

## On the identities of *Parasesarma carolinense* (Rathbun, 1907) and *Parasesarma sigillatum* (Tweedie, 1950), with description of a new species from Taiwan (Crustacea: Brachyura: Sesarmidae)

Peter K. L. Ng<sup>1\*</sup>, Peter J. F. Davie<sup>2</sup> & Jheng-Jhang Li<sup>3</sup>

**Abstract.** The intertidal sesarmid crab *Sesarma sigillata* Tweedie, 1950, described from Cocos-Keeling Islands in the Indian Ocean has long been in the synonymy of *Sesarma* (*Parasesarma*) *carolinensis* Rathbun, 1907, from the Caroline Islands in the western Pacific. Examination of the types of the taxa, as well as a good series of specimens from Cocos-Keeling Islands shows that both are distinct species of *Parasesarma* De Man, 1895. In addition, a new species, *P. corallicum*, which is allied to *P. carolinense* and *P. sigillatum* is described from Taiwan.

**Key words.** Taxonomy, *Parasesarma carolinense*, *Parasesarma sigillatum*, new species, Indian Ocean, Pacific Ocean, Taiwan

### INTRODUCTION

*Sesarma* (*Parasesarma*) *carolinensis* was described by Rathbun (1907) on the basis of one male obtained from the Caroline Islands in the west Pacific. This poorly known species has been retained in *Parasesarma* De Man, 1895, by most authors (e.g., Serène, 1968; Ng et al., 2008). Tweedie (1950: 131, fig. 3a–e) described *Sesarma sigillata* from the Cocos Keeling Islands in the eastern Indian Ocean, but Serène (1968: 108) synonymised it under *S. carolinensis* without comment, presumably because of their very similar carapace form. The male first gonopod structure, so important in helping to discriminate *Parasesarma* species, has not been previously described for *S. carolinensis*.

In this paper, we clarify the identities of *Sesarma carolinensis* Rathbun, 1907, and *S. sigillata* Tweedie, 1950, on the basis of the types, and fresh material of the latter species. Both taxa are here recognised as valid. Since *S. carolinensis* is so poorly known, we herewith take the opportunity to redescribe it in detail. We also describe a new species from Taiwan, *P. corallicum* n. sp., which is allied to the two described species.

Measurements (in millimetres) are of the maximum carapace width and length, respectively. The abbreviations G1 and G2 are used for the male first and second gonopods, respectively.

For the descriptions, only the first known member of the group, *P. carolinense*, is described in full and is then used as a baseline for diagnosing the other two species. Specimens examined are deposited in National Museum of Marine Biology and Aquarium (Crustacea Decapoda) (NMMBCD), Pingtung, Taiwan R.O.C.; National Museum of Natural Science (NMNS), Taichung, Taiwan R.O.C.; Zoological Reference Collection (ZRC), of the Lee Kong Chian Natural History Museum (previously Raffles Museum of Biodiversity Research), National University of Singapore; The Natural History Museum (NHM), London; U.S. National Museum of Natural History (USNM), Smithsonian Institution, Washington D.C.; and the Queensland Museum (QM), Brisbane.

### TAXONOMY

#### Family Sesarmidae Dana, 1851

#### *Parasesarma* De Man, 1895

**Type species.** *Cancer quadratus* Fabricius, 1798; subsequent designation by Rathbun (1918).

**Remarks.** *Parasesarma* De Man, 1895, is one of the largest genera in the Sesarmidae, with 38 recognised species (Ng et al., 2008; Rahayu & Ng, 2009, 2010; Davie & Pabriks, 2010; Naderloo & Schubart, 2010; Rahayu & Li, 2013). *Parasesarma carolinense* and *P. sigillatum* belong to a group of species that have relatively short ambulatory legs, with the meri transversely broad; and the meri and propodi of the second leg less than three times as long as wide (cf. Rahayu & Ng, 2009); and are unique in having the distal margin of their cheliped merus expanded into a lamelliform structure with distinct spination. A third species from Taiwan, *P. corallicum* n. sp., is recognised here. The three species also share the following features: small adult size (mature

<sup>1</sup>Lee Kong Chian Natural History Museum, National University of Singapore, Kent Ridge, Singapore. Email: peterng@nus.edu.sg (\*corresponding author)

<sup>2</sup>Queensland Museum, PO Box 3300, South Brisbane, Queensland, Australia. Email: Peter.Davie@qm.qld.gov.au

<sup>3</sup>Department of Marine Biotechnology and Resources, National Sun Yat-sen University, 70 Lienhai Rd., Kaohsiung 80424, Taiwan. Email: epigrapsus@yahoo.com.tw

