

## New genera and new species of Hexapodidae (Crustacea, Brachyura) from the Indo-West Pacific and east Atlantic

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**Abstract.** The hexapodid genera *Hexapus* De Haan, 1833, *Hexapinus* Manning & Holthuis, 1981, *Latohexapus* Huang, Hsueh & Ng, 2002, and *Hexaplax* Doflein, 1904, are revised and redescribed on the basis of their respective type species. *Hexapus* s. str. is redefined and a new species is described from Indonesia. *Hexapinus* is restricted for *H. latipes* (De Haan, 1835), *H. edwardsi* (Serène & Soh, 1976) and three new species from Indonesia, Philippines, China and Japan. A new genus, *Mariaplax*, is established for *Lambdophallus anfractus* Rathbun, 1909, *Hexapus granuliferus* Campbell & Stephenson, 1970, and 11 new species from the China, Japan, Vietnam, Philippines, Indonesia, Singapore, New Guinea and Australia. A new genus, *Rayapinus*, is recognised for an unusual new species from Japan. Two new species of *Hexaplax* from Papua New Guinea, Philippines, Taiwan, and Japan are described. A new genus, *Theoxapus*, is also established for the east Atlantic *Hexapus buchmanani* Monod, 1956, which had previously been placed in *Hexapinus*. A revised key to the genera of Hexapodidae is presented.

**Key words.** Crustacea, Brachyura, Hexapodidae, taxonomy, Indo-West Pacific, East Atlantic, new genera, new species

### INTRODUCTION

Unique among the extant Brachyura in the complete absence of the last pair of ambulatory legs, members of the family Hexapodidae Miers, 1886, occur throughout temperate and tropical seas. In their revision of west African crabs, Manning & Holthuis (1981) followed Guinot (1978) in treating the Hexapodidae as a distinct family, recognising 11 genera and 18 species. Since then, two new genera have been described and 19 extant species are known at present (Huang et al., 2002; Guinot, 2006; Ng et al., 2008). Of these, 11 genera and 10 species occur in the Indo-West Pacific.

The present study started some 20 years ago when the late Chen Hui-Lian (Qingdao, China) gave a collection of hexapodid crabs to the second author for a proposed study of East Asian species. However, this study was never finished due to her untimely death in the interim. In 2008, the first author obtained specimens of a new species from Lombok, as well as several specimens from other parts of Indonesia, and initiated a study of this material with the second author. This study gradually expanded to include material from Australia, New Guinea, China, Taiwan, Vietnam, Japan, Indonesia, Philippines, Malaysia and Singapore.

The present study treats seven genera (three new) and 25 species (18 new) from the Indo-West Pacific and east Atlantic: *Hexapus sexpes* (Fabricius, 1798), *Hexapus timika*, new species, *Hexapinus latipes* (De Haan, 1835), *Hexapinus ceres*, new species, *Hexapinus latus*, new species, *Hexapinus simplex*, new species, *Mariaplax*, new genus, *Mariaplax anfracta* (Rathbun, 1909), new combination, *Mariaplax chenaee*, new species, *Mariaplax cyrtophallus*, new species, *Mariaplax daviei*, new species, *Mariaplax galaxeeae*, new species, *Mariaplax granulifera* (Campbell & Stephenson, 1970), new combination, *Mariaplax mica*, new species, *Mariaplax narusei*, new species, *Mariaplax ourabay*, new species, *Mariaplax propinqua*, new species, *Mariaplax secus*, new species, *Mariaplax sinensis*, new species, *Mariaplax streptophallus*, new species, *Rayapinus*, new genus, *Rayapinus maenosonoi*, new species, *Latohexapus granosus* Huang, Hsueh & Ng, 2002, *Hexaplax megalops* Doflein, 1904, *Hexaplax aurantium*, new species, *Hexaplax saudade*, new species, *Theoxapus*, new genus, and *Theoxapus buchmanani* (Monod, 1956), new combination.

Specimens examined are deposited in the Institute of Oceanology, Chinese Academy of Science, Qingdao, China (IOCAS); National Museum of Nature and Science, Tsukuba, Japan (NSMT); Kanagawa Prefectural Museum of Natural History, Iriuda, Japan (KPM); Ryukyu University Museum, Fужukan, Okinawa, Japan (RUMF); Natural History Museum and Institute, Chiba, Japan (CMB); Crustacean Collection of the National Museum of the Philippines, Manila (NMCR), Zoological Reference Collection of the Raffles Museum of Biodiversity Research, National University of Singapore, Singapore (ZRC); Museum Zoologi Bogor, Indonesian Institute of Sciences (MZB); Western Australian Museum, Perth, Australia (WAM); Queensland Museum, Brisbane,

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Australia (QM); The Natural History Museum, London, United Kingdom (NHM); The Naturalis (ex Rijksmuseum van Natuurlijke Historie), Leiden, The Netherlands (RMNH); Muséum national d'Histoire naturelle, Paris, France (MNHN); Zoological Museum of Berlin (ZMB); and the U.S. National Museum of Natural History, Smithsonian Institution, Washington D.C., U.S.A. (USNM). The abbreviations P2, P3, and P4 are used for the second, third, and fourth pereopods (= first, second, and third ambulatory legs), respectively; G1 for first male gonopod; and coll. is for collected. Measurements provided, in millimetres, are of the carapace width and length, respectively. Detailed descriptions are only provided for the type species of each genus, with other species only diagnosed. As the generic concepts have changed substantially in recent years, the synonymy for genera is restricted primarily to the original citation.

## TAXONOMY

### Family Hexapodidae Miers, 1886

**Remarks.** Following suggestions by Monod (1956), Manning & Holthuis (1981) distinguished the various hexapodid genera using a combination of characters such as the structure of the eyes, shape of the third maxilliped (especially the shape of the propodus), presence or absence of a flagellum on the exopod of the third maxilliped, relative length of the second, third, and fourth pereopods, structure of the male thoracic sternal groove, shape and configuration of the male abdomen, and structure of the G1. To separate *Hexapus* De Haan, 1833, and *Hexapinus* Manning & Holthuis, 1981, Manning & Holthuis (1981: 169) argued that *Hexapus* has broad and deep male thoracic sternal grooves that extend anterolaterally from the sternoabdominal cavity to the bases of the third maxillipeds; while those in *Hexapinus* are not as long or broad, being only a triangular projection and not reaching the bases of the third maxillipeds. The present study shows that the shape and extent of the male thoracic sternal groove cannot always be used to separate the two genera. This character varies with the size of the individual and there are intermediate conditions between species in other hexapodid genera (see *Mariaplax chenaie*, new species). These generic groupings are better defined by other characters. As such, both genera need to be rediagnosed.

In this paper, separation of the genera in the family Hexapodidae essentially follows the system suggested by Manning & Holthuis (1981) except for relying less on the shape and extent of the male thoracic sternal groove. One new character added is the shape and proportions of the ischium and merus of the third maxillipeds. At the species level, the structure of the adult G1 is important and it can sometimes be the only reliable means of separating species that are otherwise very close (e.g., see *Mariaplax granuliferus* and *M. daviei*, new species). If only juveniles or females are known, species identifications may be difficult.

That been said, the proportions of the carapace and pereopods as well as structure of the male abdomens are usually useful in discriminating species. While most hexapodid taxa are

known from only few specimens, we are fortunate in this study to be able to study abundant material of four species (*Hexapinus simplex*, new species, *Mariaplax chenaie*, new species, *Hexaplax megalops*, and *Hexaplax aurantium*, new species). They demonstrate that the characters of the carapace, third maxillipeds, and pereopods do not vary substantially. The good series of specimens of both sexes and various sizes also allows us to ascertain variation in key characters as well as changes in the G1 structure associated with growth.

**Comparative material.** *Tritoplax stebbingi* (Barnard, 1950): lectotype male (14.1 × 9.5 mm), 1 female (12.2 × 8.2 mm) (NHM), Agulhas Bay (St. Sebastian Bay to Algoa Bay), South Africa, coll. 19 November 1946 (Fig. 7).

### Key to genera of Hexapodidae (modified from Manning & Holthuis, 1981)

1. Eye hammer-shaped, cornea very large, much broader than peduncle; carpus, propodus, and dactylus of third maxilliped very slender; P2–P4 very long, slender, merus of longest pair longer than carapace [Indo-West Pacific]..... *Hexaplax* Doflein, 1904
- Eye relatively small or reduced, cornea scarcely or not broader than peduncle; third maxilliped and P2–P4 various..... 2
2. Eyes fixed; P2–P4 long, slender, merus of longest pair much longer than carapace; male thoracic sternal groove long, narrow, transverse, extending laterally from sternoabdominal cavity to beyond base of third maxilliped; carpus, propodus and dactylus of third maxilliped slender [Indian Ocean]..... *Lambdophallus* Alcock, 1900
- Eyes movable; P2–P4 relatively short, merus of longest pair shorter or subequal in length to carapace; male thoracic sternal groove with or without transverse extension from sternoabdominal cavity to base of third maxilliped; third maxilliped various..... 3
3. Propodus of third maxilliped strongly dilated distally..... 4
- Propodus of third maxilliped not strongly dilated distally, slender; carpus and dactylus relatively slender..... 6
4. G1 stout, strongly twisted into a tight spiral [South Africa]..... *Spiroplax* Manning & Holthuis, 1981
- G1 variously shaped, not twisted into tight spiral..... 5
5. Male abdominal somite 6 relatively long; male telson with lateral margins concave; G1 slender, sinuous directed anteriorly [West Africa]..... *Thaumastoplax* Miers, 1881
- Male abdominal somite 6 relatively shorter; male telson with lateral margins convex; G1 recurved posteriorly [Indo-West Pacific]..... *Hexaloughlia* Guinot, 2006
6. Some of female abdominal somites fused..... 7
- All female abdominal somites free..... 8
7. Female abdominal somite 1 free, somites 2–6 fused, but sutures visible [Guatemala]..... *Stevea* Manning & Holthuis, 1981
- Female abdominal somites 1–6 fused, suture visible only on somites 5 and 6 [Japan]..... *Rayapinus*, new genus
8. Exopod of third maxilliped with flagellum; dactylus of P2–P4 neither enlarged nor distinctly flattened dorsoventrally; male abdominal somite 6 constricted proximally..... 9
- Exopod of third maxilliped without flagellum; dactylus of P2–P4 enlarged, triangular, strongly flattened dorsoventrally; male abdominal somite 6 not constricted proximally [West Africa]..... *Pseudohexapus* Monod, 1956
9. Male abdominal somite 6 much longer than combined length of somites 3–5 [Galapagos]..... *Paeduma* Rathbun, 1897
- Male abdominal somite 6 shorter than combined length of somites 3–5..... 10

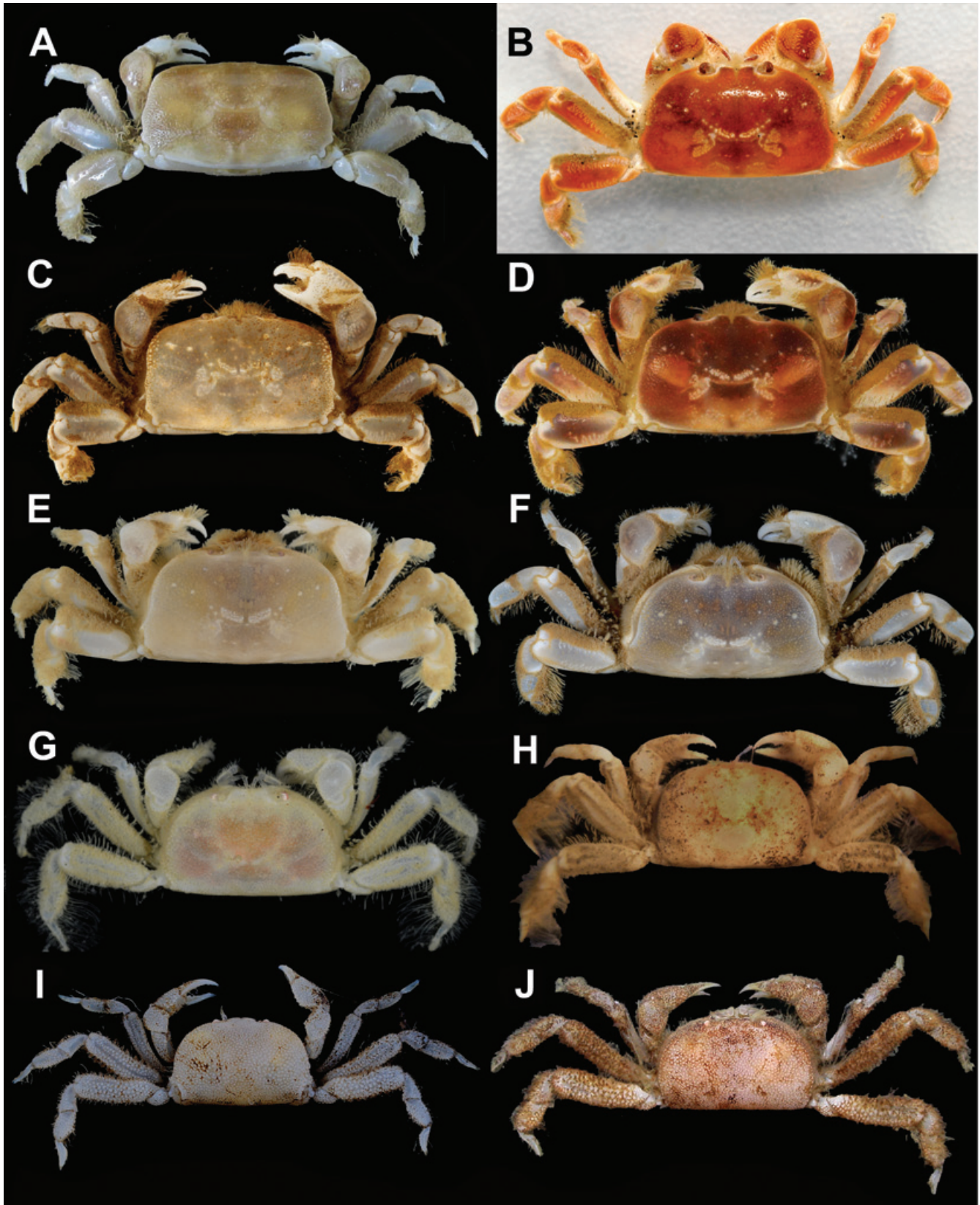


Fig. 1. Colours in life. A, *Hexapinus simplex*, new species, paratype male (8.7 × 5.0 mm) (MZB), Lombok, Indonesia; B, *Hexapinus simplex*, new species, male (9.3 × 5.8 mm) (ZRC), Lembah Straits, Sulawesi Indonesia; C, *Hexapinus simplex*, new species, male (12.6 × 8.4 mm) (RUMF-ZC-2110), Tekebu, Amami-Ohshima Island, Japan; D, *Hexapinus simplex*, new species, male (12.6 × 8.4 mm) (ZRC 2013.1688), Funaura, Iriomote Island, Japan; E, *Hexapinus simplex*, new species, female (8.3 × 6.0 mm) (ZRC 2013.1687), Raffles Reserve near Raffles Lighthouse, Singapore; F, *Hexapinus simplex*, new species, male (11.2 × 7.0 mm) (ZRC), Pulau Senang, Singapore; G, *Mariaplax galaxeae*, new species, holotype female (4.2 × 3.2 mm) (ZRC 2013.1690), Singapore Strait; H, *Mariaplax chenaee*, new species, East China Sea (courtesy W.-L. Liu, specimen not examined); I, *Mariaplax secus*, new species, holotype male (4.7 × 3.0 mm) (MNHN IU-2013-916), Madang, Papua New Guinea; J, *Mariaplax mica*, new species, holotype female (6.7 × 4.5 mm) (NMCR 39069), Bohol Sea, Philippines.

10. Male telson distinctly trilobed or trifol in shape with distinct lateral angular projection, male abdominal somite 6 divided longitudinally [South Africa]. ..... *Tritoplax* Manning & Holthuis, 1981  
 – Male telson various, male abdominal somite 6 entire. .... 11
11. Carapace regions distinct; thoracic sternites 1 and 2 strongly bent inwards towards buccal cavity [West Pacific]. .....  
 ..... *Latohexapus* Huang, Hsueh & Ng, 2002
- Carapace regions indistinct; thoracic sternites 1 and 2 gently curved or flat, not bent inwards towards buccal cavity ..... 12
12. Third maxilliped slender, ischium width about 2/3 to 3/4 merus length. .... 13
- Third maxilliped broad, ischium width usually subequal to or longer than merus length. .... 14

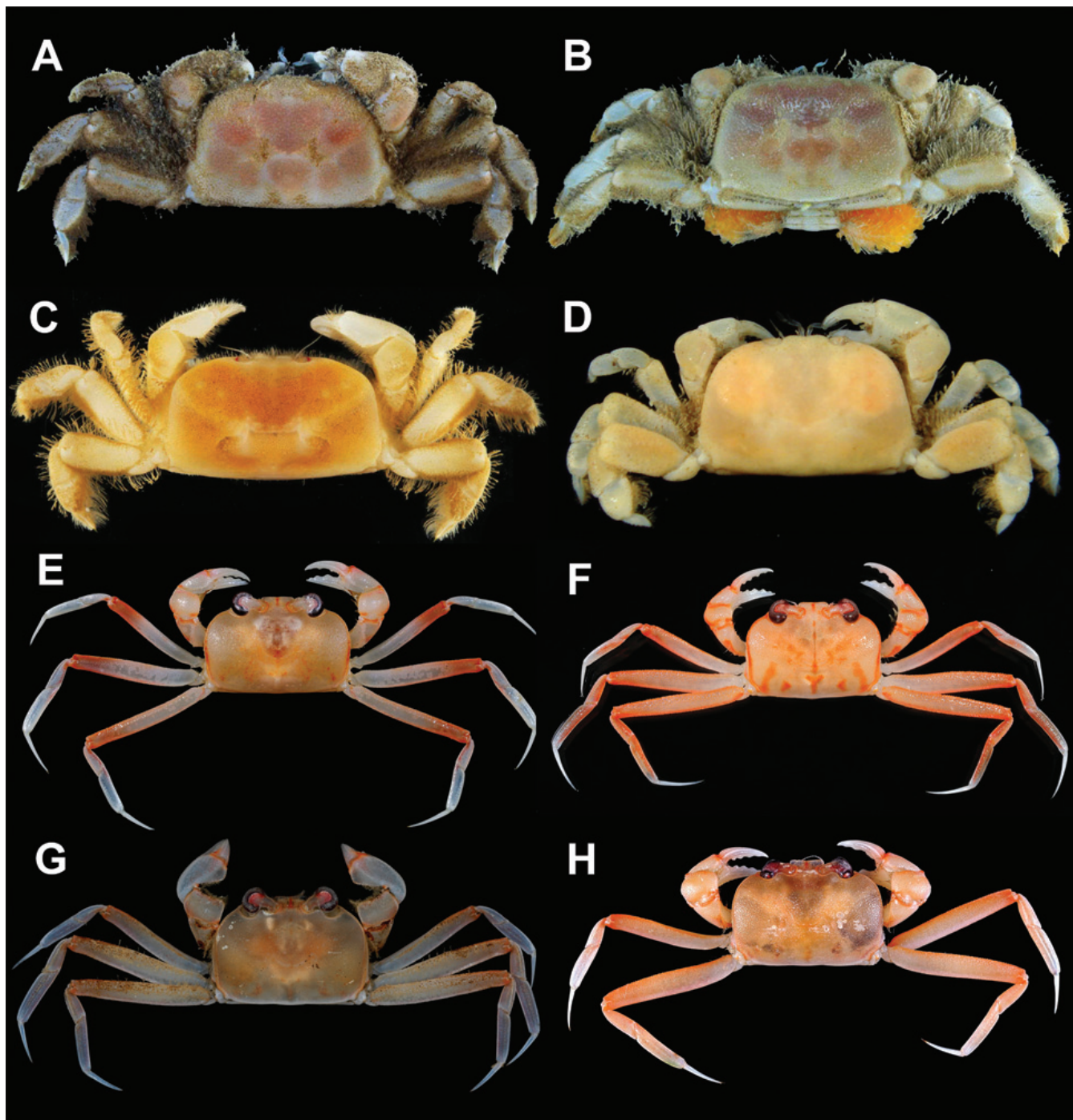


Fig. 2. Colours in life. A, *Mariaplax ourabay*, new species, holotype male (7.6 × 5.4 mm) (RUMF-ZC-2114), Oura Bay, Okinawa Island, Japan; B, *Mariaplax ourabay*, new species, paratype female (9.2 × 7.0 mm) (ZRC 2012.1032), Oura Bay, Okinawa Island, Japan; C, *Mariaplax narusei*, new species, holotype male (9.6 × 5.8 mm) (RUMF-ZC-2112), Funaura Bay, Iriomote Island, Japan; D, *Rayapinus maenosonoi*, new species, holotype male (6.6 × 4.9 mm) (RUMF-ZC-2115) Sesoko, Okinawa, Japan; E, *Hexaplax megalops* Doflein, 1904, male, (13.5 × 9.0 mm) (MNHN-IU-2011-1026), west of New Hanover; F, *Hexaplax aurantium*, new species, paratype male (12.1 × 8.4 mm) (MNHN-IU-2011-1527), south of Lae, Gulf of Huon; G, *Hexaplax saudade*, new species, paratype male (16.9 × 9.8 mm) (ZRC 2013.1692), AURORA, 2007, station CP2658, Philippines; H, *Hexaplax saudade*, new species, male (15.9 × 11.1 mm) (ZRC 2008.1456), Su-Ao fish port, Ilan province, Taiwan.

13. Male abdominal somite 6 and telson very slender, narrower than somites 3–5; G1 slender, sinuous, tapering abruptly to almost filiform apex, with strong recurved spines near midlength [West Africa]..... *Parahexapus* Balss, 1922
- Male abdominal somite 6 and telson relatively stout, almost as broad as somites 3–5; G1 relatively stout, bent 60° medially, directed anterolaterally, with distal part gradually tapered [Indo-West Pacific]..... *Hexapus* De Haan, 1833
14. Ischium of third maxilliped strongly expanded mesially, exopod broad; P2–P4 without longitudinal groove on outer surface of merus; G1 gently curved [West Pacific]..... *Hexapinus* Manning & Holthuis, 1981
- Ischium of third maxilliped not strongly expanded mesially, exopod relatively narrow; P2–P4 may have longitudinal groove on outer surface of merus at least on P3; G1 various. .... 15
15. Carapace subtrapezoidal; one or all of P2–P4 with distinct longitudinal groove on outer surface of merus (except in *M. cyrtophallus*); G1 twisted, curved, S-shaped or sinuous, apex tapering into more or less pointed tip [Indo-West Pacific]..... *Mariaplax*, new genus
- Carapace ovate; P2–P4 without groove on outer surface of merus; G1 straight, tip covered by dense setae, almost same wide as proximal part [East Atlantic]..... *Theoxapus*, new genus

### *Hexapus* De Haan, 1833

*Hexapus* De Haan, 1833: 5.

**Diagnosis.** Carapace broader than long, surface pitted, granules lining margin; regions indistinct, with shallow median H-shaped depression. Anterolateral margin arcuate; pterygostomial region with rows of long, oblique striae and scattered tubercles. Eyes very small, slightly movable, corneas subglobular. Third maxillipeds narrow, not covering buccal cavity, with gap when closed; ischium narrow, longer than merus, mesial margin rounded subproximally, straight distally, carpus, propodus and dactylus cylindrical, dactylus longer than propodus; exopod relatively broad compared to ischium. Chelipeds unequal or subequal. P2–P4 relatively short; merus relatively short, without median longitudinal groove on outer surface; dactylus as long as or slightly longer than propodus, upcurved or straight. Thoracic sternites 1 and 2 fused; sternite 3 partly or fully separated from sternite 4 by tuberculate ridge; sternite 8 exposed, rectangular, slightly longer than abdominal somite 1. Sternoabdominal cavity reaches base of thoracic sternite 3. Male thoracic sternal groove oblique, short. Male abdomen relatively narrow, somites 1, 2 and 6 free, somites 3–5 fused; telson subtriangular. G1 slender, slightly curved subdistally, distal part gradually tapering, apice not concealed under abdomen, exposed on sternal groove. Female abdomen with 6 free somites and telson.

**Species included.** *Cancer sexpes* Fabricius, 1798 (type species by original designation) and *H. timika*, new species.

**Remarks.** Manning & Holthuis (1981) separated *Hexapus* De Haan, 1833, s. str. from *Hexapinus* Manning & Holthuis, 1981, primarily by the extent of the male thoracic sternal groove, being proportionately longer in *Hexapus*. However, due consideration of the third maxilliped, male abdomen and ambulatory leg structures suggest that the male thoracic sternal groove is not a good character by itself.

The form of the ischium and merus of the third maxilliped easily distinguishes *Hexapus* from *Hexapinus*. The two *Hexapus* species recognised here have distinctively more elongate third maxillipeds, with the merus subovate and the ischium longer than broad (e.g., Fig. 5E). In *Hexapinus* species, the third maxilliped is distinctively shorter, with the merus squarish and the ischium broader than long (e.g., Fig. 13E). The P2–P4 (notably the meri) of *Hexapus* are also proportionately more slender and elongated (Fig. 3A) compared to those of *Hexapinus* that are distinctly shorter and stouter (Fig. 18A, C). The male abdomen of *Hexapus* is relatively short and broad (Fig. 5F) while in *Hexapinus*, it is elongated and slender (Fig. 21E–G). These characters separate the two genera, with the P2–P4 and third maxilliped also effectively distinguishing females as well. The male abdomen of *Hexapus* is similar to that of *Mariaplax*, new genus, but their third maxillipeds are very different, with that of *Mariaplax* appearing intermediate in condition (e.g., Fig. 38B) between *Hexapus* and *Hexapinus*. *Mariaplax* can also usually be distinguished from *Hexapus* and *Hexapinus* by its differently structured G1, its relatively longer P2–P4 (except *M. narusei*, new species), with the merus usually possessing a deep longitudinal median groove on the outer surface, sometimes it is not so obvious because of the dense tubercles (P2–P4 relatively shorter and the median groove absent or if present, very shallow).

With regards to the male thoracic sternal groove, *Hexapus sexpes* has a distinct male sternal groove that extends from the end of the sternoabdominal cavity to the middle part of sternite 4, before the base of the third maxillipeds (Figs. 4A, D, 5B, C), but in *Hexapus timika*, new species, the groove is very short and is just a very short extension from the sternoabdominal cavity (Figs. 8B, 9C). *Hexapinus simplex*, new species, on the other hand, has a male sternal groove that resembles that of *Hexapus sexpes* (Figs. 5B, 20B). Although the condition of the male thoracic sternal groove does not vary substantially in *Hexapus* and *Hexapinus* species (even for *Hexapinus simplex* for which there is a very good series), its value as a taxonomic character in the Hexapodidae is questionable. In the genus *Mariaplax* (notably for *M. chena*, new species, for which there is a good series), the condition of the male thoracic sternal groove varies with size and is intermediate in condition (see remarks for this species).

### *Hexapus sexpes* (Fabricius, 1798)

(Figs. 3–6)

*Cancer sexpes* Fabricius, 1798: 334.

*Hexapus (Hexapus) estuarinus* Sankarankutty, 1975: 1, figs. 1, 2.

*Hexapus estuarinus* – Ng et al., 2008: 86.

*Hexapus sexpes* – Manning & Holthuis, 1981: 172; Manning,

1982: 158, figs. 1, 2; Ng et al., 2008: 86; Low & Ng, 2012: 60.

**Material examined.** 1 male (8.5 × 5.4 mm), 1 female (7.1 × 4.5 mm) (ZRC 2012.1014), 1 male (7.5 × 5.1 mm), 1 female (6.3 × 4.1 mm) (CMB-ZC 11354), sand flat, Ko Sirae, Phuket, Thailand, coll. T. Komai, 22 December 2009; 1 female (5.8 × 3.9 mm) (ZRC 1965.11.24.5), Penang Strait, Malaysia.

**Diagnosis.** Carapace subquadrate, about 1.5 times as broad as long; regions indistinct; scattered granules on anterolateral surfaces, dorsal surface pitted. Front deflexed, divided into 2 lobes. Eye small, slightly movable, cornea narrower than peduncle. Pterygostomial region with 4 long oblique striae and scattered tubercles. Third maxillipeds narrow; ischium longer and narrower than merus, mesial margin rounded subproximally, straight distally. Male chelipeds stout, unequal; major chela with gap when fingers closed, with large tooth at cutting edge of dactylus; minor chela with relatively wider gap when fingers closed; cutting edges of dactylus and fixed finger with row of small teeth. Female chelipeds equal. P2–P4 relatively short, stout, P3 longest. Male thoracic sternum broad; short thoracic sternal groove extend obliquely from sternoabdominal cavity to middle of sternite

4; sternoabdominal cavity reaches base of sternite 3. Male abdomen relatively narrow; somites 1 and 2 free, somites 3–5 fused; somite 6 slightly shorter than length of somites 3–5, expanded laterally near base; telson subtriangular with rounded tip. G1 bent 60° medially, directed anterolaterally, with subdistal protuberance, distal part gradually tapered, not concealed under abdomen, exposed on thoracic sternal groove, obscured by setae of telson, lower margin with row of tiny spines. Female abdomen with 6 somites and telson free.

**Description.** Carapace subquadrate, about 1.5 times as broad as long; regions indistinct, with median H-shaped shallow depression; scattered granules on anterolateral surfaces, dorsal surface pitted (Figs. 3, 5A). Anterolateral margin arcuate; posterolateral corner with feeble angle over

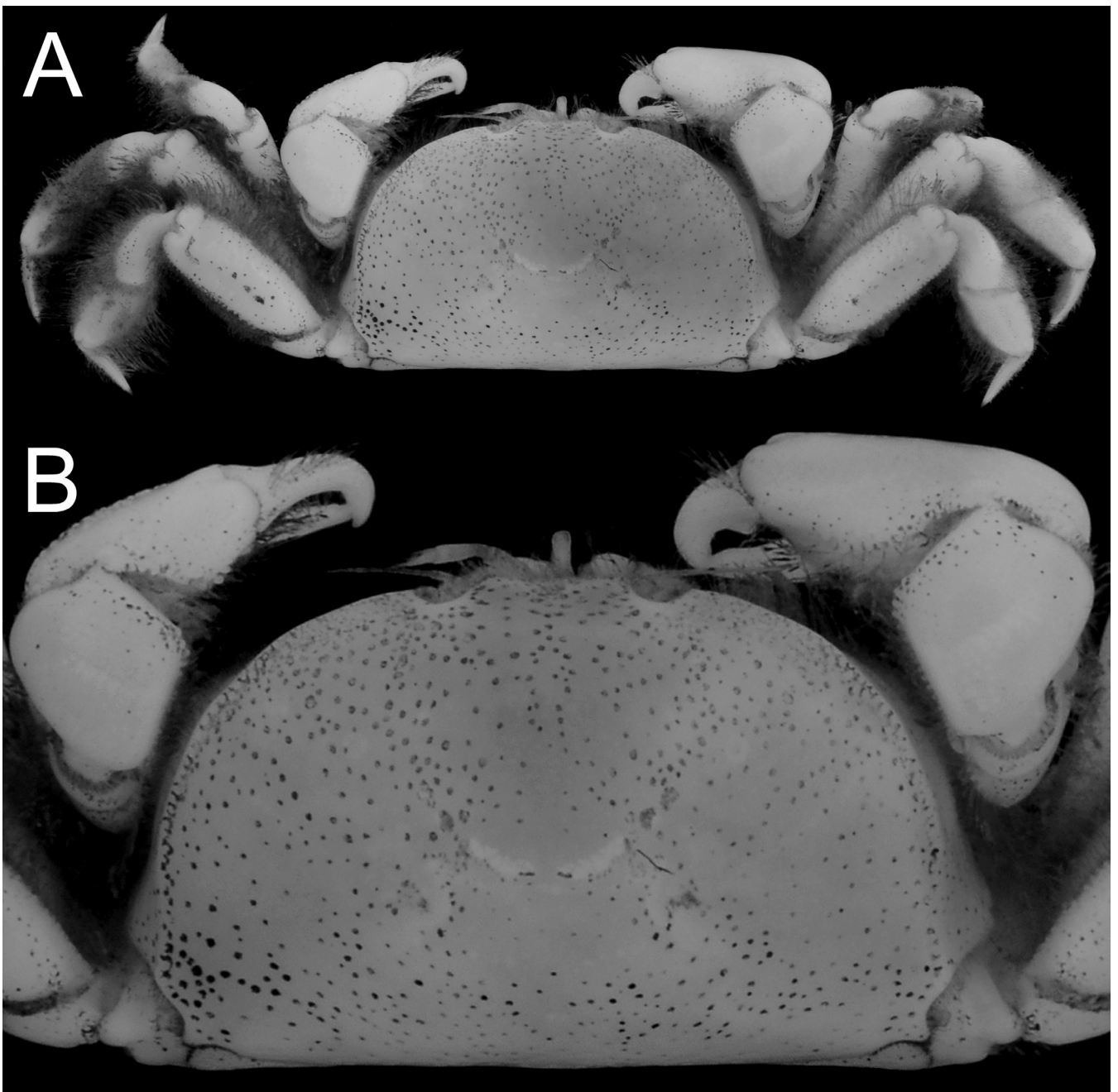


Fig. 3. *Hexapus sexpes* (Fabricius, 1798), male (8.5 × 5.4 mm) (ZRC 2012.1014). A, overall view of carapace, chelipeds and P2–P4; B, carapace.

base of posterior pereopods; lateral margin of carapace wall strongly produced posteriorly. Front deflexed, divided into 2 lobes, not projecting beyond outer edge of orbits (Fig. 4B). Orbit distinct, transverse; eye small, slightly movable, cornea black, narrower than peduncle (Figs. 4B, 5D). Pterygostomial region with row of long oblique striae and scattered tubercles, oblique row of setae under row of striae adjacent to Milne Edwards' opening (Figs. 4A, 5D). Third maxillipeds narrow, not covering buccal cavity, with gap when closed (Figs. 4D, 5E); ischium longer than merus, mesial margin rounded subproximally, straight distally; merus slightly wider than ischium, some granules dorsomesially; carpus, propodus and dactylus cylindrical; dactylus longer than propodus; combined length of dactylus, propodus and carpus shorter than that of merus and ischium; exopod relatively broad, width of exopod about 0.6 times width of ischium, flagellum well developed.

Male chelipeds stout, unequal (Fig. 4C). Major chela (Figs. 4C, 6A) with gap when fingers closed, with large tooth at cutting edge of dactylus; dactylus with row of setae on proximal third of upper margin; outer and inner surfaces of dactylus glabrous; palm slightly wider than long, outer surface with tubercles on lower half; upper margin with few tubercles proximally; inner surface with tubercles near upper margin and midlength; carpus with row of tubercles on upper margin, setose on upper inner margin, inner angle blunt, unarmed; merus short, unarmed, fringe of setae dorsomesially. Minor chela (Figs. 4C, 6B) with relatively wider gap when fingers closed; dactylus with short row of tubercles on upper margin proximally, cutting edges of dactylus and fixed finger with row of small teeth; shallow longitudinal groove on outer surface of dactylus and fixed finger; outer surface of palm covered by large tubercles on lower half, carpus and merus unarmed, fringe of setae on each upper inner margin. Female cheliped equal, narrow gap when fingers closed.

P2–P4 relatively short, stout, P3 longest (Fig. 3A). P2 most slender, dactylus slightly upcurved, fringe of setae on upper and lower margins, slightly longer than propodus, latter covered by short setae on outer surface, longer, denser setae on upper and lower margins; carpus slightly longer than propodus, unarmed, tufts of setae distally; merus almost twice length of carpus, upper margin with tufts of short setae, outer surface with sparse short setae on lower half, lower margin with rows of tubercles obscured by long, dense setae. P3 stouter, longer than P2. P4 (Fig. 6C) stouter than P3. Setation of dactylus, propodus and carpus of P3 and P4 similar to that of P2; merus of P3 and P4 with rows of tubercles on upper and lower margin obscured by dense setae; outer face of P3 covered by short setae, outer face of P4 glabrous, about 2.5 times as long as broad.

Male thoracic sternum broad (Figs. 4A, D, 5B, C), sternites 1 and 2 fused, separated from sternite 3 by distinct ridge; sternite 3 and 4 separated by distinct ridge laterally, medially appear fused, short thoracic sternal groove (Figs. 4A, D, 5B, C) extends obliquely from sternoabdominal cavity to middle of sternite 4 and below base of third maxilliped, sternites

4–7 well developed, separated from each other by distinct suture; sternite 8 exposed, rectangular, slightly longer than abdominal somite 1; sternoabdominal cavity reaches base of sternite 3. Male abdomen relatively narrow (Figs. 4A, D, 5F); somites 1 and 2 free, somites 3–5 fused, lateral margin sinuous; somite 6 slightly shorter than length of somites 3–5, expanded laterally near base; telson subtriangular, distal margin rounded, setose.

G1 (Fig. 6D, E) bent 60° medially, directed anterolaterally, with subdistal protuberance, distal part gradually tapered, lower margin with row of tiny spines; distal part not concealed under abdomen, exposed on thoracic sternal groove, obscured by setae of telson.

Female abdomen with 6 free somites and telson (Fig. 5G).

**Colour.** In life, the species is dirty white overall.

**Remarks.** Manning & Holthuis (1981) were uncertain about the identity of *H. estuarinus* Sankarankutty, 1975, from India. Later, Manning (1982) considered it to be a junior synonym of *H. sexpes*, but Ng et al. (2008) provisionally treated it as valid species in view of the differences observed by Sankarankutty (1975). The study of fresh material leads us to concur with Manning (1982) (see also Low & Ng, 2012). The present material from Phuket agrees very well with the redescription of the dried type of *H. sexpes* by Manning (1982); the only difference being in the shape of the minor chela. According to Manning (1982), the fingers of the minor chela are not gaping, while in the present material, those of the minor cheliped form a large hiatus, meeting only at the tips. The prominently crossed fingers of the minor chela in the type (Manning, 1982: fig. 1d) may be an artifact due to poor preservation (the specimen was dried). In fresh specimens (Fig. 4D), the tips are only partially crossed.

Being the best known member of the family, “*Hexapus sexpes*” has been reported by many workers over the last 200 years. However, it is often difficult to ascertain what species they actually referred to, especially in the context of the substantial changes in hexapodid taxonomy that have occurred in the last 50 years. The records by Tesch (1918), Sakai (1939, 1976), Serène & Soh (1976) and Guinot (1979) are probably referable to *Hexapinus* as good figures are provided (see discussion for the genus). Stebbing's (1910: 315, pl. 15) “*Hexapus sexpes*” is now *Tritoplax stebbingi* (Barnards, 1950) (see Manning & Holthuis, 1981). Stephensen's (1946: 182, fig. 53) “*Hexapus sexpes*” from the Persian Gulf, was described as a new species (*Hexapus stephenseni*) by Serène & Soh (1976). Manning & Holthuis (1981: 180) believed Stephensen's specimen may be in *Tritoplax* Manning & Holthuis, 1981, and Huang et al. (2002) and Ng et al. (2008) followed their suggestion by referring *Hexapus stephenseni* there. We have re-examined the types of *T. stebbingi*, the type species of *Tritoplax* (Fig. 7) and are now certain *Hexapus stebbingi* and *Hexapus stephenseni* cannot be classified in the same genus. The present study refers *Hexapus stephenseni* to *Mariaplax*, new genus, instead. Records of “*Hexapus sexpes*” by various authors from the

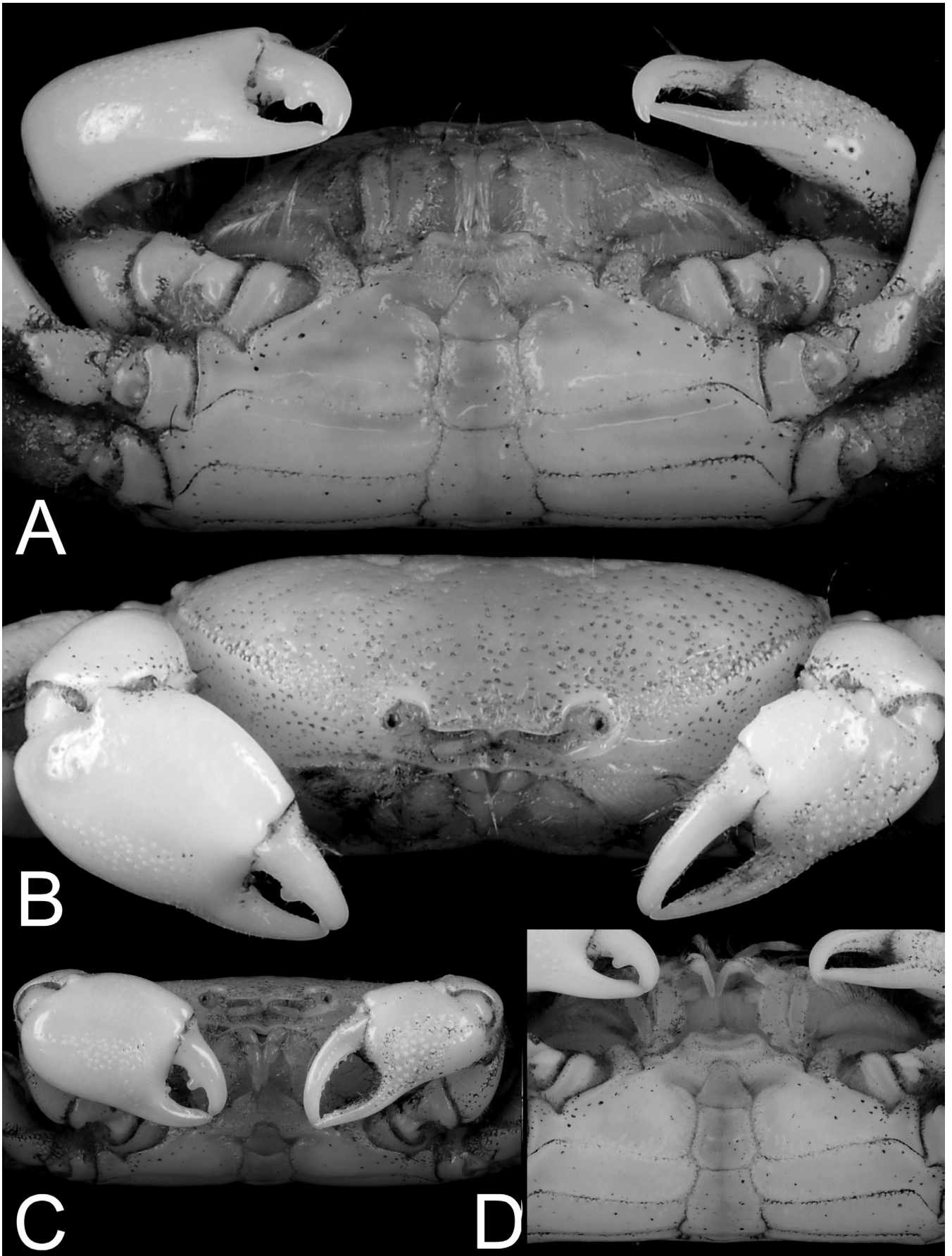


Fig. 4. *Hexapus sexpes* (Fabricius, 1798), male (8.5 × 5.4 mm) (ZRC 2012.1014). A, ventral view of cephalothorax; B, front, showing orbit and eye; C, chelae; D, third maxilliped and abdomen.



Indo-West Pacific: Zehntner (1894: 159, Ambon, Indonesia); Nobili (1906: 146, Persian Gulf); Balss (1938: 74, Marshall Islands); and Griffin (1972: 85, off Yamba, New South Wales, Australia) (see also Davie, 2002: 232) for the moment must be treated as *incerta cedis* as the description and/or figures were too brief or absent. Although A. Milne-Edwards (1873:

253, pl. 12, fig. 1, New Caledonia), Guinot (1979: Pl. 24 fig. 6, Persian Gulf) and Guinot & Bouchard (1998: Fig. 17E, Persian Gulf) gave short descriptions and/or figures of their material, they are insufficient to allow us to determine the precise identities of the genus or species.

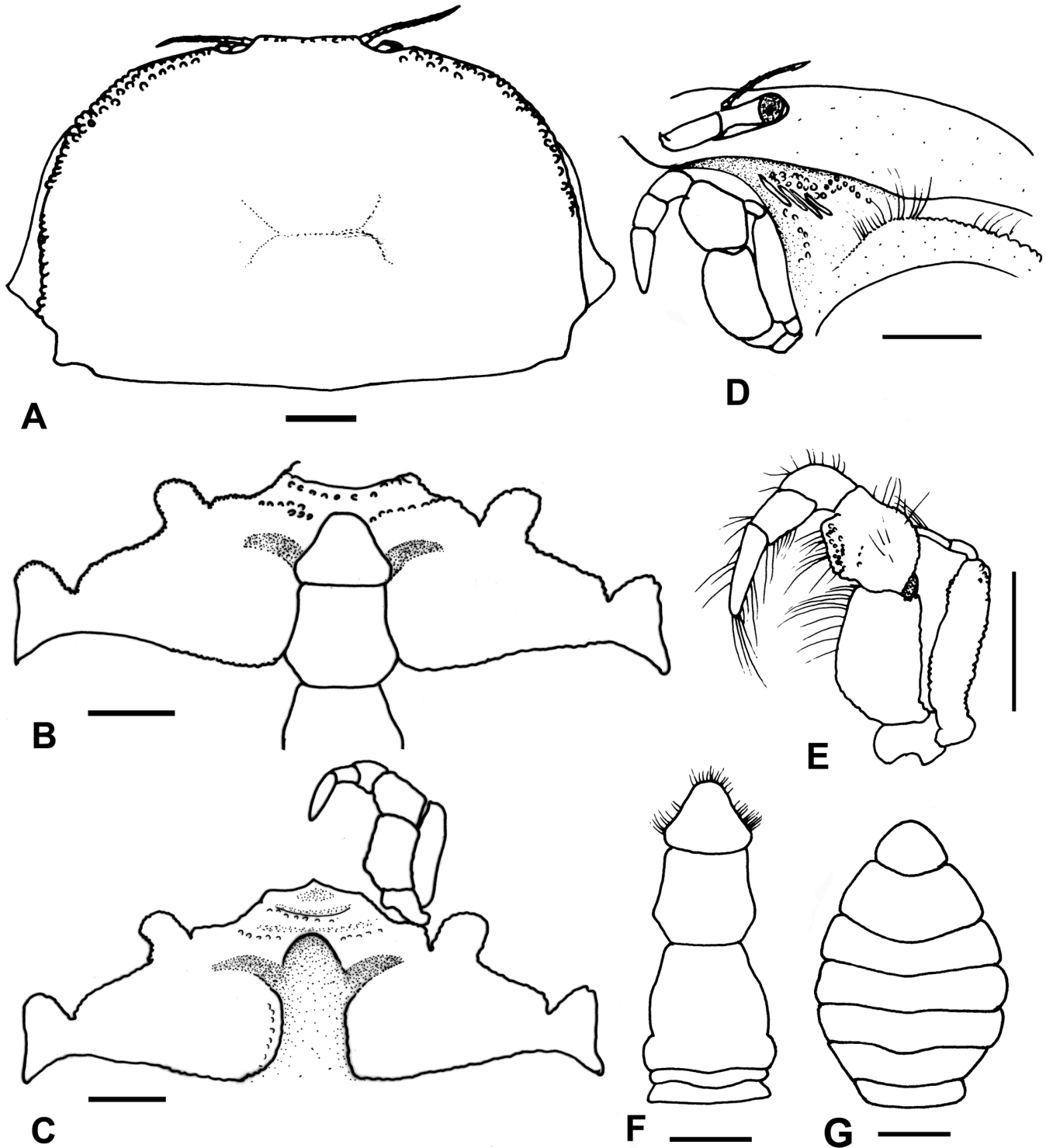


Fig. 5. *Hexapus sexpes* (Fabricius, 1798). A–F, male (8.5 × 5.4 mm) (ZRC 2012.1014); G, female (5.8 × 3.9 mm) (ZRC 1965.11.24.5). A, carapace; B, thoracic sternites 3 and 4, showing thoracic sternal groove and telson; C, thoracic sternites 1–4, showing thoracic sternal groove; D, anterior view of cephalothorax; E, left third maxilliped; F, male abdomen and telson; G, female abdomen and telson. Scale bars = 1.0 mm.

**Type locality.** Southern India.

**Distribution.** Cochin, south west India; Phuket, Thailand; and Penang Strait, Malaysia. Intertidal to subtidal.

***Hexapus timika*, new species**  
(Figs. 8, 9)

**Material examined.** Holotype: male (4.6 × 3.0 mm) (MZB Cru 3789), station OT 14A, Otakwa, Timika, Papua, Indonesia, coll. A. Haris, 8 December 2003. Paratype: **Indonesia:** 1 male (6.2 × 4.5 mm) (ZRC 2013.0946), station EM 771, Muara Mawati, Timika, Papua, coll. A. Haris, 11 August 2001.

**Diagnosis.** Carapace rounded, about 1.5 times as broad as long; regions indistinct, with median H-shaped shallow depression; dorsal surface with flattened granules (Fig. 8A). Anterolateral margin arcuate; posterolateral corner with feeble angle over base of posterior pereopods (Fig. 9A). Orbit distinct, eye slightly movable, cornea globular. Pterygostomial region (Fig. 9B) with long oblique striae and scattered tubercles. Third maxillipeds narrow, not covering buccal cavity, with gap when closed (Figs. 8B, 9D); ischium longer than merus, mesial margin rounded subproximally, straight distally; merus slightly wider than ischium; combined length of dactylus, propodus and carpus shorter than that of merus and ischium; exopod relatively broad, about 0.5

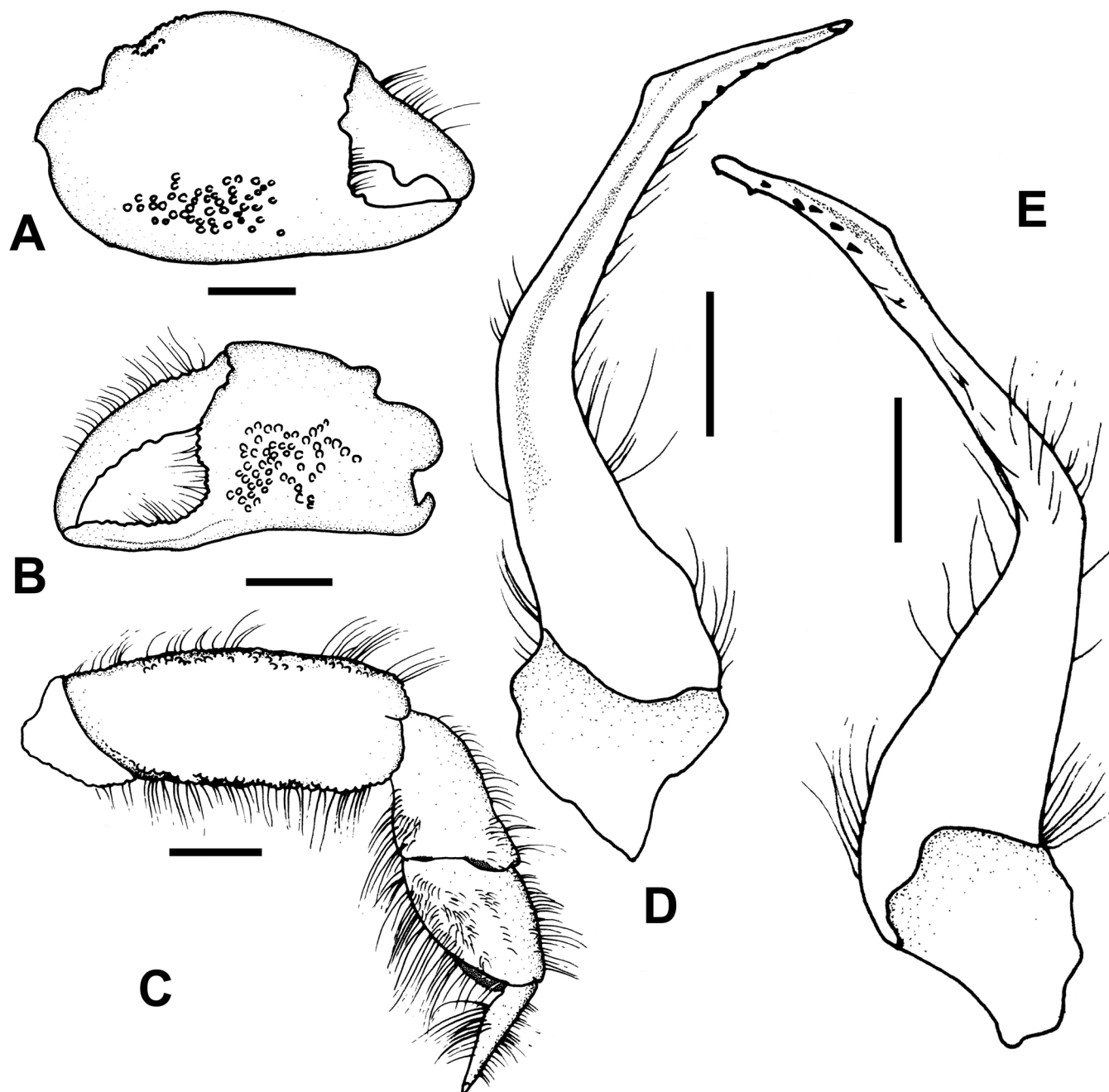


Fig. 6. *Hexapus sexpes* (Fabricius, 1798), male (8.5 × 5.4 mm) (ZRC 2012.1014). A. major chela; B, minor chela; C, right P4; D, E, right G1. Scale bars = 1.0 mm.

width of ischium, flagellum well developed. Chelipeds stout, unequal (Fig. 8B); major chela with gap when fingers closed, with large tooth at cutting edge of dactylus; palm slightly longer than wide; minor chela with narrow gap when fingers closed; shallow longitudinal groove on outer surface of dactylus and fixed finger; outer surface of palm covered by large tubercles on lower half. P2–P4 (Fig. 8A) relatively short, slender; dactylus of P2 slightly upcurved, dactylus of P3 and P4 straight; merus of P4 about 3 times as long as broad. Male thoracic sternum broad (Figs. 8B, 9C), sternites 1 and 2 fused, separated from sternite 3 by distinct ridge; sternite 3 and 4 separated by distinct ridge, very short

thoracic sternal groove extends slightly from sternoabdominal cavity (Fig. 9C); sternite 8 exposed, triangular, slightly shorter than abdominal somite 1; sternoabdominal cavity reaches base of sternite 3. Male abdomen relatively wide (Figs. 8B, 9E); somites 1 and 2 free, somites 3–5 fused, lateral margin weakly produced subproximally, slightly constricted distally; somite 6 half length of somites 3–5, expanded laterally near base; telson triangular with rounded tip, margin setose. G1 (Fig. 9F, G) bent 60° on distal third, directed anterolaterally, distal part tapered, unarmed, not concealed under abdomen, exposed on thoracic sternal groove, obscured by setae of telson. Female unknown.

