Nat. Hist. Res., Vol. 11 No. 1: 09—33, April 2010

# A Review of the Northwestern Pacific Species of the genus *Paguristes* (Decapoda: Anomura: Diogenidae). III. Clarification of the Identity of a Species Heretofore Referred to *Paguristes balanophilus* Alcock and Descriptions of Two New Species from Japan

Tomoyuki Komai

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

**Abstract** Comparison of Japanese specimens, the type descriptions, and a specimen identified by H. Milne Edwards in the collection of the Muséum national d'Histoire naturelle, Paris, has confirmed that the species heretofore referred to *Paguristes balanophilus* Alcock, 1905 by Japanese authors actually represents *P. gonagrus* (H. Milne Edwards, 1836). Now the distribution of *P. gonagrus* includes Japan, Taiwan (new record), China Sea and the Philippines. A detailed description accompanied by illustrations is given for *P. gonagrus*. Additionally, two new species of *Paguristes sensu stricto*, *P. ocellus* sp. nov. and *P. tosaensis* sp. nov., are described from the Ryukyu Islands and Tosa Bay, respectively. *Paguristes ocellus* sp. nov. appears closest to *P. balanophilus* and *P. alcocki* McLaughlin and Rahayu, 2005. *Paguristes tosaensis* sp. nov. is most similar to *P. calvus* Alcock, 1905. Affinities of these three species are discussed in detail.

**Key words :** Crustacea, Decapoda, Anomura, Diogenidae, *Paguristes*, new species, Japan

In the last decade, species of the diogenid hermit crab genus *Paguristes* Dana, 1852 in the Indo-West Pacific have been extensively studied at regional bases, resulting in the clarifications of the identities of the previously described taxa and in the discovery of many new species or unrecorded species (Forest and McLaughlin, 1998; Komai, 1999; 2001; 2009; Forest *et al*., 2000; McLaughlin, 2002, 2008; Osawa and Takeda, 2004; Rahayu, 2005; 2006; 2007; McLaughlin and Rahayu, 2005; Rahayu and McLaughlin, 2006; McLaughlin *et al*., 2007; Rahayu and Forest, 2009).

This is the third part of the multiserial papers reviewing the taxonomy of species assigned to *Paguristes sensu lato* from the northwestern Pacific. In the first paper (Komai, 2001), seven species were treated: *Paguristes acanthomerus* Ortmann, 1892, *P. albimaculatus* Komai, 2001, *P. digitalis* Stimpson, 1858, *P. doederleini* Komai, 2001, *P. palythophilus* Ortmann, 1892, *P. ortmanni* Miyake, 1978, and *P. versus* Komai, 2001. In the second paper (Komai, 2009), two species transferred to the genus *Stratiotes* Thomson, 1899, *S. japonicus* (Miyake, 1961) and *S. taenia* (Komai, 1999), were redescribed and two new species, *S. nigroapiculus* Komai, 2009 and *S. orbis* Komai, 2009 were described. In this paper, the identity of a species heretofore assigned to *P. balanophilus* Alcock, 1905 by Japanese workers is clarified. Two new species, *P. ocellus* sp. nov. and *P. tosaensis* sp. nov., are also described.

In earlier studies of the anomuran fauna of local waters in Japan, Prof. S. Miyake and co-authors reported *Paguristes balanophilus* in several publications (Miyake 1961, 1975, 1978, 1982; Miyake *et al*., 1961; Kikuchi and Miyake, 1978; Miyake and Imafuku 1980). Rahayu and McLaughlin (2006) redescribed *P. balanophilus* based on material including syntypic specimens from the Andaman Sea, housed in The Natural History Museum, London, one of which was designated as the lectotype. They noted that a Japanese species previously referred to *P. balanophilus* (e.g., Miyake, 1975; 1978; 1982) was not the species described by Alcock (1905). The present author was already aware that the Japanese species might represent *P. gonagrus* (H. Milne Edwards, 1836), described from the China Sea, after examining a nontype specimen identified by H. Milne Edwards himself, and preserved in the collection of the Muséum national d'Histoire naturelle, Paris (see McLaughlin and Rahayu, 2006: 875). Recently Rahayu and Forest (2009) finally redescribed the holotype of *P. gonagrus*

and identified specimens from Bohol, the Philippines, with that species. Now, I am fully convinced that the Japanese *P. balanophilus* actually represents *P. gonagrus*. In this paper, a detailed description of *P. gonagrus* is presented in order to confirm the identification and to supplement diagnostic details not mentioned or illustrated by Rahayu and Forest (2009). *Paguristes ocellus* sp. nov., described on the basis of a single ovigerous female from the Ryukyu Islands, closely resembles *P. balanophilus* and *P. alcocki* McLaughlin and Rahayu, 2005. *Paguristes tosaensis* sp. nov., described on the basis of a single ovigerous female from Tosa Bay, Shikoku, is morphologically most similar to *P. calvus* Alcock, 1905.

## Material and Methods

Specimens examined in this study are deposited in the Muséum national d 'Histoire naturelle (MNHN), Paris, Natural History Museum and Institute, Chiba (CBM), National Taiwan Ocean University (NTOU), Keelung, and the Showa Memorial Institute, National Museum of Nature and Science, Tsukuba (NSMT), The shield length, abbreviated as sl, is measured from the tip of rostrum to the midpoint of posterior margin of the shield. For detailed observation of the surface structure of the integument, the specimens (including removed appendages) were stained with methylene blue. In order to observe the armature of the chelipeds in *P. gonagrus* and *P. ocellus* sp. nov., the dense setae were removed by immersing the appendage for about 10 minutes in full strength comme rcial " Clorox ", and subsequently cleaning the surfaces with a piece of paper towel. Terminology used in the description follows that of McLaughlin (2008). The drawings were made with the aid of a drawing tube mounted on a Leica MZ8 stereomicroscope.

## Taxonomic Account

***Paguristes gonagrus*** (H. Milne Edwards, 1836)
(Figs. 1–5)

*Pagurus gonagrus* H. Milne Edwards, 1836 : 281; 1837 : 233.

*Paguristes gonagrus* : Alcock, 1905 : 155 (list); Gordan, 1956 : 322 (bibliography); Rahayu and Forest, 2009 : 1312, figs. 1, 2.

*Paguristes balanophilus* : Miyake, 1961 : 11 (list) ; Miyake *et al*., 1962 : 165 (list) ; Miyake, 1975 : 294, pl. 112, figs. 8–11; Matsuzawa, 1977 : pl. 79, fig. 2; Kikuchi and Miyake, 1978 : 29 (list); Miyake, 1978 : 40, text-fig. 14, pl. 2, fig. 7; Miyake and Imafuku, 1980 : 4; Miyake, 1982 : 97, pl. 33, fig. 1; Takeda, 1982 : 58, fig. 173; Minemizu, 2000 : 131, unnumbered fig. Not *Paguristes balanophilus* Alcock, 1905.

*Material examined*. Non-type : 1 male (sl 6.2 ㎜), China Sea, MNHN-Pg 1599; 1 female (sl 6.7 ㎜), Kanonzuka-dashi, Amadaiba, Sagami Bay, Japan, 65 m, 5 December 1959, Miyake det. No. 300, NSMT-CrR 1643; 1 male (sl 6.8 ㎜), Amami Straight, Amami Islands, 250 m, 29 March 1989, dredge, coll. S. Nagai, CBM-ZC 1097; 1 female (sl 5.7 ㎜), 1 ovigerous female (sl 5.5 ㎜), off Yamakawa, near mouth of Kagoshima Bay, depth not recorded, 30 May 1997, commercial trap, coll. T. Komai, CBM-ZC 4441; 1male (sl 6.9 ㎜), 1 female (sl 6.5 ㎜), off Minabe, Kii Peninsula, 60–80 m, March 1997, commercial gill net, coll. T. Komai, CBM-ZC 9651; 1 male (sl 8.2 ㎜), 2 ovigerous females (sl 6.6, 8.0 ㎜), RV *Ocean Reseaercher 1*, southwestern Taiwan, 22 °29.94 'N, 119 °00.73 'E, 91m, 5 August 2009, NTOU.

*Description*. Thirteen pairs of deeply quadriserial gills.

Shield (Fig. 1A) about 1.2 times longer than broad; rostrum moderately to narrowly triangular, usually distinctly overreaching lateral projections and nearly reaching midlength of ocular acicles; lateral projections broadly triangular, with or without submarginal spinule; anterior margin between rostrum and lateral projections evenly concave; anterolateral margins sloping; lateral margins slightly convex; dorsal surface with granules and several tufts of moderately short to long setae laterally; gastric elevations clearly delimited, not particularly rugose. Branchiostegites each with row of small spines on dorsal margin extending to anterior end (Fig. 1D). Posteromedian plate (Fig. 1B) well calcified, moderately narrow.

Ocular peduncles (Fig. 1A) relatively slender, slightly unequal (left longer than right), 0.8–0.9 times as long as shield, slightly inflated basally, bearing longitudinal row of tufts of setae dorsomesially; corneas not dilated, slightly narrower than basal width of ocular peduncle, corneal diameter less than 0.2 of peduncular length; ocular acicles triangular, each terminating in simple, sharp spine.

Antennular peduncles (Fig. 1A, C) with tips of ultimate segments falling short of corneal bases of ocular peduncles; basal segment with small spine on distolateral margin of statocyst lobe, ventrodistal margin produced and terminating in sharp spine; penultimate segment with spinule on ventral surface slightly proximal to midlength; ultimate segment longer than penultimate segment. Dorsal flagellum distinctly longer than ultimate peduncular segment.

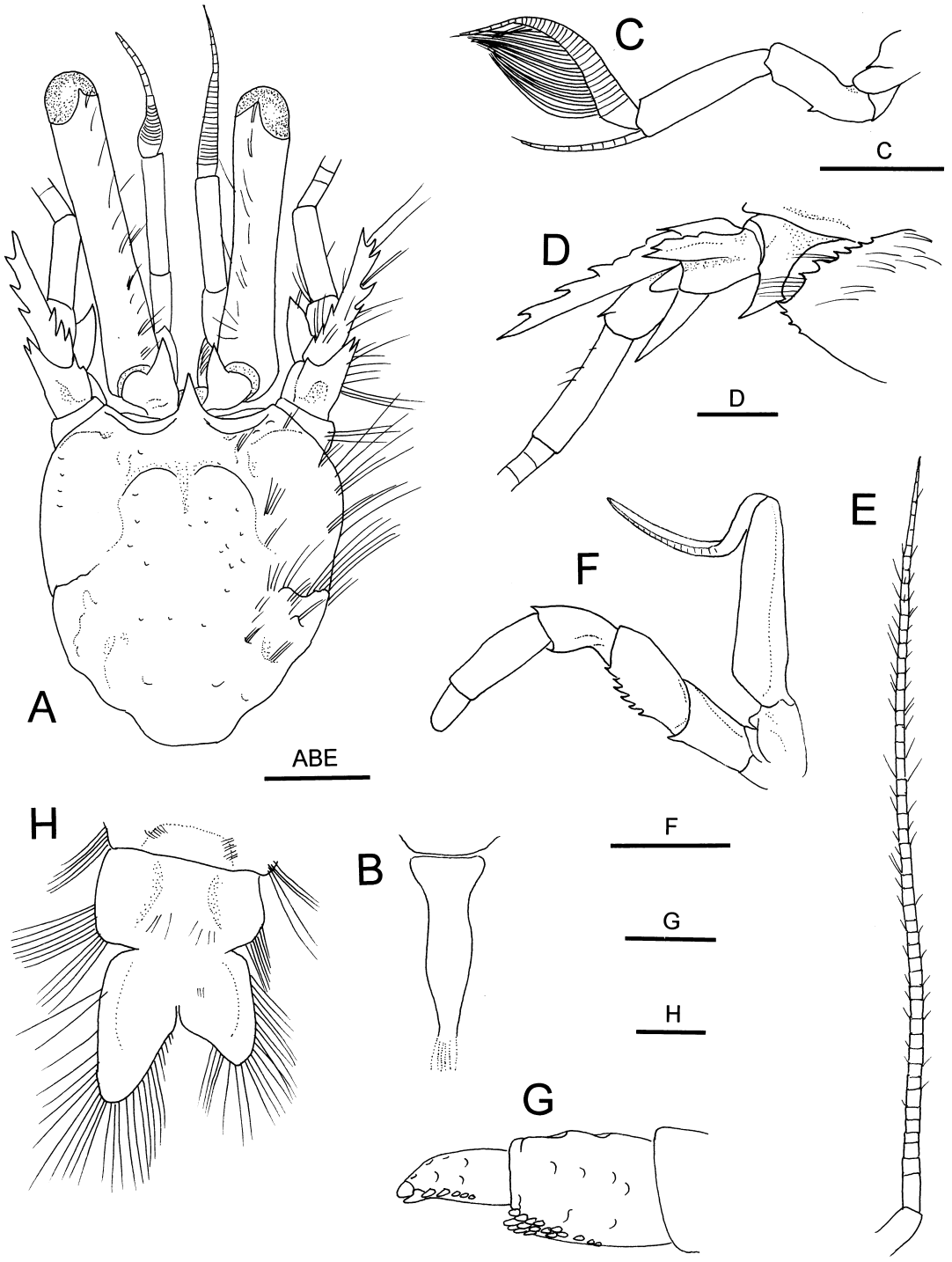


**Fig. 1.** *Paguristes gonagrus* (H. Milne Edwards, 1836). Male (sl 6.9 ㎜), CBM-ZC 9651. A, shield and cephalic appendages, dorsal view (setae on left side omitted); B, posteromedian plate of carapace, dorsal view; C, left antennule, lateral view; D, left antenna; peduncle and anterior part of branchiostegite, lateral view; E, left antennal flagellum, dorsal view; F, left third maxilliped, lateral view (setae omitted); G, dactylus, propodus and distal part of carpus of left fourth pereopod, lateral view (setae omitted); H. telson, dorsal view. Scale bars : 2 ㎜ for A, B, E, C, F; 1 ㎜ for D, G, H.