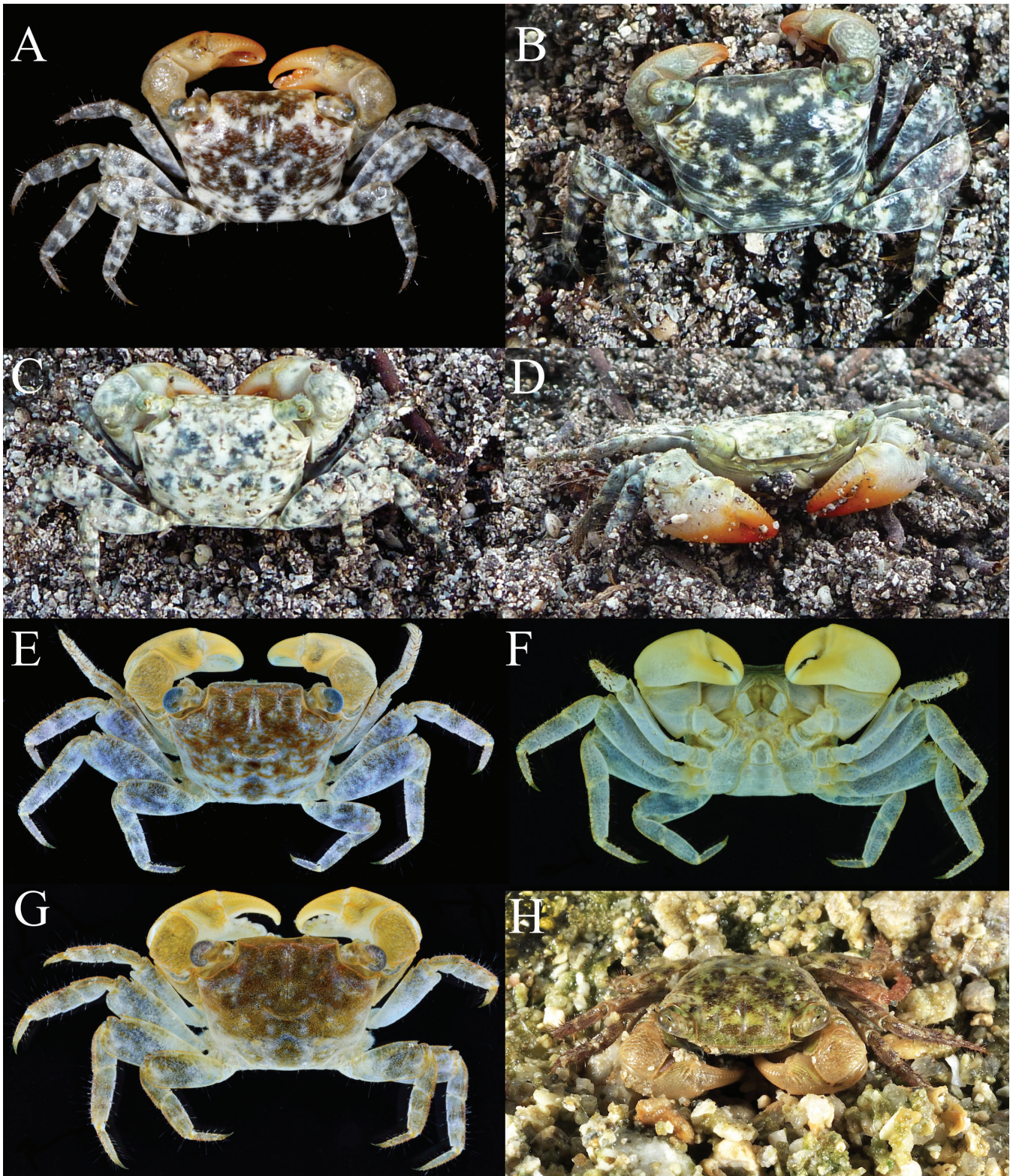


Fig. 1. Colour in life. A–D, *Parasesarma sigillatum*, Cocos-Keeling Islands; E–H, *Parasesarma corallicum* n. sp., Taiwan. A, male, not preserved; B, female (8.7 × 6.4 mm) (QM-W28343); C, D, male (9.4 × 6.9 mm) (QM-W28342); E, F, male, Hsiangchiaowan, Taiwan (10.3 × 7.6 mm) (NMMBCD 4698); G, Holotype, same data (9.5 × 7.0 mm) (NMMBCD 4697); H, Wanlitung, Taiwan (8.0 × 5.7 mm) (NMNS-7548-002).

at carapace widths of 7–8 mm); a trapezoidal carapace in which the lateral margins are strongly convergent towards the posterior carapace margin; the dorsal pectinate ridges on the palm are short; the inner surface of the chela has a transverse granulated ridge; the dorsal margin of the dactylus of the cheliped has about 16 triangular tubercles; and the tips of the fingers are excavated on the inner face. The two species freshly collected for this study (*P. sigillatum* and *P. corallicum* n. sp.) also do not appear to be dependent on mangrove habitats, as is typical of most *Parasesarma* species. They occur, instead, in relatively exposed supralittoral habitats on coral atolls, usually under debris or among rocks. The habitat of *P. carolinense* in the Caroline Islands is not known, but we believe it is likely to be similar.

***Parasesarma carolinense* (Rathbun, 1907)**

(Figs. 2; 5A–C; 6A–F)

*Sesarma* (*Parasesarma*) *carolinensis* Rathbun, 1907: 34, pl. 5 fig. 2, 2a; pl. 9 fig. 1; Tesch, 1917: 141; Serène, 1968: 108.  
*Parasesarma carolinense* – Ng et al., 2008: 222 (list, part).

**Material examined.** Holotype: male (9.2 × 7.0 mm) (USNM 32861), Kusaie, Carolines, coll. 9 February 1900.

**Diagnosis.** Carapace 1.31 times broader than long; lobes of frontal margin separated by broad, very shallow concavity (Fig. 2A–C); upper surface of cheliped palm with 2 transverse pectinate crests, primary (distalmost) consisting of row of 14 or 15 tall pectinate teeth, tip of each tooth gently curved, secondary crest with 16 or 17 relatively lower pectinate teeth (Fig. 2F, I); inner surface of palm with short obliquely transverse granulated ridge on upper half (Fig. 2G); dorsal surface of dactylus with 15 or 16 triangular tubercles, each dactylar tubercle with distinct transverse ridge (Fig. 2F, G, I); inner distal margin of lamelliform process of merus lined with sharp triangular teeth (Fig. 2F, G); ambulatory legs short, stout; merus of third leg 2.0 times as long as wide; upper margin of merus with subdistal spine; propodus of third leg 2.7 times as long as wide; dactylus of third and fourth legs 0.7 and 0.8 times length of propodus, respectively (Figs. 2A; 5A–C); male telson triangular with strongly convex lateral margins, ca. 1.5 times length of pleonal somite 6 (Fig. 6B); G1 relatively slender, straight; apical process bent to form an angle of about 80° from the vertical, chitinous distal part long (Fig. 6C–F).

**Description.** Carapace trapezoidal, 1.31 times broader than long; dorsal surfaces relatively smooth, glabrous; regions poorly defined, separated by shallow grooves except for deeper H-shaped median gastric groove; lateral parts of dorsal carapace surface with distinct oblique striae; posterior surface with short transverse striae; lateral margins with numerous tufts of short setae (Fig. 2A, B). Postfrontal region distinct, low, rounded, not cristate, separated into 4 lobes by narrow, distinct longitudinal grooves; median lobes approximately same width as lateral lobes (Fig. 2A–C). Front truncate, distinctly deflexed downwards, margin weakly bilobed from dorsal view with lobes separated by broad,

very shallow median concavity; confluent with supraorbital margin (Fig. 2A–C). Supraorbital margin entire, posteriorly oblique, convex along anterior half, posterior half gently sinuous (Fig. 2A, B). External orbital tooth triangular, directed obliquely outwards, representing point of greatest carapace width; antero- and posterolateral margins not demarcated, without trace of tooth or indentation, lateral margins straight, converging to meet weakly convex posterior carapace margin (Fig. 2A, B). Eyes with large cornea, not reaching to external orbital tooth (Fig. 2A, B). Antennal and antennular basal segments adjacent, not separated by septum; basal antennular segment large; antennal flagellum relatively long, entering orbit.

Third maxilliped with ischium relatively short, subrectangular in shape, with shallow median sulcus, left one relatively shorter than right one (see Remarks) (Figs. 2E; 6A); merus subovate, with distinct submedian ridge; inner margin of merus-ischium with stiff setae; exopod slender, tip reaching about half length of outer margin of merus, flagellum long (Figs. 2D, E; 6A).

Chelipeds relatively stout in adult male, symmetrical (Fig. 2A). Merus short, inner distal part prominently carinate, forming large lamelliform structure; distal margin of lamelliform structure appears serrated, with short sharp teeth, inner margin with denticles; outer margin uneven or with low granules; outer surface with dorsal striation; inner surface gently concave, smooth, with 2 rows of setae (Fig. 2A, F, G). Carpus with inner angle not produced, rounded; outer margin and surface striated (Fig. 2F, G). Upper surface of palm with 2 obliquely transverse pectinate crests, primary (distalmost) crest with row of 14 or 15 tall pectinate teeth, tip of each tooth gently curved, secondary crest with 16 or 17 relatively lower pectinate teeth (Fig. 2F, I). Outer surface of palm with striations and punctations; inner surface of palm with short oblique granulated crest on upper part (Fig. 2H). Fingers short, subequal to length of palm; cutting edge of pollex with large, rounded teeth on distal half, teeth on proximal part relatively lower, tip excavated, spatulate; dactylus with rounded tooth on subproximal part of cutting margin, rest of margin with small teeth, tip excavated, spatulate; dorsal surface of dactylus with 15 or 16 triangular tubercles, gradually sloping distally, becoming lower, each tubercle with a strong proximal transverse ridge (Fig. 2F–I).

