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A new species of ocellated *Xanthias* Rathbun, 1897 (Crustacea: Decapoda: Brachyura: Xanthidae) from the Bohol Sea, Philippines

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Abstract

A new species of xanthid crab (Brachyura: Xanthidae) is described from the Bohol Sea in the central Philippines. *Xanthias joanneae* **sp. nov.** is most similar in morphology to *X. maculatus* Sakai, 1961 (type locality: Sagami Bay, Japan), particularly in the presence of distinctive ocelli on the carapace and pereopods. It can be separated from this species by the greater number of ocelli on the dorsal surface of the carapace, wider teeth separated by narrow notches on the carapace anterolateral margin, absence of longitudinal ridges on the external surface of the chelar palm, shorter and stouter ambulatory legs, narrower male anterior thoracic sternum, and stouter G1.

Key words: Brachyura, Xanthidae, *Xanthias maculatus*, *Xanthias joanneae*, PANGLAO 2004, Bohol Sea, Visayas, Philippines

Introduction

Several specimens of a small, brightly colored xanthid crab were collected from subtidal habitats in the Bohol Sea, Philippines, during the PANGLAO 2004 Expedition. These crabs were initially thought to be *Xanthias maculatus* Sakai, 1961, originally described from Sagami Bay, central Japan, particularly because of the similarity in color pattern. Subsequent comparison with clear photographs of the holotype of *X. maculatus*, currently deposited at the Showa Memorial Institute (National Museum of Nature and Science, Tsukuba, Japan) and kindly provided by Dr. Hironori Komatsu, confirmed that the Philippine specimens comprised a distinct new species, which is described in the present work.

The material examined is deposited in the Crustacean Reference Collection, National Museum of the Philippines, Manila (NMCR), the Showa Memorial Institute, National Museum of Nature and Science, Tsukuba (NMST), the Muséum national d'Histoire naturelle, Paris (MNHN) and the Zoological Reference Collection, Raffles Museum of Biodiversity Research, National University of Singapore (ZRC). Measurements are of the carapace width and length, in millimeters. The abbreviations used are: G1, G2, for the first and second male pleopods, respectively; P1-P5, for the first to fifth pereopods, respectively, P1 being the chelipeds and P2-P5 being the first to fourth ambulatory legs, respectively. The terminology for the carapace regions follows that of Dana (1852). For the PANGLAO 2004 alpha-numeric station codes (Bouchet *et al.*, 2009), the first letter depicts the method of collection, e.g., “B” for coral brushing, and “L” for *lumun-lumun*, a method involving tangle nets.

Systematic account

Superfamily Xanthoidea MacLeay, 1838

Family Xanthidae MacLeay, 1838

Subfamily Xanthinae MacLeay, 1838 *sensu lato*

Xanthias Rathbun, 1897 *sensu lato*

Remarks. The genus *Xanthias* Rathbun, 1897, is poorly defined, and, as presently composed (14 spp.; Ng *et al.* 2008), polyphyletic. A study on the phylogeny of the brachyuran family Xanthidae MacLeay, 1838, by Lai *et al.* (2011) showed selected representatives of the genus, including the type species, *Xanthias lamarckii* (H. Milne Edwards, 1834), falling into separate, independent clades. In the same study, the subfamily Xanthinae was also shown to be polyphyletic, with representative species, including those belonging to the type genus *Xantho* Leach, 1814, distributed among at least 10 clades (Lai *et al.* 2011). The implication is that *Xanthias* will have to be properly defined and restricted, and that some of the species included at present will have to be assigned to other genera. For the present work, however, the new species described herein is placed in *Xanthias sensu lato* and Xanthinae *sensu lato*, with the understanding that it is probably not congeneric with *X. lamarckii* and is probably not a true xanthine. The establishment of a separate genus for this new species is premature, and such action should be done in context, with a proper examination of all the other species of *Xanthias* and the rest of the Xanthinae. This would then require a systematic revision at the genus and subfamily levels, which is beyond the scope of the present work.

Xanthias joanneae sp. nov.

Figs. 1–4

Material examined. Holotype, male, 7.9 × 5.1 mm (NMCR 39080), stn B5, 4 m, reef slope with overhangs, Biking, Panglao Is., coll. PANGLAO 2004, 2 June 2004.

