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*Minicopenaon intermedium intermedium* BOURDON, 1981  
(Crustacea: Bopyridae)**

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# New distribution and host record of a penaeid ectoparasitic isopod, *Minicopenaeon intermedium intermedium* BOURDON, 1981 (Crustacea: Bopyridae)

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**ABSTRACT** — The penaeid ectoparasitic isopod, *Minicopenaeon intermedium intermedium* BOURDON, 1981, is recorded for the first time from Japan. This study provides additional information on this subspecies, including a new host, description, infection rate, keys, and morphological variation.

**KEY WORDS:** Bopyridae, taxonomy, parasite

## INTRODUCTION

The Bopyridae RAFINESQUE-SCHMALTZ, 1815 is the largest family in the superfamily Bopyroidea RAFINESQUE-SCHMALTZ, 1815: about 570 species in genera are reported worldwide (SCHOTTE *et al.*, 1995). All species in the family are holoparasites of decapod crustaceans. In Japan, 95 species belonging to 55 genera are known (SAITO *et al.*, 2000, 2010; SHIMOMURA *et al.*, 2006).

Penaeid ectoparasitic bopyrids of the genus *Minicopenaeon* BOURDON, 1979 comprise 3 species including 2 subspecies: *M. apertum* (BOURDON, 1979), *M. crosnieri* (BOURDON, 1979), *M. intermedium intermedium* BOURDON, 1981, and *M. intermedium curvatum*, BOURDON, 1981.

During our recent survey in Kyushu, western Japan, a bopyrid isopod was found in the branchial chamber of the penaeid shrimp *Metapenaeopsis lata* KUBO, 1949. Based on this material, we report in this paper *Minicopenaeon intermedium intermedium* BOURDON, 1981 for the first time from Japan.

## MATERIALS AND METHODS

The gear used for the collection was a beam trawl of 3 m span opening on board TS Nagasaki-Maru (Nagasaki University, Japan) to collect the host shrimp. The appendages of specimens were dissected, mounted in a glycerin and ethanol solution and drawn with a camera lucida under a light compound microscope (Nikon E600). Terminology follows BOYKO (2004). The

specimens are deposited in the Kitakyushu Museum of Natural History & Human History (KMNH IvR).

## TAXONOMY

### Genus *Minicopenaeon* BOURDON, 1979

#### *Minicopenaeon intermedium intermedium* BOURDON, 1981

*Minicopenaeon intermedium intermedium* BOURDON, 1981, 257, figs. 17–18.

(Figs. 1–4)

Material examined. Kyushu, Japan. St. A-2-1, 32°29.872'N, 129°07.443'E–32°30.006'N, 129°09.242'E, 238–237 m deep, beam trawl, by TS Nagasaki-Maru, N342 cruise, 20 November 2011; in left branchial chamber of male *Metapenaeopsis lata* (det. J. HASHIMOTO) (14.7 mm CL): brooding dextral female (KMNH IvR 500,547), 8.2 mm, male (KMNH IvR 500,593), 2.0 mm; in left branchial chamber of male *M. lata* (14.8 mm CL): brooding dextral female (KMNH IvR 500,548), 7.8 mm, male (KMNH IvR 500,594), 1.9 mm; in left branchial chamber of female *M. lata* (13.3 mm CL): brooding dextral female (KMNH IvR 500,549), 7.5 mm, male (KMNH IvR 500,595), 1.8 mm; in left branchial chamber of female *M. lata* (11.9 mm CL): brooding dextral female (KMNH IvR 500,550), 7.2 mm, male (KMNH IvR 500,596), 2.0 mm; in left branchial chamber of male *M. lata* (12.6 mm CL): brooding dextral female (KMNH IvR 500,551), 6.9 mm, male (KMNH IvR 500,597), 2.0 mm; in right branchial

