

## THE DISTINCTIVE SPECIES CHARACTERISTICS OF *METAPROTELLOA SANDALENSIS* MAYER, 1898 (CRUSTACEA: AMPHIPODA), COMMONLY DISTRIBUTED THROUGHOUT THE TROPICAL WEST PACIFIC COASTS

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**ABSTRACT.** — *Metaprotella sandalensis* has been widely described from tropical to subtropical regions of the Indo-west Pacific by several authors. However, the exact characteristics of the species are still unclear. The present study provides detailed descriptions of *Metaprotella sandalensis* Mayer, 1898 (Crustacea: Amphipoda) based on newly collected specimens from Lifou Island, New Caledonia, the type locality. The generic diagnosis of *Metaprotella* was also revised. The following species characteristics for *Metaprotella sandalensis* are indicated: 1) suture between head and pereonite 1 is vestigial; 2) antenna 1, 0.6 to 0.8× body length; 3) peduncle article 3 longer than article 2 in antenna 1; and 4) pereonite 4 longest among all body somites. These characteristics indicate that the distribution of *Metaprotella sandalensis* is more narrow within the tropical Indo-west Pacific than previously reported.

**KEY WORDS.** — Amphipoda, *Metaprotella sandalensis*, redescription, taxonomy, Lifou Island, West Pacific

### INTRODUCTION

*Metaprotella sandalensis* Mayer, 1898 is one of the dominant species of caprellidean amphipods and is widely distributed in shallow waters of the tropical Indo-west Pacific. Mayer (1898) first reported this species from Sandal Bay, Lifou Island, Loyalty Islands, which is located 100 km northeast from New Caledonia. Mayer (1903) reported six variants from the Indo-Pacific tropics, and Schellenberg (1938) added a seventh variant from Gilbert Islands, central Pacific Ocean. McCain & Steinberg (1970) synonymised the variants by Mayer (1903) and Schellenberg (1938) as *Metaprotella sandalensis* Mayer, 1898 without providing remarks comparing each of the variant. Furthermore, these variants lacked detailed description. Subsequently, several authors reported this species from various tropical to subtropical areas of the Indo-west Pacific, i.e., Bora Bora and Morea, Society Islands (Müller, 1990), Kii Peninsula, central Japan (Utinomi, 1973; Arimoto, 1976), Indonesia and the Philippines (Laubitz, 1991), Papua New Guinea (Guerra-García, 2003a), Queensland (Guerra-García, 2004a; Guerra-García & Lowry, 2009), Northern Territory and

Western Australia, Australia (Guerra-García, 2004a), Phuket Island, Thailand (Guerra-García, 2004b), and Mauritius Island, Western Indian Ocean (Guerra-García, 2003b). A massive invasion of *M. sandalensis* on gorgonians in North Sulawesi, Indonesia was recently reported (Scinto et al., 2008). The highest densities of *M. sandalensis* were recorded from nutrient-enriched sites along the coasts of Mauritius, Indian Ocean (Guerra-García & Koonjul, 2005). Takeuchi & Sawamoto (1998) also reported the species in plankton samples collected from the Malacca Straits. However, Mayer's (1898) original description includes several characteristics (including the formation of dorsal projections on the head and pereonites as well as the presence or absence of a suture between the head and pereonite 1) that differ from those of recent studies.

Thus, it is necessary to clarify the species characteristics of *M. sandalensis* from the type locality. During Nov. and Dec. 1995, IT, junior author, participated in a project studying Amphipoda species diversity of the south-west lagoon of New Caledonia and adjacent areas. During this project, about 30 specimens of *M. sandalensis* were successfully collected

from Lifou Island, the type locality. This paper provides a redescription of *M. sandalensis* based on a mature male and female specimen from the new collection.

## MATERIAL AND METHODS

All figures were drawn with the aid of a *camera lucida*. Material are lodged at the Australian Museum, Sydney, Australia, and Muséum national d'Histoire naturelle, Paris, France. Abbreviations used in the present study are as follows; AM, the Australian Museum; MNHN, Muséum National d'Histoire Naturelle; A, antenna; ABD (L), abdomen lateral view; ABD (V), abdomen ventral view; G, gnathopod; HD, head; LL, lower lip; MD, mandible; MX, maxilla; MXP, maxilliped; P, pereopod; UL, upper lip; L, left; R, right; ♂, male; ♀, female. The setal formula (1-x-y-1 or 1-x-1) is used to describe the setae on mandibular palp article 3 (see Takeuchi & Lowry, 2007).

## TAXONOMY

### Genus *Metaprotella* Mayer, 1890

**Diagnosis.** — Head fused (suture present or vestigial as slight concaved area) with pereonite 1. Antenna 1 well developed; flagellum with more than 2 articles. Antenna 2 well developed; flagellum with 2 articles. Mandible well developed; molar present, well developed; palp 3-articulate, setal formula 1-x-y-1 or 1-x-1. Maxilliped well developed; inner plate (basal endite) smaller than outer plate (ischial endite); outer plate (ischial endite) well developed; palp article 3 with distal projection; palp article 4 well developed. Pereonite 4 clavate appendage absent. Pereonites 6 and 7 completely fused (dorsal suture absent). Pereopod 3 vestigial, with 1 article. Pereopod 4 vestigial, with 1 article. Pereopod 5 well developed, with 7 articles, with sparse, short setae and well-developed dactylus. Pereopods 6 and 7 well developed, with 7 articles. Gills on pereonites 3 and 4. Pleopods absent. Uropods 2 pairs; biarticulate, uniramous and vestigial (unclear). Telson (dorsal lobe) present.

**Type species.** — *Protella haswelliana* Mayer, 1882, by monotypy

**Remarks.** — The generic diagnosis of the *Metaprotella* was recently defined by Takeuchi & Lowry (2007) based on newly collected material of *M. haswelliana* (Mayer, 1882), the type species of *Metaprotella* from Albany, Western Australia. Unlike *M. haswelliana* (Mayer, 1882) which has a clear suture between the head and pereonite 1, *Metaprotella sandalensis* Mayer, 1898 has a more vestigial suture, recognised by a slight concave area (see Fig. 1). Thus, the generic diagnosis of *Metaprotella* in this paper is revised in order to include this variation.

### *Metaprotella sandalensis* Mayer, 1898

(Figs. 1–6)

*Metaprotella sandalensis* Mayer, 1898: 53–56, Figs. 1–6; 1903: 40–42 (in part), Plate 1, Fig. 36, Plate 6, Figs. 56–58, Plate 9, Figs. 16, 44; McCain & Steinberg, 1970: 55–56; Müller, 1990: 836–842, Figs. 41–64; Laubitz, 1991: 113, Fig. 10.

Not *Metaprotella sandalensis*: Utinomi, 1973: 29–31, Fig. 1; Arimoto, 1976: 48–49, Fig. 20; Guerra-García, 2003b: 14–15, Fig. 8; 2004b: 163–165, Figs. 4, 5.