Ambulatory legs short, stout, laterally flattened; second and third pairs longest (Fig. 2A). Merus with low transverse striae on upper surface, meri of second and third legs 2.2 and 2.0 times as long as wide, respectively; upper margin of merus with subdistal spine (Figs. 2A; 5A–C). Carpus with 2 accessory carinae on outer surface. Propodus of third leg ca. 2.7 times as long as wide with low carina on inferior proximal portion of outer surface, dorsal and ventral margins with short stiff setae (Figs. 2A; 5A–C). Dactylus of third and fourth legs 0.7 and 0.8 times length of propodus, respectively, tip gently curved distally, terminating in acute calcareous tip, dorsal and ventral margins with short stiff setae (Figs. 2A; 5B, C).

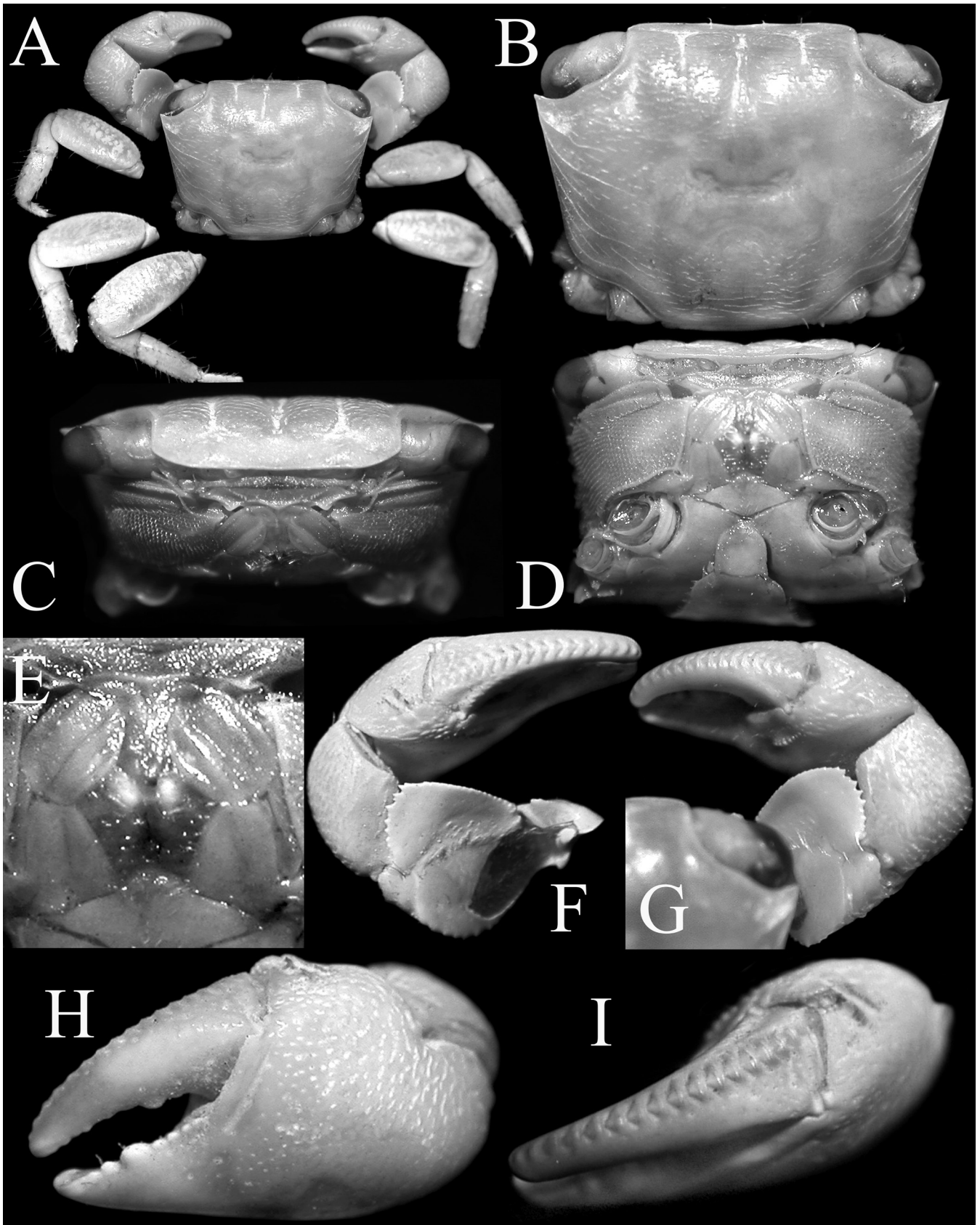


Fig. 2. *Parasesarma carolinense* (Rathbun, 1914), holotype male (9.2 × 7.0 mm) (USNM 32861), Caroline Islands. A, overall habitus; B, dorsal view of carapace; C, frontal view of cephalothorax; D, anterior thoracic sternum and pleon; E, third maxillipeds; F, dorsal view of left cheliped; G, dorsal view of right cheliped; H, outer view of left chela; I, dactylar tubercles of left chela.

Surface of thoracic sternites 1–4 smooth; sternites 1–3 completely fused, without trace of sutures; separated from sternite 4 by deep suture (Fig. 2D). Male sternopleonal cavity reaching suture between sternites 3, 4. Male pleon relatively broad, all somites free; telson triangular with strongly convex lateral margins, ca. 1.5 times length of pleonal somite 6; somite 6 almost twice as wide as long, lateral margins strongly convex; somites 3–5 progressively more trapezoidal; somites 1, 2 very narrow longitudinally; reaching coxa of fourth ambulatory leg, sternite 8 completely covered (Fig. 6B).

G1 relatively slender, straight; apical process bent to form an angle of about 80° from the vertical, chitinous distal part long, aperture terminal (Fig. 6C–F). G2 short, about a third length of G1.

**Colour in life.** Not known.

**Habitat.** Not known.

**Remarks.** The left third maxilliped (Fig. 6A) appears to be aberrant, with the ischium relatively short. On the right third maxilliped, the ischium is proportionately longer (Fig. 2E). The right third maxilliped structure of *P. carolinense* agrees well with those of *P. sigillatum* and *P. corallicum* (Fig. 6G, N), respectively.

The species is known only from the holotype specimen. Comparisons with *P. sigillatum* and *P. corallicum* n. sp. are provided in the Discussion.

***Parasesarma sigillatum* (Tweedie, 1950)**

(Figs. 1A–D; 3; 5D–G; 6G–M; 7A)

*Sesarma sigillata* Tweedie, 1950: 131, fig. 3a–e.

*Sesarma* (*Parasesarma*) *sigillatum* – Serène, 1968: 108.

*Parasesarma carolinense* – Ng et al., 2008: 222 (list, part) (not *Sesarma* (*Parasesarma*) *carolinensis* Rathbun, 1907).