Paratypes: 1 female, 9.4 × 6.0 mm (NMCR 39081), stn B11, 2–4 m, coral rubble, Pamilacan Is., coll. PANGLAO 2004, 11 June 2004; 1 female, 4.1 × 2.8 mm (MNHN-IU-2010-8062), stn B24, 38 m, floor of cave, Pamilacan Is., coll. PANGLAO 2004, 25 June 2004; 1 male, 4.8 × 3.2 mm, 1 female, 5.9 × 3.8 mm (MNHN-IU-2010-8061), stn B41, 17–19 m, floor of large cave, Balicasag Is., coll. PANGLAO 2004, 4 July 2004; 1 male, 6.3 × 4.2 mm (MNHN-IU-2010-8063), stn R38, 6–37 m, reef slope, Pamilacan Is., coll. PANGLAO 2004, 11 June 2004; 1 female, 8.9 × 5.5 mm (ZRC 2013.0433), stn B3, 8 m, base of reef slope, Arco Point, Panglao Is., coll. PANGLAO 2004, 31 May 2004; 1 male, 4.5 × 3.0 mm (ZRC 2013.0434), stn B8, 3 m, subtidal reef platform, Napaling, Panglao Is., coll. PANGLAO 2004, 7 June 2004; 1 male, 7.1 × 4.8 mm, 1 female, 6.1 × 4.5 mm (ZRC 2013.0435), stn B10, 3–14 m, reef wall with small caves, Momo Beach, Panglao Is., coll. PANGLAO 2004, 10 Jun. 2004; 1 male, 7.4 × 4.9 mm (ZRC 2013.0436), stn B12, 24–27 m, reef slope, Doljo Point, Panglao Is., coll. PANGLAO 2004, 14 June 2004; 2 juv., 3.1 × 2.2 mm, 3.8 × 2.6 mm (ZRC 2013.0437), stn B16, 20 m, coral rubble on sand & gravel, Bingag, Panglao Is., coll. PANGLAO 2004, 17 June 2004; 1 female, 6.4 × 4.2 mm (ZRC 2013.0438), stn L41, 90–100 m, front of PTA compound, Panglao Is., coll. PANGLAO 2004, 1 July 2004; 1 female, 5.6 × 3.8 mm (ZRC 2013.0439), stn L43, 60 m, Pamilacan Is., coll. PANGLAO 2004, 2 July 2004; 1 female, 5.3 × 3.5 mm (ZRC 2013.0440), stn L46, 90–110 m, Balicasag Is., coll. PANGLAO 2004, 4 July 2004.

Description. Carapace (Figs. 1, 2A, 3A) transversely ovate, subhexagonal, width about 1.5 times length, dorsal area slightly convex transversely, longitudinally; dorsal surface smooth, glabrous, regions mostly poorly defined, except orbital region, with mesial, posterior limit delineated by deep groove, anterior portions of 2M, 3M feebly indicated; subhepatic, pterygostomial regions smooth, glabrous. Front weakly advanced, broad, about 0.4 times carapace width, slightly deflexed ventrally; separated into two lobes by wide V-shaped notch, continuing posteriorly as shallow median groove on dorsal carapace, as median suture reaching tip of proepistome ventrally; anterior margin of frontal lobes gently convex in dorsal view. Anterolateral margin convex, divided into 4 low, lobiform teeth, separated from each other by distinct V-shaped notches; first tooth low, barely indicated; second, widest, low but more projecting than first, anterior margin much shorter than posterior; third, narrower at base but more projecting than preceding, anterior margin much shorter than posterior; fourth, similar to third but much smaller, posterior margin continuous with carapace posterolateral margin; maximum carapace width across tips of third teeth, short transverse groove between second, third teeth, continuing onto branchial region. Posterolateral margin longer than anterolateral margin, straight to slightly convex. Posterior margin with central region slightly concave.

