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Article

A new species of the pontoniine shrimp genus *Onycocaris* Nobili, 1904 (Crustacea: Decapoda: Caridea: Palaemonidae) from Sagami Bay, central Japan

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Abstract

The pontoniine shrimp genus *Onycocaris* Nobili, 1904 currently contains 18 species, all known from the Indo-West Pacific. In this study, a new species of the genus, *O. hayamaensis*, is described and illustrated on the basis of four ovigerous female and three male specimens collected from Sagami Bay, central Japan, at shallow subtidal depths of 5–6 m. The specimens lived in internal cavities of an unidentified species of a haliclonid sponge, *Haliclona* sp. This new species is referred to the *O. quadratophthalma* (Balss, 1921) species group, represented by four species, i.e., *O. balssi* Bruce, 2011, *O. fujinoi* Bruce, 2011, *O. quadratophthalma*, and *O. trullata* Bruce, 1978. Differentiating characters between the new species and the latter four species are discussed. The present new species exhibits strong sexual dimorphism in the second pereopods and heterochaely in the male second pereopods, though these traits are not fully documented in some of other congeneric species. Diagnostic characters derived from the second pereopods should be treated carefully.

Key words: Crustacea, Decapoda, Caridea, Palaemonidae, Pontoniinae, *Onycocaris*, new species, sponge, association, Japan

Introduction

The pontoniine shrimp genus *Onycocaris* Nobili, 1904 (Caridea: Palaemonidae) is currently represented by 18 species, all known from the Indo-West Pacific (De Grave & Fransen 2011). Most species are found in association with sponges in those cases in which the hosts are known (cf. Holthuis 1952; Fujino & Miyake 1969; Bruce 1971, 1980, 2011a; Bruce & Coombes 1995; Hayashi 2003; Marin 2005). From Japanese waters, six species have been reported (Hayashi 2003; Bruce 2011b): *O. amakusensis* Fujino & Miyake, 1969; *O. callyspongiae* Fujino & Miyake, 1969; *O. fujinoi* Bruce, 2011; *O. oligodentata* Fujino & Miyake, 1969; *O. seychellensis* Bruce, 1971; and *O. spinosa* Fujino & Miyake, 1969.

The present paper serves to describe a new species of *Onycocaris* from Sagami Bay, central Japan, on the basis of seven specimens that were found in association with an unidentified sponge of the genus *Haliclona* Grant, 1836 (Demospongiae: Chalinidae), encrusted on bottom surface of a small rock at depths of 5–6 m. The new species, *O. hayamaensis*, is morphologically similar to the four species referred to the *O. quadratophthalma* (Balss, 1921) species group (Bruce 2011), i.e., *O. balssi* Bruce, 2011, *O. fujinoi* Bruce, 2011, *O. quadratophthalma* and *O. trullata* Bruce, 1978. Differentiating characters between the new species and the latter four known species are discussed.

Specimens were collected by hand sorting during diving. The type material is deposited in the Natural History Museum and Institute, Chiba (CBM). Carapace length (cl) was measured from the tip of the rostrum to the posterior margin of the carapace.

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Taxonomic account

Family Palaemonidae Rafinesque, 1815

Subfamily Pontoniinae Kingsley, 1879

Genus *Onycocaris* Nobili, 1904

Onycocaris hayamaensis n. sp.

(Figs 1–7)

Material examined. Holotype: ovigerous female (cl 3.4 mm), Sagami Bay, Hayama, Kanagawa Prefecture, 5–6 m, 14 August 2011, SCUBA diving, coll. Satoko Komai and Isamu Itou, CBM-ZC 11215.

Paratypes: 3 ovigerous females (cl 2.9–3.8 mm), 3 males (cl 1.9–2.2 mm), same data as holotype, CBM-ZC 11216.

Description. *Females*. Body (Figs 1, 2A–C) stoutly built, plump, subcylindrical; relatively large for genus, attaining 3.5 mm in cl in female.

FIGURE 1. *Onycocaris hayamaensis* **n. sp.**, paratype, ovigerous female (cl 3.8 mm), entire animal in lateral view, CBM-ZC 11216.

Rostrum (Fig. 3A) short, broadly triangular, reaching midlength of eyestalks; dorsal surface with short, distinct carina extending to level of posterior margin of orbit, without teeth; lateral margin merging into orbital margin. Carapace smooth, glabrous; dorsal surface rounded, sloping down toward rostrum; orbital margin concave; antennal tooth absent; inferior orbital angle broadly subtriangular, subacutely pointed, extending as far as rostrum; pterygostomial angle rounded, slightly exceeding beyond antennal tooth.

Abdomen (Fig. 2C) with all pleura rounded; first to third pleura strongly expanded, enclosing large brood chamber. Sixth somite (Fig. 3B) depressed dorsoventrally, widened posteriorly, subequal in length to fifth somite, 2.0 times wider than long; posteroventral angle triangular, subacutely pointed; posterolateral process triangular, sharply pointed; posterodorsal margin straight, unarmed. Telson (Fig. 3C) about half length of carapace, 1.8 times as long as anterior width; lateral margins feebly convex, posteriorly convergent, with 2 pairs of small marginal dorsal spines (anterior pair located at 0.4 of telson length, posterior pair at 0.7), these spines subequal in length, about 0.05 of telson length; posterior margin convex, without median point, armed with 3 pairs of spines (lateral spines 0.06 of telson length, intermediate spines 0.10 and submedian spines 0.09 of telson length).