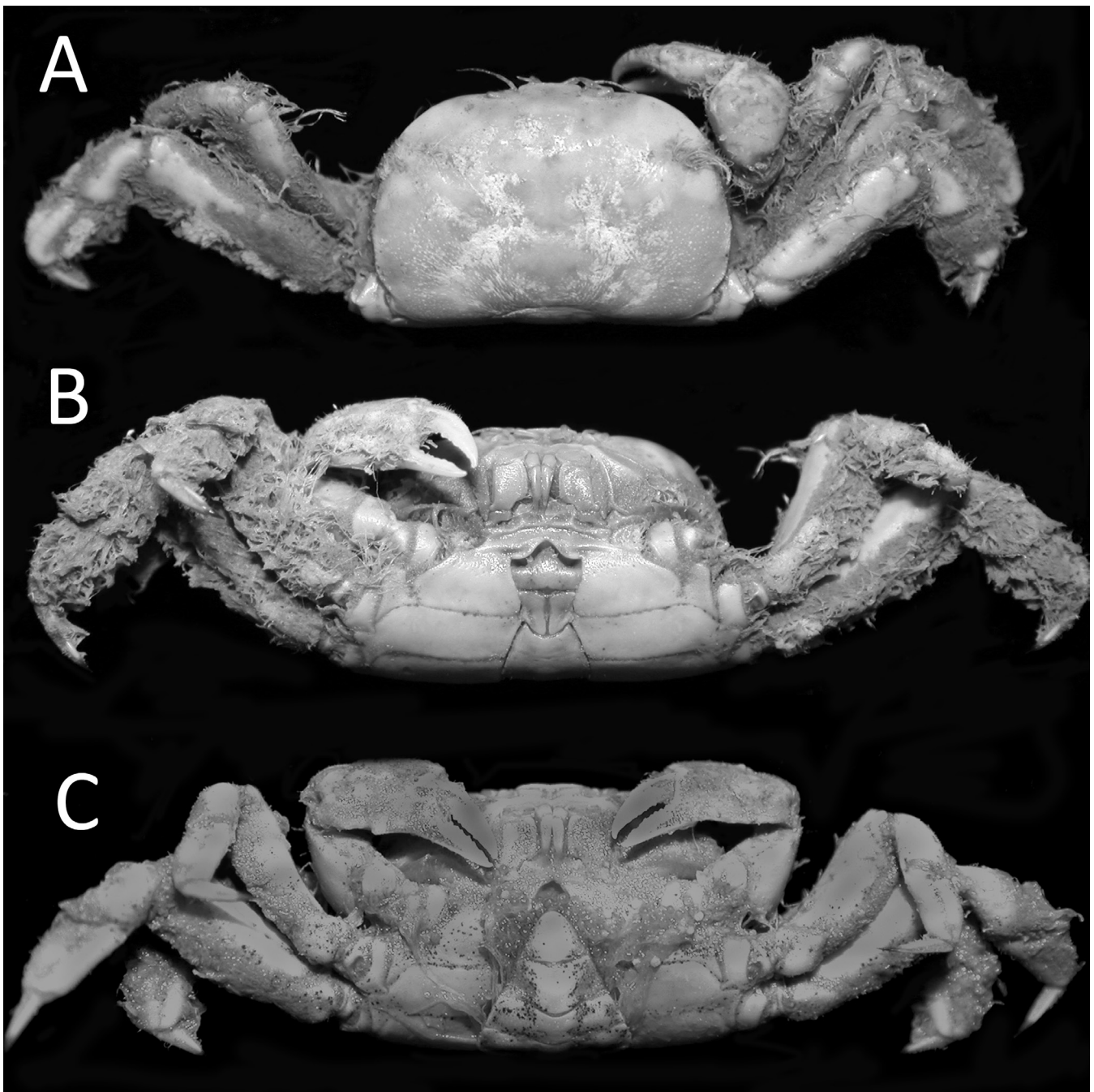


Fig. 7. *Tritoplax stebbingi* (Barnard, 1950). A, B, lectotype, male (14.1 × 9.5 mm); C, lectotype, female (12.2 × 8.2 mm). A, overall view of carapace, chelipeds and P2–P4; B, C, ventral view of carapace.



Fig. 8. *Hexapus timika*, new species, holotype male (4.6 × 3.0 mm) (MZB Cru 3789). A, overall view of carapace, chelipeds and P2–P4; B, ventral surface of cephalothorax.

**Colour.** In life, dirty white overall, covered with black mud and stains.

**Etymology.** Named after the type locality Timika. The name is used as a noun in apposition.

**Remarks.** The differences in the shape of the carapace, male abdomen and G1 between *H. sexpes* and *H. timika*, new species, are distinct. The carapace of *H. sexpes* is subquadrate with dorsal surface pitted, the granulation is only on the dorsolateral surface (Figs. 3A, 5A) while in *H. timika*, the carapace is more or less rounded, and the dorsal surface covered by flattened granules (Figs. 8A, 9A). The abdomen of *H. sexpes* is also relatively narrower and longer than the stouter and wider abdomen of *H. timika* (Fig. 5F versus Fig. 9E). The G1 of *H. sexpes* and *H. timika* are both bent at around 60° but in *H. sexpes*, a protuberance is present subdistally and the lower margin has a row of small spines (Fig. 6D, E), whereas in *H. timika*, it is unarmed (Fig. 9F, G).

**Type locality.** Otakwa, Papua, Indonesia.

**Distribution.** Timika, Papua, Indonesia. Subtidal, 7–14 m.

#### Genus *Hexapinus* Manning & Holthuis, 1981

*Hexapinus* Manning & Holthuis, 1981: 169.

**Diagnosis.** Carapace broader than long; regions not demarcated except for poorly defined cardiac region; anterolateral margin arcuate, posterolateral margin sinuous. Eye movable, small, stout, transverse; with small cornea. Third maxillipeds broad, completely covering buccal cavity; merus and ischium subequal, ischium subauriculiform, expanded distally, mesial margin strongly convex; carpus, propodus and dactylus slender, subcylindrical; dactylus same length as, or longer than propodus; exopod broad, or narrow compared to ischium width, flagellum well developed. Pterygostomial region with row of oblique striae. Chelipeds

equal or subequal. P2–P4 very short; merus short without median longitudinal groove on outer surface; dactylus almost as long as or slightly longer than propodus. Male thoracic sternum broad; sternites 1 and 2 fused, separated from sternite 3 by distinct ridge; sternite 3 delimited from sternite 4 laterally; thoracic sternal groove short, extends obliquely

from sternoabdominal cavity, sometimes to middle of sternite 4; sternites 4–7 well developed, separated by distinct sutures; sternite 8 exposed, triangular or quadrangular, half or same length as male abdominal somite 1. Sternoabdominal cavity elongated, reaching base of thoracic sternite 3. Male abdomen relatively long, slender, extending beyond bases of

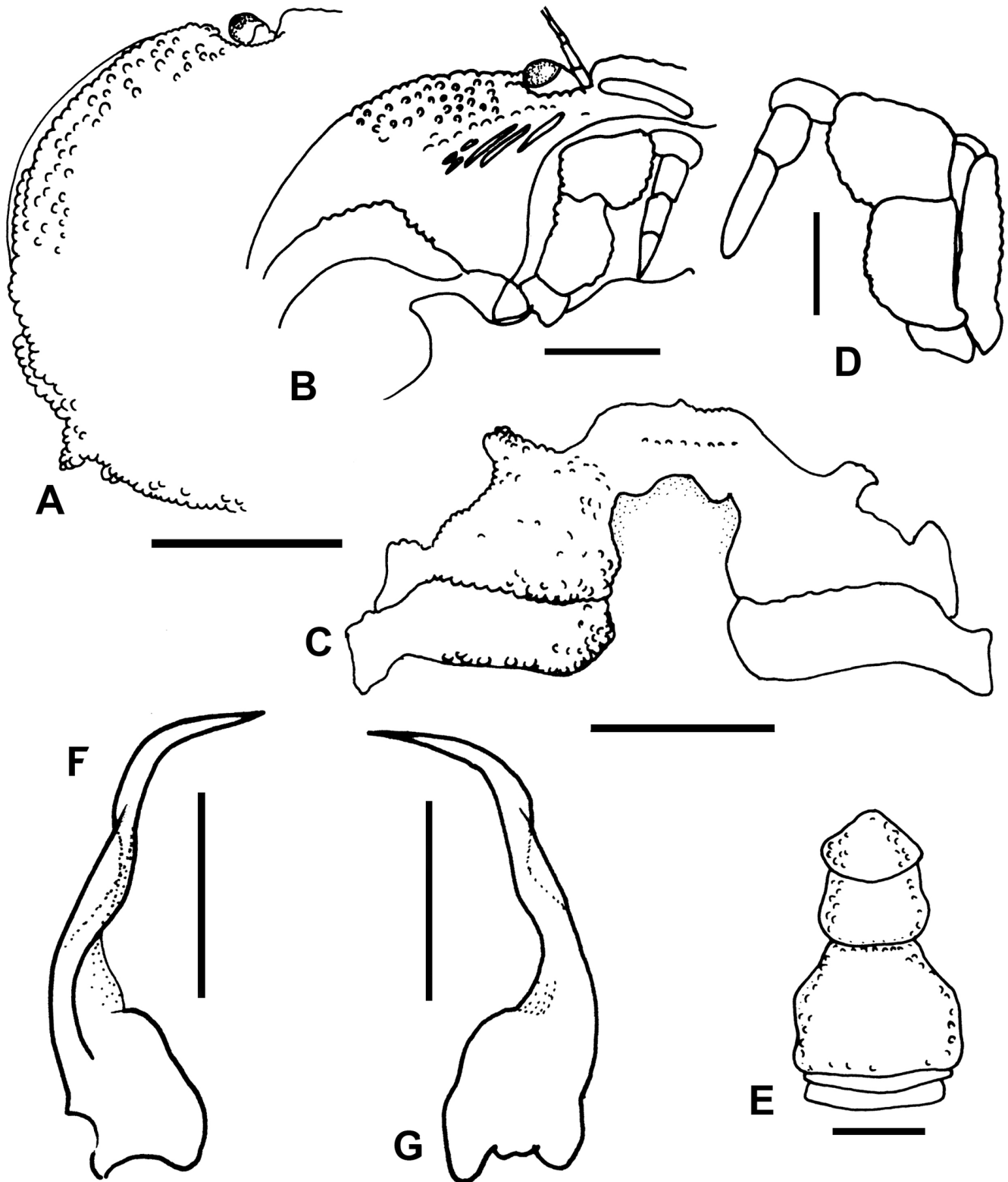


Fig. 9. *Hexapus timika*, new species, holotype male (4.6 × 3.0 mm) (MZB Cru 3789). A, dorso-lateral margin of carapace; B, ventral view of cephalothorax; C, thoracic sternites 1–4, showing thoracic sternal groove and sternoabdominal cavity; D, left third maxilliped; E, male abdomen and telson; F, G, G1. Scale bars: A–E = 1.0 mm; F, G = 0.5 mm.

third maxilliped, moderately narrow; somites 1 and 2 free, somites 3–5 fused, narrow; somite 6 slightly shorter than fused somites 3–5; telson subpentagonal, with rounded distal margin. G1 simple, slightly curved, lying in oblique groove on anterior part of sternum, distal one-fifth not concealed under abdomen. Female abdomen with 6 free somites and rounded or subtriangular telson.

**Species included.** *Hexapus latipes* De Haan, 1835 (type species by original designation), *Hexapus edwardsi* Serène & Soh, 1976, *Hexapinus ceres*, new species, *Hexapinus latus*, new species, and *Hexapinus simplex*, new species.

**Remarks.** The type species of *Hexapinus*, *Hexapus latipes* De Haan, 1835, is poorly known. The series of specimens available, including the dried type, does not include any adult males and so male diagnostic characters are not available. The type specimen is dried and almost certainly a young female, with the telson missing. The genus characters of the male abdomen, G1 and female abdomen are therefore based mainly on *H. simplex*, new species.

As redefined here, the most characteristic feature of *Hexapinus* s. str. is the third maxilliped possessing a short and distally expanded ischium with a strongly convex mesial margin (Figs. 13C–E, 15B, 17B, 20G). No other hexapodid genus has such a third maxilliped. Some species of *Mariaplax*, new genus, have third maxillipeds that approach the condition in *Hexapinus* (e.g., *M. mica*, new species, and *M. narusei*, new species, Figs. 38B, 40D), but none are as short and laterally expanded. The male abdomen of *Hexapinus* is also distinctively more slender and elongated (Fig. 21E–G) compared to *Hexapus* (Figs. 5F, 9E) or *Mariaplax* (Fig. 25F). Compared to *Hexapus*, the P2–P4 of *Hexapinus* are relatively shorter and stouter (cf. Figs. 1A, 18A, C). *Mariaplax* species are distinctive because their P2–P4 are usually prominently longer and more slender, with almost always with a distinct longitudinal groove on the outer surface (Fig. 24A).

Manning & Holthuis (1981) included *Hexapus buchanani* Monod, 1956, and *H. granuliferus* Campbell & Stephenson, 1970, in *Hexapinus*. However, the shapes of the third maxillipeds of *H. buchanani* (Fig. 67B, 68G), and *H. granuliferus* (Fig. 36E; see Campbell & Stephenson, 1970: 286, fig. 49) are quite different from *Hexapinus* as defined at present. The shapes of the third maxilliped of *H. granuliferus* conform to what is here described as *Mariaplax*, new genus, and this species is transferred there. *Hexapus buchanani* Monod, 1956, was collected from West Africa and it differs from other hexapodids in a suite of characters: the carapace is ovate (Figs. 67A, 68E), the meri of P2–P4 do not have a longitudinal groove on the outer surface (Figs. 67A, 68E), the abdomen is proportionately more elongate (Fig. 68F), and it has a relatively much straighter G1 (Fig. 68H, I). As such we establish *Theoxapus*, new genus, for this species (see later).

Tesch's (1918: 240, pl. 17, fig. 1) specimens from the Indonesian Kei islands probably belong to a species of *Hexapinus*. The third maxilliped figured, with the expanded

ischium (Tesch, 1918: pl. 17 fig. 1a) is indicative. It is different from *H. simplex*, new species, here described from nearby Lombok Island as it has a relatively short and wide male abdominal somite 6. In the form of the abdomen, it resembles what is known for *H. latipes* (Figs. 10B, 13G). The same is true for Guinot (1979: 115, 145, Figs. 32, 33A, B, C–E, 37F) who used Tesch's specimen for her study. Sakai's (1939: 577, text fig. 68, pl. CII, fig. 4) female specimen from Kii Peninsula in Japan seems closest to *H. simplex* with regard to its relatively smoother carapace. Sakai (1976: 554) had access to more Japanese material, and he appears to have material of both species; one from Sagami Bay closely resembling *H. latipes* in its heavily pitted carapace (Sakai, 1976: pl. 196, fig. 1) with the other smoother animal from Yoron Island likely to be *H. simplex* (Sakai, 1976: pl. 196, fig. 2). Odawara's (1965: 47, fig. a–d) Japanese records could be either as well but as his figures clearly depict heavily pitted specimens, this suggests they are probably *H. latipes*. Serène & Soh's (1976: 24, fig. 24, pl. 7, fig. A) "*Hexapus ?sexpes*" from the Andaman Sea is almost certainly a species of *Hexapinus* but we cannot identify it for the moment with any known taxon. De Man's (1888: 322, pl. 13, fig. 3) female specimen from Ambon is also likely to be a species of *Hexapinus* although he does not show the maxillipeds; it resembles *H. simplex* described from nearby Lombok. All these specimens will need to be re-examined to ascertain their precise identities.

Miyake's (1983: 151, pl. 51–1) "*Hexapus anfractus*" from Japan is probably a species of *Hexapinus* with regard to its broad carapace and short pereopods. However, a re-examination of his specimen(s) will be required to determine its precise identity.

Serène & Soh's (1976: 25, fig. 27, pl. 7, fig. D) species, *Hexapus edwardsi*, described from a subadult male from the Andaman Sea, is also probably a species of *Hexapinus* as redefined here, especially considering the shapes of the third maxilliped and male abdomen (Serène & Soh, 1976: 25, fig. 27, plate 7, fig. D). It is here transferred to *Hexapinus*.

### *Hexapinus latipes* (De Haan, 1835)

(Figs. 10–13)

*Hexapus latipes* De Haan, 1835: pl. D.

*Hexapus sexpes* – De Haan, 1835: 35, 63, pl. 11, fig. 5; Odawara, 1965: 47, fig. a–d; Takeda, 1979: 153. (not *Cancer sexpes* Fabricius, 1798)

*Hexapus (Hexapus) sexpes* – Sakai, 1976: 554 (part), pl. 196, fig. 1. (not *Cancer sexpes* Fabricius, 1798)

*Hexapinus latipes* – Manning & Holthuis, 1981: 170; Yamaguchi & Baba, 1993: 434, fig. 154; Ng et al., 2008: 86.

**Material examined.** Lectotype: female (10.0 × 6.7 mm) (RMNH 31783d), Japan. Others: **Japan:** 1 female (10.2 × 7.6 mm) (NSMT-Cr 5694), Kushimoto, Kii Peninsula, Wakayama Prefecture, 33°27.2'N 135°45.4'E–33°27.2'N 135°45.6'E, 19–27 m, dredge, coll. M. Takeda, 17 July 1978; 1 female (30.4 × 17.9 mm) (KPM NH 7123), Enoshima Island, T. Sakai Collection; 1 female (28.7 × 16.7 mm) (KPM NH 7460) Minabe, Wakayama, T. Sakai Collection; 1 female (30.4 × 17.5 mm) (KPM NH 6331), Mikawa-Ishiki, Aichi Prefecture, T. Sakai Collection.

**Diagnosis.** Carapace subquadrate, about 1.2–1.3 times as broad as long, dorsal surface pitted, region indistinct. Anterolateral margin arcuate, posterolateral margin sinuous with 1 protuberance; posterolateral corner with angled prominence over base of posterior pereopods; lateral margin of carapace wall produced medially. Orbit distinct, transverse; eye small, slightly movable. Pterygostomial region with row of oblique striae. Third maxillipeds broad; ischium of third maxillipeds longer than merus, strongly expanded distally, with rounded mesial margin, merus broader than long; exopod relatively broad, flagellum well developed. Chelipeds stout, unequal; major chela with very slightly gaping fingers when closed, large tooth at cutting edge of dactylus; minor chela with same ornamentation as major chela, fingers not gaping when closed. P2–P4 short, stout; P3 longest. Female thoracic sternum relatively broad; thoracic sternal groove

very short, extends obliquely from sternoabdominal cavity; sternoabdominal cavity reaches distal part of sternite 4.

**Description.** Carapace subquadrate, about 1.3 times as broad as long, dorsal surface pitted, region indistinct, median H-shaped depression shallow; some granules present on dorsolateral margins, only scattered granules on posterior margin (Figs. 10A, 11A, 12A, 13A). Anterolateral margin arcuate, posterolateral margin sinuous with 1 protuberance; posterolateral corner with angled prominence over base of posterior pereopods; lateral margin of carapace wall produced medially. Front deflexed, obscurely divided into 2 lobes, not projecting beyond lower edge of orbits (Fig. 10C). Orbit distinct, transverse; eye small, slightly movable, cornea small, as wide as peduncle (Figs. 10C, 12C). Pterygostomial region with row of oblique, broken or entire, striae, oblique

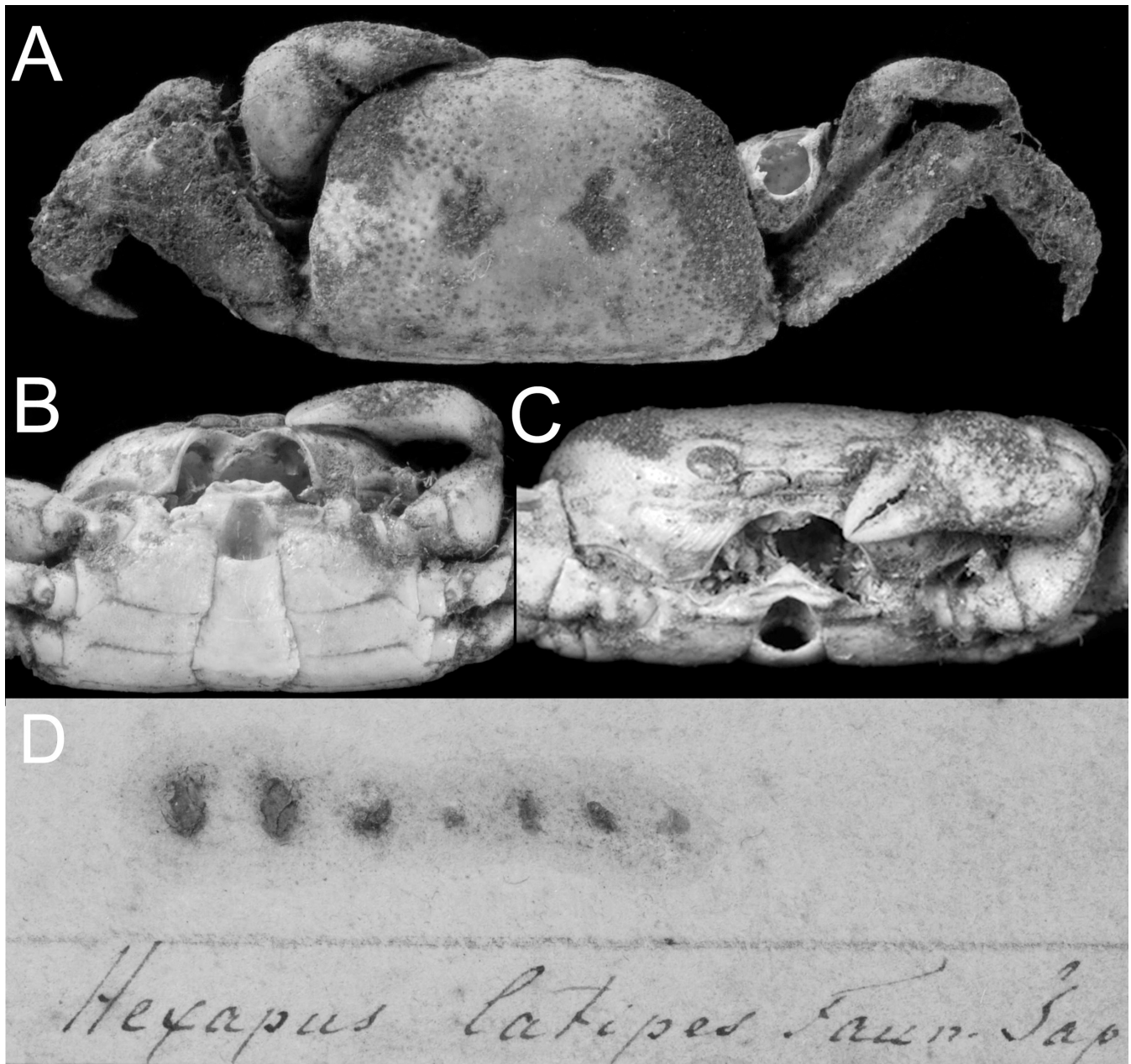


Fig. 10. *Hexapinus latipes* (De Haan, 1835), lectotype female (10.0 × 6.7 mm) (RMNH 31783d). A, overall view of carapace, chelipeds and P2–P4; B, ventral surface of cephalothorax; C, frontal view of cephalothorax; D, card with mouthparts.

row of setae under row of striae adjacent of Milne Edwards' opening. Third maxillipeds (Fig. 13C–E) broad; ischium of third maxillipeds 1.2 times as broad as long, longer than merus, strongly expanded distally, with rounded mesial margin, merus broader than long, carpus, propodus and dactylus cylindrical; dactylus longer than propodus, combined length of dactylus, propodus and carpus shorter than that of merus and ischium; exopod relatively broad, about 0.5 times width of ischium, flagellum well developed.

Chelipeds stout, unequal (Fig. 11C). Major chela with very slightly gaping fingers when closed, large tooth at cutting edge of dactylus; dactylus with scattered tubercles on upper outer surface proximally, tufts of setae on upper margin proximally; inner surface near upper margin with longitudinal ridge; palm slightly wider than long, surface covered with tubercles; lower margin with long and dense setae medially, fixed finger smooth; carpus without setae on upper outer surface, setose on upper inner surface, inner angle blunt, unarmed, outer face covered by tubercles; merus short, upper outer surface covered with tubercles, fringe of setae dorsomesially. Minor chela with same ornamentation as major chela, fingers not gaping when closed.

P2–P4 (Figs. 10A, 11A) short, stout; P3 longest. P2 most slender, dactylus upcurved, fringe of setae on upper and

lower margins, slightly longer than propodus, outer surface of propodus with tubercles obscured by tufts of short setae, lower margin with long setae, strong spines distally, carpus longer than propodus, outer surface with tubercles on upper half covered by short setae, short setae on lower margin, merus almost twice length of carpus, outer surface with tubercles and short setae, upper and lower margins with tufts of dense short setae. P3 stouter, longer than P2; P4 stouter than P3. Ornamentation of P3 and P4 similar to P2 but with longer, denser setation; merus of P4 about 2 times as long as broad.

Female thoracic sternum relatively broad (Figs. 10B, 11B, 12B), sternites 1 and 2 fused, separated from sternite 3 by distinct ridge; sternite 3 separated from sternite 4 by ridge laterally, thoracic sternal groove very short, extends obliquely from sternoabdominal cavity (Fig. 13B); sternites 4–7 well developed, separated by distinct sutures; sternite 8 exposed, triangular, half length of female abdominal somite 1, sternoabdominal cavity reaches distal part of sternite 4. Juvenile female abdomen relatively narrow (Figs. 10B, 13G); somites 1 and 2 free; somites 3–5 separated by shallow grooves, lateral margin sinuous; somite 6 slightly shorter than somites 3–5, lateral margin sinuous; adult female abdomen relatively broad (Figs. 12B, 13F) with 6 somites free and rounded telson.

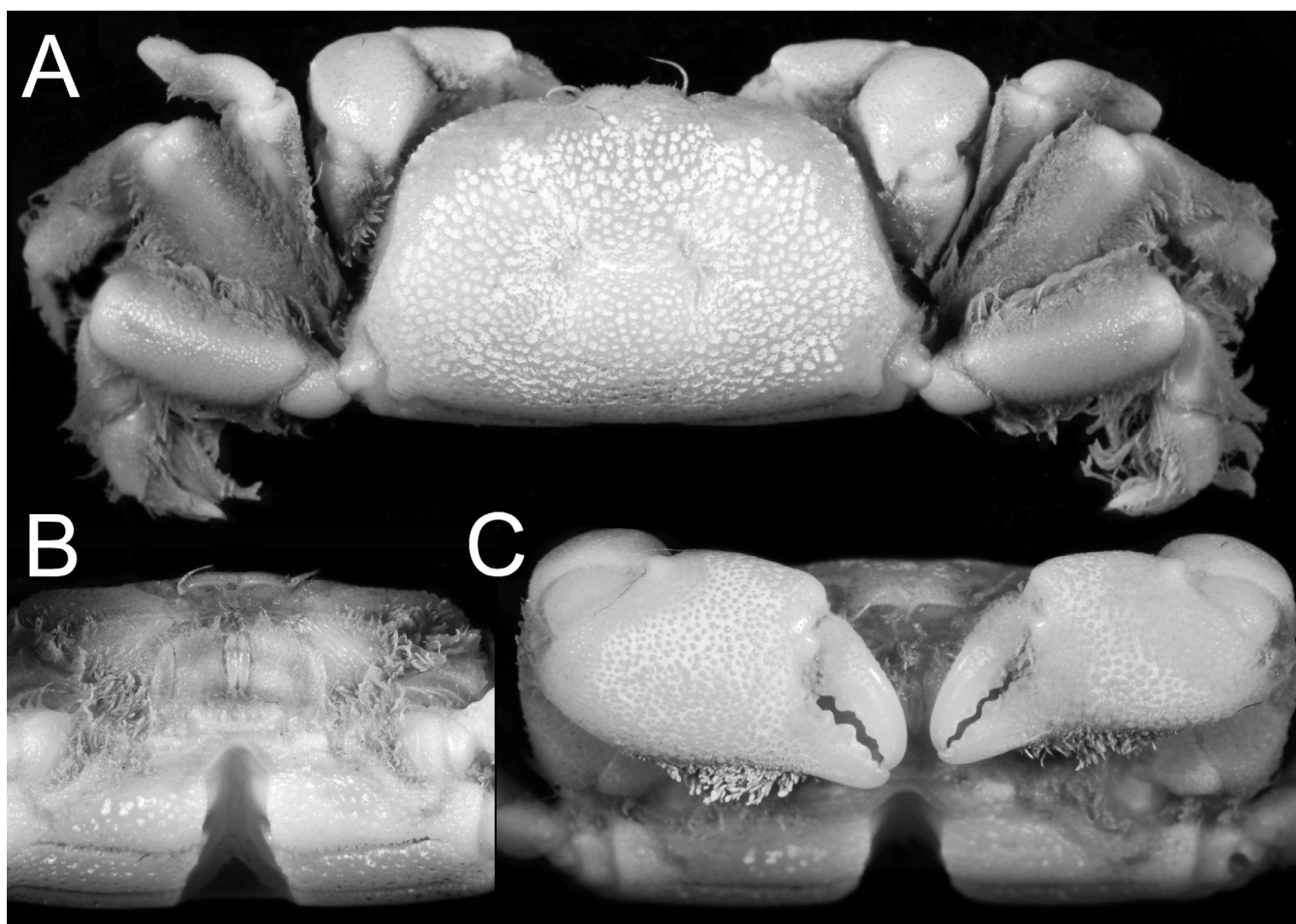


Fig. 11. *Hexapinus latipes* (De Haan, 1835), female (10.2 × 7.6 mm) (NSMT-Cr 5694). A, overall view of carapace, chelipeds and P2–P4; B, ventral surface of cephalothorax; C, chelae.



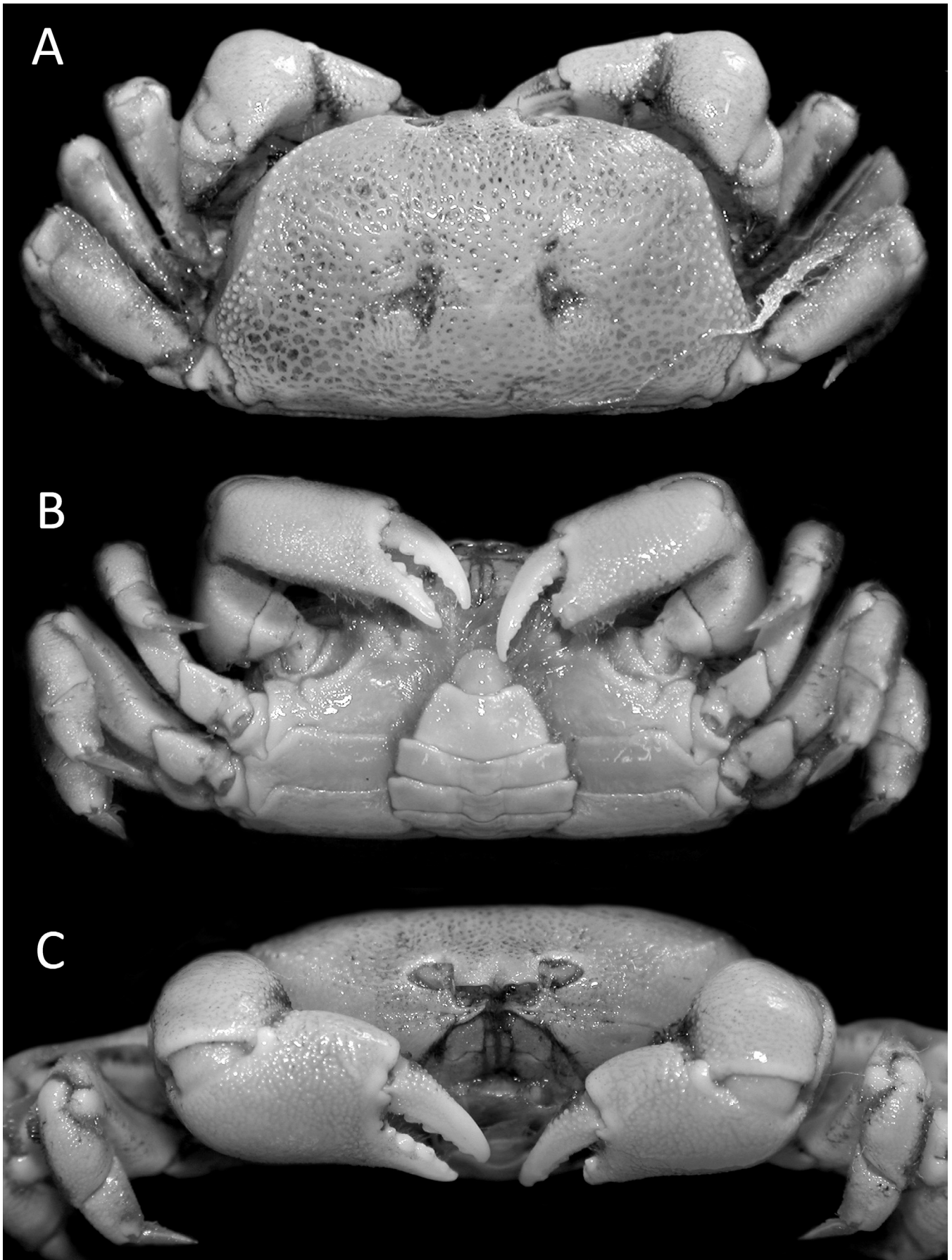


Fig. 12. *Hexapinus latipes* (De Haan, 1835), 1 female (30.4 × 17.5 mm) (KPM NH 6331). A, overall view of carapace, chelipeds and P2–P4; B, ventral surface of cephalothorax; C, frontal view of cephalothorax.

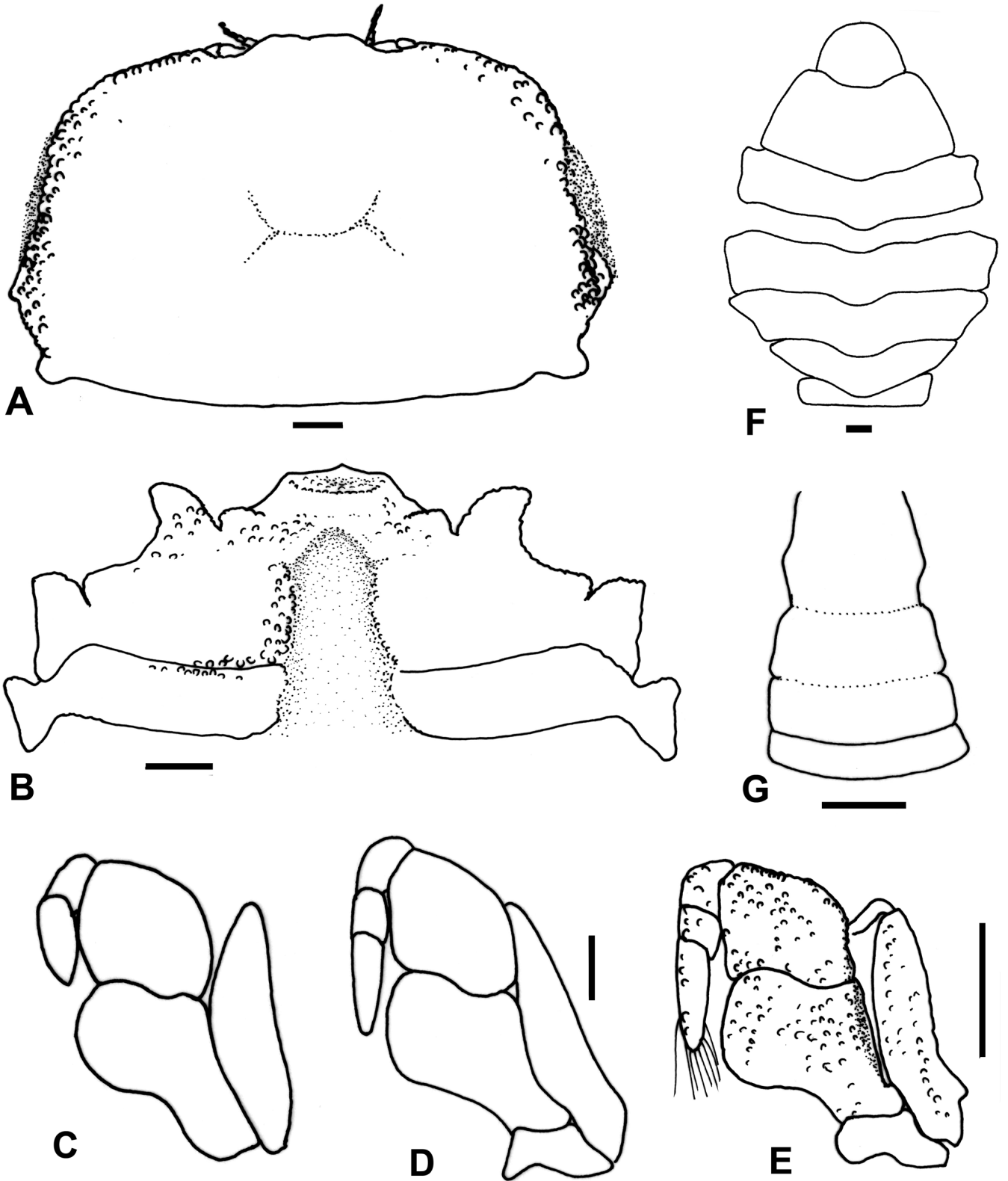


Fig. 13. *Hexapinus latipes* (De Haan, 1835). A, B, E, G, female (10.2 × 7.6 mm) (NSMT-Cr 5694); C, holotype female (10.6 × 6.4 mm) (RMNH 31783d; D, F, female (30.4 × 17.5 mm) (KPM NH 6331). A, overall view of carapace; B, thoracic sternites 1–5, showing thoracic sternal groove and sternoabdominal cavity; C–E, left third maxilliped; F, G, female abdomen and telson. Scale bars: A, B, D–G = 1.0 mm; C not to scale.

G1 not known.

**Colour.** Not known.

**Remarks.** The lectotype of *H. latipes* is a small dried specimen (10.0 × 6.7 mm, RMNH 31783d) and not in very good condition (Fig. 10). It has been listed as a male by Manning & Holthuis (1981: 170), and in every respect, it does look like a male. The abdomen is relatively narrow and triangular (De Haan, 1835: pl. 11, fig. 5; Figs. 10B), and somites 3–5 even appear to be fused. However, a close examination of the abdomen shows that the sutures between somites 3–5 are still discernible albeit rather shallow. The short and stout abdomen, while superficially resembling the male abdomens of *Hexapus* and *Mariaplax*, new genus, differ in that in these genera, male abdominal somites 3–5 are completely fused without any trace of sutures (e.g., Figs. 5F, 25F). Another specimen from Japan examined which is about the same size (10.2 × 7.6 mm, NSMT-Cr 5694) (Fig. 11A) also resembles the holotype and has the same abdominal structure (Fig. 13G). However, when the abdomen is detached, it is clear that it is actually a juvenile female, with the pleopods already evident. Like the holotype specimen, the abdominal somites 3–5 also have shallow but distinct sutures (Fig. 13G). We are therefore certain that the holotype specimen of *Hexapinus latipes*, which is smaller than the NSMT juvenile female, is also a female. We have observed the same situation in *Hexapinus simplex*, new species, in which both male and female specimens are known. Juvenile females of this species possess abdomens that resemble those of males except they are relatively shorter and stouter, and the sutures between abdominal somites 3–5 are still visible (Fig. 21D). True males of *Hexapinus simplex*, even when juvenile (5.4 × 3.4 mm, ZRC 2013.1689), have elongate abdomens, with somites 3–5 completely fused (Fig. 21E, F). We believe when males of *Hexapinus latipes* are found, the male abdomens will also be more elongate and slender. Odawara (1965) briefly describes and illustrates a male (28.0 × 17.0 mm) and a female (33.0 × 19.5 mm) of what he identifies as “*Hexapus sexpes*” (Odawara, 1965: 48, text fig. a–d) from Japan. His figures leave little doubt in our mind that his species is what we now call *Hexapinus latipes*. Odawara’s (1965: 48 fig. d) of the male ventral surface shows a male abdomen that appears to be relatively elongate, especially somite 6, and agrees in general with what is here defined for the genus. Unfortunately, we have not been able to locate these specimens; they are not in NSMT or KPM.

The above observations are also supported by the fact that *H. latipes* is a large species, at least for the Hexapodidae. We have adult females measuring 30.4 mm in carapace width (KPM NH 7123), and possess all the non-sexual characters of smaller specimens. We are confident they are conspecific. Manning & Holthuis (1981: 170) suggested that because of the substantial size differences observed between the reported specimens of “*Hexapus latipes*” from Japan, it seemed there are possibly two species present there. We now know that the small ones are merely juvenile females. However, these authors are not incorrect that there is more than one species

of “*Hexapus latipes*” in Japan; two other species, *Hexapinus simplex*, new species, and *Mariaplax chenaе*, new species, both of which have been confused with “*Hexapus latipes*” at one time or another (see discussion for these species), occur in the islands.

The figure of the third maxilliped of the type of *Hexapinus latipes* in the original publication (De Haan, 1835: pl. D) (present Fig. 13C) is problematic. The figure of the entire buccal cavity with the intact third maxillipeds shows a third maxilliped that closely resembles that of our present specimens (Fig. 13E). However, De Haan’s figure of the right third maxilliped (De Haan, 1835: pl. D) does not look like that of the other *Hexapinus* species, with the merus and ischium too quadrate in shape, and the exopod too slender. In fact, it closely resembles the third maxilliped of *Mariaplax* species. In the RMNH is a box containing several mouthparts glued onto a card labelled as “*Hexapus latipes*” which were almost certainly extracted from the type specimen (Fig. 10D; see also Yamaguchi & Baba, 1993: 434). Yamaguchi & Baba (1993: fig. 154b) depicted the card but it is too small to see details; it is figured here again (Fig. 13C). The third maxilliped on the card is the left one (Fig. 10D) and is almost identical to those observed in our present material, with the merus less quadrate and the ischium clearly wider than long with the mesial margin prominently convex (Fig. 13C). Where the right third maxilliped has gone is not known. The specimen itself no longer has any mouthparts, with both third maxillipeds removed (Fig. 10B). It would therefore appear that De Haan’s original figure of the third maxilliped is simply inaccurate. It is also possible that De Haan had more than one specimen of what he called “*Hexapus latipes*”, and the right third maxilliped he figured was actually from a similar-sized *Mariaplax* specimen (perhaps *M. chenaе*, which is known from Japan), but the specimen is just no longer around. Whatever be the case, there is only one extant specimen left in RMNH and it is the lectotype of the species, and we are now certain this is what Manning & Holthuis (1981) as well as ourselves are now recognising as *Hexapinus latipes* (De Haan, 1835) s. str.

The form of the third maxilliped is relatively constant. One slight variation observed is that the exopod of a young female (10.2 × 7.6 mm, NSMT-Cr 5694) is relatively narrower, being only slightly more than 0.4 times the width of the ischium. In other specimens, the exopod is wider, at 0.5 times the width of the ischium (Fig. 13C, D).

**Type locality.** Japan.

**Distribution.** Kii Peninsula, Enoshima Island, Aichi Prefecture, Japan. Subtidal, 27 m.

***Hexapinus ceres*, new species**  
(Figs. 14, 15)

**Material examined.** Holotype: female (5.2 × 3.2 mm) (NMCR 39070), dive site at Basura, Anilao, Batangas, Philippines, 5 m, coll. H. Takakura, 22 August 2011.

**Diagnosis.** Carapace subquadrate, about 1.6 times as broad as long, dorsal surface granulated; regions indistinct, median depression shallow (Fig. 14A). Lateral margin with protuberance medially (Figs. 14A, 15A). Eye small, slightly movable, cornea globular, wider than tuberculate peduncle (Fig. 14C). Pterygostomial region with row of oblique striae. Third maxillipeds with outer surface tuberculate (Figs. 14D, 15B); ischium almost as long as merus, with rounded mesial margin; dactylus missing; exopod short, broad, more than 0.5 times width of ischium, flagellum well developed. Chelipeds slender (Fig. 14C, D) with slight gap when fingers closed. P2–P4 (Fig. 14A, B) short, stout, covered by tubercles; merus of P4 2 times as long as broad; dactylus of P2–P4 slightly longer than propodus, upper margin tuberculate. Female thoracic sternum relatively broad (Fig. 14B, D),

sternites 1 and 2 fused, separated from sternite 3 by distinct ridge; sternite 3 separated laterally from sternite 4, appears medially fused, sternites 4–7 well developed, separated by distinct sutures. Female abdomen relatively broad (Figs. 14B, D, 15C) with 6 free somites and telson. Male unknown.

**Colour.** Not known.

**Etymology.** From the Latin “ceres” for grain; alluding to the granular dorsal carapace surface. The name is used as a noun in apposition.

**Remarks.** Although this species is known from only one female specimen, it can be placed in *Hexapinus* mainly on the basis of the form of the ischium and merus of the third

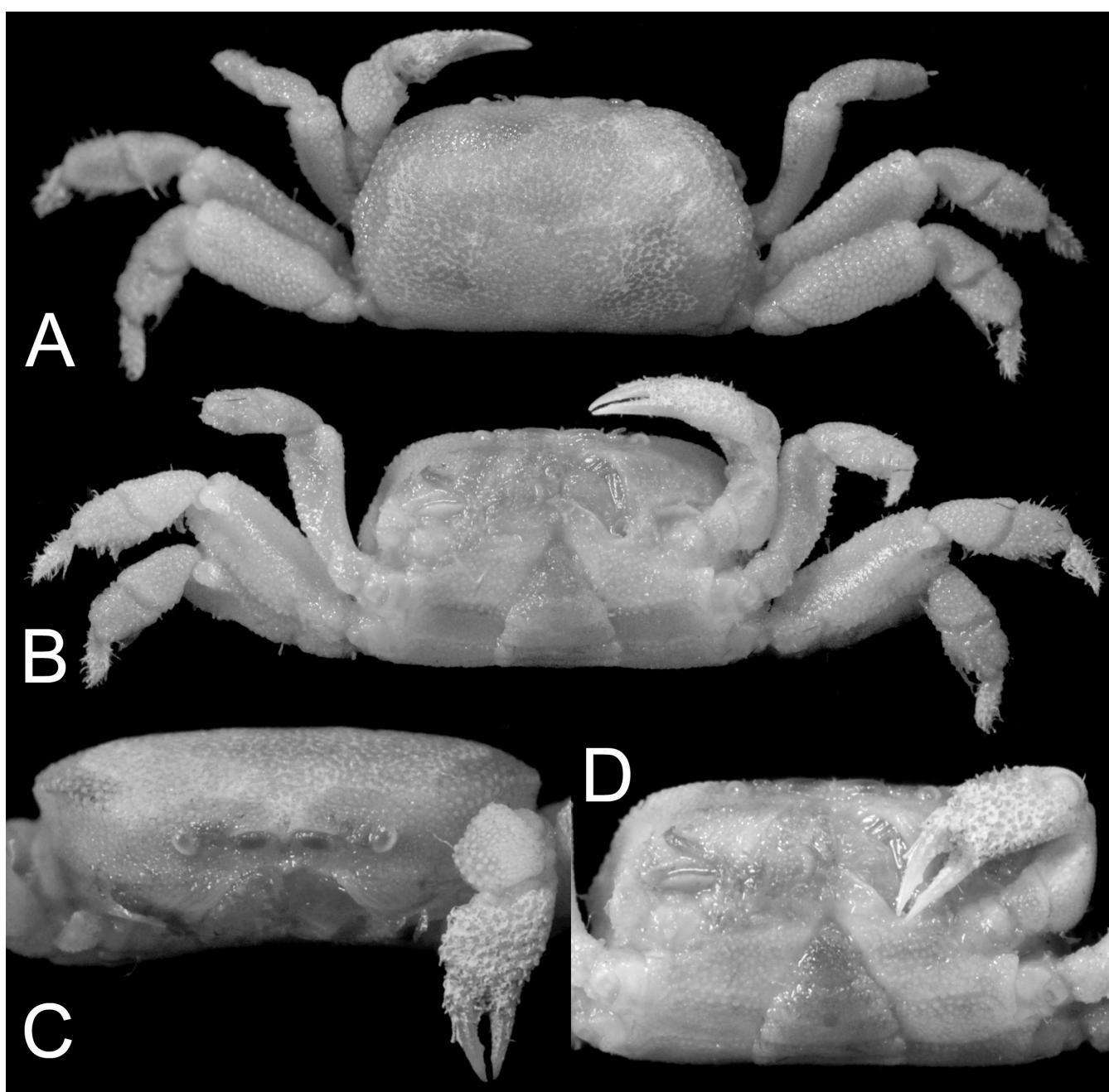


Fig. 14. *Hexapinus ceres*, new species, holotype female (5.5 × 3.3 mm) (NMCR 39070). A, overall view of carapace, left cheliped and P2–P4; B, ventral view of cephalothorax; C, frontal view of cephalothorax; D, abdomen and telson.

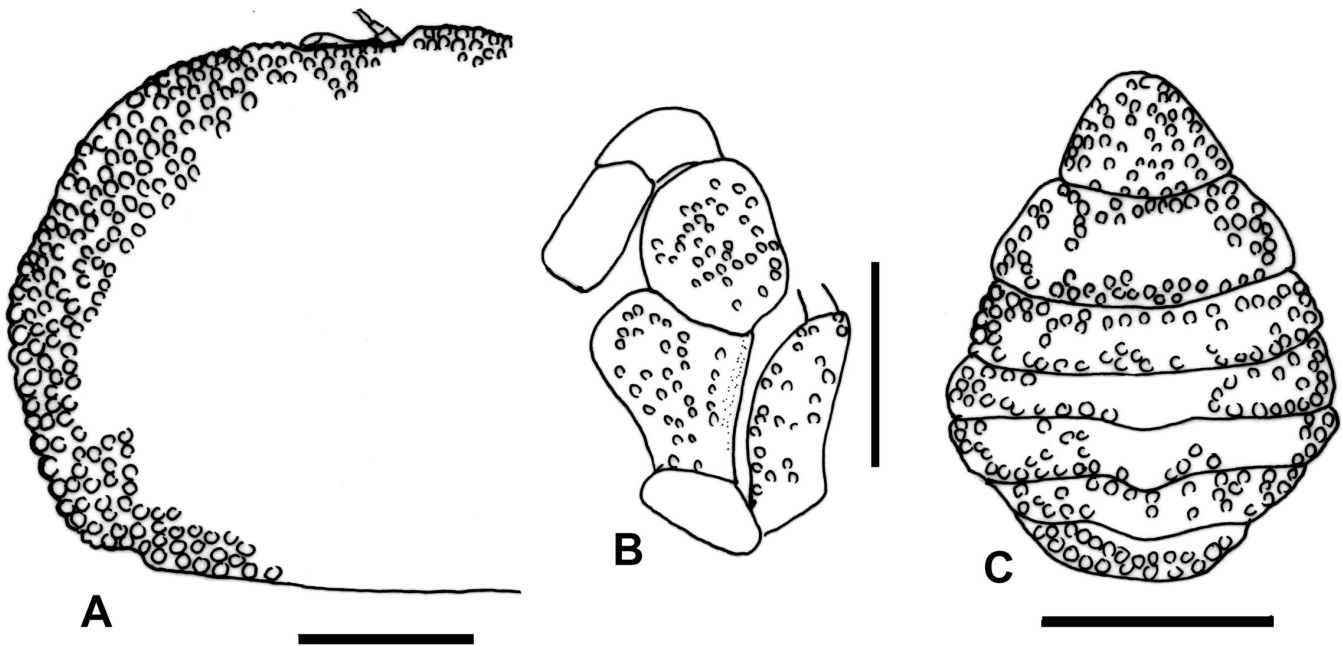


Fig. 15. *Hexapinus ceres*, new species, holotype female (5.5 × 3.3 mm) (NMCR 39070). A, anterior view of carapace; B, left third maxilliped (dactylus missing); C, abdomen and telson. Scale bars = 1.0 mm.

maxilliped (Fig. 15B), although the mesial margin of the ischium is relatively less convex compared to its congeners. Its exopod is also broad like its congeners although it is relatively shorter (Fig. 15B). It shares the pereopod condition with other *Hexapinus* species: the P2–P4 are short and stout with the dactylus slightly longer than propodus, and the merus of P4 is about twice as long as broad, without a longitudinal groove (Fig. 14A). A male specimen will nevertheless need to be collected to confirm the generic position of this species.

*Hexapinus ceres*, new species, differs markedly from *H. latipes*, *H. latus*, new species, and *H. simplex*, new species, in having numerous closely spaced tubercles on the carapace, chelipeds and P2–P4.

**Type locality.** Batangas, Philippines.

**Distribution.** Batangas, Philippines. Subtidal, 5 m.

***Hexapinus latus*, new species**

(Figs. 16, 17)

**Material examined.** Holotype: female (8.1 × 5.0 mm) (MZB Cru 3918), Kecinan, Lombok, Indonesia, coll. 15 May 2007. Paratype: **Indonesia:** 1 female (6.5 × 4.0 mm) (ZRC 2013.1691), Sira, northern Lombok, Indonesia, coll. 21 July 2009.

**Diagnosis.** Carapace subquadrate, about 1.6 times as broad as long, dorsal surface very smooth, region indistinct, median H-shaped depression shallow; some small granules present on dorsolateral margins, only scattered tiny granules on posterior margin (Fig. 16A). Anterolateral margin arcuate, posterolateral margin sinuous with 1 protuberance; posterolateral corner with angled prominence over base of posterior pereopods; lateral margin of carapace wall produced medially. Front deflexed (Fig. 16C). Orbit distinct,

eye small, slightly movable, cornea pigmented (Fig. 16C). Pterygostomial region with row of oblique striae. Third maxillipeds relatively broad (Figs. 16B, 17B); ischium 1.1 times as broad as long, longer than merus, strongly expanded distomesially, with rounded mesial margin; combined length of dactylus, propodus and carpus shorter than that of merus and ischium; exopod narrow, about 0.3 times width of ischium, flagellum well developed. Chelipeds stout, unequal (Fig. 16C); major chela gaping when fingers closed; palm slightly wider than long, outer surface smooth, tubercles on upper margin; minor chela with narrower gap between closed fingers (Fig. 16C). P2–P4 (Fig. 16A) short, stout, P3 longest; merus of P4 about 2 times as long as broad; dactylus longer than propodus; dactylus of P4 slightly upcurved. Female thoracic sternum broad (Figs. 16B), sternites 1 and 2 fused, separated from sternite 3 by distinct ridge; sternite 3 separated from sternite 4 by distinct ridge. Female abdomen broad (Figs. 16B, 17C) with 6 free somites and subtriangular telson.

**Colour.** In life, the carapace and appendages are creamish-white overall.

**Etymology.** From the Latin *latus* for broad/wide, alluding to the broad carapace.

**Remarks.** Although only female specimens were available, this species clearly belongs to *Hexapinus* as it has a broad and mesially convex ischium of the third maxilliped, and the P2–P4 are short. The broad carapace of *H. latus*, new species, is similar to *H. simplex*, new species. However, comparisons of similar-sized females show that *H. latus* has a proportionately broader abdomen with the telson as long as somite 6 (Fig. 17C) while in *H. simplex* the abdomen is narrow and the telson is shorter than the sixth abdominal somite (Fig. 21D). In addition, the merus of the third maxilliped of *H. latus* is shorter than the ischium (Fig. 17B),

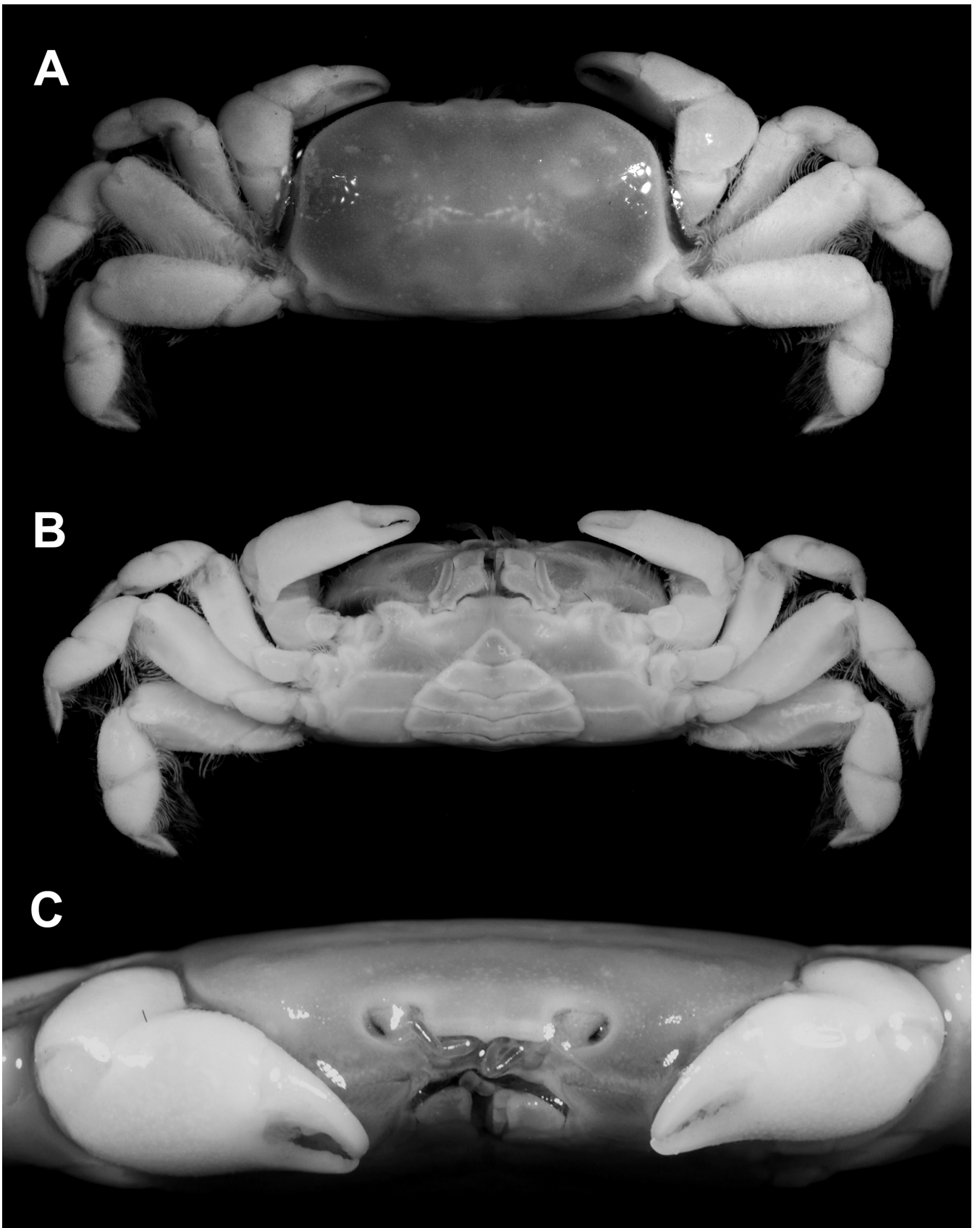


Fig. 16. *Hexapinus latus*, new species, holotype female (8.1 × 5.0 mm) (MZB Cru 3918). A, overall view of carapace, chelipeds and P2–P4; B, ventral view of cephalothorax; C, frontal view of cephalothorax.