**Material examined.** Lectotype (here designated): male (10.7 × 7.6 mm) (NHM 1950.4.17.4), Cocos-Keeling Islands, coll. C.A. Gibson-Hill, 1941. Paralectotype: 1 female (10.4 × 7.5 mm) (NHM 1950.4.17.5), same data as lectotype. Others: 24 males (largest 11.1 × 7.8 mm), 20 females (largest 11.0 × 7.8 mm) (1 ovigerous) (ZRC 1965.8.2.260–269), Cocos-Keeling Islands, coll. C.A. Gibson-Hill, 1941; 1 female (9.9 × 7.0 mm) (ZRC), Cocos-Keeling Islands, coll. P.K.L. Ng & P.J.F. Davie, 21 March 2011; 1 male (9.1 × 6.7 mm), 1 juvenile male, 6 females (largest 8.6 × 6.3 mm) (ZRC), stn CK 26, lagoon side of airport near Meteorological Station, West Island, Cocos-Keeling Islands, coll. P.K.L. Ng & P.J.F. Davie, 24 March 2011; 2 males (9.4 × 6.9 mm, 9.0 × 6.7 mm) (QM-W28342), stn CK16, lagoon side of airport near Meteorological Station, West Island, Cocos-Keeling Islands, coll. P.J.F. Davie & P.K.L. Ng, 22 March 2011; 3 males (largest 7.8 × 5.9 mm), 16 females (largest 8.7 × 6.4 mm) (QM-W28343), same data QM-W28342; 2 males (largest 9.2 × 6.9 mm) (QM-W28344), stn CK26, lagoon side of airport near Meteorological Station, West Island, Cocos-Keeling

Islands, coll. P.J.F. Davie & P.K.L. Ng, 24 March 2011; 2 males (largest 10.5 × 7.9 mm), 4 females (largest 11.4 × 8.1 mm) (QM-W28345), stn CK3, Tanjong Puji, West Island, Cocos-Keeling Islands, 12°11.589'S, 96°51.549'E, coll. P.J.F. Davie & P.K.L. Ng, 20 March 2011.

**Diagnosis.** Carapace 1.35–1.44 times broader than long; frontal margin bilobed, separated by broad, very shallow concavity (Fig. 3A–C); upper surface of cheliped palm with 2 transverse pectinate crests, primary (distalmost) crest with row of 15–18 tall pectinate teeth, tip of each tooth gently curved, secondary crest with 9 or 10 relatively lower pectinate teeth, followed by patch of 12–15 scattered low, more rounded pectinate tubercles on median part of palm (Figs. 3H; 7A); inner surface of palm with low, obliquely transverse, submedian granulated ridge (Fig. 3I); dorsal surface of dactylus with 16–18 triangular tubercles, each dactylar tubercle with distinct transverse ridge (Fig. 3E, F, H, I); inner distal margin of inner lamelliform process of merus lined with sharp triangular teeth (Fig. 3E, F, I); ambulatory legs short, stout; merus of third leg 2.0 times as long as wide; upper margin of merus with subdistal spine; propodus of third leg 2.8 times as long as wide; dactylus of third and fourth legs 0.8 and 1.0 times length of propodus, respectively (Figs. 3A; 5D–G); male telson semicircular, ca. 1.2 times length of pleonal somite 6 (Fig. 6H); G1 relatively slender, straight; apical process bent at 90° from the vertical, chitinous distal part long, aperture terminal (Fig. 6I–L).

**Colour in life.** Dorsal surfaces of carapace and ambulatory legs dirty white with large and small uneven patches of dark brown to grey (Fig. 1A–C). Chelae light orange, although ventral half darker, with dorsal parts sometimes appearing paler (Fig. 1A–D).

**Habitat.** *Parasesarma sigillatum* inhabits supralittoral or upper intertidal zones. It prefers a sandy substrate with some mud, and with grass growing nearby. The crabs were found hiding under flotsam, pieces of wood and small rocks. An allied species, *Parasesarma* cf. *lenzii* (De Man, 1895) can sometimes be found with it, although this species prefers muddier and wetter substrates.

**Remarks.** Tweedie (1950: 131) stated that one male and one female were “cotypes”, but noted that he also had 43 additional specimens. This means that only the two specimens in the NHM (labelled as cotypes) are syntypes, with the remaining material in ZRC not types. The NHM male is here designated the lectotype of *Sesarma sigillata* Tweedie, 1950. There are, however, 44 specimens in a bottle in the ZRC (24 males, 20 females), not 43, suggesting that Tweedie miscounted. The two NHM specimens are in very poor condition: all the chelipeds and ambulatory legs are detached; and their carapaces are very delicate, with that of the female already medially broken. However, they agree with the ZRC specimens in all aspects, including the structure of the G1. Both G1s of the lectotype male are intact and still on the specimen, and the G1 figured by Tweedie (1950: fig. 3d) must have therefore come from one of the males in the ZRC. It was probably from the male in ZRC which has

