Squat Lobsters of the Genus *Munida* Leach, 1820 (Crustacea: Decapoda: Anomura: Munididae) from the Sagami Sea and Izu Islands, Central Japan, with Descriptions of 10 New Species

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Abstract. The present study reports on collections of squat lobster species of the genus *Munida* Leach, 1820 (Anomura: Munididae) collected in the Sagami Sea and its adjacent waters, Pacific side of central Japan, and deposited in the Natural History Museum and Institute, Chiba, and the National Museum of Nature and Science, Tokyo. Nineteen species were identified, including 10 new species and one species new to Japanese fauna: *M. consobrina* sp. nov., *M. honshuensis* Benedict, 1902, *M. japonica* Stimpson, 1858, *M. maculata* sp. nov., *M. megalophthalma* sp. nov., *M. multilineata* sp. nov., *M. munin* Komai, 2011, *M. ommata* Macpherson, 2004 (new record), *M. olivarae* Macpherson, 1994, *M. osawai* sp. nov., *M. parvioculata* Baba, 1982, *M. paucistria* sp. nov., *M. pectinata* Macpherson and Machordom, 2005, *M. rufiantennulata* Baba, 1969, *M. solitaria* sp. nov., *M. squamifera* sp. nov., *M. tiresias* Macpherson, 1994, *M. trigonocornus* sp. nov., and *M. vicina* sp. nov. Affinities of these new species are discussed. Notes on Japanese species of the genus are provided. This study brings up the number of species of *Munida* known from Japanese waters from 26 to 37.

Key words: Crustacea, Decapoda, Anomura, Munididae, *Munida*, new species, new record, Japan

The squat lobster genus *Munida* Leach, 1820 is most species-rich in the Galatheoidea, represented by 265 species worldwide (Baba *et al*., 2008; Macpherson, 2009; Cabezas *et al*., 2009; 2011; Hendrickx and Ayon-Parente, 2010; Komai, 2011a; 2011b). The fauna of the genus in the western Pacific has received great attention in the last two decades (e.g., Baba, 1988; 1994; 2005; Baba and Türkay, 1992; Macpherson, 1993; 1994; 1995; 1996a; 1996b; 1997; 1999a; 1999b; 2000; 2004; 2006a; 2006b; 2009; Macpherson and de Saint Laurent, 1991; Macpherson and Baba, 1993; Wu *et al*., 1998; Osawa and Okuno, 2002; Machordom and Macpherson, 2004; Lin and Chan, 2005; Macpherson and Machordom, 2005; Ahyong and Poore, 2004; Ahyong, 2007; Baba *et al*., 2009; Cabezas *et al*., 2009, 2011; Komai, 2011a; 2011b), and it has been revealed that the southwestern part represents a particular hot spot of the biodiversity of this genus (Baba *et al*., 2008). The documentation of the rich fauna of the area has been mainly based on extensive sampling efforts in Indonesia, Fiji, Tonga, New Caledonia, Vanuatu, French Polynesia, and Australia, mainly led by French programs (e.g., Bouchet *et al*., 2008). The fauna of the genus in Japan has been also fairly well studied (e.g., Ortmann, 1892; Benedict, 1902; Doflein, 1902; Balss, 1913; Yanagita, 1943; Baba, 1969; 1982; 2005; Baba *et al*., 1986; Baba and Macpherson, 1993; Osawa and Okuno, 2002; Osawa and Takeda, 2007; Komai, 2011a; 2011b), and 26 species are known prior to this study (Table 1).

The present study deals with collections of species of *Munida*, made in the area including the Sagami Sea, Boso Peninsula and the Izu Islands during 1995 – 2007 by the author aboard RV *Tansei-maru* of the Japan Agency of Marine Science and Technology (JAMSTEC) and TRV *Shin'yo-maru* of the Tokyo University of Marine Science and Technology. This material has been supplemented by other collections from the study area preserved in the Natural History Museum and Institute, Chiba (CBM) and the National Museum of Nature and Science, Tokyo (NSMT). Examination of this material has resulted in significant findings of 19 species, including 10 new species and one new record for Japanese fauna, representing a major range extension: *M.consobrina* sp. nov., *M. honshuensis* Benedict, 1902, *M. japonica* Stimpson, 1858, *M. maculata* sp. nov., *M. megalophthalma* sp. nov., *M. multi-*

Table 1. Species of *Munida* known from Japanese waters prior to this study. Asterisks indicate species recorded from the Sagami Sea and Izu Islands.

Species	General distribution	References to Japanese records
Munida agave Macpherson and Baba, 1993*	Japan, Philippines	Macpherson and Baba (1993); Baba (2005)
Munida ampliantennulata Komai, 2011	Japan	Komai (2011a)
Munida andamanica Alcock, 1894*	Indo-West Pacific	Balss (1913); Parisi (1917); Yanagita (1943); Miyake (1982); Baba (1982); Baba *et al.* (1986); Baba (2005).
Munida caesula Macpherson and Baba, 1993	Japan, Taiwan, Phlippines, Indonesia	Macpherson and Baba (1993)
Munida compressa Baba, 1988	Japan, Taiwan, South China Sea, Indonesia	Baba (1988)
Munida crassa Baba, 1982	Japan, Taiwan	Baba (1982); Baba *et al.* (1986)
Munida disiunctus Komai, 2011	Japan	Komai (2011b)
Munida heteracantha Ortmann, 1892*	Western Pacific, southwestern Australia	Ortmann (1892); Macpherson and Baba (1993)
Munida honshuensis Benedict, 1902*	Japan	Benedict (1902); Macpherson and Baba (1993); Baba (2005); Komai (2011)
Munida japonica Stimpson, 1858*	Indo-West Pacific	Stimpson (1858); Macpherson and Baba (1993); Komai *et al.* (2002); Baba *et al* . (1986); Baba (1989; 2005)
Munida kawamotoi Osawa and Okuno, 2002	Japan	Osawa and Okuno (2002)
Munida koyo Komai, 2011	Japan	Komai (2011b)
Munida kuboi Yanagita, 1943*	Japan, Taiwan, Philippines, Indonesia	Yanagita (1943); Baba (2005)
Munida leptosyne Macpherson, 1994	Japan, Coral Sea	Osawa and Okuno (2002)
Munida longinquus Komai, 2011	Japan	Komai (2011b)
Munida munin Komai, 2011	Japan	Komai (2011b)
Munida nesaea Macpherson and Baba, 1993	Japan, Philippines	Baba (2005)
Munida olivarae Macpherson, 1994	Japan, Coral Sea, Tonga	Osawa and Okuno (2002)
Munida parvioculata Baba, 1982*	Japan	Baba (1982); Osawa and Takeda (2007)
Munida pectinata Macpherson and Machordom, 2005	Japan, New Caledonia	Komai (2011b)
Munida pherusa Macpherson and Baba, 1993	Japan, Philippines, Indonesia	Macpherson and Baba (1993); Komai *et al* . (2002)
Munida pilorhyncha Miyake and Baba, 1966	Japan, Taiwan, Philippines	Miyake and Baba (1966); Miyake (1982)
Munida rufiantennulata Baba, 1969	Western Pacific; Mauritius	Baba (1969; 1989)
Munida sagamiensis Doflein, 1902*	Japan	Doflein (1902)
Munida striola Macpherson and Baba, 1993	Japan, Taiwan, Indonesia	Macpherson and Baba (1993)
Munida tiresias Macpherson, 1994	Japan, Taiwan, New Caledonia	Osawa and Takeda (2007)

lineata sp. nov., *M. munin* Komai, 2011, *M. ommata* Macpherson, 2004 (new record for Japan), *M. olivarae* Macpherson, 1994, *M. osawai* sp. nov., *M. parvioculata* Baba, 1982, *M. paucistria* sp. nov., *M. pectinata* Macpherson and Machordom, 2005, *M. rufiantennulata* Baba, 1969, *M. solitaria* sp. nov., *M. squamifera* sp. nov., *M. tiresias* Macpherson, 1994, *M. trigonocornus* sp. nov., and *M. vicina* sp. nov.

The examined specimens remain deposited in the collections of CBM and NSMT. The carapace length (cl), as the indication of specimen size, was measured along the midline from the level of the sinus between rostrum and supraocular spines to the posterior margin of the carapace. The lengths of segments of cheliped are measured along the dorsomesial margin and those of ambulatory legs are along the extensor margin. The higher classification follows Ahyong et al. (2010). Recent molecular studies have revealed that various subtle morphological differences, previously considered to be intraspecific variation, are of specific significance (e.g., Machordom and Macpherson, 2004; Macpherson and Machordom, 2005; Cabezas *et al*., 2009), and therefore, a detailed description is provided for each new species and newly recorded *M. ommata* in order to show diagnostic details for species recognition.

Taxonomic Account

Family **Munididae**

Genus ***Munida*** Leach, 1820

Munida consobrina sp. nov.

(Figs. 1, 2)

Material examined. Holotype: TRV *Shin' yo-maru*, 1996 research cruise, stn 7, Takase Bank, Izu Islands, 34° 20.75' N, 139° 20.00' E, 87 – 93 m, 23 October 1996, dredge, coll. T. Komai, male (cl 6.8 mm), CBM-ZC 4635. Paratypes: same data as holotype, 1 male (cl 5.2 mm), CBM-ZC 10532; 1997 cruise, stn 22, off Torishima Island, 30° 30.76' N, 140° 17.57' E, 172 – 192 m, 17 October 1997, dredge, coll. T. Komai, 1 male (cl 5.0 mm), CBM-ZC 10533.

Description. Carapace (Fig. 1A) 1.2 times longer than wide. Dorsal surface gently convex transversely; main transverse ridges interrupted or uninterrupted; some secondary transverse striae present between main ridges; most ridges and striae with dense short setae and/or some long setae. Gastric region slightly elevated, with 5 pairs of epigastric spines, spine posterior to base of supraocular spine strongest; median tubercles on epigastric region squamiform. Hepatic region with some squamiform or transverse ridges. Cervical groove distinct. Parahepatic, branchial dorsal and postcervical spines present on each side, these spines moderately small. Anterior part of branchial region with some arcuate striae; lateral part of posterior branchial region with 6 transverse ridges or striae (excluding posterior transverse ridge). Intestinal region with interrupted transverse stria. Posterior transverse ridge with 1 stria. Frontal margins strongly oblique. Lateral margins feebly convex in dorsal view. Anterolateral spine moderately long, not reaching sinus between rostrum and supraocular spines, directed forward or slightly mesially; no spine on frontal margin mesial to anterolateral angle. Hepatic margin with 1 spine, about half-length of anterolateral spine. Branchial margins each with 4 moderately small spines, slightly decreasing in size posteriorly.

Rostrum (Fig. 1A) spiniform, 0.4 – 0.5 times as long as carapace, directed forward, faintly sinuous in lateral view; dorsal carina not particularly delimited. Supraocular spines moderately long, slender, almost parallel in dorsal view and directed forward in lateral view, 0.4 length of rostrum.

Orbit with 1 relatively strong spine; ventral margin produced, with 1 small spine.

Pterygostomial flap (Fig. 1B) rounded anteriorly, lateral surface moderately rugose with transverse to obliquely transverse striae.

Epistomal ridge sinuous, ending at excretory pore of first segment of antennal peduncle; mesial protuberance distinct (Fig. 1E).

Thoracic (Fig. 1C) wider than long. Third thoracic sternite about 3.1 times wider than long, contiguous with anterior margin of fourth sternite; anterior margin minutely granular, faintly bilobed. Fourth to sixth sternites almost smooth, but with 1 medially interrupted stria anteriorly on fourth sternite. Anterior margin of fourth sternite slightly concave. Seventh sternite with deep median groove; lateral parts with numerous coarse granules. Transverse ridges nearly smooth, without setae.

First abdominal tergite (Fig. 1A) with some shallow punctations. Second somite (Fig. 1A) with anterior ridge armed with 8 spines (arranged in 4 pairs, including 2 submedian pairs); tergum with 1 main transverse ridge; pleuron with a few short striae. Third somite (Fig. 1A) with anterior ridge unarmed; tergum with 1 main transverse ridge; pleuron almost smooth.

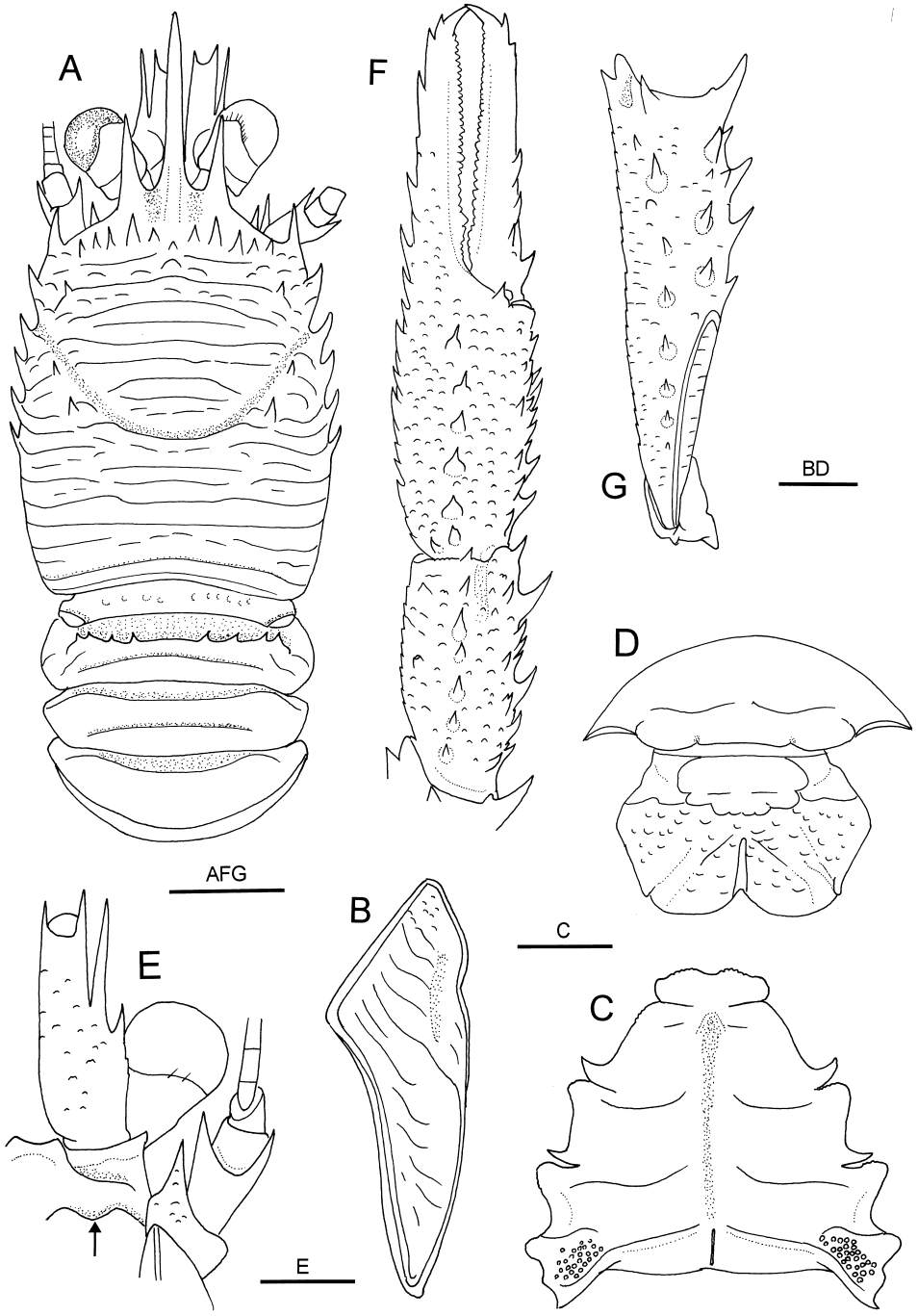

Fig. 1. *Munida consobrina* sp. nov., holotype, male (cl 6.8 mm), CBM-ZC 4635. A, carapace, cephalic appendages and first to fourth abdominal somites, dorsal view (setae omitted except for left eye; antennal flagella omitted); B, left pterygostomial flap, ventrolateral view; C, thoracic sternum, ventral view (setae omitted); D, sixth abdominal somite and telson, outer (ventral) view (setae omitted); E, left anterolateral part of carapace, eye, first segment of antennular peduncle and antennal peduncle, ventral view (arrow indicating epistomal ridge); F, chela and carpus of left cheliped, dorsal view (denuded); G, merus of left cheliped, dorsal view. Scale bars: 2 mm for A, F, G; 1 mm for B – D, E.

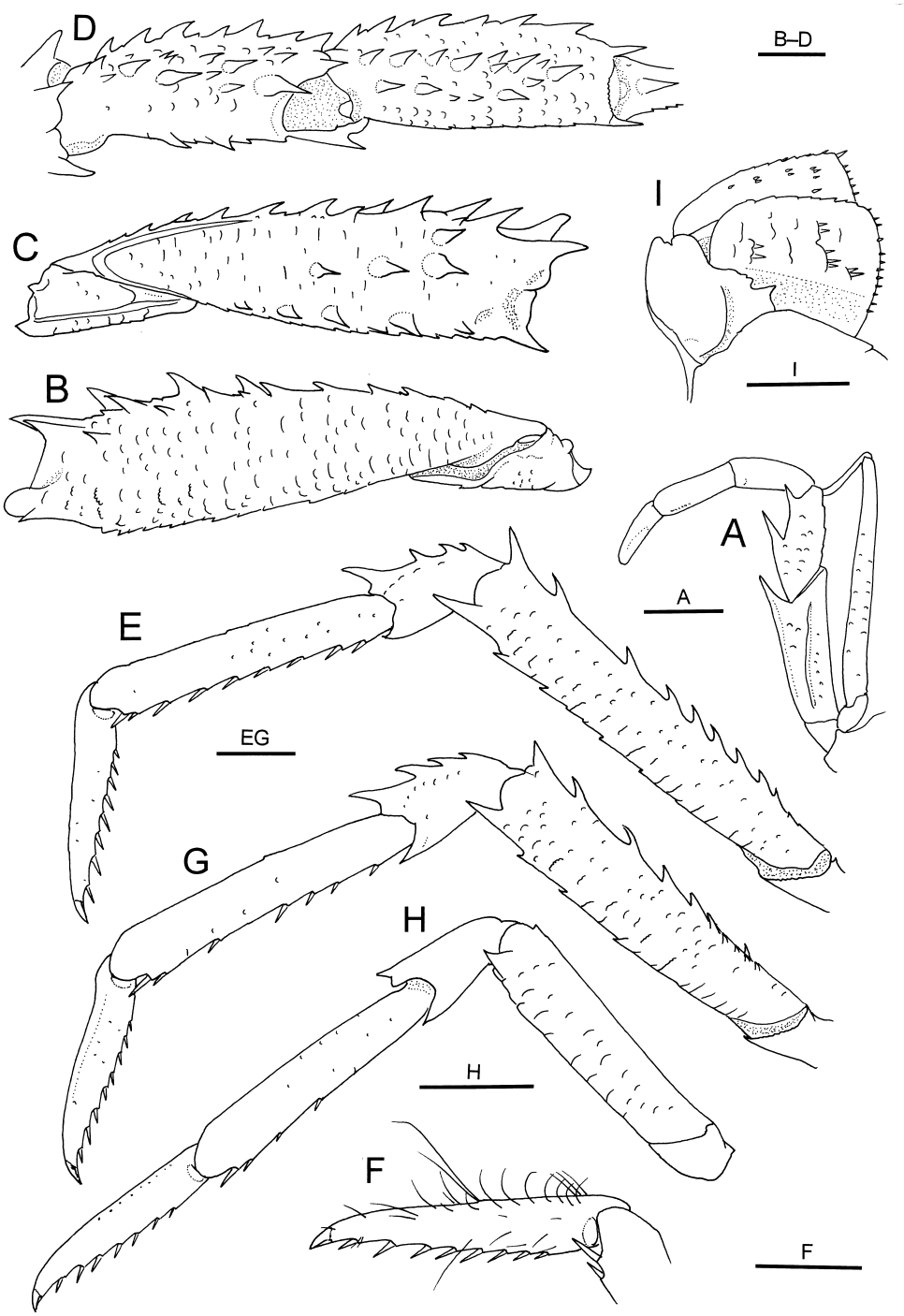

Fig. 2. *Munida consobrina* sp. nov. A – G, I, holotype, male (cl 6.8 mm), CBM-ZC 4635; H, paratype, male (cl 5.2 mm), CBM-ZC 10532. A, left third maxilliped, lateral view (setae omitted); B, merus of left cheliped, lateral view; C, same, mesial view; D, palm and carpus of left cheliped, mesial view; E, left second pereopod, lateral view; F, same, dactylus, lateral view; G, left third pereopod, lateral view; H, left fourth pereopod, lateral view; I, left uropod, outer (ventral) view (setae omitted). Scale bars: 1 mm.

Fourth and fifth somites smooth, devoid of transverse ridge. Sixth somite (Fig. 1D) with paired arcuate ridges in posterior half of tergum, otherwise smooth. Telson (Fig. 1D) 1.6 times wider than long, incompletely divided into 7 plates (division between lateral and posterolateral plates indistinct); anteromedian plate with shallow median groove and trace of striae; lateral and posterior plates moderately squamous.

Eyes (Fig. 1A, E) moderately large, not particularly flattened dorsoventrally. Cornea slightly dilated, corneal width much greater than sinus between rostrum and supraocular spine and about 0.3 of distance between bases of anterolateral spines of carapace. Eyestalk not narrowed proximally, with 1 setiferous striae on dorsal surface proximally; eyelashes short, sparse, not covering dorsal part of cornea.

Basal segment of antennular peduncle (Fig. 1E) relatively slender, distinctly overreaching distal corneal margin, length excluding distal spines 2.3 of width; ventral surface scattered minute squamiform tubercles; distomesial spine shorter than distolateral spine; 2 lateral spines present, first spine elongate, reaching distolateral spine, arising at distal 0.3 of basal segment; second spine short, located slightly distal to midlength of basal segment; statocyst lobe not inflated.

Antennal peduncle (Fig. 1E) moderately stout, reaching midlength of eye. First segment with relatively short distomesial spine far falling short of distal margin of third segment; distolateral margin not produced. Second segment without striae on ventral surface; distomesial spine relatively short, reaching distal margin of third segment; no mesial spine; distolateral spine reaching or slightly overreaching distal margin of third segment. Third and fourth segments unarmed, former without striae on ventral surface.

Third maxilliped (Fig. 2A) moderately slender. Ischium with moderately strong flexor distal spine extending as far as extensor distal angle; lateral surface with distinct median ridge, slightly squamous. Merus with 2 spines on flexor margin, distal spine moderately small, proximal spine moderately strong, slender; extensor distal margin unarmed; extensor margin minutely denticulate, lateral surface with some minute squamiform tubercles. Carpus nearly smooth on extensor surface. Propodus slightly longer than carpus, not particularly expanded. Dactylus shorter than propodus.

Chelipeds (Figs. 1F, G, 2B–D) moderately squamous, 2.2–3.0 times longer than carapace, equally broad on merus, carpus and palm; dorsal and mesial surfaces of palm to distal part of merus covered with numerous short plumose setae, masking armature; long iridescent setae present on mesial faces of chela and carpus. Merus gradually narrowing proximally; dorsal surface with row of 8 – 9 spines laterally and 4 spines mesially (distomesial spine diverging, falling short of proximal 0.2 of carpus); ventrolateral distal angle bearing small spine; mesial face with 3 spines on midline and 6 spines adjacent to ventral margin (including ventromesial distal spine). Carpus 0.9 times as long as palm, 2.0 times longer than wide (excluding distomesial projection); dorsal surface with row of 7 spines on midline; dorsomesial margin with double row of 10 – 12 spines; lateral surface with a few spines; ventral surface with row of 3 spines; ventrolateral distal angle with small spine. Palm not widened distally, 1.7 – 1.9 times longer than wide; dorsal surface with median row of 5 or 6 spines, 1 spine at articulation to dactylus, and 1 spine at proximolateral portion; dorsolateral margin with about 10 main spines along entire length of palm (occasionally 1 or 2 additional spinules present between main spines), dorsomesial margin with 7 or 8 main spines and additional spinules; mesial surface with 5 spines on midline; ventral surface with 1 small spine at dactylar articulation. Fixed finger straight, with 7 spines along entire length of lateral margin; dorsal surface with sparse minute tubercles in proximal half; cutting edge with row of minute, acute or subacute denticles. Dactylus 1.2 times longer than palm, terminating in sharp, curved claw crossing tip of fixed finger, with 1 or 2 subterminal spines; mesial margin with 1 proximal spine; dorsal surface mesially with 3 spines in proximal 0.4; cutting edge with row of minute denticles over entire length. No proximal hiatus between dactylus and fixed finger.

Ambulatory legs (second to fourth pereopods) moderately long and slender, decreasing in length posteriorly; dorsal margins of meri with sparse, long iridescent setae interspersed with row of short plumose setae, those of carpi and propodi with sparse short to long, stiff setae. Second pereopod (Fig. 2E) about 2.0 times longer than carapace, nearly reaching level of tip of anterolateal spine on carapace by merocarpal articulation; merus 0.9 times as long as carapace, 5.7 times longer than high, dorsal surface with row of 10 or 11 spines (distal spine moderately strong), ventral margin with strong distolateral spine followed by several squamiform or transverse ridges

(distalmost squamiform ridge occasionally with small spine), lateral face with many small squamiform or short transverse ridges; carpus about 0.4 length of propodus, with 4 spines increasing in size distally on extensor margin, flexor distal margin produced in relatively small spine; lateral surface without longitudinal ridge; propodus unarmed on extensor margin, lateral surface with slightly granular, flexor margin with row of 9 small movable spines (penultimate spine close to ultimate spine), basal protuberance of ultimate spine unarmed; dactylus (Fig. 2F) 0.7 times as long as propodus and 5.8 – 6.0 times longer than high, slightly curved in distal part, bearing sparse short to long stiff setae on extensor margin; row of short curled setae on lateral face nearly parallel to extensor margin; flexor margin faintly sinuous, with 8 small corneous spines along entire length (second to fifth spine from distal longest) and subterminal spinule contiguous to unguis. Third pereopod (Fig. 2G) generally similar to second pereopod, reaching anterolateral angle of carapace by mero-carpal articulation; merus 0.9 length of that of second pereopod, dorsal surface with 9 spines laterally and 1 or 2 spines mesially in proximal 0.3, ventral margin with strong distolateral spine followed by several squamiform or transverse ridges; carpus with 4 spines on extensor margin; propodus with 8 movable spines on flexor margin; dactylus about 0.7 times as long as propodus, with 8 corneous spines and subterminal spinule on flexor margin. Fourth pereopod (Fig. 2H) reaching to lateral end of cervical groove of carapace by mero-carpal articulation; merus about 0.6 length of that of second pereopod, dorsal surface unarmed except for tiny distal tubercle, ventral surface with small distal spine followed by several squamiform ridges, lateral surface with some small squamiform ridges; carpus with dorsodistal spine, ventrodistal angle produced in small spine; propodus bearing 4 movable spines in distal half of flexor margin; dactylus 0.7 times as long as propodus, with 7 corneous spines and subterminal spinule on flexor margin.

Merus of fifth pereopod sparsely granulate on outer surface.

Uropodal exopod (Fig. 2I) with lateral margin slightly denticulate, with row of minute movable spinules; outer surface with longitudinal row of minute movable spinules along lateral margin; posterior margin roundly truncate, with row of minute movable spinules. Endopod with lateral margin serrate, bearing a few minute movable spinules; outer surface with some low squamiform ridges sometimes bearing 1 – 3 movable spinules; posterior margin roundly truncate, with row of minute movable spinules.

Distribution. Takase Bank, and off Torishima Island, Izu Islands, at depths of 87 – 192 m.

Remarks. *Munida consobrina* sp. nov. is very similar to *M. pasithea* Macpherson and de Saint Laurent, 1991, known from French Polynesia. Shared diagnostic characters are: branchial margin of carapace bearing four spines; second abdominal somite bearing spines on anterior ridge; third thoracic sternite contiguous with fourth thoracic sternite; seventh thoracic sternites having granules on lateral parts; fixed finger of cheliped bearing spines on lateral margin along entire length; and propodus of second pereopod with penultimate flexor spine closely situated to ultimate flexor spine. Nevertheless, *M. consobrina* can be distinguished from *M. pasithea* by the following characters (Macpherson and de Saint Laurent, 1991): the carapace bears one branchial dorsal spine in *M. consobrina*, but this spine is absent in *M. pasithea*; the distomesial spine of the basal segment of the antennular peduncle is clearly shorter than the distolateral spine in *M. consobrina*, rather than subequal or slightly longer than in *M. pasithea*; the dactylus of the cheliped is armed with dorsomesial spines only in the proximal half in *M. consobrina*, rather than extending along entire length in *M. pasithea*.

Munida gordoae Macpherson, 1994 known from the Southwest Pacific, *M. longinquus* Komai, 2011 from the Ogasawara Islands, Japan, and *M. rogeri* Macpherson, 1994 from the Southwest Pacific are also similar to *M. consobrina* in the carapace and abdominal armature, and the coarsely granular lateral parts of the seventh thoracic sternite. *Munida gordoae* can be easily distinguished from *M. consobrina* by the narrowly separated third and fourth thoracic sternites, the lack of spines in the distal half of the lateral side of the fixed finger (except for subdistal spines), and the equidistant distal flexor spines on the propodi of the second pereopod (Macpherson, 1994). In *M. gordoae*, the palm of the male cheliped is fairly widened, resulting in forming a prominent proximal hiatus between fingers, but such a condition is not seen in *M. consobrina*. *Munida longinquus* further differs from *M. consobrina* in the lack of submedian pairs of spines on the second abdominal somite, the absence of a median stria on the intestinal region of the carapace and the equidistant flexor spines on the propodus of the second pereopod (Komai, 2011b). *Munida rogeri* is immediately

distinguished from *M. consobrina* in having coarse granules extending to the lateral parts of the sixth and seventh thoracic sternites, the very slender basal segment of the antennular peduncle, and the presence of dorsomesial spines distal to the midlength of the dactylus of the cheliped (except for the subdistal spines) (Macpherson, 1994).

Etymology. From the Latin *consobrinus* (= close), alluding to the close similarity between the new species and *M. pasithea*.

Munida honshuensis Benedict, 1902

Munida honshuensis Benedict, 1902: 261, fig. 11 [type locality: Ose-zaki, Suruga Bay, Japan, 110 – 128 m]; Macpherson and Baba, 1993: 396, fig. 7; Baba, 2005: 264; Baba *et al*., 2008 : 99 (compilation) ; Komai, 2011b: 344, fig. 11A.

Munida japonica : Ortmann, 1892: 254, pl. 11, fig. 11, 11i, 11k; Komai, 1999: 65.

Material examined. RV *Tansei-maru*, KT95-5 cruise, stn TB18-2, Okinoyama Bank, Sagami Sea, 34° 59' N, 139° 39' E, 105 – 113 m, 21 April 1995, dredge, 1 male (cl 5.7 mm), 1 female (cl 6.2 mm), CBM-ZC 1988; same data, 5 males (cl 5.2 – 6.2 mm), 3 females (cl 4.6 – 6.2 mm), 3 juveniles (cl 3.1 – 3.7 mm), CBM-ZC 2009.

Distribution. Japan: Sagami Sea to Suruga Bay, and Ogasawara Islands; 92 – 300 m.

Munida japonica Stimpson, 1858

Munida japonica Stimpson, 1858: 252 [type locality: Kagoshima Bay, Japan, 36 m]; 1907: 235; Doflein, 1902: 644; Parisi, 1917: 1; Yokoya, 1933: 58; Miyake and Baba, 1967: 240, figs. 11, 12; Miyake, 1982: 146, pl. 49, fig. 4; Baba, 1986: 171, 290, fig. 122; Macpherson and Baba, 1993: 399, fig. 9; Baba, 2005: 109, 265; Baba *et al*., 2008: 103 (compilation); Baba *et al*., 2009: 163, unnumbered figs.

Munida japonica typica: Balss, 1913: 15, fig. 14.

Munida japonica japonica: Yanagita, 1943: 24, fig. 7.

Not *Munida japonica*: Ortmann, 1892: 254, pl. 11, fig. 11, 11i, 11k (= *Munida honshuensis* Benedict, 1902).

Material examined. RV *Tansei-maru*, KT95-5 cruise, stn TB18-2, Sagami Sea, Okinoyama Bank, 34° 59' N, 139° 39' E, 105 – 113 m, 21 April 1995, dredge, 1 female (cl 6.6 mm), CBM-ZC 1989. TRV *Shin' yo-maru*, 1996 cruise, stn 16, Sagami Sea, Tateyama Bay, 35° 00.57' N, 139° 41.45' E, 100 – 258 m, 24 October 1996, dredge, 1 ovig. female (cl 5.5 mm), CBM-ZC 4704; stn 19, Sagami Sea, Okinoyama Bank, 34° 58.47' N, 139° 34.15' E, 121 – 129 m, 24 October 1996, dredge, 1 male (cl 8.7 mm), CBM-ZC 5276.

Distribution. Japan (Sagami Sea to East China Sea), Taiwan, Philippines and Indonesia; 98 – 732 m.

Munida maculata sp. nov.
(Figs. 3, 4)

Material examined. Holotype: RV *Tansei-maru*, KT07-31 cruise, L-3-200, Izu Islands, N of Toshima Island, 34° 34.40' N, 139° 18.37' E, 198 – 152 m, rocky bottom, 27 November 2007, chain bag dredge, coll. T. Komai, female (cl 7.7 mm), CBM-ZC 10527.

Paratypes: RV *Tansei-maru*, KT95-5 cruise, stn TB18-2, Sagami Sea, Okinoyama Bank, 34° 59' N, 139° 39' E, 105 – 113 m, coarse sand, 21 April 1995, dredge, coll. T. Komai, 1 male (cl 4.0 mm), 2 females (cl 5.5, 6.5 mm), CBM-ZC 1990; same data as holotype, 1 male (cl 7.2 mm), CBM-ZC 10528. RV *Takunan*, stn 6, Kurose Bank, 33° 25.08' N, 139° 42.08' E, 136 – 145 m, 10 September 2007, dredge, coll. H. Komatsu, 1 male (cl 8.4 mm), NSMT-Cr S1141; stn 8, S of Hachijo Island, 32° 58.45' N, 139° 46.71' E, 206 – 207 m, 11 September 2007, coll. H. Komatsu, 1 male (cl 4.7 mm), NSMT-Cr S1142.

Description. Carapace (Fig. 3A) 1.2 times longer than wide. Dorsal surface gently convex transversely; main transverse ridges interrupted or uninterrupted; some secondary transverse striae present between main ridges; most ridges and striae with dense short setae and/or some long setae. Gastric region slightly elevated, with 5 pairs of epigastric spines, spine posterior to base of supraocular spine strongest; median tubercles on epigastric region scale-like. Hepatic region with some squamiform ridges. Cervical groove distinct. Parahepatic, branchial dorsal and postcervical spines present on each side, these spines moderately small. Anterior part of branchial region with some transverse striae; lateral part of posterior branchial region with 4 – 6 transverse ridges or striae (excluding posterior transverse ridge). Intestinal region traversed by interrupted stria. Posterior transverse ridge with 1 stria. Frontal margins strongly oblique. Lateral margins feebly convex in dorsal view. Anterolateral spine moderately long, not reaching sinus between rostrum and supraocular spines, directed forward; no spine on frontal margin mesial to anterolateral angle. Hepatic margin

with 1 or 2 small spines. Branchial margins each with 4 small spines, anterior 3 spines subequal in size, fourth spine distinctly smaller than others.

Rostrum (Fig. 3A) spiniform, about 0.4 times as long as carapace, directed forward, faintly sinuous in lateral view; dorsal carina not particularly delimited. Supraocular spines moderately long, slender, almost parallel in dorsal view and directed forward in lateral view, 0.3 – 0.5 length of rostrum.

Orbit (Fig. 3A) with 1 spine; ventral margin produced, with 1 small spine.

Pterygostomial flap (Fig. 3B) unarmed anteriorly, lateral surface moderately rugose with transverse to oblique striae.

Epistomal ridge slightly sinuous, ending at excretory pore of first segment of antennal peduncle; mesial protuberance distinct (Fig. 3E).

