



## A new genus and new species of leucosiid crab (Crustacea: Decapoda: Brachyura) from coral reefs in the Indo-West Pacific

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### Abstract

A new genus and new species of leucosiid crab, *Coralliocryptus caementa* n. sp., is described from Indo-West Pacific coral reefs in the Ryukyu Islands (Japan), Vanuatu, and Comoros. Although the new genus exhibits superficial resemblance to the Iphiculidae in having prominent vertical spiniform teeth on the cutting edges of the chela and the female abdomen consisting of freely articulated somites, the deeply excavated female sterno-abdominal cavity, which is completely covered by the abdomen, unambiguously places this unique taxon in the Leucosiidae. The highly eroded, coral-rubble mimic carapace suggests some degree of relationship between *Coralliocryptus* and some other eballiine genera, e.g., *Alox* Tan & Ng, 1995, *Oreophorus* Rüppel, 1830, *Oreotlos* Ihle, 1918.

Key words: Crustacea, Decapoda, Brachyura, Leucosiidae, new genus, new species, Indo-West Pacific

### Introduction

Numerous species of Indo-West Pacific leucosiid crabs resemble pieces of coral rubble so well that it is almost impossible to see them unless they move (e.g., Tan & Richer de Forges 1993; Tan & Ng 1995). Between 2007 and 2011, the authors independently obtained specimens of an unusual coral rubble mimic from Japan and Vanuatu. Joseph Poupin (Institut de Recherche de l'École Navale, France) then kindly sent the authors specimens of an unusual leucosiid from the Comoro Is. in the Indian Ocean that also turned out to be conspecific with the Western Pacific material. While the carapace of these specimens resembles those of genera like *Alox* Tan & Ng, 1995, *Oreophorus* Rüppel, 1830, and *Oreotlos* Ihle, 1918, their chelae and female abdomen are unlike any of these genera, with sharp vertical and spiniform teeth along the cutting margins of finger as well as freely articulated abdominal somites, superficially resembling those of Iphiculidae Alcock, 1896, another leucosioid taxon (see Ng *et al.* 2008). These specimens are here referred to as a new genus and new species of Eballiinae.

Specimens examined are deposited in the Natural History Museum and Institute, Chiba (CBM), Japan; Muséum national d'Histoire naturelle (MNHN), Paris; and Zoological Reference Collection (ZRC) of the Raffles Museum of Biodiversity Research, National University of Singapore. Measurements provided, in millimeters, are of the maximum carapace length and width, respectively. For detailed data of the collections from Mayotte, Comoro Is., see Bouchard *et al.* (in press). The abbreviations G1 and G2 are used for the first and second male gonopods, respectively.

### Systematics

**Family Leucosiidae Samouelle, 1819**

**Subfamily Eballiinae Stimpson, 1871**

***Coralliocryptus* n. gen.**

**Type species.** *Coralliocryptus caementa* n. sp., by monotypy.

**Diagnosis.** Carapace distinctly wider than long, subhexagonal in general outline; dorsal surface covered with tubercles of various sizes, often stalked, but without distinct keels; frontal region slightly produced, bilobed by shallow median sulcus; cardiac region with low subconical tubercle; intestinal region with large elevation; epibranchial region strongly expanded laterally, divided into 2 lobes; pterygostomial region with prominent subconical tubercle; posterolateral margin with 1 tubercle; posterior margin with distinct tubercle at each lateral angle. Orbital hiatus effectively closed with dorsolateral angle of antennular fossa fusing with inner suborbital angle. Ocular peduncle short. Antennular basal article and flagellum folding slightly obliquely in fossa, concealed by operculiform basal article when closed. Basal antennal article positioned at lateral half of ventral floor of antennular fossa, passing under orbital margin in distal part, with distal articles and antennal flagellum inside orbit. Buccal cavern reaching beyond anterodorsal ends of afferent channel. Exopod of first and second maxilliped with flagellum. Third maxilliped with basis completely fused with ischium; merus distinctly shorter than ischium measured along mesial margin; exopod with rounded proximolateral angle. Chelipeds moderately long; merus with row of prominent stalked-tubercles on anterior and posterior margins; carpus without crests; palm gently inflated; fingers elongated, distinctly longer than palm, each with row of prominent, sharp teeth on opposable (cutting) margin. Ambulatory legs similar in shape and ornamentation; meri weakly compressed, with row of mushroom-shaped tubercles on extensor and flexor margins; carpi without crests; dactylo-propodal locking mechanism well developed. Thoracic sternum covered with numerous granules of various sizes; each suture separating sternites interrupted medially; medial suture absent; female sterno-abdominal cavity deeply excavated, well defined, completely covered by abdomen. Male abdomen narrowly triangular, consisting of free somites 1, 2 and 6, and functionally fused somites 3–5 (trace of sutures still evident on outer surface) plus telson. Female abdomen relatively narrow, consisting of 6 free somites plus telson, with first somite concealed beneath carapace; telson distinctly wider than long. G1 slender, compressed laterally, slightly sinuous in lateral view, terminating in subacute tip. G2 short, less than one-third length of G1, with foliaceous distal part.

**Distribution.** Widely distributed in the Indo-West Pacific, from the Comoro Is. to the Western Pacific; shallow coral reefs, 13–30 m.