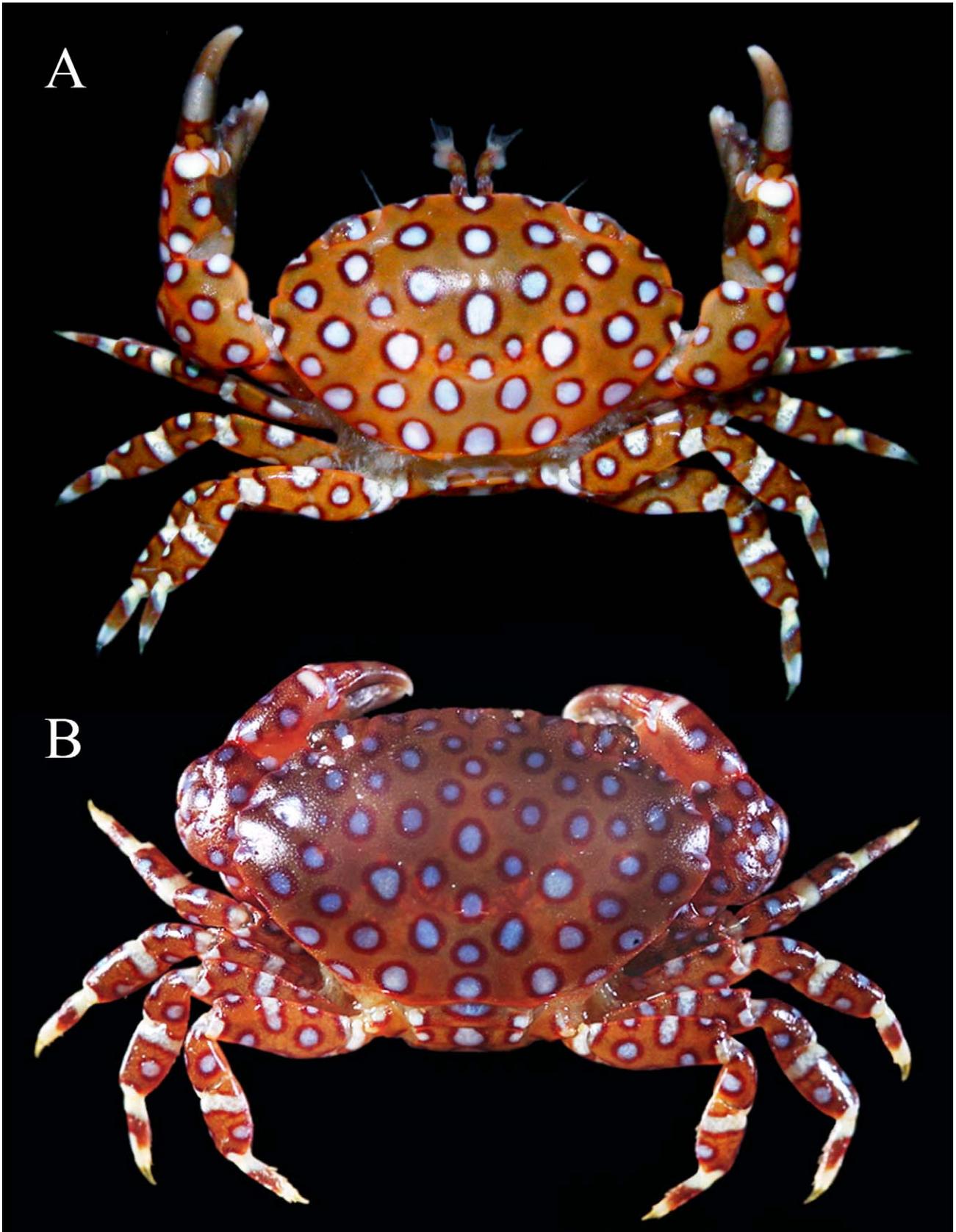


FIGURE 1. *Xanthias joanneae* sp. nov., live coloration. A, holotype, male, 7.9 × 5.1 mm (NMCR 39080); B, paratype, female, 9.4 × 6.0 mm (NMCR 39081). Photos by (A) Peter K.L. Ng/Tan Swee-Hee (NUS); (B) Chan Tin-Yam/Lin Chia-Wei (NTOU).

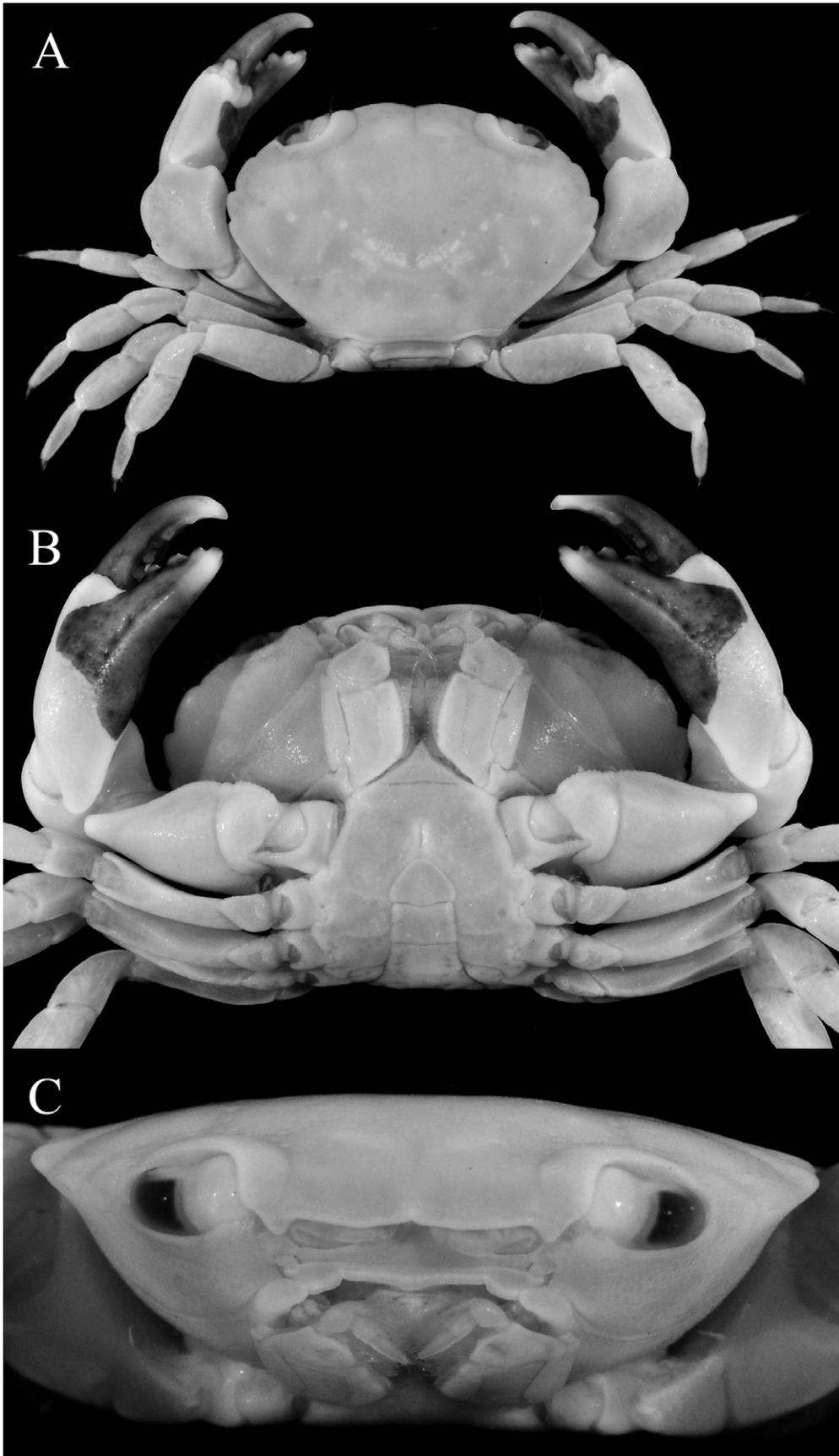


FIGURE 2. *Xanthias joanneae* sp. nov., holotype, male, 7.9 × 5.1 mm (NMCR 39080), Panglao Is., Bohol Sea, Philippines. A, dorsal view; B, ventral view; C, anterior view.

