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ON THE LAND CRABS OF THE GENUS *DISCOPLAX* A. MILNE EDWARDS, 1867 (CRUSTACEA: DECAPODA: BRACHYURA: GECARCINIDAE), WITH DESCRIPTION OF A NEW CAVERNICOLOUS SPECIES FROM THE PHILIPPINES

Peter K. L. Ng

Department of Biological Sciences, National University of Singapore, Kent Ridge, Singapore 119260, Republic of Singapore
Email: dbsngkl@nus.edu.sg

Danièle Guinot

Laboratoire de Zoologie (Arthropodes), Muséum national d'Histoire naturelle, 61 rue de Buffon, Paris 05 Cedex, France
Email: guinot@cimrs1.mnhn.fr

ABSTRACT. – The taxonomy of the gecarcinid land crabs of the genus *Discoplax* A. Milne Edwards, 1867, is revised, and its differences with the related genus, *Cardisoma* Latreille, 1828, enumerated. *Discoplax* had been separated from *Cardisoma* primarily by its elongated ambulatory legs, but as this is not a reliable generic character, many authors have regarded both names as synonyms. However, a number of new differences (antennal structure, orbits, carapace, thoracic sternal and abdominal characters) show that both are distinct genera. The genus *Discoplax* now contains four species, the type species *D. longipes* A. Milne Edwards, 1867, *D. hirtipes* (Dana, 1852), *D. rotunda* (Quoy & Gaimard, 1824), and a new species, *D. gracilipes*, from the Philippines. *Discoplax gracilipes* is allied to *D. longipes* but can immediately be distinguished by its relatively longer ambulatory legs and smoother carapace. A key to the known *Discoplax* species is provided.

KEY WORDS. – Land crabs, systematics, Gecarcinidae, *Discoplax*, new species, Philippines.

INTRODUCTION

The Indo-West Pacific land crabs of the family Gecarcinidae MacLeay, 1838, are currently represented by four genera, viz. *Cardisoma* Latreille, 1828, *Discoplax* A. Milne Edwards, 1867, *Gecarcoidea* H. Milne Edwards, 1837, and *Epigrapsus* Heller, 1862. The status of *Discoplax* is not clear. For a long time, it was regarded as distinct from *Cardisoma*, and containing only its type species, *D. longipes* A. Milne Edwards, 1867, although admittedly, there have been few reports of it. Of late, and especially since Türkay's (1974) revision of the Indo-Pacific Gecarcinidae, many authors have regarded *Discoplax* as a junior synonym of *Cardisoma* (see also Ortmann, 1894; Alcock, 1900). Guinot (1985, 1988, 1994) regarded *Discoplax* as a distinct genus, using it for *D. longipes*, but she did not elaborate. Türkay (1987) subsequently commented briefly that both were different genera but did not elaborate on his decision. This classification was subsequently followed by Ng (1998) and Ng et al. (1999, 2001).

Over the years, we have examined most of the species associated with *Cardisoma* and *Discoplax*, and the conclusion of the present study is that both genera are distinct, with their general similarity attributed to convergent lifestyles. Within *Discoplax*, Türkay (1987) recognised three species, *D. longipes* A. Milne Edwards, 1867 (type species by monotypy), *D. hirtipes* (Dana, 1852) and *D. rotunda* (Quoy & Gaimard, 1824). Of these, the most characteristic species is *D. longipes*, with its prominently elongated legs and preference for karst and cave environments.

In 1992, we had an opportunity to examine several small specimens from caves in Bohol in the Philippines collected by Dr. Thomas Iliffe, which closely resembled *D. longipes* but appeared to differ in having smoother carapaces and perciopods as well as proportionately longer and more slender ambulatory legs. But because these specimens were all juveniles or subadults, and no good series of *D. longipes* was available then, we preferred not to describe the species at the time. In 1993, Dr. Bernard Séret obtained a good series of *D. longipes* from the Loyalty Islands near New Caledonia, through his investigations of the fishes there; and from this same locality, Dr. Louis Deharveng sent us another good

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collection in 2000 from his speleological explorations. In 1999, Dr. Gustav Paulay facilitated in the collection of another good series of this species from Guam. In 2000, Dr. Lawrence Liao and his students of the University of San Carlos in Cebu finally obtained a good series of adult specimens of the *D. longipes*–like crab from the Philippines. This excellent material confirms that the Philippines long-legged *Discoplax* is indeed a distinct species from *D. longipes*. The present paper serves to describe this new species (here named *D. gracilipes*) as well as provide a detailed diagnosis of the genus *Discoplax*.

MATERIALS AND METHODS

The abbreviations G1 and G2 refer to the male first and second pleopods respectively. The first to fourth ambulatory legs correspond to pereiopods 2 to 5. Specimens examined are deposited in the following institutions: MNHN – Muséum national d'Histoire naturelle, Paris, France; NSMT – National Science Museum, Tokyo, Japan; QM – Queensland Museum, Brisbane, Australia; RMNH – Nationaal Natuurhistorisches Museum (former Rijksmuseum van Natuurlijke Histoire), Leiden, The Netherlands; SMF – Natur–Museum und Forschungs Institut Senckenberg, Frankfurt–am–Main, Germany; TMCD – Taiwan National Museum, Taipei, Taiwan; USC – University of San Carlos, Cebu City, Cebu, Philippines; ZMUC – Zoological Museum, University of Copenhagen, Denmark; ZRC – Zoological Reference Collection, Raffles Museum of Biodiversity Research, National University of Singapore.

The terminology used here essentially follows that used by Ng (1998), with consideration of the suggestions of Tavares & Secretan (1993). Measurements provided are of the carapace length and width respectively. The widest point of the carapace is not across the anterolateral margin but at the inflated sub–branchial regions. The length of the carapace is taken at the maximal, i.e. from the outer edge of the frontal lobes to the lateral part of the posterior margin, which may be medially indented in some specimens. The length of each leg segment is of the maximum linear length, and the width is taken at the widest (highest) point; spines (when present) were not measured. All measurements were taken along the outer surface. Measurements are usually taken of the right legs, unless one of the pereiopods are missing, damaged, malformed or recently regenerated. The measurement of the dactylus is particularly difficult and may not be very accurate as the tip is often eroded, broken or damaged. Nevertheless, the length–width proportions are usually useful. All measurements are in millimetres (mm).

TAXONOMY

Discoplax A. Milne Edwards, 1867

Discoplax A. Milne Edwards, 1867: 284; Balss, 1957: 1671; Guinot, 1979: 152; Türkay, 1987: 145; Guinot, 1994: 168.

Type species. – *Discoplax longipes* A. Milne Edwards, 1867, by monotypy. Gender feminine.

Diagnosis. – Carapace transversely ovate, dorsal surfaces convex; epigastric and postorbital ridges usually prominent. Anterolateral margin strongly convex, external orbital tooth small but well defined, clearly demarcated from rest of anterolateral margin by cleft. Infraorbital margin well developed, not confluent with anterolateral margin; outer edge separated from anterolateral margin by wide space. Basal article of antenna quadrate, positioned relatively far from front, not touching frontal margin, not expanded, not forming lobe; article 4 minute, not expanded to close hiatus. Eyestalk relatively short. Thoracic sternites 1 and 2 longitudinally narrow, triangular, not conspicuous, may be partially covered by third maxillipeds; sternite 3 relatively broad, clearly separated from sternite 4 by prominent suture; sternite 4 transversely broad to very broad; abdominal cavity without trace of longitudinal suture between sternites 5 and 6; dorsal surface of abdominal cavity distinctly flattened, shelf–like. Male abdomen relatively broad; segment 6 subquadrate, never longer than broad.

Discussion. – The genus *Discoplax* A. Milne Edwards, 1867, was originally established for *D. longipes* A. Milne Edwards, 1867, only. The genus was regarded as distinct and monotypic by most authors (see however, Ortmann, 1894; Alcock, 1900) until Türkay (1974) formally synonymised it with *Cardisoma* Latreille, 1828. As a species, *Discoplax longipes* is distinctive in possessing long ambulatory legs, and it was thus not surprising that the genus *Discoplax* was recognised as a valid genus for so long. Yet, the length of the legs alone is not sufficient reason to recognise a distinct genus for *D. longipes*, especially since in almost all carapace features, it closely resembles several species of *Cardisoma*. Guinot (1985, 1988, 1994), however, continued to use *Discoplax* for *D. longipes*, but she did not provide any explanations. Türkay (1987) briefly commented that *Discoplax* was a good genus, but interestingly, included in it, *D. rotunda* (Quoy & Gaimard, 1824) and *D. hirtipes* (Dana, 1852) as well, two species which had long been in the genus *Cardisoma*. Unfortunately, he did not provide any explanations.

We concur with Türkay's (1974) prognosis that *Discoplax* is a valid genus. It can be distinguished from *Cardisoma* sensu stricto by numerous carapace and thoracic sternal characters. The most significant character is in the form of the anterior thoracic sternites. In all *Discoplax* species recognised here, there is no trace of a longitudinal suture between sternites 5 and 6 in the abdominal cavity, the surface appearing entire, with the dorsal surface of the cavity relatively flatter, forming a relatively shelf–like structure, particularly in *D. longipes* (Fig. 4A) and *D. gracilipes*. In all *Cardisoma* species recognised here, there is a deep longitudinal suture between sternites 5 and 6 in the abdominal cavity, with the lateral surfaces of the cavity sloping gradually to the median, forming a more distinct valley–like structure (Fig. 3). In species like *D. longipes* and *D. gracilipes*, the anterior thoracic sternum is especially wide,

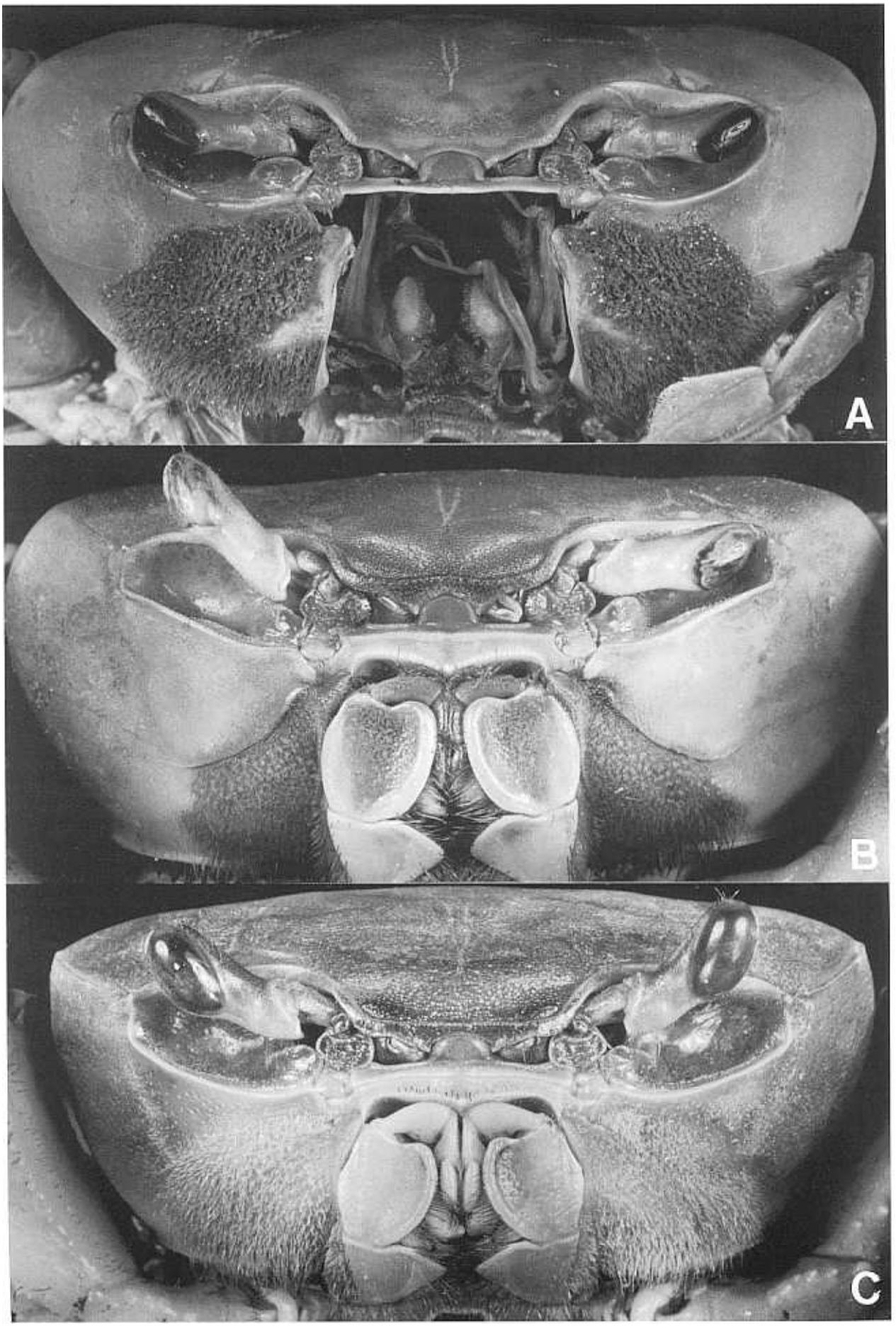

Fig. 1. Frontal views of male *Cardisoma* species. A, *C. guanhumi* (72.8 by 91.6 mm) (ZRC 2000.1573), Panama; B, *C. carnifex*, (62.6 by 75.8 mm) (ZRC 2000.1651), Sabah, Malaysia; C, *C. armatum*, (43.1 by 53.1 mm) (ZRC 1996.121), West Africa.