Thoracic sternum (Fig. 3C) wider than long. Third thoracic sternite about 4.7 times wider than long, much broader than anterior margin of fourth sternite; anterior margin nearly smooth, faintly bilobed. Fourth sternite almost smooth, but with 1 medially interrupted short stria. Fifth to seventh sternites with sharp carinae on lateral parts, otherwise smooth; seventh sternite with deep median groove. Transverse ridges nearly smooth, without setae.

First abdominal tergite (Fig. 3A) smooth. Second somite (Fig. 3A) with anterior ridge armed with 6 spines (2 lateral pair and 1 submedian pair); tergum with 1 main transverse ridge and 1 interrupted stria anteriorly; pleuron with a few short striae. Third somite (Fig. 3A) with anterior ridge unarmed; tergum with 1 main transverse ridge and 1 short striae laterally; pleuron almost smooth. Fourth and fifth somites smooth, devoid of transverse ridge. Sixth somite (Fig. 3D) with paired arcuate ridges in posterior half of tergum, otherwise smooth. Telson (Fig. 3D) 1.3 – 1.4 times wider than long, incompletely divided into 7 plates (division between lateral and posterolateral plates indistinct); anteromedian plate with shallow median groove and trace of striae; lateral and posterior plates weakly squamous.

Eyes (Fig. 3A, E) moderately large, not particularly flattened dorsoventrally. Cornea dilated, corneal width much greater than sinus between rostrum and supraocular spine and about 0.3 of distance between bases of anterolateral spines of carapace. Eyestalk slightly narrowed proximally, with 1 setiferous stria on dorsal surface proximally; eyelash consisting of short setae, not covering dorsal part of cornea.

Basal segment of antennular peduncle (Fig. 3E) moderately stout, slightly overreaching distal corneal margin, length excluding distal spines 2.0 – 2.2 of width; ventral surface with some short transverse ridges; distal spines subequal, moderately long and slender; lateral margin with 2 spines, first (distal) spine elongate, overreaching distal spines of segment, arising considerably proximal to base of distolateral spine; second spine moderately long, located slightly distal to midlength of basal segment; statocyst lobe not inflated.

Antennal peduncle (Fig. 3E) moderately stout, reaching midlength of eye. First segment with moderately long distomesial spine nearly reaching distal margin of third segment; distolateral margin slightly produced in rounded lobe. Second segment without striae on ventral surface; distomesial spine moderately long, reaching distal margin of fourth segment; no mesial spine; distolateral spine reaching distal margin of third segment. Third and fourth segments unarmed, former without striae on ventral surface.

Third maxilliped (Fig. 3F) moderately slender. Ischium with moderately strong flexor distal spine extending as far as produced extensor distal angle (only in holotype, 1 small extra spine at base of ventrodistal spine); lateral surface with distinct, granulated median ridge. Merus with 2 unequal, moderately strong spines on flexor margin; extensor distal margin unarmed; extensor margin minutely denticulate, lateral surface with some granules. Carpus microscopically granulate on extensor surface. Propodus longer than carpus, not expanded. Dactylus much shorter than propodus.

Chelipeds (Figs. 3G, 4A – C) moderately squamous, 2.2 – 2.8 times longer than carapace, equally broad on merus, carpus and palm; dorsal and mesial surfaces of palm to distal part of merus covered with numerous short plumose setae, masking armature; long iridescent setae present on mesial faces of chela and carpus. Merus gradually narrowing proximally; dorsal surface with row of 10 spines laterally and 4 spines mesially (distomesial spine strongest, diverging, far falling short of midlength of carpus); ventrolateral distal angle bearing small spine; mesial face with 2 spines on midline and 4 spines adjacent to ventral margin (including strong ventromesial distal spine). Carpus about 0.8 times as long as palm, about 2.0 times longer than wide (excluding distomesial projection); dorsal surface with 6 spines on midline; dorsomesial margin with double row of 7 or 8 spines of

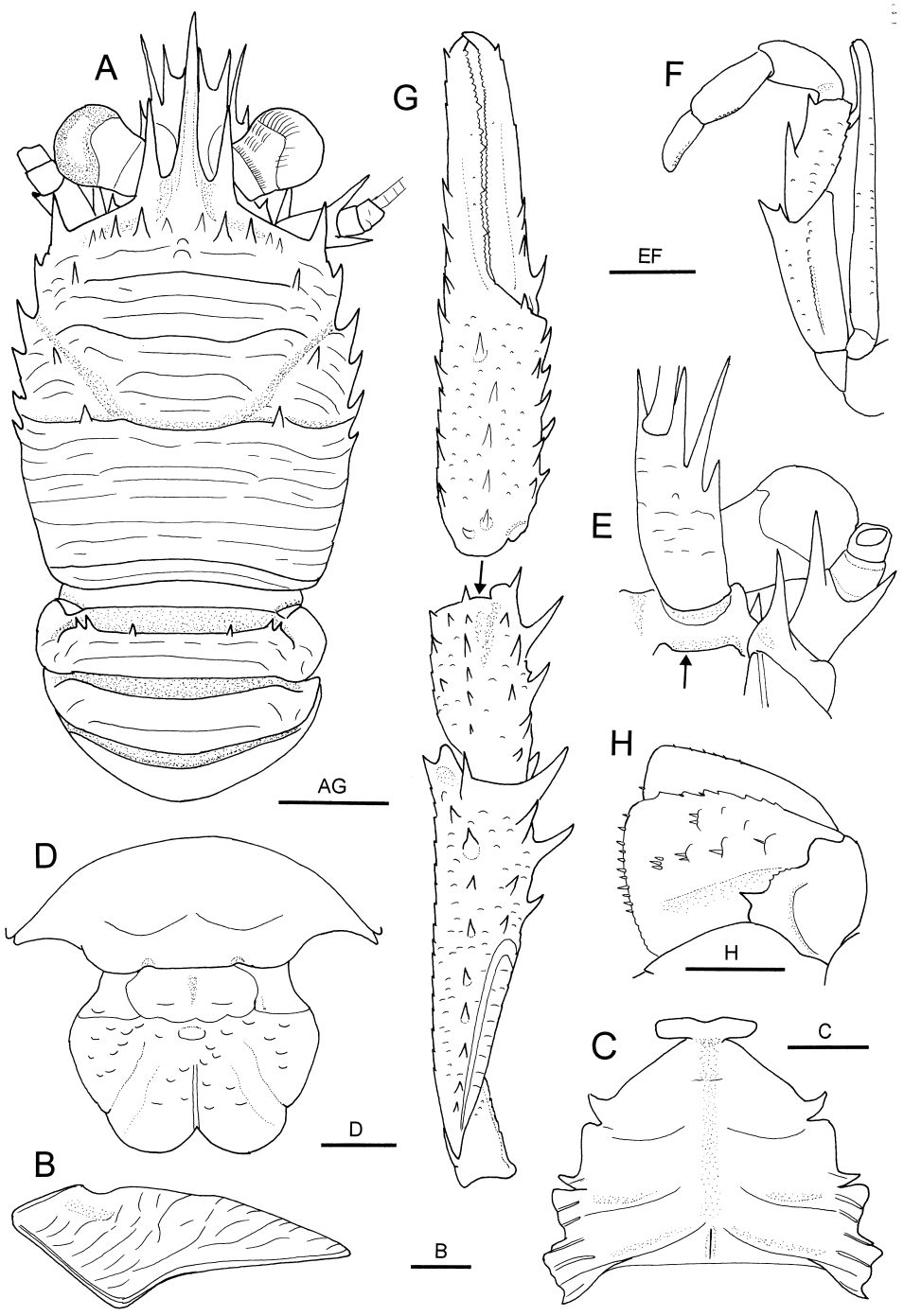

Fig. 3. *Munida maculata* sp. nov., holotype, ovig. female (cl 7.7 mm), CBM-ZC 10527. A, carapace, cephalic appendages and first to fourth abdominal somites, dorsal view (setae omitted except for left eye; antennal flagella omitted); B, left pterygostomial flap, ventrolateral view; C, thoracic sternum, ventral view (setae omitted); D, sixth abdominal somite and telson, outer (ventral) view (setae omitted); E, left anterolateral part of carapace, eye, first segment of antennular peduncle and antennal peduncle, ventral view (arrow indicating epistomal ridge); F, left third maxilliped, lateral view (setae omitted); G, left cheliped, dorsal view (denuded); H, left uropod, outer (ventral) view (setae omitted). Scale bars: 2 mm for A, G; 1 mm for B – F, H.

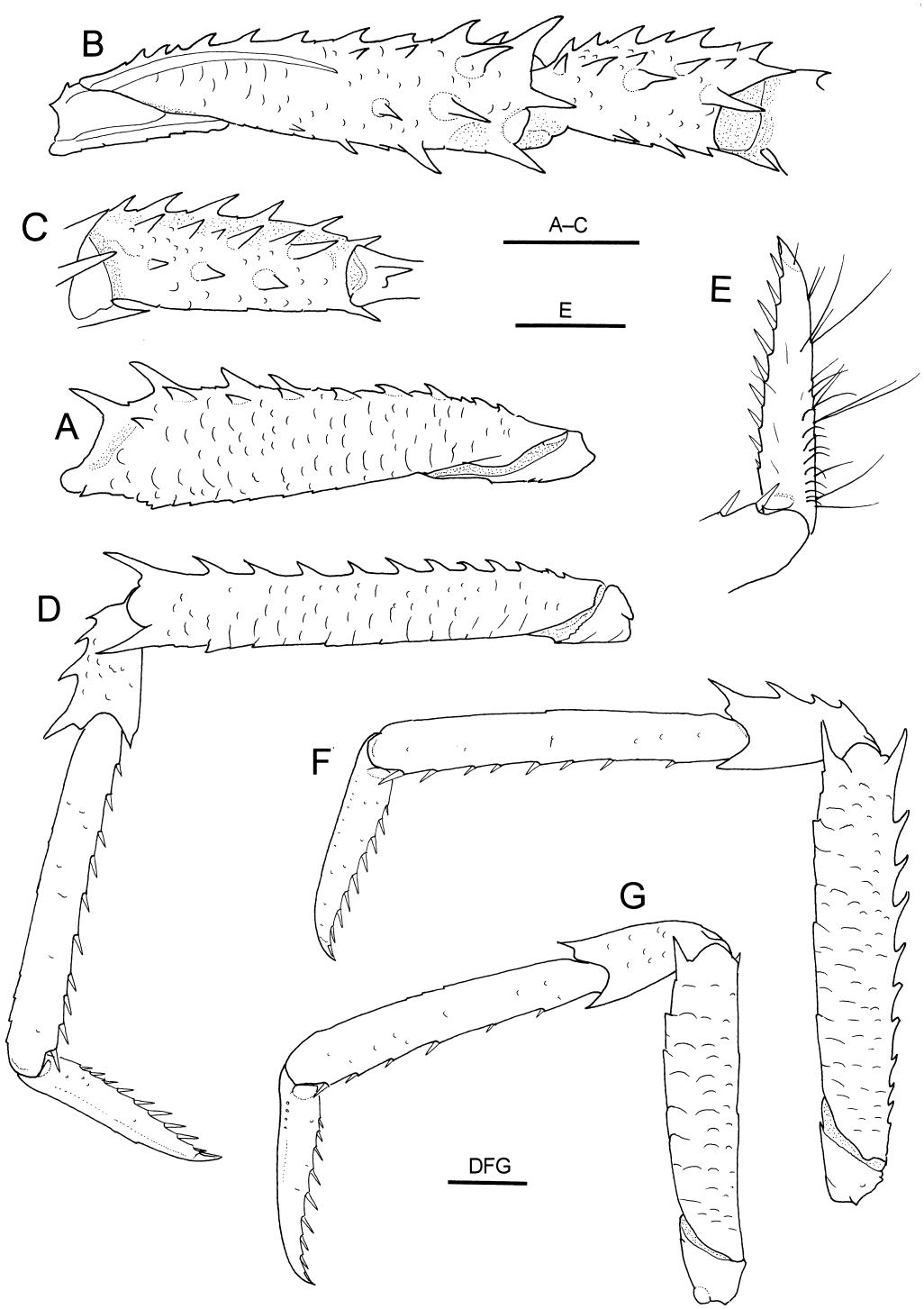

Fig. 4. *Munida maculata* sp. nov., holotype, female (cl 7.7 mm), CBM-ZC 10527 (setae omitted except for E). A, merus of left cheliped, lateral view; B, merus and carpus of left cheliped, mesial view; C, palm of left cheliped, mesial view; D, left second pereopod, lateral view; E, same, dactylus, lateral view; F, left third pereopod, lateral view; G, left fourth pereopod, lateral view. Scale bars: 2 mm for A – C; 1 mm for D – G.

various length; lateral surface with 5 spines arranged in irregular longitudinal row; ventral surface with row of 3 spines; ventrolateral distal angle with small spine. Palm not widened distally, about 2.2 times longer than wide; dorsal surface with median row of 5 slender spines, 1 spine at articulation to dactylus, and 1 spine at proximolateral portion; dorsolateral margin with 5 main spines along entire length of palm (occasionally 1 or 2 additional spinules present between main spines), dorsomesial margin with 5 or 6 slender spines; mesial surface with row of 3 spines on midline; ventral surface with 1 small spine at dactylar articulation. Fixed finger nearly straight, with 1 subdistal spine; lateral margin with 3 slender spines and a few spinules in proximal half; dorsal surface nearly smooth; cutting edge with row of minute, acute or subacute denticles. Dactylus about 1.3 times longer than palm, terminating in sharp, curved claw crossing tip of fixed finger, with 1 or 2 subterminal spines; mesial margin with 1 prominent proximal spine; dorsal surface mesially with 1 or 2 spines in proximal 0.3; cutting edge with row of minute denticles over entire length. No proximal hiatus between dactylus and fixed finger.

Ambulatory legs (second to fourth pereopods) moderately long, relatively slender, decreasing in length posteriorly; dorsal margins of meri with sparse short, simple or plumose setae, those of carpi and propodi with sparse short to long, stiff setae. Second pereopod (Fig. 4D) about 2.0 times longer than carapace, nearly reaching level of tip of anterolateal spine on carapace by mero-carpal articulation; merus 0.8 – 0.9 times as long as carapace, 6.5 times longer than high, dorsal surface with row of 11 or 12 spines (distal spine moderately strong), ventral margin with strong distolateral spine followed by many squamiform or transverse ridges (distalmost squamiform ridge occasionally with small spine), lateral face with many, small squamiform or short transverse ridges; carpus about 0.4 length of propodus, with 4 spines increasing in size distally on extensor margin, flexor distal margin produced in moderately strong spine; lateral surface without longitudinal ridge; propodus unarmed on extensor margin, lateral surface nearly smooth, flexor margin with row of 10 small equidistant movable spines, basal protuberance of ultimate spine unarmed; dactylus (Fig. 4E) 0.6 times as long as propodus and 5.0 – 5.5 times longer than high, slightly curved in distal part, bearing sparse short to long stiff setae on extensor margin (row of curled setae on lateral face nearly parallel to extensor margin), flexor margin faintly sinuous, with 7 – 9 small corneous spines along entire length (distal 4 or 5 spines subequal in length) and subterminal spinule contiguous to unguis. Third pereopod (Fig. 4F) generally similar to second pereopod, reaching anterolateral angle of carapace by mero-carpal articulation; merus 0.9 length of that of second pereopod, dorsal surface with 9 – 11 spines, ventral margin with strong distolateral spine followed by many squamiform or transverse ridges; carpus with 4 spines on extensor margin; propodus with 8 or 9 movable spines on flexor margin; dactylus 0.6 times as long as propodus, with 7 or 8 corneous spines and subterminal spinule on flexor margin. Fourth pereopod (Fig. 4G) reaching to lateral end of cervical groove of carapace by mero-carpal articulation; merus 0.6 length of that of second pereopod, dorsal surface unarmed except for tiny distal spine, ventral surface with strong distal spine followed by several squamiform ridges, lateral surface with many squamiform or short transverse ridges; carpus with dorsodistal spine, ventrodistal angle produced in spine; propodus bearing 6 movable spines on flexor margin; dactylus 0.7 time as long as propodus, with 7 or 8 corneous spines and subterminal spinule on flexor margin.

Merus of fifth pereopod sparsely granulate on outer surface.

Uropodal exopod (Fig. 3H) with lateral margin not denticulate, but with row of minute movable spinules; outer surface nearly smooth; posterior margin roundly truncate, with few minute movable spinules. Endopod with lateral margin minutely serrate, bearing few minute movable spinules; outer surface with some low squamiform ridges sometimes bearing 1 – 3 movable spinules; posterior margin roundly truncate, with row of minute movable spinules.

Coloration in life. Carapace generally reddish orange, mesogastric and cardiac regions purplish; anterior part of branchial region with small red spot. Abdomen also reddish orange generally, second and third somites with irregular purplish markings. Chelipeds generally reddish orange, squamiform ridges or spines sometimes dark red; fingers whitish in proximal one-third, red in distal two-thirds. Ambulatory legs banded with orange and white.

Distribution. Known only from Sagami Sea and northern part of Izu Islands, central Japan; 105 – 198 m.

Remarks. *Munida maculata* sp. nov. is very similar to

Munida ignea Macpherson, 2006 known from the Austral Islands, French Polynesia, and *M. lenticularis* Macpherson and de Saint Laurent, 1991 from Tuamotu Archipelago, French Polynesia. Shared characters include: branchial margin of carapace bearing four spines; fifth to seventh thoracic sternites having short carinae on lateral parts; anterior ridge of second abdominal somite with spines; distal spines of basal segment of antennular peduncle subequal in length; and fixed finger of chela bearing spines on proximal half of lateral margin. Nevertheless, *M. maculata* differs from both *M. ignea* and *M. lenticularis* in the longer first lateral spine on the first segment of the antennular peduncle (overreaching the distolateral spine versus falling short of it). Furthermore, the present new species differs from *M. ignea* in the following minor characters (Macpherson, 2006): the rostrum is about 0.4 times as long as the carapace in *M. maculata*, while attaining to 0.5 times in *M. ignea* ; and the dactylus of the second pereopods bears more numerous flexor spines in *M. maculat*a than in *M. ignea* (seven to nine versus six or seven; except for the subterminal spinule contiguous with the unguis). *Munida maculata* is distinguished from *M. lenticularis* by the following characters (Macpherson and de Saint Laurent, 1991): the carapace bears a stria on the intestinal region in *M. maculata*, but such a stria is absent in *M. lenticularis* ; the basal segment of the antennular peduncle reaches or slightly overreaches the distal corneal margin in *M. maculata*, rather than distinctly overreaching it in *M lenticularis*; and the carpus of the male cheliped is less elongate in *M. maculata* than in *M. lenticularis* (less than twice as long as wide versus twice or more). The color in life is also different among the three species. *Munida maculata* and *M. lenticularis* has a red spot on the anterior branchial region of the carapace, but Macpherson (2006) clearly mentioned that such a spot is absent in *M. ignea* ; the spot on the anterior branchial region is encircled by white in *M. lenticularis*, but not encircled in *M. maculata* ; the carapace has white bands in *M. lenticularis*, whereas there are no white bands on the carapace in *M. ignea* and *M. maculata* ; and the ambulatory legs are banded with red and white in *M. lenticularis* and *M. maculata*, while not banded in *M. ignea* (Macpherson and de Saint Laurent, 1991; Macpherson, 2006).

Etymology. From the Latin "*maculatus*" (= spotted), referring to the red spot on the anterior branchial region of the carapace.

Munida megalophthalma sp. nov.
(Figs. 5, 6)

Material examined. Holotype: TRV *Shin' yo-maru*, 1996 research cruise, stn 4, Izu Islands, Hyotan-se Bank, 34° 20.87' N, 139° 03.77' E, 183 – 230 m, 22 October 1996, dredge, coll. T. Komai, ovig. female (cl 6.4 mm), CBM-ZC 4604.

Paratypes: RV *Tansei-maru*, KT97-1 cruise, Izu Islands, SW of Izu-oshima Island, 34° 40.2' N, 139° 18.0' E, 278 – 300 m, 27 February 1997, dredge, coll. E. Tsuchida, 1 female (cl 6.9 mm), CBM-ZC 6661; TRV *Shin' yo-maru*, 2002 research cruise, stn 25, Sagami Sea, off Izu-oshima Island, 35° 02.03' N, 139° 11.90' E, 130 – 135 m, 23 October 2002, dredge, coll. T. Komai, 1 male (cl 7.1 mm), CBM-ZC 10529; stn 29, similar locality, 34° 40.21' N, 139° 18.62' E, 289 – 307 m, 24 October 2002, dredge, coll. T. Komai, 1 male (cl 7.4 mm), CBM-ZC 10530.

Description. Carapace (Fig. 5A) 1.2 times longer than wide. Dorsal surface gently convex transversely; main transverse ridges not interrupted; few secondary transverse striae present between main ridges; most ridges and striae with dense short, non-iridescent setae. Gastric region slightly elevated, with 5 pairs of epigastric spines, spine posterior to base of supraocular spine strongest; median tubercle on epigastric region scale-like, unarmed. Hepatic region with some squamiform ridges. Cervical groove distinct. Parahepatic and postcervical spines on each side, these spines small; no branchial dorsal spines. Anterior part of branchial region with some striae, but without granules; lateral part of posterior branchial region with 6 or 7 transverse ridges or striae (excluding posterior transverse ridge). Intestinal region with short arcuate stria on median part. Posterior transverse ridge with 2 striae. Frontal margins slightly oblique. Lateral margins feebly convex in dorsal view. Anterolateral spine moderately long, nearly reaching sinus between rostrum and supraocular spines; no spine on frontal margin mesial to anterolateral angle. Hepatic margin with 1 or 2 spines much smaller than anterolateral spine (less than 0.3 length). Branchial margins each with 5 moderately small spines, anteriormost spine larger than other spines.

Rostrum (Fig. 5A) spiniform, about 0.5 times as long as carapace, directed forward, faintly sinuous in lateral view; dorsal carina not particularly delimited. Supraocular spines relatively long and slender, nearly parallel in dorsal view and very slightly as-

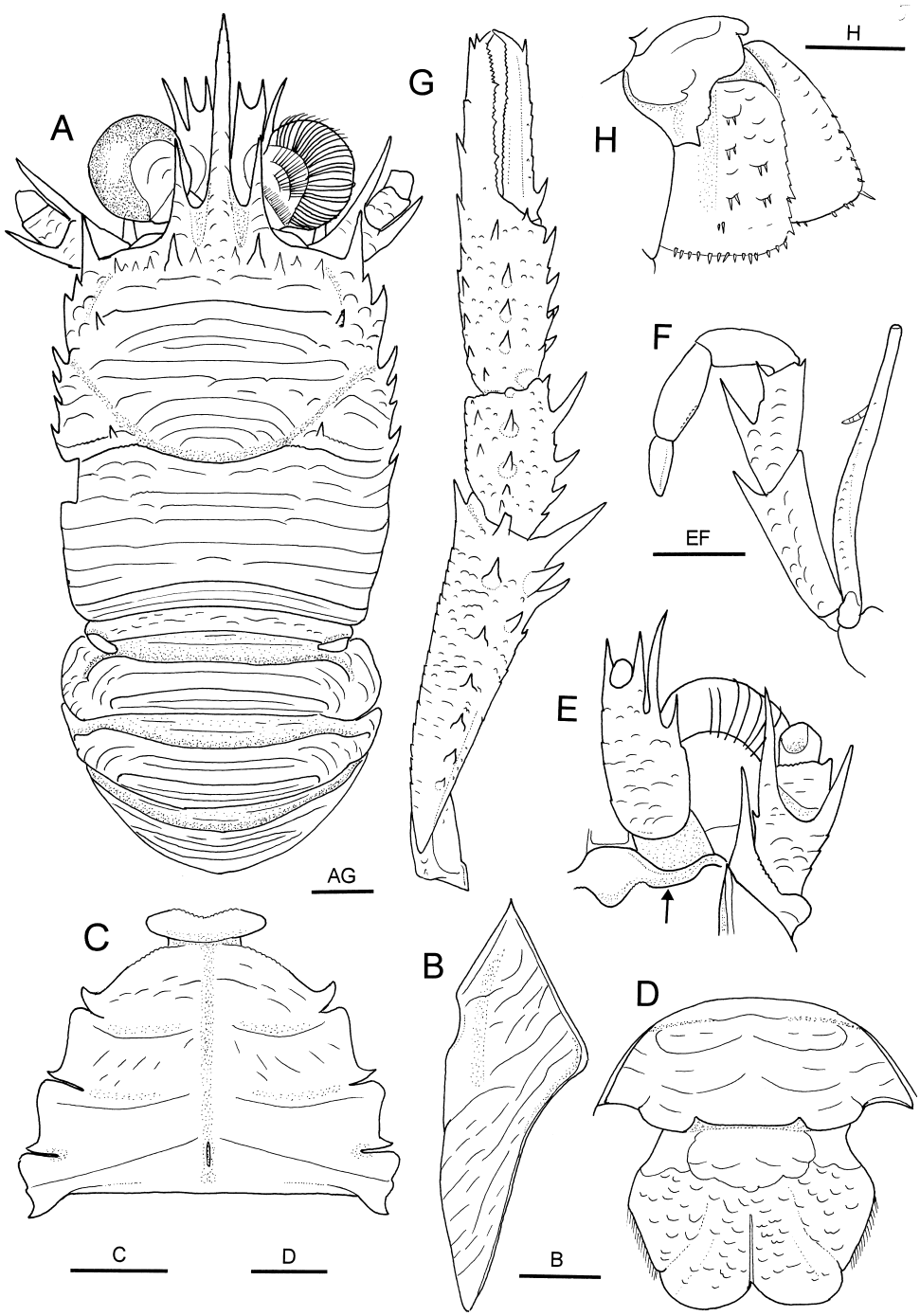

Fig. 5. *Munida megalophthalma* sp. nov., holotype, ovig. female (cl 6.4 mm), CBM-ZC 4604. A, carapace, cephalic appendages and first to fourth abdominal somites, dorsal view (left branchial margin damaged; setae omitted except for left eye; antennal flagella omitted); B, right pterygostomial flap, ventrolateral view; C, thoracic sternum, ventral view (setae omitted); D, sixth abdominal somite and telson, outer (ventral) view (setae omitted); E, left anterolateral part of carapace, eye, first segment of antennular peduncle and antennal peduncle, ventral view (arrow indicating epistomal ridge); F, left third maxilliped, lateral view (setae omitted); G, left cheliped, dorsal view (denuded); H, right uropod, outer (ventral) view (setae omitted). Scale bars: 1 mm.

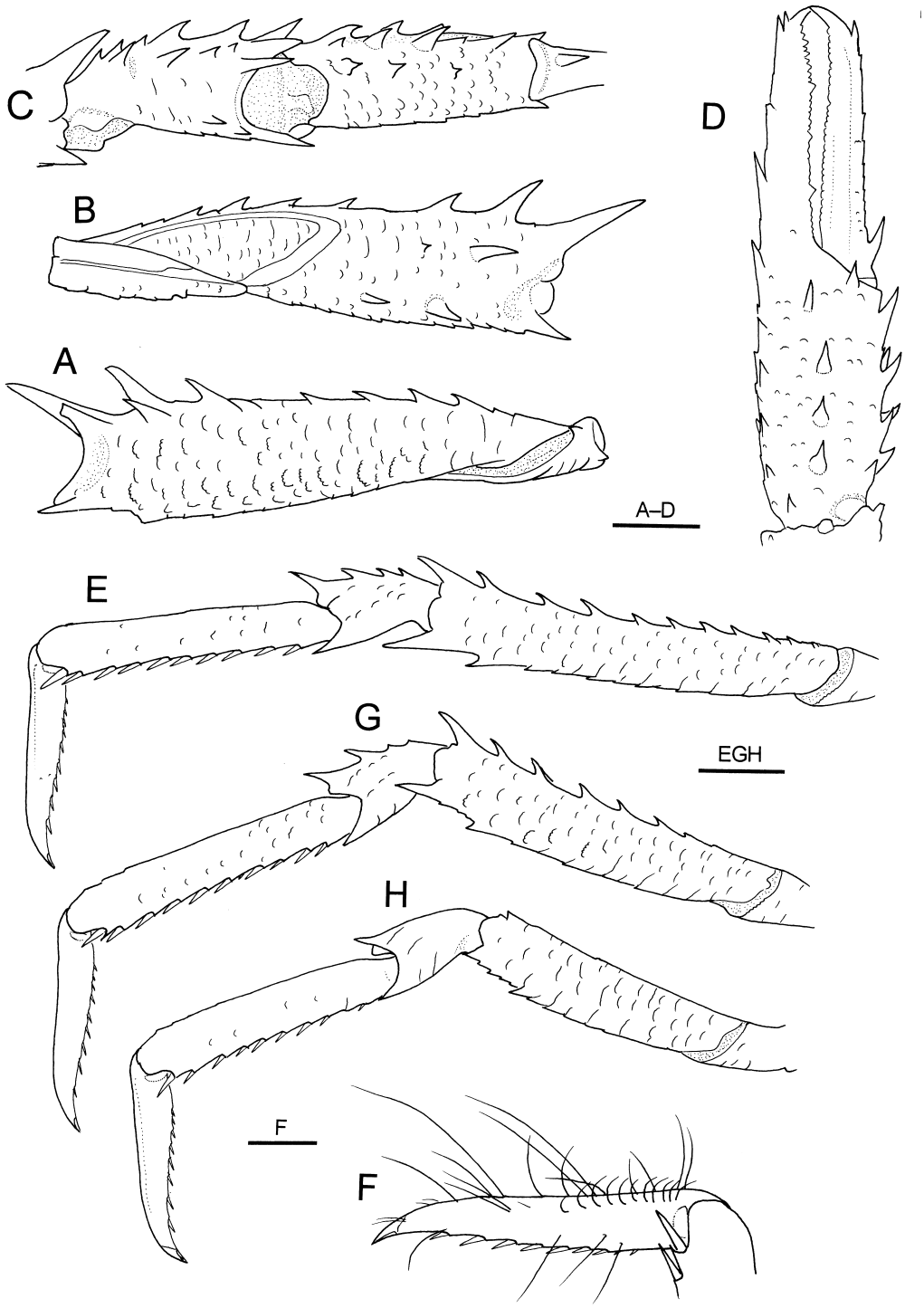

Fig. 6. *Munida megalophthalma* sp. nov., holotype, ovig. female (cl 6.3 mm), CBM-ZC 4604 (setae omitted except for F). A, merus of left cheliped, lateral view; B, same, mesial view; C, carpus and palm of left cheliped, mesial view; D, left chela, dorsal view; E, left second pereopod, lateral view; F, same, dactylus, lateral view; G, left third pereopod, lateral view; H, left fourth pereopod, lateral view. Scale bars: 1 mm for A – E, G, H; 0.5 mm for F.

cending in lateral view, about 0.4 length of rostrum.

Orbit with 1 tiny spine; ventral margin produced, bearing 1 spinule.

Pterygostomial flap (Fig. 5B) with sharp spine anteriorly, lateral face moderately rugose with irregular transverse or obliquely transverse striae.

Epistomal ridge sinuous, ending slightly anterior to excretory pore of basal segment of antennal peduncle; mesial protuberance distinct (Fig. 5E).

Thoracic sternite (Fig. 5C) wider than long. Third thoracic sternite about 3.6 times wider than long, broader than anterior margin of fourth sternite, narrowly separated from fourth sternite; anterior margin slightly bilobed with shallow median notch. Fourth and fifth sternites with several short striae. Sixth and seventh sternites smooth. Seventh sternite with deep median groove. Transverse ridges nearly smooth, with row of short setae.

First abdominal tergite (Fig. 5A) with numerous short striae. Second somite (Fig. 5A) with anterior ridge unarmed; tergum with 1 main transverse ridge and 3 transverse striae (1 stria anterior to main ridge and 2 striae posterior to main ridge), and some lateral striae; pleuron also with some short striae. Third somite (Fig. 5A) with anterior ridge unarmed; tergum with 1 main transverse ridge and 4 transverse striae (2 striae anterior to and posterior to main ridge, respectively), and 2 lateral striae; pleuron with some arcuate striae. Fourth somite with anterior ridge unarmed; tergum with 1 main transverse ridge and 4 or 5 transverse striae, and few lateral striae; pleuron with some squamiform ridges. Fifth somite with 2 main transverse ridges and 3 interspersed striae on tergum; pleuron with some arcuate ridges or striae. Sixth somite (Fig. 5D) with 2 main transverse ridges medially interrupted, and some secondary striae laterally. Telson (Fig. 5D) about 1.4 times wider than long, incompletely divided into 7 plates (division between lateral and posterolateral plates indistinct); anteromedian plate with 1 medially interrupted transverse stria; lateral and posterolateral plates squamous.

Eye (Fig. 5A, E) large. Cornea strongly dilated, width much greater than sinus between rostrum and supraocular spine and about 0.40 of distance between bases of anterolateral spines of carapace. Eyestalk narrowed proximally, with 2 setiferous striae on dorsal surface; eyelash long, covering dorsal part of corneal surface.

Basal segment of antennular peduncle (Fig. 5E) moderately stout, reaching distal corneal margin, length excluding distal spines about 1.9 of width; ventral surface with many short squamiform ridges; distal spines moderately long and slender, subequal in length; 2 lateral spines present, first spine overreaching distal spines, arising somewhat proximal to base of distolateral spine, second spine relatively long and slender, located distal to midlength of basal segment; statocyst lobe slightly inflated.

Antennal peduncle (Fig. 5E) stout, slightly overreaching midlength of eye. First segment with moderately long distomesial spine reaching distal margin of third segment; distolateral margin weakly produced, unarmed. Second segment with several squamiform striae on ventral surface; distomesial spine distinctly overreaching distal margin of fourth segment; tiny mesial spine present; distolateral spine overreaching third segment, but not reaching fourth segment. Third and fourth segments unarmed, former with several transverse striae on ventral surface.

Third maxilliped (Fig. 5F) moderately slender. Ischium with moderately strong flexor distal spine extending as far as produced dorsodistal angle; lateral surface with interrupted median ridge and squamiform ridges on flexor side. Merus with 2 greatly unequal spines on ventral margin, proximal spine strong; extensor margin with tiny distal spine; lateral surface with several squamiform ridges. Carpus slightly rugose on extensor surface. Propodus slightly longer than carpus, not expanded. Dactylus much shorter than propodus.

Chelipeds (Figs. 5G, 6A – D) moderately squamous, 2.3 – 2.5 times longer than carapace, equally broad on merus, carpus and palm; surfaces covered with short plumose setae, mesial faces with some iridescent setae. Merus gradually narrowing proximally; dorsal surface with row of 7 or 8 spines laterally (spines increasing in size distally) and 3 spines in distal 0.4 mesially (distomesial spine diverging, far falling short of midlength of carpus); ventrolateral distal angle with strong spine; mesial surface with 1 or 2 spines on midline and row of 3 spines adjacent to ventral margin (including strong ventromesial distal spine); squamiform ridges on ventrolateral part marginally denticulate. Carpus 0.9 times as long as palm, 1.8 times longer than wide (excluding distomesial projection); dorsal surface with several minute squamiform tubercles and 4 spines on midline; dorsomesial margin with 5 spines (penultimate spine strongest); lateral surface with 1 or 2 small spines; mesial surface with few short ridges; ventral surface with 1 or 2 small subdis-

tal spines, ventrolateral distal angle with small spine. Palm slightly widened distally, 1.9 – 2.0 times longer than wide; dorsal surface with median row of 4 or 5 spines, 1 spine at articulation to dactylus, and 1 spine at proximolateral portion; dorsolateral margin with 4 or 5 spines, dorsomesial margin with 4 spines; mesial surface with row of 3 spines on midline; ventral surface with 1 small spine at dactylar articulation. Fixed finger nearly straight, with 2 small subdistal spines and 2 spines on proximal half of lateral margin; dorsal surface almost smooth; cutting edge with row of minute, acute or subacute denticles. Dactylus 1.2 times longer than palm, terminating in sharp, curved claw crossing tip of fixed finger; mesial margin with 1 proximal and 1 subterminal spines; dorsal surface unarmed; cutting edge with row of minute, subacute to blunt denticles along entire length. No proximal hiatus between dactylus and fixed finger.