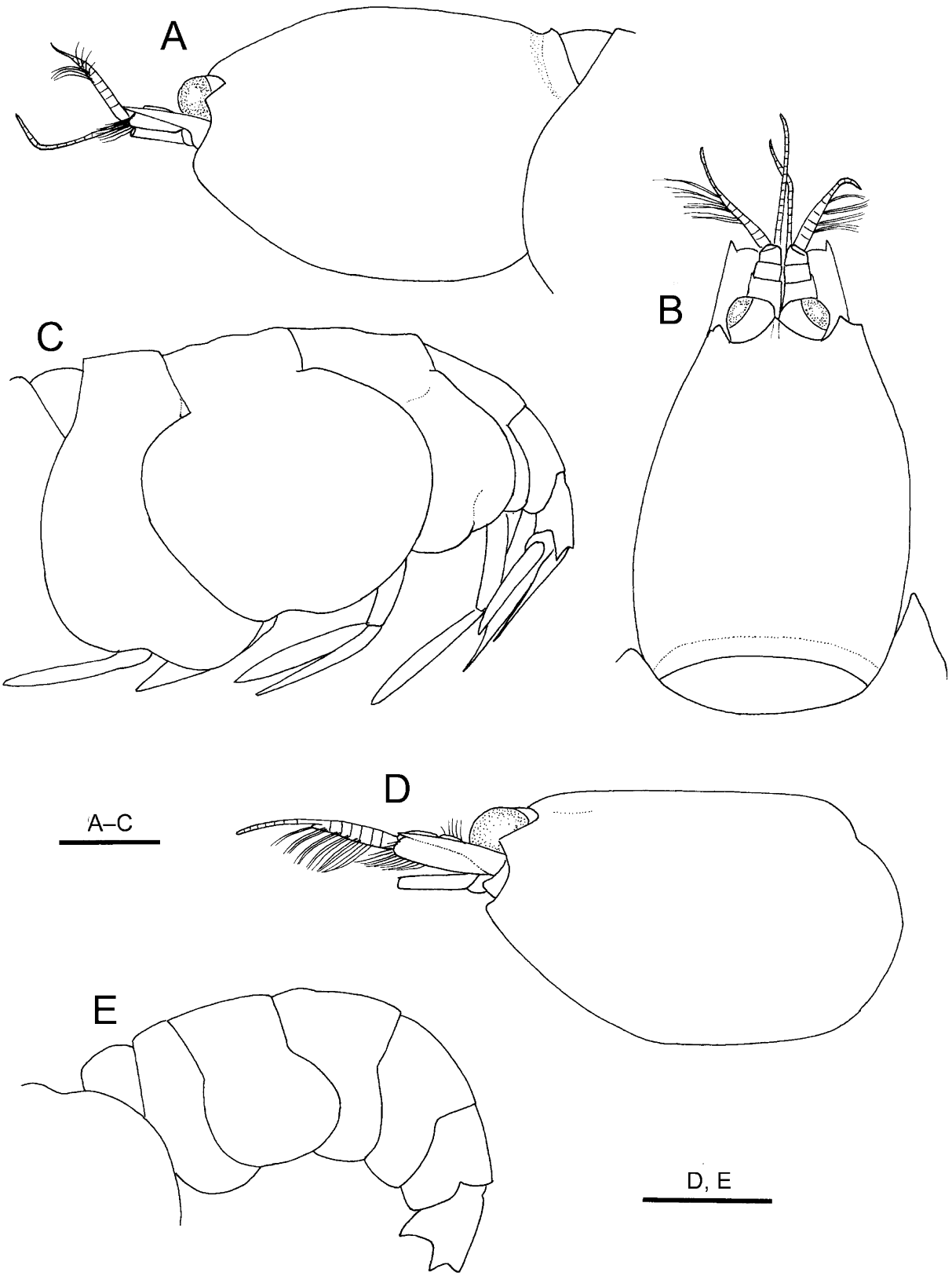

FIGURE 2. *Onycocaris hayamaensis* **n. sp.** A–C, holotype, ovigerous female (cl 3.4 mm), CBM-ZC 11215; D, E, paratype, male (cl 2.2 mm), CBM-ZC 11216. A, D, carapace and cephalic appendages, lateral view; B, same, dorsal view; C, E, abdomen, lateral view (appendages omitted in E). Scale bars: 1 mm.

Epistome with small rounded submedian swellings.

Eye (Fig. 3A) subquadrate in dorsal view, corneas hemispherical, lightly pigmented, without ocellar spot, its width about 0.1 of cl. Eyestalks swollen, narrowly separated; anterior surface flat, slightly sloping posteriorly, anteromesial angle weakly delimited.

