

## *Nursia tohae*, a new species of coral rubble mimic crab (Crustacea: Brachyura: Leucosiidae) from the Philippines and Singapore

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**Abstract.** A new species of leucosiid crab, *Nursia tohae*, is described from Panglao, the Philippines, and Pulau Hantu in Singapore. It closely resembles *N. alata* Komatsu & Takeda, 1999, from Japan, but the new species has a proportionately more elongate gastro-cardiac tubercle; the external surface of its third maxilliped is prominently granulated; the male first gonopod being of similar width throughout its length; and the tip of the male second gonopod is gently curved.

**Key words.** Crustacea, Brachyura, Leucosiidae, taxonomy, *Nursia*, new species, Singapore, Philippines

### INTRODUCTION

There are a number of crabs living in tropical coral reefs which are coral rubble mimics, with their carapace and appendages closely resembling pieces of dead and eroded coral. This is particularly common in many genera of Leucosiidae, Parthenopidae and Xanthidae. In Singapore, two such leucosiids have previously been reported, both originally described from the island: *Alox somphos* Tan & Ng, 1995, and *Favus granulatus* Lanchester, 1900 (Tan & Ng, 1995; Ng et al., 2007). In this paper, we add a new species of *Nursia* Leach, 1817.

The terminology used here follows that used in Ihle (1918) and Komatsu & Takeda (2001). The measurements provided, in millimetres, are of the maximum carapace width and length, respectively. The type specimens are deposited in the Muséum national d'Histoire naturelle, Paris, France (MNHN); the crustacean collection of the National Museum, Manila, Philippines (NMCR); the National Museum of Nature and Science, Tsukuba, Japan (NSMT); and the Zoological Reference Collection (ZRC) of the Lee Kong Chian Natural History Museum (previously the Raffles Museum of Biodiversity Research), National University of Singapore. Other abbreviations used in the text are: G1 = male first gonopod; G2 = male second gonopod; R = fused abdominal somites; stn = station; T = telson.

### TAXONOMY

#### Family Leucosiidae Samouelle, 1819

#### Genus *Nursia* Leach, 1817

**Remarks.** The genus *Nursia* Leach, 1817, contains 20 species from the Indo-West Pacific (Ng et al., 2008). Most species are characterised by their plate-like appearance, with the dorsal surface of the carapace covered with distinct ridges. The genus is very heterogeneous and is in urgent need of a revision. Alcock (1896) and Ihle (1918) recognised three groups in the genus, characterised by the presence or absence of a hepatic ridge, a post-branchial ridge, the features of the dorsal carapace surface and form of the posterior carapace margin. Serène & Soh (1976) removed *Nursia abbreviata* Bell, 1855, to a new genus, *Paranursia*; while Komatsu & Takeda (2003) transferred *Nursia jousseaumei* Nobili, 1906, and *N. jousseaumei cornigera* Nobili, 1906, to their new genus, *Nobiliella*, treating both as separate species.

#### *Nursia tohae*, new species

(Figs. 1–6)

**Material examined.** Holotype: male (3.26 × 2.14 mm) (NMCR) stn S10, Pamilacan Island, Panglao, Philippines, 09°29.4'N, 123°56.0'E, coral plateau with fine sand covering rocks, coll. underwater suction, 11 June 2004. Paratypes: PHILIPPINES: 1 male (3.14 × 2.36 mm) (ZRC), stn B9, Panglao Island, Napaling, 8–10 m, caves in the reef wall, 9°33.1'N, 123°44.0'E, coll. underwater coral brushing, 8 June 2004; 1 male (3.18 × 2.19 mm), 1 ovigerous female (4.08 × 2.79 mm) (NSMT), stn R31, Pamilacan Island, S-SW slope, 10–41 m, reef slope with caves, 9°29.4'N, 123°56.0'E, coll. SCUBA, 8 June 2004; 1 female (3.44 × 2.30 mm) (ZRC), stn S2, Bohol Island, Baclayon, 4–5 m, hard bottom with small pockets of sediment, 9°37.4'N, 123°54.5'E, coll. underwater suction, 3 June 2004; 1 ovigerous female (3.30 × 2.46 mm), 1 female (3.36 × 2.30 mm), 1 female (with