**Remarks.** With regards to the highly eroded carapace, *Coralliocryptus* **n. gen.** superficially resembles genera like *Oreophorus*, *Oreotlos* and *Alox*, but many characters argue against a close relationship. Firstly, the cheliped fingers of *Coralliocryptus* **n. gen.** are very slender and elongated with the cutting margins armed with strong spiniform teeth. In members of the latter three genera, the fingers are usually stout and stocky, and while the cutting margins may have sharp teeth, they are never spiniform (e.g., see Tan & Ng 1995: Figs. 2E; 8C; 12C; 16B; 17D; Naruse & Ng 2006: Fig. 2C; Galil & Ng 2007: Fig. 1A–C; 2009: Fig. 2C; Huang 2010: Fig. 2D; Ng *et al.* 2009: Fig. 3A). Most significantly, the female abdomen of *Coralliocryptus* **n. gen.** is unique in having all the somites and telson free, whereas all other known leucosiids have most of the somites fused to form a domed plate (e.g., see Tan & Ng 1995: Figs. 8F; 16D). However, *Coralliocryptus* still has a deeply excavated sterno-abdominal cavity in which the eggs are retained and are completely covered by the abdomen, as in other leucosiid taxa. As such, *Coralliocryptus* **n. gen.** should be included in the Leucosiidae as defined at present rather than in Iphiculidae Alcock, 1896, another family placed in the Leucosioidea, in spite of the similarity in the armature of the fingers of the chelae and the freely articulated female abdominal somites between the present new taxon and the members of Iphiculidae. The primary character that defines the Iphiculidae is the relatively narrow female abdomen in which all the somites are free, the sterno-abdominal cavity is relatively shallow and the eggs are never completely covered by the abdomen, with the egg mass protruding from the sides of the abdomen (see Ng *et al.* 2008). It is worth mentioning that all iphiculids have the same kind of chela as that of *Coralliocryptus* **n. gen.**, with slender fingers and spiniform teeth along the cutting margins. This unusual chela, however, is not unique to iphiculids, and is also seen in various leucosiids, including some species of *Myra* Leach, 1817 (see Galil 2001) and *Nursilia* Bell, 1855 (see Ihle 1918; Chen 1982).

In most species of *Oreophorus*, *Oreotlos* and *Alox*, the basal antennal article is tightly lodged in the orbital hiatus, fusing with it (e.g., see Tan & Ng 1995: Figs. 5K). In *Coralliocryptus*, however, while the basal antennal article is still in the same position, there is no real orbital hiatus because the orbital margin is effectively closed, with the dorsolateral angle of the antennular fossa and inner suborbital angle fused together (Fig. 3E). The basal antennal article of *Coralliocryptus* is therefore, actually underneath the orbital margin (Fig. 5D). This is a rare feature in leucosiids but is not well studied and may be of higher systematic value. It is noteworthy that at least one *Oreotlos* species, *O. heuretosi* Tan & Ng, 1995, has an orbital structure similar to that of *Coralliocryptus* (H. Komatsu, pers. comm.).

**Etymology.** From the combination of the Latinized Greek *corallium* (= coral) and *cryptus* (hidden), in reference to the new taxon cryptic habitat and mimic habit in shallow coral reefs, having prevented its discovery until recently. Gender masculine.

**Comparative material.** *Alox ornatum* (Ihle, 1918): 1 male (CBM-ZC 6885), N of Yakushima I., Ohsumi Is, southwestern Japan, 30°28.00'N, 130°34.60'E, 96 m, TRV *Toyoshio-maru*, 1997-05 cruise, stn 11, 3 June 1997, dredge, coll. T. Komai. *Alox rugosum* (Stimpson, 1858): 1 male (CBM-ZC 3999), Singapore, 15–20 m, 9 May 1997, dredge, coll. T. Komai; 1 female (CBM-ZC 9635), Red Beach, Kin, Okinawa, Ryukyu Archipelago, 4 m, 23 January 2009, SCUBA diving, coll. Yusuke Yamada. *Alox uru* Naruse & Ng, 2006: 1 male (CBM-ZC 7080), Uehara beach, Iriomote I., Yaeyama Is., Ryukyu Archipelago, subtidal, 8 July 2001, dip net, coll. T. Komai. *Oreotlos latus* (Borradaile, 1903): 1 male (CBM-ZC 6906), off Muko-jima I., Ogasawara Is, 27°47.72'N, 142°02.97'E, 68–70 m, TRV *Shin'yo-maru*, 1997 cruise, stn 2, 15 October 1997, dredge, coll. T. Komai. Comparative material of *Oreophorus*, *Oreotlos*, *Alox*, *Iphiculus* and *Pariphiculus* species in the ZRC recorded in Tan & Ng (1995), Naruse & Ng (2006), Galil & Ng (2007, 2009), and Ng *et al.* (2009) are not relisted here.

***Coralliocryptus caementa* n. sp.**

(Figs. 1–6)

**Material examined.** Holotype: ovigerous female (5.4 × 9.1 mm) (CBM-ZC 10875), Awa, Nago, Okinawa, Ryukyu Islands, Japan, 13 m, coll. Yusuke Yamada, SCUBA diving, 11 May 2009. Paratype: 1 ovigerous female (5.4 × 8.8 mm) (ZRC 2012.0144), Cape Maeda, Okinawa, Ryukyu Is., Japan, coll. Satoko Komai, SCUBA diving, 2 July 2011. Additional material: 1 male (3.8 × 6.4 mm) (CBM-ZC 10876), SANTO 2006, stn DB 20, northwest of Urélapa I., Vanuatu, 15°30.5'S, 167°01.4'E, 22–25 m, sand with coral patches, dredge, 15 September 2006; 1 male (3.3 × 5.3 mm) (ZRC 2012.0145), stn DB 58, Aésé I., Vanuatu, 15°24.6'S, 167°14.3'E, 6–43 m, dredge, among sand and corals, 23 September 2006. Mayotte KUW fieldwork, 1 female (5.4 × 8.8 mm) (MNHN), stn 14, La Prudente Bank, 12°38'50.68"S, 44°58'41.93"E, Mayotte, Comoro Is., 15–17 m, sandy bottom, coral boulders, coll. J.-M. Bouchard, V. Dinhut and J. Dumas, SCUBA diving, sediment suction pump, 10h–12h, 9 November 2009; 1 female (5.2 × 8.3 mm) (MNHN), Choizil Pass, "patate à teddy", 12°40'56.91"S, 44°57'51.63"E, Mayotte, Comoro Is., 15–30 m, collapsed reef edge, coll. J.-M. Bouchard, V. Dinhut and J. Dumas, SCUBA, 11h–13h, 13 November 2009.

