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Designation of *Ancylomenes* gen. nov., for the '*Periclimenes aesopius* species group' (Crustacea: Decapoda: Palaemonidae), with the description of a new species and a checklist of congeneric species*

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Abstract

A new genus of the subfamily Pontoniinae, *Ancylomenes* gen. nov. is established for the '*Periclimenes aesopius* species group' of the genus *Periclimenes* Costa. The new genus is distinguished from other genera of Pontoniinae on account of the strongly produced inferior orbital margin with reflected inner flange, and the basicerite of the antenna armed with an angular dorsal process. Fourteen species have been previously recognized as belonging to the '*P. aesopius* species group'. One Eastern Pacific species (*P. lucasi* Chace), and two Atlantic species (*P. anthophilus* Holthuis & Eibl-Eibesfeldt, and *P. pedersoni* Chace) are now also placed in *Ancylomenes* gen. nov. A further new species associated with a cerianthid sea anemone, *A. luteomaculatus* sp. nov. is described and illustrated on the basis of specimens from the Ryukyu Islands, southern Japan, and Philippines. A key for their identification, and a checklist of the species of *Ancylomenes* gen. nov. are provided.

Key words: Crustacea, Decapoda, Palaemonidae, *Periclimenes*, *Ancylomenes*, new genus, new species

Introduction

In 1993 and 1994, important references for taxonomic studies on the subfamily Pontoniinae were proposed; a partial revision for the Philippine-Indonesian species of Palaemonoidea (Chace & Bruce 1993), and the synopsis of the Indo-Pacific genera of Pontoniinae (Bruce 1994). In these articles, *Periclimenes* Costa, 1844 was considered the largest genus in Pontoniinae, containing over 140 species worldwide at that time. Bruce (1994) suggested that *Periclimenes* might be polyphyletic in origin because several distinct species groups have been recognized in the genus (Kemp 1922; Bruce 1987, 1989, 1990b; Berggren 1994; Okuno 2002). Since 2004, indeed, several *Periclimenes* species have been removed, 8 genera newly established (Bruce 2006, 2007b, c; Bruce *et al*. 2005; Marin 2006, 2007; Marin & Chan 2006; Li 2009) and 4 resurrected genera (Bruce 2004, 2007a, d; Okuno & Fujita 2007; Okuno 2009). Furthermore, the generic position of some of the remaining species of *Periclimenes* remains unclear.

One of the species groups within *Periclimenes*, the '*Periclimenes aesopius* species group' is characterized by the reflected infraorbital angle on carapace, an interocular process on the ophthalmic somite, and an angular process on the dorsal margin of the antennal basicerite. These morphological particulars are lacking not only in other *Periclimenes* species but also in other genera of the Pontoniinae, we consider, therefore, that this species group should be elevated to full generic status. In this paper, we establish a new genus, *Ancylomenes*, for the '*P. aesopius* species group'. Fourteen Indo-West Pacific species previously considered

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in this species group, one East Pacific species, *P. lucasi* Chace, 1937, and two Atlantic species, *P. pedersoni* Chace, 1958 and *P. anthophilus* Holthuis and Eibl-Eibesfeldt, 1964, are now placed to *Ancylomenes* gen. nov.

The colour pattern in life is a most useful distinguishing feature separating the species of *Ancylomenes* gen. nov. (see Bruce 1990b, 2005; Okuno 2004, 2005). An unfamiliar species of the genus was reported in some field guides of decapod crustaceans (Debelius 1999; Kawamoto & Okuno 2003). The presence of golden-yellow spots on the carapace and pattern on the third abdominal somite in this species did not agree with the colour pattern of the previously described related species. Our examination of specimens from the Ryukyu Islands and Philippines clearly showed that they represent an undescribed species. This species is described below as new to science under the name of *Ancylomenes luteomaculatus* sp. nov.

Materials and Methods

The additional specimens of the Indo-West Pacific species examined in this study were collected from the sublittoral zone in southern Japan with the use of SCUBA equipment.

Abbreviations of institutional names: AHF = Allan Hancock Foundation, Los Angeles; AM = The Australian Museum, Sydney; AMPI = Australian Marine Photographic Index, Brisbane; BMNH = The Natural History Museum, London; CBM = Natural History Museum and Institute, Chiba; CMNH = Coastal Branch of Natural History Museum and Institute, Chiba; MNHN = Muséum National d'Histoire Naturelle, Paris; NFU = National Fisheries University, Shimonoseki; NSMT = National Museum of Nature and Science, Tokyo; NTM = Northern Territory Museum, Darwin; QM = Queensland Museum, South Brisbane; RMNH = Nationaal Natuurhistorisch Museum - Naturalis, Leiden (formerly Rijksmuseum van Natuurlijke Historie); SMF = Naturmuseum Senckenberg, Frankfurt; USNM = National Museum of Natural History, Washington, D. C; ZMC = Zoological Museum, Cambridge.

Taxonomy

Palaemonidae Rafinesque, 1815

Pontoniinae Kingsley, 1879

Ancylomenes gen. nov.

Diagnosis. Medium sized pontoniine shrimp with subcylindrical body, with relatively small cephalothorax and large abdomen. Rostrum well developed, usually arched, dorsal margin dentate, ventral margin dentate or edentate, lateral and ventral carinae obsolete. Carapace smooth, glabrous, antennal and hepatic spines present, supraorbital spine or eave absent, epigastric spine present or absent, inferior orbital margin strongly produced, with reflected inner ventral flange, pterygostomial angle blunt, unarmed. Abdomen smooth, tergum of third somite distinctly posteriorly produced, pleura of fourth and fifth somites posteriorly produced. Telson with 2 pairs of dorsal spines, 3 pairs of posterior spines. Ophthalmic somite with well developed or obsolete interocular process. Second and third thoracic sternites not considerably elongate, fourth sternite without finger-like median process. Antennule well developed, upper flagellum biramous. Antenna with basicerite with proximal angular process dorsally, scaphocerite well developed. Epistome unarmed. Mandible without palp, molar process slender, incisor process well developed, dentate. Maxillula with feebly bilobed palp, laciniae slender. Maxilla with slender, tapering palp, distal endite well developed, simple or bilobed, proximal endite obsolete, scaphognathite narrow. Maxillipeds with functional exopods. First pereiopods with fingers simple, not spatulate, cutting borders entire, not denticulate. Second pereiopods elongate, similar or dissimilar, fingers with cutting borders dentate or edentate, merus without distoventral spine. Ambulatory pereiopods slender, propodi spinulate ventrally, dactyli simple or biunguiculate. Endopod of male first pleopod oval, with small appendix interna.

Type species. *Periclimenes venustus* Bruce, 1990, by present designation.

Etymology. From Greek word *ancylos* meaning bent, and part of the generic name *Periclimenes*, in allusion to the well developed and humpbacked third abdominal tergum of the members of the genus. Gender: masculine.

Distribution. Tropical to warm-temperate waters of the Indo-West Pacific, Eastern Pacific, and Western Atlantic Ocean.

Ecology. Species of *Ancylomenes* gen. nov. are associated with cnidarian marine invertebrates. Most of species are also known to clean fishes (e. g. Limbaugh *et al* 1961; Nizinski 1989; Okuno & Nomura 2002; Becker & Grutter 2004).

Systematic position. Closely related to *Periclimenes* sensu stricto, in which the species were formerly included. Distinguished from that genus by the small cephalothorax and larger abdomen, nearly always acutely produced inferior orbital angle with reflected inner flange, large anterolateral lobe on proximal segment of antennular peduncle, dorsoproximal angular process of antennal basicerite, and well developed or obsolete interocular process of ophthalmic somite.

Ancylomenes gen. nov. is also similar to *Leptomenaeus* Bruce, 2007 in sharing several morphological features. These two genera are discriminated on account of the structure of second and third thoracic sternites, antennular peduncle, and second pereiopod pointed out by Ďuriš & Horká (2008).

Remarks. *Periclimenes lucasi* from the tropical Eastern Pacific, and *P. pedersoni* and *P. anthophilus* from the western Atlantic Ocean have been reported several times, but the structure of their inferior orbital margin, ophthalmic somite and antennal basicerite have not previously been described in detail. We examined additional specimens of these three species, and found that they possess the diagnostic features of *Ancylomenes* gen. nov. as mentioned above. These species are also associated with sea anemones, as well as being reef fish cleaners. This behaviour is also similar to that of some of the Indo-Pacific species. Thus, we regard without doubt that *P. lucasi*, *P. pedersoni* and *P. anthophilus* also belong to *Ancylomenes* gen. nov.
Bruce (2008a) and Okuno & Imazeki (2008) regarded *Periclimenes tonga* Bruce, 1990, known only by the ovigerous female holotype, as a member of '*P. aesopius* species group'. However, the unarmed basicerite of the antenna and the finely tuberculate second pereiopod distinguish *P. tonga* from the members of *Ancylomenes* gen. nov. (see Bruce 1990a). Thus, we consider *P. tonga* as not assigned to the present new genus.