**Material examined.** — 1 male, (AM P.87572), hydroids, 12 m, Pointe de Easo (= Easho), Baie de Sandal (20°47.27'S, 167°07.34'E), Lifou Island, Loyalty Islands, New Caledonia, coll. I. Takeuchi, 27 Nov.1995; 1 premature male, (AM P.87573), hydroids, 12 m, Pointe de Easo (= Easho), Baie de Sandal (20°47.27'S, 167°07.34'E), Lifou Island, Loyalty Islands, New Caledonia, coll. I. Takeuchi, 27 Nov.1995; 2 males (AM P.87574), red alga, 12 m, Pointe de Easo (= Easho), Baie de Sandal (20°47.27'S, 167°07.34'E), Lifou Island, Loyalty Islands, New Caledonia, coll. I. Takeuchi, 27 Nov.1995; 2 males and 1 female, (AM P.87575), red alga under hanging of the coral reef, 6 m, Dokin (= Joking) (20°42.15'S, 167°09.90'E), Lifou Island, Loyalty Islands, New Caledonia, coll. I. Takeuchi, 28 Nov.1995; 1 female, (AM P.87576), *Halimeda* sp. on the small pass on the surface of the coral reef, 3 m, Pointe de Easo (= Easho), Baie de Sandal (20°47.27'S, 167°07.34'E), Lifou Island, Loyalty Islands, New Caledonia, coll. I. Takeuchi, 28 Nov.1995; 3 males and 3 females, (AM P.87577), *Halimeda* sp. on the small pass on the surface of the coral reef, 3 m, Pointe de Easo (= Easho), Baie de Sandal (20°47.27'S, 167°07.34'E), Lifou Island, Loyalty Islands, New Caledonia, coll. I. Takeuchi, 28 Nov.1995; 2 males, (AM P.87578), *Halimeda* sp., 18 m, Dozip (= Jozip), west coast of Lifou Island (20°56.30'S, 167°20.85'E), Loyalty Islands, New Caledonia, coll. I. Takeuchi, 29 Nov.1995; 1 male and 1 female, (MNHN-IU-2011-5620), green alga, meshed type, 10 m, Pointe de Easo (= Easho), Baie de Sandal (20°47.27'S, 167°07.34'E), Lifou Island, Loyalty Islands, New Caledonia, coll. I. Takeuchi, 27 Nov.1995; 1 male, (MNHN-IU-2011-5621), hydroids, 12 m, Pointe de Easo (= Easho), Baie de Sandal (20°47.27'S, 167°07.34'E), Lifou Island, Loyalty Islands, New Caledonia, coll. I. Takeuchi, 27 Nov.1995; 1 male and 1 female, (MNHN-IU-2011-5622), red alga near the bottom of the steep reef, 8 m, Dokin (= Joking), Lifou Island (20°42.15'S, 167°09.90'E), Loyalty Islands, New Caledonia, coll. I. Takeuchi, 28 Nov.1995; 3 males and 3 females (1 premature), (MNHN-IU-2011-5623), red alga in the pot of the surface of the reef, 2 m, Dokin (= Joking), Lifou Island (20°42.15'S, 167°09.90'E), Loyalty Islands, New Caledonia, coll. I. Takeuchi, 28 Nov.1995; 3 males, (MNHN-IU-2011-5624), red alga & hydroids along the steep reef, 8–10 m, Pointe de Easo (= Easho), Baie de Sandal (20°47.27'S, 167°07.34'E), Lifou Island, Loyalty Islands, New Caledonia, coll. I. Takeuchi, 28 Nov.1995.

**Type locality.** — Sandal Bay, Lifou Island, Loyalty Islands, New Caledonia.

**Description.** — **Male.** Body length, 8.87 mm. AM P.87572. Head, 0.37 mm, and pereonite 1, 0.35 mm; head and pereonite 1 fused, with a slight concaved area between head and pereonite 1; head with a pair of anterodorsally curved projections and subtriangular lateral projection below the eye; eye large, distinctive. Pereonite 2, 1.15 mm with a pair of anteriorly curved mid-dorsal projections, an unpaired dorsodistal projection and anterior lateral projection. Pereonite 3, 2.09 mm with a pair of mid-dorsal projections and a dorsodistal projection. Pereonite 4 longest, 2.28

