilliped, mesial view; H, same, dorsal view; I, sternal shield and coxae of third pereopods, ventral view; J, propodus and dactylus of left fourth pereopod, perpendicular lateral view; K, propodus and dactylus of left fifth pereopod, extensor view, setae omitted; L, left first pleopod, ventral view; M, left second pleopod, ventral view; N, distal part of basal article and distal article of endopod of second pleopod, ventrolateral view; O, left third pleopod, ventral view; P, appendix interna of left third pleopod, dorsal view. Scales: 1 mm for F-I, K, O; 0.5 mm for A-E, J, L-N, P.

in acute tip; cutting edge unarmed. Dactylus about 2.2 times longer than palm, terminating in acute tip; dorsal margin rounded, with row of setae; cutting edge unarmed; no hiatus between fingers.

Second pereopod (Fig. 9D) chelate, moderately stout; ischium with few setae; merus with slightly sinuous dorsal and ventral margins, latter with row of long setae; carpus subtriangular; chela triangular, shorter than carpus; palm very short, about 0.3 times as long as dactylus, dorsal margin convex; both fingers elongate triangular, terminating in small corneous tips, cutting edges with row of minute corneous teeth. Third pereopod (Fig. 9E) moderately stout; ischium with ventrodiscal angle not markedly produced; merus about 3.7 times longer than wide, unarmed on ventral margin; carpus triangular, unarmed; propodus subrectangular, armed with 1 small movable spine at anteroventral angle, and with numerous tufts of short setae on lateral surface and row of numerous setae along dorsal and ventral margins, setae on posterior margin particularly elongate; ventral margin of propodus shallowly concave, posterior margin forming distinct heel, projecting slightly beyond flexor margin of carpus; dactylus about half length of propodus, terminating small corneous tip, lateral surface covered with short setae, dorsal and ventral margins with numerous short setae. Fourth pereopod (Figs. 9F) relatively slender, all segments unarmed, articulation between carpus and propodus strongly twisted; coxa large, flattened ventrally, unarmed, partially fused with sternum; propodus (Fig. 8J) about 3.3 times longer than wide, subequal in length to carpus, dorsal and ventral margins setose; dactylus (Fig. 8J) subtriangular, terminating in small corneous tip. Fifth pereopod (Figs. 8K, 9G) subchelate, moderately slender; propodus subequal in length to carpus, slightly broadened distally.

Sternal shield on seventh thoracic somite (Fig. 8I) trapezoidal, broadened anteriorly, divided by deep median groove; anterior margin weakly produced medially; no grooves delimiting anterolateral lobes.

In male, first and second pleopods absent. Female first pleopod (Fig. 8L) with ramus consisting of 2 articles, distal article directed mesially; protopod longer than proximal article of ramus. Female second pleopod (Fig. 8M, N) biramous; protopod strongly curved laterally; endopod 2-articulated, proximal article with distinctly produced dorsodistal margin, distal article about half length of proximal article, articulation between two articles forming slight angle; exopod slender, distinctly shorter than endopod, slightly curved. Third to fifth pleopods (Fig. 8O) biramous, rami broad

; appendices internae (Fig. 8P) longer than wide, partially embedded, but distinctly projecting beyond margin of endopod, arising at about midlength of endopod, each bearing numerous small adhesive hooks along obliquely truncate mesial margin; protopods broad, flattened.

Uropod (Fig. 7G) with endopod distinctly longer than wide; lateral and mesial margins nearly straight, posterior margin rounded, unarmed. Exopod longer than wide, with weak middorsal carina; lateral margin nearly straight, posterolateral angle somewhat produced; mesial margin with short row of long spiniform setae (not illustrated); dorsal plate with distal rows of stiff setae separated from setal rows of posterior margin.

Distribution. Mombasa, Australia, Arafra Sea, New Caledonia, Indonesia, Philippines, Viet Nam, Thailand, South China Sea, Taiwan, and Ogasawara Islands; 15–300 m (de Man, 1905, 1928; Poore and Griffin, 1979; Ngoc-Ho, 1991, 1994; Liu and Zhong, 1994; Sakai, 1999, 2005). The present specimens represent the first record of this species from Japanese waters.

Remarks. The present species is provisionally assigned to *Callianassa* s.s., although the composition of the genus still remains unclear. *Callianassa jocularix* agrees with *C. subterranea* (Montagu, 1808), the type species of the genus, in many diagnostic aspects, including (1) the subpediform third maxilliped with slender propodus and dactylus and with a crista dentata consisting of a row of strong spines, (2) the presence of conspicuous hook-like projection on the merus of the major cheliped, (3) the well-developed heel of the propodus of the third pereopod, and (4) the stubby, but projecting appendices internae on the third to fifth pleopods. Structure of the mouthparts and female pleopods are also similar between the two species. Nevertheless, *C. jocularix* differs from *C. subterranea* in the lack of the first and second pleopods in male.

Other callianassiniine species characterized by a pediform or subpediform third maxilliped with the merus being longer than wide or approximately as long as wide and the possession of stubby appendices internae on the third to fifth pleopods include *Callianassa caledonica* Ngoc-Ho, 1991, *C. chakratongae* Sakai, 2002, *C. diaphora* Le Leouff and Int-s, 1974, *C. exilimaxilla* Sakai, 2005, *C. malaccaensis* Sakai, 2002, *C. marchali* Le Leouff and Int-s, 1974, *C. matzi* Sakai, 2002, *C. mocambiquensis* Sakai, 2004, *C. plantei* Sakai, 2004, *C. persica* Sakai, 2005, *C. propriopedis* Sakai, 2002, *C. stenomastaxa* Sakai, 2002, *C. thailandica* Sakai, 2005, and *C. tongkinae* Grebenjuk, 1975 (Le Leouff and Intés, 1974;

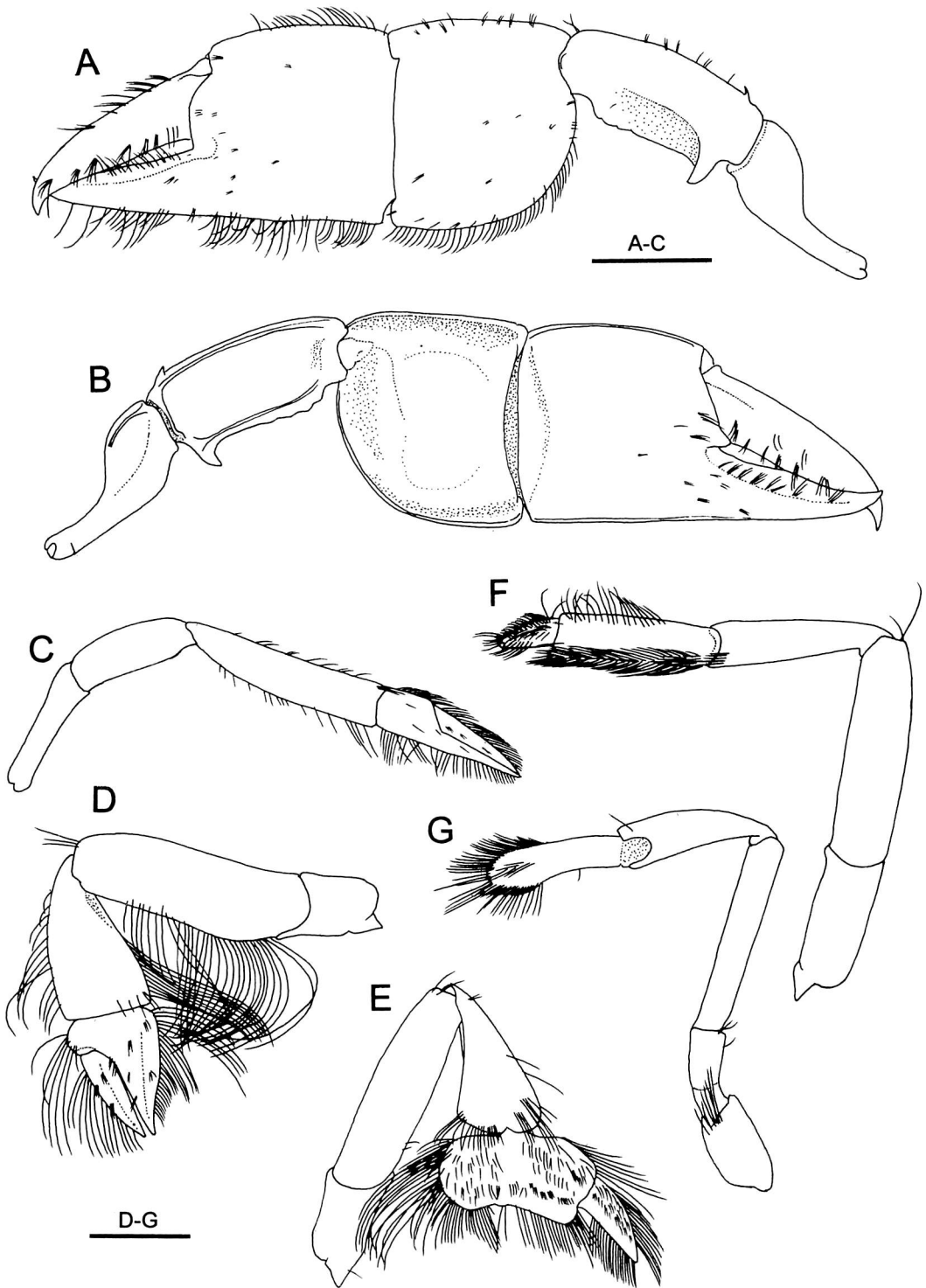


Fig. 9. *Callianassa jocularis* de Man, 1905. Ovigerous female (cl 5.5 mm; CMNH-ZC 2239), Byobu-dani, Chichi-jima Island, Ogasawara Islands. A, major cheliped (left), lateral view; B, same, lateral view (setae partially omitted); C, minor cheliped (right), lateral view; D, left second pereopod, lateral view; E, right third pereopod, lateral view; F, left fourth pereopod, lateral view; G, left fifth pereopod, lateral view. Scales: 2 mm for A-C; 1 mm for D-G.

Ngoc-Ho, 1991; Sakai, 1999; 2002; 2004; 2005). Morphological diversity found in these species, however, is rather substantial. For example, the shape of the telson, the armament of the merus of the major cheliped, and the development of the first and second pleopods in male, which are considered to be of genus level significance (e.g., Manning and Felder, 1991a; Ngoc-Ho, 2003), vary according to species. Careful comparison of various characters is necessary to evaluate the generic position of these species, but it is beyond the scope of the present paper.

***Paratrypaea* gen. nov.**

Type species. *Callianassa (Trypaea) Bouvieri* Nobili, 1904. Present designation, by monotypy. Gender: masculine.

Composition. *Paratrypaea bouvieri* (Nobili, 1904) comb. nov.; and *P. rectangularis* (Ngoc-Ho, 1991) comb. nov.