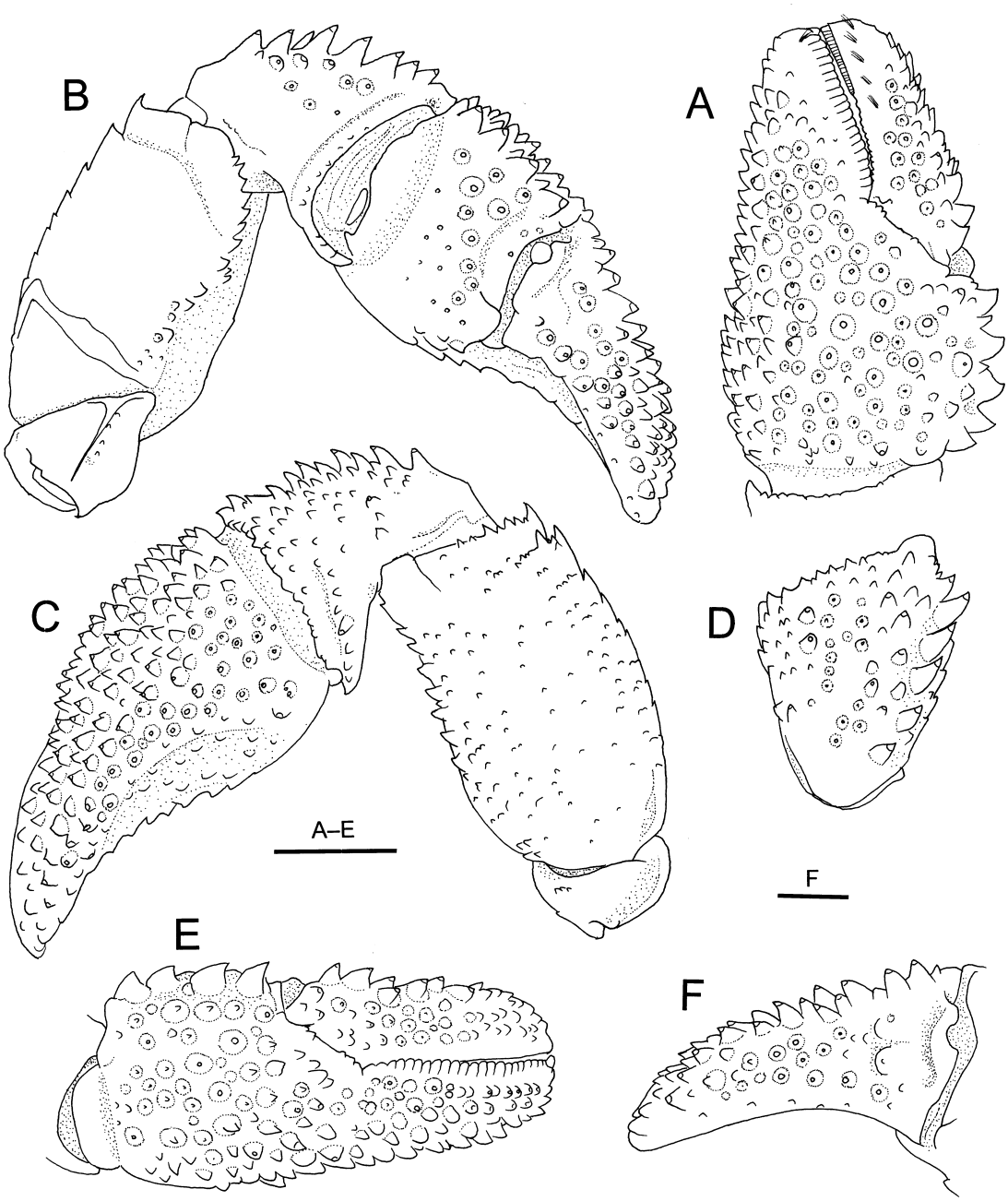


**Fig. 2.** *Paguristes gonagrus* (H. Milne Edwards, 1836). Male (sl 6.9 ㎜), CBM-ZC 9651. Chelipeds, setae omitted. A, left chela, dorsal view; B, left cheliped, mesial view; C, same, lateral view; D, carpus of left cheliped, dorsal view; E, right chela, dorsal view; F, dactylus of right cheliped, mesial view. Scale bars : 2 ㎜ for A–E; 1 ㎜ for F.

Antennal peduncles (Fig. 1A, D) short, reaching distal 0.3–0.4 of ocular peduncles; first segment unarmed on lateral face, ventromesial distal angle strongly produced; second segment with dorsolateral distal angle produced, terminating in bifid spine, dorsomesial distal angle with small spine, mesial half of dorsal surface not particularly elevated; third segment with strongly produced, sharply pointed ventromesial distal angle; fourth segment with small spine at distolateral angle; fifth segment moderately slender, unarmed. Antennal acicle moderately slender, slightly falling short of distal end of fifth peduncular segment, terminating in simple or bifid spine, mesial margin with 3 spines proximally, lateral margin with 3 or 4 spines. Antennal flagellum (Fig. 1E) about twice length of shield, consisting of more than 40 articles, each article with some very short setae on distal margin.

Third maxilliped (Fig. 1F) moderately slender; carpus with small dorsodistal spine; merus with row of 5 or 6 small spines on ventrolateral margin, but unarmed on dorsodistal margin; ischium with ventrodistal spine, and with well-developed crista dentata consisting of row of sharp triangular corneous teeth; coxa with 2 spinules at ventrodistal angle.

Chelipeds (Figs. 2A–E, 5) subequal or slightly unequal; left slightly larger; armature and setation generally similar; spines on palms and carpi usually corneous-tipped. Chelae about 1.8 times longer than broad in left and about 2.0 times in right. Dactyli 1.5–1.8 times as long as palm, slightly curved ventrally; dorsomesial margin delimited by row of moderately small to large spines, dorsal surface with irregular rows of small spines and dense long soft setae partially obscuring surface; mesial face with several small spines or tubercles and tufts of long setae, spines arranged in irregular longitudinal rows (Fig. 2B, F); cutting edge with row of tiny calcareous teeth in proximal half and row of corneous teeth in distal half, terminating in small corneous claw; no hiatus between dactylus and fixed finger. Palms each with row of large spines on dorsomesial margin, convex dorsal surface with covering of prominent spines (spines often rather abruptly tapering distally) obscured by dense long soft setae (Fig. 5), dorsolateral margin not clearly delimited; mesial face with scattered small, short spines, nearly naked except for dorsal and distal parts; lateral face of palm and fixed finger with scattered spinulose tubercles or small spines; ventral surface generally convex, but shallowly excavate around base of fixed finger, with longitudinal row of low protuberances on midline and scattered small tubercles, and also with tufts of long stiff setae; fixed finger curved ventrally, cutting edge with row of small blunt calcareous teeth each separated by distinct sutures, terminating in small corneous claw. Carpi each with row of large spines on dorsomesial margin; dorsolateral margin not delimited; dorsal and lateral surfaces with numerous scattered small spines or tubercles, and at least partially obscured by dense long setae; mesial face with several tubercles in dorsal half. Meri each with row of small, sharp spines on dorsal margin decreasing in size proximally and becoming obsolete; subdistal transverse ridge extending onto lateral face, spinose; distal margin with row of spines extending laterally, dorsal spine strongest; lateral face with scattered tiny tubercles or granules, ventrolateral margin with row of small spines and long setae; mesial face nearly smooth, ventromesial margin with row of small spines or spinulose tubercles over entire length and sparse setae. Ischia each with row of minute tubercles on ventromesial margin.

Second pereopods (Figs. 3A, B, 4A) moderately slender. Dactyli 1.5–1.7 times as long as propodi; dorsal margins each with row of small, slender spines, sometimes corneous-tipped, in proximal half, and numerous long stiff setae, setae forming distinct tufts distally; lateral faces each with shallow longitudinal sulcus proximally and row of tufts of setae on midline; mesial faces each with row of tufts of setae dorsally and ventrally, and with row of small protuberances or tubercles (sometimes spinulose) accompanied by tufts of long plumose setae adjacent to ventral margin; ventral margins each with 17–26 small corneous spines becoming smaller and slenderer proximally (Fig. 4A, B). Propodi each with row of prominent spines and tufts of setae on dorsal margin; lateral faces each with dorsal row of low protuberances bearing tufts of setae and row of tufts of setae on midline, otherwise with scattered tufts of very short setae; mesial faces each with row of low protuberances bearing setae on midline and several tufts of short setae ventral to midline; ventral surfaces each with short, sometimes weakly spinose ridges (occasionally extending onto mesial face), and tufts of short to long plumose setae. Carpi each with shallow longitudinal sulcus and some tufts of setae on dorsal half of lateral surface; dorsal margin with irregular double row of prominent spines mesially and tufts of setae; mesial faces nearly naked; ventral surfaces with sparse setae. Meri with tufts of setae on dorsal margins; lateral faces with few tufts of very short

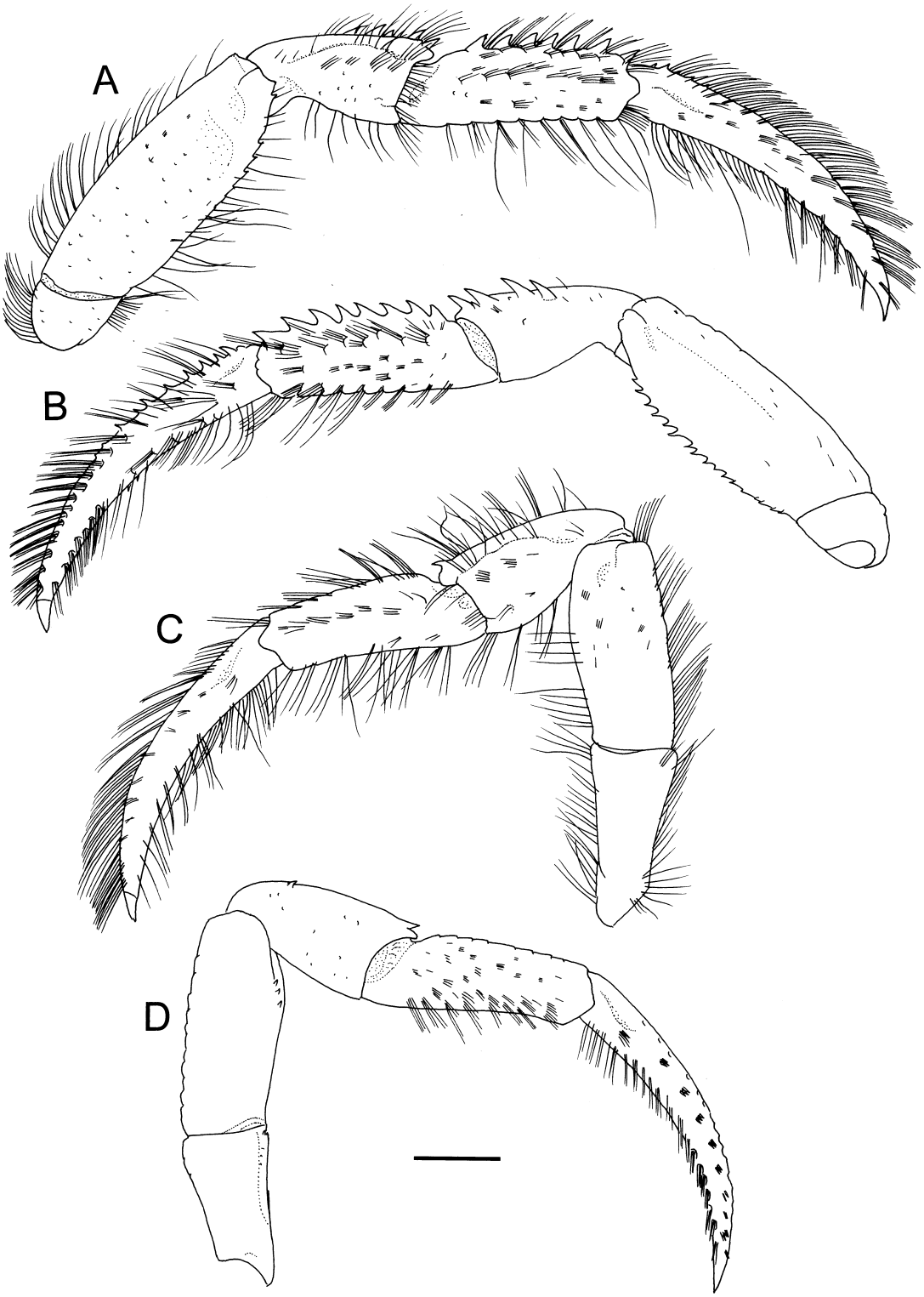


**Fig. 3.** *Paguristes gonagrus* (H. Milne Edwards, 1836). Male (sl 6.9 ㎜), CBM-ZC 9651. A, right second pereopod, lateral view; B, same, mesial view; C, left third pereopod, lateral view; D, same, mesial view. Scale bar : 2 ㎜.