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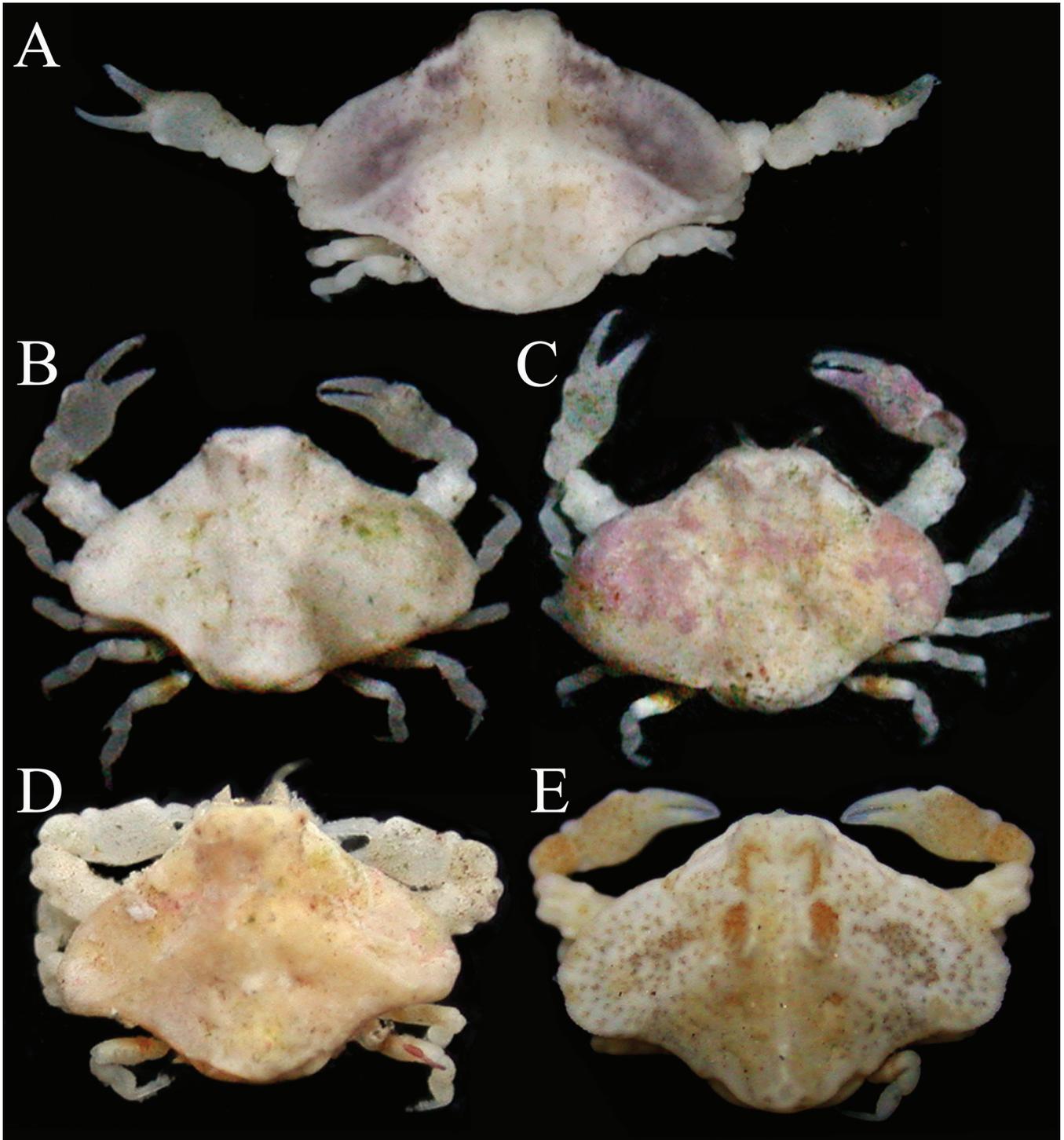


Fig. 1. *Nursia tohae*, new species. Colours in life. A, paratype ovigerous female (3.93 × 2.66 mm) (ZRC), Pamilacan Island, Philippines; B, paratype female (3.53 × 2.26 mm) (ZRC), Panglao, Philippines; C, paratype female (3.71 × 2.54 mm) (ZRC), Panglao, Philippines; D, paratype female (3.44 × 2.30 mm) (ZRC), Bohol, Philippines; E, female (3.90 × 2.69 mm) (ZRC), Pulau Hantu, Singapore (shortly after preservation).

bopyrid parasite in right branchial chamber; 3.53 × 2.26 mm), 1 female (with bopyrid parasite in left branchial chamber; 3.71 × 2.54 mm) (ZRC), stn S5, Panglao Island, Napaling, 2–4 m, rock and coral patches, brown algae, 9°37.1'N, 123°46.1'E, coll. underwater suction, 8 June 2004; 2 males (2.31 × 1.92 mm, 2.70 × 1.98 mm), 1 male (with bopyrid parasite in left branchial chamber; 3.05 × 2.18 mm), 1 young female (2.53 × 1.88 mm) (NSMT), stn S5, Panglao Island, Napaling, 2–4 m, rock and coral patches, brown

algae, 9°37.1'N, 123°46.1'E, coll. underwater suction, 8 June 2004; 1 male (with bopyrid parasite in left branchial chamber; 2.86 × 2.04 mm), 1 female (with bopyrid parasite in left branchial chamber; 3.57 × 2.31 mm) (ZRC), stn S12, Pamilacan Island, 6–8 m, coral plateau with fine sand, 9°29.4'N, 123°56.0'E, coll. underwater suction, 14 June 2010; 1 male (with bopyrid parasite in left branchial chamber; 3.14 × 2.08 mm), 1 ovigerous female (3.54 × 2.39 mm), 1 young female (1.46 × 1.82 mm) (ZRC), stn S17, Panglao

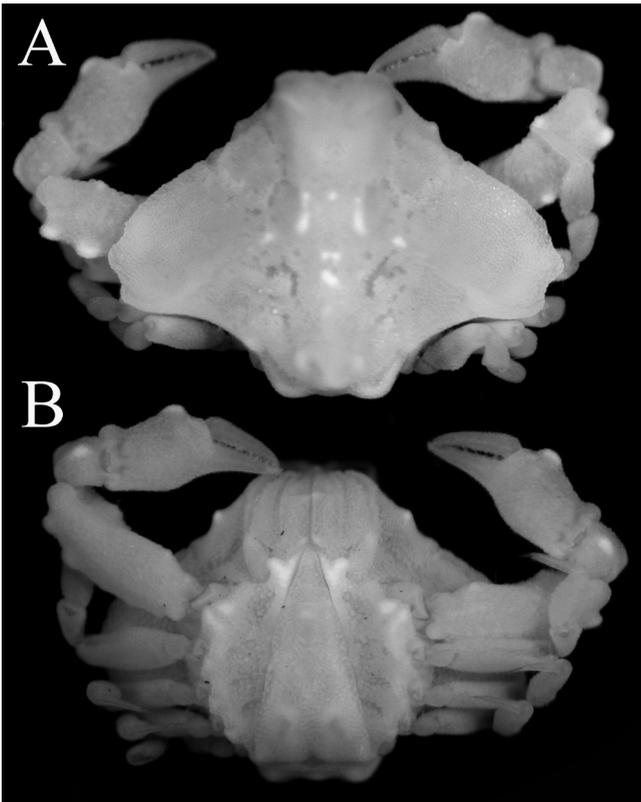


Fig. 2. *Nursia tohae*, new species, holotype male (3.26 × 2.14 mm) (NMCR), Pamilacan Island, Philippines. A, dorsal habitus; B, ventral surface of cephalothorax.