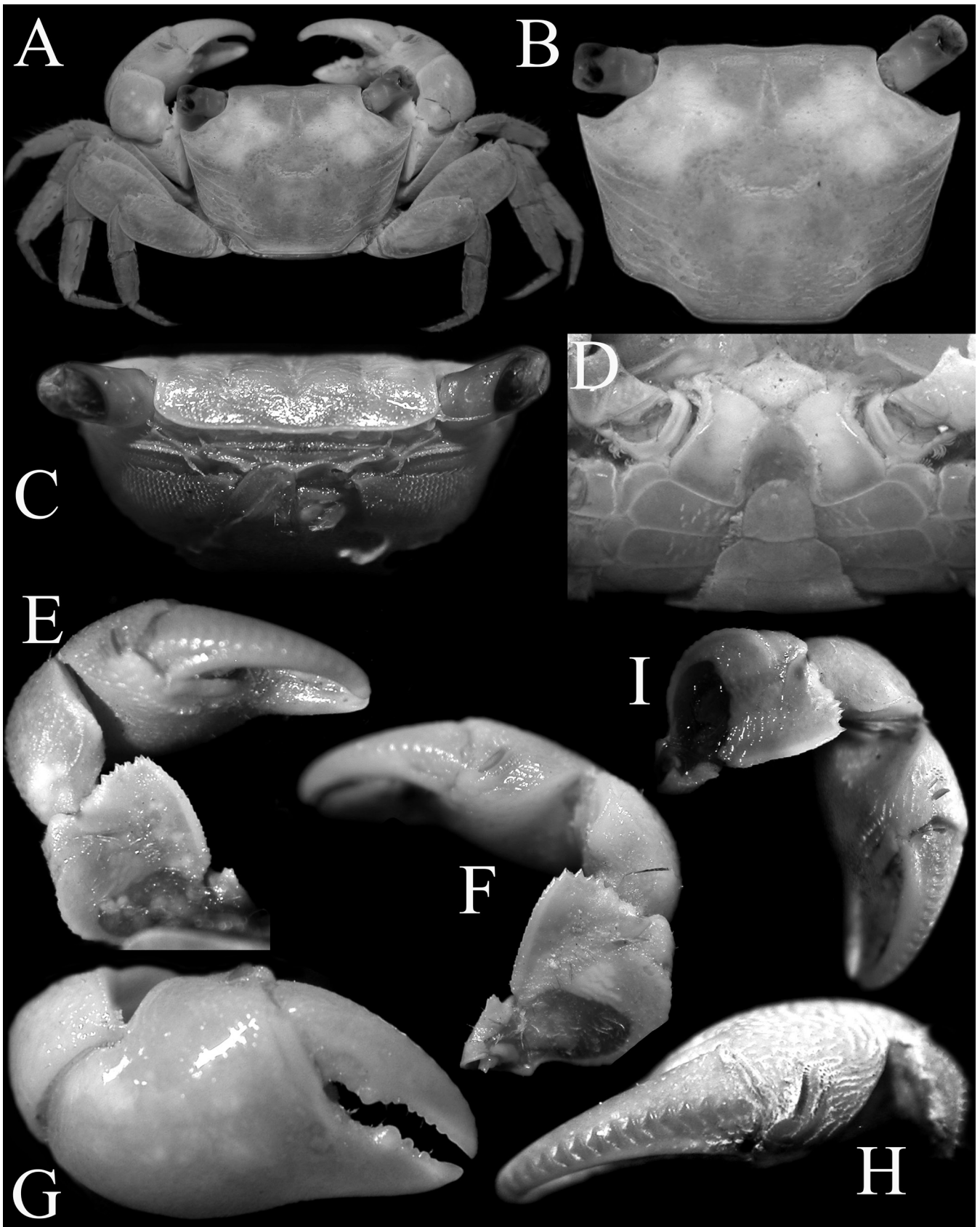


Fig. 3. *Parasesarma sigillatum* (Tweedie, 1950). A–H, male (9.5 × 6.8 mm) (ZRC 1965.8.2.269), Cocos-Keeling Island; I, lectotype male (10.7 × 7.6 mm) (NHM 1950.4.17.4), Cocos-Keeling Island. A, overall habitus; B, dorsal view of carapace; C, frontal view of cephalothorax; D, anterior thoracic sternum and pleon; E, dorsal view of left cheliped; F, dorsal view of right cheliped; G, outer view of right chela; H, dactylar tubercles of right chela; I, inner view of left chela.

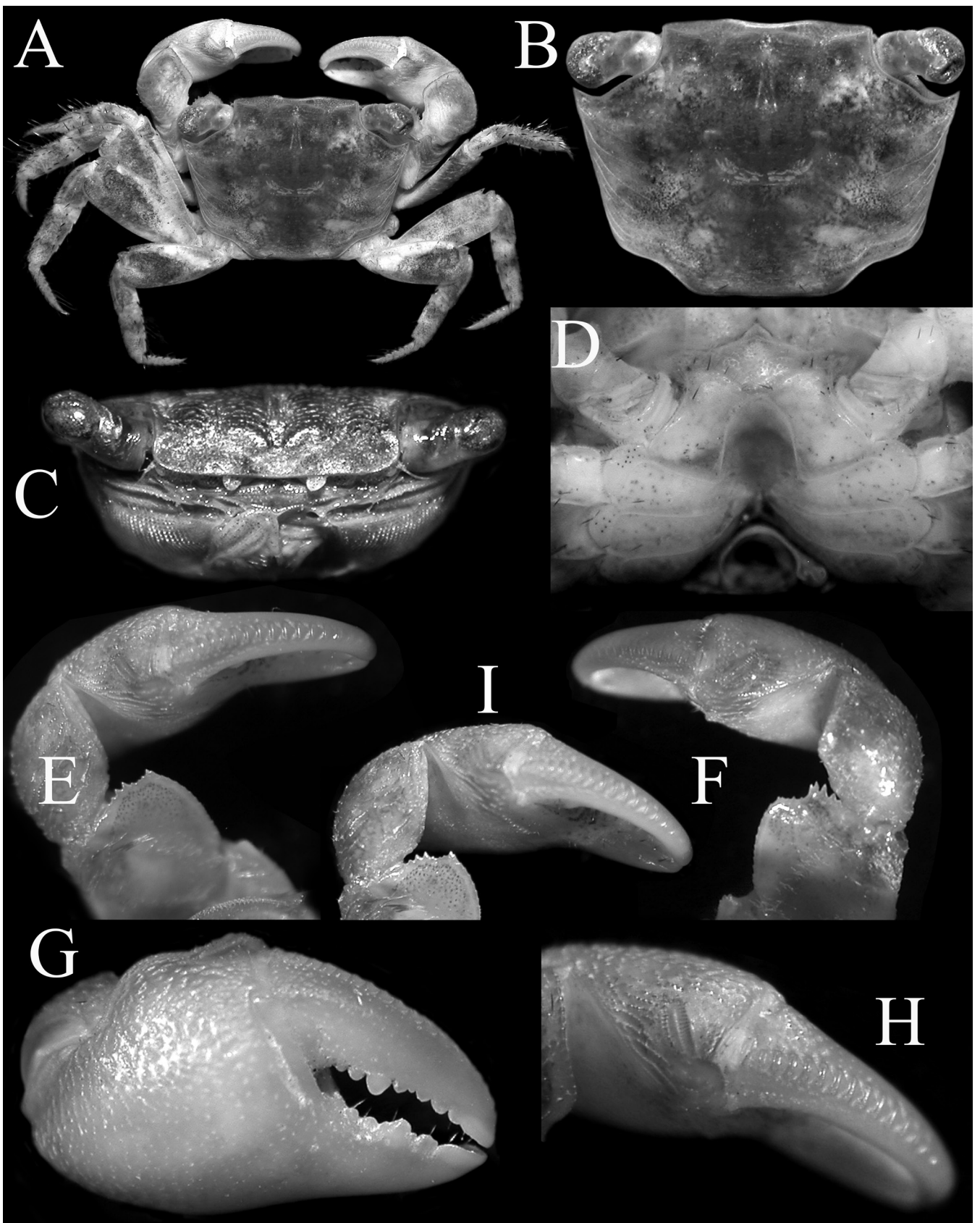


Fig. 4. *Parasesarma corallicum* n. sp., holotype male (9.5 × 7.0 mm) (NMMBCD 4697), Taiwan. A, overall habitus; B, dorsal view of carapace; C, frontal view of cephalothorax; D, anterior thoracic sternum and sternopleonal cavity; E, dorsal view of left cheliped; F, dorsal view of right cheliped; G, outer view of right chela; H, dactylar tubercles of right chela; I, inner view of left chela.