Diagnosis. Carapace with dorsal oval; rostrum conspicuous, spiniform; linea thalassinica distinct. Second somite of pleon slightly shorter than sixth somite; third to fifth pleonal somites each with lateral tufts of setae. Telson subquadrate. Ocular peduncle short, flattened dorsoventrally; cornea disk-shaped, subterminal, submedial. Antennular peduncle longer than antennal peduncle. Third maxilliped with merus-ischium operculiform; ischium with crista dentata consisting of row of small spines; propodus and dactylus slender, latter digitiform; exopod absent. Exopod present on first and second maxillipeds. Single arthrobranch above base of second maxilliped, paired arthrobranches above base of third maxilliped to fifth pereopods. Chelipeds (first pereopods) greatly dissimilar at least in males (female unknown in *P. rectangularis*), major with broad, marginally denticulate projection on ventral margin or with row of sharp teeth. Propodus of third pereopod oval, no heel. Propodus of fourth pereopod moderately broad. Fifth pereopod chelate. Male lacking first and second pleopods. Third to fifth pleopods biramous, foliaceous, appendix interna small, stubby, projecting from mesial margin of endopod. Uropodal exopod with dorsal plate bearing thick assemblage of stiff setae posteriorly; endopod also with small dorsal plate.

Remarks. In addition to the type species, *Callianassa rectangularis* is referred to *Paratrypaea* gen. nov., although the taxonomic status of the latter species has been subject to disagreement. Sakai (1999) considered *C. rectangularis* as a junior synonym of *C. bouvieri*. On the other hand, Tudge *et al.* (2000) referred *C. rectangularis* to *Cheramus* in a separate subfamily

Cheraminae. Reexamination of the holotype of *C. rectangularis* has shown that the taxon is indeed specifically distinct from *C. bouvieri* (see "Remarks" under the account of *Paratrypaea bouvieri*), although the two taxa appear closely related.

Substantial similarities are also seen between the type species and *Callianassa gravieri* Nobili, 1905. Particularly, the two taxa resemble for each other in the shape of the rostrum, third maxilliped and telson (Nobili, 1906; Sakai, 1999). However, at present, it is impossible to ascertain whether *C. gravieri* is assigned to the present new genus, because no information on males is available for that species.

This new genus appears closest to *Pestarella*, represented by *P. tyrrhena* (Petagna, 1892), *P. candida* (Olivi, 1792), *P. rotundicaudata* (Stebbing, 1902), *P. convexa* (de Saint Laurent and Le Loeuff, 1979) and *P. whitei* (Sakai, 1999) (Ngoc-Ho, 2003). Shared apomorphic characters include the lack of the male first and second pleopods and the operculiform ischium-merus of the third maxilliped (Tudge *et al.*, 2000). *Paratrypaea* differs from *Pestarella* in the presence of a spiniform rostrum, the second pleonal somite being shorter than sixth somite, and the subquadrate telson. In *Pestarella*, the rostrum is broadly triangular; the second pleonal somite is subequal in the length to the sixth somite; and the posterior half of the telson is rounded (Ngoc-Ho, 2003). Furthermore, the merus of the major cheliped bears a marginally denticulated, broadly triangular lobe or a row of sharp teeth on the ventral margin in *Paratrypaea*, rather than hook-like projection or spine subproximally in *Pestarella*.

Etymology. The generic name is formed by combining the Greek prefix *para* (meaning aside) with the generic name *Trypaea*. The gender is feminine.

***Paratrypaea bouvieri* (Nobili, 1904), comb. nov.**
(Figs. 10-12)

Callianassa (Trypaea) Bouvieri Nobili, 1904: 236; 1906: 105, pl. 6, fig. 3 [type locality: Dibouti].

Callianassa (Trypaea) maldivensis Borradaile, 1904: 753, pl. 58, fig. 3a, b [type locality: Hulule, Male Atoll, Maldives].

Callianassa bouvieri - Holthuis, 1958: 37, fig. 15; Sakai, 1987: 303; Dworschak and Pervesler, 1988, fig. 3; Dworschak, 1992: 192; Sakai, 1999: 40, fig. 6a-c; Tudge *et al.*, 2000: 143; Sakai, 2005: 78.

Trypaea bouvieri - Poore, 2000: 150.

Material examined. Chichi-jima Island: CMNH-ZC 2240, 1 female (cl 3.3 mm), Miyano-hama, 1 m, sand, 4 March 1995, coll. H. Tachikawa; CMNH-ZC 2241, 1

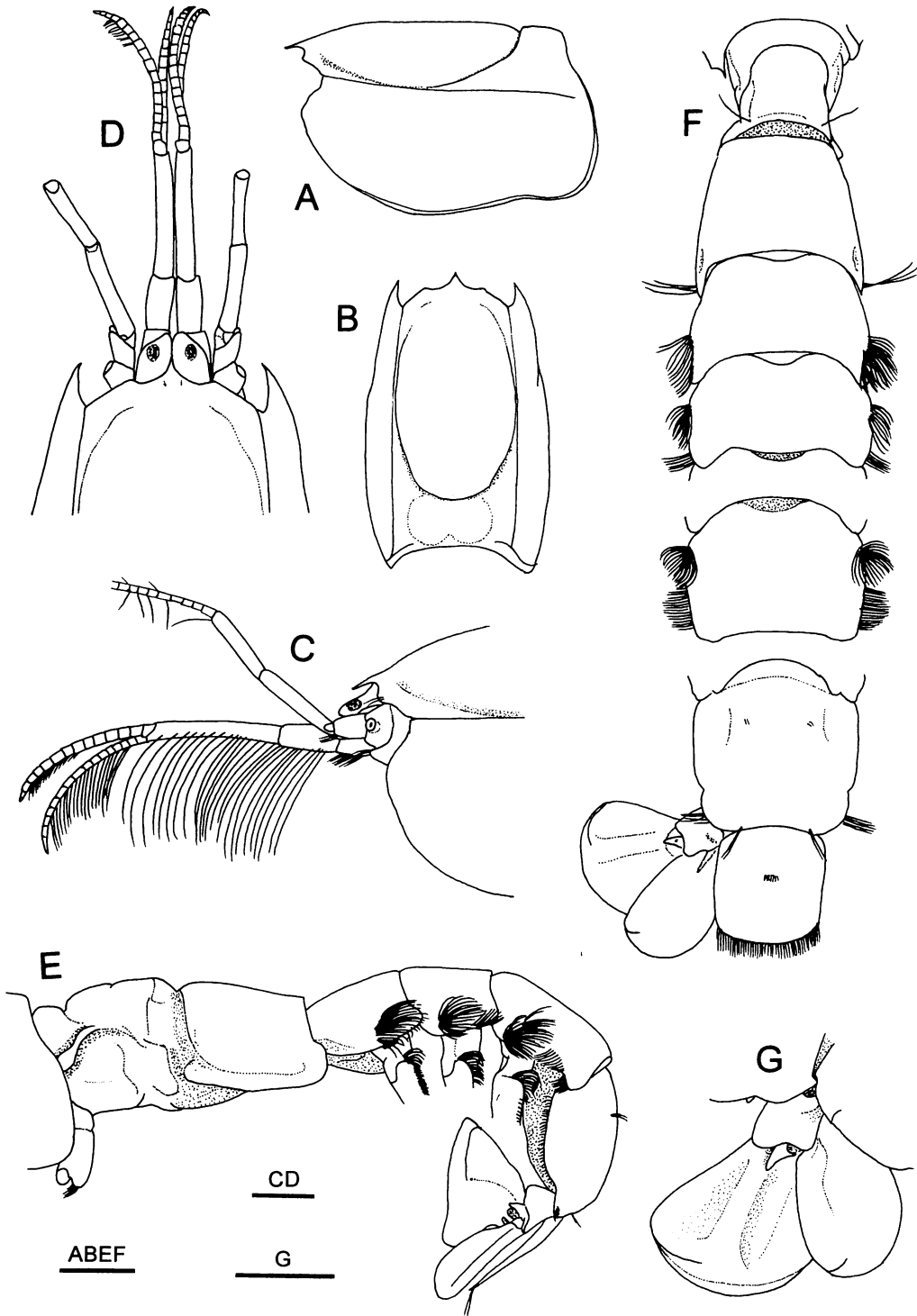


Fig. 10. *Paratrypaea bouvieri* (Nobili, 1904), comb. nov. Male (cl 7.4 mm; CBM-ZC 7422), Chichi-jima Island, Ogasawara Islands. A, carapace, lateral view; B, same, dorsal view; C, anterior part of carapace and cephalic appendages, lateral view (only basal part of antennal flagella omitted); D, same, dorsal view (antennal flagellum omitted); E, pleon, telson and left uropod, lateral view, basal parts of third to fifth pleopods shown; F, same, dorsal view; G, left uropod, perpendicular dorsal view (setae omitted). Scales: 2 mm for A, B, E-G; 1 mm for C, D.

male (cl 3.6 mm), Byobu-dani, 1 m, under rock, 30 March 1996, coll. H. Tachikawa; CBM-ZC 7422, 2 males (5.2 mm, 7.4 mm), 1 ovigerous female (cl 6.9 mm), Okumura River, rivermouth, tidal flat. 7 August 2002, coll. K. Kinoshita; CBM-ZC 7423, 2 males (cl 5.5, 6.1 mm), 2 females (cl 5.6, 5.8 mm), Kiyose River, rivermouth, tidal flat, 8 August 2002, coll. K. Kinoshita.

Comparative material. Holotype: MNHN-Th 65, male, Djibouti, coll. H. Coutière. Non-types. Red Sea: MNHN-Th, 1 male, Zabargad Island, 0.5 m, 5 March 1973, coll. C. Froggia. Non-types: CBM-ZC 8232, 2 ovigerous females (cl 3.7, 3.9 mm), Untenbaru, Haneji, Okinawa Island, Ryukyus, tidal flat, 31 March 1998, coll. K. Nomura; CBM-ZC 8291, 1 female (cl 4.6 mm), Haneji, Okinawa Island, tidal flat, 5 November 2005, coll. K. Nomura; CBM-ZC 8800, 1 ovigerous female (cl 4.8 mm), Karimata beach, Miyako Island, Ryukyu Islands, tidal flat, 15 May 1997, coll. K. Nomura; CBM-ZC 8801, 1 male (cl 4.3 mm), 1 female (cl 5.0 mm), 1 ovigerous female (cl 5.1 mm), Komi, Iriomote Island, Yaeyema Islands, Ryukyus, intertidal, 18 March 1998, coll. K. Nomura; CBM-ZC 8943, 2 males (cl 3.6, 4.7 mm), 2 females (cl 3.8, 5.0 mm), 3 ovigerous females (cl 4.4-4.6 mm), Shirahama, Iriomote Island, tidal flat, digging, 13 July 2002, coll. T. Komai; CBM-ZC, 4 males (cl 6.4-6.2 mm), 2 ovigerous females (cl 5.0, 5.4 mm), Sugira Beach, Kikai Island, Amami Islands, intertidal, sand, 25 May 2005, coll. T. Komai.

Description. Carapace (Fig. 10A-C) about 0.2 of total body length; rostrum spiniform, directed slightly downward, falling slightly short of or nearly reaching midlength of eyestalk, anterolateral projection obtuse; anterolateral concavity moderately deep, with tiny cleft; dorsal oval well defined, smooth, cervical groove across about posterior 0.2 of carapace length; linea thalassinica extending nearly to posterolateral margin of carapace.

Length ratio of first to sixth pleonal somites measured along midline 0.65 : 1.0 : 0.9 : 0.9 : 1.15 : 1.3 (Fig. 10E, F). First pleonal somite narrowing anteriorly in dorsal view; pleuron not distinctly delimited. Second somite with posterolateral margin of pleuron slightly produced, bearing tuft of few long setae. Third to fifth pleura each with prominent tuft of plumose setae; fourth and fifth pleura also each with longitudinal row of setae on ventral margin posteriorly; posteroventral margin of each pleuron rounded. Sixth somite slightly wider than long, subquadrate in dorsal view, bearing shallow notches on posterior one-third; no ventrolateral projection. Telson (Fig. 10F) subrectangular, slightly longer than wide; dorsal surface nearly flat; lateral margin unarmed, with short transverse suture

subproximally; posterior margin generally convex, but with faint median concavity, median tooth absent or minute.