Island, San Isidro, 6 m, reef flat, mixed bottoms, 9°34.6'N, 123°49.9'E, coll. underwater suction, 17 June 2010; 1 male (3.06 × 2.29 mm), 2 ovigerous females (3.32 × 2.20 mm, 3.72 × 2.58 mm) (ZRC), stn S22, Pamilacan Island, 15–20 m, hard ground covered with sand, 9°29.4'N, 123°56.0'E, coll. underwater suction, 21 June 2004; 1 male (with bopyrid parasite in left branchial chamber; 2.95 × 2.15 mm), 1 ovigerous female (with bopyrid parasite in left branchial chamber; 3.70 × 2.41 mm), 1 young female (2.69 × 1.90 mm) (MNHN), stn S32, Panglao Island, Looc, 2–3 m, hard plateau with sand covering rocks, 9°35.8'N, 123°44.6'E, coll. underwater suction, 28 June 2004; 1 ovigerous female (3.93 × 2.66 mm) (ZRC), stn S42, Pamilacan Island, 15–20 m, sand on hard ground, 9°30.1'N, 123°55.5'E, coll. underwater suction, 1 July 2004; 1 female (3.31 × 2.23 mm) (ZRC), stn S18, subtidal platform, mixed bottoms, Looc, Panglao, 0–2 m, 9°35.7'N, 123°44.4'E, coll. underwater suction, 18 June 2004. Non-types: SINGAPORE: 1 female (3.90 × 2.69 mm) (ZRC), subtidal rubble area, Pulau Hantu, coll. C. H. Toh, 29 March 2015.

**Diagnosis.** Carapace rhomboidal, 1.2–1.5 times wider than long (Figs. 1, 2, 3, 4A, 6A); front 0.2–0.3 times carapace width; frontal region raised; postfrontal ridges distinct, rounded, gently diverging from front towards median mesogastric region; gastro-cardiac region with 2 low, obliquely longitudinal tubercles, marking beginning of oblique epibranchial ridge; intestinal region prominent, with