In conclusion, fifteen Indo-Pacific, one Eastern Pacific, and two Western Atlantic species are now placed the new genus. The key to the species of *Ancylomenes* gen. nov. is provided below.

Key to the species of *Ancylomenes* gen. nov.

1. Dactyli of ambulatory pereiopods simple 2
– Dactyli of ambulatory pereiopods biunguiculate 3
2. Second pereiopods similar in form ..... ***A. tosaensis* (Kubo) comb. nov.**
– Second pereiopods unequal and dissimilar, major pereiopod with dactylus dorsally with lateral flange ..... ***A. lucasi* (Chace) comb. nov.**
3. Carapace with 2-3 postorbital teeth (third abdominal tergum with elevated posterior median carina) ..... ***A. aesopius* (Bate) comb. nov.**
– Carapace with 0-1 postorbital teeth 4
4. Carpus of second pereiopod distinctly longer than chela (carapace without epigastric spine; third abdominal tergum with posterior median carina) ..... ***A. longicarpus* (Bruce & Svoboda) comb. nov.**
– Carpus of second pereiopod shorter than chela 5
5. Distolateral margin of proximal segment of antennular peduncle pointed, triangular 6
– Distolateral margin of proximal segment of antennular peduncle rounded 7
6. Dactylus of major second pereiopod slender, gradually tapering distally…***A. pedersoni* (Chace) comb. nov.**
– Dactylus of major second pereiopod depressed, dorsally flattened ..... ***A. anthophilus* (Holthuis & Eibl-Eibesfeldt) comb. nov.**
7. Ophthalmic somite with interocular process obsolete 8
– Ophthalmic somite with interocular process developed 11

8. Rostrum armed dorsally with 10–13 teeth 9
– Rostrum armed dorsally with 7–9 teeth 10
9. Dactylus of third pereiopod 7.5 or more times as long as basal width; rostrum armed ventrally with 1 or 2 teeth ..... ***A. adularans* (Bruce) comb. nov.**
– Dactylus of third pereiopod about 5.5 times as long as basal width; rostrum armed ventrally with 3–5 teeth ..... ***A. aqabai* (Bruce) comb. nov.**
10. Third abdominal tergum posterodorsally subcarinate; scaphocerite narrow, 2.7–3.3 times as long as width ..... ***A. luteomaculatus* sp. nov.**
– Third abdominal tergum posterodorsally not markedly carinate; scaphocerite broad, 1.9–2.4 times as long as width. ..... ***A. magnificus* (Bruce) comb. nov.**
11. Propodi of ambulatory pereiopods with single ventral spine posterior to distoventral spine 12
– Propodi of ambulatory pereiopods with two or more ventral spines posterior to distoventral spine 13
12. Second pereiopods overreaching tip of scaphocerite by distal part of meri, cutting borders of fingers with 6–8 acute, recurved teeth ..... ***A. venustus* (Bruce) comb. nov.**
– Second pereiopods overreaching tip of scaphocerite by proximal part of palm, cutting borders of fingers with 2–4 acute, recurved teeth ..... ***A. sarasvati* (Okuno) comb. nov.**
13. Rostrum straight, upwardly directed ..... ***A. tenuirostris* (Bruce) comb. nov.**
– Rostrum horizontal, usually arched 14
14. Dactylus of second pereiopod armed proximally with a single tooth; closed fingers of second pereiopod with marginal proximal concavity ..... ***A. holthuisi* (Bruce) comb. nov.**
– Dactylus of second pereiopod armed with 2 or more recurved teeth 15
15. Fingers of second pereiopod armed with 4 large acute teeth. ..... ***A. grandidens* (Bruce) comb. nov.**
– Fingers of second pereiopod armed with small recurved teeth 16
16. Carpus of second pereiopod shorter than palm; third abdominal tergum posterodorsally subcarinate ..... ***A. kobayashii* (Okuno & Nomura) comb. nov.**
– Carpus of second pereiopod as long as , or longer than palm; third abdominal tergum posterodorsally not markedly carinate 17
17. Second pereiopod with carpus distinctly longer than palm; dactyli of ambulatory pereiopods with ungues only slightly longer than accessory teeth ..... ***A. speciosus* (Okuno) comb. nov.**
– Second pereiopod with carpus shorter or not markedly longer than palm; dactyli of ambulatory pereiopods with ungues markedly longer than accessory teeth ..... ***A. amirantei* (Bruce) comb. nov.**

Description of a new species

Ancylomenes luteomaculatus sp. nov.

(Figs. 1–5, 6A–B)

Periclimenes cf. *venustus.* — Debelius 1999: 179, unnumbered figs. Not *Periclimenes venustus* Bruce, 1990 (see **Remarks**).

Periclimenes sp. D. — Kawamoto & Okuno 2003: 45, unnumbered figs. (see **Remarks**).

Periclimenes sp. — Fransen 2004: 21, unnumbered fig. (see **Remarks**).

Material examined. Holotype. CMNH-ZC 02200, male, CL 3.6 mm, off Gima Harbor, Kume-jima Island, Ryukyu Islands, Japan, 26º19.7'N, 126º45.6'E, 32 m, associated with *Pachycerianthus* sp., 13 November 2002, leg. J. Okuno and T. Kawamoto. Paratypes. **Ryukyu Islands**. CMNH-ZC 02372, 1 male, CL 3.3 mm, 1 male, CL 3.4 mm, 1 female, CL 3.0 mm, same data as holotype. **Philippines**. QM W28900, AMPI 1494, 1 ov. female, CL 4.7 mm, Anilao, Batangas Bay, Luzon, 27 m, associated with "tube anemone", 9 April 2004, leg. N. Coleman.

Description of male and small female. Medium sized pontoniine shrimp of subcylindrical body form (Fig. 1).

Carapace (Fig. 1) smooth, glabrous; orbit (Fig. 2B) feebly developed, inferior orbital angle strongly produced, acute, with reflected ventral inner flange; antennal spine well developed, slender, submarginal, arising with distinct interval from inferior orbital angle; hepatic spine large, arising slightly ventral to level of antennal spine; median carina armed with single postrostral tooth; supraorbital spine absent; pterygostomial angle blunt.

Rostrum (Fig. 2B) slender, almost straight, 0.9–1.1 times as long as carapace, reaching or slightly overreaching level of midlength of distal segment of antennular peduncle; dorsal margin armed with 7–9 equidistant, small, acute teeth, interspaced by short plumose setae, distal part unarmed; ventral margin with carina obsolete, fringed with row of long plumose setae, subterminally armed with 1 or 2 small, acute teeth; lateral carina obsolete.

Abdomen (Fig. 1) smooth, glabrous; pleura of first to third somites broad, second pleuron roundly expanded. Posteroventral margin of fourth and fifth somites with pleura produced posteriorly, rounded. Posterior third of median carina of third tergum strongly elevated, subcarinate. Sixth somite elongate, 1.2–1.3 times as long as carapace, 1.3–1.4 times as long as telson, posterolateral process acute, posteroventral margin produced, acute. Telson (Fig. 2D) 0.9–1.0 times as long as carapace, gradually tapering posteriorly to posterior margin with midpoint convex; dorsal surface armed with 2 pairs of small, submarginal spines at 0.5 and 0.7 of telson length; posterior margin (Fig. 2E) with 3 pairs of spines, intermediate spines longest, lateral and intermediate spines simple, submedian spines plumose.