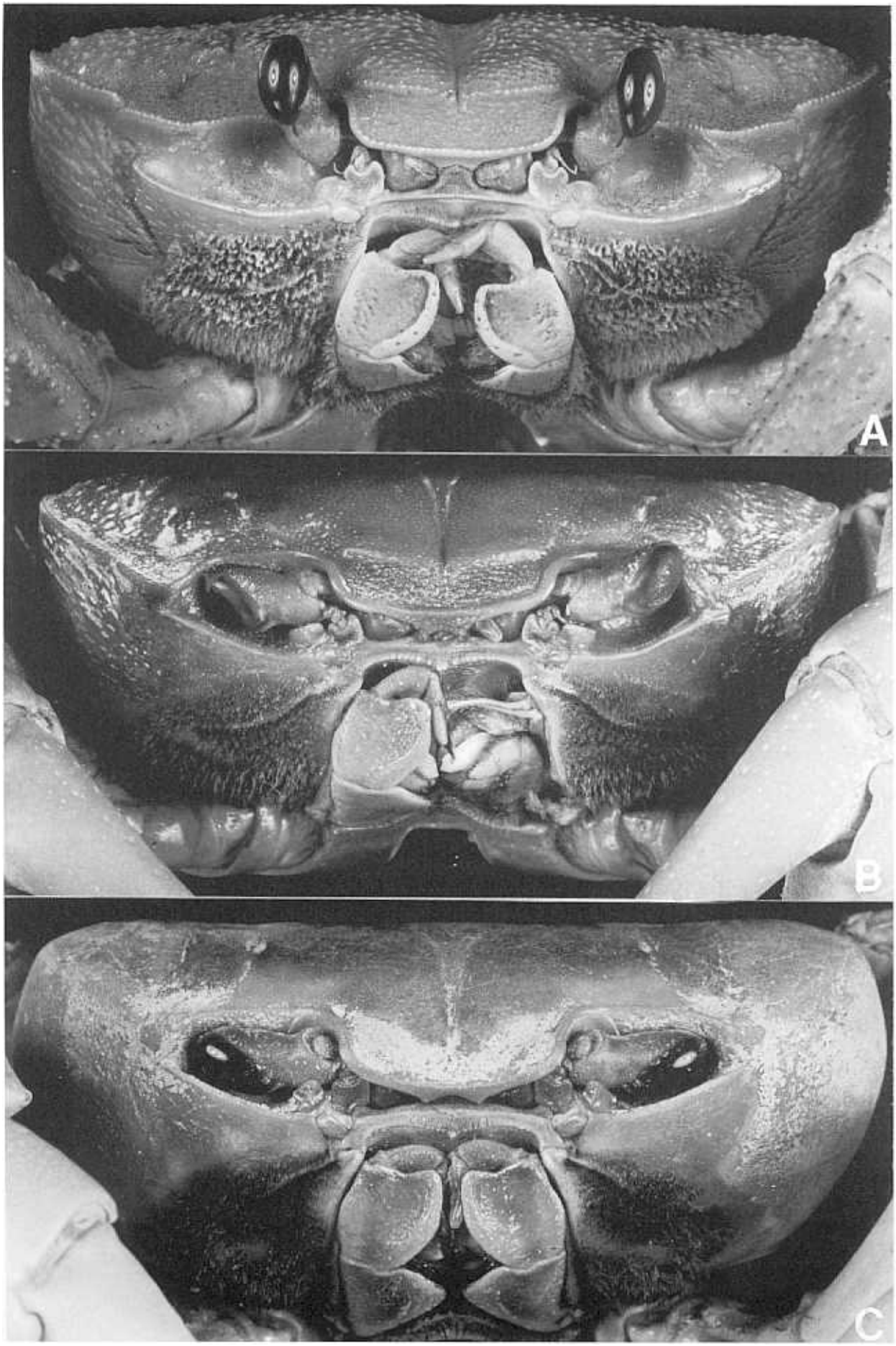

Fig. 2. Frontal views of male *Discoplax* species. A, *D. longipes*, (60.0 by 68.3 mm) (ZRC 2000.0571), Piggy Cave, Guam; B, *D. rotunda*, (46.5 by 57.4 mm) ZRC 1965.12.1.7), Cocos–Keeling Islands; C, *D. hirtipes*, (55.5 by 68.5 mm) (ZRC 1999.1039), Taiwan.

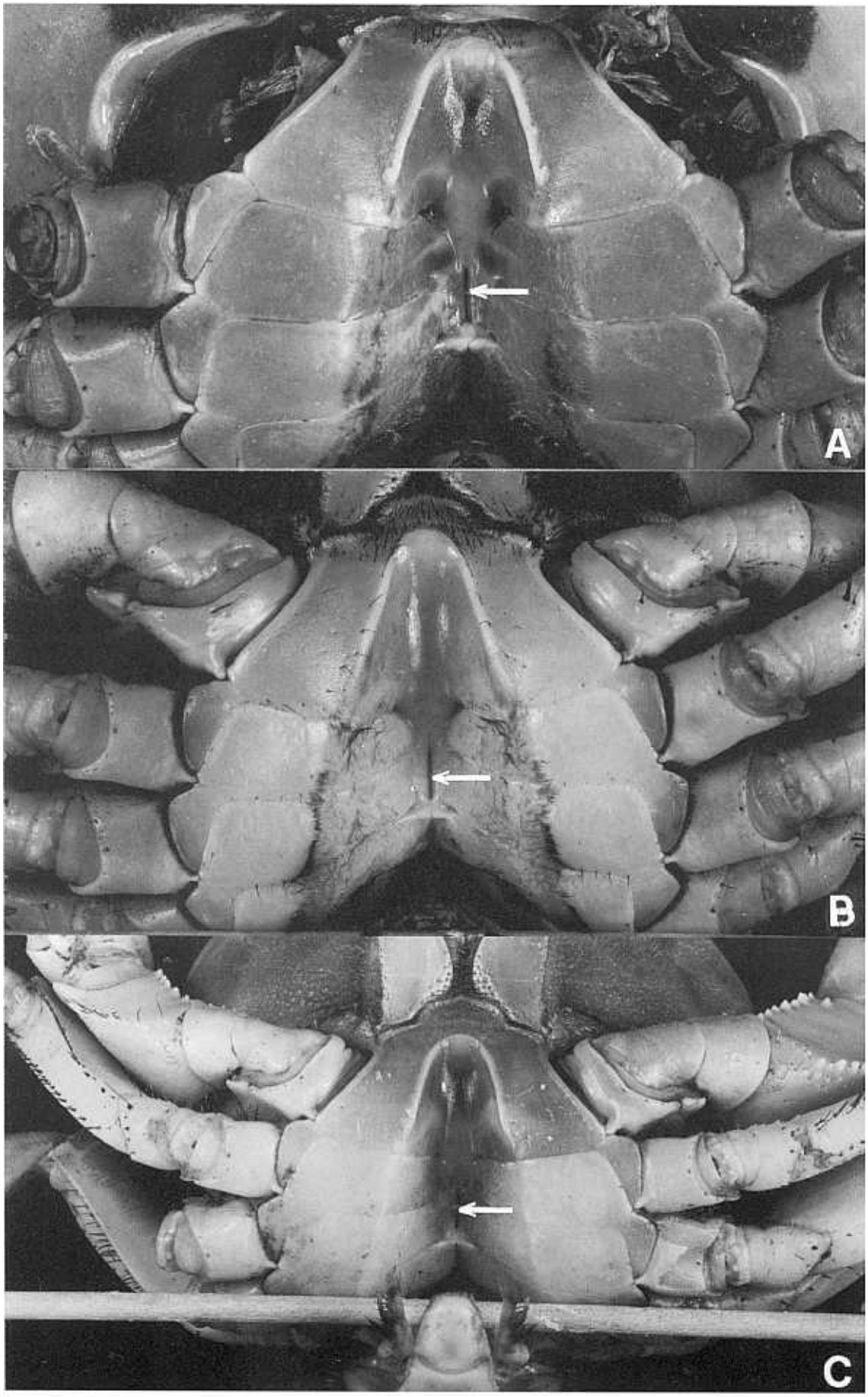

Fig. 3. Anterior thoracic sternal plates of male *Cardisoma* species. A, *C. guanhumi* (72.8 by 91.6 mm) (ZRC 2000.1573), Panama; B, *C. carnifex*, (62.6 by 75.8 mm) (ZRC 2000.1651), Sabah, Malaysia; C, *C. armatum*, (43.1 by 53.1 mm) (ZRC 1996.121), West Africa. White arrow marking longitudinal sternal suture.

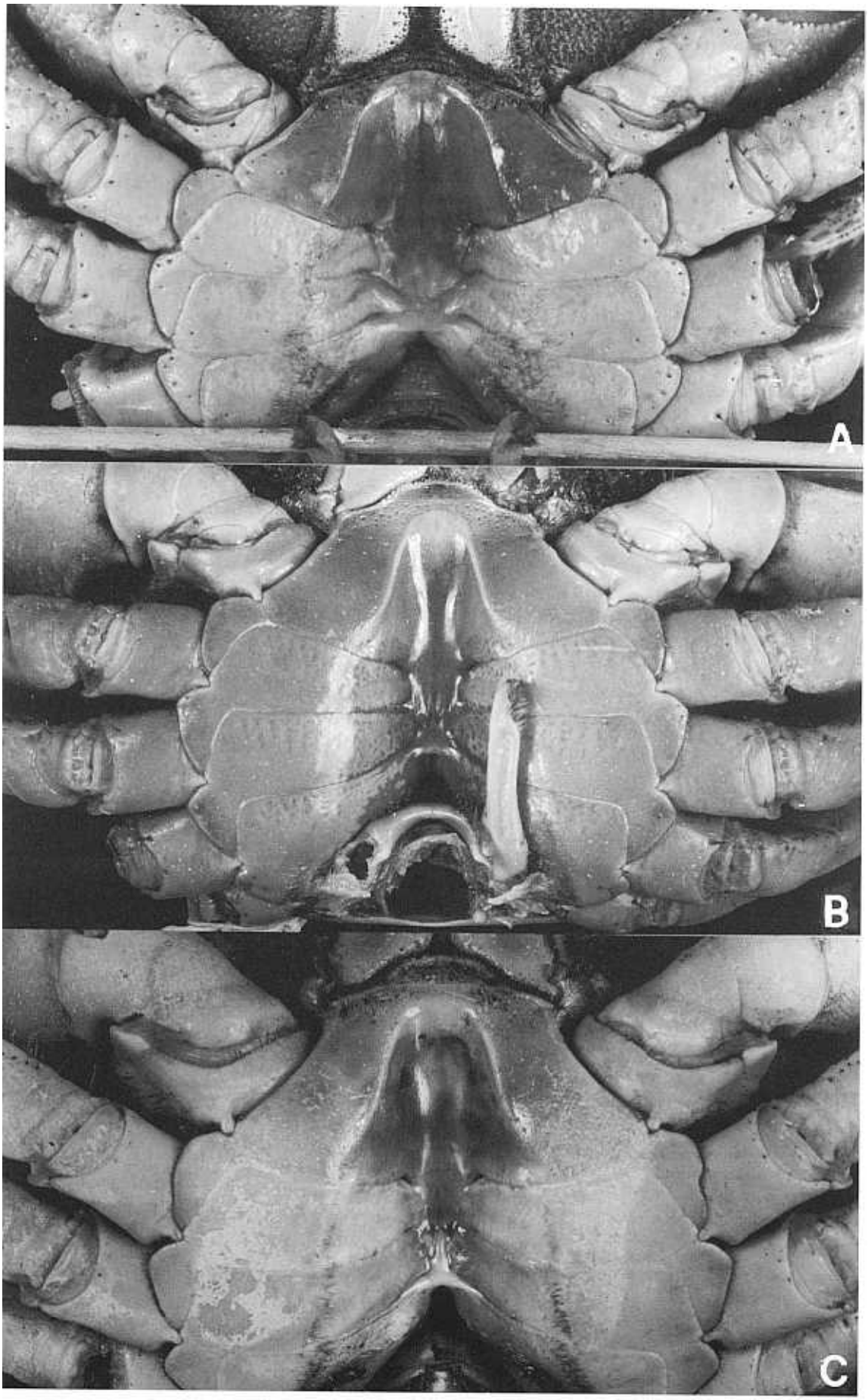

Fig. 4. Anterior thoracic sternal plates of male *Discoplax* species. A, *D. longipes*, (60.0 by 68.3 mm) (ZRC 2000.0571), Piggy Cave, Guam; B, *D. rotunda*, (46.5 by 57.4 mm) ZRC 1965.12.1.7), Cocos–Keeling Islands; C, *D. hirtipes*, (55.5 by 68.5 mm) (ZRC 1999.1039), Taiwan.

with thoracic sternite 4 prominently broader (Fig. 4A) than in *D. rotunda* and *D. hirtipes* (Fig. 4B, C), but in all other features, agree with them. This difference alone does not warrant the assignment of *D. hirtipes* and *D. rotunda* into a separate genus from *D. longipes* and *D. gracilipes*. The carapace of *D. hirtipes* does differ markedly from those of the other three *Discoplax* species, being more inflated and much smoother (Fig. 2C). The carapace of *D. rotunda* (Fig. 2B), however, approaches those of *D. longipes* (Fig. 2A) and *D. gracilipes* (Fig. 9C).

In addition, compared to *Cardisoma* species, all recognised *Discoplax* species have a clearly defined external orbital tooth in adults (Figs. 2, 5B, 9C) (vs. usually absent to almost absent, with anterolateral margin appearing entire, Fig. 1); the suborbital margin is not confluent with anterolateral margin, being separated by a wide gap (Fig. 2, 5B, 9C) (vs. appearing joined, with outer edge of suborbital margin almost reaching base of external orbital tooth, Fig. 1); the eyestalk is relatively shorter (Fig. 2, 5B, 9C) (vs. distinctly longer, Fig. 1); the basal antennal article (actually segments 2 and 3) does not touch the outer edge of the frontal margin, being separated by a prominent gap (Fig. 2, 5B, 9C) (vs. inner edge of basal antennal article touching or positioned just below outer edge of frontal margin, Fig. 1); antennal article 4 is minute and does not close the hiatus between the antenna and front (Fig. 2, 5B, 9C) (vs. more well developed article 4 which helps to close the space between antenna and front, Fig. 1); and the male abdominal cavity and abdomen are proportionately broader (Fig. 4), with segment 6 relatively narrower longitudinally, being never longer than broad (Figs. 7A, 10A) (vs. proportionately narrower [Fig. 3], segment 6 almost as long as to longer than broad). All these differences indicate that *Discoplax* and *Cardisoma* are distinct genera.

A note on the date of publication of *Cardisoma* is pertinent. Many workers cite the genus as "*Cardisoma* Latreille, 1825", but according to Sherborn & Woodward (1899), pages 1–334 of the Latreille's "Encyclopédie Méthodique" were published in 1825, while pages 345–833 were published only in 1828. As the name *Cardisoma* was published on page 685, the genus should thus be cited as "*Cardisoma* Latreille, 1828".

Discoplax longipes A. Milne Edwards, 1867
(Figs. 2A, 4A, 5–8, 12A, 13)

Discoplax longipes A. Milne Edwards, 1867: 284 (New Caledonia); A. Milne Edwards, 1873: 294, Pl. 15 (New Caledonia); De Man, 1902: 548; Tesch, 1918: 137 (list); Sendler, 1923: 23, Pl. 20 figs. 1a, b (Tuamotu); Forest & Guinot, 1961: 74 (no new locality); Serène, 1968: 110 (list); Guinot, 1985: 454 (French Polynesia); Türkay, 1987: 145 (no new locality); Guinot, 1988: 6 (Loyalty Islands); Guinot, 1994: 168 (no new locality); Poupin, 1996: 66 (list).

Cardisoma rotundum – Anonymous, 1970: 2, Fig. (Niue) (not *Thelphusa rotunda* Quoy & Gaimard, 1824)

Cardisoma longipes – Yaldwyn, 1970: 2, Fig. (Niue); Yaldwyn, 1972: 508 (no new locality); Türkay, 1974: 236, Figs. 4, 10, 15 (New Caledonia, Ocean [Pleasant] Island, Kandavu, Niue, Cook Islands, Tuamotus); Yaldwyn & Wodzicki, 1979: 25 (part) (key only); Hartnoll, 1988: 21 (no new locality); Tavares, 1989: 35 (no new locality); McLay & Ryan, 1990: 115, tabl. 2 (Fiji); Ng, 1998: 1151 (various parts of South Pacific, including Guam); Omori & Holthuis, 2000: 38, Fig. 32.19 (no new locality).

