

# A reappraisal of the family Goneplacidae MacLeay, 1838 (Crustacea, Decapoda, Brachyura) and revision of the subfamily Goneplacinae, with the description of 10 new genera and 18 new species

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## ABSTRACT

A reappraisal of the taxonomy of the brachyuran crabs belonging to the family Goneplacidae MacLeay, 1838 *sensu lato* has resulted in the revision of the subfamily Goneplacinae, which combines the subfamilies Goneplacinae MacLeay, 1838 and Carcinoplacinae H. Milne Edwards, 1852. Most of the 66 species of Goneplacinae *sensu stricto* that are listed herein inhabit relatively deep water and are infrequently collected. The subfamily Goneplacinae *sensu stricto* now consists of 17 genera of which 10 are being described as new: *Carcinoplax* H. Milne Edwards, 1852, with 18 species of which four are new; *Entricoplax* n. gen., monotypic; *Exopheticus* n. gen., with two species; *Goneplacoides* n. gen., monotypic; *Goneplax* Leach, 1814, with four species; *Hadroplax* n. gen., monotypic; *Menoplax* n. gen., monotypic; *Microgoneplax* n. gen., with five species of which four are new; *Neogoneplax* n. gen., with three species of which two are new; *Neommatocarcinus* Takeda & Miyake, 1969, monotypic; *Notonyx* A. Milne-Edwards, 1873, with three species; *Ommatocarcinus* White, 1852, with four species; *Paragoneplax* n. gen., monotypic; *Psopheticus* Wood-Mason, 1892, with four species; *Pycnoplax* n. gen., with five species of which one is new; *Singhaplax* Serène & Soh, 1976, with seven species of which four are new; and *Thyraplax* n. gen., with five species of which three are new. All goneplacine genera are exclusive to the Indo-West Pacific region (plus contiguous temperate areas) except *Goneplax*, which is so far known mostly from the Atlantic and Mediterranean regions. Four nominal species described by other authors were found to be junior subjective synonyms for other species: *Carcinoplax verdensis* Rathbun, 1914 and *C. polita* Guinot, 1989 synonymous of *C. specularis* Rathbun, 1914; *Goneplax megalops* Komatsu & Takeda, 2003 of *Goneplacoides marivenae* (Komatsu & Takeda, 2003) n. comb.; and *Psopheticus insolitus* Guinot, 1990 of *P. stridulans* Wood-Mason, 1892.

## KEY WORDS

Crustacea,  
Decapoda,  
Brachyura,  
Goneplacidae,  
Goneplacinae,  
Carcinoplacinae,  
revision,  
new genera,  
new species.

## RÉSUMÉ

Redéfinition de la famille *Goneplacidae* MacLeay, 1838 (Crustacea, Decapoda, Brachyura) et révision de la sous-famille *Goneplacinae*, avec description de 10 genres nouveaux et 18 espèces nouvelles.

Une redéfinition des caractères taxonomiques des crabes brachyours appartenant à la famille *Goneplacidae* MacLeay, 1838 *sensu lato* a permis une révision de la sous-famille des *Goneplacinae*, qui réunit les sous-familles *Goneplacinae* MacLeay, 1838 et *Carcinoplacinae* H. Milne Edwards, 1852. La plupart des 66 espèces de *Goneplacinae sensu stricto* citées se trouvent dans des eaux profondes et n'ont été que rarement récoltées. La sous-famille des *Goneplacinae sensu stricto* comprend au terme de cette révision 17 genres, dont 10 sont décrits comme nouveaux: *Carcinoplax* H. Milne Edwards, 1852, avec 18 espèces, dont quatre nouvelles; *Entricoplax* n. gen., monotypique; *Exopheticus* n. gen., avec deux espèces; *Goneplacoides* n. gen., monotypique; *Goneplax* Leach, 1814, avec quatre espèces; *Hadroplax* n. gen., monotypique; *Menoplax* n. gen., monotypique; *Microgoneplax* n. gen., avec cinq espèces, dont quatre nouvelles; *Neogoneplax* n. gen., avec trois espèces, dont deux nouvelles; *Neommatocarcinus* Takeda & Miyake, 1969, monotypique; *Notonyx* A. Milne-Edwards, 1873, avec trois espèces; *Ommatocarcinus* White, 1852, avec quatre espèces; *Paragoneplax* n. gen., monotypique; *Psopheticus* Wood-Mason, 1892, avec quatre espèces; *Pycnoplax* n. gen., avec cinq espèces, dont une nouvelle; *Singhaplax* Serène & Soh, 1976, avec sept espèces, dont quatre nouvelles; et *Thyraplax* n. gen., avec cinq espèces, dont trois nouvelles. Tous les genres de cette sous-famille ne se trouvent que dans la région de l'Indo-Ouest Pacifique (ainsi que dans des régions tempérées voisines), à l'exception de *Goneplax* essentiellement présent dans l'Atlantique et la mer Méditerranée. Quatre espèces sont mises en synonymie avec d'autres espèces: *Carcinoplax verdensis* Rathbun, 1914 et *C. polita* Guinot, 1989 avec *C. specularis* Rathbun, 1914; *Goneplax megalops* Komatsu & Takeda, 2003 avec *Goneplacoides marivenae* (Komatsu & Takeda, 2003) n. comb.; et *Psopheticus insolitus* Guinot, 1990 avec *P. stridulans* Wood-Mason, 1892.

## MOTS CLÉS

Crustacea,  
Decapoda,  
Brachyura,  
*Goneplacidae*,  
*Goneplacinae*,  
*Carcinoplacinae*,  
révision,  
genres nouveaux,  
espèces nouvelles.

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## INTRODUCTION: CURRENT STATUS OF THE FAMILY GONEPLACIDAE

Members of the family Goneplacidae MacLeay, 1838 include a wide variety of brachyuran crabs, most of which are found in moderately deep water from the shallow subtidal to 1300 m in the bathyal zone. This poorly-defined family has traditionally been a depository for groups of unrelated taxa, some of which eventually proved to belong to other families. The Goneplacidae *sensu lato* was in due course demonstrated to be a polyphyletic group (see Guinot 1969a; Ng *et al.* 2001; Karasawa & Kato 2003a, b; Števcic 2005; Karasawa & Schweitzer 2006).

There have been few attempts to thoroughly revise the family as a single taxon. Tesch (1918) treated goneplacids comprehensively in his report on the material collected by the *Siboga* expedition, but his discussion was limited to relatively few taxa. Other extensive treatments of the family have highlighted species of particular regions, such as Alcock (1900) for the Indian subcontinent, Rathbun (1918) for

North America, Sakai (1939, 1976) for Japan, Barnard (1950) for South Africa, Dai & Yang (1991) and Chen (1998) for China, and Davie (2002) for Australia. The comprehensive discussion of the Goneplacidae by Guinot (1969a-c, 1971) was for a long time the most complete effort to revise the family and its phylogenetic relationships. Attempts to elucidate the phylogeny of some goneplacid genera can also be found in the work of R. Serène (Serène & Lohavanijaya 1973; Serène & Vadon 1981). Guinot subsequently revised the genera *Carcinoplax* H. Milne Edwards, 1852 (Guinot 1989) and *Psopheticus* Wood-Mason, 1892 (Guinot 1990). Karasawa & Kato (2003a, b) and Karasawa & Schweitzer (2006) examined the phylogeny of the family, including several fossil genera, using cladistic methods. Their analysis unfortunately included only a few representative taxa from the Goneplacidae (Goneplacinae and Carcinoplacinae) and from the other families they studied. They placed most emphasis on the structure of the carapace and pereopods, the structures most likely to survive in fossil specimens. Furthermore, *Goneplax* Leach, 1814, the type genus of Goneplacidae, was not included in the analysis of Karasawa & Schweitzer (2006). Ng & Manuel-Santos (2007) have more recently commented on the taxonomy of the Goneplacidae using a wide variety of characters.

Ortmann (1894, 1896, 1898) divided the Goneplacidae MacLeay, 1838 into two separate families, Goneplacidae and Carcinoplacidae. Most taxonomists, however, consider the crabs grouped in Ortmann's two families as members of a single family, the Goneplacidae. The Goneplacidae *sensu lato* was traditionally classified following Balss (1957), who divided the family into five subfamilies (see Table 1): Goneplacinae MacLeay, 1838; Carcinoplacinae H. Milne Edwards, 1852; Rhizopinae Stimpson, 1858; Eucratopsinae Stimpson, 1871 (= Prionoplacinae Alcock, 1900); and Hexapodinae Miers, 1886. Guinot (1969b) recognized that the Goneplacidae *sensu lato* of these authors consisted of three major groups: "Goneplacidae dérivés des Xanthidae", "Goneplacidae euryplaciens (Euryplacinae)", and a group consisting of the Goneplacidae *sensu stricto*, "Goneplacidae carcinoplaciens-goneplaciens (Carcinoplacinae + Goneplacinae)". Three of

Balss' five subfamilies are now regarded as separate from the polyphyletic Goneplacidae *sensu* Balss 1957. The Rhizopinae has been assigned to the Pilumnidae Samouelle, 1819 (Guinot 1969c, 1978; Ng 1987; Davie & Guinot 1996), Eucratopsinae to the Panopeidae Ortmann, 1893 (Guinot 1978; Martin & Abele 1986; Števčić 2005), while the Hexapodinae is now regarded as a separate family, the Hexapodidae (Guinot 1978, 2006; Manning & Holthuis 1981).

Other subfamilies were subsequently added to the Goneplacidae *sensu* Balss 1957, although these were ultimately assigned to other families (see Table 1). The subfamily Pseudoziinae Alcock, 1898 was first treated as a separate family by Ng & Liao (2002) and more recently by Karasawa & Kato (2003a, b), Števčić (2005), and Karasawa & Schweitzer (2006). The Pseudorhombilinae Alcock, 1900 was raised to a family status by Hendrickx (1998) and more recently treated as such by Števčić (2005) and Karasawa & Schweitzer (2006). The Troglolacinae Guinot, 1986, although treated as part of the Goneplacidae by Karasawa & Kato (2003a, b), was raised to a family status by Davie (2002) and similarly treated as a family by Karasawa & Schweitzer (2006). The Chasmocarcininae Serène, 1964, included in the Goneplacidae by Davie (2002) and Karasawa & Kato (2003a, b), is sometimes but not always treated as a family, as done by Karasawa & Schweitzer (2006). Števčić (2005) treats the group as a superfamily excluded from the Goneplacoidea. Also sometimes placed as subfamilies of the Goneplacidae are the Pilumnoidinae Guinot & Macpherson, 1987 (first raised to a family status by d'Udekem d'Acoz 1999 and treated as such by Karasawa & Schweitzer 2006) and the Planopilumninae Serène, 1984 (family status in Števčić 2005).

The subfamilies Euryplacinae Stimpson, 1871 and Carcinoplacinae H. Milne Edwards, 1852, although traditionally considered part of the Goneplacidae (Guinot 1969a, b; Davie 2002; Karasawa & Kato 2003a, b), were separately raised to a family status, the Euryplacidae and Carcinoplacidae (together with the Goneplacidae *sensu stricto* under the superfamily Goneplacoidea) by d'Udekem d'Acoz (1999). More recently, the Euryplacinae was also

TABLE 1. — Extant taxa traditionally included in the family Goneplacidae and their position in more recent schemes.

Taxa traditionally included in the Goneplacidae	Davie (2002)	Karasawa & Kato (2003a, b)	Števc̆ić (2005)	Karasawa & Schweitzer (2006)
Goneplacidae <i>sensu</i> Balss, 1957				
Goneplacinae MacLeay, 1838	Goneplacinae MacLeay, 1838	Goneplacinae MacLeay, 1838 (including Carcinoplacinae H. Milne Edwards, 1852)	Goneplacinae MacLeay, 1838	Goneplacinae MacLeay, 1838 (including Carcinoplacinae H. Milne Edwards, 1852), correspond to the Goneplacidae of MacLeay (1838)
Carcinoplacinae H. Milne Edwards, 1852	Carcinoplacinae H. Milne Edwards, 1852	Carcinoplacinae H. Milne Edwards, 1852	Carcinoplacinae H. Milne Edwards, 1852 (two genera removed to Conleyidae Števc̆ić, 2005, and Notonycidae Števc̆ić, 2005)	
Rhizopinae Stimpson, 1858	In Pilumnidae Samouelle, 1819	In Pilumnidae Samouelle, 1819	In Pilumnidae Samouelle, 1819	In Pilumnidae Samouelle, 1819
Eucratopsinae Stimpson, 1871	In Panopeidae Ortmann, 1893	In Panopeidae Ortmann, 1893	In Panopeidae Ortmann, 1893	In Panopeidae Ortmann, 1893
Hexapodinae Miers, 1886	Family Hexapodidae Miers, 1886	Family Hexapodidae Miers, 1886	Family Hexapodidae Miers, 1886	Family Hexapodidae Miers, 1886
Chasmocarcininae Serène, 1964	Chasmocarcininae Serène, 1964	Chasmocarcininae Serène, 1964	Family Chasmocarcinidae Serène, 1964; some genera removed to Parapilumnidae Števc̆ić, 2005, and Raouliidae Števc̆ić, 2005	Family Chasmocarcinidae Serène, 1964
Euryplacinae Stimpson, 1871	Euryplacinae Stimpson, 1871	Euryplacinae Stimpson, 1871	Family Euryplacidae Stimpson, 1871	Family Euryplacidae Stimpson, 1871
Pseudoziinae Alcock, 1898	Pseudoziinae Alcock, 1898	Family Pseudoziidae Alcock, 1898	Family Pseudoziidae Alcock, 1898	Family Pseudoziidae Alcock, 1898
Trogloplacinae Guinot, 1986	Family Trogloplacidae Guinot, 1986	Trogloplacinae Guinot, 1986	Family Trogloplacidae Guinot, 1986	Family Trogloplacidae Guinot, 1986
	Planopilumninae Serène, 1984	(not considered)	Family Planopilumnidae Serène, 1984	(not considered)
		Mathildelliinae Karasawa & Kato, 2003	Tribe Mathildellini Karasawa & Kato, 2003 in Geryonidae Colosi, 1923	Family Mathildellidae Karasawa & Kato, 2003 (in superfamily Portunoidea Rafinesque, 1815)

treated as an independent family by Števc̆ić (2005), Karasawa & Schweitzer (2006) and Ng & Castro (2007).

Števc̆ić (2005) removed several additional taxa from the Goneplacidae. *Mathildella* Guinot & Richer de Forges, 1981 and *Intesius* Guinot & Richer de Forges, 1981 (which had been grouped as the subfamily Mathildelliinae Karasawa & Kato, 2003) were included in the Geryonidae Colosi, 1923. *Conleyus* Ng & Ng, 2003 and *Notonyx* A. Milne-Edwards, 1873 were treated as new independent families (i.e. Conleyidae Števc̆ić, 2005, and Notonycidae Števc̆ić, 2005), a status followed by Ng & Manuel-Santos (2007) (see Remarks for Goneplacinae). It

remains unclear, however, which of the taxa listed by Števc̆ić were studied using actual specimens and which were based mostly or completely on data gathered from the literature. Karasawa & Schweitzer (2006) more recently raised the Mathildelliinae Karasawa & Kato, 2003, to a family status and placed it, surprisingly, within the Portunoidea Rafinesque, 1815. The Goneplacidae, together with four other extant families (Chasmocarcinidae, Euryplacidae, Hexapodidae, and Trogloplacidae) plus a fossil group (Carcinocarcinoididae Karasawa & Kato, 2003) were grouped in the superfamily Goneplacoidea by Karasawa & Schweitzer (2006). This is a more logical grouping than the placement of these families in

the Xanthoidea MacLeay, 1838, a taxon which has often included the Goneplacidae.

Some views on the phylogeny of goneplacids and related taxa were discussed by Karasawa & Kato (2003a, b), Štević (2005), Karasawa & Schweitzer (2006), and Ng & Manuel-Santos (2007).

The present revision focuses solely on the Goneplacinae. The Euryplacinae, regarded here as an independent family, is excluded. Also excluded is the Mathildellinae, which has been treated by some as an independent subfamily and more recently as a family (see above). The Mathildellidae is nevertheless considered here a taxon related to the Goneplacidae and it is for the time being kept in the Goneplacoidea.

The study of the large collection deposited in the Muséum national d'Histoire naturelle, Paris, in addition to material from the more recent PANGLAO 2004 and 2005 expeditions deposited in the Zoological Reference Collection of the National University of Singapore, and material deposited in other museums, particularly type material, has permitted this reappraisal of this fascinating and challenging group. It is hoped that this study will trigger even further discussion.

## MATERIALS AND METHODS

Morphological terms follow terminology used by Castro (2000: figs 1, 2) except that "cornea" is used instead of "retina" as incorrectly indicated in these two figures. "Outer orbital tooth" is used for a tooth or spine connected to the orbit instead of the "first anterolateral tooth" of some authors. The teeth below the orbital margin are referred to as "anterolateral teeth". Pereopods are referred to by the abbreviations P1 (chelipeds) and P2 to P5 (ambulatory legs); the first and second pairs of male pleopods by G1 and G2 respectively. Following general usage, the exposed terminal portion of the vas deferens that delivers sperm to the G1 has been referred to as "penis" although it does not truly function as the copulatory organ. The skeletal element that partially or almost completely covers the vulva (see Figs 15; 18; 19; 22; 32) is being referred to as "vulvar cover" rather than by "operculum" or "vulvar operculum", a term used for the hinged, mobile element present

on the vulva of some brachyurans (see Hartnoll 1968; Thompson & Mclay 2005).

Carapace length (cl) was measured along the middle of the carapace from the middle of the front to the middle of the posterior border of the carapace. Carapace width (cw) was measured across the widest breadth of the carapace, in most cases between the longest anterolateral teeth. In a few species the widest breadth of the carapace was between the outer orbital teeth. Practically all of the type material examined was re-measured. The length of the eye peduncle was measured along its dorsal surface from the proximal edge of the peduncle to the margin of the cornea, not including the thin extension of the peduncle along the surface of the cornea. The width across the front was measured between the outer edges of the frontal margin. The total length of the merus of the fifth pereopods (P5) was measured along the dorsal margin, width across the median portion of the article. Unless missing, right pereopods were used in the measurements. In their descriptions, paired appendages, including G1, G2, and the vulvae, are referred to in the singular for simplicity.

Most of the material examined was collected by French expeditions in the Indo-West Pacific region. The following publications give information on these expeditions and the stations from which the material examined was collected: BATHUS 1-4 and HALIPRO 1 (Richer de Forges & Chevillon 1996); BERYX 11 (Lehodey *et al.* 1992); BIOCAL, BIOGEOCAL, and CEPROS (Intès & Bach 1989), CHALCAL 2, MUSORSTOM 4-6 (Richer de Forges 1990); BORDAU 1 (Richer de Forges *et al.* 2000b); CORINDON 1, 2 (Moosa 1984); KARUBAR (Crosnier *et al.* 1997); LAGON (Richer de Forges 1991); MUSORSTOM 1 (Forest 1981); MUSORSTOM 2 (Forest 1985); MUSORSTOM 3 (Forest 1989); MUSORSTOM 4 (Richer de Forges 1990); MUSORSTOM 5 (Richer de Forges *et al.* 1986); MUSORSTOM 8, 9 (Richer de Forges *et al.* 1996); MUSORSTOM 10 (Richer de Forges *et al.* 2000a); SMIB 2-6, 8, 10 (Richer de Forges 1993). Information on stations, including collecting gear, on most of these as well as other recent expeditions (BORDAU 2, SALOMON 1 and 2, NORFOLK 1, TAIWAN 2000-2003, BENTHAUS,

PANGLAO 2004 (Panglao Marine Biodiversity Project), PANGLAO 2005 (PANGLAO 2005 Deep-Sea Cruise), BOA 1, and EBISCO) is available on line (<http://www.tropicaldeepseabenthos.org>).

All depth measurements originally given in the Imperial, or English, system were converted into the metric system. Depth range given for each of the species was taken from data obtained from the material examined as well as from the literature. Geographic names in English follow the orthography given in the eighth edition (2005) of *Atlas of the World* (National Geographic Society, Washington, DC).

Genera are listed in alphabetical order except new genera, which are listed immediately after genera in which the new taxa were previously included (see Table of contents), and except *Neommatocarcinus* Takeda & Miyake, 1969, and *Notonyx* A. Milne-Edwards, 1873, which are placed at the end due to their unique characters. The type species of each genus is discussed first, followed by the remaining species in alphabetical order. Some of the new species of *Carcinoplax* are grouped with close, previously described species. With a few exceptions, not included among the list of references are those where the particular taxon is only listed without any additional information or discussion.

#### ABBREVIATIONS

AM	Australian Museum, Sydney;
BMNH	The Natural History Museum, London;
BPBM	Bishop Museum, Honolulu, Hawai'i;
CBM-ZC	Natural History Museum and Institute, Chiba;
IOAS	Institute of Oceanology, Academia Sinica, Qingdao;
IRSNB	Institut royal des Sciences naturelles de Belgique, Brussels;
KMNH	Kitakyushu Museum of Natural History and Human History, Kitakyushu;
KPM	Kanagawa Prefectural Museum of Natural History, Odawara;
MMBA	National Museum of Marine Biology and Aquarium, Pingtung, Taiwan;
MNHN	Muséum national d'Histoire naturelle, Paris;
MZUSP	Museu de Zoologia, Universidade de São Paulo;
NIWA	National Institute of Water and Atmosphere, Wellington;
NMCR	National Museum of the Philippines, Manila;

NMV	Museum of Victoria, Melbourne;
NSMT	National Science Museum, Tokyo;
NTOU	National Taiwan Ocean University, Keelung;
RMNH	Nationaal Natuurhistorisch Museum, Leiden;
SAM	South African Museum, Cape Town;
SMSRB	Service mixte de Surveillance radiologique et biologique, Monthéry, France;
UF	Florida Museum of Natural History, University of Florida, Gainesville;
USNM	United States National Museum, Smithsonian Institution, Washington, DC;
USU	Departamento de Biologia Animal, Universidade Santa Ursula, Rio de Janeiro;
ZMA	Zoologisch Museum, Universiteit van Amsterdam, The Netherlands;
ZMB	Museum für Naturkunde (Zoologisches Museum), Humboldt-Universität, Berlin;
ZMMU	Zoological Museum, Moscow State University;
ZMUC	Zoological Museum, University of Copenhagen;
ZRC	Zoological Reference Collection, Raffles Museum of Biodiversity Research, National University of Singapore.

#### SYSTEMATICS

##### Superfamily GONEPLACOIDEA MacLeay, 1838

##### Family GONEPLACIDAE MacLeay, 1838

Goneplacidae MacLeay, 1838: 64. — Dana 1851: 285 [diagnosis]; 1852: 308 [diagnosis], 310, 1425 [diagnosis], 1493 [in list], 1496 [in list]. — Haswell 1882: 85 [diagnosis]. — Alcock 1900: 286, 297. — Borradaile 1907: 468 [in list], 482 [in key], 485 [key to species]. — Calman 1909: 315 [in list].

Goneplacidae – Stebbing 1910: 312. — Rathbun 1918: 14 [in key], 15 [diagnosis, key to genera]; 1937: 265 [diagnosis]. — Tesch 1918: 4. — Sakai 1939: 366 [in key], 554; 1965: 165; 1976: 321, 522. — Stephensen 1946: 226 [male pleopods]. — Barnard 1950: 77 [in key], 281 [diagnosis]. — Monod 1956: 340. — Bals 1957: 1655. — Edmondson 1962: 2. — Serène 1964: 188 [discussion]. — Williams 1965: 201 [key to genera]. — Glaesner 1969: R445, R524 [diagnosis]. — Guinot 1969a: 242; 1969b: 507; 1971: 1078 [list of subfamilies, genera, and species]; 1979: 223, 241 [male gonopods]. — Takeda & Shimazaki 1974: 59 [discussion]. — Ingle 1980: 108 [diagnosis]. — Rice 1980: 337, 360 [in key], 378 [larvae]. — Manning & Holthuis 1981: 159. — Abele &

Felgenhauer 1982: 323 [diagnosis]. — Bowman & Abele 1982: 24 [in list]. — Williams 1984: 17 [in key], 431. — Dai *et al.* 1986: 364 [diagnosis], 365 [key to species]. — Dai & Yang 1991: 186 [in key], 393 [diagnosis, key to species]. — Chen 1998: 265. — Ng 1998: 1058, 1114 [diagnosis]. — Tirmizi & Ghani 1996: 76 [diagnosis]. — Guinot & Bouchard 1998: 660 [abdomen-locking mechanism]. — Martin & Davis 2001: 75. — Ng *et al.* 2001: 32 [discussion]. — Chen & Sun 2002: 32, 35. — Davie 2002: 189 [diagnosis]. — Hsueh & Huang 2002: 113 [key to subfamilies] (part). — Karasawa & Kato 2003b: 130 [in list], 137 [diagnosis]. — Poore 2004: 433 [diagnosis]. — Števc̆ić 2005: 67 [diagnosis]. — Karasawa & Schweitzer 2006: 26 [in list], 57 [diagnosis]. — Ng & Manuel-Santos 2007: 40 [discussion], 44 [diagnosis], 45.

Gonoplacidae – H. Milne Edwards 1852: 154.

Carcinoplacidae – Stimpson 1858: 93 (39).

Galénides – A. Milne-Edwards 1862: 40.

Carcinoplacinae – Miers 1886: 222.

Carcinoplacini – Ortman 1894: 684 [as “Untergruppe”]; 1896: 416, 445 [diagnosis; as “Subsection”].

EXTANT SUBFAMILY INCLUDED. — Goneplacinae MacLeay, 1838 (including Carcinoplacinae H. Milne Edwards, 1852).

FOSSIL SUBFAMILIES INCLUDED. — Carinocarcinoidinae Karasawa & Kato, 2003 (family status in Karasawa & Schweitzer [2006]).

Icriocarcininae Števc̆ić, 2005 (questionable subfamily status).

TYPE GENUS. — *Goneplax* Leach, 1814.

DIAGNOSIS (Goneplacinae [including Carcinoplacinae, but excluding Euryplacinae Stimpson, 1871 and Mathildellinae Karasawa & Kato, 2003]). — Carapace transversely rectangular, subquadrate, or trapezoidal; front narrow to wide, typically lamellar, straight. Dorsal surface smooth. Varying number of anterolateral teeth posterior to outer orbital angle (sometimes none but typically 1 or 2). Notch between frontal margin, inner edge of supraorbital border slight in some species. Orbits moderately to conspicuously wide, long; fissure in supraorbital border absent. Eye peduncle of varying length; cornea round to elongated. Antennules fold transversely, separated by septum (septum absent in *Neommatocarcinus*). Basal antennal article short to relatively long, subcylindrical; lying freely in orbital hiatus, not reaching front. Thoracic sternum wide. Median sulcus on thoracic sternite 4 absent; sutures 4/5, 5/6 interrupted medially, 6/7, 7/8 interrupted medially or complete. Anterior end of sterno-abdominal

cavity anterior to thoracic sternite 4. Prolongation of male episternite 7 present; thoracic sternite 7 laterally covered with thoracic sternite 8; thoracic sternite 8 without supplementary plate, portions of varying size left visible or covered by abdomen. Cheliped (P1) fingers varying from dark to light in colour; ambulatory legs (P2-P5) compressed. Male abdomen with 6 freely articulated somites plus telson (somites 3-5 fused for total of 4 somites plus telson in *Neommatocarcinus*); narrower than sternum, somite 3 being narrower than thoracic sternite 7; fills space between coxae of P5; telson typically slightly longer than wide. Abdomen-locking mechanism with medium-size button on edge of thoracic sternite 5 pairing with shallow socket on underside (ventral surface) of abdominal somite 6. Male opening coxal, with soft, free penis arising directly from P5 coxa (sclerified proximal portion in *Neommatocarcinus*) but coxosternal condition since protected for short distance and in varying degrees by sternum. G1 slender or stout. G2 long, typically with long flagellum (short in some species). Female abdomen with 6 freely articulated somites plus telson; locking mechanism of immature individuals consisting of medium-size button on edge of thoracic sternite 5; vulva of varying size, shape on thoracic sternite 6, vulvar cover present in some species.

#### REMARKS

The differing views on the taxonomy and phylogeny of the taxa in question basically stem from disagreements on the relative importance of particular characters. Obviously needed is a comprehensive and rigorous revision that includes morphological as well as molecular and larval characters. As far as morphological characters are concerned, stress should be placed on biologically significant structures such as those directly involved in reproduction, as in the case of the external reproductive structures (see Reproductive structures and the taxonomy of the Goneplacidae, p. 755). There is, however, very limited information on the larval development of goneplacids, knowledge that has so far shed little light on the phylogenetic relationships of the taxa comprising the family (see Rice 1980: 337, 354; Wear & Fielder 1985: 62). The same can be said about the molecular characterizations of goneplacids.

A comprehensive revision of the taxa included here as comprising the Goneplacidae (i.e. Goneplacinae [including Carcinoplacinae]) may ultimately show that some or all of these taxa are perhaps best treated as independent families under the superfamily Goneplacoidea, an arrangement already followed



TABLE 2. — Morphological differences between the subfamilies of Goneplacidae MacLeay, 1838 *sensu lato* and the family Euryplacidae Stimpson, 1871.