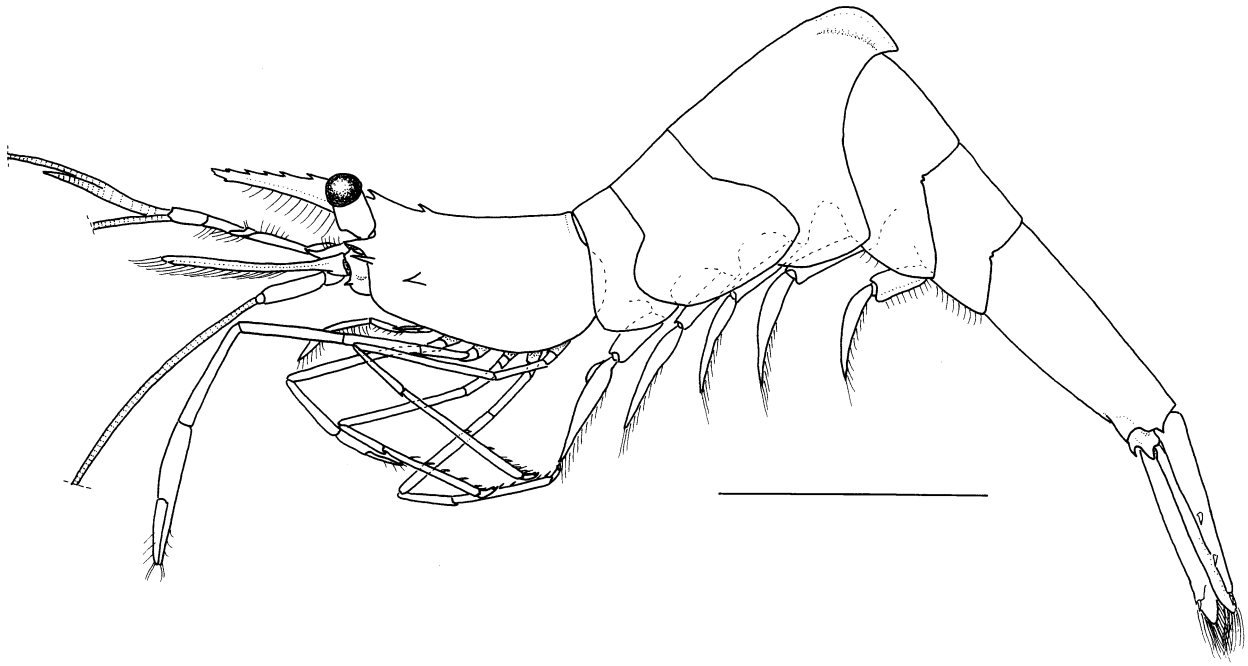

FIGURE 1. *Ancylomenes luteomaculatus* sp. nov. Holotype, male, CL 3.6 mm, CMNH-ZC 02200: Entire animal in lateral view, scale bar = 5.0 mm.

Ophthalmic somite with interocular process obsolete (Fig. 2C). Eye (Fig. 2A) with large, globular cornea, with minute accessory pigment spot; stalk slightly longer than maximum corneal diameter.

Fourth thoracic sternite without finger-like median process.

Antennular peduncle (Fig. 2F) reaching level of distal blade of scaphocerite. Proximal segment longer than distal two segments combined; distolateral margin produced, rounded, slightly overreaching midlength of intermediate segment, with row of plumose setae; lateral margin straight, terminating distally in small acute tooth; ventromesial margin armed with small acute tooth; stylocerite short, tapering to acute tip, reaching proximal third of proximal segment (distolateral lobe excluded); statocyst well developed, rounded. Intermediate segment slender, about half of length of proximal segment, marginally with long plumose setae. Distal segment slender, non-setose, obliquely articulated with flagella. Upper flagellum biramous, proximal 9 segments fused, shorter free ramus consisting of 10 segments; groups of long aesthetascs present on proximal fused rami and shorter free ramus.

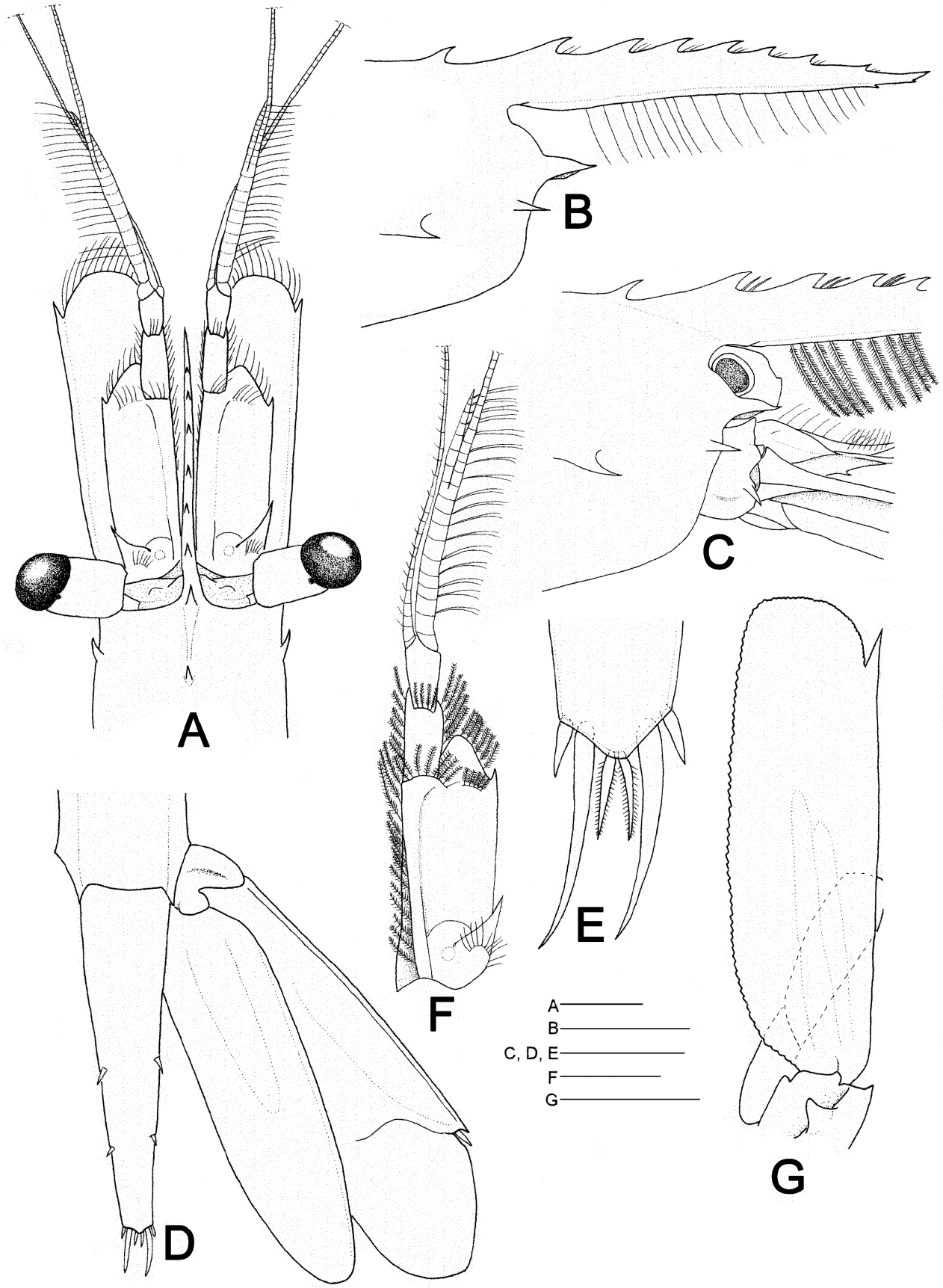

FIGURE 2. *Ancylomenes luteomaculatus* sp. nov. Holotype, male, CL 3.6 mm, CMNH-ZC 02200: A, anterior part of carapace, rostrum and cephalic appendages, dorsal view; B, anterior part of carapace and rostrum, lateral view; C, orbital region of carapace, ophthalmic somite and proximal part of right cephalic appendages, lateral view; D, telson and right uropod, dorsal view; E, posterior part of telson, dorsal view; F, right antennular peduncle and proximal part of flagella, dorsal view; G, right antenna, dorsal view. D, G, marginal setae omitted. Scale bars: A–D, F, G = 1.0 mm; E = 0.25 mm.

Antenna with stout basicerite (Fig. 2G) armed ventrolaterally with acute tooth, dorsal margin with proximal angular process. Scaphocerite well developed, 2.7–3.3 times as long as maximum broad, lateral margin almost straight, terminating in acute tooth falling distinctly short of distal margin of subquadrate lamella; carpocerite falling slightly short of midlength of scaphocerite.

Epistome unarmed.