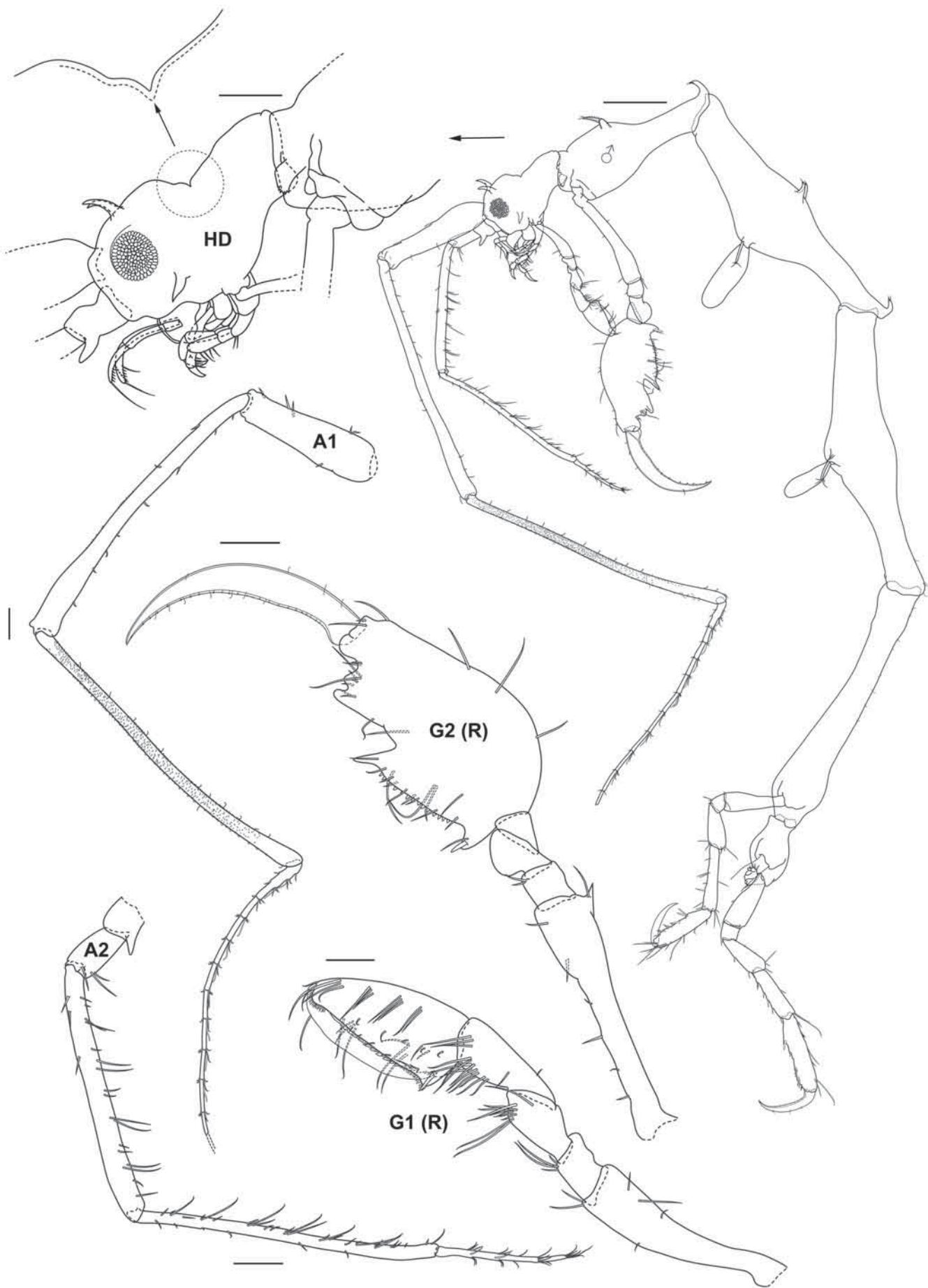


Fig. 1. *Metaprotella sandalensis*, male, 8.87 mm, AM P.87572, Pointe de Easo (= Easho), Baie de Sandal, Lifou Island. Scales for A1, G1, and HD represent 0.1 mm; A2 and G2 represent 0.2 mm; whole body represents 0.5 mm.

mm. Pereonite 5 almost subequal to pereonite 3, 2.05 mm. Pereonites 6 and 7 completely fused, 0.58 mm. *Antenna 1* about 0.8× body length; peduncular article 2 about 2.3× longer than article 1; article 3 longest, 1.1× longer than article 2; flagellum with more than 11 articles, proximal article composed of 3 articles. *Antenna 2* slender, about 0.5× the length of antenna 1; flagellum 0.2× peduncular length, with 2 articles; proximal article 3.5× distal article (Fig. 1).

*Upper lip* notched, wider than long, forming rounded quadrilateral projections. *Lower lip* well developed, finely setose on inner lobe. *Mandible* left incisor with 5 teeth followed by lacina mobilis with 5 teeth and 2 accessory bundled setae; molar well developed, truncate; palp 3 articulate; article 2 with 4 simple setae; article 3 with setal formula 1-11-2-1 and several setules along terminal margin. *Maxilla 1* outer plate with 7 stout apical setal-teeth; palp biarticulate; article 2, 5× the length of article 1 with 4 triangular projections at distal margin and armed with 3 robust setae, 2 slender setae and 3 facial setae. *Maxilla 2* inner plate with 5 apical setae and 2 medial setae; outer plate with 8 apical setae and 2 medial setae. *Maxilliped* basal endite (inner plate) subrectangular with 1 stout tooth, 2 simple setae and 2 plumose setae apically; ischial endite (outer plate) 2× the length of inner plate with 1 plumose setae apically; inner margin with many blade-like setae and 2 setae medially; palp 4 articulate; article 2 longest and setose on inner margin; article 3 subequal in length with article 1 with a large triangular distal projection, 7 setae on inner margin and 2 setae on outer margin; palp article 4 (dactylus) falcate, with row of setules (Fig. 2).

**Pereon.** *Gnathopod 1* basis subequal in length to ischium, merus and carpus combined; carpus subtriangular, setose posterodistally; propodus subtriangular, longer than wide (1.8× width) with 4 rows of submarginal setae, palm begins 1/5 along posterior margin with 1 robust/stout proximal setae, minutely setose along 3/4 of palm; dactylus slightly curved distally, inner margin with serratiformed teeth. *Gnathopod 2* nearly 2× the length of gnathopod 1, begins 1/5 along anterior margin of pereonite 2; basis 0.75× the length of pereonite 2, scarcely setose, with an acute anterodistal projection provided with 1 seta; carpus triangular; propodus enlarged, subovate and subequal in length to basis; palm proximal projection with 1 robust seta (grasping spine), mid-palmar projection with 1 seta followed by a deep sinus and a well-developed distal shelf with 2 projections, palm with serratiform teeth between grasping proximal and mid-palmar projection; dactylus falcate, with several fine setae (Fig. 1). *Gill 3* length 0.25× pereonite 3, oval. *Pereopod 3* slender, 0.1× pereonite 3, 1 articulate with 5 distal setae and 1 lateral seta. *Gill 4* length 0.25× pereonite 4, oval, smaller than gill 3. *Pereopod 4* slender, 0.1× pereonite 4, 1 articulate with 5 distal setae and 1 lateral seta. *Pereopod 5* well developed, carpus and propodus subequal in length, propodus with a pair of grasping spines near proximal end of palm and a tuff of distal setae, dactylus falcate with several fine setae along inner and outer margin. *Pereopod 6* lacking in this specimen. *Pereopod 7* more robust than pereopod 5, basis subequal in length with carpus, carpus with several spines along inner margin, propodus longest with a pair of proximal grasping spines, dactylus falcate (Fig. 3).

**Pleon.** *Uropod 1* uniramus with 5 setae along outer margin. Tuff of setae present between penes and uropod 1. *Uropod 2* ramus very vestigial, confused with abdomen. Telson with a pair of fine setae and a pair of plumose setae (Fig. 3).

**Female.** Body length, 5.03 mm. AM P.87576. Head length 0.34 mm and pereonite 1, 0.18 mm; head and pereonite 1 fused, with a slight concaved area between head and pereonite 1. Head with a pair of anterodorsally curved projections; eye large, distinctive; subtriangular lateral projection below the eye absent; pereonite 2, 0.93 mm with a pair of anteriorly curved mid-dorsal projection, a dorsodistal projection, and a small knobbed-like anterior lateral projection; pereonite 3, 0.80 mm with a pair of mid-dorsal projections and a dorsodistal projection; pereonite 4, 1.00 mm; pereonite 5, 1.34 mm, longest; pereonites 6 and 7 completely fused, 0.44 mm. *Antenna 1*, 0.7× body length; peduncular article 1 shortest; article 2 longest, 2.6 x longer than article 1; article 3, 1.7× longer than article 1; flagellum with 10 articles, proximal article composed of 2 articles. *Antenna 2* slender, about 0.6× the length of antenna 1; flagellum 0.2× peduncular length, with 2 articles; proximal article 2.3× distal article (Fig. 4).

*Upper lip* notched, wider than long, forming rounded quadrilateral projections. *Mandible* right incisor with 5 teeth followed by lacina mobilis with many small teeth and 2 accessory bundled setae; molar flake present; molar well developed, truncate; palp 3 articulate; article 2 with 5 simple setae; article 3 with setal formula 1-9-2-1. *Mandible* left incisor with 5 teeth followed by lacina mobilis with 5 teeth and 2 accessory bundled setae; molar well developed, truncate; palp 3 articulate; article 2 with 6 simple setae; article 3 with setal formula 1-10-2-1. *Maxilla 1* outer plate with 7 stout apical setal-teeth; palp biarticulate; article 2 about 3 x the length of article 1 with 4 triangular projections at distal margin and armed with 6 setae and a row of 4 slender facial setae. *Maxilla 2* inner plate with 9 setae; outer plate with 14 apical setae. *Maxilliped* basal endite (inner plate) subrectangular with 1 stout tooth, 2 simple setae and 2 plumose setae apically; ischial endite (outer plate) 2× the length of inner plate with 1 setae apically; inner margin with many blade-like setae and 2 setae medially; palp 4 articulate; article 2 longest and setose on inner margin; article 3 with large triangular distal projection and 12 setae at distal margin, subequal in length with article 4 (dactylus); dactylus falcate, with row of setules (Fig. 5).