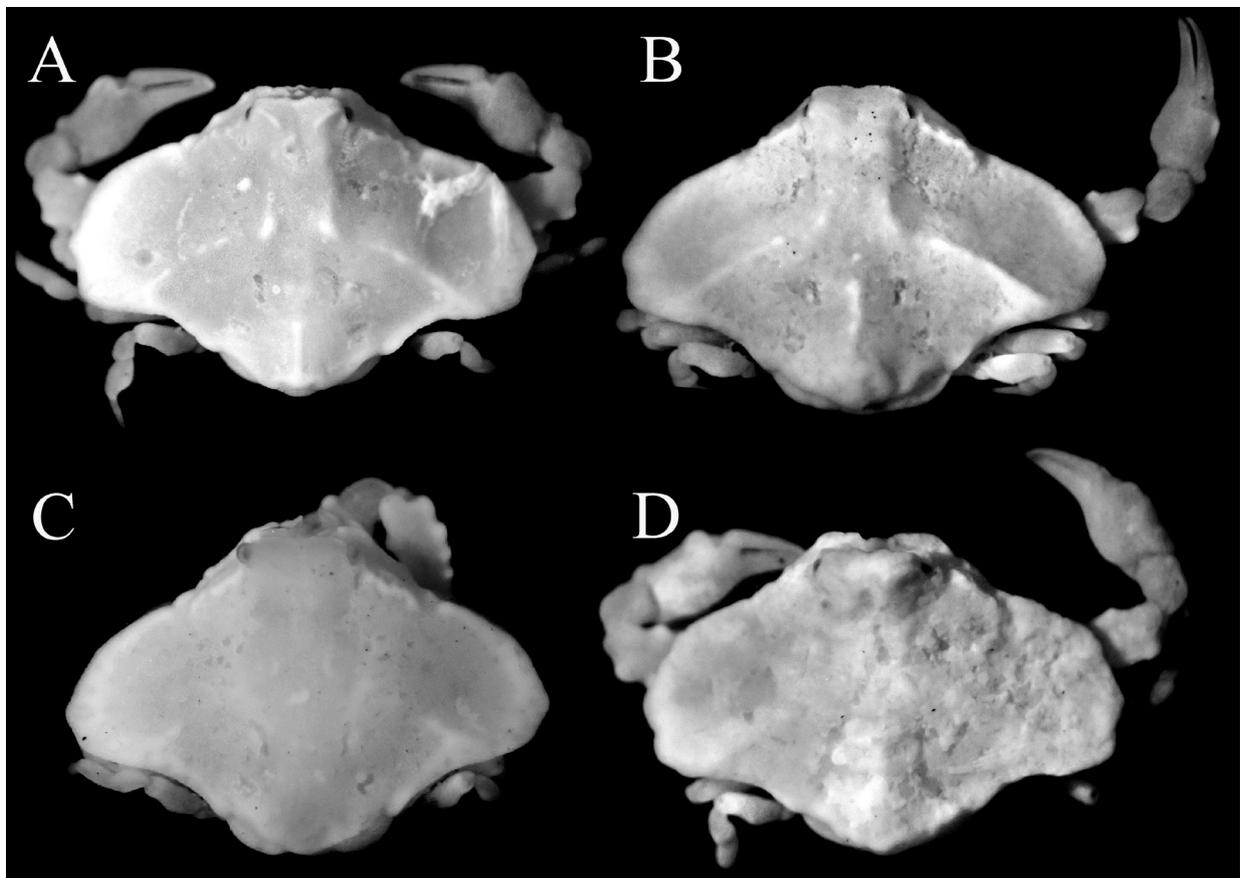


Fig. 3. *Nursia tohae*, new species. A, paratype ovigerous female (4.08 × 2.79 mm) (NSMT), Pamilacan Island, Philippines; B, paratype ovigerous female (3.93 × 2.66 mm) (ZRC), Pamilacan Island, Philippines; C, paratype ovigerous female (3.54 × 2.39 mm) (ZRC), Panglao Island, Philippines; D, paratype ovigerous female (3.32 × 2.20 mm) (ZRC), Pamilacan Island, Philippines.

median longitudinal ridge extending towards inflated, rounded posterior surface of region; epibranchial regions expanded laterally, forming gently concave surface; posterior carapace surface trilobate, side lobes situated lower than metabranchial region; maxillule lacking endopod (Fig. 5C); outer surface of third maxilliped covered with distinct granules, without proximal tooth on lateral margin of exopod (Fig. 5F), with vestigial internal exopodal ridge (Fig. 3G); male abdomen with formula of 1+2+R+T (Fig. 4E); female abdomen with formula of 2+R+T (Fig. 6E, F); G1 width more or less even throughout length, tip rounded (Fig. 4F, G); G2 longer than G1, tip gently curved and directed dorsally (Fig. 4F, G).

**Description of holotype.** Carapace (Figs. 2A, 4A) 1.52 times wider than long; dorsal surface covered with minute and flat granules and almost symmetrical pits. Front prominent, 0.26 times as wide as carapace, slightly narrower than posterior lobes; margin divided into 2 truncated lobes by median triangular notch; postfrontal ridge gently arcuate postero-mesially. Orbit with 2 longitudinal fissures on dorsal margin; infraorbital lobe with V-shaped notch with terminal fissure. Mesogastric region gently convex broadly, with shallow longitudinal, median groove. Gastro-cardiac region moderately raised, with 2 slightly divergent, longitudinal tubercles and median small tubercle. Intestinal region prominently raised, with median ridge and 3 tubercles anterior to ridge; posterior surface reticulated; posterior margin not beyond posterior lobes. Hepatic region slightly demarcated; margin inside general outline of carapace. Pterygostomian margin developed, formed general outline of carapace, with small triangular tooth medially, divided from epibranchial margin by small notch. Epibranchial region foliaceous, strongly developed laterally, sloping towards margin from epibranchial ridge, but somewhat upturned at margin; epibranchial ridge obliquely radiating from near gastric tubercle to medial part of metabranchial margin, with tubercle anterior to ridge; epibranchial margin obliquely diverging, obtusely angled at posterior 0.3, forming rounded tooth at junction with metabranchial margin. Metabranchial region deeply concave between epibranchial and intestinal ridges; margin forming right angle at anterior 0.2, concave in posterior 0.8. Posterior margin trilobate; lobes of each side small, semicircular, situated lower than metabranchial region; median one smallest, semicircular, slightly seen in dorsal view.

Ocular peduncle (Fig. 4B) very short, set in orbital fossa. Antennule slightly obliquely folded in fossa; basal segment occupying ventral 0.7 of fossa, sparsely covered with minute flat granules. Basal segment of antenna subcylindrical, obliquely lodged in orbital hiatus. Afferent channel with small notch on medial part of anterior border. Epistome projecting far beyond anterior border of afferent channel.

Mandible (Fig. 5A, B) well calcified; cutting edge triangular in outline, pointed at anterior end; endopod palp 3-segmented, terminal segment fringed with short setae along outer margin. Maxillule (Fig. 5C): coxal endite subcylindrical, with some terminal setae; basal endite triangular, with thin and thick setae on mesial margin; endopod absent; epipod small, with

long setae. Maxilla missing. First maxilliped (Fig. 5D): coxal endite semiglobular, with dense setae; basal endite lobular, expanded into triangular structure, fringed with setae; endopod lobular, longitudinally expanded, fitting in efferent channel, plicate on upper surface, with short setae along plication, fringed with very short setae along mesial margin; exopod longitudinally filiform, with long setae on distal part of mesial margin, bearing flagellum with long terminal setae. Second maxilliped (Fig. 5E): endopod with long setae along mesial margins of ischium and merus and outer margin of propodus, with short setae along distal 0.2 of lateral margin of merus, dactylus fringed with stout setae around tip; exopod filiform, tapering distally, with long setae on distal portion of mesial margin, bearing flagellum with some long terminal setae.

Third maxilliped (Fig. 5F, G) entirely covered with small and large rounded granules on outer surface; granules on merus weakened distally; basis fused with ischium, but with remnant suture on internal surface; ischium weakly convex longitudinally in lateral 0.6; merus slightly longer than ischium along mesial margin, weakly directed dorsally in situ; propodus and dactylus with dense setae on lower borders; exopod fringed with short plumose setae along lateral margin, lacking proximal tooth on lateral margin; internal exopodal ridge vestigial, with row of mesially directed setae.

Chelipeds (Figs. 2, 4C) moderate, equal in shape and size, covered with minute granules; coxal condyle vestigial; merus subcylindrical, with rounded tooth on anterior 0.3 of inner border and evenly arranged five rounded teeth on outer border, anterior second tooth largest, posterior three teeth small and subequal in size; carpus convex dorsally and ventrally, slightly crested on outer margin, with rounded tubercle on median part of ventral surface; palm convex dorsally, with rounded tooth on anterior end of outer margin; fingers slightly longer than palm, covered with microscopic granules, rimmed with row of minute, triangular granules on outer margins of both fingers; both cutting edges entirely meeting, with several small triangular teeth on entire length; tip of movable finger crossed on immovable one.