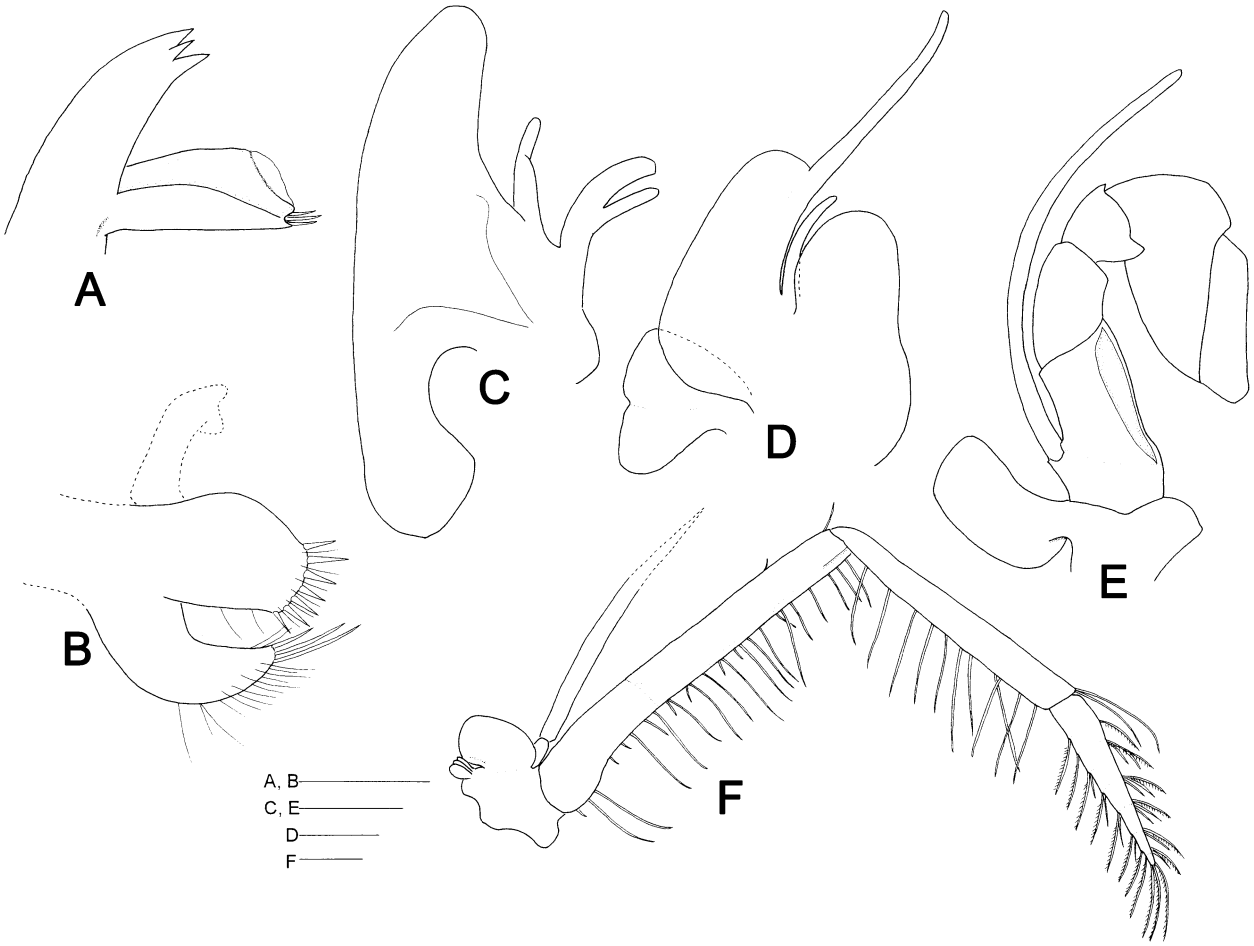

FIGURE 3. *Ancylomenes luteomaculatus* sp. nov. Holotype, male, CL 3.6 mm, CMNH-ZC 02200. Right mouthparts, external view: A, mandible; B, maxillula; C, maxilla; D, first maxilliped; E, second maxilliped; F, third maxilliped. Scale bars = 0.25 mm.

Mandible (Fig. 3A) moderately slender, without palp; molar process obliquely truncate distally, with blunt teeth and few short setae; incisor process obliquely truncate distally, with three acute distal teeth. Maxillula (Fig. 3B) with feebly bilobed palp; upper lacinia broad, distal margin truncate, with 7 simple spines, interspaced with long setae, ventral margin with 2 long setae; lower lacinia narrower than upper lacinia, with some long slender spines distally and numerous shorter setae. Maxilla (Fig. 3C) with simple palp tapering distally; distal endite deeply bilobed, terminally with dense long setae, upper lobe broader than lower lobe, lower lobe rounded distally; proximal endite obsolete; scaphognathite well developed, with dense plumose setae marginally, anterior lobe tapering slightly distally, rounded, posterior lobe distally subquadrate. First maxilliped (Fig. 3D) with slender palp; distal endite broad, mesial margin densely setose, proximal endite obsolete; exopod with flagellum well developed, terminally with 4 or 5 long setae, caridean lobe well developed; epipod robust, triangular, feebly bilobed. Second maxilliped (Fig. 3E) with normal endopod; ischium and basis feebly demarcated, obliquely articulated with merus, mesial surface slightly concave; merus elongate, about twice as long as carpus; carpus short, with anterolateral margin bluntly pointed; propodus with anteromesial margin produced, broad, with sparse setae; dactylus moderately broad, mesial margin almost

straight, with marginal dense setae and row of sparse submarginal setae; exopod with well developed flagellum, terminally with long setae; epipod subquadrate, broad, without podobranch. Third maxilliped (Fig. 3F) with endopod reaching level of proximal fourth of scaphocerite; coxal plate well developed, oval; antepenultimate segment twisted, with long ventral setae and a single short distodorsal seta, weakly demarcated from basis; penultimate segment 1.4–1.6 times as long as ultimate segment, ventral surface long setae; ultimate segment tapering distally, with set of transverse rows of short plumose setae; exopod with well developed flagellum, distally and distomesially with 4–7 long setae; small arthrobranch present.

Branchial formula shown as Table 1.

TABLE 1. *Ancylomenes luteomaculatus* sp. nov. Branchial formula.

	Maxillipeds			Pereiopods				
	I	II	III	I	II	III	IV	V
Pleurobranchs	-	-	-	1	1	1	1	1
Arthrobranchs	-	-	1	-	-	-	-	-
Podobranchs	-	-	-	-	-	-	-	-
Epipods	1	1	-	-	-	-	-	-
Exopods	1	1	1	-	-	-	-	-

First pereiopod (Fig. 4A) slender, overreaching distal margin of scaphocerite by lengths of distal half of palm and dactylus. Merus slightly longer than carpus, unarmed. Carpus subequal to chela in length, slightly widened distally, with longitudinal row of long grooming setae distoventrally. Chela (Fig. 4B) 0.4–0.5 times as long as carapace, palm subcylindrical, slightly compressed, with 5 transverse rows of short, serrulate grooming setae proximoventrally; fingers 1.2–1.4 times as long as palm, each terminating in small, hooked unguis, cutting borders situated laterally, unarmed.

Second pereiopods (Fig. 4C) well developed, similar, overreaching distal margin of scaphocerite by distal part of carpi and chelae. Merus slender, entire, subequal to carpus in length. Carpus slender, entire, 0.6 times as long as carapace, 1.2–1.5 times as long as palm, slightly widening distally. Chela slightly bowed, 0.8–0.9 times as long as carapace, 1.4–1.5 times as long as carpus; palm 1.0–1.3 times as long as dactylus, slightly compressed; dactylus (Fig. 4D) terminating in hooked, acutely pointed unguis, cutting border situated laterally, armed proximally with 1–3 small, acute, recurved teeth, remaining part entire, sharply edged; fixed finger (Fig. 4D) generally similar to dactylus, armed proximally with 3 small, acute, recurved teeth.

Ambulatory pereiopods increasing in length posteriorly. Third pereiopod (Fig. 4E) slender, falling slightly short of level of distal margin of scaphocerite. Merus 2.4–2.6 times as long as carpus, unarmed. Carpus unarmed, distodorsal angle prominent. Propodus 2.2–2.6 times as long as carpus, armed with pair of long distoventral spines and set of 5 spaced spines on ventral margin, distodorsally with long spiniform setae. Dactylus (Fig. 4F) slightly compressed, dorsal margin weakly bowed, ventral margin with 1 subterminal accessory tooth, unguis not clearly demarcated. Fourth pereiopod similar to third, falling slightly short of level of distal margin of scaphocerite. Fifth pereiopod overreaching level of distal margin of scaphocerite by length of dactylus. Carpus 1.2 times as long as that of third pereiopod. Propodus (Fig. 4G) with ventral margin with 1 distoventral and 2 subterminal spines and tufts of setae and spaced set of 2 spines proximal to distal group of spines.

Male first pleopod (Fig. 4H) with endopod (Fig. 4I) short, reaching level of proximal third of exopod, generally oval, distally expanded, prominent short appendix interna arising at distal two-fifth of mesial margin, fringed with sparse simple setae distally, long plumose setae proximomesially. Endopod of male second pleopod (Fig. 4J) with appendices interna and masculina arising at proximal two-fifths of mesial margin; appendix interna slender, slightly overreaching tip of appendix masculina, with few distal cincinnuli; appendix masculina with 2 long spiniform setae terminally, 5 setae laterally.