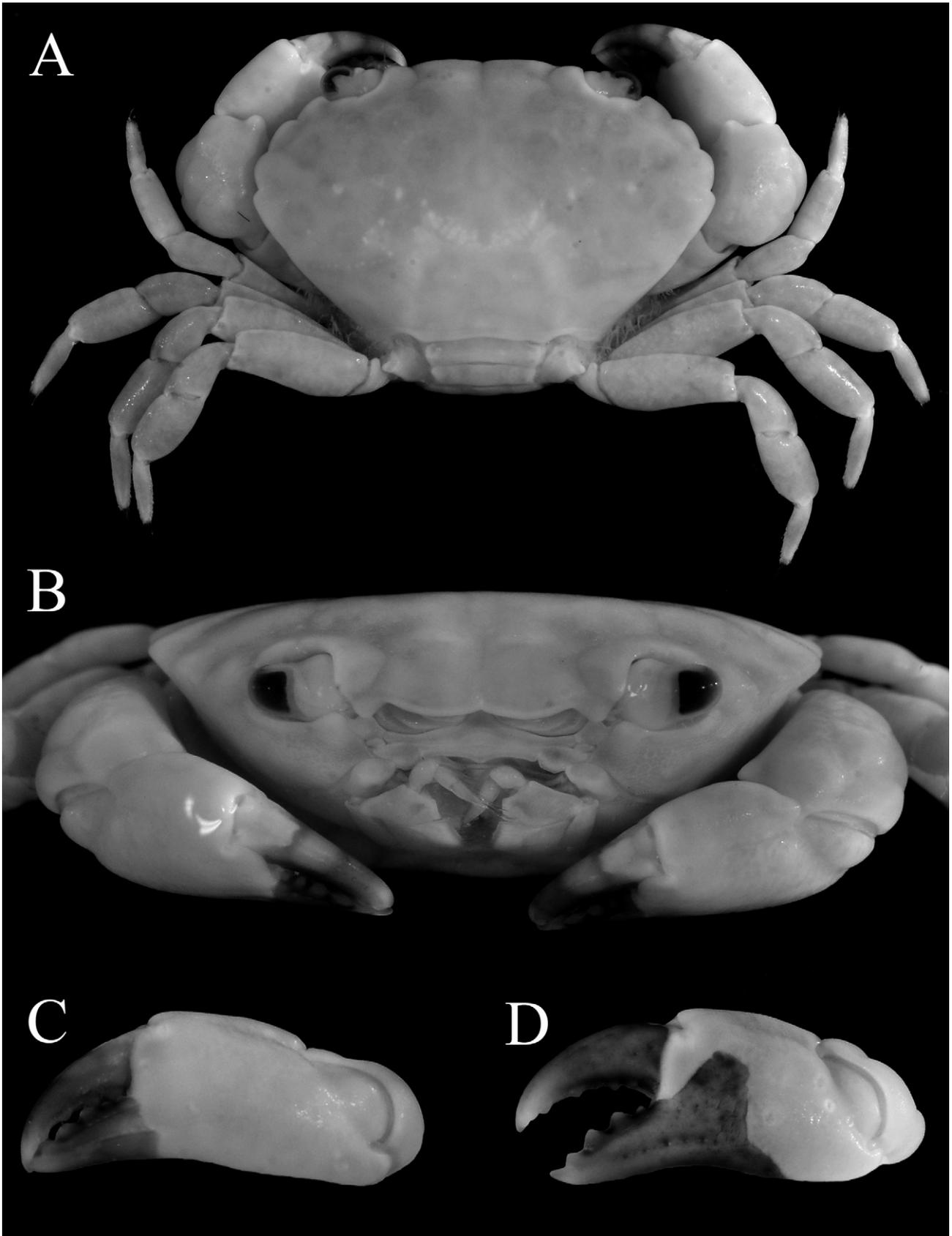


FIGURE 3. *Xanthias joanneae* sp. nov., paratype, female, 9.4 × 6.0 mm (NMCR 39081), Pamilacan Is., Bohol Sea (A–C); holotype, male, 7.9 × 5.1 mm (NMCR 39080), Panglao Is., Bohol Sea (D). A, habitus, dorsal view; B, habitus, anterior view; C, D, left chela, external view.