Eyestalks (Fig. 10C, D) contiguous, flattened, each reaching distal margin of first segment of antennular peduncle, terminating in rounded projection anteromesially; lateral margin convex; cornea medial, disk-shaped, corneal width less than half of peduncular width.

Antennular peduncle (Fig. 10C, D) somewhat longer than antennal peduncle; first segment short, partially concealed by eye-stalk in dorsal view; second segment slightly longer than first segment; third segment more than twice length of second segment, moderately slender, slightly tapering distally; second and third segments with row of long setae on ventral surfaces; antennular flagella both shorter than peduncle; dorsal flagellum slightly thicker, but shorter than ventral flagellum; ventral flagellum with tufts of long setae on ventral margin. Antennal peduncle reaching distal 0.15-0.2 of third segment of antennular peduncle; distal two segments subcylindrical; scaphocerite rudimentary, subovate; flagellum distinctly longer than carapace, with some setae on every 1 or 2 articles.

Epistome devoid of prominent tuft of setae (Fig. 10C).

Sternal shield on seventh thoracic somite (Fig. 11F) trapezoidal, broadened anteriorly, divided by deep median groove; no conspicuous grooves delimiting anterolateral lobes.

Maxilla (Fig. 11A, B) with stout, unsegmented endopod tapering distally and bearing subterminal tuft of long setae on lateral margin; scaphognathite moderately large, anterior lobe not reaching distal margin of basal endite; coxal endite with rounded plate on outer surface; anterior lobe of basal endite subtriangular. First maxilliped (Fig. 11C, D) with endopod reduced to rudimentary bud, still visible in outer view; exopod curved mesially, slightly overreaching distal margin of basal endite, weakly bilobed, with submarginal cluster of very long setae on outer surface mesially; epipod unilobed. Second maxilliped (Fig. 11E) with moderately slender endopod; dactylus slightly longer than wide; exopod falling far short of distal margin of merus, hardly visible in outer view; epipod greatly reduced as rudimentary bud; podobranch absent. Third maxilliped (Fig. 11F, G) without exopod; ischium-merus operculiform, about 1.6 times longer than wide, with dense setation on ventral margin (not illustrated); ischium slightly longer than broad, distinctly widened distally, crista dentata consisting of row of small acute spines arranged in sinuous row on midline; merus

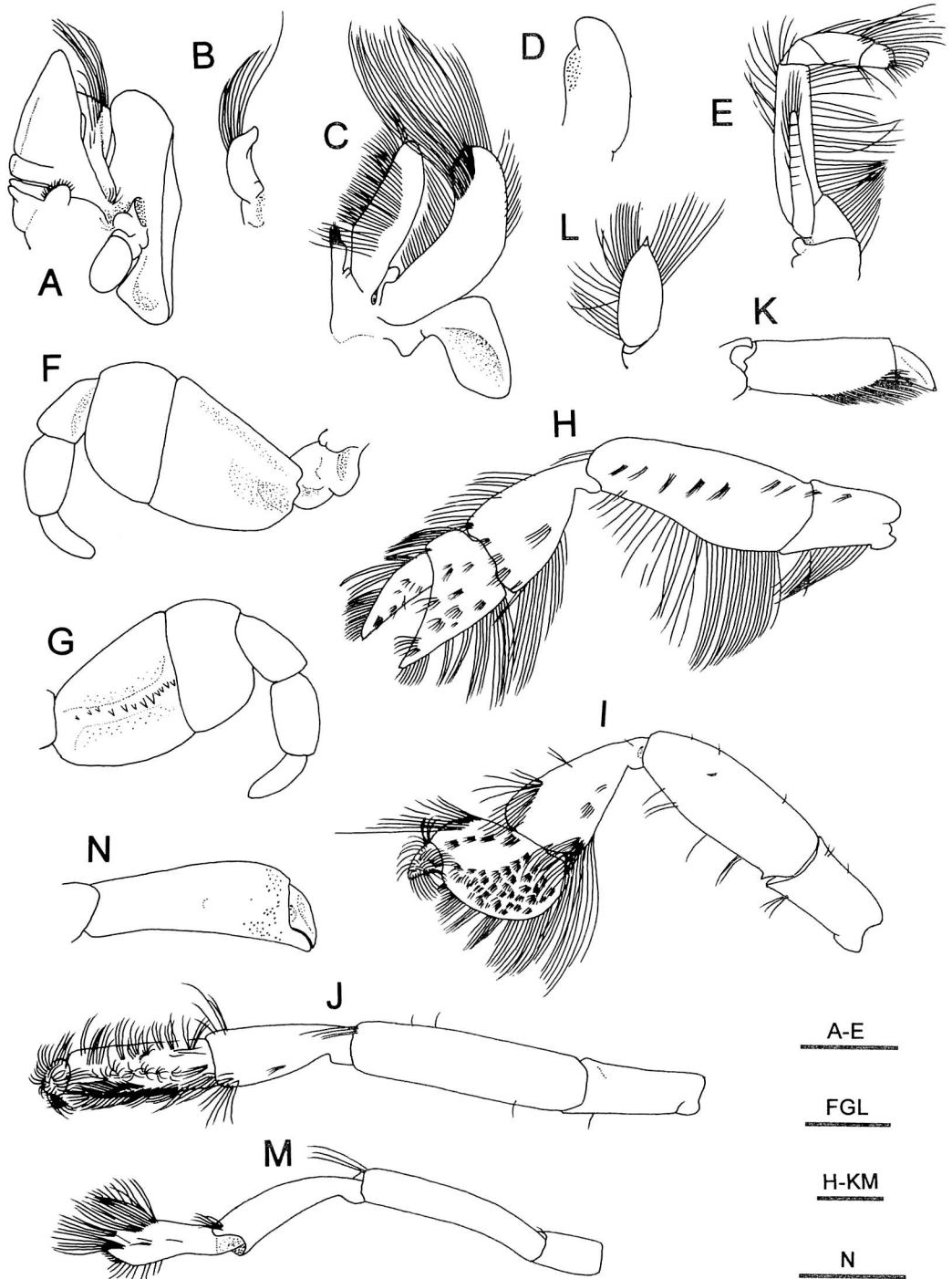


Fig. 11. *Paratrypaea bouvieri* (Nobili, 1904), comb. nov. Male (cl 7.4 mm; CBM-ZC 7422), Chichi-jima Island, Ogasawara Islands. A, left maxilla, outer view (setae partially omitted); B, endopod of maxilla, inner view; C, left first maxilliped, outer view; D, distal part of exopod of first maxilliped, outer view (setae omitted); E, left second maxilliped, inner view; F, left third maxilliped, lateral view (setae omitted); G, left third maxilliped, mesial view; H, left second pereopod, lateral view; I, left third pereopod, lateral view; J, left fourth pereopod, lateral view; K, propodus and dactylus of fourth pereopod, mesial view; L, dactylus of fourth pereopod, extensor view; M, left fifth pereopod, lateral view; N, propodus and dactylus of fifth pereopod, extensor view. Scales: 1 mm for A-K, M, N; 0.5 mm for L.

about twice wider than long, distinctly shorter than ischium, unarmed on distomesial margin, ventrodiscal angle not produced; carpus longer than wide, subequal in length to merus; propodus about twice longer than wide, slightly longer than carpus; dactylus slender, digitiform, shorter than propodus.

Chelipeds (first pereopods) greatly dissimilar. Major cheliped (Fig. 12A-C) variable in length and armament and setation of dactylus, sometimes greatly elongate in males. Ischium moderately slender, becoming wider distally in general contour, dorsal margin sinuous, unarmed; lateral surface convex; ventral margin with row of 5-7 small teeth or denticles. Merus subequal in length to carpus; dorsal margin with row of small tubercles in proximal 0.3-0.4; lateral surface generally convex, ventral half forming shallow concavity accommodating proximal part of carpus; mesial surface slightly concave in general; ventral margin forming broadly subtriangular, strongly compressed, marginally denticulate projection. Carpus quadrate or subquadrate, sometimes elongate in males; dorsomesial and ventromesial margins sharply ridged, each edge smooth; lateral surface smooth, convex; mesial surface medially convex, margins strongly upturned. Palm with dorsal and ventral margin parallel or slightly diverging proximally, 1.0-1.1 times longer than wide; lateral surface smooth, convex, with tufts of short setae adjacent to margins; palmar process absent; mesial surface convex medially, without sculpture or armament, margins somewhat upturned, dorsomesial and ventromesial margins sharply ridged. Fixed finger about half length of palm, clearly overreaching midlength of dactylus, nearly straight to noticeably curved, terminating in subacute or acute tip; cutting edge unarmed or minutely dentate; lateral surface convex, with tufts of short setae adjacent to cutting edge; ventral margin with several long setae; concavity on mesiodorsal part occasionally with patch of dense setae. Dactylus subequal in length to or shorter than palm, weakly hooked, terminating in acute or subacute tip; dorsal and lateral surfaces occasionally with mat of dense, soft setae; cutting edge variable from sinuous to bearing 1 or 2 molar-like teeth.

Minor cheliped (Fig. 12D, E) rather slender, about 0.6-0.7 length of major cheliped, also showing considerable variation in stoutness and proportion of segments. Ischium with margins unarmed, ranging from slightly shorter to longer than merus; dorsal margin nearly straight; ventral margin weakly concave to straight. Merus varying from shorter to slightly longer than carpus; dorsal margin convex, unarmed; lateral

surface weakly convex, smooth; ventral margin usually with 1 small spine at midlength. Carpus 1.5-2.0 times longer than wide; dorsal and ventral margins bluntly ridged, smooth, with row of short setae. Palm as long as wide or slightly wider than long; dorsal margin bluntly ridged, smooth; ventral margin sharply ridged, with row of tufts or individual setae; lateral and mesial surfaces weakly convex, smooth. Fixed finger triangular, terminating in acute tip; cutting edge unarmed. Dactylus longer than palm, as long as fixed finger, terminating in acute tip; dorsal margin rounded, with row of tufts of setae; cutting edge smooth; hiatus between fingers prominent, sometimes filled with dense setation in males.

Second pereopod (Fig. 11H) chelate, moderately long and slender; ischium with numerous setae along ventral margin; merus with dorsal margin smooth, nearly straight, ventral margin sinuous, with row of numerous long setae; carpus subtriangular; chela triangular, with scattered tufts of short setae on lateral surface; palm much shorter than fingers; both fingers triangular, terminating in small corneous tip, cutting edges bordered by thin corneous ridge; carpus and chela fringed with short to long setae along margins. Third pereopod (Fig. 11I) moderately stout; ischium with weakly produced ventrodiscal angle; merus about 2.7 times longer than wide, with small spine on ventral margin proximally; carpus subtriangular, unarmed; propodus roundly subrectangular, about 1.5 times wider than long, with numerous tufts of short setae on lateral surface and row of numerous long setae along dorsal and ventral margins; ventral margin armed with 1 small subdistal spine practically obscured by setae; posterior margin not forming conspicuous heel; dactylus triangular, terminating in short, ventrolaterally directed corneous tip, lateral surface covered with short setae, dorsal and ventral margins with numerous short setae. Fourth pereopod (Fig. 11J) moderately stout, all segments unarmed; coxa flattened ventrally, unarmed, movable; propodus (Fig. 11K) 2.4-2.6 times longer than wide, slightly longer than carpus, lateral surface and ventral margin densely setose; dactylus elongate oval (Fig. 11L), about 2.5 times longer than wide, terminating in small, corneous tip. Fifth pereopod (Fig. 11M, N) chelate, moderately stout; propodus shorter than carpus, somewhat broadened distally.