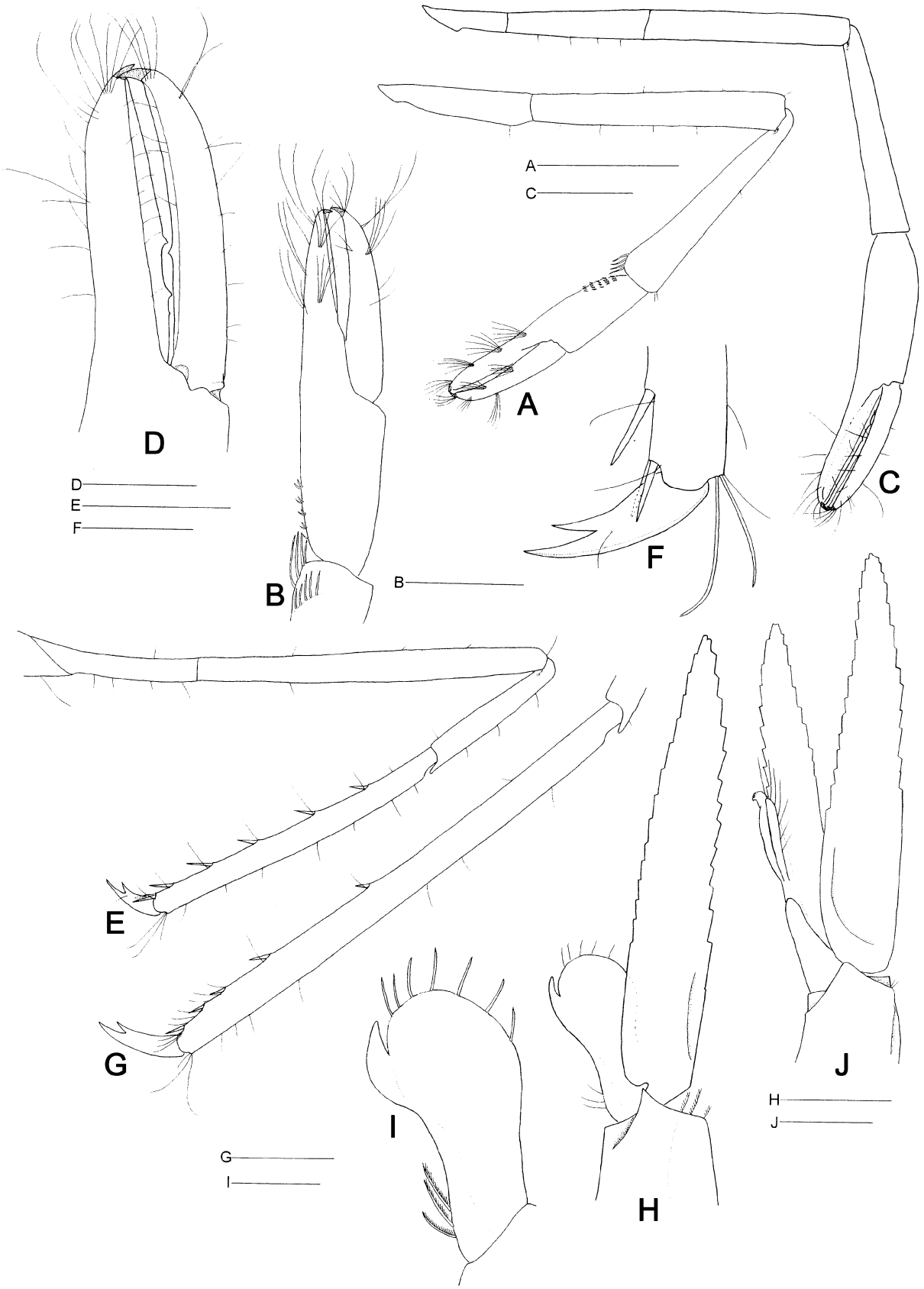

FIGURE 4. *Ancylomenes luteomaculatus* sp. nov. Holotype, male, CL 3.6 mm, CMNH-ZC 02200: A, right first pereiopod, lateral view; B, same, chela, mesial view; C, right second pereiopod, lateral view; D, same, fingers, mesial view; E, right third pereiopod, lateral view; F, same, posterior part of propodus and dactylus, lateral view; G, propodus and dactylus of right fifth pereiopod, lateral view; H, right first pleopod, external view; I, same, endopod, external view; J, right second pleopod, external view. H, J, marginal setae omitted. Scale bars: A, C, E = 1.0 mm; B, D, G–H, J = 0.5 mm; F, I = 0.25 mm.

Uropod (Fig. 2D) with protopodite posteroventrally produced; exopod broad, overreaching posterior margin of telson, posterior margin broadly rounded, lateral margin nearly straight, terminating in small acute tooth, with larger mobile spine just mesial to distolateral tooth; endopod reaching distal margin of exopod, slightly tapering distally.

Description of ovigerous female. Meristic characters similar to, but general body form more robust than those of male and small female. Rostrum distinctly arched (Fig. 5A). Second pereiopod with carpus slightly shorter than palm (Fig. 5B); cutting borders of fingers armed with more acute teeth (Fig. 5C).

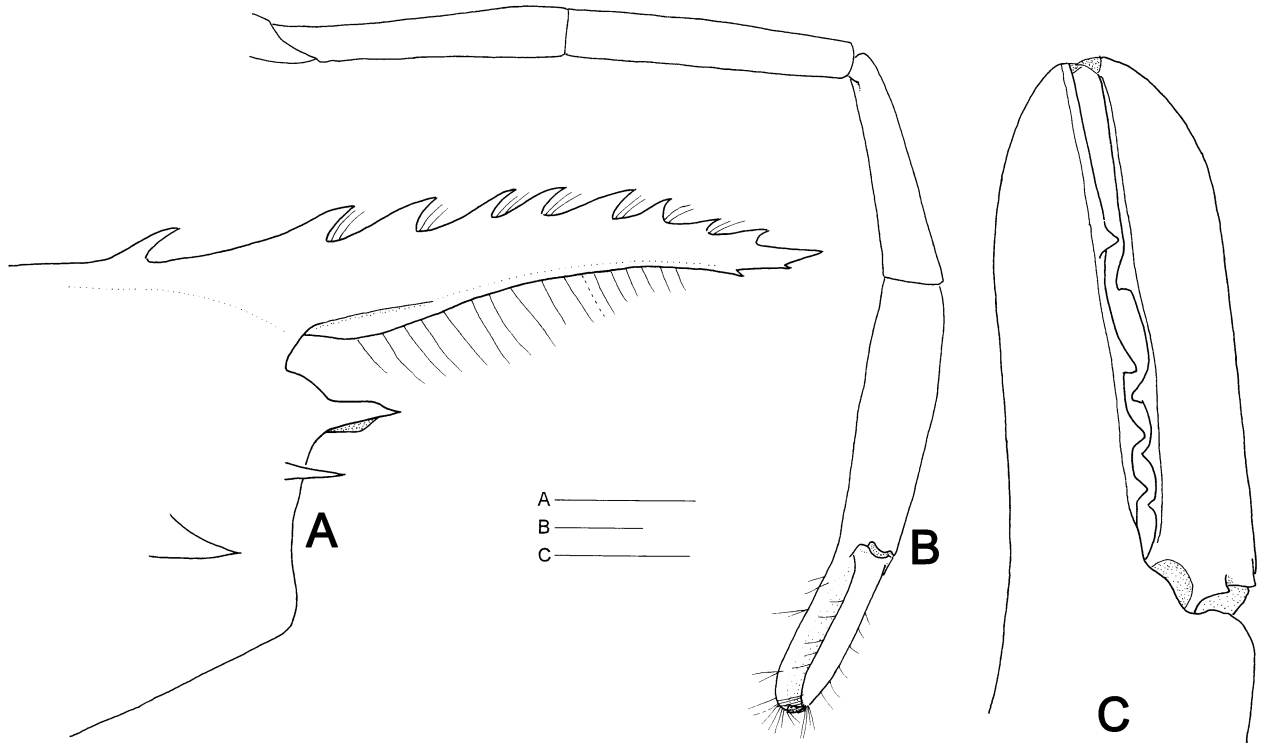

FIGURE 5. *Ancylomenes luteomaculatus* sp. nov. Paratype, ovigerous female, CL 4.7 mm, QM W 28900, AMPI 1494: A, anterior part of carapace and rostrum, lateral view; B, right second pereiopod, lateral view; C, same, same, fingers, mesial view. Scale bars: A–B = 1.0 mm; C =0.5 mm.

Coloration. See Figure 6A, B. Body and appendages generally transparent. Lateral and posterodorsal part of carapace with sparse yellow spots. Transverse, narrow white band running across posterior part of carapace. Posterior half of subcarinate part of third abdominal tergum with large white patch anteriorly tapering, extending obliquely ventrally, posterior margin of patch fringed with short red stripe; midlength of dorsal midline with distinct yellow spot outlined in red on either side. Pleura of first to fifth abdominal somites with yellow or white spots at base of pleopods. Posterior margin of sixth somite with transverse red stripe. Telson transparent, midlength with broad, white transverse band, posterior margin white. Eyestalk white, anterodorsally with longitudinal purple stripe. First and second pereiopods with meri proximally transparent, subterminally white, terminally purple, continuing posterior part of carpi. Midlength of carpi white, terminally purple, extending to proximal part of palms. Fingers largely purple, tips white, palms largely white. Proximal half of uropods transparent, posterior half white, with large, purple rounded patch on distal part of exopods.