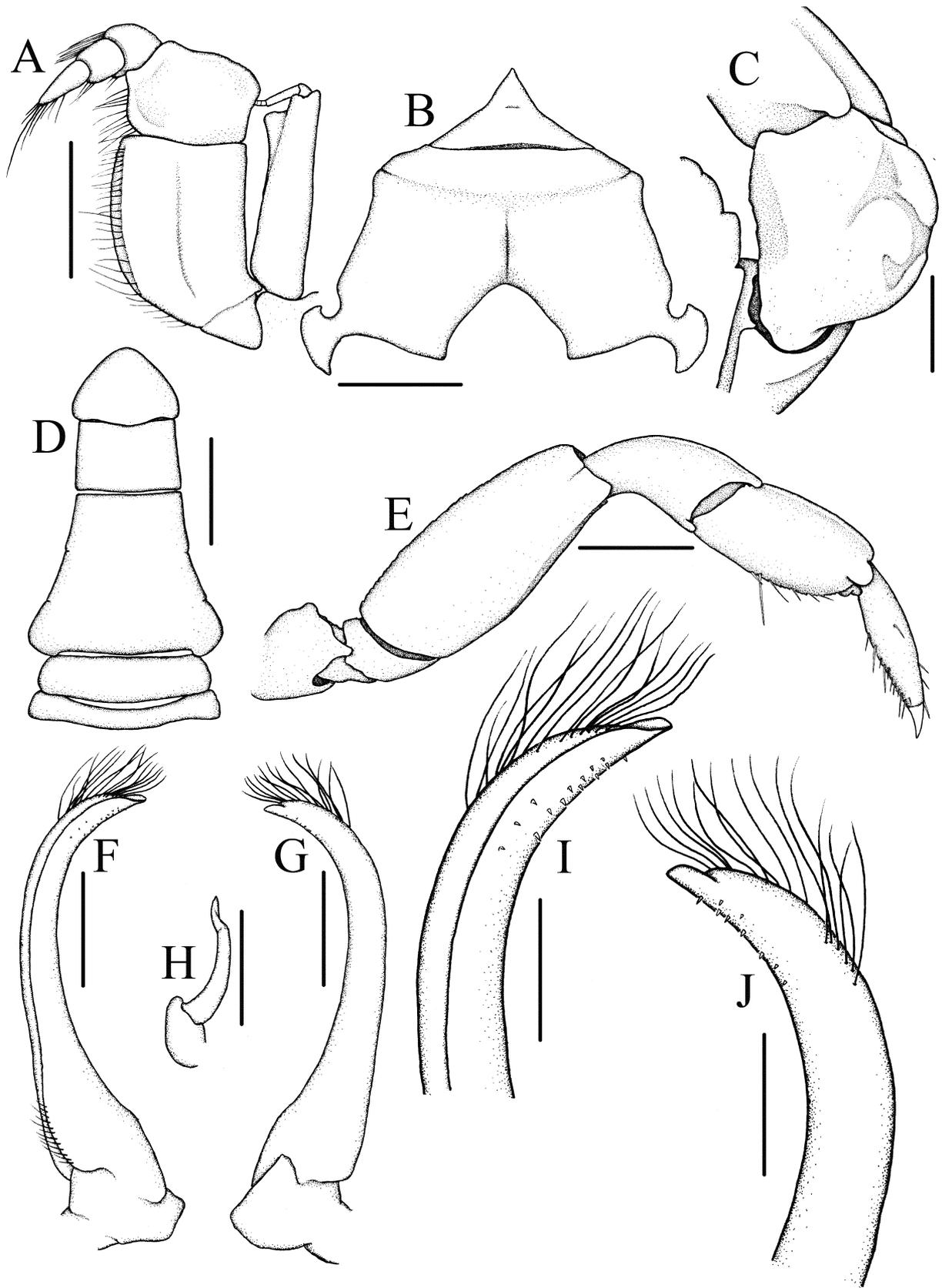


FIGURE 4. *Xanthias joanneae* sp. nov., holotype, male, 7.9 × 5.1 mm (NMCR 39080). A, left third maxilliped, external view; B, anterior thoracic sternum, ventral view; C, carpus of right cheliped, dorso-external view; D, abdomen, ventral view; E, right P5, dorsal view; left G1 (F, G, I, J), F, external view; G, internal view; I, distal tip, external view; J, distal tip, internal view; H, left G2, external view. Scale bars: A–E = 1.0 mm; F–H = 0.5 mm; I, J = 0.25 mm.

Orbits (Figs. 2C, 3B) suboval, margins subcristate; supraorbital margin with 2 small notches, smooth; infraorbital margin finely granular, infraorbital tooth bluntly triangular, apex rounded. Eyes well developed, eyestalks short, stout, corneas large. Antennular fossae transversely oval; antennules folding transversely. Basal article of antenna short, subrectangular; flagellum freely entering orbital hiatus, short, tip not reaching exorbital angle. Epistome broad, lateral regions more produced posteriorly than central region, regions separated by deep notches; posterior margin with broad median triangular prominence on central region, convex on lateral regions. Endostome smooth, with distinct, oblique ridges on posterior half.

Third maxillipeds (Figs. 2B, 4A) finely granular; palp tapering distally, articles subcylindrical; merus subquadrate, anterolateral angle rounded, slightly projecting, anterior margin gently convex except for slight depression mesially; ischium about twice as long as merus, sulcate submedially, mesial margin cristate, lined with submarginal setae; exopod stout, margins straight, tapering slightly toward distal end, with subdistal triangular projection beneath mesial margin, flagellum as long as width of merus.

Male thoracic sternum (Figs. 2B, 4B) finely granular; sternites 1, 2 fused, but boundary between them marked by row of setae; deep suture between sternites 2, 3; sternites 3, 4 mostly fused, with remnants of suture only at lateral edges continued mesially by deep transverse groove; sternite 4 with prominent median longitudinal line extending through most of its exposed length, lateral margins mostly straight; median longitudinal line interrupted on sternite 4 within anterior region of sternoabdominal cavity, continued at posterior limit of sternite 4, absent in sternites 5, 6, continued in sternites 7, 8 without interruption; sutures 4/5, 5/6 joining towards median longitudinal axis of thoracic sternum; small, central, triangular, non-calcified area present between sternites 6, 7 within sternoabdominal cavity; press-button on anterior half of sternite 5, closer to suture 4/5.