**Description.** Carapace (Figs. 1A; 2A; 3A) subhexagonal in outline, 1.6–1.7 times broader than long; dorsal surface eroded, covered with tubercles of various sizes, but without ridges or keels; tubercles closely set, rounded, flattened medially (resembling stone pavement), those on lateral and posterior parts separated from each other, stalked, mushroom-like, tips of granules sometimes coarsely granulated (Fig. 3C). Front weakly produced, concave medially (Fig. 3B, D); margin slightly divided into 2 lobes by shallow median notch; anterior part of carapace shallowly concave behind frontal region. Mesogastric region broadly convex, having 3 low, rounded tubercles on either side of midline (tubercles more conspicuous in males) (Fig. 3A). Hepatic region scarcely convex, having 2 low tubercles, lacking hepatic facet (Fig. 3A). Pterygostomial region convex, with prominent tubercle (Fig. 3A, B). Gastro-cardiac region slightly demarcated, with low tubercle on cardiac region (Fig. 3A). Intestinal region well demarcated, raised into rounded elevation (Fig. 3A). Epibranchial region projecting laterally, with 2 large, low median tubercles (Fig. 3A); margin distinctly divided in 2 lobes (Fig. 3C), greatest carapace width across tips of posterior lobes (Fig. 3A); lower branchial region roughly eroded, with numerous stalked tubercles. Metabranial region with small but prominent tubercle lateral to intestinal elevation (Fig. 3A). Posterolateral surface concave to accommodate meri of third and fourth ambulatory legs. Posterior margin visible in dorsal view, with small tubercle at each lateral angle (Fig. 3A).

Ocular peduncle very short; dorsal surface granular (Fig. 3E). Orbit with 1 faint fissure (Fig. 3B) or without trace of fissure on dorsal roof, with trace of notch or fissure on infraorbital margin; orbital hiatus closed with septum formed by fusion of dorsolateral angle of antennular fossa and inner suborbital angle (Fig. 3D). Suborbital region with distinct depression. Antennular basal article and flagellum folded slightly obliquely into fossa, completely concealed by "operculum" formed by basal article when folded; flagellum with 2 apical accessory setae. Basal antennal article positioned on lateral part of floor of antennular fossa, extending beneath closed orbital margin formed by antennular fossa and inner suborbital angle, with distal articles and flagellum lodged inside orbit (Fig. 3D, E).

Epistome (Fig. 3D) very short; anteromedian part of buccal cavern roundly triangular. Afferent channel with shallow concavity on anterolateral end (Fig. 3D).

Mandible (Fig. 4A, B) well calcified; cutting edge triangular in outline, pointed medially; palp 3-segmented, terminal segment fringed with short stiff setae. First maxilliped (Fig. 4C) with prominent, suboval coxal endite; basal endite subtriangular with rounded distal margin; endopod longitudinally expanded, fitting in efferent channel; exopod with flagellum. Second maxilliped (Fig. 4D) with endopod pediform, consisting of 5 segments; dactylus subsemicircular, with spiniform setae on margins; exopod tapering distally, bearing flagellum.

Third maxilliped (Figs. 3F; 4E) covered with granules of various sizes on outer surface. Ischium with mesial margin bordered with fine minute granules. Merus subtriangular, slightly bent dorsally in situ, about 0.4 times as long as ischium measured along mesial margin; inner face mesially with distinct excavation accommodating carpus to dactylus. Distal 3 segments tapering distally. Exopod without conspicuous tooth on lateral margin, though proximal angle delimited; inner surface grooved medially, with strong keel mesially.

Chelipeds (Figs. 1A, C; 2A, C; 5A–C) subequal, relatively slender for family, not particularly enlarged or elongated, about 2.5 times as long as carapace, measured along outer margin from merus to tip of dactylus, entirely covered with flattened or rounded tubercles of various sizes. Coxal condyle large, rounded, with granules in both sexes. Merus slightly compressed dorsoventrally, with row of prominent, subconical tubercles on each anterior and posterior margin. Carpus short. Palm slightly inflated, convex on outer and inner surfaces. Fingers elongated (1.6 times longer than palm), more slender than palm, distinctly curved in dorsal view, both cutting edges with prominent, slender spiniform teeth (3 or 4 on fixed finger, 1 or 2 on dactylus) interspersed by row of much smaller acute teeth; tips of fingers crossed when closed; ventral surface of fixed finger and dorsal surface of dactylus each with 3 longitudinal rows of granules, granules becoming larger and conical toward proximal on dactylus.

Ambulatory legs (Figs. 1A, C; 2A, C; 3D) moderately short, not covered by carapace, slightly compressed; similar in shape and structure, gradually decreasing in length from first to fourth; surfaces covered with granules of various sizes. Coxal condyles large, rounded, with granules in both sexes. Meri subcylindrical, each with single row of prominent, subconical tubercles on upper margin and 2 or 3 conspicuous irregular or similarly shaped tubercles on lower surface (tubercles sometimes stalked, mushroom-like). Carpi short, slightly widened distally; propodi rectangular in cross-section; tubercles on extensor and flexor margins well differentiated. Dactyli distinctly longer than propodi, subconical, nearly straight or slightly curved, covered with minute, sharp granules; dactylo-propodal lock well developed in all ambulatory legs (Fig. 5E).