Characters	Subfamily Goneplacinae MacLeay, 1838 <i>sensu stricto</i>	Subfamily Carcinoplacinae H. Milne Edwards, 1852 <i>sensu stricto</i>	Family Mathildellidae Karasawa & Schweitzer, 2006	Family Euryplacidae Stimpson, 1871
Carapace	Transversely rectangular to trapezoidal, subquadrate; smooth; straight front; long to moderately long orbits, eye peduncles; 1 anterolateral tooth or none	Subquadrate to trapezoidal; smooth; straight front (median notch rare); short orbits, eye peduncles; 1 or 2 anterolateral teeth	Subquadrate; regions weakly defined; flattened; straight front with median notch; short orbits with fissure on supraorbital border, eye peduncles; 1-3 anterolateral teeth	Transversely rectangular, trapezoidal; smooth (sometimes weakly defined); straight front often with median notch; short to long orbits, eye peduncles; 3 or 4 anterolateral teeth
Basal antennal article	Free in orbital hiatus, not reaching front	Free in orbital hiatus, not reaching front	Free in orbital hiatus, not reaching front	Typically closed by extension of carapace margin, thus reaching front
Anterior end of sterno-abdominal cavity	Anterior to thoracic sternite 4	Anterior to thoracic sternite 4	Posterior to thoracic sternite 4	Anterior to thoracic sternite 4
Prolongation of male episternite 7	Present	Present	Absent	Present
Male abdomen	Narrow to relatively wide (but somite 3 always narrower than thoracic sternite 7); 6 freely articulated somites plus telson (somites 3-5 fused for a total of 4 somites plus telson in <i>Neommatocarcinus</i> )	Typically narrow, somite 3 always narrower than thoracic sternite 7; 6 freely articulated somites plus telson	Narrow, somite 3 narrower than thoracic sternite 7; sutures distinct but somites 3-5 immovable	Conspicuously slender, somite 3 much narrower than thoracic sternite 7; 6 freely articulated somites plus telson
Penis	Soft (sclerified proximal portion in <i>Neommatocarcinus</i> )	Soft	Soft	Soft, conspicuously long; in concave ("tube like") thoracic sternite 8; thoracic sternite 8 not visible dorsally
G1	Slender or stout	Typically slender	Slender	In most genera: conspicuously slender, narrow, armed with small teeth
G2	Slightly shorter or slightly longer than G1 (much shorter in some species)	Slightly shorter or slightly longer than G1	Slightly shorter or slightly longer than G1	Much shorter than G1
Vulva	Small, vulvar cover typically absent	Large, vulvar cover absent	Small, vulvar cover absent	Small, vulvar cover absent

by d'Udekem d'Acoz (1999), and in part by Števcíć (2005) and Karasawa & Schweitzer (2006), who raised the Goneplacinae to family status (see Remarks for subfamily Goneplacinae below). The question of which taxa actually make up the Goneplacidae is unfortunately not as "simple" as indicated by Števcíć (2005: 138). Not all taxa included in his conception of the family share, for instance, the interrupted sternal sutures 4/5 to 7/8 and the "long G2" as stated. The presence of additional, strong

synapomorphies should clearly establish, or challenge, the monophyly of the family.

The subfamily Euryplacinae is treated here as a family independent of the Goneplacidae, a status previously suggested by Guinot (1969b) and followed by Števcíć (2005) and Karasawa & Schweitzer (2006). Prominent among its diagnostic characters are the conspicuously narrow male abdomen, slender and long G1, and short G2 (see Ng & Castro 2007). Table 2 summarizes the most important diagnostic

characters of the Euryplacidae in comparison with those of the subfamilies of the Goneplacidae *sensu stricto*, including the Carcinoplacinae, which is treated here as part of the Goneplacinae.

### Subfamily GONEPLACINAE MacLeay, 1838

Gonoplacidae MacLeay, 1838: 64. — Ortmann 1894: 684; 1896: 416, 446 (part).

Carcinoplacinae H. Milne Edwards, 1852: 164. — Miers 1886: 223 (part). — Ortmann 1894: 685; 1898: 1176 (part). — Borradaile 1907: 485 [in key] (part). — Rathbun 1918: 16 [in key], 17, 265 [diagnosis] (part). — Monod 1956: 340 [in key]. — Bals 1957: 1655 [in key], 1655 (part). — Serène 1964: 188 (part); 1968: 89 [in list] (part). — Sakai 1965: 165 [in key], 166 (part); 1976: 522 [in key], 523 (part). — Glaessner 1969: R524 [diagnosis]. — Guinot 1969b: 519 (part); 1971: 1081 [list of genera and species] (part). — Serène & Lohavanijaya 1973: 62. — Takeda & Shimazaki 1974: 59 [discussion]. — Dai *et al.* 1986: 365 (part). — Dai & Yang 1991: 393 (part). — Tirmizi & Ghani 1996: 76 [diagnosis]. — Davie 2002: 192, 193 (part). — Hsueh & Huang 2002: 113 [in key] (part). — Karasawa & Kato 2003b: 130 [in list] (part). — Števc̆ić 2005: 67 [diagnosis] (part). — Ng & Manuel-Santos 2007: 40 [discussion].

Gonoplacinae – Miers 1886: 237 (part). — Alcock 1900: 286, 293, 316 (part). — Borradaile 1907: 485 [in key] (part). — Calman 1909: 315 [in list] (part).

Carcinoplacidae – Ortmann 1894: 684, 685; 1896: 416, 446; 1898: 1175 [diagnosis] (part). — Stebbing 1905: 34 [discussion].

Goneplacidae – Ortmann 1898: 1176 [diagnosis] (part). — Karasawa & Schweitzer 2006: 26 [in list], 36 [discussion].

Pseudorhombilinae Alcock, 1900: 286, 292, 297 (part). — Tesch 1918: 153 (part). — Sakai 1939: 554 [in key], 555 [key to genera].

Goneplacinae – Rathbun 1918: 16 [in key], 24 [diagnosis] (part). — Tesch 1918: 181 (part). — Bals 1957: 1655 [in key], 1656 (part). — Sakai 1939: 554 [in key], 562 [key to genera]; 1965: 165 [in key], 169 (part); 1976: 522 [in key], 537 (part). — Stephensen 1946: 226 [male pleopods]. — Bennett 1964: 73 [discussion]. — Serène 1964: 189 (part). — Glaessner 1969: R526 [diagnosis] (part). — Guinot 1969b: 519 (part); 1971: 1081 [list of genera and species] (part). — Serène & Umali 1972: 77 [key to species]. — Ingle 1980: 109 [diagnosis]. — Wil-

liams 1984: 431 [in key], 433. — Dai *et al.* 1986: 376 (part). — Dai & Yang 1991: 406 (part). — Davie 2002: 200 (part). — Hsueh & Huang 2002: 113 [in key] (part). — Karasawa & Kato 2003b: 130 [in list], 137 [in list], 140. — Števc̆ić 2005: 68 [diagnosis] (part).

GENERA INCLUDED. — *Carcinoplax* H. Milne Edwards, 1852; *Entricoplax* n. gen.; *Exopheticus* n. gen.; *Goneplacoides* n. gen.; *Goneplax* Leach, 1814; *Hadroplax* n. gen.; *Menoplax* n. gen.; *Microgoneplax* n. gen.; *Neogoneplax* n. gen.; *Neommatocarcinus* Takeda & Miyake, 1969; *Notonyx* A. Milne-Edwards, 1873; *Ommatocarcinus* White, 1852; *Paragoneplax* n. gen.; *Psopheticus* Wood-Mason, 1892; *Pycnoplax* n. gen.; *Singhaplax* Serène & Soh, 1976; *Thyraplax* n. gen.

FOSSIL GENERA INCLUDED. — *Amydrocarcinus* Schweitzer, Feldmann, Gonzáles-Barba & Vega, 2002 (in Amydrocarcinidae Števc̆ić, 2005; in Goneplacidae in Karasawa & Schweitzer [2006]).

*Icriocarcinus* Bishop, 1998 (in Goneplacinae in Karasawa & Kato [2003a] and Karasawa & Schweitzer [2006]; subfamily Icriocarcininae in Števc̆ić [2005]).

*Magyarcarcinus* Schweitzer & Karasawa, 2004 (in Goneplacidae in Karasawa & Schweitzer [2006]).

GENERA NOT INCLUDED IN GONEPLACINAE *SENSU STRICTO* (see Remarks). — *Bathyplax* A. Milne-Edwards, 1880. *Conleyus* Ng & Ng, 2003 (in family Conleyidae Števc̆ić, 2005 in Števc̆ić [2005] and Ng & Manuel-Santos [2007]).

*Paragalene* Kossmann, 1878 (in family Geryonidae Colosi, 1923 in Števc̆ić [2005]; unknown status in Karasawa & Schweitzer [2006]).

*Progeryon* Bouvier, 1922 (*incertae sedis* in family Goneplacidae in Karasawa & Kato [2003a]; in family Geryonidae Colosi, 1923 in Števc̆ić [2005]; Progeryonidae Števc̆ić, 2005 in Karasawa & Schweitzer [2006] and Ng & Manuel-Santos [2007]).

*Psopheticoides* Sakai, 1969 (in Euryplacidae).

DIAGNOSIS. — Carapace transversely rectangular, quadrate, subcircular, or trapezoidal; front narrow to wide, lamellar, straight, rarely marked by median notch or projection. Dorsal surface smooth or marked with variously distinct regions. Single anterolateral tooth posterior to outer orbital angle, sometimes obsolete. Notch between frontal margin, inner edge of supraorbital border typically slight. Orbits moderately to conspicuously wide, fissure typically absent. Eye peduncles of varying length; cornea round to elongated. Antennules fold transversely. Basal antennal article short to relatively long, subcylindrical; lying freely in orbital hiatus, not reaching front. Thoracic sternum wide. Median sulcus on thoracic sternite 4 absent; sutures 4/5, 5/6 interrupted medially, 6/7, 7/8 interrupted medially or complete. Anterior end of sterno-abdominal cavity anterior to thoracic sternite 4. Prolongation of

male episternite 7 present; thoracic sternite 7 laterally covered with thoracic sternite 8; thoracic sternite 8 without supplementary plate, portions of varying size left visible or not by abdomen. Cheliped (P1) fingers varying from dark to light in colour; ambulatory legs (P2-P5) compressed. Male abdomen with 6 freely articulated somites plus telson; narrower than sternum, somite 3 being narrower than thoracic sternite 7; telson slightly longer than wide. Abdominal-locking mechanism with medium-size button on edge of thoracic sternite 5 pairing with shallow socket on underside (ventral surface) of abdominal somite 6. Male opening coxal, with soft, free penis arising directly from P5 coxa but protected by sternum for a short distance (coxosternal condition). G1 slender or stout, typically with truncated tip. G2 long, typically with long flagellum (short in a few species). Female abdomen with 6 freely articulated somites plus telson; locking mechanism with medium-size button on edge of thoracic sternite 5 in immature individuals; vulva of varying size on thoracic sternite 6, vulvar cover may be present.

#### REMARKS

As part of the Goneplacidae *sensu* Balss 1957, the subfamilies Goneplacinae and Carcinoplacinae were traditionally separated by the shape of their respective carapaces. The typical carcinoplacine carapace, represented by *Carcinoplax*, is subquadrate, with orbits that are not excessively elongated (or “normal”) so that the widest breadth of the carapace is at the level of the anterolateral borders, a shape often referred to as “xanthoid”. In contrast, the typical goneplacine carapace, as in *Goneplax*, is transversely rectangular and has its widest breadth typically at the level of the outer orbital angles as a result of conspicuously elongated orbits to accommodate long eye peduncles. An almost identical goneplacine carapace also appears among some members of the Euryplacidae (such as *Frevillea* A. Milne-Edwards, 1880, and *Trapezioplax* Guinot, 1969), clearly not members of the Goneplacinae as evidenced by the morphology of their respective male abdomens, G1, and vulvae (see discussion of *Psopheticoides* Sakai, 1969, p. 620). As in other groups of brachyuran crabs, carapace shape is not always a reliable synapomorphy.

Guinot (1971: 1081, footnote) precisely explained that the separation between Carcinoplacinae and Goneplacinae was more a matter of convenience and that the distinction between the two taxa “ne

sera peut-être pas justifiée dans une classification peu découpée”. Although the morphometry of the carapace conveniently separates some genera, carapace shape and the relative length of the orbits are clearly intermediate between the two extremes in the case of *Psopheticus* Wood-Mason, 1892 and *Exopheticus* n. gen. The absence of a clear distinction among other characters, such as the morphology of the male abdomen and its relation to the thoracic sternum, and the morphology of the G1 and vulva, do not support the traditional dichotomy (see Table 2).

The Carcinoplacinae was synonymized with Goneplacinae by Karasawa & Kato (2003a, b) based on the cladistic analysis of characters among recent and fossil genera included or purportedly related to the Goneplacidae. Their hypothesis is supported by the original “Goneplacidae carcinoplaciens-goneplaciens (Carcinoplacinae + Goneplacinae)” line of Guinot (1969b) and more recently by Karasawa & Schweitzer (2006). The present work also supports Karasawa & Kato’s hypothesis, and the two subfamilies are thus treated as one. An alternate hypothesis is the creation of at least three subfamilies for the Carcinoplacinae (see Karasawa & Kato 2003a, b); another is the elevation of the subfamilies of the Goneplacidae to full family status, as originally done by Ortmann (1894) and more recently by d’Udekem d’Acoz (1999) and Karasawa & Schweitzer (2006) and in part by Štević (2005). For Karasawa & Schweitzer (2006) the Goneplacidae consists of only one subfamily so in essence the Goneplacinae was raised to family status.

Five genera that have been placed at one time or another in the Carcinoplacinae or Goneplacidae are herein excluded from the Goneplacinae *sensu stricto*. The inclusion in the Goneplacidae of the first four genera listed below is questionable at best, but for the time being, these four genera are herein retained in the superfamily Goneplacoidea.

*Bathyplax* A. Milne-Edwards, 1880, a monotypic Western Atlantic genus, has a carapace not unlike that of *Carcinoplax*. It has one anterolateral tooth and a conspicuous outer orbital tooth. The G1 is slender, the G2 about half the length of the G1. The vulva is round and large but not as large as in *Carcinoplax*, and partially covered by a vulvar

cover in large females. The orbits and eyes are short. Although these characters may be found in some goneplacids, *Bathyplox* shows similarities to various other groups. Guinot (1969c, 1978), Manning & Holthuis (1989), and Tavares (1996) have discussed its affinities to the families Geryonidae Colosi, 1923, and Xanthidae MacLeay, 1838, although they did not explicitly recommend its transfer to any of these two families.

*Conleyus* Ng & Ng, 2003, a monotypic Western Pacific genus, has a flattened, ridged, and bidentate carapace with superficial similarities to *Intesius* Guinot & Richer de Forges, 1981, which together with *Mathildella* Guinot & Richer de Forges, 1981, has been allied to the Goneplacidae. The male holotype (cl 12.2 mm, cw 16.4 mm; UF 2098) and male paratype (cl 7.1 mm, cw 9.4 mm; ZRC 2002.175) show the unusually reduced orbits, eye peduncles, and eyes (Ng & Ng 2003: figs 2, 4A, B), which are not typical goneplacine characters and which were considered adaptations to its presence in rubble at moderate depths (30–67 m). The G1 of *Conleyus* (Ng & Ng 2003: fig. 5D–F) has similarities to the stout G1 of *Pycnoplax* n. gen. and *Thyraplax* n. gen. but it is shorter, thinner, the tip is slightly flared, and the terminal spinules much smaller than in the two goneplacine genera. The G2 is long but it has a short flagellum and lacks the slightly-expanded tip with one or more spinules often seen in the G2 of goneplacines. The male abdomen is not typically triangular as in goneplacines, somites 5 and 6 being distinctively narrower than somite 4 (Ng & Ng 2003: fig. 5D). The morphology of the vulva remains unknown since the species is known only from two males. The anterior portion of the thoracic sternum (Ng & Ng 2003: fig. 5A) is narrower than in goneplacines and there is a complete and well developed 3/4 suture, a character absent in the Goneplacidae. *Conleyus* was included in the Carcinoplacinae by Ng & Ng (2003) but removed from the Goneplacidae and placed, without explanation, in the superfamily Conleyodea [sic], family Conleyidae by Števcic (2005). Ng & Manuel-Santos (2007) kept the genus in an independent family within the superfamily Goneplacoidea.

*Paragalene* Kossman, 1878, a monotypic genus from the Mediterranean Sea, has a carapace with a

superficial resemblance to *Carcinoplax*. Somites 3 and 4 of the male abdomen are fused, however, and the long flagellum of the G2 is serrated (Guinot 1969c: fig. 103). Guinot (1969c: 696) tentatively included the genus in the family Geryonidae Colosi, 1923. Although Števcic (2005) kept *Paragalene* in Geryonidae, Karasawa & Schweitzer (2006: 55) stated that the genus “might be assigned to the Mathildellidae” but solely on account of its carapace.

*Progeryon* Bouvier, 1922, with four Indo-West Pacific species, has a carapace similar to that of geryonids. Nevertheless, all somites of the male abdomen are mobile (somites 3–5 fused and immobile in Geryonidae) and the G1 and G2 are similar to those of some goneplacines (see Ng & Guinot 1999). Sutures 4/5 to 6/7 are incomplete, thoracic sternite 8 is not visible ventrally, and the abdomen covers the space between the P5 coxae. The systematic position of *Progeryon* is a controversial one (see Karasawa & Schweitzer 2006: 35, 55). More recently, it has been listed as *incertae sedis* in the family Goneplacidae by Karasawa & Kato (2003a), in the tribe Progeryonini of the family Geryonidae Colosi, 1923, by Števcic (2005), and in the Progeryonidae Števcic, 2005, by Karasawa & Schweitzer (2006). Ng & Manuel-Santos (2007) kept the genus in its own family, the Progeryonidae, within the superfamily Goneplacoidea.

*Psopheticoides* Sakai, 1969, a monotypic Western Pacific genus, is being referred to the Euryplacidae. The examination of numerous specimens of *Psopheticoides sanguineus* Sakai, 1969, from the Philippine Is and Tonga, all deposited at ZRC and MNHN, show a slender male abdomen, a deep steno-abdominal cavity, a slender G1 with pointed tip and armed with spinules, a short G2 that is much shorter than the G1, a relatively long penis that lies in a concave thoracic sternite 8 before joining the G1, a relatively narrow female abdomen where the distal border of the thoracic sternites are left uncovered, and a thoracic sternite 8 that is concealed from dorsal view. The examination of these specimens is part of an ongoing revision of the Euryplacidae and related genera.

## KEY TO GENERA OF GONEPLACINAE MACLEAY, 1838

1. Carapace distinctively quadrate, with anterolateral borders only slightly rounded and at a nearly 90° angle and no anterolateral teeth (see Clark & Ng 2006: fig. 2). Cornea of eye small, spherical ..... *Notonyx*  
 — Carapace of various shapes (hexagonal, transversely rectangular, ovoid) but never distinctively quadrate, with rounded anterolateral borders typically having one or two anterolateral teeth posterior to outer orbital margin (no anterolateral teeth but carapace oval, not quadrate, in very large adults in some species). Cornea of eye large, not reduced, clearly spherical or reniform ..... 2
2. Eye peduncles short, as long as or only slightly longer than cornea, much shorter than front. Cornea always spherical, not elongated or reniform ..... 3  
 — Eye peduncles long, clearly longer than cornea, sometimes as long as or longer than front (if eye peduncles short, cornea is distinctively reniform, being dorso-ventrally flattened and almost completely divided into anterior and posterior portions). Cornea elongated or reniform ..... 6
3. Two anterolateral teeth posterior to outer orbital angle (one or the two anterolateral teeth may be greatly reduced or even obsolete in some large individuals; always one tooth in *Carcinoplax ischurodous* (Stebbing, 1923) [see Guinot 1989: pl. 13, fig. F, as *Carcinoplax eurysternum*]) ..... 4  
 — Only one anterolateral tooth posterior to outer orbital angle (shallow lobe or carina, but no tooth, may be present anterior to each anterolateral tooth) ..... 5
4. G1 slender, thin (dorso-ventrally flattened). Vulva greatly expanded, without vulvar cover (see Fig. 1). Sternal suture 6/7 incomplete ..... *Carcinoplax*  
 — G1 stout, thick. Vulva relatively small, vulvar cover in large mature females (see Figs 14; 15; 18) (not found in small mature females of *P. surugensis* (Rathbun, 1932)). Sternal suture 6/7 complete ..... *Pycnoplax* n. gen.
5. One long, horn-like, acute, dorsally oriented anterolateral tooth on each side of carapace (blunt tooth anterior to anterolateral tooth in males). G1 stout, tip conspicuously truncated ..... *Menoplax* n. gen.  
 — One short, triangular or slightly elongated anterolateral tooth on each side of carapace (shallow lobe or carina, but no tooth, may be present anterior to anterolateral tooth). G1 slender, tip typically pointed (truncated in *Thyraplax truncata* n. sp., see Fig. 25C) ..... *Thyraplax* n. gen.
6. Carapace, pereopods, eye peduncles with conspicuous setae ..... *Entricoplax* n. gen.  
 — Carapace, pereopods, eye peduncles without conspicuous setae (naked or only with sparse setae) ..... 7
7. Eye peduncles conspicuously long, almost always more than half front (0.4-1.2 front width). Carapace conspicuously wider than long (often 1.5 as long as wide or more) ..... 8  
 — Eye peduncles not conspicuously long, not more than half front (0.2-0.5 front width). Carapace conspicuously quadrate or nearly circular, approximately as wide as long .... 16
8. Cornea elongated, not conspicuously dorso-ventrally flattened, distal margin spherical without being nearly divided into anterior and posterior portions ..... 9  
 — Cornea reniform (dorso-ventrally flattened and almost completely divided into anterior and posterior portions) ..... 13

9. Anterolateral teeth in median portion of carapace (see Fig. 35A). Carapace of adults small (cl rarely more than 4.5 mm) ..... 10  
 — Anterolateral teeth (if present) in upper, anterior portion of carapace. Carapace of adults not small (cl more than 7-8 mm) ..... 11
10. G2 short (see Fig. 39C), much shorter than G1. Broad suborbital tooth ..... *Microgoneplax* n. gen.  
 — G2 long, slender, longer than or as long as G1. Short or obsolete suborbital tooth ..... *Singhaplax*
11. Eye peduncle clearly not much longer than carapace front. Outer orbital teeth anteriorly oriented. Anterolateral teeth present (except some individuals of *Goneplax rhomboides* (Linnaeus, 1758)) ..... *Goneplax*  
 — Eye peduncle long, much longer than carapace front. Outer orbital teeth straight or nearly straight. Anterolateral teeth obsolete (except obtuse prominence in *Ommatocarcinus fibriophthalmus* Yokoya, 1933) ..... 12
12. Male abdomen with 6 somites plus telson; antennules divided by median septum ..... *Ommatocarcinus*  
 — Male abdomen with 4 somites plus telson, somites 3-5 fused; antennules not divided by septum ..... *Neommatocarcinus*
13. P5 dactylus dorso-ventrally flattened, broad. G2 with nearly coiled flagellum ..... *Goneplacoides* n. gen.  
 — P5 dactylus slender. G2 with slightly curved flagellum, straight tip ..... 14
14. G2 much shorter than G1. G1 bent in adult males. Suborbital teeth obsolete. Iridescent region at distal end of eye peduncle ..... *Paragoneplax* n. gen.  
 — G2 about same size of G1. G1 straight. One or two short suborbital teeth on each orbit. No iridescent region at distal end of eye peduncle ..... 15
15. Long basal antennular articles do not fit into antennular fossae (see Serène & Umali 1972: fig. 73). Anterolateral teeth obsolete. Vulva without vulvar cover ..... *Hadroplax* n. gen.  
 — Relatively short basal antennular articles that fit into antennular fossae. Anterolateral teeth present (obsolete or reduced in *Neogoneplax costata* n. sp.; see Figs 30A; 31). Vulva with vulvar cover (see Fig. 32) ..... *Neogoneplax* n. gen.
16. Carapace subquadrate. G1 stout, proximal portion broad, nearly triangular (Guinot 1990: figs 44, 45, 47, 48, 50, 52, 53). Vulva small, with small vulvar cover (see Fig. 47) ..... *Psopheticus*  
 — Carapace subcircular. G1 slender, proximal portion not expanded (see Fig. 48B). Vulva much expanded, without vulvar cover (see Figs 48; 49) ..... *Exopheticus* n. gen.

Genus *Carcinoplax* H. Milne Edwards, 1852

*Curtonotus* de Haan, 1833: 4, 20, 233 [as subgenus without nominal species, name preoccupied by *Curtonotus* Stephens, 1827 (Coleoptera)]. — Dana 1851: 285 [diagnosis]; 1852: 310 [diagnosis], 1493 [in list].

*Carcinoplax* H. Milne Edwards, 1852: 164 [replacement name]. — Ortmann 1894: 685 [in key]; 1898: 1176

[in list] (part). — Alcock 1899: 70 [diagnosis]; 1900: 292 [in list], 298 [in key], 301. — Stebbing 1905: 37 [discussion]. — Tesch 1918: 154 (part). — Bals 1922: 135; 1957: 1656 (part). — Sakai 1939: 555 [in key], 555; 1969: 269; 1976: 523 [in key] (part). — Barnard 1950: 282 [in key], 286 [diagnosis] (part). — Imaizumi 1960: 219; 1961: 162, 163 [fossils]. — Serène 1968: 89 [in list] (part). — Guinot 1969a: 246 [discussion]; 1969b: 520, 524 [discussion]; 1971: 1081 [list of

species]; 1989: 273 [revision] (part). — Glaessner 1969: R526 [diagnosis]. — Serène & Lohavanijaya 1973: 62, 63 [key to species] (part). — Chen 1984: 188; 1998: 266 [key to species] (part). — Dai *et al.* 1986: 366 [key to species] (part). — Dai & Yang 1991: 394 [key to species] (part). — Hsueh & Huang 2002: 116 [in key], 119 [key to species] (part). — Davie 2002: 193 (part). — Karasawa & Kato 2003b: 130 [in list], 140 [in list], 141 [in table] (part). — Poore 2004: 434 (part). — Karasawa & Schweitzer 2006: 26 [in list], 40 (part). — Ng & Manuel-Santos 2007: 42 [discussion].

Not *Carcinoplax* – A. Milne-Edwards 1873: 267 (= *Heteropilumnus* De Man, 1895).

TYPE SPECIES (of *Curtonotus*). — *Cancer* (*Curtonotus*) *longimana* de Haan, 1833 (subsequent designation by Glaessner [1929]; gender feminine).

EXTANT SPECIES INCLUDED. — *Carcinoplax abyssicola* (Miers, 1886); *C. confragosa* Rathbun, 1914; *C. cracens* n. sp.; *C. inaequalis* (Yokoya, 1933); *C. indica* Doflein, 1904; *C. ischurodous* (Stebbing, 1923); *C. longimana* (de Haan, 1833); *C. longipes* (Wood-Mason, 1891); *C. monodi* Guinot, 1989; *C. nana* Guinot, 1989; *C. purpurea* Rathbun, 1914; *C. sinica* Chen, 1984; *C. specularis* Rathbun, 1914; *C. spinosissima* Rathbun, 1914; *C. tenuidentata* n. sp.; *C. tomentosa* Sakai, 1969; *C. tuberosa* n. sp.; *C. velutina* n. sp.

All species are restricted to the Indo-West Pacific region; some also found in subtropical areas contiguous to the Indo-West Pacific region.

FOSSIL SPECIES INCLUDED (Karasawa & Kato [2003b]). — *Carcinoplax antiqua* (Ristori, 1889); *C. granulimanus* Karasawa & Inoue, 1992; *C. imperfecta* Karasawa & Inoue, 1992; *C. mongosungi* Hu & Tao, 1985; *C. proavita* (Glaessner, 1960); *C. prisca* Imaizumi, 1961; *C. sp. aff. C. purpurea* Rathbun, 1914 (Karasawa & Kato 2003b); *C. shukumi* Hu & Tao, 1985; *C. temikoensis* Feldmann & Maxwell, 1990; *C. thongi* Hu & Tao, 1985; *C. tsengi* Hu & Tao, 1996; *Carcinoplax* sp. (Feldmann & Keyes 1992); *Carcinoplax* sp. (Karasawa 1997); *Carcinoplax* sp. (Kato 1996).

SPECIES NOT INCLUDED IN *CARCINOPLAX*. — *Carcinoplax angusta* Rathbun, 1914 (in yet undescribed genus in the family Euryplacidae; see Remarks).

*Carcinoplax barnardi* Capart, 1951 (in *Goneplax* Leach, 1814).

*Carcinoplax eburnea* Stimpson, 1858 (type material lost and never figured; perhaps a synonym of the portunid *Libystes nitidus* A. Milne-Edwards, 1867 (see Serène & Lohavanijaya [1973: 62])).

*Carcinoplax microphthalmus* Guinot & Richer de Forges, 1981 (in yet undescribed genus with affinities to the family Euryplacidae; see Remarks).

DIAGNOSIS. — Carapace transversely rectangular, wider than long, or quadrate, only slightly wider than long; widest at junction of anterolateral, posterolateral borders; front lamellar, straight, very rarely marked by slight median notch or projection (in *C. confragosa*). Notch between front, inner edge of supraorbital border distinct, very slight, or absent; orbits narrow, not expanded distally; supraorbital borders slightly sinuous; suborbital borders rounded, with short, blunt inner tooth not visible dorsally; anterolateral borders convex. Dorsal surface of carapace typically smooth (slight horizontal ridges in some species), moderately convex, without clear indication of regions. Outer orbital angle with tooth, elongated prominence, or unarmed; 2 (3 in rare cases when outer orbital tooth detached from outer orbital angle is included; one in *C. ischurodous*) anterolateral teeth on each side of carapace (no teeth in large specimens of few species). Basal antennal article short, slender, distalmost (third) article reaches front. Eye peduncles short, much shorter than front (0.2–0.3 front width); cornea spherical, only slightly expanded distally. No obvious stridulating mechanism other than possible rubbing of proximal portion of cheliped (P1) merus against pterygostomial ridge. Thoracic sternum wide. Median sulcus on thoracic sternite 4 absent; sutures 4/5, 5/6, 6/7, 7/8 interrupted medially (Fig. 1). Anterior end of sterno-abdominal cavity anterior to thoracic sternite 4. Cheliped fingers moderately slender or thick, shorter than propodus, darker in colour in most species; carpus with tooth on inner margin. Dorsal margins of meri, carpi, propodi of ambulatory legs (P2–P5) unarmed (except P2 merus of *C. spinosissima*); dactyli slender, smooth, setose. Male abdomen with 6 freely-movable somites plus telson, narrowly triangular, somites 4–6 gradually decreasing in width from somite 3 (widest somite). Telson about as long as wide. Somite 3 covers space between P5 coxae, somite 2 slightly narrower than or as narrow as somite 3 so that somites 1, 2 leave small, often triangular portion of thoracic sternite 8 visible (Guinot 1969b: fig. 61; 1989: fig. 2; Hsueh & Huang 2002: figs 7B, 9C, 10B), or somite 2 much narrower than somite 3 leaving a larger portion of thoracic sternite 8 visible (*C. monodi*; see Guinot 1969b: fig. 65, as *C. indica*; Guinot 1989: fig. 3). G1 long, slender, thin, straight or slightly sinuous, only slightly broadened proximally; truncated or pointed, thin tip. G2 slender, slightly longer than or as long as G1, flagellum shorter than proximal part (peduncle), slightly-expanded tip with 1 or 2 (rarely 3) spinules. Penis arising from P5 coxa, moderate size; broad, soft proximal expansion. Female abdomen with 6 freely-movable somites, wide. Telson wider than long. Somite 3 covers space between P5 coxae, somite 2 narrower than somite 3 so that somites 1, 2 leave small, often triangular portion of thoracic sternite 8 visible, or somite 2 as wide as somite 3 so that thoracic sternite 8 not visible. Vulva of mature females (Fig. 1) greatly expanded, extending

from suture 5/6 to suture 6/7, covered by soft membrane, vulvar cover absent.