Etymology. The specific epithet, *luteomaculatus* is coined from the Latin *luteus* meaning yellow and *macula* meaning a spot, in allusion to the beautiful golden-yellow spots scattered on the carapace and abdomen.

Common name. Tsukihoshi-kakure-ebi (new Japanese name).

Distribution. Kume-jima Island, Ryukyu Islands, Japan; Batangas Bay, Luzon, Philippines, East Kalimantan, Indonesia, and Milne Bay, New Guinea Island, Papua New Guinea.

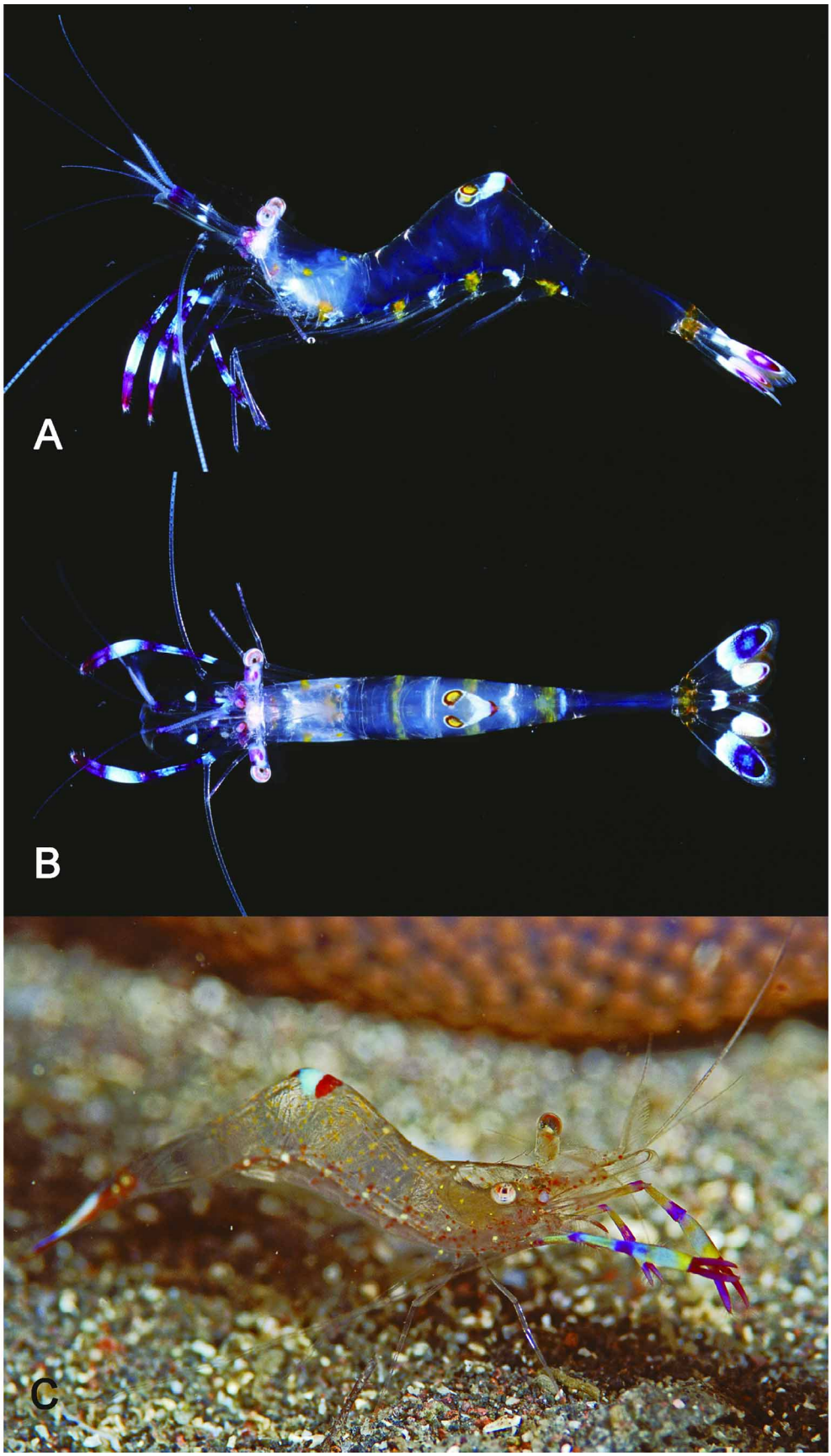

FIGURE 6. A, B, *Ancylomenes luteomaculatus* sp. nov. Holotype, male, CL 3.6 mm, CMNH-ZC 02200. A, fresh specimen, lateral view (photo J. Okuno); B, same, dorsal view (photo J. Okuno). C, *Ancylomenes tosaensis* (Kubo, 1951) comb. nov. Living individual *in situ*, in association with *Dofleinia armata* Wassilieff, 1908 at Ose-zaki, Suruga Bay, Japan, 31 m, 20 November 2003 (photo T. Yanagisawa).

Bathymetric range. Sublittoral zone, to 32 m.

Host. *Pachycerianthus* sp. (Anthozoa: Ceriantharia: Cerianthidae). Underwater observation at Kume-jima Island by one of us (JO) represented that specimens of the new species lived on the basal tube of the cerianthid.

Remarks. The colour pattern in life of *A. luteomaculatus* sp. nov., most notably the presence of distinct yellow spots on the carapace and abdomen, is unlike any previously reported congeneric species.

Morphologically, the obsolete interocular process at the ophthalmic somite and armature of the rostrum link *A. luteomaculatus* sp. nov. to *A. magnificus* comb. nov., also known from Western Pacific region. We compared the specimens of the present new species with those of *A. magnificus* comb. nov. listed under "Material examined" of that species. The present new species is distinguishable from *A. magnificus* comb. nov. by the distinctly elevated and subcarinate posterior median carina of the third abdominal tergum, and the narrow scaphocerite being 2.7–3.3 times as long as broad, instead of 1.9–2.4 times in *A. magnificus* comb. nov.

The holotype and three paratypes from the Ryukyu Islands were collected during a survey to prepare the decapod crustacean Kume-jima Island guidebook by Kawamoto & Okuno (2003). The new species was briefly reported in the book as *Periclimenes* sp. D. The species reported as *Periclimenes* cf. *venustus* from Papua New Guinea (Debelius 1999) and as *Periclimenes* sp. from East Kalimantan, Indonesia (Fransen 2004) are also identifiable without doubt with *A. luteomaculatus* sp. nov. on account of its distinctive colour pattern in life.

Checklist of the species of *Ancylomenes* gen. nov.

Ancylomenes adularans (Bruce, 2003) comb. nov.

Restricted synonymy:
Periclimenes adularans Bruce, 2003: 116–117, fig. 2. — Okuno 2005: 592–597, figs. 1–3.

Type data. Ovigerous female holotype, QM W26554; a male and an ovigerous female paratypes, QM W26555 and 26556.

Distribution. Type locality: Cape Flattery Service Jetty, Northern Queensland, Australia. Also known from Taiwan and southern Japan (Okuno 2005).

Bathymetric range. Sublittoral zone, to 28.5 m. Found on silty mud substrate.

Host. In association with actiniarian, *Megalactis hemprichii* Ehrenberg, 1834, and ceriantharian, *Cerianthus filiformis* Carlgren, 1922. Also known as a fish cleaner.

Ancylomenes aesopius (Bate, 1863) comb. nov.

Restricted synonymy:
Anchistia æsopia Bate, 1863: 502–503; pl. 41, fig. 5.
Periclimenes aesopius. — Kemp 1922: 142–143, fig. 15. — Bruce 1977: 217–230, figs. 1–30.

Type data. Two syntypes, BMNH 68-81.

Distribution. Type locality: Gulf of St. Vincent, South Australia. Known only from South Australian and Western Australian temperate waters.

Bathymetric range. Sublittoral zone.

Host. Not determined.

Remarks. This species was fully redescribed by Bruce (1977).

***Ancylomenes amirantei* (Bruce, 2007) comb. nov.**

Restricted synonymy:
Periclimenes amirantei Bruce, 2007e: 52–57, figs. 1–4.

Type data. Ovigerous female holotype, ZMC I.9600.1 (in part); a male and three ovigerous female paratypes, ZMC I.9600.1 (in part) and ZMC I.9600.2.