Ambulatory legs (Figs. 2A, 4D) similar in shape, gradually decreasing in length from 1st to 4th, entirely covered with minute granules except dactylus; coxal condyles vestigial; merus subcylindrical, as long as combination of carpus and propodus, inner border convex at proximal 0.4; carpi and propodi weakly compressed; dactylus subconical, with indistinct dactylo-propodal locks on proximal borders of dorsal surfaces; flexor margin of dactylus with small denticles or uneven.

Thoracic sternites (Fig. 2B) entirely covered with minute flat granules; episternites not divided; first to fourth sternites fused together; suture between sternites 3/4 short, without hiatus; sutures between sternites 4/5, 5/6, 6/7, 7/8 interrupted medially; abdominal cavity reaching to buccal cavern.

Abdomen (Figs. 2B, 4E) entirely covered with small, rounded granules, formula of 1+2+R+T; somite 1 short, transversely

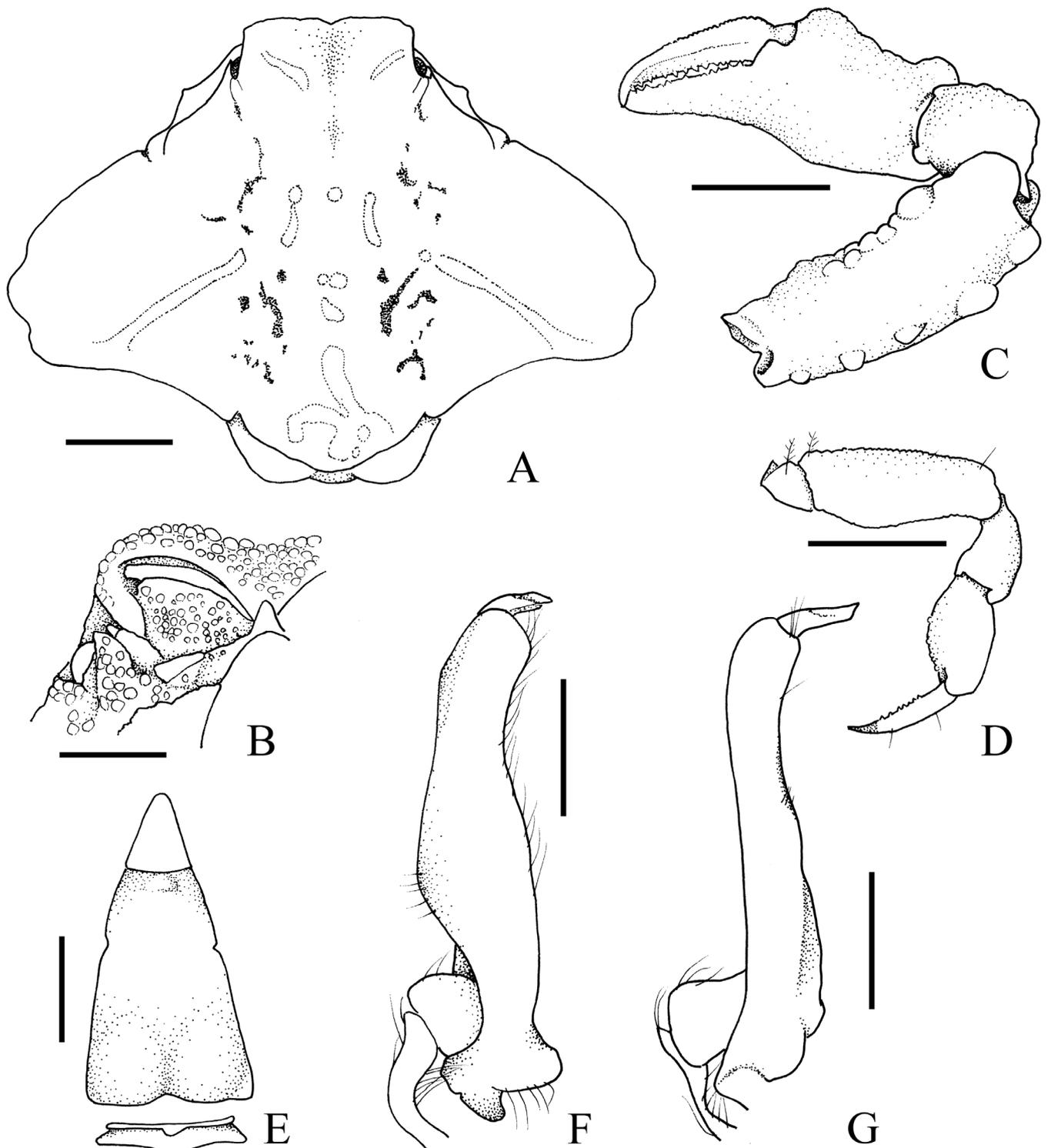


Fig. 4. *Nursia tohae*, new species, holotype male (3.26 × 2.14 mm) (NMCR), Pamilacan Island, Philippines. A, carapace, dorsal view; B, frontal region, frontal view; C, right cheliped, dorsal view; D, right first ambulatory leg, posterior view; E, male abdomen, ventral view; F, G, left G1 and G2, ventral view, G2 inserted in G1, with curved tip of G2 protruding from aperture of G1. Scale bars = 0.5 mm [A, C, D, E]; 0.25 mm [B, F, G].