**Pereon.** *Gnathopod 1* basis subequal in length to ischium, merus and carpus combined; carpus subtriangular, setose posterodistally; propodus subtriangular, longer than wide with 3 rows of submarginal setae, palm begins 1/5 along posterior margin with serratiform teeth along entire margin and a strong proximal spine; dactylus slightly curved distally, inner margin with serratiformed teeth. *Gnathopod 2* begins 1/6 along anterior margin of pereonite 2; basis 0.6× the length of pereonite 2, scarcely setose, with an anterodistal projection provided with two setae; carpus triangular; propodus 0.6× the length of pereonite 2, enlarged, and subovate; palm without any excavations, setose along entire margin, proximal projection with 1 robust seta; dactylus falcate, fitting on palm

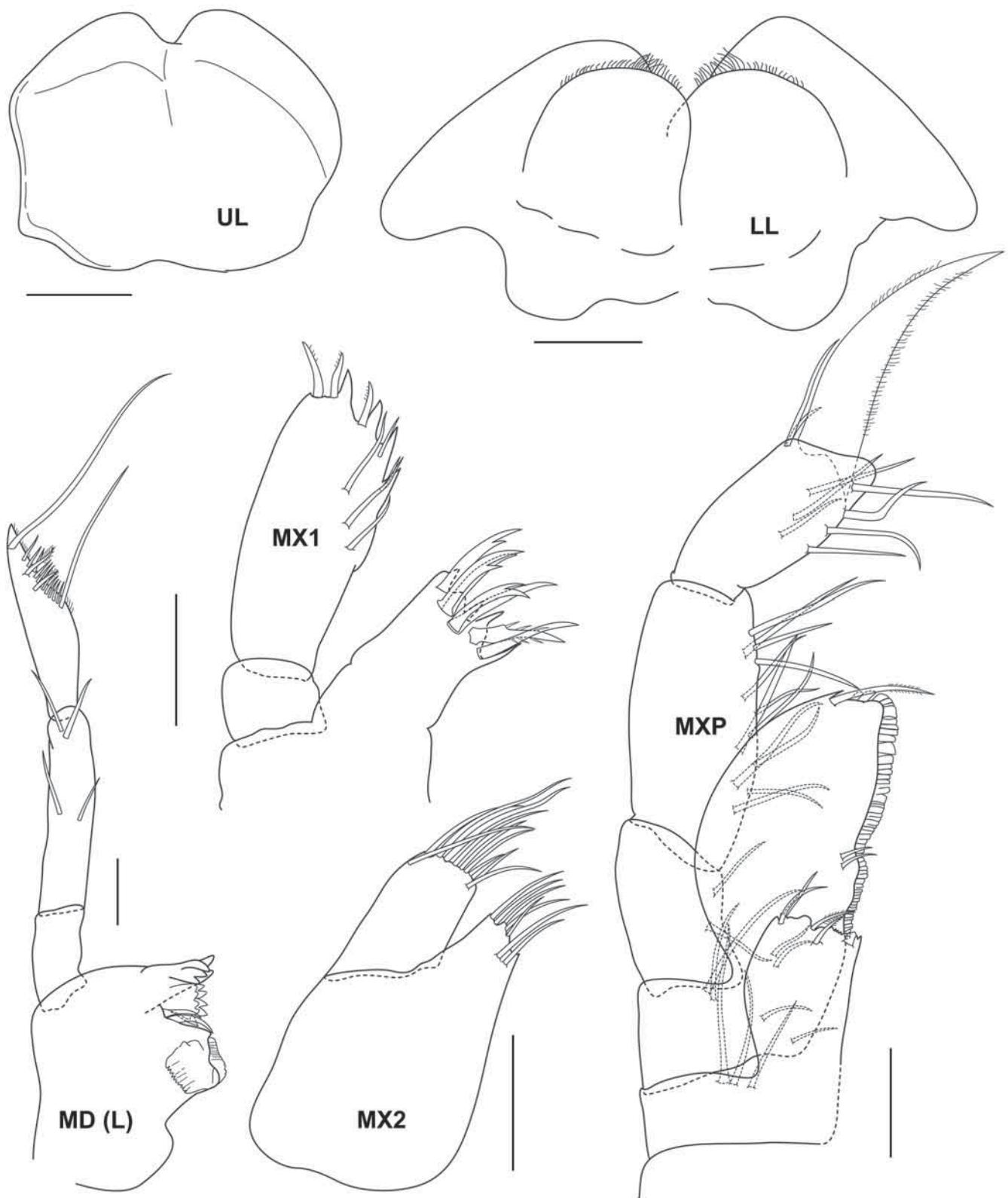


Fig. 2. *Metaprotella sandalensis*, male, 8.87 mm, AM P.87572, Pointe de Easo (= Easho), Baie de Sandal, Lifou Island. All scales represent 0.05 mm.