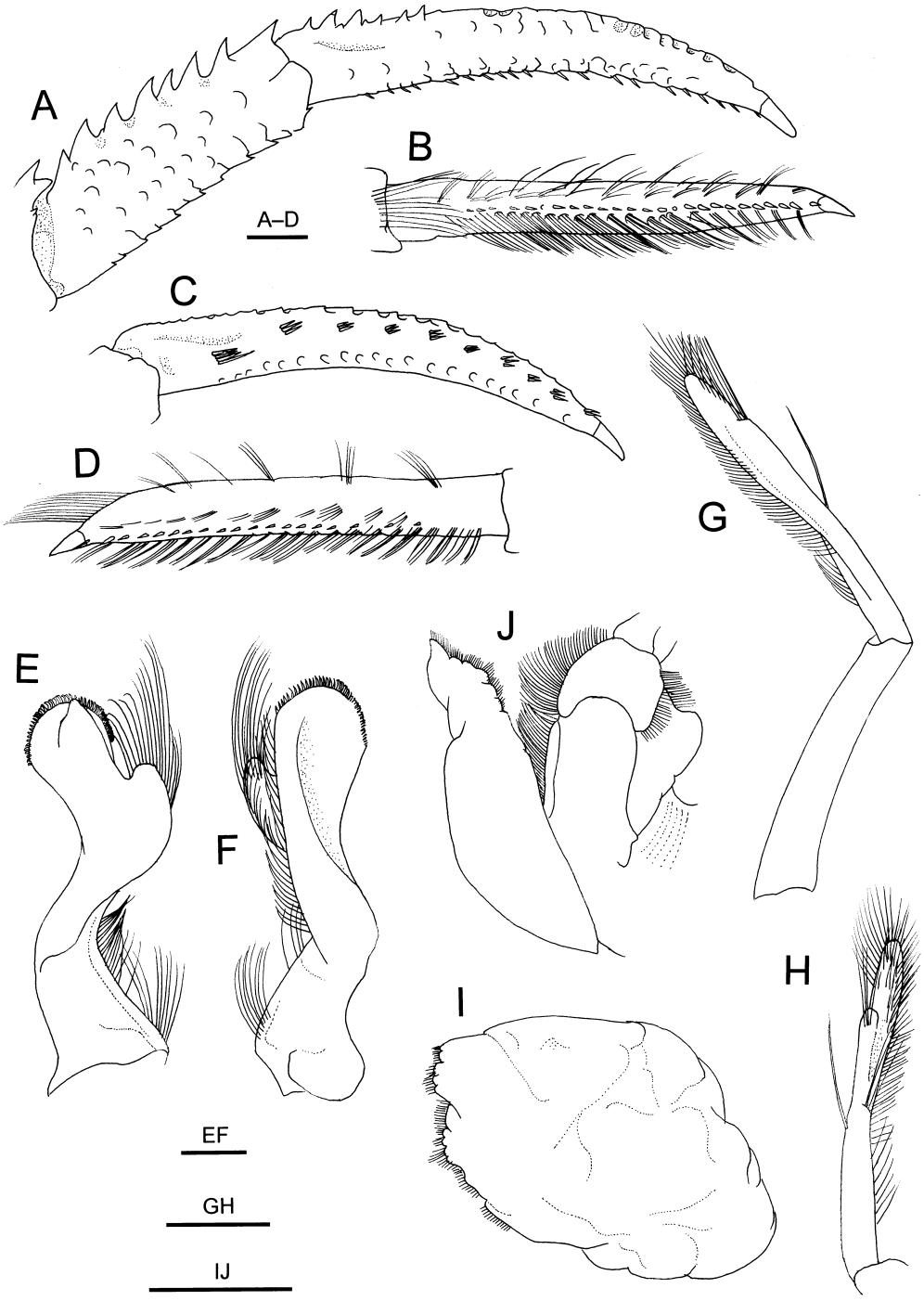


**Fig. 4.** *Paguristes gonagrus* (H. Milne Edwards, 1836). A–D, male (sl 6.9 ㎜), CBM-ZC 9651; E–H, male (sl 8.2 ㎜), NTOU; I, J, female (sl 6.5 ㎜), CBM-ZC 9651. A, dactylus and propodus of left second pereopod, mesial view (setae omitted); B, dactylus of right second pereopod, ventral view; C, dactylus of left third pereopod, mesial view (setae and ventral spinules omitted); D, same, ventrolateral view; E, left first pleopod, dorsal view; F, same, lateral view; G, left second pleopod, ventral view; H, same, distal segment, dorsal view; I, brood pouch, lateral view; J, brood pouch and anterior second and third pleonal tergites, dorsal view. Scale bars : 5 ㎜ for I, J; 1 ㎜ for A–D, G, H; 0.5 ㎜ for E, F.

setae; mesial faces nearly smooth, only with few setae; ventral surfaces each with 2 rows of small spines (spines of mesial row more conspicuous). Ischia unarmed, with numerous setae on dorsal and ventral margins.

Third pereopods (Fig. 3C, D) somewhat differing from second pereopods in armature. Dactyli unarmed on dorsal margin; mesial faces each with longitudinal row of sets of 2–4 corneous spinules approximating to dorsal margin distally and row of tufts of long stiff setae along ventral margin (Fig. 4C); ventral margins each with 11–27 small corneous spines or spinules (Fig. 4A, B, D). Propodi unarmed on dorsal margin; mesial faces each with scattered tufts of very short setae and tufts of moderately short to long setae ventrally; ventral margin smooth. Carpi each with dorsodistal spine and 1–4 small spines on dorsal margin proximally. Meri unarmed on ventrolateral margin; ventromesial margin with few spinules in distal 0.3. Ischia with few spinules ventrally.

Fourth pereopods each with prominent preungual process followed by several corneous scale-like teeth on ventral margin of dactylus (Fig. 1G). Propodal rasp consisting of 2 or 3 rows of rounded corneous scales extending to midlength to proximal 0.3. Carpi without dorsal spine.

Male first pleopods (Fig. 4E, F) each with row of moderately short setae on lateral margin of inferior lamella, row of slender, hooked spines on broadly rounded distal margin; external lobe triangular, reaching distal margin of inferior lamella; internal lobe short, rounded, with long marginal stiff setae extending onto inner face. Second pleopod (Fig. 4G, H) with basal segment naked; distal segment slightly twisted, endopod rather clearly delimited, bearing prominent tuft of stiff setae distally; appendix masculina narrow, rounded terminally, with numerous marginal or submarginal setae.

Female paired first pleopods each with indistinct articulation between basal and distal segments; basal segment with moderately long setae marginally; distal segment subequal in length to and distinctly narrower than basal segment. Second to fourth unpaired left pleopods with both rami well developed, exopods much longer than endopods; fifth pleopod with exopod well developed, endopod rudimentary. Brood pouch (Fig. 4I, J) very large, covering anterior half of left side of pleon; margins fringed with short to moderately short setae. Second to fourth pleonal tergites each with area of weak calcification on both left and right margins, left each with row of dense, long setae partially obscuring bases of pleopods, right with shorter and fewer setae only on second tergite (Fig. 4J); left posterolateral end of third tergite produced in prominent subtriangular flap.

Telson (Fig. 1H) with deep lateral incisions; median cleft relatively deep, narrow; posterior lobes strongly asymmetrical, roundly triangular, terminal and lateral margins unarmed, each with row of long setae.

Eggs small, about 0.6 mm in diameter.

*Variation*. The rostrum is narrowly triangular and distinctly overreaches the lateral projections in the six Japanese and one male Taiwanese specimens, but roundly triangular and only reaches the lateral projections in the two ovigerous females (sl 6.6, 8.0 ㎜) from Taiwan. Setation on the mesial face of propodi of the second pereopods varies moderately dense to dense.

*Coloration*. Shield generally orangish brown, paler laterally; calcified area of posterior carapace mottled orangish brown and white. Ocular peduncles orange. Antennular peduncles generally violet. Antennal peduncles whitish. Chelipeds generally orangish brown, cutting edges of fingers and proximal parts of meri whitish; lateral and mesial faces of meri each with small red spot distally, circumscribed by broad violet ring; setae on palm dark brown. Ambulatory legs also orangish brown, tips of dactyli and distal parts of propodi whitish; lateral faces of meri each with small red spot distally, circumscribed by broad violet ring. See Fig. 5.

*Distribution*. Pacific coast of Japan from Sagami Bay to Ryukyu Islands, Taiwan, China Sea, Bohol in the Philippines; at depths of 13–200 m.

*Biological note*. Found in various species of gastropod shells, which are always encrusted with *Epizoanthus*.

*Remarks*. Although *Paguristes gonagrus* has long been confounded with *P. balanophilus* in Japanese literature, it does not appear to be closely related to *P. balanophilus*. The ocular acicles are simple in *P. gonagrus*, but bi- or multi-spinose in *P. balanophilus*. The dorsal armature and setation of the palms of chelipeds are quite different between the two. In *P. gonagrus*, the armature consists of covering of simple corneous tipped spines, which is obscured or concealed by thick long soft setae. On the other hand, in *P. balanophilus*, the armature consists of covering of closely spaced tubercles or tuberculate spines, each usually with muricated or studded with bi- to multifid spinules and accompanied by or circumscribed by short setae.

*Paguristes gonagrus* is morphologically similar to *P.*

**Fig. 5.** *Paguristes gonagrus* (H. Milne Edwards, 1836). Male (sl 8.2 ㎜), NTOU. Entire animal in dorsal view, showing coloration in life. Photography T.-Y. Chan.

*calvus, P. macrops* Rahayu and Forest, 2009, *P. simplex* Rahayu and McLaughlin, 2006, and *P. tosaensis* sp. nov. In these five species, the armature of the dorsal surfaces of the palms of chelipeds consists of simple, acute or subacute spines. However, *P. gonagrus* is distinctive in having dense covering of long soft setae on the dorsal surface of each chela, which obscure or conceal the armature. The characteristic armature of the mesial faces of the dactyli of third pereopods distinguishes *P. gonagrus* from *P. calvus, P. simplex* and *P. tosaensis*. *Paguristes calvus* and *P. simplex* further differ from *P. gonagrus* in the longer antennular peduncle and different pattern of the armature of the mesial face of dactylus of left cheliped. In the former two species, the antennular peduncle reaches or slightly overreaches the distal corneal margins, but in *P. gonagrus*, it far falls short of the distal corneal margins; and tubercles or spines other than those consisting of the median row on the mesial dactylar face are scarce or absent in *P. calvus* and *P. simplex*, but in *P. gonagrus*, there are additional rows of spines or tubercles on the mesial face. *Paguristes tosaensis* sp. nov. differs from *P. gonagrus* in having much shorter antennal flagellum (only slightly longer than shield versus about twice length of shield) and the ornamentation of the mesial faces of the propodi of the second pereopods. There are some low, sometimes scute-like protuberances on each mesial face of the second pereopod in *P. gonagrus*, which are absent in *P. tosaensis* sp. nov.

Among species of *Paguristes* having an unarmed telson, characteristic patch of color on meri of the chelipeds is seen in *P. alcocki* McLaughlin and Rahayu, 2005, *P. balanophilus*, *P. gonagrus*, *P.*

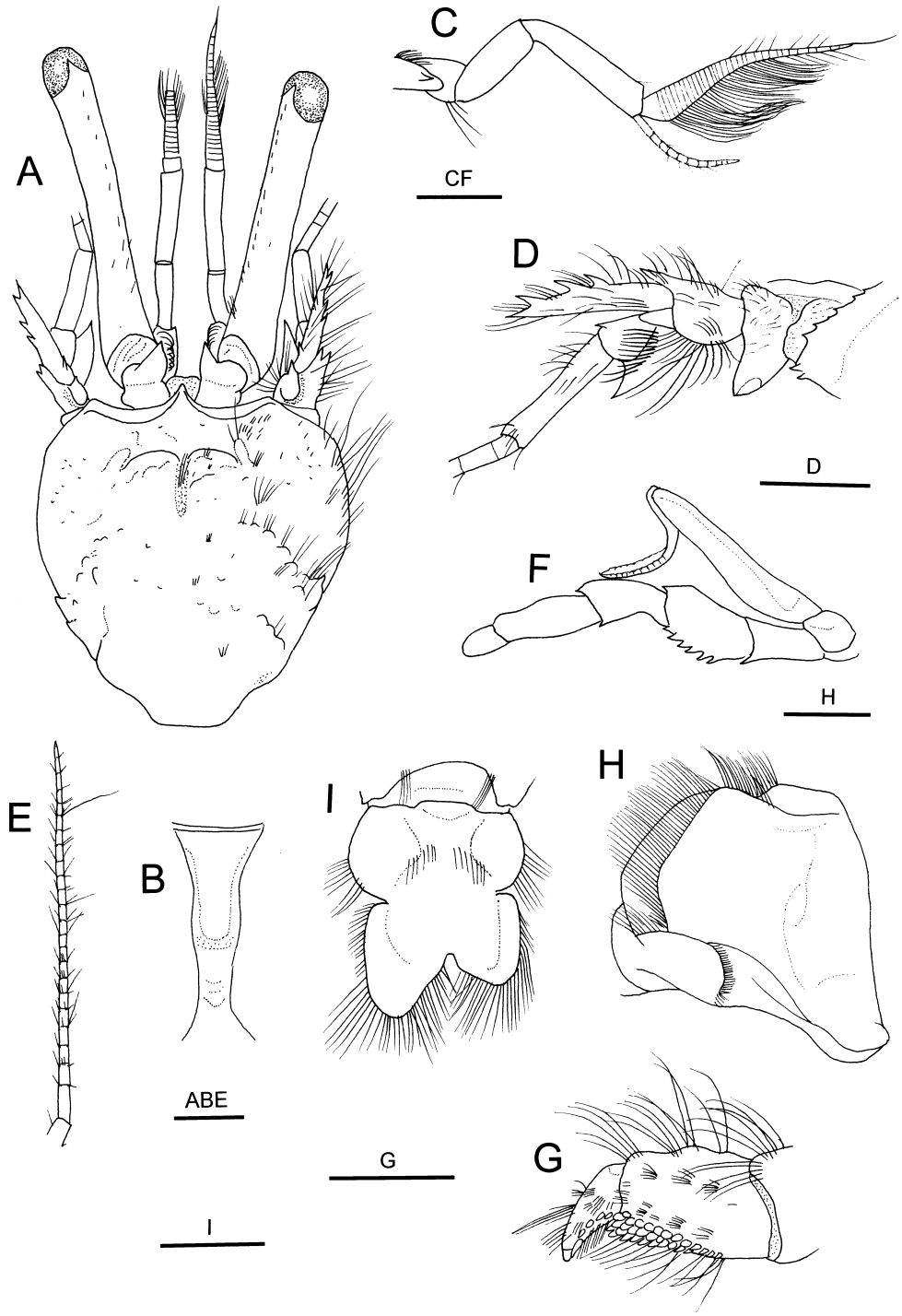


**Fig. 6.** *Paguristes ocellus* sp. nov. Holotype, ovigerous female (sl 5.0 ㎜), CBM-ZC 9742. A, shield and cephalic appendages, dorsal view (setae on left side omitted); B, posteromedian plate of carapace, dorsal view; C, right antennule, lateral view; D, left antennal peduncle and anterior part of branchiostegite, lateral view; E, left antennal flagellum, dorsal view; F, left third maxilliped, lateral view (setae omitted); G, dactylus, propodus and distal part of carpus of left fourth pereopod, lateral view; H, brood pouch, lateral view; I, telson, dorsal view. Scale bars : 2 ㎜ for H; 1 ㎜ for A–G, I.