Material examined. – Holotype – male (54.0 by 55.0 mm) (MNHN–B 3763 S), New Caledonia, no other data.

Others – **Loyalty Islands, New Caledonia**: 1 male (61.7 by 71.9 mm) (MNHN–B 20150), Cong–Ouloup Cave, Ouvea Atoll, coll. J.–P. Guillerm, 26 Sep.1987; 1 female (soft, freshly moulted) (MNHN), Cong–Ouloup Cave, Ouvea Atoll, coll. P. Wea & L. Deharveng, 14 Nov.2000; 1 adult female (43.0 by 49.0 mm), 1 young male (26.9 by 30.6 mm) (MNHN–B 24812), Xodre Cave, Lifou Island, by hand, coll. B. Séret, 1 Sep.1993; 1 male (37.7 by 37.2 mmm), 1 juvenile female (27.6 by 32.8 mm) (MNHN–B 24815), 1 male (37.7 by 43.3 mm), 1 juvenile female (25.9 by 30.3 mm) (ZRC 2001.1150), Inegoj Cave, Lifou Island, by hand, coll. B. Séret, 2 Feb.1993; 2 females (32.6 by 36.8 mm, 23.7 by 26.9 mm) (MNHN–B 26944) (photographed), station K10, "siphon cristal", Inegoj Cave, Lifou Island, in water, coll. B. Séret, 12 Aug.1995; 1 ex. (15.7 by 17.7 mm, dried, badly damaged) (MNHN–B 26945), in closed pool, near a siphon, Mexel Cave, Lifou Island, coll. B.Séret, 2 Aug.1995; 1 male (damaged, 39.0 mm width), 1 female (50.0 by 56.0 mm) (MNHN–B 27949), Kumo Cave, Lifou Island, coll. "Workshop Lifou 2001"; 1 juvenile male (16.2 by 19.0 mm) (MNHN/ZRC), station NC00–073, Pekepié Cave, Drueulu, Lifou Island, coll. L. Deharveng & A. Bedos, 21 Oct.2000; 1 male (51.1 by 58.9 mm), 1 juvenile (7.5 by 8.2 mm) (MNHN/ZRC), station NC00–114, Peng Cave, Hapetra, Lifou Island, coll. L. Deharveng & A. Bedos, 26 Oct. 2000; 1 male (57.4 by 68.2 mm), 2 juvenile females (17.8 by 20.7 mm, 14.0 by 17.2 mm) (MNHN/ZRC), station NC00–144, Peng Cave, Hapetra, Lifou Island, coll. L. Deharveng & A. Bedos, 29 Oct.2000; 1 juvenile (8.0 by by 9.0 mm) (MNHN–B 26949), from a small pool, station 88–057, in fresh water, limestone cave, Panace Cave, Tiga Island, coll. T. M. Iliffe & S. Sarbu, 16 Jun.1988; 1 male (24.9 by 22.4 mm), 2 juveniles (6.1 by 7.3 mm, 6.7 by 7.8 mm) (MNHN/ZRC), station NC00–165, Wea Cave, Tiga Island, coll. L. Deharveng & A. Bedos, 2 Nov.2000; 1 female (53.4 by 61.2 mm), 1 juvenile male (15.3 by 18.0 mm), 1 juvenile female (18.6 by 21.8 mm) (MNHN/ZRC), station NC00–150, Wea Cave, Tiga Island, coll. L. Deharveng & A. Bedos, 1 Nov.2000. **Guam** – 5 males (38.6–47.1 by 43.9–54.1 mm), 1 female (40.3 by 47.8 mm) (ZRC 2000.2054), 2 ex–ovigerous females (40.3 by 47.8 mm, 45.9 by 52.7 mm) (ZRC 2000.2052–2053), 1 male (QM), 4 males (TMCD), in limestone cave, about 50 m from beach, behind beach forest, Faifai Beach, near Gun Beach, Tumon Bay, coll. P. K. L. Ng & G. Paulay, Apr.2000; 1 male (TMCD), in limestone cave, Faifai Beach, near Gun Beach, coll. L. Kirkendale, 2000; 6 males (48.1 by 56.8 mm, 43.3 by 50.2 mm, 40.7 by 46.8 mm, 38.3 by 44.2 mm, 36.0 by 41.8 mm, 30.6 by 36.3 mm), 4 females (56.5 by 66.2 mm [ovigerous], 47.5 by 56.2 mm, 41.0 by 47.4 mm) (ZRC), 3 males, 3 females (TMCD), 1 male (36.2 by 42.5 mm) (USC), in limestone cave and adjacent limestone cliffs and beach, Faifai Beach, near Gun Beach, Tumon Bay, coll. P. K. L. Ng et al., 28 Jul.–1 Aug.2001; 1 male (34.1 by 39.6 mm) (ZRC), outside University of Guam guesthouse, Pago Bay, coll. P. K. L. Ng & H.–C. Liu, 1 Aug.2001; 1 male (57.8 by 69.7 mm) (ZRC 2000.5072), no specific location, from University of Guam teaching collection, coll. between 1980–1990; 1 male (60.0 by 68.3 mm) (ZRC 2000.0571), Piggy Cave, Mount Santa Rosa, coll. S. Bauman, 18 Mar. 1996; 1 juvenile female (15.3 by 17.3 mm) (ZRC 2001.1151), in cave, Ritidian, coll. 16 Dec.1992; 2 juveniles (5.5 by 6.2 mm, 4.3 by 4.8 mm) (MNHN–B 26946), station 85–013, Ritidian Cave, coll. T. M. Iliffe, 26 Jan.1985.

Diagnosis. – Epigastric regions well defined, margin relatively sharp; postorbital cristae relatively strong (Figs. 2A, 6B). Frontal, epigastric, epibranchial and anterior part

of mesobranchial regions covered with small rounded granules, those on anterior part flattened; mesogastric and metagastric regions distinctly granulose; posterior part of mesobranchial and metabranchial regions with prominent striae and granules (Fig. 6B). Frontal margin usually relatively broader transversely. Anterolateral margin arcuate. Surfaces of chela in adults granulose to rugose (Fig. 7B). Ambulatory legs long; ratios of maximum length to maximum width of second to fourth ambulatory meri 3.6–4.4, 3.5–4.3, 2.9–3.6 respectively; ratios of maximum length to maximum width of second to fourth ambulatory legs (dactylus, propodus and merus only) 13.9–16.0, 13.5–15.0, 11.1–12.1 respectively (Figs. 5A, 6A, 12A); surfaces covered with distinct granules and/or striae, appearing very rugose; dorsal margins of merus prominently granulated, appearing serrated; lateral margins of propodus and dactylus lined with strong, stiff spines or setae, propodus always distinctly armed (Fig. 12A). Male abdomen relatively broad; lateral margin of segment 6 convex; telson semicircular, lateral margins gently convex (Fig. 7A). G1 tip bent at an angle of about 90° from vertical; outer margin of distal part meets curved distal part of pectinated part abruptly, forming gentle shelf–like structure; base of pectinated distalmost part (outer marginal view) prominently broad; inner surface with relatively deep median longitudinal depression (Fig. 13).

Remarks. – Alphonse Milne Edwards (1873: 294) regarded the species as "very rare" in New Caledonia. The holotype was simply labelled as from "New Caledonia", without any other indication, and the presence of *D. longipes* on the main island of New Caledonia needs to be verified. Certainly, no specimens of *D. longipes* are known from the main island since A. Milne Edwards (1867) description and is not known locally (B. Richer de Forges, pers. comm.). In fact, it seems likely that the original specimen on which A. Milne Edwards based his description may have come actually been collected from the nearby Loyalty Islands where *D. longipes* is not uncommon.

Behaviour. – Numerous specimens of living *D. longipes* were observed by the first author *in situ* in Guam in April 2000 and July 2001. At least a dozen specimens of *D. longipes* of various sizes (all adults) were also kept in the aquaria by C.–H. Wang and the first author for a week in Guam and then for several months after that in Singapore.

Discoplax longipes moves primarily using its first and last ambulatory legs which are distinctly shorter than the median two pairs. When moving about, the second and third pairs are often raised (with the dactylus not touching the ground) in the direction of the movement, with the crab clearly using them as feelers. In such cases, the second and third pairs on the side opposite to the direction of movement may be touching the ground or raised. Presumably, this mode of locomotion is especially useful in caves where there is no light. In fact, it is because of the prominently elongated second and third pairs of ambulatory legs that the species has its distinctive appearance. Without these legs, the similarity between *D. longipes* and *D. rotunda* is remarkable. In the caves, *D. longipes* usually moves slowly in this manner, but when disturbed, it uses all four pairs of legs to run off at stunning speed. This speed and agility, especially in the karst landscape, make their capture extremely difficult. *Discoplax longipes* has a tendency of climbing upside–down in caves (Fig. 8A), even foraging in this position, and its locomotory style does not change. In the aquaria, it often climbs upside down (on the cover of the tank), sometimes staying in that position for many hours. This habit is especially prevalent among smaller specimens.

Discoplax longipes likes water, and many specimens were observed in the water itself, sometimes up to two metres deep. Smaller specimens are always found in or near water. In the terrarium, they normally perch themselves above the dishes of water provided using their elongated legs, with their carapace half submerged. In one case, a specimen was observed to initially position itself with its back against the water dish, and anchoring itself to the edge of the dish with its last pair of legs, did a back–flip into the water! This action was repeated several times by this specimen.

In the cave, *D. longipes* usually shelters in deep crevices and cracks. There was no evidence that they dig permanent burrows, certainly none were observed. They do, however, dig out the mud between crevices to create a shelter. They are essentially solitary animals and fight when confined to small areas without adequate cover. This is especially so with large specimens.

Discoplax longipes is not blind and reacts to light as any other terrestrial crab. Its eyes are not modified for a cavernicolous lifestyle and are comparable to more typically epigeal species of *Discoplax*. Still, the species seems to show a distinct preference for living in limestone caves and can be considered a facultative cavernicole.

In the caves, they have been observed to scrape off the dense mats of blue–green algae and/or bacteria growing near the water. In most of the freshly specimens collected, examination of their faeces suggests that this formed a major part of their diet. Like most crabs, they will eagerly feed on any plant or animal matter presented. Some specimens in Guam had been caught in baited traps left overnight in shallow water.

On Guam, *D. longipes*, is certainly present in many other parts. It is most easily studied at Tumon Bay on the western part of the island because a good part of this area has been extensively developed for ecotourism, although the particular stretch of beach and limestone forest of Faifai Cave is protected to some degree and is safe for the near future. There are also specimens from Ritidian to the north, and Pago Bay in the east. At Ritidian, which is a national wildlife refuge, the park rangers have reported seeing this species in one of the caves but they are apparently not common (A. Webster, personal communication). In Guam, *D. longipes* is not well known locally, and is certainly not harvested for food unlike *Cardisoma carnifex* and *Discoplax hirtipes* which appear regularly in the local markets. According to locals, even *D. rotunda* is occasionally sold but they regard this species as

rare. *Gecarcoidea lalandii* H. Milne Edwards, 1837, is not yet known from Guam.

Reproduction. – While the migrations of land crabs to the sea to release their zoeae have been reported for many gecarcinid species (see Gibson–Hill, 1947; Gifford, 1962; Bliss, 1968; Grubb, 1971; Shokita, 1971; Henning, 1975a, b; George, 1978; Hicks et al.,1984; Wolcott, 1988; Chia & Ng, 1994), that for *D. longipes* is not known. Of the four recognised *Discoplax* species, *D. hirtipes* is perhaps the best studied (see Gibson–Hill, 1947; Goshima et al., 1978; Shokita, 1971; Wolcott, 1988; Shokita & Shikatani, 1990) and its reproductive behaviour is similar to those of *Cardisoma* species. *Discoplax rotunda* behaves in the same manner (unpublished data). All move across relatively flat landscapes on their way to the sea, although they may climb past cliffs and hills to reach there.

The preferred habitat of *D. longipes*, deep in caves, sometimes several hundred metres from the sea does seem to pose problems. In the Loyalty islands, the caves from which the crabs were collected are completely isolated, without a real communication with the sea (B. Séret, personal communication). In Guam, they were collected from caves which can be some distance from the sea. In the case of Faifai Cave in Guam, it is about 50 to 100 metres from the sea, and the entrance is about 30 metres above the ground. To reach the entrance, we had to cut through dense beach forest, with the substrate mainly composed of sand and decaying vegetation. In this beach forest, at least three species of land hermit crabs (*Coenobita* spp., Coenobitidae) and the supralittoral ghost crab, *Ocypode cordimanus* Latreille, 1818 (Ocypodidae) were very common on the forest floor, while on the trees, *Labuanium* aff. *rotundatum* (Hess, 1865) (Grapsidae) was present. Faifai Cave is actually part a large

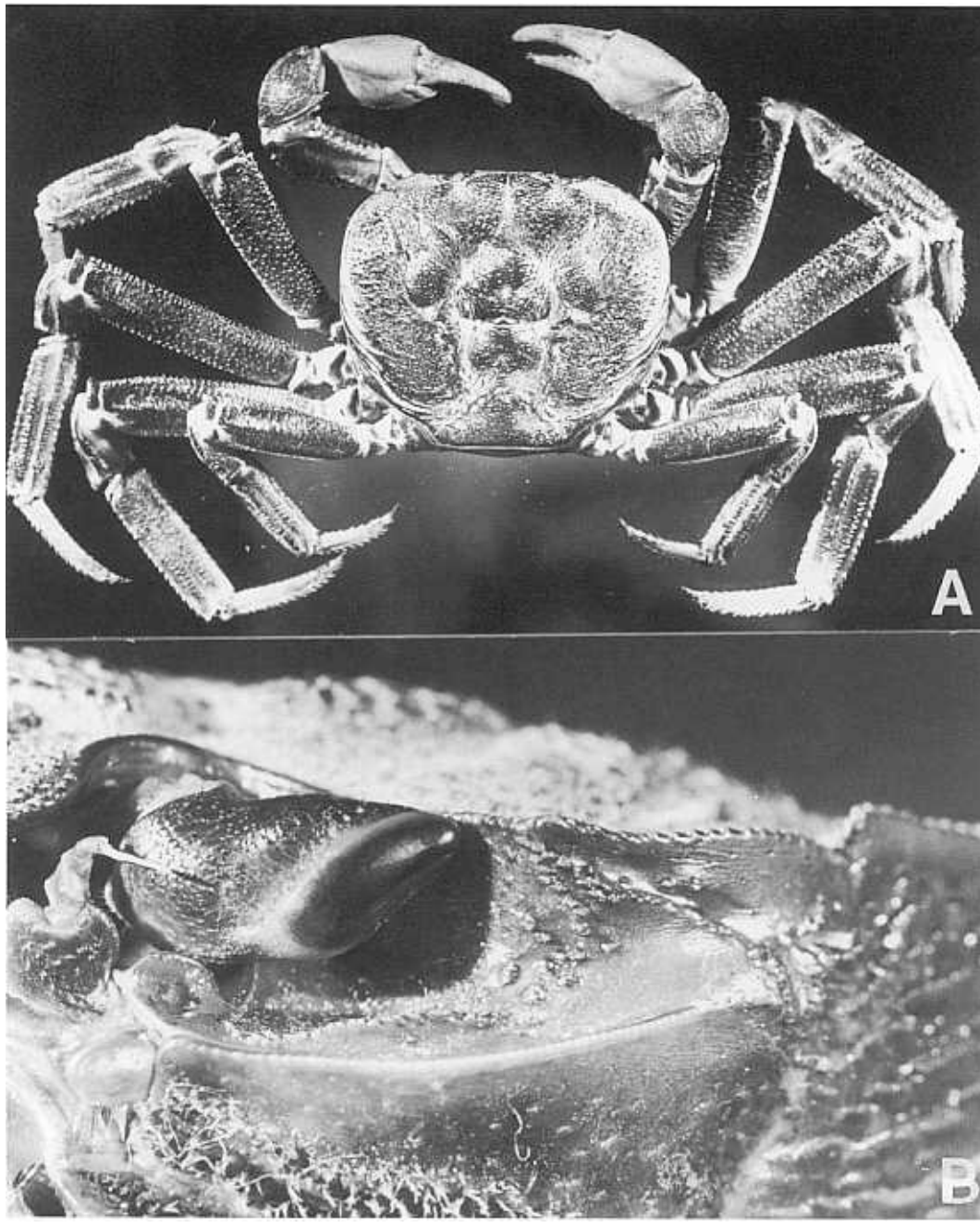

Fig. 5. *Discoplax longipes*. Male (61.7 by 71.9 mm) (MNHN–B 20150), Loyalty Islands. A, overall view; B, left orbit.