Ambulatory legs (second to fourth pereopods) moderately long and slender, decreasing in length posteriorly; dorsal margins of meri with sparse long iridescent setae interspersed by many short plumose setae; extensor margins of carpi and propodi with sparse long iridescent setae. Second pereopod (Fig. 6E) about 2.0 times longer than carapace, reaching nearly to level of tip of anterolateal spine on carapace by mero-carpal articulation; merus 0.8 – 0.9 times as long as carapace, 6.0 – 6.5 times longer than high, dorsal surface with row of 8 – 10 spines (distal spine strong), ventral margin with strong distolateral spine followed by 1 small spine and several transverse ridges, lateral face with numerous small squamiform tubercles or ridges; carpus about 0.4 length of propodus, with 4 spines increasing in size distally on extensor margin, flexor distal margin produced in strong spine; lateral surface with some short striae; propodus unarmed on extensor margin, lateral face with few very short squamiform ridges, flexor margin with row of 10 – 12 movable spines (penultimate spine somewhat close to ultimate spine, other spines equidistant), basal protuberance of ultimate spine with fixed spine; dactylus (Fig. 6F) 0.7 – 0.8 times as long as propodus and 6.0 – 6.5 times as long as high, slightly curved in distal part, bearing sparse short to long stiff setae on extensor margin (row of short curled setae on lateral face nearly parallel to extensor margin), flexor margin slightly sinuous, with 9 small corneous spines along entire length; minute subterminal spinule contiguous to unguis. Third pereopod (Fig. 6G) generally similar to second pereopod, slightly overreaching anterolateral angle of carapace by mero-carpal articulation; merus 0.8 length of that of second pereopod, dorsal surface with lateral row of 8 – 10 spines, ventral margin with strong distolateral spine followed by 1 small spine and several transverse ridges; carpus with 2 conspicuous spines and 2 minute spinules on extensor margin; propodus with 10 movable spines on flexor margin; dactylus with 9 small corneous spines and 1 subterminal spinule on flexor margin. Fourth pereopod (Fig. 6H) reaching to lateral end of cervical groove of carapace by mero-carpal articulation; merus 0.6 length of that of second pereopod, dorsal surface unarmed except for tiny distal spine, ventral surface with relatively small distal spine followed by 1 small spine and several transverse ridges, lateral surface with numerous squamiform ridges; carpus with prominent dorsodistal and ventrodistal spines; propodus similar to those of second and third pereopods, bearing 9¬ or 10 movable spines on flexor margin; dactylus 0.8 times as long as propodus, with 8 corneous spines and 1 subterminal spinule on flexor margin.

Merus of fifth pereopod moderately rugose with scattered short transverse ridges on outer surface.

Uropodal exopod (Fig. 5H) with lateral margin faintly denticulate, armed with row of minute movable spinules; outer surface with short transverse striae laterally; posterior margin with row of spinules, posterolateral spinule longest. Endopod with lateral margin denticulate, bearing few minute movable spinules; outer surface with several short squamiform ridges sometimes bearing 1 or 2 spinules; posterior margin with row of spinules.

Distribution. Sagami Sea and northern part of Izu Islands, central Japan, 130 – 307 m deep.

Remarks. *Munida megalophthalma* sp. nov. appears closest to *M. caesura* Macpherson and Baba, 1993 and *M. pherusa* Macpherson and Baba, 1993, both known from Japan, Taiwan, the Philippines and Indonesia, and *M. sao* Macpherson, 1994 from New Caledonia and Vanuatu. Shared key characters include: carapace bearing parahepatic, postcervical and five branchial spines and five spines on branchial margin; thoracic sternum with some short striae on fourth and fifth sternites, no granules or carinae on lateral parts of posterior sternites; frontal margin of carapace slightly oblique; abdomen unarmed, but bearing relatively numerous ridges and striae; eyes large; distal spines on basal segment of antennular peduncle subequal; distomesial spine of first segment of anten-

nal reaching distal margin of third segment, distomesial spine of second segment distinctly overreaching fourth segment; merus of third maxilliped bearing dorsodistal spine; and chela having spines on lateral margin of fixed finger. However, *M. megalophthalma* differs from these three allies in the arrangement of the flexor spines on the dactyli of the second pereopod. In *M. megalophthalma*, the ultimate flexor spine (except for subterminal spinule closely contiguous with the unguis) is located at the distal 0.2 of the dactyl length, whereas this spine is located at the distal 0.3 – 0.4 in the latter three species (Macpherson and Baba, 1993; Macpherson, 1994). Consequently, it appears that the dactylus of the second pereopod bears flexor spinules along the almost entire length in *M. megalophthalma* unlike the other three species. The presence of relatively few striae on the fourth and fifth thoracic sternites and the absence of striae on the sixth sternite also distinguish *M. megalophthalma* from *M. caesura* and *M. pherusa*. *Munida sao* further differs from *M. megalophthalma* in the following characters: the anterolateral spine on the carapace overreaches the sinus between the rostrum and the supraocular spine, rather than falling short of it; the third thoracic sternite is more strongly bilobed in *M. sao* than in *M. megalophthalma* ; the anterior margin of the fourth sternite is concave to receive the third sternite in *M. sao*, whereas it is gently convex in *M. megalophthalma* ; the chelipeds is more elongate in *M. sao* than in *M. megalophthalma* even in comparison of females (for example, the carpus is more than twice as long as in *M. sao*, in contrast less than twice in *M. megalophthalma*).

Munida spilota Macpherson, 1994 known from the Southwest Pacific is also similar to *M. megalophthalma* sp. nov., particularly in the armature of the dactyli of the ambulatory legs. However, the presence of two pairs of lateral spines on the anterior ridge of the second abdominal somite and the smooth fifth thoracic sternites distinguish *M. spilota* from *M. megalophthalma* (Macpherson, 1994).

Etymology. From the combination of the Greek *megalos* (= large) and *ophthalmus* (eyed), in reference to the large eye of this new species.

Munida multilineata sp. nov.
(Figs. 7, 8)

Material examined. Holotype: RV *Tansei-maru*, KT95-5 cruise, stn TB18-2, Sagami Sea, Okinoyama Bank, 34° 59' N, 139° 39' E, 105 – 113 m, 21 April 1995, dredge, coll. T. Komai, 1 ovig. female (cl 10.5 mm), CBM-ZC 2010.

Description. Carapace (Fig. 7A) 1.2 times longer than wide. Dorsal surface gently convex transversely; most main transverse ridges not interrupted; few secondary transverse striae present between main ridges; most ridges and striae with dense short, non-iridescent setae. Gastric region slightly elevated, with 6 pairs of epigastric spines; spine posterior to base of supraocular spine strongest; median tubercle on epigastric region scale-like, bearing minute spinule. Hepatic region with some transverse ridges and 1 small extra spine anterior to parahepatic spine. Cervical groove distinct. Parahepatic, branchial dorsal and postcervical spines present on each side, these spines moderately small. Anterior part of branchial region with some striae; lateral part of posterior branchial region with 7 or 8 transverse ridges or striae (excluding posterior transverse ridge). Intestinal region without stria on median part. Posterior transverse ridge with 3 striae. Frontal margins somewhat oblique, slightly concave. Lateral margins feebly convex in dorsal view. Anterolateral spine relatively long, reaching sinus between rostrum and supraocular spines; no spine on frontal margin mesial to anterolateral angle. Hepatic margin with 3 spines, strongest second spine about 0.2 length of supraocular spine. Branchial margins each with 5 moderately small spines, anteriormost spine subequal in size to other spines.

Rostrum (Fig. 7A) spiniform, about 0.4 times as long as carapace, spiniform, directed forward, faintly sinuous in lateral view; dorsal carina not particularly delimited. Supraocular spines relatively long and slender, slightly diverging in dorsal view and very slightly ascending in lateral view, about 0.4 length of rostrum.

Orbit with 1 small spine; ventral margin prominently produced, minutely denticulate.

Pterygostomial flap (Fig. 7B) terminating anteriorly in sharp spine, lateral face strongly rugose with irregular transverse or obliquely transverse ridges.

Epistomal ridge (not figured) sinuous, ending at excretory pore of first segment of antennal peduncle; mesial protuberance distinct.

Thoracic sternum (Fig. 7C) wider than long. Third thoracic sternite about 3.0 times wider than long, almost as broad as anterior margin of fourth sternite, narrowly separated from fourth sternite; anterior margin minutely granulate, slightly bilobed with shal-

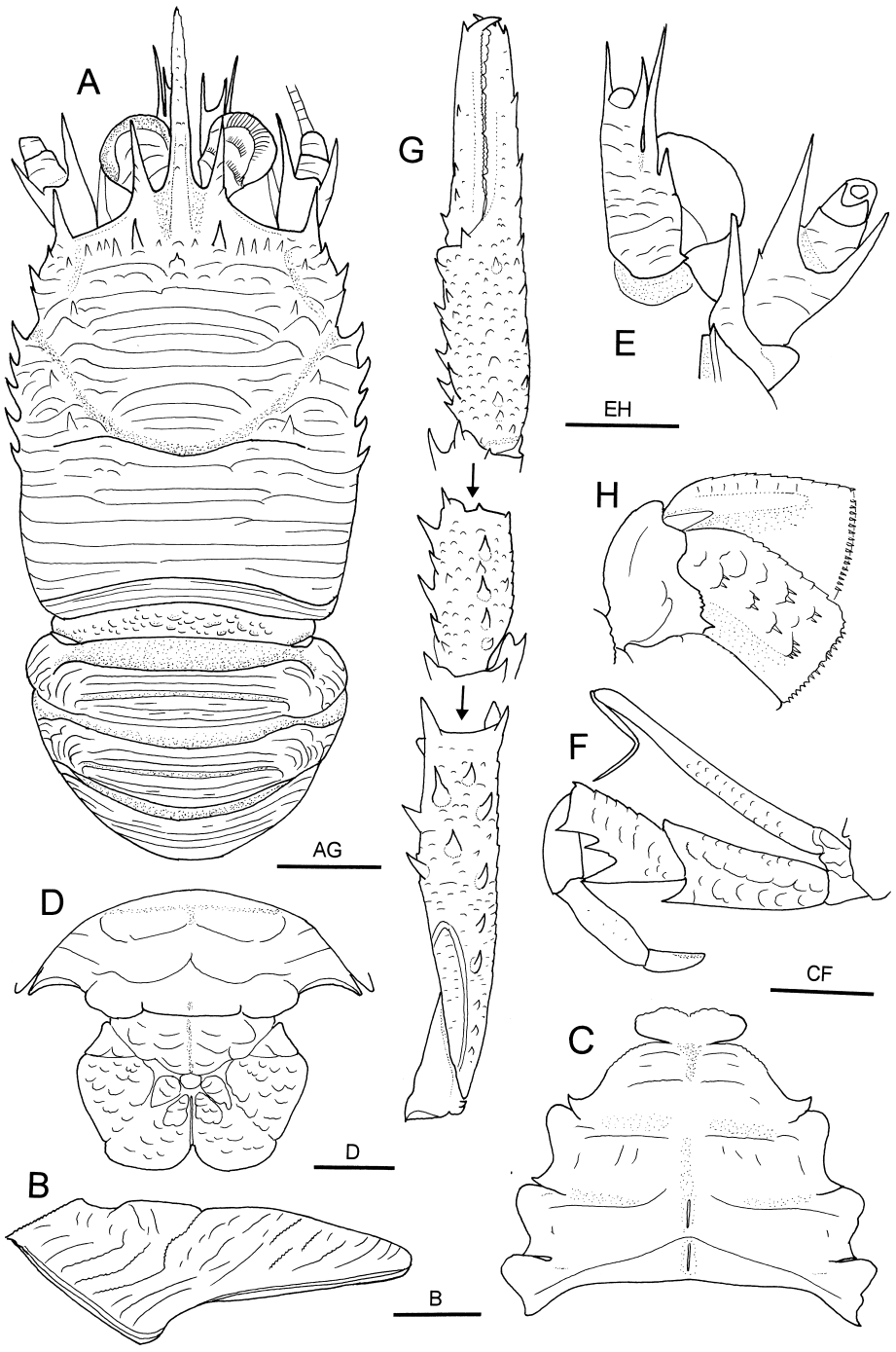

Fig. 7. *Munida multilineata* sp. nov., holotype, ovig. female (cl 10.5 mm), CBM-ZC 2010. A, carapace, cephalic appendages and first to fourth abdominal somites, dorsal view (setae omitted except for left eye; antennal flagella omitted); B, left pterygostomial flap, ventrolateral view; C, thoracic sternum, ventral view (setae omitted); D, sixth abdominal somite and telson, outer (ventral) view (setae omitted); E, left anterolateral part of carapace, eye, first segment of antennular peduncle and antennal peduncle, ventral view; F, left third maxilliped, lateral view (setae omitted); G, right cheliped, dorsal view (denuded); H, right uropod, outer (ventral) view (setae omitted). Scale bars: 3 mm for A, G; 2 mm for B – F, H.

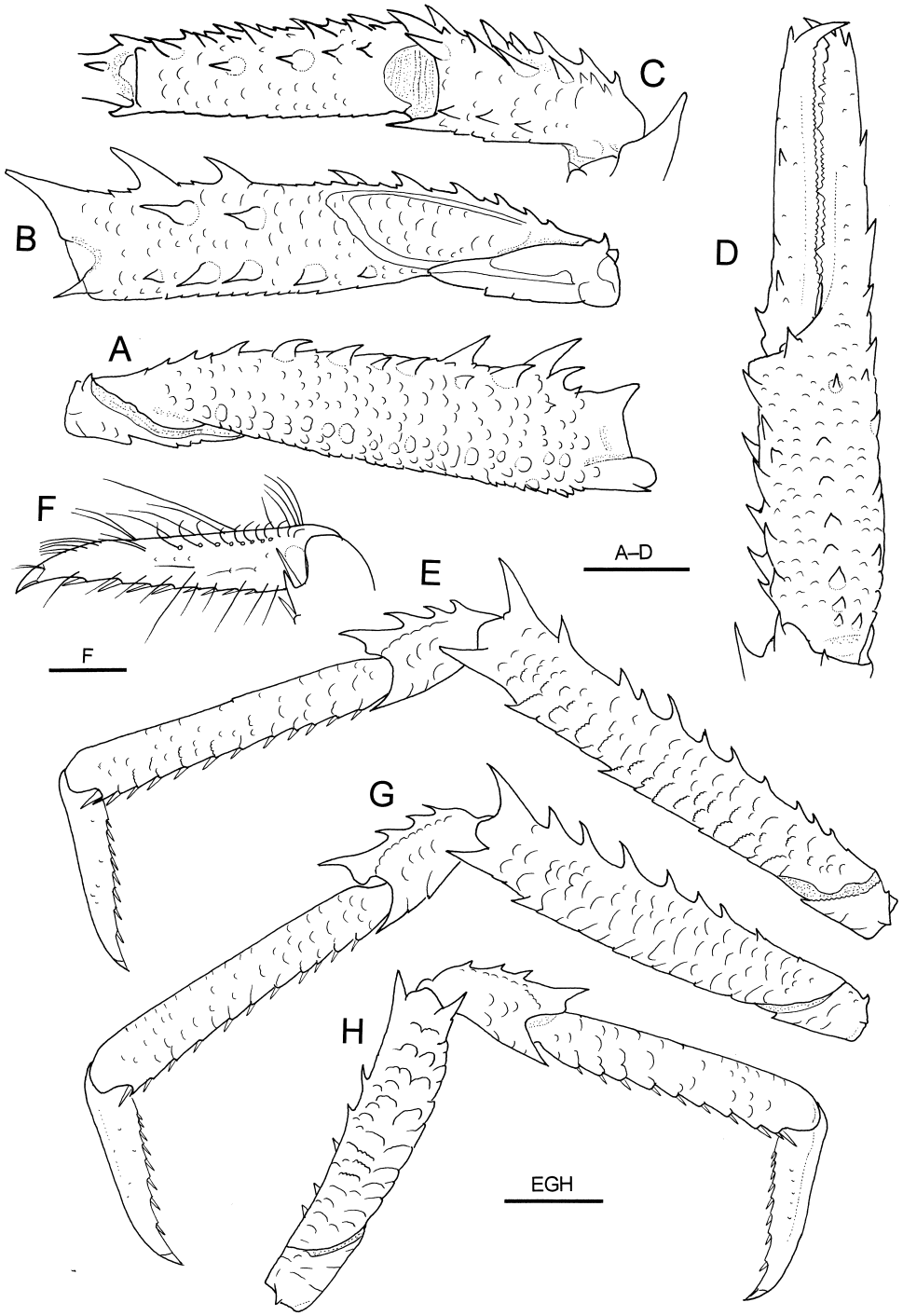

Fig. 8. *Munida multilineata* sp. nov., holotype, ovig. female (cl 10.5 mm), CBM-ZC 2010 (setae omitted except for F). A, merus of right cheliped, lateral view; B, same, mesial view; C, carpus and palm of right cheliped, mesial view; D, right chela, dorsal view; E, left second pereopod, lateral view; F, same, dactylus, lateral view; G, left third pereopod, lateral view; H, right fourth pereopod, lateral view. Scale bars: 2 mm for A – E, G, H; 1 mm for F.

low median notch. Fourth and fifth sternites with few striae. Sixth and seventh sternites smooth, each with deep median groove. Transverse ridges nearly smooth, with row of short setae.

First abdominal tergite (Fig. 7A) with numerous shallow punctations. Second somite (Fig. 7A) with anterior ridge unarmed; tergum with 1 main transverse ridge and 5 interrupted transverse striae and a few additional very short striae; pleuron also with several short striae. Third somite (Fig. 7A) with anterior ridge unarmed; tergum with 1 main transverse ridge and 5 transverse striae, and some lateral striae; pleuron with some arcuate striae. Fourth somite with anterior ridge unarmed; tergum with 3 main transverse ridges and 2 medially interrupted transverse striae, and some lateral striae; pleuron with some squamiform striae. Fifth somite with 3 main transverse ridges on tergum; pleuron with some arcuate ridges or striae. Sixth somite (Fig. 7D) with 2 main transverse ridges medially interrupted, and a few striae laterally. Telson (Fig. 7D) about 1.5 times wider than long, incompletely divided into 7 main plates; anteromedian plate with 3 transverse ridges interrupted by distinct median groove; lateral and posterior plates strongly squamous.

Eyes (Fig. 7A, E) moderately large. Cornea strongly dilated, corneal width much greater than sinus between rostrum and supraocular spine and 0.3 of distance between bases of anterolateral spines of carapace. Eyestalk slightly narrowed proximally, with 2 setiferous striae on dorsal surface; eyelash long, covering dorsal part of corneal surface.

Basal segment of antennular peduncle (Fig. 7E) moderately stout, distinctly overreaching distal corneal margin, length excluding distal spines about 2.3 of width; ventral surface with many short squamiform ridges and few transverse striae; distal spines moderately long and slender, distomesial spine somewhat longer than distolateral spine; 2 lateral spines present, first spine elongate, overreaching distal spines, arising considerably proximal to base of distolateral spine, second spine located at midlength of basal segment; statocyst lobe slightly inflated.

Antennal peduncle (Fig. 7E) stout, slightly overreaching midlength of eye. First segment with moderately long distomesial spine not reaching distal margin of third segment; distolateral margin noticeably produced in rounded lobe. Second segment with some striae on ventral surface; distomesial spine distinctly overreaching distal margin of fourth segment; minute mesial spine present; distolateral spine overreaching third segment, but not reaching fourth segment. Third and fourth segments unarmed, former with few striae on ventral surface.

Third maxilliped (Fig. 7F) moderately slender. Ischium with moderately strong flexor distal spine slightly falling short of level of extensor distal angle; lateral surface with interrupted median ridge and squamiform ridges ventrally. Merus with 3 spines on flexor margin, 2 distal spines moderately small and subequal, proximal spine very strong; extensor margin with tiny distal spine; extensor margin and lateral surface with several squamiform or transverse ridges. Carpus smooth on extensor surface. Propodus longer than carpus, not expanded. Dactylus much shorter than propodus.

Cheliped (only right side preserved) (Figs. 7G, 8A – D) strongly squamous, 2.5 times longer than carapace, equally broad on merus, carpus and palm; surfaces covered with short plumose setae, mesial faces with some iridescent setae. Merus gradually narrowing proximally; dorsal surface with row of 8 spines interspersed by spinules laterally and 3 spines in distal 0.4 mesially (distomesial spine quite prominent and diverging, but far falling short of midlength of carpus); ventrolateral distal angle with 1 small spine; mesial face with 2 strong spines on midline and row of 6 spines adjacent to ventral margin (ventromesial distal spine broken). Carpus 0.8 times as long as palm, 2.1 times longer than wide (excluding distomesial projection); dorsal surface with 6 spines on midline (1 on dorsodistal margin); dorsomesial margin with 6 spines; lateral surface with 1 small spine; ventral surface mesially with longitudinal row of 3 spines; ventrolateral distal angle with small spine. Palm not widened distally, 2.4 times longer than wide; dorsal surface with median row of 8 small spines, 1 spine at articulation to dactylus, and 1 spine at proximolateral portion; dorsolateral margin with 4 spines, dorsomesial margin with 5 spines; mesial surface with 4 spines on midline; ventral surface with 1 small spine at dactylar articulation. Fixed finger nearly straight, with 2 small subdistal spines and 3 spines on proximal 0.7 of lateral margin; dorsal surface with some minute tubercles; cutting edge with row of minute, acute or subacute denticles. Dactylus 1.1 times longer than palm, terminating in sharp, curved claw crossing tip of fixed finger; mesial margin with 1 proximal and 1 subterminal spines; dorsal surface with 3 mesial spines in proximal 0.6; cutting edge with row of minute, subacute to

blunt denticles along entire length. No proximal hiatus between dactylus and fixed finger.

Ambulatory legs (second to fourth pereopods) moderately long, relatively slender, decreasing in length posteriorly; dorsal margins of meri, carpi and propodi each having row of short plumose setae and sparse iridescent setae. Second pereopod (Fig. 8E) about 1.9 times longer than carapace, falling short of level of tip of anterolateal spine on carapace by mero-carpal articulation; merus 0.7 times as long as carapace, 6.0 times longer than high, dorsal surface with row of 11 spines (distal spine strong), ventral margin with strong distolateral spine followed by 2 smaller spines and several squamiform ridges, lateral face with numerous small squamiform ridges; carpus about 0.4 length of propodus, with 4 spines increasing in size distally on extensor margin, flexor distal margin produced in strong spine; lateral surface with longitudinal dorsal ridge consisting of small squamiform ridges and some squamiform ridges or striae; propodus unarmed on extensor margin, lateral surface with many small squamiform ridges, flexor margin with row of 12 equidistant movable spines, basal protuberance of ultimate spine with fixed spine; dactylus (Fig. 8F) 0.7 times as long as propodus and 5.6 times as long as high, slightly curved in distal part, bearing sparse short to long stiff setae on extensor margin; lateral surface dorsally with row of short curled setae parallel to extensor margin; flexor margin slightly sinuous, with 8 small corneous spines notably increasing in length distally along entire length; minute subterminal spinule closely appressed to unguis. Third pereopod (Fig. 8G) generally similar to second pereopod, reaching anterolateral angle of carapace by mero-carpal articulation; merus 0.8 length of that of second pereopod, dorsal surface with row of 9 spines, ventral margin with strong distolateral spine followed by 1 smaller spine and several squamiform ridges; carpus with 4 spines on extensor margin; propodus with 11 movable spines on flexor margin; dactylus with 8 small corneous spines and 1 subterminal spinule on flexor margin. Fourth pereopod (Fig. 8H) reaching to lateral end of cervical groove of carapace by mero-carpal articulation; merus 0.6 length of that of second pereopod, dorsal surface armed with 6 spines including strong dorsodistal spine, ventral surface with 1 strong distal spine and row of transverse ridges, lateral surface with numerous squamiform ridges; carpus with prominent dorsodistal and ventrodistal spines, dorsal margin further with 3 small spines; propodus similar to those of second and third pereopods, bearing 9 or 10 movable spines on flexor margin; dactylus about 0.8 times as long as propodus, with 8 corneous spines and subterminal spinule on flexor margin.

Merus of fifth pereopod strongly squamous on outer surface.

Uropodal exopod (Fig. 7H) with lateral margin minutely denticulate, armed with a few minute movable spinules; outer surface with short transverse striae laterally; posterior margin subtruncate, with row of minute spinules. Endopod with lateral margin denticulate, bearing few minute movable spinules; outer surface laterally with several short squamiform ridges sometimes bearing 1 or 2 spinules; posterior margin truncate, with row of numerous minute spinules.

Distribution. Known only from the type locality, Okinoyama Bank, Sagami Sea, Japan, at depths of 105 – 113 m.

Remarks. *Munida multilineata* sp. nov. appears close to *M. abelloi* Macpherson, 1994 known from Kiribati and Futuna Islands and *M. moliae* Macpherson, 1994 and *M. notata* Macpherson, 1994 from the Southwest Pacific. Shared key characters are: branchial margin of carapace bearing five spines; eyes moderately large; abdomen lacking spines, but having relatively numerous ridges and striae; thoracic sternum lacking patch of granules or carinae on lateral parts; basal segment of antennular peduncle having distomesial spine longer than distolateral spine; and second segment of antennal peduncle with distomesial spine distinctly overreaching fourth segment. *Munida multilineata* differs from the latter three species in having some short oblique striae on the fifth thoracic sternite. In the latter three species, there are no striae on the fifth thoracic sternite. The relatively small eye distinguishes *M. abelloi* and *M. multilineata* from *M. moliae* and *M. notata*. *Munida notata* is easily distinguished from the other three species here considered by the dactylus of the second pereopod unarmed in the distal 0.3 of the flexor margin. In the other three species, the dactylus of the second pereopod is armed with corneous spines along the entire length. *Munida abelloi* further differs from *M. multilineata* in the following characters: the merus of the third maxilliped lacks a dorsodistal spine in *M. abelloi*, which is present in *M. multilineata*; and the ultimate protuberance on the flexor margin of the propodus of the second pereopod lacks a fixed spine proximal to the base of

corneous spine unlike *M. multilineata*. The other differentiating characters between *M. moliae* and *M. multilineata* are: the carapace is devoid of branchial dorsal and postcervical spines in *M. moliae*, whereas these spines are present in *M. multilineata*; and the dactylus of the cheliped lacks dorsomesial spines in *M. moliae*, but there are three dorsomesial spines in *M. multilineata*. *Munida notata* is further separated from *M. multilineata* by the more elongate chelipeds even in comparison of females.

Etymology. From the combination of the Latin *multus* (= many) and *lineatus* (= lined), in reference to the numerous transverse striae on the abdominal somites.

Munida munin Komai, 2011

Munida munin Komai, 2011b: 355, figs. 8, 9, 11C [type locality: E of Nishi-jima Island, Ogasawara Islands, 50 – 52 m].

Material examined. TRV *Shin'yo-maru*, 1996 cruise, stn 7, Izu Islands, Takase Bank, 34° 26.80' N, 139° 11.17' E, 87 – 93 m, 23 October 1996, dredge, 2 males (cl 7.2, 7.2 mm), 1 ovig. female (cl 6.1 mm), CBM-ZC 4634. RV *Takunan*, stn 6, Izu Islands, Kurose Bank, 33° 22.51' N, 139° 42.50' E, 110 – 111 m, 25 July 2007, dredge, 1 male (cl 6.8 mm), NSMT-Cr S1143.

Distribution. Izu-Ogasawara Arc, 50 – 178 m.

Remarks. The present specimens agree well with the original type description by Komai (2011b).

Munida olivarae Macpherson, 1994

Munida olivarae Macpherson, 1994: 505, figs. 36, 80 [type locality: Loyalty Islands, 33 m]; Osawa and Okuno, 2002: 132, figs. 2, 5B; Kawamoto and Okuno, 2003: 97, unnumbered fig; Macpherson, 2004: 268; Baba *et al*., 2008: 110 (compilation).

Material examined. RV *Takunan*, stn 4, Izu Islands, Kurose Bank, 33° 22.64' N, 139° 42.52' E, 110 – 114 m, 10 September 2007, dredge, 1 male (cl 4.9 mm), NSMT-Cr S1144; stn 10, Izu Islands, off Hachijo Island, 33° 06.62' N, 139° 51.96' E, 65 – 75 m, 11 September 2007, dredge, 2 males (3.2, 3.4 mm), 2 females (one damaged, cl 4.0 mm), NSMT-Cr S1145.

Distribution. New Caledonia, Loyalty Islands, Mathew and Hunter Islands, and Japan (Ryukyu Islands and Izu-Ogasawara Arc); 6 – 190 m.

Munida ommata Macpherson, 2004
(Figs. 9, 10)

Munida rufiantennulata: Macpherson, 1994: 523 (in part), figs. 46, 83; 1997: 610. Not *Munida rufiantennulata* Baba, 1969.

Munida ommata Macpherson, 2004: 268, fig. 8 [type locality: Chesterfield Islands, 480 – 601 m]; Baba *et al*., 2008: 111 (compilation).

Material examined. RV *Tansei-maru*, KT07-31 cruise, stn L-3-200, Izu Islands, N of Toshima Island, 34° 34.40' N, 139° 18.37' E, 152 – 198 m, 27 November 2007, chain bag dredge, coll. T. Komai, 1 male (cl 6.5 mm), CBM-ZC 10531.

Description of Japanese specimen. Carapace (Fig. 9A) 1.2 times longer than wide. Dorsal surface gently convex transversely; main transverse ridges interrupted or uninterrupted; a few secondary transverse striae present between main ridges; most ridges and striae with dense short setae and/or some long setae. Gastric region slightly elevated, with 5 pairs of epigastric spines; spine posterior to base of supraocular spine strongest; median tubercle on epigastric region scale-like. Hepatic region almost smooth. Cervical groove distinct. One parahepatic, 1 branchial dorsal and 1 postcervical spines present on each side, these spines moderately small. Anterior part of branchial region with a few transverse striae; lateral part of posterior branchial region with 6 transverse ridges or striae (excluding posterior transverse ridge). Intestinal region without striae medially. Posterior transverse ridge without transverse striae. Frontal margins strongly oblique. Lateral margins feebly convex in dorsal view. Anterolateral spine moderately long, not reaching sinus between rostrum and supraocular spines, directed forward; no spine on frontal margin mesial to anterolateral angle. Hepatic margin with 1 spine much smaller than anterolateral spine. Branchial margins each with 4 small spines, anterior 3 spines subequal in size, fourth spine distinctly smaller than others.

Rostrum (Fig. 9A) spiniform, 0.4 times as long as carapace, directed forward, faintly sinuous in lateral view; dorsal carina not particularly delimited. Supra ocular spines relatively short and moderately slender, almost parallel in dorsal view and directed forward in lateral view.

Orbit with 1 spine; ventral margin strongly produced, terminating in spine.

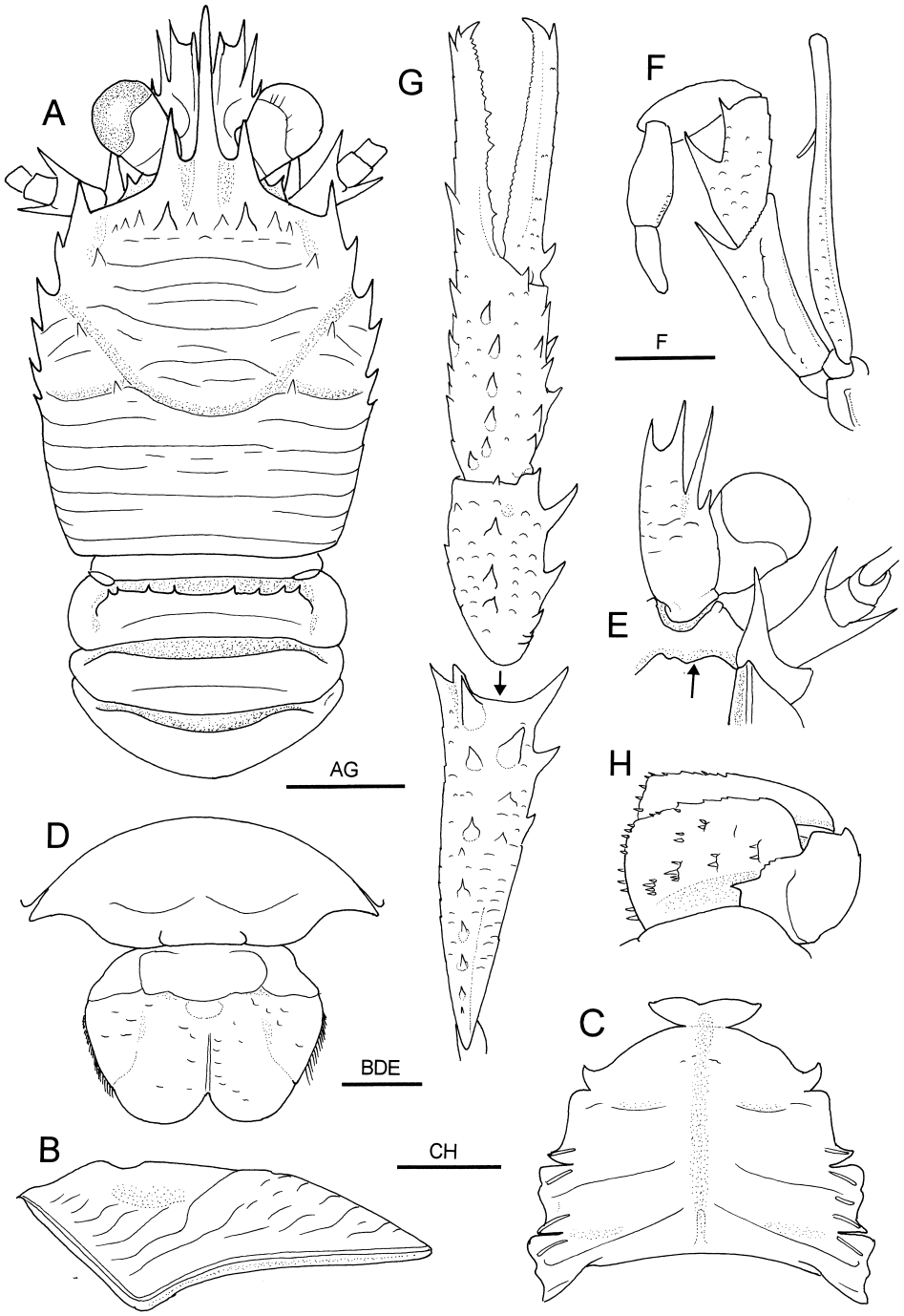

Fig. 9. *Munida ommata* Macpherson, 2004, male (cl 6.5 mm), CBM-ZC 10531. A, carapace, cephalic appendages and first to fourth abdominal somites, dorsal view (setae omitted except for left eye; antennal flagella omitted); B, left pterygostomial flap, ventrolateral view; C, thoracic sternum, ventral view (setae omitted); D, sixth abdominal somite and telson, outer (ventral) view (setae omitted); E, left anterolateral part of carapace, eye, first segment of antennular peduncle and antennal peduncle, ventral view (arrow indicating epistomal ridge); F, left third maxilliped, lateral view (setae omitted); G, left cheliped, dorsal view (denuded); H, left uropod, outer (ventral) view (setae omitted). Scale bars: 2 mm for A, G; 1 mm for B – F, H.