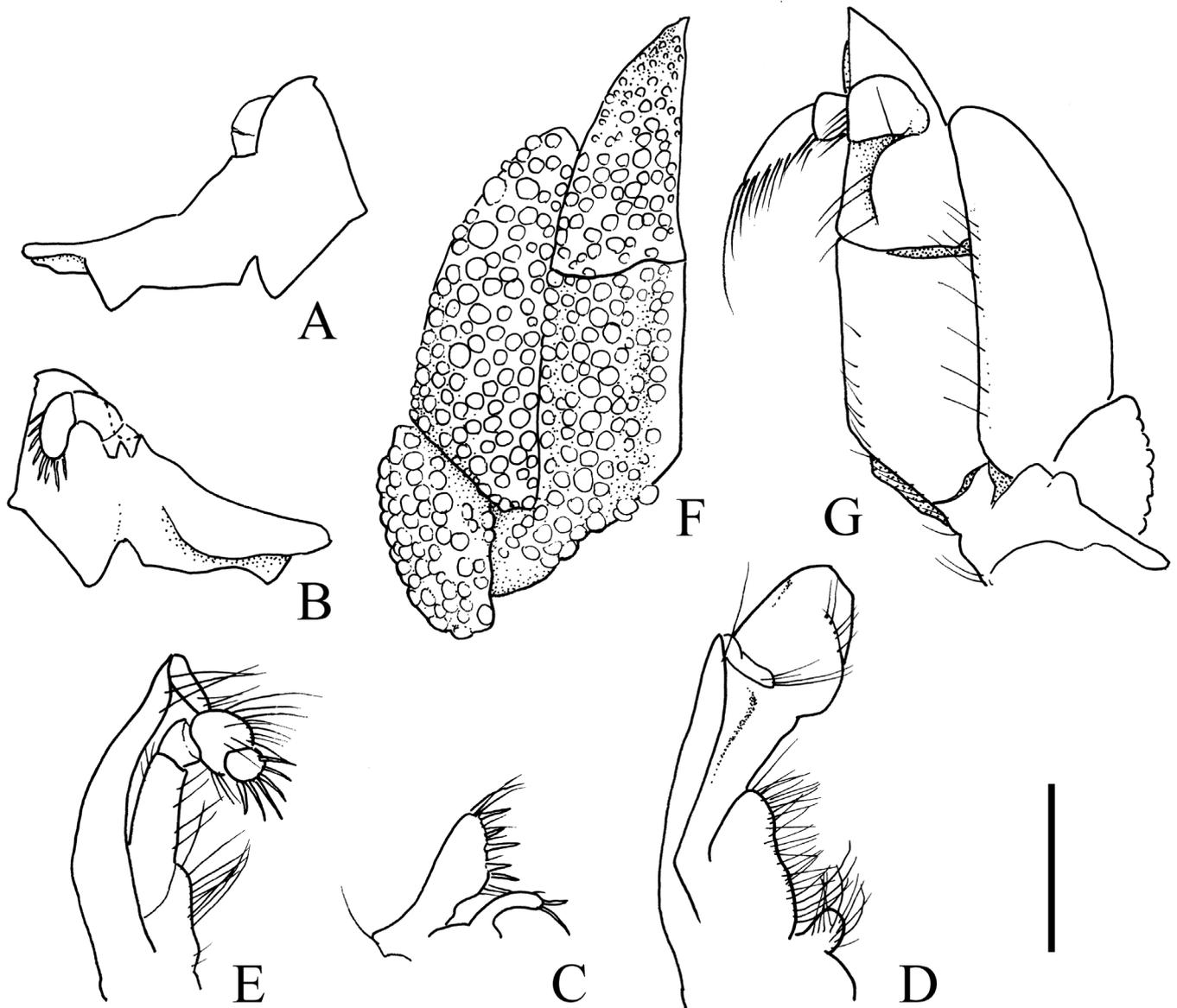


Fig. 5. *Nursia tohae*, new species, holotype male (3.26 × 2.14 mm) (NMCR), Pamilacan Island, Philippines. A, mandible, external view; B, same, internal view; C, maxillule, external view; D, first maxilliped, external view; E, second maxilliped, external view; F, third maxilliped, external view; G, same, internal view. Scale bars = 0.25 mm.

subrectangular; somite 2 very short, transversely linear, roundly swollen at median part; somites 3–6 completely fused, elongate trapezoidal, constricted at border between somites 5/6, with small tubercle on distal end; telson subtriangular, with rounded tip.

G1 (Fig. 4F, G) subcylindrical, weakly compressed dorsoventrally, rounded at apex, width more or less even throughout length; with plumose setae along distal 0.6 of lateral border. G2 longer than G1, protruding from apex of G1 in situ, tip gently curved (Fig. 4F, G). Male genital pore with coxal-sternal opening.

**Notes on paratypes.** The carapace proportions vary, being 1.2–1.5 times wider than long in males, and 1.3–1.5 in females (Figs. 1, 3). The anterolateral margin is gently to distinctly convex, with 2 or 3 low lobes on the lateralmost parts, although it may be almost entire (Figs. 1–3; 4A; 6A). As a result, the carapace varies from somewhat subhexagonal

in shape (Figs. 1B, D; 3A, D) to more broadly subovate (Figs. 1A, E; 3B, C; 6A). The structure of the postfrontal, longitudinal gastric, intestinal and epibranchial ridges is stable, although the number and arrangement of gastrocardiac and epibranchial tubercles are variable (Figs. 2A; 3, 4A; 6A). The pterygostomial angle and posterior lobes are relatively smaller in females; with the epibranchial margin forming an obtuse angle with metabranchial margin in females (Figs. 1, 3, 6A).