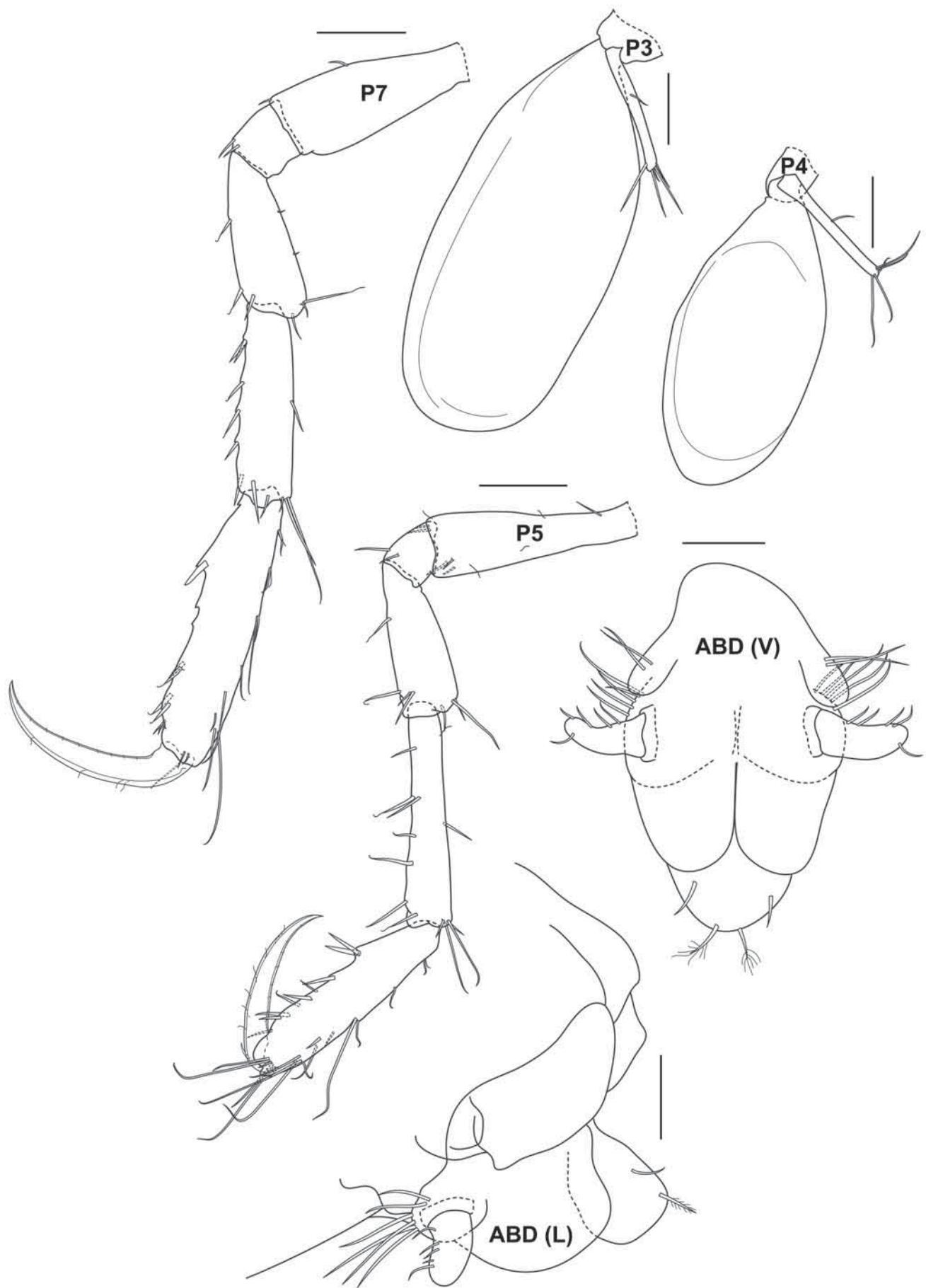


Fig. 3. *Metaprotella sandalensis*, male, 8.87 mm, AM P.87572, Pointe de Easo (= Easho), Baie de Sandal, Lifou Island. Scales for ABD (L) and ABD (V) represent 0.05 mm; P3 and P4 represent 0.1 mm; P5 and P7 represent 0.2 mm.

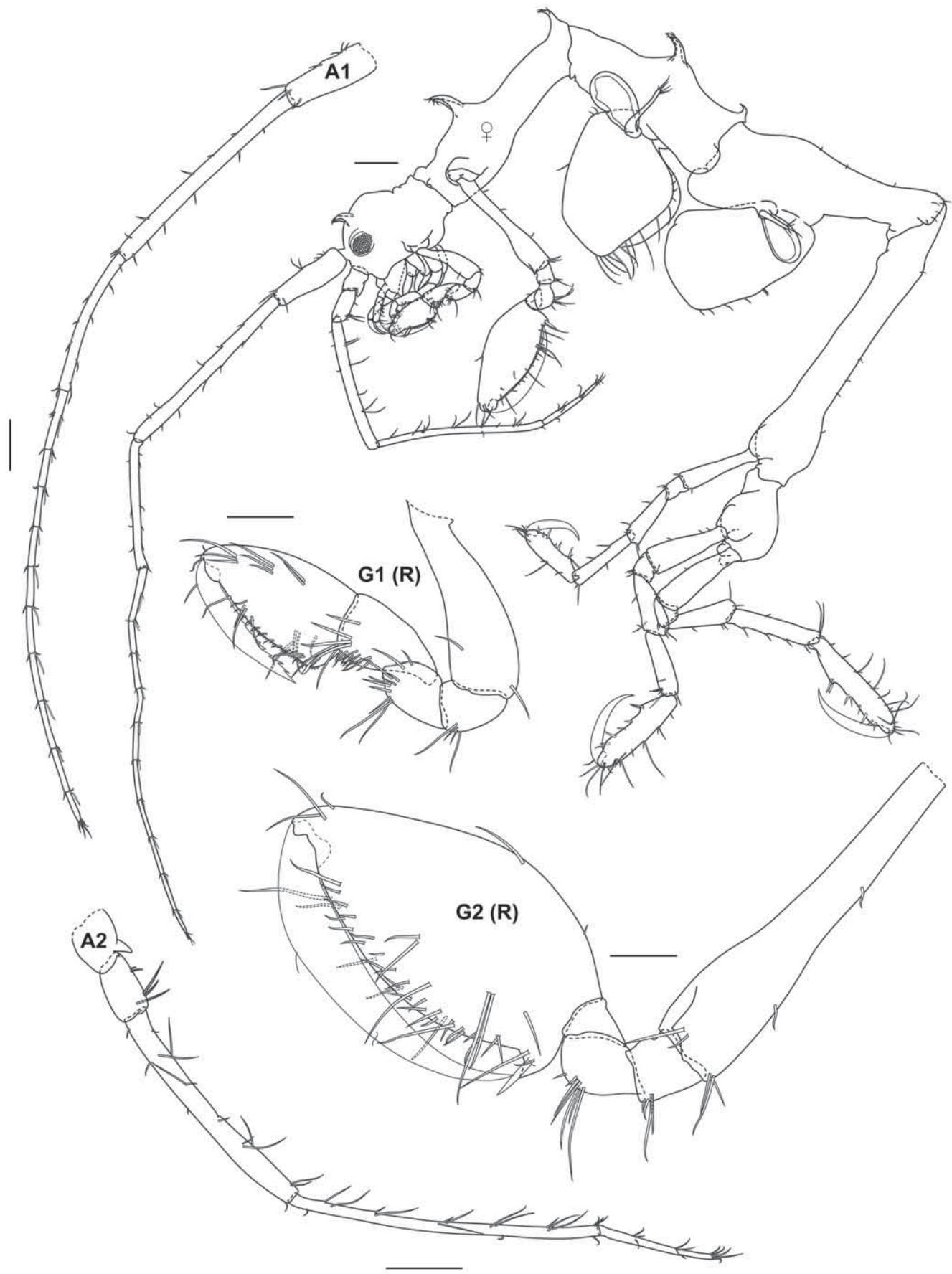


Fig. 4. *Metaprotella sandalensis*, female, 5.03 mm, AM P.87576, Pointe de Easo (= Easho), Baie de Sandal, Lifou Island. Scales for G1 and G2 represent 0.1 mm; A1, A2, and whole body represent 0.2 mm.