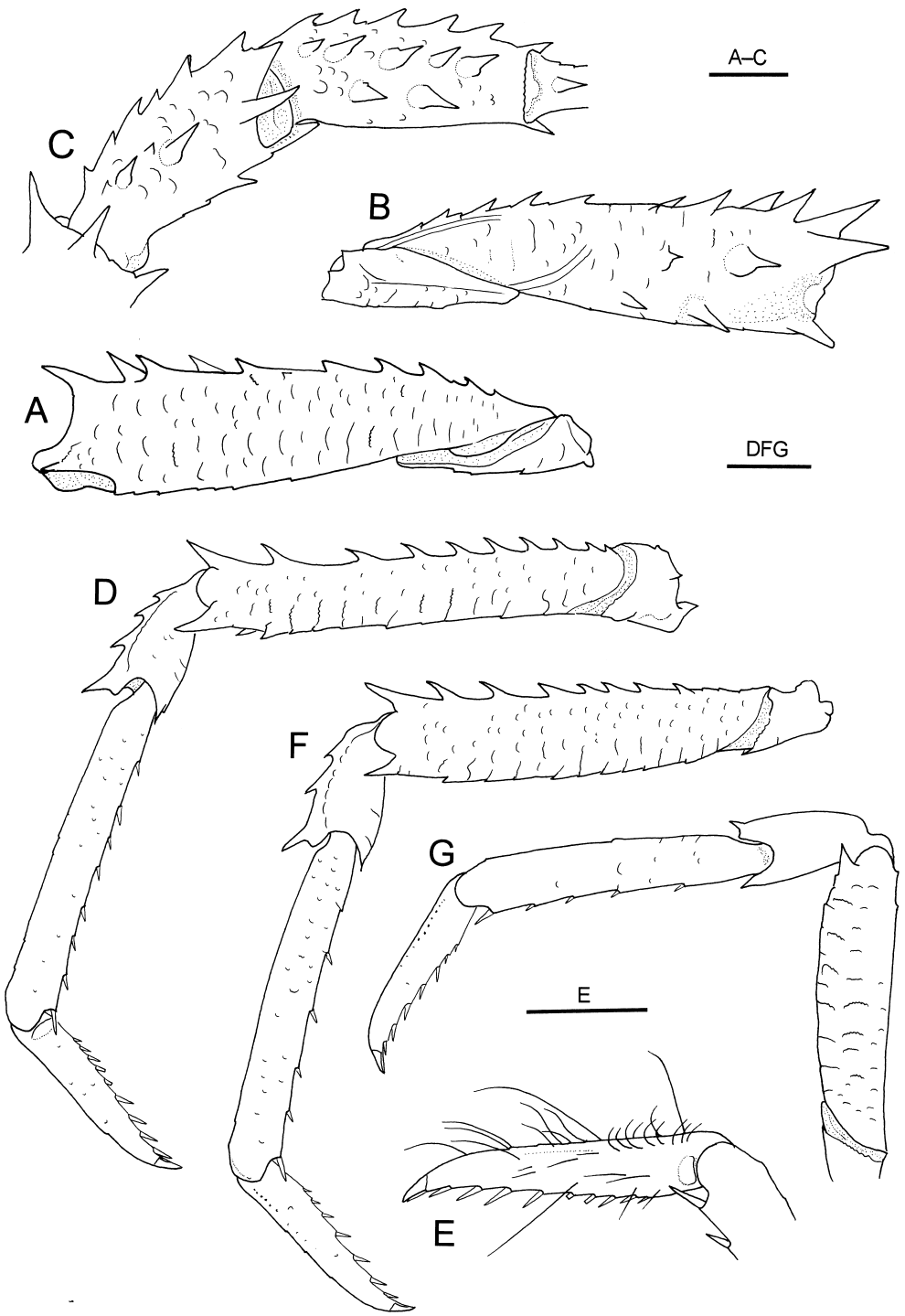

Fig. 10. *Munida ommata* Macpherson, 2004, male (cl 6.5 mm), CBM-ZC 10531 (setae omitted except for E). A, merus of left cheliped, lateral view; B, same, mesial view; C, carpus and palm of left cheliped, mesial view; D, left second pereopod, lateral view; E, same, dactylus, lateral view; F, left third pereopod, lateral view; G, left fourth pereopod, lateral view. Scale bars: 1 mm.

Pterygostomial flap (Fig. 9B) armed with small spine anteriorly, lateral surface moderately rugose with transverse to obliquely transverse striae.

Epistomal ridge sinuous, ending at excretory pore of first segment of antennal peduncle; mesial protuberance weak (Fig. 9E).

Thoracic sternite (Fig. 9C) wider than long. Third thoracic sternite about 4.0 times wider than long, much broader than anterior margin of fourth sternite; anterior margin faintly bilobed. Fourth sternite almost smooth, with only a few very short striae on median part. Fifth to seventh sternites with sharp carinae on lateral parts, otherwise smooth; seventh sternite with deep median groove. Transverse ridges nearly smooth, without setae.

First abdominal tergite (Fig. 9A) smooth. Second somite (Fig. 9A) with anterior ridge armed with 8 spines (arranged in 4 pairs); tergum with only 1 main transverse ridge; pleuron almost smooth. Third somite (Fig. 9A) with anterior ridge unarmed; tergum with 1 main transverse ridge; pleuron almost smooth. Fourth and fifth somites devoid of transverse ridges. Sixth somite (Fig. 9D) with paired arcuate striae in posterior half of tergum, otherwise smooth. Telson (Fig. 9D) 1.3 times wider than long, incompletely divided into 7 plates (division between lateral and posterolateral plates indistinct); anteromedian plate nearly smooth; lateral and posterior plates weakly squamous.

Eyes (Fig. 9A, E) moderately large, not particularly flattened dorsoventrally. Cornea dilated, corneal width much greater than sinus between rostrum and supraocular spine and about 0.3 of distance between bases of anterolateral spines of carapace. Eyestalk not narrowed proximally, with 1 setiferous striae on dorsal surface proximally; eyelash consisting of few short setae.

Basal segment of antennular peduncle (Fig. 9E) moderately stout, overreaching distal corneal margin, length excluding distal spines about 2.2 of width; ventral surface with some short transverse ridges; distal spines unequal, distomesial spine distinctly shorter than distolateral spine; 2 lateral spines present, first spine elongate, reaching tip of distolateral spine, arising considerably proximal to base of distolateral spine; second spine short, located slightly distal to midlength of basal segment; statocyst lobe slightly inflated laterally.

Antennal peduncle (Fig. 9E) moderately stout, reaching midlength of eye. First segment with moderately long distomesial spine nearly reaching distal margin of third segment; distolateral margin slightly produced in rounded lobe. Second segment without striae on ventral surface; distomesial spine moderately long, slightly reaching distal margin of fourth segment; no mesial spine; distolateral spine not reaching distal margin of fourth segment. Third and fourth segments unarmed, former without striae on ventral surface.

Third maxilliped (Fig. 9F) moderately slender. Ischium with moderately strong flexor distal spine extending as far as extensor distal angle; lateral surface with distinct median ridge. Merus with 2 spines on flexor margin, distal spine small, proximal spine strong; extensor distal margin unarmed; dorsal margin slightly rugose, lateral surface with scattered granules or scale-like tubercles. Carpus microscopically granulate on extensor surface. Propodus subequal in length to carpus, not expanded. Dactylus much shorter than propodus.

Chelipeds (Figs. 9G, 10A – C) moderately squamous, 2.7 times longer than carapace, equally broad on merus, carpus and palm; dorsal surfaces of palm and carpus bearing sparse short plumose setae and longer stiff setae; mesial faces of chela to merus bearing long stiff and iridescent setae. Merus gradually narrowing proximally; dorsal surface with row of 9 spines laterally and 4 spines mesially (distomesial spine diverging, far falling short of midlength of carpus); mesial surface with 2 spines on midline and 3 spines adjacent to ventral margin (including strong ventromesial distal spine). Carpus subequal in length to palm, 1.9 times longer than wide (excluding distomesial projection); dorsal surface with 4 spines on midline; dorsomesial margin with single row of 5 spines; lateral surface without conspicuous spines; ventral surface with 1 subdistal spine; ventrolateral distal angle with small spine. Palm not widened distally, about 2.0 times longer than wide; dorsal surface with median row of 5 spines, 1 spine at articulation to dactylus, and 1 spine at proximolateral portion; dorsolateral margin with 4 spines along entire length of palm, dorsomesial margin with 5 spines; mesial surface with 2 spines on midline; ventral surface with 1 small spine at dactylar articulation. Fixed finger nearly straight, with 2 subdistal spines; lateral margin with 2 spines in proximal 0.3; dorsal surface nearly smooth; cutting edge faintly sinuous, with 3 acute teeth interspersed by minute acute denticles. Dactylus 1.4 times longer than palm, terminating in

sharp, curved claw crossing tip of fixed finger; mesial margin with 1 subterminal spine and 1 proximal spine; dorsal surface unarmed; cutting edge with row of minute denticles along entire length. No proximal hiatus between dactylus and fixed finger.

Ambulatory legs (second to fourth pereopods) moderately long, relatively slender, decreasing in length posteriorly; dorsal margins of meri with sparse short, simple or plumose setae, those of carpi and propodi with very sparse short to long, stiff setae. Second pereopod (Fig. 10D) about 2.1 times longer than carapace, nearly reaching level of tip of anterolateal spine on carapace by mero-carpal articulation; merus 0.8 times as long as carapace, 6.3 times longer than high, dorsal surface with row of 10 spines (distal spine moderately strong), ventral margin with strong distolateral spine followed by several squamiform or transverse ridges (distalmost squamiform ridge bearing 1 small spine), lateral face with many small squamiform or short transverse ridges; carpus about 0.4 length of propodus, with 4 spines increasing in size distally on extensor margin, flexor distal margin produced in moderately strong spine; lateral surface with longitudinal ridge adjacent to extensor margin; propodus unarmed on extensor margin, lateral surface sparsely granulate, flexor margin with row of 8 small equidistant movable spines, basal protuberance of ultimate spine without fixed spine; dactylus (Fig. 10E) 0.6 times as long as propodus and 5.8 times longer than high, slightly curved in distal part, bearing sparse short to long stiff setae on extensor margin, lateral surface with row of short curled setae parallel to extensor margin, flexor margin faintly sinuous, with 9 small corneous spines along entire length (distal second to fourth spines from distal longest) and subterminal spinule contiguous to unguis. Third pereopod (Fig. 10F) generally similar to second pereopod, reaching anterolateral angle of carapace by mero-carpal articulation; merus 0.9 length of that of second pereopod, dorsal surface with 8 spines, ventral margin with strong distolateral spine followed by several squamiform or transverse ridges; carpus with 3 spines on extensor margin; propodus with 5 movable spines on flexor margin; dactylus 0.6 times as long as propodus, with 7 corneous spines and subterminal spinule on flexor margin. Fourth pereopod (Fig. 10G) reaching to lateral end of cervical groove of carapace by mero-carpal articulation; merus about 0.7 length of that of second pereopod, dorsal surface unarmed, ventral surface with moderately strong distolateral spine followed by some squamiform or transverse ridges, lateral surface with several squamiform ridges or short transverse ridges; carpus only with small dorsodistal spine, ventrodistal angle produced in strong spine; propodus similar to that of third pereopods, bearing 5 movable spines on flexor margin; dactylus about 0.7 times as long as propodus, with 7 corneous spines and subterminal spinule on flexor margin.

Merus of fifth pereopod nearly smooth on outer surface.

Uropodal exopod (Fig. 9H) with lateral margin minutely serrate, with few minute movable spinules; outer surface unarmed; posterior margin roundly truncate, with row of movable spinules. Endopod with lateral margin minutely serrate, bearing few minute movable spinules; outer surface with some short transverse ridges bearing 1 – 4 movable spinules; posterior margin roundly truncate, with row of movable spinules.

Distribution. Previously known from Indonesia, New Caledonia, Chesterfield Islands, Loyalty Islands, Tonga and Fiji; 170 – 610 m. Now from Japan, 152 – 198 m. The present material represents the first record of this species from the North Pacific.

Remarks. The present specimen from the Izu Islands agrees well with *Munida ommata* in the following key characters (Macpherson, 2004; Baba, 2005): branchial margin of carapace bearing four spines; fifth to seventh thoracic sternites having short carinae on lateral parts [Macpherson (2004: 270) noted "Lateral surfaces of sixth and seventh thoracic sternites with distinct carinae" in his description, but his figure (Macpherson, 2004: fig. 8B) clearly shows the presence of a short carina on the posterolateral part of the fifth thoracic sternite]; second abdominal somite with row of spines on anterior ridge; corneal width approximating 0.3 of distance between bases of anterolateral spines of carapace; first segment of antennular peduncle with distomesial spine distinctly shorter than distolateral spine; fixed finger of chela bearing spines on proximal half of lateral margin. Nevertheless, some minor differences are apparent between the present specimen and the original description as follows: the fourth thoracic sternite has only a trace of a few striae on the median part in the present specimen, but there are a pair of anterolateral arcuate striae in the type specimens; the basal segment of the antennular peduncle seems to be slightly more stout in the present specimen compared with the fig-

ure by Macpherson (2004: fig. 8C); the ventrodistal spine on the ischium of the third maxilliped appears stronger in the present specimen when compared with the figure by Macpherson (2004: fig. 8D); and spines on the cheliped are generally more conspicuous in the present specimen compared with those figured by Macpherson (2004: fig. 8E). It is not easy to evaluate whether these minor differences are of specific or not at present. Indeed, the size of spines on the cheliped is rather variable in species of *Munida*. I refer the present specimen to *M. ommata* for the time being.

Munida ommata is very similar to *M. rufiantennulata*, and in fact, it had been confounded with the latter species in previous reports (Macpherson, 1994; 1997). Macpherson (2004) cited the number of branchial spines on the carapace (four in *M. ommata* versus three in *M. rufiantennulata*), the armature of the fixed finger of the cheliped (armed with one or two proximal spines in *M. ommat*a versus unarmed in *M. rufiantennulata*), and the coloraton in life in differentiating the two species. As noted in the account of *M. rufiantennulata* (see below), the number of branchial spines in *M. rufiantennulata* is considered to be variable (three or four) and thus this character is not reliable in differentiating these two species. The present identification with *M. ommata* is primarily based on the presence of two proximal spines on the fixed finger in the present specimen. In addition, comparison between the specimens in the present collection suggests that the ambulatory legs are stouter in *M. ommata* than in *M. rufiantennulata* (cf. Fig 10D, F, G versus Fig. 16D, F, G).

Munida osawai sp. nov.
(Figs.11, 12)

Munida sp.: Osawa, 1999: 351, fig. 21-114.

Material examined. Holotype: Boso Peninsula, off Banda, Tateyama Bay, 30 – 60 m, 22 May 1990, dredge, coll. M. Osawa, female (cl 5.3 mm), CBM-ZC 2378.

Paratype: same data as holotype, 1 female (cl 4.3 mm), CBM-ZC 10526.

Description. Carapace (Fig. 11A) 1.2 times longer than wide. Dorsal surface gently convex transversely; main transverse ridges interrupted or entire; only few secondary transverse striae present between main ridges; most ridges and striae with dense short, non-iridescent setae. Gastric region slightly elevated, with 5 or 6 pairs of epigastric spines and minute median spine; spine posterior to base of supraocular spine strongest; anteriormost striae interrupted by small median spine. Hepatic region with 1 additional spine anterior to parahepatic spine and few striae. Cervical groove distinct. Parahepatic, branchial dorsal and postcervical spines present on each side, these spines small. Lateral part of posterior branchial region with 7 transverse ridges or striae (excluding posterior transverse ridge). Intestinal region without stria on median part. Posterior transverse ridge with 1 interrupted stria. Frontal margins somewhat oblique. Lateral margins feebly convex in dorsal view. Anterolateral spine moderately long, falling short of sinus between rostrum and supraocular spines; no spine on frontal margin mesial to anterolateral angle. Hepatic margin with 1 small spine (about 0.2 length of anterolateral spine). Branchial margins each with 5 small spines, anteriormost spine larger than other spines. Posterior transverse ridge with 1 interrupted stria.

Rostrum (Fig. 11A) spiniform, about 0.5 times length of carapace, nearly horizontal in lateral view; dorsal carina not particularly delimited. Supraocular spines moderately long and slender, almost parallel in dorsal view and very slightly ascending in lateral view, about 0.3 length of rostrum.

Orbit with 1 spine mesial to base of antennal peduncle; ventral margin produced in triangular projection, but without distinct spines.

Pterygostomial flap (Fig. 11B) with sharp spine anteriorly, lateral face moderately rugose with irregular transverse or obliquely transverse ridges or striae.

Epistomal ridge sinuous, ending at excretory pore of first segment of antennal peduncle; mesial protuberance weak (Fig. 11E).

Thoracic sternum (Fig. 11C) moderately wide. Third thoracic sternite about 2.7 times wider than long, slightly narrower than and contiguous with anterior margin of fourth sternite; anterior margin minutely granulate, bilobed with distinct median notch. Fourth sternite with few transverse striae. Fifth to seventh sternites nearly smooth. Transverse ridges nearly smooth, with row of short setae.

First abdominal tergite (Fig. 11A) with some punctations. Second and third abdominal somites (Fig. 11A) each with anterior ridge unarmed; tergum with 1 main transverse ridge and 2 transverse striae; pleuron with a few short striae. Fourth somite with anterior ridge unarmed; tergum with 1 transverse ridge

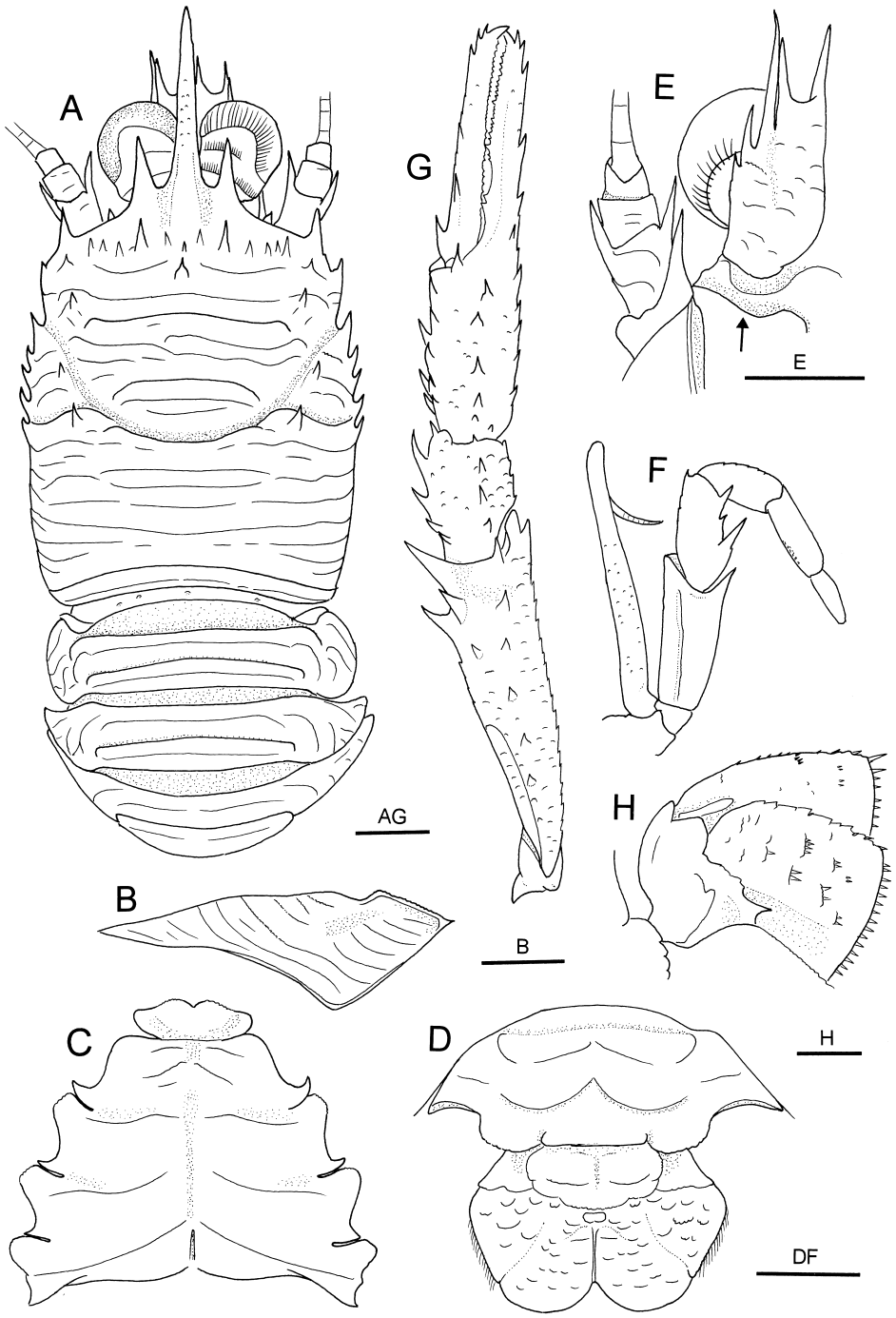

Fig. 11. *Munida osawa*i sp. nov., holotype, female (cl 5.3 mm), CBM-ZC 2378. A, carapace, cephalic appendages and first to fourth abdominal somites, dorsal view (setae omitted except for left eye; antennal flagella omitted); B, right pterygostomial flap, ventrolateral view; C, thoracic sternum, ventral view (setae omitted); D, sixth abdominal somite and telson, outer (ventral) view (setae omitted); E, right anterolateral part of carapace, eye, first segment of antennular peduncle and antennal peduncle, ventral view (arrow indicating epistomal ridge); F, right third maxilliped, lateral view (setae omitted); G, left cheliped, dorsal view (denuded); H, right uropod, outer (ventral) view (setae omitted). Scale bars: 1 mm for A – G; 0.5 mm for H.

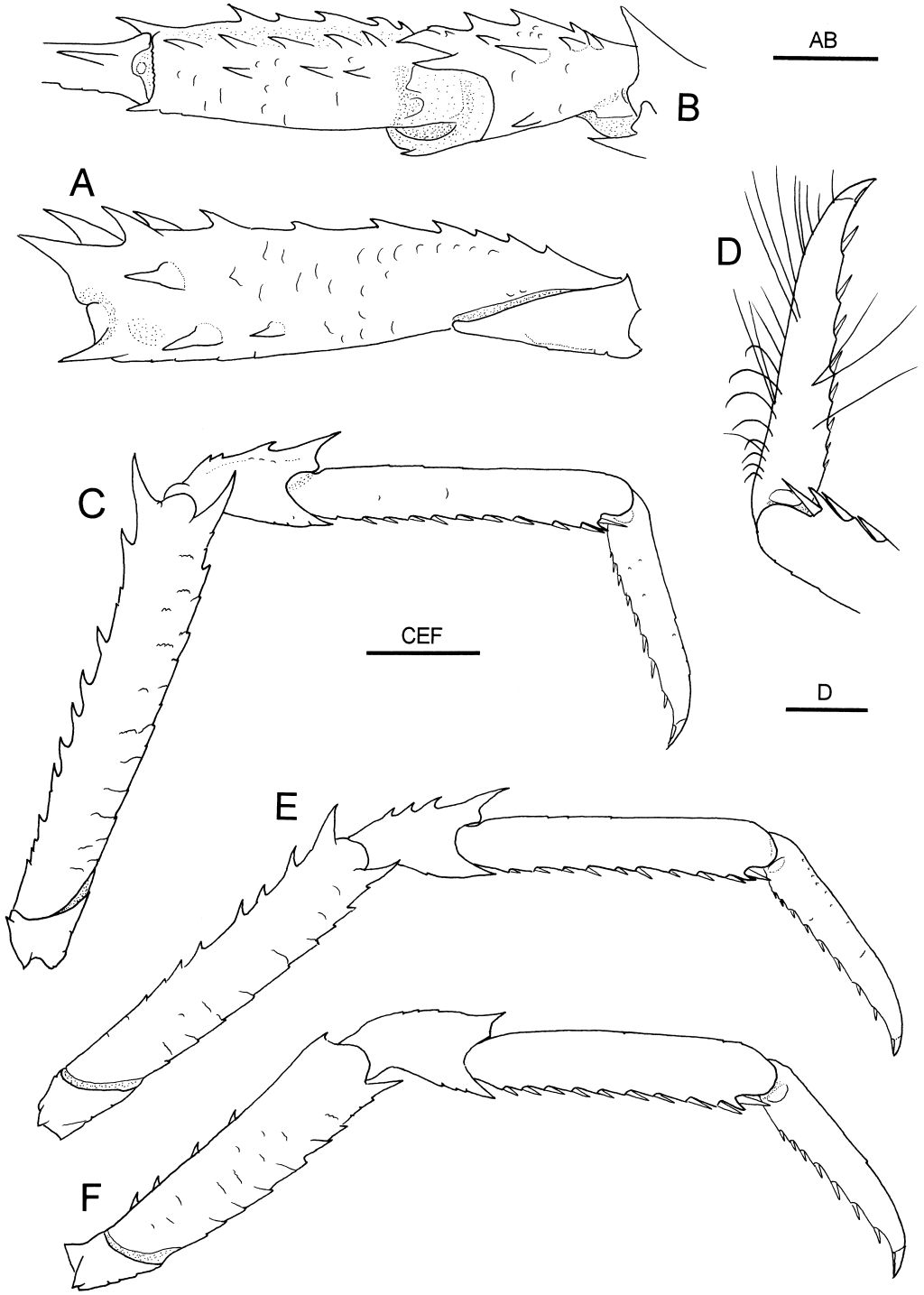

Fig. 12. *Munida osawai* sp. nov., holotype, female (cl 5.3 mm), CBM-ZC 2378 (setae omitted except for D). A, merus of right cheliped, mesial view; B, carpus and palm of right cheliped, mesial view; C, right second pereopod, lateral view; D, same, dactylus, lateral view; E, right third pereopod, lateral view; F, right fourth pereopod, lateral view. Scale bars: 1 mm for A – C, E, F; 0.5 mm for D.

and 2 transverse striae (striae medially interrupted); pleuron with some arcuate striae. Fifth somite with 2 transverse striae on tergum; pleuron with a few striae. Sixth somite (Fig. 11D) with 1 transverse, interrupted stria on anterior half, and 1 pair of arcuate ridges and aligned lateral striae on posterior part. Telson (Fig. 11D) 1.5 times wider than long, incompletely divided into 7 plates (division between lateral and posterolateral plates indistinct); anteromedian plate with median groove and 1 transverse stria interrupted medially; lateral and posterolateral plates squamous.

Eyes (Fig. 11A, E) large. Cornea dilated and somewhat flattened dorsoventrally, width much greater than sinus between rostrum and supraocular spine and 0.35 of distance between bases of anterolateral spines of carapace. Eyestalk slightly narrowed proximally, with 2 setiferous striae on dorsal surface; eyelash long, covering dorsal part of corneal surface.

Basal segment of antennular peduncle (Fig. 11E) moderately stout, reaching distal corneal margin, length excluding distal spines about 1.9 times of width; distal spines moderately long and slender, unequal with distomesial spine somewhat longer than distolateral spine; ventral surface with several short transverse or squamiform ridges; lateral margin with 3 spines, first (distalmost) spine overreaching distal spines of segment, located somewhat proximal to base of distolateral spine, second spine moderately short, located slightly distal to midlength of segment, third spine small, located at midlength of segment. Statocyst lobe not particularly inflated.

Antennal peduncle (Fig. 11E) moderately stout, reaching midlength of eye. First segment with moderately long distomesial spine not reaching distal margin of third segment; distolateral angle unarmed. Second segment with 2 transverse striae on ventral surface; distomesial spine not overreaching distal margin of fourth segment, distolateral spine just reaching third segment; no spine on mesial margin. Third and fourth segments unarmed.

Third maxilliped (Fig. 11F) moderately slender. Ischium with strong flexor distal spine extending as far as extensor distal angle. Merus with 2 or 3 greatly unequal spines on flexor margin, distal spine moderately small, proximal spine relatively slender; extensor margin with tiny distal spine. Carpus faintly rugose on extensor surface. Propodus slightly longer than carpus, not expanded. Dactylus much shorter than propodus.

Chelipeds (Figs. 11G, 12A, B) slightly squamous, similar, subequal in length, 1.5 times longer than carapace, equally broad on merus, carpus and palm; mesial surface of merus to palm with mixture of short plumose setae and stiff iridescent setae. Merus gradually narrowing proximally; dorsal surface with row of 8 spines laterally (spines increasing in size distally) and 3 spines in distal half mesially (distomesial spine diverging, far falling short of midlength of carpus); lateral surface with small spine at ventrodistal angle, no other spines; mesial surface with 1 or 2 spines on midline and 3 spines adjacent to ventral margin (including ventromesial distal spine). Carpus distinctly shorter than palm, 1.4 times longer than wide (excluding distomesial projection); surfaces with some tiny, squamiform or short transverse ridges or striae; dorsal surface with 4 small spines on midline, dorsomesial margin also with 5 spines (penultimate spine strongest); ventrolateral distal angle with small spine. Palm slightly widened distally, about 2.0 times longer than wide; surfaces with sparse, minute, squamiform ridges or striae; dorsal surface with median row of 5 small spines and 1 spine at articulation to dactylus; dorsolateral margin with 6 small spines, dorsomesial margin with 5 small spines; mesial surface with 3 small spines on midline. Fixed finger nearly straight, terminating in sharp claw, with 2 small subdistal spines and row of 4 spines on lateral margin; cutting edge with row of minute to tiny, acute or subacute denticles, some of them slightly larger than others. Dactylus 1.4 times longer than palm, terminating in sharp, curved claw crossing tip of fixed finger; mesial margin with 1 proximal and 3 subterminal spines; dorsal surface with 2 slender spines adjacent to lateral margin in proximal half; cutting edge with row of minute, sharp denticles along entire length. No hiatus between dactylus and fixed finger.

Ambulatory legs (second to fourth pereopods) moderately long and slender, decreasing in length posteriorly. Second pereopod (Fig. 12C) about 2.5 times longer than carapace, reaching level of tip of anterolateal spine on carapace by mero-carpal articulation; merus 0.7 times as long as carapace, about 5.3 times longer than high, dorsal margin with row of short setulose setae and iridescent setae, and with row of 9 spines, distal spine strongest, ventral margin with 1 strong distolateral spine followed by 1 small spine and several marginally denticulate transverse ridges, lateral face with few short transverse ridges ventrally; carpus about 0.4 length of propodus, with 3 or 4

spines on extensor margin, flexor distal margin produced in strong spine; propodus unarmed on extensor margin, lateral surface almost smooth, flexor margin with row of 9 or 11 equidistant movable spines, basal protuberance of ultimate spine bearing sharp fixed spine; dactylus (Fig. 12D) 0.7 times as long as propodus and about 5.8 times as long as high, slightly curved, bearing sparse short to long stiff setae (row of curled setae on lateral face parallel to extensor margin), flexor margin faintly sinuous, with 8 or 9 slender corneous spines notably increasing in length distally along entire length; subterminal spinule contiguous to unguis present. Third pereopod (Fig. 12E) similar to second pereopod, reaching anterolateral angle of carapace by mero-carpal articulation; merus 0.8 length of that of second pereopod, bearing row of 8 spines increasing in size distally on dorsal margin and strong ventrodistal spine followed by row of 1 or 2 small spines and short, marginally denticulate transverse ridges on ventral margin; carpus with 1 prominent distal spine and 2 or 3 extra smaller spines on extensor margin; propodus with 10 movable spines on flexor margin; dactylus with 7 or 8 corneous spines and 1 subterminal spinule on flexor margin. Fourth pereopod (Fig. 12F) reaching nearly to lateral end of cervical groove of carapace by mero-carpal articulation; merus 0.7 length of that of second pereopod, bearing minute dorsodistal spine, dorsal surface armed with 4 small spines mesial to midline, ventral margin with prominent distal spine followed by some short transverse ridges; carpus with prominent dorsodistal and ventrodistal spines; propodus similar to those of second and third pereopods, bearing 10 movable spines on flexor margin; dactylus subequal or slightly shorter than propodus, with 8 corneous spines and 1 subterminal spinule on flexor margin.

Merus of fifth pereopod with smooth outer surface.

Uropodal exopod (Fig. 11H) with lateral margin faintly denticulate, armed with row of minute movable spinules; outer surface with few short transverse striae bearing 2 or 3 minute spinules laterally; posterior margin with spinules increasing in size laterally. Endopod with lateral margin serrate, bearing few minute spinules; outer surface with several short transverse ridges sometimes bearing 2 – 4 spinules; posterior margin with row of spinules.

Variation. The basal segment of the antennular peduncle bears three lateral spines in the holotype and two lateral spines in the paratype. Ventral spines on the merus of the third maxilliped are three in the holotype, two in the paratype.

Distribution. Known only from the type locality, Tateyama Bay, Boso Peninsula, 30 – 60 m deep.

Remarks. *Munida osawai* sp. nov. is morphologically most similar to *M. pavonis* Macpherson, 2004, known from Tonga. Shared diagnostic characters include: frontal margin of carapace oblique; branchial margin of carapace bearing five spines; third thoracic sternite contiguous with fourth sternite; no patch of granules or carinae on lateral parts of fifth to seventh thoracic sternites; abdomen devoid of spines on second to fourth somites; eye large; basal segment of antennular peduncle with distomesial spine longer than distolateral spine; distomesial spine of first segment of antennal peduncle not reaching distal margin of third segment, distomesial spine of second segment not reaching distal margin of fourth segment; merus of third maxilliped bearing small dorsodistal spine; and cheliped merus with distomesial spine far falling short of midlength of carpus. However, the new species is distinguished from *M. pavonis* by the following characters (Macpherson, 2004): the carapace is less elongate in *M. osawai* than in *M. pavonis* (1.2 times longer than wide versus 1.3 times); the epigastric region of the carapace with two median spines in *M. osawai*, instead of a scale-like tubercle in *M. pavonis*; the lateral margins of the carapace is slightly convex in *M. osawai*, rather than nearly straight in *M. pavonis*; and spines on the basal segment of the antennular peduncle are more elongate in *M. osawai* than in *M. pavonis*.

Munida clinata Macpherson, 1994 from the tropical western Pacific, *M. disiunctus* Komai, 2011 from the Ogasawara Islands, Japan, *M. pauxilla* Macpherson, 2009 from Vanuatu and Loyalty Islands, and *M. pectinata* Macpherson and Machordom, 2005 from New Caledonia and Japan, are also similar to *M. osawai* in the general shape and armature of the carapace, the structure of the thoracic sternum, the armature of the basal segment of the antennular peduncle, and the armature of the chela (Macpherson, 1994, 2009; Macpherson and Machordom, 2005; Komai, 2011b). Nevertheless, *M. clinata*, *M. disiunctus* and *M. pectinata* differs from *M. osawai* in the lack of median spines on the epigastric region and of an additional spine on the hepatic region of the carapace. Furthermore, *M. clinata* is distinguished from *M. osawai* by the more strongly oblique frontal margin of the carapace, and the longer distomesial spine of the second segment of

the antennal peduncle (overreaching the distal margin of the fourth segment). *Munida disiunctus* is separated from *M. osawai* by the less oblique frontal margin of the carapace, the lack of the postcervical spines on the carapace, the distomesial spine on the second segment of the antennal peduncle overreaching the distal margin of the fourth segment, the presence of a small spine on the mesial margin of the second antennal segment, and the absence of a dorsodistal spine of the merus of the third maxilliped. *Munida pauxilla* is distinguished from *M. osawai* by the more strongly oblique frontal margin of the carapace, the presence of additional spines posterior to epigastric spines and on the hepatic region, and the presence of scattered spines on the dorsal surface of the palm of chelipeds. *Munida pectinata* differs from *M. osawai* in the absence of an extra spine on the hepatic region of the carapace, the smaller eye with very short eye-lashes, and the longer distomesial spines on the first and second segments of the antennal peduncle (the former spine reaches the distal margin of the third segment and the latter spine overreaches the distal margin of the fourth segment), and the absence of a small spine on the mesial margin of the second antennal segment.

Osawa (1999) reported an unidentified species of *Munida* based on specimens collected from off Tateyama, Boso Peninsula, as *Munida* sp. The given figure and the brief description agree well with the present new species, and thus this record is referred to *M. osawai*.

Etymology. This new species is dedicated to my friend and colleague Dr. Masayuki Osawa in recognition of his contributions to the taxonomy and systematics of decapod crustaceans.

Munida parvioculata Baba, 1982

Munida parvioculata Baba, 1982: 104, figs. 1, 2b [type locality: SE of Miyake Island, Izu Islands, Japan, 430 – 1400 m]; Osawa and Takeda, 2007: 134, fig. 1A, B; Baba *et al*., 2008: 111 (compilation).

Material examined. TRV *Shin' yo-maru*, 1996 cruise, stn 21, off Tateyama, Sagami Sea, 34° 56.46' N, 139° 33.12' E, 1039 – 1300 m, 24 October 1996, dredge, 1 ovig. female (cl 15.6 mm), CBM-ZC 5348.

Distribution. Izu Islands, Sagami Sea, and Tosa Bay; 430 – 1300 m.