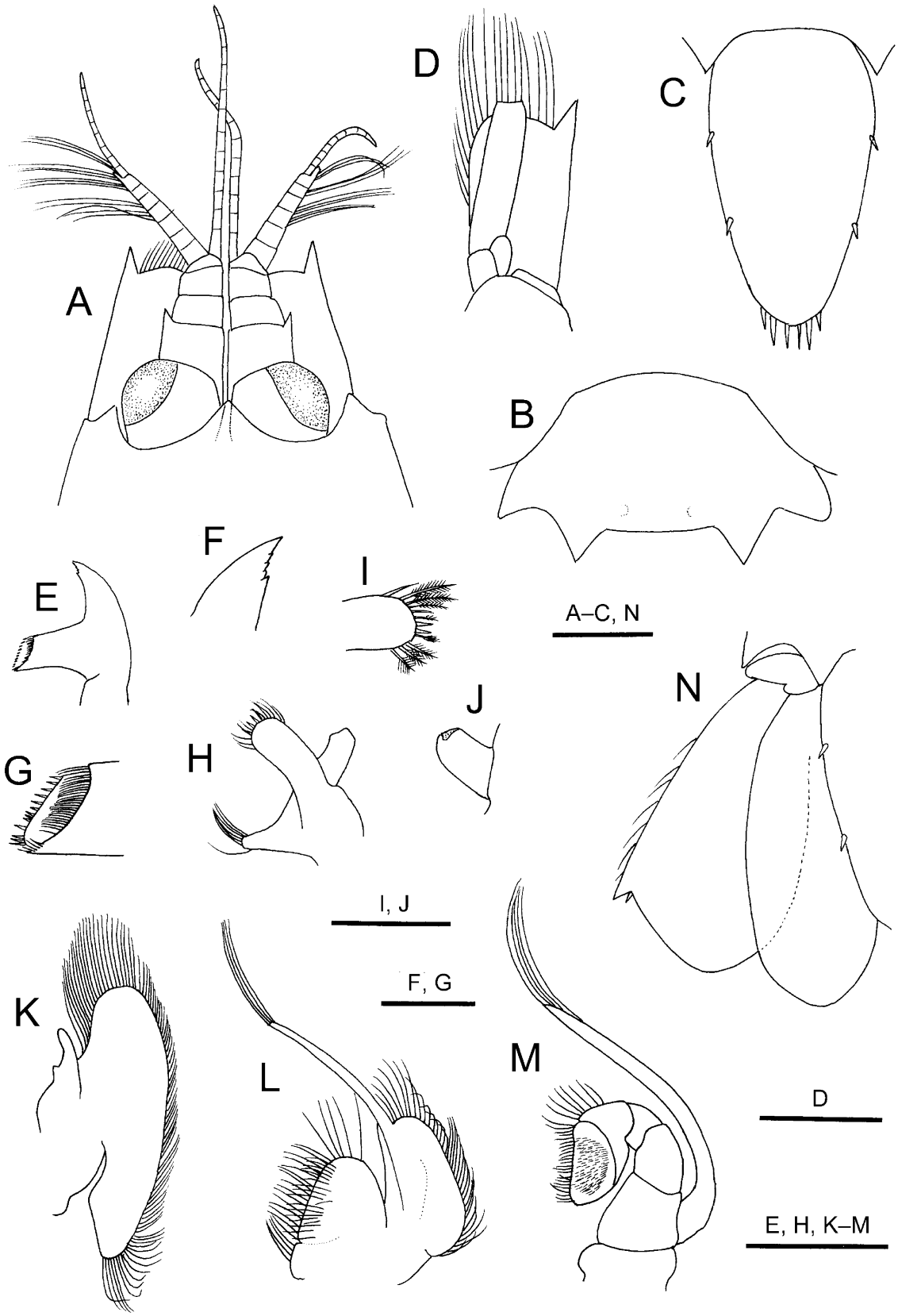

FIGURE 3. *Onycocaris hayamaensis* **n. sp.**, holotype, ovigerous female (cl 3.4 mm), CBM-ZC 11215. A, anterior part of carapace and cephalic appendages, dorsal view; B, sixth abdominal somite, dorsal view; C, telson, dorsal view; D, left antenna, ventral view (flagellum missing); E, left mandible, outer view; F, same, distal part of incisor process, inner view; G, same, distal part of molar process, outer view; H, left maxillule, outer view; I, same, distal part of basial endite, inner view; J, same, palp, inner view; K, left maxilla, outer view (endites broken); L, left first maxilliped, outer view; M, left second maxilliped, outer view; N, left uropod, dorsal (perpendicular) view. Scale bars: 0.5 mm for A–E, H, K–N; 0.25 mm for I, J; 0.1 mm for F, G.

Antennular peduncle (Fig. 3A) short, about 0.3 times as long as carapace. First segment about twice as long as wide; lateral and mesial margins sub-parallel; distolateral tooth reaching midlength of second segment; ventromesial margin without tooth; stylocerite reaching half segment length, acute, with several short plumose setae distally; statocyst poorly developed, with obsolescent statolith. Second and third segments subequal in length, combined length about half of first segment. Outer flagellum biramous, proximal 5 or 6 articles fused, bearing 5 or 6 groups of long aesthetascs; short free ramus consisting of single article, longer ramus short, consisting of 8–10 articles; inner flagellum slender, longer than outer flagellum, consisting of 10–12 articles.

Antenna (Fig. 3A, D) with stout basicerite unarmed. Carpocerite subcylindrical, 4.0 times longer than wide, slightly overreaching distal margin of antennal scale. Antennal scale well-developed, about 0.3 times as long as carapace, 1.7 times longer than wide; lateral margin straight, with strong distal tooth, far exceeding distal margin of broadly rounded lamella.

Labrum without special features.

Mandible (Fig. 3E) without palp. Molar process moderately slender, subcylindrical, distally obliquely truncate; distal surface with thick marginal row of setae on outer side and marginal row of spinules on inner side (Fig. 3G). Incisor process moderately broad, slightly curved, tapering to acute distal tooth, mesial edge armed with 4 minute subdistal teeth (Fig. 3F).

Maxillule (Fig. 3H) of normal form; palp simple, stout, with shallow excavation terminally (Fig. 3J). Basal endite moderately broad, rounded distal margin bearing row of several setulose setae and 2 spines (Fig. 3I). Coxal endite slender, tapering distally, bearing tuft of stiff setulose setae terminally.

Maxilla (Fig. 3K) with moderately slender tapering, non-setose palp. Endites damaged during dissection. Scaphognathite moderately broad.

First maxilliped (Fig. 3L) with well-developed, non-setose palp, extending well beyond caridean lobe. Basal and coxal endites fused, distal margin broadly rounded, mesial margin straight, with sparse long setulose setae, coxal portion slightly convex. Exopod with slender flagellum with 4 plumose terminal setae; caridean lobe well developed, rounded. Epipod broken off.

Second maxilliped (Fig. 3M) of normal form, consisting of 6 segments. Dactylus with mesial margin slightly concave, with numerous coarsely setulose spines; outer face with large patch of short setae. Propodus with anteromesial margin nearly straight, with several stiff finely setulose setae. Carpus and merus without special features. Ischiobasis widened proximally, slightly excavate mesially. Coxa with mesial margin rounded. Exopod long, with several plumose terminal setae. Epipod absent.

Table 1. *Onycocaris hayamaensis* n. sp. Gill formula. r=rudimentary.

	maxillipeds			pereopods				
	1	2	3	1	2	3	4	5
Pleurobranchs	0	0	0	1	1	1	1	1
Arthrobranchs	0	0	r	0	0	0	0	0
Podobranchs	0	0	0	0	0	0	0	0
Epipods	1	0	1	0	0	0	0	0
Exopods	1	1	1	0	0	0	0	0

Third maxilliped (Fig. 4A, B) with endopod slender, extending to distal margin of antennal scale. Ultimate segment subequal to carpal length, slightly tapering distally. Penultimate segment (= carpus) 0.6 times as long as antepenultimate segment, subcylindrical, 2.0 times longer than wide. Antepenultimate segment 2.3 times as long as proximal width, tapering distally; lateral margin nearly straight, mesial margin slightly concave, with row of setae. Exopod well developed, distinctly overreaching distal end of antepenultimate segment, with some terminal plumose setae. Coxa large, with large, broadly rounded lateral plate; mesial margin convex, non-setose. Rudimentary arthrobranch present above base of third maxilliped.