#### REMARKS

The history of the genus *Carcinoplax* was summarized by Serène & Lohavanijaya (1973: 62) and Guinot (1989: 267). The genus was described as *Curtonotus* by de Haan (1833) for *Curtonotus longimanus* and *C. vestitus* (= *Entricoplax vestita* n. comb.), both from Japan. *Curtonotus* was preoccupied and consequently replaced by *Carcinoplax* by H. Milne Edwards (1852: 164). Additional species were described, which were progressively listed by Tesch (1918) and Balss (1957). The status of some of the species remained questionable, mostly because of changes in the shape of the carapace and the size of the chelipeds (P1) with age. Barnard (1950: 287), for instance, doubted the validity of the seven species from the Philippine Is described by Rathbun (1914). Serène & Lohavanijaya (1973: 63) commented on the status of some of the species and gave a key to 17 species, of which seven do not belong to *Carcinoplax sensu stricto*, one (*C. verdensis* Rathbun, 1914) proved to be a junior synonym of another (*C. specularis* Rathbun, 1914), and a ninth species (*C. angusta* Rathbun, 1914) actually belongs in another family.

The heterogeneous nature of the genus was recognized by earlier workers. Sakai (1969: 269) recognized three groups among the 17 species he listed but solely based on the morphology of the orbits and the anterolateral teeth. This was a very artificial grouping since species with very different G1, G2, male abdomens, and vulvae were placed together in the same groups. Guinot (1969b: 524) similarly recognized three groups (plus the unique status of some species), which were different from those of Sakai (1969). Although far more significant characters such as the G1, male abdomens, and thoracic sternites were considered, it was concluded that it was premature to create sub-generic or other taxa ("catégories sous-génériques ou autres") for the genus since several species had not been examined by her. Guinot (1989) made the only revision of the genus so far, listing a total of 28 species, seven of which were not examined.

The status of several species described under *Carcinoplax* nevertheless remained problematic. Serène & Vadon (1981: 127) listed two unidentified species that presumably were new. Their *Carcinoplax* sp. A appears to indeed belong in *Carcinoplax* based on their description of the G1. *Carcinoplax* sp. B, however, most probably belonged in *Pycnoplax* n. gen. because, as pointed out (Serène & Vadon 1981: 127), the G1 was of the same type as that of *C. bispinosa* Rathbun, 1914 (= *Pycnoplax bispinosa* n. comb.) and *C. surugensis* Rathbun, 1932 (= *P. surugensis* n. comb.). No "*Carcinoplax* sp. A and B" specimens could be found in the MNHN collections.

*Carcinoplax angusta* Rathbun, 1914 does not belong to *Carcinoplax sensu stricto*. This species was described from specimens collected in the Philippine Is, a female holotype (23.8 × 27.6 mm, USNM 46166; see Guinot 1989: fig. 39, pl. 12, figs A-E) and a pre-adult male (10 × 10.8 mm, same catalogue number). Most of the unique characters that separate *C. angusta* from *Carcinoplax sensu lato* were nevertheless clearly outlined by Rathbun (1914: 142): narrow male abdomen; slightly bilobed front; oblique supraorbital borders; sub octagonal, convex carapace; inner margin of suborbital border with a "very large and prominent" tooth; and two small anterolateral teeth (first being a "blunt tooth or large tubercle"). The G1 is slender and the distal portion provided with small spinules (Zarenkov 1972: fig. 6-4; Guinot 1989: fig. 39D; Chen 1998: fig. 6-7, as *C. angustata* [sic]) and the G2 is much shorter than the G1 (Chen 1998: fig. 6-8, as *C. angustata* [sic]). The sterno-abdominal cavity of males is conspicuously deep. The penis is relatively long, much longer than in *Carcinoplax*, and it lies in a concave thoracic sternite 8 before joining the G1. The thoracic sternite 8 is not visible from dorsal view. Females have a relatively narrow abdomen and the vulva is large and round (though not as large as in *Carcinoplax*) and surrounded by a thick lip. All of these characters clearly separate *C. angusta* from other species of *Carcinoplax sensu stricto* and from the other goneplacine genera being described as new. These characters support the inclusion of *C. angusta* in the family Euryplacidae (see Table 2).



A species morphologically similar to *C. angusta*, *C. microphthalmus* Guinot & Richer de Forges, 1981, was described from a very large male holotype (53.3 × 61.4 mm, MNHN-B 6832; Guinot & Richer de Forges 1981a: pl. 6, figs 1, 1a) and eight male and one female paratypes, also of large size (33.1 × 37.0 mm to 53.2 × 61.8 mm, MNHN-B 6828-6831, 6833; Guinot & Richer de Forges 1981a: pl. 6, figs 2, 3), all from New Caledonia.

*Carcinoplax microphthalmus* differs from *Carcinoplax sensu stricto* and from other new goneplacine genera in having a narrow male abdomen (Guinot & Richer de Forges 1981b: fig. 9C), very slender and long G1 with a pointed tip (Guinot & Richer de Forges 1981b: fig. 10E-G), and a relatively narrow female abdomen, all suggesting affinities to

the Euryplacidae. The G2, however, is as long as or slightly longer than the G1 (Guinot & Richer de Forges 1981b: fig. 10H) as in *Carcinoplax sensu stricto*, although the flagellum is as long as the proximal part, not shorter as in *Carcinoplax*. Also unlike *Carcinoplax* is a small vulva that is partially covered by a thick vulvar cover, a structure that appears to be absent among euryplacids. Other differences from typical euryplacids are the absence of many small denticles on the G1 and a penis that is not long and protected by a concave thoracic sternite 8. The thoracic sternite is not visible dorsally as in euryplacids. The taxonomic position of *C. microphthalmus* thus remains uncertain in anticipation of a revision of the Euryplacidae and related genera still in progress.

#### KEY TO SPECIES OF *CARCINOPLAX* H. MILNE EDWARDS, 1852

1. Only one well developed, anteriorly curved anterolateral tooth posterior to outer orbital tooth on each side of carapace (see Guinot 1989: pl. 13, fig. F, as *Carcinoplax eury sternum*) ..... *Carcinoplax ischurodous*
- Two anterolateral teeth posterior to outer orbital angle (one or two anterolateral teeth may be greatly reduced or even obsolete in some large individuals) ..... 2
2. Adults attain large size (cl more than 30-40 mm) and have reduced outer orbital and anterolateral teeth (obsolete in largest individuals), rounded anterolateral borders (carapace becoming spherical), and much enlarged chelipeds (P1) with conspicuously elongated meri, propodi ..... 3
- Adults do not attain large size (cl less than 30-40 mm) and do not show progressive reduction in outer orbital (if present) and anterolateral teeth with corresponding rounded anterolateral borders and chelipeds (P1) with conspicuously elongated meri, propodi ..... 7
3. Low, conspicuous granules on carapace. Dark red-brown carapace, bright red-brown markings on chelipeds (P1). Small individuals with triangular, acute first and curved, acute second anterolateral teeth (see Guinot 1989: pl. 1, fig. D) ..... *Carcinoplax longimana*
- No conspicuous granules on carapace. Carapace not dark-red brown. Small individuals with narrow, acute anterolateral teeth, or small, blunt first anterolateral teeth ..... 4
4. Small- to medium-size individuals with two narrow, acute, spine-like anterolateral teeth below acute, conspicuous outer orbital tooth on each side of carapace (see Guinot 1989: pl. 1, figs G, H; Hsueg & Huang 2002: fig. 6A). Carapace nearly quadrate, with red, round spot on dorsal surface in most individuals (see Hsueg & Huang 2002: fig. 8B) ...  
..... *Carcinoplax indica*
- Small- to medium-size individuals with blunt first anterolateral tooth, second tooth curved, acute. Carapace globose ..... 5
5. Outer orbital angle with short, triangular tooth. Second anterolateral tooth salient, usually hook-like (see Chen 1984: figs 2-1 to 2-4) ..... *Carcinoplax sinica*
- Outer orbital angle without tooth. Second anterolateral tooth short (more conspicuous in small individuals) ..... 6

6. Wide, purple-red vertical band across carapace from front to posterior border (see Hsueg & Huang 2002: fig. 8C). G1 with flat, truncated tip (Guinot 1989: fig. 21A). Western Pacific Ocean (Japan to Indonesia) in distribution ..... *Carcinoplax purpurea*  
 — No purple-red band across carapace. G1 with pointed tip (Guinot 1989: fig. 8A, B). Red Sea in distribution ..... *Carcinoplax monodi*
7. Carapace, chelipeds (P1), and ambulatory legs (P2-P5) covered with conspicuous setae ... 8  
 — Carapace, chelipeds (P1), and/or ambulatory legs (P2-P5) may have sparse setae, short tomentum, or mostly or completely devoid of conspicuous setae, or tomentum ..... 9
8. Conspicuous, acute tubercles on proximal portion of P1 propodi (may be absent in large individuals) (see Hsueh & Huang 2002: fig. 5E). Dark portion of about one quarter of fingers. Acute tooth on distal portion of ambulatory leg (P2-P5) meri (see Chen 1998: fig. 4-2; Hsueh & Huang 2002: fig. 5C). No conspicuous colour pattern .....  
 ..... *Carcinoplax spinosissima*  
 — Conspicuous, low, blunt tubercles on proximal portion of P1 propodi (see Guinot 1989: pl. 6, fig. H). Dark portion of about one half of fingers. Distal portion of ambulatory legs (P2-P5) meri smooth. Orange reticulated lines on P1 and carapace (clear when setae are removed) ..... *Carcinoplax nana*
9. Carapace, chelipeds (P1), and ambulatory legs (P2-P5) covered with short tomentum (large individuals only on ambulatory legs) (see Hsueh & Huang 2002: fig. 7A) .....  
 ..... *Carcinoplax tomentosa*  
 — Carapace, chelipeds (P1), and ambulatory legs (P2-P5) not covered with conspicuous short tomentum ..... 10
10. Outer orbital angle without tooth or eminence. Two thin, spine-like anterolateral teeth (see Figs 4A; 5) ..... *Carcinoplax tenuidentata* n. sp.  
 — Outer orbital angle ends in lobe or tooth. Anterolateral teeth not thin, spine like ..... 11
11. Front with slight median notch (see Guinot 1989: fig. 17) ..... *Carcinoplax confragosa*  
 — Front straight, without distinct median notch ..... 12
12. Conspicuous, well developed anterolateral teeth, with acute, anteriorly-oriented or hook-like tips ..... 13  
 — Relatively small, blunt anterolateral teeth (see Figs 7; 10) ..... 17
13. Ambulatory legs (P2-P5) long, relatively slender, distal end of merus of folded P5 extending beyond tip of second anterolateral tooth ..... 14  
 — Ambulatory legs (P2-P5) short, distal end of merus of folded P5 only reaching or barely reaching tip of second anterolateral tooth ..... 15
14. Two conspicuous, wide horizontal ridges on dorsal surface of carapace (see Fig. 3) .....  
 ..... *Carcinoplax cracens* n. sp.  
 — Dorsal surface of carapace without conspicuous ridges ..... *Carcinoplax longipes*
15. Two conspicuous, wide horizontal ridges on dorsal surface of carapace .....  
 ..... *Carcinoplax inaequalis*  
 — Dorsal surface of carapace without conspicuous ridges ..... 16
16. Outer orbital angle prominent, often with raised, tooth-like prominence (see Guinot 1989: pl. 8, figs A, B). Chelipeds (P1), particularly propodi, inflated (see Guinot 1989: pl. 9, fig. F, as *C. verdensis*) ..... *Carcinoplax specularis*

- Outer orbital angle flattened, inclined outwardly (see Guinot 1989: fig. 38, pl. 9, figs A, B). Chelipeds (P1), particularly propodi, slender (see Guinot 1989: pl. 9, fig. C) .....  
..... *Carcinoplax abyssicola*
17. Outer, dorsal surface of cheliped (P1) propodi and carpi with conspicuous granular tubercles (see Fig. 8). Ambulatory legs (P2-P5) relatively short (see Fig. 7), distal end of merus of folded P5 only reaching tip of second anterolateral tooth ..... *Carcinoplax tuberosa* n. sp.
- Outer, dorsal surface of chelipeds (P1) smooth. Ambulatory legs (P2-P5) relatively long (see Fig. 10), distal end of merus of folded P5 extending beyond tip of second anterolateral tooth ..... *Carcinoplax velutina* n. sp.

*Carcinoplax longimana* (de Haan, 1833)  
(Fig. 1)

*Cancer* (*Curtonotus*) *longimanus* de Haan, 1833: 50, pl. 6, fig. 1 [Japan].

*Curtonotus longimanus* – White 1847: 37 [in list].

*Cancer longimanus japonicus* – Doflein 1904: 115, pl. 36 (as *Cancer longimanus typicus*), 306 [in table] [Japan].

*Carcinoplax longimana* – H. Milne Edwards 1852: 164. — Ortmann 1894: 688. — Alcock 1900: 302 [in key], 303 [Southern India, Andaman Sea, Japan]. — Doflein 1904: 114 [Andaman Sea]. — Stebbing 1905: 37; 1910: 313; 1923: 3 [South Africa]. — Parisi 1918: 90 [Japan]. — Urita 1918: 194; 1926: 17 [in list] [Japan]. — Balss 1922: 135 [Japan]. — Gee 1925: 163 [in list] [China]. — Barnard 1926: 120; 1950: 287 [in key], 287, fig. 53g, h [South Africa]. — Yokoya 1933: 191, 211, 218 [Japan]. — Sakai 1934: 311; 1935: 181, pl. 53, fig. 3; 1939: 555, 721, pl. 101; 1940: 42 [in list]; 1956: 45 [in list]; 1965: 166, pl. 81; 1969: 269 [in lists]; 1976: 524 [in key], 524, pl. 189 [Japan]. — Kamita 1941a: 237, 241 [in list]; 1941b: 137 [Korea]; 1963: 23 [in list] [Japan]. — Lin 1949: 25 [Taiwan]. — Grindley 1961: 131 [South Africa]. — Imaizumi 1960: 220; 1961: 157, 161, pl. 21, figs 1-6 [fossils]. — Park 1964: 17 [in list] [Korea]. — Yamashita 1965: 10, figs 1-13 [Yellow and East China seas]. — Kurata 1968: 167, fig. 1 [larvae] [Japan]. — Takeda & Miyake 1968: 562, fig. 5a-e; 1969a: 459 [East China Sea]. — Kensley 1969: 151, 177 [in lists]; 1981: 46 [in list; South Africa]. — Guinot 1969b: 524 [discussion], fig. 61; 1971: 1081 [in list]; 1989: 273 [discussion], figs 2, 4, 6, pl. 1, figs A-D, pl. 2, figs A-D [Madagascar, Philippine Is]. — Kim 1970: 16 [in list] [Korea]. — Kim & Rho 1971: 18 [in list] [Korea]. — Zarenkov 1972: 244, fig. 6-3 [Vietnam]. — Sankarankutty & Subramaniam 1976: 22 [Tanzania]. — Serène & Soh 1976: 19 [Andaman Sea]. — Serène & Vadon 1981: 118, 119, 123, 126 [Philippine Is]. — Yamaguchi & Baba 1993: 428, fig. 151 A-C; 2003: 51 [type material]. — Chen 1998: 266 [in key], 266, 310 [in list], fig. 1 [South China

Sea]. — Ng 1998: 1114, unnumb. fig. — Yamaguchi & Holthuis 2001: figs 120, 121. — Karasawa & Kato 2003b: 130 [in list], 141 [in list]. — Karasawa & Schweitzer 2006: 26 [in list].

*Carinoplax* [*sic*] *longimanus* – Kamita 1936: 32 [in list] [Korea].

*Carcinoplax longimana* – Ortmann 1894: 688, pl. 23, fig. 3 [Japan]. — Tesch 1918: 154 [in list]. — Miyake 1961: 21 [in list] [Japan]. — Miyake *et al.* 1962: 129 [in list; Japan]. — Holthuis & Sakai 1970: 127, 279, pl. 23 [Japan]. — Serène 1968: 89 [in list]. — Serène & Lohavanijaya 1973: 62 [in list], 63 [in key], 65, figs 143-147, pl. 14, fig. A, pl. 15, fig. A [South China Sea]. — Kim 1970: 206; 1973: 405, 635, figs 160, 161, pls 30, 31, fig. 122a-c; 1977: 206 [in list] [Korea]. — Takeda 1973a: 13 [in list]; 1973b: 50, 61; 1975: 151, 152 [Japan]; 1995: 139 [in list]. — Kikuchi & Miyake 1978: 42 [in list] [Japan]. — Wang & Chen 1981: 155 [in list] [Taiwan]. — Kim & Kim 1982: 141, 151 [in list] [Korea]. — Chen 1984: 189 [in key], 189, 197, fig. 8, pl. 1, fig. 2 [East China Sea]. — Imanaka *et al.* 1984: 68 [Japan]. — Kim & Chang 1985: 53 [Korea]. — Dai *et al.* 1986: 366 [in key], 366, fig. 190-1, pl. 53, fig. 4 [China]. — Yamaguchi *et al.* 1987: 22 [list] [Japan]. — Tung *et al.* 1988: 93, 111, 112, 124, fig. 85 [East China Sea]. — Dai & Yang 1991: 394 [in key], 394, fig. 190-1, pl. 53, fig. 4 [China]. — Miyake 1991: 145, 219 [in list], pl. 49, figs 2, 2 [*sic*] [Japan]. — Rikuta 1991: 21 [Japan]. — Ho 1996: 85, unnumb. colour figs [Taiwan]. — Ikeda 1998: 41, 15, 132, pl. 53, figs 2 [as 3]-6 [Japan]. — Muraoka 1998: 47 [in list] [Japan]. — Ng *et al.* 2001: 33 [references] [Taiwan]. — Ito & Honma 2001: 29 [in list; Japan]. — Hsueh & Huang 2002: 119 [in key], 124, figs 2G, 9 [Taiwan]. — Ng & Davie 2002: 378 [Andaman Sea coast of Thailand]. — Ikeda & Takeda 2006: 179 [in list] [Japan]. — Takeda *et al.* 2006: 204 [in list] [Japan].

?*Pilumnoplax inaequalis* – Guinot 1969b: 526 [discussion], figs 62, 79, 80 (not *C. inaequalis* (Yokoya, 1933)).

*Carcinoplax longimana longimana* – Takeda 1975: 149, pl. 2, fig. 1, pl. 3, fig. 1 [East China Sea].

*Carcinoplax longimana indica* – Takeda 1975: 149, pl. 2, figs 2, 3, pl. 3, fig. 2 [South Africa].

Not *Carcinoplax longimanus* – Monod 1938: 143 (= *Carcinoplax monodi* Guinot, 1989).

TYPE MATERIAL. — Japan, P. F. von Siebold & H. Bürger coll., ♂ lectotype, ♂ paralectotype (RMNH D 308); 5 ♂♂ paralectotypes, dry, 1 ♀ dry (RMNH D 42139); 2 ♂♂ paralectotypes, dry (RMNH D 44436), mouthparts of paralectotype (RMNH 42140); ♂ paralectotype, dry cl 48.1 mm, cw 66.6 mm (MNHN-B 2958) (see Yamaguchi & Baba 1993: 428; 2003: 51; Fransen *et al.* 1997: 111).

TYPE LOCALITY. — Japan.

MATERIAL EXAMINED. — **South Africa.** Off Umvoti River, Natal, 220 m, T.R.R. Stebbing coll., 1 ♀ (BMNH 1928.12.I.100).

**Madagascar.** Tuléar, Grand Récif, 250-300 m, 10.III.1968, 1 ♂, 1 ♀ (MNHN-B 29798).

Off west coast, FAO 26, stn 151, 22°22'S, 43°08'E, 230-140 m, 6.XI.1973, 1 ♂ dry, cl 55.0 mm, cw 72.1 mm (MNHN-B 10045).

**Thailand.** Phuket I., Pichai fishing port, P. K. L. Ng *et al.* coll., 3-6.V.2000, 1 ♂, 1 ♀ (BMNH 2000.1976-1977).

**Japan.** Honshu, Sagami Bay, X.1966, M. Hayashi coll., 1 ♂ (MNHN-B 10217). — Tosa Bay, T. Sakai coll., IV.1961, 1 ♂ (BMNH 1986.942).

Unknown localities, P. F. von Siebold & H. Bürger coll., 1823-1834, ♂ dry paralectotype (MNHN-B 2958). — Boucard coll., 1883-1898, 1 ♂ dry, 1 ♀ dry (MNHN-B 4602). — 1 ♂ (BPBM S375).

**Taiwan.** Tai-Chi fishing port, 7.VIII.1990, 1 ♂, 1 ♀ (NTOU). — 7.XII.2004, P. Castro coll., 1 ♂, 1 ♀ (MNHN-B 29768).

Northeastern Taiwan, 100-300 m, VI.1993, 1 ♂ (BPBM S12119, ex ZRC 1995.592).

TAIWAN 2001, stn CC 63, 24°55.0'N, 122°03.2'E, 240-350 m, 5.V.2001, 1 ♂, 3 ♀♀ (MNHN-B 29655). — Stn CP 67, 24°51.3'N, 121°59.0'E, 259 m, 6.V.2001, 13 ♂♂, 6 ♀♀ (MNHN-B 29651). — Stn CP 68, 24°49.6'N, 122°00.8'E, 370 m, 6.V.2001, 5 ♂♂ (MNHN-B 29671), 1 ♀ (MMBA). — Stn CP 74, 24°50.8'N, 121°59.3'E, 220 m, 7.V.2001, 1 ♂, 1 ♀, 1 pre-adult ♀ (MNHN-B 29653). — Stn CP 78, 24°53.5'N, 121°57.3'E, 100-118 m, 7.V.2001, 1 ♀ (MNHN-B 29688). — Stn CP 79, 24°50.4'N, 121°59.9'E, 145-200 m, 8.V.2001, 2 ♂♂, 2 ♀♀ (MNHN-B 29647). — Stn CP 80, 24°50.9'N, 121°59.4'E, 194-214 m, 8.V.2001, 23 ♂♂, 13 ♀♀ (MNHN-B 29650). — Stn CP 81, 24°50.5'N, 121°59.9'E, 205 m, 8.V.2001, 1 ♂, 2 ♀♀ (MNHN-B 29648). — Stn CP 83, 24°51.4'N, 121°57.4'E, 75-110 m, 8.V.2001, 1 ♀ (MNHN-B 29656). — Stn CP 90, 24°53.6'N, 122°01.4'E, 300-330 m, 10.V.2001, 1 ♀ (MNHN-B 29654). — Stn CP 93, 24°50.1'N, 121°55.7'E, 66-110 m,

10.V.2001, 1 pre-adult ♂ (MNHN-B 29686). — Stn CP 95, 24°55.8'N, 122°05.7'E, 269-360 m, 18.V.2001, 5 ♂♂, 3 ♀♀ (MNHN-B 29660). — Stn CP 97, 24°54.2'N, 122°02.6'E, 377 m, 18.V.2001, 1 ♂ (MNHN-B 29649). — Stn CP 100, 24°53.2'N, 122°59.8'E, 233 m, 18.V.2001, 1 ♂ (MNHN-B 29678). — Stn CP 113, 24°50.8'N, 121°59.9'E, 281 m, 21.V.2001, 1 ♂, 2 ♀♀ (MNHN-B 29659). — Stn CP 114, 24°51.0'N, 121°58.3'E, 128-250 m, 21.V.2001, 4 ♂♂, 4 pre-adult ♂♂, 2 ♀♀, 6 pre-adult ♀♀ (MNHN-B 29687).

TAIWAN 2004, stn CH 256, 24°31.38'N, 121°53.98'E, 93-140 m, 27.VIII.2004, 6 ♂♂, 2 ♀♀ (MNHN-B 29645). — Stn CH 257, 24°30.33'N, 121°53.70'E, 157-275 m, 27.VIII.2004, 1 ♀ (MNHN-B 29657). — Stn CH 258, 24°29.22'N, 121°54.975'E, 173-225 m, 28.VIII.2004, 1 ♂ parasitised by *Sacculina*, 2 ♀♀ (MNHN-B 29644). — Stn CH 263, 24°31.45'N, 121°53.34'E, 101-106 m, 1.IX.2004, 1 ♂ (MNHN-B 29658).

**Philippine Islands.** South China Sea, MUSORSTOM 2, stn 68, 14°02'N, 120°19'E, 195-199 m, 29.XI.1980, 1 ♂ dry, cl 60.7 mm, cw 82.6 mm (MNHN-B 10055).

Bohol, Balicasag I., off Panglao I., tangle nets of local fishermen, 2.2004, 1 ♂ (ZRC 2004.0766).

**Indonesia.** Tanimbar Is, KARUBAR, stn CP 63, 08°00'S, 132°58'E, 215-214 m, 1.XI.1991, 6 ♂♂, 1 ♀, 1 ovig. ♀ (MNHN-B 29373).

DISTRIBUTION. — Wide distribution from South and East Africa to the western Pacific Ocean (Korea and Japan to Indonesia). Recorded here for the first time from Indonesia (Tanimbar Is). Depth: 66-377 m.

#### REMARKS

*Carcinoplax longimana* is very common throughout its wide geographical range. It is abundant as an incidental catch in bottom trawls. The marked variation in its morphometry with age has been illustrated by Yamashita (1965), Guinot (1989), and Ikeda (1998). As in *C. indica* Dofflein, 1904, the anterolateral teeth are much reduced and the carapace becomes rounded in large individuals. The two species can be distinguished by the presence of a large red spot on the dorsal surface of the carapace of *C. indica*, which is absent in *C. longimana*.

#### *Carcinoplax abyssicola* (Miers, 1886)

*Pseudorhombila* (*Pilumnoplax*) *abyssicola* Miers, 1885: 588 (*nomen nudum*).

*Pilumnoplax abyssicola* Miers, 1886: xxiv, xl, xlvi, 226, 227 [in list], 228, pl. 19, figs 2, 2a, 2b [Fiji]. — Tesch 1918:



FIG. 1. — *Carcinoplax longimana* (de Haan, 1833), ♀, cl 29.1 mm, cw 37.8 mm, off northeastern Taiwan, TAIWAN 2001, stn CP 81, 205 m (MNHN-B 29648), thoracic sternum and vulva.

155 [in list], 156 [in key], 156 [Indonesia]. — Serène 1968: 90 [in list]. — Guinot 1969b: 526 [discussion]; 1971: 1081 [in list]. — Serène & Lohavanijaya 1973: 62 [in list], 65 [in key].

Not *Pilumnoplax abyssicola* – Whitelegge 1900: 158 (= *Pycnoplax meridionalis* (Rathbun, 1923) n. comb.; see McNeil 1929: 150).

*Carcinoplax abyssicola* – Guinot 1969b: 526 [discussion]; 1989: 305, fig. 38, pl. 9, figs A-C [holotype] [Fiji].

TYPE MATERIAL. — *Challenger*, stn 173, ♂ holotype, cl 8.2 mm, cw 10.0 mm (BMNH 84.31).

TYPE LOCALITY. — Fiji, 576 m.

MATERIAL EXAMINED. — Fiji. *Challenger*, stn 173, 576 m, ♂ holotype, cl 8.2 mm, cw 10.0 mm (BMNH 84.31).

DISTRIBUTION. — Fiji (Miers 1886) and questionably Indonesia (North Maluku, Kai Is [Tesch 1918]). Depth: 397–984 m.

#### REMARKS

Guinot (1969b: 526, as *Pilumnoplax abyssicola*) commented on the position of *C. abyssicola*, suggesting its position in *Carcinoplax sensu lato* rather than in the original conception of the genus (“*Carcinoplax sensu stricto*”). The species was included in *Carcinoplax* in a later revision, however (Guinot 1989).

*Carcinoplax abyssicola* is only known from its male holotype, a small specimen collected from Fiji (cl 8.2 mm, cw 10.0 mm; BMNH 84.31). It is close to small specimens of *C. specularis* Rathbun, 1914, which has also been collected in Fiji (see Remarks of *C. specularis* below). The main difference between the two species is their outer orbital angles, flat and inclined posteriorly in *C. abyssicola* (Miers 1886: pl. 19, fig. 2; Guinot 1989: fig. 38, pl. 9, figs A, B) but typically raised as a conspicuous process in *C. specularis* (Guinot 1989: figs 24, as *C. polita*, 25;

pl. 8, figs A, B). Guinot (1989: 307) considered *C. verdensis* Rathbun, 1914, a synonym of *C. specularis* (see Remarks for *C. specularis* below), as the species closest to *C. abyssicola*. *Carcinoplax specularis* is a highly variable species, however, and its outer orbital angle (Guinot 1989: fig. 22, as *C. verdensis*) can sometimes be as flat as that of *C. abyssicola*. *Carcinoplax abyssicola* and *C. verdensis* were correctly differentiated by the presence of more slender cheliped (P1) propodi in *C. abyssicola* (Guinot 1989: pl. 9, fig. C) in contrast to the conspicuously inflated ones of *C. verdensis* (and thus of *C. specularis*) (Guinot 1989: pl. 9, fig. F). The examination of the holotype of *C. abyssicola* also showed that its anterolateral teeth and ambulatory legs (P2-P5) are more slender than in *C. specularis*.

There are doubts that Tesch's specimens from Indonesia (Tesch 1918) actually belong to *C. abyssicola*. The specimens were collected by the *Siboga* Expedition but could not be found at ZMA, where all other *Siboga* goneplacids are deposited.

### *Carcinoplax confragosa* Rathbun, 1914

*Carcinoplax confragosa* Rathbun, 1914: 140 [Philippine Is]. — Tesch 1918: 154 [in list]. — Estampador 1937: 533 [in list]; 1959: 89 [in list] [Philippine Is]. — Serène 1968: 90 [in list]. — Sakai 1969: 271 [in list], fig. 15e [holotype]. — Guinot 1989: 289 [discussion], figs 17, 29, pl. 6, figs A, B, B1, C-E [Philippine Is, Indonesia].

Not *Carcinoplax confragosa* – Zarenkov 1972: 241, fig. 7-1 (= *Carcinoplax indica* Doflein, 1904).

Not *Carcinoplax confragosa* – Serène & Lohavanijaya 1973: 62 [in list], 64 [in key], 67, figs 174, 175, pl. 16, fig. A (? = Xanthidae).

*Carcinoplax* aff. *tomentosa* – Serène & Vadon 1981: 119, 123, 126 [Philippine Is] (not *Carcinoplax tomentosa* Sakai, 1969).

TYPE MATERIAL. — *Albatross*, stn 5420, ♀ holotype, cl 38.3 mm, cw 44.9 mm (USNM 46153).

TYPE LOCALITY. — Philippine Islands, between Cebu and Bohol, 09°49'N, 123°45'E, 232 m.