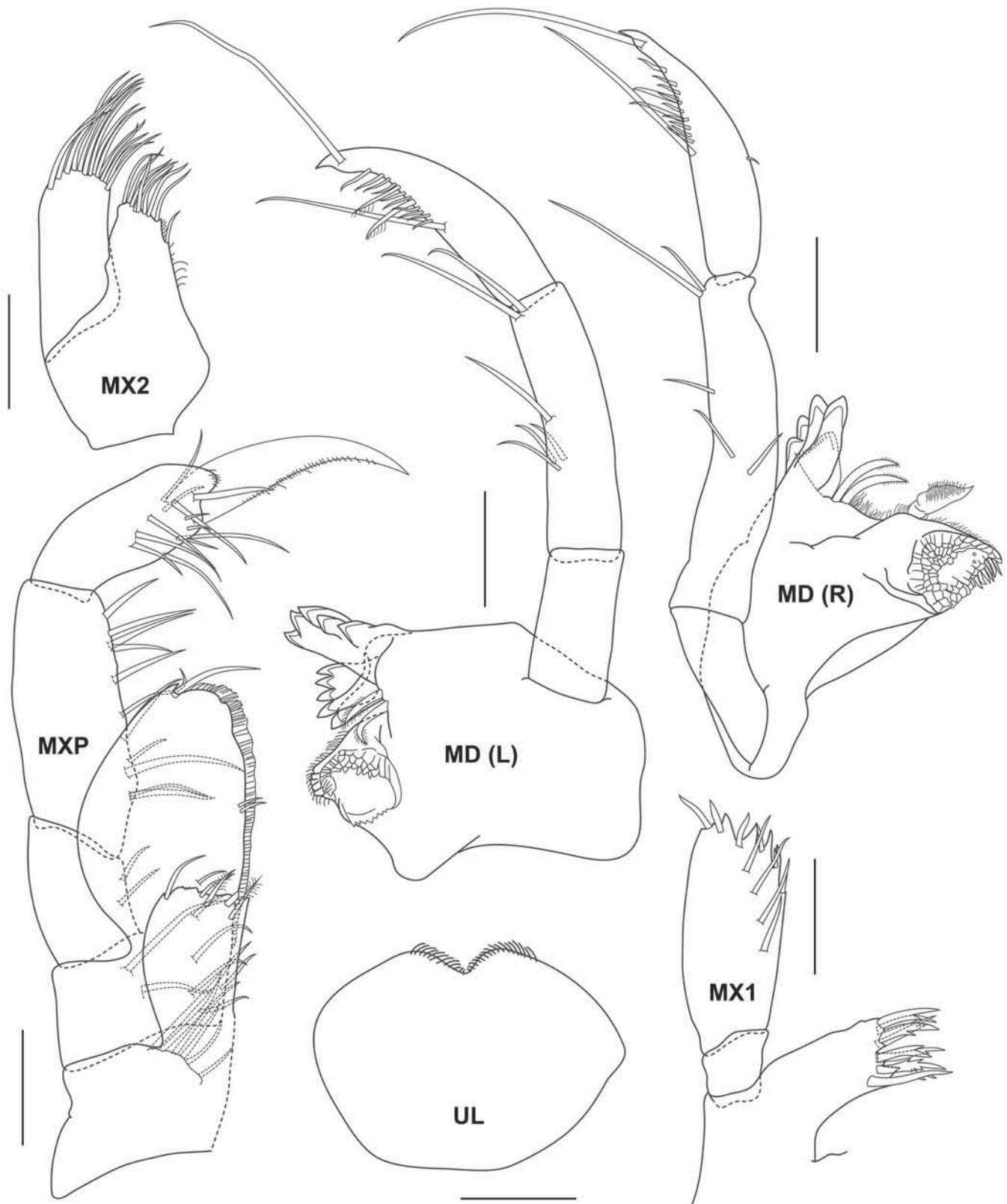


Fig. 5. *Metaprotella sandalensis*, female, 5.03 mm, AM P.87576, Pointe de Easo (= Easho), Baie de Sandal, Lifou Island. All scales represent 0.05 mm.

(Fig. 4). *Gill 3* length  $0.4 \times$  of pereonite 3, oval. *Pereopod 3* slender,  $0.3 \times$  of pereonite 3,  $0.7 \times$  gill length, 1 articulate, with 7 distal setae and 1 lateral seta. *Oostegite 3* length  $1.0 \times$  the width, setose along entire margin. *Gill 4*,  $0.2 \times$  of pereonite 4, oval. *Pereopod 4* slender,  $0.14 \times$  of pereonite 4,  $0.6 \times$  gill length, 1 articulate with 5 distal setae and 1 lateral seta. *Oostegite 4* length  $0.7 \times$  the width with 7 setae on anterior margin. Pereopods 5, 6 and 7 similar, becoming more robust progressively. *Pereopod 5* propodus with a pair of stout setae near proximal end of palm; dactylus falcate. *Pereopod 6* basis and merus length subequal with pereopod 5 basis and merus; propodus with a pair of stout setae near proximal end of palm; dactylus falcate with 1 plumose seta on anterior margin at proximal region. *Pereopod 7* basis subequal in length to ischium and merus combined; propodus with a pair of proximal stout setae; dactylus falcate (Fig. 6).

**Pleon.** *Uropod 2* present, ramus very vestigial, confused with abdomen. *Telson* with a pair of fine setae and a pair of plumose setae (Fig. 6).

**Remarks.** — Mayer (1898) described this species from the collections of Dr. Arthur Willey from transparent ascidians at 18–27 m depth in Sandal Bay, Lifou Island, Loyalty Islands, but did not indicate where the type material were deposited. His description was based on a male of 9 mm body length, with figures of a lateral view, mandibular palp, maxilliped, gnathopods 1 and 2, and abdomen. This specimen was then redescribed in Mayer (1903). In Mayer (1898), female specimens were collected but none were described. McCain & Steinberg (1970) mentioned the location of the type material for *Metaprotella sandalensis* as Universitetets Zoologiske Museum (= Zoologisk Museum), Copenhagen, while Zoologisch Museum, Amsterdam has varietal types. The Zoologisk Museum, however, possesses the types of *Metaprotella sandalensis singaporenensis*, but not those of *Metaprotella sandalensis* (N. L. Bruce, pers. comm.). This situation suggests the possibility that other institution(s) might possess the types of *Metaprotella sandalensis*, and as such, we prefer not to designate a neotype from the present material until the status of the type material is ascertained.

The redescription of a male specimen from the present study closely resembles the original description by Mayer (1898) in the following characteristics: body somites of our specimen possess a slight concave area between head and pereonite 1 representing the presence of a vestigial suture; antenna 1 very long, nearly as long as body length; peduncular article 1–3 longer than half of the body length, article 3 longer than article 2 in larger male ( $> ca. 6.0$  mm in body length); a pair of anterodorsally curved projections on the head; a subtriangular lateral projection below the eye at the point of insertion of the mandibles; pereonite 2 and 3 each with a pair of anteriorly curved mid-dorsal projections and an unpaired dorsodistal projection. As shown in Fig. 7, the length of antenna 1 is about 0.6 to 0.8 times the body length in both sexes. Apart from that, specimens of both sexes also have a projection positioned latero-ventrally near the anterior margin of pereonite 2.

Similarities in mouthparts are also apparent, specifically: 1) mandibular palp with setal formula of 1-8 or more-2-1; and 2) maxilliped palp article 3 with an inwardly directed large triangular distal projection.

Gnathopods 1 and 2 of the present study are largely similar in shape and form to Mayer's (1898) description; however, slight differences do occur in setae density in gnathopod 1, with the present specimen slightly more setose in the carpus and propodus region than Mayer's (1898). In both this study and Mayer (1898), gnathopod 2 palm is armed with serratifom teeth (blunt teeth) between grasping proximal and mid-palmar projection. However, our specimens have a basis with an acute anterodistal projection (not shown in Mayer [1898]). Pereopods 3 and 4 are also similar; slender and are half or nearly half of gill length.