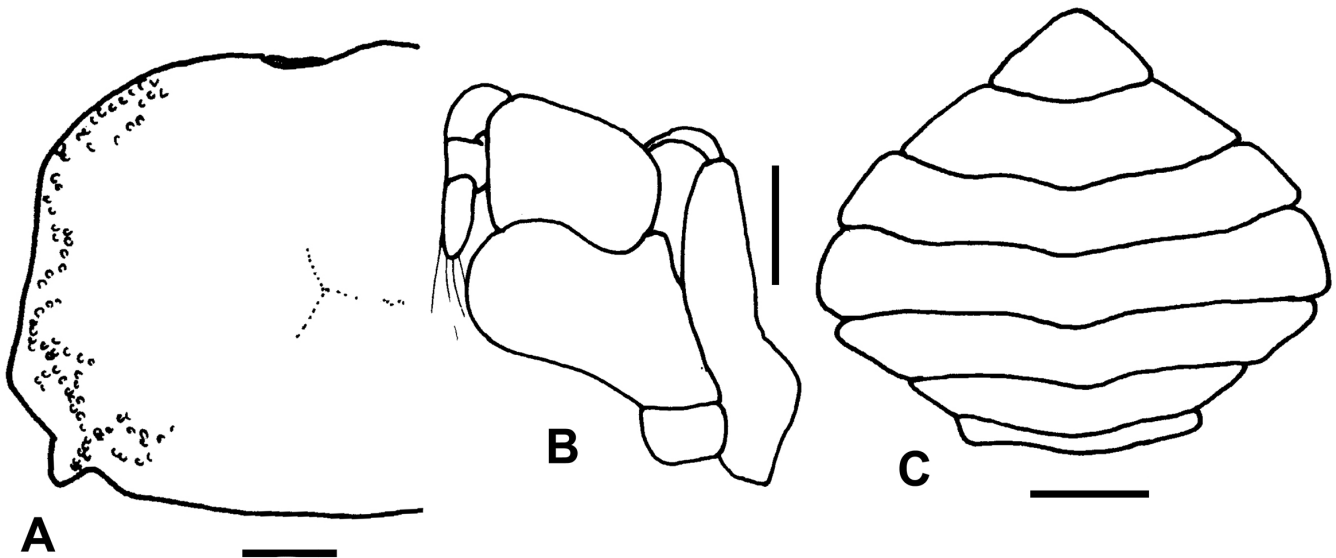


Fig. 17. *Hexapinus latus*, new species, holotype female (8.1 × 5.0 mm) (MZB). A, dorsal view of carapace; B, left third maxilliped; C, abdomen and telson. Scale bars: A, C = 1.0 mm; B = 0.5 mm.

while in *H. simplex*, the merus is longer than the ischium (Fig. 20G). The posterolateral margin of the carapace of *H. latus* has only one protuberance (Fig. 16A) while in *H. simplex* it always has two protuberances (Fig. 18B). The dorsal carapace surface of *H. latus* is very smooth (Fig. 16A); specimens of *H. simplex* the size of *H. latus* on the other hand, are always distinctively pitted (Fig. 18).

Although *H. latus* was collected in the same island as *H. simplex*, the differences discussed above argue against them being conspecific. The habitats of also appear to be somewhat different. The specimens of *H. latus* were collected from coarse white sand in shallow depressions in the reef flat. The area had previously been mined for building material by local villagers. The area is always filled with some water, even during low tide. *Hexapinus simplex* on the other hand seems to prefer finer substrates (see next species).

*Hexapinus latus* also differs from *H. latipes* in having broad female abdomen. In a female specimen of *H. latipes* (10.2 × 7.6 mm, NSMT-Cr 5694), which is slightly larger than the female type specimens of *H. latus*, the abdomen is still narrow and resembles that of a male (Fig. 17C versus Fig. 13G). The female abdomens of both *H. latus* and *H. ceres*, even though they are relatively small, are already broad. *Hexapinus latus* and *H. ceres* are easily distinguished; the carapace surface, chelipeds and P2–P4 of *H. latus* are smooth (Fig. 17A) but in *H. ceres*, these are covered with closely spaced granules (Fig. 14A).

**Type locality.** Kecinan, Lombok, Indonesia

**Distribution.** North coast of Lombok Island, Indonesia. Intertidal.

### *Hexapinus simplex*, new species

(Figs. 1A–F, 18–21)

*Hexapus (Hexapus) sexpes* – Sakai, 1976: 554 (part), pl. 196, fig. 2. (not *Cancer sexpes* Fabricius, 1798)

**Material examined.** Holotype: male (7.8 × 5.0 mm) (MZBCru 3790), Ekas, Lombok, 8°52'9"S 116°27' 26.1"E, Indonesia, coll. 15 October 2007. Paratypes: **Indonesia:** 4 males (8.0 × 5.6 mm, 6.4 × 4.4 mm, 5.6 × 3.8 mm, 5.1 × 3.5 mm), 2 females (6.9 × 4.5 mm, 5.3 × 3.5 mm), 1 ovigerous female (10.9 × 6.7 mm) (MZB Cru 3791); 3 males (6.4 × 4.4 mm, 5.1 × 3.5 mm, 4.5 × 3.1 mm), 2 females (10.0 × 6.0 mm, 6.7 × 4.5 mm) (ZRC 2012.1015), 1 ovigerous female (10.9 × 7.1 mm) (ZRC 2009.750), Ekas, eastern Lombok, 8°52'9"S 116°27' 39"E, 15 October 2007; 1 male (5.4 × 3.4 mm), 2 females (4.5 × 2.8 mm, 6.9 × 4.5 mm) (ZRC 2013.1689), Ekas, eastern Lombok, 8°52'9"S 116°27' 39"E, coll. 22 July 2009; 5 males (7.3 × 5.0 mm – 8.5 × 5.8 mm), 5 females (4.1 × 2.9 mm – 8.9 × 5.9 mm) (USNM), Ekas, eastern Lombok, 8°52'9"S 116°27' 39"E, coll. 22 July 2009. Others: **Indonesia:** 28 males (3.3 × 2.0 mm – 8.7 × 5.0 mm), 22 females (3.8 × 2.3 mm – 9.2 × 5.3 mm), 7 ovigerous females (9.5 × 5.3 mm) (MZB Cru 3919); 30 males (4.6 × 3.0 mm – 8.5 × 5.1 mm), 20 females (5.3 × 3.5 mm – 9.1 × 5.7 mm), 6 ovigerous females (8.0 × 4.8 mm – 8.7 × 5.8 mm) (ZRC 2010.0297), Ekas, eastern Lombok, coll. 22 July 2009; 1 male (9.3 × 5.8 mm) (ZRC), Lembeh Straits, Sulawesi, subtidal, diving, coll. H. H. Tan, 17 July 2003. **Singapore:** 1 female (11.9 × 7.3 mm) (ZRC 2013.1686), St. John Island, north lagoon, 1°13.116'N 103°51.079'E, coll. P. K. L. Ng & A. Anker, yabby pump, 31 May 2013; 1 ovigerous female (8.3 × 6.0 mm) (ZRC 2013.1687), DR2, Raffles Reserve near Raffles Lighthouse, 1°10'27.3"N 103°45'61.3"E, coll. RV *Galaxea*, 20 May 2013; 1 male (11.2 × 7.0 mm) (ZRC), station Sen-AA04, Pulau Senang, northern side near jetty, intertidal sand-mud flat with abundant rubble and rocks, 01°10.504'N 103°44.1790.5'E, 0.5 m, from burrow together with chaetopterid worm, coll. A. Anker, yabby pump, 30 March 2014; 1 male (6.0 × 3.6 mm) (ZRC), station grid 0523 DR3 AA19, sandy with broken shell substrate, between Pulau Tekong East and Pengerang, 01°23.914'N 104°05.353'E – 01°24.141'N 104°05.400'E, 10.6–10.7 m, trawl, coll. S. C. Lim et al., 25 March 2014. **China:** 3 females (10.0 × 6.2 mm, 13.7 × 7.7 mm, 11.5 × 6.7 mm) (MNHN), station 57K29, coastal waters of Guangdong Province, off Longwo,

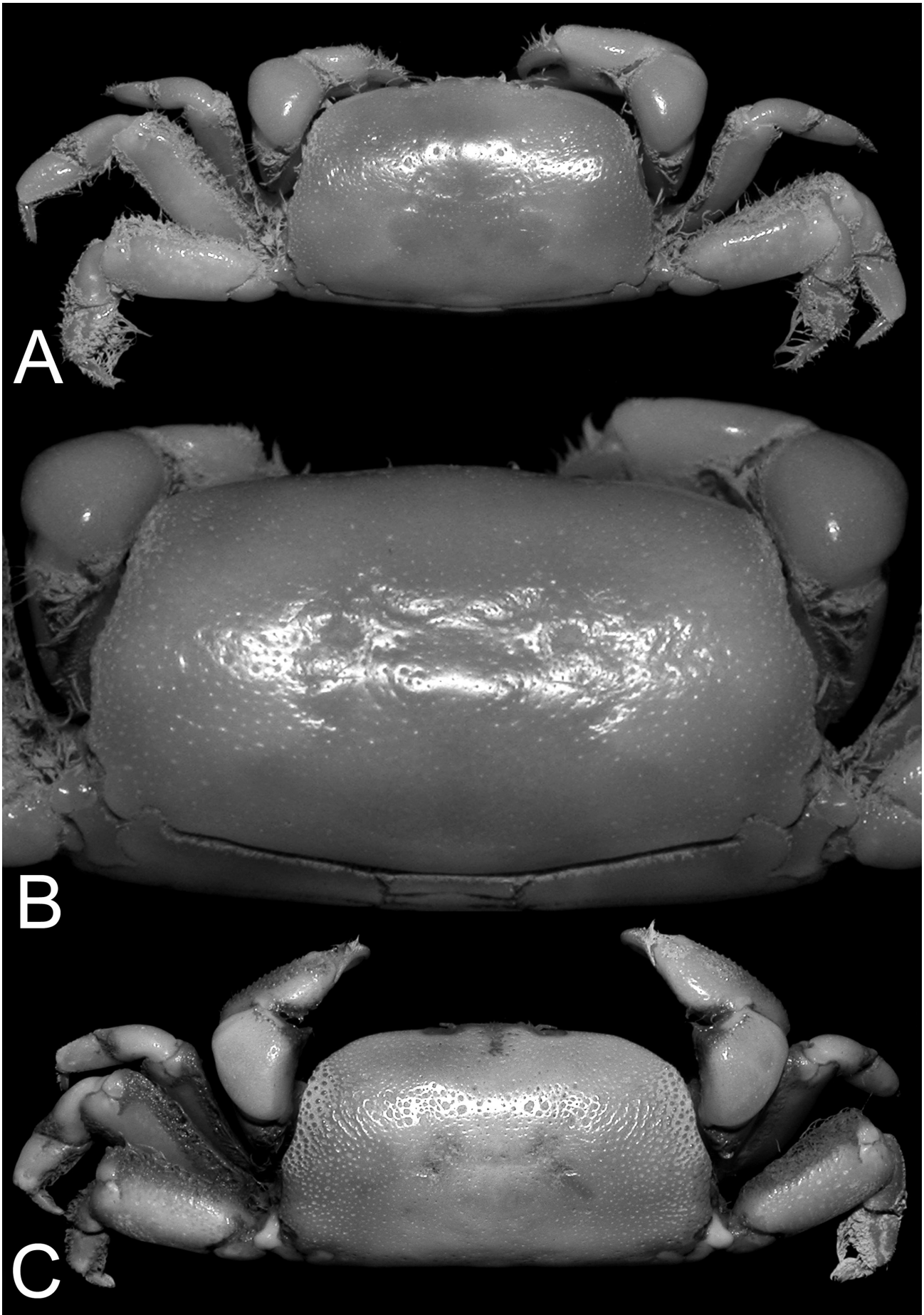


Fig. 18. *Hexapinus simplex*, new species. A, B, holotype male (7.8 × 5.0 mm) (MZB Cru 3790); C, paratype female (6.9 × 4.5 mm) (MZB 3791). A, C, overall view of carapace, chelipeds and P2–P4; B, carapace.



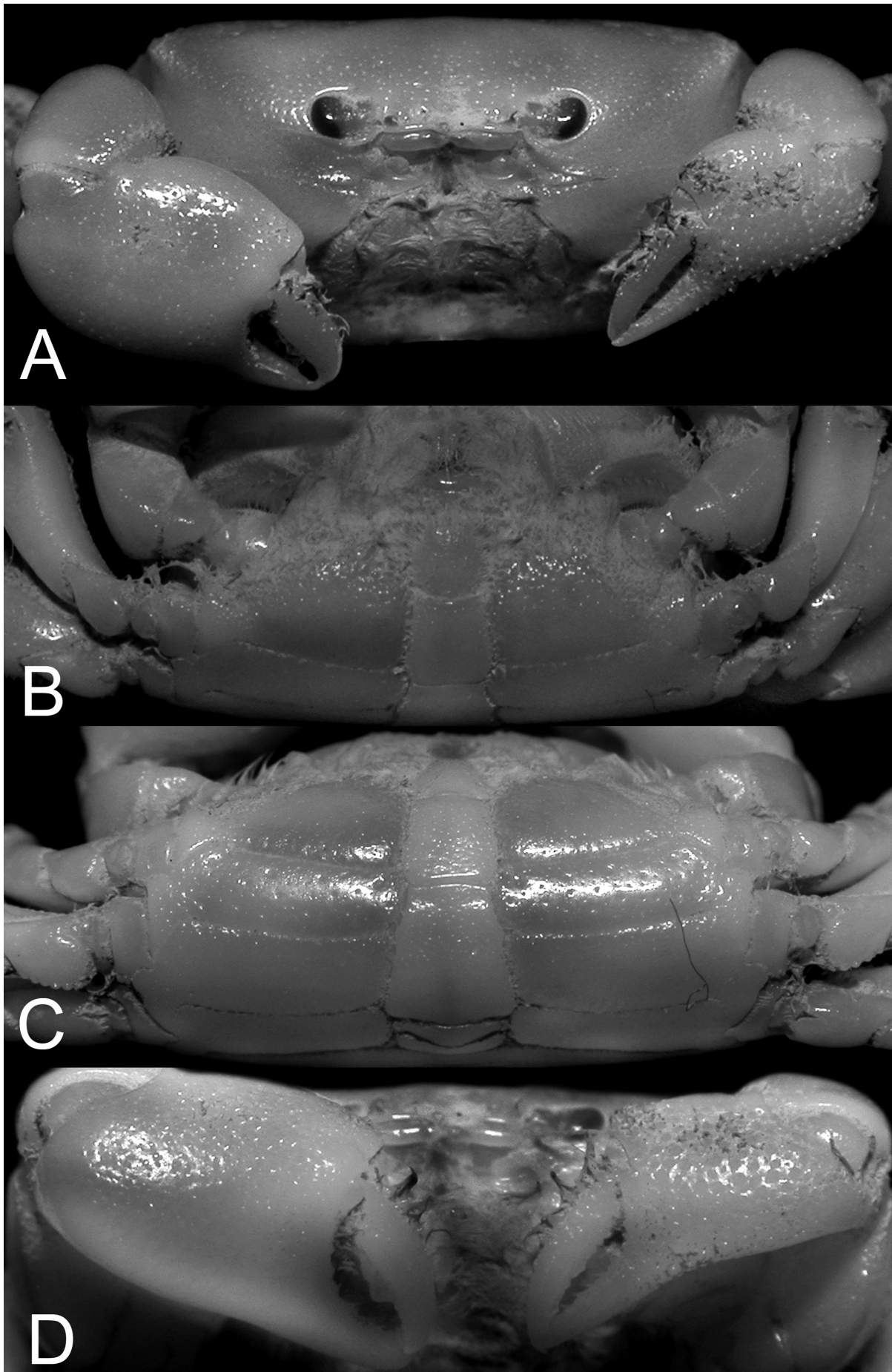


Fig. 19. *Hexapinus simplex*, new species, holotype male (7.8 × 5.0 mm) (MZB Cru 3790). A, frontal view of cephalothorax; B, ventral view of cephalothorax; C, abdomen and telson; D, chelae.

South China Sea, coll. 22 April 1957; 1 male (12.7 × 7.5 mm), 1 female (12.5 × 8.2 mm) (ZRC 2012.1016), station 75C-2368, pearl shell culture ground, Dongshan, Fujian Province, Taiwan Strait, coll. 1 June 1975; 1 female (12.5 × 7.5 mm) (ZRC 2012.1017), station 6160, southeast Hainan Island, 18°30'N 110°30'E, South

China Sea. **Japan:** 1 female (9.2 × 7.4 mm) (RUMF-ZC-2107), river mouth of Nakara River, Iriomote Island, coll. J. Nawa, 22 July 2005; 1 ovigerous female (16.1 × 11.1 mm) (RUMF-ZC-2108), Oura Bay, Okinawa Island, in front of Camp Schwab, coll. 21 Jul. 2010; 1 female (13.6 × 8.1 mm), 1 male (12.6 × 8.4 mm) (RUMF-

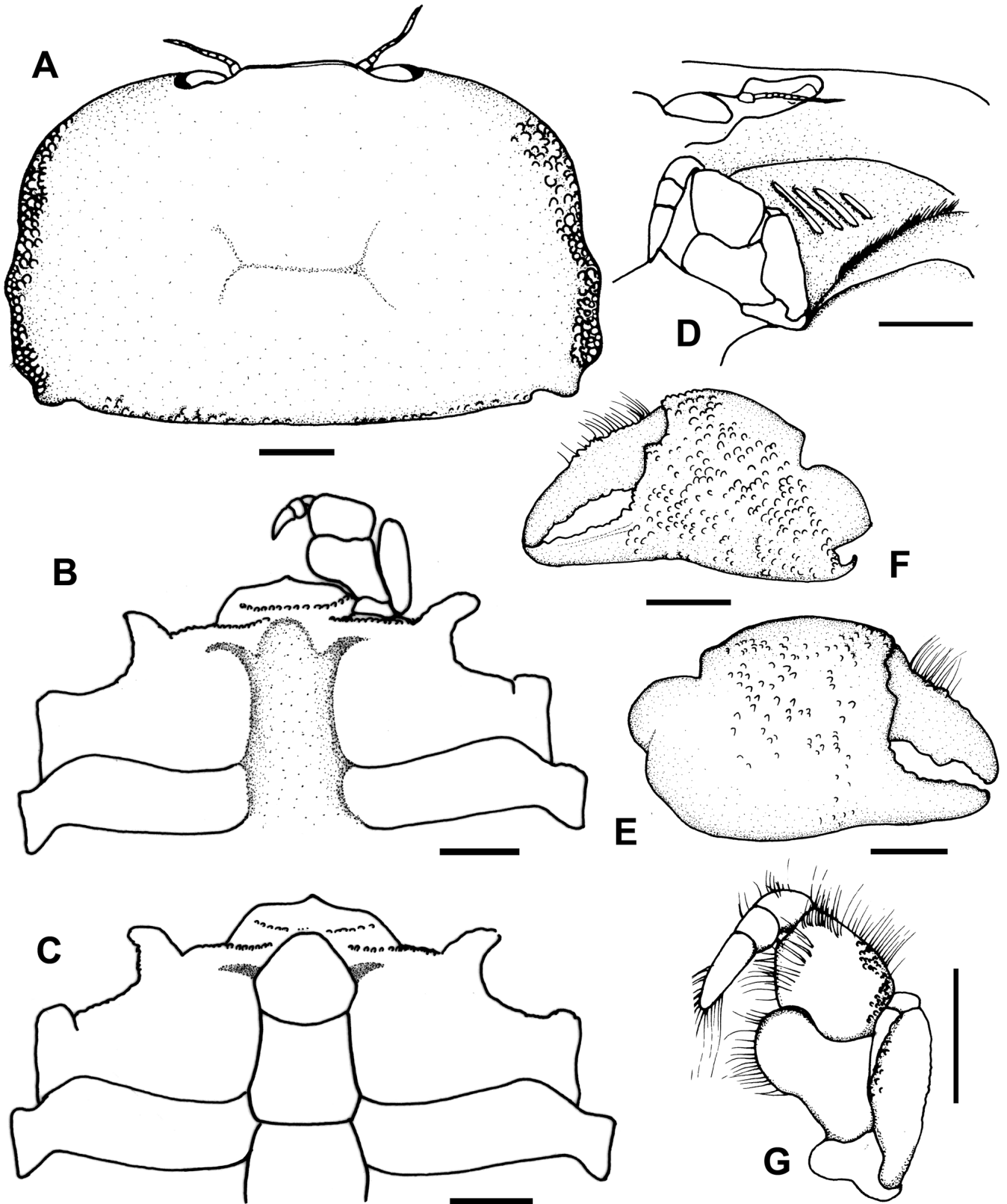


Fig. 20. *Hexapinus simplex*, new species, holotype male (7.8 × 5.0 mm) (MZB Cru 3791). A, carapace; B, thoracic sternites 1–5, showing thoracic sternal groove; C, thoracic sternites 1–5, showing thoracic sternal groove and telson; D, anterior view of cephalothorax; E, major chela; F, minor chela; G, left third maxilliped. Scale bars = 1.0 mm.

ZC-2110), Tekebu, Amami Island, coll. T. Maenosono, 25 April 2012; 2 males (10.7 × 7.1 mm, 10.9 × 7.2 mm), 1 female (12.4 × 7.4 mm) (RUMF-ZC-2109), Funaura Bay, Iriomote Island, coll. T. Naruse, 12 and 17 Jun. 2007; 1 male (12.6 × 8.4 mm) (ZRC 2013.1688), Funaura Bay, Iriomote Island, coll. T. Naruse, 1 July 2011; 2 females (13.0 × 8.2 mm, 12.5 × 8.1 mm), 1 ovigerous female (12.9 × 7.9 mm) (ZRC 2012.1018), Tekebu, Amami Island, coll. T. Maenosono, 27 Apr. 2012; 1 male (13.1 × 8.0 mm), 10 females (12.2 × 7.3 mm – 15.3 × 8.7 mm), 3 ovigerous females (13.3 × 7.8 mm – 13.8 × 8.0 mm) (RUMF-ZC-2111) Tekebu, Amami Island, coll. T. Maenosono, 27 April 2012.

**Diagnosis.** Carapace subquadrate, about 1.5–1.6 times as broad as long, dorsal surface finely pitted to smooth, regions indistinct, median H-shaped depression shallow; some granules present on dorsolateral margins, only scattered granules on posterior margin (Figs. 18, 20A). Anterolateral margin arcuate, posterolateral margin sinuous with 2 protuberances; posterolateral corner with angled prominence over base of posterior pereopods. Front deflexed, fringed medially with setae (Fig. 19A). Eye small, slightly movable, cornea pigmented (Figs. 19A, 20A). Pterygostomial region with row of oblique, broken and entire, striae (Fig. 20D). Third maxillipeds relatively broad, densely setose (Figs. 19B, 20G); ischium 1.1 times as broad as long, slightly shorter than merus, strongly expanded distomesially, with rounded

mesial margin; combined length of dactylus, propodus and carpus shorter than that of merus and ischium; exopod broad, about 0.5 times width of ischium, flagellum well developed. Chelipeds stout, unequal (Fig. 19A, D), dactylus with tufts of setae on upper margin proximally; major chela (Fig. 20E) slightly gaping when fingers closed; palm slightly wider than long, surface covered with tubercles on upper half; minor chela (Fig. 20F) with wider gap between closed fingers. P2–P4 (Fig. 18A, C) short, stout, P3 longest; merus of P4 1.9 times as long as broad; dactylus of P2–P4 straight. Male thoracic sternum broad (Figs. 19B, C, 20B, C), sternites 1 and 2 fused, separated from sternite 3 by distinct ridge; sternite 3 separated from sternite 4 laterally, medially appear fused, short thoracic sternal groove, extends obliquely from sternoabdominal cavity to middle of sternite 3 to below base of third maxilliped (Fig. 20B, C); sternite 8 exposed, triangular, half length of abdominal somite 1; sternoabdominal cavity reaches base of sternite 2 (Fig. 20C). Male abdomen relatively narrow (Figs. 19B, C, 21E–G), somites 1 and 2 free; somites 3–5 fused, lateral margin sinuous; somite 6 slightly shorter than length of somites 3–5, lateral margin sinuous; telson subpentagonal with setose margin. G1 (Fig. 21A, B) bent submedially, directed anterolaterally, distal part tapered, glabrous or with sparse short setae, apices not concealed under abdomen, exposed on thoracic sternal

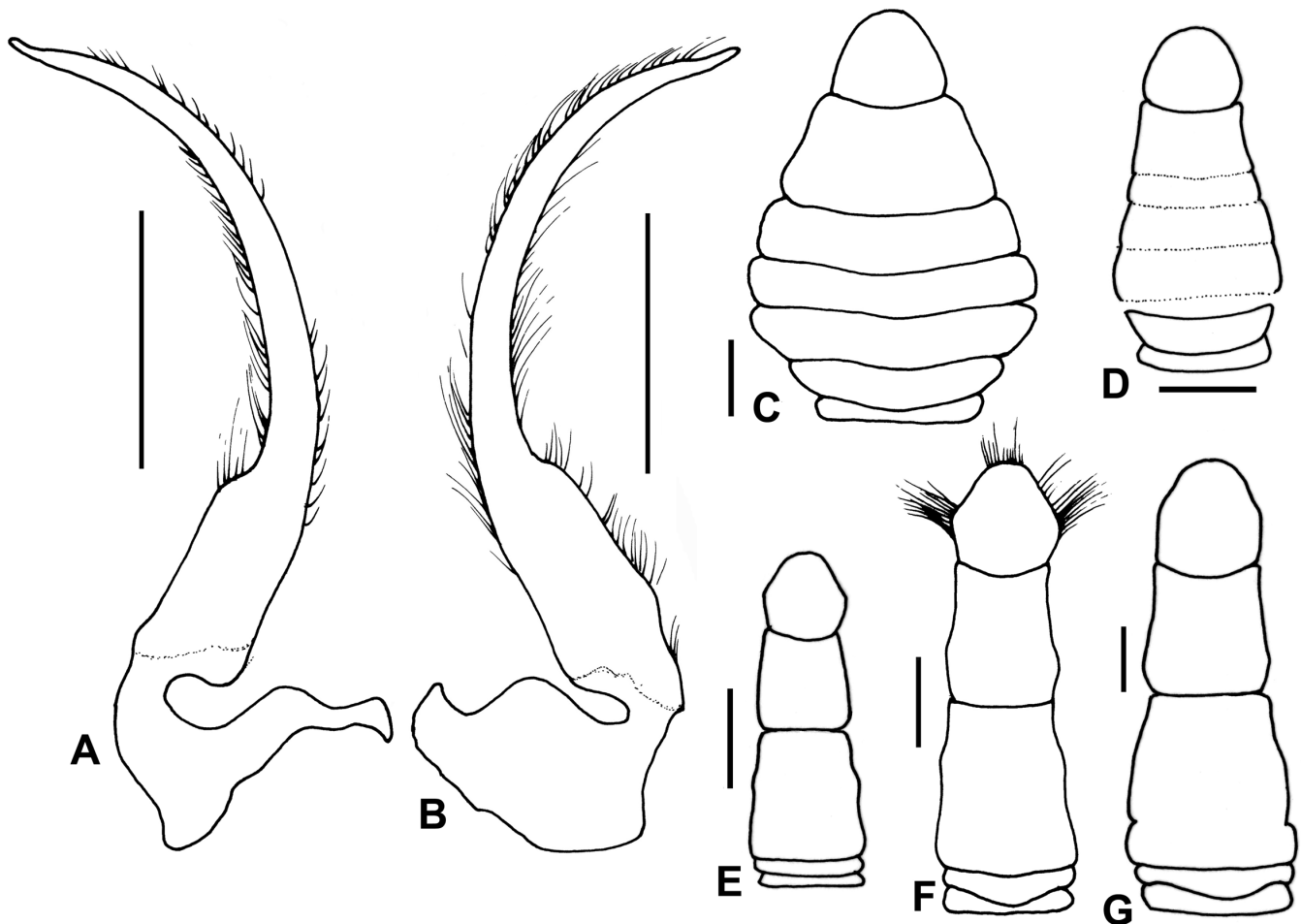


Fig. 21. *Hexapinus simplex*, new species. A, B, F, holotype male (7.8 × 5.0 mm) (MZB); C, paratype female (6.9 × 4.5 mm) (ZRC 2013.1689); D, paratype female (4.5 × 2.8 mm) (ZRC 2013.1689); E, paratype male (5.4 × 3.4 mm) (ZRC 2013.1689); G, male (12.7 × 7.5 mm) (ZRC 2012.1016). A, B, G1; C, D, female abdomen and telson; E–G, male abdomen and telson. Scale bars = 1.0 mm.

groove, obscured by setae of telson. Female abdomen (Fig. 21C, D) with 6 free somites and rounded telson.

**Colour.** Fresh specimens from Lombok, Indonesia, are brownish grey in colour (Fig. 1A). One specimen collected by diving from Sulawesi is a striking bright orange (Fig. 1B). Those from Amami Island, Ryukyus, Japan, are brown, with the chelipeds, and P2–P4 light brown (Fig. 1C). The specimen from Iriomote Island, Ryukyus, has a reddish brown carapace and light brown chelipeds and P2–P4 (Fig. 1D). Specimens from Singapore are light to greyish-brown on the dorsal surfaces (Fig. 1E, F).

**Etymology.** The species name is derived from the relatively simple appearance of the carapace and G1.

**Remarks.** *Hexapinus simplex*, new species, is easily distinguished from other species in the genus by having the lateral margin of the carapace arcuate anterolaterally and the posterolateral margin sinuous with two distinct protuberances (Figs. 18B, 20A). In *H. latipes* and *H. latus*, there is only one protuberance on posterolateral margin (Figs. 10A, 11A, 12A, 13A, 16A, 17A), while in *H. ceres* the protuberance is on the median part of lateral margin of the carapace (Figs. 14A, 15A).

*Hexapinus simplex* is also different from *H. latipes* by the relatively shorter ischium of the third maxilliped with more strongly convex mesial margin, with merus as broad as long (Fig. 20G versus Fig. 13C). Furthermore the carapace of *H. simplex* is broader (1.5–1.6 times as broad as long), the surface smooth with some granules on dorsolateral surface and posterolateral margin. In *H. latipes* the carapace is more squarish (1.2–1.3 times as broad as long) and the carapace surface is more heavily pitted with only a few granules on dorsolateral surface.

*Hexapinus simplex* is the only species in the genus in which males were available for study. In all adult specimens, the male abdomen is slender with a long somite 6 that is almost as long as the entire length of fused somites 3–5 (Fig. 21G). In adults, the length of somite 6 does not vary with the size although the shape of male telson varies slightly (Fig. 21E–G). In one small male (5.4 × 3.4 mm, ZRC 2013.1689), the telson is only very slightly subpentagonal with the distal margin rounded (Fig. 21E); in the holotype male (7.8 × 5.0 mm, MZB Cru 3790), it is subpentagonal with a rounded distal margin (Fig. 21F), while in larger specimens (e.g., male 12.7 × 7.5 mm, ZRC 2012.1016) is more rounded (Fig. 21G). The abdomen of a small paratype female from Lombok (4.5 × 2.8 mm, ZRC 2013.1689) is interesting as it is narrow and resembles that of a male except it is relatively shorter and less narrow (Fig. 21D). In this specimen, which is clearly a juvenile female, the sutures between somites 3–5 are shallow but are complete although all the somites do not appear to articulate very freely. This is the same condition observed in juvenile female of *Hexapinus latipes* (see discussion for that species). Male specimens of *Hexapinus simplex*, even when juvenile, on the other hand, always have elongate and slender abdomens with somites 3–5 completely fused.

With regards to the male thoracic sternal groove, the condition does not vary in *Hexapinus simplex*, even when the specimens are small. All the male specimens, however, have distinct G1 structures suggesting none of them are immature.

**Biological notes.** In Lombok, specimens were collected by sieving substrates consisting of mud, fine and coarse sand in intertidal areas, among frames established for seaweed culture. In Singapore, the specimens were collected by yabby pumping and dredging on sandy mud substrates. The specimens from the Ryukyus were collected from burrows in intertidal seagrass beds by using yabbie pumps. The specimens from Amami-Oshima were collected from tubes of chaetopterid worms. Zehntner (1984) and Sakai (1976) observed the association of their specimens of “*Hexapinus seipes*” with annelid tubes.

**Type locality.** Ekas, Lombok, Indonesia.

**Distribution.** South coast of Lombok Island, Indonesia; Singapore; Ryukyu Islands, Japan; South China Sea; and Taiwan Strait. Intertidal and subtidal.

#### *Mariaplax*, new genus

**Diagnosis.** Carapace broader than long, surface granular, region indistinct, H-shaped medial depression shallow. Anterolateral margin arcuate; pterygostomial region with rows of long and short, broken or entire, oblique striae and scattered tubercles. Eyes small, slightly movable, corneas subglobular. Third maxilliped broad, completely covering buccal cavity; ischium longer than merus, mesial margin straight, oblique, or very slightly rounded; carpus, propodus and dactylus cylindrical, dactylus longer than propodus; exopod narrow compared to width of ischium, flagellum present. Chelipeds equal or subequal. P2–P4 relatively long; merus slender, usually with distinct median groove on lateral surface on some of legs; dactylus straight or upcurved, as long as propodus. Thoracic sternites 1 and 2 fused, sternite 3 partly or completely separated from sternite 4 by tuberculate ridge, sternite 8 exposed, triangular or subrectangular, as long as or half length of first abdominal somite. Male sternoabdominal cavity reaches distal margin of thoracic sternite 4; thoracic sternal groove oblique, short or long, straight or curved, wide or narrow, sometimes reaches base of cheliped. Male abdomen relatively narrow; somites 1, 2 and 6 free, somites 3–5 fused; telson shorter than somite 6, subtriangular to subpentagonal, distal margin rounded. G1 curved or twisted, more or less S-shaped, apice exposed on thoracic sternal groove, not concealed under abdomen. Female abdomen with 6 free somites and telson.

**Etymology.** We dedicate this new genus to Mary J. Rathbun who described *Lambdophallus anfractus*, the type species. The name “*Mariaplax*” is derived from “*Maria*”, the Latin of her first name Mary, and “-plax”, a typical suffix for many crab genera. Gender of genus feminine.

**Species included.** *Lambdophallus anfractus* Rathbun, 1909 (type species by present designation), *M. chenaе*, new species,

*M. cyrtophallus*, new species, *M. daviei*, new species, *M. galaxeae*, new species, *Hexapus granuliferus* Campbell & Stephenson, 1970, *M. mica*, new species, *M. narusei*, new species, *M. ourabay*, new species, *M. propinqua*, new species, *M. secus*, new species, *M. sinensis*, new species, *Hexapus stephensi* Serène & Soh, 1976, and *M. streptophallus*, new species.

**Remarks.** Rathbun (1909) assigned her new species to *Lambdophallus* without any comments. Manning & Holthuis (1981) transferred *Lambdophallus anfractus* to *Hexapus* on the basis of the G1 shape, and the shape and extension of the male thoracic sternal groove. However, as discussed for *Mariaplax chenaе*, new species (see later), the form of the male thoracic sternal groove sometimes varies with the size of the specimen.

*Lambdophallus anfractus* shares a unique suite of third maxilliped, ambulatory leg, male abdominal and G1 characters with *Hexapus granuliferus* Campbell & Stephenson, 1970, and *H. stephensi* Serène & Soh, 1976, as well as 11 new species from the Indo-West Pacific. These characters argue for establishing a new genus *Mariaplax*, for these species.

*Mariaplax*, new genus, differs markedly from *Lambdophallus* in that it has slightly movable eyes, with globular corneas (versus immovable eyes with small corneas in *Lambdophallus*); the male telson is shorter than the sixth abdominal somite (Fig. 23C) (versus the telson is longer than the sixth abdominal somite in *Lambdophallus*, Alcock, 1902: pl. 62, fig. 1); and the G1 is usually twisted and S-shaped in *Mariaplax* (see Fig. 23F, G) (with the exception of *M. cyrtophallus*, new species and *M. secus*, new species) (versus sharply bent at a 90° angle and L-shaped in *Lambdophallus*, Alcock, 1902: pl. 62, fig. 1).

*Mariaplax* differs from *Hexapus* s. str. as follows: the third maxilliped of *Mariaplax* is broad, completely covering the buccal cavity, and the ischium is as broad as the merus (Fig. 23D) (the third maxilliped is longitudinally narrow, showing most of the underlying mouthparts, with the ischium much narrower than the merus in *Hexapus*, Fig. 4E); P2–P4 is relatively longer, with the merus usually possessing a shallow or deep longitudinal groove on the outer surface in *Mariaplax* (the groove on outer surface of P2–P4 is absent in *Hexapus*).

*Hexapinus* s. str. differs from *Mariaplax* in possessing a subauriculiform ischium of the third maxillipeds (Fig. 13C) (subtruncate or subquadrate ischium in *Mariaplax*, Fig. 23D), a male thoracic sternite 4 which is transversely narrower but longitudinally broader (Fig. 10B) (transversely broader but longitudinally narrower in *Mariaplax*, Fig. 23B, C), and the short P2–P4 with almost evenly convex lateral surface (Figs. 11A, 12A) (long P2–P4 with longitudinal groove on the outer surface of the merus in *Mariaplax*, Fig. 22A, C).

As discussed earlier, *Hexapus granuliferus* Campbell & Stephenson, 1970, originally placed in *Hexapinus* by Manning & Holthuis (1981), and *Hexapus stephensi* (Serène & Soh,

1976), which was placed in *Tritoplax* by Huang et al. (2002) and Ng et al. (2008), should be transferred to *Mariaplax*.

***Mariaplax anfracta* (Rathbun, 1909), new combination**  
(Figs. 22, 23)

*Lambdophallus anfractus* Rathbun, 1909: 113; Rathbun, 1910: 348, fig. 36; Guinot, 1979: fig. 33F.

*Hexapus anfractus* – Manning & Holthuis, 1981: 172, fig. 33; Ng et al., 2008: 86.

**Material examined.** Paratypes: **Thailand:** 1 male (5.0 × 3.2 mm), 1 female (6.1 × 4.0 mm), 1 ovigerous female (6.6 × 4.3 mm) (USNM 39752), west coast of Koh Chang, Gulf of Thailand, 6 fms, 26 January 1900. Others: **Thailand:** 1 female (5.2 × 3.4 mm) (ZRC 2012.1019), sand flat, Ko Sirae, Phuket, coll. T. Komai, 22 December 2009. **Malaysia:** 1 ovigerous female (4.1 × 2.8 mm) (ZRC 1965.11.24.6), Penang Strait.

**Diagnosis.** Carapace subquadrate about 1.5 times as broad as long, dorsal surface finely granulated, punctate with short pubescence; regions indistinct. Anterolateral margin arcuate, gently granular; posterolateral margin with protuberance, posterolateral corner with angled prominence over base of posterior pereopods. Orbit distinct, transverse; eye almost immovable. Pterygostomial region covered by granules and with row of 4 striae. Third maxillipeds broad, completely covering buccal cavity; ischium almost as long as broad, slightly longer than merus, with scattered granules, mesial margin straight; exopod narrow. Chelipeds asymmetrical, major chela slightly gaping when fingers closed; large teeth on cutting edge of dactylus and fixed finger; minor chela with relatively wider gap when fingers closed. P2–P4 tomentose, surfaces granulated, P3 stoutest, longest; merus of P4 2.5 times as long as broad, with distinct median groove on lateral surface. Male thoracic sternum relatively broad, surface finely granular; deep, wide transverse groove extends obliquely from edge of sternoabdominal cavity, subparallel to frontal margin, not reaching base of chelipeds. Sternoabdominal cavity reaching distal margin of thoracic sternite 4. Male abdomen relatively narrow, surface granular, somites 1 and 2 free; somites 3–5 fused, lateral margin slightly arched; somite 6 as long as wide, lateral margin expanded into blunt triangular projection subproximally; telson subtriangular, distal margin rounded, sparsely setose. G1 S-shaped, distal part tapered, sparse short setae present medially; distal part exposed on thoracic sternal groove, not concealed under abdomen. Female abdomen relatively broad, with 6 somites free and telson.

**Description.** Carapace subquadrate about 1.5 times as broad as long, dorsal surface finely granulated, punctate with short pubescence; regions indistinct, with shallow median H-shaped depression (Fig. 22A, C). Anterolateral margin arcuate, gently granular; posterolateral margin with protuberance, posterolateral corner with angled prominence over base of posterior pereopods (Figs. 22A, C, 23A). Front deflexed, divided into 2 lobes, not projecting beyond edge of orbits (Fig. 22B). Orbit distinct, transverse; eye almost immovable, small, cornea pigmented, wider than peduncle. Pterygostomial

region covered by granules and with row of oblique striae. Third maxillipeds broad (Fig. 23D), completely covering buccal cavity; ischium almost as long as broad, slightly longer than merus, with scattered granules, mesial margin straight, narrow proximal part very short, about one-tenth length of ischium, dactylus, propodus and carpus cylindrical, dactylus longer than propodus, combined length of dactylus, propodus and carpus slightly longer than that of merus and ischium; exopod narrow, about 0.4 times width of ischium slightly granular, flagellum well developed.

Chelipeds asymmetrical (Fig. 22B). Major chela (Fig. 23E) slightly gaping when fingers closed; large teeth present on cutting edge of dactylus and fixed finger; outer surface of dactylus with shallow, narrow groove medially, small granules and sparse setae present proximally; inner surface near upper margin with longitudinal ridge; palm almost as long as wide or slightly longer than wide, surface finely tuberculate; carpus glabrous dorsally, inner angle blunt, unarmed; merus short, unarmed, fringe of setae dorsomesially. Minor chela with relatively wider gap when fingers closed; cutting edge of

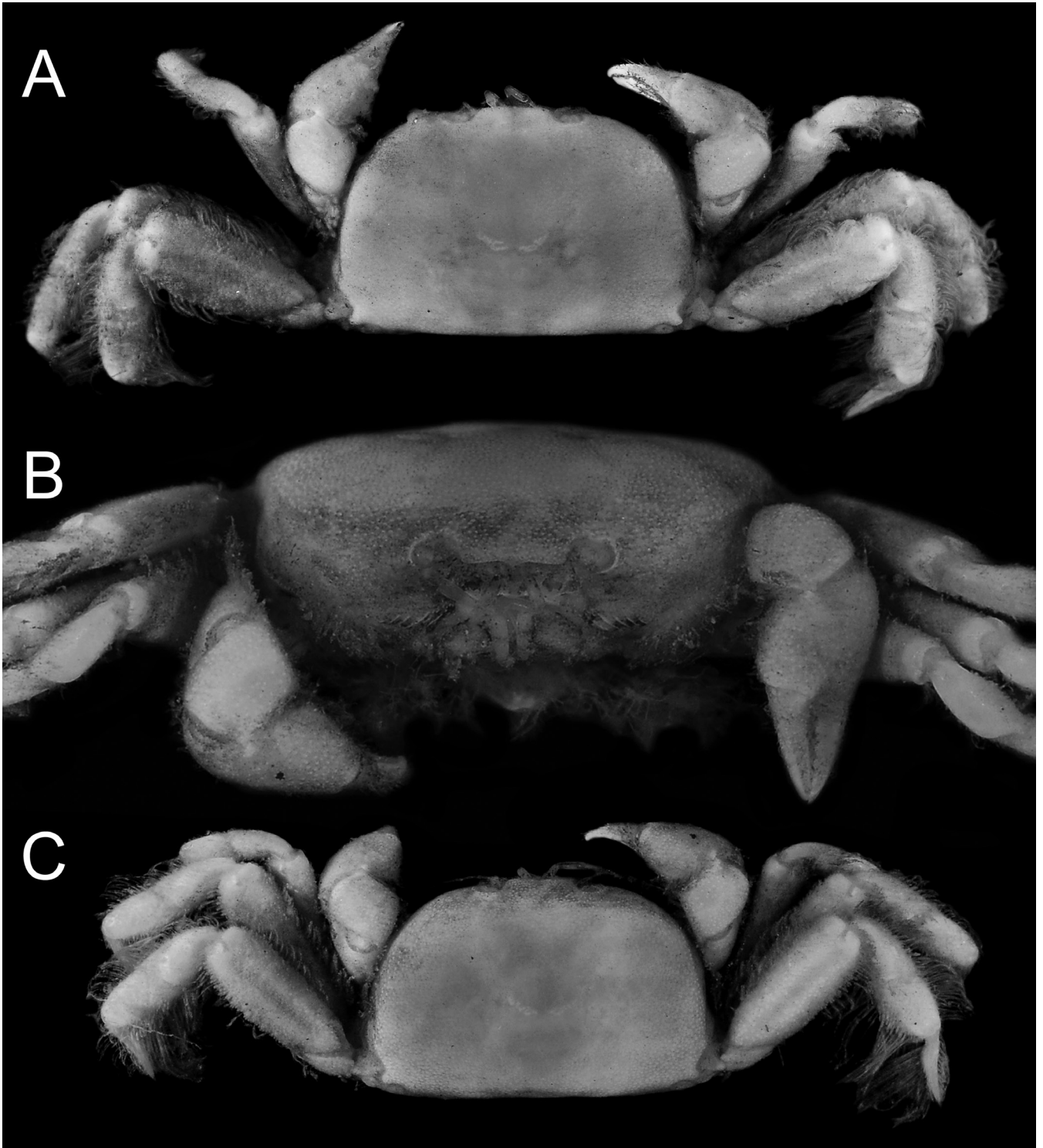


Fig. 22. *Mariaplax anfracta* (Rathbun, 1909). A, B, paratype female (6.1 × 4.0 mm) (USNM 39752); C, paratype male (5.0 × 3.2 mm) (USNM 39752). A, C, overall views of carapace, chelipeds and P2–P4; B, frontal view of cephalothorax.

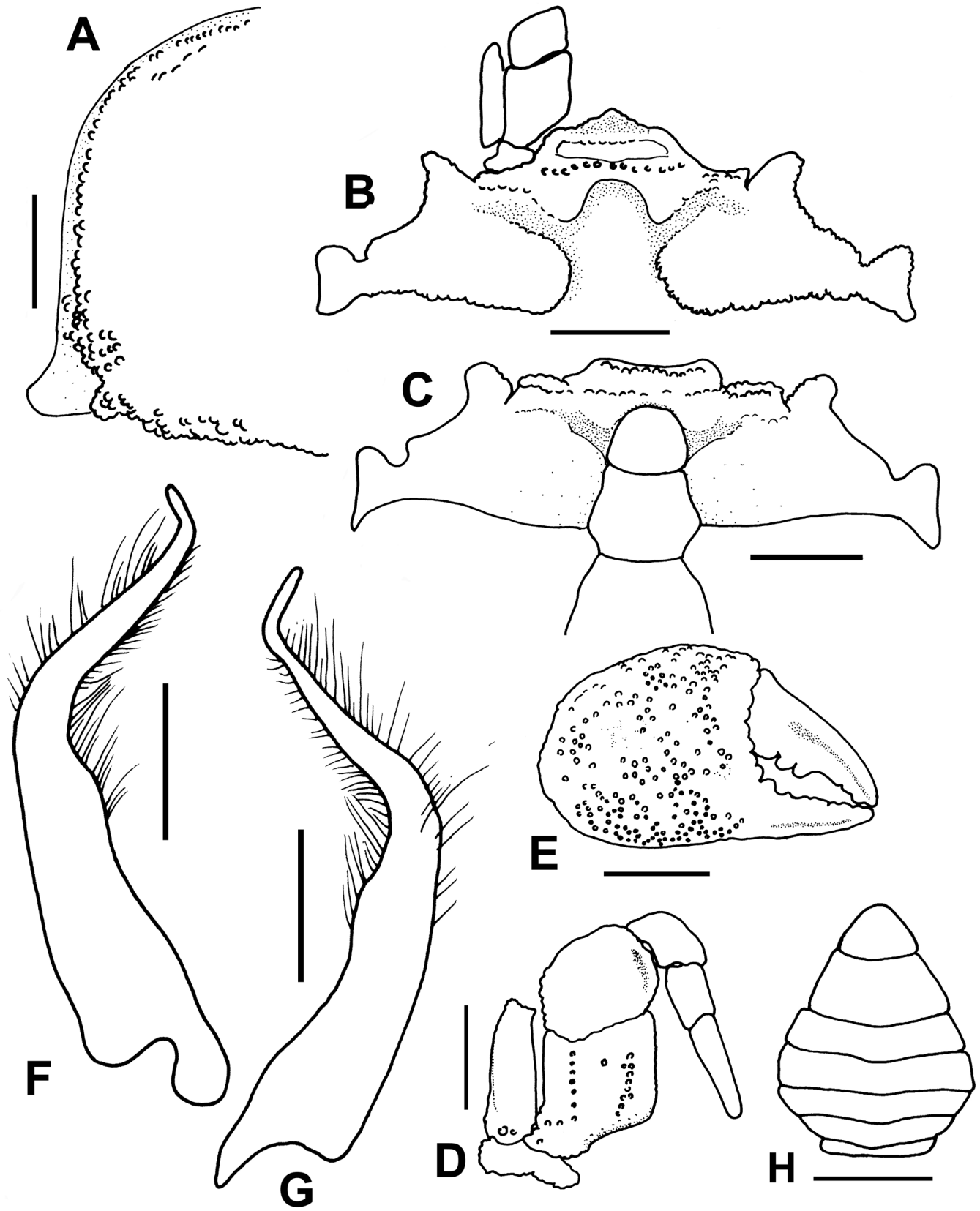


Fig. 23. *Mariaplax anfracta* (Rathbun, 1909). A–G, paratype male (5.0 × 3.2 mm) (USNM 39752); H, female (4.1 × 2.8 mm) (ZRC 1965.11.24.6). A, dorso-lateral margin of carapace; B, thoracic sternites 1–4, showing sternoabdominal cavity and thoracic sternal groove; C, thoracic sternites 3 and 4, showing thoracic sternal groove and telson; D, right third maxilliped; E, major chela; F, G, G1; H, female abdomen and telson. Scale bars = 1.0 mm.

dactylus and fixed finger with row of moderately large teeth; dactylus with tubercles on upper half of outer surface; inner surface with longitudinal ridge near upper margin; outer surface of fixed finger with longitudinal ridge; dorsal surface of palm covered by granules, carpus and merus unarmed, fringe of sparse setae on each dorsomesial margin.

P2–P4 tomentose, surfaces granular (Fig. 22A, C). P2 most slender; dactylus gently upcurved, fringe of long setae on upper and lower margins, slightly shorter than propodus; propodus with row of tiny tubercles on upper and lower margins with long setae; carpus longer than propodus, unarmed, tufts of setae distally; merus twice length of carpus, upper and lower outer surface with rows of granules accompanied by tufts of long setae, shallow longitudinal groove on outer surface medially. P3 stouter and longer than P2; dactylus straight, longer than propodus; propodus and carpus with long setae on upper and lower margins, and most of upper outer surface; merus slightly more than twice length of carpus, upper and lower outer surfaces with rows of granules accompanied by tufts of long setae, shallow longitudinal groove on outer surface medially. P4 stouter and shorter than P3, dactylus gently upcurved; upper and lower outer surface of propodus and carpus with rows of granules obscured by tufts of long and short setae; merus slightly twice length of carpus, 2.5 times as long as broad, upper and lower outer surfaces with rows of granules obscured by tufts of long and short setae, shallow longitudinal groove on outer surface medially.

Male thoracic sternum relatively broad (Fig. 23B, C), surface finely granular; sternites 1 and 2 fused, separated from sternite 3 by distinct ridge; sternite 3 separated from sternite 4 by distinct ridge; deep, wide transverse groove extends obliquely from edge of sternoabdominal cavity (Fig. 23B), thoracic sternal groove subparallel to frontal margin, not reaching base of chelipeds; sternite 8 exposed, rectangular, equal to length of male abdominal somite 1; sternoabdominal cavity reaching distal margin of thoracic sternite 4 (Fig. 23B). Male abdomen relatively narrow (Fig. 23C), surface granular, somites 1 and 2 free; somites 3–5 fused, lateral margin slightly arched; somite 6 as long as wide, lateral margin expanded into blunt triangular projection subproximally; telson subtriangular, distal margin rounded, sparsely setose (Fig. 23C).

G1 (Fig. 23F, G) S-shaped, distal part tapered, sparse short setae present medially; distal part exposed on thoracic sternal groove, not concealed under abdomen.

Female abdomen relatively broad, with 6 free somites and subtriangular telson (Fig. 23H).

**Colour.** Not known.

**Remarks.** *Mariaplax anfracta*, new combination, is a small sized species. One paratype female and a non-type female from Penang, both ovigerous, measured less than 7 mm in carapace width.

Records of “*Hexapus anfractus*” from China by Huang (1994: 592) and Yang et al. (2008: 772) cannot be reliably identified and are probably mixed. Specimens from China we have examined that have been identified as this species belong to two new species, *Mariaplax chenae* and *M. sinensis*.

**Type locality.** West coast of Koh Chang, Gulf of Thailand.

**Distribution.** Gulf of Thailand, Phuket; and Penang Strait, Malaysia. Intertidal to 12 m.

### *Mariaplax chenae*, new species

(Figs. 1H, 24–27)

*Hexapus (Hexapus) granuliferus* – Dai et al., 1986: 388, pl. 56(5), text fig. 205(1-2); Dai & Yang, 1991: 418, pl. 56(5), text fig. 205(1-2). (not *Hexapus granuliferus* Campbell & Stephenson, 1970)

*Hexapus granuliferus* – Liu & He, 2007: 149, unnumbered figure. (not *Hexapus granuliferus* Campbell & Stephenson, 1970)

*Hexapinus granuliferus* – Yang et al., 2008: 771.

*Hexapus (Lambdophallus) anfractus* – Sakai, 1976: 554, pl. 196, fig. 3. (not *Lambdophallus anfractus* Rathbun, 1909)

**Material examined.** Holotype: male (9.2 × 6.1 mm) (IOCAS), station 1066 (R578B-23), coastal waters of Zhejiang Province, East China Sea, China, 39 m, soft mud, coll. AT & J. Xu, 27 August 1960. Paratypes: **China:** 1 male (4.0 × 2.7 mm) (ZRC 2012.1020), station 9 (K 56A-7), Jiaozhou Bay, southern coast of Shandong Peninsula, Yellow Sea, very likely 36°06'N 120°17'E, 11 m, soft mud, 5 September 1979; 1 female (5.3 × 3.5 mm) (ZRC 2012.1021), station 23 (WC38B-10), coastal water outside Dongtou Island, Zhejiang Province, East China Sea, 4 m, soft mud, coll. AT, Y. Cui & Y. Wu, 8 October 1979; 1 male (5.3 × 3.6 mm) (ZRC 2012.1022), station 29 (WC26B-56), coastal waters outside Dongtou Island, Zhejiang Province, East China Sea, 12 m, soft mud, coll. AT, Y. Cui & Y. Wu, 3 October 1979; 2 males (9.9 × 6.7 mm, 7.1 × 4.8 mm), 1 female (8.2 × 5.4 mm) (ZRC 2012.1023), off Xiamen, Fujian Province, soft mud, 13 Aug. 1981. Others: **China:** 1 female (4.4 × 2.3 mm) (ZRC 2012.1024), station 817, Wutong, Xiamen, Fujian Province, mud, 5 m, coll. 18 May 1981; 1 female juvenile (3.3 × 2.1 mm) (ZRC 2012.1025), station 4071, East China Sea, soft mud, 8 mm, coll. Y. Cui, 10 December 1979; 1 female (6.0 × 4.0 mm) (ZRC 2012.1026), East China Sea, soft mud, 20 m, coll. Y. Cui, 14 December 1979; 1 female (6.4 × 4.3 mm) (ZRC 2012.1027), station 40, Jiaozhou Bay, Qingdao, Shandong, soft mud, 12 m, coll. Y. Cui, 7 September 1979; 1 female (5.0 × 3.4 mm) (ZRC 2012.1028), station 819, Wutong, Xiamen, Fujian Province, mud, 6 m, 15 July 1981; 2 females (7.7 × 5.2 mm, 8.6 × 5.8 mm) (ZRC 2012.1029), Xiamen Harbour, Fujian Province, February 1988; 2 females (4.4 × 2.5 mm, 4.5 × 2.9 mm) (ZRC 2012.1030), Xiamen Harbour, Fujian Province, coll. April 1988. **Japan:** 1 female (10.8 × 7.5 mm) (NSMT-Cr. 8229), Suo-nada Sea, Seto Inland Sea, coll. T. Habe; 1 male (9.5 × 6.5 mm) (ZRC 1970.1.20.26), Anake Bay, Nagasaki, coll. T. Sakai, 1967; 1 female (NSMT-Cr 6894), Amakusa, Ike-jima Island, Matsu-shima, coll. Y. Fukuda, 10 June 1979.