MATERIAL EXAMINED. — **Philippine Islands.** Between Cebu and Bohol, *Albatross*, stn 5420, 09°49'N, 123°45'E, 232 m, 25.III.1909, ♀ holotype (USNM 46153). South China Sea, MUSORSTOM 1, stn CP 51, 13°49'N,

120°04'E, 170-200 m, 25.III.1976, 1 ♂, 1 ♀ (MNHN-B 10069).

DISTRIBUTION. — Philippine Is and Indonesia (Makassar Strait) (see Guinot 1989). Depth: 170-232 m.

#### REMARKS

Unique among the species of *Carcinoplax* is the presence of a front that has a slight median notch (see Guinot 1989: fig. 17). Also characteristic is the presence of thick granules on the dorsal surface of the chelipeds (P1) and carapace, particularly the anterior and anterolateral margins. The granules, however, become less noticeable with size although they remain visible along the anterior margin.

The morphology of the G1 also departs slightly from the typical G1 of *Carcinoplax*, the tip being elongated and slender (see Guinot 1989: fig. 29).

The Vietnam material identified as *C. confragosa* by Zarenkov (1972: 241, fig. 7-1) clearly does not belong to this species. As previously noted by Guinot (1989: 91), there are clear differences between the three acute anterolateral teeth, which are directed outwards in the Vietnam specimen (shorter, blunt tip, directed anteriorly in *C. confragosa*), the slender and acute teeth of the P1 (shorter, blunt in *C. confragosa*), the complete front (with a median notch in *C. confragosa*), and the broad tip of the G1 of Zarenkov's specimen (pointed and slender in *C. confragosa*). All of these characters are diagnostic of *C. indica* Doflein, 1904.

A female from the South China Sea identified by Serène & Lohavanijaya (1973: 67, figs 174, 175, pl. 16, fig. A) as *C. confragosa* does not belong to this species. It is perhaps an unidentified xanthid (Guinot 1989: 291).

### *Carcinoplax cracens* n. sp. (Figs 2; 3)

*Carcinoplax inaequalis* – Ho *et al.* 2004: 660, fig. 6G [Taiwan] (not *Carcinoplax inaequalis* Yokoya, 1933).

TYPE MATERIAL. — SMIB 5, stn DW 94, ♂ holotype, cl 18.9 mm, cw 25.6 mm (MNHN-B 29430); pre-adult ♀ paratype, cl 7.0 mm, cw 11.2 mm (MNHN-B 29816). — Panglao I., tangle nets of local fishermen, 100-300 m, ♂ paratype, cl 13.5 mm, cw 19.4 mm (MNHN-B 29721); 3 ♀♀ paratypes (cl 15.2 mm, cw

21.3 mm; cl 15.0 mm, cw 10.8 mm; cl 18.4 mm, cw 25.0 mm) (MNHN-B 29721).

TYPE LOCALITY. — New Caledonia, off southeastern coast, 22°19.6'S, 168°42.8'E, 275 m.

MATERIAL EXAMINED. — **Taiwan.** TAIWAN 2000, stn DW 5, 22°40.5'N, 119°56.5'E, 213-236 m, 27.VII.2000, 1 ♀ (MMBA).

**Philippine Islands.** Bohol, Balicasag I., off Panglao I., tangle nets of local fishermen of local fishermen, 50-500 m, 28.XI.2001, 2 ♂♂ (ZRC 2001.0527). — 200-300 m, VI.2002, 8 ♂♂, 2 ♀♀, 3 ovig. ♀♀ (ZRC 2002.0653), 3 ♂♂, 1 ♀ (ZRC 2002.0649). — 50-500 m, III.2004, 2 ♂♂ (ZRC 2004.0767). — V.2004, 1 ♀ (ZRC 2004.0768). — Panglao I., Maribohoc Bay, tangle nets of local fishermen, 100-300 m, T. J. Arbasto coll., XI.2003-IV.2004, 1 ♂, 3 ♀♀ (MNHN-B 29721). — Panglao I., north coast, tangle nets of local fishermen, T. J. Arbasto coll., VII.2004-V.2005, 1 ♂ parasitised by sacculinid (ZRC 2006.0218).

?**Indonesia.** Kai Is, KARUBAR, stn DW 49, 07°59'S, 132°58'E, 209-206 m, 29.X.1991, 1 pre-adult ♀ (MNHN-B 30056).

**Solomon Islands.** SALOMON 2, stn DW 2255, 08°07.7'S, 157°02.1'E, 185-196 m, 3.XI.2004, 1 ♂, 1 pre-adult ♂ (MNHN-B 30465).

**New Caledonia.** SMIB 5, stn DW 94, 22°19.6'S, 168°42.8'E, 275 m, 13.IX.1989, ♂ holotype (MNHN-B 29430); 1 pre-adult ♀ paratype (MNHN-B 29816).

ETYMOLOGY. — From *cracens*, Latin for “slender” and “graceful”, in reference to the long and slender ambulatory legs (P2-P5) diagnostic of the species.

DISTRIBUTION. — Western Pacific Ocean from Taiwan (Ho *et al.* 2004, as *C. inaequalis*) to New Caledonia. Depth: 50-500 m.

#### DESCRIPTION

Carapace (Fig. 3; Ho *et al.* 2004: fig. 6G, as *Carcinoplax inaequalis*) quadrate, slightly wider than long (1.3 as wide as long in holotype), anterolateral borders arched. Carapace convex, with 2 conspicuous, raised horizontal regions extending to lateral borders, anterior one across gastric region, posterior one across cardiac region; 2 spherical, slightly raised regions in central gastric portion of wide groove formed between horizontal ridges. Dorsal surface of carapace granular along anterior (hepatic region) and posterolateral borders; granules conspicuous along posterolateral borders. Front lamellar, straight, margin slightly convex, not marked by median notch. Slight notch between front, inner edge of

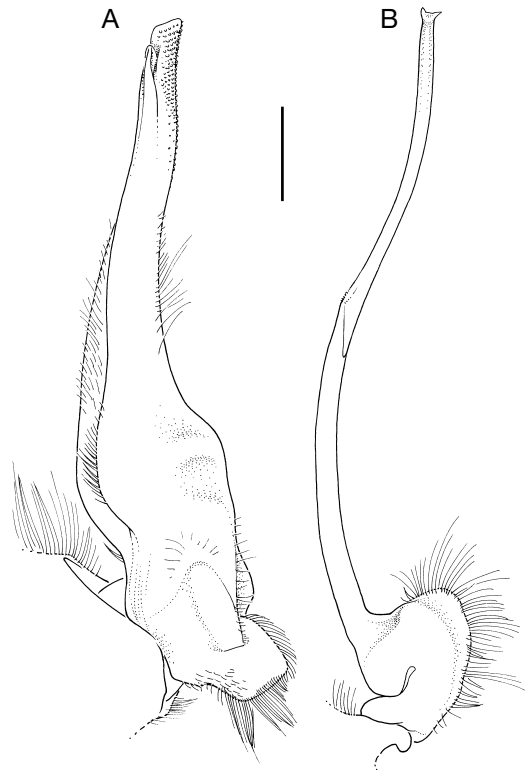


FIG. 2. — *Carcinoplax cracens* n. sp., ♂ holotype, cl 18.9 mm, cw 25.6 mm, off southeastern coast of New Caledonia, SMIB 5, stn DW 94 (MNHN-B 29430): **A**, left G1, dorsal view; **B**, left G2, ventral view. Scale bar: 1 mm.

supraorbital border. Supraorbital borders sinuous, margins smooth. Suborbital borders with large granules, each border with blunt inner tooth not visible dorsally. Large blunt to slightly pointed tooth on outer orbital angle; 2 anterolateral teeth on each side of carapace, first blunt, second curved, acute-tipped. Posterolateral borders arched.

Subhepatic, pterygostomial regions, pterygostomial crest, pterygostomial lobe, merus, ischium of third maxilliped endopod with short, conspicuous granules.

Eye peduncles (Fig. 3) short (0.2 front width), distal margin slightly granular, cornea slightly expanded distally.

Chelipeds (P1) nearly equal in males, females, slightly more slender in males; fingers slender, as long as propodus, with cutting edges and broadly

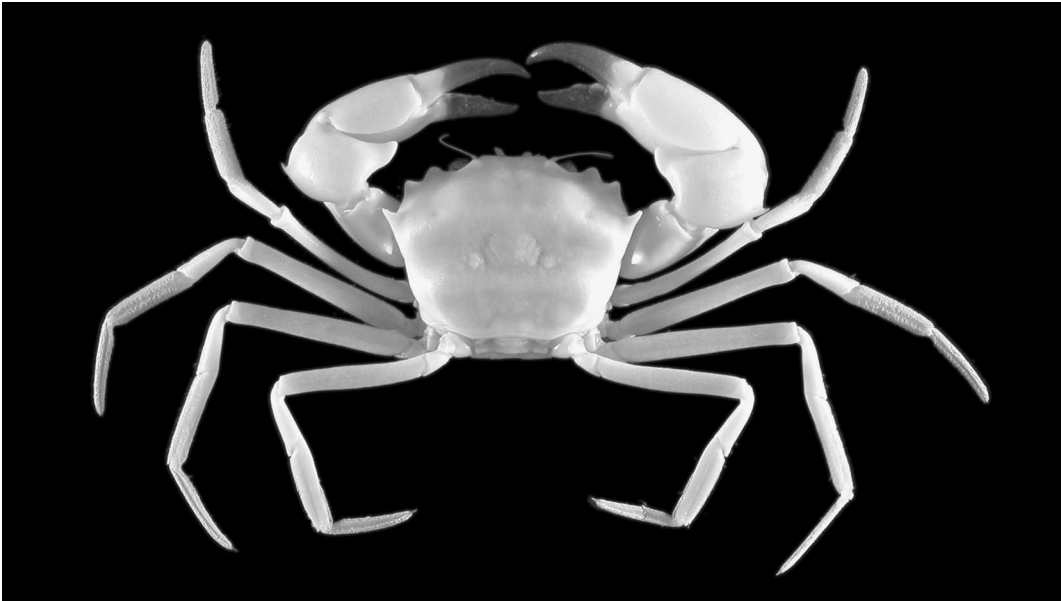


FIG. 3. — *Carcinoplax cracens* n. sp., ♂ holotype, cl 18.9 mm, cw 25.6 mm, off southeastern coast of New Caledonia, SMIB 5, stn DW 94 (MNHN-B 29430).

blunt teeth, more than half of distal portion of fingers dark brown. Broad, curved, acute- to obtuse-tipped tooth on inner (ventral), proximal margin of carpus; smaller, curved, acute-tipped tooth on outer (dorsal), distal margin. Ambulatory legs (P2-P5) conspicuously long, slender, smooth; many short simple setae along inner, outer margins of P5 propodus, dactylus, outer margin of P5 carpus; P5 dactylus long, slender, smooth; length of P5 merus 0.6 cl.

Male abdomen narrowly triangular, with 6 freely-movable somites plus telson; telson slightly wider than long, somite 3 covers space between P5 coxae. Somites 1, 2 slightly narrower than somite 3, thoracic sternite 8 not visible. G1 (Fig. 2A) long, slender; straight, slightly pointed tip. G2 (Fig. 2B) slender, nearly equal or slightly longer than G1, slightly curved flagellum, tip with spinule at each side.

Female abdomen wide. Telson slightly wider than long. Somites 1, 2 cover space between P5 coxae, thoracic sternite 8 not visible. Vulva of mature females greatly expanded, extending from edge of slightly deflected suture 5/6 to suture 6/7; membrane covers aperture leaving space open along pointed anterior margin.

#### Colour

Carapace and chelipeds of recently preserved specimens with thick orange-red bands on a white to light orange-red background; ambulatory legs banded orange-red (see Ho *et al.* 2004: fig. 6G, as *Carcinoplax inaequalis*).

#### REMARKS

The examination of part of the type material of *C. inaequalis* (Yokoya, 1933) (see Remarks of the species below) showed that the Taiwan material identified as belonging to *C. inaequalis* species by Ho *et al.* (2004) as well as additional material from the Philippine Is and New Caledonia actually belong to a previously undescribed species.

The new species shares many characters with *C. inaequalis* and *C. specularis* Rathbun, 1914: similar G1 and G2; conspicuous, rounded outer orbital angle; and acute second anterolateral tooth. The walking legs are noticeably longer and more slender in *C. cracens* n. sp. (Fig. 3) than in both *C. inaequalis* and *C. specularis*. The distal end of the merus of the folded P5 extends well beyond the tip of the second anterolateral tooth, but they extend



to just the tip of the tooth in the other two species. The second anterolateral tooth is blunt in *C. cracens* n. sp. but acute in *C. inaequalis* and *C. specularis*. Also characteristic of the new species are the two conspicuous, carina-like horizontal ridges that extend across the carapace along the hepatic and gastric regions. Although not that conspicuous, the ridges may also be observed in *C. inaequalis* and in large specimens of *C. specularis*. The low tubercles on the hepatic region of the carapace are larger and hence more conspicuous in *C. cracens* n. sp. than in the other two species.

A small (cl 5.2 mm, cw 6.3 mm), incomplete specimen (P1 and P2-P4 on one side only) from the Kai Is, Indonesia (MNHN-B 30056) is questionably identified as belonging to the new species.

### *Carcinoplax inaequalis* (Yokoya, 1933)

*Pilumnoplax inaequalis* Yokoya, 1933: 194, 217, 220, fig. 63 [Japan]. — Sakai 1935: 183, pl. 54, fig. 1 [Japan]. — Imai-zumi 1960: 219 [Japan]. — Chen 1984: 193.

*Homoiooplax haswelli* – Sakai 1939: 566, pl. 102, fig. 2; 1940: 42 [in list]; 1976: 540, fig. 287 [Japan]. — Miyake *et al.* 1962: 130 [in list] [Japan]. — Kikuchi & Miyake 1978: 42 [in list] [Japan]. — Miyake 1991: 220 [in list] [Japan] (not *Homoiooplax haswelli* Miers, 1884).

*Homoiooplax inaequalis* – Serène 1968: 90 [in list].

?Not *Pilumnoplax inaequalis* – Guinot 1969b: 526, figs 62, 79, 80 (= *C. longimana* (de Haan, 1833)).

*Carcinoplax inaequalis* – Sakai 1969: 269 [in list]. — Guinot 1971: 1081 [in list]. — Serène & Lohavanijaya 1973: 62 [in list], 64 [in key].

Not *Carcinoplax inaequalis* – Ho *et al.* 2004: 660, fig. 6G [Taiwan] (= *Carcinoplax cracens* n. sp.).

TYPE MATERIAL. — ♂ dry lectotype, cl 11.6 mm, cw 15.6 mm (KMNH IvR 100,002); 2 ♀♀ dry paralectotypes (cl 6.6 mm, cw 9.0 mm; cl 6.0 mm, cw 10.0 mm) (KMNH IvR 100,006); 2 ♀♀ dry paralectotypes (cl 7.7 mm, cw 11.0 mm; cl 8.0 mm, cw 11.6 mm) (KMNH IvR 100,004).

TYPE LOCALITY. — Japan, Shikoku, northeast of Asizuri-zaki [Cape Ashizuri], 130 m.

MATERIAL EXAMINED. — **Japan.** Honshu, south of Inuboe-zaki [Cape Inuboe], stn 9, 238 m, 22.VI.1926,

2 ♀♀ paralectotypes (KMNH IvR 100,006). — Off Maisaka, Shizuoka-ken, stn 194, 192 m, 1.VII.1927, 2 ♀♀ paralectotypes (KMNH IvR 100,004). Shikoku, northeast of Asizuri-zaki [Cape Ashizuri], stn 337, 130 m, 26.VII.1928, ♂ lectotype (KMNH IvR 100,002).

DISTRIBUTION. — Japan (see Sakai 1976). Depth: 35–384 m.

### REMARKS

The species was not mentioned by Guinot (1989) in her revision of *Carcinoplax* but was commented upon in an earlier publication (Guinot 1969b: 526). The taxonomy of the species was discussed by Ho *et al.* (2004: 660) but their Taiwan material did not belong to *C. inaequalis* but to a species being described as new, *C. cracens* n. sp. (see above).

The validity of *C. inaequalis* and its inclusion in *Carcinoplax* has been confirmed by the examination of five of the 20 syntype specimens listed in its description (Yokoya 1933: 194). The only male among the specimens examined is designated herein as the lectotype (KMNH IvR 100,002), and the four females as paralectotypes (KMNH IvR 100,004, 100,006). All characters agree with the description including the “two well-marked transversal carinae; the anterior on the gastric and another on the cardiac region”, which unfortunately are not indicated in the drawing accompanying the description (Yokoya 1933: 195, fig. 63). The anterolateral teeth are slender, with an acute tip, a character not clearly shown in Yokoya’s drawing. The ambulatory legs (P2–P5) are relatively short and thick, another character that distinguished *C. inaequalis* from *C. cracens* n. sp. (see Remarks for *C. cracens* n. sp. above).

*Carcinoplax inaequalis* was placed in synonymy with *Carcinoplax surugensis* Rathbun, 1932 by Takeda & Miyake (1969a). The material examined by them belonged indeed to *C. surugensis* as evidenced by their illustrations (Takeda & Miyake 1969a: fig. 2) of the characteristic G1, G2, and male abdomen of this species (see Remarks for *P. surugensis* n. comb. and its inclusion in *Pycnoplax* n. gen. below). This is very puzzling since the authors (Takeda & Miyake 1969a: 459) state that they examined dried specimens identified by Yokoya as *Pilumnoplax inaequalis*,

including “some syntypes”. The syntype selected as the lectotype (see above) was actually examined by Takeda as confirmed by the label “*Carcinoplax surugensis* Rathbun, 1932 (June 1969, M. Takeda det.)” that was found together with the specimen. It seems that Takeda did not examine the G1 and G2 of the lectotype since the abdomen of the dried specimen was tightly closed. To add to the confusion, Sakai (1976: 540) erroneously referred to the *P. surugensis* n. comb. record of Takeda & Miyake (1969a) as *C. inaequalis* (as *Homoiooplax haswelli*), obviously unaware of the sharp differences in their respective G1 and G2.

The G1 of the lectotype of *C. inaequalis* is typical of *Carcinoplax* (i.e. long, slender, and thin, being dorso-ventrally flattened). It has a pointed tip. The G2 (with flagellum that is shorter than the proximal portion) and narrow male abdomen are also characteristic of *Carcinoplax*. In *Pycnoplax* n. gen. the G1 is stout, thick, proximally broad, the G2 has a flagellum that is as short (as in *P. surugensis* n. comb.) or slightly shorter than the proximal portion, and the male abdomen is wider than in *Carcinoplax* (see Remarks for *Pycnoplax* n. gen. below).

The material from Taiwan identified as *C. inaequalis* by Ho *et al.* (2004: 660) is characterized by long and slender ambulatory legs (P2-P5) and is being described as a new species (*C. cracens* n. sp.). Other differences and similarities between *C. inaequalis* and *C. cracens* n. sp. are given in the Remarks section of *C. cracens* n. sp. (above).

### *Carcinoplax indica* Doflein, 1904

*Carcinoplax longimanus indicus* Doflein, 1904: 114, 306 (table), pl. 35, figs 1, 2 [Andaman Sea]. — Sakai 1969: 269 [in list].

*Carcinoplax logimana indica* – Tesch 1918: 154 [in list]. — Serène 1968: 89 [in list].

*Carcinoplax indica* – Sakai 1977: 55, figs 1, 2, pl. 4, fig. 1 [Japan]. — Guinot 1969b: 524 [discussion]; 1989: 276 [discussion], figs 5, 7, pl. 1, figs E-H, pl. 2, figs E-G [Philippine Is]; 1971: 1081 [in list]. — Serène & Lohavanijaya 1973: 62 [in list], 63 [in key]. — Serène & Vadon 1981: 118, 119, 123, 126, pl. 4, figs A, B [Philippine Is]. — Matsuzawa 1993: 21, fig. 1 (colour)

[Japan]. — Ng *et al.* 2001: 33, fig. 7c [Taiwan]. — Hsueh & Huang 2002: 119 [in key], 119, figs 6, 8B [Taiwan]. — Ng & Davie 2002: 378 [Andaman Sea coast of Thailand]. — Karasawa & Kato 2003b: 130 [in list]. — Karasawa & Schweitzer 2006: 26 [in list].

*Carcinoplax confragosa* – Zarenkov 1972: 241, fig. 7-1 [Vietnam] (not *Carcinoplax confragosa* Rathbun, 1914).

Not *Carcinoplax indica* – Guinot 1969b: 524, figs 65-67, 75, 76 (= *Carcinoplax monodi* Guinot, 1989).

Not *Carcinoplax longimana indica* – Takeda 1975: 149, pl. 2, figs 2, 3, pl. 3, fig. 2 (= *C. longimana* (de Haan, 1833)).

TYPE MATERIAL. — 4 syntypes, 2 extant ♂♂, *Valdivia* (ZMB 13606).

TYPE LOCALITY. — India, Nicobar Is, 06°54'N, 93°28.8'E, 226 m.

MATERIAL EXAMINED. — **Philippine Islands.** South China Sea, MUSORSTOM 1, stn CP 21, 14°01'N, 120°23'E, 223-174 m, 21.III.1976, 1 ♂, 1 ♀ (MNHN-B 10063).

Bohol, Balicasag I., off Panglao I., 200-300 m, tangle nets of local fishermen, XII.2000, 1 ♂ (ZRC 2001.0363). — 50-500 m, 28.XI.2001, 1 ♂, 3 ♀♀ (ZRC 2001.0541). — 200-300 m, VI.2002, 1 ♀ (ZRC 2002.0654). — Purchased from fishermen, 25-30.VII.2003, 2 ♂♂, 1 ♀ (ZRC 2004.0749). — 50-500 m, III.2004, 2 ♂♂ (ZRC 2004.0708). — I.2004, 1 ♂, 2 ♀♀ (ZRC 2004.0769); II.2004, 7 ♂♂, 5 ♀♀ (ZRC 2004.0770). — III.2004, 1 ♂ (ZRC 2004.0771). — 29.V.2004, 2 ♂♂ (MNHN-B 29724).

Panglao I., Maribohoc Bay, stn P2, tangle nets of local fishermen, XI.2003, 1 ♀ (ZRC 2006.0180). — 100-300 m, T. J. Arbasto coll., XI.2003-IV.2004, 5 ♂♂, 2 ♀♀ (ZRC 2004.0772).

PANGLAO 2004, stn P1, 09°36.00'N, 123°45.00'E, 150-200 m, tangle nets of local fishermen, 7.VII.2004, 1 ♂ (MNHN-B 29724). — Stn P5, Pamilacan I., 09°30.00'N, 123°54.60'E, 100 m, tangle nets of local fishermen, 1.VI.2004, 1 ♀ (ZRC 2004.0773).

PANGLAO 2005, stn CP 2332, Maribohoc Bay, 09°38.8'N, 123°45.9'E, 396-418 m, 22.V.2005, 1 ♀ (ZRC 2006.0213). — Stn CP 2406, Maribohoc Bay, 09°40.6'N, 123°46.8'E, 334-387 m, 1.VI.2005, 1 ♀ parasitised by sacculinids (ZRC 2006.0180).

**Indonesia.** Tanimbar Is, KARUBAR, stn CP 79, 09°16'S, 131°22'E, 250-239 m, 3.XI.1991, 1 ♂ (MNHN-B 29372). — Stn CP 83, 09°23'S, 131°00'E, 285-297 m, 4.XI.1991, 2 pre-adult ♀♀ (MNHN-B 29389).

**Solomon Islands.** SALOMON 1, stn CP 1804, 09°32.0'S, 160°37.4'E, 309-328 m, 2.X.2001, 1 ♀ (MNHN-B 29398).

**DISTRIBUTION.** — Andaman Sea (Dofflein 1904; Davie *et al.* 2002; Ng & Davie 2002) to the western Pacific Ocean from Taiwan (Ng *et al.* 2001, Hsueh & Huang 2002) to Vietnam (Zarenkov 1972, as *C. confragosa*) and the Philippine Is (Guinot 1989), and now Indonesia (Tanimbar Is) and the Solomon Is. Depth: 110–418 m. Specimens were also obtained from tangle nets of local fishermen in the Philippines that obtained material from estimated depths of 50–500 m.

**COLOUR.** — Many, but not all, preserved specimens have a large red spot on the dorsal surface of the carapace (see Hsueh & Huang 2002: fig. 8B). The spot in live individuals is red-brown bordered on each side by a thick, irregular yellow stripe.

#### REMARKS

Small adult specimens of *C. indica* are characterised by an almost quadrate carapace and nearly identical acute outer orbital and anterolateral teeth that give the appearance of a carapace with three anterolateral teeth (Hsueh & Huang 2002: fig. 6A). The teeth are much reduced in large individuals and the carapace becomes rounded (Guinot 1989: pl. 1, figs E–H). The teeth nearly disappear and are reduced to slight swellings in the largest individuals. The carapace is smooth except many low, round tubercles on the hepatic region.

The specimen described and illustrated by Zarenkov (1972: 241, fig. 7.1) and identified as *C. confragosa* Rathbun, 1914, clearly belongs to *C. indica* (see Remarks for *C. confragosa* above).

### *Carcinoplax ischurodous* (Stebbing, 1923)

*Geryon ischurodous* Stebbing, 1923: 2, pl. 11 [South Africa]. — Barnard 1950: 292, fig. 54k [South Africa]. — Manning & Holthuis 1987: 59 [in list].

*Carcinoplax eury sternum* Guinot & Richer de Forges, 1981a: 1113, pl. 6, figs 5, 5a, 5b (*nomen nudum*); 1981b: 249, figs 9E, 10A–D, pl. 6, fig. 5, 5a, 5b [Vanuatu]. — Guinot 1989: 314 [in list], fig. 44, pl. 13, fig. F [Vanuatu].

*Carcinoplax ischurodous* – Manning & Holthuis 1988: 78, fig. 1 [discussion] [South Africa].

**TYPE MATERIAL.** — *Geryon ischurodous* Stebbing, 1923: ♂ holotype cl 16 mm, cw 26 mm (BMNH 1928.12. I.104).

*Carcinoplax eury sternum* Guinot & Richer de Forges, 1981: ♂ holotype, cl 31.7 mm, cw 47.0 mm (MNHN-B 6835).

**TYPE LOCALITY.** — *Geryon ischurodous*: South Africa, Durban, 29°51'S, 31°01'E, “from a coral on the beach” (Stebbing 1923: 2).

*Carcinoplax eury sternum*: Vanuatu, Loh Toga I., Torres Is, 600 m., A. Intès coll.

**MATERIAL EXAMINED.** — **Seychelles.** CEPROS, stn 1.3, 04°08'S, 56°11.3'E, trap, 580–550 m, 20.X.1987, 1 ♂ (MNHN-B 19109). — Transect 2, trap, 800 m, A. Intès coll., 21–22.X.1987, 1 ♂ (MNHN-B 19101). — Stn 4.21, 04°45.6'S, 56°38.9'E, trap, 590–620 m, 23.X.1987, 1 ♂, 1 ♀ (MNHN-B 19111).

**Solomon Islands.** SALOMON 2, stn CP 2184, 08°16.9'S, 159°59.7'E, 464–523 m, 23.X.2004, 1 ♀ (MNHN-B 30067). — Stn CP 2213, 07°38.7'S, 157°42.9'E, 495–650 m, 26.X.2004, 1 ♂ (MNHN-B 30099). — Stn CP 2248, 07°42.5'S, 156°24.8'E, 650–673 m, 1.XI.2004, 1 ♀ (MNHN-B 30098).

**Vanuatu.** Loh Toga I., Torres Is, 600 m., A. Intès coll., ♂ holotype of *C. eury sternum* (MNHN-B 6835).

BOA 1, stn CP 2462, 16°37.5'S, 167°57.4'E, 618–641 m, 13.IX.2005, 1 ♂ (MNHN-B 30090). — Stn CP 2471, 16°22.8'S, 167°50.4'E, 591–627 m, 14.IX.2005, 1 pre-adult ♀ (MNHN-B 30131).

**New Caledonia.** BIOCAL, stn DW 106, 21°35.82'S, 166°29.26'E, 650 m, 8.IX.1985, 1 ♂ (MNHN-B 16571).

BIOGOECAL, stn CP 232, 21°33.81'S, 166°27.07'E, 760–790 m, 12.IV.1987, 1 ♀ (MNHN-B 20619).

BATHUS 1, stn CP 663, 20°58.7'S, 165°38.3'E, 730–780 m, 13.III.1993, 1 ♂ (MNHN-B 29357). — Stn CP 709, 21°41.78'S, 166°37.88'E, 650–800 m, 19.III.1993, 1 ♀ (MNHN-B 29306).

BATHUS 3, stn CC 848, 23°02'S, 166°53'E, 680–700 m, 1.XII.1993, 1 ♀ (MNHN-B 29305).

**Tonga.** BORDAU 2, stn CP 1528, 21°14'S, 174°59'W, 587–592 m, 3.VI.2000, 2 ovig. ♀♀ (MNHN-B 29370). — Stn CP 1640, 21°09'S, 175°24'W, 564–569 m, 21.VI.2000, 1 ♂, 1 ♀, 1 pre-adult ♀ (MNHN-B 29553).

**DISTRIBUTION.** — Across the Indo-West Pacific region from South Africa (Barnard 1950) to the southwestern Pacific Ocean (Guinot & Richer de Forges 1981a). Recorded here for the first time from the Seychelles, Solomon Is, New Caledonia, and Tonga. Depth: 464–800 m.

#### REMARKS

*Carcinoplax ischurodous* is unique among the species of *Carcinoplax sensu stricto* in having only one anterolateral tooth on each side of the rounded

carapace. The outer orbital angle, however, is in the form of an acute, anteriorly-oriented tooth. A round carapace with small or no anterolateral teeth at all is restricted to large specimens of *C. indica*, *C. longimana*, *C. monodi*, and *C. purpurea*. Nevertheless, a relatively narrow male abdomen, slender and thin G1, greatly expanded vulva, and absence of a vulvar cover clearly establish the inclusion of *C. ischurodous* in *Carcinoplax* (see Manning & Holthuis 1988). Guinot (1989: 314) included the species (as *C. eurysternum*) in a list of eight “non-revised” species of *Carcinoplax* in which only *C. ischurodous* proved not to belong to other genera.

### *Carcinoplax longipes* (Wood-Mason, 1891)

*Nectopanope longipes* Wood-Mason in Wood-Mason & Alcock, 1891: 262 [Andaman Sea]. — Alcock & Anderson 1895: pl. 14, fig. 7 [Andaman Sea].