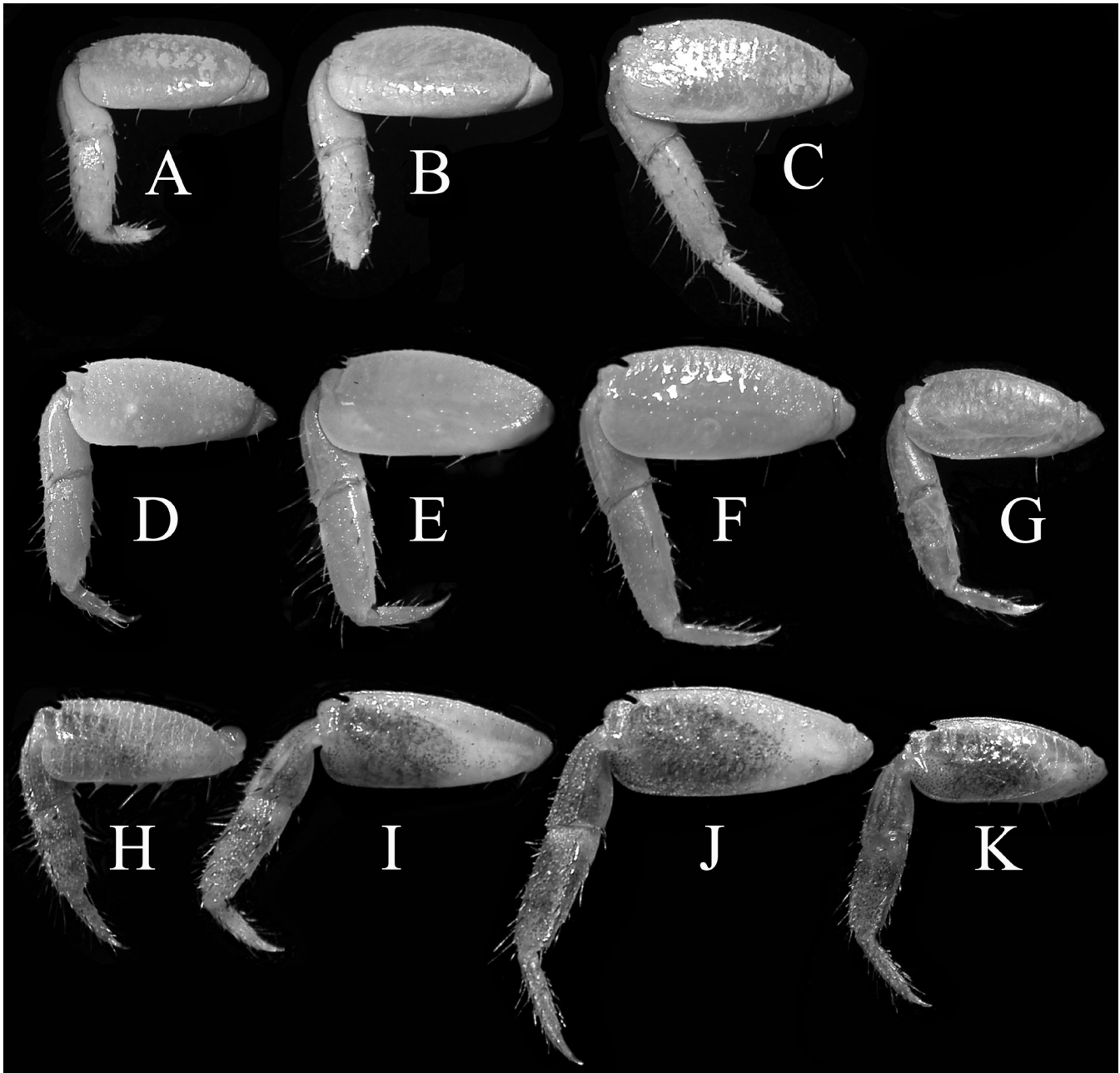


Fig. 5. Left ambulatory legs. A–C, *Parasesarma carolinense* (Rathbun, 1914), holotype male (9.2 × 7.0 mm) (USNM 32861), Caroline Islands; D–G, *Parasesarma sigillatum* (Tweedie, 1950), male (9.5 × 6.8 mm) (ZRC 1965.8.2.269), Cocos-Keeling Island; H–K, *Parasesarma corallicum* n. sp., holotype male (9.5 × 7.0 mm) (NMMBCD 4697), Taiwan. A, D, H, first ambulatory leg; B, E, I, second ambulatory leg; C, F, J, third ambulatory leg; G, K, fourth ambulatory leg. Legs of all species to scale.

its own catalogue number (ZRC 1965.8.2.260) and a note in Tweedie's handwriting that it was photographed; this specimen no longer has an pleon or gonopods suggesting they may have been removed for figuring and not returned to the bottle.

There is a label with the NHM material that states that this species is conspecific with "*Sesarma carolinense*", suggesting that Serène may have examined the material before he synonymized *S. carolinense* with *S. sigillata*.

The differences between *P. carolinense* s. str. and *P. corallicum* n. sp. are outlined in the Discussion.

***Parasesarma corallicum* sp. nov.**

(Figs. 1E–H; 4; 5H–K; 6N–T; 7B)

**Material examined.** Holotype: male (9.5 × 7.0 mm) (NMMBCD 4697), Hsiangchiaowan, Kenting, Pingtung, southern Taiwan, coll. J.-J. Li, 10 August 2015. Paratypes: 1 male (10.0 × 7.3 mm) (ZRC), same data as holotype; 1 male (10.3 × 7.6 mm), 1 female (8.0 × 5.8 mm) (NMMBCD 4698), Hsiangchiaowan, Kenting, Pingtung, southern Taiwan, coll. J.-J. Li, 21 August 2015; 2 males (8.1 × 5.7 mm, 6.3 × 4.7 mm), 1 female (6.9 × 4.7 mm) (ZRC), Wanlitung, Kenting, Pingtung, southern Taiwan, coll. J.-J. Li, 5 July 2014; 1 male (9.1 × 6.1 mm) (NMMBCD 4699), Wanlitung, Kenting, Pingtung, southern Taiwan, coll. J.-J. Li, 20 July