Munida paucistria sp. nov.
(Figs. 13, 14)

Material examined. Holotype: RV *Tansei-maru*, KT97-1 cruise, stn OS-1, SW of Izu-oshima Island, 34° 40.2' N, 139° 18.0' E, 278 – 300 m, 27 April 1997, dredge, coll. E. Tsuchida, ovig. female (cl 5.1 mm), CBM-ZC 6662.

Description. Carapace (Fig. 13A) 1.2 times longer than wide. Dorsal surface gently convex transversely; main transverse ridges not interrupted; few secondary transverse striae present between main ridges; most ridges and striae with dense short, non-iridescent setae. Gastric region slightly elevated, with 4 pairs of epigastric spines; spine posterior to base of supraocular spine strongest; median tubercle on epigastric region scale-like, unarmed; only 3 main transverse ridges present. Hepatic region almost smooth. Cervical groove distinct. Parahepatic, 2 branchial dorsal and postcervical spines present on each side, these spines small. Anterior part of branchial region almost smooth; lateral part of posterior branchial region with 5 transverse ridges or striae (excluding posterior transverse ridge). Intestinal region without stria on median part. Posterior transverse ridge without striae. Frontal margins strongly oblique. Lateral margins feebly convex in dorsal view. Anterolateral spine moderately long, not reaching sinus between rostrum and supraocular spines, slightly diverging; no spine on frontal margin mesial to anterolateral angle. Hepatic margin with 1 minute spine. Branchial margins each with 4 small spines, first spine largest.

Rostrum (Fig. 13A) narrowly triangular, about 0.4 length of carapace, directed forward, faintly sinuous in lateral view; dorsal surface convex. Supraocular spines relatively short and robust, almost parallel in dorsal view and directed forward in lateral view, 0.3 length of rostrum.

Orbit with 1 spine directed anterolaterally; ventral margin markedly produced in rounded lobe with minutely denticulate margin.

Pterygostomial flap (Fig. 13B) unarmed anteriorly, lateral surface weakly rugose with few obliquely transverse striae.

Epistomal ridge nearly straight, ending slightly anterior to excretory pore of first segment of antennal peduncle; mesial protuberance low (Fig. 13E).

Thoracic sternum (Fig. 13C) longer than broad. Third thoracic sternite about 3.6 times wider than long, much broader than anterior margin of fourth sternite; anterior margin microscopically granulate,

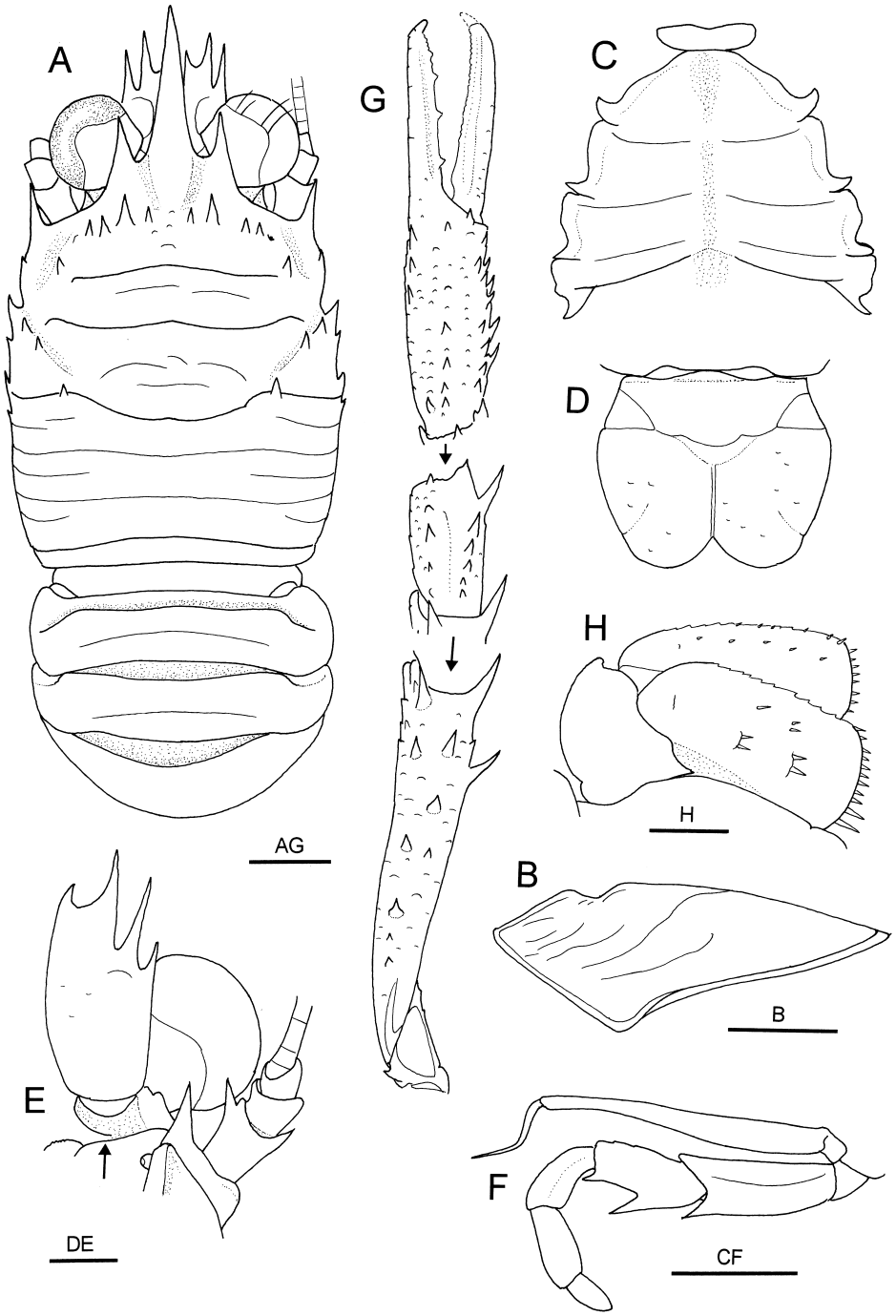

Fig. 13. *Munida paucistria* sp. nov., holotype, ovig. female (cl 5.1 mm), CBM-ZC 6662. A, carapace, cephalic appendages and first to fourth abdominal somites, dorsal view (setae omitted except for left eye; antennal flagella omitted); B, left pterygostomial flap, ventrolateral view; C, thoracic sternum, ventral view (setae omitted); D, telson, outer (ventral) view (setae omitted); E, left anterolateral part of carapace, eye, first segment of antennular peduncle and antennal peduncle, ventral view (arrow indicating epistomal ridge); F, left third maxilliped, lateral view (setae omitted); G, left cheliped, dorsal view (denuded); H, right uropod, outer (ventral) view (setae omitted). Scale bars: 1 mm for A – C, F, G; 0.5 mm for D, E, H.

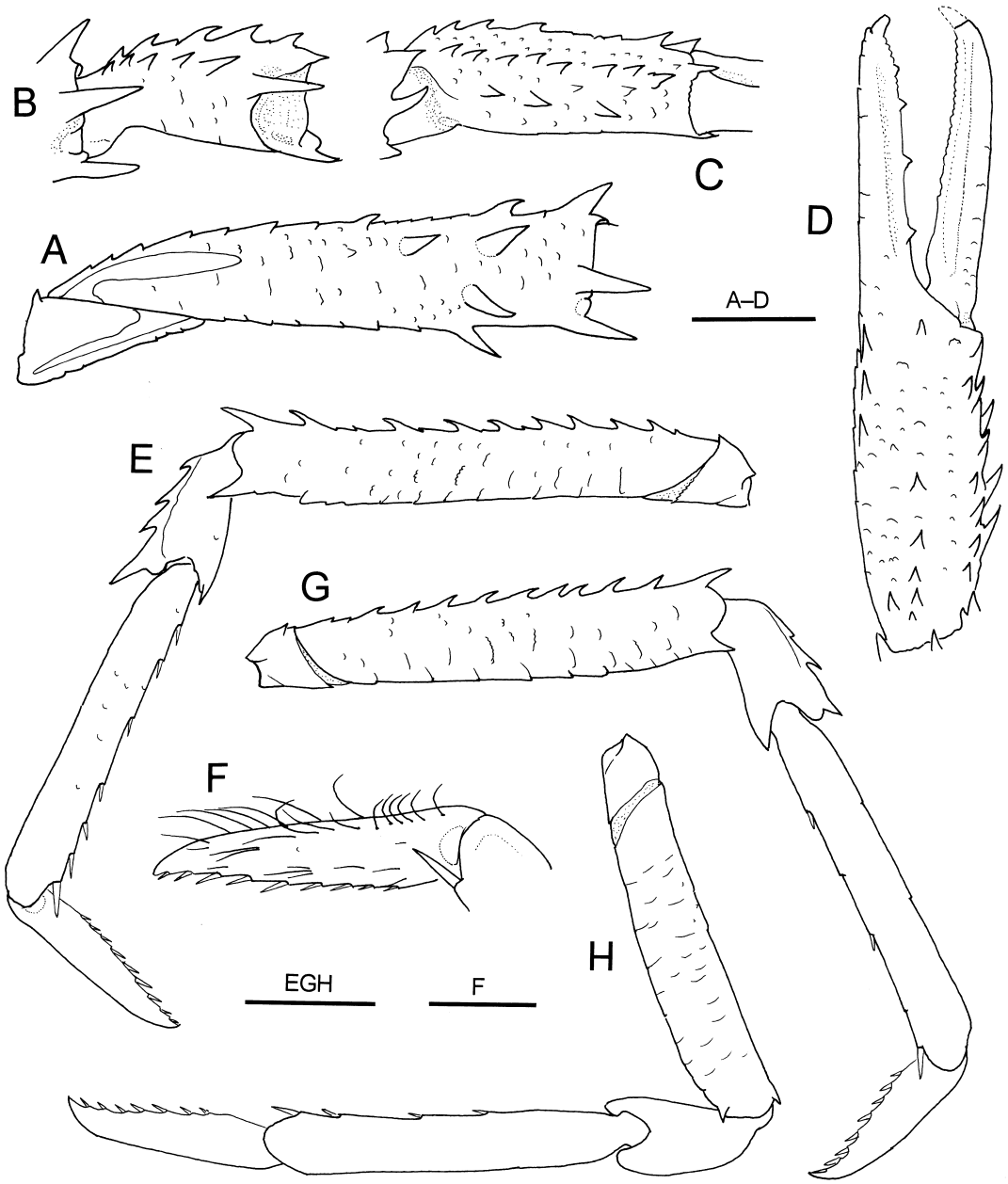

Fig. 14. *Munida paucistria* sp. nov., holotype, ovig. female (cl 5.1 mm), CBM-ZC 6662 (setae omitted except for F). A, merus of left cheliped, mesial view; B, carpus of left cheliped, mesial view; C, palm of left cheliped, mesial view; D, left chela, dorsal view; E, left second pereopod, lateral view; F, same, dactylus, lateral view; G, right third pereopod, lateral view; H, right fourth pereopod, lateral view. Scale bars: 1 mm for A – E, G, H; 0.5 mm for F.

faintly bilobed. Fourth and fifth sternites smooth, devoid of striae. Sixth and seventh sternites also smooth, each without deep median groove. Transverse ridges nearly smooth, without setae.

First abdominal tergite (Fig. 13A) smooth. Second and third somites (Fig. 13A) each with anterior ridge unarmed; tergum with only 1 main transverse ridge; pleuron almost smooth. Fourth and fifth somites smooth. Sixth somite with paired arcuate striae in posterior half of tergum. Telson (Fig. 13D) about 1.3 times wider than long, incompletely divided into 7 plates (division between lateral and posterolateral plates indistinct); anteromedian plate smooth; lateral and posterior plates with few tiny squamiform ridges.

Eyes (Fig. 13A, E) large, not particularly flattened dorsoventrally. Cornea strongly dilated, corneal width much greater than sinus between rostrum and supraocular spine and about 0.3 of distance between anterolateral spines of carapace. Eyestalk slightly narrowed proximally, without setiferous striae on dorsal surface; eyelash consisting of very sparse, short to long setae.

Basal segment of antennular peduncle (Fig. 13E) relatively stout, distinctly overreaching distal corneal margin, length excluding distal spines about 1.8 of width; ventral surface with 1 short squamiform proximal to base of first lateral spine; distal spines greatly unequal, distomesial spine very short, less than half length of distolateral spine; distolateral spine moderately long, slender; 2 lateral spines present, first (distal) spine elongate, not reaching tip of distolateral spine, arising considerably proximal to base of distolateral spine; second spine moderately long, located distal to midlength of basal segment; statocyst lobe not inflated.

Antennal peduncle (Fig. 13E) moderately stout, not reaching midlength of eye. First segment with moderately long distomesial spine not reaching distal margin of third segment; distolateral margin slightly produced in rounded lobe. Second segment without striae on ventral surface; distomesial spine short, only reaching distal margin of third segment; no mesial spine; distolateral spine reaching midlength of third segment. Third and fourth segments unarmed, former without striae on ventral surface.

Third maxilliped (Fig. 13F) moderately slender. Ischium with moderately strong flexor distal spine extending as far as extensor distal angle; lateral surface with weak median ridge. Merus with 2 spines on flexor margin, distal spine moderately small, proximal spine moderately strong; extensor distal margin unarmed; extensor margin and lateral surface almost smooth. Carpus smooth on extensor surface. Propodus subequal in length to carpus, not expanded. Dactylus much shorter than propodus.

Chelipeds (Figs. 13G, 14A – D) weakly squamous, 2.4 times longer than carapace, equally broad on merus, carpus and palm; setation quite sparse, only with noniridescent, plumose setae. Merus gradually narrowing proximally; dorsal surface with row of 6 spines laterally and 4 spines mesially (distomesial spine quite prominent, but far falling short of midlength of carpus); ventrolateral distal angle with 1 small spine; mesial surface with 1 strong spine on midline and 2 strong spines adjacent to ventral margin (including ventromesial distal spine). Carpus 0.7 times as long as palm, 1.9 times longer than wide (excluding distomesial projection); dorsal surface with 4 spines on midline, dorsomesial margin with 5 spines, dorsomesial distal projection terminating in small spine; lateral and ventral surfaces lacking distinct spines; ventrolateral distal angle with small spine. Palm not widened distally, about 2.4 times longer than wide; dorsal surface with median row of 6 spines, 1 spine at articulation to dactylus, and 1 spine at proximolateral portion; dorsolateral margin with 3 spines in distal half, dorsomesial margin with 8 small spines; mesial surface with row of 3 spines on midline; ventral surface with 1 small spine at dactylar articulation. Fixed finger nearly straight, without distinct spines (only tiny tubercle present subdistally); dorsal surface nearly smooth; cutting edge with 4 tiny triangular teeth interspersed by minute denticles, otherwise nearly smooth. Dactylus about 1.1 times longer than palm, terminating in sharp, curved claw crossing tip of fixed finger, without conspicuous spines; cutting edge minutely to faintly denticulate. No proximal hiatus between dactylus and fixed finger.

Ambulatory legs (second to fourth pereopods) moderately long, relatively slender, decreasing in length posteriorly; dorsal margins of meri with sparse simple setae, those of carpi and propodi scarcely setose. Second pereopod (Fig. 14E) about 2.0 times longer than carapace, nearly reaching level of tip of anterolateal spine on carapace by mero-carpal articulation; merus 0.8 times as long as carapace, 7.1 times longer than high, dorsal surface with row of 11 spines and some minute spinules (distal spine moderately strong), ventral margin with strong distolateral spine

followed by several squamiform ridges, lateral face with several small squamiform or short transverse ridges; carpus about 0.4 length of propodus, with 4 spines increasing in size distally on extensor margin, flexor distal margin produced in moderately strong spine; lateral surface with weak longitudinal dorsal ridge; propodus unarmed on extensor margin, lateral surface nearly smooth, flexor margin with row of 7 small movable spines (distal 4 spines equidistant), basal protuberance of ultimate spine without fixed spine; dactylus (Fig. 14F) 0.6 times as long as propodus and 3.9 times as long as high, slightly curved in distal part, bearing sparse short to long stiff setae on extensor margin, lateral surface dorsally with row of short curled setae parallel to extensor margin, flexor margin faintly sinuous, with 9 small corneous spines along entire length and minute subterminal spinule closely appressed to unguis. Third pereopod (Fig. 14G) generally similar to second pereopod, reaching anterolateral angle of carapace by mero-carpal articulation; merus 0.9 length of that of second pereopod, dorsal surface with 11 spines, ventral margin with moderately strong distolateral spine followed by several squamiform ridges; carpus with 3 spines on extensor margin; propodus with 5 movable spines on flexor margin; dactylus about 0.5 times as long as propodus, with 7 small corneous spines and 1 subterminal spinule on flexor margin. Fourth pereopod (Fig. 14H) reaching to lateral end of cervical groove of carapace by mero-carpal articulation; merus 0.7 length of that of second pereopod, dorsal surface unarmed except for tiny distal spine, ventral surface with small distolateral spine followed by several squamiform ridges, lateral surface with several short transverse ridges; carpus unarmed dorsally, ventrodistal angle produced, but blunt; propodus similar to those of third pereopods, bearing 4 movable spines on flexor margin; dactylus 0.6 times as long as propodus, with 7 corneous spines on flexor margin (no subterminal spinule).

Merus of fifth pereopod nearly smooth on outer surface.

Uropodal exopod (Fig. 13H) with lateral margin faintly denticulate, armed with some minute movable spinules; outer surface with longitudinal row of minute movable spinules along lateral margin; posterior margin roundly truncate, with row of minute movable spinules. Endopod with lateral margin minutely serrate, bearing few minute movable spinules; outer surface with single or paired spinules; posterior margin roundly truncate, with row of minute movable spinules increasing in size mesially.

Distribution. Known only from the type locality, off Izu-oshima Island, Sagami Sea, at depths of 278 – 300 m.

Remarks. *Munida paucistria* sp. nov. appears closest to *M. trigonocornus* sp. nov. in the following characters: carapace bearing two spines on anterior branchial region and four spines on branchial margin; frontal margin of carapace strongly oblique; rostrum narrowly triangular, not spiniform; thoracic sternum devoid of patches of granules or carinae on lateral parts; abdomen lacking spines; and basal segment of antennular peduncle with distomesial spine distinctly shorter than distolateral spine. No other species of the genus have this combination of characters. Detailed comparison between the two species is made in the account of *M. trigonocornus*. *Munida hyalina* Macpherson, 1994 known from the Southwest Pacific substantially resembles *M. paucistria* in most of the above characters (Macpherson, 1994), but the former is readily distinguished from this new species by the spiniform, rather than narrowly triangular, rostrum, the broader anterior margin of the fourth thoracic sternite, the granulate lateral parts of the seventh thoracic sternite and the absence of spines on the anterior branchial region. *Munida antliae* Macpherson, 2006 and *M. descensa* Macpherson, 2006, both described from the Austral Islands, French Polynesia, also superficially resemble *M. paucistria* in the shape of the carapace. *Munida antliae* is immediately separated from *M. paucistria* by the possession of two submedian spines on the anterior ridge of the second abdominal somite (Macpherson, 2006). *Munida descensa* is also readily distinguished from *M. paucistria* by more numerous transverse striae on the carapace, the distomesial spine on the basal segment of the antennular peduncle being slightly longer than the distolateral spine, and the presence of a small dorsodistal spine on the merus of the third maxilliped (Macpherson, 2006). In addition, the rostrum is spiniform in *M. antliae* and *M. descensa* (cf. Macpherson, 2006) unlike *M. paucistria*.

Etymology. From the combination of the Latin, *paucus* (= few) and *stria* (= line), in reference to the relatively few transverse ridges on the carapace in this new species. Used as a noun in apposition.

Munida pectinata Macpherson and Machordom, 2005

Munida pectinata Macpherson and Machordom, 2005: 828, fig. 3 [type locality: New Caledonia, 190 – 212 m]; Baba *et al*., 2008: 112 (compilation); Komai, 2011b: 359, figs. 10, 11D.

Material examined. TRV *Shin' yo-maru*, 1997 research cruise, stn 22, N of Torishima Island, Izu Islands, 30° 30.76' N, 140° 17.57' E, 172 – 192 m, 17 October 1997, dredge, coll. T. Komai, 1 ovig. female (cl 7.4 mm), CBM-ZC 9693.

Distribution. Previously known from New Caledonia and Ogasawara Islands, Japan; at depths of 92 – 240 m.

Munida rufiantennulata Baba, 1969
(Figs. 15, 16)

Munida rufiantennulata Baba, 1969: 23, fig. 7 [type locality: near Danjo Island, W of Kyushu, Japan, 167 m]; Baba, 1988: 128; 1989: 131; 2005: 124, fig. 48b; Macpherson, 1994: 523 (in part); 1999: 423; 2004: 277, figs. 11, 18; Baba *et al*., 2008: 117 (compilation); 2009: 188, 189, unnumbered figs.

Not *Munida rufiantennulata* : Macpherson, 1994: 523 (in part), figs. 46, 83; 1997: 610. = *Munida ommata* Macpherson, 2004.

Material examined. RV *Tansei-maru*, KT95-5 cruise, stn TB-13, off Taito-saki, Boso Peninsula, 35° 11.4' N, 140° 46.0' E, 194 – 195 m, 26 April 1995, dredge, coll. T. Komai, male (cl 9.3 mm), CBM-ZC 3737. TRV Shin' yo-maru, 1996 research cruise, stn 20, Sagami Sea, Okinoyama Bank, 34° 57.18' N, 139° 40.30' E, 190 – 450 m, 24 October 1996, dredge, coll. T. Komai, 1 male (cl 6.8 mm), CBM-ZC 5298.

Description. Carapace (Fig. 15A) 1.2 times longer than wide. Dorsal surface gently convex transversely; main transverse ridges interrupted or entire; few secondary transverse striae present between main ridges; most ridges and striae with dense short setae. Gastric region slightly elevated, with 4 pairs of epigastric spines, 2 spine posterior to base of supraocular spine strongest; scale-like median tubercles on epigastric region. Hepatic region almost smooth. Cervical groove distinct. Parahepatic and branchial dorsal spines present (these spines moderately small), postcervical spines present or absent. Anterior part of branchial region with some transverse striae; lateral part of posterior branchial region with 5 transverse ridges or striae (excluding posterior transverse ridge). Intestinal region with short transverse stria medially. Posterior transverse ridge with entire stria. Frontal margins strongly oblique. Lateral margins feebly convex in dorsal view. Anterolateral spines located at anterolateral angles, relatively long, nearly reaching sinus between rostrum and supraocular spines, directed forward; no spine on frontal margin mesial to anterolateral angle. Hepatic margin with 1 spine (less than 0.2 length of anterolateral spine). Branchial margins each with 3 small spines slightly decreasing in size posteriorly.

Rostrum (Fig. 15A) spiniform, 0.3 – 0.4 times as long as carapace, directed forward, slightly arched in lateral view; dorsal carina not particularly delimited. Supraocular spines moderately long, about 0.4 length of rostrum, slender, almost parallel in dorsal view and directed forward in lateral view.

Orbit with 1 spine directed forward; ventral margin produced in acute spine.

Pterygostomial flap (Fig. 15B) unarmed anteriorly; lateral surface moderately rugose with transverse to obliquely transverse striae or ridges.

Epistomal ridge slightly sinuous, ending just anterior to excretory pore of first segment of antennal peduncle; mesial protuberance very low.

Thoracic sternum (Fig. 15C) wider than long. Third thoracic sternite about 4.6 times wider than long, much broader than anterior margin of fourth sternite, narrowly separated from fourth sternite; anterior margin bilobed by distinct median notch. Fourth sternite almost smooth, with rather well defined median concavity; anterior ridge somewhat thickened anteromesially. Fifth to seventh sternites with sharp carinae on lateral parts, otherwise smooth; seventh sternite with deep median groove. Transverse ridges nearly smooth, without setae.

First abdominal tergite (Fig. 15A) smooth. Second somite (Fig. 15A) with anterior ridge bearing 4 pairs of spines; tergum with 1 main transverse ridge; pleuron almost smooth. Third somite (Fig. 15A) with anterior ridge unarmed; tergum with 1 main transverse ridge; pleuron almost smooth. Fourth and fifth somites smooth, devoid of transverse ridge. Sixth somite (Fig. 15D) with paired arcuate ridges in posterior half of tergum, otherwise smooth. Telson (Fig. 15D) 1.4 times wider than long, incompletely divided into 7 main plates (division between lateral and posterolateral plates indistinct); anteromedian plate with shallow median groove; lateral and postero-

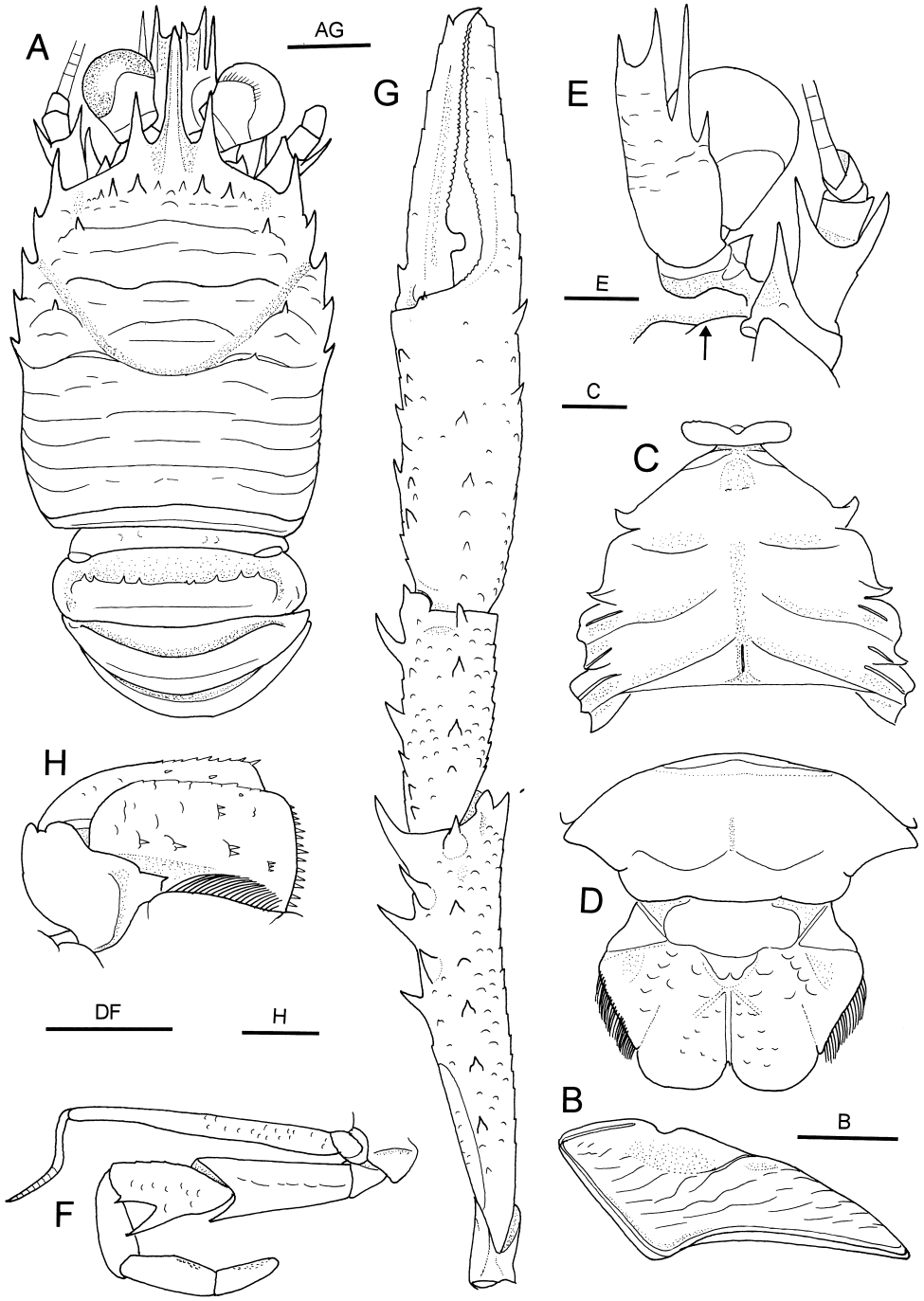

Fig. 15. *Munida rufiantennulata* Baba, 1969, male (cl 9.3 mm), CBM-ZC 3737. A, carapace, cephalic appendages and first to fourth abdominal somites, dorsal view (setae omitted except for left eye; antennal flagella omitted); B, left pterygostomial flap, ventrolateral view; C, thoracic sternum, ventral view (setae omitted); D, sixth abdominal somite and telson, outer (ventral) view (setae partially omitted); E, left anterolateral part of carapace, eye, first segment of antennular peduncle and antennal peduncle, ventral view (arrow indicating epistomal ridge); F, left third maxilliped, lateral view (setae omitted); G, right cheliped, dorsal view (denuded); H, right uropod, outer (ventral) view (setae omitted). Scale bars: 2 mm for A, B, D, F, G; 1 mm for C, E, H.

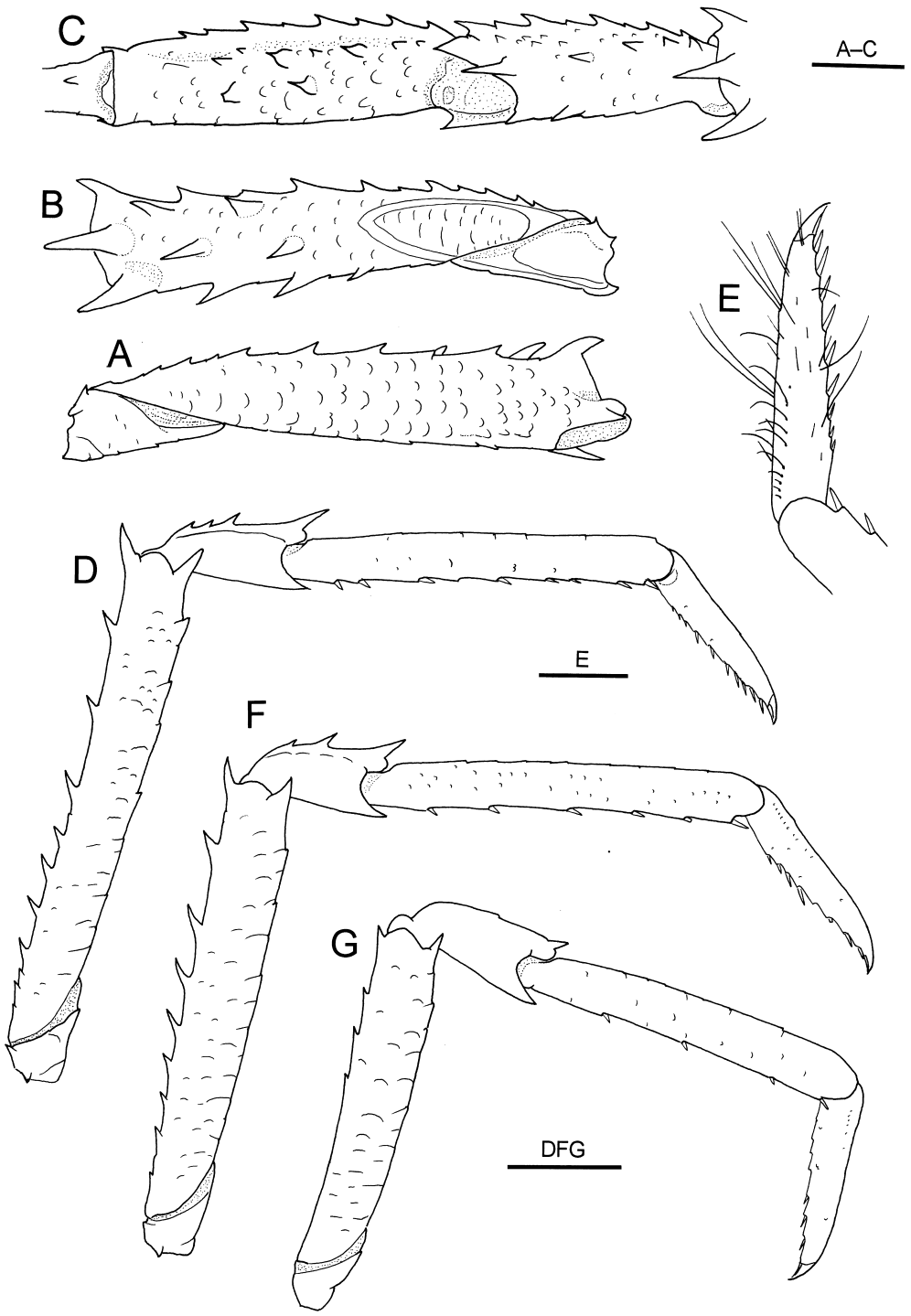

Fig. 16. *Munida rufiantennulata* Baba, 1969, male (cl 9.3 mm), CBM-ZC 3737 (setae omitted except for E). A, merus of right cheliped, lateral view; B, same, mesial view; C, palm and carpus of right cheliped, mesial view; D, left second pereopod, lateral view; E, same, dactylus, lateral view; F, left third pereopod, lateral view; G, left fourth pereopod, lateral view. Scale bars: 2 mm for A – D, F, G; 1 mm for E.

lateral plates slightly squamous.

Eyes (Fig. 15A, E) moderately large, not particularly flattened dorsoventrally. Cornea dilated, corneal width much greater than sinus between rostrum and supraocular spine and about 0.3 of distance between bases of anterolateral spines of carapace. Eyestalk slightly narrowed proximally, with 1 setiferous stria on dorsal surface proximally; eyelash consisting only of very short setae.

Basal segment of antennular peduncle (Fig. 15E) moderately stout, slightly overreaching distal corneal margin, length excluding distal spines 2.3 of width; ventral surface with several short transverse ridges; distomesial spine distinctly shorter than distolateral spine; 2 lateral spines present, first spine elongate, reaching distolateral spine, arising distinctly proximal to base of distolateral spine; second spine moderately short, located at midlength of basal segment; statocyst lobe slightly inflated laterally.

Antennal peduncle (Fig. 15E) moderately stout, reaching midlength of eye. First segment with moderately long distomesial spine reaching base of third segment; distolateral margin slightly not particularly produced. Second segment without striae on ventral surface; distomesial spine moderately long, distinctly overreaching distal margin of third segment; no mesial spine; distolateral spine slightly overreaching distal margin of third segment. Third and fourth segments unarmed, former without striae on ventral surface.

Third maxilliped (Fig. 15F) relatively slender. Ischium with moderately strong flexor distal spine extending as far as extensor distal angle; lateral surface with median ridge consisting of short squamiform striae. Merus with 2 spines on flexor margin, distal spine tiny, proximal spine strong; extensor distal margin unarmed; extensor margin minutely granulate, lateral surface with some granules along midline. Carpus nearly smooth on extensor surface. Propodus subequal in length to carpus, not expanded. Dactylus much shorter than propodus.

Chelipeds (Fig. 15G, 16A – C) moderately squamous, about 3.3 times longer than carapace, equally broad on merus, carpus and palm; dorsal and mesial surfaces of palm and carpus with sparse short plumose setae; long iridescent or simple stiff setae present on mesial faces of chela to carpus. Merus narrowing proximally; dorsal surface with row of 7 spines laterally and 3 spines mesially (distomesial spine far falling short of midlength of carpus); mesial face with 2 spines on midline and 4 spines adjacent to ventral margin (including ventromesial distal spine). Carpus 0.7 times as long as palm, about 2.5 times longer than wide (excluding distomesial projection); dorsal surface with 3 spines on midline; dorsomesial margin with single row of 6 spines; lateral surface without conspicuous spines; ventral surface with 2 spines; ventrolateral distal angle with small spine. Palm slightly widened distally, about 2.4 times longer than wide; dorsal surface with median row of 7 spines and 1 minute spine at articulation to dactylus; dorsolateral margin with 2 main spines followed by tiny spiniform tubercles, dorsomesial margin with 4 main spines and some spinules; mesial surface with 2 spines on midline; ventral surface with 1 minute spine at dactylar articulation. Fixed finger faintly sinuous, without distinct spines; dorsal surface nearly smooth; cutting edge minutely denticulate along entire length. Dactylus subequal in length to palm, with 1 subterminal spine, terminating in sharp, curved claw crossing tip of fixed finger; mesial margin with 1 proximal and 1 subdistal spines; dorsal surface unarmed; cutting edge with row of minute denticles in distal 0.8 and 1 prominent subquadrate tooth in proximal 0.2. Broad proximal hiatus between dactylus and fixed finger.