**Diagnosis.** Carapace subquadrate, about 1.5 times as broad as long, dorsal surface granulated; regions indistinct, median H-shaped depression shallow (Figs. 24A, 25A). Eye small, slightly movable, cornea not pigmented (Fig. 24B). Pterygostomial region with long and short, oblique striae and



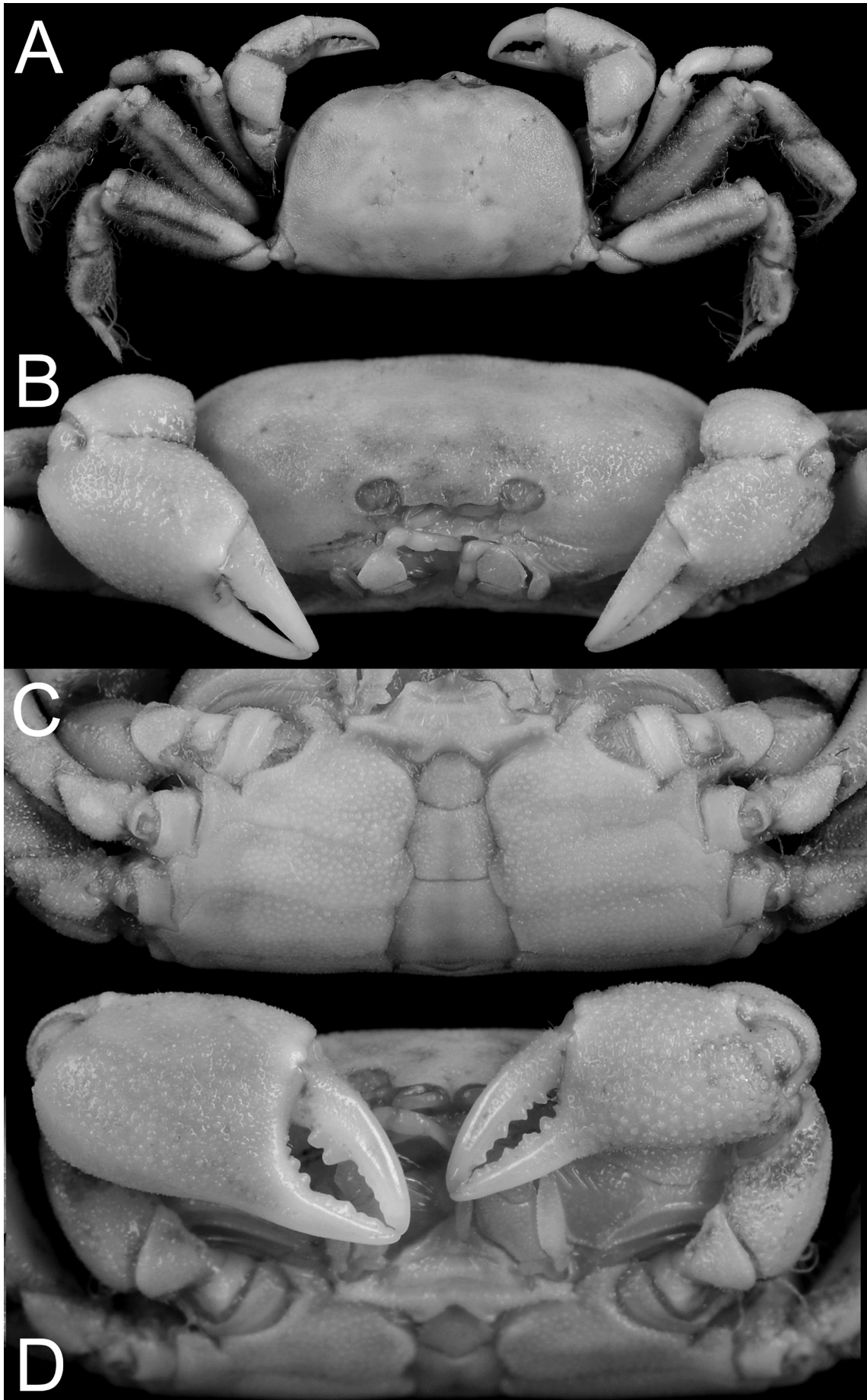


Fig. 24. *Mariaplax chenae*, new species, holotype male (9.2 × 6.1 mm) (IOCAS). A, overall view of carapace, chelipeds and P2–P4; B, frontal view of cephalothorax; C, abdomen and telson; D, chelae.

scattered tubercles (Fig. 25B). Third maxillipeds relatively broad, almost completely covering buccal cavity (Figs. 25E, 26D, 27F); ischium longer than merus, distalmost mesial margin slightly rounded, median part of mesial margin straight; combined length of dactylus, propodus and carpus

shorter than that of merus and ischium; exopod relatively narrow, about 0.4 width of ischium, flagellum well developed. Chelipeds stout, unequal (Fig. 24D); major chela (Fig. 25G) with gap when fingers closed; dactylus and fixed finger with shallow longitudinal groove on outer surface; palm almost as

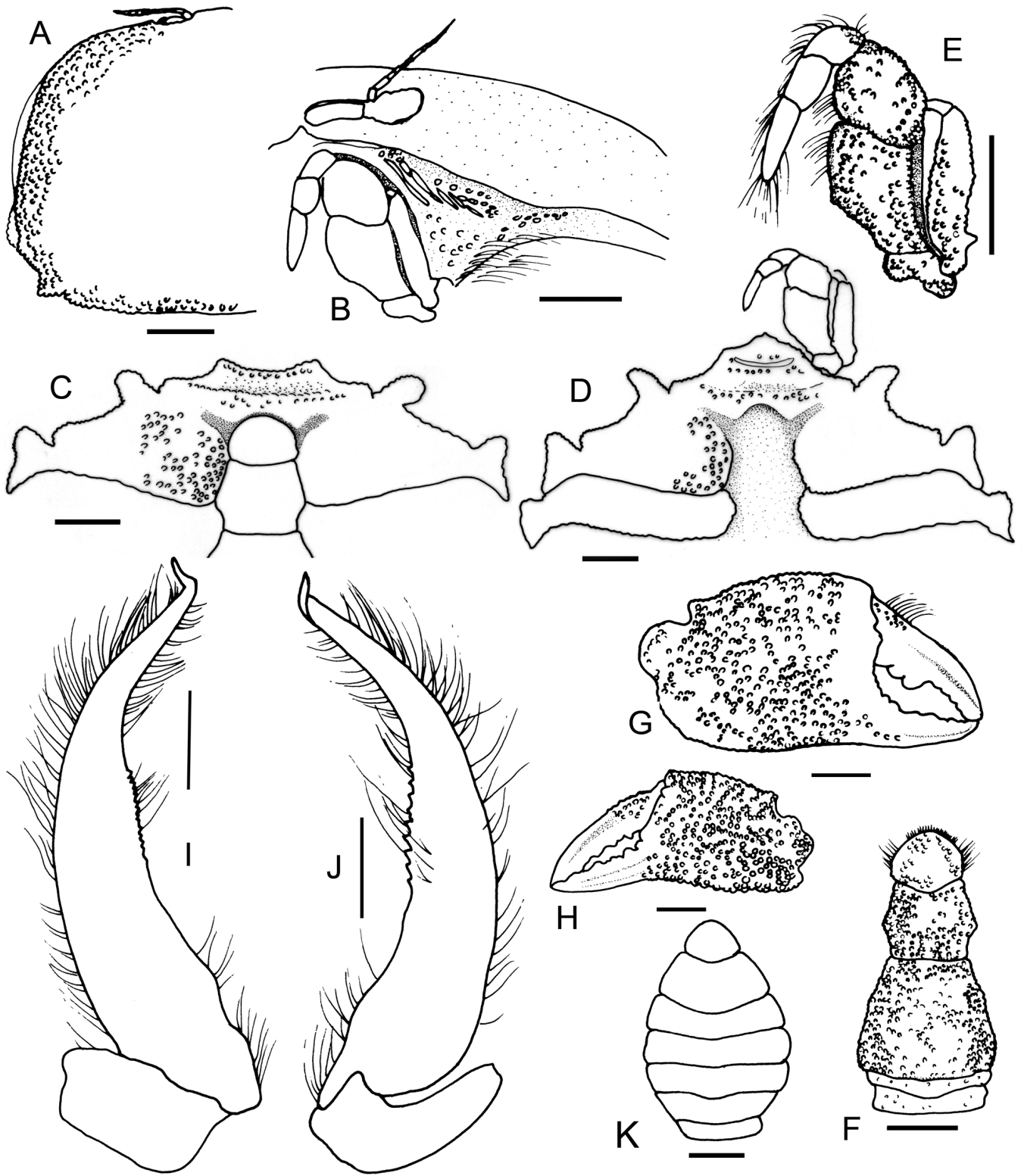


Fig. 25. *Mariaplax chenae*, new species, A–J, holotype male (9.2 × 6.1 mm) (IOCAS); K, paratype female (8.2 × 5.4 mm) (ZRC 2012.1023). A, dorso-lateral margin of carapace; B, anterior view of cephalothorax; C, thoracic sternites 3 and 4, showing thoracic sternal groove and telson; D, thoracic sternites 1–5, showing sternoabdominal cavity and thoracic sternal groove; E, left third maxilliped; F, male abdomen and telson, G, major chela; H, minor chela; I, J, G1; K, female abdomen and telson. Scale bars = 1.0 mm.

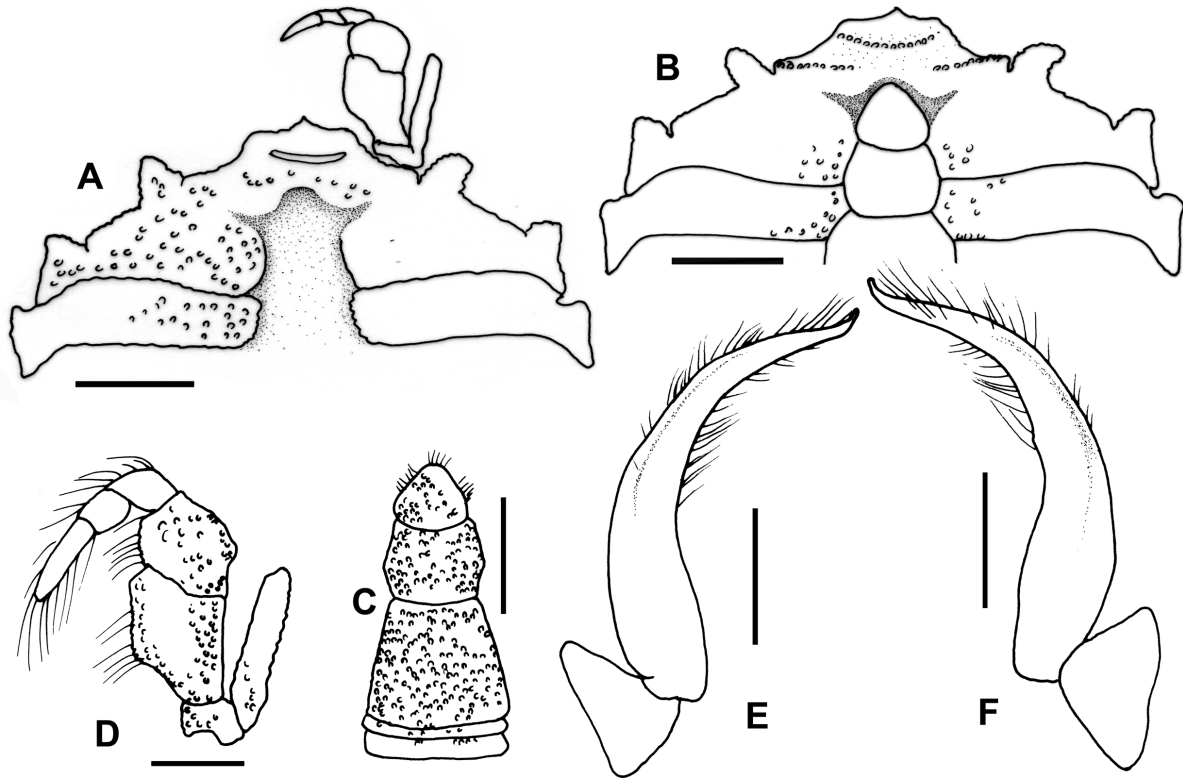


Fig. 26. *Mariaplax chenaie*, new species, paratype male (5.3 × 3.6 mm) (ZRC 2012.1022). A, thoracic sternites 1–5, showing sternoabdominal cavity and thoracic sternal groove; B, thoracic sternites 1–5, showing thoracic sternal groove and telson; C, male abdomen and telson; D, left third maxilliped; E, F, G1. Scale bars = 1.0 mm.

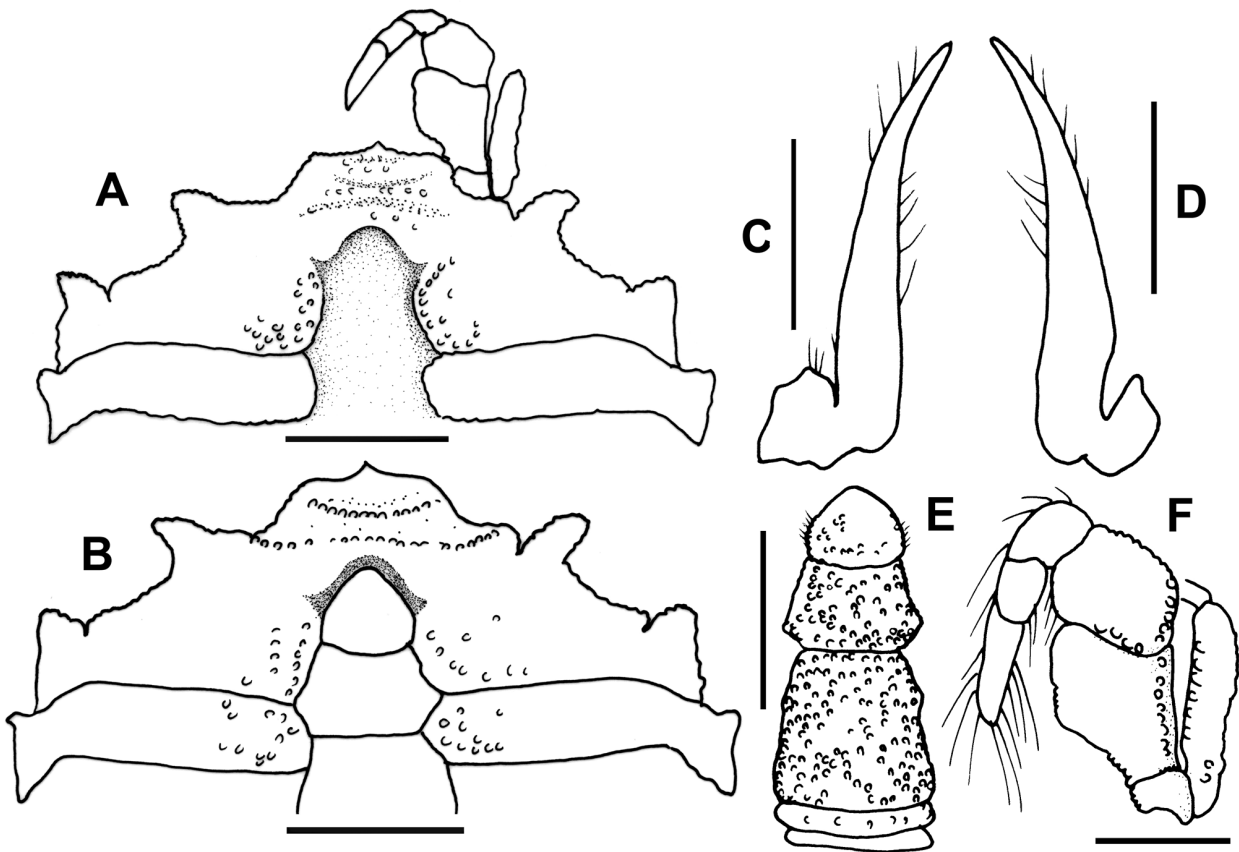


Fig. 27. *Mariaplax chenaie*, new species, paratype male (4.0 × 2.7 mm) (ZRC 2012.1020). A, thoracic sternites 1–5, showing sternoabdominal cavity and thoracic sternal groove; B, thoracic sternites 1–5, showing thoracic sternal groove and telson; C, D, G1; E, male abdomen and telson; F, left third maxilliped. Scale bars = 1.0 mm.

long as broad covered by tubercles; minor chela (Fig. 25H) with relatively smaller gap when fingers closed. P2–P4 (Fig. 24A) short, relatively slender; merus of P4 3 times as long as broad, tubercles on upper and lower halves of outer surface, separated by longitudinal groove; dactylus of P4 slightly upcurved. Male thoracic sternum relatively broad (Figs. 24C, 25C, D); sternites 1 and 2 fused, separated from sternite 3 by distinct ridge; sternite 3 separated from sternite 4 by distinct ridge laterally, medially appearing fused, thoracic sternal groove extends obliquely from sternoabdominal cavity, not reaching base of third maxillipeds (Figs. 24C, 25D); sternite 8 exposed, subrectangular, as long as abdominal somite 1; sternoabdominal cavity reaches middle to sternite 4. Male abdomen relatively narrow (Figs. 24C, 25F); somites 1 and 2 free, somites 3–5 fused, lateral margin slightly sinuous; somite 6 shorter than length of somites 3–5, lateral margin expanded subproximally, forming triangular projection; telson subtriangular, distal margin rounded, sparsely setose. G1 (Fig. 25I, J) S-shaped distally, directed anterolaterally, distal part tapering, slightly twisted, apice not concealed under abdomen, row of spinules on midlength laterally, long setae on mesial and lateral margins. Female abdomen relatively narrow, 6 free somites and telson (Fig. 25K).

**Variation.** In larger individuals of *M. chenae*, new species (e.g., 9.2 × 6.1 mm, holotype, IOCAS), the male thoracic sternal groove is relatively wider and longer, oblique, and reaching the middle of sternite 4 (Fig. 25C, D), and the G1 is curved medially with the tip twisted (Fig. 25I, J). In a small individual (5.3 × 3.6 mm, ZRC 2012.1022), the thoracic sternal groove is slightly wider, shorter and oblique, but not reaching the middle of sternite 4 (Fig. 26A, B), the G1 curved at midlength, without row of spinules and the tip is only slightly twisted (Fig. 26E, F). In an even smaller individual (4.0 × 2.7 mm, ZRC 2012.1020), the thoracic sternal groove is very short, oblique, and barely extends from the sternoabdominal cavity into sternite 4 (Fig. 27A, B), with the G1 only slightly curved, tip not twisted (Fig. 27C, D). The shape of male abdomen, however, does not vary substantially with size (Figs. 25F, 26C, 27E).

**Colour.** Carapace, cheliped and pereopods uniformly yellowish-brown (Fig. 1H).

**Etymology.** The species is named after the late Chen Hui-Lian, a doyen of Chinese crab taxonomy and a good friend. She had in fact passed the present material to the second author many years ago as part of an anticipated broader study of Asian hexapodids. However, this was never realised with her untimely death.

**Remarks.** *Mariaplax chenae*, new species, resembles *M. anfracta* in having closely spaced tubercles on the carapace and cheliped, and the rounded distal margin of the telson. However, there are differences in the shapes of the third maxillipeds and G1s. In *M. chenae*, the ischium of the third maxilliped is obviously longer than the merus, the lateral and mesial margins along the distal half of the ischium are parallel, with distalmost mesial margin slightly rounded, the proximal half being narrow (Figs. 25E, 26D, 27F). In *M.*

*anfracta*, the ischium is only slightly longer than merus, and although the lateral and mesial margins of the ischium are parallel, the narrow proximal part is very short, only about one-tenth the length of the ischium (Fig. 23D). Although the G1 of *M. chenae* varied with individual size, the difference is noticeable in the same size male individual of both species. The G1 of *M. chenae* (male, 5.3 × 3.6 mm, ZRC 2012.1022) is stout, tapering to twisted tip (Fig. 26E, F) while in *M. anfracta* (male, 5.0 × 3.2 mm, USNM 39752), the G1 is more slender, sinuous, the bent tip is longer, but not clearly twisted (Fig. 23F, G).

Significantly, *M. anfracta* s. str. is also a much smaller species, with males measuring 5.0 × 3.2 mm (USNM 39752) already mature, and females measuring 4.1 × 2.8 mm (ZRC 1965.11.24.6) already ovigerous. Female specimens of *M. chenae* of similar sizes are still immature.

The Chinese records of “*Hexapus granuliferus*” by Dai et al. (1986), Dai & Yang (1991) and Liu & He (2007), as well as the Japanese records of “*Hexapus (Lambdophallus) anfractus*” by Sakai (1976) are almost certainly *M. chenae*. The figures provided in these references agree very well with what is here diagnosed for this species.

**Type locality.** Coastal waters of Zhejiang Province, East China Sea, China.

**Distribution.** East China Sea and Japan. Subtidal, 4–39 m.

***Mariaplax cyrtophallus*, new species**  
(Figs. 28, 29)

**Material examined.** Holotype: male (6.5 × 4.2 mm) (MZB), off Otakwa, Timika, Papua, Indonesia, near 05°01'32"S 137°10'56.7"E, coll. A. Haris, 7 November 2000.

**Diagnosis.** Carapace subquadrate, about 1.5 times as broad as long, dorsal surface strongly granulated; regions indistinct, with H-shaped shallow depression medially (Figs. 28A, 29A). Eye small, slightly movable, cornea black, wider than granular peduncle. Pterygostomial region (Figs. 28B, 29D) covered by granules, with row of 5 oblique striae. Third maxillipeds broad (Figs. 28B, 29E), completely covering buccal cavity; ischium slightly longer than merus, slightly expanded subproximally, with oblique mesial margin, combined length of dactylus, propodus and carpus almost as long as that of merus and ischium; exopod relatively narrow, about 0.4 width of ischium, flagellum well developed. Chelipeds asymmetrical, covered by closely spaced tubercles (Fig. 29G, H); major chela (Fig. 29G) with slightly gaping finger when closed; dactylus and fixed finger with longitudinal ridge at midline distally; palm slightly shorter than broad; minor chela (Fig. 29H) with narrow gap when fingers closed; dactylus and fixed finger with median longitudinal ridge distally. P2–P4 (Fig. 29I) relatively long, slender, covered by dense granules; P3 longest (Fig. 29I); merus of P4 relatively long, about 3.4 times as long as broad; dactylus of P4 gently upcurved (Fig. 29J); merus without discernible distinct median groove on lateral surface (Fig. 29J). Male thoracic sternum broad

(Fig. 29B, C), surface prominently granular; sternites 1 and 2 fused, separated from sternite 3 by distinct furrow; sternite 3 separated from sternite 4 laterally, medially appear fused, thoracic sternal groove deep, transverse, extending laterally from edge of sternoabdominal cavity, parallel to frontal margin, not reaching base of chelipeds (Figs. 28B, 29C); sternite 8 exposed, quadrangular, as long as male abdominal somite 1; sternoabdominal cavity not reaching middle to sternite 4 (Fig. 29C). Male abdomen relatively narrow (Fig. 29F), surface granular; somites 1 and 2 free,

somites 3–5 fused, lateral margin slightly arched; somite 6 shorter than length of somites 3–5, median part of lateral margin expanded into blunt triangular projection; telson subpentagonal (Figs. 28B, 29F), slightly shorter than somite 6, distal margin rounded, sparsely setose. G1 (Fig. 29J, K) bent 90° at midlength, directed anterolaterally, distal part tapered, not concealed under abdomen, exposed on thoracic sternal groove. Female unknown.

**Colour.** Dirty white when freshly preserved.

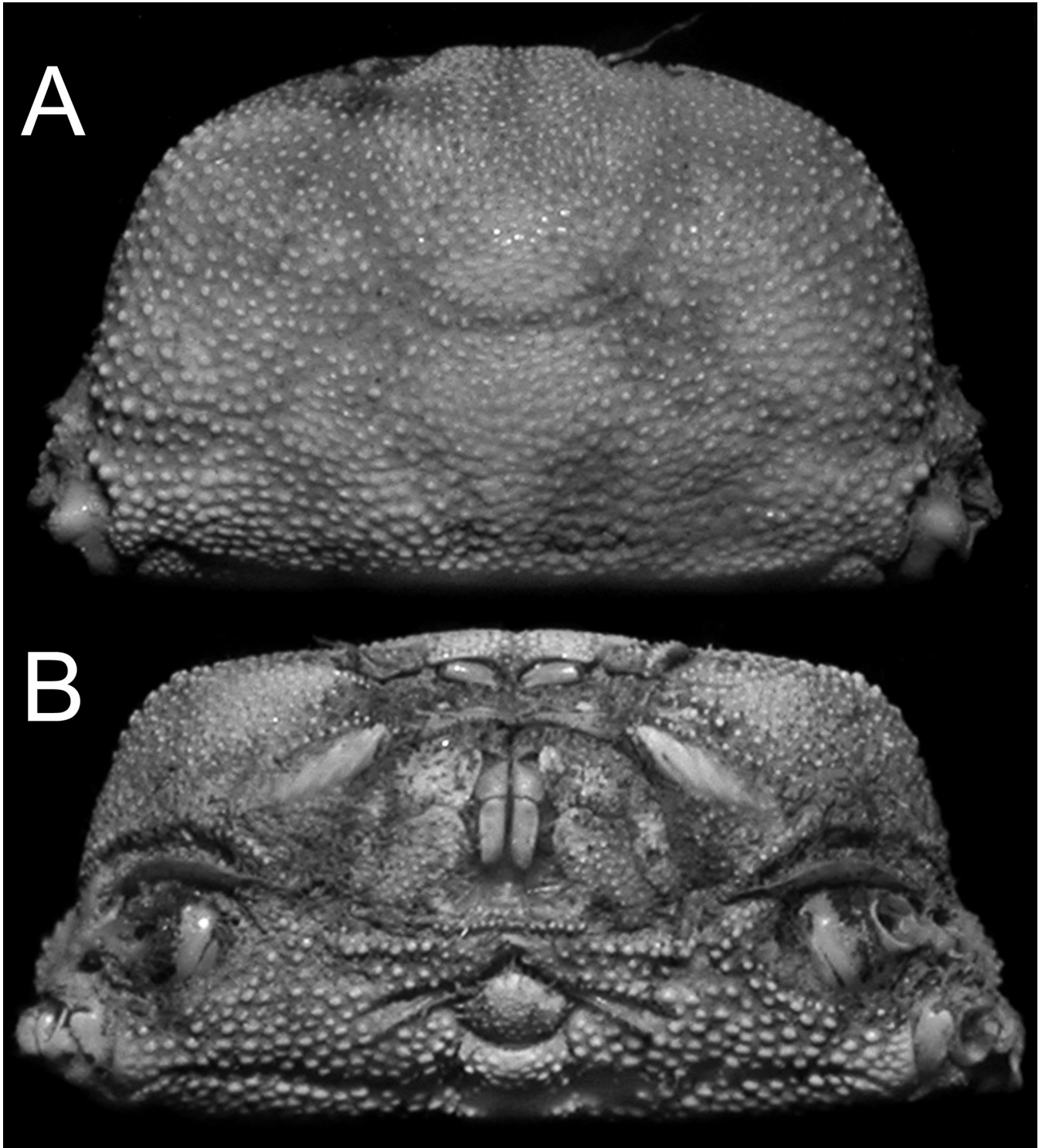


Fig. 28. *Mariaplax cyrtophallus*, new species, holotype male (6.5 × 3.8 mm) (MZB). A, dorsal view carapace; B, ventral view of cephalothorax.

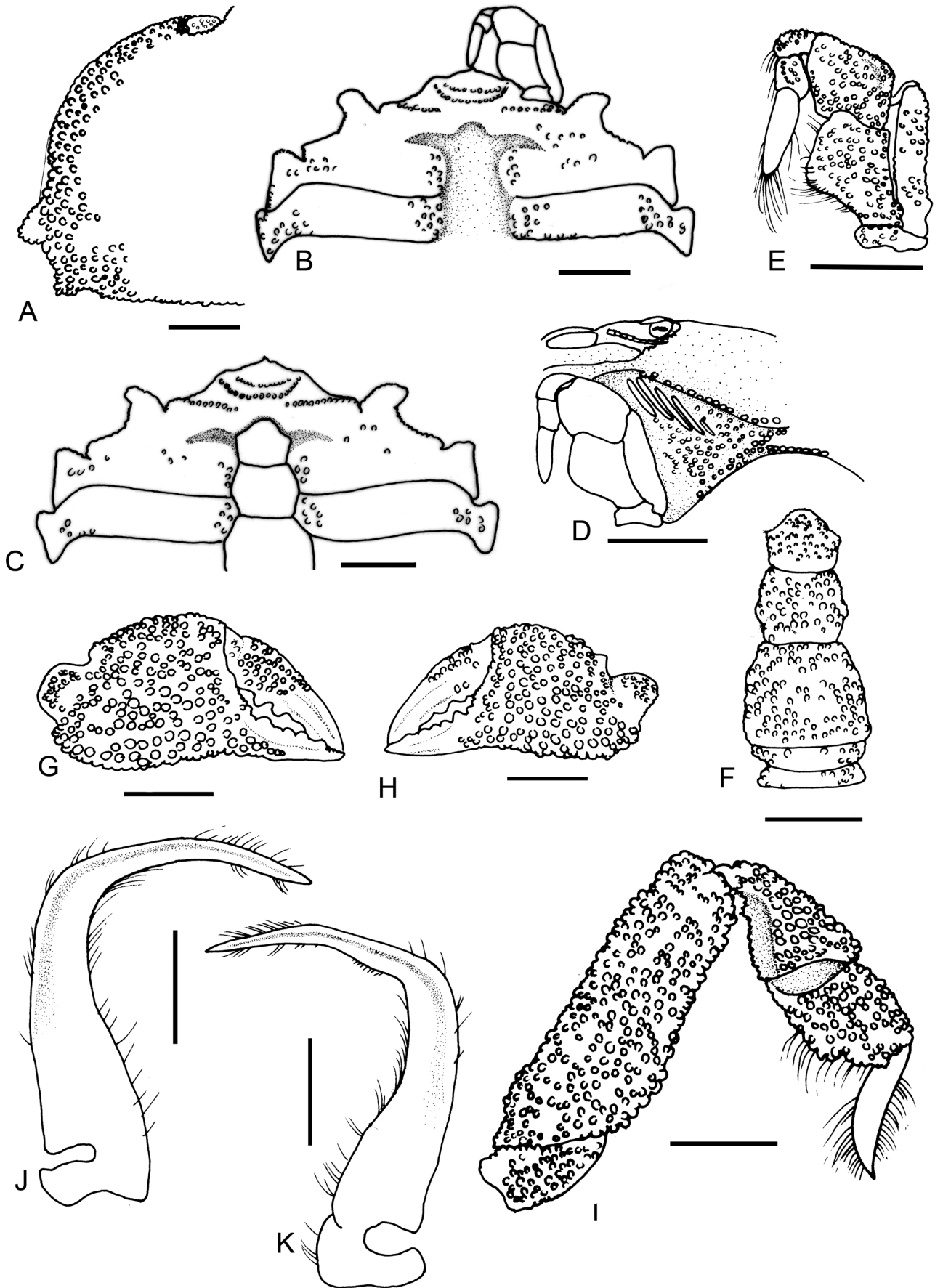


Fig. 29. *Mariaplax cyrtophallus*, new species, holotype male (6.5 × 3.8 mm) (MZB). A, dorso-lateral margin of carapace; B, thoracic sternites 1–5, showing sternoabdominal cavity and thoracic sternal groove; C, thoracic sternites 1–5, showing thoracic sternal groove and telson; D, anterior view of cephalothorax; E, left third maxilliped; F, male abdomen and telson; G, major chela; H, minor chela; I, left P4; J, K, left G1. Tubercles on thoracic sternum omitted. Scale bars = 1.0 mm.

**Etymology.** From the Latin *cyрто*, bend, and *phallus*, for penis; alluding to the bent structure of the G1. The name is used as a noun in apposition.

**Remarks.** Several features of the present new species suggest its affinity to *Lambdophallus*, notably the transverse sternal groove extends a good distance laterally and is parallel to frontal margin, the G1 bent at a 90° angle, and the shape of the third maxilliped that is slightly expanded subproximally and has straight mesial margin. However, *Lambdophallus* has immovable and very short eyes peduncle, the third maxillipeds was rather narrow and leave wide gap between them, the male thoracic sternal groove starts above the articulation of the sixth abdominal somite and the telson was longer than the sixth somite (Alcock, 1902: pl. 62, fig. 1). These characters indicate that we cannot place this new species in *Lambdophallus*. Although the longitudinal groove on the outer surface of the merus of P2–P4 is indiscernible, obscured by tubercles, other characters such as the movable eyes peduncle, the male thoracic sternal groove that starts almost at subdistalmargin of the telson, the telson that was shorter than the sixth abdominal somite, and the oblique mesial margin of ischium of the third maxilliped clearly place this species in *Mariaplax*. The structure of the male thoracic sternal groove (Fig. 29B, C) and shape of the G1 of *M. cyrtophallus*, new species (Fig. 29I, J), however, easily distinguishes it from all congeners.

Unusual among members of the genus is that *M. cyrtophallus* does not have a discernible median groove on the lateral surface of the ambulatory merus. This is distinct in all other congeners, although it may be shallow at times. In *M. cyrtophallus*, the surface of the merus is covered with dense granules and no groove can be seen. In all other aspects, however, *M. cyrtophallus* is a typical *Mariaplax* species. It is apparently closest to *M. secus*, new species, from the other side of the island of New Guinea, which also has a similar strongly bent G1; but in *M. secus*, the lateral surface of the ambulatory merus has a distinct longitudinal groove (see discussion for that species).

**Distribution.** Timika, Papua, Indonesia. Intertidal, 15–30 m.

***Mariaplax daviei*, new species**  
(Figs. 30, 31)

*Hexapus sexpes* – Haswell, 1882: 71. (not *Cancer sexpes* Fabricius, 1798)

*Hexapus granuliferus* – Campbell & Stephenson, 1970: 286 (in part), fig. 49G, H. (not *Hexapus granuliferus* Campbell & Stephenson, 1970)

**Material examined.** Holotype: male (6.0 × 4.5 mm) (WAM C23270), Tasmania, Spring Bay, 42°33.00'S 147°55.50'E, 15 m, black mud and some fine shell, coll. R. S. Wilson, 23 April 1985. Paratypes: **Australia:** 3 females (5.1 × 3.9 mm, 6.2 × 4.9 mm, 6.8 × 5.0 mm) (WAM C23270), same locality as holotype; 2 females (4.6 × 3.3 mm, 3.8 × 2.6 mm), 1 ovigerous female (4.8 × 3.3 mm) (WAM), Jervis Bay, New South Wales, coll. P. Hutching, 5 June 1989.

**Diagnosis.** Carapace subquadrate, about 1.3–1.4 times as

broad as long, dorsal surface pubescent, finely granulated (Fig. 30A). Anterolateral margin arcuate; posterolateral corner with angled prominence over base of posterior pereopods (Figs. 30A, 31A). Eye small, slightly movable, cornea wider than peduncle. Pterygostomial region with oblique row of broken striae. Third maxillipeds broad, completely covering buccal cavity (Figs. 30C, 31D); mesial margin of ischium of third maxillipeds slightly rounded; combined length of dactylus, propodus and carpus subequal to that of merus and ischium; exopod narrow, 0.4 width of ischium, flagellum well developed. Chelipeds stout, unequal (Figs. 30D, E, 31F, G); major chela (Figs. 30D, 31F) with narrow gap when fingers closed, dactylus and fixed finger with shallow longitudinal groove on outer surface; palm pubescent, finely tuberculate, slightly wider than long; minor chela (Figs. 30E, 31G) with relatively wider gap when fingers closed; dorsal surface of palm covered by large tubercles and short pubescent. P2–P4 relatively long (Fig. 30A, B); merus of P4 3.7 times as long as broad; outer face with longitudinal groove and sparse short setae. Male thoracic sternum broad (Figs. 30B, C, 31B, C), sternites 1 and 2 fused, separated from sternite 3 by distinct ridge; sternite 3 not clearly delimited from sternite 4, thoracic sternal groove very short, slightly extend outward from sternoabdominal cavity; sternite 8 exposed, quadrangular, as long as male abdominal somite 1; sternoabdominal cavity not reaching base of sternite 3. Male abdomen relatively narrow (Figs. 30B, 31E); somites 1 and 2 free; somites 3–5 fused, lateral margin slightly arched; somite 6 slightly shorter than half length of somites 3–5, lateral margin expanded medially into blunt triangular projection; distal margin of telson rounded, setose. G1 (Fig. 31H, I) slightly curved medially, directed anterolaterally, distal part tapered, ended in blunt tip, not concealed under abdomen, exposed on thoracic sternal groove, obscured by setae of telson. Abdomen of female with 6 free somites and telson (Fig. 31J).

**Colour.** Not known.

**Etymology.** Named after our friend, Peter Davie, who provided important advice on the type material of *Hexapus granuliferus*.

**Remarks.** The holotype and male paratype of *H. granuliferus* described by Campbell & Stephenson (1970) are not conspecific, and should be referred to two separate species. The shape of the third maxilliped, structure of the G1, and the relative length of P2–P4 of both species, however, agree with *Mariaplax* as presently defined (see remarks for *M. granulifera*). The G1 of *M. daviei*, new species, resembles those of *H. simplex*, both are simple, arched, and without spinules. Nevertheless these two species cannot be placed in the same genus as the generic characters such as the strongly convex mesial margin of the ischium of the third maxilliped and the longitudinally broad sternite 4 in *Hexapinus*, are only slightly rounded mesial margin of ischium of the third maxilliped and transversally broad sternite 4 in *Mariaplax*.

**Type locality.** Spring Bay, Tasmania, Australia.

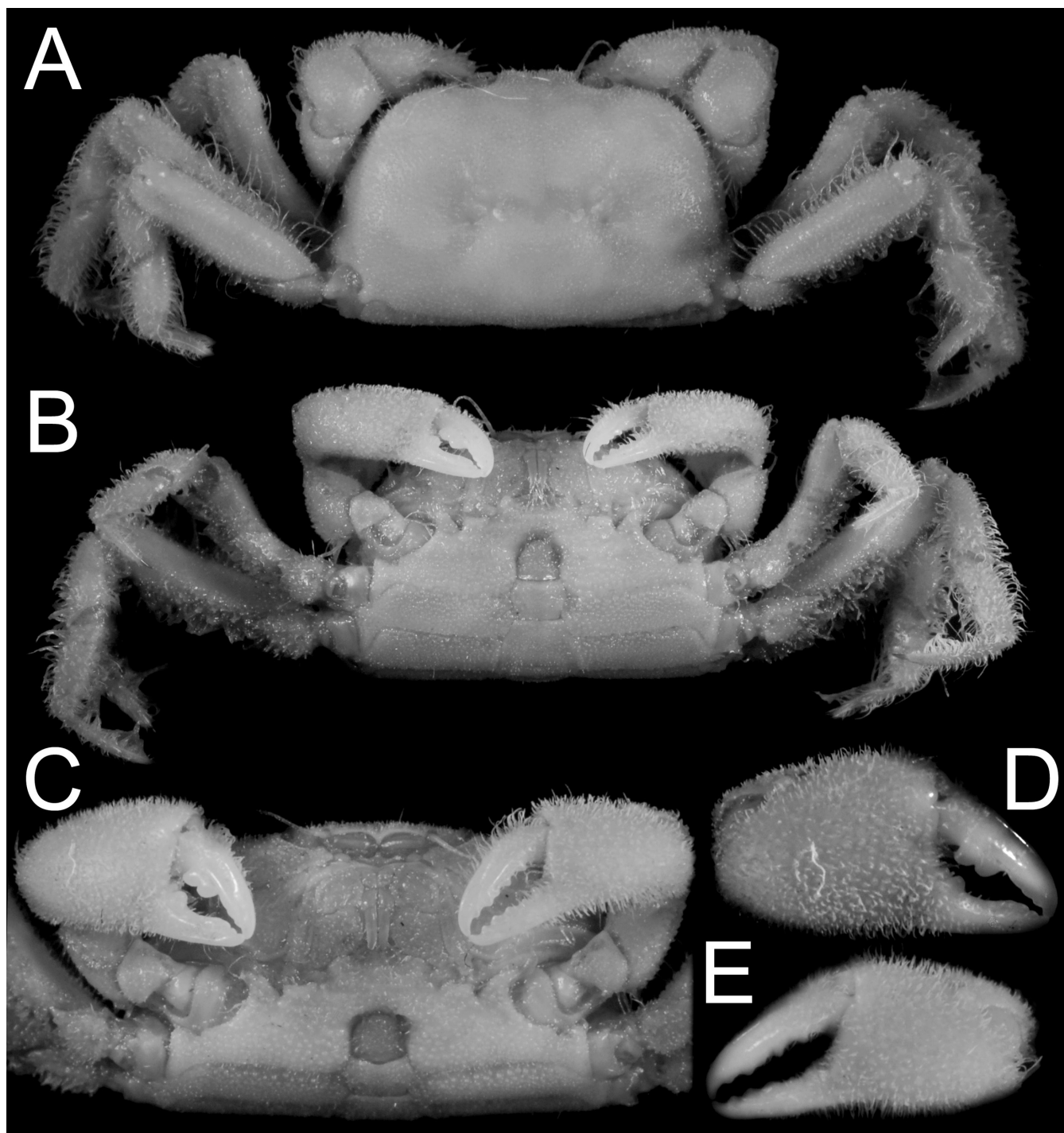


Fig. 30. *Mariaplax daviei*, new species, holotype male (6.0 × 4.5 mm) (WAM C23270). A, overall view of carapace, chelipeds and P2–P4; B, ventral view of cephalothorax; C, ventral view of cephalothorax showing third maxillipeds and telson, D, major chela; E, minor chela.

**Distribution.** Port Jackson, New Southwell and Tasmania, Australia; 15 m.

***Mariaplax galaxeae*, new species**  
(Figs. 1G, 32, 33)

**Material examined.** Holotype: female (4.2 × 3.2 mm) (ZRC 2013.1690), station TB99, Singapore Strait, 1°18'861N 104°05'128, 33.7–36.7 m, Singapore, coll. RV *Galaxea*, 28 May 2013.

**Diagnosis.** Carapace subquadrate, about 1.4 times as broad as long; dorsal surface covered by tubercles; regions indistinct

(Figs. 32A). Anterolateral margin arcuate; posterolateral corner with slight protuberance angle over base of posterior pereopods. Eye small, slightly movable, cornea globular (Fig. 32C). Pterygostomial region with row of long and short striae with scattered tubercles. Third maxillipeds relatively broad, almost completely covering buccal cavity (Figs. 32C, 33B); ischium of third maxillipeds longer than merus, with straight margin; combined length of dactylus, propodus and carpus slightly shorter than that of merus and ischium; exopod narrow, 0.3 times width of ischium, flagellum well developed. Chelipeds stout, unequal, covered by tubercles (Fig. 32B, C); major chela with gap when fingers closed,



large teeth on cutting edges; dactylus with shallow groove on outer surface, palm slightly wider than long; minor chela with narrow gap between closed fingers, smaller teeth on cutting edges; dactylus with shallow longitudinal groove medially. P2–P4 relatively long (Fig. 32A), long setae on anterior and posterior margin of dactylus, propodus, short setae on carpus and merus; merus of P4 about 2.6 times as long as broad, longitudinal groove on outer face; dactylus of P2 and P4 slightly upcurved, dactylus of P3 straight. Female thoracic sternum broad (Fig. 32B), covered by tubercles; sternites 1 and 2 fused, separated from sternite 3 by distinct ridge; sternite 3 and 4 fused, abdominal cavity reached distal margin of sternite 3. Female abdomen relatively broad (Figs. 32B, 33C); all somites and telson free; somite 6 slightly

longer than telson; telson with rounded tip, margin with sparse setae. Male unknown.

**Colour.** Carapace cream, mottled light and dark brown; chelipeds and P2–P4 light brown (Fig. 1G).

**Etymology.** Named after the Tropical Marine Science Institute research vessel “Galaxea”, which was used during Singapore Strait Expedition of the Comprehensive Marine Biodiversity Survey for collecting material.

**Remarks.** *Mariaplax galaxeae*, new species, resembles *M. cyrtophallus*, new species, and *M. mica*, new species, in having the carapace, chelipeds and P2–P4 strongly

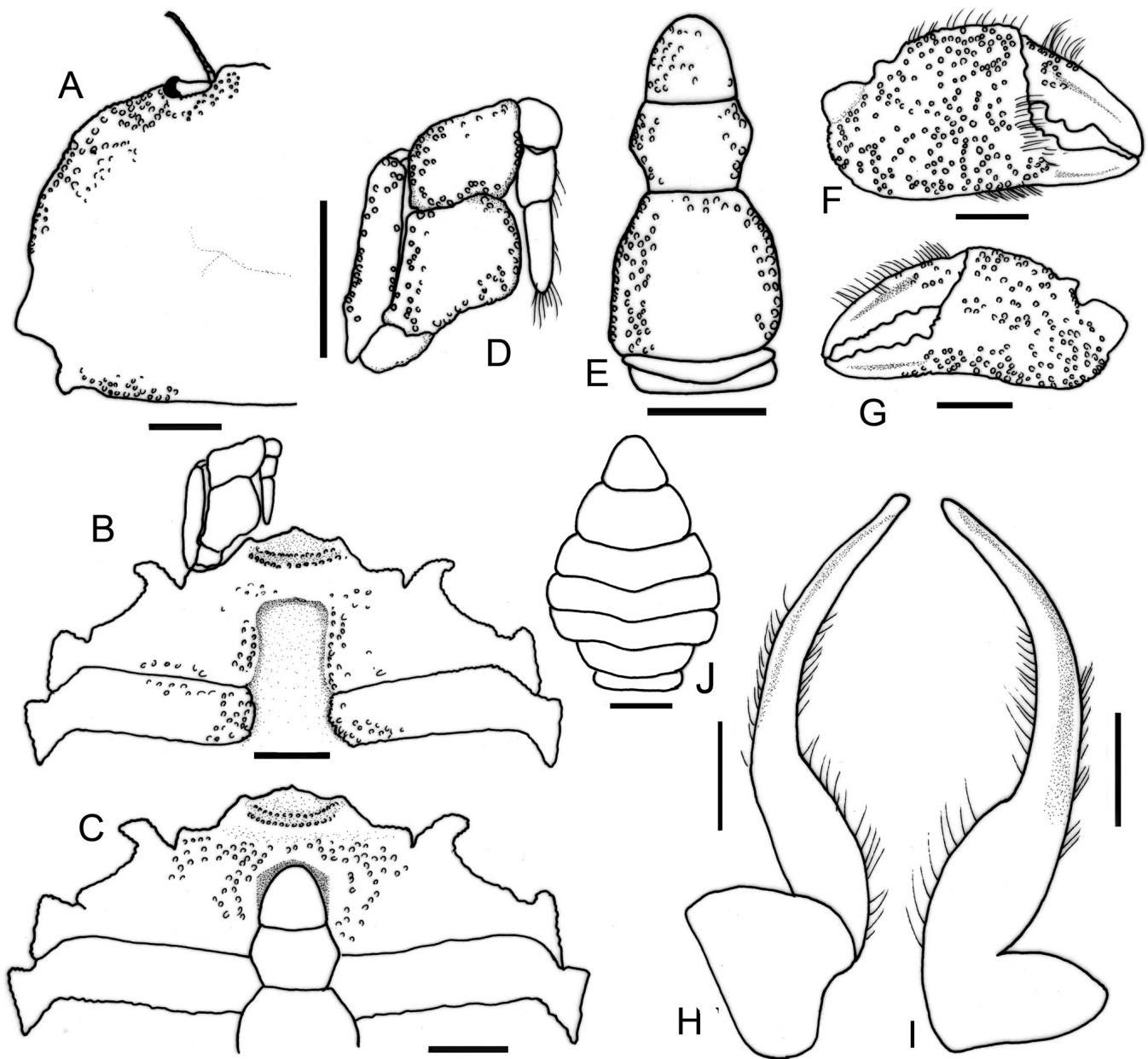


Fig. 31. *Mariaplax daviei*, new species. A–I, holotype male (6.0 × 4.5 mm) (WAM C23270); J, paratype female (6.2 × 4.9 mm) (WAM C23270). A, dorso-lateral margin of carapace; B, thoracic sternites 1–5, showing sternoabdominal cavity and thoracic sternal groove; C, thoracic sternites 1–5, showing thoracic sternal groove and telson; D, right third maxilliped; E, male abdomen and telson, F, major chela; G, minor chela; H, I, G1; J, female abdomen and telson. Scale bars = 1.0 mm.

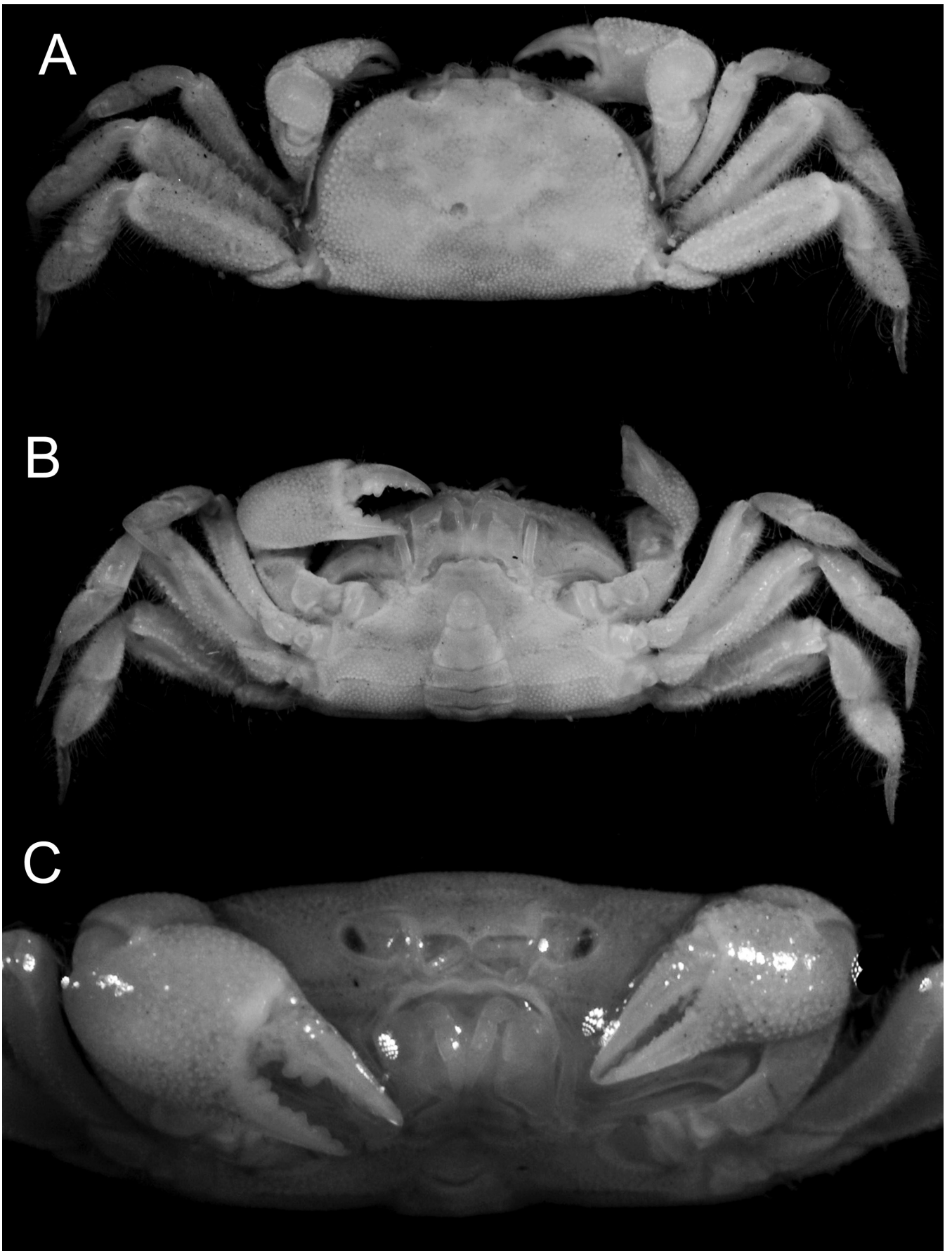


Fig. 32. *Mariaplax galaxeae*, new species, holotype female (4.2 × 3.2 mm) (ZRC 2013.1690). A, overall view of carapace, chelipeds and P2–P4; B, ventral view of cephalothorax; C, frontal view of cephalothorax.

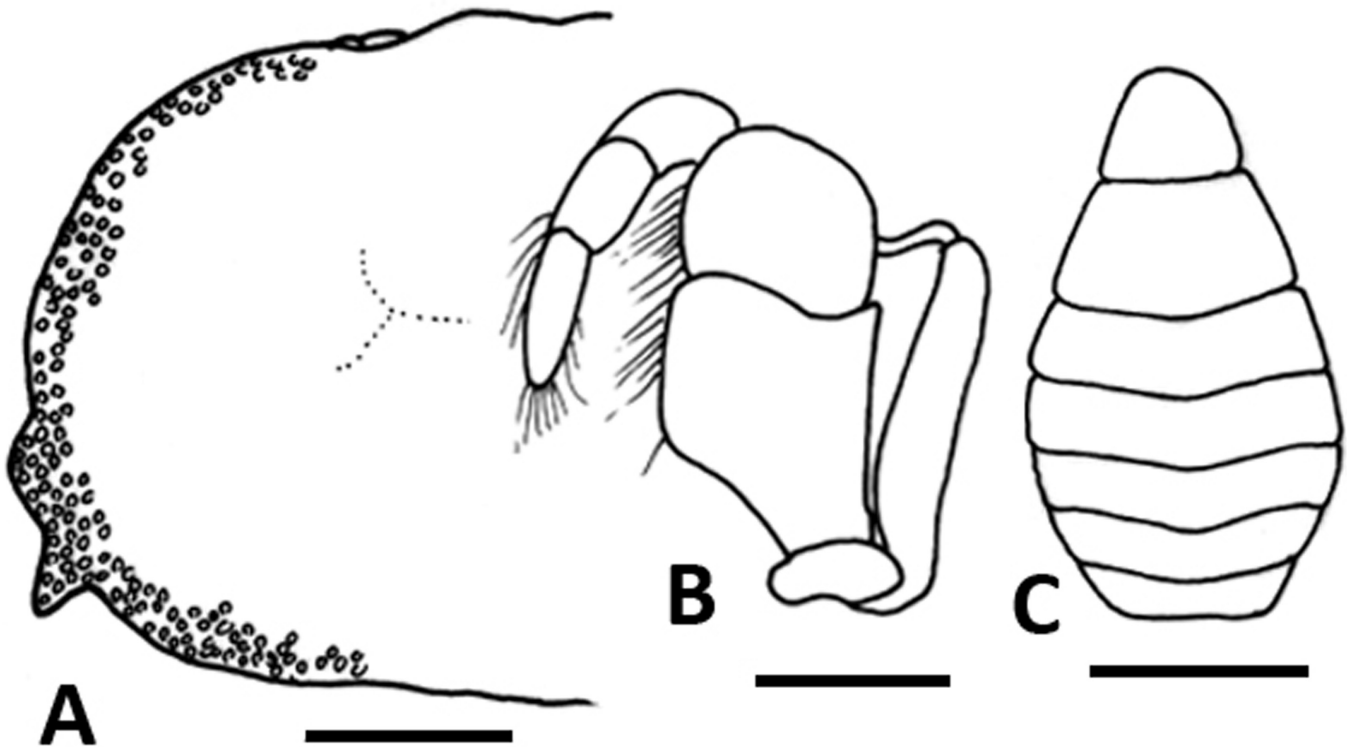


Fig. 33. *Mariaplax galaxeae*, new species, holotype female (4.2 × 3.2 mm) (ZRC 2013.1690). A, dorsal view of carapace; B, left third maxilliped; C, abdomen and telson. Scale bars: A, C = 1.0 mm; B = 0.5 mm.

tuberculated. Differences can be seen in the shape of the third maxillipeds and the proportion of width to length of the carapace. In *M. galaxeae*, the mesial and lateral margins along the distal three quarters of the ischium of the third maxilliped are parallel, straight, the narrow proximal part relatively short (Fig. 33B), while in *M. cyrtophallus* and *M. mica*, the mesial margin is oblique with slightly expanded subproximally, the narrow proximal part short (Fig. 29E and Fig. 38B, respectively). The carapace of *M. galaxeae* is visibly more quadrangular with 1.4 times as broad as long compared to 1.5 as broad as long in *M. cyrtophallus* and *M. mica*. Furthermore, the pereopods are shorter in *M. galaxeae*, which has the merus of P4 2.6 as long as broad whereas in *M. cyrtophallus* and *M. mica* it is 3.4 and 3.6 times as long as broad respectively.