Chelipeds (Figs. 2A, B, 3D, 4C) symmetrical, moderately robust, external surfaces generally smooth. Meri short, distal end not extending beyond carapace anterolateral margin in dorsal view. Carpi with rugose external surface because of deep, curved groove; internal angle with blunt, triangular projection. Palm smooth, with shallow but distinct groove on dorso-external surface only. Fingers thick, each with longitudinal, submarginal groove, both pigmented throughout most of length except at hemi-cupuliform tips, pigment extending well into external, internal surfaces of palm, cutting margins with variably sized teeth; dactylus curved, distinctly longer than superior margin of palm, with ocellus near proximal end; fixed finger slightly deflexed.

Ambulatory legs (Figs. 2A, 3A, 4E) flattened, broad, moderate in length, P3, P4 longest, coxa-to-dactylus length about equal to carapace width, P5 shortest, coxa-to-dactylus length about 0.9 times carapace width; anterior margins of meri, carpi, propodi sharp but not distinctly cristate. Meri subrectangular, median length about 2.2–2.4 times greatest width; anterior margin gently convex throughout length, posterior margin convex proximally, concave distally. Carpi curved, distal end distinctly wider than proximal end. Propodi subrectangular, median length about 1.9–2.1 times greatest width; anterior, posterior margins convex, posterior margin denticulate, lined with stiff setae. Dactyli about as long as propodi, stout proximally, tapering distally, terminating in sharp chitinous claw; margins lined with stiff setae.

Abdomen (Figs. 2B, 4D) long relative to thoracic sternum, tip of telson reaching level anterior to sternal condyles of P1 coxae; somites 1, 2 trapezoidal, much wider than long; somites 3–5 fused, base of somite 3 widest, distal somites progressively narrower, combined lateral margin gently concave; somite 6 subquadrate, slightly wider than long, lateral margins straight; telson subtriangular, angles rounded, basal width about 1.3 times median length, base distinctly wider than adjacent distal end of somite 6.

G1 (Fig. 4F, G, I, J) moderate in length, stout, distal half curving laterally; distal tip with narrow, semi-fluted apical lobe, few spiniform granules immediately proximal to it, several (14) plumose subterminal setae. G2 (Fig. 4H) sigmoidal in shape, about one-third length of G1. Penis emerging near base of sternal condyle of P5 coxa.

Female morphology. The female (Figs. 1B, 3A–C) is similar in morphology to the male except in the sexual characters and chelipeds. The abdomen is generally wider and oval in shape, with all the somites freely articulated. The sternoabdominal cavity is also wider but shallower, and the median longitudinal line is of a similar pattern as in the male. The vulvae are oval, without an operculum but with a vulvar cover, and located on the mesial third of sternite 6. The chelipeds are less robust than in the male, and the pigment on the fingers does not extend into the palm.

Live coloration. Yellow-orange base (Fig. 1), with several ocelli, bluish-white spots ringed with maroon. About 40 or more ocelli on the dorsal surface of carapace and fewer on the external surfaces of the chelipeds. Ambulatory legs with 2–4 ocelli each on the dorsal surfaces of meri, carpi and propodi and white bands at the

joints. Third maxillipeds, thoracic sternum and abdomen much lighter in color than the dorsal surfaces, but also decorated with ocelli. Eyes with one ocellus on each eyestalk.

Etymology. This strikingly colored species is named after the author's wife, Joanne (née Uy), who has been constantly supportive of his carcinological research.