Fig. 6. *Discoplax longipes*. Male (47.2 by 54.1 mm) (ZRC 2000.2054), Faifai Beach, Guam. A, overall view; B, carapace; C, frontal view.

limestone formation, part of which continues all the way to the ocean, forming steep cliffs when it meets the sea (see Lotz, 2000). In Faifai Cave, there are large ponds and scattered pools, with the water essentially fresh, and they do not seem to be directly connected to the sea. In pools, the anchialine crab *Orcovita mollitia* Ng, Guinot & Iliffe, 1996 (Varuninae: Grapsidae) and the euryhaline goby, *Eleotris melasoma* (Gobiidae), was also caught; and on the roof and dry parts of the cave, we obtained an unidentified species of *Sesarmoides* Serène & Soh, 1970 (Grapsidae: Sesarminae). In April 2000, the first author observed two adult ovigerous females (with dark–coloured eggs) in Faifai Cave, foraging in about a metre depth of water in the larger ponds; and in July 2001, more ovigerous specimens were observed under similar circumstances.

The puzzle of how *D. longipes* released their zoeae was first solved on the night of 18th April 2000, when Wang Chia–Hsiang (TMCD), Gustav Paulay (then with the University of Guam) and the first author went into Faifai Cave just before the full moon (ca. 21:00 hours). Just as we started to enter the cave, C.–H. Wang caught an ovigerous female right at the entrance as she was climbing out. No other ovigerous females were seen, although a good number of males were observed in the cave itself. Since gecarcinids are known to "march" across the forest floor to reach the sea, we searched the beach forest adjacent to Faifai Cave, but did not find any specimens then. As we were collecting *Geograpsus crinipes* (Dana, 1851), *G. stormi* De Man, 1895 (Grapsinae: Grapsidae), and *Stelgistra stormi* (De Man, 1895) (Sesarminae: Grapsidae) on the limestone cliffs at the water's edge about 200 metres from Faifai Cave, another ovigerous female *D. longipes* was encountered climbing down from the cliff wall, towards the surf zone (Fig. 8C). This specimen was collected and her zoeae hatched in the aquaria a few hours later. Another female was observed some distance

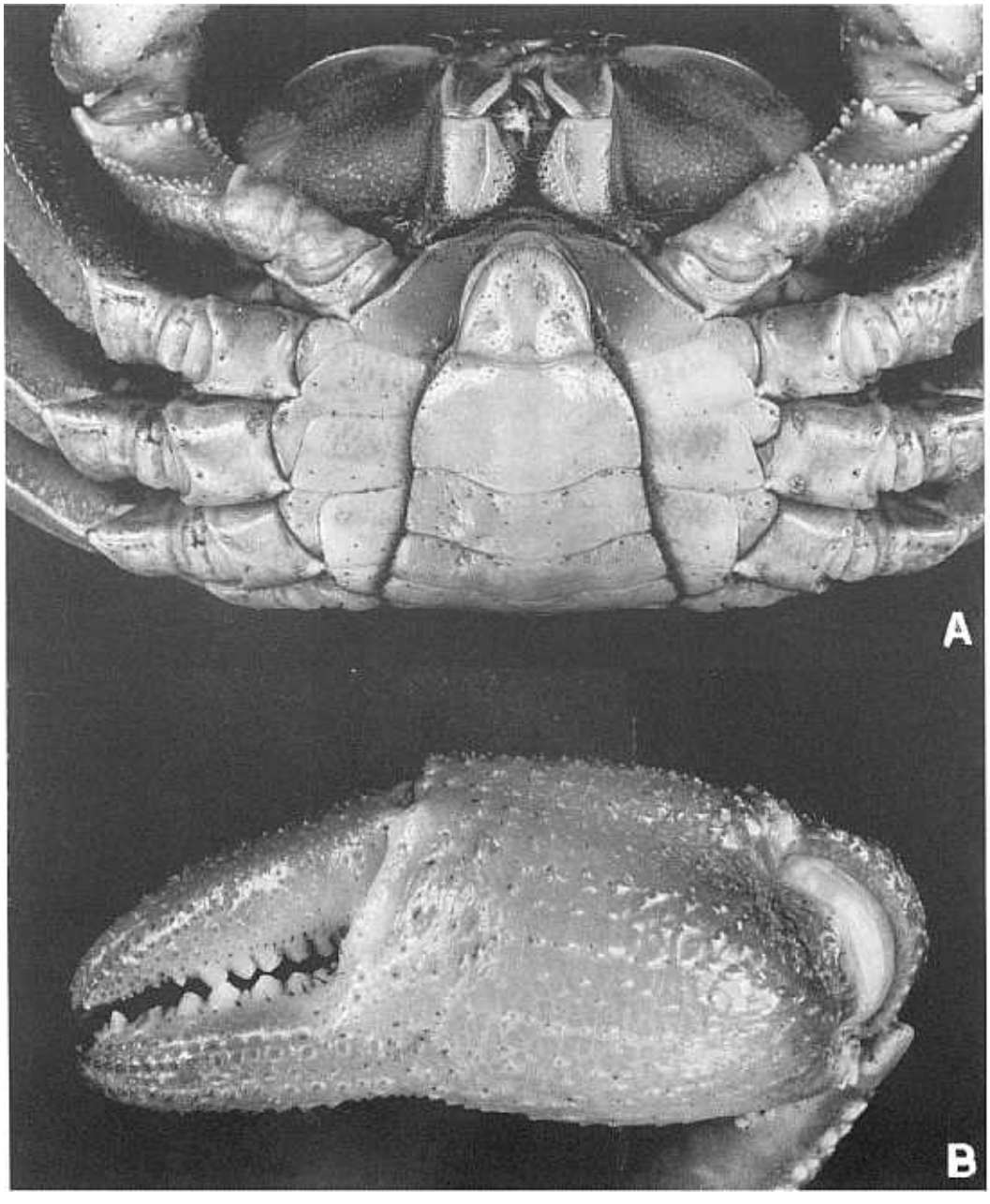

Fig. 7. *Discoplax longipes*. Male (47.2 by 54.1 mm) (ZRC 2000.2054), Faifai Beach, Guam. A, ventral surface; B, left chela.

Fig. 8. *Discoplax longipes*. Life colours. A, B, male (part of ZRC 2000.2054), in caves of Faifai Beach, Guam; C, female (45.9 by 52.7 mm) (ZRC 2000.2053), at coastline ready to spawn, Faifai Beach, Guam. (Photographs: G. Paulay)

away. We were unable to search the cliffs along the beach forest leading to the cave as the vegetation was too dense and covered much of the cliff–face.

Between July and August 2001, H.–C. Liu, C.–H. Wang and the first author again surveyed Faifai Cave and the Tumon Bay area under a full moon between 19:00 and 23:00 hours. This time, we observed over a dozen ovigerous females climbing down from the cliffs. We also observed several ovigerous females walking across the forest floor through relatively dense undergrowth from the cave opening and across the beach vegetation and sand flats to spawn in the sea. Clearly, while *D. longipes* prefers climbing down the karst landscape directly to the water's edge, some are also taking the more direct approach. Their spawning behaviour in the sea is typical for that observed for other gecarcinids.

Dr. Gustav Paulay comments that *D. longipes* is not really a cave crab, but one closely associated with karst environments, using caves whenever possible. On Niue, he notes they are also found in deep crevices outside caves during the day, with locals catching them at night or during the full moon for food. In Niue, ovigerous female *D. longipes* also apparently move out to sea via the karst formations in the same way. In Guam, we observed ovigerous specimens climbing down the karst cliff face from just outside Tumon Bay, and we also collected a male specimen (34.1 by 39.6 mm, ZRC) from just outside the University of Guam Marine Biology Laboratory, areas where there are no known caves nearby. Presumably, they are also present in the deep crevices and uneven landscape of the karst forest, coming out to forage only at night.

It is probable that the reproductive behaviour of female *D. longipes* is the same in the other Pacific islands. There remains the question of whether males also migrate out of caves. Certainly, we did not observe this. It is also not known where mating takes place, but this presumably takes place in the caves as well. Almost nothing is known about other aspects of their reproductive behaviour.

Both ovigerous females of *D. longipes* collected were kept in the aquaria of the University of Guam, and first zoeae were collected. These zoeae are currently under study by Dr. José Cuesta and his associates. Both female voucher specimens were preserved (ZRC 2000.2052, 2053). A molecular phylogenetic study of the various *Discoplax* and *Cardisoma* species is also underway by Dr. Christoph Schubart and his colleagues.

Colour. – See Fig. 8. Younger specimens tend to have the the purple areas lighter in tone and more brightly coloured. In addition in these smaller specimens, at least the distal half of the ambulatory dactylus is yellowish in life, becoming more evenly brown with age.

Notes on Loyalty Islands. – The Loyalty Islands, consisting of Ouvea, Lifou and Maré, are an isolated group of islands lying between New Caledonia and Australia in the Coral Sea. The islands are essentially old coral atolls, whose present features have been formed by fluctuating sea levels and erosion through rainfall. Some 300,000 years ago, the sea level was 120 metres below the present one; and even during the most recent ice age, about 15,000 years ago, the sea level was lower by some 100 metres. This has resulted in a karst landscape, with numerous caves. Today, many of these caves are flooded and come in a wide diversity of size, form and depths, from just a few metres deep to several kilometres in length. The waters in these caves are invariably fresh, although they may be brackish in deeper parts because of the intrusion of seawater percolating through the porous rocks. Anchialine habitats abound.

These islands have been explored sporadically over the years, but surprisingly, nothing has been published on the terrestrial crab fauna there. Recently, during a survey of the freshwater fishes of New Caledonia (Program PEDCAL) in 1991, Dr. Bernard Séret managed to obtain a good series of terrestrial crabs from these islands. According to Dr. Séret, these caves are difficult to access for a variety of reasons. Firstly, one must respect indigenous traditions and pay a courtesy visit to the chief of the tribe, who is the owner of the cave, and negotiate for permission to enter. Indeed, a number of caves are restricted as they are considered sacred. Then, one has to deal with the difficulties with the terrain as the entrance to the cave is often deep in the bush. The entrance is often dangerous as the path may be slippery, and the underlying stones and rocks unstable. The underground lake could be some distance from the entrance (1400 m in the case of Xodre cave) with a slope of up to 50 m. These difficulties probably explain why these habitats have not been well explored previously.

Dr. Séret provides the following notes on Xodre Cave, where specimens of *D. longipes* were collected. The entrance is about 40 minutes walking distance from the road (RM 16), entering a large "cône d'effondrement", then into long and large galleries with numerous smaller ones. The lake is 1400 m from the entrance, with a slope of about 50 m. The lake is fresh water, looks very "clear" ("siphon cristal"), with numerous stalagmites and stalactites.

Distribution. – New Caledonia (?), Loyalty Islands, Ocean Island [Gilbert Islands], Kandavu [Fiji], Cook Islands, Niue, Makatea, Tuamotus [French Polynesia], Guam. The current range of *D. longipes* is probably an underestimate of its distribution, and is probably present in all islands which have major karst formations. Currently, it appears to have a western Pacific distribution, but has not been found north of Guam, being prominently absent from the Ryukyus and adjacent areas. Unlike some gecarcinids, *D. longipes* is clearly an oceanic species, and has not been recorded from shelf waters thus far.

Discoplax gracilipes, new species
(Figs. 9–11, 12B, 14-16)

Discoplax aff. *longipes* – Takeda, 2000: 62, Fig. 1B.

Material examined. – Holotype – male (45.9 by 53.1 mm) (USC), Virata Cave, Libaong, Panglao, Panglao Island, Bohol, Philippines, coll. local villagers, 18 Dec.2000.

Paratypes – 3 males (22.6–43.3 by 26.0–50.5 mm), 1 female (44.3 by 52.0 mm) (ZRC 2001.317), 2 males (30.9 by 35.6 mm, 40.6 by 46.9 mm) (MNHN–B 27771), same data as holotype; 1 male (15.5 by 17.7 mm), 1 female (17.4 by 20.2 mm) (ZRC 2001.318), 1 male (26.3 by 29.6 mm), 1 female (19.9 by 22.7 mm) (MNHN–B 27770), Tawala Cave, in pools near entrance, Tawala, Panglao, Panglao Island, Bohol, Philippines, coll. L. Liao et al., 17 Dec.2000; 1 male (15.5 by 17.7 mm) (MNHN–B 26951), station 85–067, Calingoob Cave, Panglao Island, Bohol, 1 m depth, bottom rocks, with dip net, coll. T. M. Iliffe, 6 Apr.1985; 1 male (15.8 by 18.0 mm) (MNHN–B 26952), station 85–077, Underpass Cave, Panglao Island, Bohol, 1 m depth, salinity 8 ppt, coll. T. M. Iliffe, 8 Apr.1985; 1 female (22.1 by 25.7 mm) (MNHN–B 26950), station 85–062, Tuala Cave, Panglao Island, Bohol, 0–1 m depth, mud bottom, in dark section, salinity 4 ppt, with dip net, coll. T. M. Iliffe, 3 Apr.1985; 1 male (28.6 mm by 32.2 mm), 2 females (18.9 by 21.8 mm, 19.5 by 22.2 mm) (NSMT–Cr 12990), Alona Cave, Balicasag Island, Panglao, Bohol, coll. T. Kase, Feb.1999; 7 males (36.0-47.3 by 40.2-53.5 mm), 2 females (42.0 by 46.3 mm, 42.4 by 47.2 mm) (USC), Virata Cave, Libaong, Panglao, Panglao Island, Bohol, Philippines, coll. A. Porpetcho, R. Diaz & V. M. Racho, Apr.-May.2001; 5 males (35.8-50.6 by 40.6-57.8 mm), 3 females (33.3-54.4 by 38.1 by 62.0 mm) (ZRC 2001.2301), Virata and Tawala Caves, Libaong, Panglao, Panglao Island, Bohol, Philippines, coll. Manong et al., 29 Nov.2001; 5 males (30.9-52.9 by 35.2-59.2 mm), 9 females (35.0-50.8 by 39.6-58.1 mm) (ZRC 2001.2302), Baloc-Baloc Cave, near Virata Cave, Libaong, Panglao, Panglao Island, Bohol, Philippines, coll. Manong et al., 30 Nov.2001; 1 juvenile male (ZRC), Hinagdanan Cave, northern part of Panglao Island, Bohol, Philippines, coll. P. K. L. Ng, 29 Nov.2001; 7 males (43.2-53.5 by 48.3-62.8 mm), 1 female (48.6 by 55.3 mm) (ZRC 2001.2303), caves near Hinagdanan Cave, northern part of Panglao Island, Bohol, Philippines, coll. Gary et al., 30 Nov.2001; 1 male (57.2 by 48.6 mm), 4 females (44.8 by 51.0 mm, 32.6 by 39.0 mm, 30.4 by 36.2 mm, 24.8 by 28.8 mm) (NSMT), river mouth, close to Hinagdanan Cave, Panglao Island, Bohol, Philippines, coll. T. Kase et al., 2000.