The shape of the third maxilliped is comparable to that of *M. anfracta*, but the narrow proximal part of the ischium is even shorter in *M. anfracta* (Fig. 33B versus Fig. 23D). The abdomen of the same size female is also relatively broader in *M. anfracta* (Fig. 23H) compared to *M. galaxeae* (Fig. 33C).

**Type locality.** Singapore Strait, Singapore.

**Distribution.** Singapore Strait, Singapore. Subtidal, 33–36 m.

***Mariaplax granulifera* (Campbell & Stephenson, 1970)**  
(Figs. 34–36)

*Hexapus granuliferus* Campbell & Stephenson, 1970: 286 (part), fig. 49 (not fig. 49G, H = *Mariaplax daviei*, new species); Ng et al., 2008: 86.

*Hexapus ?granuliferus* – Serène & Soh, 1976: 25, fig. 26, pl. 7, fig. C  
*Hexapinus granuliferus* – Manning & Holthuis, 1981: 169 (not fig. 32c, d); Davie, 2002: 232.

**Material examined.** Holotype: female (6.5 × 3.8 mm) (QM-W3108), Red Buoy, Moreton Bay, Queensland, Australia, coll. 24 April 1968 (photographs examined). Others: **Australia:** 1 male (6.2 × 4.5 mm), 2 females (6.1 × 4.4 mm, 5.9 × 4.4 mm) (QM-W8299), Middle Bank North Moreton Bay, sandy mud, 105 feet, coll. S. Cook, 29 September 1972.

**Diagnosis.** Carapace subquadrate, about 1.4 times as broad as long; dorsal surface covered by tubercles; regions indistinct (Figs. 34A, 35A). Anterolateral margin arcuate; posterolateral corner with angled prominence over base of posterior pereopods (Figs. 34A, 35A, 36A). Eye small, slightly movable, cornea globular (Fig. 34B). Pterygostomial region with row of long and short, oblique striae and with scattered tubercles (Figs. 34B, 35C). Third maxillipeds relatively broad, almost completely covering buccal cavity (Figs. 34B, 35B, C, 36E); ischium of third maxillipeds noticeably longer than merus, mesial margin straight; combined length of dactylus, propodus and carpus shorter than that of merus and ischium; exopod relatively narrow, 0.4 width of ischium, flagellum well developed. Chelipeds stout, unequal; major chela (Fig. 36F) with gap when fingers closed; dactylus with shallow groove on outer surface, groove present on outer surface of fixed finger distally; palm slightly wider than long, surface with sparse tubercles; minor chela (Fig. 36G) with wider gap between closed fingers, dactylus and fixed finger with shallow longitudinal groove medially. P2–P4 relatively long (Fig. 34A) merus of P4 2.9 times as long as broad; dactylus of P2 upcurved (Fig. 36H). Male thoracic sternum

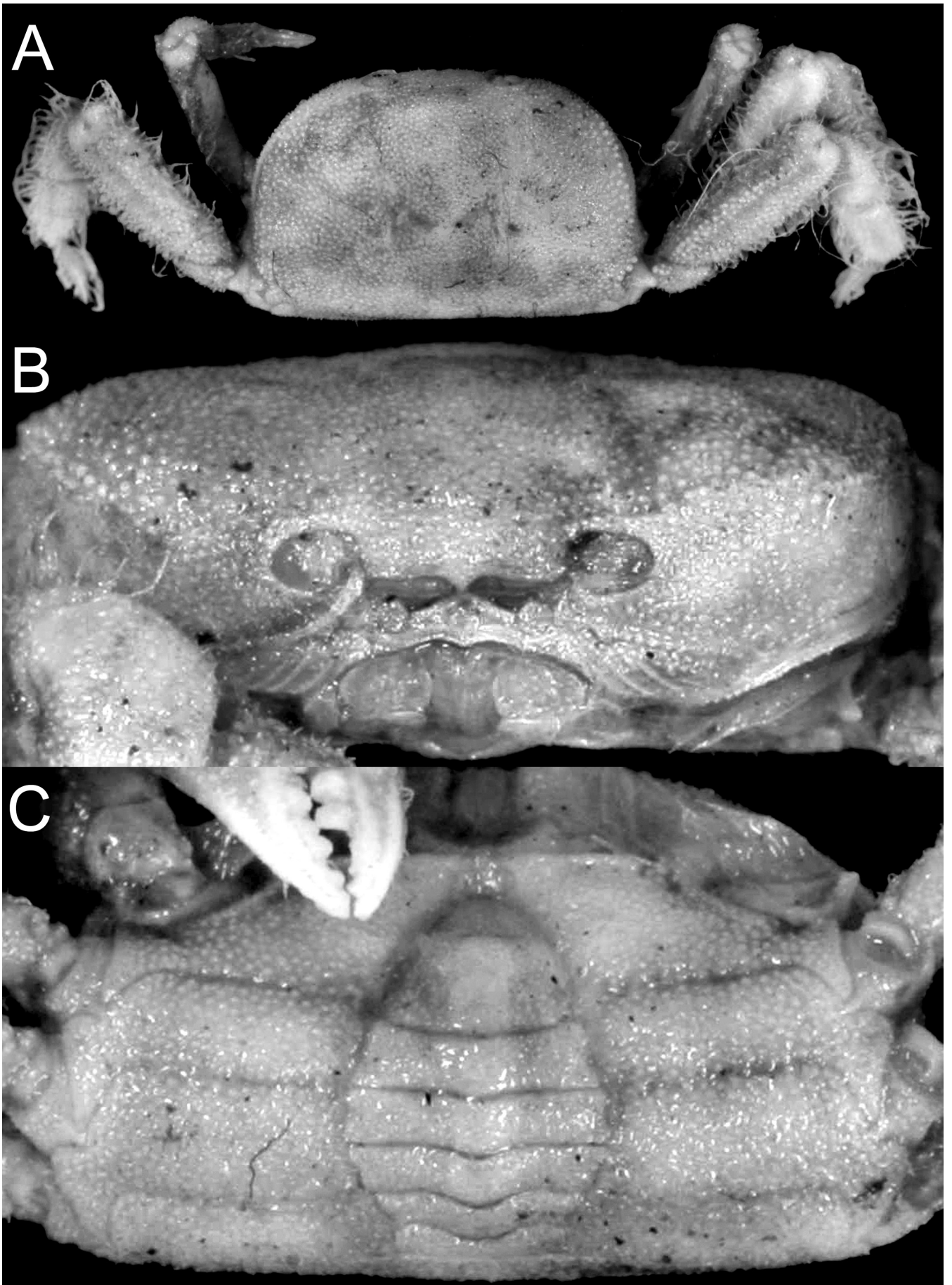


Fig. 34. *Mariaplax granulifera* (Campbell & Stephenson, 1970), holotype female (6.5 × 3.8 mm) (QM-W3108). A, overall view of carapace and P2–P4; B, frontal view of cephalothorax; C, abdomen and telson.

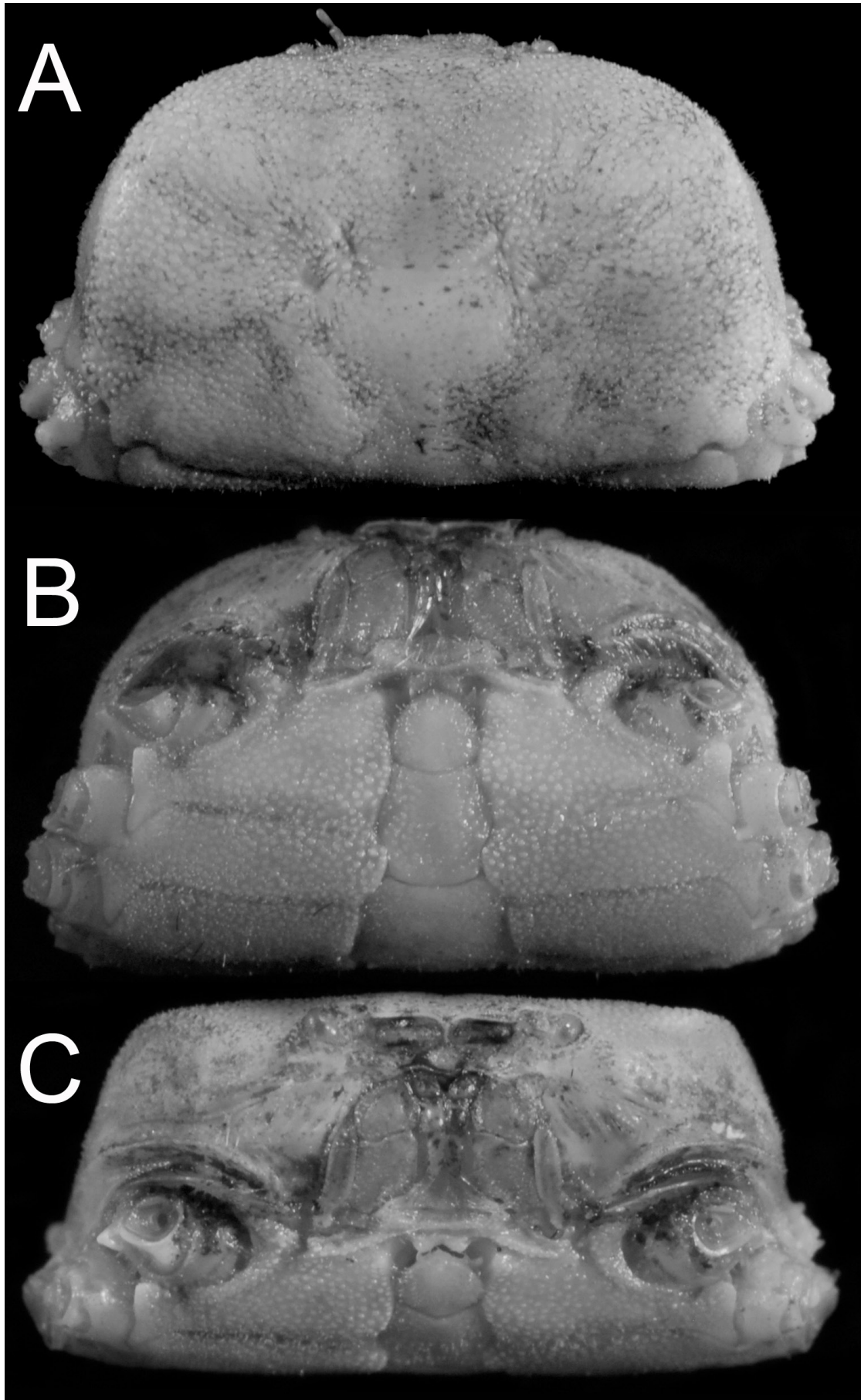


Fig. 35. *Mariaplax granulifera* (Campbell & Stephenson, 1970), male (6.2 × 4.5 mm) (QM-W8299). A, dorsal view of carapace; B, ventral view of cephalothorax, showing abdomen and telson; C, anteroventral view of cephalothorax showing third maxillipeds and sternoabdominal cavity.

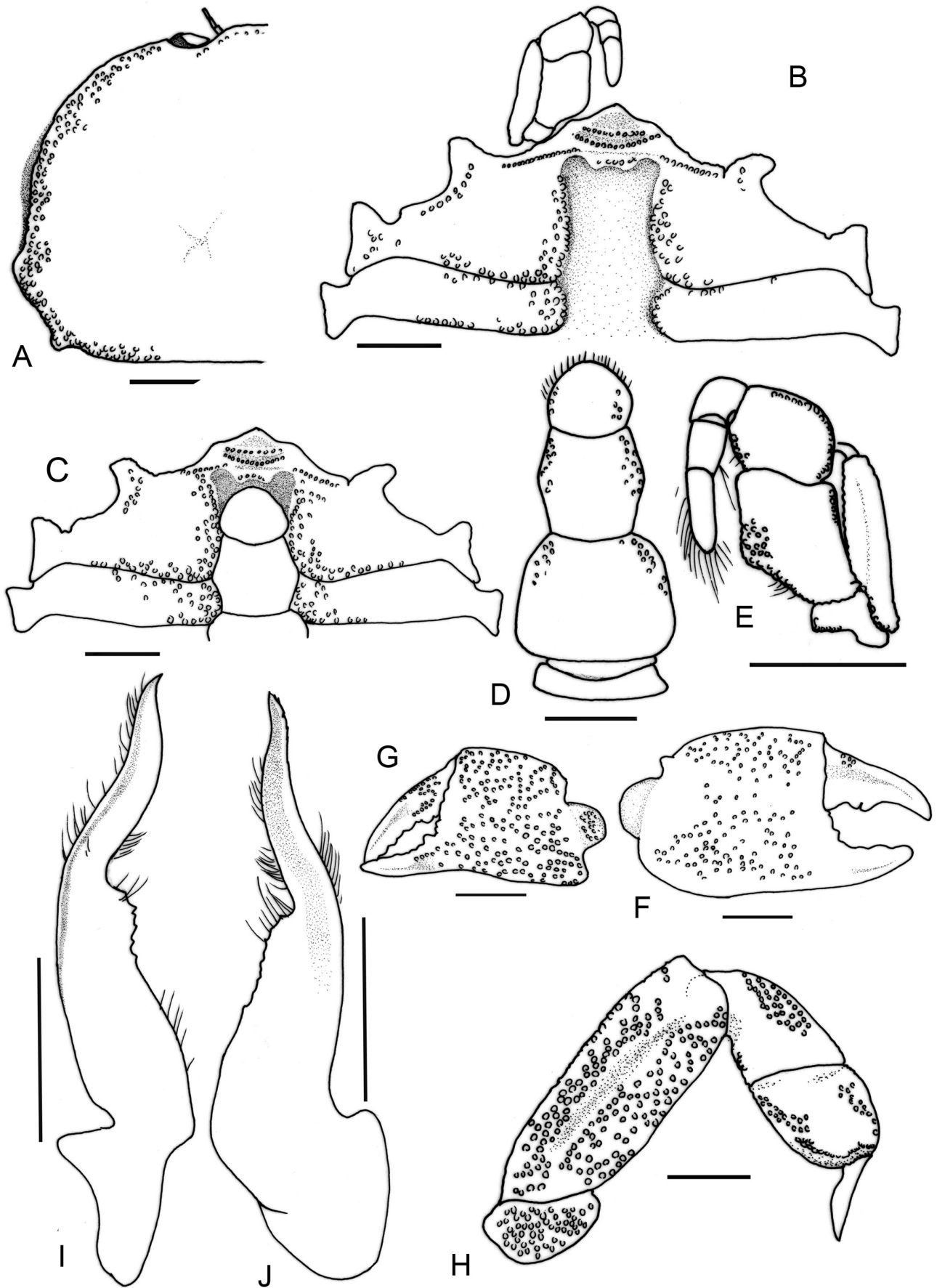


Fig. 36. *Mariaplax granulifera* (Campbell & Stephenson, 1970), male (6.2 × 4.5 mm) (QM-W8299). A, dorsolateral margin of carapace; B, thoracic sternites 1–5, showing sternoabdominal cavity and thoracic sternal groove; C, thoracic sternites 1–5, showing thoracic sternal groove and telson; D, male abdomen and telson; E, left third maxilliped; F, major chela; G, minor chela; H, left P4; I, J, G1. Scale bars = 1.0 mm

broad (Figs. 35B, 36B, C), covered by tubercles; sternites 1 and 2 fused, separated from sternite 3 by distinct ridge; sternite 3 separated from sternite 4 by distinct tuberculate ridge laterally, thoracic sternal groove wide, short, directed anteriorly, extends from sternoabdominal cavity to base of sternite 3 (Figs. 35C, 36C); sternite 8 exposed, rectangular, slightly longer than abdominal somite 1; sternoabdominal cavity not reaching base of sternite 3 (Fig. 36B). Male abdomen relatively wide (Figs. 35B, 36D); somites 1 and 2 free, somites 3–5 fused, wider than somite 6, lateral margin rounded; somite 6 slightly shorter than length of somites 3–5, lateral margin slightly expanded medially forming blunt triangular projection; telson with distal margin rounded, sparsely setose. G1 (Fig. 36I, J) stout, slightly S-shaped, distal part tapered, basal part swollen, row of spines on midlength mesially, sparse short setae laterally and mesially, distal part not concealed under abdomen, exposed on thoracic sternal groove, obscured by setae of telson. Female abdomen with 6 free somites and telson (Fig. 34C).

**Colour.** Not known.

**Remarks.** The holotype of *Hexapus granuliferus* is a female from Moreton Bay, Queensland, while the paratypes are one male and one female from Port Jackson, New South Wales. Campbell & Stephenson (1970) described and figured the holotype female (6.5 × 3.8 mm, in the QM) and a paratype male (15.5 × 9.1 mm, in the Australian Museum). Manning & Holthuis (1981) assigned this species to *Hexapinus* on the basis of the short, oblique male thoracic sternal groove.

Interestingly, when we examined specimens from eastern Australia that had been assigned to *H. granuliferus*, we found there were in fact two kinds of G1 structures. A male from Moreton Bay (QM-W8299) had a relatively stouter G1 with the inner margin gently serrated medially (Fig. 36I, J) while the male from Tasmania (WAM C23270) (which is also in southeastern Australia like Port Jackson) had a more slender G1 with a smooth inner margin (Fig. 31H, I). They clearly belong to two separate species. Campbell & Stephenson (1970) stated that the tip of the G1 of the paratype male (their fig. 49G, H) is probably broken, but this is incorrect; the G1 of the present Tasmanian male (Fig. 31H, I) is almost identical to that in their figure. *Mariaplax granulifera* is here restricted for the Moreton Bay material; while the specimens from southeastern Australia (including the paratype of *Hexapus granuliferus*) are referred to another species, *M. daviei*, new species.

*Mariaplax granulifera* and *M. daviei* are very close in general appearance of the carapace, but some differences are noticeable: the male sixth abdominal somite of *M. granulifera* is slightly shorter than the length of somites 3–5, and distinctly longer than telson (Fig. 36D) while in *M. daviei* the somite 6 is distinctly shorter than somite 3–5 and nearly as long as telson (Fig. 31E); and the ischium of the third maxilliped of *M. granulifera* is slightly longer than that of *M. daviei* (Fig. 36E versus Fig. 31D). Furthermore the form of G1 is certainly different, being slightly S shaped in *M. granulifera* (Fig. 36I, J) versus slightly curved in *M.*

*daviei* (Fig. 31H, I). In the form of their third maxillipeds and pereopods, however, both species are clearly referable to *Mariaplax*.

The “*Hexapus ?granuliferus*” of Serène & Soh (1976) from Queensland, Australia, is assigned to this species because of the shape of the third maxilliped and female abdomen (cf. Serène & Soh, 1976, fig. 26; Fig. 26C).

**Type locality.** Red Buoy, Moreton Bay, Australia.

**Distribution.** Moreton Bay, Australia. Subtidal, 35 m.

### *Mariaplax mica*, new species

(Figs. 1J, 37, 38)

**Material examined.** Holotype: female (6.7 × 4.5 mm) (NMCR 39069), PANGLAO 2005, station CP 2407, 9°41.3'N, 123°48.5'E, Bohol Sea, Philippines, coll. M/V *BFAR*, 204–256m, 1 June 2005.

**Diagnosis.** Carapace subquadrate, about 1.5 times as broad as long; dorsal surface covered by tubercles; regions indistinct (Fig. 37A). Anterolateral margin arcuate; posterolateral corner with angled prominence over base of posterior pereopods (Figs. 37A, 38A). Eye small, slightly movable, cornea globular (Fig. 37C). Pterygostomial region with row of oblique striae (Fig. 37B). Third maxillipeds relatively broad, almost completely covering buccal cavity (Figs. 37B, 38B); ischium of third maxillipeds slightly expanded subproximally, mesial margin oblique; combined length of dactylus, propodus and carpus shorter than that of merus and ischium; exopod narrow, 0.3 width of ischium, flagellum well developed. Chelipeds stout, unequal (Fig. 37D) pubescent, tuberculated; major chela with gap when fingers closed; minor chela with narrower gap between closed fingers. P2–P4 long, slender (Fig. 37A) covered by tubercles; merus of P4 3.6 times as long as broad; dactylus of P2 and P4 upcurved (Fig. 37A); outer surface of merus with longitudinal groove (Fig. 37A). Female thoracic sternum relatively broad (Fig. 37B), covered by tubercles; sternites 1 and 2 fused, separated from sternite 3 by distinct ridge; sternite 3 separated from sternite 4 by distinct tuberculate ridge laterally; sternoabdominal cavity not reaches base of sternite 3. Female abdomen wide (Figs. 37B, 38C); somites 1 to 6 free, telson with rounded distal margin.

**Colour.** In life, pinkish brown overall, with the tubercles on the pereopods dark brown (Fig. 1J).

**Etymology.** From Latin *mica*, tuberculate, alluding to the heavily granular carapace and pereopods. Name is used as a noun in apposition.

**Remarks.** *Mariaplax mica*, new species, resembles *M. cyrtophallus*, new species, in the heavily granulated carapace and pereopods, a similar shape of the third maxilliped and the relatively long P2–P4. However, the carapace is distinctively more squarish in *M. mica* (Figs. 37A) while in *M. cyrtophallus* the anterolateral margin of the carapace is narrower, sloping to wider posterolateral margin (Fig. 28A). The P2–P4 are also proportionately longer and the granules

on the carapace and pereopods are relatively larger in *M. mica* (Figs. 37A, 38A versus Figs. 28A, 29I).

They also appear to have different depth preferences: *M. mica* was collected from more than 200 m while *M. cyrtophallus* was collected from shallow waters 15–30 m.

**Type locality.** Bohol Sea, Philippines.

**Distribution.** Bohol Sea, Philippines. Deep water, 204–256 m.

***Mariaplax narusei*, new species**  
(Figs. 2C, 39, 40)

**Material examined.** Holotype: male (9.6 × 5.8 mm) (RUMF-ZC-2112), Funaura Bay, Iriomote Island, Ryukyu Islands, Japan, coll. T. Naruse, 1 July 2011. Paratypes: **Japan:** 1 female (12.0 × 7.1 mm) (ZRC 2012.1031), 1 ovigerous female (11.5 × 6.7 mm) (RUMF-ZC-2113), same locality as holotype.

**Diagnosis.** Carapace much broader than long, about 1.7 times as broad as long, dorsal surface smooth, granulated near margin; regions indistinct, H-shaped depression

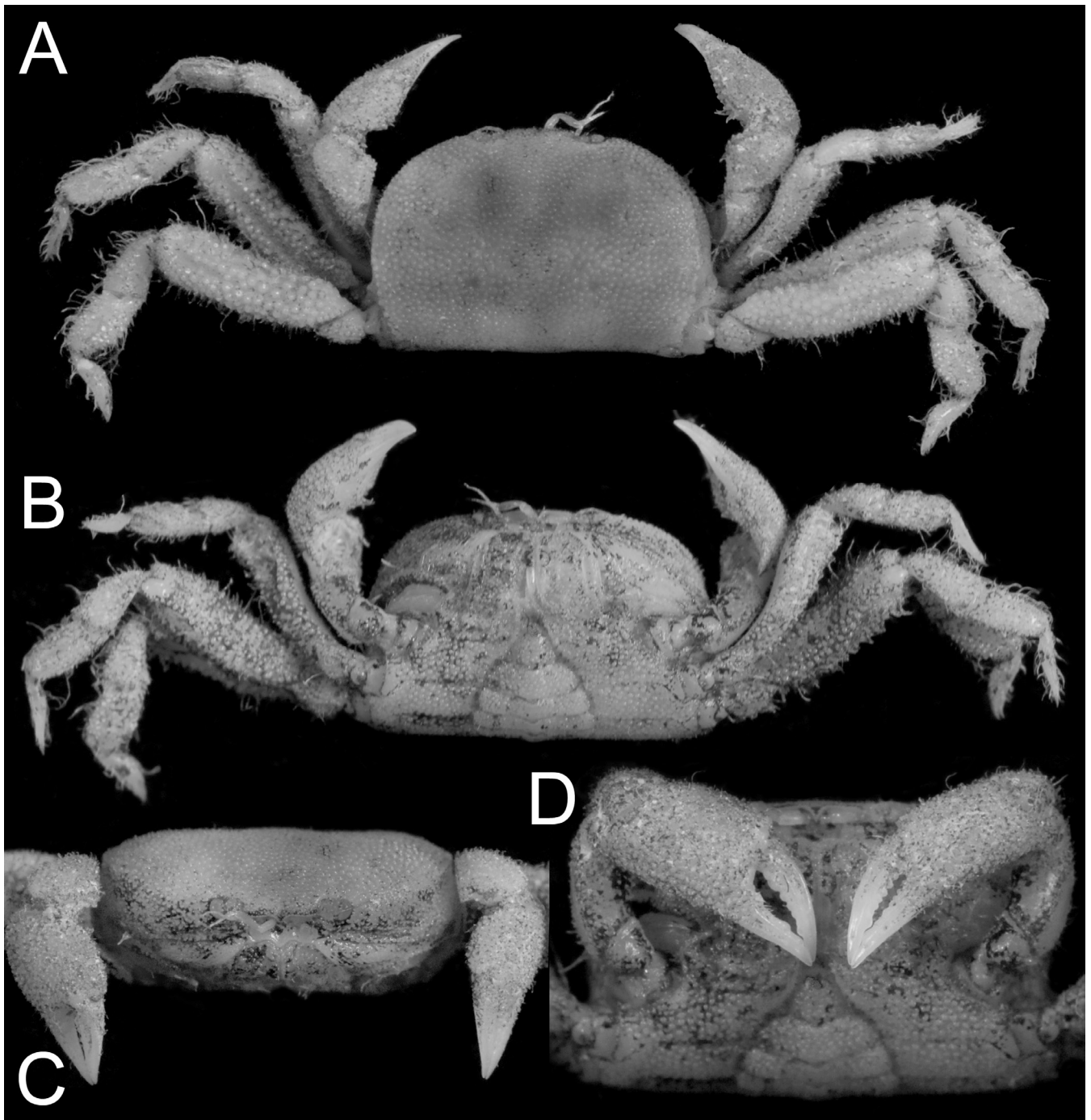


Fig. 37. *Mariaplax mica*, new species, holotype female (6.7 × 4.5 mm) (NMCR 39069). A, overall view of carapace, chelipeds and P2–P4; B, ventral view of cephalothorax; C, frontal view of cephalothorax; D, chelae.



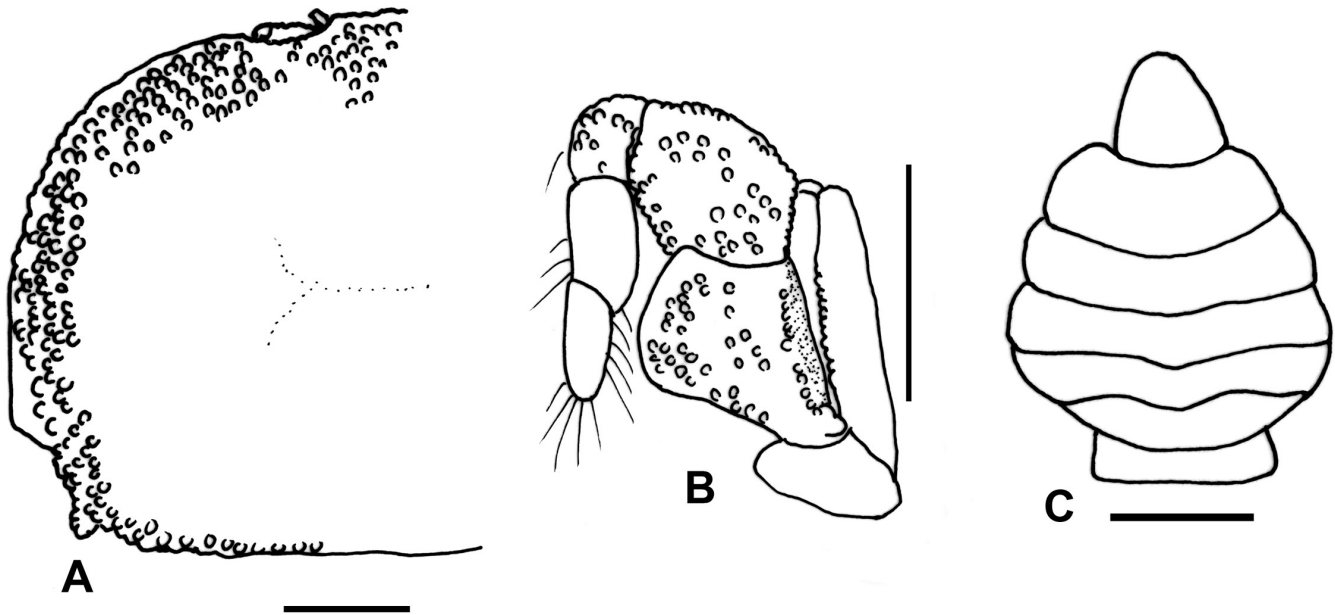


Fig. 38. *Mariaplax mica*, new species, holotype female (6.7 × 4.5 mm) (NMCR 39069). A, dorsolateral margin of carapace; B, left third maxilliped; C, abdomen and telson. Scale bars = 1.0 mm.

shallow medially (Fig. 39A). Anterolateral margin arcuate; posterolateral margin with angled prominence over base of posterior pereopods (Figs. 39A, 40A). Eye small, slightly movable, cornea globular, peduncle granular (Fig. 39C). Pterygostomial region with row of 3 relatively long, widely separated oblique striae and some tubercles. Third maxillipeds broad, completely covering buccal cavity (Figs. 39D, 40D); ischium of third maxillipeds slightly longer and wider than merus, with straight mesial margin; combined length of dactylus, propodus and carpus slightly shorter than that of merus and ischium; exopod narrow, 0.4 width of ischium, flagellum well developed. Chelipeds stout, unequal (Fig. 39E); major chela with gap when fingers closed; palm slightly wider than long, outer surface covered by tubercles; minor chela with relatively wider gap when fingers closed. P2–P4 relatively long (Fig. 39A); dactylus of P2 slightly upcurved; P3 with shallow longitudinal groove on outer surface; P4 entirely covered by tubercles, merus 2.8 times as long as broad. Male thoracic sternum relatively broad (Figs. 39B, 40B, C); sternites 1 and 2 fused, slightly curved posteriorly, separated from sternite 3 by distinct ridge; sternite 3 separated from sternite 4 by distinct tuberculate ridge laterally, thoracic sternal groove narrow, short, oblique, extends from sternoabdominal cavity to middle of sternite 4 (Figs. 39B, 40B); sternite 8 exposed, rectangular, slightly longer than abdominal somite 1; abdominal cavity not reaching base of sternite 3 (Figs. 39B, 40C). Male abdomen relatively narrow (Figs. 39B, 40E); somites 1 and 2 free, somites 3–5 fused, slightly wider than somite 6; lateral margin sinuous, somite 6 slightly shorter than length of somites 3–5, lateral margin slightly expanded medially; telson subpentagonal with distal margin rounded, margin sparsely setose. G1 (Fig. 40F, G) stout, bent 60° along two-thirds of length, slightly twisted, distal part tapered, apices not concealed under abdomen, exposed on thoracic sternal groove, obscured by setae of telson, with sparse short setae laterally and mesially. Female

abdomen broad, with 6 somites free and subtriangular telson (Fig. 40H).

**Colour.** In life, generally uniformly yellowish brown with the carapace slightly darker (Fig. 2C).

**Etymology.** This species is named after Tohru Naruse who kindly passed the specimens to us for this study; and helped us carefully read this long manuscript.

**Remarks.** *Mariaplax narusei*, new species, can be distinguished from congeners by the following characters: the carapace is much broader than long, the ischium of the third maxilliped is wider than the merus, and P4 is entirely covered by tubercles.

The much broader carapace and the shape of the G1 superficially resemble the condition in *Latohexapus granosus*. However, the carapace of *L. granosus* is covered by numerous tubercles and the regions are distinct, thoracic sternites 1 and 2 are bent inwards towards the buccal cavity, and the G1 is not twisted (Huang et al., 2002: Figs. 1B, 3A, B, D, E; 54A, C). In *M. narusei*, the carapace surface is smooth with the regions indistinct, thoracic sternites 1 and 2 are only very slightly curved (not bent inwards) and the G1 is twisted medially (Figs. 39A, 40F, G).

Two characters of *M. narusei* resemble species of *Hexapinus*: the ischium of the third maxilliped is relatively broader than the merus, and the P2 to P4 are relatively shorter. However, the ischium of the third maxillipeds is still more angular in *M. narusei*, with the mesial margin not distinctly convex (Fig. 40D) (versus the mesial margin is strongly convex and subauriculiform in *Hexapinus* species). Unlike *Hexapinus* species, the outer surface of the ambulatory merus in *M. narusei* has a longitudinal groove albeit shallow (Fig. 39A)

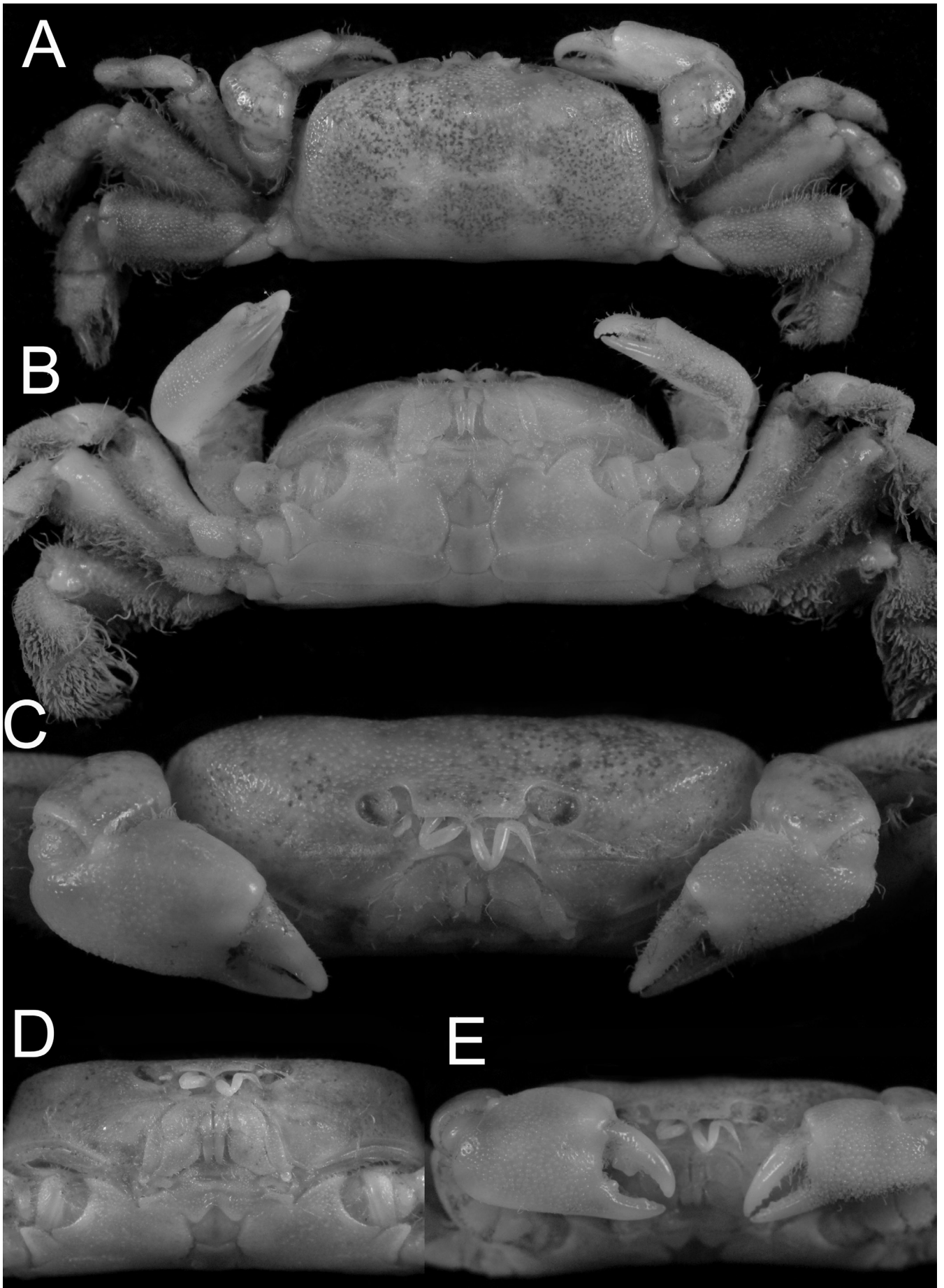


Fig. 39. *Mariaplax narusei*, new species, holotype male (9.6 × 5.8 mm) (RUMF-ZC-2112). A, overall view of carapace, chelipeds and P2–P4; B, ventral view of cephalothorax; C, frontal view of cephalothorax; D, third maxillipeds; E, chelae.

(versus smooth and entire). The G1 structures are also different, with that of *M. narusei* S-shaped (Fig. 40F, G) (typical for *Mariaplax* species) while *Hexapinus* species have gently curved G1s.

**Type locality.** Funaura Bay, Iriomote Island, Ryukyu Islands, Japan.

**Distribution.** Iriomote Island, Ryukyu Islands, Japan. Intertidal.

***Mariaplax ourabay*, new species**  
(Figs. 2A, B, 41, 42)

**Material examined.** Holotype: male (7.6 × 5.4 mm) (RUMF-ZC-2114), Futami, Oura Bay, Okinawa Island, Ryukyu Islands,

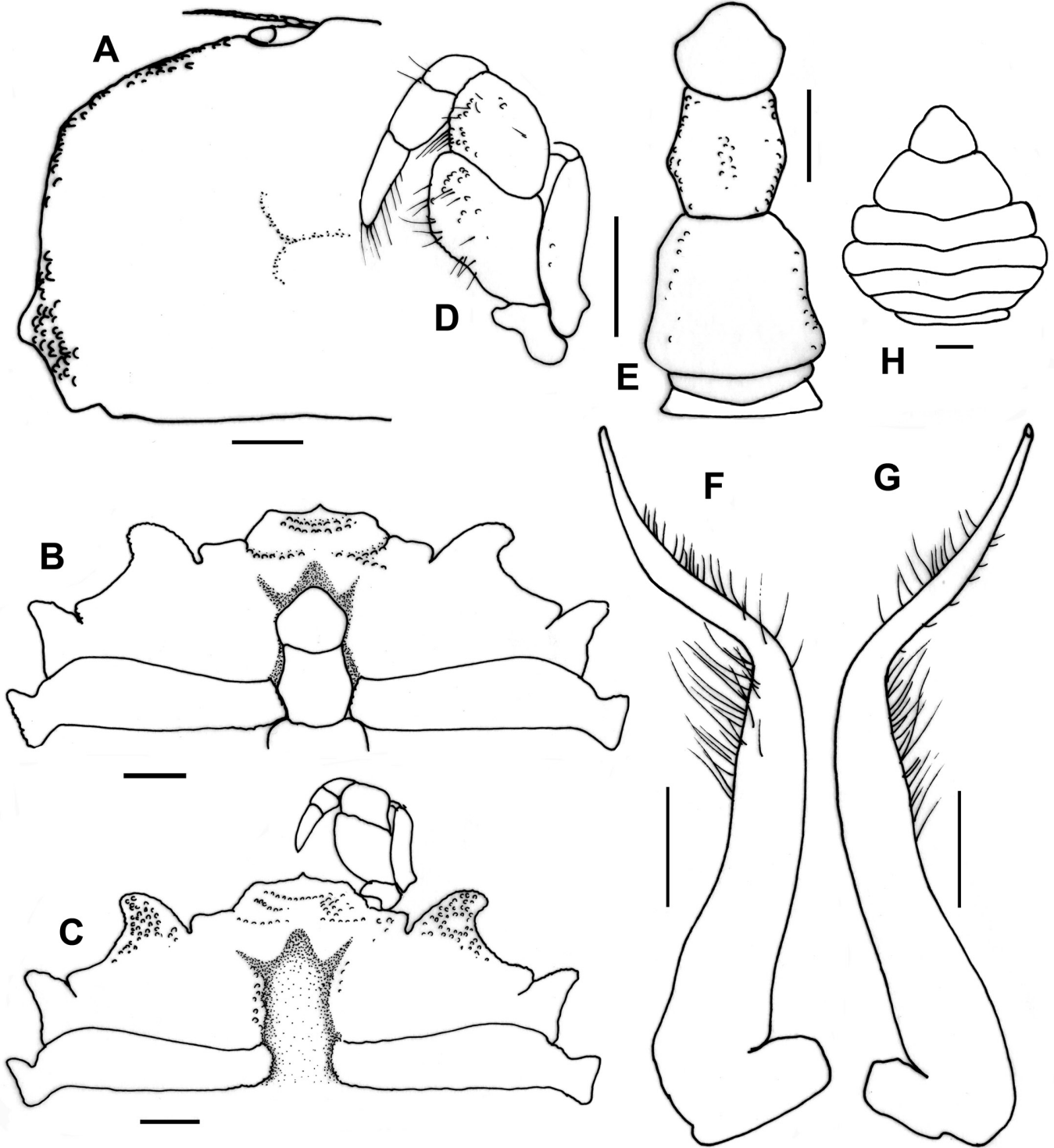


Fig. 40. *Mariaplax narusei*, new species. A–G, holotype male (9.6 × 5.8 mm) (RUMF-ZC-2112); H, paratype female (12.0 × 7.1 mm) (ZRC 2012.1031). A, dorsolateral margin of carapace; B, thoracic sternites 1–5, showing thoracic sternal groove and telson; C, thoracic sternites 1–5, showing sternoabdominal cavity and thoracic sternal groove; D, left third maxilliped; E, male abdomen and telson; F, G1; H, female abdomen and telson. Scale bars = 1.0 mm.

Japan, coll. Oura Bay Survey Team, 20 June 2009. Paratype: **Japan**: 1 ovigerous female (9.2 × 7.0 mm) (ZRC 2012.1032), same locality as holotype, 22 June 2009

**Diagnosis.** Carapace subquadrate, about 1.4 times as broad as long, dorsal surface granulated; regions indistinct, H-shaped

depression shallow medially (Fig. 41A). Eye small, slightly movable, cornea small, globular, narrower than peduncle, peduncle with scattered granules. Pterygostomial region with row of oblique striae and scattered tubercles. Third maxilliped (Figs. 41B, 42D) broad, ischium longer than merus, mesial

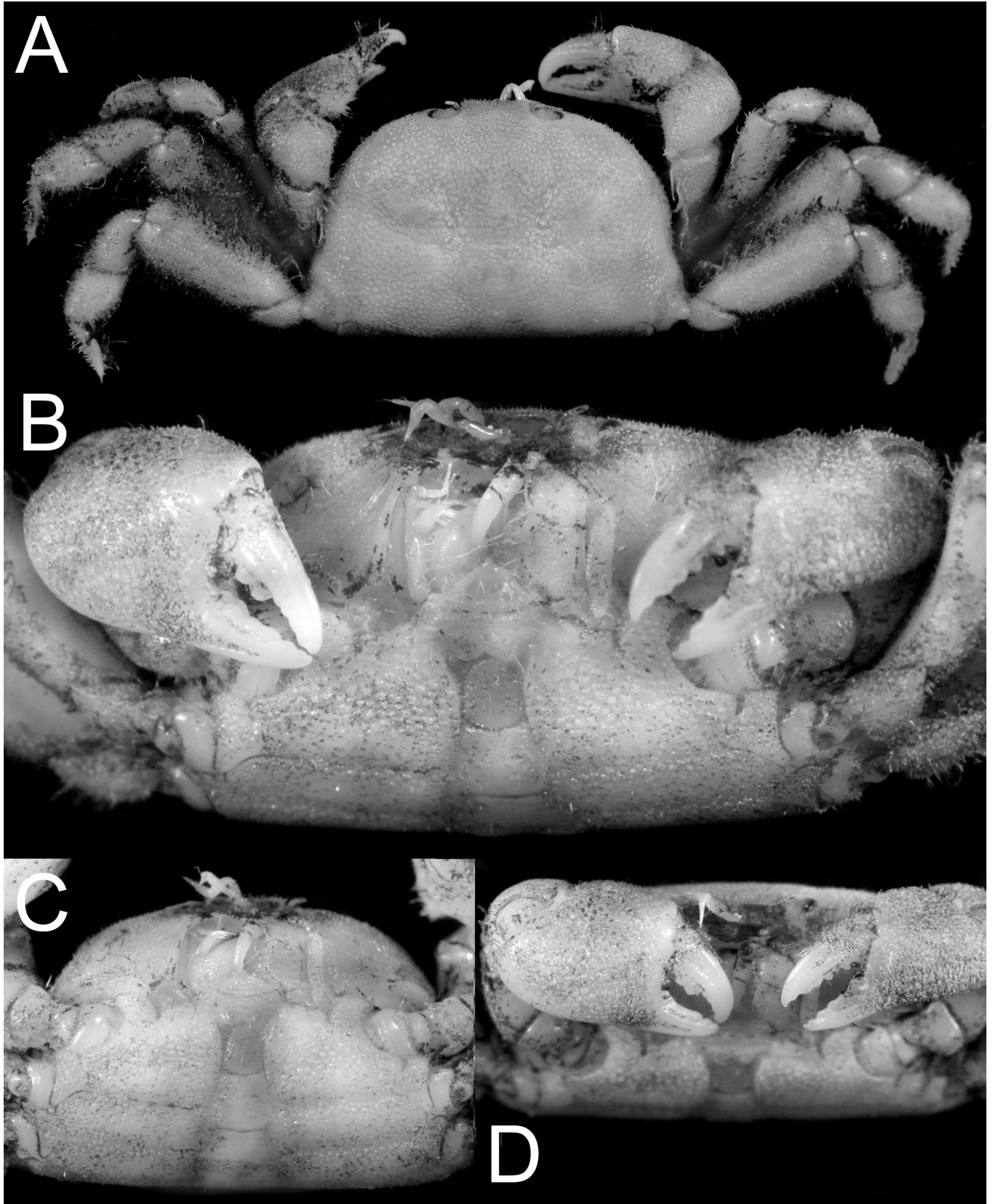


Fig. 41. *Mariaplax ourabay*, new species, holotype male (7.6 × 5.4 mm) (RUMF-ZC-2114). A, overall view of carapace, chelipeds and P2–P4; B, ventral view of cephalothorax; C, abdomen and telson; D, chelae.

margin straight; combined length of dactylus, propodus and carpus shorter than that of merus and ischium; exopod narrow, 0.4 width of ischium, flagellum well developed. Chelipeds (Fig. 41D) stout, unequal; major chela with slight gap when fingers closed, palm slightly wider than long, surface covered with tubercles; minor chela with narrow gap when fingers closed, dorsal surface of palm covered by large tubercles. P2–P4 relatively long (Fig. 41A); merus of P4 2.8 times as long as broad, shallow longitudinal median groove present; P2 with dactylus upcurved. Male thoracic sternum broad (Figs. 41B, C, 42B, C); sternites 1 and 2 fused, separated from

sternite 3 by distinct ridge; sternites 3 and 4 fused; thoracic sternal groove short, extends obliquely from sternoabdominal cavity to middle of sternite 3 (Figs. 41B, 42B); sternite 8 exposed, rectangular, slightly longer than abdominal somite 1; sternoabdominal cavity reaches base of sternite 3. Male abdomen (Figs. 41C, 42E) relatively narrow; somites 1 and 2 free, somites 3–5 fused, lateral margin sinuous; somite 6 slightly shorter than length of somites 3–5, lateral margin expanded medially into blunt triangular projection; telson almost as long as somite 6, distal margin rounded, margin setose. G1 (Fig. 42F, G) slender, slightly S-shaped, sparse

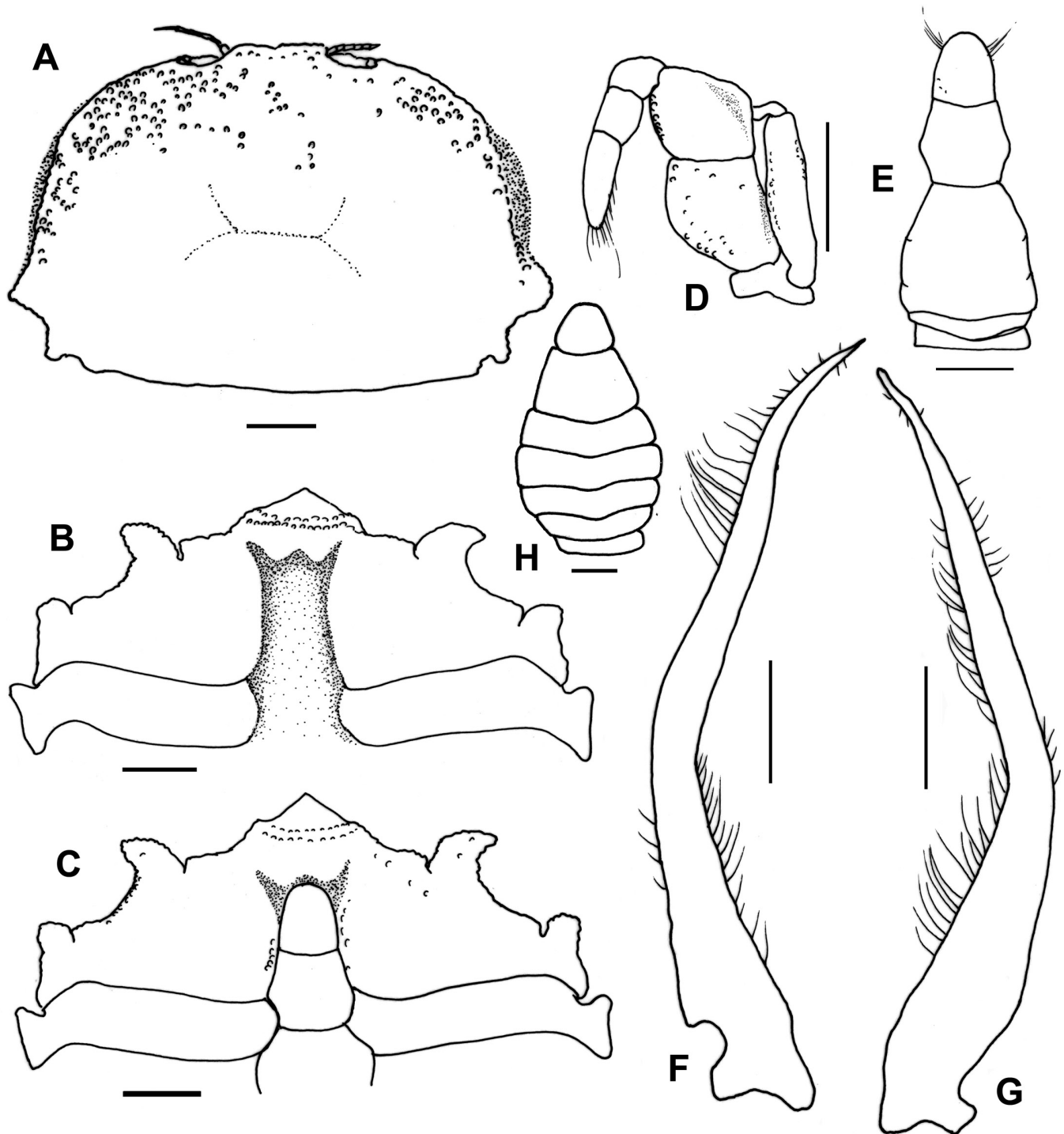


Fig. 42. *Mariaplax ourabay*, new species, holotype male (7.6 × 5.4 mm) (RUMF-ZC-2114). A, dorsolateral margin of carapace; B, thoracic sternites 1–5, showing sternoabdominal cavity and thoracic sternal groove; C, thoracic sternites 1–5, showing thoracic sternal groove and telson; D, left third maxilliped; E, male abdomen and telson; F, G, G1; H, female abdomen and telson. Scale bars = 1.0 mm.

short setae on mesial and lateral margins; distal part tapered, not concealed under abdomen, exposed on thoracic sternal groove, obscured by setae of telson. Female abdomen relatively narrow, with 6 free somites and telson (Fig. 42H).

**Colour.** In life, carapace mottled pink and cream, with the branchial region darker pink, pereopods cream (Fig. 2A). Female lighter coloured than male (Fig. 2B)

**Etymology.** Named after the type locality Oura Bay, Okinawa Islands, Japan. The name is used as a noun in apposition.

**Remarks.** The male telson of *Mariaplax ourabay*, new species, is almost as long as the sixth abdominal somite, a characters shared only with *M. granulifera*. However, the male abdomen of these two species differs in the length proportion of the somite 6 to that of the somites 3–5 (0.6 in *M. ourabay* versus 0.8 in *M. granulifera*). Furthermore, the G1 structures of these two species differ markedly: *M. ourabay* has long, slender G1 with a pointed tip (Fig. 42F, G) while in *M. granulifera*, the G1 is stout and proximally much wider than the tip (Fig. 36I, J).

**Type locality.** Futami, Oura Bay, Okinawa Island, Ryukyu Islands, Japan.

**Distribution.** Oura Bay, Okinawa Island, Ryukyu Islands, Japan. Intertidal.

***Mariaplax propinqua*, new species**  
(Figs. 43–45)

**Material examined.** Holotype: male (10.3 × 6.5 mm) (IOCAS), station 6197, 21°00'N 109°00'E, Tonkin Gulf, China. Paratype: **China:** 1 male (9.0 × 5.6 mm) (ZRC 2012.1033), station 6214, 20°45'N 108°30'E, coll. cruise boat 228, 15 February 1960.

**Diagnosis.** Carapace subquadrate, about 1.5 times as broad as long, dorsal surface granulated; regions indistinct, with shallow median H-shaped depression (Fig. 43A). Anterolateral margin arcuate; posterolateral margin with angled prominence over base of posterior pereopods (Figs. 43A, 45A). Front deflexed, divided into 2 lobes, not projecting beyond edge of orbits (Fig. 43B). Eye slightly movable, small, cornea pigmented, wider than peduncle. Pterygostomial region with row of oblique striae (Figs. 43B, C, 45B). Third maxillipeds broad (Figs. 43C, 44A, 45E), completely covering buccal cavity; ischium slightly longer than merus, combined length of dactylus, propodus and carpus slightly shorter than that of merus and ischium; exopod narrow, 0.3 width of ischium, slightly granular, flagellum well developed. Chelipeds asymmetrical (Fig. 44B, C). Fingers gaping when closed, palm of both chela finely tuberculate (Figs. 44B, C, 45G, H). P2–P4 tomentose, surfaces granulated (Fig. 43A); merus of P4 3.5 times as long as broad, shallow longitudinal groove on outer surface medially; dactylus of P4 gently upcurved. Male thoracic sternum relatively broad (Figs. 44A, 45C, D), surface finely granular; sternites 1 and 2 fused, separated from sternite 3 by distinct ridge; sternite 3 separated from sternite 4 by

distinct ridge; transverse sternal groove extends obliquely from edge of sternoabdominal cavity, almost reaching base of chelipeds (Figs. 44A, 45C, D); sternite 8 exposed, triangular, slightly shorter than abdominal somite 1; sternoabdominal cavity reaching middle to thoracic sternite 4 (Figs. 44A, 45C). Male abdomen relatively narrow (Figs. 44A, 45F), surface granular, somites 1 and 2 free; somites 3–5 fused, lateral margin slightly arched; somite 6 as long as wide, lateral margin expanded into blunt triangular projection subproximally; telson subpentagonal, distal margin rounded, sparsely setose. G1 (Fig. 45I, J) S-shaped, distal part tapered, sparse short setae present medially; row of 3 large teeth on lateral margin medially; distal part exposed on thoracic sternal groove, not concealed under abdomen. Female unknown.