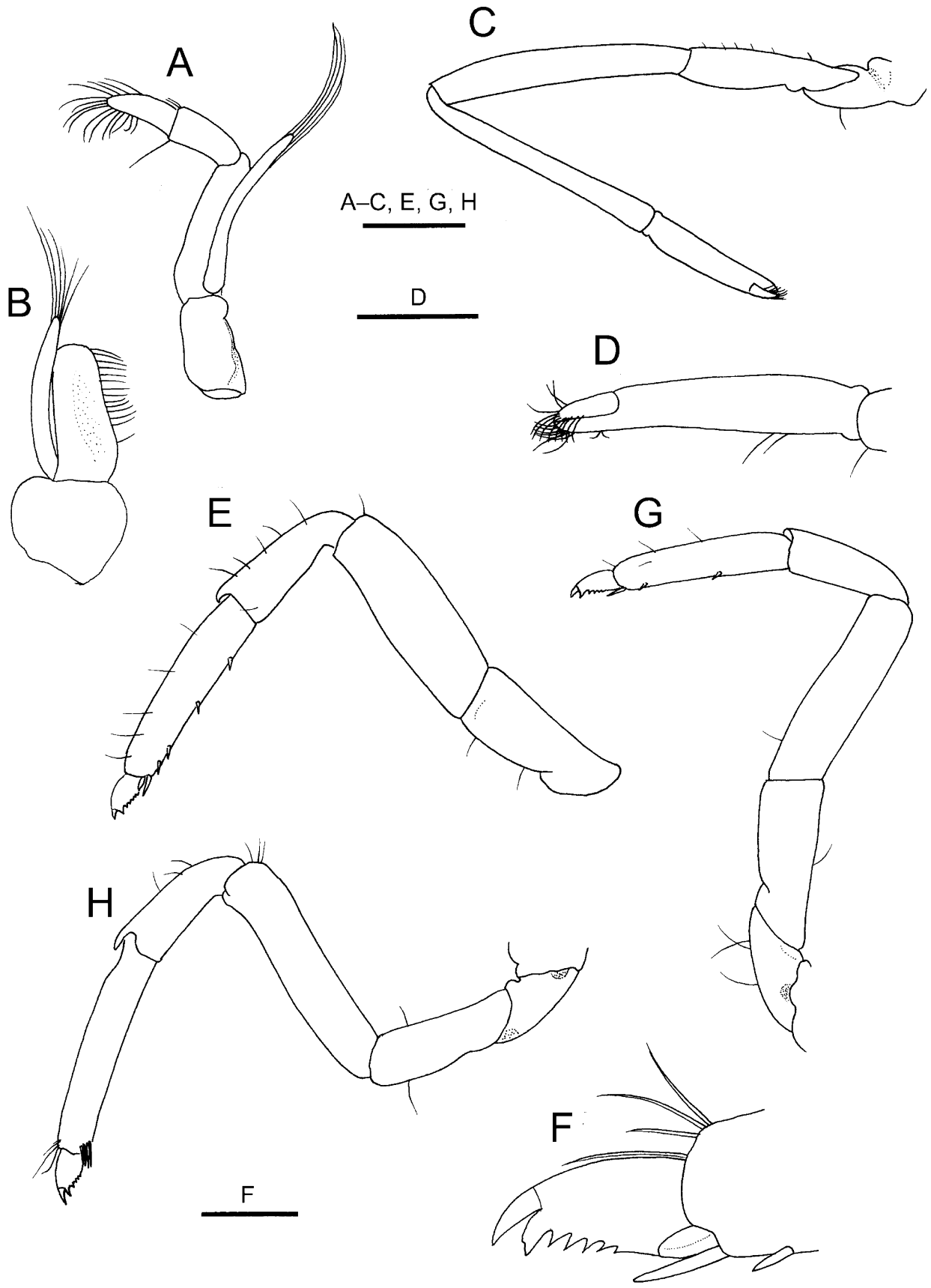

FIGURE 4. *Onycocaris hayamaensis* **n. sp.**, holotype, ovigerous female (cl 3.4 mm), CBM-ZC 11215. A, left third maxilliped, lateral view; B, same, antepenultimate segment, coxa, and exopod, dorsal view; C, left first pereopod, lateral view; D, same, chela; E, left third pereopod, lateral view; F, same, dactylus, lateral view; G, left fourth pereopod, lateral view; H, left fifth pereopod, lateral view. Scale bars: 0.5 mm for A–C, E, G, H; 0.25 mm for D; 0.1 mm for F.

First pereopod (Fig. 4C) slender, overreaching distal margin of antennal scale by distal 0.2 of merus. Chela (Fig. 4D) subcylindrical, slightly tapering distally, 0.6 times as long as carpus, 5.5 times as long as greatest width, with sparse grooming setae proximoventrally; dactylus about 0.3 of palm length; fingers distally with curved setae forming basket-like structure. Carpus 8.0–9.0 times as long as distal width, tapering slightly proximally. Merus slightly curved, subequal in length to carpus, 6.0–7.0 times as long as greatest width. Ischium 0.7 of carpal length. Second pereopods slightly unequal, similar. Major second pereopod (Fig. 5A, B) stout. Chela moderately large, about 0.8 times as long as carapace, 2.3 times longer than greatest width, ventral margin gently sinuous; palm compressed, smooth, about 1.4 times as long as greatest width, slightly projecting posterodorsally. Dactylus about 0.7 of palm length, 3.2 times as long as proximal width, scaphoid with strongly hooked acute tip; lateral surface with scattered tufts of short setae; mesial surface with 3 rows of tufts of short to long setae; cutting edge chitinous with proximal one-third slightly concave, with 1 or 2 small triangular teeth, distal two-thirds chitinous, serrate with row of sharp (acute ?) teeth increasing in size distally (Fig. 5C). Fixed finger tapering, deeply bifid distally, longitudinally grooved (Fig. 5D); lateral surface with scattered tufts of short setae; mesial surface with irregular 2 rows of tufts of short setae along mesial cutting edge; lateral cutting edge with 1 or 2 triangular teeth on proximal two-fifths, distal three-fifths forming chitinous flange with slightly convex, microscopically serrate margin (teeth increasing in size distally) (Fig. 5C); mesial edge mostly entire, but with some minute acute denticles on strongly curved, acute distal part (Fig. 5C). Carpus cup-shaped, about 0.3 of chela length, smooth; distal part deeply excavate to accommodate posterior extension of chela. Merus 1.3–1.4 times longer than carpus, centrally swollen, 2.0–2.2 times as long as wide, distoventrally excavate; ventral margin smooth. Ischium about half of meral length, slightly tapered proximally, unarmed. Basis and coxa robust.

Minor second pereopod (Fig. 5E–G) with palm about 1.5 times longer than greatest width; proximal one-third of cutting edge of fixed finger irregularly denticulate to bearing up to 5 tiny teeth.

Third pereopod (Fig.4E) moderately robust, overreaching distal margin of antennal scale by half length of propodus. Dactylus (Fig. 4F) strongly compressed laterally, 2.0–2.1 times longer than wide, extensor margin convex; unguis curved, without ventral denticulations; flexor margin nearly straight, armed with large, faintly bicuspidate, distal accessory tooth followed by row of 5 acute, obliquely erect denticles decreasing in size proximally in distal 0.6. Propodus about 4.3 times as long as greatest width, slightly tapering distally, slightly compressed laterally, sparsely setose, with single long flexor distal spine and 4 widely spaced, small flexor spines. Carpus 0.7 times as long as propodus, slightly widened distally. Merus about 3.0 times longer than greatest width, unarmed. Ischium 0.8 times as long as merus, unarmed. Basis and coxa without distinctive features.