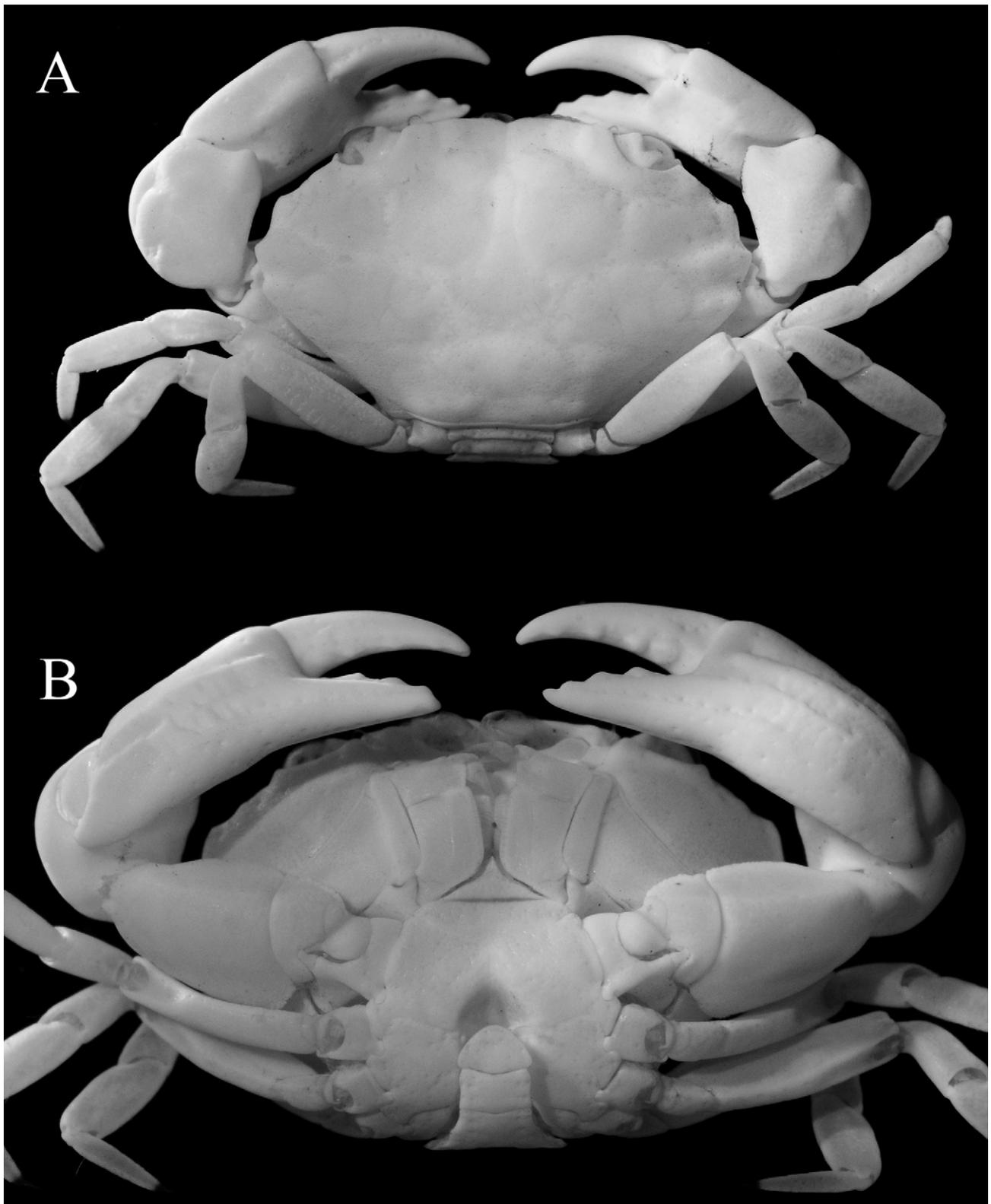


FIGURE 5. *Xanthias maculatus* Sakai, 1961, holotype, male, 9.5 × 6.0 mm (NMST), Okinoyama, Sagami Bay, Japan. A, dorsal view; B, ventral view. Photos from Hironori Komatsu (NMST).

Remarks. *Xanthias maculatus* Sakai, 1961, was originally described from two male specimens, with one being designated as the holotype, whereas the other was not explicitly called a paratype though it was listed as material examined in the describing paper. The holotype (9.5 × 6.0 mm) was collected by the then Emperor of Japan from Okinoyama, near Jogashima Island in Sagami Bay, Kanagawa Prefecture, at a depth of 85 m. Sakai (1961) also mentioned that the other male was collected from Tosa Bay, in Shikoku farther to the southwest. This species' most easily observed distinguishing character is the coloration of the live specimens, consisting of a yellow carapace and pereopods, decorated with several ocelli (purplish-blue spots ringed with maroon) (Sakai 1961: 141, fig. 1e–g; 1965: 142, pl. 71 fig. 1). It has since been reported from other parts of Japan: Kii Nagashima and Ishigaki Island (Sakai 1976: 429, pl. 154 fig. 3); Nii-jima (Takeda 1978: 77, tab. 1); Shiono-misaki (Takeda 1979: 153, tab. 1); Nanki (Miyake 1983: 113, pl. 38 fig. 3); and Amami-Oshima (Takeda & Komatsu 2005: 282, fig. 5A, B).

It should be noted that *X. maculatus* is not well known. The description by Sakai (1961) is not detailed enough for comparisons with current species, and there have not been any published photographs of the holotype. The only figures available until recently were line drawings of the entire animal and its G1 (Sakai 1961: fig. 1e–g) as well as a color painting of the entire animal in dorsal view (presumably the holotype) (Sakai 1965: pl. 71 fig. 1; 1976: pl. 154 fig. 3). Examination of the photographs of the holotype (Fig. 5) shows that there are some inaccuracies in these early figures, particularly in the proportions of the ambulatory legs (i.e., the holotype has stouter legs than was previously depicted). Miyake (1983) provided a short description and the first published color photograph for this species, with a specimen (12.6 × 8.3 mm) collected from a depth of 60–70 m in Nanki (南紀古). This specimen (Miyake 1983: pl. 38 fig. 3) compares favorably with the earlier figures by Sakai (1961, 1965, 1976), with the same number and location of the ocelli, and similar carapace and pereopod dimensions as the holotype. Although Miyake (1983) reports this specimen as a male, the characteristic pigmentation of the cheliped fingers, which extends into the external and internal surfaces of the palm, is not observed, indicating that the specimen may be a female instead. There is no doubt, however, that this specimen and the holotype of *X. maculatus* are conspecific.

The photographs published by Takeda & Komatsu (2005: fig. 5A, B) of two specimens collected near Amami-Oshima, in the northern Ryukyu archipelago, one of an ovigerous female (10.7 × 6.9 mm; NMST-Cr 16194), and another, a smaller male (no data), exhibit considerable variation with each other and from the earlier published figures of this species. Takeda & Komatsu (2005: 282, 283), however, gave no detailed description of these specimens, only remarking on the variable size and number of the “spots” (ocelli) on the carapace, pereopods and thoracic sternum, and raising the possibility that there were more than one species involved. It is noteworthy to mention that the female from Amami-Oshima (Takeda & Komatsu 2005: fig. 5A) closely resembles the present new species, although it has not been examined for this study. It is highly likely, therefore, that there are at least two species in the territorial waters of Japan that are being referred to as “*Xanthias maculatus*”. To avoid confusion, the following comparisons to *X. maculatus* in this paper refer to the holotype (Fig. 5) and also, where relevant, to the specimen figured by Miyake (1983: pl. 38 fig. 3).