Diagnosis. – Epigastric regions well defined, margin sharp; postorbital cristae strong (Fig. 9A, B). Frontal, epigastric, epibranchial and anterior part of mesobranchial regions covered with small rounded granules, those on anterior part flattened; mesogastric region punctate or with very small granules, appearing smooth; metagastric region weakly punctate to almost smooth; posterior part of mesobranchial and metabranchial regions with strong striae and granules (Figs. 9B, C, 11A, B) Frontal margin usually relatively narrower transversely. Anterolateral margin strongly arcuate. Surfaces of chela of adults gently granulose, gently rugose to punctate (Figs. 10B, C, 11C). Ambulatory legs very long, very slender; ratios of maximum length to maximum width of second to fourth ambulatory meri 4.3–4.8, 4.7–5.2, 3.5–4.1 respectively; ratios of maximum length to maximum width of second to fourth ambulatory legs (dactylus, propodus and merus only) 18.0–26.2, 19.5–32.7, 15.9–29.0 respectively (Figs. 9A, 11A, 12B); surfaces covered with low granules to gently rugose; dorsal margins of merus gently granulated, not appearing serrated; lateral margins of propodus and dactylus lined with small, relatively weak setae or spines, propodus appearing almost unarmed occasionally (Fig. 12B). Male abdomen broad; lateral margin of segment 6 gently concave to almost straight, proximal parts somewhat subparallel, distal part strongly arcuate; telson triangular, with lateral margins gently convex (Fig. 10B). G1 tip bent at an angle of about 80° from vertical; outer margin of distal part gently sloping towards base of pectinated part, without distinct shelf or hump; base of pectinated distalmost part (outer marginal view) broad; inner surface with deep median longitudinal depression (Fig. 14)

Description of holotype. – Carapace subovate, longer than broad; dorsal surface evenly convex tranversely and longitudinally, regions poorly demarcated; H–shaped median depression (gastro–cardiac) deep, prominent; region just behind intestinal and branchial regions gently depressed (Figs. 9B, 11B). Epigastric region well defined, separated from each other by deep median furrow, anterior margin relatively sharp, almost cristate; separated from postorbital cristae by short furrow (Figs. 9B, 11B). Postorbital cristae relatively strong but lower and less strong than epigastric cristae, in two parts, separated by short furrow; outer part ends at beginning of shallow cervical groove (Figs. 9B, 11B). Frontal, epigastric, epibranchial and anterior part of mesobranchial regions covered with small rounded granules, those on anterior part somewhat flattened. Mesogastric region with very small granules to punctate, appearing smoother than anterior areas. Metagastric region and areas behind it weakly punctate to almost smooth. Posterior part of mesobranchial region with strong striae and granules. Metabranchial (posterolateral) regions with prominent oblique striae of various lengths and strengths (Figs. 9B, 11B). Sub–branchial region prominently striated to rugose. Pterygostomial region densely covered with relatively short setae which completely obscures surface (Fig. 9C).

Front prominently deflexed downwards; frontal margin gently convex from dorsal view, median part gently upturned to form shallow shelf–like indentation; margin gently granulated (Fig. 9C). Supraorbital margin sinuous, entire; margin gently granulated (Fig. 9C). External orbital tooth relatively broadly triangular, outer margin gently convex, not distinctly crested, separated from rest of anterolateral margin by small but distinct cleft (Fig. 9C). Anterolateral margin strongly arcuate, distinctly crested, crest beaded with small granules; gradually curving to meet posterolateral margin. Posterolateral margin gently convex, converging towards posterior carapace margin. Posterior carapace margin gently convex (Figs. 9B, 11B). Suborbital margin weakly granulated, shelf–like, appears gently sinuous from frontal view, gently arcuate from dorsal view, inner surface of orbital shelf with about 3 uneven short oblique rows of small granules; inner edge reaching to base of basal antennal article; outer edge reaching point directly below end of external orbital tooth, but not joined to tooth or anterolateral margin, separated by broad space, space lined with 1–2 weak rows of low, short oblique striae which slope from outer edge of suborbital margin to median point below external orbital tooth) (Fig. 9C). Eyes well developed, filling entire orbital

cavity; eyestalks relatively short. Basal article of antenna quadrate, positioned away and separated from outer edge of deflexed frontal margin by prominent gap; article 4 minute, not closing hiatus between front and ocular peduncle. Antennules folding transversely (Fig. 9C). Epistome relatively narrow; posterior margin gently sinuous, with triangular lobe which gently slopes to entire lateral parts (Fig. 9C). Buccal cavity broad, third maxillipeds not closing anterior part which appears as a prominent tranverse gap. Third maxillipeds relatively elongate, meri and ischia forming rhomboidal gape when maxillipeds closed; merus vaguely triangular, anterior and outer lateral margins concave, median surface depressed; ischium subquadrate with prominent submedian sulcus; exopod slender, tip reaching to about half length of merus, with well developed flagellum which is longer than width of merus (Fig. 10A).

Chelipeds not prominently elongate; subequal; surfaces gently granulose, rugose to almost smooth (Figs. 9A, B, 11A)). Merus with all margins granulated but not distinctly serrated, without prominent sundistal tooth or spine. Carpus with large, well developed inner subdistal tooth; dorsal surface granulose, with several weak, uneven ridges (Figs. 9B, 11B). Chela relatively slender, not prominently swollen; palm gently granular, gently rugose to punctate, sometimes appearing almost smooth, outer subdorsal surface with shallow longitudinal depression; fingers slender, as long as palm; cutting margins with evenly spaced teeth and denticles along most of length, distalmost part pectinated, blade–like, tip corneous, gently recurved (Figs. 10B, C, 11C).

Ambulatory legs very long, third pair longest, last pair shortest; surfaces generally glabrous (Figs. 9A, 11A, 12B). Outer surface of merus, carpus, and propodus covered with low granules to gently rugose. Coxa with prominent flange on dorsal margin, for those on legs 1–3, flange well developed, medially indented; that on leg 4 lower with posterior margin gradually sloping to lower anterior part. Merus laterally flattened, very slender, ratios of maximum length to maximum width of second to fourth meri 4.7, 4.8, 3.8 respectively; dorsal gently gently serrate to almost smooth, without prominent subdistal tooth; with sharp, subdistal dorsal spine. Carpus slender; outer surface with 2 low, subparallel carinae. Propodus very long, ratios of maximum length to maximum width of second to fourth propodi 4.8, 4.7, 3.3 respectively; lateral margins generally subparallel, lined with weak movable spines (very stout setae) on margins, stronger on inner margin; anterior distal margin with prominent rounded lobe into which base of dactylus fits. Dactylus prominently elongate, styliform, gently curving, subquadrate in cross–section; maximum length to maximum width of second to fourth dactyli 8.8, 10.0, 8.8 respectively; tip corneous (Figs. 9A, 11A, 12B).

Thoracic sternites 1–3 relatively narrow, forming triangular structure, setose but not completely obscuring surface. Sternite 4 very broad, with relatively broad abdominal cavity reaching almost to distinct suture between sternites 3 and 4 (Fig. 10A).

Male abdomen relatively broad, all segments freely articulating. Segment 1 longitudinally very narrow, sublunate. Segment 2 similar in shape and form to segment 1 but relatively broader longitudinally. Segment 3–5 becoming increasingly trapezoidal in shape, all lateral margins gently convex. Segment 6 with lateral margin strongly convex, relatively broad, length ca. more than half width. Telson triangular, with lateral margins gently concave to almost straight, tip rounded (Fig. 10A).

G1 almost straight, very stout; distal part densely lined with long, stiff setae which completely obscures surface and margin except for pectinated tip, rest of surface with scattered long setae; tip gradually bent at an angle of about 80° from vertical; distal part with outer margin gently sloping towards base of pectinated part, not forming any shelf or hump; from ventral view; distal part of inner margin prominently convex; subdistal part of dordal (sternal) surface with well developed subovate fleshy flap which is tightly appressed to main structure, distal margins lined with dense stiff setae; inner surface with deep median longitudinal depression; distalmost part pectinated, beak–like, gradually tapering to subtruncate tip (Fig. 14). G2 relatively short, ca. 0.2 times length of G1; tip spatulate.

Variation. – The other specimens agree well with the holotype in most characters. The proportions of the ambulatory legs varies somewhat even in adults, but the range of values is invariably greater than those of *D. longipes*. When specimens of similar carapace lengths are compared, the difference is very clear (Fig. 12). As in *D. longipes*, smaller specimens have proportionately much longer ambulatory legs. The degree of granulation on the carapace and pereiopods or the strength of the epigastric and postorbital cristae do not vary significantly between sexes or sizes. The number of weak oblique ridges between the outer edge of the suborbital margin and external orbital angle varies from two to three, although they are not always easily discernable. The pattern of granules on the inner surface of the suborbital shelf seems to vary with size, being more prominent in smaller specimens.

None of the specimens of *D. gracilipes* examined have chelae as granulated as those of large *D. longipes*. Specimens of *D. gracilipes* as large as *D. longipes*, have distinctly less swollen and less granulose chela.

Remarks. – Takeda (2000) recently reported three specimens collected from a cave in Balicasag Island just off Panglao and noted that they seem to differ from typical *Discoplax longipes* (as *Cardisoma longipes*) in having more slender legs. He had compared his specimens with adults from the Senckenberg Museum, but as the Balicasag specimens were all subadults or juveniles, he could not be more certain. The first author examined these specimens during a visit to the NSMT in February 2000, they are clearly identical with what is here regarded as *D. gracilipes*.

Takeda's (2000) record from Balicasag is rather dubious in any case. The island has no fresh water, no caves or deep

crevices, and the elders on Balicasag are not aware that *D. gracilipes* is on the island, although they know that this crab is present on Panglao. Three other gecarcinids, *Discoplax rotunda*, *D. hirtipes* and *Gecarcoidea lalandii*, however, are present on the island (A. Porpetcho, R. Diaz, personal communication). In addition, the location stated on the label, "Alona Cave", is actually on the main island of Panglao and not Balicasag Island. The name "Alona Cave" is a popular local name for the caves along the coastline of the town of Panglao (same name as the island itself), and is sometimes used for Virata Cave as well as other nearby caves. The fact that Takeda (2000) also records the anchialine crab *Orcovita fictilia* Ng, Guinot & Iliffe, 1996 (Varuninae: Grapsidae) from this cave in Balicasag is also indicative that the original data may be incorrect – *Orcovita* is always associated with anchialine habitats, which usually have a good deal of freshwater inputs (see Ng et al., 1996). In the caves along the Panglao coastline, *O. fictilia* is very common (unpublished data) and can be caught in large numbers using baited traps.

The major difference between *D. gracilipes* and *D. longipes* is certainly in the proportions of their ambulatory legs. For any pair of similar sized specimens of *D. gracilipes* and *D. longipes* compared, the legs of *D. gracilipes* are 1.3 to 1.5 times longer than the equivalent leg of *D. longipes* (Fig. 12). The differences are marked in the merus, propodus and dactylus, being less obvious in the carpus. The differential proportions make the leg segments of *D. gracilipes* distinctly more slender than those of *D. longipes*. The chelipeds do not show such differences in proportions. The carapace of *D. gracilipes* appears to be more rounded (Figs. 9B, 11B) than in *D. longipes* (which appears slightly more quadrate, Fig. 6B), even though there are no obvious morphometric differences. This is probably due to the generally more arcuate margins in *D. gracilipes*, with the frontal margin relatively narrower transversely (Figs. 9B, 11B, vs. 6B). These non–sexual differences are only valid for specimens of similar sizes. *Discoplax gracilipes* is a distinctly smoother species compared to *D. longipes*; with the difference especially marked when the surfaces are dried. This is primarily because in *D. gracilipes*, the meso– and metagastric regions are punctate (Figs. 9B, 11B) (vs. distinctly granulose in *D. longipes*, Fig. 6B), the outer surfaces of the ambulatory merus, carpus and propodus are gently rugose (Fig. 12B) (vs. distinctly granulose and/or prominently lined with strong striae, Fig. 12A), and the outer surface of the chela is punctate to granulose (Figs. 10B, C, 11C) (vs. distinctly granulose, Fig. 7B). The degree of granulation of the carapace of *D. longipes* tends to be stronger in larger specimens, but even in small ones, it is still distinctly stronger than in large *D. gracilipes*. When similar sized specimens are compared, the differences are especially marked.

The structures of the G1s of the two species are subtly, but distinctly different. In *D. longipes*, the outer margin meets the curved distal part rather abruptly, forming a gentle shelf–like structure (Fig. 13A). In *D. gracilipes*, the outer margin meets the curved distal part gradually and smoothly (Fig. 14A). The distalmost part in *D. longipes* is more strongly bent, forming an angle of almost 90° from the vertical (Fig. 13A) whilst in *D. gracilipes*, it is less strongly bent (Fig. 14A). The median longitudinal groove on the dorsal surface is also distinctly deeper in *D. gracilipes* (Fig. 14D, E) when compared with that of *D. longipes* (Fig. 13C, D). From the outer marginal view, the base of the pectinated distalmost part of the G1 is prominently broader in *D. longipes* (Fig. 13B) when compared with that in *D. gracilipes* (Fig. 14B, C). The differences enumerated here are independent of carapace size, being evident in the G1s of all adult specimens examined.