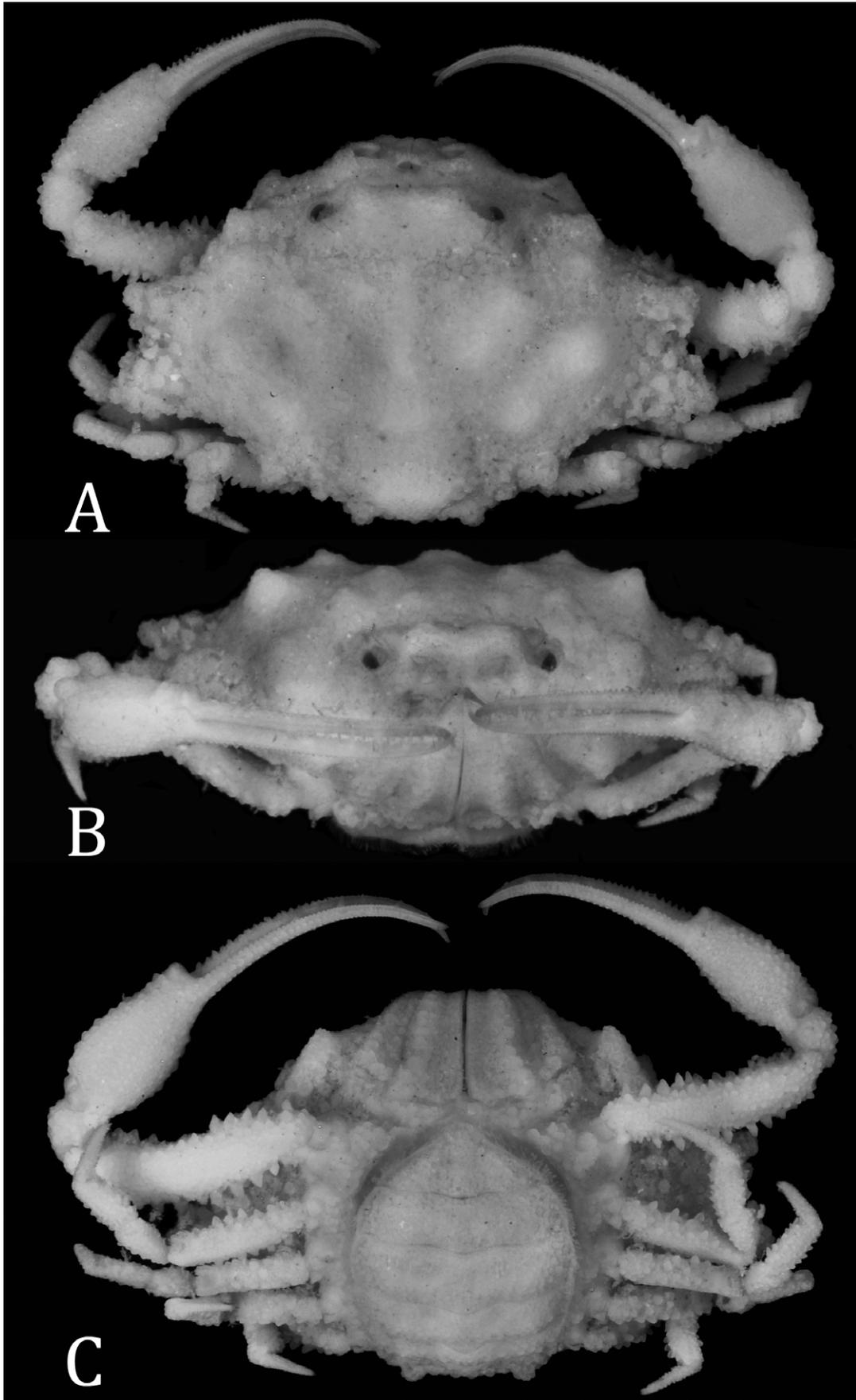
Male thoracic sternum (Figs. 2C; 4F) covered with rounded granules or tubercles of various sizes, concave between sternites, episternites not completely divided. Sternites 1–4 completely fused; sterno-abdominal cavity reaching nearly to buccal cavern, margins sharply delimited, limbed by tubercles; sutures between sternites 4/5, 5/6, 6/7, and 7/8 interrupted medially; median suture absent.

Female thoracic sternum (Figs. 1C; 3G) covered with coarse granules or tubercles of various sizes outside of sterno-abdominal concavity; sternites 1–3 fused, deeply depressed below; sterno-abdominal cavity reaching to buccal cavern, margins distinctly delimited, limbed by tubercles; sutures between sternites 4/5, 5/6, 6/7, and 7/8 interrupted medially; median suture absent. Vulvae large, subsemicircular in shape (Fig. 3G).