The new species collected from the Bohol Sea is most similar to *Xanthias maculatus* Sakai, 1961, primarily in having a smooth carapace and pereopods, and having several ocelli decorating the carapace and pereopods (Fig. 5; also Sakai 1961: 141, fig. 1e–g; 1965: 142, pl. 71 fig. 1; 1976: 429, pl. 154 fig. 3). *Xanthias joanneae* **sp. nov.**, however, differs from *X. maculatus* in these aspects: 1) though roughly similar in size, there are more ocelli, at least 40, on the dorsal surface of the carapace (Fig. 1A, B) (in contrast to fewer, about 14, in *X. maculatus*; see Sakai 1961: fig. 1e; 1965: pl. 71 fig. 1; 1976: pl. 154 fig. 3; Miyake 1983: pl. 38 fig. 3); 2) the dorsal carapace regions (especially 2M, 3M) are not well demarcated (Figs. 2A, 3A) (regions easily discernible, particularly 2M and 3M in *X. maculatus*; Fig. 5A, also Sakai 1961: fig. 1e; Miyake 1983: pl. 38 fig. 3); 3) the teeth on the anterolateral margins of the carapace have more rounded apices, and are closer together, separated by narrow, V-shaped notches (Figs. 2A, 3A) (teeth with more acute apices, and farther apart, as crests separated by wide troughs, in *X. maculatus*; Fig. 5A); 4) sternite 4 is narrower and has mostly straight lateral margins (Figs. 2B, 4B) (sternite 4 wider, with convex lateral margins in *X. maculatus*; Fig. 5B); 5) the external surface of the palm of the chelipeds does not have any longitudinal ridges (Figs. 2B, 3C, D) (palm external surface has two longitudinal ridges on its lower half in *X. maculatus*; Fig. 5B); and 6) the ambulatory legs have noticeably broader and stouter meri, with the ratio of the width of the P5 merus to carapace length = 0.22 (Figs. 2A, 3B, 4E) (ambulatory meri more slender, P5 merus width/CL ratio = 0.17 in *X. maculatus*; Fig. 5A). Although the G1 of both species are similar in general form, some differences can still be noted: that of *X. joanneae* **sp. nov.** appears to be stouter, with fewer subterminal

setae and a narrower apical lobe (Fig. 4F, G, I, J), whereas that of *X. maculatus*, as illustrated by Sakai (1961), is relatively more slender, with more subterminal setae and a wider apical lobe (see Sakai 1961: fig. 1f, g). Together, these differences are sufficient to consider *X. joanneae* **sp. nov.** as a distinct species from *X. maculatus*.

A male and three females collected from the intertidal zone in Mombasa, Kenya, in east Africa, were reported by Serène (1984) as “*Xanthias* aff. *maculatus*”. He provided a black-and-white photograph of the male specimen and a line drawing of the distal tip of the G1 (Serène 1984: fig. 114, pl. 28 fig. A). Serène apparently had doubts on the conspecificity of the Kenyan specimens with *X. maculatus*, pointing out that they had a straighter, less undulate frontal margin, less prominent/distinct supraorbital margin and carapace regions, lower, less produced carapace anterolateral teeth, indistinct tuberosities on the cheliped carpus, and shorter, wider ambulatory legs. He further points out that specimens he collected from Nhatrang, Vietnam, were identical to the Kenyan specimens, at least in the proportions of the ambulatory legs. But Serène stopped short of describing them as a new species, suggesting that these variations may be intraspecific and that more material from different localities still needed to be examined (Serène 1984: 198).

Compared with *X. joanneae* **sp. nov.**, the carapace of the Kenyan specimen appears more inflated dorsally, with the first two teeth on the carapace anterolateral margin virtually effaced, the last two teeth less pronounced, and external surface of the cheliped carpus smooth, without grooves or tuberosities. Furthermore, the G1 (Serène 1984: fig. 114) is also more slender, and, unlike in the new species and in *X. maculatus*, appears to have two apical lobes instead of one. It is very likely that the Kenyan specimens comprise a distinct species from either *X. maculatus* or *X. joanneae* **sp. nov.**, but the specimens, presently deposited at MNHN, have to be re-examined for a proper description. There are no published figures of the specimen from Nhatrang which Serène (1984) referred to, and it could not be examined for this work, although it may still be in the Nhatrang Oceanography Institute, which currently maintains his collection of crustaceans from that region (P. Castro pers. comm.).

Ecology and geographical distribution. The type material of *X. joanneae* **sp. nov.** were all collected from the Bohol Sea, off the islands of Panglao, Balicasag and Pamilacan, at a depth of 2–110 m. The microhabitats were described by the diver-collectors as reef platforms, slopes or walls, as well as the floors of submarine caves, with the substrate consisting mostly of coral rubble, but some also including sand and gravel. Most were collected by hand or by coral brushing at diving depth (< 40 m), but some specimens were collected at greater depths (60–110 m) utilizing tangle nets (see Ng *et al.*, 2009).

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