First and second pleopods absent in males (Fig. 10E). Female first pleopod (Fig. 12G) with ramus slightly longer than protopod, abruptly tapering at midlength. Female second pleopod (Fig. 12H) with exopod noticeably curved mesially, slightly shorter

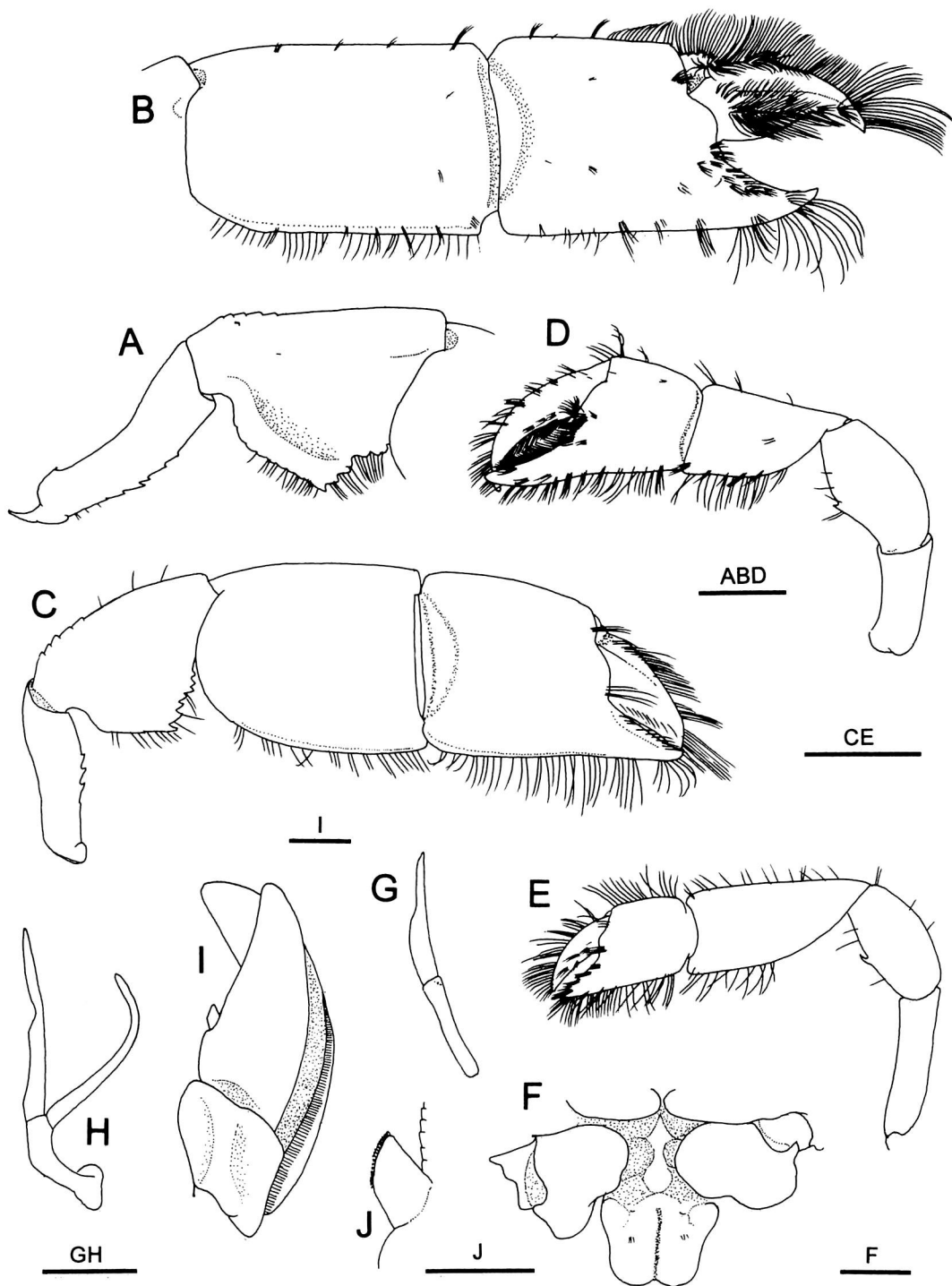


Fig. 12. *Paratrypaea bouvieri* (Nobili, 1904), comb. nov. A, B, D, F, I, J, male (cl 7.4 mm; CBM-ZC 7422), Chichi-jima Island, Ogasawara Islands; C, E, G, H, female (cl 5.8 mm; CBM-ZC 7423). A, ischium and merus of major (right) cheliped, lateral view; B, carpus and chela of major (right) cheliped, lateral view; C, major right cheliped, lateral view; D, E, minor (left) cheliped, lateral view; F, sternal shield and coxae of third pereopods, ventral view; G, left first pleopod, ventral view (setae omitted); H, left second pleopod, ventral view; I, left third pleopod, ventral view; J, appendix interna of third pleopod, ventral view. Scales: 2 mm for A-E; 1 mm for F-I; 0.5 mm for J.

than endopod; endopod with shallow concavity on mesial margin slightly distal to midlength; protopod strongly curved. Third to fifth pleopods (Fig. 12I) biramous, rami broad; appendices internae (Fig. 12J) stubby, arising at about proximal 0.3 of endopod, distinctly projecting beyond margin of endopod, bearing numerous small adhesive hooks along subtruncate mesial margin.

Uropod (Fig. 20F, G) overreaching posterior margin of telson. Endopod distinctly longer than wide, with obsolete middorsal carina and small dorsal plate, bordered with row of corneous spinules or stiff setae, subterminally; posterior margin of endopod unarmed. Exopod nearly as long as wide, with broad middorsal carina, unarmed on posterior margin; dorsal plate conspicuous, bordered with mixture of corneous spinules and stiff setae (not illustrated).

Coloration in life. Generally transparent to pale grayish green, with pink dots sometimes forming blotches (carapace) or transverse band on each pleonal somite. Major chelipeds white to pink.

Distribution. Widely distributed in the Indo-West Pacific: Red Sea, Gulf of Aden, India, Maldives, Sri Lanka, Philippines, Indonesia, and southern Japan; intertidal to 30 m (Nobili, 1906; Borradaile, 1904, Holthuis, 1958; Sakai, 1970, 1999, 2005; Dworschak, 1992). Japanese records include: Amakusa (Kumamoto Prefecture), Tsushima (Nagasaki Prefecture), Ryukyu Islands and Ogasawara Islands (Sakai, 1970, 1987; this study).

Remarks. The specific identity of the present material from the Ogasawara Islands has been confirmed by the comparison with the type (MNHN-Th 65). Individual variation of the major cheliped of this species has been reported by Dworschak and Pervesler (1988) and Sakai (1999) (as *Callianassa bouvieri*). In the present material, a wide range of variation is seen in the length of the entire major cheliped, conformation of the ventral margin of the merus, armament of the dactylus, and the setation of the fingers. The elongation of the major cheliped and dense setation on the fingers are conspicuous in large males. No correlation to sexes is found in the variation of the armament of the dactylus.

The synonymy of *Callianassa maldivensis* Borradaile, 1904 follows Sakai (1999; 2005), since we did not examine the type of Borradaile's taxon. Sakai (1999; 2005) considered *C. rectangularis* Ngoc-Ho, 1991, described from New Caledonia, to be a junior synonym of the present species. On the other hand, Tudge *et al.* (2000) assigned Ngoc-Ho's (1991) taxon to the genus *Cheramus*. Reexamination of the holotype of

Paratrypaea rectangularis (MNHN-Th 1069) has shown that the taxon is indeed distinct from *Paratrypaea bouvieri*, although the morphological similarities suggest that the two taxa are congeneric. The broad third to fifth pleopods each bearing a stubby appendix interna clearly exclude *Paratrypaea rectangularis* from *Cheramus*. The distoventral margin of the merus of the third maxilliped seems to be more strongly produced in *P. rectangularis* than in *P. bouvieri*. The posterolateral angle is armed with two spinules in *P. rectangularis*, rather than being unarmed in *P. bouvieri*. The ventral margin of the merus of the major cheliped bears a broadly triangular, marginally denticulated or incised projection in *P. bouvieri*, but the margin is not produced and only serrated in *P. rectangularis*. All these diagnostic characters are clearly illustrated by Ngoc-Ho (1991).

Poore (2000) assigned the present species to *Trypaea* without comments. However, *Paratrypaea bouvieri* differs from *Trypaea australiensis* Dana, 1852, the type species of *Trypaea*, in many respects (Poore and Griffin, 1979). In *P. bouvieri*, the antennular peduncle is 1.1-1.2 times longer than the antennal peduncle; the second segment is moderately slender. In contrast, in *T. australiensis*, the antennular peduncle is greatly elongate, about 1.8 times longer than the antennal peduncle; the second segment is stout. The ventral projection on the merus of the major cheliped is broadly triangular in *P. bouvieri*, rather than hook-like in *T. australiensis*. The heel of the propodus of the third pereopod is not developed in *P. bouvieri*, but well developed in *T. australiensis*. The male first pleopod is absent in *P. bouvieri*, but present in *T. australiensis*. Furthermore, the third maxilliped of *T. australiensis* is distinctive; the ventrodorsal projection of the merus is prominent, thus the length along the dorsal margin is about twice of the length along the ventral margin; the carpus is greatly elongate. We cannot conclude that the two species are congeneric.

***Rayllianassa* gen. nov.**

Type species. *Callianassa amboinensis* de Man, 1888. Present designation, by monotypy. Gender: masculine.

Diagnosis. Carapace with dorsal oval; rostrum obsolete or broadly triangular, not spiniform; linea thalassinica distinct. Second somite of pleon subequal in length to sixth somite; third to fifth pleonal somites each with lateral tufts of setae. Telson trapezoidal. Eyestalk relatively long, flattened dorsoventrally; cornea distinct, disk-shaped, subterminal, lateral. Antennular peduncle longer than antennal peduncle. Epipod of first maxilliped subtriangular. Exopods

present on first and second maxillipeds. Third maxilliped with merus-ischium broadly operculiform; ischium with crista dentata consisting of row of small spines or denticles, superior to midline; propodus and dactylus slender, latter digitiform; exopod absent. Single arthrobranch above base of second maxilliped, paired arthrobranches above base of third maxilliped to fifth pereopods. Chelipeds (first pereopods) weakly unequal and dissimilar in male and female, major without conspicuous projection on ventral margin; carpus of minor cheliped much deeper than long. Propodus of third pereopod subcircular. Propodus of fourth pereopod moderately broad. Fifth pereopod subchelate. First and second pleopods present in male; first pleopod showing as minute rudimentary bud; second pleopod very small, consisting of protopod, rudimentary exopod and small endopod. Female with uniramous first pleopod and biramous second pleopod. Third to fifth pleopods biramous, foliaceous in both sexes; appendices internae longer than wide, distinctly projecting from mesial margin of endopod. Uropodal exopod with dorsal plate bearing thick assemblage of stiff setae posteriorly; endopod without dorsal plate.