Another character associated with sex is the form of the posterior carapace margin. In males, the posterior carapace margin is distinctly trilobate, with the lateral lobes large (Figs. 2A; 4A). In females, the lateral lobes are relatively low (Fig. 3C) to almost undiscernible (Figs. 1, 3A, B, D; 6A), with the structure appearing almost evenly convex.

The female cheliped is relatively smaller (Figs. 1, 3, 6G) compared to males (Figs. 2, 4C); the coxal condyle being

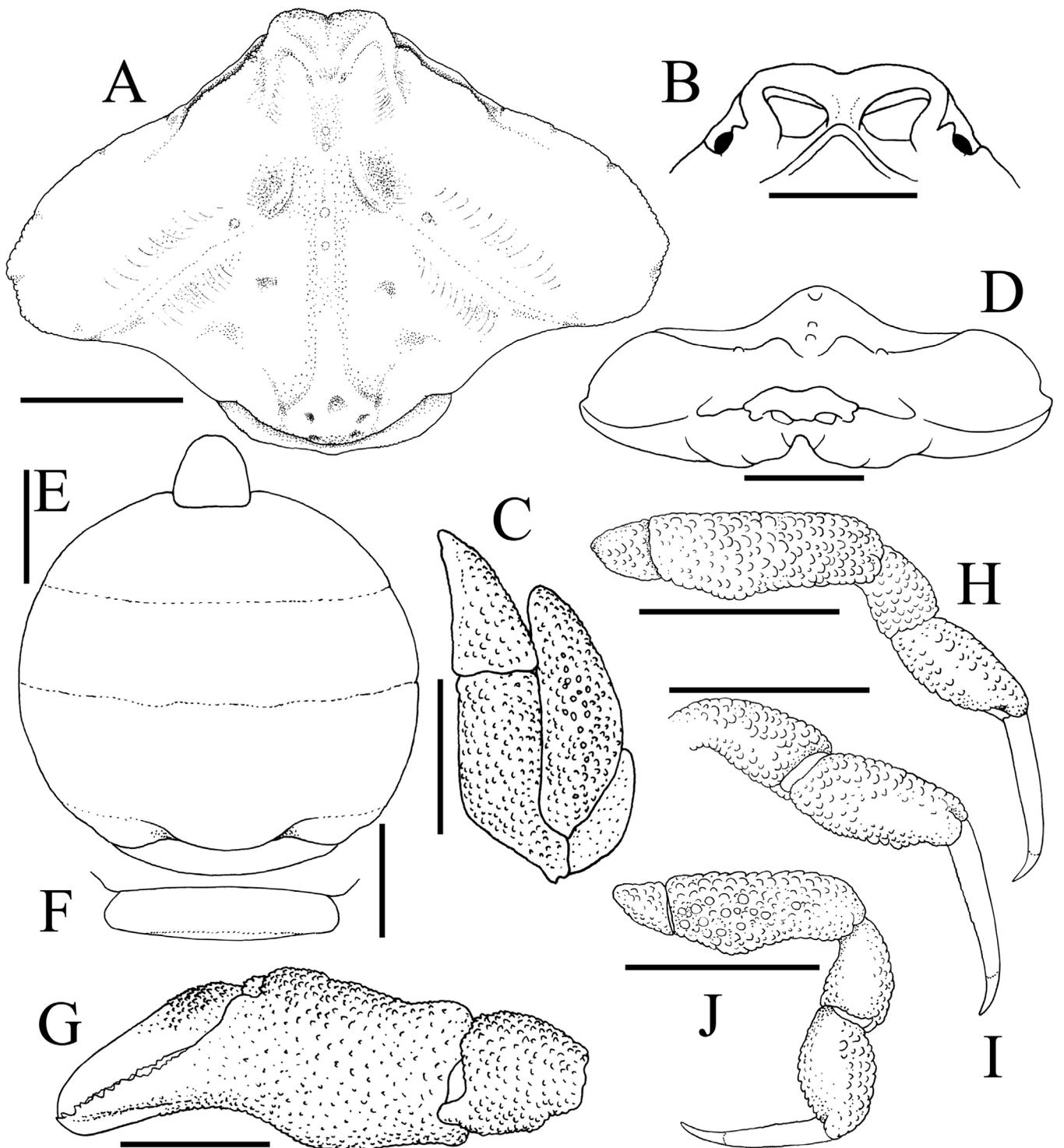


Fig. 6. *Nursia tohae*, new species. A–I, female (3.90 × 2.69 mm) (ZRC), Pulau Hantu, Singapore; J, paratype female (3.31 × 2.23 mm) (ZRC), Panglao, Philippines. A, dorsal view of carapace (pits not drawn); B, frontal view showing antennules; C, left third maxilliped; D, frontal view of carapace; E, female abdomen (fused somites 3–6 and telson); F, somite 2 of female abdomen; G, outer view of left chela and carpus; H, J, right fourth ambulatory leg; I, right first ambulatory leg carpus, propodus and dactylus. Scales bars = 1.0 mm [A, D, E, F]; 0.5 mm = [B, C, G].

vestigial, and the outer margin of the merus sometimes lacks the anterior fourth tooth. Like in the male, the female thoracic sternum is entirely covered with small granules; with the first to fourth sternites completely fused together, without transverse groove between second and third sternites; sutures between sternites 4/5, 5/6, 6/7, 7/8 interrupted medially; and the abdominal cavity reaching to the buccal cavern. The female abdomen (Fig. 6E, F) is also entirely covered with small granules, with formula of 2+R+T; with somite 1 completely concealed beneath the carapace; somite 2 short and transversely subrectangular; with the main fused section composed of somites 3–6, ovoid, convex ventrally, divided into subregions by 2 longitudinal and 3 transverse, shallow grooves; the telson is tongue-shaped and directed antero-dorsally in situ.