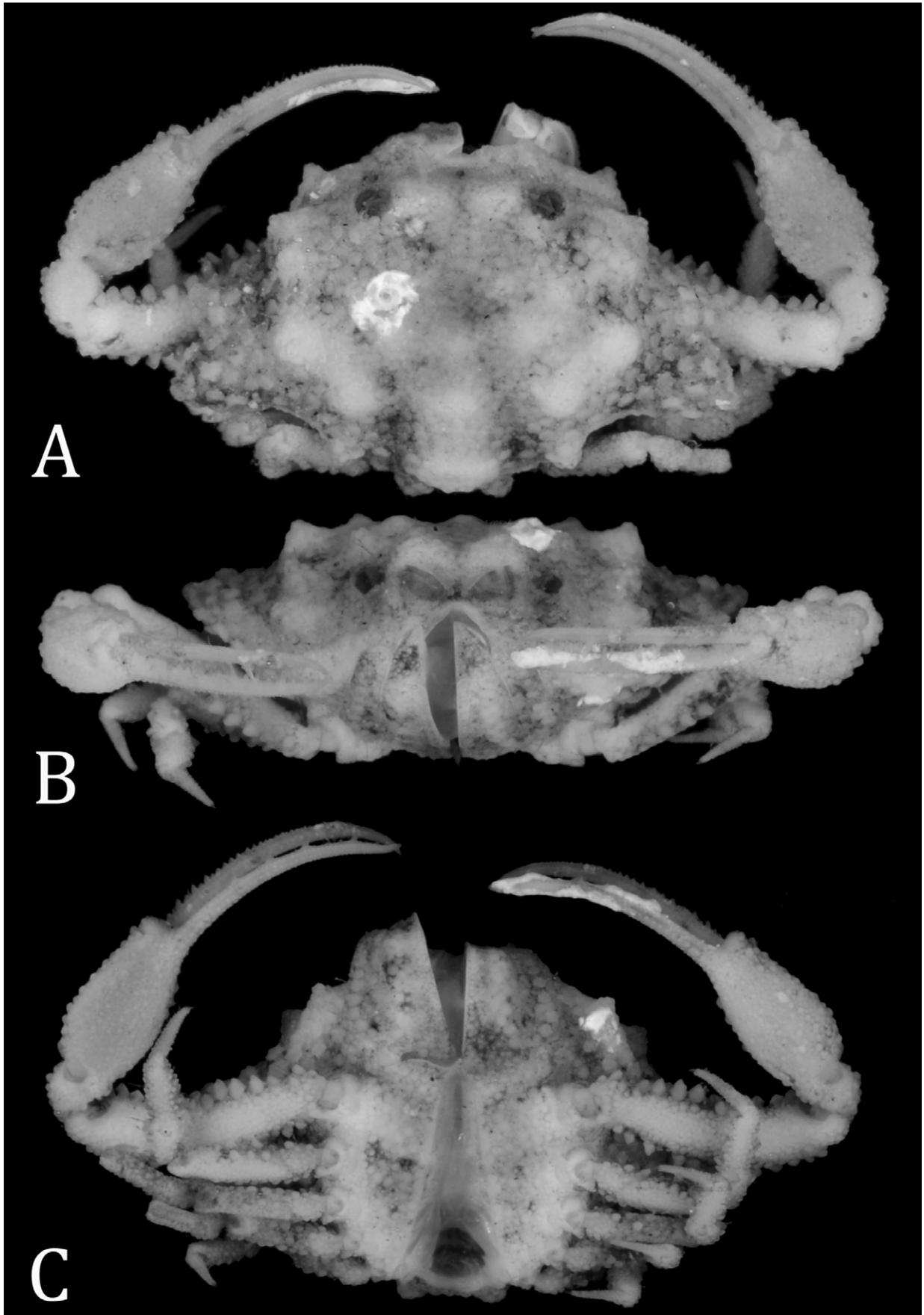
Male abdomen (Fig. 4G) narrowly triangular, widest at third somite, covered with rounded granules or tubercles of various sizes. Somite 1 very short, transversely linear. Somite 2 short; Somites 3–5 fused, elongated, gradually narrowing distally; trace of sutures between somites 3/4 and 4/5 still discernible. Telson elongated, about 1.8 times longer than wide, triangular with rounded tip.

Female abdomen (Figs. 1C; 3H) consisting of 6 freely articulated somites and telson, entirely covered with closely set vesicular granules or tubercles of various sizes on outer surface, about 1.5 times longer than wide (greatest width at somite 5); lateral margins slightly upturned, fringed with short plumose setae. Telson subtriangular with strongly sinuous lateral margins, about 1.9 times wider than long, terminating in subacute or blunt tip.

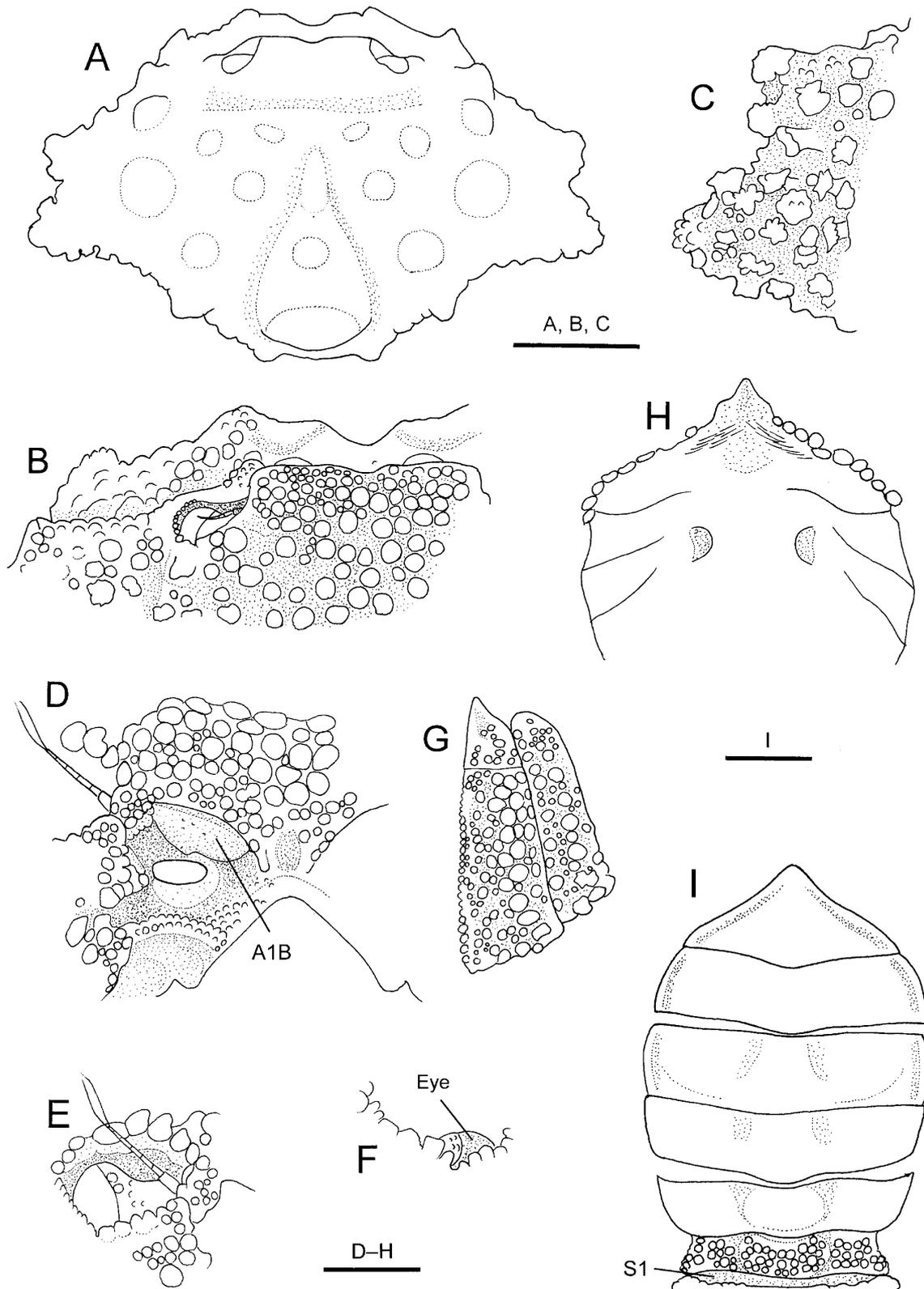
G1 (Fig. 4F, H, I) slender, almost straight in ventral view, slightly sinuous in lateral view, compressed laterally, reaching to level of groove between sternites 3/4, terminating in subacute tip; distal part without particular armature. G2 (Fig. 4J, K) short, about one-fourth length of G1, distal part lance-like in shape, terminating in sharp spine.