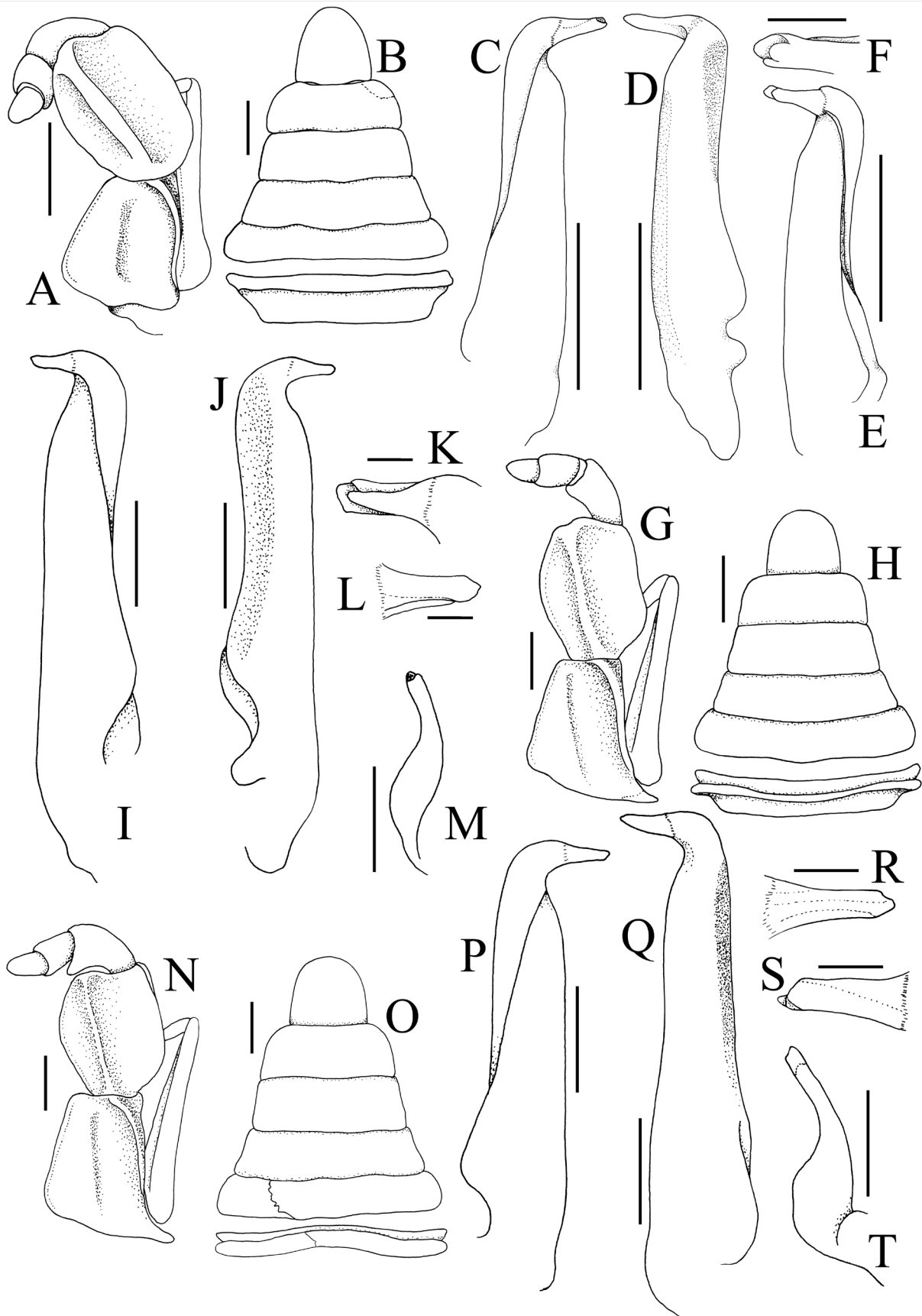


Fig. 6. A–F, *Parasesarma carolinense* (Rathbun, 1914), holotype male (9.2 × 7.0 mm) (USNM 32861), Caroline Islands; G–M, *Parasesarma sigillatum* (Tweedie, 1950), male (9.5 × 6.8 mm) (ZRC 1965.8.2.269), Cocos-Keeling Island; N–T, *Parasesarma coralliticum* n. sp., holotype male (9.5 × 7.0 mm) (NMMBCD 4697), Taiwan. A, G, N, left third maxilliped; B, H, male pleon; O, male pleon (somites 1 and 3 broken); C, P, ventral view of left G1; D, Q, dorsal view of left G1; E, ventral view of right G1; F, distal chitinous part of right G1 (ventral view); I, ventral view of right G1; J, dorsal view of right G1; K, distal chitinous part of right G1 (ventral view); L, distal chitinous part of right G1 (dorsal view); M, right G2; R, distal chitinous part of left G1 (ventral view); S, distal chitinous part of left G1 (dorsal view); T, left G2. Setae for all structures denuded. Scale bars = 0.5 mm [A–E, G–J, M–Q, T]; 0.1 mm [F, K, L, R, S].

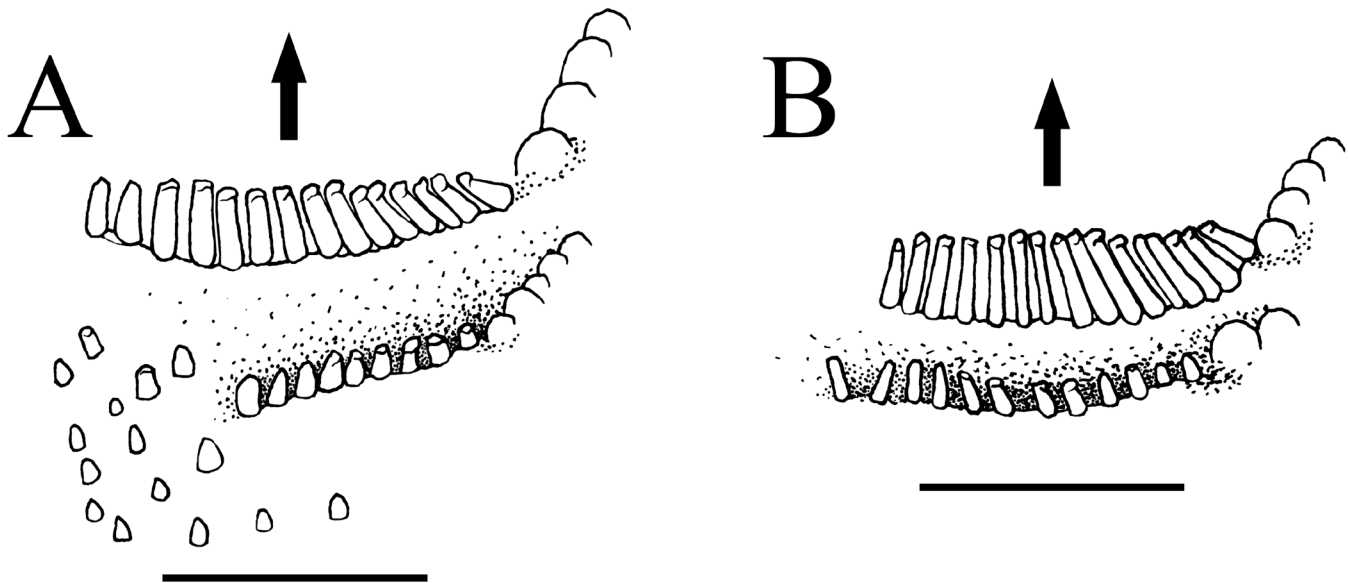


Fig. 7. Details of pectinate crests on chela. A, *Parasesarma sigillatum* (Tweedie, 1950), lectotype male (10.7 × 7.6 mm) (NHM 1950.4.17.4), Cocos-Keeling Island; B, *Parasesarma coralicum* n. sp., holotype male (9.5 × 7.0 mm) (NMMBCD 4697), Taiwan. Arrow points to direction of dactylar finger. Scales = 0.5 mm.

2014; 1 male (8.8 × 6.4 mm), 1 female (8.8 × 6.3 mm) (QM), Wanlitung, Kenting, Pingtung, southern Taiwan, coll. J.-J. Li, 21 July 2014; 2 males (9.0 × 6.6 mm, 8.6 × 6.0 mm) (QM), Wanlitung, Kenting, Pingtung, southern Taiwan, 6 August 2014; 1 ovigerous female (8.3 × 5.8 mm) (NMMBCD 4700), Wanlitung, Kenting, Pingtung, southern Taiwan, coll. L.-K. Tseng, 28 July 2014; 3 male (11.3 × 7.6 mm – 8.1 × 5.6 mm), 1 female (10.7 × 7.8 mm) (NMMBCD 4701), Hsiangchiaowan, Kenting, Pingtung, southern Taiwan, coll. J.-J. Li, 2 Nov 2014. 1 ovigerous female (7.7 × 5.3 mm) (NMNS-7548-001), Wanlitung, Kenting, Pingtung, southern Taiwan, coll. L.-K. Tseng, 25 October 2014; 1 male (8.0 × 5.7 mm) (NMNS-7548-002), Wanlitung, Kenting, Pingtung, southern Taiwan, coll. J.-J. Li, 3 May 2014.