chamber of male *M. lata* (15.0 mm CL): brooding sinistral female (KMNH IvR 500,552), 8.9 mm, male (KMNH IvR 500,598), 1.5 mm; in right branchial chamber of female *M. lata* (12.9 mm CL): brooding sinistral female (KMNH IvR 500, 553), 8.5 mm, male (KMNH IvR 500,599), 2.1 mm; in right branchial chamber of male *M. lata* (14.3 mm CL): brooding sinistral female (KMNH IvR 500,554), 8.2 mm, male (KMNH IvR 500,600), 1.9 mm; in right branchial chamber of male *M. lata* (14.2 mm CL): brooding sinistral female (KMNH IvR 500,555), 8.0 mm, male (KMNH IvR 500,601), 1.7 mm; in right branchial chamber of male *M. lata* (12.9 mm CL): brooding sinistral female (KMNH IvR 500,556), 7.9 mm, male (KMNH IvR 500,602), 1.9 mm; in right branchial chamber of male *M. lata* (12.9 mm CL): brooding sinistral female (KMNH IvR 500,557), 7.9 mm, male (KMNH IvR 500,603), 1.7 mm; in right branchial chamber of female *M. lata* (14.7 mm CL): brooding sinistral female (KMNH IvR 500,558), 7.6 mm, male (KMNH IvR 500,604), 1.7 mm; in right branchial chamber of male *M. lata* (12.0 mm CL): brooding sinistral female (KMNH IvR 500,559), 7.5 mm, male (KMNH IvR 500,605), 1.5 mm; in right branchial chamber of female *M. lata* (13.0 mm CL): brooding sinistral female (KMNH IvR 500,560), 7.4 mm, male (KMNH IvR 500,606), 1.9 mm; in right branchial chamber of female *M. lata* (11.1 mm CL): brooding sinistral female (KMNH IvR 500,561), 7.2 mm, male (KMNH IvR 500,607), 1.3 mm; in right branchial chamber of female *M. lata* (12.9 mm CL): brooding sinistral female (KMNH IvR 500,562), 6.9 mm, male (KMNH IvR 500,608), 1.7 mm; in right branchial chamber of male *M. lata* (14.0 mm CL): non-brooding sinistral female (KMNH IvR 500,563), 8.2 mm, male (KMNH IvR 500,609), 1.5 mm; in right branchial chamber of female *M. lata* (13.2 mm CL): non-brooding sinistral female (KMNH IvR 500,564), 6.4 mm.

St. A-2-2, 32°29.957'N, 129°10.123'E–32°29.924'N, 129°08.525'E, 238 m deep, beam trawl, by TS Nagasaki-Maru, N342 cruise, 20 November 2011; in left branchial chamber of male *M. lata* (14.5 mm CL): brooding dextral female (KMNH IvR 500,565), 8.8 mm, male (KMNH IvR 500,610), 1.9 mm; in left branchial chamber of female *M. lata* (15.1 mm CL): brooding dextral female (KMNH IvR 500,566), 8.5 mm, male (KMNH IvR 500,611), 2.1 mm; in left branchial chamber of female *M. lata* (14.7 mm CL): brooding dextral female (KMNH IvR 500,567), 8.4 mm, male (KMNH IvR 500,612), 1.7 mm; in left branchial chamber of female *M. lata* (12.9 mm CL): brooding dextral female (KMNH IvR 500,568), 8.2 mm, male (KMNH IvR 500,613), 2.0 mm; in left branchial chamber of male *M. lata* (14.4 mm CL): brooding dextral female (KMNH IvR 500,569), 8.0 mm, male (KMNH IvR 500,614), 1.7 mm; in left branchial chamber of female *M. lata* (15.4 mm CL): brooding dextral female (KMNH IvR 500,570), 7.9 mm, male (KMNH IvR 500,615), 2.0 mm; in left branchial chamber of male *M. lata* (13.0 mm CL): brooding dextral female (KMNH IvR 500,571), 7.9 mm, male (KMNH IvR 500,616), 1.9 mm; in left branchial