There are several other characters that work for most specimens. The epigastric and postorbital cristae in *D. gracilipes* is generally usually sharper and more prominent than in *D. longipes* (Figs. 9B, 11B vs. 6B). The dorsal margins of the cheliped and ambulatory merus of *D. longipes* are prominently granulated, appearing serrated, whereas in *D. gracilipes*, the same margins appear much smoother (Fig. 12A vs. Fig. 12B). The lateral margins of the ambulatory propodus and dactylus of *D. longipes* are lined with strong, stiff spines or setae, but in *D. gracilipes*, these spines/setae are proportionately much smaller and weaker; with the propodus of *D. gracilipes* appearing almost unarmed in some specimens. The shape of the male telson of *D. gracilipes* is distinctly triangular in shape (Fig. 10A), with that of *D. longipes* more semicircular and having the lateral margins more arcuate (Fig. 7A). The male abdominal segment 6 of *D. gracilipes* also appears to be distinctly broader (Fig. 10A), but this is because the proximal parts of the lateral margins are somewhat subparallel with the distal part strongly arcuate. For *D. longipes*, the lateral margins of male abdominal segment 6 is more evenly convex (Fig. 7A).

Notes on Panglao Island. – *Discoplax gracilipes* has only been found in and around the island of Panglao in the Philippines. Panglao is located about a kilometre southwest of the island of Bohol, a large and mainly limestone island east of the island of Cebu. These islands, as well as Samar, forms the region in the Philippines known as the Visayas. Panglao is a relatively low limestone island with numerous anchialine sinkholes and caves. In the original survey of Panglao by Dr. Iliffe, *D. gracilipes* was found from three caves, Tuala Cave, Calingoob Cave and Underpass Cave. In our survey of December 2000, the first author and his colleagues from the University of San Carlos were unable to locate these three caves, possibly because they were not their actual names, the names were very localised, and that one cave may be known by several names. In any case, there are so many caves on Panglao that many have not even been catalogued or studied. Dr. Thomas Iliffe provides the following information of his three caves:

Tuala Cave (station 85–062): specimens collected from 0–1 m depths in dark section of anchialine pool on 2 April 1985. This limestone cave on the northern side of Panglao Island is a popular bathing site. It consists of a collapse chamber containing an anchialine pool with depths to 3 m and sections extending into areas of total darkness. Surface salinity and temperature in the pool were 4 ppt and 29°C.

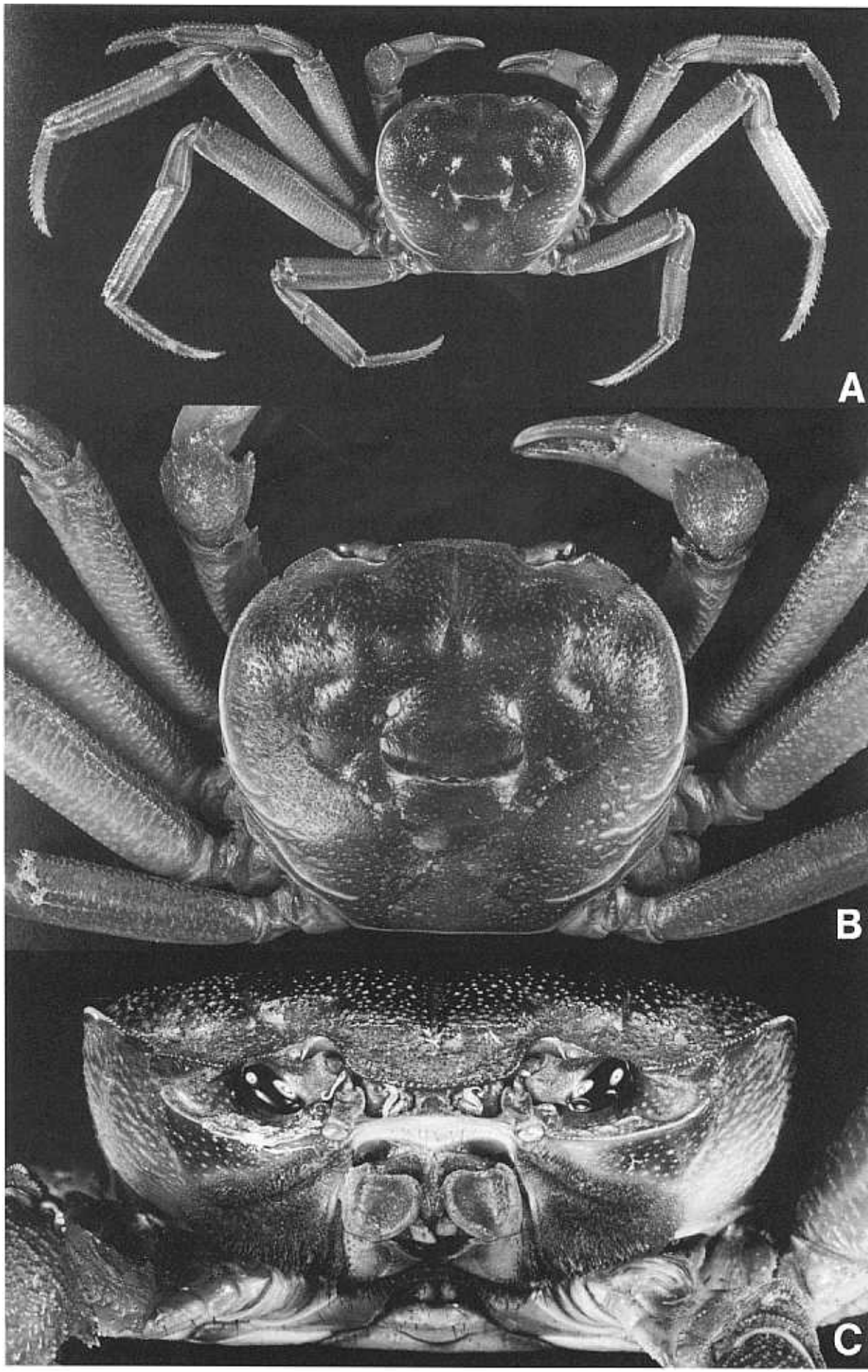

Fig. 9. *Discoplax gracilipes*. Paratype male (43.3 by 50.5 mm) (ZRC 2001.317), Virata Cave, Panglao, Philippines. A, overall view; B, carapace; C, frontal view.

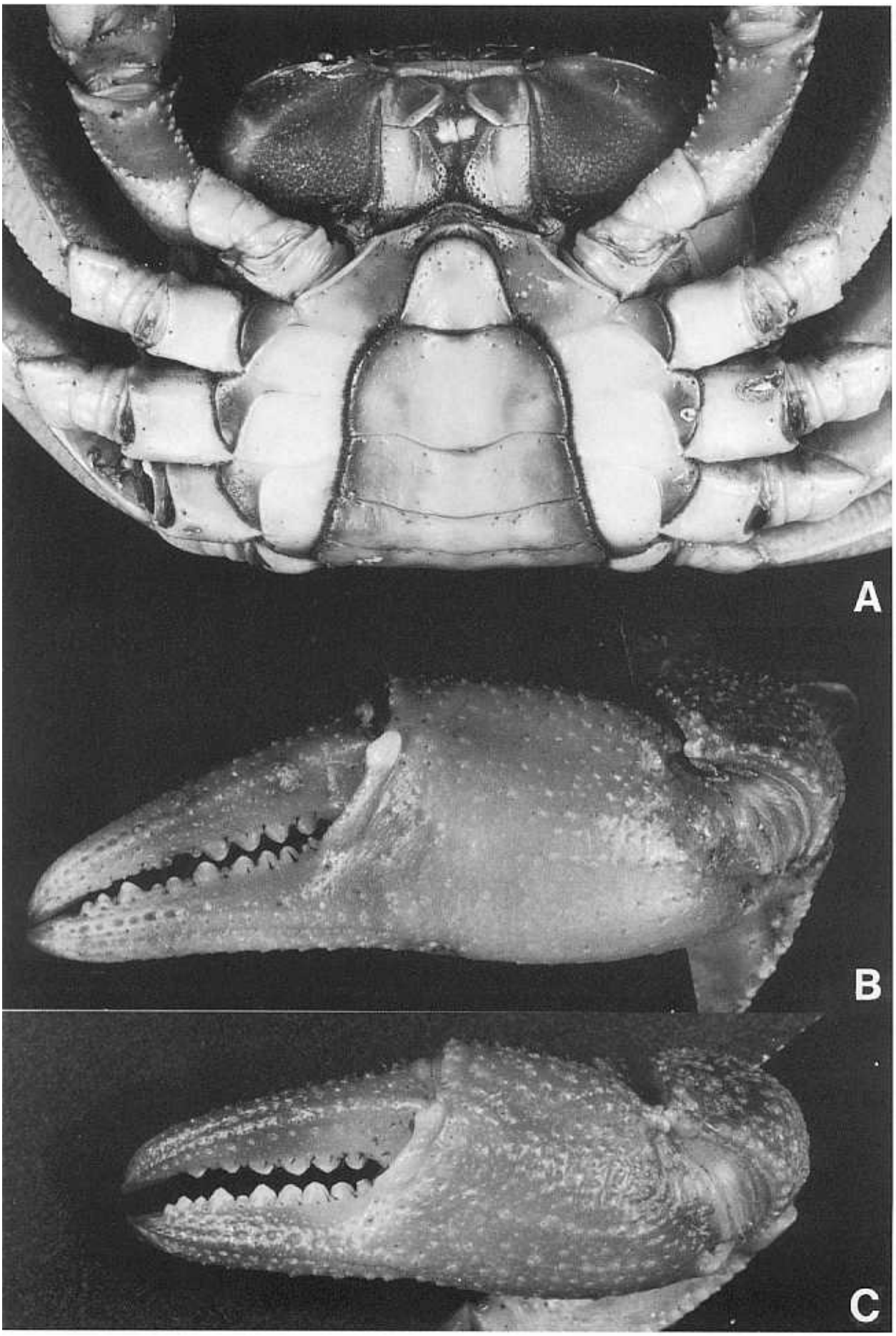

Fig. 10. *Discoplax gracilipes*. A, B, holotype male (45.9 by 53.1 mm) (USC), Virata Cave, Panglao, Philippines; C, paratype male (39.1 by 44.5 mm) (ZRC 2001.317), Virata Cave, Panglao, Philippines. A, ventral surface; B, C, left chelae.

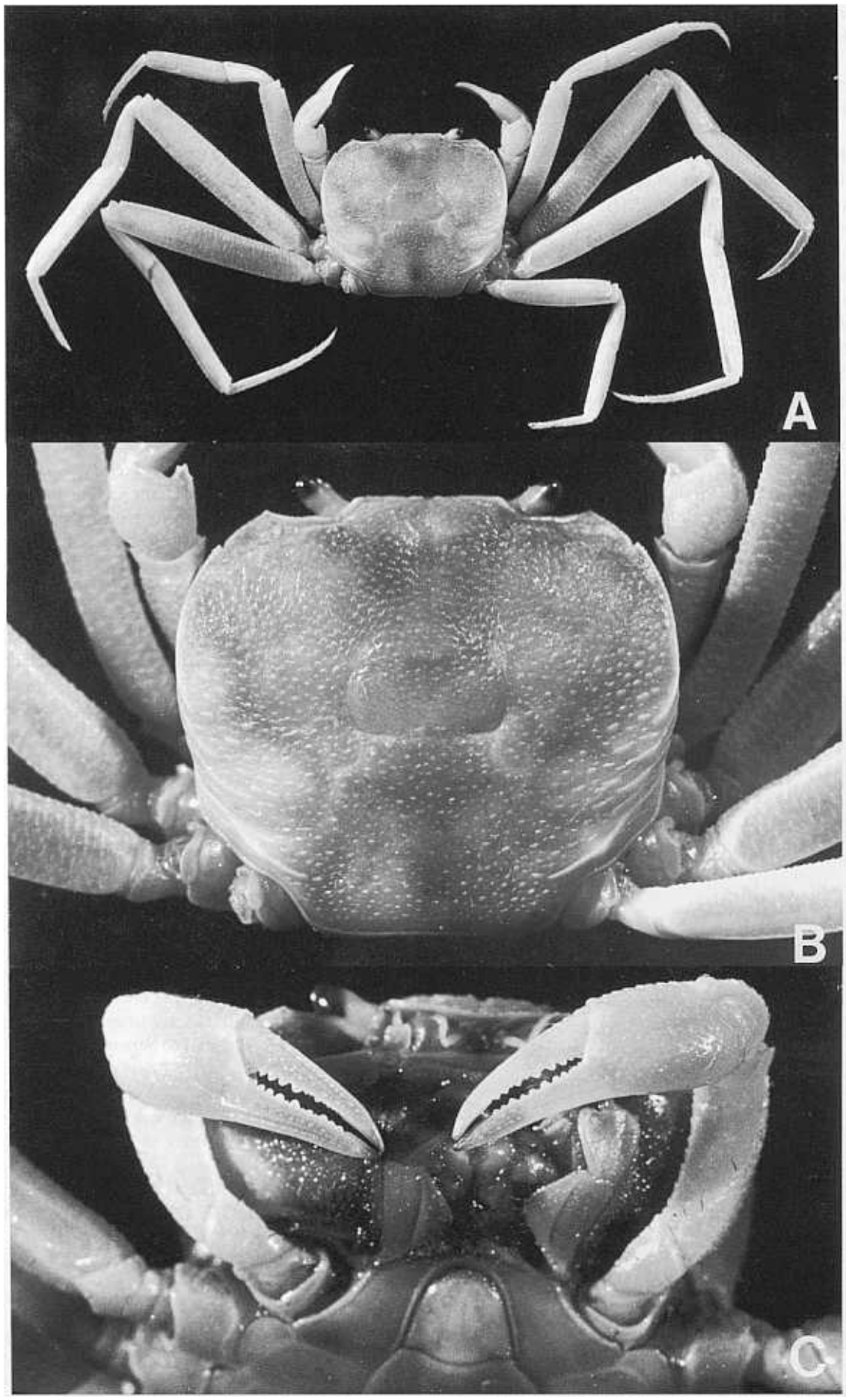

Fig. 11. *Discoplax gracilipes*. Paratype male (15.8 by 18.0 mm) (MNHN–B 26952), Panglao, Philippines. A, overall view; B, carapace; C, chelipeds.

Also collected from the pool were copepods, ostracods, amphipods and isopods.

Calingoob Cave (station 85–067): specimen collected with a dip net from bottom rocks in 1 m water depth of anchialine pool on 6 April 1985. The entrance to this cave is located in the bush on the northern side of Panglao. It consists of a single collapse chamber with an anchialine pool, partially in darkness, reaching depths to 6 m. Also collected from the pool were copepods and one shrimp.

Underpass Cave (station 85–077): specimen noted as pale grey–purple in color, was collected with a dip net from the mud bottom of the anchialine pool in 1 m water depth on 8 April 1985. This previously unnamed cave is located west of the known Hinagdanan Cave, a commercially operated tourist attraction. This small cave has two entrances on opposite sides of the pool. The surface salinity was 8 ppt. One shrimp was also collected from the pool.