Ambulatory legs (second to fourth pereopods) relatively long and slender, decreasing in length posteriorly; dorsal margins of meri with sparse short, simple or plumose setae, those of carpi and propodi with sparse short to long, stiff setae. Second pereopod (Fig. 16D) about 2.4 times longer than carapace, reaching nearly to level of rostral tip by mero-carpal articulation; merus 0.7 times as long as carapace, about 7.9 times longer than high, dorsal surface with row of 10 or 11 spines (distal spine moderately strong), ventral margin with strong distolateral spine followed by several squamiform or transverse ridges (margins of these ridges multidenticulate), lateral face with many small squamiform or short transverse ridges; carpus about 0.4 length of propodus, with 4 spines increasing in size distally on extensor margin, flexor distal margin produced in moderately strong spine; lateral surface with distinct longitudinal ridge dorsally; propodus unarmed on extensor margin, lateral surface sparsely granular, flexor margin with row of 8 or 9 small movable spines, basal protuberance of ultimate spine without fixed spine; dactylus (Fig. 16E) 0.6 times as long as propodus and 5.4 times longer than high, slightly curved in distal part, bearing sparse short to long stiff setae on extensor margin, lateral

surface with row of short curled setae nearly parallel to extensor margin, flexor margin faintly sinuous, with 8 or 9 slender corneous spines along entire length (distal 5 spines longest, subequal in length) and slender subterminal spinule contiguous to unguis. Third pereopod (Fig. 16F) generally similar to second pereopod, reaching distal end of antennal peduncle by mero-carpal articulation; merus 0.9 length of that of second pereopod, dorsal surface with row of 9 spines, ventral margin with strong distolateral spine followed by several squamiform or transverse ridges; carpus with 3 spines on extensor margin; propodus with 6 or 7 movable spines on flexor margin; dactylus 0.6 – 0.7 times as long as propodus, with 8 corneous spines and subterminal spinule on flexor margin. Fourth pereopod (Fig. 16G) overreaching lateral end of cervical groove of carapace by mero-carpal articulation; merus 0.7 length of that of second pereopod, dorsal surface with 4 – 7 small spines or spinules, ventral surface with distolateral spine followed by some squamiform or transverse ridges, lateral surface with some squamiform or short transverse ridges or striae; carpus with small dorsodistal spine, ventrodistal angle produced in small spine; propodus similar to those of third pereopods, bearing 4 small movable spines on flexor margin; dactylus 0.6 times as long as propodus, with 6 or 7 small corneous spines and subterminal spinule on flexor margin.

Merus of fifth pereopod nearly smooth on outer surface.

Uropodal exopod (Fig. 15H) with lateral margin minutely denticulate, with some minute movable spinules; outer surface with longitudinal row of minute movable spinules along lateral margin; posterior margin roundly truncate, with row of minute movable spinules. Endopod with lateral margin faintly serrate, bearing a few minute movable spinules; outer surface with some low squamiform ridges sometimes bearing 1 – 3 movable spinules; posterior margin roundly truncate, with row of minute movable spinules decreasing in size laterally.

Distribution. Previously recorded from various western Pacific localities, but certain localities include only Japan (see "Remarks").

Remarks. *Munida rufiantennulata* was originally described from Danjo Islands, off Kyushu, Japan, based on two female specimens (Baba, 1969). Since the original description, this species has been reported from various Indo-West Pacific localities (Baba, 1988; 1989; 2005; Macpherson, 1994; 1999; 2004). It has been reported that the branchial margin is armed with three or four spines in this species (e.g., Baba, 1988; 2005; Macpherson, 1994; 2004), although the number of branchial spines is generally considered to be diagnostic in species of *Munida*. The present two specimens both have three spines on the branchial margin. Through an examination of literature, I noticed that the number of the branchial spines is correlated with the variation in the presence or absence of lateral carinae on the fifth thoracic sternite, viz., the three-spined morph bears lateral carinae on the fifth sternite, whereas the four-spined morph lacks those lateral carinae on the fifth sternite, suggesting a possibility that two species are confounded in the previous records of *M. rufiantennulata*. At my request, Dr. K. Baba (personal communication, 29 September 2011) kindly informed me that the holotype of *M. rufiantennulata* has three branchial spines and the presence of lateral carinae on the fifth thoracic sternite, whereas the paratype, which was simultaneously collected with the holotype, has four branchial spines and no lateral carinae on the fifth sternite. The present two specimens agree with the holotype, and I am fully convinced that they represent *M. rufiantennulata*. The specific status of the four-spined morph is not fully established at present. As Macpherson (2004) noted, a more complete study of specimens from various localities is strongly recommended to clarify the status of the variant currently referred *M. rufiantennulata*. The identification key proposed by Baba (2005) should be used with caution regarding *M. rufiantennulata*, because the variation of the branchial spine numbers is not considered. In order to clarify diagnostic details of this species, a detailed description is given in this paper.

Munida kapala Ahyong and Poore, 2004 is very similar to *M. rufiantennulata*. Nevertheless, as Ahyong and Poore (2004) indicated, the difference in the armature of the merus of the fourth pereopod seems to work in distinguishing these two species (dorsal margin unarmed in *M. kapala* versus armed with spines in *M. rufiantennulata*). Furthermore, the male chelipeds may be proportionally slenderer in *M. kapala* than in *M. rufiantennulata* (cf. Ahyong and Poore, 2004: fig. 7E), while the ambulatory legs are less slender in *M. kapala* than in *M. rufiantennulata* (cf. Ahyong and Poore, 2004: fig. 7F – H). Ahyong and Poore (2004) also cited the presence or absence of lateral carinae on the fifth thoracic sternite as a diagnostic character distinguishing the two species, but this cannot be used consider-

ing the variation seen in *M. rufiantennulata* in the current concept.

Munida solitaria sp. nov.
(Figs. 17, 18)

Material examined. RV Tansei-maru, KT07-31 cruise, stn L-2’-600, off Jogashima, Miura Peninsula, 35° 03.96’ N, 139° 34.93’ E, 634 – 433 m, 28 November 2007, dredge, coll. T. Komai, male (cl 4.6 mm), CBM-ZC 10534.

Description. Carapace (Fig. 17A) 1.2 times longer than wide. Dorsal surface gently convex transversely; main transverse ridges mostly interrupted; few secondary transverse striae present between main ridges; ridges and striae without setae. Gastric region slightly elevated, with 3 pairs of epigastric spines, spine posterior to base of supraocular spine strongest; 2 tiny, scale-like median tubercles on epigastric region; two transverse ridges on mesogastric region laterally each with 2 or 3 extra spinules. Hepatic region with a few very short striae. Cervical groove distinct. One parahepatic and 1 postcervical spines on each side, these spines tiny. Anterior part of branchial region devoid of striae or ridges, bearing 3 – 4 spinules, including branchial dorsal spine, along ridge defining cervical groove; lateral part of posterior branchial region with 5 transverse ridges or striae (excluding posterior transverse ridge). Intestinal region without stria on median part. Posterior transverse ridge without striae. Frontal margins strongly oblique. Lateral margins feebly convex in dorsal view. Anterolateral spine far falling short of sinus between rostrum and supraocular spines, directed forward; no spine on frontal margin mesial to anterolateral angle. Hepatic margin with 1 small spine. Branchial margins each with 5 small to minute spines, first spine largest.

Rostrum (Fig. 17A) narrowly triangular, 0.4 times as long as carapace, directed forward, straight in lateral view; dorsal surface convex, slightly granulate. Supraocular spines very short, triangular, directed forward.

Orbit with flattened, triangular, marginally denticulate tooth; ventral margin strongly produced in bluntly pointed subtriangular lobe.

Pterygostomial flap (Fig. 17B) rounded anteriorly, lateral surface weakly rugose with some obliquely transverse striae.

Epistomal ridge slightly sinuous, ending anterior to excretory pore of first segment of antennal peduncle; mesial protuberance obsolescent (Fig. 17E).

Thoracic sternite (Fig. 17C) wider than long. Third thoracic sternite about 4.0 times wider than long, much wider than anterior margin of fourth sternite, rather widely separated from fourth sternite; anterior margin bilobed by shallow median notch. Fourth to seventh sternites smooth, without patches of granules or carinae on lateral parts; no deep median groove on any somite. Transverse ridges smooth, without setae.

First abdominal tergite (Fig. 17A) smooth. Second somite (Fig. 17A) with anterior ridge unarmed; tergum with only 1 main transverse ridge; pleuron almost smooth. Third somite (Fig. 17A) with anterior ridge unarmed; tergum lacking transverse ridge; pleuron almost smooth. Fourth and fifth somites also smooth, without transverse ridge on each tergum. Sixth somite (Fig. 17D) smooth on tergum. Telson (Fig. 17D) about 1.5 times wider than long, incompletely divided into 7 plates (division between lateral and posterolateral plates incomplete); anteromedian plate smooth; lateral and posterior plates almost smooth.

Eyes (Fig. 17A, E) large, not particularly flattened dorsoventrally. Cornea not particularly dilated, width much greater than sinus between rostrum and supraocular spine and about 0.3 of distance between bases of anterolateral spines of carapace. Eyestalk not narrowed proximally, without setiferous striae on dorsal surface; eyelash consisting of very sparse, short setae.

Basal segment of antennular peduncle (Fig. 17E) stout, clearly overreaching distal corneal margin, length excluding distal spines about 2.0 of width; ventral surface with a few tiny tubercles; distal spines greatly unequal, distomesial spine about half length of distolateral spine; 2 lateral spines present, first spine moderately elongate, not reaching distolateral spine, arising slightly proximal to base of distolateral spine; second spine moderately short, located at about distal 0.2 of basal segment; statocyst lobe slightly inflated laterally.

Antennal peduncle (Fig. 17E) moderately stout, not reaching midlength of eye. First segment with short distomesial spine not reaching midlength of second segment; distolateral margin not produced. Second segment without striae on ventral surface; distomesial spine greatly reduced to minute tubercles; no mesial spine; distolateral spine very short, not reaching

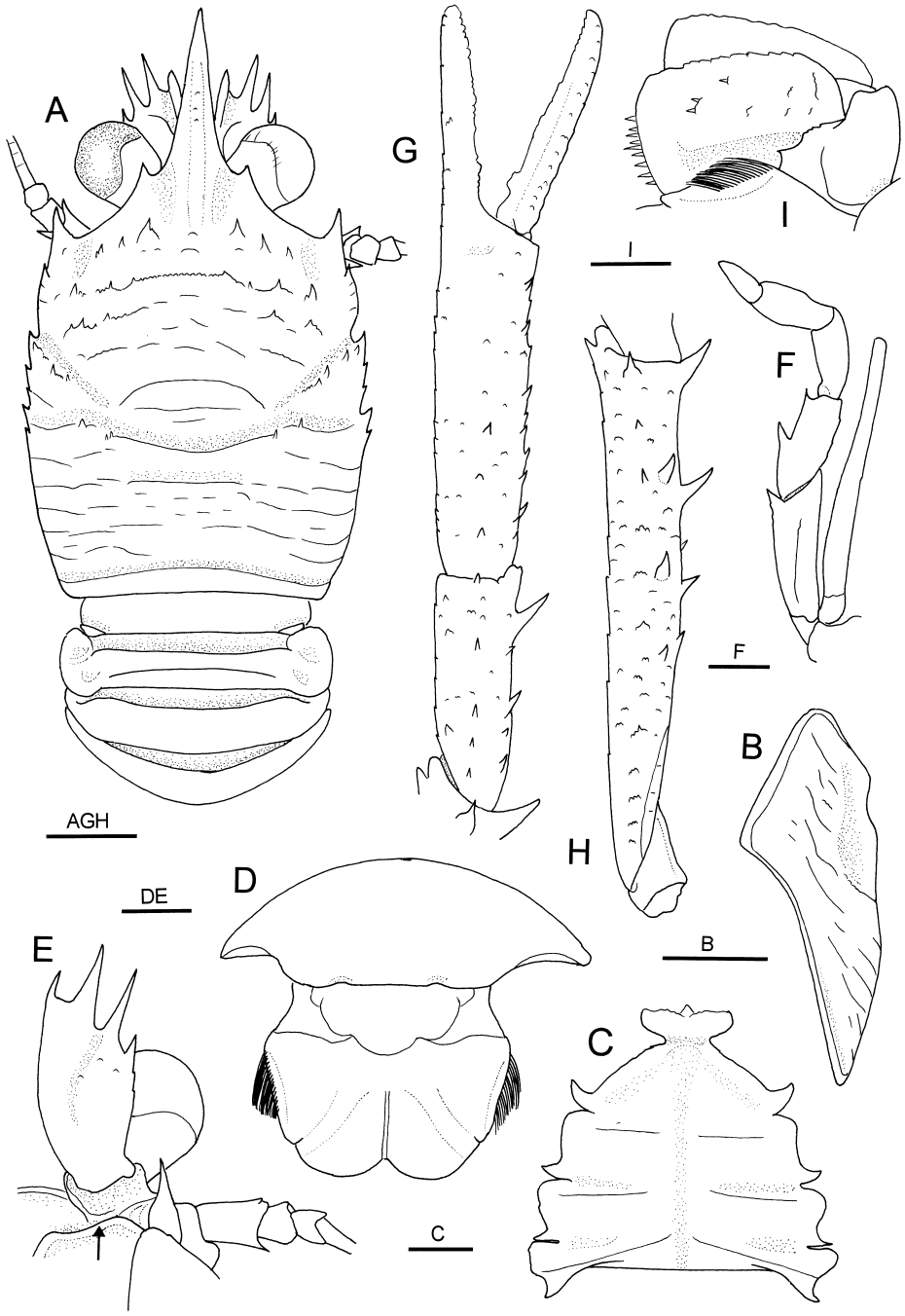

Fig. 17. *Munida solitaria* sp. nov., holotype, male (cl 4.6 mm), CBM-ZC 10534. A, carapace, cephalic appendages and first to fourth abdominal somites, dorsal view (setae omitted except for left eye; antennal flagella omitted); B, left pterygostomial flap, ventrolateral view; C, thoracic sternum, ventral view (setae omitted); D, sixth abdominal somite and telson, outer (ventral) view (setae partially omitted); E, left anterolateral part of carapace, eye, first segment of antennular peduncle and antennal peduncle, ventral view (arrow indicating epistomal ridge); F, left third maxilliped, lateral view (setae omitted); G, chela and carpus of right cheliped, dorsal view (denuded); H, merus of left cheliped, dorsal view; I, left uropod, outer (ventral) view (setae omitted). Scale bars: 1 mm for A, B, G, H; 0.5 mm for C – F, I.

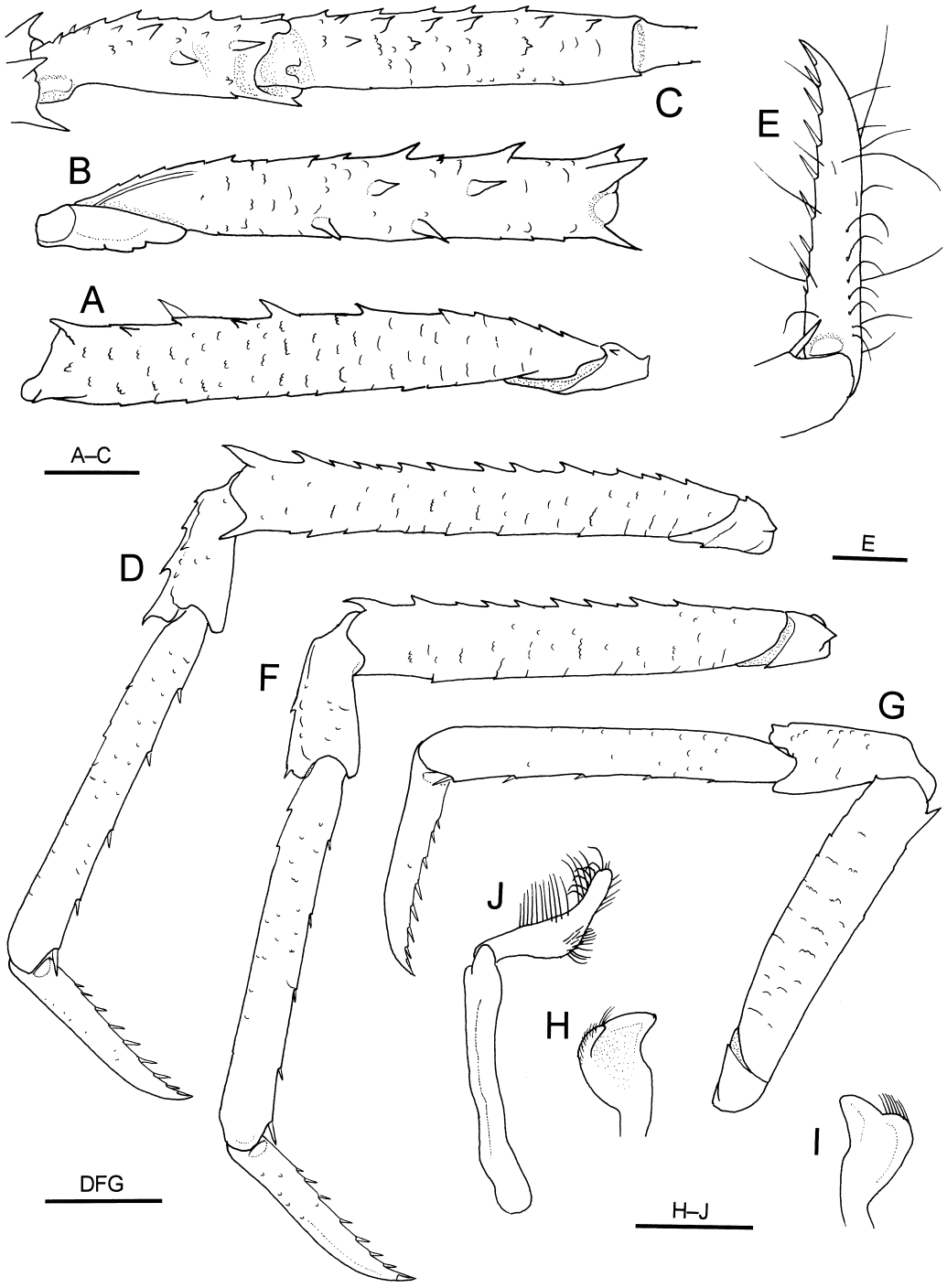

Fig.18. *Munida solitaria* sp. nov., holotype, male (cl 4.6 mm), CBM-ZC 10534 (setae omitted except for E). A merus of right cheliped,, lateral view; B, same, mesial view; C, palm and carpus of right cheliped, mesial view; D, left second pereopod, lateral view; E, same, dactylus, lateral view; F, left third pereopod, lateral view; G, left fourth pereopod, lateral view; H, distal segment of left first gonopod, inner view; I, same, outer view; J, left second gonopod, mesial view. Scale bars: 1 mm for A – D, F, G; 0.5 mm for E, H – J.

midlength of third segment. Third and fourth segments unarmed, former without striae on ventral surface.

Third maxilliped (Fig. 17F) moderately slender. Ischium with relatively small flexor distal spine not reaching level of extensor distal angle; lateral surface with distinct median ridge. Merus with 2 spines on flexor margin, distal spine moderately small, proximal spine distinctly stronger than distal spine; extensor distal margin unarmed; extensor margin faintly rugose, lateral surface nearly smooth. Carpus smooth on extensor surface. Propodus subequal in length to carpus, not expanded. Dactylus distinctly shorter than propodus.

Chelipeds (Figs. 17G, H, 18A – C) weakly squamous, elongate, 3.4 times longer than carapace, equally broad on merus, carpus and palm; palm and carpus with sparse short plumose setae on dorsal surfaces and long stiff setae on mesial faces; no iridescent setae. Merus narrowing in proximal half; dorsal surface with row of 3 small spines and some spinules or tubercles laterally and 4 spines mesially (distomesial spine relatively short); mesial surface with 2 prominent spines on midline and 3 spines adjacent to ventral margin (including ventromesial distal spine); ventrolateral distal angle with 1 small spine. Carpus 0.7 times as long as palm, 2.8 times longer than wide (excluding distomesial projection); dorsal surface with 5 small spines on midline, dorsomesial margin with 5 spines increasing in size distally (distomesial projection unarmed); mesial surface with 1 prominent spine medially; lateral surface with row of 3 tiny spines; ventrolateral distal angle with tiny spine. Palm slightly widened distally, elongate, 3.5 times longer than wide; dorsal surface with median row of 5 tiny spines or tubercles, no spine at articulation to dactylus; dorsolateral margin without distinct spines, dorsomesial margin with 6 small spines; mesial surface with 2 small spines and a few tubercles on midline; no spine at dactylar articulation on ventral surface. Fixed finger nearly straight, without conspicuous spines; dorsal surface almost smooth; cutting edge minutely denticulate. Dactylus 0.7 times as long as palm (tip slightly damaged), without conspicuous spines; cutting edge faintly denticulate. No proximal hiatus between dactylus and fixed finger.

Ambulatory legs (second to fourth pereopods) relatively long and slender, decreasing in length posteriorly; dorsal margins of meri with few short setae, those of carpi and propodi scarcely setose. Second pereopod (Fig. 18D) about 2.4 times longer than carapace, nearly reaching level of tip of rostrum by mero-carpal articulation; merus 0.9 times as long as carapace, 7.3 times longer than high, dorsal surface with row of 15 spines (distal spine moderately strong), ventral margin with strong distolateral spine followed by 1 small spine and several squamiform or transverse ridges, lateral face with many small squamiform or short transverse ridges; carpus about 0.4 length of propodus, with 4 spines increasing in size distally on extensor margin, lateral surface with 2 spinules adjacent to extensor margin, flexor distal margin produced in blunt projection; propodus with 1 minute spinule on proximal half of extensor margin, lateral surface sparsely granulate, flexor margin with row of 5 small equidistant movable spines, basal protuberance of ultimate spine without fixed spine; dactylus (Fig. 18E) 0.6 times as long as propodus and 6.6 times as long as high, slightly curved in distal part, bearing sparse stiff setae on extensor margin, lateral surface with row of short curled setae parallel to extensor margin, flexor margin not sinuous, with 8 slender corneous spines along entire length (second to fifth spines from distal longest) and subterminal spinule contiguous to unguis. Third pereopod (Fig. 18F) generally similar to second pereopod, overreaching level of tip of supraocular spines by mero-carpal articulation; merus about 0.9 length of that of second pereopod, dorsal surface with 9 spines, ventral margin with small distolateral spine followed by several squamiform or transverse ridges; carpus with 2 small spines on extensor margin; propodus with 2 minute spinules on extensor margin proximally and 5 movable spines on flexor margin; dactylus 0.6 times as long as propodus, with 7 slender corneous spines and 1 subterminal spinule on flexor margin. Fourth pereopod (Fig. 18G) overreaching lateral end of cervical groove of carapace by mero-carpal articulation; merus 0.6 length of that of second pereopod, dorsal surface armed only with small dorsodistal spine, ventral surface with tiny distolateral spine followed by some transverse ridges, lateral surface with some short transverse ridges or striae; carpus only with 1 minute dorsodistal tubercle on extensor margin, ventrodistal angle produced blunt projection; propodus similar to those of third pereopods, bearing 5 movable spinules on flexor margin; dactylus 0.7 times as long as propodus, with 7 corneous spines and subterminal spinule on flexor margin.

Merus of fifth pereopod slightly rugose with weak

striae.

Uropodal exopod (Fig. 17I) with lateral margin faintly denticulate, without movable spinules; outer surface unarmed; posterior margin roundly truncate, without minute movable spinules. Endopod with lateral margin minutely serrate, lacking movable spinules; outer surface with some short squamiform ridges sometimes bearing 1 – 2 spinules; posterior margin roundly truncate, with row of relatively long minute movable spinules.

First gonopod (Fig. 18H, I) with distal segment weakly bilobed, distal lobe subtriangular. Second gonopod (Fig. 18J) moderately slender; distal segment recurved, with distinct patch of setae at middle of convex dorsal surface.

Distribution. Known only from the type locality, Sagami Sea off Jogashima, 433 – 634 m.

Remarks. *Munida solitaria* is similar in some extent to *M. paucistria* sp. nov. and *M. trigonocornus* sp. nov., particularly in the narrowly triangular, non-spiniform, rostrum, and the structure of the antennae, but the very short, triangular supraocular spines and the presence of extra spinules on the gastric and branchial regions of the carapace immediately distinguish *M. solitaria* from the latter two species.

Using the identification key by Baba (2005), *M. solitaria* sp. nov. keys out the couplets including *M. micula* Macpherson, 1996 known from Futuna Island, and *M. offella* Macpherson, 1996 from the Southwest Pacific, because of the following shared characters: branchial margin of carapace bearing five spines; rostrum moderately long (less than half as long as carapace); thoracic sternum smooth, devoid of granular patches or carinae on lateral parts; second abdominal somite unarmed on anterior ridge; eyes large; basal segment of antennular peduncle with distomesial spine distinctly shorter than distolateral spine; and merus of third maxilliped unarmed on dorsodistal margin. However, *M. micula* and *M. offella* are easily separated from *M. solitaria* in the lack of extra spinules on the gastric and branchial regions of the carapace, the spiniform rostrum, the slender supraocular spines, and the third thoracic sternite being contiguous with the fourth sternite (Macpherson, 1996). In *M. solitaria*, the third thoracic sternite is clearly separated from the fourth sternite.

Munida pumilla Macpherson, 2004, known from Tonga is also similar to *M. solitaria* in the presence of additional spines on the anterior part of the carapace, the very short supraocular spines, and the triangular rostrum. However, *M. pumilla* is easily distinguished from *M. solitaria* by the absence of spines on the anterior part of the branchial region of the carapace, the more proximally located lateral spines on the first segment of the antennular peduncle, and the possession of an extensor distal spine on the merus of the third maxilliped.

Munida antonbruuni (Tirmizi and Javed, 1980) resembles *M. solitaria* in some characters, including short interrupted transverse ridges or striae on the carapace, the narrowly triangular rostrum, the very short supraocular spines, and the less developed ventrodistal spine of the ischium of the third maxilliped. This species was originally assigned to *Phylladiorhynchus* Baba, 1969 (Tirmizi and Javed, 1980), but later transferred to *Munida* by Baba (1991). Baba (2005) and Baba *et al*. (2008) noted that the systematic status of this species cannot be fixed because of the holotype is in poor condition and in a young state. Nevertheless, comparison with the descriptions of *M. antonbruuni* (cf. Tirmizi and Javed, 1980; Baba, 1991; Tirmizi and Javed, 1993) indicates that *M. solitaria* can be distinguished from *M. antonbruuni* by the presence of additional spinules on the lateral parts of the gastric region, the strongly oblique frontal margin of the carapace, and the entire lateral margin of the rostrum without a trace of a pair of subterminal teeth.

Etymology. From the Latin, *solitarius* (= alone), in reference to the distinctiveness of this new species.

Munida squamifera sp. nov.
(Figs. 19, 20)

Material examined. Holotype: RV *Tansei-maru*, KT95-5 cruise, stn TB18-2, Sagami Sea, Okinoyama Bank, 34° 59' N, 139° 39' E, 105 – 113 m, 21 April 1995, dredge, coll. T. Komai, 1 male (cl 10.5 mm), CBM-ZC 1991.

Description. Carapace (Fig. 19A) 1.2 times longer than wide. Dorsal surface gently convex transversely; main transverse ridges mostly not interrupted; few secondary transverse striae present between main ridges; most ridges and striae with dense short, non-iridescent setae. Gastric region slightly elevated, with 6 pairs of epigastric spines and minute median tubercle, spine posterior to base of supraocular spine strongest; 1 extra small spine posterolateral to epigastric series of spines on either side. Anteriormost transverse ridge (just behind epigastric spines) bearing small median spine. Cervical groove distinct. One or 2 parahepatic, 1 branchial dorsal and 1 postcervical

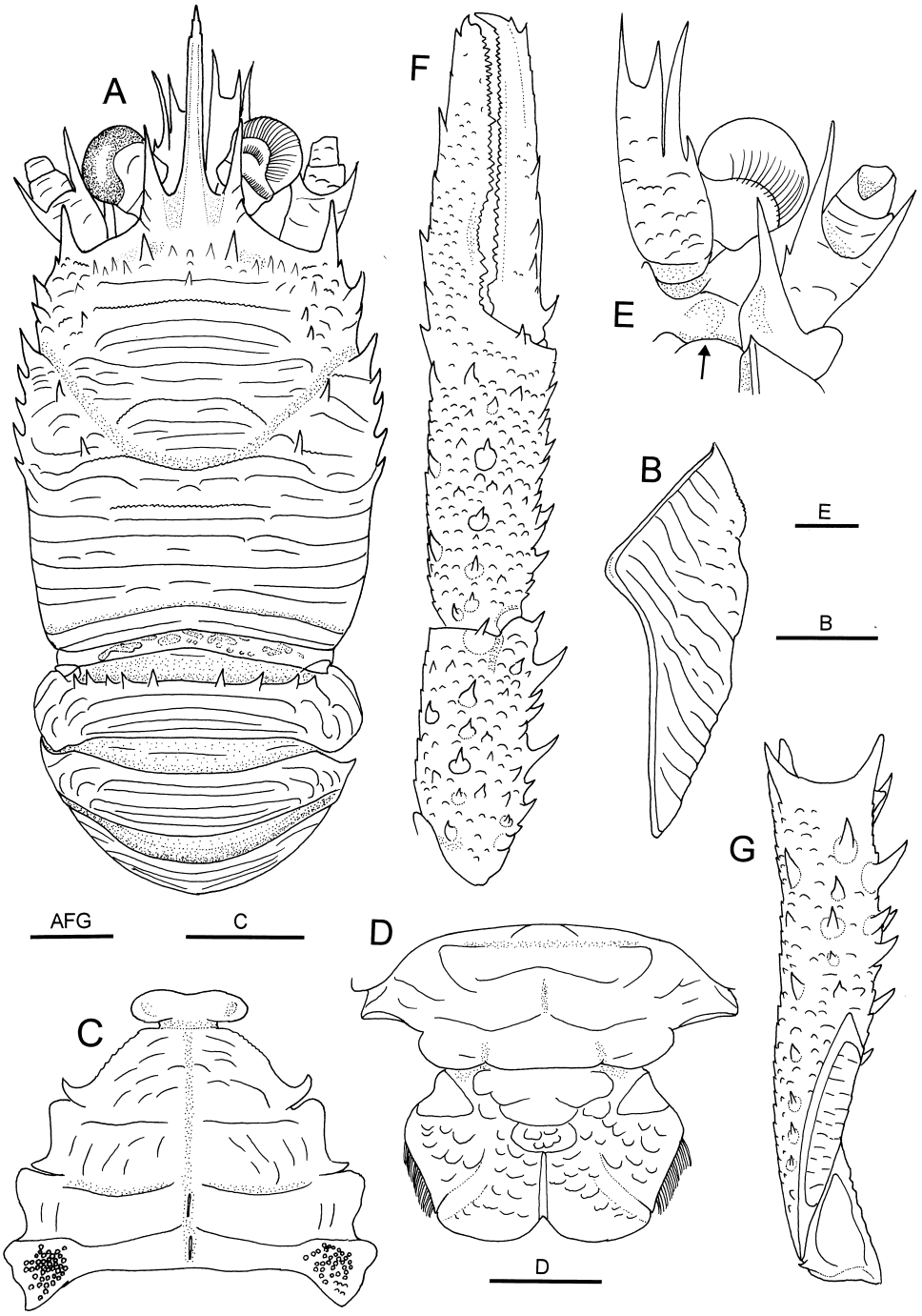

Fig. 19. *Munida squamifera* sp. nov., holotype, male (cl 10.5 mm), CBM-ZC 1991. A, carapace, cephalic appendages and first to fourth abdominal somites, dorsal view (setae omitted except for left eye; antennal flagella omitted); B, left pterygostomial flap, ventrolateral view; C, thoracic sternum, ventral view (setae omitted); D, sixth abdominal somite and telson, outer (ventral) view (setae partially omitted); E, left anterolateral part of carapace, eye, first segment of antennular peduncle and antennal peduncle, ventral view (arrow indicating epistomal ridge); F, chela and carpus of left cheliped, dorsal view (denuded); G, merus of left cheliped, dorsal view. Scale bars: 2 mm for A – D, F, G; 1 mm for E.

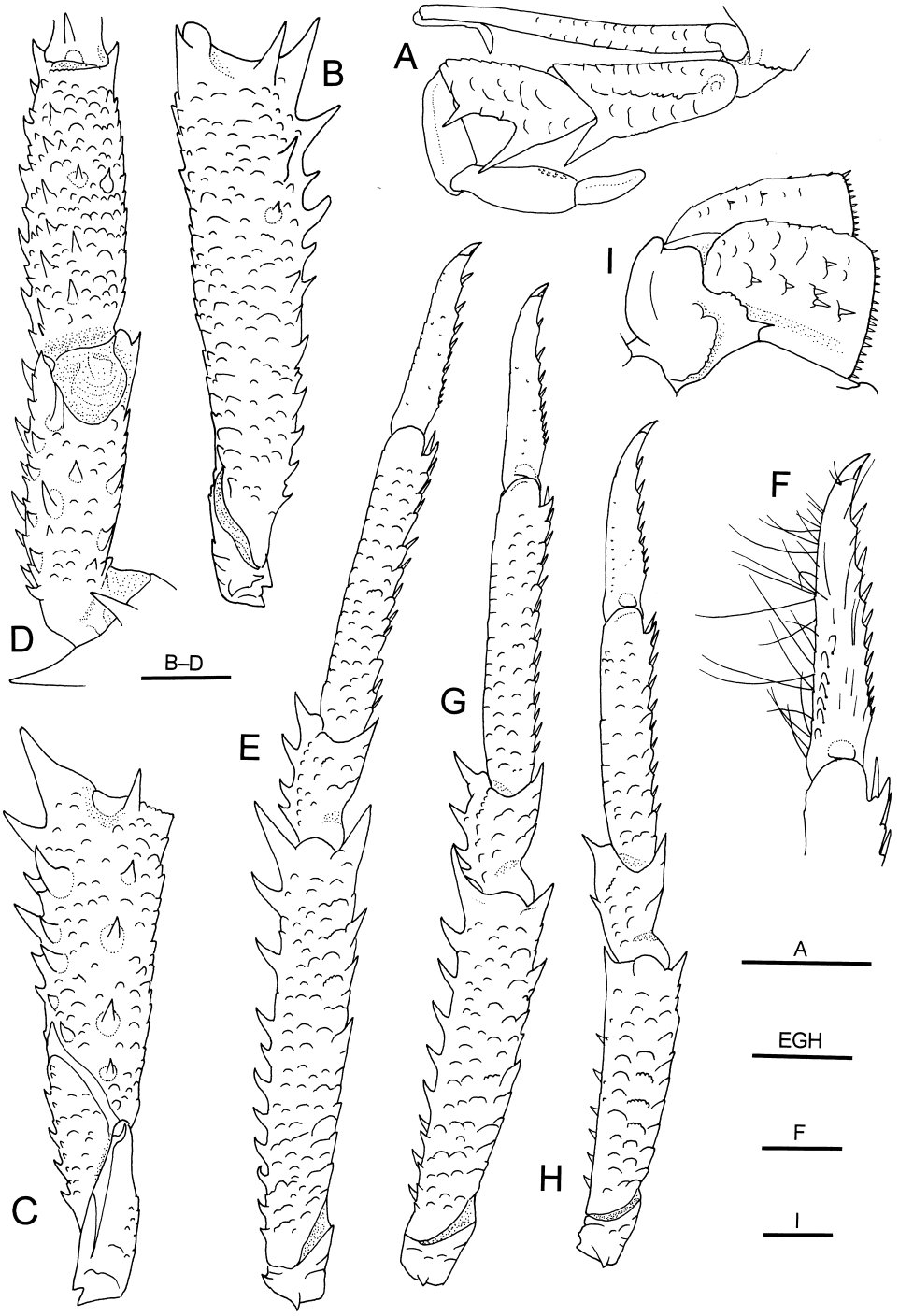

Fig. 20. *Munida squamifera* sp. nov., holotype, male (cl 10.5 mm), CBM-ZC 1991 (setae omitted except for E). A, left third maxilliped, lateral view (setae omitted); B, merus of left cheliped, lateral view; C, same, mesial view; D, palm and carpus of left cheliped, mesial view; E, right second pereopod, lateral view; F, same, dactylus, lateral view; G, right third pereopod, lateral view; H, right fourth pereopod, lateral view; I, left uropod, outer (ventral) view (setae omitted). Scale bars: 2 mm for A – E, G, H; 1 mm for F, I.

spines present on each side, these spines moderately small. Anterior part of branchial region with some striae. Lateral part of posterior branchial region with 5 transverse ridges or striae (excluding posterior transverse ridge). Intestinal region with short stria on median part. Posterior transverse ridge with 1 medially interrupted stria. Frontal margins strongly oblique. Lateral margins feebly convex in dorsal view. Anterolateral spine located at anterolateral angle, moderately long, nearly reaching sinus between rostrum and supraocular spines, directed forward; no spine on frontal margin mesial to anterolateral angle. Hepatic margin with 2 or 3 spines, strongest spine about 0.3 length of anterolateral spine. Branchial margins each with 5 moderately small spines, anteriormost spine larger than others.