chamber of male *M. lata* (12.0 mm CL): brooding dextral female (KMNH IvR 500,572), 7.6 mm, male (KMNH IvR 500,617), 1.7 mm; in left branchial chamber of female *M. lata* (12.9 mm CL): brooding dextral female (KMNH IvR 500,573), 7.5 mm, male (KMNH IvR 500,618), 1.8 mm; in left branchial chamber of female *M. lata* (13.6 mm CL): brooding dextral female (KMNH IvR 500,574), 7.3 mm, male (KMNH IvR 500,619), 1.8 mm; in right branchial chamber of female *M. lata* (13.9 mm CL): brooding sinistral female (KMNH IvR 500,575), 8.5 mm, male (KMNH IvR 500,620), 2.0 mm; in right branchial chamber of female *M. lata* (14.0 mm CL): brooding sinistral female (KMNH IvR 500,576), 8.4 mm, male (KMNH IvR 500,621), 1.7 mm; in right branchial chamber of female *M. lata* (13.9 mm CL): brooding sinistral female (KMNH IvR 500,577), 8.2 mm, male (KMNH IvR 500,622), 2.1 mm; in right branchial chamber of female *M. lata* (12.3 mm CL): brooding sinistral female (KMNH IvR 500,578), 8.2 mm, male (KMNH IvR 500,623), 1.7 mm; in right branchial chamber of male *M. lata* (13.8 mm CL): brooding sinistral female (KMNH IvR 500,579), 8.1 mm, male (KMNH IvR 500,624), 1.9 mm; in right branchial chamber of female *M. lata* (14.6 mm CL): brooding sinistral female (KMNH IvR 500,580), 8.1 mm, male (KMNH IvR 500,625), 1.9 mm; in right branchial chamber of female *M. lata* (12.9 mm CL): brooding sinistral female (KMNH IvR 500,581), 8.0 mm, male (KMNH IvR 500,626), 1.7 mm; in right branchial chamber of male *M. lata* (14.9 mm CL): brooding sinistral female (KMNH IvR 500,582), 7.9 mm, male (KMNH IvR 500,627), 1.8 mm; in right branchial chamber of female *M. lata* (13.0 mm CL): brooding sinistral female (KMNH IvR 500,583), 7.8 mm, male (KMNH IvR 500,628), 2.0 mm; in right branchial chamber of female *M. lata* (14.0 mm CL): brooding sinistral female (KMNH IvR 500,584), 7.8 mm, male (KMNH IvR 500,629), 1.9 mm; in right branchial chamber of female *M. lata* (11.2 mm CL): brooding sinistral female (KMNH IvR 500,585), 7.8 mm, male (KMNH IvR 500,630), 1.7 mm; in right branchial chamber of female *M. lata* (13.9 mm CL): brooding sinistral female (KMNH IvR 500,586), 7.4 mm, male (KMNH IvR 500,631), 2.1 mm; in right branchial chamber of female *M. lata* (12.9 mm CL): brooding sinistral female (KMNH IvR 500,587), 7.4 mm, male (KMNH IvR 500,632), 1.9 mm; in right branchial chamber of female *M. lata* (14.5 mm CL): brooding sinistral female (KMNH IvR 500,588), 7.4 mm, male (KMNH IvR 500,633), 1.8 mm; in right branchial chamber of female *M. lata* (13.6 mm CL): brooding sinistral female (KMNH IvR 500,589), 7.2 mm, male (KMNH IvR 500,634), 1.7 mm; in right branchial chamber of female *M. lata* (13.5 mm CL): brooding sinistral female (KMNH IvR 500,590), 6.9 mm, male (KMNH IvR 500,635), 1.8 mm; in left branchial chamber of female *M. lata* (12.8 mm CL): non-brooding dextral female (KMNH IvR 500,591), 7.2 mm, male (KMNH IvR 500,636), 1.9 mm; in right branchial chamber of male *M. lata* (13.9 mm CL): *Cabirops*-infested non-brooding sinistral female (KMNH IvR 500,592).