Distribution. Type locality: Amirante Island, western Indian Ocean. Also known from North Malé Atoll, Maldive Islands, central Indian Ocean.

Bathymetric range. Certainly known from 70 m.

Host. Unknown.

***Ancylomenes anthophilus* (Holthuis & Eibl-Eibesfeldt, 1964) comb. nov.**

Restricted synonymy:
Periclimenes (*Periclimenes*) *anthophilus* Holthuis & Eibl-Eibesfeldt, 1964: 185–192, figs. 1–4.

Material examined. QM W 28901, 1 ovigerous female, CL 4.2 mm, 3 females, 1 male, wreck of the 'Sea Venture', E of St. George, Bermuda Island, 8 m, associated with *Condylactis gigantea*, 2 April 2004, leg. W. Sterrer.

Type data. Male holotype, SMF 2608; 8 paratypes, SMF 2609, and RMNH D 19485 and 19486.

Distribution. Type locality: Whalebone Bay, Bermuda Island. Known only from that island.

Bathymetric range. Sublittoral zone, to 2–3 m.

Host. In association with actiniarians, *Actinia bermudensis* McMurrich, 1889 and *Condylactis gigantea* Weinland, 1860. Also known as a fish cleaner.

Remarks. See “Remarks” section of *Ancylomenes pedersoni* comb. nov.

***Ancylomenes aqabai* (Bruce, 2008) comb. nov.**

Restricted synonymy:
Periclimenes aqabai Bruce, 2008a: 27–32, figs. 1–4.

Type data. Ovigerous female holotype, RMNH D 33266a; 2 female paratypes, RMNH D 33266b.

Distribution. Type locality: Aqaba, Jordan, Red Sea. So far known from the type locality.

Bathymetric range. 35–45 m.

Host. In association with jellyfish, *Cassiopea andromeda* (Forskål, 1775).

***Ancylomenes grandidens* (Bruce, 2005) comb. nov.**

Restricted synonymy:
Periclimenes grandidens Bruce, 2005: 348–355, figs. 8–10, 22C.

Type data. Ovigerous female holotype, QM W 27245; 4 female paratypes, QM W 27238, 27239, and 27246.

Distribution. Type locality: Loloata Island, Papua New Guinea. So far only known from the type locality.

Bathymetric range. Sublittoral zone, to 20 m.

Host. In association with scleractinians, *Euphyllia paradivisa* Veron, 1990, and *Plerogyra sinuosa* (Dana, 1846), and actiniarian, *Stichodactyla mertensii* Brandt, 1835.

***Ancylomenes holthuisi* (Bruce, 1969) comb. nov.**

Restricted synonymy:
Periclimenes holthuisi Bruce, 1969: 258–259. — Bruce 1979: 205–206, fig. 6; pl. 1D; 1982: 244–246, fig. 7.

Type data. Male holotype, RMNH D 33226.

Distribution. Type locality: Lung Ha Wan, New Territories, Hong Kong (22º18.5'N, 114º18.2'E). Widely distributed in the Indo-West pacific: Jordan, Zanzibar, Maldive Islands, Sri Lanka, Malaya, Singapore, Vietnam, Philippines, South China Sea, Indonesia, Papua New Guinea, New Caledonia, Caroline Islands, and Marshall Islands (Bruce 2007f).

Bathymetric range. Sublittoral zone, to 36 m.

Host. In association with sea anemones, scleractinian corals and jelly fishes.

Remarks. Some of the previous reports as *Periclimenes holthuisi* are possibly incorrect. Indeed, *A. aqabai* comb. nov., *A. kobayashii* comb. nov. and *A. speciosus* comb. nov. have been identified as *holthuisi* in some scientific publications (see Bruce 2008a; Okuno & Nomura 2002; Okuno 2004).

***Ancylomenes kobayashii* (Okuno & Nomura, 2002) comb. nov.**

Restricted synonymy:
Periclimenes kobayashii Okuno & Nomura, 2002: 84–93, figs. 1–5.

Type data. Male holotype, CMNH-ZC 00536; 13 paratypes, CBM-ZC 6190-6193, CMNH-ZC 00514, 000515, 000537, and 000538, and RMNH D 49194.

Distribution. Type locality: Akazawa, Ito, Izu Peninsula, Honshu, Japan (34º5.2'N, 139º05.5'E). Known only from Japanese waters.

Bathymetric range. Sublittoral zone, to 60 m.

Host. In association with actiniarians, *Dofleinia armata* Wassilieff, 1908, and *Entacmaea quadricolor* (Rüppell & Leuckart, 1828). Also known as a fish cleaner.

***Ancylomenes longicarpus* (Bruce & Svoboda, 1983) comb. nov.**

Restricted synonymy:
Periclimenes longicarpus Bruce & Svoboda, 1983: 13–24, figs. 4–8.

Type data. Female holotype, RMNH D 33228; paratypes, USNM 184101, and BMNH 1981: 47.

Distribution. Type locality: Aqaba, Jordan, Red Sea. Known only from Red Sea.

Bathymetric range. Sublittoral zone, to 15 m.

Host. Associated with sea anemones, *Entacmaea quadricolor*, *Heteractis aurora* (Quoy & Gaimard, 1833), and *Megalactis hemprichii*.

***Ancylomenes lucasi* (Chace, 1937) comb. nov.**

Restricted synonymy:
Periclimenes (*Ancylocaris*) *lucasi* Chace, 1937: 133–135, fig. 8.
Periclimenes (*Harpilius*) *lucasi*. — Holthuis 1951: 54–57; pls. 18–19, figs. f–h.

Material examined. AHF 118701, 1 male CL 3.0 mm, 1 ovig. female, CL 4.7 mm, Isla Catalina, San Carlos, Sonora, Mexico, 18.2 m, next to cerianthid sea anemone, 17 June 1978, leg. A. Kerstitch.

Type data. Female holotype (Cat. No. 361090) and 3 paratypes are deposited at the Department Tropical Research, New York Zoological Society; other paratype is housed at the Museum of Comparative Zoology at Harvard College, Cambridge (see Holthuis 1951).

Distribution. Type locality: San Lucas Bay, Baja California, Mexico (22º53'N, 109º54'E). Known from Baja California to southern Panama, Eastern Pacific (Wicksten 1983).

Bathymetric range. Sublittoral zone, to 90 m.

Host. Associated with cerianthids. Also known as a fish cleaner.

***Ancylomenes luteomaculatus* sp. nov.**

See above.

***Ancylomenes magnificus* (Bruce, 1979) comb. nov.**

Restricted synonymy:
Periclimenes magnificus Bruce, 1979: 195–207, figs. 1–5; pl. 1A–C.

Material examined. CMNH-ZC 02329, 1 female, CL 5.1 mm, Hira-ne, Hasama, Tateyama, Boso Peninsula, Honshu, Japan, 16 m, SCUBA, in association with *Entacmaea quadricolor*, 14 June 2001, leg. J. Okuno; CMNH-ZC 02373, 1 ov. female, CL 6.6 mm, same locality as CMNH-ZC 02329, in association with *Aglaophenia whiteleggei*, 29 August 2003, leg. J. Okuno; CMNH-ZC 01461, 1 female, CL 3.3 mm, Tatsunokuchi, Nagasaki, East China Sea coast of Kyushu, Japan, 15 m, SCUBA, in association with *Antheopsis maculata*, leg. J. Okuno; NFU, 1 female, CL 4.0 mm, Aotaka, Nakadoori-jima Island, Goto Islands, Kyushu, Japan, 3-5 m, in association with an unidentified sea anemone, 1 December 1979, leg. N. Higashi; QM W 28902, 1 ov. female, CL 7.2 mm, Milne Bay, Papua New Guinea, in association with *Plerogyra* sp., November 2003, leg. B. Halstead.

Type data. Female holotype, AM P27106; 2 paratypes, RMNH D 31957, and USNM 171273.

Distribution. Type locality: Heron Island, Capricorn Islands, Queensland, Australia. Also known from Andaman Sea, Western Australia and Northern Territory, Australia, Vietnam, Philippines, Indonesia, southern Japan, Papua New Guinea, and New Caledonia (Marin *et al*. 2004; Bruce 2007f).

Bathymetric range. Sublittoral zone, to 32 m.

Host. In association with hydroid, *Aglaophenia whiteleggei* Bale, 1888, octocorallia, *Lobophyton* sp., scleractinians, *Catalaphyllia plicata* (Milne-Edwards and Haime, 1857) and *Plerogyra* sp., actiniarians, *Entacmaea quadricolor*, *Antheopsis maculata* (Klunzinger, 1877), *Macrodactyla* sp., and ceriantheans, *Cerianthus* sp. (Marin *et al*. 2004; present study).