Remarks. A phylogenetic analysis based on morphological characters by Tudge *et al.* (2000) suggests that *Callianassa amboinensis* is basal to the subfamily Callianassinae. They noted that the species might warrant separate generic status. The strongly operculate third maxilliped and stubby appendices internae of the third to fifth pleopods link *C. amboinensis* to several previously described genera, including *Biffarius*, *Gilvossius*, *Neotrypaea*, *Nihonotrypaea*, *Notiax*, *Pestarella*, *Paratrypaea*, *Pseudobiffarius* and *Trypaea*. However, *Callianassa amboinensis* appears unique in the structure of the minor cheliped. In *C. amboinensis*, the minor cheliped is rather stout, of which the carpus is much wider than long. In species of the other genera, the minor cheliped is slender to very slender, of which the carpus is much longer than wide. Following the key of Poore (1994), *C. amboinensis* is placed close to *Biffarius* and *Gilvossius*. *Callianassa amboinensis* cannot be referred either to *Biffarius* and *Gilvossius* by the lack of a conspicuous projection on the ventral margin of the merus of the major cheliped. In *Biffarius* and *Gilvossius*, the merus of the major cheliped is normally provided with a conspicuous hook-like spine or projection on the ventral margin (Manning and Felder, 1991a; 1991b). From *Biffarius*, *C. amboinensis* differs in the antennular peduncle being longer than the antennal peduncle. Consequently, we propose a new genus *Rayllianassa* to accommodate *C. amboinensis*.

Etymology. This new genus is dedicated to the late Dr. Raymond B. Manning for his great contributions to the systematics of decapod and stomatopod crustaceans, particularly to the Callianassidae.

***Rayllianassa amboinensis* (de Man, 1888), comb. nov.**
(Figs 13-15)

Callianassa amboinensis de Man, 1888: 480, pl. 20, fig. 4 [type locality: Ambon, Indonesia]; Poore and Griffin, 1979: 248, fig. 14; Sakai, 1984: 96, figs. 1, 2; 1988: 53, 57, fig. 1; Ngoc-Ho, 1991: 283, fig. 1; Sakai, 1999: 35 (key), 38; Tudge *et al.*, 2000: 143; Ngoc-Ho, 2005: 68, fig. 12.

Callianassa (Trypaea) amboinensis - de Man, 1928: 27, 93, 107, 165, pl. 18, fig. 28-28c.

Callianassa ngochoae Sakai, 1999: 49 [type locality: Grand Récif Sud, New Caledonia, 80 m].

Material examined. Chichi-jima Island: CMNH-ZC 2242, 1 ovigerous female (cl 4.9 mm), Matsuyama, 6 m, 9 January 1996, SCUBA diving, coll. H. Tachikawa.

Other material. Philippines: MNHN-Th 1227, 1 female (cl 3.5 mm), MUSORSTOM 3, stn DR 117, 12° 31' N, 120° 39' E, 92-97 m, 3 June 1985. New Caledonia: MNHN-Th 1071, 1 male (cl 2.8 mm), south of Grand Récif, stn 392, 80 m, 22° 48' S, 167° 02' E, 22 January 1985, coll. B. Richer de Forges.

Description. Carapace (Fig. 13A-D) about 0.2 of total body length; rostrum obsolete or broadly triangular; anterolateral projections obtuse; anterolateral concavity deep, with tiny cleft; dorsal oval well defined, smooth, cervical groove across about posterior 0.2 of carapace length; linea thalassinica extending nearly to posterolateral margin of carapace.

Length ratio of first to sixth pleonal somites measured along midline 0.6 : 1.0 : 0.7 : 0.7 : 0.5 : 0.7 (Fig. 13F). First pleonal somite narrowing anteriorly in dorsal view; pleuron not delimited. Second somite with posterolateral margin of pleuron weakly produced, bearing few tufts of long setae. Third to fifth pleura each with prominent tuft of plumose setae; fifth pleuron also with short longitudinal row of short setae on adjacent to ventral margin posteriorly; posteroventral margin of each pleuron slightly produced posteriorly, rounded. Sixth somite slightly wider than long, subquadrate in dorsal view, bearing faint notches on posterior one-third, lacking ventrolateral projection; ventral margin with row of very short setae. Telson (Fig. 13F, G) trapezoidal, slightly longer than wide; dorsal surface nearly flat; lateral margin unarmed; posterior margin roundly truncate, with shallow median notch, but unarmed.

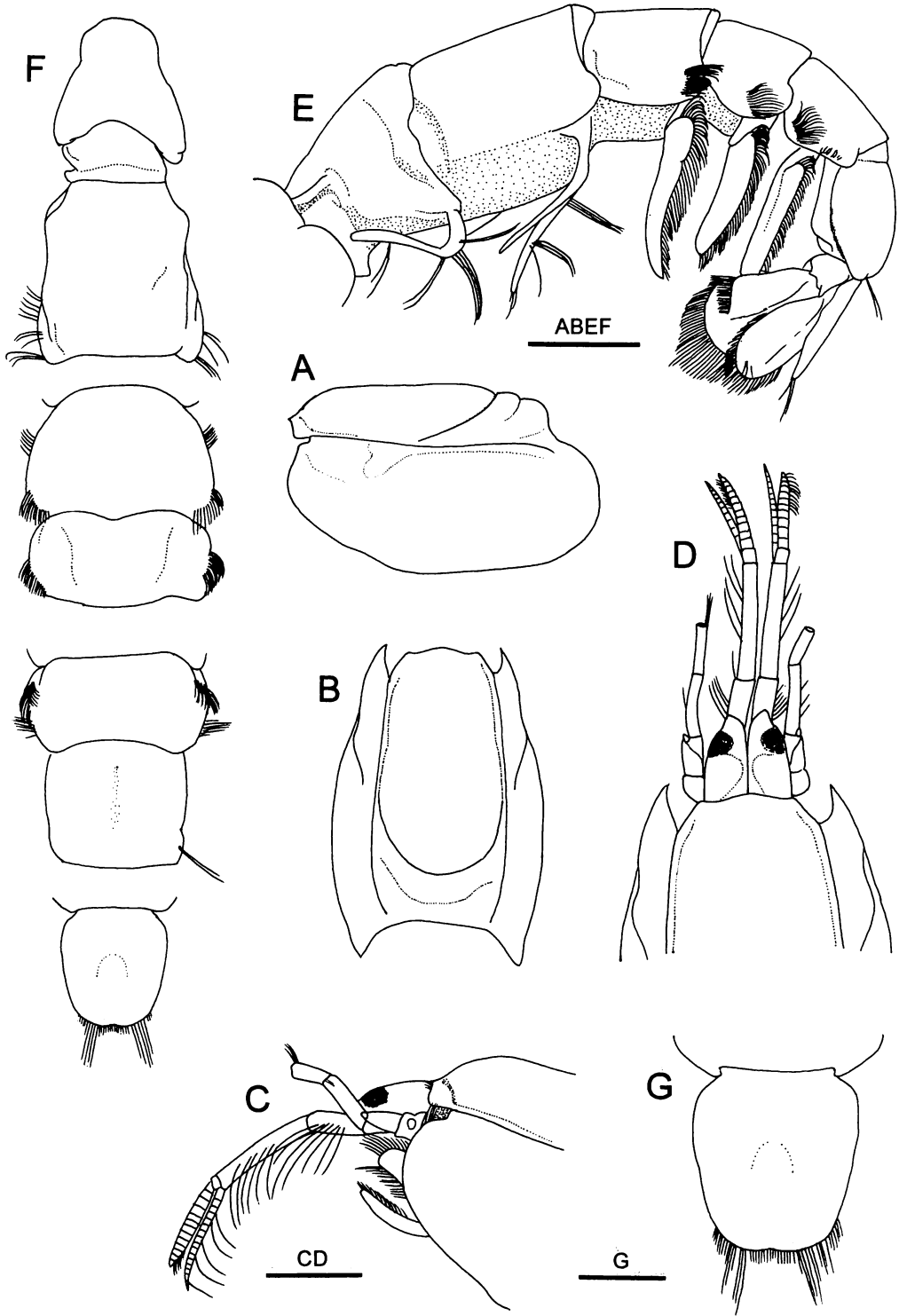


Fig. 13. *Rayllianassa amboinensis* (de Man, 1888), comb. nov. Ovigerous female (cl 4.9 mm; CMNH-ZC 2242), Matsuyama, Chichijima Island, Ogasawara Islands. A, carapace, lateral view; B, same, dorsal view; C, anterior part of carapace and cephalic appendages, lateral view (antennal flagella missing); D, same, dorsal view; E, pleon, pleonal appendages, and telson, lateral view; F, same, dorsal view (uropods omitted); G, telson, dorsal view. Scales: 2 mm for A-F; 1 mm for G.

Eyestalks (Fig. 13C, D) contiguous, flattened, each overreaching distal margin of first segment of antennular peduncle, terminating in obliquely truncate projection; lateral margin slightly sinuous; cornea subterminal and lateral, disk-shaped, corneal width greater than half of peduncular width.

Antennular peduncle (Fig. 13C, D) distinctly longer than antennal peduncle; first segment short, fully concealed by eye-stalk in dorsal view; second segment slightly longer than first segment; third segment about twice length of second segment, not stouter than that, slightly tapering distally; second and third segments with row of long setae on ventral surfaces; antennular flagella both shorter than third segment of peduncle; dorsal flagellum thicker, but shorter than ventral flagellum; ventral flagellum with row of long setae on ventral margin. Antennal peduncle reaching midlength of third segment of antennular peduncle; distal two segments subcylindrical; scaphocerite rudimentary, subovate; flagellum missing in specimens examined.

Epistome devoid of tuft of setae.

Sternal shield on seventh thoracic somite (Fig. 15D) trapezoidal, broadened anteriorly, divided by deep median groove; anterior margin weakly produced medially; anterolateral lobes each clearly delimited by distinct groove.

Maxilla (Fig. 14A, B) with relatively slender, unsegmented endopod tapering distally to curved tip and bearing subterminal tuft of relatively short setae on lateral margin; scaphognathite relatively small, anterior lobe falling far short of distal margin of basial endite; coxal endite consisting of two greatly unequal lobes, anterior lobe narrow rectangular, posterior lobe triangular; basial endite large, with fine setae marginally and submarginally, divided in two strongly unequal lobes. First maxilliped (Fig. 14C) with endopod reduced to rounded, rudimentary bud, still visible in outer view; coxal endite flattened mesially, weakly divided in two lobes (Fig. 14D); basial endite elongate oval; exopod noticeably curved mesially, non-segmented, reaching distal margin of basial endite, with submarginal tuft of several long setae on outer surface mesially; epipod subtriangular. Second maxilliped (Fig. 14E) with relatively stout endopod; dactylus longer than wide; exopod short, moderately narrow, slightly overreaching midlength of merus-ischium fused segment, partially visible in outer view; epipod greatly reduced to rudimentary bud (not figured); podobranch absent. Third maxilliped (Fig. 14F, G) without exopod; ischium-merus very broadly operculiform, about 1.5 times longer than wide, with

numerous setae on ventral margin; ischium slightly wider than long, slightly widened distally, crista dentata consisting of row of small acute spines arranged in sinuous row on superior to midline; merus about twice wider than long, distinctly shorter than ischium, unarmed on distolateral margin, ventrodistal angle not markedly produced; carpus longer than wide, distinctly shorter than merus; propodus more than twice longer than wide, slightly longer than carpus; dactylus slender, digitiform, shorter than propodus.