Fourth pereopod (Fig. 4G) similar to third.

Fifth pereopod (Fig. 4H) generally similar to third. Propodus about 5.3 times longer than wide, with cluster of submarginal grooming setae on distal flexor part, distal flexor margin with single spine, flexor margin otherwise unarmed.

Gill formula summarized in Table 1.

Pleopods without distinctive features. Uropod (Fig. 3N) with protopodite unarmed, posterolaterally rounded. Endopod longer than telson, about 2.3 times longer than wide; lateral margin gently convex; posterior margin rounded. Exopod slightly shorter than endopod, slightly widened posteriorly; lateral margin slightly convex, sparsely setose, terminating in small acute tooth; spinule present just mesial to base of posterolateral tooth; posterior margin broadly rounded; no diaeresis.

Eggs numerous (Fig. 1), 1.0–1.2 x 1.0–1.4 mm.

Males. Body less stout than in females (Fig. 2D, E). Carapace (Fig. 2D) with dorsal margin in lateral view nearly straight; pterygostomial angle more narrowly pointed. Abdominal pleura not expanded; sixth somite less compressed (Fig. 2E).

Cornea (Fig. 2D) relatively larger, its diameter about 0.2 of carapace length. Antennal scale about 0.4 times as long as carapace; carpocerite slightly falling short of distal margin of lamella.

First, third to fifth pereopods generally similar to those of males.

Second pereopods markedly unequal and dissimilar. Major second pereopod (Fig. 6A, B) massive. Chela about 1.8 times longer than carapace, about 2.0 times longer than greatest width, ventral margin sinuous; palm strongly compressed, about 1.3 times as long as greatest width, slightly projecting posterodorsally; mesial surface with shallow excavation proximally; ventral margin faintly tuberculate. Dactylus about 0.6 of palm length, terminally in-curved, tip acute; lateral surface with row of tufts of short setae along cutting edge located slightly laterally, with 2 prominent triangular teeth (proximal tooth subacute, distal tooth blunt, much lower than proximal tooth). Fixed finger feebly deflexed, terminating in hooked tip; lateral surface with row of tufts of short setae along cutting edge; mesial surface with scattered tufts of short setae; cutting edge with 3 prominent teeth (proximal and distal teeth

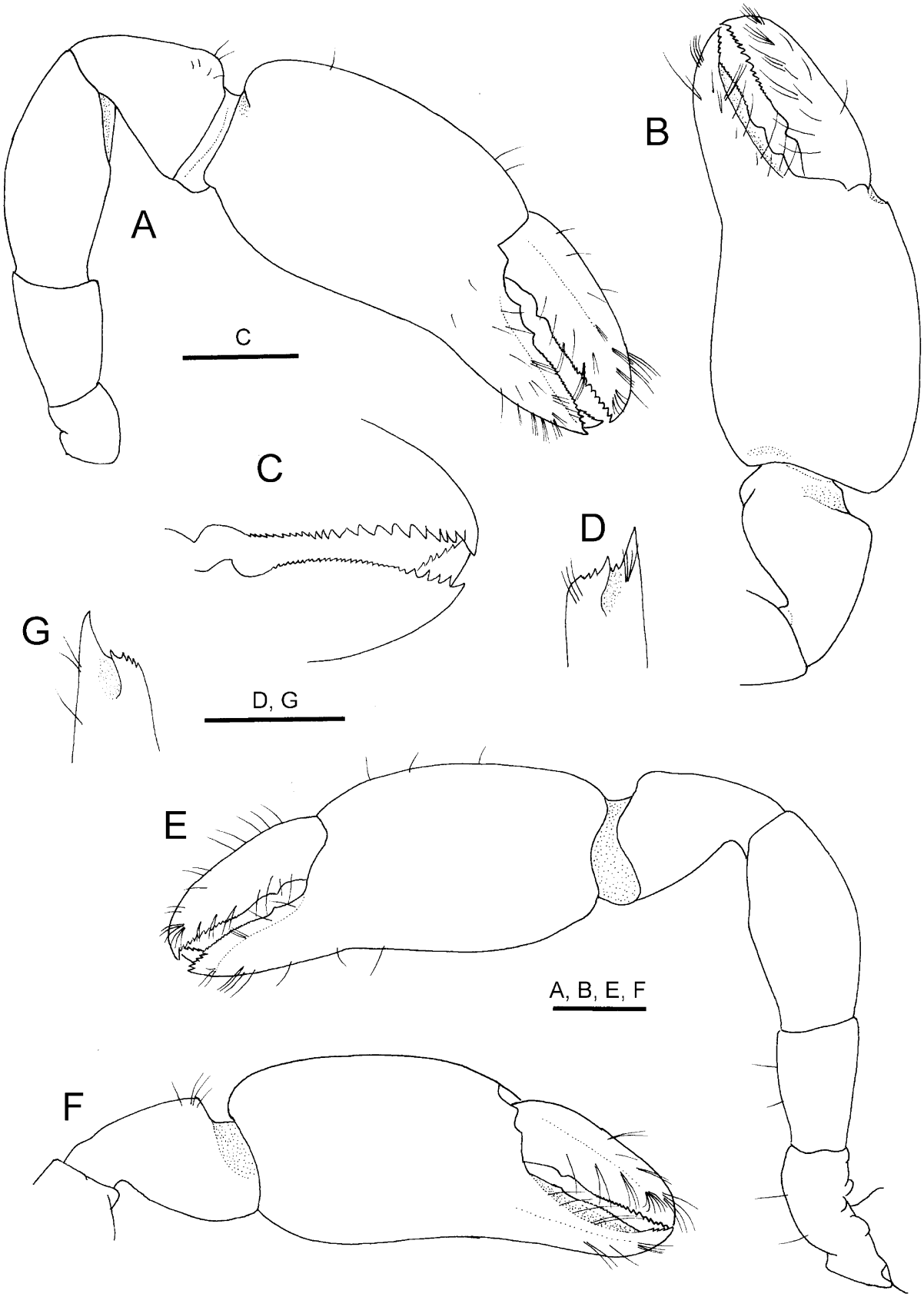

FIGURE 5. *Onycocaris hayamaensis* **n. sp.**, holotype, ovigerous female (cl 3.4 mm), CBM-ZC 11215. A, right major second pereopod, lateral view; B, same, chela and carpus, mesial view; C, same, distal part of fingers, lateral view, showing details of armature of cutting edges; D, same, distal part of fixed finger, ventral (flexor) view; E, left minor second pereopod, lateral view; F, same, chela and carpus, mesial view; G, same, distal part of fixed finger, ventral (flexor) view. Scale bars: 0.5 mm for A, B, D–F; 0.25 mm for C.