*lewinsohni* McLaughlin and Rahayu, 2005, *P. macrops* and *P. ocellus* sp. nov. (McLaughlin and Rahayu, 2005; Rahayu and Forest, 2009; this study). *Paguristes lewinsohni* is immediately distinguished from *P. gonagrus* by bi- or trispinose instead of simple ocular acicles and distinctly dissimilar chelipeds without dense setation on the chela as seen in the latter species. As noted below, *P. ocellus* sp. nov. is rather similar to *P. balanophilus* in the characteristic armature of the chelae.

Prof. S. Miyake and his coauthors (Miyake, 1961; 1975; 1978; 1982; Miyake *et al*., 1961; Miyake and Imafuku, 1980) noted the occurrence of *Paguristes balanophilus* in Japanese waters, but he provided rather brief diagnoses of the species that he had identified as *P. balanophilus* in his monograph of the Anomura of Sagami Bay (Miyake, 1978) and his book on decapod crustaceans of Japan (Miyake, 1982, reprinted in 1992 and 1998). Color photographs or illustration were also provided in his 1975, 1978, and 1982 publications. Matsuzawa (1977) similarly presented a photo of a species identified as *P. balanophilus*. Takeda (1982) presented rather diagrammatic color illustration and very brief diagnosis, but clearly mentioned the characteristic color patches on the chelipeds. Minemizu (2000) published a color photograph of living animals *in situ*. Miyake (1975, 1978, 1982) described that his species is characteristic among the Japanese members of *Paguristes* (*sensu lato*) in having its particular color pattern including a dark red patch in a violet field on both the mesial and lateral surfaces of the meri of the chelipeds. There is little doubt that those specimens reported by Japanese authors belong to a same species. Rahayu and McLaughlin (2006), who redescribed *P. balanophilus* on the basis of the type series from the Andaman Sea and additional material from the Gulf of Oman, concluded that the Japanese species that had been reported as *P. balanophilus* is not the Alcock's (1905) taxon. Rahayu and Forest (2009) finally redescribed *P. gonagrus* based on the type material and specimens from the Bohol Sea, the Philippines. In this study, I have compared a specimen referred to *P. gonagrus* by H. Milne Edwards in the collection of MNHN with material from Japan and Taiwan, including one specimen from Sagami Bay, identified with *P. balanophilus* by Miyake (1978). It is confirmed that the Japanese and Taiwanese specimens actually belong to *P. gonagrus*, instead of *P. balanophilus*.

## ***Paguristes ocellus*** sp. nov.
(Figs. 6–10)

*Material examined*. Holotype : ovigerous female (sl 5.0 mm), TRV *Toyoshio-maru*, 1998-04 cruise, stn 11, S of Nagannu Island, Okinawa Islands, Ryukyus, 26 °14.50 ′N, 127 °32.00 ′E, 53 m, coral sand, 21 May 1998, sledge net, coll. T. Komai, CBM-ZC 9742.

*Description*. Thirteen pairs of deeply quadriserial gills.

Shield (Fig. 6A) about 1.1 times longer than broad; rostrum moderately broadly triangular, slightly overreaching lateral projections; lateral projections broadly triangular, unarmed; anterior margin between rostrum and lateral projections weakly concave; anterolateral margins sloping; lateral margins gently convex; dorsal surface with some low protuberances and tufts of moderately short to long setae laterally; gastric elevations clearly delimited, slightly rugose, divided by distinct median groove. Branchiostegites each with row of small spines on dorsal margin extending to anterior end (Fig. 6D). Posteromedian plate (Fig. 6B) well calcified, relatively broad.

Ocular peduncles (Fig. 6A) long, slightly unequal (left longer than right), subequal to shield length, slightly inflated basally, bearing longitudinal row of short single setae dorsomesially; corneas not dilated, slightly narrower than basal width of ocular peduncles, corneal diameter slightly more than 0.1 of peduncular length; ocular acicles triangular, each terminating in simple, sharp spine.

Antennular peduncles (Fig. 6A, C) with tips of ultimate segments reaching about 0.6 of ocular peduncles; basal segment with small spine on distolateral margin of statocyst lobe, ventrodistal margin not produced; penultimate segment unarmed on ventral surface; ultimate segment distinctly longer than penultimate segment; dorsal flagellum distinctly longer than ultimate segment of peduncle.

Antennal peduncles (Fig. 6A, D) short, falling short of midlength of ocular peduncles; first segment unarmed on lateral face, ventromesial distal angle strongly produced; second segment with dorsolateral distal angle produced, terminating in bifid spine, dorsomesial distal angle with small spine, mesial half of dorsal surface markedly elevated; third segment with strongly produced, sharply pointed ventromesial distal angle; fourth segment with small spine at dorsolateral distal angle; fifth segment slender, unarmed. Antennal acicle moderately slender, slightly falling short of distal end of fifth peduncular segment,

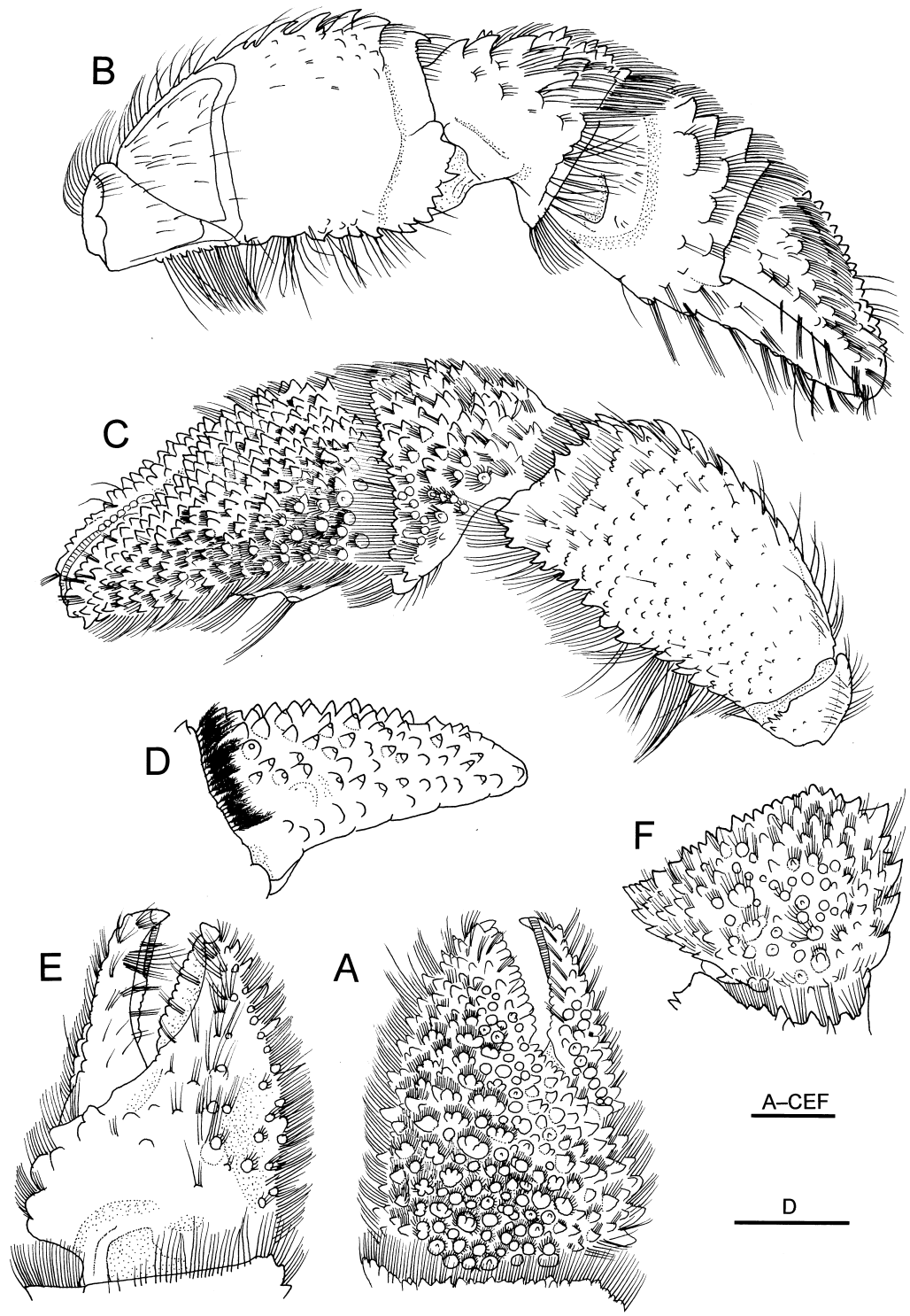


**Fig. 7.** *Paguristes ocellus* sp. nov. Holotype, ovigerous female (sl 5.0 ㎜), CBM-ZC 9742. Left cheliped (setae partially omitted). A, chela, dorsal view; B, entire left cheliped, mesial view; C, same, lateral view; D, dactylus, mesial view (setae omitted); E, chela, ventral view; F, carpus, dorsal view. Scale bar : 1 ㎜.

terminating in acute spine, mesial margin with 1 or 2 small spines proximally, lateral margin with 3 spines. Antennal flagellum (Fig. 6E) subequal in length to shield, consisting of about 25 articles, each article with some short setae, few articles with long setae.

Third maxilliped (Fig. 6F) moderately slender; carpus with tiny dorsodistal and ventrodistal spines; merus with row of 6 small spines on ventral margin, and minute dorsodistal spine; ischium with ventrodistal spine, and with well-developed crista dentata consisting of row of sharp triangular corneous teeth; coxa with 2 minute spinules at ventrodistal angle, partially obscured by setae.

Chelipeds unequal, somewhat dissimilar; left larger. Left cheliped (Fig. 7) with chela about 1.5 times longer than wide, subtriangular in dorsal view. Dactylus about 1.5 times as long as palm, not curved ventrally; dorsomesial margin delimited by irregular row of small, blunt to subacute spines, dorsal surface covered by closely spaced, small, blunt or subacute spines, some accompanied by short setae; mesial face with numerous scattered small spines and irregular row of low, sometimes scute-like protuberances along ventral margin, dorsal half obscured by tufts of dense plumose setae (Fig. 7B, D); ventral surface with several tufts of long setae; cutting edge with row of small, blunt teeth in proximal half and row of corneous teeth in distal half, terminating in large corneous claw; no hiatus between dactylus and fixed finger. Palm with row of large spines on dorsomesial margin, convex dorsal surface with covering of closely spaced, tuberculate spines or tubercles, each armed with bi- or trifid, acute to blunt spinule, circumscribed by tuft of short, stiff setae, armature continuing onto fixed finger and becoming simple and sharper; mesial face with small to large, low protuberances accompanied by tufts of numerous setae; lateral face of palm and fixed finger with numerous small, acute spines circumscribed by tuft of setae, ventrolateral margin delimited and with fringe of dense, moderately short setae; ventral surface with few low, partially corneous protuberances mesially and longitudinal row of blunt, corneous-tipped tubercles and tufts of long setae extending onto fixed finger, shallowly concave ventrolateral part with some blunt tubercles. Carpus with row of large spines on dorsomesial margin, each spine accompanied by tuft of dense setae, dorsodistal margin with row of small tubercles, extending onto laterodistal margin; dorsolateral margin not delimited, dorsal and lateral surfaces with numerous small spines or tubercles circumscribed by tuft of setae; mesial face with some low protuberances bearing tuft of short to long setae in dorsal half. Merus with row of large, curved spines in distal half of dorsal margin; dorsodistal margin with row of moderately large spines extending onto laterodistal margin; subdistal transverse ridge distinct, extending onto lateral face as granular row; lateral face with scattered granules and few tufts of short setae, ventrolateral margin with row of moderately large spines and dense setae; mesial face with some small tubercles and tufts of short setae adjacent to dorsal margin, but remainder glabrous, ventromesial margin with row of small spines and sparse setae; ventral surface with scattered tufts of setae. Ischium with row of small tubercles on ventromesial margin, distolateral margin spinulose ventrally.