Chelipeds (first pereopods) unequal in size, but rather similar in structure. Major cheliped (Fig. 15A, B) massive, not particularly elongate. Ischium relatively stout, becoming wider distally in general contour, dorsal margin slightly sinuous, unarmed; lateral surface convex; ventral margin with 2 small spines or tubercles. Merus longer than carpus, wider than long; dorsal margin strongly convex, unarmed; lateral surface generally convex, distoventral part forming shallow concavity to accommodate proximoventral margin of carpus; mesial surface nearly flat; ventral margin sinuous, with few tiny spines or tubercles in proximal half. Carpus subsemicircular, not elongate; dorsal and ventral margins rounded; lateral surface smooth, convex; mesial surface shallowly concave in proximal half, weakly convex in distal half. Palm 1.25-1.35 times longer than wide; dorsal and ventral margins rounded; lateral surface smooth, convex, with few tufts of setae distally; palmar process absent; mesial surface weakly convex, without sculpture or armament; ventral margin (including fixed finger) slightly sinuous. Fixed finger greater than half length of palm, slightly curved, terminating in subacute tip; cutting edge without conspicuous teeth; ventral margin with few tufts of long setae; mesial surface with shallow excavation proximally. Dactylus slightly shorter than palm, weakly curving, terminating in subacute tip, crossing with fixed finger when closed; dorsal and lateral surfaces with few tufts of short setae; cutting edge unarmed; mesial surface weakly elevated along midline.

Minor cheliped (Fig. 15C) stout. Ischium similar to that of major cheliped, slightly longer than merus. Merus slightly shorter than ischium, about 1.4-1.5 times longer than wide; dorsal margin strongly convex, unarmed; lateral surface with shallow concavity ventrodistally to accommodate proximoventral margin of merus; ventral margin unarmed, slightly sinuous. Carpus distinctly wider than long; dorsal and ventral margins rounded, unarmed. Palm about 1.3 times longer than wide; dorsal and ventral margins

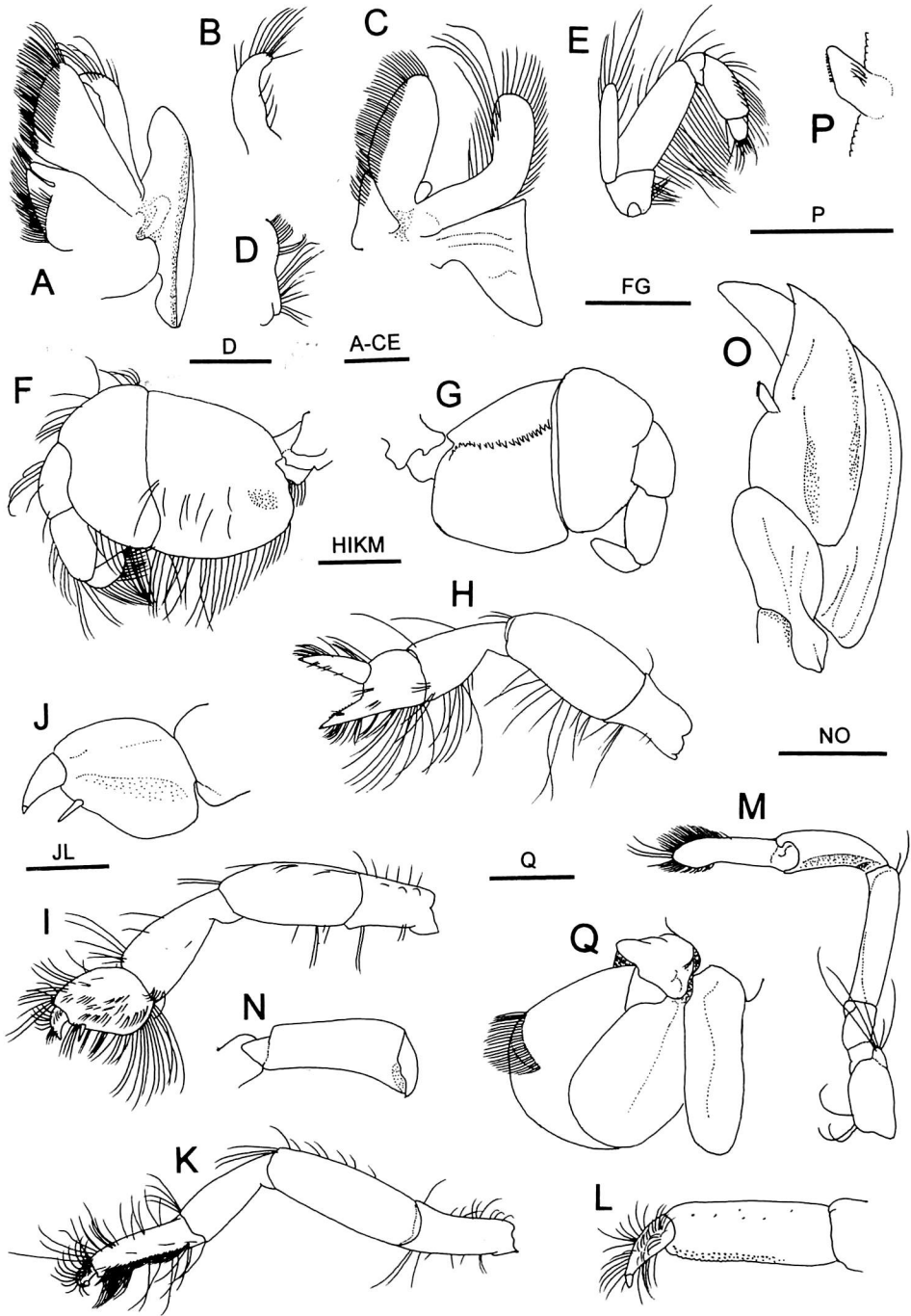


Fig. 14. *Raylianassa amboinensis* (de Man, 1888), comb. nov. Ovigerous female (cl 4.9 mm; CMNH-ZC 2242), Matsuyama, Chichijima Island, Ogasawara Islands. A, left maxilla, outer view (setae partially omitted) ; B, endopod of left maxilla, inner view ; C, left first maxilliped, outer view ; D, coxal endite of left first maxilliped, obliquely inner view ; E, left second maxilliped, inner view ; F, left third maxilliped, lateral view ; G, same, mesial view (setae omitted) ; H, left second pereopod, lateral view ; I, left third pereopod, lateral view ; J, propodus and dactylus of left third pereopod, lateral view (setae omitted) ; K, left fourth pereopod, lateral view ; L, propodus and dactylus of left fourth pereopod, perpendicular lateral view ; M, left fifth pereopod, lateral view ; N, propodus and dactylus of left fifth pereopod, extensor view ; O, left third pleopod, ventral view ; P, close up of appendix interna of left third maxilliped, ventral view ; Q, left uropod, perpendicular dorsal view (setae omitted). Scales: 1 mm for F, G-I, K, M-O, Q ; 0.5 mm for A-E, J, L, P.

rounded, latter with row of tufts or individual setae; lateral and mesial surfaces weakly convex, smooth. Fixed finger elongate triangular, terminating in acute tip; cutting edge forming thin edge, with 1 or 2 low teeth or minutely serrate. Dactylus subequal in length to palm, terminating in acute tip; dorsal margin rounded, with tufts of stiff setae; cutting edge forming thin edge, nearly smooth or minutely serrate; hiatus between fingers very narrow.

Second pereopod (Fig. 14H) chelate, relatively stout; ischium with sparse setae along ventral margin; merus with slightly convex dorsal and slightly sinuous ventral margins, both with few setae; carpus widened distally; chela triangular, with few tufts of short setae on lateral surface; palm distinctly shorter than fingers; both fingers elongate triangular, terminating in small corneous tips, cutting edges with row of minute corneous teeth; carpus and chela fringed with short to long setae along ventral margins. Third pereopod (Fig. 14I) relatively stout; ischium with ventrodorsal angle not markedly produced; merus about 2.4 times longer than wide, unarmed on ventral margin; carpus widened distally, unarmed; propodus (Fig. 14J) roundly suboval, with numerous tufts of short setae on lateral surface and row of numerous long setae along dorsal and ventral margins, ventral margin with 1 long corneous spine subdistally; dactylus (Fig. 14J) triangular, slightly curved, terminating in small corneous tip, lateral surface covered with short setae, dorsal and ventral margins with numerous short setae. Fourth pereopod (Fig. 14K) moderately stout, all segments unarmed, articulation between carpus and propodus strongly twisted; coxa large, flattened ventrally, unarmed, partially fused with sternum, immovable; propodus (Fig. 14L) about 2.6 times longer than wide, slightly longer than carpus, dorsal and ventral margins densely setose; dactylus subtriangular, terminating in small, curved corneous tip. Fifth pereopod (Fig. 14M, N) subchelate, moderately stout; propodus subequal in length to carpus, slightly broadened distally.

Male first pleopod greatly reduced to minute papilla; male second pleopod very small, exopod greatly reduced to rudimentary bud, endopod slightly shorter than protopod. Female first pleopod with distal segment distinctly longer than protopod, curved mesially. Female second pleopod with exopod noticeably curved mesially, slightly shorter than endopod; endopod consisting of two segments, distal segment shorter than proximal segment; protopod strongly curved. Third to fifth pleopods (Fig. 14O) biramous, rami broad; appendices internae (Fig. 14P) longer than wide, distinctly projecting beyond margin of

endopod, arising at about midlength of endopod, each bearing numerous small adhesive hooks along obliquely truncate mesial margin; protopods broad, flattened.

Uropod (Fig. 14Q) overreaching posterior margin of telson. Endopod distinctly longer than wide, middorsal carina obsolete, posterior margin unarmed. Exopod slightly longer than wide, middorsal carina weak, posterior margin unarmed; dorsal plate with distal rows of stiff setae distinctly separated from setal row of posterior margin.

Coloration in life. Unavailable.

Distribution. Ambon, Indonesia (de Man, 1888); Eylath, Israel (Holthuis, 1958); Dampier Archipelago, Western Australia (Poore and Griffin, 1979); Heron Island, Queensland, Australia (Sakai, 1984); Port Essington, Northern Territory, Australia (Sakai, 1988); New Caledonia (Ngoc-Ho, 1991); Marquesus Islands, French Polynesia (Ngoc-Ho, 2005); and Ogasawara Islands, Japan (this study). The present specimen from Chichi-jima Island represents the first record of this species from Japanese waters.

Remarks. The present specimen from the Ogasawara Islands agrees well with the previous descriptions or accounts of *Callianassa amboinensis* (cf. de Man, 1888; Sakai, 1984; 1988; Ngoc-Ho, 1991).

This species was first described by de Man (1888) based on a single specimen from Ambon, Indonesia, collected by Dr. J. Brock. Ngoc-Ho (1991) considered that an ovigerous female collected by the Siboga Expedition was the holotype, but Sakai (1999) pointed out that Ngoc-Ho's (1991) interpretation was incorrect. Sakai (1999) noted that three specimens collected by Dr. Brock in 1885 were still extant in the collection of the Senckenberg Museum, but he indicated that none of them should be the holotype. The holotype is presumably no longer extant (Sakai, 1999).