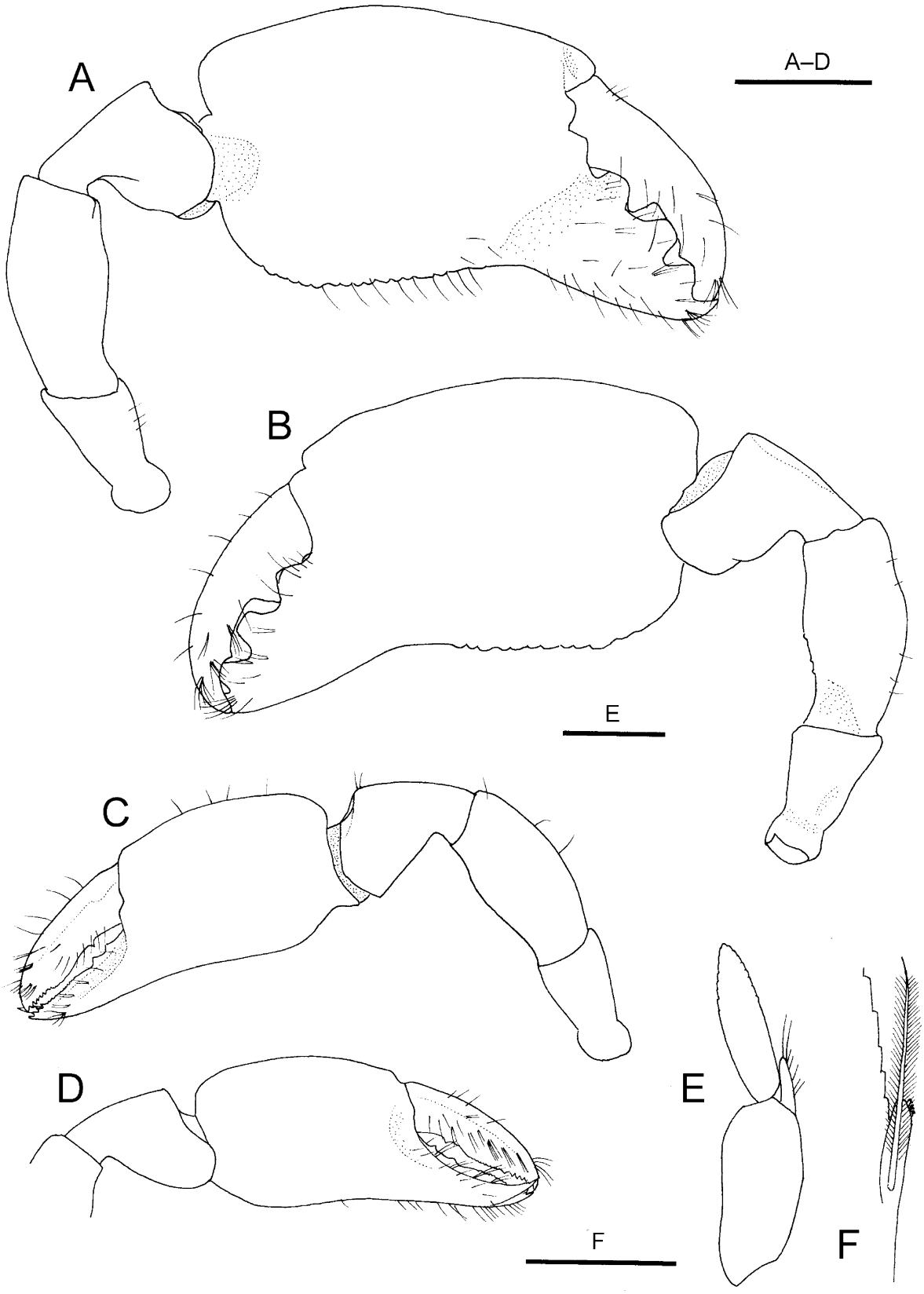

FIGURE 6. *Onycocaris hayamaensis* **n. sp.**, paratype, male (cl 2.9 mm), CBM-ZC 11216. A, major right second pereopod, lateral view; B, same, mesial view; C, minor left second pereopod, lateral view; D, same, chela and carpus, mesial view; E, left first pleopod, dorsal view; F, appendices interna and masculina on endopod of left second pleopod, mesial view. Scale bars: 1 mm for A–D; 0.5 mm for E; 0.25 mm for I.

triangular, middle tooth subrectangular). Carpus short, cup-shaped, smooth; distodorsal part deeply excavate to accommodate posterior extension of chela. Merus 1.6 times longer than carpus, centrally slightly swollen, 2.2–2.3 times longer than wide, distoventrally excavate; ventral margin with few minute tubercles. Ischium about 0.6 of meral length, slightly tapered proximally, unarmed. Basis and coxa robust.

Minor second pereopod (Fig. 6C, D) similar to female second pereopods.

First pleopod (Fig. 6E) with small, slender endopod about 0.4 times as long as exopod, tapering distally to rounded tip, sparsely setose. Endopod of second pleopod with appendix masculina greatly reduced to socket for single long slender setulose seta located at base of appendix interna (Fig. 6F).

Coloration in life. Body and appendages translucent. Carapace with scattered red chromatophores. Abdomen with numerous scattered white chromatophores and less numerous red chromatophores. Ovary green. Eggs pale greenish gray. See Figs. 1, 7)

Variation. As is apparent from the above description, the size and structure of the chelae of the second pereopods exhibit strong sexual dimorphism in this new species. In males, the second pereopods are greatly unequal in the size and dissimilar in the structure and armature of the fingers. In contrast, in females, the second pereopods are slightly unequal and similar, and generally similar to the minor second pereopod of males. In addition, the body is plump in females, with strongly expanded pleura forming broad brood chamber.

Distribution. Presently known only from Sagami Bay, central Japan, at depths of 5–6 m.

Ecology. Specimens were all found in association with *Haliclona* sp., encrusted on bottom surfaces of free rocks (about 60–70 cm in longer axis) (Fig. 7A). The animals lived in small cavities of the sponge in a heterosexual pair. Females were all ovigerous in August.