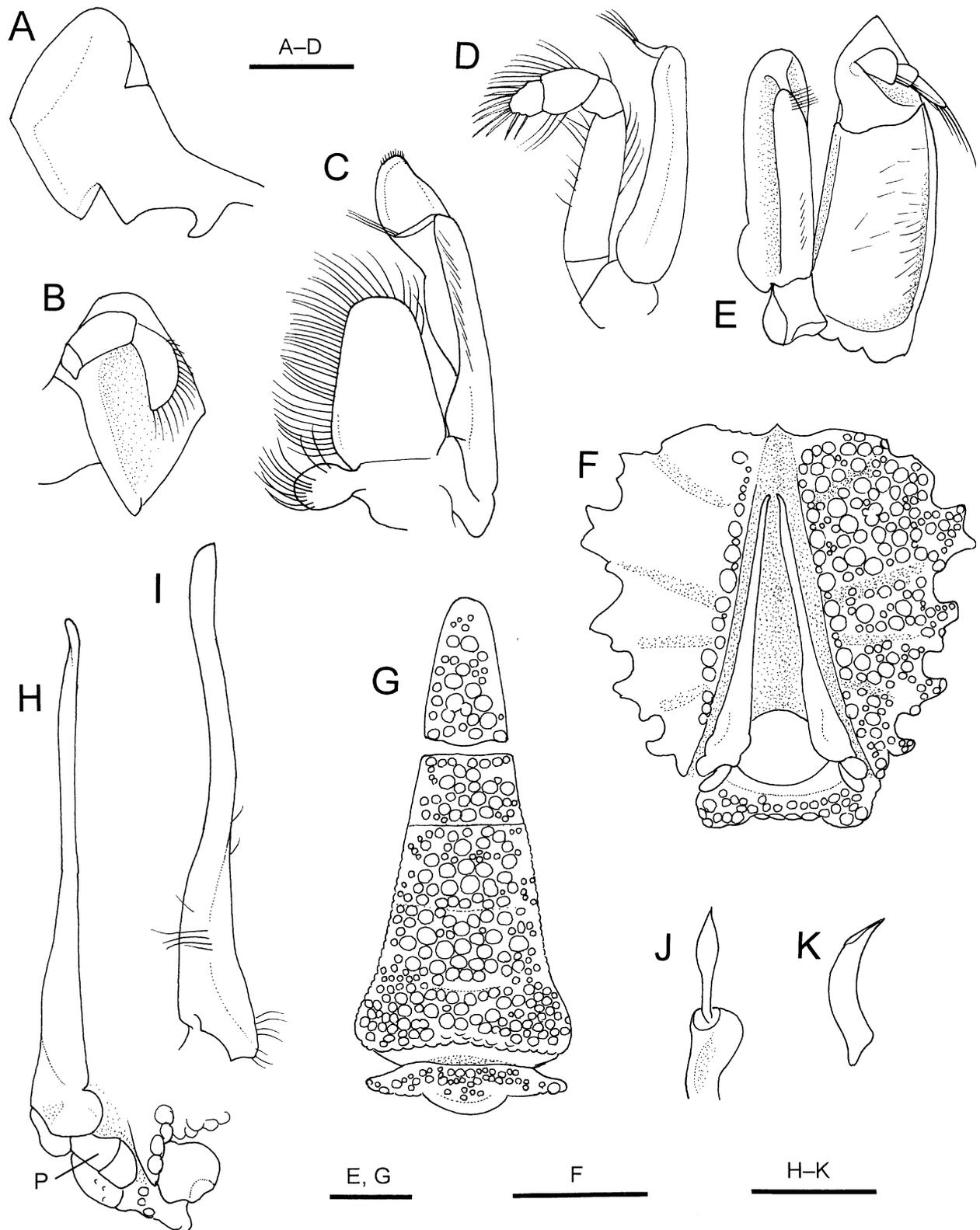
**FIGURE 1.** *Coralliocryptus caementa* n. gen., n. sp., holotype, female (5.4 x 9.1 mm) (CBM-ZC 10875), Okinawa, entire animal. A, dorsal view; B, anterior (frontal) view; C, ventral view.