Rostrum (Fig. 19A) spiniform, about 0.5 times as long as carapace, spiniform, directed forward, faintly sinuous in lateral view; dorsal carina not particularly delimited. Supraocular spines relatively long and slender, slightly diverging in dorsal view and very slightly ascending in lateral view, about half-length of rostrum.

Orbit with 1 spine slightly curved laterally; ventral margin strongly produced in rounded lobe bearing minute spinules and granules distally.

Pterygostomial flap (Fig. 19B) with sharp spine anteriorly, lateral face strongly rugose with irregular transverse or obliquely transverse ridges.

Epistomal ridge sinuous, ending anterior to excretory pore of first segment of antennal peduncle; mesial protuberance distinct.

Thoracic sternum (Fig. 19C) distinctly wider than long. Third thoracic sternite about 2.7 times wider than long, slightly broader than anterior margin of fourth sternite, narrowly separated from fourth sternite; anterior margin microscopically granulate, slightly bilobed with very shallow median notch. Fourth and fifth sternites with several short striae. Sixth sternite laterally with 2 longitudinal striae on each side. Seven sternite with numerous granules on lateral parts. Transverse ridges nearly smooth, with row of short setae.

First abdominal tergite (Fig. 19A) with numerous punctations or shallow depressions filled by short setae. Second abdominal somite (Fig. 19A) with anterior ridge bearing 9 spines (5 left + 4 right); tergum with 1 main transverse ridge and 3 transverse striae; pleuron with a few short striae. Third somite (Fig. 19A) with anterior ridge unarmed; tergum with 1 main transverse ridge and 4 transverse striae; pleuron with some arcuate striae. Fourth somite with anterior ridge unarmed; tergum with 1 main transverse ridge, 3 transverse striae, and 3 lateral striae; pleuron with some squamiform ridges. Fifth somite with 1 main transverse ridge, 3 transverse striae on tergum; pleuron with some squamiform ridges. Sixth somite (Fig. 19D) with 1 transverse, laterally interrupted ridge on anterior half and 1 pair of arcuate ridges on posterior part; lateral part with few short striae. Telson (Fig. 19D) about 1.6 times wider than long, incompletely divided into 7 main plates (division between lateral and posterolateral plates incomplete); anteromedian plate with interrupted transverse ridge and median groove; lateral and posterolateral plates strongly squamous, posterior angle of lateral plate sclerotized, forming small slender process.

Eyes (Fig. 19A, E) moderately large. Cornea strongly dilated, corneal width much greater than sinus between rostrum and supraocular spine and 0.3 of distance between anterolateral spines of carapace. Eyestalk slightly narrowed proximally, with 2 setiferous striae on dorsal surface; eyelash long, covering dorsal part of corneal surface.

Basal segment of antennular peduncle (Fig. 19E) moderately stout, distinctly overreaching distal corneal margin, length excluding distal spines about 2.3 of width; distal spines moderately long and slender, unequal with distomesial spine somewhat longer than distolateral spine; ventral surface with several short squamiform ridges; 2 lateral spines present, first spine overreaching distolateral spine, arising at about midlength of segment, second spine short, located just lateral to base of first spine; statocyst lobe slightly inflated.

Antennal peduncle (Fig. 19E) moderately stout, slightly overreaching midlength of eye. First segment with moderately long distomesial spine nearly reaching distal margin of third segment; distolateral margin produced, unarmed. Second segment with some short striae on ventral surface; distomesial spine overreaching distal margin of fourth segment; minute mesial spine present, distolateral spine nearly reaching distal margin of fourth segment. Third and fourth segments unarmed, former with few transverse striae on ventral surface.

Third maxilliped (Fig. 20A) moderately slender. Ischium with strong flexor distal spine extending as far as extensor distal angle; lateral surface with irregularly tuberculate median ridge and short transverse

ridges or striae. Merus with 2 greatly unequal spines on flexor margin, proximal spine very strong; extensor distal margin unarmed; lateral surface with several squamiform ridges. Carpus smooth on extensor surface. Propodus subequal in length to carpus, not expanded. Dactylus much shorter than propodus.

Cheliped (Figs. 19F, G, 20B – D) (only left preserved) strongly squamous, about 3.2 times longer than carapace, equally broad on merus, carpus and palm; mesial surface of merus to palm with mixture of short plumose setae and stiff iridescent setae. Merus with row of 9 spines on dorsal surface laterally (spines increasing in size distally) and 6 spines mesially (distomesial spine slightly diverging, far falling short of midlength of carpus); ventrolateral distal angle with small spine; mesial face with row of 5 spines on midline and row of 5 spines adjacent to ventral margin (including strong ventromesial distal spine). Carpus subequal in length to palm, 1.4 times longer than wide (excluding distomesial projection); dorsal and lateral surfaces with small spines mixed with squamiform tubercles; dorsal midline with 5 spines; dorsomesial margin with 5 spines; mesial surface with row of 4 spines dorsally and a few spines ventrally; ventrolateral distal angle with small spine. Palm slightly widened distally, about 2.3 times longer than wide; dorsal surface with median row of 6 spines, 1 spine at articulation to dactylus, and several additional tiny spines mixed with squamiform tubercles; dorsolateral margin with 3 spines, dorsomesial margin with 7 spines; mesial face with 3 spines on midline and 1 small spine ventrally. Fixed finger nearly straight, with 2 small subdistal spines and row of 5 spines on lateral margin; dorsal surface with scattered granules; cutting edge with row of minute, acute or subacute denticles. Dactylus 1.2 times longer than palm, terminating in sharp, curved claw crossing tip of fixed finger; mesial margin with 1 proximal and 2 subterminal spines; dorsal surface with 3 slender main spines adjacent to lateral margin in proximal half; cutting edge with row of minute, subacute to blunt denticles over entire length. Narrow hiatus proximally between dactylus and fixed finger.

Ambulatory legs (second to fourth pereopods) moderately long and slender, decreasing in length posteriorly. Second pereopod (Fig. 20E) about 2.1 times longer carapace, reaching nearly to tip of anterolateal spine on carapace by mero-carpal articulation; merus about 0.8 times as long as carapace, about 6.0 times longer than high, dorsal margin with dense setal row consisting of moderately short plumose setae and iridescent setae and with row of 11 spines (distal spine strong), ventral margin with 1 strong distal spine followed by 3 smaller spines and several short transverse ridges, lateral face with numerous small squamiform or ridges; carpus about 0.4 length of propodus, with 4 spines noticeably increasing in size distally on extensor margin, flexor distal margin produced in strong spine; lateral surface with longitudinal row of tubercles dorsally and several squamiform tubercles or ridges; propodus unarmed on extensor margin, lateral face with numerous squamiform tubercles or ridges, flexor margin with row of 12 equidistant movable spines, basal protuberance of ultimate spine bearing sharp fixed spine; dactylus (Fig. 20F) 0.7 times as long as propodus and about 6.0 times as long as high, slightly curved in distal part, bearing sparse short to long stiff setae on extensor margin, lateral surface with row of short curled setae nearly parallel to extensor margin, flexor margin faintly sinuous, with 10 corneous spines notably increasing in length distally along over entire length; minute subterminal spinule closely appressed to unguis. Third pereopod (Fig. 20G) similar to second pereopod, reaching anterolateral angle of carapace by mero-carpal articulation; merus 0.8 length of that of second pereopod, dorsal surface with lateral row of 10 spines and proximal mesial row of 3 spines, ventral margin with strong distolateral spine followed by 2 smaller spines and several transverse ridges; carpus with 4 spines on extensor margin; propodus with 13 movable spines on flexor margin; dactylus with 9 corneous spines and subterminal spinule on flexor margin; terminal spinule present. Fourth pereopod (Fig. 20H) reaching nearly to lateral end of cervical groove of carapace by mero-carpal articulation; merus 0.6 length of that of second pereopod, dorsal surface with mesial row of 6 small spines and dorsodistal spine, ventral surface with distal spine and several transverse ridges, lateral surface with numerous squamiform ridges; carpus with prominent dorsodistal and 1 dorsal spine at midlength; propodus similar to those of second and third pereopods, bearing 10 movable spines on flexor margin; dactylus 0.8 times as long as propodus, with 8 corneous spines and subterminal spinule on flexor margin.

Merus of fifth pereopod squamous on outer surface.

Uropodal exopod (Fig. 20I) with lateral margin faintly denticulate, armed with few minute movable spinules; outer surface with few short transverse

striae bearing 1 minute spinules laterally; posterior margin with row of spinules. Endopod with lateral margin irregularly denticulate; outer surface with several short squamiform ridges sometimes bearing 1 or 2 spinules; posterior margin with row of spinules.

Distribution. Known only from the type locality, Okinoyama Bank, Sagami Sea, 105 – 113 m deep.

Remarks. *Munida squamifera* sp. nov. is morphologically most similar to *M. distiza* Macpherson, 1994 known from the Philippines, the Coral Sea and French Polynesia, and *M. ducoussoi* Macpherson and de Saint Laurent, 1991 from French Polynesia in sharing the following diagnostic characters (Macpherson and de Saint Laurent, 1991; Macpherson, 1994; Baba, 2005): branchial margin of carapace bearing five spines; fifth thoracic sternite bearing several striae; seventh thoracic sternite with patch of granules on lateral parts; second abdominal somite with row of spines on anterior edge; eyes large; basal segment of antennular peduncle with distomesial spine distinctly longer than distolateral spine; merus of third maxilliped lacking dorsodistal spine. *Munida squamifera* differs from both *M. distiza* and *M. decoussoi* in the presence of a median spine posterior to epigastric series of spines on the carapace and the proportionally longer dactylus of the second pereopod (about 0.7 times as long as propodus versus 0.5 times as long). Furthermore, granules on the lateral parts of the seventh thoracic sternite is scattered in *M. squamifera*, but they are arranged in some obliquely transverse rows in *M. distiza* and *M. decoussoi*. *Munida distiza* is distinguished from *M. squimifera* further by the nearly transverse, instead of strongly oblique, frontal margin of the carapace. *Munida decoussoi* is separated from *M. squamifera* further by the more distantly separated third thoracic sternite and the relatively small eyes (the corneal width is 0.2 of the distance between the bases of anterolateral spines of the carapace versus 0.3).

Munida macphersoni Cabezas, Lin and Chan, 2011, recently described from Taiwan, was confounded with *M. distiza* (cf. Baba *et al*., 2009). Nevertheless, *M. macphersoni* is immediately distinguished from *M. squamifera* by the presence of spines on the anterior ridge of the third abdominal somite and the slender dactyli of the ambulatory legs unarmed on the distal one-third of the flexor margins (Cabezas *et al*., 2011).

Etymology. From the Latin *squamiferus* (= squamous), in reference to the strongly squamous chelipeds and ambulatory legs.

Munida tiresias Macpherson, 1994
(Figs. 21, 22)

Munida tiresias Macpherson, 1994: 545, fig. 57 [type locality: New Caledonia, 1430 – 1470 m]; Baba, 2005: 276 (key); Osawa and Takeda, 2007: 134, fig. 1C, D; Baba et al., 2008: 126 (compilation); Baba et al., 2009: 198, figs. 179, 178.

Material examined. Holotype: TRV *Shin' yo-maru*, 1996 research cruise, stn 21, off Tateyama, Sagami Sea, 34° 56.46' N, 139° 33.12' E, 1039 – 1300 m, rocky bottom, 24 October 1996, dredge, ovig. female (cl 5.6 mm), CBM-ZC 5349.

Distribution. Previously known from Okinawa Trough, Taiwan, and New Caledonia; 1039 – 2063 m. The present specimen slightly extends the geographical range of this species to the Pacific side of central Japan.

Remarks. The present specimen agrees generally with the type description in most diagnostic aspects, including the very small eyes (the corneal width is about 0.1 of the distance between the bases of the anterolateral spine of the carapace), the very short distomesial spine of the first segment of the antennal peduncle, and the possession of a spine on the frontal margin of the carapace mesial to the anterolateral angle (Macpherson, 1994; Osawa and Takeda, 2007; Baba *et al*., 2009). However, it differs from the type description in the following points: the transverse ridges and striae on the carapace are coarsely granulate in the present specimen (Fig. 21A), but these ridges appear smooth in the original description; the second segment of the antennal peduncle lacks a distomesial spine in the present specimen (Fig. 21E), but this spine is present in the type specimens; the second pereopod seems to be more slender in the present specimen compared with the figure by Macpherson (1994: fig. 57f); and the basal protuberance of the ultimate movable spine on the propodus of the second pereopod bears a fixed spine in the present specimen (Fig. 22E), whereas such a fixed spine is not mentioned in the original description. Nevertheless, it is possible that the granules on the transverse ridges on the carapace may be easily overlooked. Osawa and Takeda (2007) noted that the armature of the second segment was variable in their specimens from the Okinawa Trough. The proportion and armature of the ambulatory legs may be also variable. Con-

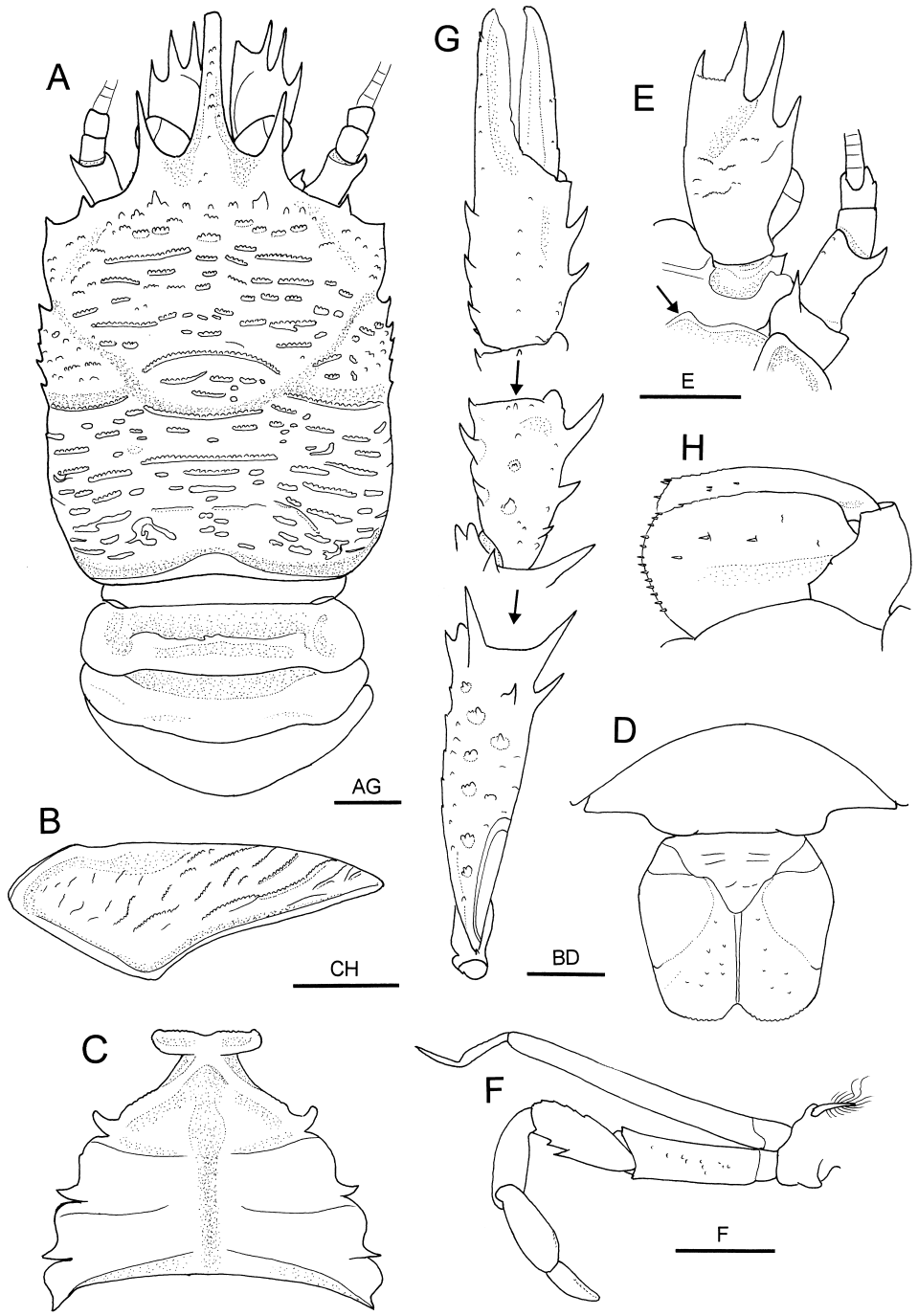

Fig. 21. *Munida tiresias* Macpherson, 1994, ovig. female (cl 5.6 mm), CBM-ZC 5349. A, carapace, cephalic appendages and first to fourth abdominal somites, dorsal view (setae omitted; antennal flagella omitted); B, left pterygostomial flap, ventrolateral view; C, thoracic sternum, ventral view (setae omitted); D, sixth abdominal somite and telson, outer (ventral) view (setae omitted); E, left anterolateral part of carapace, eye, first segment of antennular peduncle and antennal peduncle, ventral view (arrow indicating epistomal ridge); F, left third maxilliped, lateral view (setae omitted); G, left cheliped, dorsal view (denuded); H, left uropod, outer (ventral) view (setae omitted). Scale bars: 1 mm.

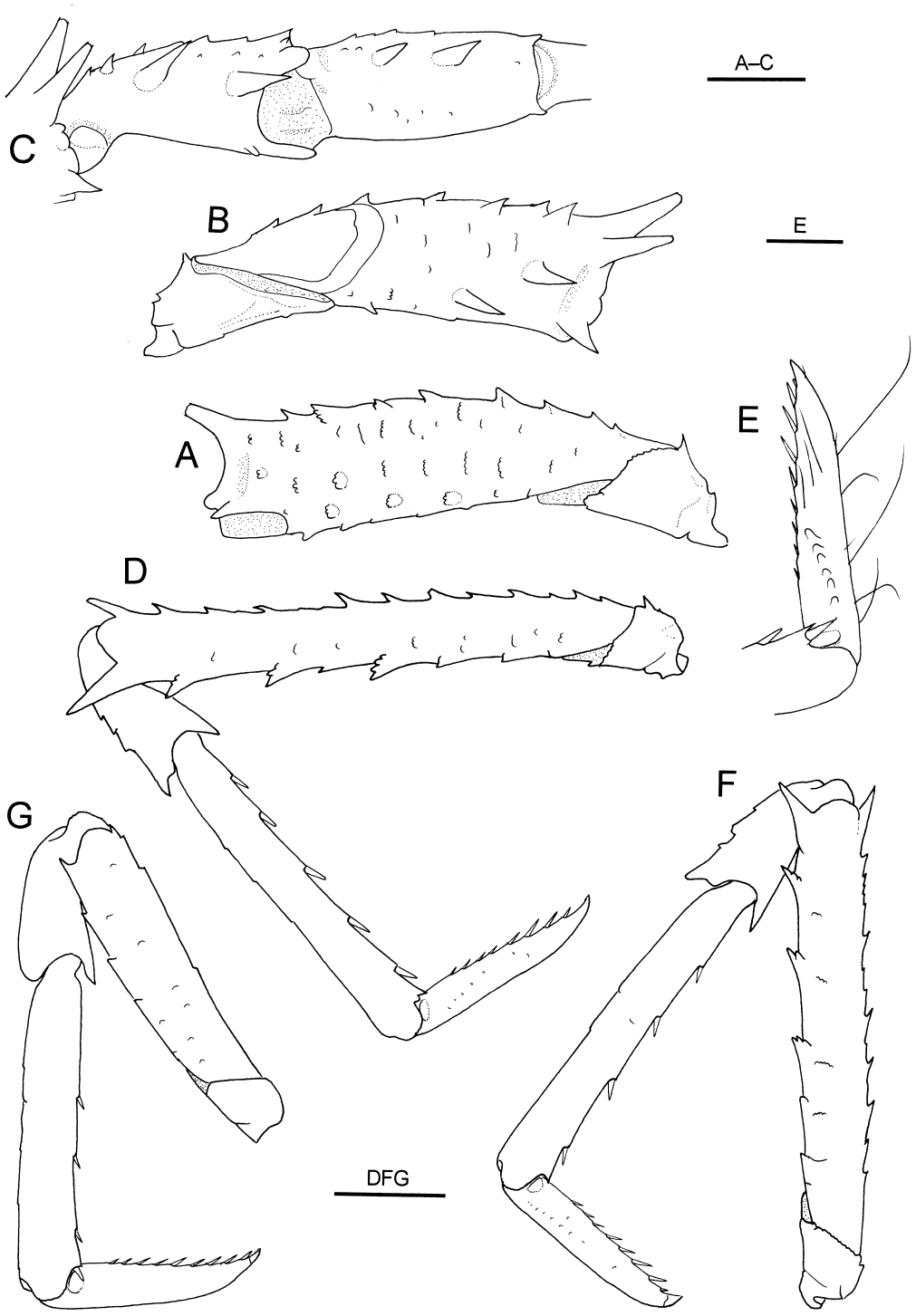

Fig. 22. *Munida tiresias* Macpherson, 1994, ovig. female (cl 5.6 mm), CBM-ZC 5349 (setae omitted except for E). A, merus of right cheliped, lateral view; B, same, mesial view; C, carpus and palm of left cheliped, mesial view; D, left second pereopod, lateral view; E, same, dactylus, lateral view; F, left third pereopod, lateral view; G, left fourth pereopod, lateral view. Scale bars: 1 mm for A – D, F, G; 0.5 mm for E.

sequently, I refer the present specimen to *M. tiresias* for the time being. In order to show diagnostic details of the present specimen, figures of various parts are presented.

Munida trigonocornus sp. nov.
(Figs. 23 – 25)

Material examined. Holotype: TRV Shin' yo-maru, 1996 research cruise, stn 6, Izu Islands, Hyotan-se Bank, 34° 20.75' N, 139° 20.0' E, 275 – 350 m, 22 October 1996, dredge, coll. T. Komai, female (cl 4.2 mm), CBM-ZC 4618.

Paratype: same data as holotype, male (cl 4.6 mm), CBM-ZC 4617.

Description. Holotype female. Carapace (Fig. 23A) 1.1 times longer than wide. Dorsal surface gently convex transversely; main transverse ridges not interrupted; few secondary transverse striae present between main ridges; most ridges and striae with dense short, non-iridescent setae. Gastric region slightly elevated, with 4 pairs of epigastric spines, spine posterior to base of supraocular spine strongest; longitudinal row of scale-like median tubercles on epigastric region; only 4 main transverse ridges present. Hepatic region almost smooth. Cervical groove distinct. One parahepatic, 2 branchial dorsal and 1 postcervical spines present on each side, parahepatic spine larger than other spines. Anterior part of branchial region devoid of striae or ridges; lateral part of posterior branchial region with 5 transverse ridges or striae (excluding posterior transverse ridge). Intestinal region without stria on median part. Posterior transverse ridge without striae. Frontal margins somewhat oblique. Lateral margins feebly convex in dorsal view. Anterolateral spine located at anterolateral angle, short, far falling short of sinus between rostrum and supraocular spines, directed in dorsal view; no spine on frontal margin mesial to anterolateral angle. Hepatic margin with 1 tiny spine. Branchial margins each with 4 small spines, first spine largest.

Rostrum (Fig. 23A) narrowly triangular, non-spiniform, 0.4 times as long as carapace, directed forward, straight in lateral view; dorsal surface slightly carinate and granulate, extending onto epigastric region. Supraocular spines short, robust, almost parallel in dorsal view and directed forward in lateral view, about 0.20 length of rostrum.

Orbit with distinct process directed anterolaterally; ventral margin strongly produced in rounded process.

Pterygostomial flap (Fig. 23B) armed with tiny spine anteriorly, lateral surface weakly rugose with some obliquely transverse striae.

Epistomal ridge transverse, fused with ridge situated at base of antennule, ending slightly anterior to excretory pore of first segment of antennal peduncle; mesial protuberance indistinct (Fig. 23E).

Thoracic sternum (Fig. 23C) wider than long. Third thoracic sternite about 3.1 times wider than long, as wide as anterior margin of fourth sternite; anterior margin bilobed by V-shaped median notch. Fourth sternite with a few granulate striae medially. Fifth to seventh sternites smooth, without carina or patch of granules on lateral parts. Seventh sternite with deep median groove. Transverse ridges faintly granulate or nearly smooth, without setae.

First abdominal tergite (Fig. 23A) smooth. Second somite (Fig. 23A) with anterior ridge unarmed; tergum with only 1 main transverse ridge; pleuron almost smooth. Third somite (Fig. 23A) with anterior ridge unarmed; tergum with only 1 main transverse ridge; pleuron almost smooth. Fourth and fifth somites smooth, without transverse ridge on tergum. Sixth somite (Fig. 23D) with trace of arcuate striae in posterior half of tergum, otherwise smooth. Telson (Fig. 23D) 1.2 times wider than long, incompletely divided into 7 plates (division between lateral and posterolateral plates incomplete); anteromedian plate smooth; lateral and posterior plates nearly smooth.

Eyes (Fig. 23A, E) large, not particularly flattened dorsoventrally. Cornea dilated, corneal width much greater than sinus between rostrum and supraocular spine and about 0.3 of distance between bases of anterolateral spines of carapace. Eyestalk not narrowed proximally, without setiferous striae on dorsal surface; eyelash consisting of very sparse, short to long setae.

Basal segment of antennular peduncle (Fig. 23E) stout, slightly overreaching distal corneal margin, length excluding distal spines about 1.7 of width; ventral surface with some short squamiform or transverse ridges; distal spines greatly unequal, distomesial spine about half length of distolateral spine; 2 lateral spines present, first spine moderately elongate, reaching beyond distolateral spine, arising slightly proximal to base of distolateral spine; second spine moderately short, located at about distal 0.2 of basal segment; statocyst lobe slightly inflated laterally.

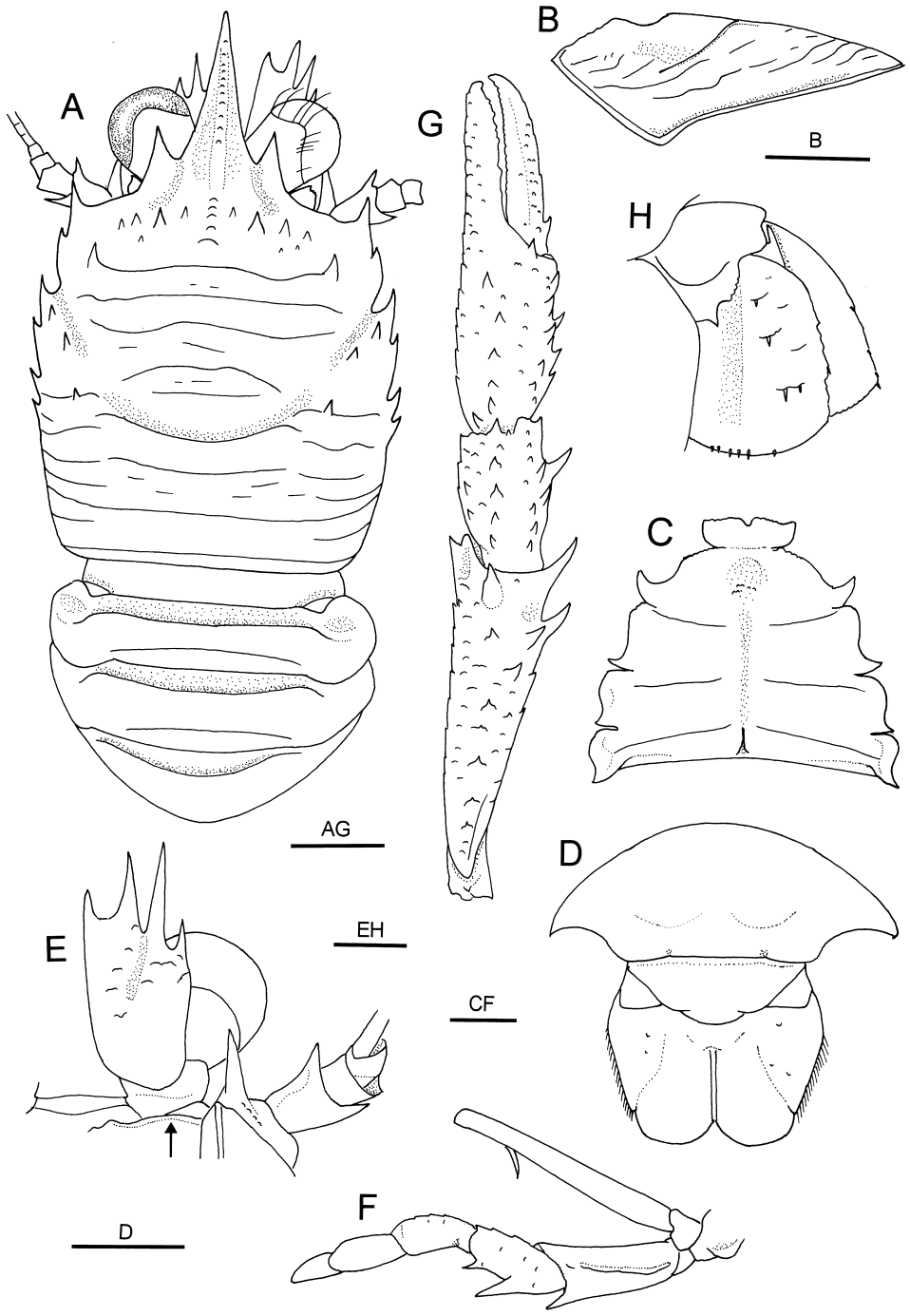

Fig. 23. *Munida trigonocornus* sp. nov., holotype, female (cl 4.2 mm), CBM-ZC 4618. A, carapace, cephalic appendages and first to fourth abdominal somites, dorsal view (setae omitted except for left eye; antennal flagella omitted); B, left pterygostomial flap, ventrolateral view; C, thoracic sternum, ventral view (setae omitted); D, sixth abdominal somite and telson, outer (ventral) view (setae partially omitted); E, left anterolateral part of carapace, eye, first segment of antennular peduncle and antennal peduncle, ventral view (arrow indicating epistomal ridge); F, left third maxilliped, lateral view (setae omitted); G, left cheliped, dorsal view (denuded); H, right uropod, outer (ventral) view (setae omitted). Scale bars: 1 mm for A, B, D, G; 0.5 mm for C, E, F, H.

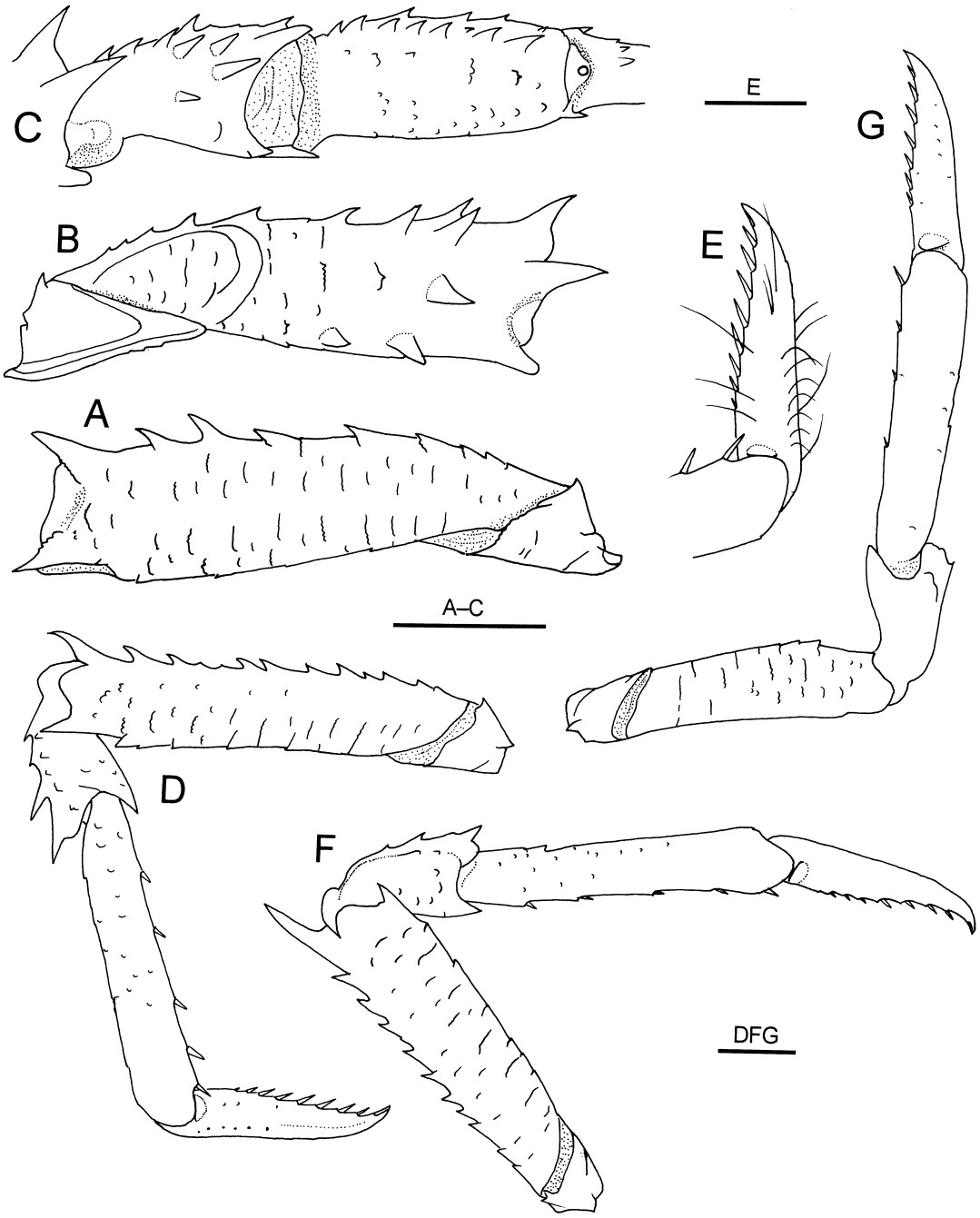

Fig. 24. *Munida trigonocornus* sp. nov., holotype, female (cl 4.2 mm), CBM-ZC 4618 (setae omitted except for E). A, merus of left cheliped, lateral view; B, mesial view; C, palm and carpus of left cheliped, mesial view; D, left second pereopod, lateral view; E, same, dactylus, lateral view; F, right third pereopod, lateral view; G, left fourth pereopod, lateral view. Scale bars: 1 mm for A – C; 0.5 mm for D – G.

Antennal peduncle (Fig. 23E) moderately stout, reaching beyond midlength of eye. First segment with moderately long distomesial spine not reaching distal margin of third segment; distolateral margin not produced. Second segment without striae on ventral surface; distomesial spine short, not reaching distal margin of third segment; no mesial spine; distolateral spine also not reaching distal margin of third segment. Third and fourth segments unarmed, former without striae on ventral surface.

Third maxilliped (Fig. 23F) moderately slender. Ischium with moderately strong flexor distal spine extending as far as extensor distal angle; lateral surface with distinct median ridge. Merus with 2 spines on flexor margin, distal spine moderately small, proximal spine moderately strong; extensor distal margin unarmed; dorsal margin and lateral surface sparsely granulate. Carpus sparsely granulate on extensor surface. Propodus subequal in length to carpus, not expanded. Dactylus much shorter than propodus.