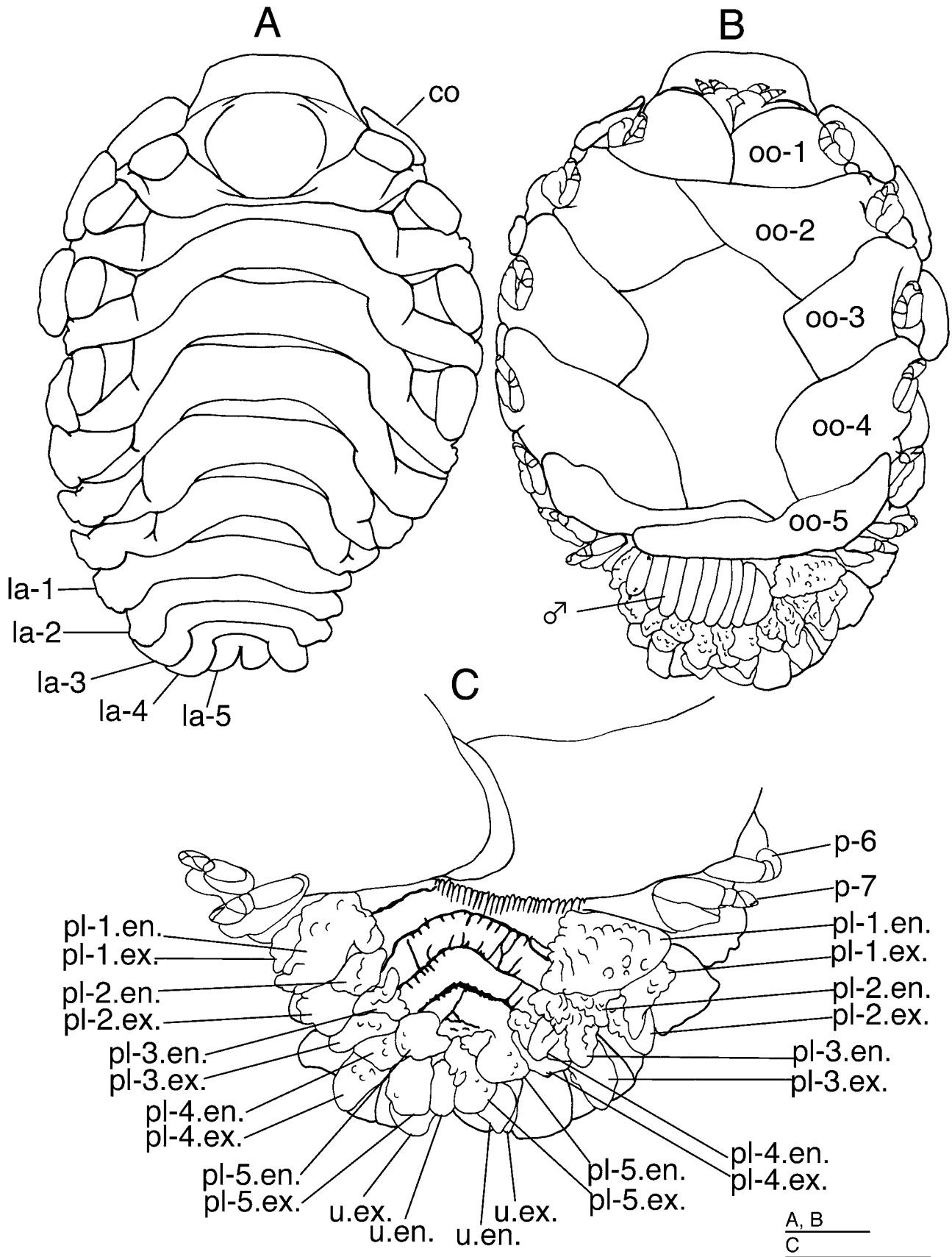


Fig. 1. *Minicopinaeaon intermedium intermedium* BOURDON, 1981: A, C, female (KMNH IvR 500,550), B, female (KMNH IvR 500,550) and male (KMNH IvR 500,596): A, habitus, dorsal; B, female, habitus, ventral, male, habitus, dorsal; C, pleon, ventral. Scales = 0.1 mm. Abbreviations: co, coxa; la-1-5, first to fifth lateral plates; oo-1-5, first to fifth oostegites; pl-1.en.-pl-5.en., endopods of first to fifth pleopods; pl-1.ex.-pl-5.ex., exopods of first to fifth pleopods; u.en., endopod of uropod; u.ex., exopod of uropod.