*Carcinoplax longipes* – Alcock 1899: 71; 1900: 302 [in key], 303 [southern India, Andaman Sea]. — Alcock & Anderson 1899: 5 [in list]. — Doflein 1904: 117, 306 (table) [Andaman Sea]. — Tesch 1918: 154 [in list]. — Serène 1968: 90 [in list]. — Sakai 1969: 270 [in list]. — Serène & Lohavanijaya 1973: 62 [in list], 65 [in key], 68, pl. 14, fig. D [type material]. — Guinot 1989: 303 [discussion], fig. 26, pl. 10, figs A-C [Andaman Sea]. — Chen 1998: 266 [in key].

*Pilumnoplax longipes* – Miers 1886: 226 [in list].

*Carcinoplax* aff. *longipes* – Guinot 1989: 305, figs 27, 35, pl. 10, figs D-F [Philippine Is].

*Carcinoplax* sp. (aff. *longipes*) – Guinot 1989: 305, fig. 36, pl. 10, fig. G [Philippine Is].

Not *Carcinoplax longipes* – Sakai 1976: 524 [in key], 527, fig. 281. — Chen 1984: 189 [in key], 195, 197, fig. 6. — Miyake 1991: 220 [in list] [Japan]. — Ikeda 1998: 15, 42, 135, pl. 55. — Takeda *et al.* 2006: 204 [in list] [Japan] (= *Carcinoplax specularis* Rathbun, 1914).

TYPE MATERIAL. — Photo of assumed “cotype” in Serène & Lohavanijaya (1973: pl. 14, fig. D), *Investigator*, stn 56 (Zoological Survey of India, Kolkata [Calcutta]).

TYPE LOCALITY. — Andaman Is, 403-439 m.

MATERIAL EXAMINED. — **India.** Travancore coast, stn 232, 07°17.5'N, 76°54.5'E, *Investigator*, A. Alcock det., Indian Museum leg., 1 ♂, 1 ♀ (USNM 46291). — Off Travancore coast, 787 m, Indian Museum leg., 1 ♀ (BMNH 1955.4.4.5).

**Philippine Islands.** South China Sea, MUSORSTOM 1, stn CP 50, 13°49'N, 120°02'E, 415-510 m, 25.III.1976, 1 ♂ (MNHN-B 10140).

MUSORSTOM 2, stn CP 36, 13°31'N, 121°24'E, 569-595 m, 24.XI.1980, 1 ♂ (MNHN-B 10377), 1 ♂ (MNHN-B 29832), 1 ♀ (MNHN-B 29831), 1 ♂, 1 pre-adult ♀, 1 ♀ (MNHN-B 29825). — Stn CP 44, 13°23'N, 122°21'E, 760-820 m, 26.XI.1980, 1 pre-adult ♂ (MNHN-B 10269). — Stn CP 46, 13°26'N, 122°17'E, 445-520 m, 26.XI.1980, 1 ♂ (MNHN-B 10264). — Stn CP 82, 13°46'N, 120°28'E, 550 m, 2.XII.1980, 1 ♀ (MNHN-B 11578).

?Off Mindoro, *Albatross*, stn 5123, 13°12'N, 121°38'E, 517 m, 2.II.1908, 1 pre-adult ♀ (MNHN-B 17729).

Visayan Sea, MUSORSTOM 3, CP 143, 11°29'N, 124°11'E, 205-214 m, 7.VI.1985, 1 pre-adult ♀ (MNHN-B 16936).

DISTRIBUTION. — Southern India (Alcock 1899), Andaman Sea (Wood-Mason & Alcock 1891; Doflein 1904), and the Philippine Is (Guinot 1989). Depth: 205-820 m.

### REMARKS

Examination of two specimens from southern India originally at the Indian Museum (female, cl 11.9 mm, cw 15.1 mm, pre-adult male, cl 8.5 mm, cw 11.4 mm; USNM 46291) allowed Guinot (1989: 303, fig. 26, pl. 10, figs A-C) to redescribe the species, but the description was based only on the female specimen. The second specimen, a pre-adult male, however, showed the most important characters outlined by Guinot for the female. It differed from the female in having only a slightly raised margin between the orbital margin and the first anterolateral tooth instead of a well defined rectangular tooth. The anterolateral teeth were thinner and more spiniform than those of the female. The G1 is thin and slender, the G2 slightly longer than the G1 and with two triangular spinules at the tip. The vulva of the female specimen was greatly enlarged, covered by a soft membrane except along the anterior margin, and occupying the whole breadth of thoracic sternite 6, all of which are characters shared by the species of *Carcinoplax sensu stricto*. The ambulatory legs (P2-P5) were long and relatively slender in both specimens so that the distal end of the merus of the folded P5 reached the tip of the second anterolateral tooth. The ambulatory legs of the female illustrated by

Alcock & Anderson (1895: pl. 14, fig. 7), however, are not as long as in the Indian Ocean specimens examined here. A photograph of a male from the Zoological Survey of India indicated as a cotype (Serène & Lohavanijaya 1973: pl. 14, fig. D), however, shows the long and slender ambulatory legs characteristic of the species.

Guinot (1989: 305) described a specimen from the Philippine Is (male, cl 18.2 mm, cw 25.0 mm; MNHN-B 10377) that showed some differences from the Indian Ocean specimens of *C. longipes*. It was listed separately as *Carcinoplax* aff. *longipes* (Guinot 1989: 305, figs 27, 35, pl. 10, figs D-F). The carapace of the Philippine Is specimen was found to be, as correctly pointed out by Guinot (1989), slightly less inflated than the Indian Ocean material of *C. longipes*, having a smooth dorsal surface (short tomentum in *C. longipes*), smooth chelipeds (P1) (distinct granules on the dorsal surface of the propodus and dactylus in *C. longipes*), and a distinct hook-like shape of the first anterolateral teeth (shorter, straighter in *C. longipes*). Another difference is that the P1-P5 appeared longer and thicker in the Philippine Is specimen than in *C. longipes*. The differences, however, were not measurable: P5 merus length 0.7 cl and P5 merus width 0.2 cl in both populations. Two additional specimens from the Philippine Is (♂, cl 15.2 mm, cw 21.2 mm, MNHN-B 10140; ♀, cl 12.3 mm, cw 17.6 mm, MNHN-B 11578) were found by Guinot (1989) to be intermediate between the Indian specimens and *Carcinoplax* aff. *longipes*. They were referred to as "*Carcinoplax* sp. (aff. *longipes*)" (Guinot 1989: 305, pl. 10, fig. G). The dorsal surface of the carapace of both specimens had a short tomentum as in *C. longipes* but the second anterolateral teeth were more incurved as in *C. aff. longipes*. The most significant difference between the specimens from the Philippine Is and the two from the Indian Ocean that were examined is that the outer orbital angle was in the form of a distinct triangular tooth in the Philippine Is specimens, higher and therefore more conspicuous than in the Indian Ocean specimens. The examination of additional material from the Philippine Is has shown that the specimens previously identified by Guinot (1989) as *Carcinoplax* aff. *longipes* and *Carcinoplax* sp. (aff. *longipes*) be-

long to *C. longipes* based on a comparison with the available Indian material.

The records of *C. longipes* from Japan by Sakai (1969, 1976) remain questionable since no illustrations were given and his specimens could not be examined, but the photograph of Ikeda (1998: 135, pl. 55) of Japanese material confirms it as *C. specularis* Rathbun, 1914. The illustration of *C. longipes* by Chen (1984: fig. 6) shows that her specimen from the East China Sea most probably belongs instead to *C. specularis*.

### *Carcinoplax monodi* Guinot, 1989

*Carcinoplax purpurea* – Balss 1929: 24 (not *Carcinoplax purpurea* Rathbun, 1914).

*Carcinoplax longimanus* – Monod 1938: 143 [Red Sea] (not *C. longimana* (de Haan, 1833)).

*Carcinoplax indica* – Guinot 1969b: 524, figs 65-67, 75, 76 [discussion] [Red Sea].

*Carcinoplax* sp. 1 – Türkay 1986: 162 [Red Sea].

*Carcinoplax* sp. 2 – Türkay 1986: 162 [Red Sea].

*Carcinoplax monodi* Guinot, 1989: 279, figs 3, 8A-C, 9A-C, pl. 3, figs A-H [Red Sea].

*Carcinoplax* sp. (aff. *monodi*) – Guinot 1989: 283, fig. 10, pl. 3, figs I-K [Red Sea].

TYPE MATERIAL. — Mission R. Ph. Dollfus en Égypte, stn 2, ♂ holotype, cl 21.4 mm, cw 30.6 mm (MNHN-B 10272); 1 ♂ paratype, cl 17.8 mm, cw 25.1 mm (MNHN-B 10378); 1 pre-adult ♀ paratype, cl 8.5 mm, cw 13.0 mm (MNHN-B 10274); 3 ♂ paratypes (MNHN-B 10273).

TYPE LOCALITY. — Red Sea, Gulf of Suez, 29°35'–29°48'N, 32°30'–32°32'E, 36–55 m.

MATERIAL EXAMINED. — Red Sea. Mission R. Ph. Dollfus en Égypte, stn 2, 29°35'–29°48'N, 32°30'–32°32'E, 36–55 m, 24.XI.1928, ♂ holotype (MNHN-B 10272). — Stn 24, 33°41'–33°45'N, 27°48'–27°55'E, 68–80 m, 30.XII.1928, 1 pre-adult ♀ paratype (MNHN-B 10378). — Stn 35, 29°38'–29°45'N, 32°31'–32°33'E, 40–50 m, 26.I.1929, 1 ♂ paratype (MNHN-B 10378).

John Murray Expedition, stn A, 29°17.00'N, 32°43.00'E, 65–68 m, 6.IX.1933, 1 ♀ (BMNH 1984.245).

DISTRIBUTION. — Known only from the Red Sea (see Guinot 1989). Depth: 36–562 m.

## REMARKS

As in *C. longimana* and a few other *Carcinoplax* species, the carapace of *C. monodi* is globose and the anterolateral teeth disappear with increased carapace size. The first anterolateral tooth, however, is not well developed even in small individuals (Guinot 1989: fig. 9A-C). The carapace shape and the size and shape of the anterolateral teeth are similar to those of *C. purpurea* Rathbun, 1914, with which it has been confused in the past. Diagnostic of *C. purpurea*, however, is a purple-red band along the carapace from the front to the posterior border (see Hsueh & Huang 2002: fig. 8C). *Carcinoplax purpurea* is found in the western Pacific Ocean, whereas *C. monodi* lacks the purple-red band and is so far known only from the Red Sea. Unusual for a species of *Carcinoplax* is the large area of thoracic sternite 8 that is left exposed by the male abdomen (see Guinot 1969b: fig. 65; 1989: fig. 3).

A relatively small female variously identified as *C. purpurea* Rathbun, 1914 (Bals 1929: 24), *Carcinoplax* sp. 2 (Türkyay 1986: 162), and *Carcinoplax* sp. (aff. *monodi*) (Guinot 1989: fig. 10, pl. 3, figs I-K) most probably belongs to *C. monodi*, an identification that should be verified when additional material becomes available.

*Carcinoplax nana* Guinot, 1989

*Carcinoplax nana* Guinot, 1989: 293, figs 18, 19, pl. 6, figs F-I [Philippine Is].

Not *Carcinoplax nana* – Ho *et al.* 2004: 661, fig. 6H (= *Carcinoplax* sp.).

TYPE MATERIAL. — MUSORSTOM 2, stn 34, ♂ holotype, cl 13.0 mm, cw 15.2 mm (MNHN-B 10136); 2 ♂♂ paratypes (cl 13.8 mm, cw 18.0 mm; cl 8.0 mm, cw 10.5 mm) (MNHN-B 10126); 4 ♂♂ paratypes (cl 20.2 mm, cw 26.4 mm; cl 15.2 mm, cw 19.8 mm; cl 15.3 mm, cw 19.8 mm; cl 11.1 mm, cw 14.5 mm), 2 pre-adult ♂♂ paratypes (cl 11.0 mm, cw 14.0 mm; cl 7.8 mm, cw 10.2 mm), 3 pre-adult ♀♀ paratypes (cl 12.2 mm, cw 16.0 mm; cl 8.8 mm, cw 11.4 mm; cl 7.1 mm, cw 8.8 mm) (MNHN-B 13844).

TYPE LOCALITY. — Philippine Islands, north of Mindoro, 155-167 m.

MATERIAL EXAMINED. — **Taiwan.** Southwest Taiwan, Douggang, commercial trawler, 11.VIII.2003, 1 ♀

(MNHN-B 29772). — Koashiung, Tungkang fishing port, H. H. Tan & L. L. Koh coll., 6-9.XII.2001, 1 ♀ (ZRC 2001.0281).

TAIWAN 2001, stn CP 80, 24°50.9'N, 121°59.4'E, 194-214 m, 8.V.2001, 1 ♀ (MNHN-B 29691).

TAIWAN 2002, stn CP 159, 22°14.6'N, 120°59.9'E, 208 m, 24.V.2002, 2 ♂♂, 1 ♀ (MNHN-B 29812). — Stn CP 160, 22°13.0'N, 120°28.8'E, 300 m, 24.V.2002, 1 ♀ (MNHN-B 29815). — Stn CH 175, 22°14.6'N, 120°26.4'E, 210 m, 28.V.2002, 2 ♀♀ (MNHN-B 29813). — Stn CH 176, 22°14.8'N, 120°27.1'E, 160 m, 28.V.2002, 2 ♂♂ (MNHN-B 29814).

**Philippine Islands.** South China Sea, MUSORSTOM 2, stn 34, 13°27.9'N, 121°12.0'E, 155-167 m, 24.XI.1980, ♂ holotype (MNHN-B 10136).

Bohol, Balicasag I., off Panglao I., tangle nets of local fishermen, 50-500 m, 23.XI.2001, 11 ♂♂, 6 ♀♀ (ZRC 2001.0536), 2 ♂♂, 2 ♀♀ (ZRC 2001.031), 1 ♀ (ZRC 2001.0532). — 200-300 m, XII.2002, 4 ♂♂, 8 ♀♀, 1 ovig. ♀ (ZRC 2001.0365), 1 ♀ (ZRC 2001.0364), 8 ♂♂, 14 ♀♀ (ZRC 2002.0656). — XI.2003, 1 ♂, 1 ♀, 1 pre-adult (MNHN-B 29731). — I.2004, 1 ovig. ♀ (ZRC 2004.0774). — II.2004, 1 ♂ (ZRC 2004.0775); 1 ♂, 1 ovig. ♀, 1 pre-adult (ZRC 2004.0776).

PANGLAO 2004, stn P4, tangle nets of local fishermen, 8.VI.2004, 1 ♂ (ZRC 2006.0175), 1 ♂, 1 ♀ parasitised by *Sacculina* (ZRC 2006.0179).

**Indonesia.** Tanimbar Is, KARUBAR, stn CP 65, 09°14'S, 132°27'E, 176-174 m, 1.XI.1991, 1 ♂, 1 ♀ parasitised by *Sacculina* (MNHN-B 29388).

DISTRIBUTION. — Philippine Is (Guinot 1989) and now Taiwan and Indonesia (Tanimbar Is). Depth: 155-300 m. Specimens were also obtained from tangle nets of local fishermen in the Philippines that obtained material from estimated depths of 50-500 m.

## COLOUR

The carapace and chelipeds are ornamented with thin, reticulated, orange lines, a colour pattern that is visible in smaller individuals when the setae of the carapace are removed.

## REMARKS

Although the holotype (♂, cl 13.0 mm, cw 15.2 mm, MNHN-B 10136) is small and the name of the species implies a small size, most specimens examined were relatively large (largest specimen examined: ♂, cl 32.9 mm, cw 43.2 mm, ZRC 2001.0536). The carapace, chelipeds (P1), and ambulatory legs (P2-P5) of the smaller specimens (to about cl 20-23 mm) were covered with conspicuous setae in contrast to the larger individuals, which lacked most or all of

the setae. Conspicuous setae is also characteristic of *C. spinosissima* Rathbun, 1914, but *C. nana* can be distinguished from the latter by the presence of conspicuous but low, blunt tubercles on the dorsal surface of the cheliped propodi (see Guinot 1989: pl. 6, fig. H) (acute tubercles in *C. spinosissima*, although they may be absent in large individuals; see Chen 1998: fig. 4-2; Hsueh & Huang 2002: fig. 5E), the dark portion of the fingers covers about half the total length of the fingers (dark portion is about one quarter of fingers in *C. spinosissima*), and the smooth distal portion of the meri of the ambulatory legs (an acute tooth in *C. spinosissima*; see Chen 1998: fig. 4-2; Hsueh & Huang 2002: fig. 5C).

Material identified as *C. nana* by Ho *et al.* (2004: 661, fig. 6H) does not belong to this species. The two small male specimens (MMBA; ZRC 2001.2216), which are badly damaged, were examined but could not be identified. They clearly belong to *Carcinoplax*.

### *Carcinoplax purpurea* Rathbun, 1914

*Carcinoplax purpurea* Rathbun, 1914: 140 [Philippine Is]. — Tesch 1918: 154 [in list]. — Estampador 1937: 533 [in list]; 1959: 89 [in list] [Philippine Is]. — Serène 1968: 89 [in list]. — Guinot 1969b: 526 [discussion]; 1989: 283 [discussion], figs 11, 21, pl. 4 [holotype] [Philippine Is, Indonesia]; 1971: 1081 [in list]. — Sakai 1969: 270 [in list], fig. 15d [holotype]; 1976: 524 [in key], 524, pl. 190, fig. 1 [Japan]. — Serène & Vadon 1981: 119, 120, 123 [Philippine Is] (part). — Chen 1984: 189 [in key], 189, 192, 197, 201, figs 1, pl. 1, figs 3, 4, 9; 1998: 266 [in key], 268, 310 [in list], fig. 2 [East and South China seas]. — Dai *et al.* 1986: 866 [in key], 368, fig. 191, pl. 53, fig. 6 [South China Sea]. — Dai & Yang 1991: 394 [in key], 396, fig. 191, pl. 53, fig. 6 [South China Sea]. — Miyake 1991: 220 [in list] [Japan]. — Muraoka 1998: 47 [in list] [Japan]. — Hsueh & Huan 2002: 119 [in key], 125, figs 8C, 10 [Taiwan]. — Karasawa & Kato 2003b: 141 [in list].

Not *Carcinoplax purpurea* – Balss 1929: 24 (? = *C. monodi* Guinot, 1989).

Not *Carcinoplax (purpurea?)* – Stephensen 1946: 166, 208, fig. 44 [Persian Gulf] (= *C. sinica* Chen, 1984).

Not *Carcinoplax purpurea* – Serène & Lohavanijaya 1973: 62 [in list], 63 [in key], 66, figs 148-155, pl. 14, figs B, C, pl. 15, fig. B (= *Carcinoplax sinica* Chen, 1984).

Not *Carcinoplax purpurea* – Serène & Vadon 1981: 118, 123 (part) (= *Carcinoplax sinica* Chen, 1984).

TYPE MATERIAL. — *Albatross*, stn 5376, ♀ holotype, cl 28.9 mm, cw 38.3 mm (USNM 46143).

TYPE LOCALITY. — Philippine Islands, between Luzon and Mindoro, Verde Island Passage, 13°42'N, 121°51.5'E, 165 m.

MATERIAL EXAMINED. — **Taiwan.** Tai-Chi fishing port, T.-Y. Chan coll., 28.X.2004, 2 ♂♂ (MNHN-B 29773).

**Vietnam.** Tonkin Bay, *Orlik*, stn 46, 22.I.1960, 1 pre-adult ♀ (MNHN-B 29771).

**Philippine Islands.** South China Sea, MUSORSTOM 1, stn CP 45, 13°46'N, 120°24'E, 100-180 m, 24.III.1976, 1 ♀ (MNHN-B 10144).

Verde Island Passage, between Luzon and Mindoro, *Albatross*, stn 5376, 13°42'N, 121°51.5'E, 165 m, 2.III.1909, ♀ holotype (USNM 46143).

PANGLAO 2005, stn CP 2377, Dipolog Bay, 08°40.6'N, 123°20.3'E, 85-88 m, 28.V.2005, 1 ♂, 1 pre-adult ♂, 1 ♀ (ZRC 2006.0187), 1 ♂ (ZRC 2006.0216). — Stn CP 2378, Dipolog Bay, 08°38.8'N, 123°20.1'E, 65 m, 28.V.2005, 1 ♂, 1 ♀ (MNHN-B 30249).

DISTRIBUTION. — Western Pacific Ocean from Japan to Indonesia. Depth: 17-180 m.

### COLOUR

The carapace of freshly-preserved specimens from Taiwan was light purple with a medial purple-red line crossing from the front to the posterior border. There was a purple-red marking on the carpi of the chelipeds and the distal margin of the meri. The postero-lateral borders of the carapace were light purple to grey.

### REMARKS

Characteristic of *C. purpurea* is its globose, inflated carapace and short anterolateral teeth that disappear with increased carapace size (see Chen 1984: figs 1-1 to 1-4, pl. 1, figs 3, 4, 9; Guinot 1989: pl. 4, figs A, D, F, G, I, J). The species is contrasted to *C. sinica* in the Remarks of the latter (see below) and by Guinot (1989: 287).

A badly preserved specimen from northwest Madagascar (♂, MNHN-B 10169) appears to be close to *C. purpurea* as far as the shape of the carapace is concerned. Only one G1 remains and it is unfortunately incomplete. Guinot (1989) showed that the Red Sea material of Balss (1929) credited to

*C. purpurea* probably belonged to *C. monodi* Guinot, 1989, and that from the Persian Gulf (Stephensen 1946) to *C. sinica* Chen, 1984.

### *Carcinoplax sinica* Chen, 1984

*Carcinoplax sinica* Chen, 1984: 189 [in key], 190, 197, 200, fig. 2, pl. 1, figs 6, 10; 1998: 266 [in key], 270, 310 [in list], fig. 3 [South China Sea]. — Dai *et al.* 1986: 366 [in key], 366, figs 190-2 to 190-4, pl. 53, fig. 5 [China]. — Guinot 1989: 285 [discussion], figs 12-14, pl. 5 [Philippine Is]. — Dai & Yang 1991: 394 [in key], 395, figs 190-2 to 190-4, pl. 53, fig. 5 [China]. — Hsueh & Huang 2002: 119 [in key], 126, figs 8D, 11 [Taiwan].

*Carcinoplax (purpurea?)* — Stephensen 1946: 166, 208, fig. 44 (pl. 5, figs A-C1 in Guinot [1989]) [Persian Gulf].

*Carcinoplax purpurea* — Serène & Lohavanijaya 1973: 62 [in list], 63 [in key], 66, figs 148-155, pl. 14, figs B, C, pl. 15, fig. B [Hong Kong, Vietnam, Gulf of Thailand]. — Serène & Vadon 1981: 118, 123 (part) [Philippine Is] (not *Carcinoplax purpurea* Rathbun, 1914).

TYPE MATERIAL. — ♂ holotype (IOAS K248B-23); ♀ allotype (IOAS X50B-37); 2 ♂♂, 1 ♀ paratypes (IOAS K234B-44); 1 ♂, 1 ♀ paratypes (IOAS Q129B-39).

TYPE LOCALITY. — South China Sea, 19°50'N, 109°00'W, 25 m.

MATERIAL EXAMINED. — **Taiwan.** Kaohsiung, Tungkang fishing port, L. S. Huang coll., 4.VIII.1996, 1 ♀ (ZRC 2001.0136).

**South China Sea.** Stn 6269, 31 m, 13.V.1960, H. Chen leg., 1 ♀ (MNHN-B 16939).

MUSORSTOM 1, stn 1, 14°28'N, 120°42'E, 36-37 m, 18.III.1976, 10 ♂♂, 1 pre-adult ♀, 14 ♀♀ (MNHN-B 10142).

**Indonesia.** Tanimbar Is, KARUBAR, stn CP 63, 08°00'S, 132°58'E, 215-214 m, 1.XI.1991, 1 ♂ (MNHN-B 29307).

DISTRIBUTION. — Persian Gulf (Stephensen 1946, as *C. purpurea*) and western Pacific Ocean from Taiwan to Indonesia. Depth: 25-215 m.

#### REMARKS

*Carcinoplax sinica* has often been confused with *C. purpurea*. Differences were outlined by Guinot (1989: 287). The most marked difference is in the morphology of the second anterolateral tooth:

hook-like and more salient in *C. sinica* (Guinot 1989: fig. 12) than in *C. purpurea* (Guinot 1989: fig. 11). There are also differences in the colour patterns, a reddish carapace in *C. sinica* (see Hsueh & Huang 2002: fig. 8D) that is unfortunately readily lost in preservation and a purple-red band along the medial axis of the carapace in *C. purpurea* (see Hsueh & Huang 2002: fig. 8C).

Photographs of specimens identified as *C. purpurea* by Serène & Lohavanijaya (1973: pl. 14, figs B, C, pl. 15, fig. B) shows that the material belongs to *C. sinica*. It can also be confirmed that part of the MUSORSTOM 1 material originally identified as *C. purpurea* by Serène & Vadon (1981) actually belonged to *C. sinica* as previously reported by Guinot (1989: 287).

### *Carcinoplax specularis* Rathbun, 1914

*Carcinoplax specularis* Rathbun, 1914: 143 [Philippine Is]. — Tesch 1918: 154 [in list]. — Estampador 1937: 533 [in list]; 1959: 89 [in list] [Philippine Is]. — Serène 1968: 90 [in list]. — Sakai 1969: 270 [in list], fig. 15c [holotype]. — Serène & Lohavanijaya 1973: 62 [in list], 64 [in key]. — Serène & Vadon 1981: 119, 120, 123, 126 [Philippine Is]. — Guinot 1989: 296 [discussion], figs 25, 34, pl. 8, figs A-D [holotype] [Philippine Is]. — Ho *et al.* 2004: 659, fig. 6F [Taiwan].

*Carcinoplax verdensis* Rathbun, 1914: 143 [Philippine Is]. — Tesch 1918: 154 [in list]. — Estampador 1937: 533 [in list]; 1959: 89 [in list] [Philippine Is]. — Serène 1968: 90 [in list]. — Sakai 1969: 269 [in list], fig. 15d [holotype]. — Serène & Lohavanijaya 1973: 62 [in list], 65 [in key]. — Serène & Vadon 1981: 119, 123, 126 [Philippine Is]. — Guinot 1989: 300 [discussion], fig. 22, pl. 9, figs D-F [holotype] [Philippine Is].

*Carcinoplax longipes* — Sakai 1969: 270 [in list]; 1976: 524 [in key], 527, fig. 281 [Japan]. — Ikeda 1998: 15, 42, 135, pl. 55 [Japan]. — Takeda *et al.* 2006: 204 [in list] [Japan] (not *Carcinoplax longipes* (Wood-Mason, 1891)).

*Carcinoplax polita* Guinot, 1989: 298, figs 24, 37, pl. 8, figs E-H [Philippine Is].

TYPE MATERIAL. — *Carcinoplax specularis* Rathbun, 1914: *Albatross*, stn 5113, ♂ holotype, cl 16.7 mm, cw 23.0 mm (USNM 46164).

*Carcinoplax verdensis* Rathbun, 1914: *Albatross*, stn 5119, ovig. ♀ holotype, cl 10.5 mm, cw 13.0 mm (USNM 46167).



*Carcinoplax polita* Guinot, 1989: ♂ holotype, cl 14.5 mm, cw 20.4 mm, MUSORSTOM 1, stn CP 31 (MNHN-B 10141); ♀ allotype, cl 12.5 mm, cw 16.9 mm (MNHN-B 10543); ♂ paratype, cl 9.2 mm, cw 12.2 mm (MNHN-B 10268).

TYPE LOCALITY. — *Carcinoplax specularis*: Philippine Islands, southern Luzon, Sombrero I., 13°51.5'N, 120°50.5'E, 291 m.

*Carcinoplax verdensis*: Philippine Islands, southern Luzon, Verde Island Passage, 13°45'N, 120°30.5'E, 721 m.

*Carcinoplax polita*: Philippine Islands, South China Sea, 187-195 m.

MATERIAL EXAMINED. — **Maldives**. John Murray Expedition, stn 143, 05°15.8'N, 73°22.8'E-05°13.7'N, 73°23.6'E, 797 m, 30.III.1934, 2 ovig. ♀♀ (BMNH 2007.64-65).

**Taiwan**. TAIWAN 2001, stn CP 73, 24°52.86'N, 122°00.98'E, 220-330 m, 7.V.2001, 1 ♀ (MMBA). — Stn CP 77, 24°54.2'N, 122°02.5'E, 220-360 m, 7.V.2001, 1 ♂ (MNHN-B 29821), 1 ♂ (MNHN-B 29822). — Stn CP 85, 24°00.55'N, 122°00.55'E, 255-390 m, 9.V.2001, 1 ♂, 1 ♀ (ZRC 2001.0134). — Stn CP 91, 24°50.6'N, 122°01.4'E, 400 m, 10.V.2001, 1 pre-adult ♀ (MNHN-B 29820). — Stn CP 96, 24°04.2'N, 122°04.2'E, 476-586 m, 18.V.2001, 1 ♂, 1 ovig. ♀ (MNHN-B 29823). — Stn CP 104, 24°48.9'N, 122°05.3'E, 365-447 m, 19.V.2001, 1 ovig. ♀ (MNHN-B 29824).

**Philippine Islands**. South China Sea, MUSORSTOM 1, stn CP 31, 14°00'N, 120°16'E, 187-195 m, 22.III.1976, ♂ holotype of *Carcinoplax polita* Guinot, 1989 (MNHN-B 10141); ♀ allotype of *C. polita* (MNHN-B 10543). — Stn CP 71, 14°09'N, 120°26'E, 174-204 m, 28.III.1976, 1 ♂ paratype of *C. polita* (MNHN-B 10268).

South China Sea, off Luzon, Sombrero I., *Albatross*, stn 5113, 13°51.5'N, 122°50.5'E, 291-324 m, 17.I.1908, ♂ holotype of *C. specularis* (USNM 46164). — *Albatross*, stn 5119, 13°45'N, 120°30'E, 291-721 m, 21.I.1908, ovig. ♀ holotype of *C. verdensis* (USNM 46167).

Mindanao, *Albatross*, stn 5512, 08°16'N, 123°58'E, 814 m, 7.VIII.1909, USNM leg. (ex. USNM 46142, id. as *C. longipes* presumably by M. J. Rathbun), 1 ♂, 1 ♀ (MNHN-B 11100).

Bohol, Balicasag I., off Panglao I., tangle nets of local fishermen, 200-300 m, XII.2000, 2 ♀♀ (ZRC 2001.0395); 50-500 m, 28.XI.2001, 1 ♂ (ZRC 2001.0973), 1 ♀ (ZRC 2001.0528), 5 ♂♂, 1 ♀, 1 ovig. ♀ (ZRC 2001.0540); 200-300 m, VI.2002, 6 ♀♀ (ZRC 2002.0655); 25-30.VII.2003, 2 ♀♀ (ZRC 2004.0730), 2 ♂♂, 4 ♀♀ (ZRC 2004.0750); XII.2003, 1 ♂, 1 ♀ (MNHN-B 29738), I.2004, 2 ♂♂ (ZRC 2004.0805), 29.V.2004, 3 ♂♂, 1 ♀ (ZRC 2004.0777); 50-500 m, 2.III.2004, 5 ♂♂, 4 ♀♀ (ZRC 2004.0727).