Remarks. *Onycocaris hayamaensis* **n. sp.** is referable to the *O. quadratophthalma* species group because of the following characters: (1) rostrum short, unarmed; (2) chelae of second pereopods lacking mesial row of prominent teeth on fingers: and (3) meri and ischia of second pereopods unarmed. This informal species group contains the following four species: *O. balssi* Bruce, 2011 from the Northern Territory, Australia (Bruce 2011b); *O. fujinoi* Bruce, 2011, from the Ryukyu Islands, Japan (Bruce 2011b); *O. quadratophthalma* from Western Australia and Hong Kong (Balss, 1921; Bruce 1992, 2011b); and *O. trullata* Bruce, 1978 from Madagascar (Bruce 1978). In previous works (e.g., Fujino & Miyake 1969; Hayashi 2003; Marin 2005; Bruce 2011a, 2011b), characters derived from chelae of the second pereopods have been routinely used in differentiating species of *Onycocaris* without careful consideration on the sexual dimorphism and heteromorph between right and left. The recent report on *O. longirostris* Bruce, 1980 by Bruce (2012) and the discovery of the present new species led us to assess the characters of the second pereopods more carefully with special attention to the variation.

Among the four species, *O. balssi* appears closest to *O. hayamaensis* **n. sp.** in the fixed fingers of both chelae of the second pereopods with deeply bifid tips and well-developed lateral flanges and the proportionally short fingers of the first pereopod (less than 0.3 times as long as the palm) (Bruce 2011b). As only the ovigerous female holotype is known for *O. balssi*, the following comparison is limited to females. Fortunately, the second pereopods of the holotype of *O. balssi* are both preserved (Bruce 2011b). The new species can be distinguished from *O. balssi* by the different armature of the cutting edges of the chela of the second pereopods. In *O. hayamaensis*, the cutting edges of dactyli and lateral flanges of the fixed finger are serrated with fine teeth increasing in size distally (Fig. 5C). In contrast, in *O. balssi*, the cutting edges of the fingers are minutely serrate with denticles of similar size (Bruce 2011b: Fig. 4C, F). Furthermore, the dorsal margin of the carapace is more strongly sloping anteriorly in *O. hayamaensis* than in *O. balssi* (Fig. 2A versus Bruce 2011b: Fig. 1A); the posterolateral process of the sixth abdominal somite is acutely pointed in *O. hayamaensis* (Fig. 3B), rather than blunt in *O. balssi* (Bruce 2011: Fig. 1I); the lateral margin of the uropod is nearly straight in the posterior three-fourths in *O. hayamaensis* (Fig. 3N), whereas entirely convex in *O. balssi* (Bruce 2011b: Fig. 1K); finally the incisor process of the mandible tapers distally and bears three or four minute subdistal teeth in *O. hayamaensis* (Fig. 4F), whereas it is slightly expanded and is serrated with about 30 closely set teeth in *O. balssi* (Bruce 2011: Fig. 5C).

Onycocaris trullata is also represented only by a single ovigerous female, of which the second pereopods are intact (Bruce 1978). It is readily distinguished from *O. hayamaensis* **n. sp.** by the following female characters (Bruce 1978): (1) the rostrum is much narrower in *O. trullata* than in *O. hayamaensis* (Bruce 1978: 37A versus Fig. 3A); (2) the inferior orbital angle is acuminate in *O. trullata* (Bruce 1978: Fig. 36), but at most subacute in *O. hayamaensis* (Fig. 2A); (3) the telson is more strongly narrowed posteriorly, with lateral spines more anteriorly located in *O. trullata* than in *O. hayamaensis* (for example, the posterior pair is located at about the midlength in *O. trullata*, rather than distinctly posterior to the midlength in *O. hayamaensis*; (Bruce 1978: Fig. 37E versus Fig. 3C); (4) the antennal scale has a small distolateral tooth exceeded by the distal lamella in *O. trullata* (Bruce 1978: Fig. 37C, D), whereas the

distolateral tooth is strong and distinctly overreaches the lamella in *O. hayamaensis* (Fig. 3D); (5) the dactyli of the second pereopods have two cutting edges in *O. trullata* (Bruce 1978: Fig. 40), but there is only one cutting edge in *O. hayamaensis* (Fig. 5A–C); (6) the mesial cutting edges of the fixed fingers of the second pereopod chelae are armed with small teeth in *O. trullata* (Bruce 1978: Fig. 40B, D), whereas such teeth are absent in *O. hayamaensis* (Fig. 5B).