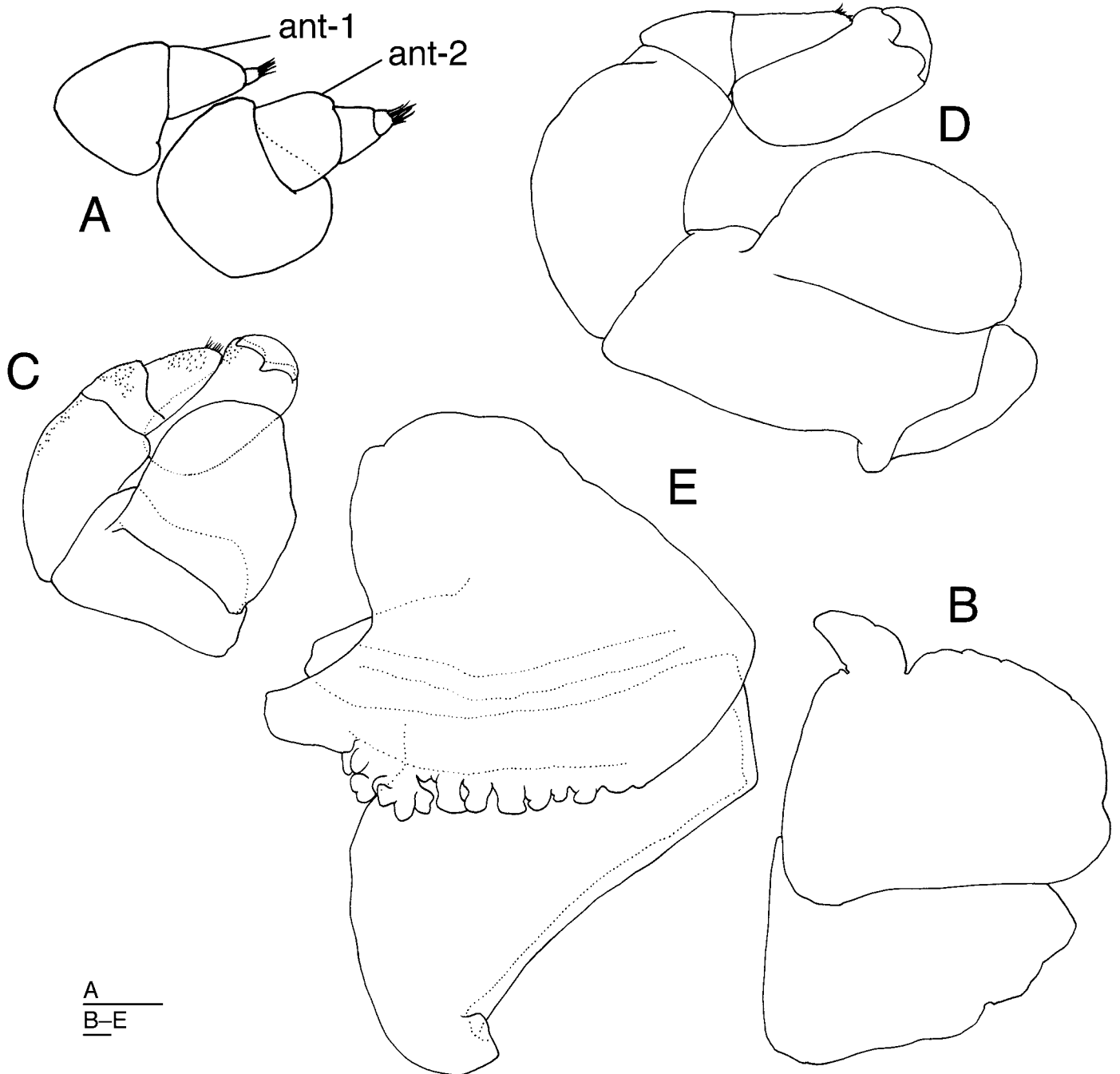


Fig. 2. *Minicopenaenon intermedium intermedium* BOURDON, 1981, female (KMNH IvR 500,550): A, left antennule and antenna, ventral; B, left maxilliped, ventral; C, left pereopod 1, lateral; D, left pereopod 7, lateral; E, left oostegite 1, ventral. Scales = 100  $\mu$ m. Abbreviations: ant-1-2, antennule and antenna.