PANGLAO 2004, stn P1, tangle nets of local fishermen, 09°36'S, 123°45'E, 90-200 m, 1 ♀ (ZRC 2006.0176). —

Stn P4, tangle nets of local fishermen, 8.VI.2004, 1 ♂ (ZRC 2006.0173).

PANGLAO 2005, stn CP 2332, Maribohoc Bay, 09°38.8'N, 123°45.9'E, 396-418 m, 22.V.2005, 1 ♂, 1 ♀ (ZRC 2006.0214). — Stn CP 2343, off Pamilican I., 09°27.4'N, 123°49.4'E, 273-356 m, 23.V.2005, 1 ♀ (ZRC 2006.0217). — Stn CP 2358, Bohol/Sulu seas sill, 08°52.1'N, 123°37.1'E, 569-583 m, 26.V.2005, 1 ♂, 2 pre-adult ♂♂, 2 pre-adult ♀♀ (ZRC 2006.0190). — Stn CP 2359, Bohol/Sulu seas sill, 08°49.9'N, 123°34.9'E, 437-476 m, 26.V.2005, 5 ♂♂, 1 ♂ parasitised by bopyrid, 1 ♂ parasitised by sacculinid, 9 ♀♀, 1 ♀ parasitised by sacculinid (ZRC 2006.0194). — Stn CP 2405, Maribohoc Bay, 09°39.0'N, 123°46.1'E, 387-453 m, 1.VI.2005, 1 ♂, 1 ♂ parasitised by bopyrid, 1 ♂ parasitised by sacculinid, 1 ♀ (ZRC 2006.0199). — Stn CP 2407, Maribohoc Bay, 09°41.3'N, 123°48.5'E, 256-268 m, 1.VI.2005, 1 ♀ (ZRC 2006.0207).

**Indonesia**. Tanimbar Is, KARUBAR, stn CP 59, 08°20'S, 132°11'E, 405-399 m, 31.X.1991, 1 ♀ (MNHN-B 29387). — Stn CP 63, 08°00'S, 132°58'E, 215-214 m, 1.XI.1991, 1 ♀ (MNHN-B 29380). — Stn CP 69, 08°42'S, 131°53'E, 356-368 m, 2.XI.1991, 1 pre-adult ♀ (MNHN-B 29385).

Kai Is, KARUBAR, stn DW 13, 05°26'S, 132°38'E, 417-425 m, 24.X.1991, 1 pre-adult ♂ (MNHN-B 29819). — Stn DW 28, 05°31'S, 132°54'E, 448-467 m, 26.X.1991, 1 ♂ (MNHN-B 29390). — Stn DW 29, 05°36'S, 132°56'E, 181-184 m, 26.X.1991, 1 ♀ (MNHN-B 29392). — Stn CP 35, 06°08'S, 132°45'E, 390-502 m, 27.X.1991, 1 ♀ parasitised by *Sacculina* (MNHN-B 29391).

**Solomon Islands**. SALOMON 1, stn DW 1747, 09°21.8'S, 159°58.7'E, 364-402 m, 25.IX.2001, 1 ♀ (MNHN-B 29394). — Stn DW 1748, 09°20.4'S, 159°58.2'E, 509-522 m, 25.IX.2001, 1 ♂ (MNHN-B 29395). — Stn DW 1768, 08°21.4'S, 160°41.8'E, 194-286 m, 28.IX.2001, 1 ♂ (MNHN-B 29393). — Stn DW 1808, 09°45.5'S, 160°52.5'E, 611-636 m, 2.X.2001, 1 pre-adult ♀, 1 ♀ (MNHN-B 29396). — Stn DW 1851, 10°27.6'S, 162°00'E, 297-350 m, 6.X.2001, 1 ♀ (MNHN-B 29397). — Stn DW 1854, 09°46.4'S, 160°52.9'E, 229-260 m, 7.X.2001, 1 ♂, 1 ♀ (MNHN-B 29400).

SALOMON 2, stn CP 2195, 08°25.5'S, 159°26.4'E, 543-593 m, 24.X.2004, 1 ♂, 1 ♀ (MNHN-B 30111). — Stn CP 2212, 07°37.8'S, 157°41.7'E, 400-475 m, 26.X.2004, 1 ovig. ♀ (MNHN-B 30114). — Stn CP 2213, 07°38.7'S, 157°42.9'E, 495-650 m, 26.X.2004, 1 ♂ (MNHN-B 30097). — Stn CP 2246, 07°42.6'S, 156°24.6'E, 664-682 m, 1.X.2004, 2 ♂♂, 1 ♀ (MNHN-B 30109). — Stn CP 2262, 07°56.4'S, 156°51.2'E, 460-487 m, 3.X.2004, 1 ♂ (MNHN-B 30112). — Stn CP 2287, 08°40.8'S, 157°24.6'E, 253-255 m, 6.XI.2004, 1 pre-adult ♀ (MNHN-B 30089). — Stn CP 2288, 08°36.3'S,

157°26.5'E, 509-520 m, 7.XI.2004, 1 pre-adult ♀ (MNHN-B 30095).

**Vanuatu.** MUSORSTOM 8, stn CP 975, 19°23.60'S, 169°28.93'E, 566-536 m, 22.IX.1994, 1 ♀ (MNHN-B 30138). — Stn CP 992, 18°52.34'S, 168°55.16'E, 775-748 m, 24.IX.1994, 1 ♂ (MNHN-B 29429). — Stn CC 996, 18°52.41'S, 168°55.73'E, 764-786 m, 24.IX.1994, 1 ♂ (MNHN-B 30137). — Stn CP 1027, 17°53.05'S, 168°39.35'E, 550-571 m, 28.IX.1994, 1 ♀ (MNHN-B 30136). — Stn CP 1045, 16°54.50'S, 168°20.37'E, 488-459 m, 30.IX.1994, 3 pre-adult ♀♀, 1 ♀, 1 ovig. ♀ (MNHN-B 29409). — Stn CP 1049, 16°39.43'S, 168°02.97'E, 469-525 m, 1.X.1994, 1 ♂, 1 ♀ (MNHN-B 29410). — Stn CP 1052, 16°32.37'S, 168°00.29'E, 561-564 m, 1.X.1994, 1 ♂, 1 ♀ (MNHN-B 29403). — Stn CP 1054, 16°27.95'S, 167°57.44'E, 522-527 m, 1.X.1994, 3 ♂♂, 1 pre-adult ♀ (MNHN-B 29401). — Stn CP 1062, 16°27.95'S, 167°57.44'E, 522-527 m, 1.X.1994, 1 ♂ (MNHN-B 29408). — Stn CP 1114, 14°52.39'S, 167°03.40'E, 647 m, 8.X.1994, 1 ♀ parasitised by *Sacculina* (MNHN-B 29406).

**BOA 1**, stn CP 2415, 15°43.8'S, 167°03.4'E, 420-670 m, 5.IX.2005, 1 ♂ (MNHN-B 30126). — Stn CP 2416, 15°04.8'S, 167°03.4'E, 420-670 m, 5.IX.2005, 5 ♂♂ (MNHN-B 30127). — Stn CP 2443, 15°08.5'S, 166°54.1'E, 220-277 m, 10.IX.2005, 2 ♂♂, 1 ♀ (MNHN-B 30120). — Stn CP 2444, 15°07.8'S, 166°53.7'E, 250-331 m, 10.IX.2005, 1 ♂ (MNHN-B 30091). — Stn CP 2445, 15°08.0'S, 166°53.3'E, 231-285 m, 10.IX.2005, 1 ♂ (MNHN-B 30121). — Stn CP 2446, 15°06.5'S, 166°52.7'E, 300-360 m, 10.IX.2005, 2 pre-adult ♀♀, 2 ♀♀ (MNHN-B 30122). — Stn CP 2448, 15°06.6'S, 166°50.8'E, 297-387 m, 10.IX.2005, 2 ♂♂, 4 pre-adult ♀♀, 5 ♀♀, 1 ovig. ♀ (MNHN-B 30117). — Stn CP 2467, 16°45.3'S, 167°59.1'E, 750-850 m, 13.IX.2005, 1 ♂ (MNHN-B 30133). — Stn CP 2468, 16°30.7'S, 167°55.5'E, 550-565 m, 14.IX.2005, 1 ovig. ♀ (MNHN-B 30092). — Stn CP 2479, 16°45.0'S, 167°51.8'E, 350-358 m, 15.IX.2005, 1 ♂ (MNHN-B 30093). — Stn CP 2480, 16°44.3'S, 167°48.7'E, 632-677 m, 15.IX.2005, 1 ♂ (MNHN-B 30132).

**New Caledonia.** MUSORSTOM 4, stn CP 238, 22°13.0'S, 167°14.0'E, 500-510 m, 2.X.1985, 1 ♂ (MNHN-B 29414). — Stn 242, 22°05'8"S, 167°10.3'E, 500-550 m, 3.X.1985, 1 pre-adult ♀ (MNHN-B 29435).

**BIOGEOGAL**, stn DW 291, 20°34.47'S, 166°53.33'E, 800 m, 27.IV.1987, 1 ovig. ♀ (MNHN-B 29469).

**SMIB 6**, stn DW 212, 19°05.6'S, 163°30.2'E, 220-225 m, 2.III.1990, 3 ♂♂ (MNHN-B 29818).

**BERYX 2**, stn CH 09, 24°44.55'S, 170°07.00'E, 790-825 m, 26.X.1991, 1 ♂ (MNHN-B 29421).

**BERYX 11**, stn DW 10, 24°53'S, 168°21'E, 565-600 m, 15.X.1992, 1 ♂, 1 ♀ (MNHN-B 29434). — Stn CP 60, 23°19'S, 168°00'E, 580-600 m, 20.X.1992, 1 ♂ (MNHN-B 29419).

**BATHUS 3**, stn DW 827, 23°22'S, 168°01'E, 381-469 m,

29.XI.1993, 1 ♀ (MNHN-B 29425).

**BATHUS 4**, stn CP 910, 18°59.32'S, 163°08.47'E, 560-608 m, 5.VIII.1994, 1 ♂ (MNHN-B 29417). — Stn CP 911, 18°57.80'S, 163°08.47'E, 566-558 m, 5.VIII.1994, 2 ♂♂ (MNHN-B 29420). — Stn CP 918, 18°49.02'S, 163°15.80'E, 613-647 m, 6.VIII.1994, 2 ♂♂ (MNHN-B 29423).

**NORFOLK 2**, stn DW 2027, 23°26'S, 167°51'E, 465-650 m, 21.X.2003, 1 ♂ parasitised by *Sacculina* (MNHN-B 29418). — Stn DW 2150, 22°43'S, 167°16'E, 245-300 m, 5.XI.2003, 3 ♀♀ (MNHN-B 29767).

**Fiji.** MUSORSTOM 10, stn DW 1330, 17°09.5'S, 177°56.3'E, 567-699 m, 8.VIII.1998, 3 ♀♀ (MNHN-B 29504).

**BORDAU 1**, stn DW 1393, 16°45'S, 179°59'E, 426-487 m, 23.II.1999, 1 ♂, 3 ♀♀ (MNHN-B 29505). — Stn DW 1395, 16°45'S, 179°59'E, 423-500 m, 23.II.1999, 4 ♂♂, 9 ♀♀ (MNHN-B 29502). — Stn CP 1401, 16°35'S, 179°41'E, 600-648 m, 25.II.1999, 1 ♂ (MNHN-B 29506). — Stn CP 1407, 16°40'S, 179°39'E, 499-527 m, 25.II.1999, 1 ♂ (MNHN-B 29507). — Stn DW 1447, 16°45'S, 179°59'E, 420-513 m, 4.III.1999, 6 ♂♂, 12 ♀♀ (MNHN-B 29503). — Stn CP 1448, 16°45'S, 179°59'E, 410-500 m, 4.III.1999, 1 ♀ (MNHN-B 29508). — Stn DW 1451, 16°45'S, 179°59'E, 400-460 m, 4.III.1999, 1 ♂, 2 ♀♀ (MNHN-B 29509). — Stn DW 1453, 16°45'S, 179°59'E, 414-510 m, 4.III.1999, 1 pre-adult ♀, 1 ♀ (MNHN-B 29510). — Stn DW 1463, 18°10'S, 178°44'W, 300-400 m, 6.III.1999, 1 ♀ (MNHN-B 29511). — Stn DW 1491, 18°50'S, 178°52'W, 777-787 m, 11.III.1999, 1 ♂ (MNHN-B 29512).

**BORDAU 2**, stn CP 1568, 21°02'S, 175°19'W, 431 m, 10.VI.2000, 1 ♂, 6 ♀♀, 9 ovig. ♀♀ (MNHN-B 29309).

**Tonga.** **BORDAU 2**, stn CP 1530, 21°12'S, 174°58'W, 802-803 m, 3.VI.2000, 1 pre-adult ♀ (MNHN-B 29555). — Stn CP 1539, 21°37'S, 175°19'W, 558-586 m, 4.VI.2000, 1 pre-adult ♀, 1 ♀, 1 ovig. ♀ (MNHN-B 29558). — Stn DW 1553, 20°42'S, 174°54'W, 650-676 m, 6.VI.2000, 1 ♂, 1 ♀ (MNHN-B 29566). — Stn CP 1556, 20°11'S, 174°45'W, 589-591 m, 7.VI.2000, 1 ♀ (MNHN-B 29560). — Stn CH 1557, 20°10'S, 174°42'W, 578m, 7.VI.2000, 1 pre-adult ♀ (MNHN-B 29563). — Stn CP 1620, 24°18'S, 176°20'W, 572 m, 18.VI.2000, 2 ovig. ♀♀ (MNHN-B 29559). — Stn CP 1641, 21°09'S, 175°22'W, 395 m, 21.VI.2000, 1 pre-adult ♀ (MNHN-B 29561).

**DISTRIBUTION.** — Western Pacific Ocean from Japan (see Sakai 1976, as *C. longipes*) to the Philippine Is, and now from the Indian Ocean (Maldives), Indonesia (Tanimbar and Kai islands), Solomon Is, Vanuatu, New Caledonia, Fiji, and Tonga. Depth: 174-850 m. Specimens were also obtained from tangle nets of local fishermen in the Philippines that obtained material from at least 50 m.

## COLOUR

A photograph of a freshly-collected female specimen from the Solomon Is (MNHN-B 29394) showed a red carapace and chelipeds and ambulatory legs banded with red. Photographs of freshly-collected material from the Philippine Is (PANGLAO 2005) showed carapaces coloured with various hues of red. A large female from the Philippine Is (cl 24.4 mm, cw 32.2 mm; ZRC 2006.0217), however, had irregular orange-red lines on the carapace and right cheliped. The specimen shown by Ikeda (1998: 135, pl. 55, as *C. longipes*) is similarly red. Hints of the red colour were observed in a few large preserved specimens.

## REMARKS

*Carcinoplax specularis* was described, but not illustrated, from a large male (cl 16.7 mm, cw 23.0 mm, USNM 46164) by Rathbun (1914). The description is relatively short and ambiguous, and most of the discussion dealt with differences between *C. specularis* and *C. longipes* (Wood-Mason, 1891). Sakai (1969: fig. 15c) illustrated the holotype but his drawing is small and not very accurate. Guinot (1989: fig. 25, pl. 8, figs A-D), however, provided clear line drawings and photographs of the holotype. The dorsal margin of the right outer orbital angle of the holotype seems to have been detached after Guinot's photograph was taken; the extreme right margin of the front is similarly detached but remains attached to the carapace.

*Carcinoplax verdensis* Rathbun, 1914 was described at the same time as *C. specularis* from only a female (cl 10.5 mm, cw 13.0 mm, USNM 46167) much smaller than the holotype of *C. specularis*. Rathbun's description does not include any illustrations and, as in the description of *C. specularis*, the short description consists of a comparison with *C. longipes*. It is surprising that Rathbun did not compare *C. verdensis* with *C. specularis*, even if both species were described using specimens collected by the *Albatross* from localities close to each other in the Philippine Is. Sakai (1969: fig. 15d) and Guinot (1989: fig. 22, pl. 9, figs D-F) illustrated the holotype of *C. verdensis*. As in the case of the holotype of *C. specularis*, Sakai's line drawing is small and inaccurate. A third species, *C. polita* Guinot,

1989, was described from three small Philippine specimens previously identified as *C. specularis* by Serène & Vadon (1981).

Examination of the holotypes of *C. specularis* and *C. verdensis* shows some clear differences. These differences, as well as similarities in the general shape of the carapace, were outlined by Guinot (1989: 301) when the holotypes were compared by her. The outer orbital angle of the holotype of *C. specularis* is prominent, tooth-like (see Guinot 1989: fig. 25, pl. 8, figs A, B) in contrast to almost straight, lacking a tooth or a lobe, in the holotype of *C. verdensis* (see Guinot 1989: fig. 22, pl. 9, figs D, E). The anterolateral teeth of *C. specularis* are also prominent and anteriorly curved, whereas those of *C. verdensis* are shorter and not as prominent. The dorsal surface of the carapace, chelipeds (P1), and the ambulatory legs (P2-P5) of the holotype of *C. verdensis* have a short, barely discernible tomentum that is absent in the holotype of *C. specularis*. Both holotypes, however, have a short tomentum on the ventral surface of the carapace and abdomen. Other differences not pointed out by Guinot are the presence of a blunt tooth on the dorsal surface of the cheliped merus of the holotype of *C. specularis* that is barely discernible in the holotype of *C. verdensis*, and visibly thicker ambulatory legs in the holotype of *C. specularis* (P5 merus width to length ratio of 0.23) than in the holotype of *C. verdensis* (P5 merus width to length ratio of 0.19). Two other characters were also mentioned by Guinot, the extent of the dark coloration of the cheliped fingers and the texture of the cheliped merus (see below).

*Carcinoplax polita* was described on account of several characters that were different from those of *C. specularis* (Guinot 1989: 300, figs 24, 37, pl. 8, figs E-H): outer orbital teeth more salient and anterolateral teeth more curved and pointed than in *C. specularis*, granules on the hepatic region that are more apparent in *C. specularis*, a small spine on the antero-external angle of the cheliped carpus that is absent in *C. specularis*, a rounded and glabrous portion on the distal portion of the cheliped carpus in contrast to a flatter and oval surface in *C. specularis*, dark fingers in contrast to colourless fingers in *C. specularis*, tip of G1 with a shorter and inflated tip in *C. specularis*, and distal part of

G2 straight rather than curved as in *C. specularis*. Guinot (1989: 301) also contrasted *C. polita* with *C. verdensis* by referring to differences in the shape of the anterolateral teeth, the shiny portion on the cheliped diagnostic of *C. polita*, and the coloration of the cheliped fingers.

Confusion between *C. specularis* and *C. verdensis* already existed before the examination of the respective holotypes by Guinot (1989). Serène & Vadon (1981: 126) reported on the presence of both *C. specularis* and *C. verdensis* from the South China Sea, but their only specimen of *C. verdensis*, a male, was identified as such with “reservations”. The same specimens identified as *C. specularis* by Serène & Vadon were the ones used by Guinot in her description of *C. polita*.

Although there are differences between the holotypes, particularly those of *C. specularis* and *C. verdensis*, examination of a large number of specimens (more than 250) from the Maldive Is as well as from the western Pacific Ocean from Taiwan to Tonga showed that these and other potential species-specific differences (morphologies of the abdomen, G1, G2, and vulva) were not constant when applied to a large number of specimens. Specimens sampled ranged from small pre-adults to large adults (largest male cl 24.0 mm, cw 32.0 mm [ZRC 2001.0973], largest female cl 19.4 mm, cw 23.8 mm [MNHN-B 29380]). Many specimens, particularly those of a size intermediate between the large holotype of *C. specularis* (cl 16.7 mm, cw 23.0 mm) and the smaller holotype of *C. verdensis* (cl 10.5 mm, cw 13.0 mm) had outer orbital angles and anterolateral teeth with a variable morphology and intermediate width of the P5 meri. The short tomentum, which is present in the holotype of *C. verdensis* but absent in that of *C. specularis*, is clearly a variable character. Some specimens had a tomentum while others of the same sex and about the same size lacked it even if collected from the same station. The assumed differences between the three species are due to size and therefore are not species-specific. The three species, *C. specularis*, *C. verdensis*, and *C. polita*, are therefore considered herein as conspecific. *Carcinoplax specularis* Rathbun, 1914 has been chosen as the name of the species since it appears first in Rathbun (1914) and its male holotype best represents the characters

of the species. *Carcinoplax verdensis* Rathbun, 1914, and *C. polita* Guinot, 1989, are therefore junior subjective synonyms of *C. specularis*.

There are also close similarities between *C. specularis* and *C. abyssicola* (Miers, 1886), a species reliably known only from the holotype specimen from Fiji (see Remarks for *C. abyssicola* above), where *C. specularis* has been collected. The taxonomy of *C. specularis* may be further complicated if both are shown to be conspecific and *C. specularis* becomes a junior synonym of *C. abyssicola*.

The G1 (see Guinot 1989: fig. 34A, G1 of holotype) is typical of that of other species of *Carcinoplax*, being long, slender, thin, and with a truncated, interiorly rounded, exteriorly pointed tip. The G2 (see Guinot 1989: fig. 34B, G2 of holotype) is slightly shorter than the G1. It has a slightly curved flagellum that ends in a slightly expanded tip with two terminal spinules. Somite 2 of the male abdomen is slightly narrower than somite 3, thoracic sternite 8 not visible. The vulva of the mature females is also typical of *Carcinoplax*, being greatly expanded, extending from suture 5/6 to suture 6/7, and covered by a soft membrane.

#### *Carcinoplax spinosissima* Rathbun, 1914

*Carcinoplax spinosissima* Rathbun, 1914: 139 [Philippine Is]. — Tesch 1918: 154 [in list]. — Estampador 1937: 533 [in list]; 1959: 89 [in list] [Philippine Is]. — Serène 1968: 90 [in list]. — Sakai 1969: 271 [in list], fig. 15f [holotype]. — Serène & Lohavanijaya 1973: 62 [in list], 64 [in key]. — Serène & Vadon 1981: 118-120, 123, 127 [Philippine Is]. — Guinot 1989: 291 [discussion], figs 16, 20, pl. 7 [Philippine Is, Indonesia]. — Chen 1998: 266 [in key], 270, 310 [in list], fig. 4 [South China Sea]. — Hsueh & Huang 2002: 119 [in key], 119, figs 5, 8A [Taiwan]. — Ng & Manuel-Santos 2007: figs 6C, 9C, 10C, 11C, 12C, 13D [Philippines Is].

TYPE MATERIAL. — *Albatross*, stn 5417, ♂ holotype, cl 28.0 mm, cw 33.5 mm (USNM 46173).

TYPE LOCALITY. — Philippine Islands, between Cebu and Bohol, 10°10'N, 123°53'E, 302 m.

MATERIAL EXAMINED. — **Philippine Islands**. Verde Island Passage, MUSORSTOM 2, stn CP 67, 14°00'N, 120°18'E, 193-199 m, 29.XI.1980, 2 ♂♂, 2 ♀♀ (MNHN-B 10113).

MUSORSTOM 3, stn DW 99, 14°01'N, 120°19'E, 196-204 m, 1.VI.1985, 1 ♂ (MNHN-B 29792).

Between Cebu and Bohol, *Albatross*, stn 5417, 10°10'N, 123°53'E, 302 m, 25.III.1909, ♂ holotype (USNM 46173).

Bohol, Balicasag I., off Panglao I., tangle nets of local fishermen, 50-500 m, 28.XI.2001, 1 ♂, 1 ♀ (ZRC 2001.0535). — 50-500 m, III.2004, 1 ovig. ♀ (ZRC 2004.0712). — II.2004, 1 ♂, 1 ♀ parasitised by *Sacculina* (ZRC). — Panglao I., Maribohoc Bay, tangle nets of local fishermen, 100-300 m, T. J. Arbusto coll., XI.2003-IV.2004, 1 ♂ (MNHN-B 29729).

PANGLAO 2005, stn CP 2331, Maribohoc Bay, 09°39.2'N, 123°47.5'E, 255-268 m, 22.V.2005, 1 ♀ (MNHN-B 30250). — Stn CP 2348, off Pamilican I., 09°31.6'N, 123°55.7'E, 219-240 m, 24.V.2005, 1 pre-adult ♀ (ZRC). — Stn CP 2373, off Aligban I., 08°42.0'N, 123°13.3'E, 165-237 m, 27.V.2005, 1 ♂ (ZRC 2006.0210). — Stn 2407, Maribohoc Bay, 09°41.3'N, 123°48.5'E, 256-268 m, 1.VI.2005, 1 ♀ parasitised by sacculinid (ZRC 2006.0206).

DISTRIBUTION. — Western Pacific Ocean from Taiwan (Hsueh & Huang 2002) to Indonesia (Guinot 1989). Depth: 165-302 m. Material was also obtained from tangle nets of local fishermen in the Philippines that obtained specimens from estimated depths of 50-500 m.

#### COLOUR

A photograph of a specimen from the Philippine Is (PANGLAO 2005) had an orange carapace with a few irregular white lines and spots. The ambulatory legs were orange with irregular white spots.

#### REMARKS

Diagnostic of *C. spinosissima* are the conspicuous setae on the carapace, chelipeds (P1), and ambulatory legs (P2-P5). Large specimens lack the setae and sometimes the characteristic acute tubercles on the dorsal surface of the cheliped meri (Guinot 1989: pl. 7, figs F, H). Also diagnostic is the presence of a tooth on the distal, dorsal margins of the ambulatory leg (P2-P5) meri, which Rathbun (1914) did not mention in her description of the species. Some specimens, however, may lack a tooth on one or more of the legs but the tooth is always present on the other member of the pair. The tooth is clearly shown by Hsueh & Huang (2002: fig. 5C). Differences between *C. spinosissima* and *C. nana*, which also has conspicuous setae, are outlined in the Remarks section for the latter (see above).

### *Carcinoplax tenuidentata* n. sp.

(Figs 4; 5)

TYPE MATERIAL. — MUSORSTOM 10, stn CP 1320, ♂ holotype, cl 9.1 mm, cw 10.8 mm (MNHN-B 29496). — Stn CP 1325, ♂ paratype, cl 12.0 mm, cw 14.5 mm (MNHN-B 29497). — MUSORSTOM 8, stn CP 1123 ♀ paratype, cl 14.3 mm, cw 17.1 mm (MNHN-B 29797). — BATHUS 4, stn DW 883 ♀ paratype, cl 11.4 mm, cw 13.4 mm (MNHN-B 29493).

TYPE LOCALITY. — Fiji, Bligh Water, 17°16.8'S, 177°53.6'E, 290-300 m.

MATERIAL EXAMINED. — **Vanuatu.** MUSORSTOM 8, stn DW 1004, 18°48.96'S, 168°59.24'E, 319-350 m, 25.IX.1994, 1 ♂ (MNHN-B 29405). — Stn CP 1123, 15°07.19'S, 166°55.20'E, 262-552 m, 9.X.1994, ♀ paratype (MNHN-B 29797).

BOA I, stn CP 2445, 18°08.0'S, 166°55.3'E, 231-285 m, 10.IX.2005, 2 ♂♂ (MNHN-B 30124).

**New Caledonia.** LAGON, stn DW 835, 20°46.8'S, 165°17.3'E, 135-150 m, 11.I.1987, 1 pre-adult ♀ (MNHN-B 29774).

Passe de Boulari, 400 m, 20.III.1988, 1 ♂, 1 ♀ (MNHN-B 29775).

BATHUS 1, stn DW 641, 21°52.18'S, 166°49.06'E, 240-258 m, 10.III.1993, 1 ♂ (MNHN-B 29551). — Stn DW 654, 21°17.11'S, 165°56.77'E, 237-298 m, 12.III.1993, 1 ♀ (MNHN-B 29490). — Stn DW 659, 21°16.98'S, 165°56.82'E, 275 m, 12.III.1993, 1 ♂ (MNHN-B 29809). — Stn CP 668, 20°57.21'S, 165°34.57'E, 205-219 m, 14.III.1993, 1 ♂ (MNHN-B 29491). — Stn CP 713, 21°45.28'S, 166°36.83'E, 250 m, 19.III.1993, 1 ♀ (MNHN-B 29492).

HALIPRO 1, stn CP 853, 21°45'S, 166°37'E, 241-250 m, 19.IV.1994, 1 ♂ parasitised by *Sacculina* (MNHN-B 29810).

BATHUS 4, stn DW 883, 22°03.43'S, 165°56.03'E, 450-600 m, 1.VIII.1994, 1 ♀ paratype (MNHN-B 29493). — Stn CP 899, 20°16.68'S, 163°50.26'E, 500-600 m, 3.VIII.1994, 1 ♀ (MNHN-B 29494).

**Fiji.** MUSORSTOM 10, stn CP 1320, 17°16.8'S, 177°53.6'E, 290-300 m, 6.VIII.1998, 1 ♀ (MNHN-B 29495), ♂ holotype (MNHN-B 29496). — Stn CP 1325, 17°16.4'S, 177°49.8'E, 282-322 m, 7.VIII.1998, 1 ♂ paratype (MNHN-B 29497). — Stn CP 1328, 17°16.8'S, 177°50.4'E, 248-277 m, 7.VIII.1998, 2 ♀♀ (MNHN-B 29498).

BORDAU 1, stn CP 1402, 16°38'S, 179°36'E, 260-279 m, 25.II.1999, 1 pre-adult ♀ (MNHN-B 29499). — Stn CP 1403, 16°40'S, 179°36'E, 220-224 m, 25.II.1999, 1 ♀ (MNHN-B 29500); 1 pre-adult ♂ (MNHN-B 29807).

ETYMOLOGY. — From *tenuis*, Latin for "thin", and *dens*, Latin for "tooth", in reference to the slender, short anterolateral teeth characteristic of the species.