We found a cave near the village of Tawala on the south of Panglao which has a name similar to that of Iliffe's Tuala Cave, but it differs in all described characteristics, and we do not believe they are the same. Tawala Cave is at the edge of Tawala village, and the entrance is about 20 metres from the road, behind overgrown vegetation. The cave is less than a kilometre from the sea. The local villagers used to use the cave for bathing and as a source of water. There is a large pool at the base, but this is deep with numerous rocks and very difficult to sample. In the frontal section, there are smaller and shallow interconnected pools, where small adult and juvenile specimens of *D. gracilipes* are relatively common. They were collected by hand and with baited traps. In this part of the cave, the fully aquatic crab *Orcovita fictilia* Ng, Guinot & Iliffe, 1996 (Grapsidae: Varuninae), was very common, with a fully terrestrial unidentified *Sesarmoides* Serène & Soh, 1970 (Grapsidae: Sesarminae), occuring in the drier parts. An unidentified species of anchialine moray eel (Muraenidae) was also present. This part of the cave is only about five metres from the entrance, but almost completely dark because it slopes down relatively suddenly. In the cave, we obtained a specimen of *Discoplax rotunda* and near the entrance, we collected *Gecarcoidea lalandii* H. Milne Edwards, 1837.

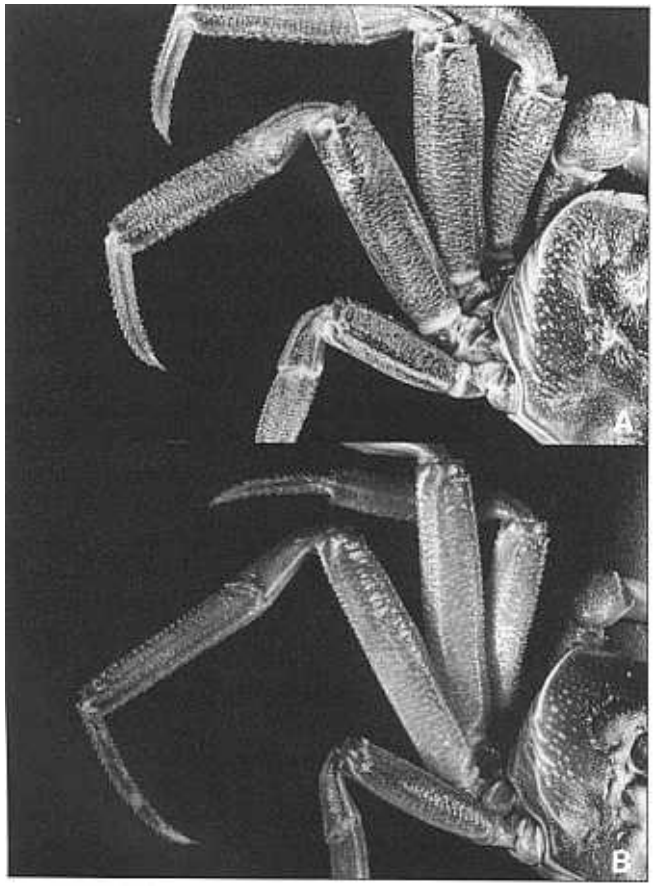

Fig. 12. Left third ambulatory legs. A, *Discoplax longipes*, male (47.2 by 54.1 mm) (ZRC 2000.2054), Faifai Beach, Guam; B, *Discoplax gracilipes*, paratype male (43.3 by 50.5 mm) (ZRC 2001.317), Virata Cave, Panglao, Philippines.

Most of the adult specimens of *D. gracilipes* were obtained from Virata Cave on the southermost part of Panglao. The cave, near the village of Libaong, is only about 100 metres from the sea. The entrance to the cave is in some degraded secondary forest, with the floor of the cave sloping very steeply (ca. 40 to 45 m from the horizontal). There is water at the bottom of the deep cave only during the wet season. According the local villagers, *D. gracilipes* hides in the caves during the day but forages near the entrance and nearby forest at night. The local village headman comments that this species, which they call "Alikuai" in the Boholano language, also occurs in the caves in cliffs along the sea front in southern Panglao. The gecarcinid *Gecarcoidea lalandii* was observed in the cave but are relatively common outside. Just outside the cave, *Discoplax hirtipes* and *D. rotunda* are also present, but locals note that they can also be present deep in the caves.

Discoplax gracilipes is regularly caught by the locals for food, especially during the wet season when fishing in the open sea is not possible due to the rough seas and the crabs are also more easily caught as they wander further from the caves foraging for food. This is true for all the land crab species in Panglao. No ovigerous females were obtained, although one such female was observed by locals crossing the sand flats from Virata Cave to spawn in the open sea on October 2001 (A. Porpetcho, personal communication).

Colour. – See Figs. 15, 16. The differences observed in the intensity and/or extent of the colours of smaller specimens of *D. gracilipes* (Fig. 15) are the same as for *D. longipes*.

KEY TO THE GENUS *DISCOPLAX*

1. Carapace very inflated dorsal surface strongly convex, smooth, regions without distinct striae or granules (Fig. 2C); carapace bluish–brown to blue coloration in life ..... *D. hirtipes*
– Carapace not prominently inflated, dorsal surface gently convex, rugose to gently granulose, especially along frontal and lateral surfaces, at least some regions with low flattened to rounded granules and/or distinct striae; purple to purplish–brown in life 2

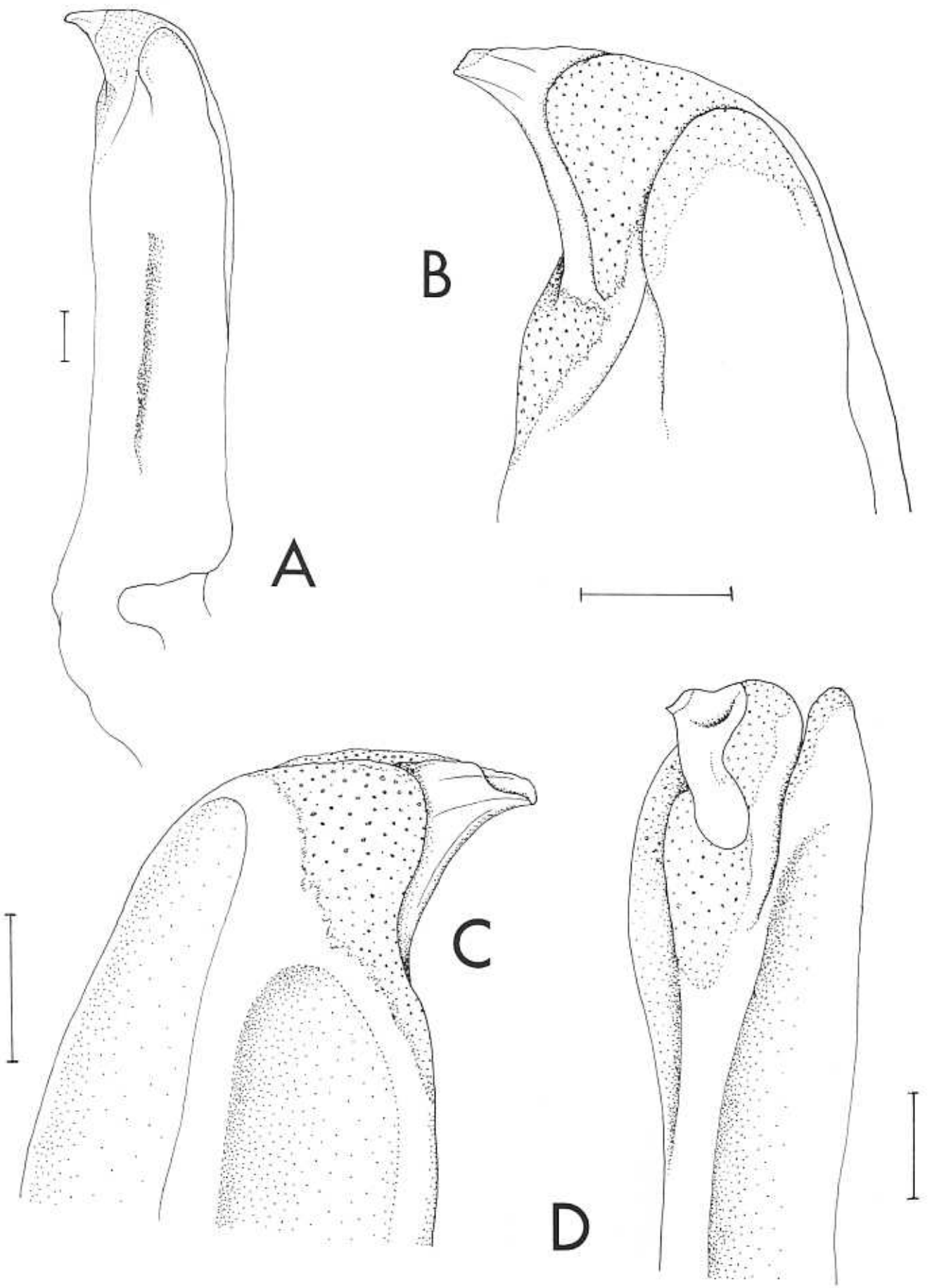

Fig. 13. Left G1 structure. *Discoplax longipes*. Male (47.2 by 54.1 mm) (ZRC 2000.2054), Faifai Beach, Guam. A, dorsal view; B, outer lateral view; C, distal part (ventral view); D, distal part (dorsal view). All setae denuded. Scales = 1.0 mm.

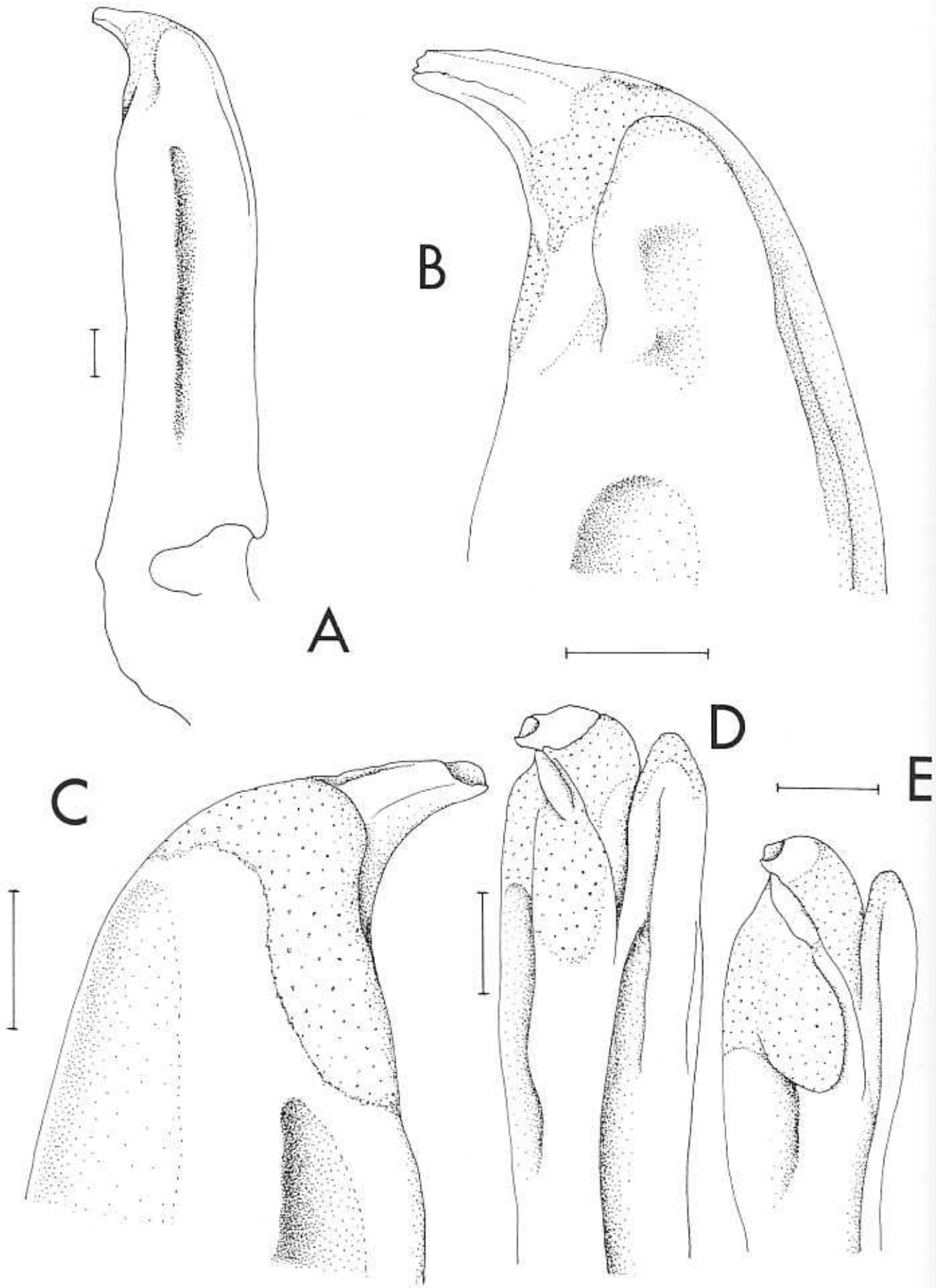

Fig. 14. Left G1 structure. *Discoplax gracilipes*. Paratype male (43.3 by 50.5 mm) (ZRC 2001.317), Virata Cave, Panglao, Philippines. A, dorsal view; B, C, outer lateral views; D, distal part (ventral view); E, distal part (dorsal view). All setae denuded. Scales = 1.0 mm.