**Colour.** Not known.

**Etymology.** From the Latin *propinqua* for close; alluding to the similarity of the new species with *M. anfracta*.

**Remarks.** This species closely resembles *M. anfracta* in the shape of G1 and the tuberculation of carapace, chelipeds and P2 to P4. However, the G1 of *M. propinqua*, new species, is relatively more slender with a row of three strong teeth on the lateral margin medially (Fig. 45I, J) (G1 is relatively stouter, without the presence of teeth in *M. anfracta* (Fig. 23F, G). In addition, the carapace and anterior thoracic sternum are also relatively wider in *M. propinqua* (Figs. 43A, 44A versus Figs. 22A, 23B, C). The telson of *M. anfracta* is subtriangular while in *M. propinqua* is subpentagonal, furthermore P2–P4 are shorter in *M. anfracta*, the merus of P4 is 2.5 as long as wide (Figs. 22A, C) versus 3.5 as long as wide in *M. propinqua* (Fig. 43A).

**Type locality.** Tonkin Gulf, Vietnam.

**Distribution.** Tonkin Gulf, Vietnam. Subtidal.

***Mariaplax secus*, new species**  
(Figs. 46, 47)

**Material examined.** Holotype: male (4.7 × 3.0 mm) (MNHN IU-2013-916), station DW3953, 05°14'S 145°49'E, Bismarck Sea, Madang, south of Cape Kussoron, 130–140 m, Papua New Guinea, coll. Expedition PAPUA NUIGINI, 2012, 7 November 2012.

**Diagnosis.** Carapace subquadrate, about 1.6 times as broad as long, dorsal surface strongly granulated; regions indistinct, with inconspicuous H-shaped shallow depression medially (Figs. 46A, 47A). Eye small, very slightly movable, cornea black, wider than granular peduncle. Pterygostomial region covered with granules, with short row of oblique striae. Third maxillipeds (Figs. 46B, 47C) broad, covering buccal cavity; ischium longer than merus, slightly expanded subproximally, with oblique mesial margin, combined length of dactylus, propodus and carpus almost as long as that of merus and ischium, dactylus as long as propodus; exopod relatively narrow, about 0.4 width of ischium, flagellum well developed. Chelipeds asymmetrical, covered by closely spaced tubercles and very short setae (Fig. 46D); major chela with broad

gaping finger when closed; dactylus and fixed finger with longitudinal ridge at midline distally; palm slightly shorter than broad; minor chela with broad gap when fingers closed; dactylus and fixed finger with median longitudinal ridge distally. P2–P4 (Fig. 46A) relatively long, slender, covered by dense granules; P3 longest, lateral surface of merus with shallow longitudinal groove; dactylus of P4 upcurved, ventral

margin with few granules proximally; merus of P4 long, about 4.3 times as long as broad. Male thoracic sternum broad (Figs. 46B, 47B), surface prominently granular; sternites 1 and 2 fused, separated from sternite 3 by distinct furrow; sternite 3 and 4 fused, thoracic sternal groove deep, relatively short, extending obliquely from edge of sternoabdominal cavity (Figs. 46B, 47B); sternite 8 exposed, quadrangular, slightly

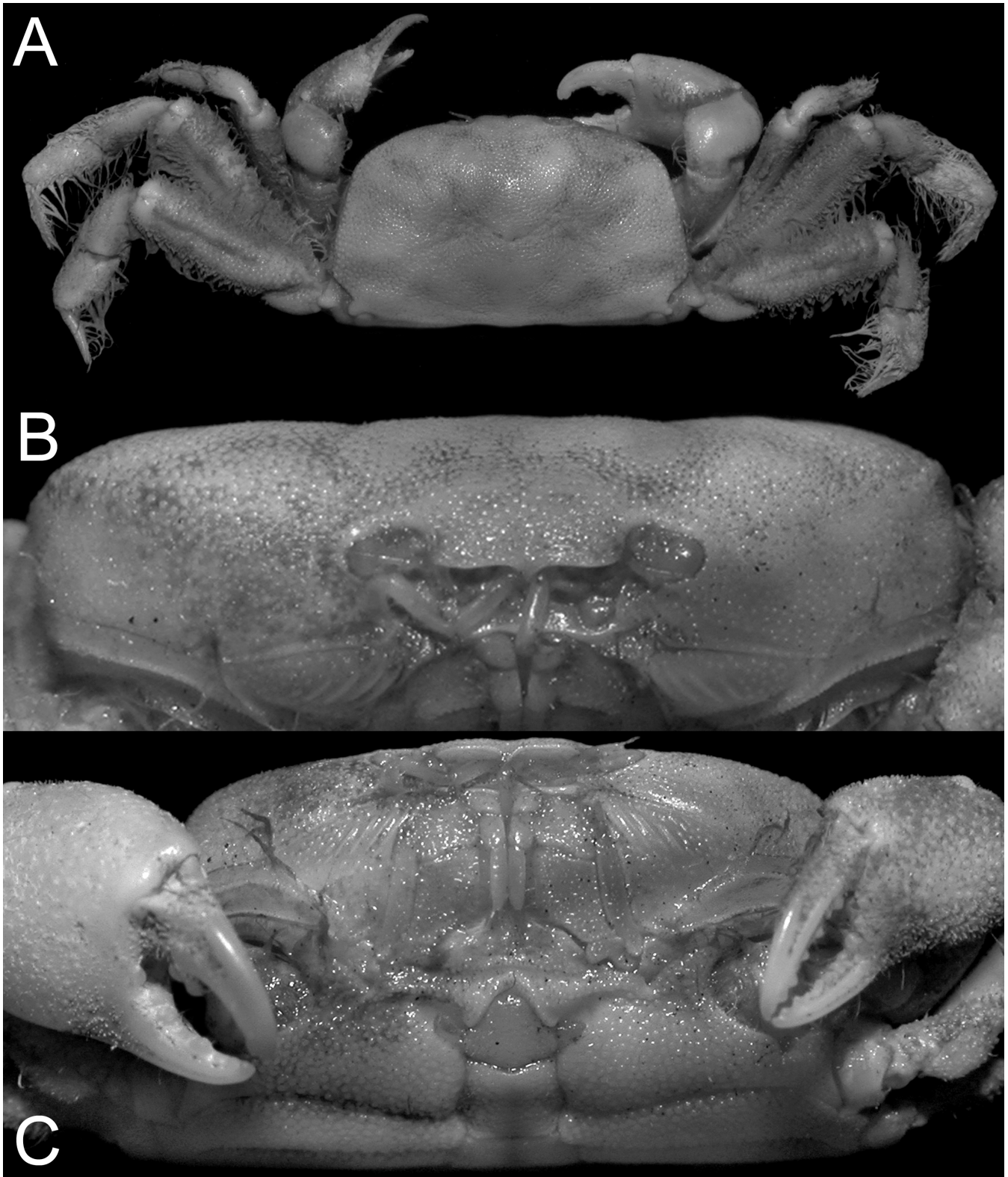


Fig. 43. *Mariaplax propinqua*, new species, holotype male (10.3 × 6.5 mm) (IOCAS). A, overall view of carapace, chelipeds and P2–P4; B, frontal view of cephalothorax; C, ventral view of cephalothorax.

longer than male abdominal somite 1; sternoabdominal cavity reaching to middle of sternite 4 (Fig. 47B), distal margin sinuous. Male abdomen broad, short (Figs. 46B, 47D), not covering sternoabdominal cavity, reaching only to fifth sternite; surface granular; somites 1 and 2 free, somites 3–6 fused, lateral margin slightly arched; telson subtriangular (Figs. 47D), distal margin rounded. G1 (Fig. 47E, F) bent ca. 90° at midlength, directed anterolaterally, tuft of long setae on mesial surface near midlength, distal part tapered, not concealed under abdomen, exposed just before thoracic sternal groove. Female unknown.

**Colour.** Dirty white in life (Fig. 11).

**Etymology.** From the Latin *secus*, for different; alluding to the unusual shape of the male abdomen. The name is used as a noun in apposition.

**Remarks.** This is the second species in *Mariaplax* to have the G1 bent at a 90° angle, forming a L-shaped structure; the other

species being *M. cyrtophallus*, new species. The differences between these two species are as follow: the carapace is more rectangular, being 1.6 times as broad as long in *M. secus* (Fig. 46A) (1.5 times as broad as long in *M. cyrtophallus*, Fig. 28A); the ischium of the third maxilliped is as long as broad with the dactylus the same length as the propodus in *M. secus* (Fig. 47C) (slightly longer than broad with the dactylus much longer than the propodus in *M. cyrtophallus*, Fig. 29E); the thoracic sternum is proportionately less broad in *M. secus* compared to that of *M. cyrtophallus* (Fig. 47B versus Fig. 29B); the distal part of sternoabdominal cavity is relatively long and narrow, with distal margin sinuous in *M. secus* (Figs. 46B, 47B) (short, broad with rounded distal margin in *M. cyrtophallus*, Fig. 29B); the lateral surface of the P3 merus has a distinct shallow longitudinal groove in *M. secus* (Fig. 46A) (an indistinct groove, obscured by tubercles, in *M. cyrtophallus*, Fig. 29I); the P4 merus is relatively much longer, being 4.3 times as long as broad in *M. secus* (Fig. 46A) (versus 3.4 times as long as broad in *M. cyrtophallus*, Fig. 29I); and the G1 has a tuft of long medial

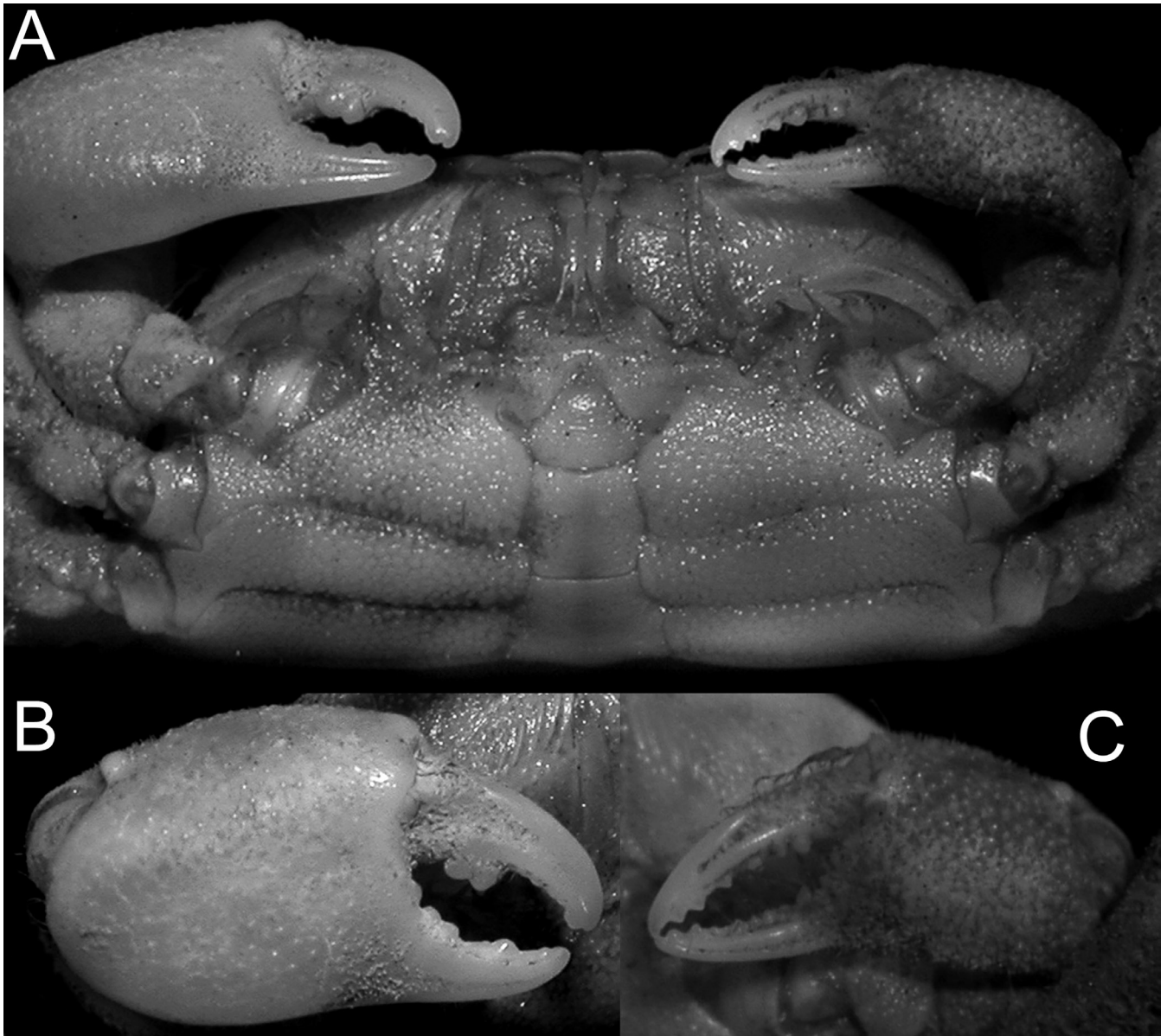


Fig. 44. *Mariaplax propinqua*, new species, holotype male (10.3 × 6.5 mm) (IOCAS). A, abdomen and telson; B, major chela; C, minor chela.



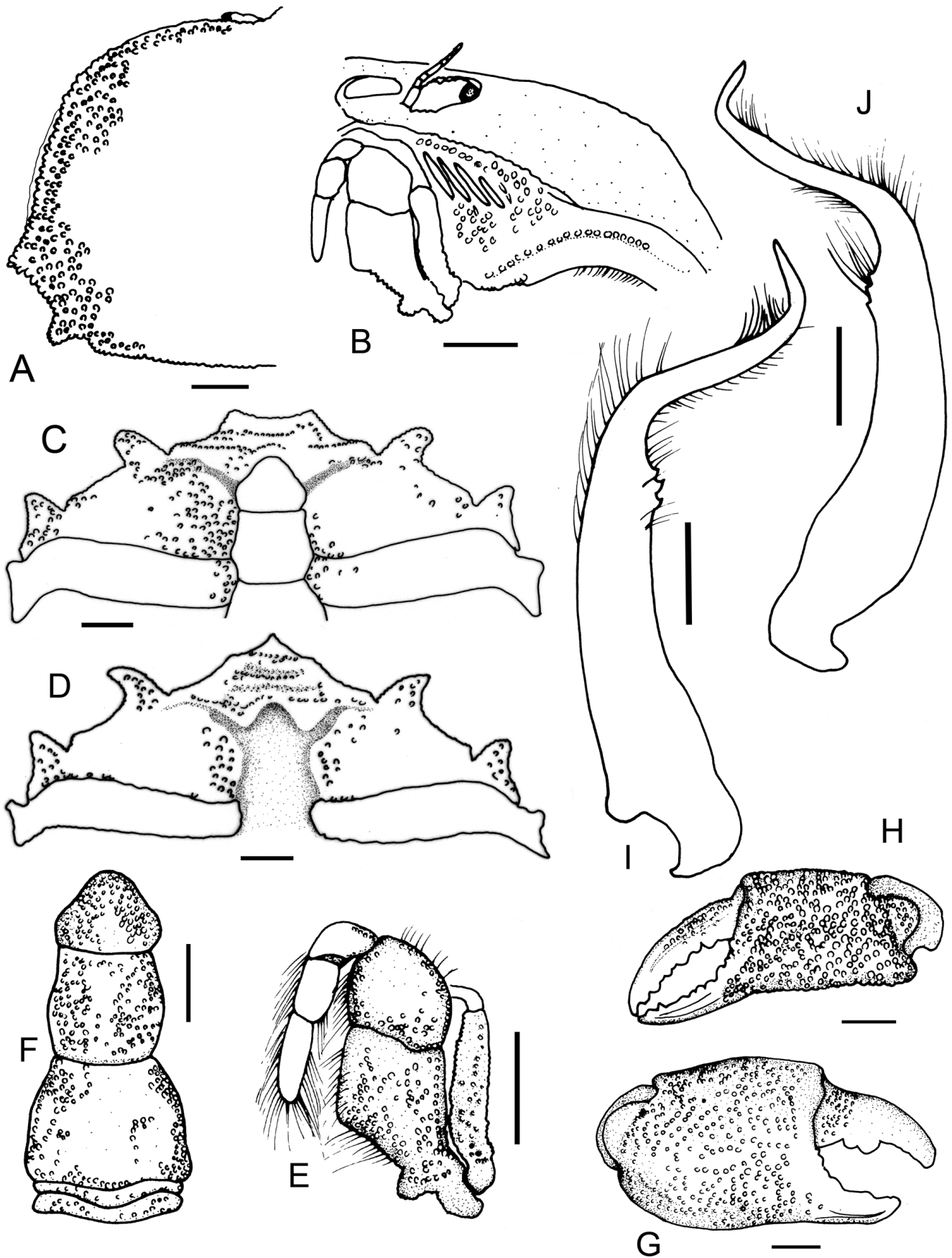


Fig. 45. *Mariaplax propinqua*, new species, holotype male (10.3 × 6.5 mm) (IOCAS). A, dorsolateral margin of carapace; B, anterior view of cephalothorax; C, thoracic sternites 3–5, showing thoracic sternal groove and telson; D, thoracic sternites 1–5, showing sternoabdominal cavity and thoracic sternal groove; E, left third maxilliped; F, male abdomen and telson, G, major chela; H, minor chela; I, J, G1. Scale bars = 1.0 mm.

setae in *M. secus* (Fig. 47E, F) (few setae along dorsal and ventral margin in *M. cyrtophallus*, Fig. 29J, K).

The male abdomen in *M. secus* is unusual, being broad and very short, with somite 6 apparently fused to somites 3–5. It is completely different from all known hexapodids. However, this is likely to be associated with some parasitic infection (e.g., a rhizocephalan as it appears unusually swollen), or the result of past damage and anomalous regrowth. As such, two of the other observed differences between *M. secus* and *M. cyrtophallus*: the differently structured male sternoabdominal cavities and G1s, should be used with caution. It is possible they have also been affected by the above factors. In any

case, the differences in the carapace, third maxillipeds, thoracic sternum and P2–P4 argue for them to be recognised as separate species.

Interestingly, both *M. cyrtophallus* and *M. secus* are found in the island of Indonesian Papua – Papua New Guinea, the latter from the east, the former from the west.

**Type locality.** Madang, south of Cape Kussoron, Bismarck Sea, Papua New Guinea.

**Distribution.** Madang, Papua New Guinea. Subtidal, 130–140 m.

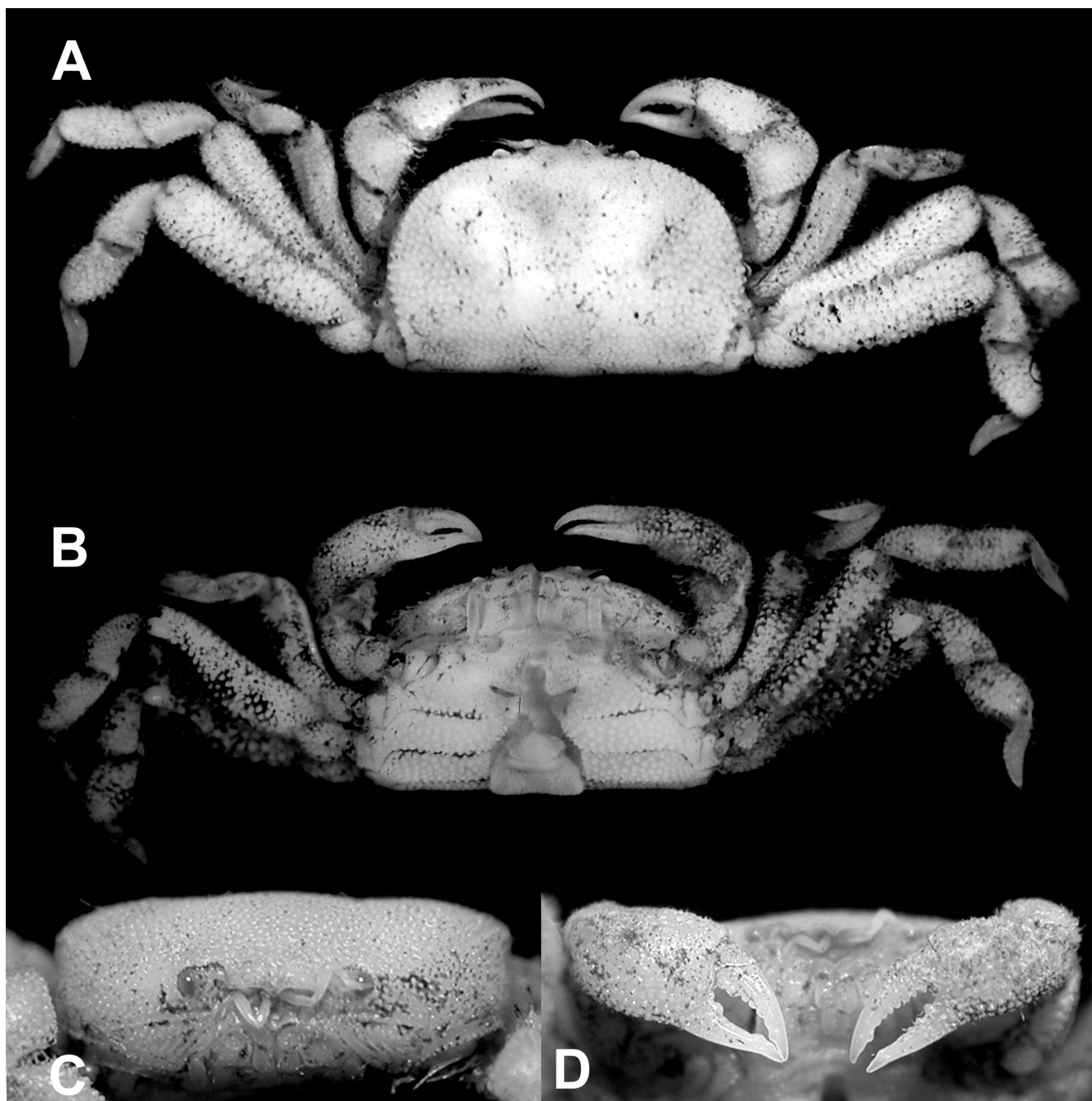


Fig. 46. *Mariaplax secus*, new species, holotype male (4.7 × 3.0 mm) (MNHN IU-2013-916). A, overall view of carapace, chelipeds and P2–P4; B, ventral view of cephalothorax; C, front view of cephalothorax; D, major chela and minor chela.

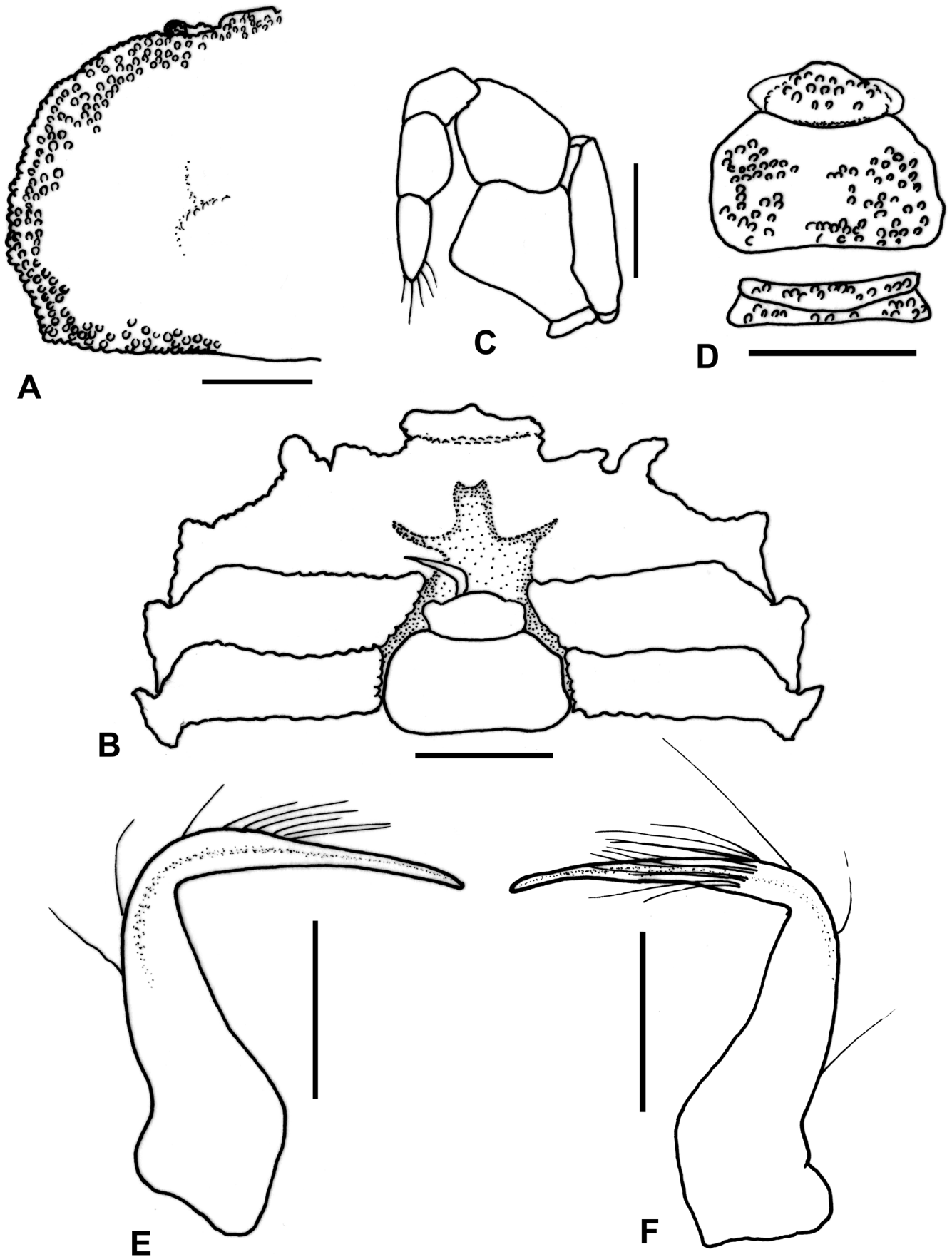


Fig. 47. *Mariaplax secus*, new species, holotype male (4.7 × 3.0 mm) (MNHN IU-2013-916). A, dorsolateral margin of carapace; B, thoracic sternites 1–6, showing sternoabdominal cavity, thoracic sternal groove and telson; C, left third maxilliped; D, male abdomen and telson; E, F, G1. Scale bars: A, B, D = 1.0 mm; C, E, F = 0.5 mm.

*Mariaplax sinensis*, new species  
(Figs. 48, 49)

**Material examined.** Holotype: male (7.5 × 5.2 mm) (IOCAS), station 21, Bohai Gulf, very close to 38°40'N 117°50'E, to 7 m depth, soft mud, coll. D. Sun & G. Lin, 27 August 1979.

**Diagnosis.** Carapace subquadrate, about 1.5 times as broad as long, dorsal surface granulated; regions indistinct, with shallow median H-shaped depression (Fig. 48A). Anterolateral margin arcuate; posterolateral margin with angled prominence over base of posterior pereopods (Figs. 48A, 49A). Eye slightly movable, small, cornea pigmented,

wider than peduncle. Pterygostomial region with row of oblique striae. Third maxillipeds broad (Figs. 48B, 49D), without distinct gap between them; ischium longer than broad, much longer than merus, mesial margin straight, combined length of dactylus, propodus and carpus shorter than that of merus and ischium; exopod narrow, 0.4 width of ischium, slightly granular, flagellum well developed. Chelipeds asymmetrical; both chelae (Fig. 48C) with gap when fingers closed; palm slightly longer than wide, surface finely tuberculate. P2–P4 tomentose, surfaces granulated (Fig. 48A); merus of P4 three times as long as broad, shallow longitudinal groove on outer surface medially; dactylus of P4 gently upcurved. Male thoracic sternum broad (Figs. 48B,

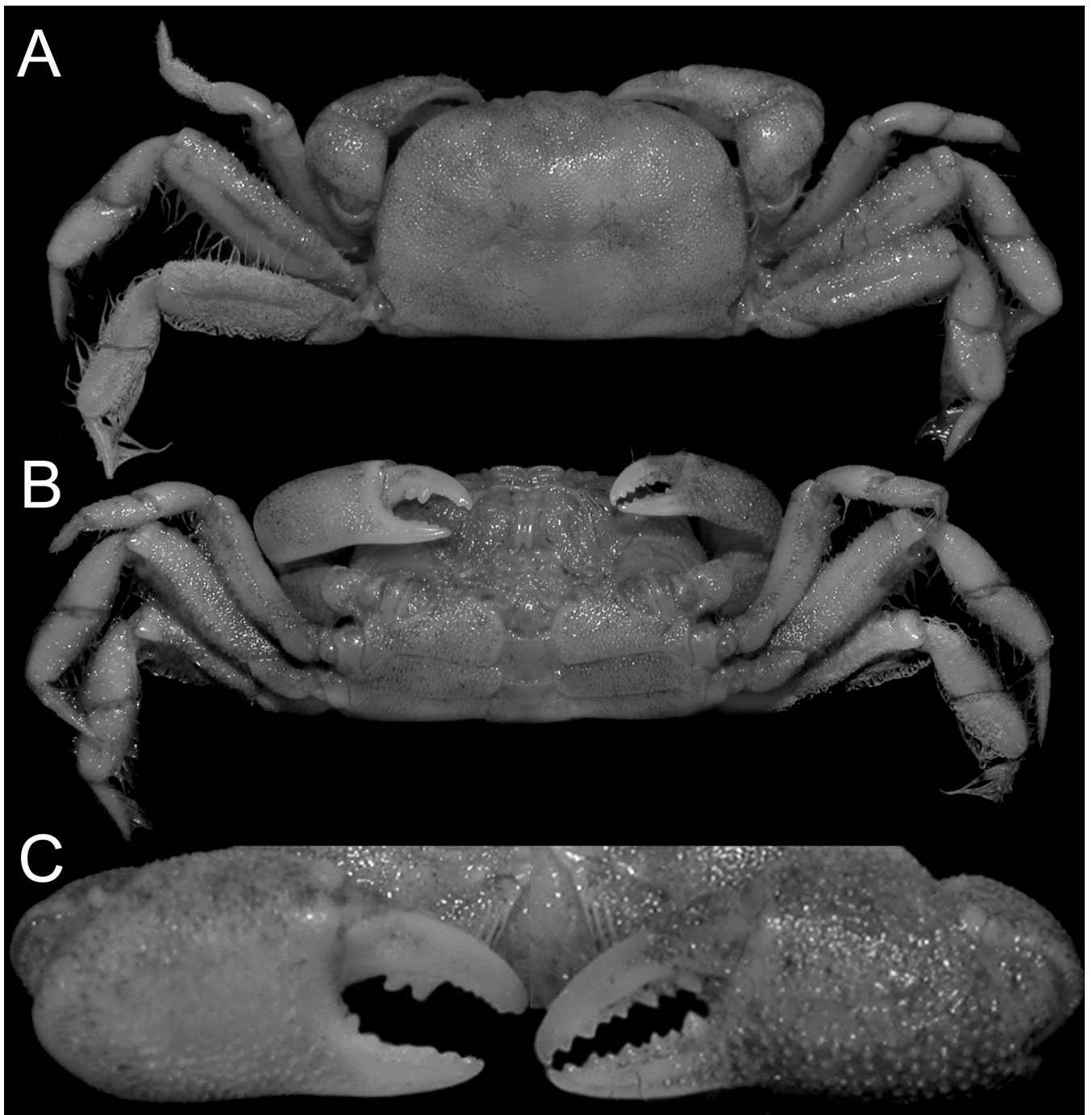


Fig. 48. *Mariaplax sinensis*, new species, holotype male (7.5 × 5.2 mm) (IOCAS). A, overall view of carapace, chelipeds and P2–P4; B, ventral view of cephalothorax; C, major and minor chelae.

49B, C), surface finely granular; sternites 1 and 2 fused, separated from sternite 3 by distinct ridge; sternite 3 separated from sternite 4 by distinct ridge; wide transverse groove extends obliquely from edge of sternoabdominal cavity, not reaching base of chelipeds (Figs. 48B, 49B); sternite 8 exposed, subrectangular, slightly longer than abdominal somite 1; sternoabdominal cavity reaching midlength of thoracic sternite 4 (Fig. 49C). Male abdomen relatively narrow (Fig. 49E), surface granular, somites 1 and 2 free;

somites 3–5 fused, lateral margin slightly arched; somite 6 slightly shorter than somites 3–5, lateral margin expanded into blunt triangular projection subproximally; telson subtriangular, distal margin rounded (Figs. 48B, 49E). G1 slender (Fig. 49F, G), S-shaped, distal part tapered, sparse short setae present laterally and mesially; row of minute spines on mesial margin medially; distal part exposed on thoracic sternal groove, not concealed under abdomen.

**Colour.** Not known.

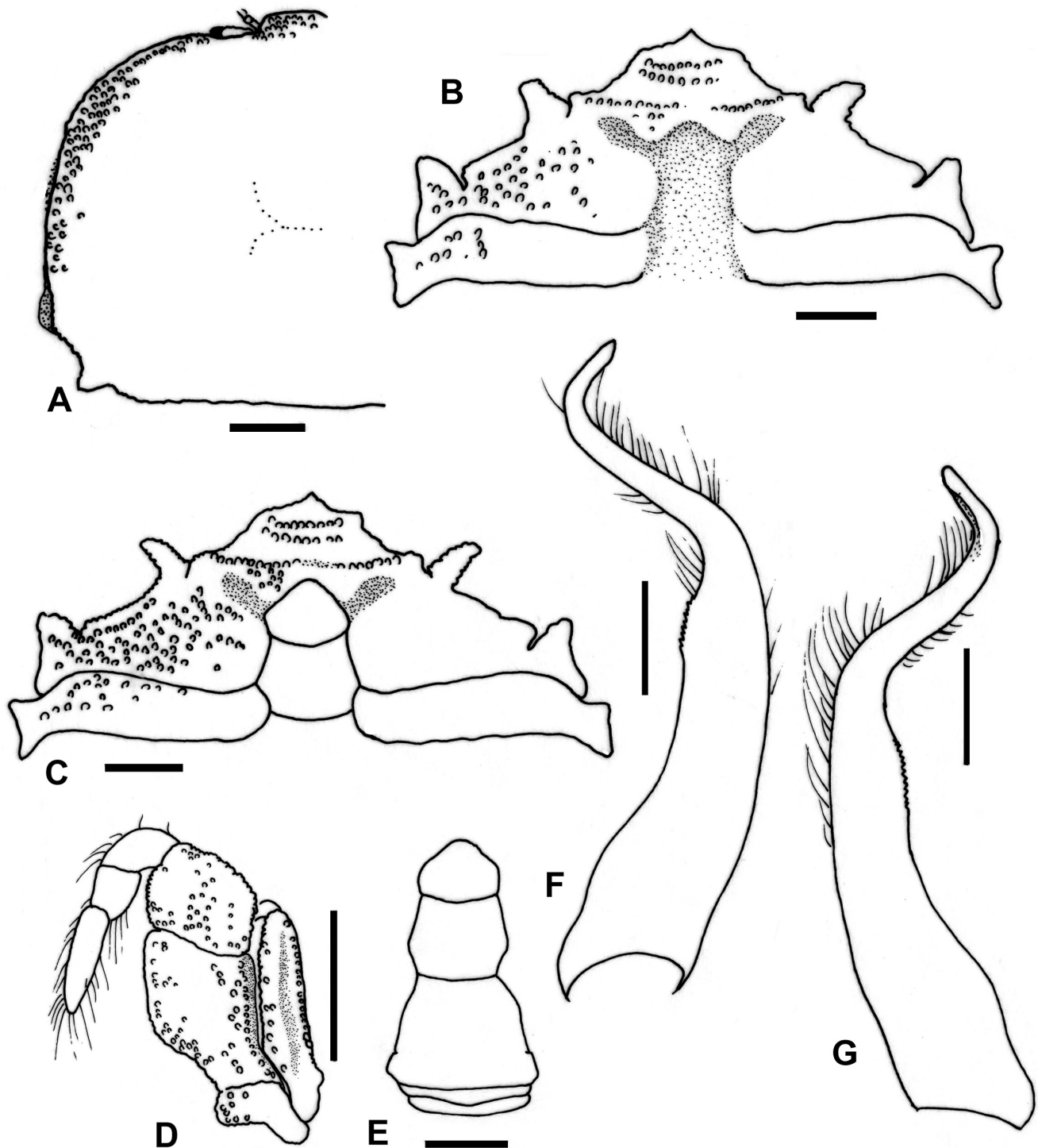


Fig. 49. *Mariaplax sinensis*, new species, holotype male (7.5 × 5.2 mm) (IOCAS). A, dorsolateral margin of carapace; B, thoracic sternites 1–5, showing sternoabdominal cavity and thoracic sternal groove; C, thoracic sternites 1–5, showing thoracic sternal groove and telson; D, left third maxilliped; E, male abdomen and telson; F, G, G1. Scale bars = 1.0 mm.

**Etymology.** Named after the type locality, China.

**Remarks.** *Mariaplax anfracta*, *M. propinqua*, new species, and *M. sinensis*, new species, share the same general shape of G1: S-shaped with a long and bent distal part. The differences between these three species are as follow: the male anterior thoracic sternum in *M. sinensis* is proportionately much wider (Fig. 49B, C) (versus Figs. 23B, C, 44A, 45C, D), and the presence of row of small spines on the G1 medial lateral margin in *M. sinensis* (Fig. 49F, G) (no spines present in *M. anfracta*, Fig. 23F, G; and three large spines in *M. propinqua*, Fig. 45I, J). Although *M. chenae* also possesses a row of minute spines at the middle of the lateral margin of the G1,

the shape of the G1 is different, being relatively stouter and distally twisted (Fig. 25I, J) (versus more slender, tapering, and only slightly twisted distally in *M. sinensis*, Fig. 49F, G).

**Type locality.** Bohai Gulf, East China Sea.

**Distribution.** East China Sea. Subtidal, 7 m.

***Mariaplax streptophallus*, new species**  
(Figs. 50, 51)

**Material examined.** Holotype: male (7.5 × 5.4 mm) (WAM C.15310), Cape Bowling Green, Queensland, Australia, coll. W. Goode, 23 November 1962.

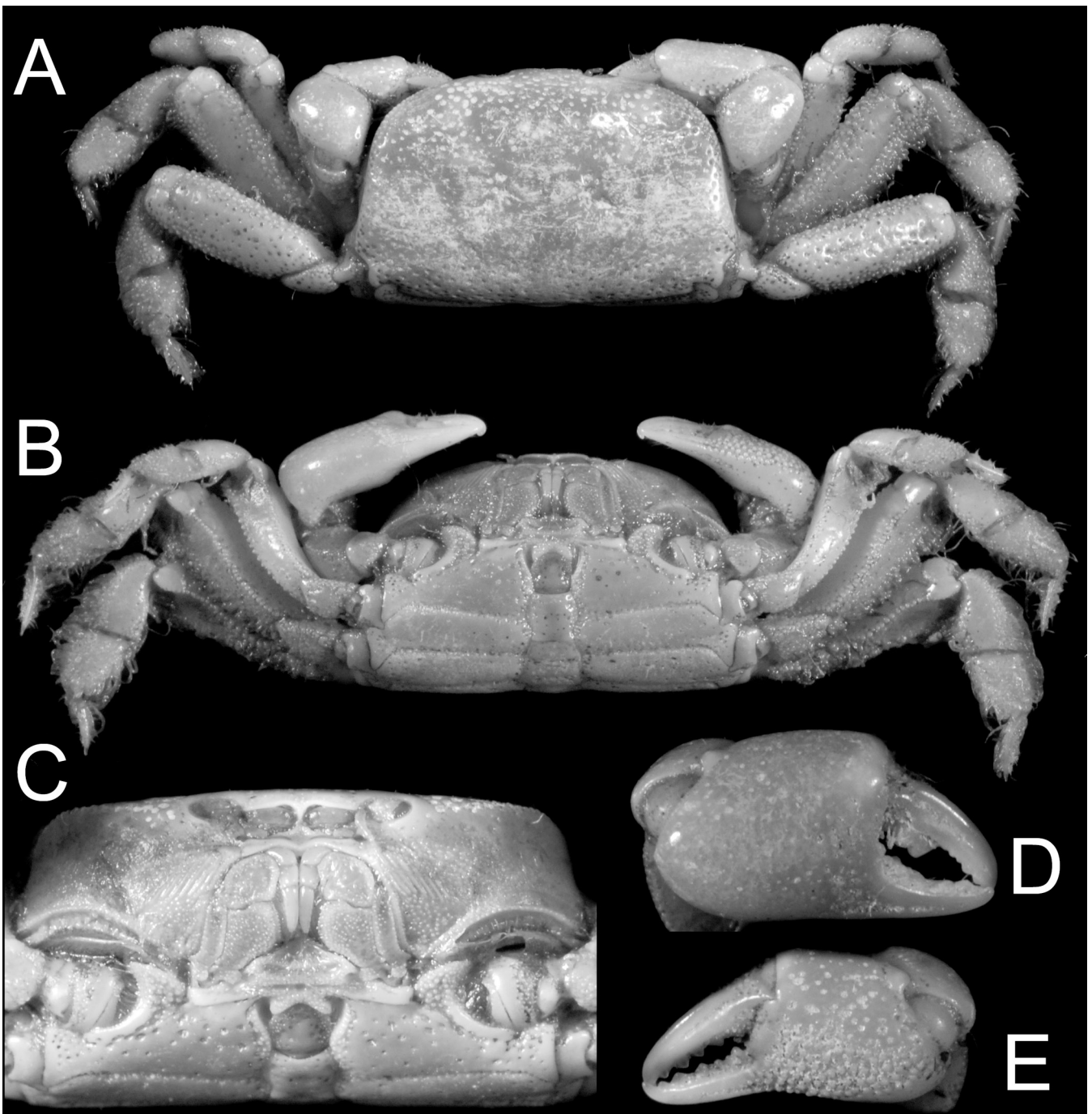


Fig. 50. *Mariaplax streptophallus*, new species, holotype male (7.5 × 5.4 mm) (WAM C.15310). A, overall view of carapace, chelipeds and P2–P4; B, ventral view of cephalothorax; C, third maxilliped; D, major chela, E, minor chela.

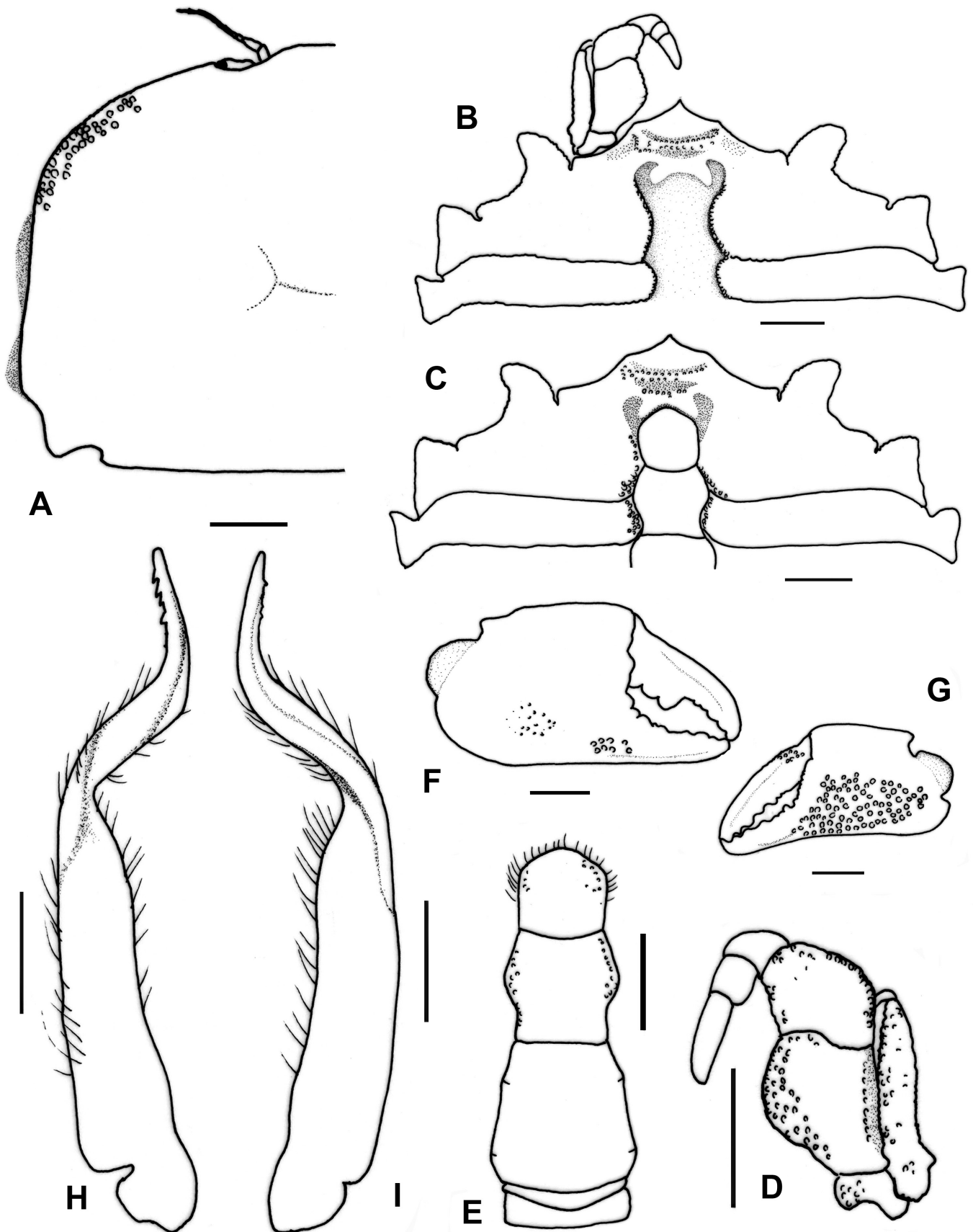


Fig. 51. *Mariaplax streptophallus*, new species, holotype male (7.5 × 5.4 mm) (WAM C.15310). A, dorsolateral margin of carapace; B, thoracic sternites 1–5, showing sternoabdominal cavity and thoracic sternal groove; C, thoracic sternites 1–5, showing thoracic sternal groove and telson; D, left third maxilliped; E, male abdomen and telson, F, major chela; G, minor chela; H, I, G1. Scale bars = 1.0 mm.

**Diagnosis.** Carapace subquadrate, about 1.4 times as broad as long, dorsal surface pitted, granulated near margin; region indistinct, H-shaped depression on surface near middle shallow (Fig. 50A). Anterolateral margin arcuate; posterolateral margin with angled prominence over base of posterior pereopods (Figs. 50A, 51A). Eye small, slightly movable, cornea globular. Pterygostomial region with row of oblique striae (Fig. 50C). Third maxillipeds relatively broad, almost completely covering buccal cavity (Figs. 50C, 51D); ischium of third maxilliped longer than merus, mesial margin very slightly oblique; combined length of dactylus, propodus and carpus shorter than that of merus and ischium; exopod relatively narrow, 0.3 width of ischium, flagellum well developed. Chelipeds stout, unequal; major (Figs. 50D, 51F) and minor (Figs. 50E, 51G) chelae with gap when fingers closed; palm almost as long as wide, surface pitted. P2–P4 relatively short; merus of P4 2.8 times as long as broad, longitudinal groove medially; dactylus of P2 and P4 slightly upcurved. Male thoracic sternum broad (Figs. 50B, 51B, C), sternites 1 and 2 fused, separated from sternite 3 by distinct ridge; sternite 3 separated from sternite 4 by distinct ridge, thoracic sternal groove directed anteriorly, curved inwards, extends from sternoabdominal cavity to base of sternite 3 (Figs. 50B, 51C); sternite 8 exposed, triangular, as long as abdominal somite 1; sternoabdominal cavity not reaching base of sternite 3 (Fig. 51B). Male abdomen relatively narrow (Figs. 50B, 51E); somites 1 and 2 free; somites 3–5 fused, lateral margin slightly sinuous; somite 6 slightly shorter than length of somites 3–5, lateral margin expanded medially into blunt triangular projection; distal margin of telson rounded, with sparse setae. G1 (Fig. 51H, I) bent submedially, twisted, directed anteriorly, distal part tapered, with row of spines mesially, sparse short setae laterally and mesially, distal quarter not concealed under abdomen, exposed on thoracic sternal groove, obscured by setae of telson. Female unknown.

**Colour.** Not known.

**Etymology.** From the Latin “strepto” for twisted, and “phallus” for penis, alluding to the twisted structure of the G1. The name is used as a noun in apposition.

**Remarks.** *Mariaplax streptophallus*, new species, differs from congeners in having a row of spinules near the tip of the G1. *Mariaplax chenaе*, new species, *M. propinqua*, new species, and *M. sinensis*, new species, also have spines on their G1, but these are positioned along the midlength of the G1. The male thoracic sternal groove, which is directed anteriorly (Fig. 51B, C), resembles that of *M. granulifera* (Fig. 36B, C), but in *M. streptophallus*, the groove is curved inwards while in *M. granulifera* it is directed anteriorly. While it has a twisted G1 like *M. chenaе*, the condition is more extreme in *M. streptophallus*, with the entire structure bent and twisted submedially, directed anteriorly and tapering distally (Fig. 51H, I). In *M. chenaе*, only the G1 tip is twisted (Fig. 25I, J).

*Mariaplax streptophallus* resembles *M. anfracta* in the less granulated surface of the carapace but differs in having a proportionately wider carapace (Fig. 50A versus Fig. 22A, C), slightly oblique mesial margin of the ischium of the third maxilliped (Fig. 51D versus Fig. 23D), a relatively longer and more slender male abdomen (Fig. 51E versus Fig. 23C), and the male thoracic sternal groove is directed anteriorly (Fig. 51B, C versus Fig. 23B, C).

**Type locality.** Cape Bowling Green, Queensland, Australia

**Distribution.** Bowling Green, Queensland, Australia. Subtidal.

### *Rayapinus*, new genus

**Diagnosis.** Carapace broader than long, surface almost smooth with sparse tubercles on margin or distinctly granulated; regions indistinct, with shallow U-shaped depression medially. Anterolateral margin arcuate; pterygostomial region with row of long and short, broken or entire, oblique striae and scattered tubercles. Eye short, stout, slightly movable, cornea subglobular. Third maxilliped broad, without gap when closed; ischium narrow slightly longer than merus, mesial margin rounded; carpus, propodus and dactylus cylindrical; dactylus longer than propodus; exopod moderately wide. Chelipeds unequal, P2–P4 short, stout; propodus and dactylus very short; propodus rounded, dactylus shorter than propodus; dactylus of P2 and P4 slightly curved. Thoracic sternites 1 and 2 fused; sternite 3 separated from sternite 4 by tuberculate ridge laterally, median area appearing fused; sternites 4–7 well developed, separated from each other by distinct suture; sternite 8 exposed, triangular, as long as male abdominal somite 1. Sternoabdominal cavity reaches middle of thoracic sternite 4. Male thoracic sternal groove short. Male abdomen narrow, somites 1, 2 and 6 free, somites 3–5 fused; telson rounded. G1 stout, bent subdistally, apice not concealed under abdomen. Female abdomen relatively narrow, somites 1–6 fused, telson almost as long as somite 6.

**Etymology.** Named in honor of Ray Manning. The name *Rayapinus* is derived from his first name, Ray, with “-pinus”, the suffix of the allied genus *Hexapinus*. Gender masculine.

**Remarks.** This genus is remarkable for its short and stout P2–P4 with the propodus and dactylus especially short, and the characteristic G1 shape that has wide apices with row of spines. The extension of the male thoracic sternal groove is similar to that of *Hexapinus* but the shapes of their third maxillipeds and male abdomens are different. In *Hexapinus*, the ischium of the third maxilliped is strongly dilated mesially (Fig. 13C) and the male abdominal somite 6 is slightly shorter than somites 3–5 (Fig. 21C). In *Rayapinus*, the ischium of the third maxilliped is not dilated mesially (Fig. 53E) and the male abdominal somite 6 is much shorter than somites 3–5 (Fig. 53F).

**Species included.** *Rayapinus maenosonoi*, new species (type species by present designation).



*Rayapinus maenosonoi*, new species

(Figs. 2D, 52, 53)

**Material examined.** Holotype: male (6.6 × 4.6 mm) (RUMF-ZC-2115), Sesoko Island near Okinawa Island, Ryukyu Islands, Japan, coll. T. Maenosono, 11 May 2010. Paratype: **Japan:** 1 female (4.3 × 3.1 mm) (ZRC 2012.1034), same locality as holotype, coll. T. Maenosono, 8 June 2009.

**Diagnosis.** Carapace subquadrate, about 1.4 times as broad as long, dorsal surface smooth; regions indistinct; anterolateral margin arcuate; posterolateral corner with angled prominence over base of posterior pereopods; orbit distinct, transverse;

eye small; pterygostomial region with row of striae. Third maxillipeds relatively broad, tuberculate; ischium longer than merus, with rounded mesial margin; merus broader than long; exopod relatively narrow, flagellum well developed. Chelipeds stout, unequal; major chela with slight gap when fingers closed; minor chela with relatively wider gap between fingers. P2–P4 short, stout, P3 longest; merus of P4 2 times as long as broad. Male thoracic sternum broad; sternoabdominal cavity not reaching base of sternite 3; thoracic sternal groove short, extends obliquely from sternoabdominal cavity. Male abdomen relatively narrow; somites 1 and 2 free; somites 3–5 fused, lateral margin sinuous; somite 6 distinctly shorter than

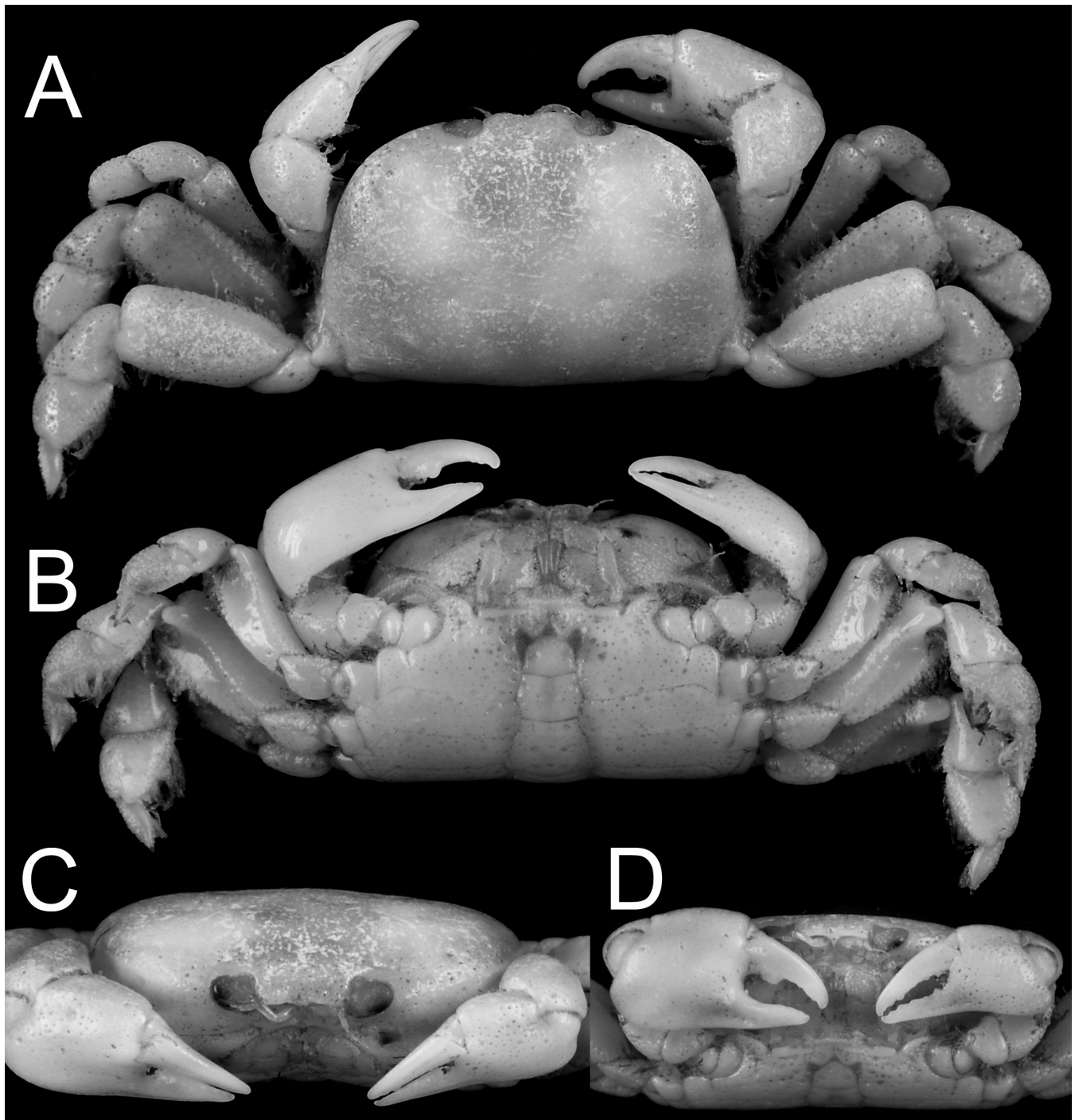


Fig. 52. *Rayapinus maenosonoi*, new species, holotype male (6.6 × 4.9 mm) (RUMF-ZC-2115). A, overall view of carapace, chelipeds and P2–P4; B, ventral view of cephalothorax; C, frontal view of cephalothorax; D, chelae.