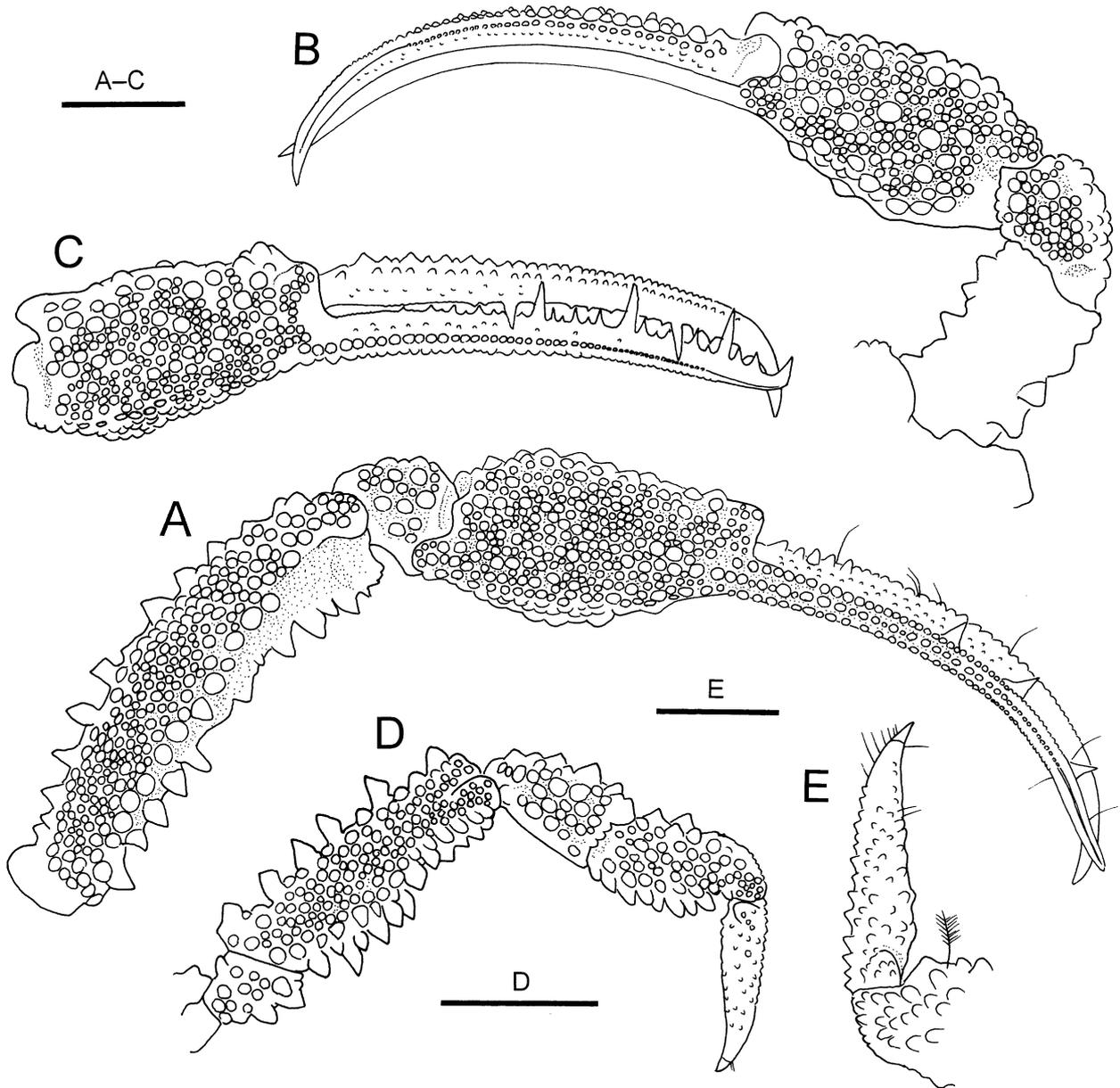
**FIGURE 2.** *Coralliocryptus caementa* n. gen., n. sp., non-type, male (3.8 x 6.4 mm) (CBM-ZC 10876), Vanuatu, entire animal. A, dorsal view; B, anterior (frontal) view; C, ventral view.



**FIGURE 3.** *Coralliocryptus caementa* n. gen., n. sp., holotype, female (5.4 x 9.1 mm) (CBM-ZC 10875), Okinawa. A, schematic drawing of carapace, dorsal view, showing outline and position of tubercles; B, anterior part of carapace, left side, dorsal view; C, lateral part of carapace, dorsal view; D, frontal part of carapace, right side, anterior (frontal) view, showing epistome, antennular fossa and antenna; E, right orbit, anterior (frontal) view; F, dorsal roof of orbit, posterodorsal view; G, left third maxilliped, outer view; H, anterior part of sterno-abdominal cavity, ventral view; I, abdomen and telson, ventral view (tubercles on somites 3–6 and telson, and setae omitted). Scale bars: 2 mm for A; 1 mm for B, C, I; 0.5 mm for D–G. Abbreviations: A1B, basal segment of antennule; S1, abdominal somite 1.



**FIGURE 4.** *Coralliocryptus caementa* n. gen., n. sp., non-type, male (3.8 x 6.4 mm) (CBM-ZC 10876), Vanuatu. A, left mandible, outer view; B, same, inner view; C, left first maxilliped, outer view; D, left second maxilliped, outer view; E, left third maxilliped, inner view; F, thoracic sternum and first gonopods, ventral view; G, second to sixth abdominal somites and telson, outer view; H, left first gonopod and coxa of fifth pereopod, ventral view; I, left first gonopod, lateral view; J, left second gonopod, dorsal view; K, same, lateral view (dissected). Scale bars: 1 mm for F, G; 0.5 mm for A–E, H–K. Abbreviation: P, penis.