Right cheliped (Fig. 8) with chela about 1.5 times longer than wide. Dactylus about 1.8 times as long as palm, not curved ventrally; dorsomesial margin delimited by row of small, blunt or subacute, corneous-tipped spines, dorsal surface covered by closely spaced subacute spines or tubercles, some accompanied by tuft of short setae; mesial face with scattered numerous small corneous-tipped tubercles or spines, and tufts of dense plumose setae partially obscuring armature; ventral surface with several tufts of long setae; cutting edge with row of small blunt teeth in proximal half and row of corneous teeth in distal half, terminating in large corneous claw; no hiatus between dactylus and fixed finger. Palm with row of prominent, corneous-tipped spines on dorsomesial margin, convex dorsal surface with covering of closely spaced, tuberculate spines or tubercles (occasionally bi- or trifid), circumscribed by tuft of short setae, armature continuing onto fixed finger and becoming smaller distally; mesial face with small to large, low protuberances accompanied by tufts of numerous setae; lateral face of palm and fixed finger with large, bi- to multifid tubercles (tips sometimes corneous) accompanied or circumscribed by tuft of setae, ventrolateral margin delimited by row of small tubercles and fringe of setae; ventral surface with 2 irregular rows of low, corneous tipped protuberances and tufts of long setae. Carpus with row of large, corneous-tipped spines on dorsomesial margin, each spine accompanied by tuft of dense setae; dorsodistal margin with row of small tubercles; dorsolateral margin not delimited, dorsal and lateral surfaces with numerous small spines or tubercles circumscribed by tuft of setae (tips sometimes corneous); mesial face with few low protuberances and small tubercles dorsally. Merus with row of spines in distal half of

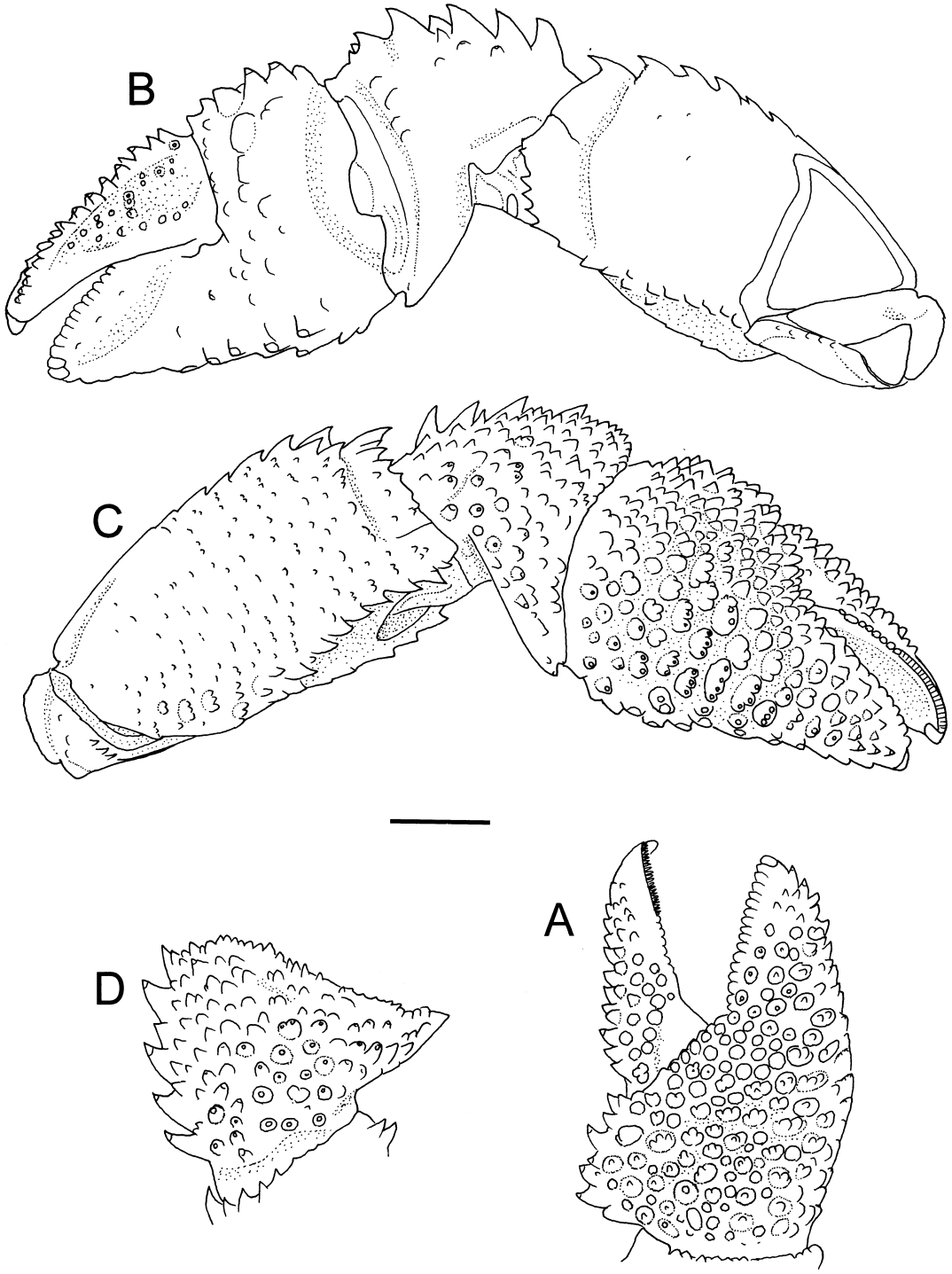


**Fig. 8.** *Paguristes ocellus* sp. nov. Holotype, ovigerous female (sl 5.0 ㎜), CBM-ZC 9742. Right cheliped (setae denuded). A, chela, dorsal view; B, entire cheliped, mesial view; C, same, lateral view; D, carpus, dorsal view. Scale bar : 1 ㎜.

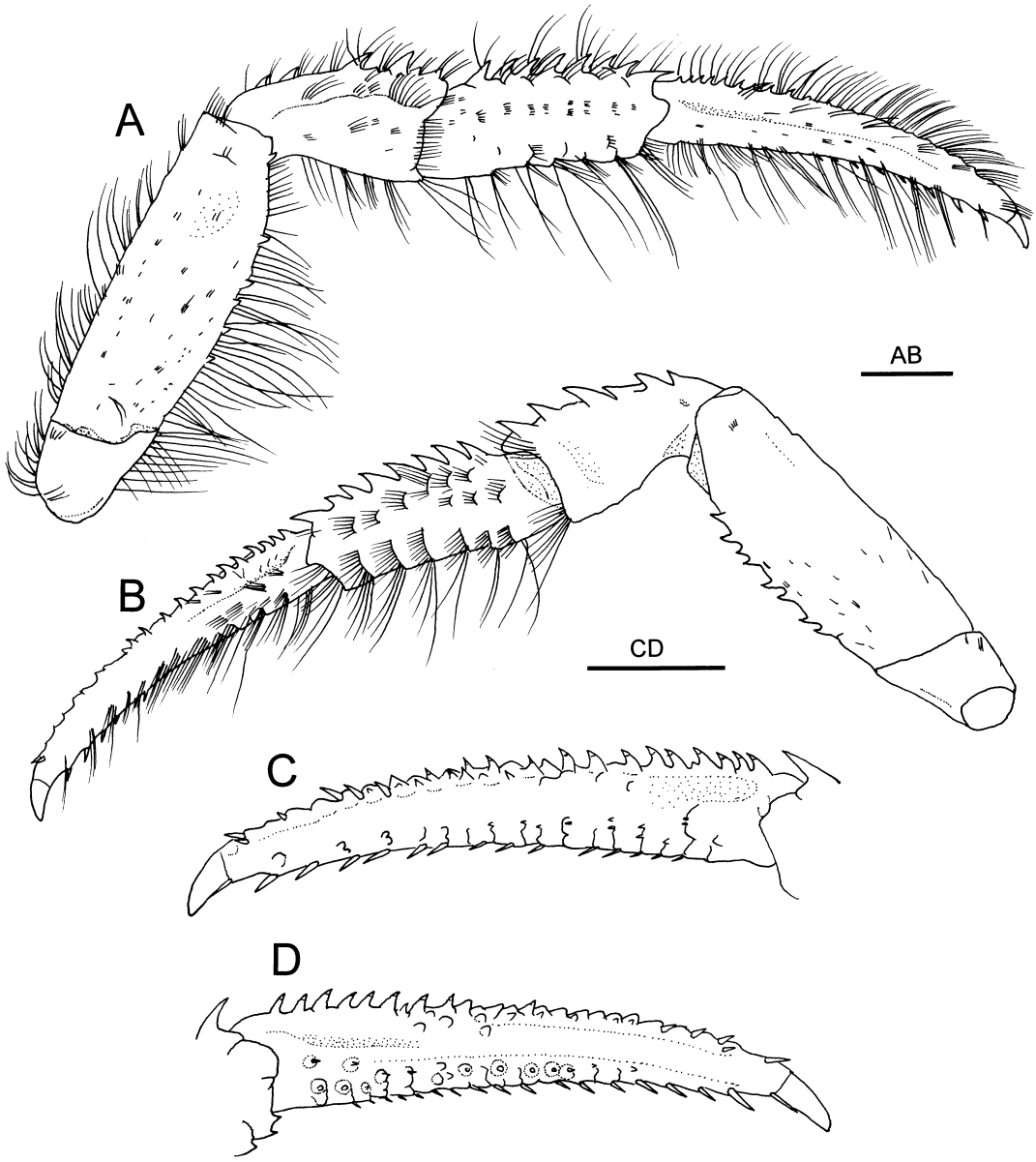


**Fig. 9.** *Paguristes ocellus* sp. nov. Holotype, ovigerous female (sl 5.0 ㎜), CBM-ZC 9742. A, right second pereopod, lateral view; B, same, mesial view (only setae on mesial face shown); C, dactylus of right second pereopod, mesial view (setae omitted); D, dactylus of left second pereopod, mesial view (setae denuded). Scale bars : 1 ㎜.

dorsal margin, noticeably increasing in size distally; dorsodistal margin with row of spines extending onto lateral face (median spine prominent); subdistal transverse ridge extending onto lateral face as row of small tubercles; lateral face with scattered granules and few tufts of short setae, ventrolateral margin with row of moderately large spines and dense setae; mesial face almost smooth, ventromesial margin with row of small spines becoming obsolete proximally; ventral surface with scattered tufts of setae. Ischium with row of minute tubercles on ventromesial margin, distolateral margin spinulose ventrally.

Second pereopods (Fig. 9A, B) moderately slender. Dactyli 1.5–1.7 times as long as propodi; dorsal margin of right with row of small, slender, corneous-tipped or corneous spines over entire length (spines

becoming entirely corneous distally), and with small rounded protuberances in distal half; numerous long stiff setae on dorsal margin, setae becoming to form distinct tufts distally; dorsal margin of left with row of corneous-tipped spines in proximal half and row of small rounded protuberances in distal half, and also with corneous spines in distal 0.2, setation similar to that of right; lateral faces each with shallow longitudinal sulcus proximally and row of tufts of setae on midline; mesial faces nearly flat in distal 0.7–0.8 except for shallow longitudinal sulcus present proximally, dorsally with some tiny spines, and ventrally with row of low protuberances or short vertical ridges (right, Fig. 9C) or row of corneous-tipped tubercles (left, Fig. 9D), most of protuberances or tubercles accompanied by tufts of long plumose setae obscuring armature; ventral margins each with 17 (left) or 19 (right) small corneous spines. Propodi each with row of prominent spines and tufts of setae on dorsal margin; lateral faces each with dorsal row of low protuberances bearing tufts of setae and tufts of very short setae on midline; mesial faces each with row of low protuberances bearing setae on midline; ventral surfaces each with transverse ridges extending onto mesial face (and few of them extending also onto lateral face), each ridge bearing marginal setae becoming noticeably longer ventrally. Carpi each with shallow longitudinal sulcus and some tufts of setae on lateral face; dorsal margin with row of prominent spines mesially and tufts of setae; mesial faces nearly naked; ventral surfaces with sparse setae. Meri with tufts of setae on dorsal margins; lateral faces with several tufts of very short setae; mesial faces only with few very short setae; ventral surfaces each with small ventrolateral distal spine and 2 rows of small spines (spines of mesial row more numerous and conspicuous). Ischia unarmed, with tufts of setae on dorsal and ventral margins.

Third pereopods (Fig. 10A, B) somewhat differing from second pereopods in armature. Dactyli with tiny spinules proximally on dorsal margin mesially; mesial faces each with row of single or set of 2 or 3 corneous spinules adjacent to dorsal margin and row of single or set of 2 corneous spinules adjacent to ventral margin (Fig. 10C); ventral margin with 15 small corneous spines becoming much smaller proximally. Propodi with low protuberances on dorsal surface; transverse ridges on ventral surface lower than those on second pereopods. Carpi each with prominent dorsodistal spine; dorsal margin with row of low protuberances and 1 small proximal spine mesially. Meri unarmed on ventral surface.

Fourth pereopods each with small preungual process followed by some corneous spinules on ventral margin of dactylus (Fig. 6G). Propodal rasp consisting of 3 rows of rounded corneous scales. Carpi without dorsodistal spine.

Female paired first pleopods with each articulation between basal and distal segments indistinct; basal segment with moderately long setae marginally; distal segment subequal in length to and narrower than basal segment. Second to fourth unpaired left pleopods with both rami well developed, exopods much longer than endopods; fifth pleopod with exopod well developed, slender, endopod rudimentary. Brood pouch (Fig. 6H) large, subquadrate, margins not scalloped, but fringed with short to long plumose setae. Second to fourth pleonal tergites each with area of weak calcification, left with row of dense, long setae partially obscuring bases of pleopods, setae on fourth tergite continuous to margin of brood pouch, right without setae; right posterolateral end of third tergite produced in prominent flap.

Telson (Fig. 6I) with moderately deep lateral incisions; median cleft small, shallow; posterior lobes asymmetrical, roundly triangular, terminal and lateral margins unarmed, each with row of long setae.

Eggs moderately small, 1.0–1.1 mm in loger axis.