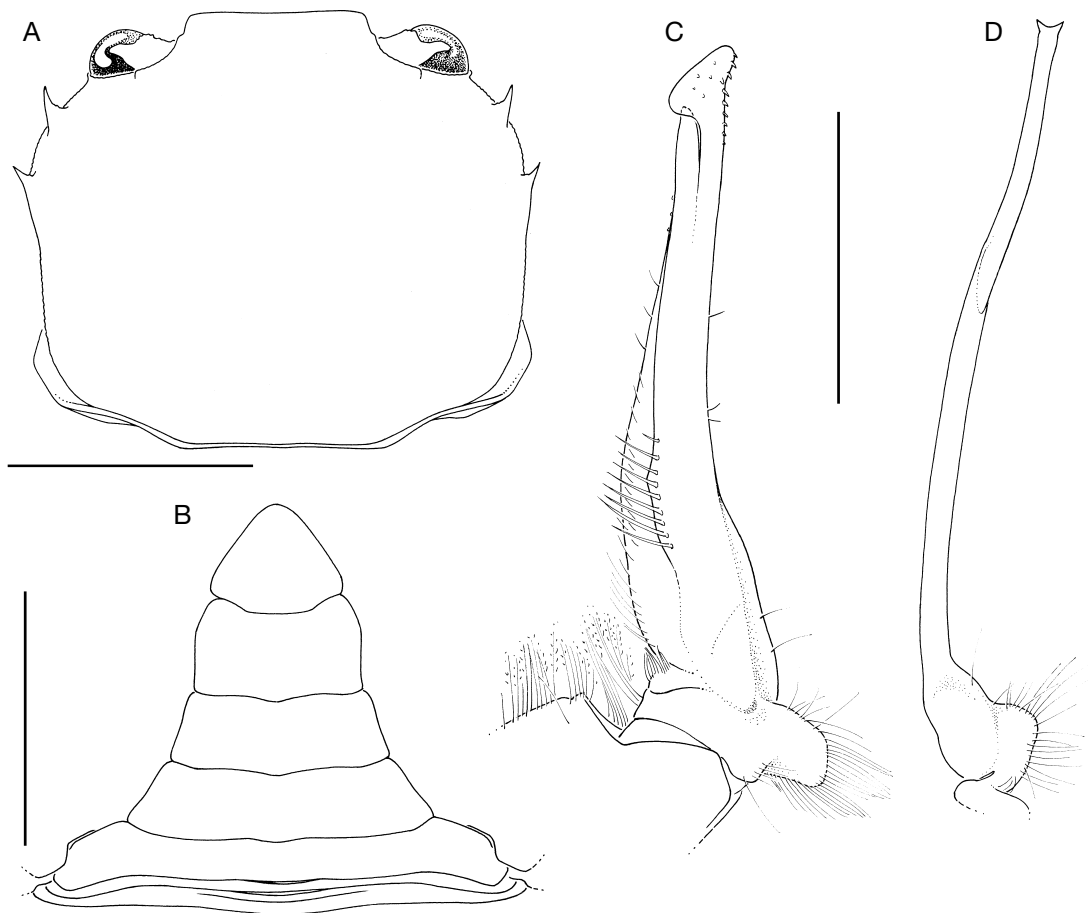


FIG. 4. — *Carcinoplax tenuidentata* n. sp., ♂ holotype, cl 9.1 mm, cw 10.8 mm, Bligh Water, Fiji, MUSORSTOM 10, stn CP 1320, 290-300 m (MNHN-B 29496): **A**, dorsal surface of the carapace; **B**, abdomen; **C**, left G1, dorsal view; **D**, left G2, ventral view. Scale bars: A, 5 mm; B, 3 mm; C, D, 1 mm.

**DISTRIBUTION.** — Southwestern Pacific Ocean: Vanuatu, New Caledonia, and Fiji. Depth: 135-720 m.

**DESCRIPTION**

Carapace (Figs 4A; 5) quadrate, slightly wider than long (1.2 as wide as long in holotype), anterolateral borders arched, inflated, giving carapace globose appearance. Carapace convex, without clear indication of regions. Front lamellar, straight, not marked by median notch. Slight notch between front, inner edge of supraorbital border. Supraorbital borders sinuous, margins granular. Suborbital borders granular, each with short, blunt inner tooth not visible dorsally. No

tooth on outer orbital angle other than the curved, granular border of the orbit; 2 slender, spinous, acute-tipped anterolateral teeth on each side of carapace. Posterolateral borders arched.

Subhepatic, pterygostomial regions, pterygostomial crest, pterygostomial lobe, merus, ischium of third maxilliped endopod with short, conspicuous granules.

Eye peduncles (Figs 4A; 5) short (0.2 front width), distal margin granular, cornea slightly expanded distally.

Chelipeds (P1) (Fig. 5) nearly equal in males, females, slightly more slender in males; fingers



FIG. 5. — *Carcinoplax tenuidentata* n. sp., ♂ holotype, cl 9.1 mm, cw 10.8 mm, Bligh Water, Fiji, MUSORSTOM 10, stn CP 1320, 290-300 m (MNHN-B 29496).

slender, as long as propodus in males, much shorter in females, with blunt teeth, less than half of distal portion of fingers dark brown. Broad, curved, acute-tipped tooth on inner (ventral), proximal margin of carpus, smaller tooth on outer (dorsal), distal margin. Ambulatory legs (P2-P5) moderately long, slender, smooth; many long simple setae along inner, outer margins of P5 propodus, dactylus, outer margin of P5 carpus, shorter along P2-P4, some long simple setae along P2-P4 meri, carpi, propodi; P5 dactylus long, slender, smooth; length of P5 merus 0.5-0.6 cl.

Male abdomen (Fig. 4B) narrowly triangular, with 6 freely-movable somites plus telson; telson slightly wider than long, somite 3 covers space between P5 coxae. Somites 1, 2 slightly narrower than somite 3, small portion of thoracic sternite 8 visible. G1 (Fig. 4C) long, slender, straight; pointed tip with scattered spinules. G2 (Fig. 4D) slender, nearly equal or slightly longer than G1, slightly curved flagellum, tip with 2 lateral spinules.

Female abdomen wide. Telson slightly wider than long. Somites 1, 2 cover space between P5

coxae, thoracic sternite 8 not visible. Vulva of mature females greatly expanded, extending from edge of slightly deflected suture 5/6 to suture 6/7; membrane covers aperture leaving space open along anterior margin.

#### Colour

The holotype specimen (MNHN-B 29496) was photographed soon after collection. The carapace was orange and the ambulatory legs transparent and banded with orange.

#### REMARKS

The overall morphology of the new species is remarkably similar, almost identical, to that of *Pycnoplax bispinosa* (Rathbun, 1914) n. comb. Both species have two relatively short, slender, and acute anterolateral teeth (Figs 4A; 5 for *C. tenuidentata* n. sp.; Fig. 13B for *P. bispinosa* n. comb.). The teeth are seemingly dorsal, just at the border of a conspicuously inflated section of the carapace. The legs are slightly longer and more slender (distal end of the merus of the folded P5 reaches the proximal portion of the

second anterolateral teeth in both species but not in the largest specimens of *P. bispinosa* n. comb.). There are also short setae on the ventral surface of the carapace, third maxilliped, abdomen, and ambulatory legs (P2-P5).

The most obvious difference between the new species and *P. bispinosa* n. comb. is in the pterygostomial region on the ventral surface of the carapace. In *C. tenuidentata* n. sp. the pterygostomial and subhepatic regions are about the same relative height. In contrast, in *P. bispinosa* n. comb. the pterygostomial region is much higher than the subhepatic region and the two regions are separated from each other by a conspicuous pterygostomial ridge. Other differences are listed in the Remarks section for *P. bispinosa* n. comb. (see below).

Unusual for a species of *Carcinoplax* is that the orbital border does not continue into a lobe or tooth. It ends as a rounded and granular border well above the first anterolateral tooth (Fig. 4A).

### *Carcinoplax tomentosa* Sakai, 1969

*Carcinoplax tomentosa* Sakai, 1969: 270 [in list], 271, figs 16a, 17c, 18a; 1976: 524 [in key], 526, fig. 280, pl. 190, fig. 2 [Japan]. — Serène & Lohavanijaya 1973: 62 [in list]. — Guinot 1989: 313 [discussion], figs 33, 41, pl. 10, fig. H [holotype]. — Miyake 1991: 146, 220 [in list], pl. 49, fig. 4 [Japan]. — Ikeda 1998: 15, 42, 136, pl. 56 [Japan]. — Muraoka 1998: 47 [in list], pl. 1, fig. 7 [colour] [Japan]. — Watanabe & Muraoka 1999: 41, fig. 1 [Japan]. — Ng *et al.* 2001: 33 [Taiwan]. — Hsueh & Huang 2002: 119 [in key], 120, figs 2E, 7 [Taiwan]. — Takeda *et al.* 2006: 204 [in list] [Japan].

*Carcinoplax* aff. *tomentosa* – Serène & Vadon 1981: 118, 119, 123, 126 [Philippine Is].

TYPE MATERIAL. — Status and location of holotype unknown; dry ♂ paratype (KPM NH106666) (see Muraoka 1998: 47, pl. 1, fig. 7 [colour]).

TYPE LOCALITY. — Japan, Tosa Bay, 150-200 m.

MATERIAL EXAMINED. — Japan. Honshu, Boso Peninsula, off Kanaya, 200-250 m, H. Tejima coll., II.1997, 1 ♂ (CBM-ZC 3517).

?Honshu, Kii Peninsula, off Shinomisaki, 300 m, S. Nagai coll., X.1996, 1 ♂ (CBM-ZC 3570).

Taiwan. Tai-Chi fishing port, P. K. L. Ng coll., 3-4.VIII.1996, 1 ♀ (ZRC 1997.748). — P. K. L. Ng &

K. Lim coll., V.1999, 1 ♂ (ZRC 1999.0775). — IV.2003, 1 ♂ (NTOU). — Sugo, Nangfangao fishing port, commercial inshore trawlers, 100-400 m, P. K. L. Ng & K. Lim coll., V.1999, 1 ♂ (ZRC 1999.0808). — 7.VI.1999, 1 ♂ (ZRC 1999.0720). — XI.2000, 2 ♂♂ (ZRC 2001.0020). — P. K. L. Ng coll., 5.XI.2000, 1 ♂ cl 37.8 mm, cw 49.6 mm (ZRC 2001.0021). — Kaohsiung, Tungking fishing port, P. K. L. Ng & H.-P. Ho coll., 6.XI.2000 (ZRC 2001.0022). — 11.VIII.2003, 1 ♂ (NTOU).

TAIWAN 2001, stn CP 113, 24°50.8'S, 121°59.9'E, 281 m, 21.V.2001, 1 ♂ (MNHN-B 29692).

DISTRIBUTION. — Western Pacific Ocean from Japan to Taiwan and questionably the Philippine Is (doubtful record by Serène & Vadon 1981). Depth: 150-300 m.

### REMARKS

Diagnostic of *C. tomentosa*, as its name implies, is the conspicuous short tomentum on the carapace, chelipeds (P1), and ambulatory legs (P2-P5). In the largest individuals the carapace becomes smooth, devoid of tomentum, but the ambulatory legs still show the tomentum. A small male (cl 6.7 mm, cw 8.8 mm, CBM-ZC 3570) from Japan, doubtfully identified as belonging to this species, only had a short tomentum throughout the carapace and legs.

Serène & Lohavanijaya (1973: 62, 63) stated that *C. tomentosa* does not belong in the genus *Carcinoplax* because of the presence of a short G2. The G2 of specimens examined during this study was actually slightly longer than the G1, raising the possibility that the specimens referred to by Serène & Lohavanijaya (1973) belonged to another, yet unidentified, species. The Philippine material identified by Serène & Vadon (1981) as *C. aff. tomentosa* also appears to be lost.

### *Carcinoplax tuberosa* n. sp. (Figs 6-8)

TYPE MATERIAL. — VOLSMAR, stn DW 5, ♂ holotype, cl 6.9 mm, cw 8.8 mm (MNHN-B 29829); ♂ paratype, cl 7.0 mm, cw 9.0 mm; ♀ paratype, cl 6.8 mm, cw 8.8 mm; ovig. ♀ paratype, cl 6.9 mm, cw 8.8 mm, same as holotype (MNHN-B 29833). — MUSORSTOM 8, stn CP 1136, ♀ paratype, cl 5.8 mm, cw 6.8 mm, (MNHN-B 29830).

TYPE LOCALITY. — New Hebrides Ridge, Matthew and Hunter islands, 22°25.9'S, 171°46.5'E, 700 m.



**MATERIAL EXAMINED.** — ?**Philippine Islands.** Bohol, Balicasag I., off Panglao I., PANGLAO 2004, stn B39, Panglao I., Pontod Lagoon, 09°32.80'N, 123°42.10'E, 17-25 m, reef wall with small caves, 2.VII.2004, 1 pre-adult ♂ (ZRC 2006.0172).

**Vanuatu.** MUSORSTOM 8, stn CP 1136, 15°40'S, 167°01'E, 398-400 m, 11.X.1994, ♀ paratype (MNHN-B 29830).

**Matthew and Hunter islands.** VOLSMAR, stn DW 5, 22°25.9'S, 171°46.5'E, 700 m, 1.VI.1989, ♂ holotype (MNHN-B 29829), ♂ paratype, ♀ paratype, ovig. ♀ paratype (MNHN-B 29833).

**ETYMOLOGY.** — From *tuber*, Latin for “swelling” or “bulb”, in reference to the conspicuous tubercle-like granules on the outer and dorsal surface of the chelipeds (P1) that is diagnostic to the species.

**DISTRIBUTION.** — Southwestern Pacific Ocean: Vanuatu and the Matthew and Hunter islands south of Vanuatu, questionably from the Philippine Is. Depth: 398-400 and 700 m, questionably 17-25 m.

#### DESCRIPTION

Carapace (Figs 6A; 7) quadrate, slightly wider than long (1.3 as wide as long in holotype). Carapace slightly convex, slightly granular along anterior, lateral borders (conspicuously granular in ovigerous female paratype), with short setae, without clear indication of regions. Front lamellar, straight, not marked by median notch. Notch between front, inner edge of supraorbital border. Supraorbital borders sinuous, margins granular in holotype and most other specimens. Suborbital borders granular, each with short, blunt inner tooth not visible dorsally. Outer orbital angle with flat, granular, short tooth; 2 dorso-ventrally flat, triangular, granular, blunt-tipped anterolateral teeth on each side of carapace, margin between anterolateral teeth nearly straight. Posterolateral borders slightly arched.

Subhepatic, pterygostomial regions, merus, ischium of third maxilliped endopod with low, conspicuous granules. Margins of thoracic sternum with short setae.

Eye peduncles (Figs 6A; 7) short (0.2 front width), distal margin granular, cornea short, not expanded distally.

Chelipeds (P1) (Figs 7; 8) nearly equal in males, females, slightly more slender in females; fingers short, thick, about a third as long as propodus in both sexes, with blunt teeth, all or nearly all distal

portion of fingers dark brown. Propodus, carpus, merus fringed with sparse, long setae (few in holotype); propodus short, thick; conspicuous, blunt or slightly acute tubercles on outer (dorsal) surface of propodus (may be only on proximal region in one of two propodi), outer (dorsal) anterior border of carpus; shorter, less conspicuous granules on inner (ventral) surface of merus, inner margin granular. Ambulatory legs (P2-P5) relatively short (distal end of merus of the folded P5 only reaches tip of second anterolateral tooth), relatively stout articles, smooth, many short and long simple setae along inner, outer margins of articles; P5 dactylus long, slender, setose; length of P5 merus 0.7 cl.

Male abdomen (Fig. 6B) narrowly triangular, with 6 freely-movable somites plus telson; telson wider than long. Somite 3 covers space between P5 coxae. Somites 1, 2 slightly narrower than somite 3, thoracic sternite 8 not visible. G1 (Fig. 6C) long, slender, straight; rounded tip with slightly pointed inner margin. G2 (Fig. 6D) slender, slightly longer than G1, slightly curved flagellum, tip with 2 terminal spinules.

Female abdomen narrow, fringed with many long setae. Telson slightly wider than long. Somites 1, 2 cover space between P5 coxae, thoracic sternite 8 not visible. Vulva of mature females greatly expanded, extending from edge of slightly deflected suture 5/6 to suture 6/7; membrane covers aperture leaving space open along anterior margin.

#### REMARKS

*Carcinoplax tuberosa* n. sp. is close to *C. velutina* n. sp. (see description below). Both species share a short tomentum on the carapace, a more conspicuous tomentum on the ambulatory legs (P2-P5), granular ventral surface of the carapace, short and thick fingers, short eye peduncles, and cornea relatively short and not expanded distally. *Carcinoplax tuberosa* n. sp. is being described as a separate species on account of several differences. The G1 has a broadly rounded tip (Fig. 6C) whereas it is pointed in *C. velutina* n. sp. (Fig. 9C). The ambulatory legs of *C. tuberosa* n. sp. are shorter and slightly narrower than in *C. velutina* n. sp. (Fig. 10). In *C. tuberosa* n. sp. the distal end of the merus in the folded P5 reaches the tip of the

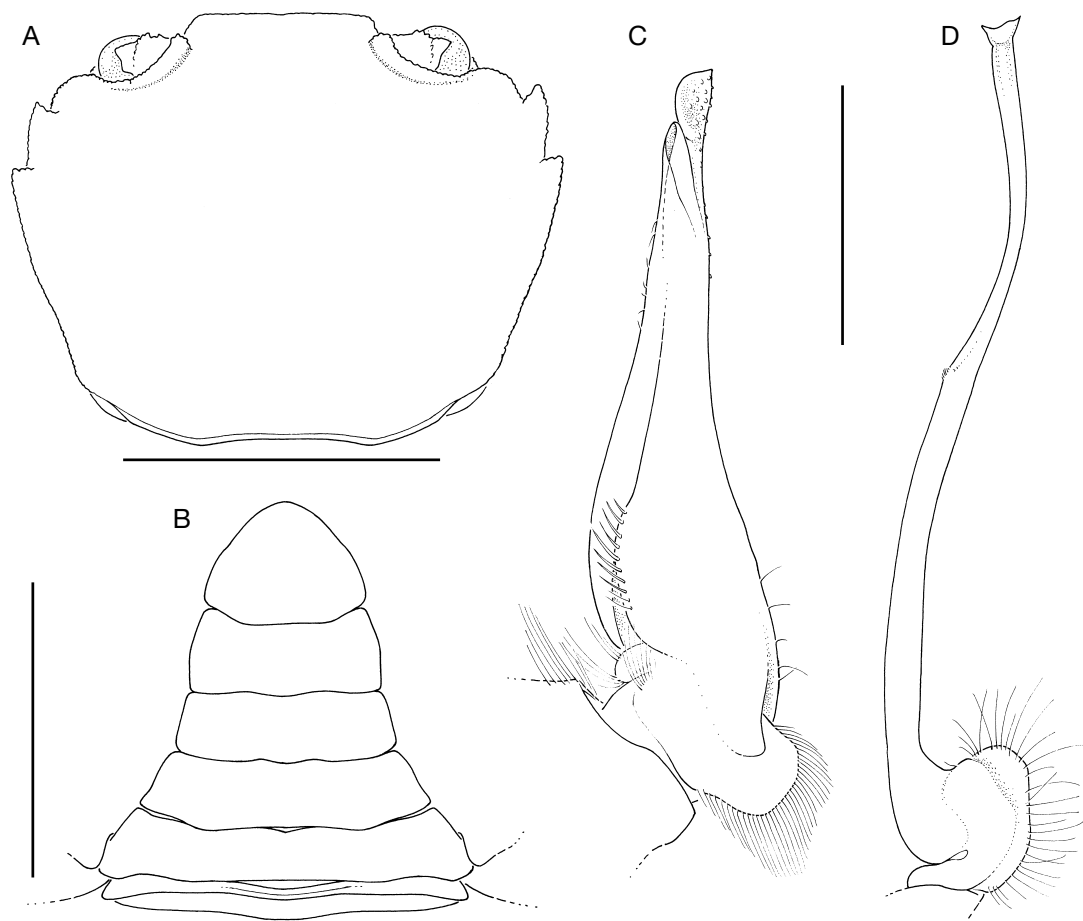


FIG. 6. — *Carcinoplax tuberosa* n. sp., ♂ holotype, cl 6.9 mm, cw 8.8 mm, Matthew and Hunter islands, New Hebrides Ridge, VOLSMAR, stn DW 5, 700 m (MNHN-B 29829): **A**, dorsal surface of the carapace; **B**, abdomen; **C**, left G1, dorsal view; **D**, left G2, ventral view. Scale bars: A, 5 mm; B, 3 mm; C, D, 1 mm.

second anterolateral tooth, whereas in *C. velutina* n. sp. they extend well over the tooth (almost reaching the tip of the first anterolateral tooth in the holotype). The setae on the ambulatory legs of *C. tuberosa* n. sp. are also conspicuously longer and more numerous than in *C. velutina* n. sp. An exception is a pre-adult male from the Philippine Is (ZRC 2006.0172), where the setae are short. The propodi and carpi of the chelipeds (P1) have conspicuous tubercles in *C. tuberosa* n. sp. (Fig. 8), which are absent in *C. velutina* n. sp. of about the same size.

*Carcinoplax tuberosa* n. sp. appears to be a small-size species, the largest male being cl 7.0 mm, cw 9.0 mm (MNHN-B 29829) and the largest female, which was ovigerous, cl 6.9 mm, cw 8.8 mm (MNHN-B 29833). A small female (cl 5.8 mm, cw 6.8 mm; MNHN-B 29830) had an enlarged vulva, evidence that it was mature. The damaged specimen of a pre-adult male from the Philippine Is (cl 2.5 mm, cw 2.9 mm; ZRC 2006.0172) shares all of the diagnostic characters of the type material except the long setae of its ambulatory legs. The new species thus appears not to be pre-adult



FIG. 7. — *Carcinoplax tuberosa* n. sp., ♂ holotype, cl 6.9 mm, cw 8.8 mm, Matthew and Hunter islands, New Hebrides Ridge, VOLSMAR, stn DW 5, 700 m (MNHN-B 29829).

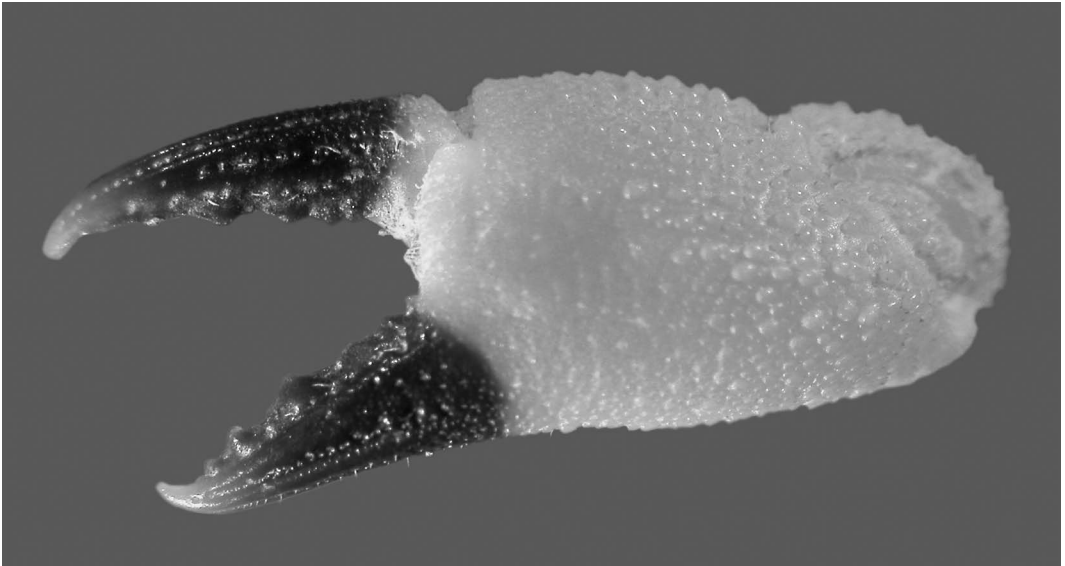


FIG. 8. — *Carcinoplax tuberosa* n. sp., ♂ holotype, cl 6.9 mm, cw 8.8 mm, Matthew and Hunter islands, New Hebrides Ridge, VOLSMAR, stn DW 5, 700 m (MNHN-B 29829), left cheliped (P1).

specimens of *C. velutina* n. sp. *Carcinoplax velutina* n. sp., however, is known mostly from relatively large specimens (smallest: female, cl 9.7 mm, cw 12.5 mm; MNHN-B 29828).

*Carcinoplax velutina* n. sp.  
(Figs 9; 10)

*Carcinoplax* aff. *verdensis* – Poupin 1996a: 98 [in list]; 1996b: pl. 16, fig. d [French Polynesia].

TYPE MATERIAL. — SMSRB collections, stn 397, ♂ holotype, cl 11.4 mm, cw 14.7 mm (MNHN-B 29826); ♂ paratype, cl 11.3 mm, cw 14.3 mm (MNHN-B 20794); ♀ paratype, cl 9.7 mm, cw 12.5 mm (MNHN-B 29828).

TYPE LOCALITY. — French Polynesia, Tuamotu Archipelago, Moruroa atoll, 21°53.3'N, 138°51.6'E, 680 m.

MATERIAL EXAMINED. — Vanuatu. BOA1, unknown station, 1 ♂ (MNHN-B 30450).

Fiji. MUSORSTOM 10, stn CP 1344, 16°45.3'S, 177°40.5'E, 588-610 m, 10.VIII.1998, 1 ♂ (MNHN-B 29835).

BORDAU 1, stn CP 1392, 16°49'S, 179°54'E, 545-651 m, 23.II.1999, 1 ♂ (MNHN-B 29834).

French Polynesia. Society Is, Bora Bora, 16°28'S, 151°47'W, trap, 450-600 m, 23.VII.1988, SMSRB collections, J. Poupin coll., 1 ♂ (MNHN-B 20904).

Tuamotu Archipelago, Moruroa atoll, 21°51'S, 138°47'W, trap, 570-670 m, 29.XI.1988, SMSRB collections, J. Poupin coll., ♂ paratype (MNHN-B 20794). — Hao I., 18°04.2'S, 141°01.8'W, trap, 500 m, 2.VI.1990, ♀ paratype (MNHN-B 29828). — Moruroa atoll, stn 383, 21°46.2'S, 138°54.0'W, trap, 600 m, 9.III.1991, 1 ♂ (MNHN-B 29827). — Moruroa atoll, stn 397, 21°53.3'N, 138°51.6'E, trap, 680 m, 17.III.1991, ♂ holotype (MNHN-B 29826).

ETYMOLOGY. — From *velutinus*, derived from *villus*, Latin for “shaggy hair”, in reference to the short tomentum on the ambulatory legs (P2-P5) and ventral surface of the carapace and abdomen, giving them, particularly the legs, a velvety appearance.

DISTRIBUTION. — Vanuatu, Fiji, and French Polynesia. Depth: 300-680 m.

DESCRIPTION

Carapace (Figs 9A; 10; Poupin 1996b: pl. 16, fig. d, as *Carcinoplax* aff. *verdensis*) quadrate, slightly wider than long (1.3 as wide as long in holotype). Carapace

slightly convex, granular along anterior, lateral borders, with short setae on posterior half, without clear indication of regions. Front lamellar, margin granular, straight, not marked by median notch. Notch between front, inner edge of supraorbital border. Supraorbital borders sinuous, margins granular, slight prominence before outer orbital angle. Suborbital borders granular, each with short, blunt inner tooth not visible dorsally. Outer orbital angle with flat, granular, blunt tooth; 2 dorso-ventrally flat, triangular, granular, blunt-tipped anterolateral teeth on each side of carapace, margin between anterolateral teeth nearly straight. Posterolateral borders arched.

Subhepatic, pterygostomial regions, pterygostomial lobe, merus, ischium of third maxilliped endopod with short, conspicuous granules. Margins of thoracic sternum with short setae.

Eye peduncles (Figs 9A; 10) short (0.2 front width), distal margin granular, cornea short, not expanded distally.

Chelipeds (P1) (Fig. 10; Poupin 1996b: pl. 16, fig. d, as *Carcinoplax* aff. *verdensis*) nearly equal in males, females, slightly more slender in females; fingers slender, as long as propodus in males, slightly longer than propodus in females, with blunt teeth, 3/4 or nearly all distal portion of fingers dark brown. Broad tooth on inner (ventral), proximal margin of carpus, acute-tipped in some specimens, inner margin granular in holotype. Ambulatory legs (P2-P5) long (distal end of the merus of the folded P5 reaches well beyond tip of second anterolateral tooth, in holotype almost reaching tip of first anterolateral tooth), relatively stout articles, granular, many short and long simple setae along inner, outer margins of articles; P5 dactylus long, slender, setose; length of P5 merus 0.7-0.8 cl.

Male abdomen (Fig. 9B) broadly triangular, fringed by short setae, with 6 freely-movable somites plus telson; telson slightly wider than long. Somite 3 covers space between P5 coxae; somites 1, 2 only slightly narrower than somite 3, thoracic sternite 8 not visible. G1 (Fig. 9C) long, slender, straight; pointed tip. G2 (Fig. 9D) slender, slightly longer than G1, slightly curved flagellum, tip with 2 terminal spinules.

Female abdomen narrow, fringed with many long setae. Telson wider than long. Somites 1, 2 cover space between P5 coxae, thoracic sternite 8 not

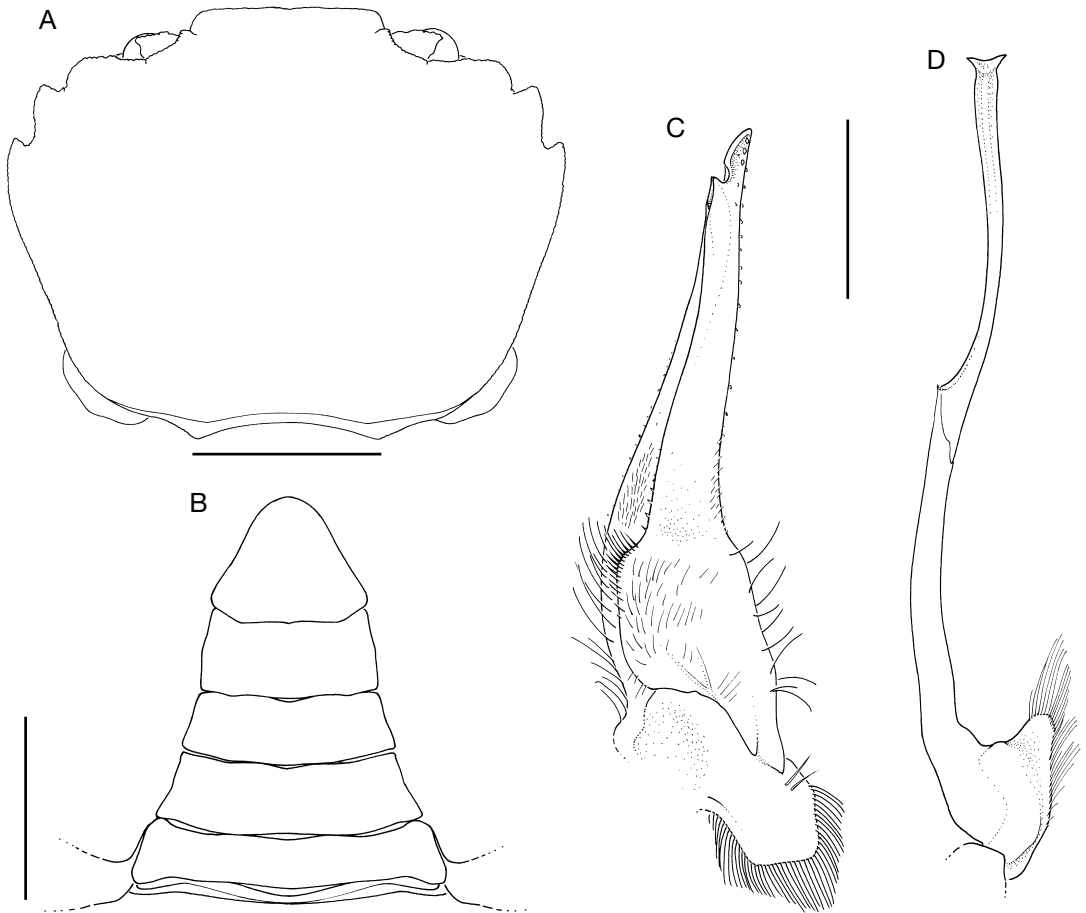


FIG. 9. — *Carcinoplax velutina* n. sp., ♂ holotype, cl 11.4 mm, cw 14.7 mm, Moruroa atoll, French Polynesia, SMSRB collections, stn 397, 680 m (MNHN-B 29826): **A**, dorsal surface of the carapace; **B**, abdomen; **C**, left G1, dorsal view; **D**, left G2, ventral view. Scale bars: A, 5 mm; B, 3 mm; C, D, 1 mm.

visible. Vulva of mature females greatly expanded, extending from edge of slightly deflected suture 5/6 to suture 6/7; membrane covers aperture leaving space open along anterior margin.