**FIGURE 5.** *Coralliocryptus caementa* n. gen., n. sp., holotype, female (5.4 x 9.1 mm) (CBM-ZC 10875), Okinawa. A, right cheliped, ventral view; B, same, dorsal view (tubercles on merus omitted); C, same, chela, extensor (anterior) view; D, right first ambulatory leg (second pereopod), ventral view; E, same, dactylus, ventral view. Scale bars: 1 mm for A–D; 0.5 mm for E.

**Etymology.** The name is derived from the Latin *caementum* for small pieces of rough, eroded rock, alluding to the resemblance of the species to pieces of coral rubble. The name is used as a noun in apposition.

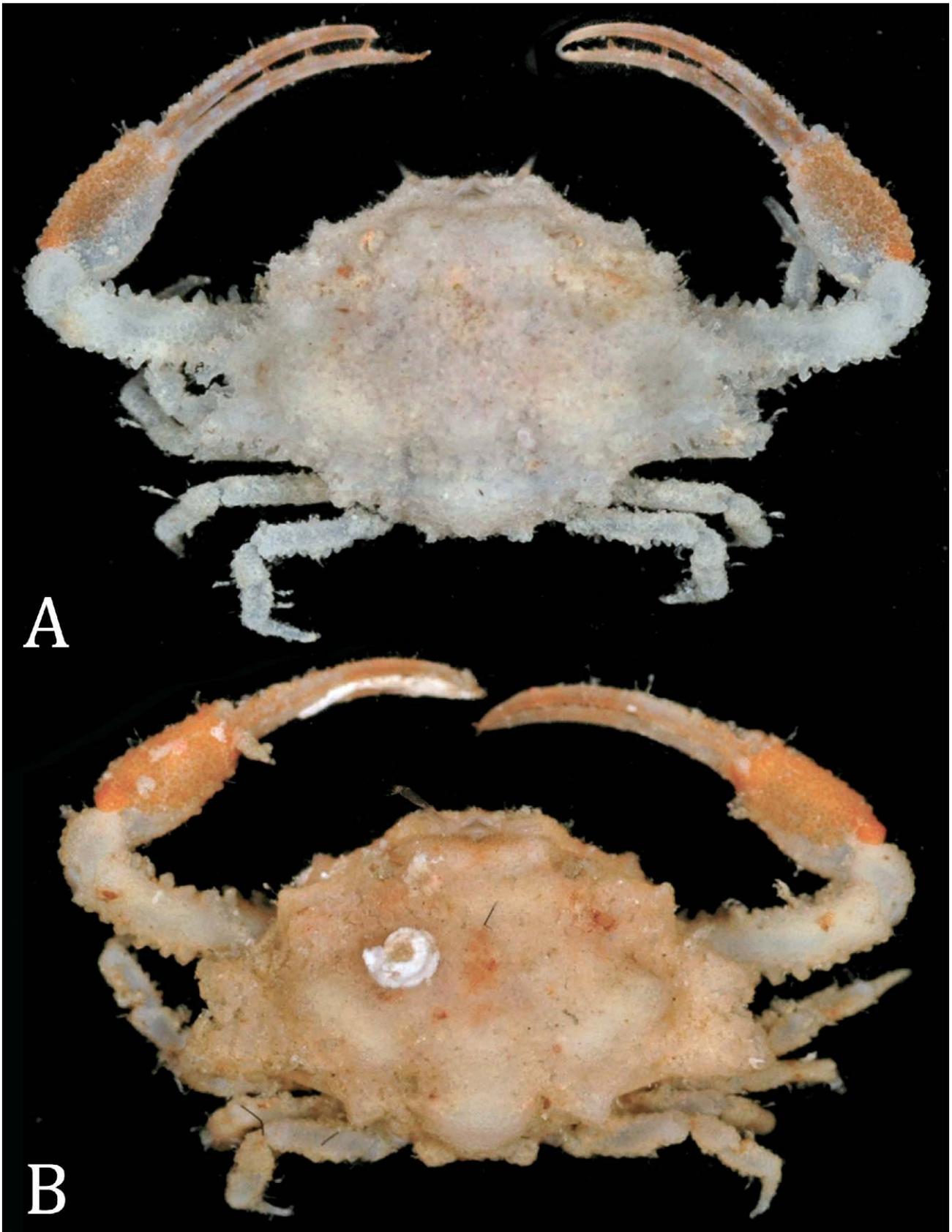
**Coloration in life.** Carapace and appendages cream-white to light tan, dorsal surface and fingers of chelae with orange tint (Fig. 6).

**Distribution.** See generic distribution.

**Remarks.** The specimens from the three localities in Vanuatu, Japan and the Comoro Is. are surprisingly constant in all major characters, and we are confident that all are conspecific. The two males from Vanuatu are relatively smaller than the females and have the granules on the carapace and legs more sharply defined and distinctly mushroom-shaped. In the females, most of the granules on the dorsal surface of the carapace have fused to form a surface that appears very eroded. The triangular cleft on the posterior margin of the epistome varies slightly in proportions, been relatively broader in the Vanuatu and Japanese specimens but slightly narrower in the Comoro Is. material.

The female abdominal somites and telson are completely free in the females, although in one Japanese speci-

men (holotype, 5.4 × 9.1 mm, CBM-ZC 10875), somites 5 and 6 cannot be moved as the marginal granules near the suture line have coalesced, functionally locking the two somites.



**FIGURE 6.** *Coralliocryptus caementa* n. gen., n. sp., non-types, showing coloration in life. A, male (3.3 × 5.3 mm) (ZRC 2012.0145), Vanuatu; B, male (3.8 × 6.4 mm) (CBM-ZC 10876), Vanuatu.

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