*Coloration*. Shield with large paired reddish brown spots anterolaterally; anterior margin pale brown; posterior carapace also with reddish brown spot on branchial region dorsally; posteromedian plate with tinge of reddish brown. Ocular peduncles and antennular peduncles uniformly pale brown. First segment of antennal peduncle with tinge of reddish brown; flagella uniformly pale reddish brown. Cheliped palms generally cream, with scattered very small red spots on dorsal surfaces, mesial surfaces with tinge of brown, ventral surfaces each with small red spot at base of dactyl; carpi with reddish brown tint on dorsal and mesial surfaces; meri each with prominent red spot, circumscribed by white ring, on each mesial and lateral faces distally, mesial and lateral surfaces with faint reddish brown markings, ventral surface cream. Second and third pereopods with dactyli each having 2 reddish brown bands on cream back ground of lateral face; mesial face each with tinge of reddish brown proximally; propodi reddish brown in proximal half (but proximal margin cream) and distal half cream, mesial face with tinge of reddish brown submedially; carpi each with broad band of reddish brown on cream lateral face, mesial surface with tinge of reddish brown dorsally; meri each

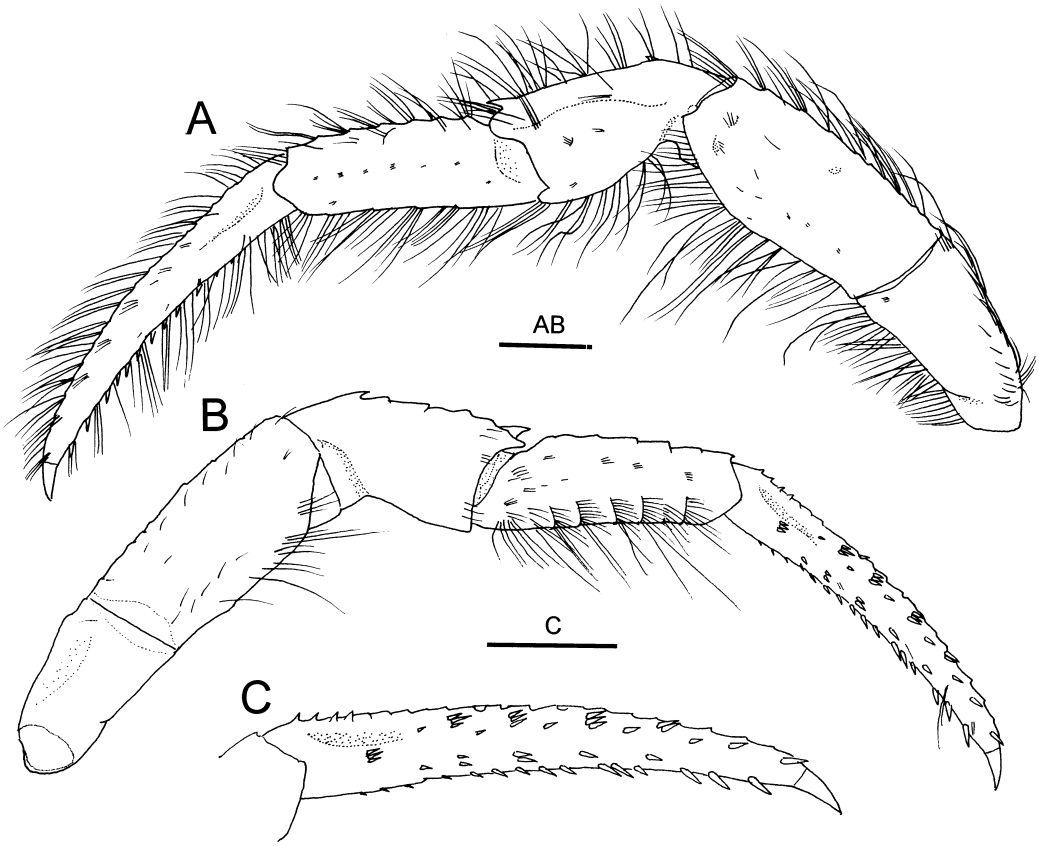


**Fig. 10.** *Paguristes ocellus* sp. nov. Holotype, ovigerous female (sl 5.0 ㎜), CBM-ZC 9742. A, left third pereopod, lateral view; B, same, mesial view (only setae on mesial face shown); C, same, dactylus, mesial view (setae omitted). Scale bars : 1㎜.

with broad median reddish brown band and subdistal dark red spot on cream lateral face, mesial surface with tinge of pale brown. Merus of fourth pereopod with dark red spot circumscribed by white ring subdistally.

*Distribution*. Known only from the type locality, off Nagannu Island, Okinawa Islands, at depth of 53 m.

*Remarks*. *Paguristes ocellus* sp. nov. is most similar to *P. balanophilus* in the armature and setation of the chelipeds (cf. Rahayu and McLaughlin, 2006). In these two species, the armature of the dorsal surfaces of the palms consists of covering of closely spaced tubercles or tuberculate spines, each usually with muricated or studded with bi- to multifid spinules and accompanied by or circumscribed by thick, short plumose setae. Furthermore, these two species have a characteristic patch of color on the distomesial and distolateral surfaces of the merus of each cheliped, although such color is also seen in *P. alcocki, P. gonagrus*, and *P. lewinsohni* among species of *Paguristes* having an unarmed telson. However, *P. ocellus* sp. nov. is readily distinguished from *P. balanophilus* by the simple, instead of bi- or multispinose, ocular acicles. The dactylus of the right cheliped bears scattered spines on the mesial face in *P. ocellus* sp. nov., instead of having a distinct median row of spines in *P. balanophilus*. The ventral faces of the propodi of the second pereopods bear prominent, but non-spinose transverse ridges in the new species, but these transverse ridges are spinulose in *P. balanophilus*. The armature of the mesial faces of the dactyli of the third pereopods consists of a row of a single or set of two or three corneous spinules along the dorsal margin and a row of a single or double spinules along the ventral margin in *P. ocellus*, but there are scattered corneous spinules ventrally in *P. balanophilus*. The antennal acicle does not reach the midlength of the ocular peduncle in *P. ocellus* sp. nov.,

rather than slightly to distinctly overreaching that in *P. balanophilus*.

McLaughlin and Rahayu (2005) argued that *Paguristes alcocki* is closely allied to *P. balanophilus*, and in fact substantial similarities are also seen between *P. ocellus* sp. nov. and *P. alcocki*. In particular, these two species have elongate ocular peduncles, and simple ocular acicles, spines or tubercles on the cheliped palms often bearing circlets of short setae, and scattered spines on the mesial face of the dactylus of the left cheliped. However, the new species can be immediately distinguished from *P. alcocki* by the different armature on the dorsal surfaces of the cheliped palms. In *P. ocellus* sp. nov., the armature consists of small spines and bifid or multifid tubercles, whereas in *P. alcocki*, it contains flattened, scale-like tubercles, each usually having one to three corneous spinules; those tubercles are closely set in the left palm. Furthermore, transverse ridges on the ventromesial faces of the propodi of the second pereopds are entire in *P. ocellus* sp. nov., rather than spinose or denticulate in *P. alcocki*. Coloration in life is also different between the two species. In particular, the meri of the ambulatory legs have red spots subdistally in *P. ocullus* sp. nov., but such spots are absent in *P. alcocki*.

*Etymology*. From the Latin "*ocellus*", eye, in reference to the characteristic color spots on the meri of chelipeds and ambulatory legs. Used as a noun in apposition.

### ***Paguristes tosaensis*** sp. nov.
(Figs. 11–14)

*Material examined*. Holotype: ovigerous female (sl 4.8 mm), off Kochi, Tosa Bay, 33°21.02′N, 133°36.98′E, 90–92 m, 3 October 1994, RV *Toyohata-maru*, beam trawl, coll. K. Sasaki, CBM-ZC 3373.

*Description*. Thirteen pairs of deeply quadriserial gills. Shield (Fig. 11A) about 1.3 times longer than broad; rostrum narrowly triangular, far overreaching lateral projections and nearly reaching tip of ocular acicles; lateral projections obtusely triangular, with submarginal spinule; anterior margin between rostrum and lateral projections evenly concave; anterolateral margins sloping; lateral margins slightly convex; dorsal surface with scattered small granules and several tufts of moderately short to long setae laterally; gastric elevations slightly rugose. Branchiostegites each with few small spines on dorsal to anterior margin (Fig. 11D). Posteromedian plate (Fig. 11B) well calcified, moderately narrow.

Ocular peduncles (Fig. 11A) moderately slender, slightly unequal (left longer than right), 0.7 times as long as shield, not inflated basally, bearing longitudinal row of tufts of setae dorsomesially; corneas not dilated, slightly broader than basal width, corneal diameter about 0.2 of peduncular length; ocular acicles triangular, each terminating in simple spine.

Antennular peduncles (Fig. 11A, C) with tips of ultimate segments falling short of distal corneal margins; basal segment with small spine on distolateral margin of statocyst lobe, ventrodistal margin produced in sharp spine; penultimate segment unarmed; ultimate segment slightly longer than penultimate segment; dorsal flagellum slightly longer than ultimate segment.

Antennal peduncles (Fig. 11A, D) short, reaching distal 0.3 of ocular peduncles; first segment unarmed, ventromesial distal angle produced; second segment with dorsolateral distal angle produced, terminating in simple spine, few subdistal spines present on mesial margin, dorsomesial distal angle with small spine, mesial half of dorsal surface not particularly elevated; third segment with strongly produced, sharply pointed ventromesial distal angle; fourth segment with simple spine at distolateral angle; fifth segment relatively slender, unarmed; antennal acicle moderately stout, reaching midlength of fifth peduncular segment, terminating in simple spine, mesial margin with 3 (right) or 4 (left) spines proximally, lateral margin with 3 (left) or 5 (right) spines. Antennal flagellum slightly longer than shield, consisting of about 30 articles (articles longer than wide), each article with some short setae on distal margin.

Third maxilliped (Fig. 11F) moderately slender; carpus with small dorsodistal and ventrodistal spines; merus with row of 6 small spines on ventrolateral margin (middle spine largest) and with minute dorsodistal spine; ischium with dorsodistal and ventrodistal spinules, and with well-developed crista dentata consisting of row of sharp triangular corneous teeth; coxa with 2 small spines at ventrodistal angle.

Chelipeds unequal, dissimilar; left larger; spines usually corneous-tipped, but these tips not particularly elongate nor darkly pigmented (Fig. 12F). Left cheliped (Fig. 12A, B, D, E) with chela about 1.7 times as long as wide, subovate in dorsal view. Dactylus about 1.5 times as long as palm; dorsomesial margin delimited by row of small spines, dorsal surface with irregular rows of small spines and tufts of stiff setae; mesial face with row of small spines or tubercles on midline, and irregular row of small tubercles dorsal and ventral to median row, spines or

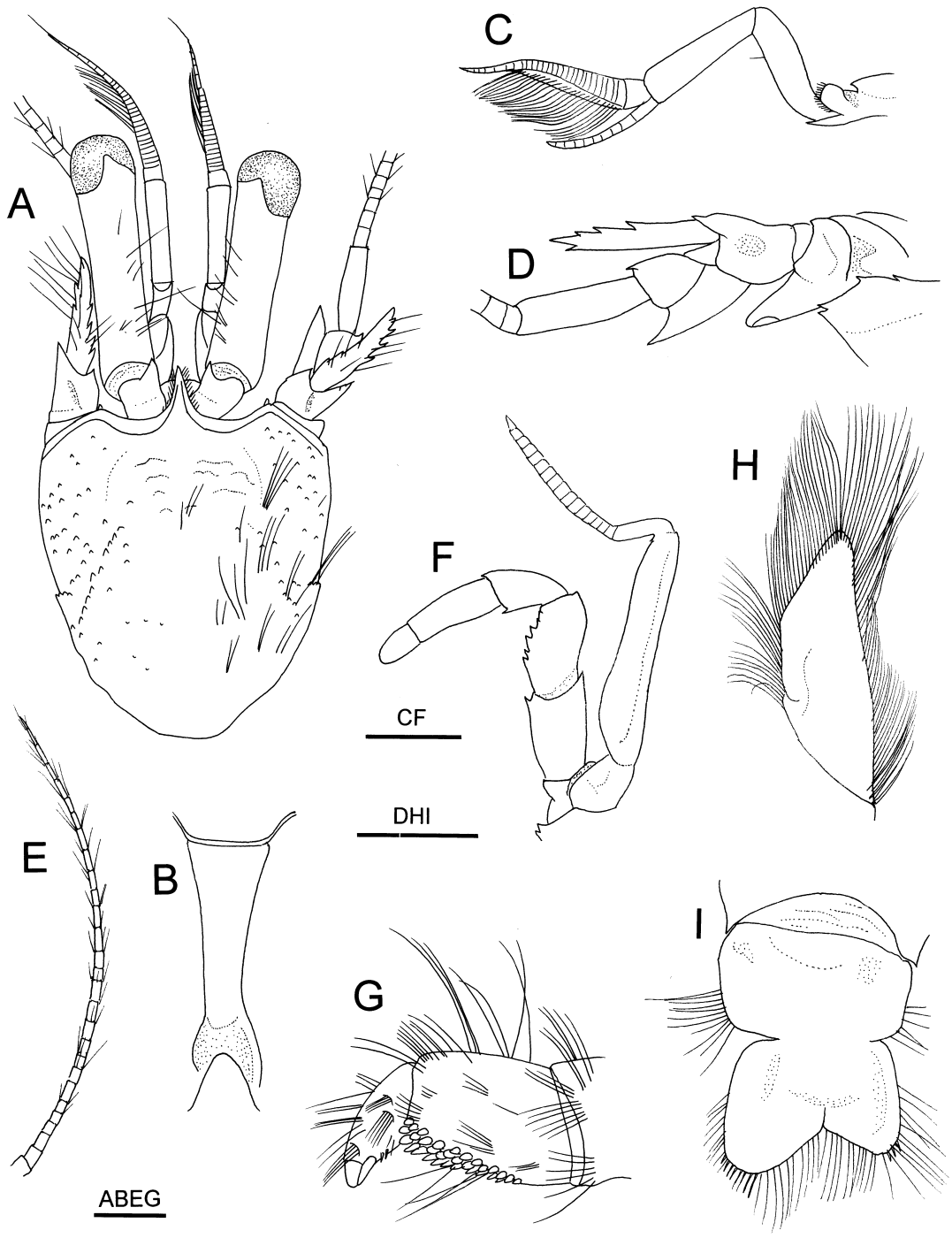


**Fig. 11.** *Paguristes tosaensis* sp. nov. Holotype, ovigerous female (sl 4.8 ㎜), CBM-ZC 3373. A, shield and cephalic appendages, dorsal view (setae on left side of shield omitted); B, posteromedian plate of carapace, dorsal view; C, right antennule, lateral view; D, left antennal peduncle and anterior part of branchiostegite, lateral view; E, left antennal flagellum, dorsal view; F, left third maxilliped, lateral view (setae omitted); G, dactylus, propodus and distal part of carpus of left fourth pereopod, lateral view; H, brood pouch, lateral view; I, telson, dorsal view. Scale bars : 2 ㎜ for H; 1 ㎜ for A–F, I; 0.5 ㎜ for G.

tubercles accompanied by tufts of setae (Fig. 12C); cutting edge with row of small calcareous teeth, terminating in small corneous claw; no hiatus between dactylus and fixed finger. Palm with row of moderate to large spines on dorsomesial margin, convex dorsal surface with covering of prominent spines and sparse tufts of setae, dorsolateral margin not clearly delimited; mesial face with few low protuberances accompanied by tufts of setae dorsally, nearly smooth ventrally; lateral face of palm and fixed finger with scattered spinulose tubercles; ventral surface with longitudinal row of spines (proximal 2 spines prominent) and sparse tufts of long setae; cutting edge of fixed finger faintly sinuous, denticulate, terminating in large corneous claw. Carpus with row of large spines on dorsomesial margin accompanied by tufts of sparse setae; dorsolateral margin not delimited; dorsal and lateral surfaces with numerous scattered spines, each spine bearing tuft of setae; mesial face with submarginal row of tiny tubercles distally and row of low protuberances along distal margin, each protuberance with tuft of setae. Merus with row of spines on dorsal margin decreasing in size proximally and becoming obsolete; subdistal transverse ridge extending onto mesial and lateral faces, tuberculate; distal margin with row of spines, dorsal spines strongest; lateral face with scattered tiny tubercles, ventrolateral margin smooth in distal 0.2, with row of small tubercles in proximal 0.8; mesial face nearly smooth, ventromesial margin with row of small spines or spinulose tubercles over entire length and sparse setae. Ischium with row of tiny tubercles on ventromesial margin.