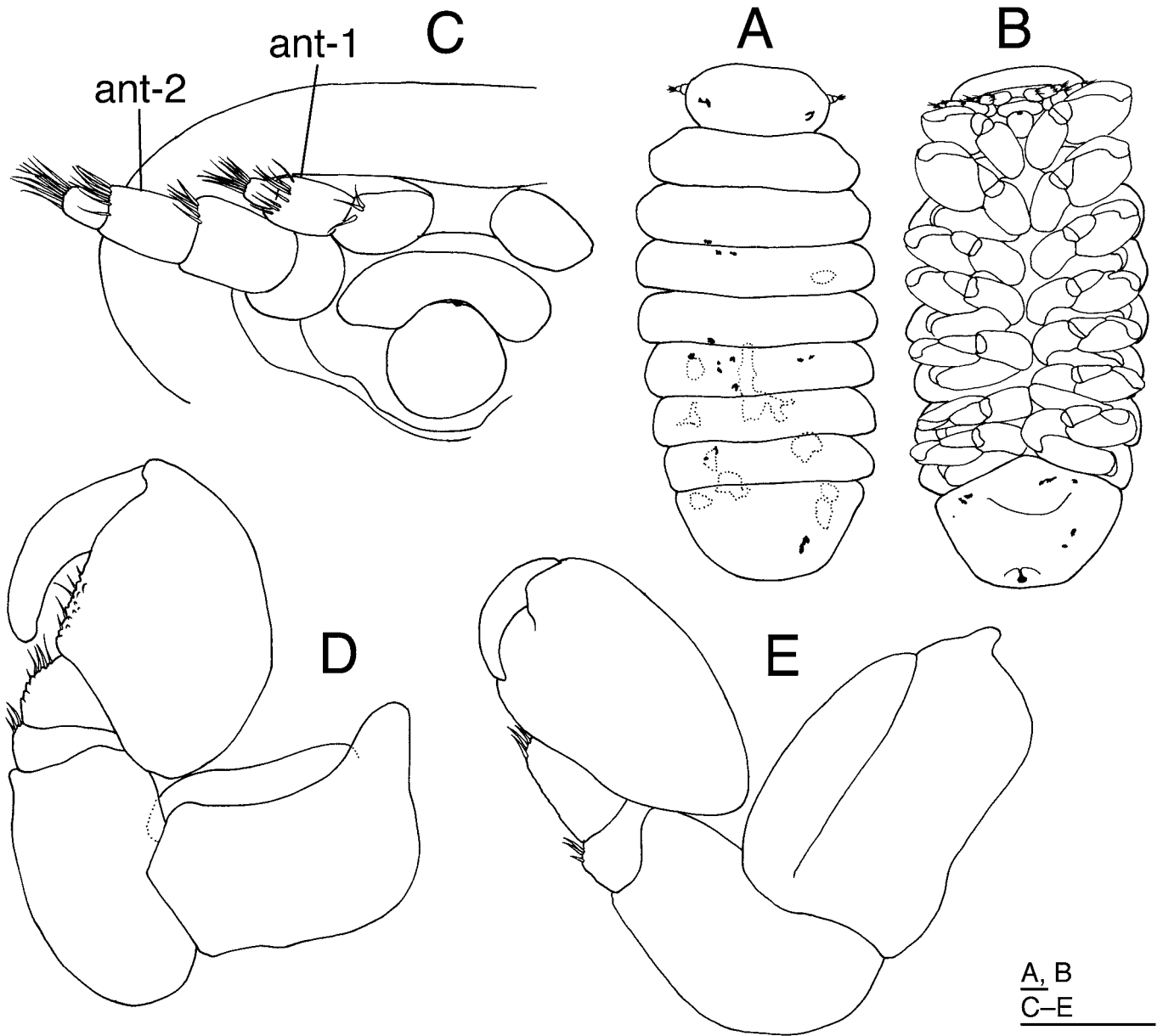


Fig. 3. *Minicopinaeon intermedium intermedium* BOURDON, 1981, male (KMNH IvR 500,596): A, habitus, dorsal; B, habitus, ventral; C, right antennule and antenna, ventral; D, left pereopod 1, lateral; E, left pereopod 7, lateral. Scales = 100  $\mu$ m. Abbreviations: ant-1-2, antennule and antenna.