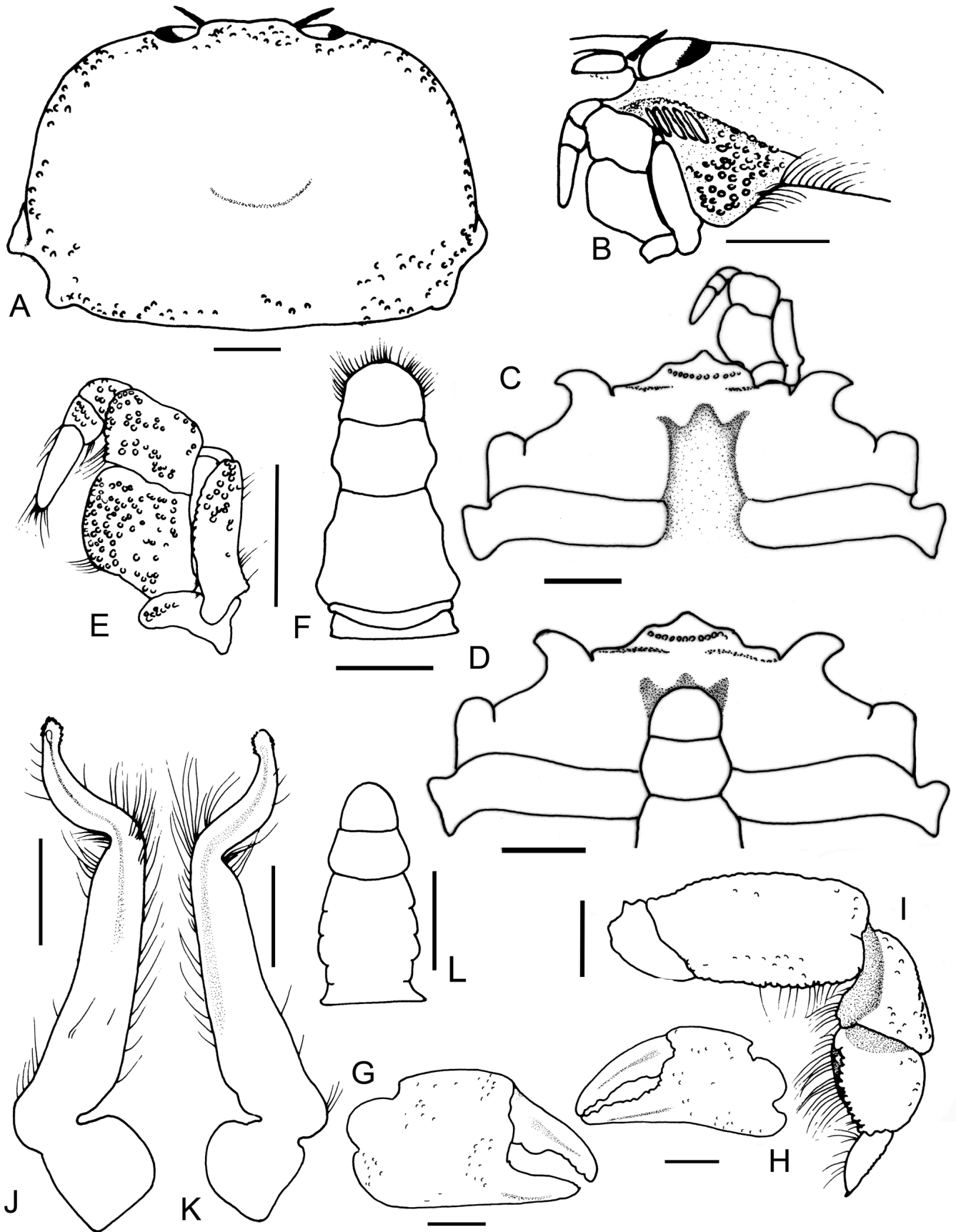


Fig. 53. *Rayapinus maenosonoi*, new species. A–K, holotype male (6.6 × 4.9 mm) (RUMF-ZC-2115); L, paratype female (4.3 × 3.1 mm) (ZRC 2012.1034). A, carapace; B, anterior view of carapace; C, thoracic sternites 1–5, showing sternoabdominal cavity and thoracic sternal groove; D, thoracic sternites 1–5, showing thoracic sternal groove and telson; E, left third maxilliped; F, male abdomen and telson, G, major chela; H, minor chela; I, left P4; J, K, G1; L, female abdomen and telson. Setae on chelae not drawn. Scale bars = 1.0 mm.

length of somites 3–5, lateral margin with blunt triangular expansion medially; telson short with distal margin rounded, setose. G1 stout, bent subdistally, apices wide, not concealed under abdomen. Female abdomen narrow, somites 1–6 fused, suture visible between somites 5 and 6 but functionally fused; lateral margin of somite 6 expanded subproximally, telson almost as long as somite 6, distal margin rounded.

**Description.** Carapace subquadrate, about 1.4 times as broad as long, dorsal surface smooth; regions indistinct, median U-shaped depression shallow; some granules present on dorsolateral margins, only scattered granules on posterior margin (Fig. 52A). Anterolateral margin arcuate; posterolateral corner with angled prominence over base of posterior pereopods (Figs. 52A, 53A). Orbit distinct, transverse; eye small, slightly movable, cornea black, wider than tuberculate peduncle (Fig. 53B). Pterygostomial region with row of oblique striae, oblique row of setae under row of striae, adjacent to Milne Edwards' opening (Fig. 53B). Third maxillipeds relatively broad, tuberculate, without gap between them (Figs. 52B, 53E); ischium longer than merus, with rounded mesial margin; merus broader than long; carpus, propodus and dactylus cylindrical; dactylus longer than propodus, combined length of dactylus, propodus and carpus shorter than that of merus and ischium; exopod narrow, 0.4 width of ischium, flagellum well developed.

Chelipeds stout, unequal (Fig. 52D). Major chela (Fig. 53G) with slight gap when fingers closed; large teeth present at cutting edge of dactylus; dactylus with longitudinal groove on outer surface, tufts of setae on cutting edge proximally; inner surface near upper margin with longitudinal ridge; palm slightly wider than long, surface with sparse tubercles on outer surface, shallow longitudinal groove on outer surface of fixed finger; carpus without setae dorsally, row of tubercles and setae dorsomesially; merus short, few tubercles and fringe of setae dorsomesially. Minor chela (Fig. 53H) with relatively wider gap between closed fingers; dactylus with longitudinal groove on outer surface; inner surface with longitudinal ridge near upper margin; outer surface of palm covered by large tubercles, carpus and merus unarmed, fringe of setae on each dorsomesial margin. P2–P4 short, stout (Fig. 52A); P3 longest; P2 most slender, dactylus upcurved, few tubercles on upper margin, fringe of short setae on upper and lower margins, slightly shorter than propodus, latter with row of tubercles on upper and lower margins distally accompanied by setae, carpus longer than propodus, tubercles on outer upper half, tufts of setae distally, merus about 1.7 times length of carpus, upper and lower margins with row of tubercles and tufts of short setae. P3 stouter, longer than P2; P4 (Fig. 53I) stouter than P3; ornamentation and setation as on P2; merus of P4 2 times as long as broad.

Male thoracic sternum broad (Figs. 52B, 53C, D), sternites 1 and 2 fused, separated from sternite 3 by distinct ridge; sternite 3 separated laterally from sternite 4, medially appear fused, sternites 4–7 well developed, separated by distinct sutures; thoracic sternal groove short, extends obliquely from sternoabdominal cavity, reaching middle of sternite 4 (Figs. 52B, 53D); sternite 8 exposed, triangular, as long as

abdominal somite 1; sternoabdominal cavity not reaching middle of sternite 4. Male abdomen relatively narrow (Figs. 52B, 53F); somites 1 and 2 free; somites 3–5 fused, lateral margin sinuous; somite 6 distinctly shorter than length of somites 3–5, lateral margin forming blunt triangular expansion medially; telson short, with rounded, setose margin.

G1 (Fig. 53J, K) bent subdistally, directed anterolaterally, distal part slightly tapered, tip rounded with several spines, mesial and lateral margin with sparse long setae, apices not concealed under abdomen, exposed on thoracic sternal groove, obscured by setae of telson. Female abdomen narrow (Fig. 53L), with somites 1–6 fused, somites 1–5 with very shallow, indiscernible sutures, suture visible between somite 5 and 6 but functionally fused; somite 6 distinctly shorter than somites 3–5, lateral margin expanded subproximally, telson almost as long as somite 6, distal margin rounded.

**Colour.** In life, carapace yellow or light yellow, merus and carpus of chelipeds and P2–P4 yellow, propodus and dactylus white yellowish (Fig. 2D).

**Etymology.** Named after Tadafumi Maenosono who collected the type specimens.

**Remarks.** As mentioned earlier, *Rayapinus*, new genus, is similar to *Hexapinus* in the extent of the male thoracic sternal groove. However, *Rayapinus maenosono* can be easily separated from *Hexapinus latipes* and *H. simplex* by having proportionately much shorter and stouter P2–P4 with a very short dactylus, and a G1 in which the distal part is expanded.

**Type locality.** Sesoko Island near Okinawa Island, Ryukyu Islands, Japan.

**Distribution.** Okinawa Island, Ryukyu Islands, Japan. Subtidal, 1.5–2 m.

### *Latohexapus* Huang, Hsueh & Ng, 2002

*Latohexapus* Huang, Hsueh & Ng, 2002: 652.

**Emended diagnosis.** Carapace much broader than long; regions distinct, separated by deep groove, strongly granulated. Eye movable; anterolateral margin arcuate. Pterygostomial region with row of striae, granular; ischium of third maxillipeds expanded distally, longer than merus; exopod with well developed flagellum. Chelipeds asymmetrical, with prominent teeth at base of fingers. Surfaces of P2–P4 granular, dactylus upcurved. Male thoracic sternum very broad; surface prominently granular; sternites 1 and 2 fused, strongly bent backward, separated from sternite 3 by distinct transverse ridge; deep transverse groove separating thoracic sternites 3 and 4; sternoabdominal cavity extending from edge of abdominal cavity to base of chelipeds; sternite 8 exposed. Male abdomen with somites 3–5 fused; somite 6 appearing hexagonal, with median part prominently expanded into triangular projection; telson subpentagonal. G1 very slender, directed anterolaterally, distal quarter not concealed under abdomen.

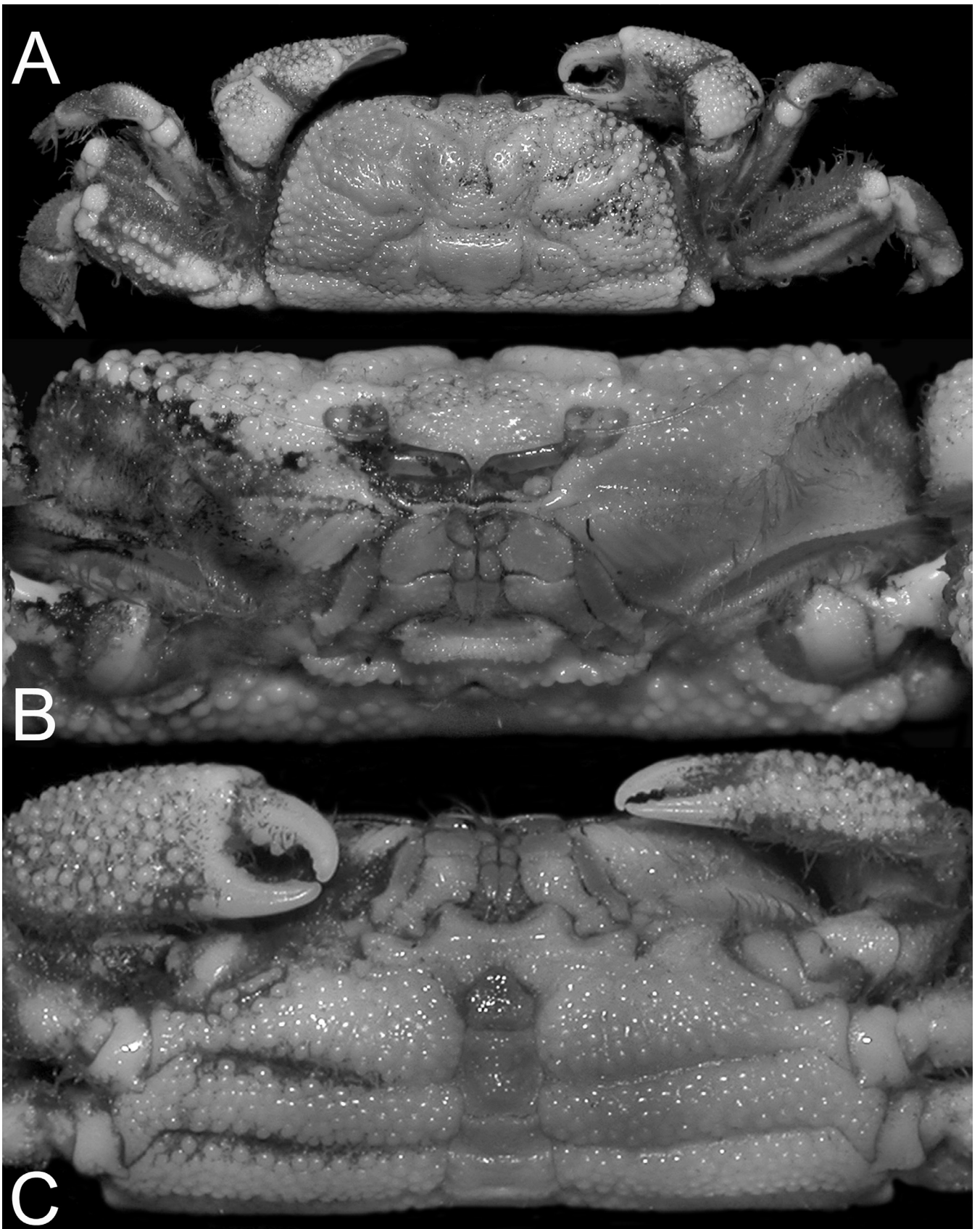


Fig. 54. *Latohexapus granosus* Huang, Hsueh & Ng, 2002, holotype male (16.3 × 8.2 mm) (ZRC 2002.001). A, overall view of carapace, chelipeds and P2–P4; B, frontal view of cephalothorax; C, ventral view of cephalothorax.

**Species included.** *Latohexapus granosus* Huang, Hsueh & Ng, 2002 (type species by original designation).

**Remarks.** So far this is the only genus in the family that has the carapace much broader than long and with the regions distinctly demarcated. As discussed by Huang et al. (2002), the extension of the male thoracic sternal groove is comparable to the condition in *Lambdophallus* but several differences such as movable eyes (versus immovable eyes in *Lambdophallus*), the shapes of the third maxillipeds with the ischium expanded distally in *Latohexapus* (Huang et al., 2002: fig. 4D) (versus slightly convex in *Lambdophallus*, Manning & Holthuis, 1981: fig. 34b), and the male abdominal somite 6 appearing hexagonal (Huang et al., 2002: fig. 4G) (versus almost squarish in *Lambdophallus*, Manning & Holthuis, 1981: fig. 34C) easily distinguishes the two genera.

***Latohexapus granosus* Huang, Hsueh & Ng, 2002**  
(Fig. 54)

*Latohexapus granosus* Huang et al., 2002: 656, figs. 1B, 3, 4; Ng et al., 2008: 86.

**Material examined.** Holotype: male (16.3 × 8.2 mm) (ZRC 2002.001), port at Bertzuliau, Yulin County, Taiwan, coll. P.-Y. Hsu, 23 March 2000.

**Diagnosis.** Carapace about 1.9 times as broad as long, dorsal surface distinctly granulated; regions separated by deep grooves; anterolateral margin arcuate; posterolateral corner with small angle over base of posterior pereopods (Fig. 54A). Orbit distinct, transverse; eye movable (Fig. 54A, B). Pterygostomial region with row of oblique striae (Fig. 54B). Third maxillipeds broad, completely covering buccal cavity; exopod with well developed flagellum (Fig. 54B, C). Chelipeds asymmetrical; major chela with wide gap when fingers closed, granulated (Fig. 54C); minor chela with narrower gap when fingers closed; ornamentation similar to that of major chela. P2–P4 relatively short; P3 longest, surfaces granulated; deep longitudinal groove on lateral face of merus of P4 (Fig. 54A). Male thoracic sternum very broad (Fig. 54C); sternites 1, 2 fused, strongly bent inwards towards buccal cavity; thoracic sternal groove extending obliquely from edge of abdominal cavity, bending to become subparallel to frontal margin to base of chelipeds; sternoabdominal cavity reaching base of sternite 3; sternite 8 exposed, triangular, as long as abdominal somite 1. Male abdomen relatively narrow (Fig. 54C), surface granular; somites 3–5 fused, lateral margin sinuous; somite 6 with median part of lateral margin prominently expanded into triangular projection, appearing evenly hexagonal; telson rounded. G1 slender, bent submedially, directed anterolaterally, distal part tapered, not concealed under abdomen.

**Colour.** In life, the carapace and appendages are dirty white overall, but stained black in many parts by the mud.

**Remarks.** Huang et al. (2002) gave a relatively complete description and figures of the genus and species, and there is no need to repeat it. One useful character not used by Huang et al. (2002) is the form of thoracic sternites 1 and

2. *Latohexapus* is the only genus known to have thoracic sternites 1 and 2 sharply bent inwards and downwards into the buccal cavity (Fig. 54B, C).

**Type locality.** Bertzuliau, Yulin County, Taiwan.

**Distribution.** Yulin County, Taiwan. Subtidal.

***Hexaplax* Doflein, 1904**

*Hexaplax* Doflein, 1904: 122; Manning & Holthuis, 1981: 171.

**Diagnosis.** Carapace broader than long, surface very finely granular; regions indistinct, with shallow median H-shaped depression. Anterolateral margin arcuate; pterygostomial region with row of short striae forming long oblique stridulatory ridge. Eye large, movable; cornea dilated. Third maxilliped wide, leaving gap when closed; ischium longer than merus, dilated distally, mesial margin rounded; carpus, propodus and dactylus cylindrical; dactylus longer than propodus; exopod narrow, flagellum present. Chelipeds stout, subequal or unequal, P2–P4 long, slender. Thoracic sternites 1 and 2 fused; sternites 3 and 4 fused; sternite 8 exposed, triangular, reaching proximal half of male abdominal somite 2. Sternal abdominal cavity reaching distal margin of thoracic sternite 4. Male thoracic sternal groove absent. Male abdomen relatively narrow; somite 1 hidden under carapace; male abdominal somites 2 and 6 free; somites 3–5 fused (but sutures may be visible); distal margin of telson rounded. G1 straight to sinuous, apice concealed under abdomen. Female abdomen with 6 free somites and telson.

**Species included.** *Hexaplax megalops* Doflein, 1904 (type species by original designation), *Hexaplax aurantium*, new species, and *Hexaplax saudade*, new species.

**Remarks.** *Hexaplax* is characterised by the large hammer-shaped cornea, and long, slender P2–P4, and has long been believed to be monotypic. Examination of recent collections from Taiwan, the Philippines and Papua New Guinea show that specimens from the Pacific belong to two new species. It is a deep-water genus, with all three species collected from 400 to 500 m.

The record of “*Hexaplax* sp.” by Rathbun (1910: 349, text-fig. 37) from the Gulf of Thailand is problematic. Her figure of the carapace (Rathbun, 1910: text-fig. 37a) superficially resembles *Hexaplax megalops* (or one of the other two species) and Rathbun commented that it had reniform eyes. However, it was a very small male only 1.8 mm in carapace width and in poor condition. Most surprisingly, it was obtained in only six fathoms (ca. 11 m) of water that is much shallower than what is known for members of this genus which are almost always from the deep sea, in excess of 200 m. The third maxilliped she figured (Rathbun, 1910: 349, text-fig. 37b), however, suggests that her specimen is not a *Hexaplax* species, being elongated with a rectangular ischium and the dactylus is shorter than the propodus. In *Hexaplax*, the ischium is much shorter and broader, and the dactylus is much longer than the propodus (Figs. 62A,

64A, 66A). This specimen will need to be re-examined to ascertain what genus it belongs to.

***Hexaplex megalops* Doflein, 1904**

(Figs. 2E, 55, 56A, B, 57A, 58A, B, 59A–C, 60A, 61C, 62)

*Hexaplex megalops* Doflein, 1904: 122, pl. 31 figs 3, 4, pl. 50 fig. 7; Ng et al., 2008: 86 (part).

**Material examined.** Holotype: male (15.0 × 10.0 mm) (ZMB) (photographs), station 199, 00°15.5'N98°04'E, 470 m, Nias, Indonesia, coll. German Deep Sea Expedition, RV *Valdivia*, 1898–1899. Others: 13 males (10.8 × 6.6 mm – 18.7 × 10.7 mm), 10 females (13.9 × 9.4 mm – 17.7 × 12.2 mm), 1 ovigerous female (16.9 × 11.2 mm) (MNHN-IU 2011-2251), station CP 3740 09°12'S 152°16'E, 556–645 m, coll. BIOPAPUA Expedition, 10 October 2010; 1 female (17.9 × 12.9 mm) (MNHN-IU-2011-2820), station CP 3739, 09°09'S 152°15'E, Woodlark Island, 503–546 m, coll. BIOPAPUA Expedition, 10 October 2010; 3 males (11.7 × 8.0 mm – 18.0 × 11.7 mm), 5 females (15.7 × 10.5 mm – 17.6 × 11.7 mm) (MNHN-IU-2011-2425), 2 males (14.6 × 9.4 mm, 15.0 × 10.0 mm), 2 females (17.9 × 11.9 mm, 18.1 × 12.3 mm) (ZRC 2013.1695 ex MNHN-IU-2011-2425), station CP 3743, 09°11'S 152°16'E, Woodlark Island, 540–585 m, coll. BIOPAPUA Expedition, 10 October 2010; 1 male (12.7 × 8.5 mm), 2 females (15.7 × 10.8 mm, 13.6 × 9.3 mm) (MNHN-IU 2011-2149), station CP 3741, 09°14'S 152°18'E, Woodlark Island, 694–766 m, coll. BIOPAPUA Expedition, 10 October 2010; 1 female (14.3 × 9.6 mm) (MNHN-IU-2011-3275), station CP 3671, 04°04'S 151°56'E, north of Rabaul, 585–601 m, coll. BIOPAPUA Expedition, 29 September 2010; 2 males (13.9 × 9.4 mm, 10.8 × 7.2 mm), 1 female (13.9 × 9.3 mm) (MNHN-IU-2011-1168), 1 male (13.4 × 8.9 mm) (MNHN-IU-2011-3343), station CP 3739, 09°09'S 152°15'E, Woodlark Islands, 503–546 m, coll. BIOPAPUA Expedition, 10 October 2010; 1 female (12.5 × 8.3 mm) (MNHN-IU-2011-987), station CP 3655, 02°15'S 150°16'E, west of New Hanover, 402–440 m, coll. BIOPAPUA Expedition, 28 August 2010; 6 males (13.6 × 9.0 mm – 15.9 × 10.1 mm), 7 females (7.8 × 5.4 mm – 14.5 × 9.8 mm) (MNHN-IU-2011-980), 1 male (13.5 × 9.0 mm) (MNHN-IU-2011-1026), station CP 3654, 02°14'S 150°16'E, west of New Hanover, 490–505 m, coll. BIOPAPUA Expedition, 28 August 2010; 2 males (12.3 × 8.2 mm, 13.0 × 8.4 mm), 3 females (13.7 × 9.3 mm – 18.1 × 12.1 mm) (MNHN-IU-2011-999), station CP 3670, 04°06'S 151°56'E, north of Rabaul, 497–500 m, coll. BIOPAPUA Expedition, 24 September 2010.

**Diagnosis.** Carapace subquadrate, about 1.5 times as broad as long, dorsal surface smooth, few fine granules on anterolateral surface; regions indistinct, median H-shaped depression shallow. Anterolateral margin arcuate; posterolateral corner with small angle over base of posterior pereopods. Front not deflexed, divided into 2 lobes, not projecting beyond distal edge of orbits in dorsal view. Orbit distinct, transverse; eye movable, large, corneas dilated, pigmented, much wider than peduncle. Pterygostomial region with long row of about 45 short striae forming oblique stridulatory ridge which reaches posterior margin of epistome; shallow oblique groove above ridge. Third maxillipeds not completely covering buccal cavity, with gap when closed; ischium longer than merus, dilated distally, mesial margin with row of small teeth, rounded; merus squarish, as long as broad; exopod relatively narrow, about 0.3 width of ischium, flagellum well developed. Chelipeds subequal; major chela with gap when

fingers closed; with large teeth at cutting edge of dactylus and fixed finger; dactylus, palm and carpus finely granulated on outer surface; minor chela with slight gap when fingers closed; ornamentation similar to that of major chela. P2–P4 long, slender; outer surface finely granulated on upper half, lower half almost smooth; merus of P4 8 times as long as broad, upper margin of merus and carpus finely serrated, outer surface of merus flattened; shallow longitudinal groove on outer surface of propodus. Male thoracic sternum broad, surface finely granular; sternites 1 and 2 fused, separated from sternite 3 by distinct ridge; sternite 3 not separated from sternite 4, sternites 4–7 well developed, separated by distinct sutures. Male abdomen relatively narrow; somite 1 hidden under carapace; somite 2 free, somites 3–5 fused with shallow but distinct suture still visible, lateral margin sinuous; somite 6 wider than long, lateral margin slightly expanded subproximally; telson rounded, as long as somite 6. G1 long, stout, tapering to pointed tip; row of 4 tiny spines subdistally. Female thoracic sternum broad, female abdomen relatively broad; somite 1 hidden under carapace; somites 2–6 free; telson rounded, slightly shorter than somite 6.

**Description.** Carapace subquadrate, about 1.5 times as broad as long, dorsal surface smooth, few fine granules on anterolateral surface; regions indistinct, median H-shaped depression shallow (Fig. 55). Anterolateral margin arcuate; posterolateral corner with small angle over base of posterior pereopods. Front not deflexed (Fig. 56A, B), divided into 2 lobes, not projecting beyond distal edge of orbits. Orbit distinct, transverse; eye movable, large, corneas dilated, pigmented, much wider than peduncle (Figs. 55, 56A, B). Pterygostomial region with oblique stridulatory ridge consist of long row of 28 short striae with ca. 17 relatively shorter, less produced, reaching distal edge of mouthpart (Fig. 60A); shallow oblique groove above ridge. Third maxillipeds (Figs. 58A, B, 62A) relatively broad, not completely covering buccal cavity, with gap when closed; ischium longer than broad, longer than merus, dilated distally, mesial margin with row of small teeth, rounded; merus squarish, as long as broad; exopod relatively narrow, about 0.3 width of ischium, flagellum well developed.

Chelipeds subequal (Fig. 57A, B); major chela with gap when fingers closed; with large teeth at cutting edge of dactylus and fixed finger; dactylus, palm and carpus finely granulated on outer surface; outer surface of dactylus with 2 longitudinal ridges, inner surface with longitudinal ridge consist of oblique striae; fixed finger with 2 longitudinal ridges; lower margin with row tiny teeth continuing to lower margin of palm, inner surface of palm with 2 low longitudinal ridges; minor chela with slight gap when fingers closed; ornamentation similar to that of major chela.

P2–P4 long, slender (Fig. 55); P2 most slender; dactylus straight, slightly shorter or as long as propodus, longitudinal ridge medially on outer surface, propodus and carpus smooth on outer surface; carpus shorter than propodus; merus 2.9 times length of carpus, upper margin with small granules. P3 longer than P2; dactylus straight, shorter than propodus, longitudinal ridge medially on outer surface, propodus

smooth with shallow longitudinal groove on outer surface; carpus shorter than propodus, outer surface finely granulated on upper half, upper margin with row of small denticles; merus 3.2 times length of carpus, upper and lower margin with row of small denticles distally, proximally smooth, outer surface with tiny granules on distal upper half. P4 shorter than P3; merus 3.4 times length of carpus, 8.8 times as long as broad, outer surface of merus slightly flattened, ornamentation same as P3 (Fig. 59A, B, C).

Male thoracic sternum broad (Fig. 58A, B), surface finely granular; sternites 1 and 2 fused, separated from sternite 3 by distinct ridge; sternite 3 not separated from sternite 4, sternites 4–7 well developed, separated by distinct sutures; sternite 8 not visible; sternoabdominal cavity reaching middle of sternite 4, no thoracic sternal groove. Male abdomen relatively narrow (Figs. 58B, 62B); somite 1 hidden under carapace; somite 2 free, somites 3–5 fused with shallow suture visible, lateral margin sinuous; somite 6 wider than long, lateral margin

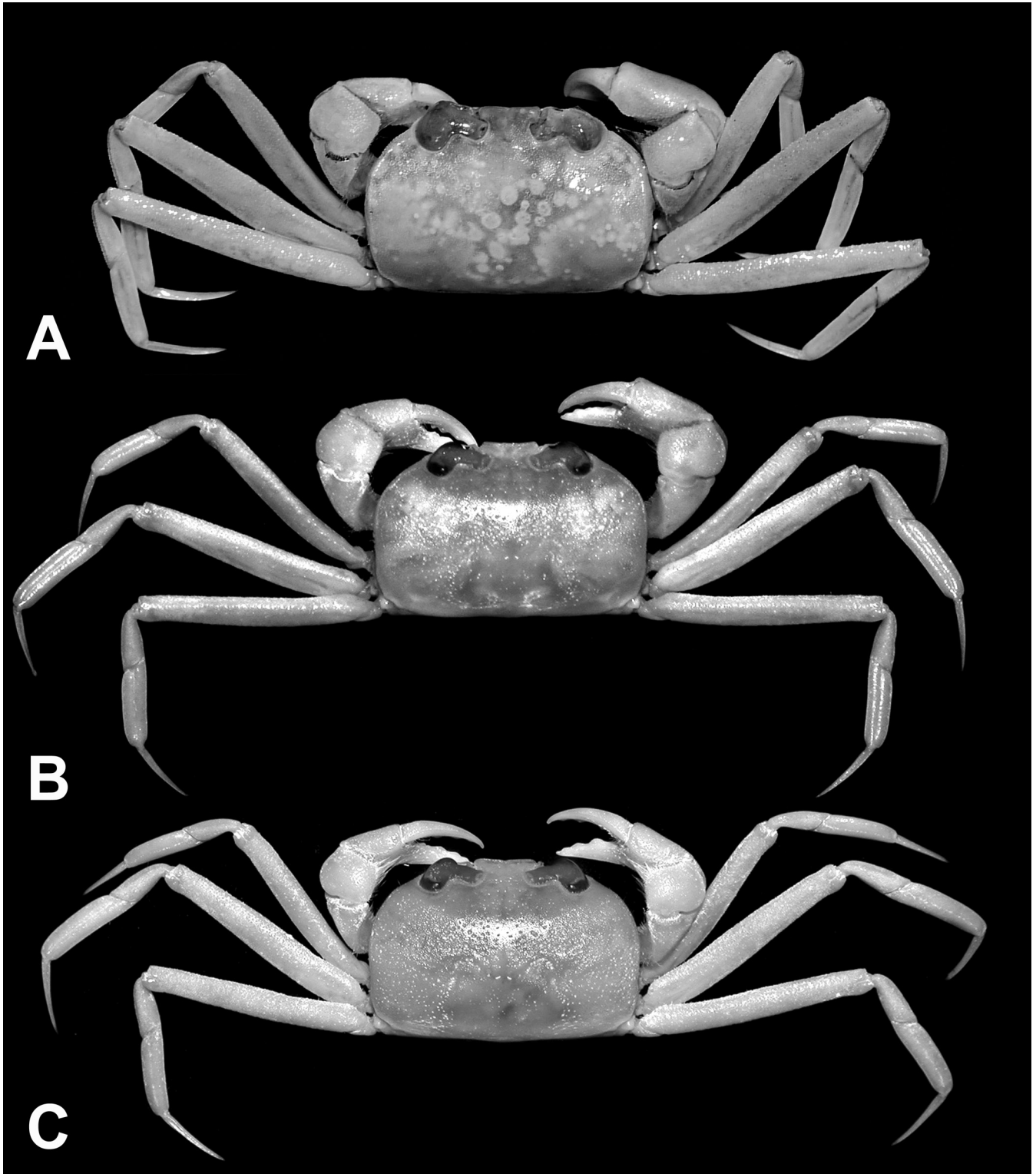


Fig. 55. *Hexaplax megalops* Doflein, 1904. Overall view of carapace, chelipeds and P2–P4. A. holotype male (15.0 × 10.0 mm) (ZMB); B, male (18.7 × 12.1 mm) (MNHN-IU-2011-2251); C, female (17.7 × 12.2 mm) (MNHN-IU-2011-2251).

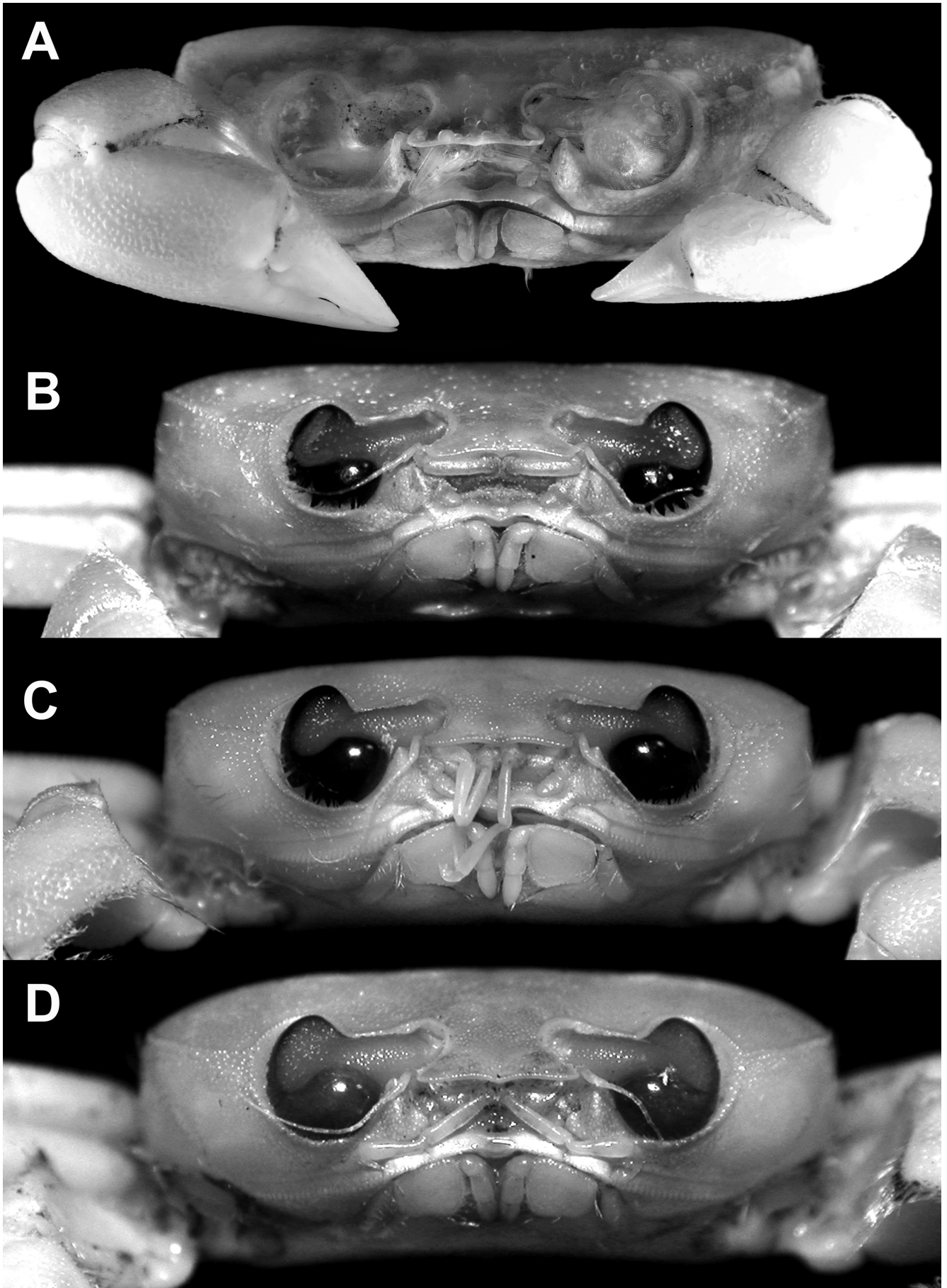


Fig. 56. Frontal view of cephalothorax. A. *Hexaplex megalops* Doflein, 1904, holotype male (15.0 × 10.0 mm) (ZMB); B. *Hexaplex megalops* Doflein, 1904, male (18.7 × 12.1 mm) (MNHN-IU-2011-2251); C. *Hexaplex aurantium*, new species, holotype male (15.3 × 10.8 mm) (MNHN-IU-2011-2158); D. *Hexaplex saudade*, new species, holotype male (16.4 × 12.1 mm) (NMCR).



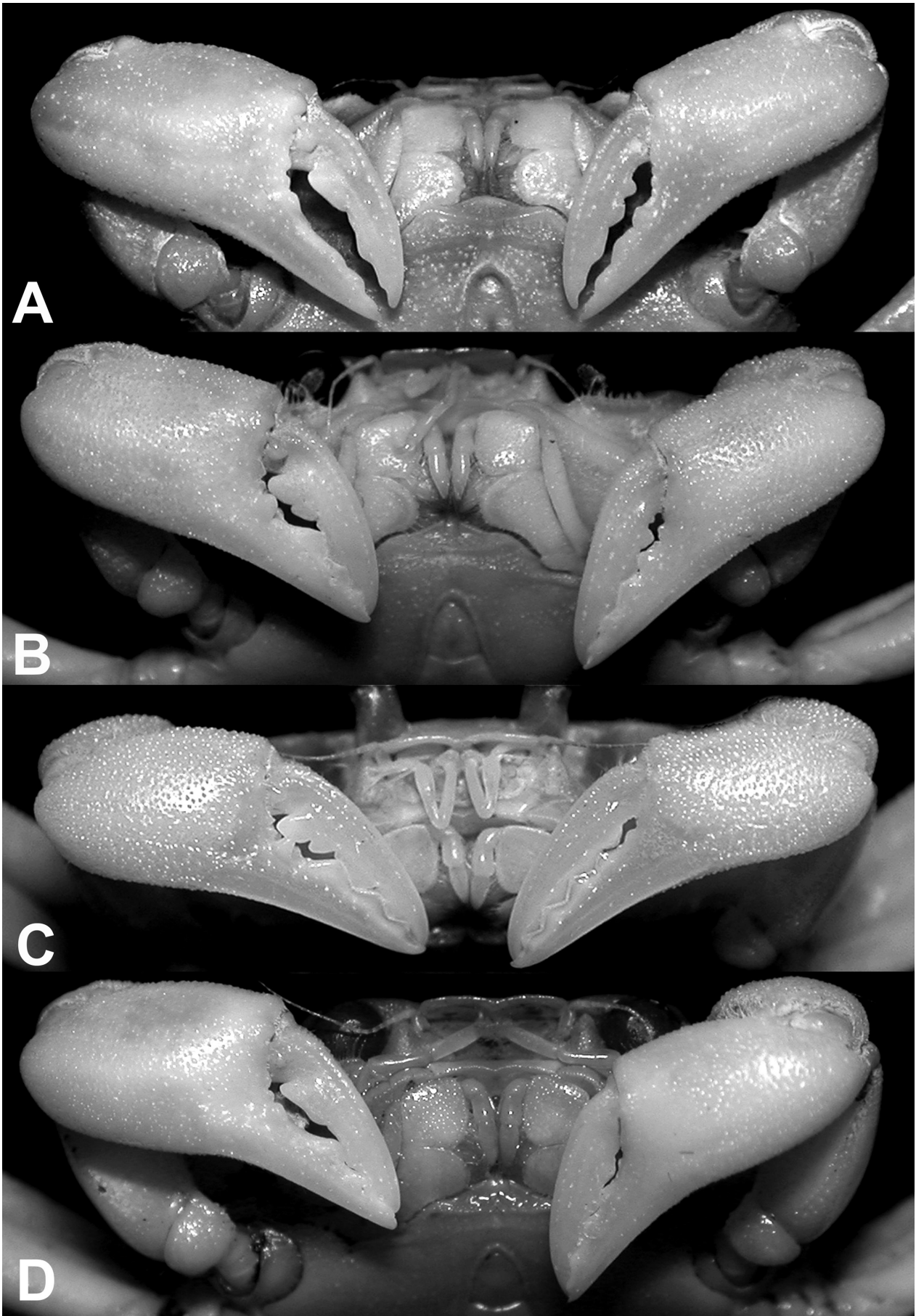


Fig. 57. Chelae. A. *Hexaplax megalops* Doflein, 1904, male (18.7 × 12.1 mm) (MNHN-IU-2011-2251); B, *Hexaplax aurantium*, new species, holotype male (15.3 × 10.8 mm) (MNHN-IU-2011-2158); C, *Hexaplax aurantium*, new species, paratype female (13.2 × 9.5 mm) (ZRC 2013.1696); D, *Hexaplax saudade*, new species, holotype male (16.4 × 12.1 mm) (NMCR).

slightly expanded subproximally; telson rounded, as long as somite 6. G1 long, stout, tapering to pointed tip (Figs. 58A, 62C, D); row of 4 tiny spines subdistally. Female thoracic sternum broad, female abdomen relatively broad (Fig. 62E); somite 1 hidden under carapace; somite 2–6 free; telson rounded, slightly shorter than somite 6.

**Colour.** In life, the carapace is orangish-yellow, with the margin orange, the eye is cream, the orbit is lined with orange, and there is an orange spot under the cornea. The cheliped is white with an orange spot at the articulation of the dactylus and palm, with the distal margins of the carpus, merus, dactylus and propodus of P2–P4 white, the carpus is white with a tinge of orange, and the merus is orange distally and orangish-white proximally (Fig. 2E).

**Remarks.** The three species of *Hexaplex* share the same general shape of the carapace, third maxilliped and P2–P4. It is therefore not surprising that material from the Pacific have been referred to *H. megalops* without query, especially since few specimens have been collected. The good series of specimens of all three species on hand allows more detailed comparisons to be made. The carapace of *H. megalops* s. str. is proportionately broader, about 1.5 times as broad as long (Fig. 55) (carapace slightly narrower, being 1.4 as broad as

long in *H. aurantium*, new species, and *H. saudade*, new species, Figs. 63, 65); the dorsal surface of the carapace is unevenly convex in frontal view, with the branchial regions more inflated than the gastric regions (Fig. 56A, B) (the surface is evenly convex in *H. aurantium* and *H. saudade*, Fig. 56C, D); the merus of the third maxilliped of *H. megalops* is longer than broad (Fig. 62A) while in *H. aurantium* and *H. saudade*, it is about as long as broad (Figs. 64A, 66A); the P2–P4 of *H. megalops* is proportionately the longest among the three species with the merus of P4 is 8.8 times as long as broad (Fig. 59A–C) (in *H. aurantium* and *H. saudade*, the merus is 7.6 times and 7 times as long as broad, respectively (Fig. 59D–H)). In addition, the outer surface of the carapace, chelipeds and P2–P4 of *H. megalops* are almost smooth (Figs. 55, 57A, B, 59A–C), while in *H. aurantium*, these structures are densely granulated (Figs. 57C, 59D–F, 63), and in *H. saudade*, they are finely granulated (Fig. 57D, 59G, H, 65). Comparisons of female specimens of *H. aurantium* and *H. saudade* of similar sizes also show that the abdomen is relatively broader in *H. aurantium*, with the thoracic sternum also proportionately broader in *H. saudade* (Fig. 64E versus Fig. 66E). The stridulatory striae on the pterygostomial region of the three species are also different. *Hexaplex megalops* has the most, with ca. 45 closely-spaced striae, including the relatively smaller and less

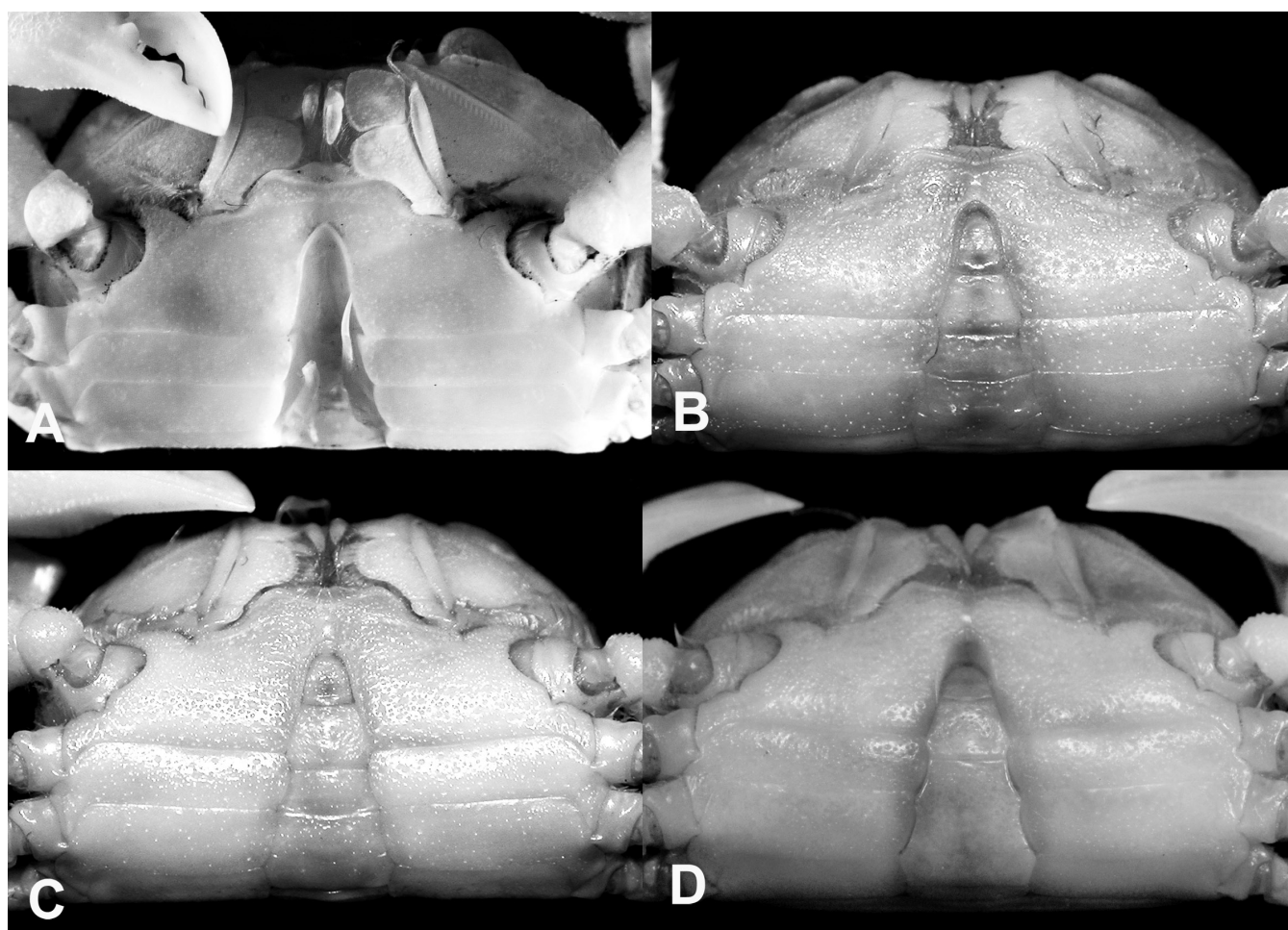


Fig. 58. Ventral view of carapace showing abdomen and telson and third maxillipeds. A, *Hexaplex megalops* Doflein, 1904, holotype male (15.0 × 10.0 mm) (ZMB); B, *Hexaplex megalops* Doflein, 1904, male (18.7 × 12.1 mm) (MNHN-IU-2011-2251); C, *Hexaplex aurantium*, new species, holotype male (15.3 × 10.8 mm) (MNHN-IU-2011-2158); D, *Hexaplex saudade*, new species, paratype male (17.9 × 12.7 mm) (ZRC 2013.1694)

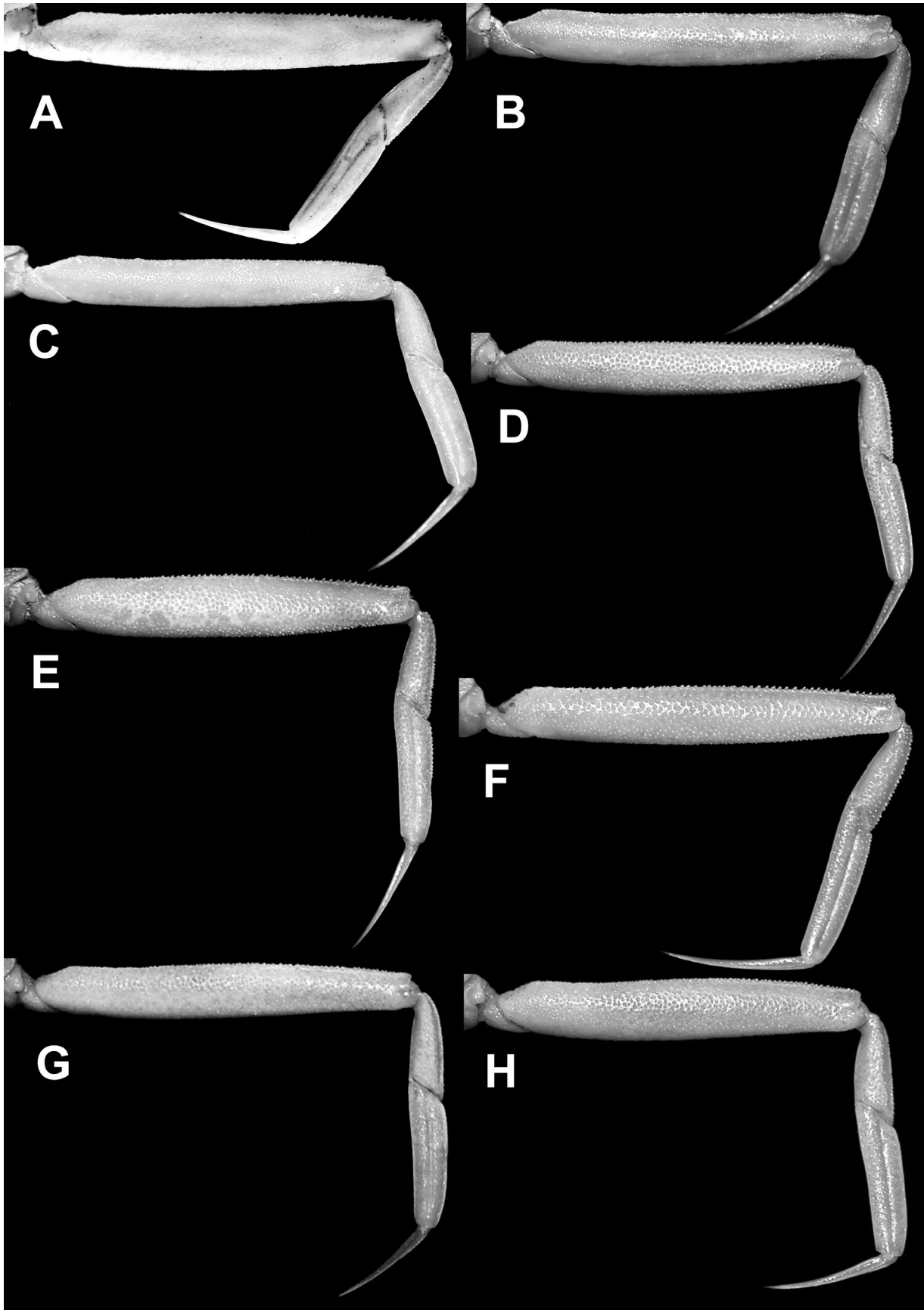


Fig. 59. Right P4, outer surface. A, *Hexaplax megalops* Doflein, 1904, holotype male (15.0 × 10.0 mm); B, *Hexaplax megalops* Doflein, 1904, female (17.7 × 12.2 mm) (MNHN-IU-2011-2251); C, *Hexaplax megalops* Doflein, 1904, male (18.7 × 12.1 mm) (MNHN-IU-2011-2251); D, *Hexaplax aurantium*, new species, holotype male (15.3 × 10.8 mm)(MNHN-IU-2011-2158); E, *Hexaplax aurantium*, new species, paratype female (17.6 × 12.4 mm) (MNHN-IU-2011-2158); F, *Hexaplax aurantium*, new species, paratype female (13.2 × 9.5 mm) (MNHN); G, *Hexaplax saudade*, new species, holotype male (16.4 × 12.1 mm); H, *Hexaplax saudade*, new species, paratype female (13.1 × 9.7 mm).

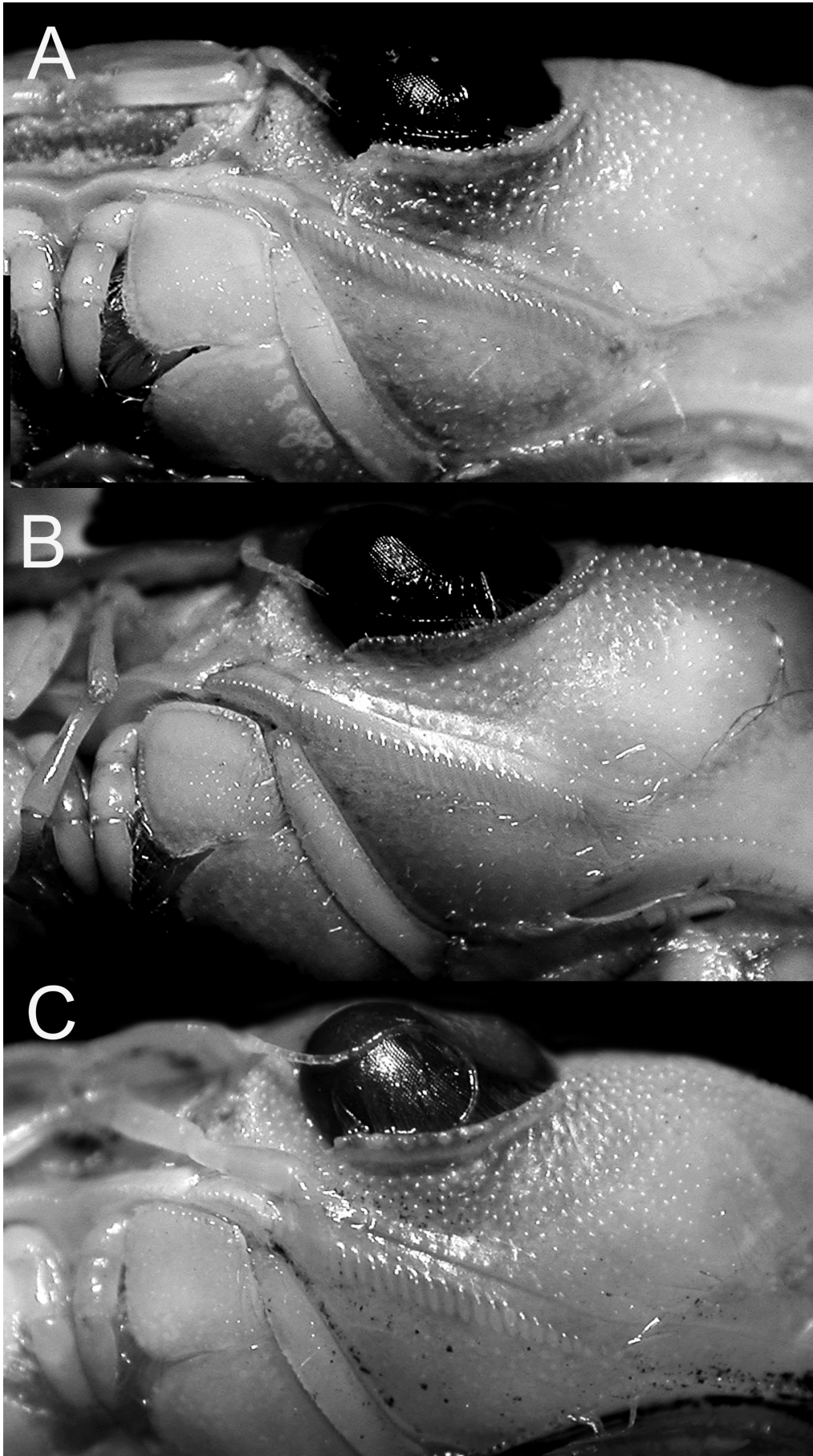


Fig. 60. Pterygostomial region showing row of stridulatory striae. A, *Hexaplax megalops* Doflein, 1904, male (18.7 × 12.1 mm) (MNHN-IU-2011-2251); B, *Hexaplax aurantium*, new species, holotype male (15.3 × 10.8 mm)(MNHN-IU-2011-2158); C, *Hexaplax saudade*, new species, holotype male (16.4 × 12.1 mm) (NMCR).