**Diagnosis.** Carapace 1.34–1.47 times broader than long; lobes of frontal margin separated by broad, relatively deeper concavity (Fig. 4A–C); upper surface of cheliped palm with 2 transverse pectinate crests, primary (distal-most) crest with row of 16 or 17 tall pectinate teeth, tip of each tooth gently curved, secondary crest with 11 or 12 relatively lower pectinate teeth (Figs. 4H; 7B); inner surface of palm with low obliquely transverse submedian granulated ridge (Fig. 4I); dorsal surface of dactylus with 15 or 16 triangular tubercles, each dactylar tubercle with distinct transverse ridge (Fig. 4E, F, H); inner distal margin of lamelliform process of merus lined with acutely triangular teeth (Fig. 4E, F); ambulatory legs short, stout; merus of third leg 2.3 times as long as wide; upper margin of merus with subdistal spine; propodus of third leg 2.7 times as long as wide; dactylus of third and fourth legs 0.8 and 0.9 times length of propodus, respectively (Figs. 4A; 5H–K); male telson semicircular, ca. 1.2 times length of pleonal somite 6 (Fig. 6O); G1 relatively slender, straight; apical process bent at 90° from the vertical, chitinous distal part long, aperture terminal (Fig. 6P–S).

**Colour in life.** Dorsal surfaces of carapace light brown with patches of white (Fig. 1E, H), with brown areas sometimes

uniformly coloured (Fig. 1G). Ambulatory legs whitish-grey with patches of brown (Fig. 1E–H). Chelae yellow to yellowish-brown (Fig. 1E–H).

**Etymology.** The name is derived from its habit of living near coral reefs.

**Habitat.** The specimens of *Parasesarma coralicum* n. sp. were active among sandy substrates around the highly eroded dead coral areas in the supralittoral zone. Most of this area is dry to moist. The crabs hide deep in numerous crevices in the dead coral during the day, and were observed only in the evening and at night. *Parasesarma coralicum* n. sp. occurs sympatrically with *Stelgistra stormi* (De Man, 1895), *Nanosesarma andersonii* (De Man, 1895) (both Sesarmidae) and *Grapsus albolineatus* (Latreille, in Milbert, 1812) (Grapsidae).

**Remarks.** The specimens of this species were consistent in all the diagnostic characters examined. One ovigerous female (7.7 × 5.3 mm) (NMNS-7548-001), however, lacked a subdistal spine on the merus of first and fourth left ambulatory legs. These spines were probably eroded as the crabs moved around the coral crevices.

See discussion for comparisons with *P. carolinense* s. str. and *P. sigillatum*.

## GENERAL DISCUSSION

The three species are all very similar in general morphology. However, the second and third ambulatory meri of *P. carolinense* are relatively shorter (Figs. 2A; 5A, B) (somewhat longer in *P. sigillatum* and even more so in *P. coralicum* n. sp.; c.f. Figs. 3A; 4A; 5E, F, I, J); the fourth ambulatory merus is more slender in *P. carolinense* (Figs. 2A; 5C) (distinctly broader in *P. sigillatum* and *P. coralicum*; Figs. 3A; 4A; 5G, K); the fourth ambulatory dactylus is distinctly shorter

in *P. carolinense* (Fig. 5C) (distinctly longer in *P. sigillatum* and *P. corallicum*, Fig. 5G, K); and the third maxilliped merus and ischium of *P. carolinense* are proportionately shorter (Figs. 2E; 6A) (relatively longer in *P. sigillatum* and *P. corallicum*; Fig. 6G, N).

The male telson of *P. carolinense* (Fig. 6B) is also proportionately longer (ca. 1.5 times length of pleonal somite 6) than those of *P. sigillatum* or *P. corallicum* (ca. 1.2 times length of pleonal somite 6) (Fig. 6H, O). The G1s of the three species are superficially similar; although the chitinous distal part of the G1 in *P. carolinense* is slightly bent upwards at an 80° angle to the vertical (Fig. 6C–E), while bent at right angles in *P. sigillatum* and *P. corallicum* (Fig. 6I, J, P, Q).

In all three species, the first oblique pectinate crest on the dorsal margin of the chela is distinct and the relatively tall pectinate teeth are arranged in one discrete row (Fig. 2F, I, 3E, H, 4E). In *P. carolinense* and *P. corallicum*, the relatively lower pectinate teeth on the secondary crest of granules are also arranged in a distinct row (Figs. 2F, I, 7B). In *P. sigillatum*, however, the pectinate tubercles on the secondary crest diffuse into a patch of low pectinate tubercles towards the median surface of the chela (Figs. 3H, 7A).

The inner distal margin of the lamelliform process of the merus is lined with sharp teeth in all three species, but in *P. corallicum* n. sp., these spines are usually more acute (Fig. 4E, F). These teeth are usually more broadly triangular in *P. carolinense* and *P. sigillatum* (Figs. 2F, G; 3E, F); but this may vary, as the lectotype specimen of *P. sigillatum* also has relatively acute teeth (Fig. 3I).

The eyes of *P. carolinense* appears to be relatively shorter, not extending beyond the tip of the external orbital tooth (Fig. 2A, B) while in *P. sigillatum* and *P. corallicum*, they appear to be longer and reach the edge of the carapace margin (Figs. 3A, B; 4A, B). However, this character is not reliable as there is variation in *P. sigillatum* and *P. corallicum*.

The colours in life of *P. sigillatum* and *P. corallicum* appear to be consistently different; with the former having a lighter coloured grey/olive and white patchy pattern, and orange chelae (Fig. 1A–D), while *P. corallicum* is more of a yellowish-brown, less obviously mottled, and has yellow chelae (Fig. 1E–H). The colour in life of *P. carolinense* is still unknown.

The supralittoral habitat, general carapace shape and presence of a transverse granulated ridge on the inner surface of the chelae of *P. carolinense*, *P. sigillatum* and *P. corallicum* are features also shared by members of the *Chiromantes obtusifrons* (Dana, 1851) species group (Davie & Ng, 2013) from the Indo-West Pacific. However, the structure of the transverse granulated ridge on the inner surface of the chelae is different; it is short, and on the upper half of the chela in the three present species, but is median in position and longer in members of the *C. obtusifrons* species group. In addition, members of the latter group are usually found in rocks and not on sand. The lamelliform cheliped merus and excavated

finger tips of the chelae of *P. carolinense*, *P. sigillatum* and *P. corallicum* closely resemble those of *Stelgistra stormi* (De Man, 1895) from Indonesia, Taiwan and Japan (see Ng & Liu, 1999; Komai et al., 2004); although the latter is from supralittoral eroded limestone rocks and the finger tips are more distinctly spoon-shaped.

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