***Ancylomenes pedersoni* (Chace, 1958) comb. nov.**

Restricted synonymy:
Periclimenes (*Periclimenes*) *pedersoni* Chace, 1958: 125–130, figs. 1–17. — Limbaugh *et al*. 1961: 242–247, figs. 3–4.
Periclimenes pedersoni. — Williams 1984: 87–88, fig. 59.

Material examined. QM W 28903, 1 ovig. female, CL 5.3 mm, 6 more specimens, off Dangriga, Pelican Cays, Belize, north-western Caribbean Sea, 1 m, associated with *Bartholomea annulata*, 25 April 2004, leg. W. Sterrer.

Type data. Male holotype, USNM 101894; paratypes, USNM 101895-101897.

Distribution. Type locality: Lyford Cay, New Providence Island, Bahamas. Known from the West Indies and Caribbean Sea (Williams 1984; Spotte *et al*. 1991).

Bathymetric range. Sublittoral zone, to 40 m.

Host. In association with actiniarians, *Aiptasia pallida* Duchassaing de Fombressin & Michelotti, 1860, *Bartholomea annulata* (Le Sueur, 1817), *Bunodosoma granulifera* (Le Sueur, 1817), *Condylactis gigantea*, *Heteractis lucida* Duchassaing de Fombressin & Michelotti, 1860, and *Lebrunia danae* (Duchassaing de Fombressin & Michelotti, 1860), ceriantharian, *Cerianthus* sp., and benthic medusa *Cassiopea xamachana* Bigelow, 1892 (Spotte *et al*. 1991). Also known as a fish cleaner.

Remarks. Wicksten (1995) and Spotte (1999) suggested that *P. anthophilus* should be regarded as a junior synonym of *P. pedersoni*. As pointed out by Holthuis & Eibl-Eibesfeldt (1964), we considered that these two species may be separated by the form of the second pereiopod. In *A. pedersoni* comb. nov., the fingers are slender and gradually tapered distally, while the dactylus of major second pereiopod in *A. anthophilus* comb. nov. is compressed, and its dorsal surface is flattened.

Ancylomenes sarasvati (Okuno, 2002) comb. nov.

Restricted synonymy:
Periclimenes sarasvati Okuno, 2002: 212–220, figs. 1–4, 6A, B.

Material examined. CMNH-ZC 01776, 1 male, CL 3.3 mm, Ashikebu, Naze, Amami-ohshima Island, northern Ryukyu Islands, 15 m, SCUBA, in association with *Euphyllia divisa*, 2 September 2004, leg. H. Kanehara.

Type data. Female holotype, NSMT-Cr 14067; 4 female paratypes, CBM-ZC 6444, and CMNH-ZC 00891-00893.

Distribution. Type locality: Off Hateno-hama, Kume-jima Island, Ryukyu Islands, Japan (26º20.2'N, 126º52.1'E). Confirmed specimens have been collected from the Ryukyu Islands only, but underwater photographs show that the species is widely distributed in tropical regions of the western pacific.

Bathymetric range. Sublittoral zone, to 26 m.

Host. In association with scleractinians, *Euphyllia ancora* Veron & Pichon, 1980 and *E. divisa* Veron & Pichon, 1980.

Remarks. This species was described on the basis of four female specimens, thus the male morphology has not been previously described. The present report represents for the first time that the endopod of male first pleopod possesses a distomesial acute appendix interna similar to those of congeneric species.

Ancylomenes speciosus (Okuno, 2004) comb. nov.

Restricted synonymy:
Periclimenes speciosus Okuno, 2004: 866–874, figs. 1–5, 6A, B.

Type data. Male holotype, CMNH-ZC 01666; 15 paratypes, CBM-ZC 7850 and 7851, CMNH-ZC 01555, 01567, 01639, 01640, 01641, 01667, 01668, and 01700, NSMT-Cr 15184, QM W26996, and RMNH D 50659 and 50660.

Distribution. Type locality: Hasama, Tateyama, Boso Peninsula, Honshu, mainland of Japan (34º58.6'N, 139º47.1'E). Also known from Ogasawara Islands, East China Sea, and possibly from Australia and New Caledonia (Okuno 2004).

Bathymetric range. Sublittoral zone, to 35 m.

Host. In association with actiniarians and scleractinian (see Okuno 2004: Table 1). Also known as a fish cleaner.

Ancylomenes tenuirostris (Bruce, 1991) comb. nov.

Restricted synonymy:
Periclimenes tenuirostris Bruce, 1991: 247–253, figs. 13–16. — Okuno & Imazeki 2008: 15–18, figs. 1–2. — Bruce 2008b: 14–15, figs. 8, 14C.

Type data. Female holotype, MNHN-Na 11204; ovigerous female paratype, MNHN-Na 11205.

Distribution. Type locality: Grand Récif Sud, New Caledonia (22º35.1'S, 166º59.5'E). Also known only from Izu-ohshima Island, Japan, and Australia (Okuno & Imazeki 2008; Bruce 2008b).

Bathymetric range. Moderately deep waters at the depths of 49–120 m.

Host. In association with actiniarians, *Dofleinia armata* and an unidentified sea anemone (see Okuno & Imazeki 2008).

Ancylomenes tosaensis (Kubo, 1951) comb. nov. (Fig. 6C)

Restricted synonymy:
Periclimenes (*Ancylocaris*) *tosaensis* Kubo, 1951: 268–271, figs. 7, 8.
Periclimenes (*Harpilius*) *tosaensis.* — Bruce 1966: 15–21, figs. 1, 2, 3a, 4a, b.
Periclimenes tosaensis. — Hayashi 1986: 100, 101, 261, unnumbered fig. — Bruce 2008b: 15–16, figs. 9, 14D.
Periclimenes sp. 4. — Minemizu 2000: 53, unnumbered fig.

Material examined. CMNH-ZC 01779, 1 male, CL 3.4 mm, Ose-zaki, Numazu, Suruga Bay, Honshu, Japan, 31 m, SCUBA, in association with *Dofleinia armata*, 20 November 2003, leg. T. Yanagisawa; CMNH-ZC 01830, 1 female CL 3.5 mm, CMNH-ZC 01831, 1 male, CL 3.0 mm, Masaki, Miho Peninsula, Shimizu, Suruga Bay, Honshu, Japan, 21 m, SCUBA, in association with *Dofleinia armata*, 4 November 2003, leg. J. Okuno.

Type data. The male holotype is now placed at the Tokyo University of Marine Science and Technology (former Tokyo University of Fisheries).

Distribution. Type locality: Off Usa, Takaoka, Tosa Bay, Shikoku, Japan. Also known from Seychelles, South China Sea, East China Sea, Philippines, northwest Australia, and Fiji (Li & Bruce 2006; Bruce 2008b).

Bathymetric range. Moderately deep waters at the depths of 21–100 m.

Host. The present paper records the host of *A. tosaensis* comb. nov. for the first time. The specimens from Suruga Bay were associated with the actiniarian, *Dofleinia armata*.

Remarks. Although Hayashi (1986) and Bruce (2008b) provided the coloration of *Periclimenes tosaensis* based on the dead fresh specimen, its detailed colour pattern in life has been unclear. We examined the specimens to be considered same species reported as *Periclimenes* sp. 4 by Minemizu (2000), and identified them with *Ancylomenes tosaensis* comb. nov. This result indicates that this species is characterized by numerous fine pale yellow spots on the carapace and abdomen, and third abdominal tergum with a conspicuous red patch just anterior to a white dorsal patch (see Fig. 6C). Previous identification of the individuals from Seychelles, Philippines and Fiji are possibly incorrect (Bruce in prep.).

Ancylomenes venustus (Bruce, 1990) comb. nov.

Restricted synonymy:
Periclimenes venustus Bruce, 1990b: 230–242, figs. 1–6, 7A, 8A. — De Grave 1998: 16–17, fig. 1 (in part). — Okuno 2002: 217–220, figs. 5, 6C.

Type data. Ovigerous female holotype, NTM; paratypes, BMNH 38041, RMNH-D 1990: 37, and USNM 239266 and 1079632.

Distribution. Type locality: Port Essington, Darwin, Northern Territory, Australia. Also known from Indonesia, Philippines, Papua New Guinea, and Ryukyu Islands (De Grave 1998).

Bathymetric range. Sublittoral zone, to 10 m.

Host. In association with scleractinians, *Goniopora* sp. and *Heliofungia actiniformis* (Quoy and Gaimard, 1833), and actiniarians, *Actinodendron arboreum* (Quoy and Gaimard, 1833) and *Radianthus crispus* (Ehrenberg, 1834).

Remarks. De Grave (1998) reported *A. venustus* comb. nov. from Papua New Guinea. However, part of his figure (Fig. 1C, D) does not agree with the dentition of *A. venustus* comb. nov., but more with that of *A. sarasvati* comb. nov.

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