Right cheliped with chela about 2.2 times as long as wide; dactylus about 1.6 times as long as palm; armature and setation generally similar to that of left cheliped (Fig. 12G, H).

Second and third pereopods (Figs. 13A, B, 14A, B) moderately slender, differing somewhat in armature. Dactyli 1.5–1.7 times as long as propodi; dorsal margins each with row of spinules, sometimes corneous-tipped in proximal half (second), and numerous long stiff setae (second and third), setae becoming to form distinct tufts distally; lateral faces each with sparse tufts of setae; mesial faces each with row of tufts of setae dorsally and ventrally, but without spines or spinules; ventral margins each with 26–30 slender corneous spinules (Fig. 13C). Propodi of second pereopods each with row of prominent spines and tufts of setae on dorsal margin; lateral faces each with dorsal row of low protuberances and rows of tufts of setae on midline and adjacent to ventral margin; mesial faces without spines or tubercles, but with irregular rows of tufts of short to moderately short setae; ventral surfaces each with row of low protuberances and tufts of setae. Propodi of third pereopods each with row of low protuberances and tufts of setae on dorsal surface; lateral faces each with row of low protuberances bearing tuft of setae dorsally and median row of tufts of short setae; mesial faces with irregular rows of short setae; ventral surfaces each with row of tufts of long setae. Carpi each with shallow longitudinal sulcus and tufts of setae in dorsal half of lateral surface; dorsal margin with irregular double row of prominent spines mesially (second) or with small dorsodistal spine and row of very low protuberances (third), these spines or protuberances accompanied by tufts of setae; mesial faces with few tufts of setae. Meri with tufts of setae on dorsal margins; lateral faces with scattered tufts of short setae; mesial faces of second with scattered short setae dorsally and ventrally, those of third with several tufts of setae dorsally; ventral margins each with blunt subdistal projection laterally and row of small spinulose tubercles (second) or unarmed (third); long setae present on ventral margins. Ischia unarmed, with numerous setae on dorsal and ventral margins.

Fourth pereopods each with prominent preungual process followed by few corneous spinules on ventral margin of dactylus (Fig. 11G) . Propodal rasp consisting of 3 irregular rows of rounded corneous scales. Carpi without dorsodistal spine.

Female paired first pleopods with each articulation between basal and distal segments indistinct; basal segment with moderately long setae marginally; distal segment subequal in length to and narrower than basal segment. Second to fourth unpaired left pleopods with both rami well developed, exopods much longer than endopods; fifth pleopod with exopod well developed, relatively broad, endopod rudimentary. Brood pouch (Fig. 11H) relatively small, narrow subtriangular, margins not scalloped, entire, fringed with long plumose setae. Second to fourth pleonal tergites each with area of weak calcification, left with row of dense, long setae partially obscuring bases of pleopods, setae on fourth continuous to margin of brood pouch, right without setae; no prominent flap-like projection developed on right third tergite.

Telson (Fig. 11I) with deep lateral incisions; median cleft relatively deep, narrow; posterior lobes asymmetrical, roundly triangular, terminal and lateral margins unarmed, each with row of long setae.

Eggs moderately small, 1.1–1.2 mm in longer axis.

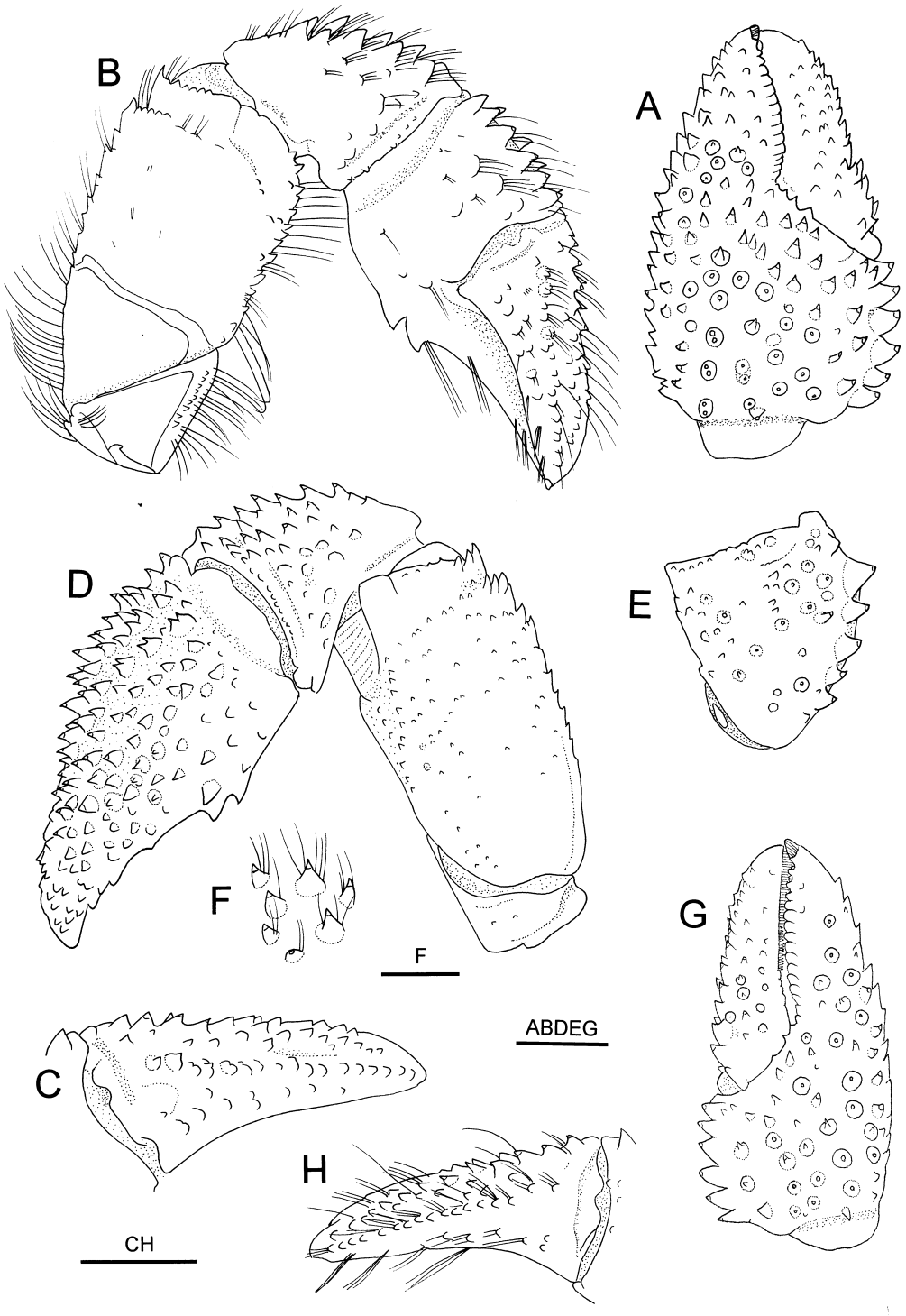


**Fig. 12.** *Paguristes tosaensis* sp. nov. Holotype, ovigerous female (sl 4.8 ㎜), CBM-ZC 3373. Chelipeds, setae omitted. A, left chela, dorsal view; B, left cheliped, mesial view; C, dactylus of right chela, mesial view; D, left cheliped, lateral view; E, carpus of left cheliped, dorsal view; F, detail of armature of left palm; G, right chela, dorsal view; H, dactylus of right chela, mesial view. Scale bars : 1 ㎜ for A–E, G, H; 0.5 ㎜ for F.

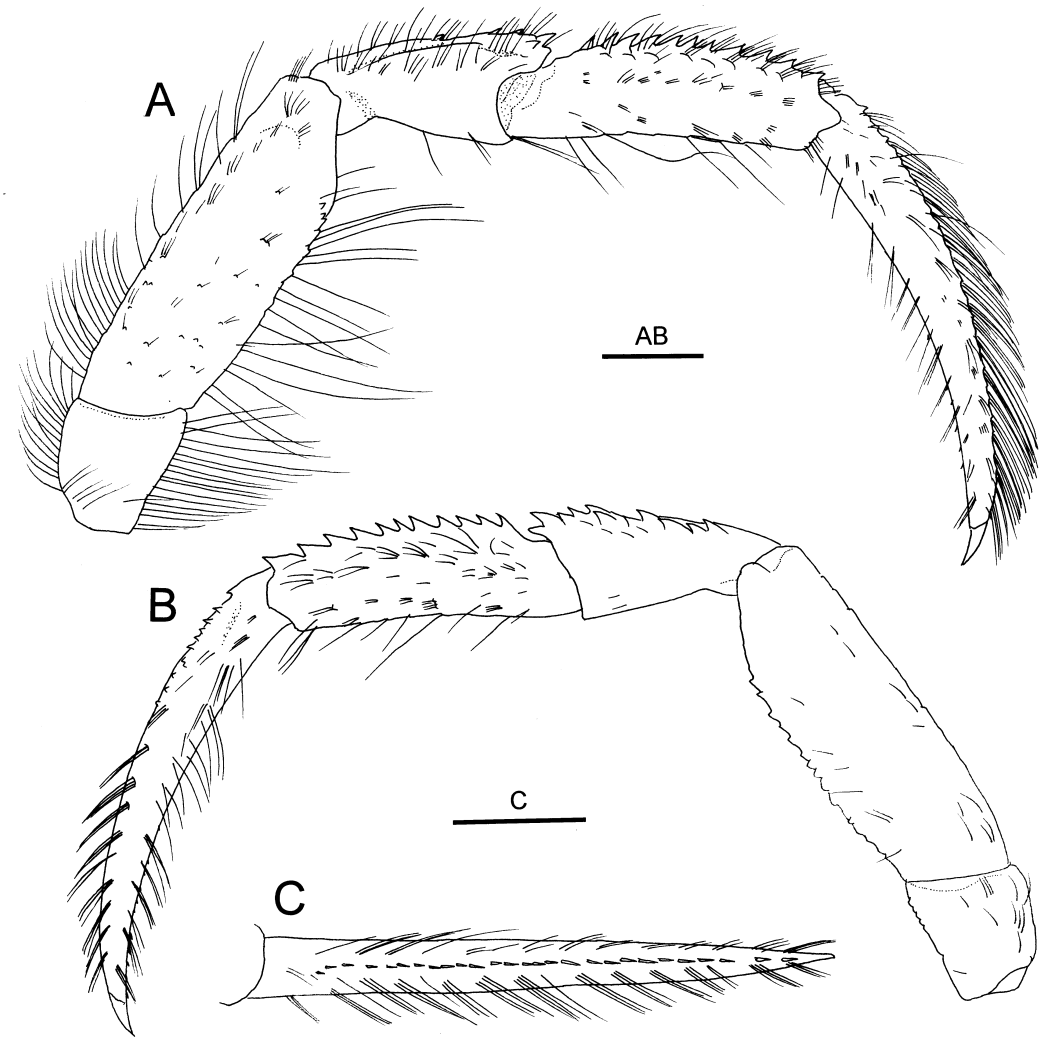


**Fig. 13.** *Paguristes tosaensis* sp. nov. Holotype, ovigerous female (sl 4.8 ㎜), CBM-ZC 3373. A, left second pereopod, lateral view; B, same, mesial view; C, same, dactylus, ventral view. Scale bars : 1 ㎜.

*Coloration*. Unavailable.

*Distribution*. Known only from Tosa Bay, at depths of 90–92 m.

*Remarks*. *Paguristes tosaensis* sp. nov. is very similar to *P. calvus*, particularly in the armature on the dorsal surfaces of chelae consisting of simple corneous-tipped spines and the possession of a median row of small spines on the mesial face of each cheliped dactylus (cf. Rahayu and McLaughlin, 2006). With the single specimen of the present new species, it is not possible to assess variation, although information on morphological variation of *P. calvus* has been recently increased (McLaughlin *et al*., 2007; Rahayu and Forest, 2009). There are characters that clearly are not subject to as much variation that can be used to distinguish between the two taxa. The mesial face of dactylus of the left second pereopod of *P. tosaensis* sp. nov. is slightly rounded in general and unarmed, but it is shallowly sulcate and armed with a row of small calcareous spines adjacent to the ventral margin in *P. calvus*. The brood pouch of the new species is narrowly triangular with smooth margins, rather than broadly subtriangular with a slightly scalloped margins in *P. calvus*. In addition, the number of spinules on ventral margins of dactyli of the second and third pereopods tends to be fewer in *P. tosaensis* sp. nov.