Sakai (1999) considered that the single male specimen identified with *Callianassa amboinensis* by Ngoc-Ho (1991) should represent a separate species, which he named *C. ngochoae*, but he (Sakai, 2005) later returned Ngoc-Ho's specimen, the holotype of *C. ngochoae*, to placement in *C. amboinensis*.

Concluding Remarks

It is generally known that the fauna and flora of the Ogasawara Islands are endemic-rich, but five of the six thalassinidean species reported in this paper are all widely distributed in the Indo-Pacific. *Planaxius brevifrons* is so far known from the Ogasawara Islands and the Japanese mainland, suggesting a wider geographical range than currently documented. In spite of

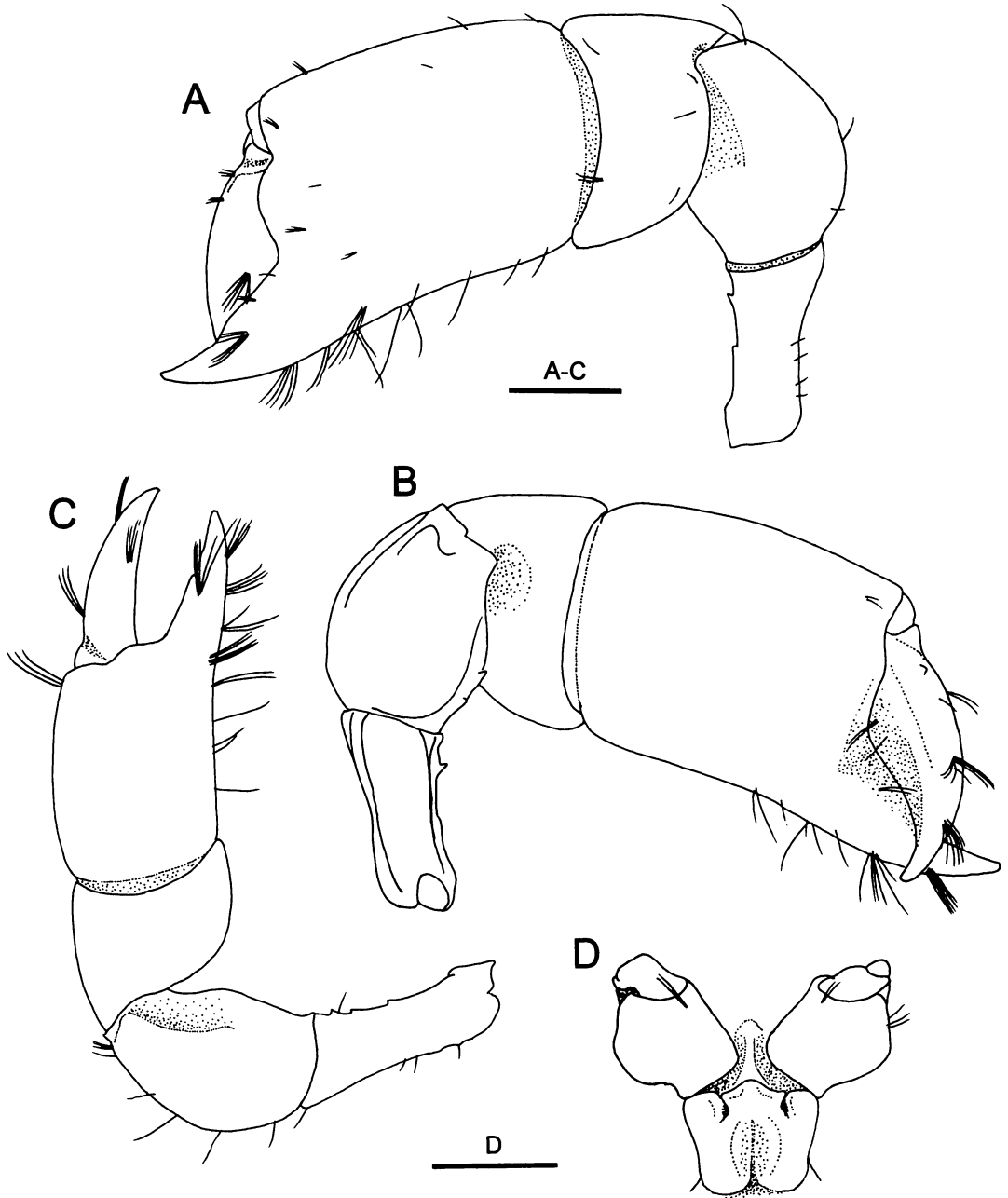


Fig. 15. *Rayllianassa amboinensis* (de Man, 1888), comb. nov. Ovigerous female (cl 4.9 mm; CMNH-ZC 2242), Matsuyama, Chichijima Island, Ogasawara Islands. A, major (left) cheliped, lateral view; B, same, mesial view; C, minor (right) cheliped, lateral view; D, coxae of third pereopods and sternal shield, ventral view. Scales: 1 mm.

the long-term survey by the second author, the collection is rather scarce. This seems to reflect the difficulty of collecting, because thalassinidean shrimps are found in cryptic habitats (*e.g.*, Dworschak, 2000). It is expected that future surveys will eventually reveal the presence of more species in the Ogasawara

Islands.

Acknowledgments

We thank Dr. Kyoko Kinoshita and Mr. Masahiro Marumura for providing us with valuable specimens for study. We are grateful to Régis Cleva of MNHN,

Paris, for making available comparative specimens deposited in MNHN for this study and to Dr. Peter C. Dworschak of the Naturhistorisches Museum, Wien, Dr. Darryl L. Felder of the University of Louisiana, and Dr. Christopher Tudge of the Biology Department, American University, for reviewing the manuscript and offering valuable comments for improvements. The senior author wishes to express sincere thanks to Prof. Dr. Susumu Segawa and Dr. Kotaro Tsuchiya of Tokyo University of Marine Science and Technology and crews on board the 1997 research cruise of the TRV *Shin'yo-maru* for collaborating to collect decapod specimens. Thanks are also extended to MNHN for providing the senior author with short-term research grants to study at MNHN. This study was partially supported by a grant from the Showa Seitoku Memorial Foundation to the first author.

References

- Borradaile, L. A. 1903. On the classification of Thalassinidea. *Ann. Mag. Nat. Hist.* (7) 12: 534-551.
- Borradaile, L. A. 1904. Marine Crustaceans. XIII. The Hippidae, Thalassinidea and Scyllaridea. *In* The Fauna and Geography of the Maldive and Laccadive Archipelagoes Vol. 2, pp. 750-754.
- Clark, P. F., B. S. Galil and G. C. B. Poore. 2007. A new species of *Calaxius* Sakai & de Saint Laurent, 1989, from West Africa (Crustacea: Decapoda: Axiidae) and synonym of *Manaxius* Kensley, 2003. *Proc. Biol. Soc. Wash.* 120: 63-73.
- Dworschak, P. C. 1992. The Thalassinidea in the Museum of Natural History, Vienna, with some remarks on the biology of the species. *Ann. Naturhist. Mus. Wien* 93(B) : 189-238.
- Dworschak, P. 2000. Global diversity in the Thalassinidea (Decapoda). *J. Crust. Biol.* 20, Special No. 2: 238-245.
- Dworschak, P. and P. Pervesler. 1988. Burrows of *Callianassa bouvieri* Nobili, 1904 from Safaga (Egypt, Red Sea) with some remarks on the biology of the species. *Senck. Marit.* 20 : 1-17.
- Galil, B. and P. F. Clark. 1993. A new genus and species of axiid (Decapoda, Thalassinidea) from the Levantine Basin of the Mediterranean. *Crustaceana* 64: 48-55.
- Heard, R. and R. B. Manning. 1998. A new genus and species of ghost shrimp (Crustacea: Decapoda: Callianassidae) from the Atlantic Ocean. *Proc. Biol. Soc. Wash.* 111: 883-888.
- Hendrickx, M. E. 2002. First record of *Axiopsis serratifrons* (A. Milne Edwards, 1873) (Crustacea: Decapoda: Thalassinidea) in western Mexico. *Hydrobiológica* 12: 163-172.
- Holthuis, L. B. 1958. Macrura. Crustacea Decapoda from the northern Red Sea (Gulf of Aqaba and Sinai Peninsula). I. Contributions to the knowledge of the Red Sea. No. 8. *Bull. Sea Fish. Res. St. Haifa* 17:1-40.
- Itani, G. 2007. [Arthropoda Malacostraca Decapoda Thalassinidea]. *In* [Report on the Shallow Water Ecosystem Investigation (Tidal Flats)], pp. 201-203. Biodiversity Center of Japan, Ministry of the Environment, Fuji-Yoshida, Yamanashi. (in Japanese)
- Kensley, B. 1981. Notes on *Axiopsis* (*Axiopsis*) *serratifrons* (A. Milne-Edwards) (Crustacea: Decapoda: Thalassinidea). *Proc. Biol. Soc. Wash.* 109: 70-74.
- Kensley, B. 1996. New thalassinidean shrimp from the Pacific Ocean (Crustacea: Decapoda: Axiidae and Calocarididae). *Bull. Mar. Sci.* 59: 469-489.
- Kensley, B. 2003. Axioid shrimps from Guam (Crustacea, Decapoda, Thalassinidea). *Micronesia* 35/36: 359-384.
- Komai, T., S. Ohtsuka, K. Nakaguchi and A. Go. 2002. Decapod crustaceans collected from the southern part of the Sea of Japan in 2000-2001 using TRV *Toyoshio-maru*. *Nat. Hist. Res.* 7: 19-73.
- Komai, T. and H. Tachikawa. 2007. New genus and species of axiid shrimp (Crustacea: Decapoda: Thalassinidea) from Japan. *Bulletin of the National Museum of Nature and Science, Series A (Zoology)* 33: 113-126.
- Kossmann, R. 1880. *Reise in die Kustengebiete des Roten Meeres*, vol. 2, part 1, section III, Malacostraca. *Zool. Ergeb. Auf. K. Acad. Wiss. Berlin* 1880: 67-140.
- Le Leouff, P. and A. Intés. 1974. Les Thalassinidea (Crustacea: Decapoda) du Golfe de Guinée. *Systématique - Ecologie. Cah. ORSTOM* 12: 17-69.
- Lanchester, W. F. 1901. On the Crustacea collected during the Skeat Expedition to the Malay Peninsula, together with a note on the genus *Actaeopsis*. Part 1. Brachyura, Stomatopoda and Macrura. *Proc. Zool. Soc. London* 1901: 534-574, pls. 33, 34.
- Lin, F.-J., T. Komai and T.-Y. Chan. 2007. A new species of a callianassid shrimp (Crustacea: Decapoda: Thalassinidea) from deep-water hydrothermal vents off Taiwan. *Proc. Biol. Soc. Wash.* 120: 143-158.
- Liu, R. and Z. Zhong. 1994. Dendrobranchiata, Caridea, Astacidea, Thalassinidea and Palinuridea. *In* Huang, Z. (ed.), *Marine Species and Their Distributions in China's Seas*, pp. 545-568. China Ocean Press, Beijing. (In Chinese)
- Man, J. G. de. 1888. *Berichte über die in Indischen Archipel von Dr. J. Brock gesammelten Decapoden*