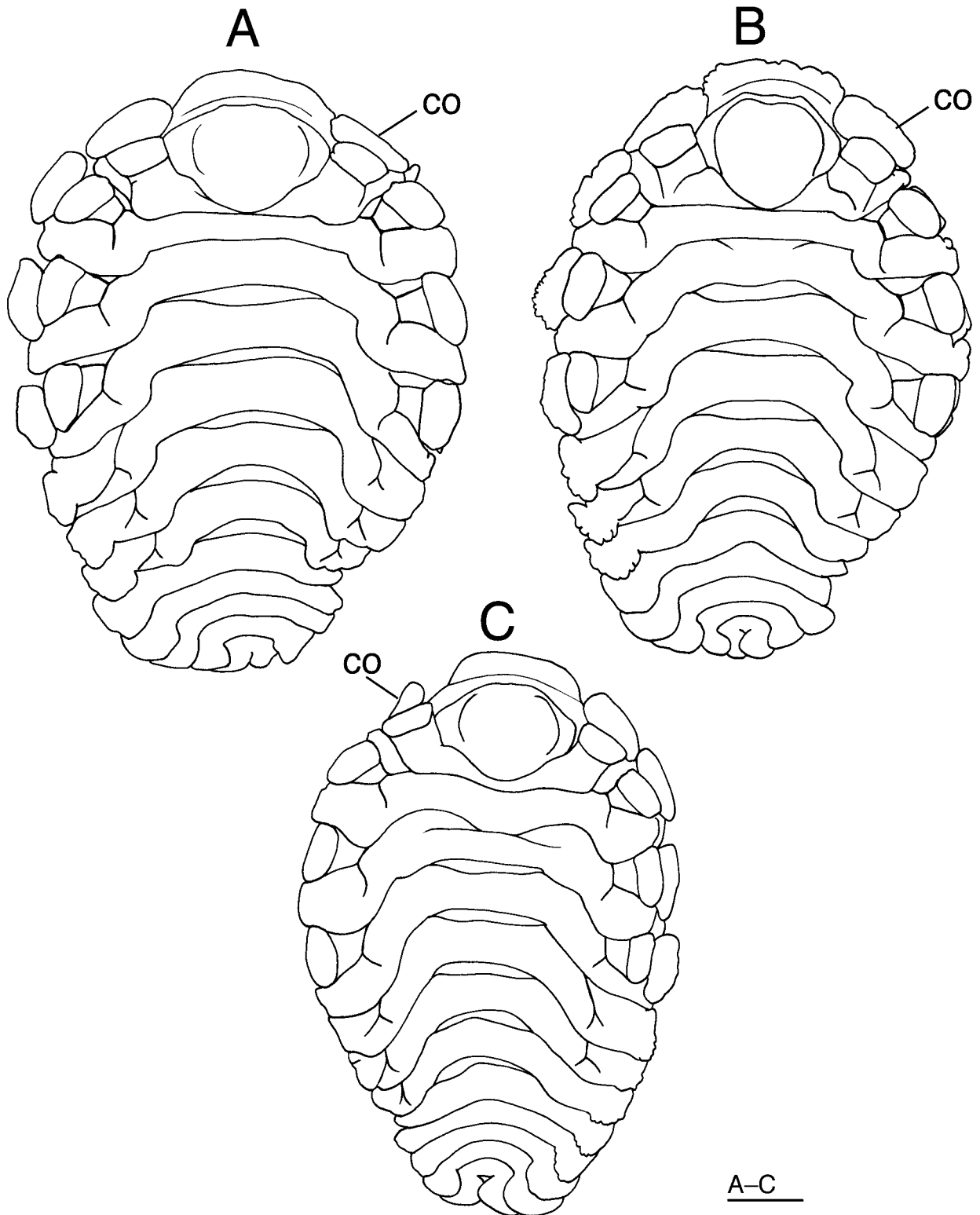


Fig. 4. *Minicopenaeon intermedium intermedium* BOURDON, 1981, female: A–C, habitus, dorsal (KMNH IvR 500,549, 548, 561). Scale = 0.1 mm. Abbreviation: co, coxa.

Description of female (KMNH IvR 500,550). –Body (Fig. 1A, B) elongate ovate; one side distinctly longer than other. All body regions and pereomeres distinctly segmented.

Head (Fig. 1A) broad, weakly produced with strong frontal lamina 0.34 times as long as head.

Pereon (Fig. 1A) broadest across pereomere 3, tapering anteriorly and posteriorly. Coxal plates well developed on longer side, clearly separated from pereomeres on 1–4, indistinctly separate on 5–7: coxal plate of shorter side developed only on pereomere 1. Dorsolateral bosses clearly demarcated on both side of pereomeres 1–4, elongate ovate in shape.

Eyes absent.

Antennule (Fig. 2A) composed of 3 segments, with tuft of short setae on terminal segment. Antenna (Fig. 2A) composed of 4 segments, with tuft of short setae on terminal segment.