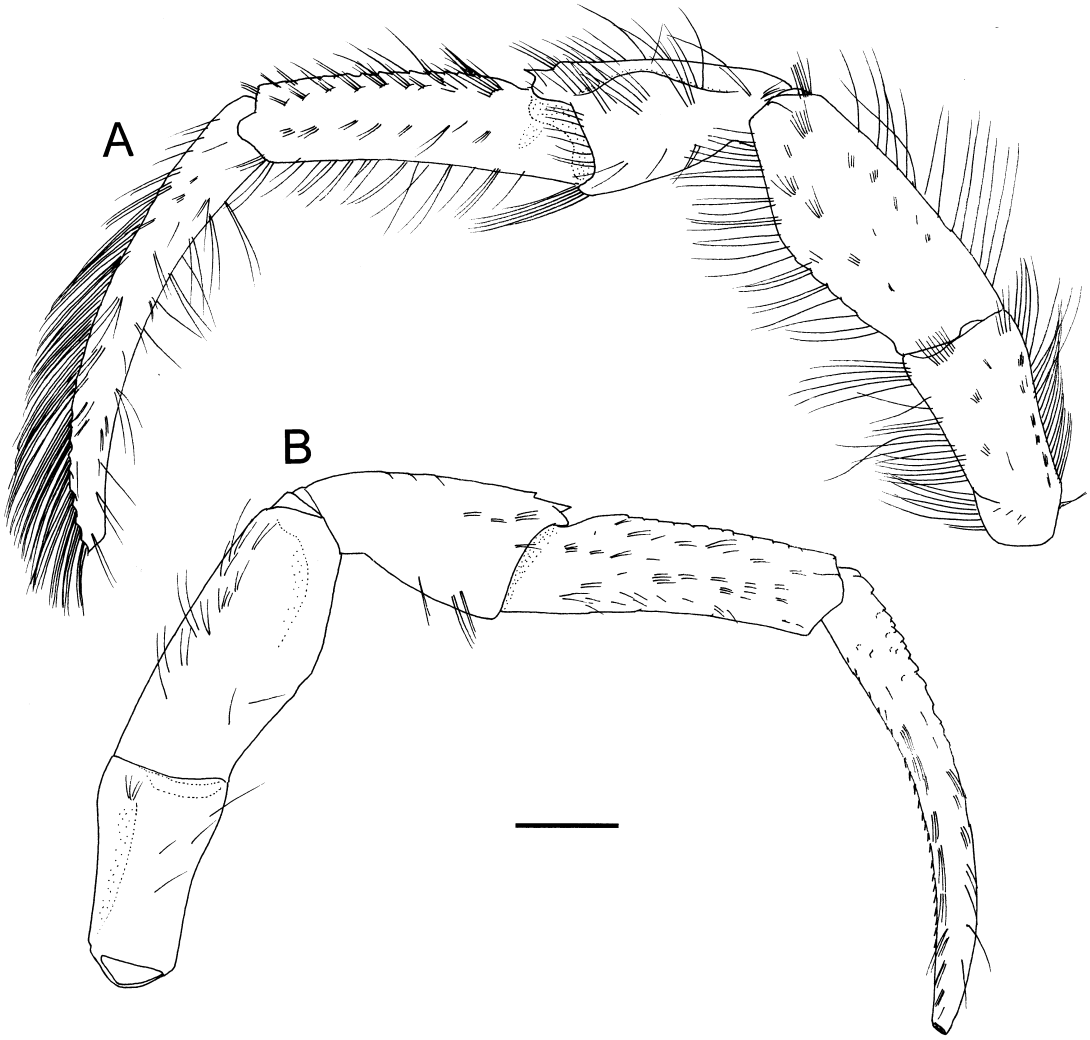


**Fig. 14.** *Paguristes tosaensis* sp. nov. Holotype, ovigerous female (sl 4.8 ㎜), CBM-ZC 3373. A, left third pereopod, lateral view; B, same, mesial view. Scale bar : 1 ㎜.

than in *P. calvus*, 27–30 rather than 29–40 in *P. calvus*. The antennular peduncles does not reach the distal corneal margins in *P. tosaensis* sp. nov., whereas they overreach them in *P. calvus*. The left posterior lobe of the telson is less elongate in the new species than in *P. calvus*.

*Etymology*. Named after the locality, Tosa Bay, where the unique type specimen was collected.

## Acknowledgments

I thank Tin-Yam Chan (NTOU), Régis Cleva (MNHN) and Hiroshi Namikawa (Showa Memorial Institute, NSMT) for loaning material under their care and Kunio Sasaki (Faculty of Science, Kochi University) for donating material of hermit crabs from Tosa Bay. I am grateful to the crews and biologists on board TRV *Toyoshio-maru* of Hiroshima University (1998 cruise, chief scientist, Prof. Susumu Ohtsuka) for their cooperation during field surveys. Sincere thanks are extended to Drs. Dwi Listyo Rahayu (Research Center for Ocenology, Indonesian Institute of Sciences) and Masayuki Osawa (University of the Ryukyus) for kind review of the manuscript and for offering helpful comments and suggestions for improvements.

## References


Alcock, A. 1905. Anomura. Fasc. I. Pagurides. Catalogue of the Indian decapod Crustacea in the collection of the Indian Museum 2 : 1–197, pls. 1–16.

Forest, J. and P. A. McLaughlin, 1998. Descriptions of two new Japanese hermit crabs (Decapoda : Paguridea : Diogenidae). Proc. Biol. Soc. Wash. 111 : 188–198.

Forest, J. and P. A. McLaughlin. 2000. Superfamily Coenobitoidea, Families Pylochelidae and Diogenidae. *In* Forest, J., M. de Saint Laurent, P. A, McLaughlin and R. Lemaitre (eds.) The Marine Fauna of New Zealand : Paguridea (Decapoda : Anomura) exclusive of the Lithodidae. NIWA Biodiv. Mem. 114 : 31–103.

Gordan, J. 1956. A bibliography of pagurid crabs, exclusive of Alcock, 1905. Bull. Amer. Mus. Nat. Hist. 108 : 253–352.

Kikuchi, T. and S. Miyake. 1978. Fauna and Flora of the Sea around the Amakusa Marine Biological Laboratory. Part II. Decapod Crustacea (Revised Edition). 52 pp. The Amakusa Marine Biological Laboratory, Kyushu University, Tomioka.

Komai, T. 1999. Hermit crabs of the families Diogenidae and Paguridae (Crustacea : Decapoda : Anomura) collected during the Shin'yo-Maru cruise to Ogasawara Islands and Torishima Island, oceanic islands in Japan. Nat. Hist. Res., Spec. Issue 6 : 1–66.

Komai, T. 2001. A review of the northwestern Pacific species of the genus *Paguristes* (Decapoda : Anomura : Diogenidae), I. Five species initially reported by Ortmann (1892) from Japan. J. Nat. Hist. 35 : 357–428.

Komai, T. 2009. A review of the northwestern Pacific species of the genus *Paguristes* (Decapoda : Anomura : Diogenidae). II. Species transferred to the genus *Stratiotes*, with descriptions of two new species. Nat. Hist. Res. 10 : 59–92.

Matsuzawa, K. 1977. Seashore Animals of Muroto. 7+15 pp., 126 pls. Publishing Committee of Sea Shore Animals of Muroto, Kansai-Insatsu-Kogyo, Co. Ltd., Kochi. (in Japanese)

McLaughlin, P. A. 2002. A review of the hermit-crab (Decapoda : Anomura : Paguridea) fauna of southern Thailand, with particular emphasis on the Andaman Sea, and descriptions of three new species. Phuket Marine Biological Center Special Publication 23 : 385–460.

McLaughlin, P. A. 2008. Australian hermit crabs of the genera *Paguristes* Dana, *Stratiotes* Thomson, and *Pseudopaguristes* McLaughlin (Crustacea :Anomura: Paguroidea : Diogenidae). Rec. West. Aust. Mus., Suppl. 73 : 185–271.

McLaughlin, P. A. and D. L. Rahayu. 2005. Two new species of *Paguristes sensu stricto* (Decapoda : Anomura : Paguroidea : Diogenidae) and a review of *Paguristes pusillus* Henderson. Zootaxa 1083 : 31–62.

McLaughlin, P. A., D. L. Rahayu, T. Komai and T.-Y. Chan. 2007. A Catalog of the Hermit Crabs (Paguroidea) of Taiwan. 367 pp. National Taiwan Ocean University, Keelung.

Milne Edwards, H. 1836. Observations zoologiques sur les Pagures et descrition d 'un nouveau genre de la tribu des Paguriens. Ann. Sci. Nat., Zool., 6 : 257–288.

Milne Edwards, H. 1837. Histoire Naturelle des Crutacés. 531 pp. Librarie Encyclopédique de Roret, Paris.

Minemizu, R. 2000. Marine Decapod and Stomatopod Crustaceans mainly from Japan. 344 pp. Bun'ichi-Sogo Publication, Ltd., Tokyo. (in Japanese)

Miyake, S. 1961. Decapod Crustacea. *In* Fauna and Flora of the Sea around the Amakusa Marine Biological Laboratory 2. 52 pp. The Amakusa Marine Biological Laboratory, Kyushu University, Tomioka. (in Japanese)

Miyake, S. 1975. Anomura. *In* Utinomi, F. (ed.), Freshwater and Marine Animals. Pp. 187–342. Gakushu-kenkyusha, Tokyo. (in Japanese)

Miyake, S. 1978. The crustacean Anomura of Sagami Bay. 200 pp. (English), 161 pp. (Japanese). Biological Laboratory, Imperial Household, Tokyo.

Miyake, S. 1982. Japanese Crustacean Decapods and Stomatopods in Color. Vol. 1. Macrura, Anomura and Stomatopoda. 261 pp., 56 pls. Reprinted 1991, 1999. Hoikusha, Osaka. (In Japanese)

Miyake, S. and M. Imafuku. 1980. Hermit crabs from Kii Peninsula I. Nankiseibutu 22 : 1–7. (In Japanese)

Miyake, S., K. Sakai and S. Nishikawa. 1962. A faunallist of the decapod Crustacea from the coasts washed by the Tsushima warm current. Rec. Oceanogr. Works Jap., Spec. No. 6 : 121–131.

Osawa, M. and M. Takeda. 2004. Hermit crabs (Crustacea : Decapoda : Anomura; Paguroidea) from submarine caves in the Ryukyu Islands, southwestern Japan. J. Nat. Hist. 38 : 1097–1132.

Rahayu, D. L. 2005. Indonesian new additions to the hermit crab genus *Pseudopaguristes* McLaughlin and a further division of the genus *Paguristes* Dana (Crustacea : Decapoda : Paguroidea : Diogenidae).

Zootaxa 831 : 1–42.
Rahayu, D. L. 2006. The genus *Paguristes* from Indonesia (Decapoda : Anomura : Diogenidae). *In* Richer de Forges, B. and J.-L. Justine (eds.) Tropical Deep-sea Benthos Vol. 24. Mém. Mus. Natn. Hist. Nat. 193 : 349–374.
Rahayu, D. L. 2007. The hermit crabs *Paguristes* Dana, 1851 s.l. (Crustacea, Decapoda, Anomura, Diogenidae) from the western Indian Ocean. Zoosystema 29 : 515–534.
Rahayu, D. L. and J. Forest. 2009. Le genre *Paguristes* Dana aux Philippines avec la description de deux nouvelles espéces (Decapoda, Anomura,Diogenidae). Crustaceana 82 : 1307–1338.
Rahayu, D. L. and P. A. McLaughlin. 2006. Clarifications of the identities of *Paguristes balanophilus* and *P. calvus* Alcock (Decapoda : Anomura : Paguroidea : Diogenidae) and the description of another broadly distributed new species. Zoosystema 28 : 865–886.
Takeda, M. 1982. Keys to the Japanese and Foreign Crustaceans Fully Illustrated in Colors. vi＋58 pp (keys)＋284 pp. Hokuryukan, Tokyo.

# 西部北太平洋産ヒメヨコバサミ属（十脚目：異尾下目：ヤドカリ科）の再検討．Ⅲ．ヒノマルヒメヨコバサミの種同定の再検討と日本産２新種の記載

駒井智幸

千葉県立中央博物館
〒260-8682　千葉市中央区青葉町 955-2

ヒノマルヒメヨコバサミはこれまで *Pagurisutes balanophilus* Alcock, 1905 として知られてきたが，日本各地，台湾，シナ海で採集された標本をもとに再検討を行った結果，*Paguistes gonagrus* (H. Milne Edwards, 1836)と同一であることが明らかとなった．本種の詳細な再記載を与え，特徴を明らかとし，近縁種との比較を行った．さらに，２新種 *Paguristes ocellus* sp. nov.（新称：モンツキヒメヨコバサミ）と *P. tosaensis* sp. nov.（新称：トサヒメヨコバサミ）を記載した．*Paguristes ocellus* は沖縄本島近海から採取された抱卵雌１個体に基づき記載された．本新種は *P. balanophilus* と *P. alcocki* McLaughlin and Rahayu, 2005 に近縁であると考えられるが，鉗脚の掌部にある棘の形状や第２胸脚前節内面の状態などの形質により識別される．一方の *P. tosaensis* は高知沖土佐湾から採集された抱卵雌１個体に基づき記載された．本新種は *P. calvus* Alcock, 1905 に近縁であると考えられるが，左第２胸脚指節内面の構造や覆卵葉の形状で識別される．東アジア海域における *P. balanophilus* の分布は，本研究においては確認されなかった．