We are not completely certain the present specimen from Singapore is conspecific with the Philippine ones. Their carapaces are very similar in shape and structure, although the dorsal surface of the carapace of the Singapore specimen is prominently more punctate (Fig. 1E). The most significant difference between the Philippine and Singapore material is in the proportions of the ambulatory dactylus. In the Philippine specimens, the male ambulatory dactylus is relatively shorter and the flexor margin may be armed with small denticles (Fig. 4D). Female specimens from the Philippines have slightly longer ambulatory dactyli and the flexor margin is uneven to unarmed (Fig. 6J). In the Singapore female, however, the ambulatory dactylus is distinctly longer with that of the last leg more prominently hooked (Fig. 6H, I). However, in all other characters, it agrees well with the type series of *N. tohae*, so it seems best to treat the difference observed as variation for the time being.

**Colour.** Whole body creamy to yellowish-white, scattered with small orange or purple spots; anterior half may appear pale purple; chelipeds and ambulatory legs pale to yellowish-white (Fig. 1).

**Etymology.** This diminutive taxon is named the collector of the Singapore specimen, Ms Toh Chay Hoon, who has a knack for finding small and interesting species during her many beach-combing trips.

**Remarks.** The present new species belongs in the same group as *N. alata* Komatsu & Takeda, 1999, *N. guinotae* Komatsu & Takeda, 2001, and *N. mimetica* Nobili, 1906; and are all characterised by their lack of hepatic and transverse ridges on the carapace, the posterior carapace margin is trilobate, the lateral branchial regions are distinctly expanded laterally, the frontal region is distinctly projecting anteriorly, the metabranchial region is concave, the endopod of the maxilla is lacking, the formula of the female abdomen is 2+R+T, and the G2 is longer than G1. *Nursia* Leach, 1817, s. str. (as defined by the type species *Nursia hardwickii* Leach, 1817 = *Cancer lar* Fabricius, 1793) possesses distinct hepatic and transverse ridges on the carapace, the posterior margin is bilobed, the endopod of the maxilla is present, the formula for the female abdomen is 1+2+3+R+T, and the male G2 is shorter than half length of G1. Komatsu & Takeda (1999,

2001) suggested that once the genus is revised, these species may need to be transferred to their own genus. *Nursia tohae*, new species, *N. alata*, *N. guinotae* and *N. mimetica* are all relatively small species, maturing at carapace widths of less than 5 mm (Komatsu & Takeda, 1999, 2001).

Among the four species, *N. guinotae* can be distinguished from the other species by the epibranchial ridge possessing sharp tubercles that mark their presence (Komatsu & Takeda, 2001: figs. 1, 2a, b). The gastro-cardiac tubercles in *N. tohae* are distinctly more longitudinally elongate and weakly divergent (Figs. 2A; 3A, B; 4A; 6A) compared to the other three species (Komatsu & Takeda, 1999: figs. 1A, D, 2a; 2001: figs. 1, 2a, b, 3a).

*Nursia tohae* most closely resembles *N. alata* described from the Ryukyus in Japan, but in addition to the form of the gastro-cardiac tubercles discussed above, the outer surface of the third maxilliped is also more prominently granulated (Figs. 5F, 6C) (versus mostly covered in microscopic granules in *N. alata*, cf. Komatsu & Takeda, 1999: fig. 2e). The G1s of the two species are very different. In *N. tohae*, the width of the G1 is more or less even throughout its length and the distal part is more rounded (Fig. 4F, G) (versus distinctly narrowed along the distal half in *N. alata*, cf. Komatsu & Takeda, 1999: fig. 2f); and the G2 has the distal part gently curved (Fig. 4F, G) (versus straight at the tip, cf. Komatsu & Takeda, 1999: fig. 2h). As females of *N. alata* are not known (the species was described from only two males), no comparisons can be made for this sex.

*Nursia tohae* superficially bears a marked resemblance to many species of *Oreotlos* Ihle, 1918, especially with regards to the ovate carapace shape, flattened and concave branchial regions, numerous pits and somewhat eroded appearance of the dorsal surfaces. Unlike known *Oreotlos* species, however, *N. tohae* does not have the posterior parts of the branchial regions and posterolateral margins expanded posteriorly (Figs. 1, 2A, 3, 4A, 6A) and the exopod of the third maxilliped appears to be relatively shorter and broader (Figs. 5F, G, 6C). In *Oreotlos* species, the posterior parts of the carapace are prominently expanded to form an ovate plate-like structure and the exopod of the third maxilliped appears to be proportionately more slender (e.g., see Tan & Ng, 1995: figs. 1, 17B). The basal antennular article of *N. tohae* is relatively large and occupies more than three-quarters of the antennular fossa (Figs. 4B, 6B). In *Oreotlos* species, the basal antennular article is somewhat smaller, filling about half or two-thirds of the fossa (cf. Tan & Ng, 1995: fig. 29A). Species of *Alox* Tan & Ng, 1995, *Dolos* Tan & Richer de Forges, 1993, *Tlos* Adams & White, 1848, and *Coralliocryptus* Komai & Ng, 2012, on the other hand have the entire fossa occupied by the basal article (cf. Tan & Ng, 1995: fig. 29B).

From Singapore, one *Nursia* species, *N. lar* (Fabricius, 1793) is common in subtidal gravel and sand habitats adjacent to reefs, while *Paranursia abbreviata* (Bell, 1855) was recently recorded (Lee & NK Ng, 2014) from intertidal mudflats.

**Biology.** Most of the specimens were collected by suction and sorting on fine sieves from relatively shallow subtidal waters less than 20 m depth, with the substrate generally coral rubble and sand. The deepest recorded specimen was hand-collected by diving from 41 m.

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