2. Second and third ambulatory legs normal length, not distinctly elongated, 2–3 times carapace length; dactylus always uniformly coloured in life ..... *D. rotunda*
- Second and third ambulatory legs prominently elongated, at least 4–5 times carapace length (Fig. 12); dactylus with distal half or more yellowish in life when young, becoming more evenly brown coloured with age 3

3. Anterior part of carapace (especially meso– and metagastric regions) appearing gently to prominently granulose (Fig. 6B); outer surface of ambulatory meri of adults prominently granulose to distinctly rugose (Fig. 12A) ambulatory legs long, ratios of maximum length to maximum width of second to fourth ambulatory legs (dactylus + propodus + merus) 13.9–16.0, 13.5–15.0, 11.1–12.1 respectively (Fig. 12A) ..... *D. longipes*
- Anterior part of carapace (especially meso– and metagastric regions) appearing punctate to almost smooth (Fig. 9B); outer surface of ambulatory meri of adults gently granulose, gently rugose to punctate (Fig. 12B); ambulatory legs very long, ratios of maximum length to maximum width of second to fourth ambulatory legs (dactylus + propodus + merus) 18.0–26.2, 19.5–32.7, 15.9–29.0 respectively (Fig. 12B) ..... *D. gracilipes*

LIST OF RECOGNISED SPECIES OF GECARCINIDAE MACLEAY, 1858

Cardisoma Latreille, 1828
= *Cardisoma* Latreille, 1828 (type species *Cardisoma guanhumi* Latreille, 1828, subsequent designation by H. Milne Edwards, 1837; gender neuter)
= *Perigrapsus* Heller, 1862 (type species *Perigrapsus excelsus* Heller, 1862, by monotypy; gender masculine)
= *Cardiosoma* Smith, 1869 (unnecessary replacement name for *Cardisoma* Latreille, 1828; gender neuter)
Cardisoma armatum Herklots, 1851
Cardisoma carnifex (Herbst, 1796) [*Cancer*]
= *Cardisoma obesum* Dana, 1851

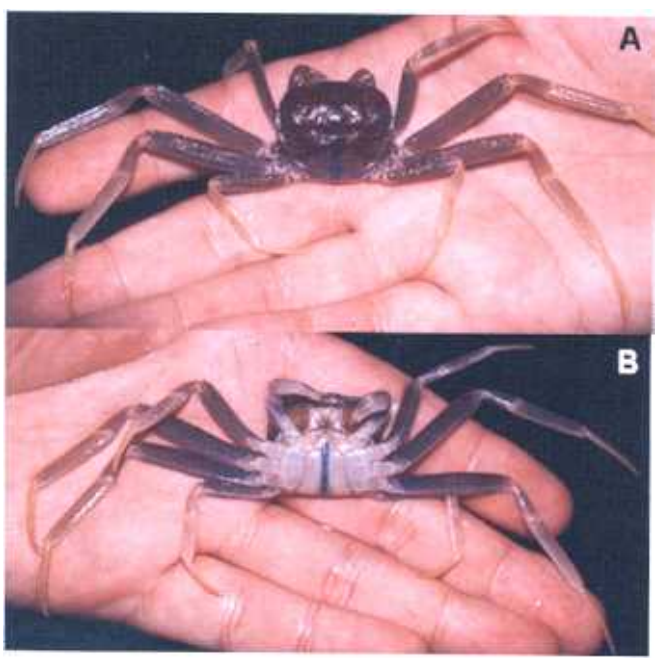

Fig. 15. Life colours. *Discoplax gracilipes*, young paratype male, (15.5 by 17.7 mm) (ZRC 2001.318), Tawala Cave, Bohol. A, dorsal view; B, ventral view. (Photograph: Y. Cai)

= *Perigrapsus excelsus* Heller, 1862
= *Cancer urvillei* H. Milne Edwards, 1853
Cardisoma crassum Smith, 1870
= *Cardisoma latimanus* Lockington, 1877
Cardisoma guanhumi Latreille, 1828
= *Ocypode gigantea* De Fréminville, 1835
= *Cardisoma quadrata* De Saussure, 1858
= *Cardisoma diurnum* Gill, 1862

Discoplax A. Milne Edwards, 1867
= *Discoplax* A. Milne Edwards, 1867 (type species *Discoplax longipes* A. Milne Edwards, 1867, by monotypy; gender feminine)
Discoplax gracilipes, new species
Discoplax hirtipes (Dana, 1852) [*Cardisoma*]
Discoplax longipes A. Milne Edwards, 1867
Discoplax rotunda (Quoy & Gaimard, 1824) [*Thelphusa*]
= *Cardisoma frontalis* H. Milne Edwards, 1853
= *Discoplax pagenstecheri* Kossmann, 1878

Epigrapsus Heller, 1862
= *Epigrapsus* Heller, 1862 (type species *Epigrapsus politus* Heller, 1862, by monotypy; gender masculine)
= *Nectograpsus* Heller, 1865 (type species *Nectograpsus politus* Heller, 1862, by monotypy; gender masculine)
= *Grapsodes* Heller, 1865 (type species *Grapsodes notatus* Heller, 1865, by monotypy; gender masculine)
= *Mystacocarcinus* Hilgendorf, 1888 (type species *Mystacocarcinus crenidens* Hilgendorf, 1888, by monotypy; gender masculine)
Epigrapsus notatus (Heller, 1865) [*Grapsodes*]
= *Epigrapsus* (*Grapsodes*) *notatus punctatus* Sendler, 1923
= *Epigrapsus* (*Grapsodes*) *wolfi* Sendler, 1923
= *Mystacocarcinus crenidens* Hilgendorf, 1888
Epigrapsus politus Heller, 1862

Gecarcinus Leach, 1814
= *Gecarcinus* Leach, 1814 (type species *Cancer ruricola* Linnaeus, 1758, designation by H. Milne Edwards, 1837; gender masculine)
= *Geocarcinus* Miers, 1886 (incorrect emendation of *Gecarcinus* Leach, 1814)
Gecarcinus quadratus De Saussure, 1853
Gecarcinus lateralis (De Fréminville, 1835) [*Ocypoda*]
= *Gecarcinus depressus* De Saussure, 1858
Gecarcinus ruricola (Linnaeus, 1758) [*Cancer*]
= *Ocypode tourlourou* Latreille, 1803
= *Ocypode rubra* De Fréminville, 1835
= *Ocypode agricola* Reichenbach, 1836

Gecarcoidea H. Milne Edwards, 1837
= *Gecarcoidea* H. Milne Edwards, 1837 (type species *Gecarcoidea lalandii* H. Milne Edwards, 1837, by monotypy; gender feminine)
= *Pelocarcinus* H. Milne Edwards, 1853 (type species *Gecarcoidea lalandii* H. Milne Edwards, 1837, by monotypy; gender masculine)
= *Hylaeocarcinus* Wood-Mason, 1873 (type species *Hylaeocarcinus humei* Wood-Mason, 1873, by monotypy; gender masculine)

Fig. 16. Life colours of adult *Discoplax gracilipes*. A, paratype female; B, C, paratype male (ZRC).

= *Limnocarcinus* De Man, 1879 (type species *Limnocarcinus intermedius* De Man, 1879, by monotypy; gender masculine)

Gecarcoidea lalandii H. Milne Edwards, 1837
= *Hylaeocarcinus humei* Wood-Mason, 1873
= *Limnocarcinus intermedius* De Man, 1879
= *Pelocarcinus marchei* A. Milne Edwards, 1890
= *Pelocarcinus cailloti* A. Milne Edwards, 1890

Gecarcoidea natalis (Pocock, 1888) [*Hylaeocarcinus*]

Johngarthia Türkay, 1970
= *Johngarthia* Türkay, 1970 (type species *Gecarcinus planatus* Stimpson, 1860, by original designation; gender feminine)

Johngarthia lagostoma (H. Milne Edwards, 1837) [*Gecarcinus*]

Johngarthia malpilensis (Faxon, 1893) [*Gecarcinus*]

Johngarthia planatus (Stimpson, 1860) [*Gecarcinus*]
= *Gecarcinus digueti* Bouvier, 1895

Johngarthia weileri (Sendler, 1912) [*Gecarcinus*]

Incerta sedis

"Gecarcinus" barbatus Poeppig, 1836

(NB. Original generic combination in square parenthesis)

Comparative material examined. – ***Discoplax hirtipes*** – 1 male (61.4 by 78.0 mm) (MNHN-B 24813), Loyalty Islands, Lifou Island, We Cave, coll. B. Richer de Forges, 14 Jul.1993; 1 male (61.0 by 79.0 mm) (MNHN-B 24811), Loyalty Islands; 1 male (55.5 by 68.5 mm) (ZRC 1999.1039), 1 female (ZRC 1998.411), Hengchun Peninsula, Pingtung County, coll. H.-C. Liu & S. H. Tan, 22 May.1998; 4 males, 2 females (ZRC 1998.398, 424, 439, 452, 472), Hengchun Peninsula, Pingtung, Taiwan, coll. H.-C. Liu et al., 19 May.1998; 1 female (ZRC), Hengchun Peninsula, Pingtung County, Taiwan, coll. May.1998; 1 male (ZRC 1999.203), Hengchun Peninsula, Pingtung County, Taiwan, coll. 30 May.1997; 1 male (ZRC 1998.531), Hengchun Peninsula, Pingtung County, Taiwan, coll. 13 May.1998; 1 male (ZRC 2001.310), Panglao, Bohol, Philippines, coll. 17 Dec.2000; 1 male, 1 female (ZRC 2000.1087), Anggaur Island, Pacific, coll. P. Colins, Sep.1998; 1 male (ZRC), Anggaur Island, Pacific, coll. P. Colins, Sep.1998; 1 male (ZRC 2000.1086), Palau, coll. S. H. Tan, Jul.1998; 1 male, 1 female (ZRC 1965.12.1.28–29), Sumatra; 1 male, 1 female (ZRC 1965.12.1.11–12), Pulau Panjang, South Natuna Island, coll. Aug.1931; 2 males (ZRC 1965.12.1.26–27), West Sumatra, coll. 1897; 1 male (ZRC 1965.12.1.25), South Pagi, Mentawei Islands, coll. Dec.1902; 1 male, 3 females (ZRC 1965.12.1.21–24), Rose Hill, Christmas Island, coll. Aug.–Sep.1932; 7 males, 1 female (ZRC 1965.12.1.13–20), Christmas Island, coll. M. W. F. Tweedie, 1932; 12 males, 2 females (ZRC 1965.12.1.30–39), Nicobar Islands, coll. C. A. Gibson-Hill, Oct.1950; 1 male (ZRC 1973.10.31.275), Vietnam, coll. Nhathrang Oceanographic Institute, 9 Apr.1971; 2 males (ZRC), Pulau Pemanggil, Peninsular Malaysia, coll. D. Chia, 11 Sep.1991; 1 male (ZRC 1999.239), Yaeyama, Ryukyus, Japan, coll. 19 Aug.1969. ***Discoplax rotunda*** – 1 female (holotype of *Discoplax pagenstecheri* Kossmann, 1878) (SMF 6872) (ex Mus. Heidelberg Cr190, Mus. Godeffroy vend.), Australisches Meeres; 1 female (identified as *Discoplax pagenstecheri*) (SMF 5855), Admirality Islands, Pak, coll. E. Wolf, Hanseat Südsee Expedition, 10 Sep.1902; 1 male (61.4 by 78.0 mm) (MNHN-B 24813), Easo Cave, 17 m depth, Lifou Island, Loyalty Islands, coll. B. Richer de Forges, 20 Aug.1993; 1 male (28.0 by 26.3 mm) (MNHN-B 24809), on the ground, Lifou Island, Loyalty Islands, coll. B. Richer de Forges, 18 Apr.1993; 2 females (38.0 by 48.0 mm, 39.0 by 49.0 mm) (MNHN-B 24814), sea level, Maré Island, Loyalty Islands, coll. B. Richer de Forges, 16 Jul.1993; 1 juvenile (3.0 by 3.5 mm) (MNHN-B 26947), cave, station 88-066, Ouvea Atoll, Loyalty Islands, coll. T. M. Iliffe & S. Sarbu, 22 Jun.1988; 9 juveniles (MNHN-B 26948), Loyalty Islands, Luecilla Cave, station 88-058, Lifou Island, coll. T. M. Iliffe & S. Sarbu, 17 Jun.1988; 1 young female, 6 juveniles (12.7 by 16.5 mm) (MNHN-B 26943), Malaita, coll. T. M. Iliffe & Sarbu, 27 Aug.1988; 1 male (36.0 by 44.0 mm) (MNHN-B 17134), New Caledonia; 1 male (46.5 by 57.4 mm) (ZRC 1965.12.1.7), Cocos-Keeling Islands, coll. C. A. Gibson-Hill, 1941; 1 male, 1 female (ZRC 1965.12.1.8–9), Christmas Island, coll. M. W. F. Tweedie, 1941; 1 male (ZRC 2000.568), Guam, coll. P. Ng, Oct.1996; 1 female (ZRC 2000.567), central Guam, coll. 20 Apr.2000; 1 male (ZRC 2001.312), Panglao, Bohol, Philippines, coll. P. Ng et al., 17 Dec. 2000; 1 male (ZRC 1998.471), Hengchun Peninsula, Pingtung County, Taiwan, coll. H.-C. Liu et al., 13 May.1998; 2 males, 1 female (ZRC 1998.432, 474), Hengchun Peninsula, Pingtung County, Taiwan, coll. H.-C. Liu et al., 22 May.1998; 1 female (ZRC 1998.476), Hengchun Peninsula, Pingtung County, Taiwan, coll. H.-C. Liu et al., 18 Sep.1997. ***Cardisoma guanhumi*** – 1 male (72.8 by 91.6 mm) (ZRC 2000.1573), Panama, coll. E. Koh, May.1988. ***Cardisoma carnifex*** – 2 ovigerous females (65.5 by 78.0 mm, 68.0 by 81.0 mm) (MNHN-B 2481b), Grande Terre, Bourail, Poé Beach, New Caledonia, coll. 8 Apr.1993; 1 ex. (dried) (MNHN-B 3730), Sandwich Islands, no other data; 1 ex. (MNHN-B 19254), Pukarua, Tuamotu, coll. B. Salvat, 1976; 1 ex. (MNHN-B 24525), Ivou Iwich, French Polynesia, coll. 1990; 1 male (70.0 by 83.0 mm) (MNHN-B 27929), Society Islands, French Polynesia; 1 male (ZRC 1998.432), Hengchun Peninsula, Pingtung County, Taiwan, coll. H.-C. Liu et al., 19 May.1998; 1 female (ZRC 1998.473), Hengchun Peninsula, Pingtung County, Taiwan, coll. H.-C. Liu et al., 1 Aug.1994; 1 male (62.6 by 75.8 mm) (ZRC 2000.1651), Tanjung Aru, Sabah, Malaysia, coll. P. K. L. Ng & C. D. Schubart, 22 Jun.2000; 3 males, 2 females (ZRC 1965.12.1.2–6), Cocos-Keeling Islands, coll. C. A. Gibson-Hill, 1941; 5 males (1 dried) (ZRC 2001.1082), Phuket, Thailand, coll. D. Yeo & Y. Cai, 22 Feb.2001; 1 female (ZRC), Phuket, Thailand, coll. P. Ng, Apr.1999; 1 male, 1 female (ZRC 1999.1423), Phuket, Thailand, coll. P. Ng, Dec.1998; 1 male (ZRC 1999.787), Phuket, Thailand, coll. P. Ng, Dec.1998; 1 male (ZRC 1987.868), Pulau Tiga, Sabah, coll. Lee Nyanti, 27 Apr.1987; 1 female (ZRC 1996.1716), Pulau Tioman, Peninsular Malaysia, coll. P. Ng, 29 Jun.1996; 1 male (ZRC 1999.1422), Pulau Redang, Peninsular Malaysia, coll. P. Ng et al., Jun.1992; 1 male (ZRC 1996.1681), Pulau Pemanggil, Peninsular Malaysia, coll. D. Chia, 16 Aug.1996; 1 female (ZRC 1991.336), Pulau Sri Buat, near Pulau Tioman, Peninsular Malaysia, coll. P. Ng, Apr.1983; 1 male (ZRC 1965.12.1.1), Labuan, Borneo, coll. Apr.1940; 3 ex. (dried) (MNHN-B 3723, 3724, 3725), Mauritius, coll. R. de Belloguet. ***Cardisoma crassum*** – 1 male (32.7 by 39.5 mm), 1 female (29.1 by 36.7 mm) (ZMUC), Puerto el Triunfo, El Salvador, coll. Peters, 1953. ***Cardisoma armatum*** – 2 males, 1 female (ZMUC), Sekondi, Gold Coast, Africa, coll. Atlantide Expedition, 19 Jan.1946; 1 male (43.1 by 53.1 mm), 1 female (ZRC 1996.121–122), West Africa, from aquarium trade, 23 Apr.1996; 1 male (ZRC 1999.6), West Africa, from aquarium trade, coll. Jan.1998; 1 male (ZRC 1999.26), West Africa, from aquarium trade, coll. 1997.

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