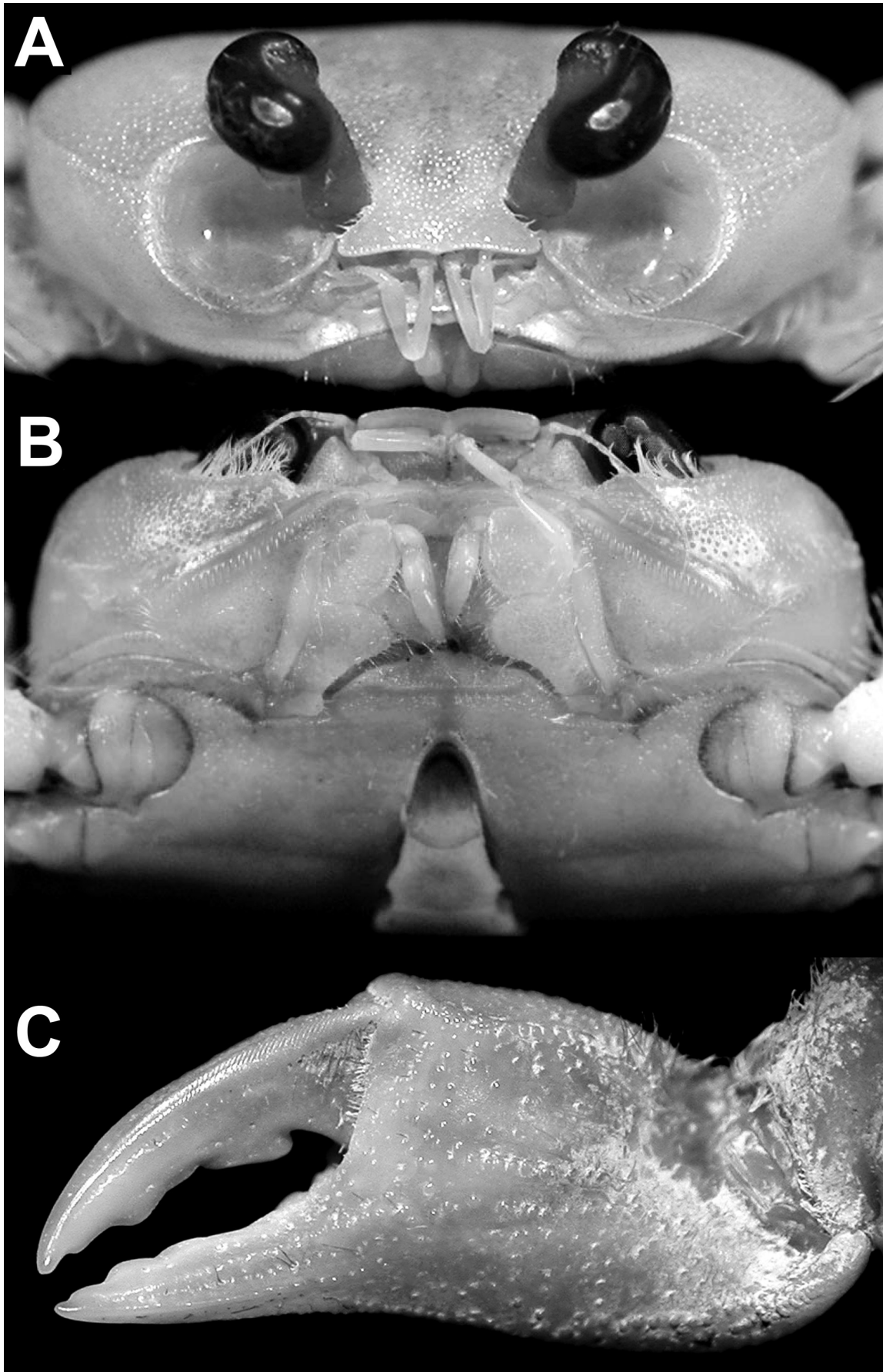


Fig. 61. A, *Hexaplax aurantium*, new species, paratype female (13.2 × 9.5 mm); B, *Hexaplax saudade*, new species, paratype male (17.9 × 12.7 mm) (ZRC 2013.1694); C, *Hexaplax megalops* Doflein, 1904, male (18.7 × 12.1 mm) (MNHN-IU-2011-2251). A, front showing eyes in orbit; B, anteroventral view of cephalothorax showing abdomen and telson, third maxillipeds and stridulatory ridge on pterygostomial regions; C, inner surface of palm.

produced ones adjacent to the epistome (Fig. 60A), while *H. aurantium* and *H. saudade* have 38 or 39 striae which are spaced relatively further apart (Fig. 60B, C). Doflein's (1904) figure of the abdomen of the type specimen (Doflein, 1904: pl. 31 fig. 4) depicted an abdomen with 6 free somites and telson. In the specimens of *H. megalops* studied here, male abdominal somites 3–5 are fused, but the suture separating them is distinct but shallow (Fig. 58B). It is similar in *H. aurantium* (Fig. 58C), but in *H. saudade*, the sutures are not discernible and somites 3–5 appear as one large plate (Fig. 58D). The G1s of the three species are different. In *H. megalops*, the G1 is relatively longer and stouter, with a row of four small denticles on the mesial margin (Fig. 62C, D); in *H. aurantium*, the G1 is more slender, without any teeth or denticles (Fig. 64C, D); while in *H. saudade*, the G1 is more slender, with small denticles on the median part of the mesial margin (Fig. 66C, D; see also Serène, 1964: 270, text fig. 21B).

**Type locality.** Nias, Indonesia.

**Distribution.** Nias, Indonesia; and northeast Papua New Guinea. Deep water, 402–766 m.

***Hexaplax aurantium*, new species**

(Figs. 2F, 56C, 57C, 58C, 59D–F, 60B, 61A, 63, 64)

*Hexaplax megalops* – Tesch, 1918: 242. (not *Hexaplax megalops* Doflein, 1904)

**Material examined.** Holotype: male (15.3 × 10.8 mm) (MNHN-IU-2158), CP 3707, 04°59'S 145°50'E, Madang, 460–466 m, Papua New Guinea, coll. BIOPAPUA Expedition, 2 October 2010. Paratypes: **Papua New Guinea:** 6 females (12.4 × 8.7 mm – 18.7 × 13.3 mm) (MNHN-IU-2011-2794), station CP 3692, 02°10'S 147°19'E, southeast Manus Island, 408–448 m, coll. BIOPAPUA Expedition, 29 September 2010; 2 males (12.0 × 8.6 mm, 12.1 × 8.4 mm), 3 females (11.8 × 8.8 mm – 16.3 × 11.5 mm) (MNHN-IU-2011-1527), 2 males (14.0 × 9.5 mm, 14.2 × 9.8 mm), 5 females (11.9 × 8.3 mm – 15.2 × 10.7 mm) (MNHN-IU-2011-1066), station CP 3635, 07°29'S 147°33'E, south of Lae, Gulf of Huon, 280–302 m, coll. BIOPAPUA Expedition, 23 August 2010; 3 males (13.1

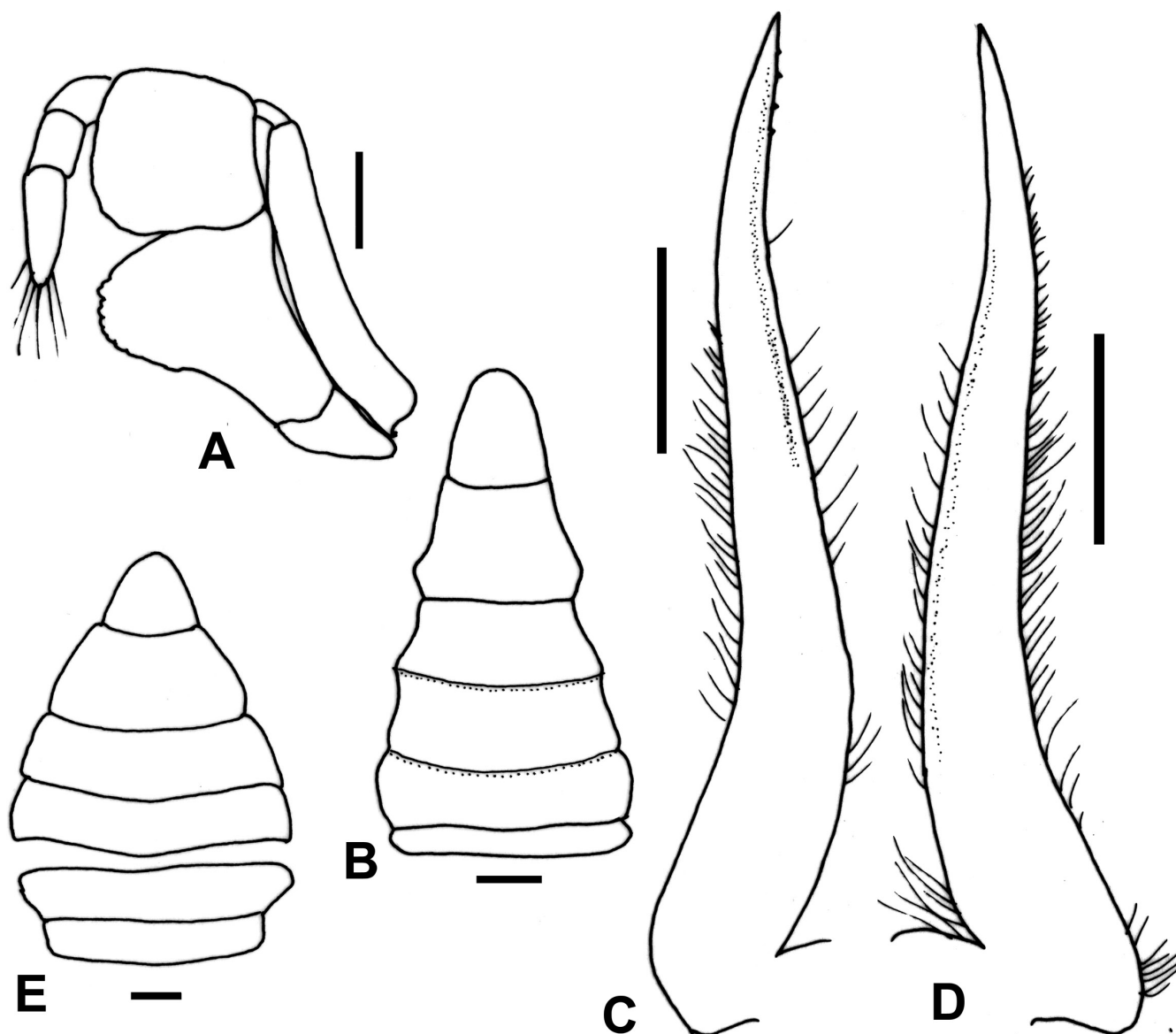


Fig. 62. *Hexaplax megalops* Doflein, 1904. A–D, male (18.7 × 12.1 mm) (MNHN-IU-2011-2251); E, female (17.7 × 12.2 mm) (MNHN-IU-2011-2251). A, left third maxilliped; B, male abdomen and telson; C, D, G1; E, female abdomen and telson. Scale bars = 1.0 mm.

× 9.0 mm – 18.1 × 12.4 mm), 4 females (17.3 × 12.4 mm – 20.7 × 15.0 mm) (MNHN-IU-2011-3519), station CP 3708, 04°58'S 145°50'E, Madang, 502–529 m, coll. BIOPAPUA Expedition, 2 October 2010; 2 males (14.6 × 10.0 mm, 16.9 × 11.6 mm), 3 females (13.3 × 9.6 mm – 16.6 × 12.1 mm) (ZRC 2013.1696 ex MNHN-IU-2158), station CP 3707, 04°59'S 145°50'E, Madang, 460–466 m, coll. BIOPAPUA Expedition, 2 October 2010; 1 male (13.8 × 9.6 mm), 2 females (14.6 × 10.4 mm, 14.9 × 10.6 mm) (MNHN-IU-1461), 1 male (13.0 × 8.7 mm) (MNHN-IU-1392), station CP 3669, 04°08'S 151°56'E, north of Rabaul, 382–389 m, coll. BIOPAPUA Expedition, 24 September 2010; 2 females (13.9 × 9.4 mm, 16.5 × 11.3 mm) (MNHN-IU-2640), station CP 3691, 02°11'S 147°18'E, southeast of Manus Island, 499–517 m, coll. BIOPAPUA Expedition, 29 September 2010; 1 female (12.2 × 8.6 mm) (MNHN-IU-2011-1723), station CP 3729, 07°52'S 148°03'E, Mambare Bay, 575–655 m, coll. BIOPAPUA Expedition, 8 October 2010; 1 female (9.5 × 6.6 mm) (MNHN-IU-2011-993), station CP 3734, 08°16'S 150°30'E, Lancasey Island, 389 m, coll. BIOPAPUA Expedition, 9 October 2010; 1 male (13.6 × 9.6 mm) (MNHN-IU-2011-987), station CP 3655, 02°15'S 150°16'E, west of New Hanover, 402–440 m, coll. BIOPAPUA Expedition, 28 August 2010; 1 male (12.3 × 8.6 mm), 3 females (9.6 × 6.9 mm – 14.1 × 9.9 mm) (MNHN-IU-2011-3386), station CP 3646, 06°45'S 147°49'E, Tami Island, 460–485 m, coll. BIOPAPUA Expedition, 24 August 2010; 3 males (12.1 × 8.5 mm – 14.6 × 10.1 mm), 4 females (10.1 × 7.2 mm – 18.5 × 12.9 mm) (MNHN-IU-2011-1704), station CP 3728, 07°52'S 148°01'E, Mambare Bay, 498–501 m, coll. BIOPAPUA Expedition, 8 October 2010; 1 female (13.2 × 9.5 mm) (ZRC 2013.1697), CP 3957, 05°05'S 145°51'E, Bismarck Sea, Madang, west of Sek Island, 452–504 m, coll. Expedition PAPUA NUIGINI, 28 November 2012.

**Diagnosis.** Carapace subquadrate, about 1.4 times as broad as long, dorsal surface finely granulated; regions indistinct, median H-shaped depression shallow (Fig. 63). Anterolateral margin arcuate; posterolateral corner with small angle over base of posterior pereopods. Front not deflexed (Fig. 56C), divided into 2 lobes, not projecting beyond distal edge of orbits. Orbit distinct, transverse; eye movable, large, corneas dilated, pigmented, much wider than peduncle (Figs. 56C, 61A). Pterygostomial region with oblique stridulatory ridge consist of long row of 25 short striae, including about 14 shorter, less produced striae adjacent to epistome (Fig. 60B); shallow oblique groove above ridge. Third maxillipeds (Figs. 64A) relatively broad, not completely covering buccal cavity, with gap when closed; ischium longer than broad, longer than merus, dilated distally, mesial margin rounded; merus squarish, as long as broad; exopod relatively narrow, about 0.3 width of ischium, flagellum well developed. Chelipeds subequal (Fig. 57C); major chela with slight gap when fingers closed; with large teeth at cutting edge of dactylus and fixed finger; dactylus, palm and carpus granulated on outer surface; outer surface of dactylus with 2 longitudinal ridges; inner surface with longitudinal ridge consist of oblique striae; fixed finger with 2 longitudinal ridges; lower margin with row small teeth continuing to lower margin of palm; minor chela with gap proximally when fingers closed; ornamentation similar to that of major chela. P2–P4 long, slender (Fig. 63); outer surface granulated; merus of P4 7.6 times as long as broad, upper margin of merus and carpus granulated, shallow longitudinal groove on outer surface of propodus (Fig. 59D–F). Male thoracic sternum broad (Fig. 58C), surface finely granular; sternites 1 and 2

fused, separated from sternite 3 by distinct ridge; sternite 3 not separated from sternite 4, sternites 4–7 well developed, separated by distinct sutures; sternoabdominal cavity reaching middle of sternite 4, no thoracic sternal groove; sternite 8 not visible. Male abdomen relatively narrow (Figs. 58C, 64B); somite 1 hidden under carapace; somite 2 free, somites 3–5 fused with shallow suture visible, lateral margin sinuous; somite 6 wider than long, lateral margin slightly expanded subproximally; telson rounded, about same length as somite 6. G1 long, slender, tapering to pointed tip (Fig. 64C, D), unarmed. Female thoracic sternum broad; sternoabdominal cavity reaching middle of sternite 4; female abdomen relatively broad (Fig. 64E); somite 1 hidden under carapace; somite 2–6 free; telson rounded, as long as somite 6.

**Colour.** In life, the carapace is cream-mottled with orange margin, the eye is cream with orange longitudinal stripes on the lateral and mesial margins, and an orange spot under the cornea. T cheliped is white with an orange stripe on the articulation of the dactylus and palm, and distal margins of the carpus and merus of P2–P4 are orangish-white (Fig. 2F).

**Etymology.** From the Latin noun *aurantium* for citrus; alluding to the orange colour of the species in life.

**Remarks.** See remarks for *H. megalops* s. str. for differences with congeners.

Tesch (1918) recorded several specimens of “*Hexaplax megalops*” from Saleyer Island (southern Sulawesi) and north of Bali. On the basis of the adult measurements provided by Tesch (1918: 243), the carapace width to length ratios of these specimens ranged from 1.34 to 1.43, indicating they probably belong to *H. aurantium*, new species. *Hexaplax megalops*, which also occurs in New Guinea waters and may be present in Sulawesi and Bali, has a proportionately broader carapace, with a width to length ratio of 1.5.

**Type locality.** Madang, Papua New Guinea.

**Distribution.** Papua New Guinea. Deep water, 280–655 m.

#### *Hexaplax saudade*, new species

(Figs. 2G, H, 56D, 57D, 58D, 59G, H, 60C, 61B, 65, 66)

*Hexaplax megalops* – Serène, 1964: 270, text fig. 21, pl. 24A; Sakai, 1965: 40, 45, pl. 6 fig. 8; Sakai, 1976: 556, pl. 196 fig. 4; Ng et al., 2008: 86 (part), fig. 78. (not *Hexaplax megalops* Doflein, 1904)

**Material examined.** Holotype: male (16.4 × 12.1 mm) (NMCR), station CP 2660, 15°52.2'N 121°48.8'E, 542 m, Philippines, coll. AURORA 2007 Expedition, 20 May 2007. Paratypes: **Philippines:** 3 males (11.6 × 8.2 mm, 14.8 × 10.5 mm, 18.2 × 13.2 mm), 3 females (14.3 × 10.8 mm, 14.6 × 10.6 mm, 16.9 × 9.8 mm, 18.6 × 13.6 mm) (ZRC 2013.1692), 3 males (13.6 × 9.7 mm, 15.3 × 11.2 mm, 17.2 × 12.0 mm), 2 females (15.2 × 11.1 mm, 15.8 × 11.7 mm) (MNHN), station CP 2658, 15°58.03'N 121°49.11'E, 422 m, coll. AURORA 2007 Expedition, 20 May 2007; 1 male (16.4 × 12.1 mm), 1 female (11.4 × 8.0 mm) (ZRC 2013.1693), station CP 2660, 15°52.2'N 121°48.8'E, 542 m, coll. AURORA 2007 Expedition, 20 May 2007; 1 male (17.9 × 12.7 mm), 2 females (16.6 × 12.3 mm,

13.1 × 9.7 mm) (ZRC 2013.1694), station CP 2735, 15°59.52'N 121°50.93'E, 431 m, coll. AURORA 2007 Expedition, 1 June 2007. Others: **Taiwan**: 1 male (15.9 × 11.1 mm) (ZRC 2008.1456), Su-Ao fish port, Ilan province, trawled, deep-sea, coll. C.-W. Lin, 29 July 2004. **Japan**: 1 male (15.1 × 11.6 mm) (NSMT-Cr 13586), Tosa Bay, 400 m, coll. Kotaka Maru, M. Takeda, 9 May 2000.

**Diagnosis.** Carapace subquadrate (Fig. 65A), about 1.4 times as broad as long, dorsal surface very finely granulated; regions indistinct, median H-shaped depression shallow.

Anterolateral margin arcuate; posterolateral corner with small angle over base of posterior pereopods. Front not deflexed (Fig. and 56D), divided into 2 lobes, not projecting beyond distal edge of orbits. Orbit distinct, transverse; eye movable, large, corneas dilated, pigmented, much wider than peduncle (Fig. 56D). Pterygostomial region with oblique stridulatory ridge consist of long row of 24 short, widely-spaced striae, including ca. 14 shorter, less produced striae adjacent to epistome (Fig. 60C); shallow oblique groove above ridge.

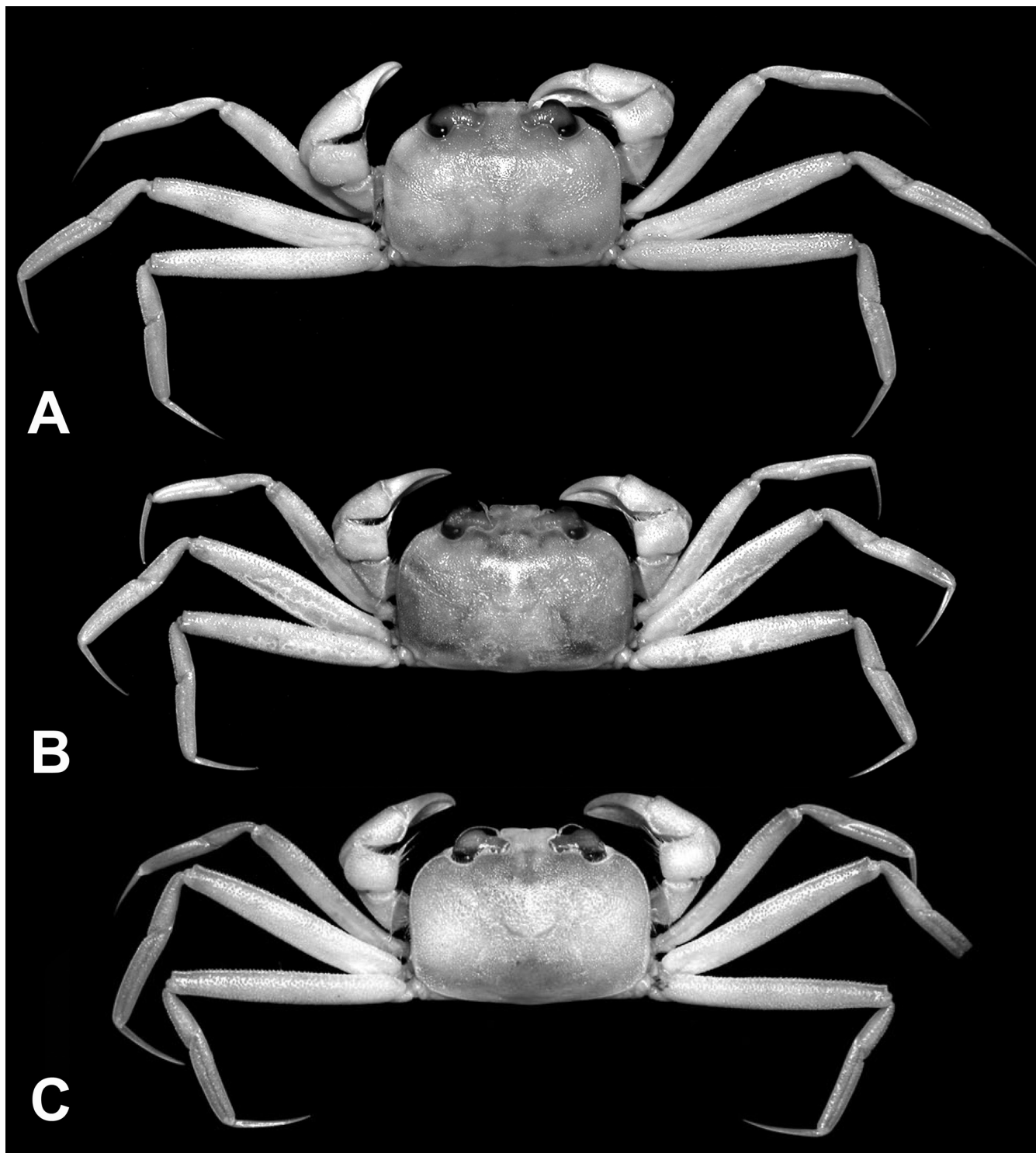


Fig. 63. *Hexaplex aurantium*, new species. Overall view of carapace, chelipeds and P2–P4. A, holotype male (15.3 × 10.8 mm) (MNHN-IU-2011-2158); B, paratype female (17.6 × 12.4 mm) (ZRC 2013.1696, ex MNHN-IU-2011-2158); C, paratype female (13.2 × 9.5 mm) (ZRC 2013.1697).



Third maxillipeds broad (Fig. 66A), not covering buccal cavity, with gap when closed; ischium longer than broad, longer than merus, with scattered granules, dilated distally, mesial margin rounded; merus squarish, as long as broad; dactylus longer than propodus; exopod relatively narrow, less than 0.3 width of ischium; flagellum well developed. Chelipeds subequal (Fig. 57D); major chela with slight gap when fingers closed; with large teeth at cutting edge of dactylus and fixed finger; outer surface of dactylus with 2 longitudinal ridges; inner surface near upper margin with longitudinal ridge; palm longer than wide, outer surface finely granulated; fixed finger with 2 longitudinal ridges; lower margin with row small teeth continuing to lower margin of

palm; carpus finely granulated on outer surface, inner angle blunt, upper margin with row of small tubercles obscured by short setae, long setae on outer angle; merus short, row of denticles on outer and inner lower margins, fringe of setae dorsomesially. Minor chela without gap when fingers closed; ornamentation similar to that of major chela. P2–P4 long, slender (Fig. 65); outer surface finely granulated; merus of P4 about 7 times as long as broad (Fig. 59G, H). Male thoracic sternum broad (Fig. 58D), surface finely granular; sternites 1 and 2 fused, separated from sternite 3 by distinct ridge; sternite 3 not separated from sternite 4, sternites 4–7 well developed, separated by distinct sutures; sternoabdominal cavity reaching middle of sternite 4, no thoracic sternal

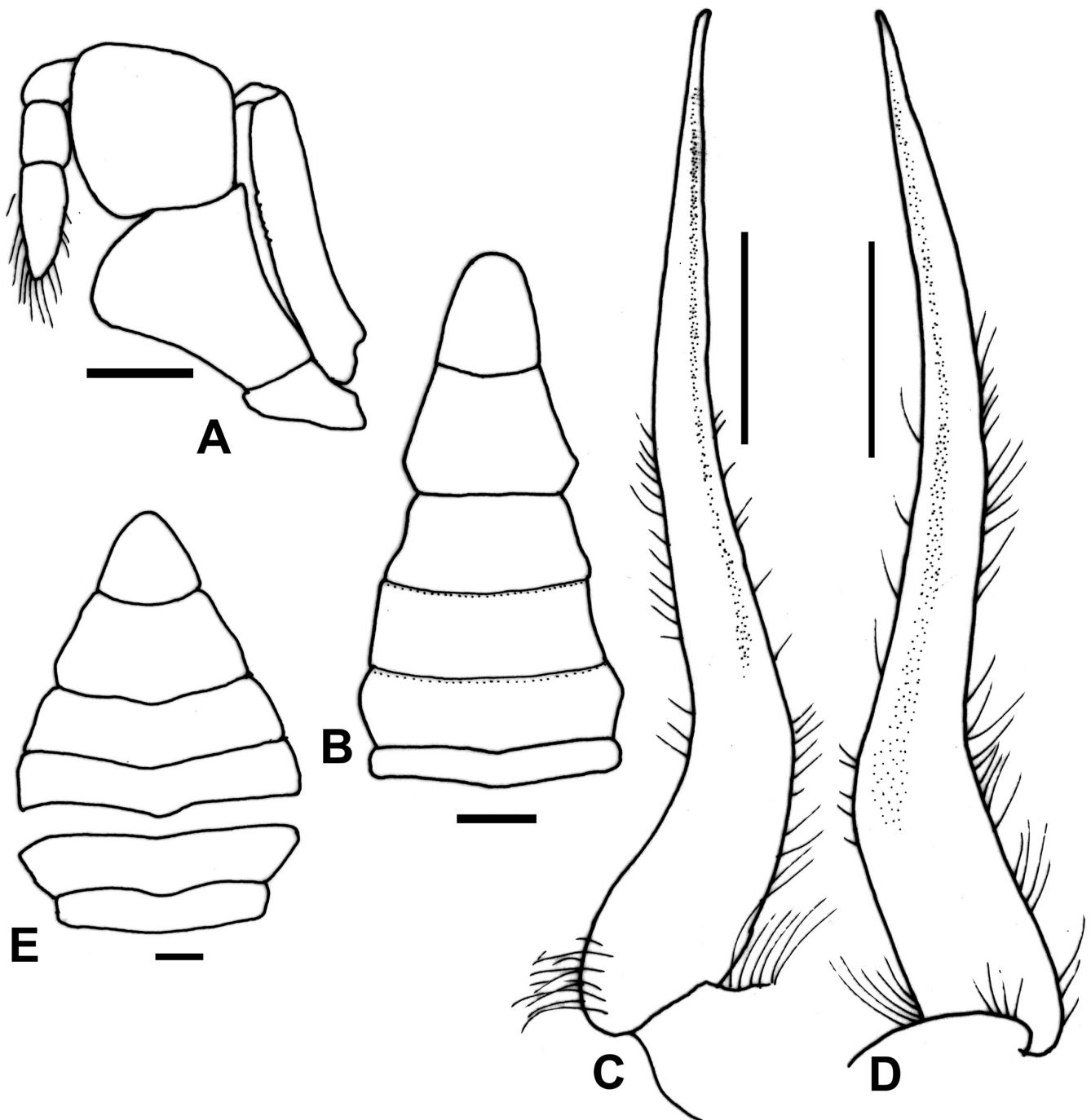


Fig. 64. *Hexaplex aurantium*, new species. A–D, holotype male (15.3 × 10.8 mm) (MNHN-IU-2011-2158); E, paratype female (13.2 × 9.5 mm). A, left third maxilliped; B, male abdomen and telson; C, D, G1; E, female abdomen and telson. Scale bars = 1.0 mm.

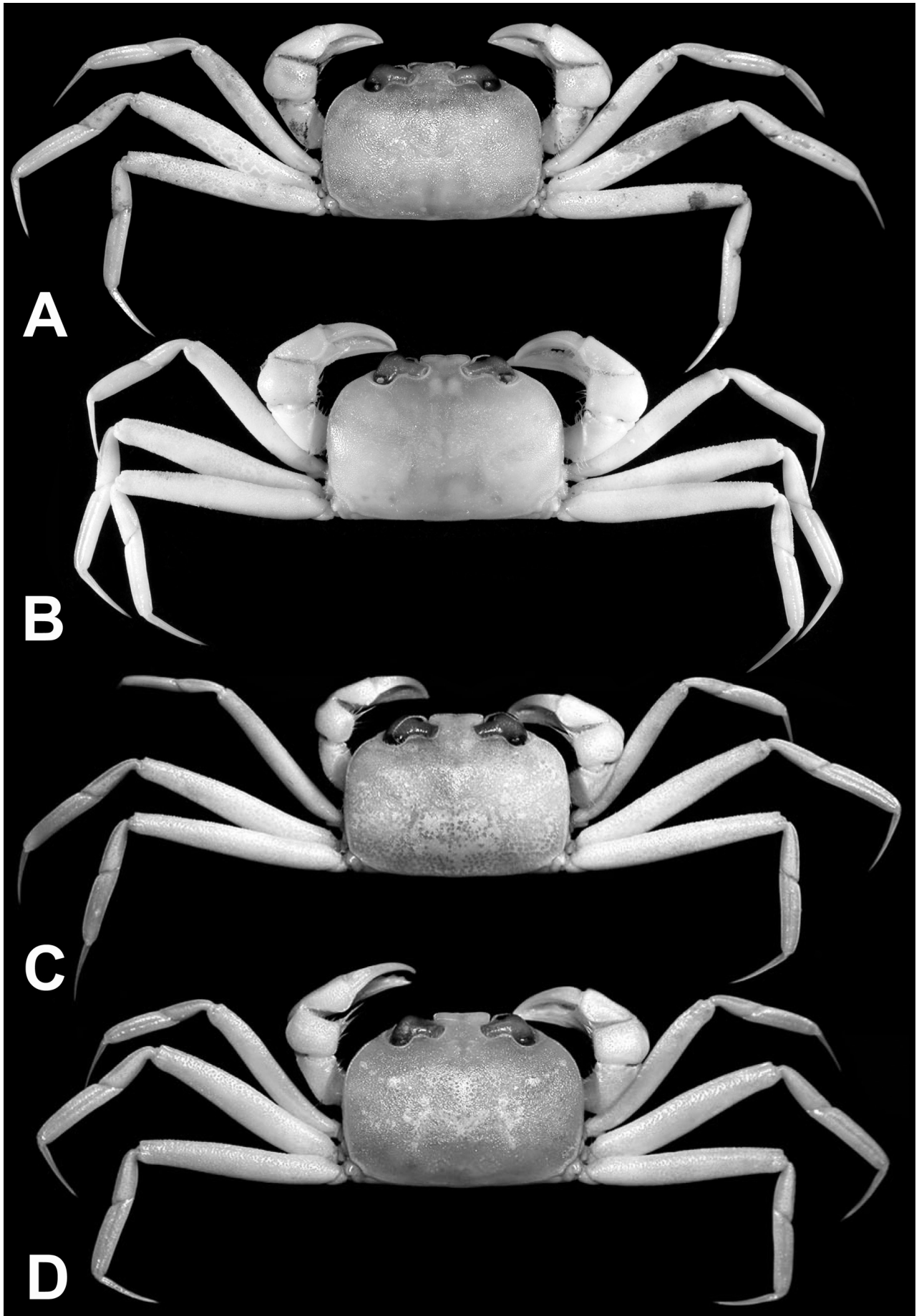


Fig. 65. *Hexaplax saudade*, new species, overall view of carapace, chelipeds and P2–P4. A, holotype male (16.4 × 12.1 mm) (NMCR); B, paratype male (17.9 × 12.7 mm); C, paratype male (18.2 × 13.2 mm); D, paratype female (13.1 × 9.7 mm).

groove; sternite 8 exposed, triangular, reaching half length of male abdominal somite 2. Male abdomen relatively narrow (Figs. 58D, 66B); somite 1 hidden under carapace; somite 2 free, somites 3–5 fused, lateral margin sinuous; somite 6 wider than long, lateral margin slightly expanded subproximally; telson rounded, as long as somite 6. Female abdomen not much wider than male (Fig. 66E), 6 free somites and telson, first somite hidden under carapace. G1 (Fig. 66C, D) concealed under abdomen, straight, distal part tapered, sparse short setae present in proximal half, small spinules on mesial margin medially.

**Colour.** In life, the carapace is light brown with a tinge of orange or orangish-brown medially. The cheliped transparent white with an orange line at the articulation of the dactylus and palm; P2–P4 transparent are whitish on the dactylus, propodus and carpus; with the merus light brown tinged of orange distally (Fig. 2G, H).

**Etymology.** The species name is derived from the Portuguese word “saudade” which means a melancholic longing for something that cannot exist or be realised; alluding to the long-held belief that *Hexaplax* was a monotypic genus. The name is used as a Latin noun in apposition.

**Remarks.** See remarks for *H. megalops* s. str. for differences with congeners.

The records of “*Hexaplax megalops*” from Philippines (Serène, 1964; Ng et al., 2008) and Tosa Bay in Japan (Sakai, 1965; Sakai, 1976) are clearly *Hexaplax saudade*, new species. The figure of a fresh specimen in Sakai (1965, 1976) agrees well with those of the new species from Philippines (Fig. 2E) and Taiwan (Fig. 2F). We have also examined a male specimen from Tosa Bay specimen (NSMT-Cr 13586) which agrees with our definition of *H. saudade*.

**Type locality.** Philippine Sea, Philippines.

**Distribution.** Philippines, Taiwan and Japan. Deep water, 422–542 m.

*Theoxapus*, new genus

**Diagnosis.** Carapace broader than long, slightly convex, surface granular, region indistinct, with H-shaped medial depression. Anterolateral margin rounded; lateral margins straight, parallel. Eyes short, movable, corneas subglobular, visible. Third maxilliped broad, completely covering buccal

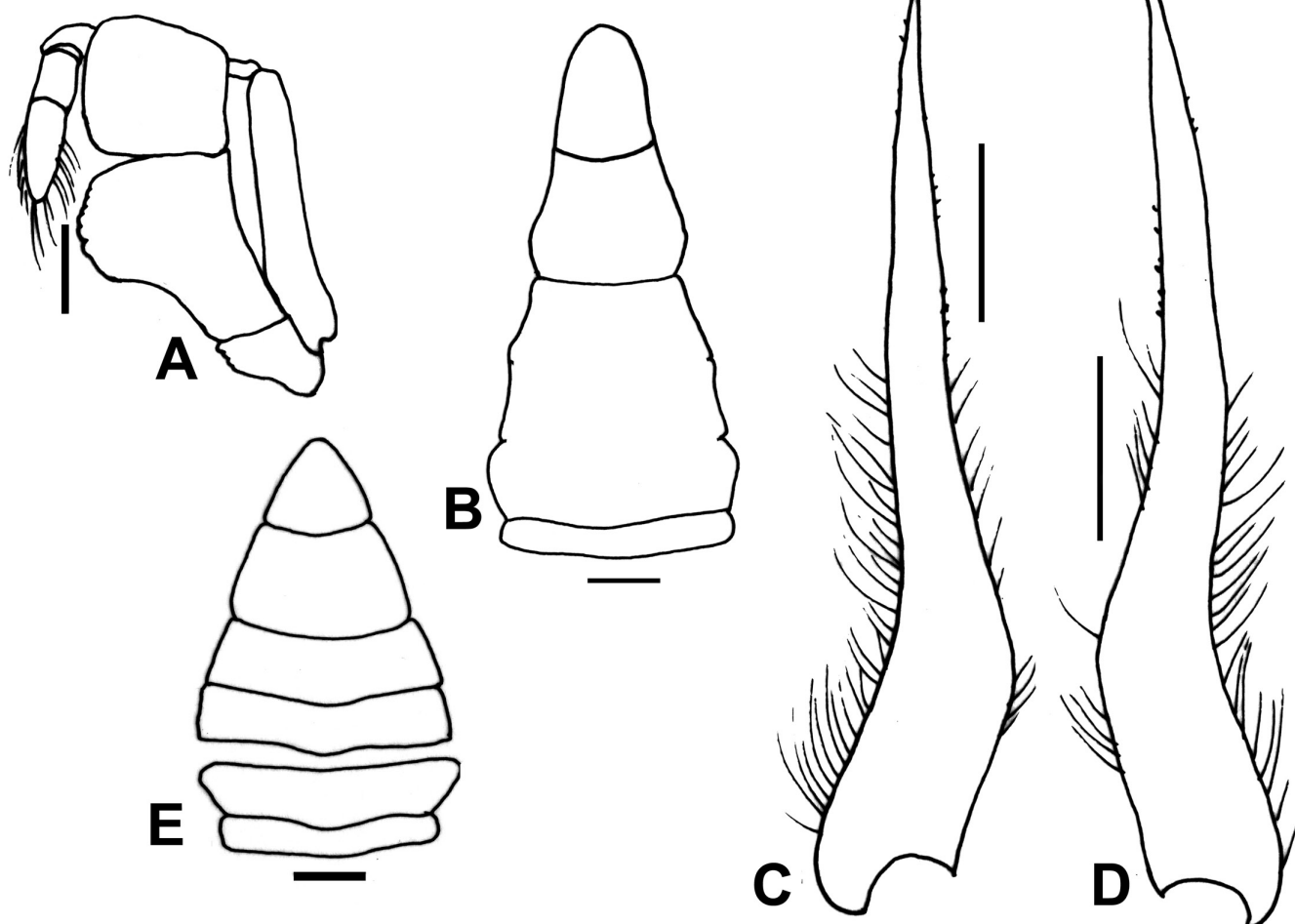


Fig. 66. *Hexaplax saudade*, new species. A–D, holotype male (16.4 × 12.1 mm) (NMCR); E, paratype female (13.1 × 9.7 mm). A, left third maxilliped; B, male abdomen and telson; C, D, G1; E, female abdomen and telson. Scale bars = 1.0 mm.

cavity; ischium notably broader and longer than merus, mesial margin slightly convex, crenulated; merus relatively ovoid, crenulated on mesial and lateral margin; carpus, propodus and dactylus cylindrical, dactylus longer than propodus; exopod narrow compared to width of ischium, slightly sinuous, margins crenulated, flagellum present. Chelipeds unequal, granulated; P2–P4 relatively long, granulated and setose; merus slender, dactylus straight or upcurved, as long as propodus. Thoracic sternum broad, granulated. Male sternoabdominal cavity reaches distal margin of thoracic

sternite 4; without sternal groove. Male abdomen relatively narrow; somites 1, 2 and 6 free, somites 3–5 fused; telson slightly shorter than somite 6, ovate, distal margin rounded. G1 slightly sinuous, stout, dense stiff setae on subdistal, obscuring pointed tip. Female unknown.

**Etymology.** The genus is named after famed French explorer, naturalist and carcinologist Théodore André Monod (1902–2000), whose 1956 book on West African crabs remains a mainstay of researchers. The name is an arbitrary

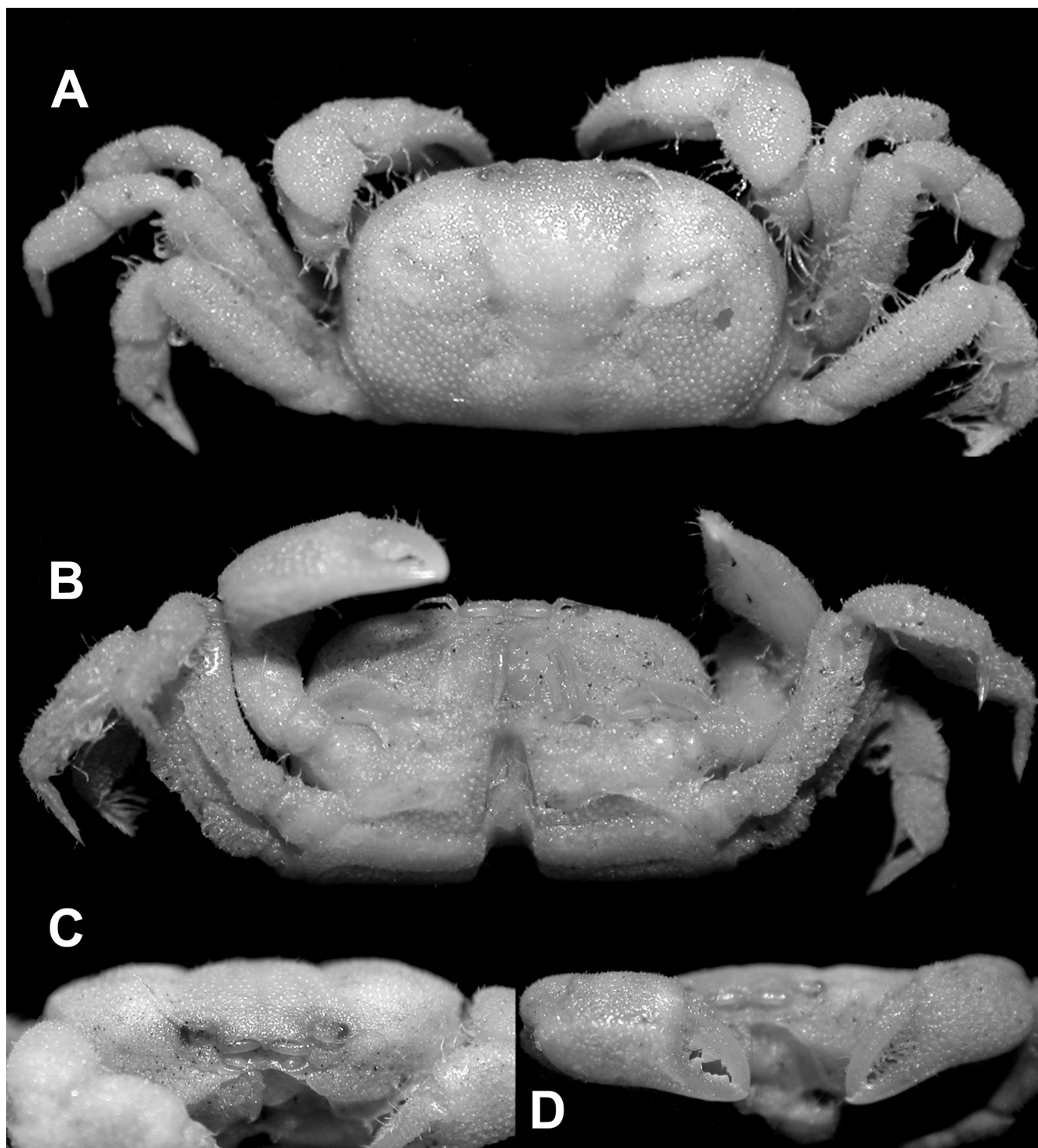


Fig. 67. *Theoxapus buchanani* (Monod, 1956), holotype male (7.0 × 4.9 mm) (NHM 1957.12.4.29). A, overall view of carapace, chelipeds and P2–P4; B, ventral view of cephalothorax; C, frontal view of cephalothorax; D, chelae.

combination of his first name, with the suffix of the genus *Hexapus*. Gender of genus masculine.

**Species included.** *Hexapus buchani* Monod, 1956 (by monotypy).

**Remarks.** When Monod (1956: 372) described *Hexapus buchani* and placed it in the subgenus *Hexapus*, he included *H. sexpes* sensu Balss (1922). As Balss (1922) indicated that the shape of the third maxilliped is similar to *Hexapus sexpes* sensu Stebbing (1910: 315), he therefore placed his species in *Hexapus* s. str. *Hexapus sexpes* sensu Stebbing (1910) is now known as *Tritoplax stebbingi* (Barnard, 1947) (see Manning & Holthuis, 1981: 180). Manning & Holthuis (1981: 171), who did not have specimens, transferred *Hexapus (Hexapus) buchani* to *Hexapinus* Manning & Holthuis, 1981, without any comments, although it was the only member of the genus occurring in the Atlantic. Considering the present revision of *Hexapus* s. str. and *Hexapinus* s. str., *Hexapus (Hexapus) buchani* Monod,

1956, is closest to species in *Mariaplax*, new genus, in that it has a similarly shaped third maxilliped (Fig. 68G). Like many *Mariaplax* species, *Hexapus buchani* also has a prominently granulated carapace and pereopods (Figs. 67A, 68E). However, *Hexapus buchani* cannot be referred to *Mariaplax* as it has distinctively more ovate carapace with the lateral margins subparallel (Figs. 67A, 68E) (rather than more trapezoidal with the lateral margins diverging), the ambulatory meri do not have a longitudinal groove on the outer surface, not even on P3 (Figs. 67A, 68E); there is no trace of a male thoracic sternal groove or depression adjacent to the sternoabdominal cavity (Fig. 67B); it has a proportionately more elongate male abdomen (Fig. 68F); the telson is elongated and much longer than broad (Fig. 68F); and it has a relatively much straighter G1 which has the distal part surrounded by long setae (Fig. 68H, I). Externally, especially with regards to the general carapace shape, *Hexapus buchani* resembles other West African taxa, notably *Parahexapus africanus* (Balss, 1922). However, *Hexapus buchani* differs markedly from *Parahexapus*

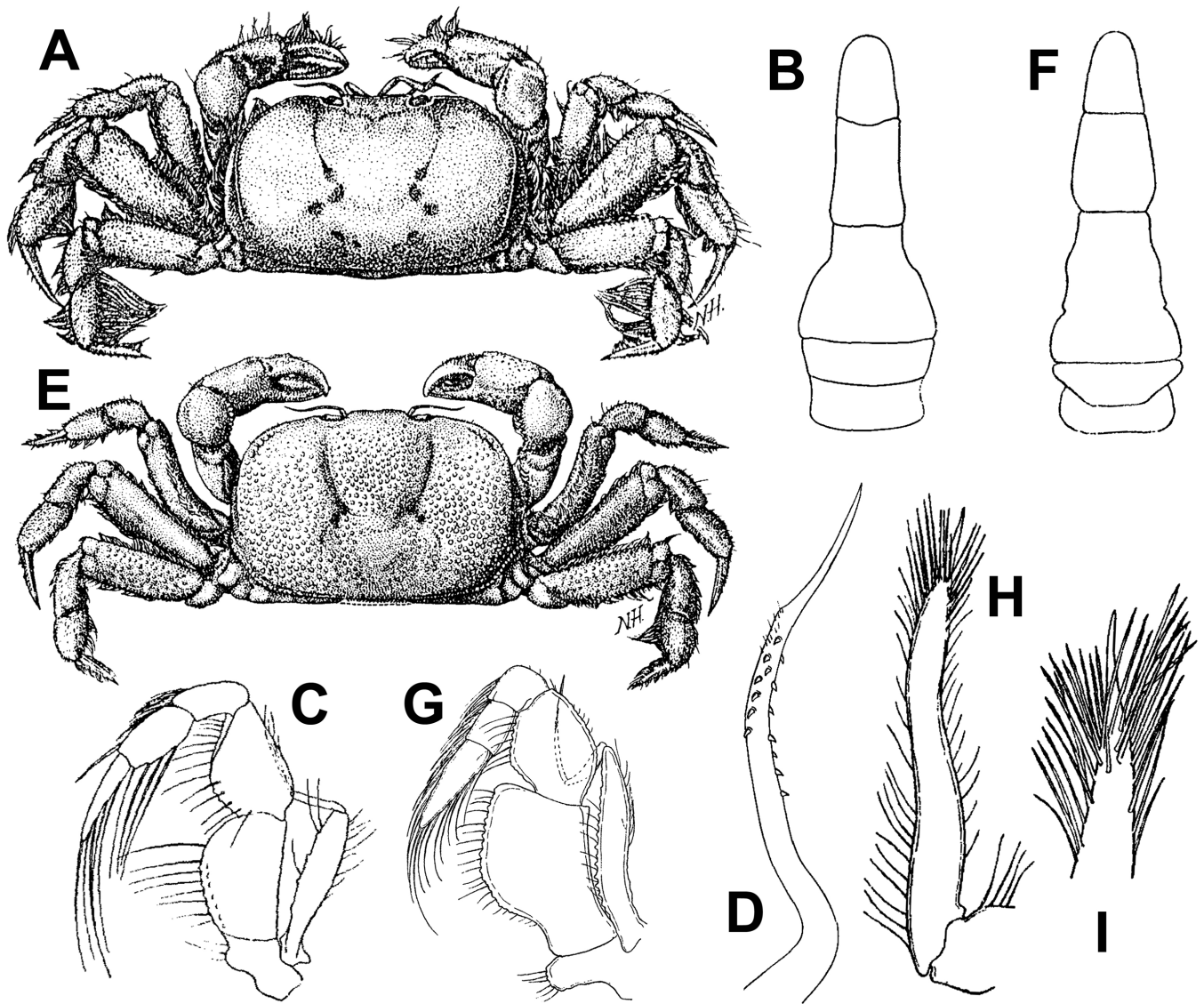


Fig. 68. A–D, *Parahexapus africanus* (Balss, 1922); E–I, *Theoxapus buchani* (Monod, 1956). A, E, overall views of carapaces, chelipeds and P2–P4; C, G, left third maxillipeds; B, F, male abdomen and telsons; D, H, G1s; I, distal part of G1. A, C, after Monod, 1956: figs. 494, 496; B, D, after Crosnier, 1967: figs. 30, 33; E–I, after Monod, 1956: figs. 497–500.

*africanus* in that the ischium of the third maxilliped is quadrate (Fig. 68G) (elongated and ovate in *P. africanus*, Fig. 68C); the exopod of the third maxilliped is proportionately longer, reaching to half the length of the merus (Fig. 68G) (relatively shorter, reaching to just beyond the length of the ischium in *P. africanus*, Fig. 68C); fused male abdominal somites 3–5 are proportionately longer, and longer than somite 6 (Fig. 68F) (fused male abdominal somites 3–5 are proportionately shorter, and subequal in length to somite 6 in *P. africanus*, Fig. 68B); and the G1 is stouter with the tip tapered and the distal part covered with long setae (Fig. 68H, I) (G1 very slender, with the distal third sharply tapering and the median surfaces lined with short spines in *P. africanus*, Fig. 68D).

These differences are significant and indicate that *Hexapus buchanani* cannot be transferred to *Mariaplax* or *Parahexapus*, or any of the other recognised genera. A new genus, *Theoxapus*, is therefore established here to accommodate the species.

***Theoxapus buchanani*, new combination**  
(Figs. 67, 68E–I)

*Hexapus buchanani* Monod, 1956: 372, figs. 497–501.

*Hexapinus buchanani* – Manning & Holthuis, 1982: 169, Fig. 31;  
Ng et al., 2008: 86; Hendrickx, 2013: fig. 3A.

**Material examined.** Holotype: male (7.0 × 4.9 mm) (NHM 1957.12.4.20), station 57-29-1-53, Gold Coast, West Africa, 7 m, coll. J. B. Buchanan.

**Diagnosis.** Carapace subquadrate (Figs. 67A, 68E), about 1.4 times as broad as long, dorsal surface granulated, convex; regions indistinct, distinct median H-shaped depression. Anterolateral margin rounded; crenulated, lateral margin parallel, straight, posterior margin straight. Front slightly deflexed (Fig. 67C), slightly divided into 2 lobes, projecting beyond edge of orbits. Orbit distinct, transverse; eye movable, corneas subglobular, pigmented (Fig. 67C). Third maxillipeds broad (Figs. 67B, 68G), covering buccal cavity, without gap when closed; ischium notably broader, longer than merus, mesial margin slightly convex, crenulated; merus relatively ovoid, crenulated on mesial and lateral margins; carpus, propodus and dactylus cylindrical, dactylus longer than propodus; exopod narrow, 0.3 width of ischium, slightly sinuous, margins crenulated, flagellum well developed. Chelipeds subequal (Fig. 67D); major chela with slight gap when fingers closed; with large teeth at cutting edge of dactylus and fixed finger; outer surface of dactylus and palm granulated; palm longer than wide; minor chela with wider gap when fingers closed; ornamentation similar to that of major chela. P2–P4 relatively long, granulated and setose (Figs. 67A, 68E); P3 longest; P2 most slender; dactylus slightly upcurved; P3 longer than P2; dactylus straight; P4 shorter than P3, merus about 3 times as long as broad. Male thoracic sternum broad (Fig. 67B), surface granulated; sternites 1 and 2 fused, separated from sternite 3 by distinct ridge; sternite 3 not separated from sternite 4, sternites 4–7 well developed, separated by distinct sutures; sternoabdominal cavity reaching middle of sternite 4, no thoracic sternal groove.

Male abdomen relatively narrow (Fig. 68F); somites 1 and 2 free, somites 3–5 fused, lateral margin sinuous; somite 6 long, lateral margin slightly expanded subproximally; telson rounded, slightly shorter than somite 6. G1 (Fig. 68H, I) concealed under abdomen, slightly sinuous, dense stiff setae subdistally, covering tapered, pointed tip.

**Colour.** Not known.

**Remarks.** See discussion for genus.

**Type locality.** Gold Coast, West Africa.

**Distribution.** West Africa.

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