- und Stomatopoden. Arch. Naturgesch. 53: 215-600, pls. 7-22a.
- Man, J. G. de. 1905. Diagnoses of new species of macrurous decapod Crustacea from the "Siboga Expedition." Tijds. Neder. Dier. Ver. Leiden 9: 287-614.
- Man, J. G. de. 1925. The Decapoda of the Siboga Expedition. Part VI. The Axidae collected by the Siboga Expedition. Siboga Expeditie 39a5: 1-128, pls. 1-10.
- Man, J. G. de. 1928. The Decapoda of the Siboga Expedition. Part VII. The Thalassinidae and Callianassidae collected by the Siboga Expedition, with some remarks on the Laomeidiidae. Siboga Expeditie 39a6: 1-187, pls. 1-20.
- Manning, R. B. and D. L. Felder. 1991a. Revision of the American Callianassidae (Crustacea : Decapoda: Thalassinidea). Proc. Biol. Soc. Wash. 104: 764-792.
- Manning, R. B. and D. L. Felder. 1991b. *Gilvossius*, a new genus of callianassid shrimp from the eastern United States (Crustacea : Decapoda : Thalassinidea). Bull. Mar. Sci. 49: 558-561.
- Manning, R. B. and A. Tamaki. 1998. A new genus of ghost shrimp from Japan. Proc. Biol. Soc. Wash. 111: 889-892.
- Melin, G. 1939. Paguriden und Galatheiden von Prof. Dr. Sixten Bocks Expedition nach den Bonin-Inseln 1914. K. Svensk. Vetensk. Handl. (3) 18: 1-119.
- Milne-Edwards, A. 1873. Description de quelques Crustacés nouveaux ou peu connus provenant du Musée de M. C. Godeffroy. J. Mus. Godeffroy 4: 77-88.
- Milne Edwards, H. 1837. Histoire naturelle des Crustacés, comprenant l'anatomie, la physiologie et la classification de ces animaux 2. 532 pp. Paris.
- Ngoc-Ho, N. 1991. Sur quelques Callianassidae et Upogebiidae de Nouvelle-Calédonie (Crustacea, Thalassinidea). In Richer de Forges, B. (ed.) Le Benthos des Fonds Meubles des Lagon de Nouvelle Calédonie Vol. 1, pp. 281-311. ORSTOM, Paris.
- Ngoc-Ho, N. 1994. Some Callianassidae and Upogebiidae from Australia with description of four new species (Crustacea: Decapoda: Thalassinidea). Mem. Mus. Vict. 54: 51-78.
- Ngoc-Ho, N. 2003. European and Mediterranean Thalassinidea (Crustacea, Decapoda). Zoosystema 25: 439-555.
- Ngoc-Ho, N. 2005. Thalassinidea (Crustacea, Decapoda) from French Polynesia. Zoosystema 27: 47-83.
- Nobili, G. 1904. Diagnoses préliminaires de vingthuit espèces nouvelles de stomatopodes et de décapodes macroures de la mer Rouge. Bull. Mus. Natn. Hist. Nat. 10: 228-237.
- Nobili, G. 1906. Mission J. Bonnier et Ch. Perez (Golfe Persique 1901) : Crustacés Décapodes et Stomatopodes. Bull. Sci. Fr. Ber. 40: 13-159, pls. 2-7.
- Nomura, K., S. Nagai, A. Asakura and T. Komai. 1996. A preliminary list of shallow water decapod Crustacea in the Kerama Group, the Ryukyu Archipelago. Bull. Biogeogr. Soc. Japan 51: 7-21.
- Ooishi, S. 1970. Marine invertebrate fauna of the Ogasawara and Volcano Islands collected by S. Ooishi, Y. Tomida, K. Izawa and S. Manabe. In Report on the Marine Biological Expedition to the Ogasawara (Bonin) Islands, 1968, pp. 75-95, pls. 10-17. Toba Aquarium, Toba, and Asahi Shinbun Publishing Company, Tokyo.
- Poore, G. C. B. 1994. A phylogeny of the families of Thalassinidea (Crustacea: Decapoda) with keys to families and genera. Mem. Mus. Vic. 54: 79-120.
- Poore, G. C. B. 1997. A review of the thalassinidean families Callianideidae Kossmann, Micheleidae Sakai, and Thomassiniidae de Saint Laurent (Crustacea, Decapoda) with descriptions of fifteen new species. Zoosystema 19: 345-420.
- Poore, G. C. B. 2000. A new genus and species of callianassid ghost shrimp from Kyushu, Japan (Decapoda: Thalassinidea). Jour. Crust. Biol. 20, Spec. No. 2: 150-156.
- Poore, G. C. B. and D. J. G. Griffin. 1979. The Thalassinidea (Crustacea: Decapoda) of Australia. Rec. Aust. Mus. 32: 217-321.
- Poupin, J. 1994. Quelques crustacés décapodes communs de Polynésie Française. Rapport Scientifiques du Service Mixte de Surveillance Radiologique et Biologique de l'homme et de l'environnement. 86 pp., 8 pls. Monthéry.
- 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. 1984. Some thalassinideans (Decapoda: Crustacea) from Heron Is., Queensland, eastern Australia, and a new species of *Gouretia* from East Africa. Beagle 1: 95-108.
- Sakai, K. 1987. Two new Thalassinidea (Crustacea: Decapoda) from Japan, with the biogeographical distribution of the Japanese Thalassinidea. Bull. Mar. Sci. 41: 296-308.
- Sakai, K. 1988. A new genus and five new species of Callianassidae (Crustacea: Decapoda: Thalassinidea) from northern Australia. Beagle 5: 51-69.
- Sakai, K. 1992a. The families Callianideidae and Thalassinidae, with the descriptions of two new sub-families, one new genus and two new species

(Decapoda, Thalassinidea). Naturalists 4: 1-33.

Sakai, K. 1992b. 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.

Sakai, K. 1994. Eleven species of Australian Axiidae (Crustacea: Decapoda: Thalassinidea) with descriptions of one new genus and five new species. Beagle 11: 175-202.

Sakai, K. 1999. Synopsis of the family Callianassidae, with keys to subfamilies, genera and species, and the description of new taxa (Crustacea: Decapoda: Thalassinidea). Zool. Verh. 326: 1-152.

Sakai, K. 2002. Callianassidae (Decapoda, Thalassinidea) in Phuket, Thailand. In Bruce, N. L., M. Berggren and S. Bussarawit (eds.) Proceedings of the International Workshop on the Biodiversity of Crustaceans of the Andaman Sea. Phuket Marine Biological Center Special Publ. 23: 461-532.

Sakai, K. 2004. Dr. R. Plante's collection of the families Callianassidae and Gourretiidae (Decapoda, Thalassinidea) from Madagascar, with the description of two new genera and one new species of the Gourretiidae Sakai, 1999 (new status) and two new species of the Callianassidae Dana, 1852. Crustaceana 77: 553-601.

Sakai, K. 2005. Callianassoidea of the World (Decapoda, Thalassinidea). Crustaceana Monographs 4. 285 pp. E. J. Brill, Leiden.

Sakai, K. and M. de Saint Laurent. 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. Naturalist 3: 1-104.

Tudge, C. C. G. C. B. Poore and R. Lemaitre. 2000. Preliminary phylogenetic analysis of generic relationships within the Callianassidae and Ctenochelidae (Decapoda: Thalassinidea: Callianassoidea). J. Crust. Biol. 20, Spec. No. 2: 129-149.

(Accepted 20 February 2008)

小笠原諸島のアナジャコ下目 (甲殻亜門：十脚目)

駒井智幸¹⁾・立川浩之²⁾

¹⁾ 千葉県立中央博物館

〒260-8682 千葉市中央区青葉町 955-2

²⁾ 千葉県立中央博物館分館海の博物館

〒299-5242 勝浦市吉尾 123

アナジャコ下目甲殻類は、砂泥などの基質中やカイメン、造礁サンゴなどの固着生物群体中に穴居するのが大多数であり、標本の採集が容易ではない。そのため、ファウナが十分に解明されていない海域が多い。小笠原諸島も例外ではなく、これまでに2種(エラゲスナモグリ *Callianidea typa* H. Milne Edwards, 1873, およびブビエスナモグリ *Callianassa bouvieri* Nobili, 1904) が知られるだけであった。本研究は、著者らにより採集された材料をもとに小笠原諸島浅海域のアナジャコ下目のファウナの概要を明らかにすることを目的に行われた。その他、千葉県立中央博物館およびパリ国立自然史博物館に所蔵される標本群も比較検討した。記録されたのは以下の6種である：*Axiopsis serratifrons* (A. Milne-Edwards, 1873) (新称：ヘンゲアナエビ-変化穴蝦)；*Planaxius brevifrons* gen., sp. nov. (新称：ヒラアナエビ-平穴蝦) (以上アナエビ科 Axiidae)；*Callianidea typa* (エラゲスナモグリ) (エラゲスナモグリ科 Callianideidae)；*Callianassa jocularis* de Man, 1905 (新称：ヨツメスナモグリ-四つ目砂潜り)；*Paratrypaea bouvieri* (Nobili, 1904), comb. nov. (ブビエスナモグリ)；*Rayllianassa amboinensis* (de Man, 1888) comb. nov. (新称：フトウデスナモグリ-太腕砂潜り) (以上スナモグリ科 Callianassidae)。アナエビ科の新属新種ヒラアナエビ (属新称：ヒラアナエビ属) は、小笠原諸島と紀伊半島南部町沖より採集された標本に基づき記載された。派生形質を含む形態の類似性から *Bouvieraxius* Sakai and de Saint Laurent, 1989 に近縁であることが示唆されるが、頭胸甲前方の隆起や歯の発達程度、雄の第1, 2 腹肢(生殖肢に変化)の構造が大きく異なることなどの点で明かに識別される。エラゲスナモグリについては、インド洋と西太平洋の標本群の暫定的な検討をあわせて行ったが、インド洋の個体群は別種である可能性が示唆された。今後の検討が必要である。スナモグリ科には以下の2新属を提唱した：*Paratrypaea* (タイプ種：*Callianassa bouvieri* Nobili, 1904) (新称：ブビエスナモグリ属)；*Rayllianassa* (タイプ種：*Callianassa amboinensis* de Man, 1888) (新称：フトウデスナモグリ属)。いずれの種も従来、*Callianassa* Leach, 1815 に帰属していたものである。ブビエスナモグリ属には、タイプ種のほか、*Paratrypaea rectangularis* (Ngoc-Ho, 1991) が含まれる。本属は大西洋に産する4種から構成される *Pestarella* Ngoc-Ho, 2003 に最も近縁であると考えられ

るが、腹部および尾節の構造、大鉗脚長節の構造に大きな相違が認められる。フトウデスナモグリ属には現在のところタイプ種のみが含まれる。形態の類似性から、本新属は *Biffarius* Manning and Felder, 1991 および *Gilvossius* Manning and Felder, 1991 の 2 属への類縁性が示唆されるが、第 1、第 2 触角や鉗脚の構造などに明瞭な相違が見られる。スナモグリ属 *Callianassa* Leach, 1815 の属レベルでの分類については論議が分かれるところであるが、種の形態的多様性はかなり大きく、属の非単系統性についてはほぼ疑いがない。

小笠原諸島は種の固有性が高いことがさまざまな分類群で報告されているが、アナジャコ下目については、小笠原諸島海域に固有な種は確認できなかった。ヒラアナエビを除く 5 種は西太平洋熱帯域に広く分布するが、ヨツメスナモグリとフトウデスナモグリは 2 種は、本研究により本邦海域から初めて記録されるものである。