Mayer's (1898) description of the male abdomen is similar to ours, with two pairs of uropods, with uropod 1 uniramus and uropod 2 ramus, very vestigial and difficult to distinguish from the abdomen. Thus, our male specimen agrees well with the original description of Mayer (1898), except for a few minor differences, such as the presence of a single projection positioned latero-ventrally near the anterior margin of pereonite 2 (paired projection otherwise known as robust spines in Mayer [1898]) and pereopods 3 and 4 with three long and two short setae (one long and six short setae in Mayer [1898]). Apart from that, pereopods 5–7 of the present study were not compared, as figures were not provided in Mayer (1898).

Currently, the following descriptions represent the recent literature on *Metaprotella sandalensis* Mayer, 1898; Utinomi (1973) and Arimoto (1976) from Japan, Müller (1990) from French Polynesia, Laubitz (1991) from Indonesia and Philippines, Guerra-García (2003a) from Papua New Guinea, Guerra-García (2003b) from Mauritius, Guerra-García (2004a) from Western Australia and Northern Territory, Guerra-García (2004b) from Phuket, Thailand, Krapp-Schickel & Guerra-García (2005) from Indonesia, and Guerra-García (2006) and Guerra-García & Lowry (2009) from the Great Barrier Reef and adjacent localities.

Of these studies, Müller's (1990) and Laubitz's (1991) descriptions are the most similar to ours and Mayer's (1898) in the characteristics mentioned above. Laubitz's (1991) figures and descriptions show strong similarity to Mayer's (1898) figures and agree well with the present illustrations. The only differences were the presence of a projection found posterior to the gnathopod 2 attachment (not found in Mayer [1898] and Müller [1990]) and the length ratio of antenna 1 peduncular article 2 and 3. Mayer (1898), Müller (1990), and the present study have peduncular article 2 slightly shorter than article 3 ( $\sim 0.8 \times$  shorter) whilst Laubitz's figure shows article 2 longer than article 3 ( $\sim 1.7 \times$  longer). There were also minor differences in certain appendages in Müller (1990), such as, antenna 1; proximal article of flagellum is composed of two articles as compared to three articles in our study.

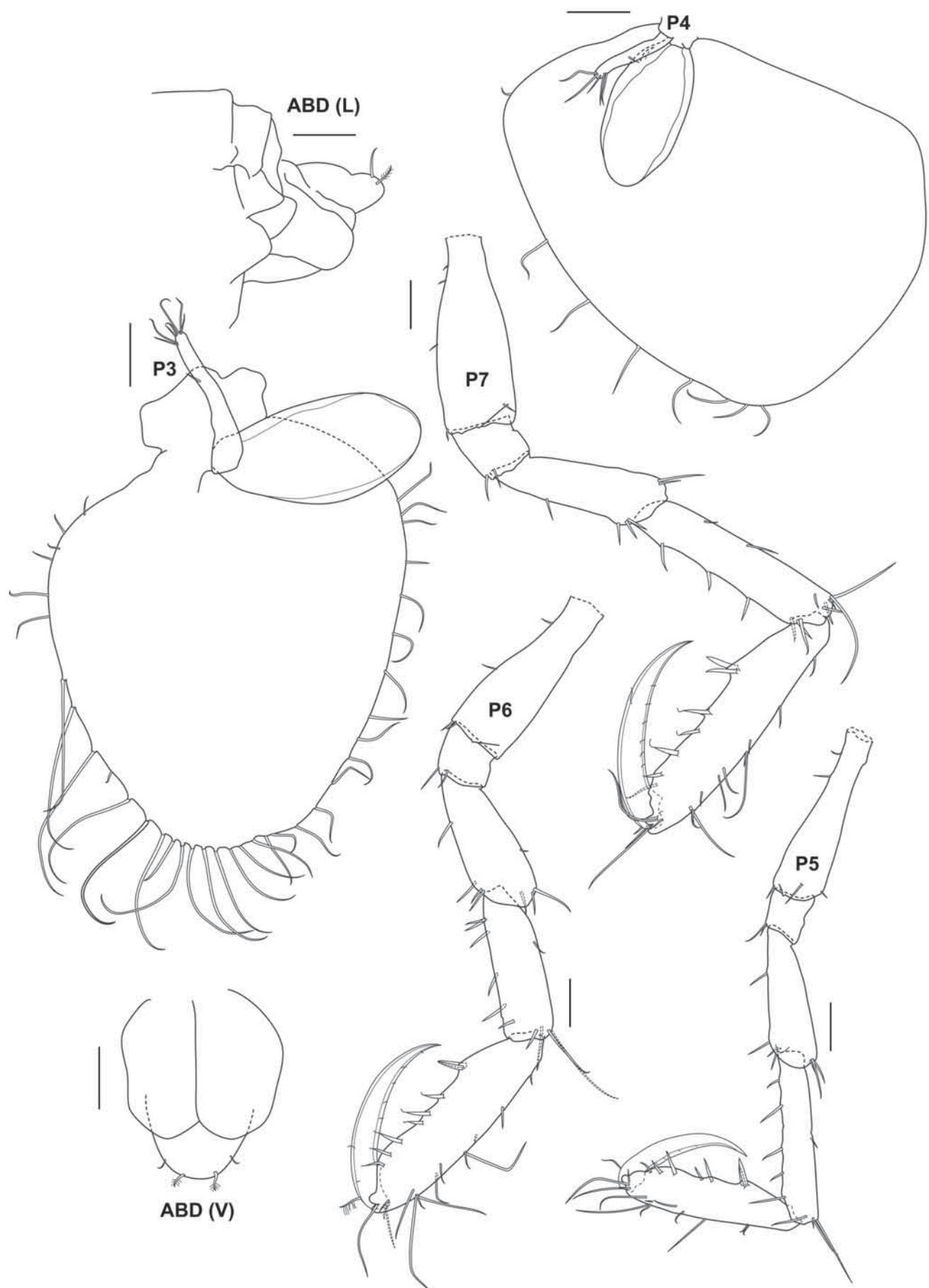


Fig. 6. *Metaprotella sandalensis*, female, 5.03 mm, AM P.87576, Pointe de Easo (= Easho), Baie de Sandal, Lifou Island. Scales for ABD (L) and ABD (V) represent 0.05 mm; P3, P4, P5, P6, and P7 represent 0.1 mm.

However, the similarity of other descriptions, such as Guerra-García (2003a, 2004a, 2006), Krapp-Schickel & Guerra-García (2005), and Guerra-García & Lowry (2009), to ours and Mayer's (1898) is questionable. Most of these studies (Guerra-García, 2004a, 2006; Krapp-Schickel & Guerra-García, 2005; Guerra-García & Lowry, 2009) share one common characteristic; the length of male antenna 1 being shorter than those of the present study (see Fig. 7);  $< 3/5^{\text{th}}$  of the body length. The body lengths reported in these five studies were between 6.5 to 9.4 mm, which overlaps with large males of our study having longer antenna 1. Moreover, most of the appendages and mouthparts were not described and/or figures were not provided. Based on whole body figures provided in these five studies, only Krapp-Schickel & Guerra-García (2005) reported Indonesian specimens with a subtriangular lateral projection below the eye, while the other four are either not drawn or absent. In addition, the palmar margin of gnathopod 2 for these four is also difficult to ascertain (distal shelf with 1–2 triangular projections). Guerra-García & Lowry (2009) also mentioned the setal formula of the mandibular palp as (1-x-1) in the description as compared to 1-x-y-1 in both our study and Mayer's (1898).