Chelipeds (Figs. 23G, 24A – C) weakly squamous, 2.0 times longer than carapace, equally broad on merus, carpus and palm; setation quite sparse, without iridescent setae. Merus narrowing proximally; dorsal sur-

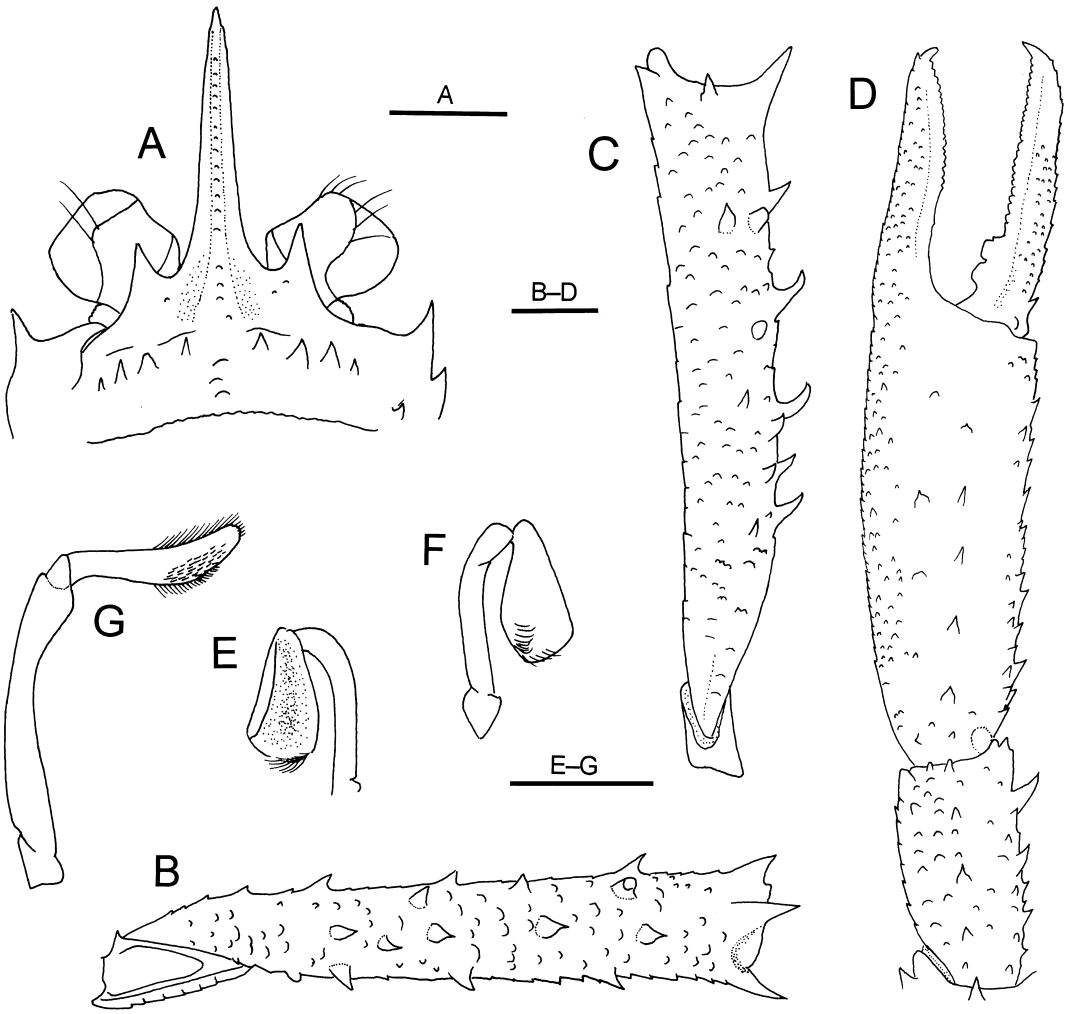

Fig. 25. *Munida trigonocornus* sp. nov., paratype, male (cl 4.6 mm), CBM-ZC 4617. A, anterior part of carapace and eyes, dorsal view (partially damaged); B, chela and carpus of left cheliped, dorsal view (denuded); C, merus of left cheliped, dorsal view; D, same, mesial view; E, left first gonopod, inner view; F, same, outer view; G, left second gonopod, outer view. Scale bars: 1 mm for A – D; 0.5 mm for E – G.

face with row of 6 spines laterally and 3 spines mesially (distomesial spine quite prominent, but far falling short midlength of carpus); mesial surface with 1 strong spine on midline and 3 spines adjacent to ventral margin (including ventromesial distal spine); ventrolateral distal angle with 1 spine. Carpus 0.8 times as long as palm, 1.6 times longer than wide (excluding distomesial projection); dorsal surface with 5 spines on midline, dorsomesial margin with single row of 6 spines; lateral surface with 1 small spine at middle; mesial surface with 2 prominent spines; ventrolateral distal angle with small spine. Palm not widened distally, 1.9 times longer than wide; dorsal surface with median row of 5 spines, 1 spine at articulation to dactylus, and 1 small spine at proximolateral portion; dorsolateral margin with 1 spine proximal to base of fixed finger, dorsomesial margin with 7 small spines; mesial surface without conspicuous spines; ventral surface with 1 small spine at dactylar articulation. Fixed finger nearly straight, without conspicuous spines; dorsal surface sparsely granulate; cutting edge minutely denticulate. Dactylus subequal in length to palm, only with 1 proximal spine on mesial margin, terminating in sharp, curved claw crossing tip of fixed finger; cutting edge minutely denticulate. No proximal hiatus between dactylus and fixed finger.

Ambulatory legs (second to fourth pereopods) relatively short and moderately slender, decreasing in length posteriorly; dorsal margins of meri with short plumose setae, extensor margins of carpi and propodi scarcely setose. Second pereopod (Fig. 24D) about 1.7 times longer than carapace, reaching level of tip of supraocular spine on carapace by mero-carpal articulation; merus 0.7 times as long as carapace, 5.1 times longer than high, dorsal surface with row of 11 spines and some minute spinules (distal spine moderately strong), ventral margin with strong distolateral spine followed by 1 smaller spine and several squamiform or transverse ridges, lateral face with small squamiform or short transverse ridges; carpus about 0.4 length of propodus, with 4 spines increasing in size distally on extensor margin, flexor distal margin produced in moderately strong spine; lateral surface with row of tiny tubercles adjacent to extensor margin; propodus unarmed on extensor margin, lateral surface sparsely granulate, flexor margin with row of 5 small equidistant movable spines, basal protuberance of ultimate spine without fixed spine; dactylus (Fig. 24E) 0.7 times as long as propodus and 4.8 times as long as high, slightly curved in distal part, bearing sparse stiff setae on extensor margin, lateral surface with row of short curled setae parallel to extensor margin, flexor margin faintly sinuous, with 8 small corneous spines along entire length (second to fifth spines from distal longest) and minute subterminal spinule closely appressed to unguis. Third pereopod (Fig. 24F) generally similar to second pereopod, reaching anterolateral angle of carapace by mero-carpal articulation; merus 0.8 length of that of second pereopod, dorsal surface with 11 spines, ventral margin with distolateral spine followed by several squamiform ridges; carpus with 3 spines on extensor margin; propodus with 5 movable spines on flexor margin; dactylus 0.7 times as long as propodus, with 8 small corneous spines and 1 subterminal spinule on flexor margin. Fourth pereopod (Fig. 24G) reaching to lateral end of cervical groove of carapace by mero-carpal articulation; merus 0.7 length of that of second pereopod, dorsal surface unarmed, ventral surface with tiny distolateral spine followed by some transverse ridges, lateral surface with several short transverse ridges; carpus with 2 tiny tubercles distally, ventrodistal angle produced, but blunt; propodus similar to those of third pereopods, bearing 4 movable spines on flexor margin; dactylus 0.8 times as long as propodus, with 7 corneous spines and subterminal spinule on flexor margin.

Merus of fifth pereopod nearly smooth on outer surface.

Uropodal exopod (Fig. 23H) with lateral margin faintly denticulate, armed with a few minute movable spinules; outer surface unarmed; posterior margin roundly truncate, without minute movable spinules. Endopod with lateral margin minutely serrate, bearing a few minute movable spinules; outer surface with some short squamiform ridges sometimes bearing 1 – 2 minute spinules; posterior margin roundly truncate, with row of minute movable spinules.

Paratype male. Carapace considerably damaged. Differing from female holotype in the followings: rostrum proportionately longer and slenderer, about 0.5 times as long as carapace (Fig. 25A).

Chelipeds (Fig. 25B – D) much more elongate than in female holotype, about 4.0 times longer than carapace. Merus with mesial surface armed with 6 slender spines on midline and 4 spines adjacent to ventral margin. Carpus about 1.9 times longer than wide. Palm slightly widening distally, about 2.6 times longer than wide; dorsomesial margin with 6 small

spines including distomesial spine; mesial surface with 3 tiny spines along midline. Fixed finger with 1 tiny subterminal spine; cutting edge sinuous. Dactylus about 0.7 times as long as palm, only with 1 proximal spine on mesial margin; cutting edge with 2 small rectangular teeth proximally. Narrow proximal hiatus between fingers.

First gonopod (Fig. 25E, F) with distal segment markedly widened distally. Second gonopod (Fig. 25G) moderately slender; distal segment gently recurved, with numerous short setae in distal part.

Distribution. Known only from the type locality, Hyotan-se Bank, northern part of Izu Islands, at depths of 275 – 350 m.

Remarks. The male paratype generally agrees with the female holotype except for the more elongate rostrum. It is unclear at present if the difference in the rostrum is a sex-related variation. The chelipeds are much more elongate and less spinose on the chela in the male paratype than in the female holotype, but this difference could be attributed to sexual variation, which is commonly seen in squat lobster species.

Munida trigonocornus sp. nov. appears closest to *M. paucistria* sp. nov., as mentioned above. These two species are discriminated by the following characters: the anterolateral spine on the carapace is relatively shorter in *M. trigonocornus* than in *M. paucistria* ; the dorsal surface of the rostrum is bluntly carinate in *M. trigonocorunus*, rather than only slightly convex in *M. paucistria* ; the female cheliped (especially the merus) is less elongate in *M. trigonocornus* than in *M. paucistria* ; the palm of the chela is unarmed laterally in *M. trigonocornus*, but there are three spines on the dorsal surface laterally in *M. paucistria* ; the dactylus of the cheliped bears a small proximal spine in *M. trigonocornus*, which is absent in *M. paucistria* ; and the ambulatory legs are relatively shorter in *M. trigonocornus* than in *M. paucistria*.

Munida pumila is also somewhat similar to *M. trigonocornus*, particularly in the triangular rostrum. Nevertheless, *M. pumila* is readily distinguished from *M. trigonocornus* by the very small supraocular spines, the main ridges on the anterior part of the carapace divided in short parts, the absence of spines on the anterior part of the branchial region, and the presence of an extensor distal spine on the merus of the third maxilliped.

Etymology. From the combination of the Latin, *trigonus* (= triangular) and *cornus* (horn), in reference to the non-spiniform, triangular rostrum of this new species. Used as a noun in apposition.

Munida vicina sp. nov.
(Figs. 26, 27)

Material examined. Holotype: RV *Takunan*, stn 25, Kurose Bank, Izu Islands, 33° 22.57' E, 139° 42.9' E, 132 – 139 m, 14 October 2009, female (cl 5.6 mm), NSMT-Cr S1146.

Description. Carapace (Fig. 26A) 1.2 times longer than wide. Dorsal surface gently convex transversely; main transverse ridges interrupted or uninterrupted; a few secondary transverse striae present between main ridges; most ridges and striae with dense short setae and/or some long setae. Gastric region slightly elevated, with 5 pairs of epigastric spines, spine posterior to base of supraocular spine strongest; scale-like median tubercles on epigastric region. Hepatic region with a few squamiform striae. Cervical groove distinct. One parahepatic, 1 branchial dorsal and 1 postcervical spines present on each side, these spines moderately small. Anterior part of branchial region with a few transverse striae; lateral part of posterior branchial region with 5 transverse ridges or striae (excluding posterior transverse ridge). Intestinal region without stria medially. Posterior transverse ridge with 1 medially interrupted stria. Frontal margins somewhat oblique. Lateral margins feebly convex in dorsal view. Anterolateral spine located at anterolateral angle, moderately long, not reaching sinus between rostrum and supraocular spines, slightly diverging; no spine on frontal margin mesial to anterolateral angle. Hepatic margin with 1 spine (about half length of anterolateral spine). Branchial margins each with 4 small spines decreasing in size posteriorly.

Rostrum (Fig. 26A) spiniform, 0.4 times as long as carapace, directed forward, faintly sinuous in lateral view; dorsal carina not particularly delimited. Supraocular spines moderately long, slender, almost parallel in dorsal view and directed forward in lateral view, 0.4 length of rostrum.

Orbit with small spine curving laterally; ventral margin strongly produced in acute spine.

Pterygostomial flap (Fig. 26B) unarmed anteriorly; lateral surface moderately rugose with transverse to obliquely transverse striae.

Epistomal ridge slightly sinuous, ending at excretory pore of first segment of antennal peduncle; mesial protuberance distinct.

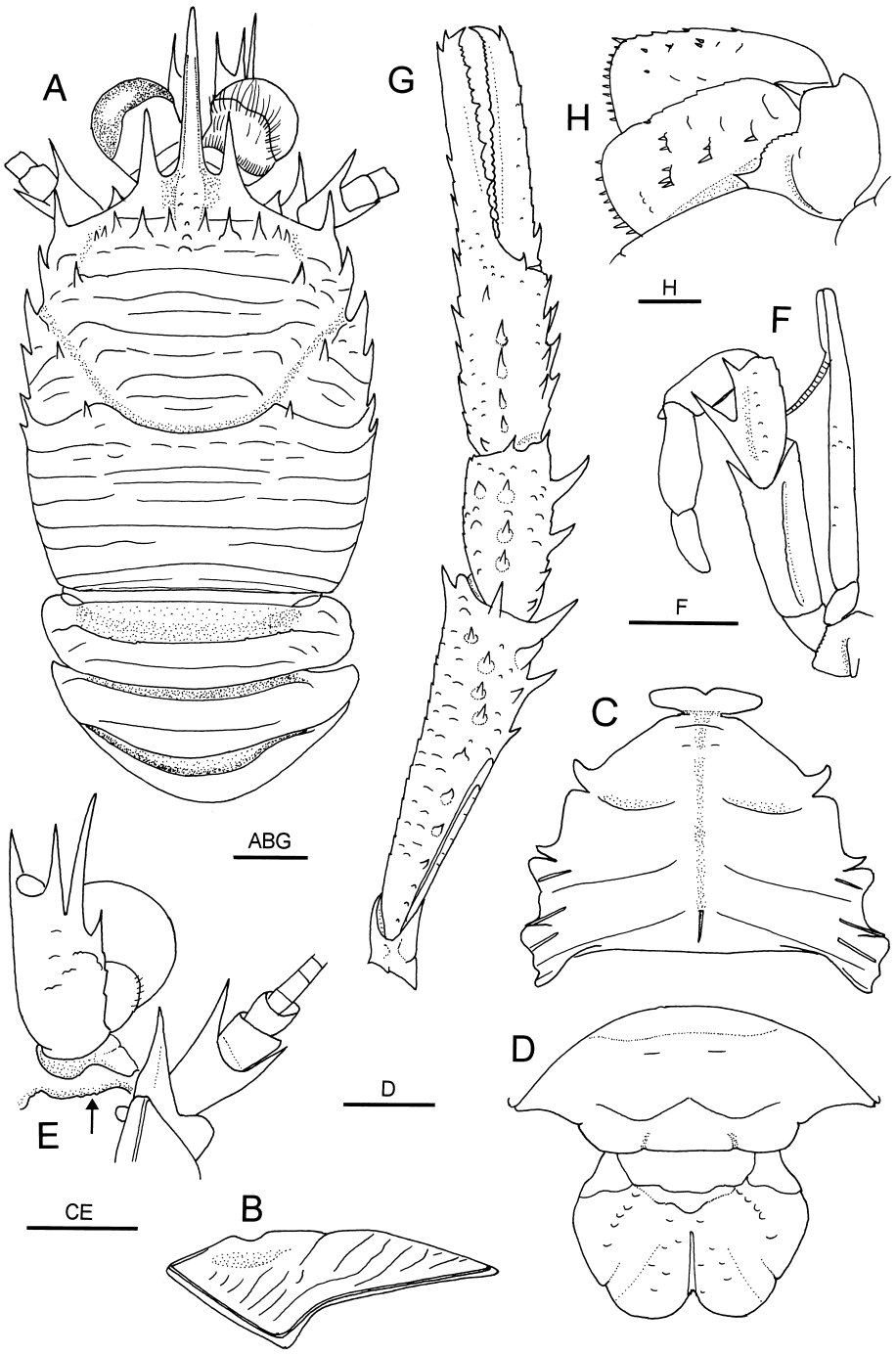

Fig. 26. *Munida vicina* sp. nov., holotype, female (cl 5.6 mm), NSMT-Cr S1146. A, carapace, cephalic appendages and first to fourth abdominal somites, dorsal view (setae omitted except for left eye; antennal flagella omitted); B, left pterygostomial flap, ventrolateral view; C, thoracic sternum, ventral view (setae omitted); D, sixth abdominal somite and telson, outer (ventral) view (setae partially omitted); E, left anterolateral part of carapace, eye, first segment of antennular peduncle and antennal peduncle, ventral view (arrow indicating epistomal ridge); F, left third maxilliped, lateral view (setae omitted); G, left cheliped, dorsal view (denuded); H, left uropod, outer (ventral) view (setae omitted). Scale bars: 1 mm for A – G; 0.5 mm for H.

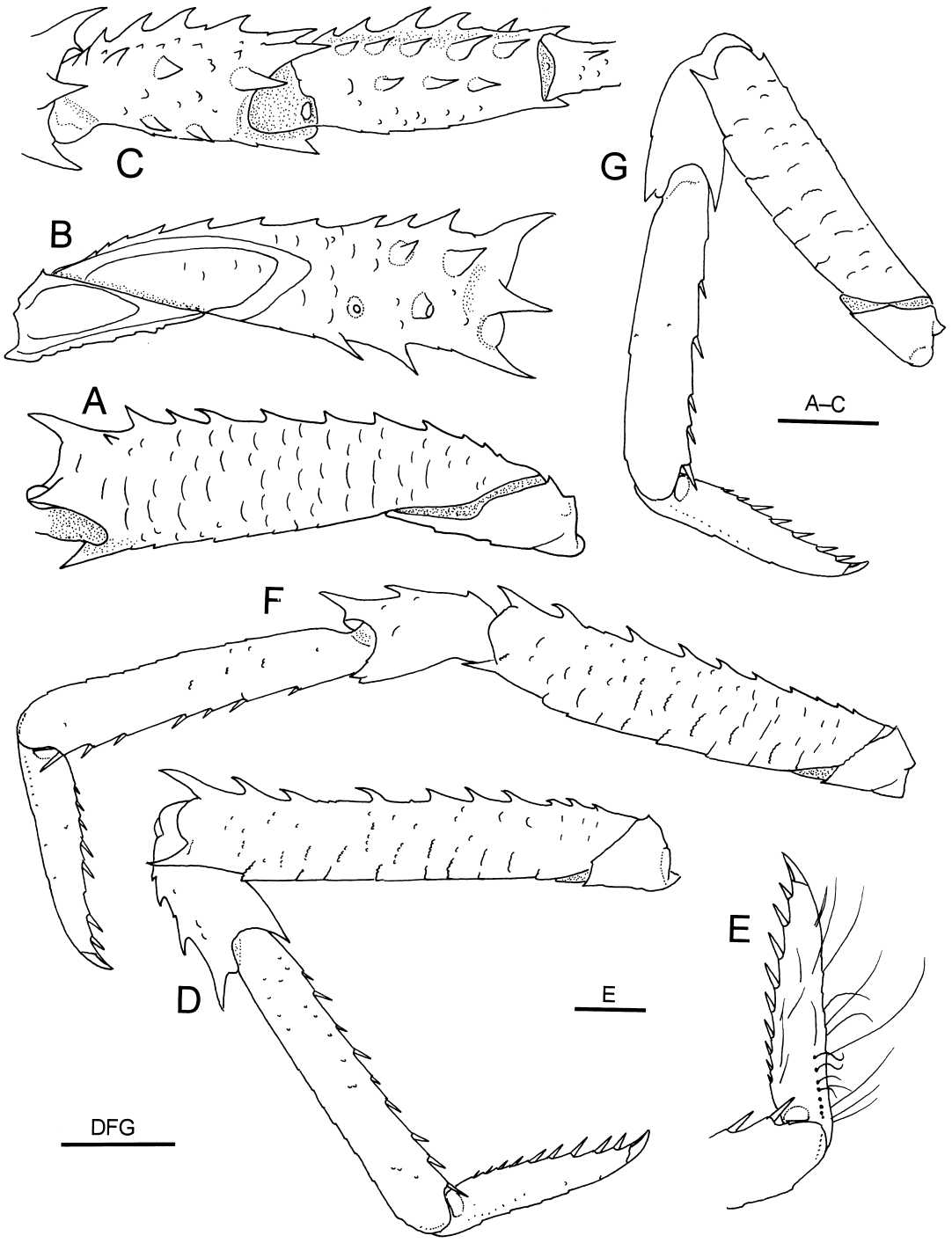

Fig. 27. *Munida vicina* sp. nov., holotype, female (cl 5.6 mm), NSMT-Cr S1146 (setae omitted except for E). A, merus of right cheliped, lateral view; B, same, mesial view; C, palm and carpus of right cheliped, mesial view; D, left second pereopod, lateral view; E, same, dactylus, lateral view; F, left third pereopod, lateral view; G, left fourth pereopod, lateral view. Scale bars: 1 mm for A – D, F, G; 0.5 mm for E.

Thoracic sternum (Fig. 26C) distinctly wider than long. Third thoracic sternite about 4.7 times wider than long, much broader than anterior margin of fourth sternite, narrowly separated from fourth sternite; anterior margin bilobed by distinct median notch. Fourth sternite with a few striae anteromedially. Fifth to seventh sternites with sharp carinae on lateral parts, otherwise smooth; seventh sternite with deep median groove. Transverse ridges nearly smooth, without setae.

First abdominal tergite (Fig. 26A) smooth. Second somite (Fig. 26A) with anterior ridge devoid of distinct spines, but having 2 or 3 minute granules laterally; tergum with 1 main transverse ridge and a few short lateral striae; pleuron with a few short striae. Third somite (Fig. 26A) with anterior ridge unarmed; tergum with 1 main transverse ridge; pleuron almost smooth. Fourth and fifth somites smooth, devoid of transverse ridge. Sixth somite (Fig. 26D) with median groove and paired arcuate ridges on posterior half of tergum, and 1 pair of short transverse striae anteriorly, otherwise smooth. Telson (Fig. 26D) 1.4 times wider than long, incompletely divided into 7 plates (division between lateral and posterolateral plates indistinct); anteromedian plate nearly smooth on surface; lateral and posterolateral plates slightly squamous.

Eyes (Fig. 26A, E) moderately large, not particularly flattened dorsoventrally. Cornea dilated, width much greater than sinus between rostrum and supraocular spine and 0.3 of distance between bases of anterolateral spines of carapace. Eyestalk not narrowed proximally, with 1 setiferous stria on dorsal surface proximally; eyelash consisting of short to moderately long setae, partially covering dorsal part of cornea.

Basal segment of antennular peduncle (Fig. 26E) moderately stout, just reaching distal corneal margin, length excluding distal spines 1.8 of width; ventral surface with a few short transverse ridges; distal spines subequal, moderately long and slender; 2 lateral spines present, first spine elongate, overreaching distal spines, arising somewhat proximal to base of distolateral spine; second spine moderately short, located distal to midlength of basal segment; statocyst lobe not inflated laterally.

Antennal peduncle (Fig. 26E) moderately stout, not reaching midlength of eye. First segment with moderately long distomesial spine reaching distal margin of third segment; distolateral margin slightly produced in rounded lobe. Second segment without striae on ventral surface; distomesial spine moderately long, nearly reaching distal margin of fourth segment; no mesial spine; distolateral spine reaching distal margin of third segment. Third and fourth segments unarmed, former without striae on ventral surface.

Third maxilliped (Fig. 26F) moderately slender. Ischium with moderately strong flexor distal spine extending as far as extensor distal angle; lateral surface with distinct, faintly granulated median ridge. Merus with 2 spines on flexor margin, distal spine moderately small, proximal spine strong; extensor distal margin unarmed; extensor margin microscopically granulate, lateral surface with some minute granules along midline. Carpus nearly smooth on extensor surface. Propodus slightly longer than carpus, not expanded. Dactylus much shorter than propodus.

Chelipeds (Figs. 26G, 27A – C) moderately squamous, about 2.3 times longer than carapace, equally broad on merus, carpus and palm; dorsal and mesial surfaces of palm to distal part of merus covered with numerous short plumose setae, partially masking armature; long iridescent setae present on mesial faces of chela to merus. Merus gradually narrowing proximally; dorsal surface with row of 9 spines laterally (spines increasing in size distally) and 3 spines mesially (distomesial spine prominent, but far falling short of midlength of carpus); mesial face with 2 spines on midline and 3 spines adjacent to ventral margin (including ventromesial distal spine). Carpus subequal in length to palm, 2.0 times longer than wide (excluding distomesial projection); dorsal surface with row of 4 small spines along midline; dorsomesial margin with single row of 5 spines; lateral surface with 1 tiny spine; ventral surface with 2 small spines; ventrolateral distal angle with small spine. Palm not widened distally, 2.0 times longer than wide; dorsal surface with median row of 5 small spines, 1 spine at articulation to dactylus, and 1 small spine at proximolateral portion; dorsolateral margin with 4 spines along entire length, dorsomesial margin with 5 slender spines; mesial surface with 3 spines on midline; ventral surface with 1 small spine at dactylar articulation. Fixed finger nearly straight, with 2 subdistal spines; lateral margin with 3 slender spines in proximal half; dorsal surface nearly smooth; cutting edge with 4 conspicuous acute teeth interspersed by minute denticles. Dactylus about 1.4 times longer than palm, terminating in sharp, curved claw crossing tip of fixed finger, with 1 subterminal spine;

mesial margin with 1 prominent proximal spine; dorsal surface unarmed; cutting edge with row of minute denticles along entire length. No proximal hiatus between dactylus and fixed finger.

Ambulatory legs (second to fourth pereopods) moderately long and slender, decreasing in length posteriorly; dorsal margins of meri with sparse short plumose setae, those of carpi and propodi with sparse short to long, stiff setae. Second pereopod (Fig. 27D) about 1.9 times longer than carapace, nearly reaching to level of tip of supraocular spine on carapace by mero-carpal articulation; merus 0.7 times as long as carapace, 5.0 times longer than high, dorsal surface with row of 10 spines (distal spine moderately strong), ventral margin with strong distolateral spine followed by many squamiform or transverse ridges, lateral face with many small squamiform or short transverse ridges; carpus about 0.4 length of propodus, with 4 spines increasing in size distally on extensor margin, flexor distal margin produced in moderately strong spine; lateral surface without longitudinal ridge; propodus unarmed on extensor margin, lateral surface sparsely granular, flexor margin with row of 9 small movable spines (distal 3 spines equidistant), basal protuberance of ultimate spine unarmed; dactylus (Fig. 27E) 0.6 times as long as propodus and 5.4 times longer than high, slightly curved in distal part, bearing sparse short to long stiff setae on extensor margin, lateral surface with row of short curled setae parallel to extensor margin, flexor margin faintly sinuous, with 9 small corneous spines along entire length (distal second to fourth spines longest); minute subterminal spinule closely appressed to unguis. Third pereopod (Fig. 27F) generally similar to second pereopod, slightly overreaching anterolateral angle of carapace by mero-carpal articulation; merus 0.9 length of that of second pereopod, dorsal surface with row of 10 spines, ventral margin with strong distolateral spine followed by several squamiform or transverse ridges; carpus with 3 spines on extensor margin; propodus with 9 movable spines on flexor margin; dactylus about 0.7 times as long as propodus, with 9 corneous spines on flexor margin; terminal spinule present. Fourth pereopod (Fig. 27G) reaching to lateral end of cervical groove of carapace by mero-carpal articulation; merus about 0.6 length of that of second pereopod, dorsal surface unarmed except for tiny distal spine, ventral surface with strong distolateral spine followed by some transverse ridges, lateral surface with many several short transverse ridges; carpus with dorsodistal spine, ventrodistal angle produced in strong spine; propodus similar to those of third pereopods, bearing 5 movable spines on flexor margin; dactylus 0.7 times as long as propodus, with 7 corneous spines and subterminal spinule on flexor margin.

Merus of fifth pereopod nearly smooth on outer surface.

Uropodal exopod (Fig. 26H) with lateral margin faintly denticulate, with a few minute movable spinules; outer surface with longitudinal row of minute movable spinules along lateral margin; posterior margin roundly truncate, with row of minute movable spinules. Endopod with lateral margin faintly serrate, bearing a few minute movable spinules; outer surface with some low squamiform ridges sometimes bearing 1 – 3 movable spinules; posterior margin roundly truncate, with row of minute movable spinules increasing in size mesially.

Distribution. So far known only from the type locality.

Remarks. The holotype is considered to be an adult, because the gonopores are fully developed and the pleopods bears ovigerous setae.

Munida vicina sp. nov. is morphologically most similar to *M. muscae* Macpherson and de Saint Laurent, 2002, known from the Réunion Islands and Madagascar, in sharing the following characters (Macpherson and de Saint Laurent, 2002; Baba, 2005): branchial margin of carapace fewer than five spines; sixth and seventh thoracic sternites bearing carinae on lateral parts; second abdominal somite without spines on anterior ridge; second segment of antennal peduncle bearing distomesial spine reaching distal margin of fourth segment; and fixed finger of chela bearing spines on lateral margin. However, *M. vicina* differs from *M. muscae* in the following characters: the branchial margin of the carapace bears four spines in *M. vicina*, three spines instead in *M. muscae*; there are more numerous transverse striae on the carapace in *M. vicina* than in *M. muscae* (for example, there are nine transverse ridges or striae, including interrupted ones, on the gastric region in *M. vicina*, rather than five in *M. muscae*); the basal segment of the antennular peduncle reaches only the distal corneal margin in *M. vicina*, rather than distinctly overreaching it in *M. muscae*; the distal spines on the basal segment of the antennular peduncle are subequal in *M. vicina*, but they are distinctly unequal with the distomesial spine being shorter than the distolateral

spine in *M. muscae*; and the dactylus of the second pereopod is more stout with a non-elongate unguis in *M. vicina*, while it has a noticeably elongate unguis in *M. muscae*.

The anterior ridge of the second abdominal somite does not have distinct spines, but a few minute granules are discernible in the holotype of *M. vicina*. Consequently, comparison with species having spines on the second abdominal somite might be necessary in considering the possibility of variation. Among species characterized by the less than five spines on the branchial margin of the carapace and the possession of carinae at least on the lateral parts of the sixth and seventh thoracic sternites, *Munida vicina* is comparable with *M. ignea*, *M. lenticularis* and *M. maculata* sp. nov. in sharing subequal distal spines on the basal segment of the antennular peduncle (Macpherson and de Saint Laurent, 1991; Baba, 2005; Macpherson, 2006). Other than the absence of distinct spines on the second abdominal somite, *M. vicina* can be distinguished from these three species by the lack of dorsomesial spines on the carpus and on the dactylus of the chela (except for the distomesial spine on the carpus and the proximal spine on the mesial margin of the dactylus). Furthermore, *M. lenticularis* differs from *M. vicina* in the smaller eyes and the elongate basal segment of the antennular peduncle that distinctly overreaches the distal corneal margin (it only reaches the distal corneal margin in *M. vicina*).

Etymology. From the Latin *vicinus* (= close), alluding to the close similarity to *M. muscae*.

Discussion

It is surprising that 10 of 19 species treated in this study are new to science, despite the Japanese fauna of the Galatheoidea being fairly investigated. Although many of the previously known species of *Munida* from Japan inhabit soft bottoms where trawls are available (e.g., Baba *et al*., 1986), the present collections were sampled mainly from hard bottoms using dredges, where operation of trawling is difficult. As listed in Table 1, 26 species of *Munida* are heretofore known from Japanese waters, and this study adds 11 species to the Japanese fauna. Of the 37 species, 20 species, including 10 new species described in this study, are so far known only from Japan, while other 16 species are widespread in the tropical West Pacific or Indo-West Pacific. From Taiwan, close to the Ryukyu Islands, 28 species of the genus have been recorded (Baba *et al*., 2009; Cabezas *et al*., 2011), of them 16 species are not recorded from Japan. There is no doubt that further exploration in the Japanese coast will likely yield many more undescribed and unrecorded species of this diverse genus.

It is worth to mention about *Munida sagamiensis* described by Doflein (1902) from the Sagami Bay, included in the study area of the present study, because Baba (2005) suggested that the identity of this species remains questionable. I tried to locate the type specimen of *M. sagamiensis* during my stay in the Zoologiche Staatssamlung, München, in 1998, where the material studied by Doflein (1902) was deposited, but it was not successful. As Baba (2005) noted, the type is probably lost. From the brief original description by Doflein (1902), the following diagnostic characters can be detected: carapace bearing five or six pairs of epigastric spines (median spine absent), two spines on hepatic margin (including anterolateral spine) and five spines on branchial margin; parahepatic spine absent on carapace; rostrum less than one-third length of carapace; supraocular spines short, about one-third length of rostrum; second abdominal somite with row of 10 spines on anterior ridge; and eyes moderately large, not compressed, with short eye-lashes. No specimens having these features are included in the present material. In order to establish the taxonomic identity of this taxon, examination of newly collected specimens will be necessary.

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房総半島沖、相模灘および伊豆諸島海域で採集されたチュウコシオリエビ属（甲殻上綱：十脚目：異尾下目：チュウコシオリエビ科）

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千葉県立中央博物館および国立科学博物館に所蔵される，相模灘（房総半島沖合を含む）～伊豆諸島海域で採集されたチュウコシオリエビ属 *Munida* の分類学的検討を行った．結果として 11 種の新種を含む以下の 19 種が記録された： *M. consobrina* sp. nov.（新称：イズチュウコシオリエビ），*M. honshuensis* Benedict, 1902（スジチュウコシオリエビ），*M. japonica* Stimpson, 1858（チュウコシオリエビ），*M. maculata* sp. nov.（新称：アカモンチュウコシオリエビ），*M. megalophthalma* sp. nov.（新称：メダマチュウコシオリエビ），*M. multilineata* sp. nov.（新称：シワチュウコシオリエビ），*M. munin* Komai, 2011（ムニンチュウコシオリエビ），*M. ommata* Macpherson, 2004（新称：モンツキチュウコシオリエビ），*M. olivarae* Macpherson, 1994（アナモリチュウコシオリエビ），*M. osawai* sp. nov.（タテヤマチュウコシオリエビ），*M. parvioculata* Baba, 1982（新称：ムクゲチュウコシオリエビ），*M. paucistria* sp. nov.（新称：コツブチュウコシオリエビ），*M. pectinata* Macpherson and Machordom, 2005（クシノハチュウコシオリエビ），*M. rufiantennulata* Baba, 1969（新称：アカヒゲチュウコシオリエビ），*M. solitaria* sp. nov.（新称：カワリチュウコシオリエビ），*M. sqaumifera* sp. nov.（新称：ウロコチュウコシオリエビ），*M. tiresias* Macpherson, 1994（新称：シンエンチュウコシオリエビ），*M. trigonocornus* sp. nov.（新称：ミツカドチュウコシオリエビ），*M. vicina* sp. nov.（新称：タクナンチュウコシオリエビ）．各新種については近縁種との詳細な比較を行った．モンツキチュウコシオリエビはこれまで南西太平洋の各地から記録されていたが，今回，本邦海域から初めて記録された．日本近海からはこれまでに 26 種の本属種が記録されていたが，本研究により 37 種に増加した．今回検討された材料の多くは岩場や礫の堆積地などの採集の容易でない環境からドレッジを用いて採集されたもので，このような環境における生物相の解明が未だ不十分であることが強く示唆される．