Maxilliped (Fig. 2B): upper margin of second article subovate with distomedial, broad, rounded, non-articulating palp without setae.

Oostegite 1 (Fig. 2E) proximal lobe broad, rounded medialdistally; distal lobe subtriangular, distally tapering and rounded; internal ridge with about 10 stout, long tubercles. Oostegites (Fig. 1B) more than half of marsupium.

Pereopods 1–4 shorter than pereopods 5–7. Pereopod 1 (Fig. 2C): basis bearing pronounced rounded boss dorsally; ischium, merus, carpus and propodus with many small scales ventrally; merus with tuft of short setae distally. Pereopod 7 (Fig. 2D): basis bearing pronounced rounded boss dorsally; carpus with tuft of short setae distally, without scales.

Pleon (Fig. 1A) with five distinct pleomeres; pleotelson fused with pleomere 5. Pleomeres 1–4 (Fig. 1A, 1C) with biramous granulate pleopods and uniramous lateral plates; pleomere 5 with biramous granulate pleopods, uniramous lateral plates and biramous uropods. Lateral plates 1–3 (Fig. 1A) of shorter side short and thin; lateral plates 1–3 of longer side long and broad; lateral plates 4 and 5 on both sides subequal in length and width.

Description of male (KMNH IvR 500,596). –Male (Fig. 1B) attached to ventral surface of female pleon. Body (Fig. 3A) dorsoventrally flattened, 2.1 times as long as maximum width, scattered dark brown pigments. Cephalon (Fig. 3A) anterior margin nearly straight. Eyes (Fig. 3A) with dark brown small pigments. Pereomeres 1 and 7 (Fig. 3A) equal in width; pereomeres 2–6 slightly broader than pereomeres 1 and 7. Pereomere 2 (Fig. 3A) longest in all pereomeres. Pleotelson (Fig. 3A) curved ventrally, narrower than pereomeres, blunt posteriorly.

Antennule (Fig. 3C) composed of 3 segments; each segments with short setae distally. Antenna (Fig. 3C) composed of 4 segments; segments 2–4 each with short setae distally.

Pereopods 1 and 2 (Fig. 3B, 3D) similar in length; pereopods 3–7 (Fig. 3B, 3E) similar in length. Pereopod 1 (Fig. 3D): basis with rounded boss dorsally; merus trapezoidal, with 3

short setae distally; carpus triangulate, denticulate ventrally, with 5 short setae; propodus ovate, with 5 short setae and some scales ventrally. Pereopod 7 (Fig. E) basis with rounded boss dorsally; merus trapezoidal, with 3 short setae distally; carpus triangulate, with 3 short setae; propodus ovate, without setae and scales.

Variations. –The frontal laminae and the coxal plates of the female are variable, sometimes being crenulated (Fig. 4B); the size of the coxal plates on the pereonite 1 of short side of the female are variable (Figs. 1A, 4A–C).

Infection rate. –The infection rates by bopyrid parasites were 9.62% (45/468) on male host and 13.41% (81/604) on female host.

Remarks. –The present specimens were identified as *Minicopenaeon intermedium* BOURDON, 1981, known from Philippines, in having pleon consisting of 5 indistinct segments and frontal lamina approximately 0.3 times as long as head. BOURDON (1981) described two subspecies of *M. intermedium* based on the difference of tubercles of oostegite 1. In *Minicopenaeon intermedium intermedium* BOURDON, 1981 it has many narrow, short tubercles, whereas in *M. intermedium intermedium* it has 7–10 stout, long tubercles. *M. intermedium intermedium* was reported from the unidentified host of *Metapenaeopsis*, while *M. intermedium curvatum* from *Metapenaeopsis andamaensis* (BOURDON, 1981).

#### Key to species and subspecies of *Minicopenaeon* (females only)

1. Pleon consisting of 6 indistinct segments .....  
..... *M. crosnieri* (BOURDON)
- Pleon consisting of 5 indistinct segments ..... 2
2. Frontal lamina less than 0.2 times as long as head .....  
..... *M. apertus* (BOURDON)
- Frontal lamina more than 0.3 times as long as head ..... 3
3. Oostegite 1 with many narrow, short tubercles .....  
..... *M. intermedium curvatum* BOURDON
- Oostegite 1 with 7–10 stout, long tubercles .....  
..... *M. intermedium intermedium* BOURDON

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