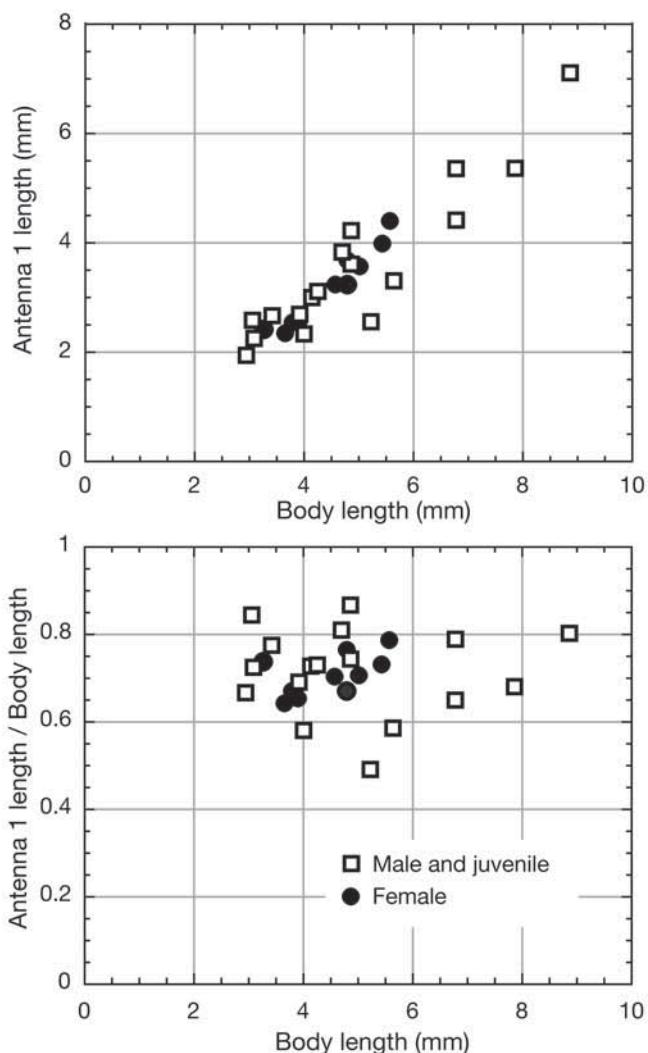


Fig. 7. The relationship between antenna 1 length and body length of *Metaprotella sandalensis* collected from coastal areas of Lifou Island.

Although the male of Guerra-García (2003a) from Papua New Guinea possesses a relatively longer antenna 1 (ca. 4/5<sup>th</sup> of body length) its head lacks a subtriangular lateral projection below the eye.

*Metaprotella sandalensis* from Utinomi (1973) and Arimoto (1976) from Japan, and Guerra-García (2003b, 2004b), from Mauritius and Thailand, respectively, clearly differs from *M. sandalensis* of this study and Mayer's (1898). This may be explained by Japan and Mauritius being at the extremes of the distribution thus far reported.

Utinomi (1973) described specimens collected from Shirahama, Kii Peninsula, central Japan. Arimoto (1976) cited the descriptions and figures of Utinomi (1973) in the monograph of the Caprellidae of Japan. Utinomi's (1973) description differs from ours and Mayer's (1898) in the absence of a subtriangular lateral projection below the eye, absence of an anterior lateral projection on pereonite 2, subequal length of pereonites 4 and 5, oval-shaped gills instead of elongated, setal formula of the mandibular palp (1-x-1) as compared to 1-x-y-1 and tuff of minute setae on distal margin of uropod 1 ramus instead of normal setae.

*Metaprotella sandalensis* collected from Mauritius (Guerra-García, 2003b) differs from the present study and Mayer's (1898) in its more prominent suture, the absence of a subtriangular lateral projection below the eye, the absence of an anterior lateral projection on pereonite 2, the length ratio of pereopod 3 or 4 to gill (1/4 of gill as compared to 1/3 of gill in our study) and very short peduncular article 3 of antenna 1 (0.4× the length of article 2 as compared to 1.1× the length of article 2 in our study). Krapp-Schickel & Guerra-García (2005) suggests that *M. sandalensis* from Mauritius might be an unknown species close to *Metaprotella africana* Mayer, 1903 recorded from Djibouti in the Gulf of Aden, northwest Indian Ocean.

Material examined by Guerra-García (2004b) from Phuket is similar to ours in the longer peduncular article 3 of antenna 1 (1.3× longer than article 2) and arrangement of the dorsal projections, but differs in the presence of an extra subtriangular lateral projection situated postero-ventrally on the head; a paired projection positioned latero-ventrally near the anterior margin of pereonite 2 (also found in Mayer [1898]); its subequal length of pereonites 4 and 5; tuff of minute setae on distal margin of uropod 1 ramus (five normal setae along outer margin in the present study); palmar margin of gnathopod 2 with a long narrow proximal projection provided with a very short robust setae (grasping spine) almost like a stub, mid-palmar projection also very narrow and elongated and absence of a well developed distal shelf (Fig. 5C in Guerra-García [2004b]). According to Guerra-García (2004b), differences in the structure of gnathopod 2 (shown in Figs. 5C, 5D) were due to different growth stages. Gnathopod 2 of Fig. 5D is closer to our study and Mayer's (1898). However, Fig. 5C appears to be very different. Considering all these differences, we feel that the specimen from Guerra-García (2004b) is unique and distinctively different from the present study and Mayer (1898).

In conclusion, the descriptions and figures of Müller (1990) and Laubitz (1991) on *Metaprotella sandalensis*, one of the dominant species of the Caprellidea in the tropical west Pacific coasts, are most similar to ours and Mayer's (1898). Conversely, descriptions by Guerra-García (2003b, 2004b), respectively from Mauritius and Thailand, as well as Utinomi (1973) and Arimoto (1976) from Japan are clearly different from the *M. sandalensis* of this study and Mayer's (1898). *M. sandalensis* in Guerra-García (2003a, 2004a, 2006), Krapp-Schickel & Guerra-García (2005), and Guerra-García & Lowry (2009) is reported based on lateral view figures of the species. Detailed descriptions of corresponding specimens in the above studies would help to clarify the status of the complex. There are indications that the distribution of *M. sandalensis* is more limited than previously thought. The present comparison suggests that further taxonomic studies on this species group are necessary. Detailed drawings and descriptions provided in this study could aid in eliminating further confusion within the *M. sandalensis* complex, including subspecies described by Mayer (1903) and Schellenberg (1938), and thus establish its definitive characteristics.

**Distribution.**—Lifou Island, Loyalty Islands, New Caledonia (Mayer, 1898); Indonesia, Philippines, (Laubitz, 1991); Bora Bora and Morea, Society Islands (Müller, 1990).

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