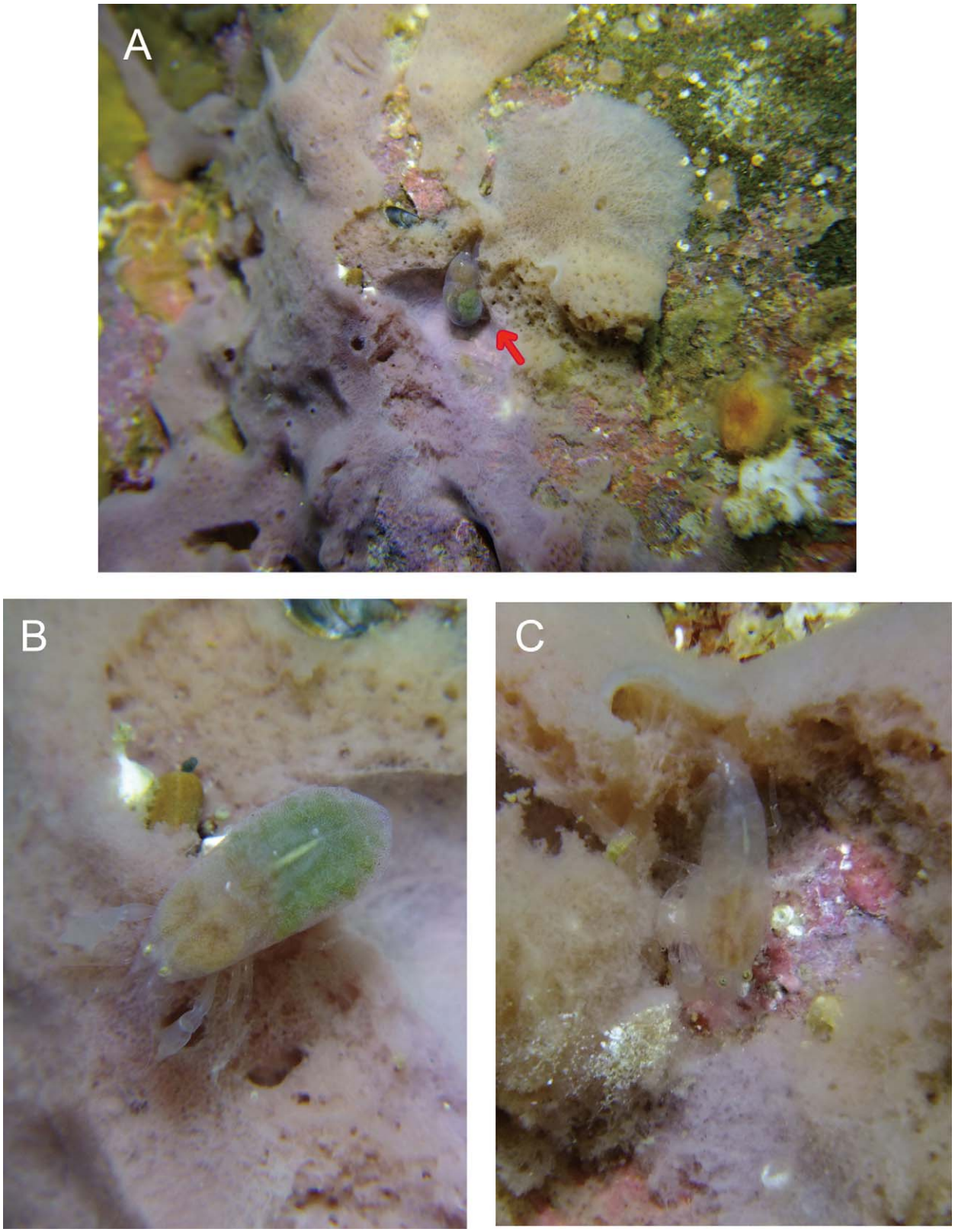

FIGURE 7. Underwater photographs. A, *Onycocaris hayamaensis* **n. sp.**, holotype, ovigerous female (cl 3.4 mm) (indicated by red arrow), and host sponge *Haliclona* sp.; B, *Onycocaris hayamaensis* **n. sp.**, holotype, ovigerous female (cl 3.4 mm); C, *Onycocaris hayamaensis* **n. sp.**, male, spouse of holotype, not collected.

Onycocaris fujinoi was named based on two specimens (one male and one ovigerous female, the former was designated as the holotype) from Yoron Islands, Ryukyu Islands, Japan, originally referred to *O. quadratophthalma* by Fujino & Miyake (1969), though Bruce (2011b) did not examine directly those specimens. In Bruce's (2011: 489) identification key, the tip of the fixed finger of the second pereopod chela is said to be simple in *O. fujinoi*, but Fujino & Miyake (1969: 440) clearly stated that it was bifid in the minor cheliped of the male, as in *O. hayamaensis* **n. sp.** Nevertheless, *Onycocaris fujinoi* can be separated from *O. hayamaensis* by the following characters (Fujino & Miyake 1969): (1) the posterior margin of the telson bears one median plumose seta flanked by two pairs of spines in *O. fujinoi* (Fujino & Miyake 1969: Fig. 18b), whereas there are three pairs of spines in *O. hayamaensis* (Fig. 3C); (2) the eye is relatively narrower with the cornea more tapering distally in *O. fujinoi* than in *O. hayamaensis* (Fujino & Miyake 1969: Fig. 16b versus Fig. 3A); (3) the chela of the first pereopod is much slenderer in *O. fujinoi* than in *O. hayamaensis* (about 8.5 times longer than the greatest width versus 5.5 times) (Fujino & Miyake 1969: Fig. 18h versus Fig. 4C, D); (4) fingers of the chela of the male major second pereopod are armed with one (dactylus) and two (fixed finger) teeth on respective cutting edges in *O. fujinoi* (Fujino & Miyake 1969: Fig. 16c), rather than two (dactylus) and three (fixed finger) teeth in *O. hayamaensis* (Fig. 6A, B); the palm of the male major second pereopod is smooth on the ventral margin in *O. fujinoi* (Funino & Miyake 1969: Fig. 16c), but tuberculate in *O. hayamaensis* (Fig. 6A, B).

Onycocaris quadratophthalma is represented with certainty only by the female holotype and one female specimen subsequently reported from Hong Kong (Bruce 1992). The second pereopods of the holotype were missing (Balss 1921; Fujino & Miyake 1969); in the specimen from Hong Kong, only the major second pereopod was preserved. *Onycocaris quadratophthalma* is readily distinguished from *O. hayamaensis* by the following characters (Fujino & Miyake 1969; Bruce 1992): (1) the eyes are quadrate with flat and transverse anterior surfaces and contiguous mesial surfaces in *O. quadratophthalma* (Fujino & Miyake 1969: Fig. 16a; Bruce 1992: Fig. 1B), whereas they are less quadrate with anterior surfaces sloping to the non-contiguous mesial surfaces in *O. hayamaensis* (Fig. 3A); (2) the antennal scale has a small distolateral tooth exceeding as far as the distal lamella in *O. quadratophthalma* (Fujino & Miyake 1969: Fig. 16a; Bruce 1992: Fig. 1F), rather than having a strong distolateral tooth distinctly overreaching the distal lamella in *O. hayamaensis* (Fig. 3D); (3) the fingers of the chela of the female major second pereopods bear two blunt teeth (dactylus) and one prominent middle tooth (fixed finger) on respective cutting edges in *O. quadratophthalma* (Bruce 1992: Fig. 3D, E), but such conspicuous teeth are absent on the fingers of the major second pereopod in *O. hayamaensis* (Fig. 4A–C); the dactyli of the third to fifth pereopods are devoid of accessory denticles proximal to the distal accessory tooth in *O. quadratophthalma* (Bruce 1992: Fig. 3G), whereas there are several denticles proximal to the distal accessory tooth in *O. hayamaensis* (Fig. 4F).

As mentioned before, six previously described species have been recorded from Japanese waters, of them the record of *O. seychellensis* mentioned by Miyake (1982) and Chace & Bruce (1993) needs to be verified, because no voucher specimen was indicated or available (cf. Hayashi 2003). Other five species have been recorded from the southwestern part of the Japanese Archipelago (Fujino & Miyake 1969; Hayashi 2003), although they have been rarely collected. The scarce records of the genus in local waters may reflect scarce sampling efforts. In fact, the present new species was discovered from the shallow subtidal depths where access for collection is not easy.

Etymology. Named after the type locality, Hayama, in Kanagawa Prefecture, Japan.

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