#### COLOUR

Carapace light orange; chelipeds (P1) mostly light orange, tips of fingers dark brown (Poupin 1996b: pl. 16, fig. d, as *Carcinoplax* aff. *verdensis*).

#### REMARKS

*Carcinoplax velutina* n. sp. is easily separated from other species of *Carcinoplax* by its long ambulatory legs

(P2-P5), the distal end of the merus of the P5 reaching the second anterolateral tooth; the short tomentum on the legs and on the margins of the abdomen (longer setae on the female abdomen) and thoracic sternum; the short setae on the posterior half of the carapace; and the nearly flat outer orbital teeth.

It is particularly close to *C. tuberosa* n. sp. Similarities and differences between the two species are discussed in the description of the latter (see above). There are also some similarities with *C. abyssicola*, described from Fiji, and *C. specularis*, with a wider geographical distribution but also known from Fiji, which have a short tomentum on the carapace and



FIG. 10. — *Carcinoplax velutina* n. sp., ♂ holotype, cl 11.4 mm, cw 14.7 mm, Moruroa atoll, French Polynesia, SMSRB collections, stn 397, 680 m (MNHN-B 29826).

ambulatory legs and the legs have relatively stout articles. In *C. abyssicola*, however, the outer orbital tooth is greatly reduced so that the carapace margin beyond the orbit is typically slanted, not straight, and the anterolateral teeth are curved and more salient than in *C. velutina* n. sp. (see Guinot 1989: fig. 38, pl. 9, figs A, B) and the eyes are clearly larger than in *C. velutina* n. sp., where the cornea is not much enlarged distally.

*Carcinoplax velutina* n. sp. somewhat resembles *C. longipes* from the Indian Ocean and the Philippine Is in the shape of the outer orbital tooth and in the long ambulatory legs. *C. longipes*, however, has a curved first anterolateral tooth (Guinot 1989: fig. 26, pl. 10, figs A, B; fig. 27, pl. 10, figs D, E, as *Carcinoplax* aff. *longipes*; pl. 10, fig. G, as *Carcinoplax* sp.) and a much sparse tomentum on the carapace and ambulatory legs.

A small male from Fiji (cl 8.0 mm, cw 10.1 mm; MNHN-B 29834) had the same carapace shape and anterolateral teeth and the same relative length of

the ambulatory legs as in *C. velutina* n. sp. but the setae of the ambulatory legs (P2-P5) were longer and more conspicuous than in *C. tuberosa* n. sp.

#### Genus *Entricoplax* n. gen.

*Carcinoplax* H. Milne Edwards, 1852: 164 (part). — Ortmann 1894: 685 [in key] (part). — Tesch 1918: 154 (part). — Bals 1922: 135; 1957: 1656 (part). — Sakai 1939: 555 [in key], 555; 1969: 269; 1976: 523 [in key] (part). — Barnard 1950: 282 [in key], 286 (part). — Serène 1968: 89 [in list] (part). — Guinot 1969b: 520, 524; 1971: 1081 [in list of species]; 1989: 273 (part). — Chen 1984: 188; 1998: 266 (part). — Serène & Lohavanijaya 1973: 62, 63 [in key to species] (part). — Dai *et al.* 1986: 366 [in key to species] (part). — Dai & Yang 1991: 394 [in key to species] (part). — Davie 2002: 193 (part). — Karasawa & Kato 2003b: 130 [in list], 140 [in list], 141 [in table] (part). — Karasawa & Schweitzer 2006: 26 [in list] (part).

TYPE SPECIES. — *Cancer* (*Curtonotus*) *vestitus* de Haan, 1833 (by present designation; gender feminine).

SPECIES INCLUDED. — *Entricoplax vestita* (de Haan, 1833) n. comb.

The genus is restricted to the Yellow and East China seas and the Pacific Ocean off Japan.

ETYMOLOGY. — From *entrichos*, Greek for “hairy”, in reference to the characteristic abundant setae on the carapace, chelipeds (P1), and ambulatory legs (P2-P5), and *plax*, Greek for “plate” or “tablet”, which is derived from the generic name *Carcinoplax* (from *karkinos*, Greek for crab) to denote that the type species of the new genus was formerly included in *Carcinoplax sensu lato*.

#### DESCRIPTION

Carapace (Shen 1932: fig. 63; Sakai 1976: pl. 190, fig. 3, as *Carcinoplax vestita*), transversely rectangular, much wider than long; widest at junction of anterolateral, posterolateral borders; front lamellar, concave, strongly deflexed, not marked by median notch or projection. Notch between front, inner edge of supraorbital border slight; orbits long, wide, expanded distally; supraorbital borders bilobed, with conspicuous tubercle-like process; suborbital borders long, rounded, without inner tooth; anterolateral borders convex. Dorsal surface of carapace covered by abundant setae, moderately convex, without clear indication of regions. Outer orbital angle with short prominence; 2 short anterolateral teeth on each side of carapace. Basal antennal article short, subquadrate, distalmost (third) article reaches front. Eye peduncles (Shen 1932: fig. 64, as *C. vestita*) relatively long (0.5 front width), dorsal surface with conspicuous setae; cornea reniform, dorso-ventrally flattened, much expanded distally, nearly divided into anterior, posterior portions. Anterior border of endostome well demarcated from buccal cavern, ridges clearly defined. Third maxillipeds completely close the buccal cavern. No obvious stridulating mechanism other than possible rubbing of proximal portion of cheliped (P1) merus against pterygostomial ridge. Thoracic sternum wide. Sulcus on thoracic sternite 4 conspicuous but interrupted medially (Fig. 11); sutures 4/5, 5/6, 6/7, 7/8 interrupted medially. Anterior end of sterno-abdominal cavity anterior to thoracic sternite 4. Cheliped fingers (Shen 1932: fig. 65a; Sakai 1976: pl. 190, fig. 3, as *C. vestita*) slender, nearly triangular, shorter than propodus, tips light in colour; large, blunt teeth. Carpus with tooth on inner margin. Dorsal margins of meri,

carpi, propodi of ambulatory legs (P2-P5) unarmed, covered with setae; dactyli slender, smooth, numerous thick setae. Male abdomen (Shen 1932: fig. 65b, as *C. vestita*) with 6 freely-movable somites plus telson, narrowly triangular; somite 1 long (longest somite), wide; somites 4-6 gradually decreasing in width from somite 3 (widest somite). Telson wider than long. Somite 3 covers space between P5 coxae, somite 2 narrower than somite 3 so that somite 2 leaves relatively large portion of thoracic sternite 8 visible. G1 (Takeda & Miyake 1968: fig. 5f; Dai & Yang 1991: fig. 192-2, as *C. vestita*) long, slender, thin, straight, only slightly broadened proximally; pointed, thin tip. G2 (Takeda & Miyake 1968: fig. 5g, as *C. vestita*) slender, slightly longer than G1, flagellum slightly shorter than proximal part (peduncle), slightly-expanded tip with lateral spinule. Penis arising from P5 coxa, moderate size; slightly-expanded, soft proximal expansion. Female abdomen (Shen 1932: fig. 65c, as *C. vestita*) with 6 freely-movable somites, wide. Telson wider than long. Somite 1 long, wide; somite 2 covers space between P5 coxae, thoracic sternite 8 not visible. Vulva of mature females (Fig. 11; Doi & Watanabe 2006: fig. 1) greatly expanded, extending from suture 5/6 to suture 6/7, covered by soft membrane, thickened inner margins but vulvar cover absent.

#### REMARKS

The new genus is being described for *Carcinoplax vestita*, which was described as *Cancer (Curtonotus) vestitus* de Haan, 1833. Guinot (1989: 314) listed the species among eight non-revised species of *Carcinoplax* that eventually proved to belong in other genera.

Diagnostic of *Entricoplax* n. gen. is a supraorbital border that is long and bilobed, with orbits expanded to accommodate the reniform eyes (in contrast to *Carcinoplax*, where the supraorbital border is curved or sinuous, with orbit not expanded and distal portion of the cornea is rounded), a concave, conspicuously deflexed front (straight in *Carcinoplax*), suborbital border long and without an inner tooth (shorter and with a short inner tooth in *Carcinoplax*), somite 1 of male and female abdomens conspicuously long, much longer than somite 2 in both sexes and longer than somite 3

in the male abdomen (short in *Carcinoplax*), and large area of thoracic sternite 8 of males is left uncovered (usually completely or partially covered by somite 2 in *Carcinoplax*), basal antennal article short and subquadrate (slender and longer in *Carcinoplax*), and short anterolateral teeth (longer and more conspicuous in most species of *Carcinoplax*). Also characteristic of *E. vestita* n. comb., the only species included in the new genus, is the relatively long and dense setae that cover the carapace and pereopods.

The G1, G2, and vulva of *Entricoplax* n. gen. are nevertheless similar to those of *Carcinoplax*. The G1 is slender, straight, and thin, being close to that of *C. longimana*, the type species of the genus (see Takeda & Miyake 1968: fig. 5; Dai & Yang 1991: fig. 192-2, as *C. vestita*; Kim 1973: fig. 162B, as *C. vestitus*). The G2 is slightly longer than the G1, shorter than the proximal part (peduncle), and has a slightly-expanded tip with one lateral spinule, similar to the G2 of some species of *Carcinoplax*. The vulva (Fig. 11) is expanded and lacks a vulvar cover as in *Carcinoplax*.

*Entricoplax vestita* (de Haan, 1833) n. comb.  
(Fig. 11)

*Cancer* (*Curtonotus*) *vestitus* de Haan, 1833: 51, pl. 5, fig. 3 [Japan].

*Curtonotus vestitus* – MacLeay 1838: 61. — Krauss 1843: 33 (not *E. vestita* (de Haan, 1833) n. comb. = *Pilumnus longicornis* Hilgendorf, 1878).

*Curtonotus vestitus* – White 1847: 37 [in list].

*Carcinoplax vestitus* – H. Milne Edwards 1852: 164. — Parisi 1918: 91 [Japan]. — Sakai 1939: 557, 722, fig. 64, pl. 66, fig. 5; 1940: 42, 45 [in lists]; 1956: 46 [in list]; 1965: 167, pl. 83, fig. 2; 1969: 269 [in list] [Japan]. — Kamita 1941a: 235, 241 [in list]; 1941b: 138, fig. 75 [Korea]. — Imaizumi 1960: 221; 1961: 187 [fossils, Japan]. — Park 1964: 17 [in list] [Korea]. — Serène 1968: 89 [in list]. — Kim 1970: 16 [in list]; 1973: 407, 636, figs 160, 162, pl. 85, fig. 123a-d; 1977: 206 [in list] [Korea]. — Lee & Hong 1970: 1, figs 1-5 [larvae, Korea]. — Kim & Kim 1982: 141, 151 [in list] [Korea].

*Pilumnoplax vestita* – Miers 1886: 227 [in list]. — Ortman 1894: 687 [Japan]. — Tesch 1918: 155 [in list],

156 [in key]. — Yokoya 1933: 191, 213 [Japan]. — Sakai 1934: 312; 1935: 182, fig. 93 [Japan]. — Kamita 1936: 32 [in list] [Korea].

*Pilumnoplax vestita* var. *sexdentata* Miers, 1886: xxx, xxxi, xxxvii, xlvi, 227, 229 [Japan].

*Carcinoplax vestita* – Rathbun 1902b: 24 [Japan]. — Shen 1932: 110, figs 63-65, pl. 5, fig. 1; 1948: 106 [in list] [Yellow and East China seas]. — Barnard 1950: 287 [in key], 288. — Miyake 1961: 21 [in list] [Japan]; 1991: 145, 219 [in list], pl. 49, fig. 1 [Japan]. — Miyake *et al.* 1962: 129 [in list] [Japan]. — Takeda & Miyake 1968: 564, fig. 5f, g [Japan]. — Guinot 1969b: 524 [discussion]; 1989: 314 [in list]; 1971: 1081 [in list]. — Holthuis & Sakai 1970: 279 [Japan]. — Serène & Lohavanijaya 1973: 62 [in list], 63 [in key]. — Sakai 1976: 524 [in key], 525, pl. 190, fig. 3 [Japan]. — Kikuchi & Miyake 1978: 42 [in list] [Japan]. — Chen 1984: 188 [in key], 189 (as *C. vestita* [sic]), 197, pl. 1, fig. 8 [Yellow and East China seas]; 1998: 266 [in key]. — Dai *et al.* 1986: 366 [in key], 370, fig. 192-2, pl. 53, fig. 8 [Yellow Sea]. — Yamaguchi *et al.* 1987: 22, pl. 9, fig. 10 [Japan]. — Dai & Yang 1991: 394 [in key], 398, fig. 192-2, pl. 53, fig. 8 [Yellow Sea]. — Rikuta 1991: 21 [Japan]. — Yamaguchi & Baba 1993: 431, fig. 152 [type material]. — Takeda 1995: 139 [in list] [Japan]. — Muraoka 1998: 47 [in list] [Japan]. — Ito & Honma 2001: 29 [in list] [Japan]. — Davie 2002: 194 [in list]. — Karasawa & Kato 2003b: 130 [in list]. — Doi & Watanabe 2006: 13, figs 1-3 [Japan]. — Ikeda & Takeda 2006: 179 [in list] [Japan]. — Takeda *et al.* 2006: 204 [in list] [Japan]. — Karasawa & Schweitzer 2006: 26 [in list].

*Pilumnoplax vestitus* – Stebbing 1910: 313 [in list]. — Bals 1922: 136.

TYPE MATERIAL. — Japan, P. F. von Siebold & H. Bürger coll., ♀ lectotype (RMNH D 311); ♂ dry paralectotype, cl 13.2 mm, cw 18.0 mm (MNHN 2958); 2 ♂♂, 2 ♀♀ dry paralectotypes (RMNH D 42274); mouthparts of paralectotype (RMNH D) (see Yamaguchi & Baba 1993: 431, fig. 152; 2003: 51; Fransen *et al.* 1997: 111).

TYPE LOCALITY. — Japan.

MATERIAL EXAMINED. — **Japan.** Honshu, off Yokosuka, *Challenger*, 18 m, 1 pre-adult ♀ (BMNH). — 34°18.0'N, 133°35.0'E, *Challenger*, stn 233B, 27 m, 1 pre-adult ♀ (BMNH).

Sagami Bay?, T. Sakai leg., 1 ♀ (BMNH 1961.6.5.82). Miyako Bay, Iwate, off Hei-gawa rivermouth, 15-20 m, T. Komai coll., 24.V.1995, 1 ♂, 2 ♀♀ (CBM-ZC 1690). Unknown localities, P. F. von Siebold & H. Bürger coll., 1823-1834, ♂ dry paralectotype (MNHN-B 2958); 1 ♂, 1 pre-adult ♀ (MNHN-B 24259).

**China.** Tuandao, off Qindao, from tangle nets of local fishermen, 30-50 m, P. K. L. Ng coll., 23-25.VIII.2001,





FIG. 11. — *Entricoplax vestita* (de Haan, 1833) n. comb., ♀, cl 28.8 mm, cw 38.8 mm, Miyako Bay, Japan, 15–20 m (CBM-ZC 1690), thoracic sternum and vulva.

4 ♂♂ (ZRC 2002.0494). — Amoy, C. J. Shen leg., 1 ♂, 1 ♀ (BMNH 1935.3.19.117).

DISTRIBUTION. — Yellow and East China seas, east (Pacific Ocean) coast of Japan (see map in Chen 1984: fig. 8, as *C. vestita*). Depth: 15–110 m.

#### REMARKS

The unique characters of *Entricoplax vestita* n. comb., which sets it apart from the species of *Carcinoplax*, where it was traditionally included, are discussed in the description of *Entricoplax* n. gen. (see above).

*Entricoplax vestita* n. comb. appears to be restricted to the Yellow and East China seas and the Pacific Ocean coast of Japan. A record from South Africa is the result of a misidentification (see Barnard 1950: 288, as *C. vestita*). It has also been listed, almost certainly as an error or oversight, as occurring in Australia (Balls 1922: 136; Barnard 1950: 288; Sakai 1976: 525; Davie 2002: 194, as *C. vestita*).

Two small pre-adult females (cl 6.3 mm, cw 8.9 mm, cl 8.7 mm, cw 12.2 mm, BMNH) from Japan identified as *Pilumnoplax vestita* var. *sexdentata* by Miers (1886: 229) clearly belong to *E. vestita* n. comb., the only difference being that their anterolateral teeth are more pronounced than those of adult individuals.

#### Genus *Menoplax* n. gen.

*Carcinoplax* – Chen 1984: 188; 1998: 266 (part).

TYPE SPECIES. — *Carcinoplax longispinosa* Chen, 1984 (by present designation; gender feminine).

SPECIES INCLUDED. — *Menoplax longispinosa* (Chen, 1984) n. comb.

The genus is restricted to the Indo-West Pacific region.

ETYMOLOGY. — From *mene*, Greek for “moon” or “crescent”, in reference to the diagnostic crescent-shaped vulva, and *plax*, Greek for “plate” or “tablet”, which is derived from the generic name *Carcinoplax* (from *karkinos*, Greek for “crab”) to denote that the type species of the new genus was formerly included in *Carcinoplax sensu lato*.

#### DESCRIPTION

Carapace (Guinot 1989: fig. 40, pl. 13, figs A, B, D, E, as *C. longispinosa*) transversely rectangular, slightly wider than long, widest at junction of anterolateral, posterolateral borders; front lamellar, straight, not marked by median notch or projection. Barely discernible notch between front, inner edge of supraorbital border; orbits narrow, not expanded distally; supraorbital borders short, slightly sinuous; suborbital borders rounded, with short, blunt inner tooth not visible dorsally; anterolateral borders convex; posterolateral borders long, arched. Dorsal surface of carapace smooth, strongly convex, without clear indication of regions. Outer orbital angle with short, triangular tooth; 2 anterolateral teeth on each side of carapace, first reduced or obsolete in females, second conspicuous, acute, long, dorsally oriented. Basal antennal article long, slender, distalmost (third) article reaches front. Eye peduncles short, much shorter than front (0.2 front width); cornea spherical, only slightly expanded distally. Anterior border of endostome well demarcated from buccal cavern, ridges faint but clearly defined. Third maxillipeds completely close the buccal cavern. No obvious stridulating mechanism other than possible rubbing of proximal portion of cheliped (P1) merus against pterygostomial ridge. Thoracic sternum wide. Median sulcus on thoracic sternite 4 absent; sutures 4/5, 5/6, 7/8 interrupted medially, 6/7 complete (Fig. 12). Anterior end of sterno-abdominal cavity anterior to thoracic sternite 4. Cheliped fingers (Chen 1984: fig. 7-1, 7-2, as *C. longispinosa*; Guinot 1989: pl. 13, fig. C, as *C. longispinosa*) slender, slightly longer than propodus, darker in colour. Carpus with acute tooth on inner margin. Ambulatory leg (P2-P5) meri, carpi, propodi long, slender; dorsal margins unarmed; dactyli long, slender, carinated, setose. Male abdomen (Chen 1984: fig. 7-3, as *C. longispinosa*) with 6 freely-movable somites plus telson, narrowly triangular, somites 4-6 gradually decreasing in length from somite 3 (widest somite). Telson wider than long. Somite 3 covers space between P5 coxae, somite

2 slightly narrower than 3 so that somites 1, 2 only leave small portion of thoracic sternite 8 visible. G1 (Chen 1984: figs 7-4-7-6, as *C. longispinosa*; Guinot 1989: fig. 32A, as *C. longispinosa*) stout, with small denticles, truncated tip. G2 (Chen 1984: figs 7-7 to 7-9, as *C. longispinosa*; Guinot 1989: fig. 32B, as *C. longispinosa*) slender, much shorter than G1, flagellum much shorter than basal part, with basal denticles, tip pointed. Penis arising from P5 coxa, large; broad, soft proximal expansion. Female abdomen with 6 freely-movable somites, relatively narrow. Telson broadly triangular, wider than long. Somite 3 covers space between P5 coxae, somite 2 as wide as somite 3, thoracic sternite 8 not visible. Vulva of mature females (Fig. 12) oblique, crescent shaped, extending from suture 5/6 to suture 6/7, vulvar cover in the form of swollen section of thoracic sternite 6 covering outer margin.

#### REMARKS

*Menoplax* n. gen. is being described as a monotypic genus for *Carcinoplax longispinosa* Chen, 1984. In contrast to *Carcinoplax*, the new genus is characterized by a stout, truncated G1 with an acuminate tip (slender, thin, with a typically rounded tip in *Carcinoplax*), a G2 that is much shorter than the G1 (typically as long as the G1, never much shorter as in *Carcinoplax*), the presence of a crescent shaped vulva provided with a vulvar cover (Fig. 12) (vulva greatly enlarged and without a vulvar cover in *Carcinoplax*), a female abdomen narrower than that of *Carcinoplax*, a complete 6/7 suture (incomplete in *Carcinoplax*), conspicuously slender and long fingers, carinated dactyli of ambulatory legs (smooth in *Carcinoplax*), slender basal antennal article that is longer than that in *Carcinoplax*, and a strongly convex carapace armed with long second anterolateral teeth unlike any species of *Carcinoplax*. Other differences are given in the Remarks for *M. longispinosa* n. comb. (see below).

*Menoplax longispinosa* (Chen, 1984) n. comb.  
(Fig. 12)

*Carcinoplax longispinosa* Chen, 1984: 189 [in key], 196, 197, 201, fig. 7, pl. 1, fig. 5 [East and South China seas];

1998: 266 [in key]. — Guinot 1989: 311, figs 32, 40, pl. 13, figs A-E [Madagascar, Philippine Is].

TYPE MATERIAL. — ♂ holotype (IOAS K69B-31), ♂ paratype (IOAS Ky11B-31).

TYPE LOCALITY. — South China Sea, 18°30'N, 113°30'E, 1100 m.

MATERIAL EXAMINED. — **Madagascar.** Off northwest coast, trawling 135, 13°01'S, 48°01'E, 1075-1110 m, A. Crosnier coll., 21.I.1975, 1 pre-adult ♀ (MNHN-B 10208). — Trawling 142, 13°45.6'S, 47°34.2'E, 1250-1300 m, A. Crosnier coll., 28.II.1975, 1 ♀ (MNHN-B 10207).

**Philippine Islands.** South China Sea, MUSORSTOM 1, stn CP 47, 13°41'N, 120°30'E, 658-757 m, 25.III.1976, 1 ♂ (MNHN-B 10187). — Stn CP 49, 13°49'N, 120°00'E, 750-925 m, 25.III.1976, 1 ♀ (MNHN-B 10206).

**Indonesia.** Tanimbar Is, KARUBAR, stn CP 91, 08°44.54'S, 131°03.10'E, 884-890 m, 5.XI.1991, 1 ♂ (MNHN-B 29364).

**Solomon Islands.** SALOMON 1, stn CP 1858, 09°37.0'S, 160°41.7'E, 435-461 m, 7.X.2001, 1 ♀ (MNHN-B 29359).

SALOMON 2, stn CP 2176, 09°09.4'S, 158°59.2'E, 600-875 m, 21.X.2004, 1 ♂ (MNHN-B 30084). — Stn CP 2181, 08°46.9'S, 159°39.8'E, 645-840 m, 22.X.2004, 1 ♀ (MNHN-B 30085). — Stn CP 2197, 08°24.4'S, 159°22.5'E, 897-1057 m, 24.X.2004, 1 ♂, 4 ♀♀ (MNHN-B 30086). — Stn CP 2215, 07°44.3'S, 157°42.3'E, 718-880 m, 26.X.2004, 1 ♂ (MNHN-B 30087). — Stn CP 2219, 07°58.3'S, 157°34.4'E, 650-836 m, 27.X.2004, 1 pre-adult ♀, 1 ♀ (MNHN-B 30105). — Stn CP 2220, 07°58.1'S, 157°33.9'E, 632 m, 27.X.2004, 1 pre-adult ♀ (MNHN-B 30104). — Stn CP 2246, 07°42.6'S, 156°24.6'E, 664-682 m, 1.X.2004, 1 ♂ (MNHN-B 30110). — Stn CP 2247, 07°44.9'S, 156°24.7'E, 686-690 m, 1.XI.2004, 2 ♂♂, 3 ♀♀ (MNHN-B 30107). — Stn CP 2248, 07°42.5'S, 156°24.8'E, 650-673 m, 1.XI.2004, 2 ♂♂ (MNHN-B 30096). — Stn CP 2252, 07°28.4'S, 156°17.5'E, 1059-1109 m, 2.XI.2004, 1 ♀ (MNHN-B 30106). — Stn CP 2267, 07°48.0'S, 156°50.0'E, 590-600 m, 4.XI.2004, 4 ♂♂, 3 ♀♀ (MNHN-B 30083). — Stn CP 2269, 07°45.1'S, 156°56.3'E, 768-890 m, 4.XI.2004, 1 ♂ (MNHN-B 30113). — Stn CP 2270, 07°37.9'S, 156°58.8'E, 970-1060 m, 4.XI.2004, 1 ♂ (MNHN-B 30075).

**Vanuatu.** MUSORSTOM 8, stn CP 956, 20°33.41'S, 169°35.95'E, 1175-1210 m, 20.IX.1994, 1 ♂ (MNHN-B 29337); 1 ♂ (MNHN-B 30139). — Stn CP 990, 18°51.63'S, 168°50.98'E, 980-990 m, 24.IX.1994, 1 ♂, 1 ovig. ♀ (MNHN-B 29407); 1 ♂ (MNHN-B 301142). — Stn CP 991, 18°51.26'S, 168°52.19'E, 936-910 m, 24.IX.1994, 1 ♂, 1 ♀ (MNHN-B 29335). — Stn CP 992, 18°52.34'S, 168°55.16'E, 775-

748 m, 24.IX.1994, 2 ♂♂, 1 ♂ parasitised by *Sacculina*, 1 ♀ (MNHN-B 29328). — Stn CP 993, 18°48.78'S, 168°54.04'E, 780-783 m, 24.IX.1994, 1 ♂ (MNHN-B 29336). — Stn CP 1007, 18°51.97'S, 168°55.92'E, 720-830 m, 25.IX.1994, 1 ♂ (MNHN-B 29334). — Stn CP 1008, 18°53.29'S, 168°52.65'E, 919-1000 m, 25.IX.1994, 1 ♂, 1 ♂ parasitised by *Sacculina*, 1 ovig. ♀, 1 ♀ parasitised by *Sacculina* (MNHN-B 29333). — Stn CC 1034, 17°54.85'S, 168°42.04'E, 690-750 m, 29.IX.1994, 4 ♂♂ (MNHN-B 29331). — Stn CP 1035, 17°56.02'S, 168°44.06'E, 765-780 m, 29.IX.1994, 5 ♂♂, 1 ♀ (MNHN-B 29329). — Stn CP 1036, 18°01.00'S, 168°48.20'E, 920-950 m, 29.IX.1994, 6 ♂♂, 3 ♀♀ (MNHN-B 29332); 1 ♂ (MNHN-B 29363). — Stn CP 1037, 18°03.70'S, 168°54.40'E, 1058-1086 m, 29.IX.1994, 8 ♂♂, 3 ♀♀ (MNHN-B 29330).

**Chesterfield Islands.** MUSORSTOM 5, stn DW 313, 22°24.31'S, 159°57.53'E, 780-930 m, 13.X.1986, 1 ♀ (MNHN-B 29245). — Stn DC 321, 20°40'S, 158°02.20'E, 1000 m, 14.X.1986, 1 ♂ (MNHN-B 29428). — Stn CP 323, 21°18.52'S, 157°57.62'E, 970 m, 14.X.1986, 17 ♂♂, 8 ♀♀, 4 ovig. ♀♀ (MNHN-B 29362); 1 ♂ (MNHN-B 29311); 1 ♂ (MNHN-B 29312). — Stn CP 324, 21°15.01'S, 157°51.33'E, 970 m, 14.X.1986, 16 ♂♂, 7 ♀♀, 1 ovig. ♀ (MNHN-B 29308); 1 ♂ (MNHN-B 29313); 1 ♀ (MNHN-B 30055). — Stn CC 390, 21°00.90'S, 160°50.30'E, 745-825 m, 22.X.1986, 1 ♂ (MNHN-B 29310); 1 ♂ (MNHN-B 29184).

**CORAIL 2**, stn DE 14, 21°00.69'S, 160°57.18'E, 65-660 m, 21.VII.1988, 1 ♂ (MNHN-B 29342).

**EBISCO**, stn CP 2557, 21°15.01'S, 157°51.33'E, 970 m, 14.X.2005, 2 ♂♂, 1 pre-adult ♀, 5 ♀, 2 ♀♀ parasitised by *Sacculina* (MNHN-B 30129). — Stn CP 2616, 19°35'S, 158°52'E, 786-836 m, 19.X.2005, 1 ♂ (MNHN-B 30134). — Stn CP 2648, 21°32'S, 162°30'E, 750-458 m, 23.X.2005, 1 pre-adult, 9 ♂♂, 9 ♀♀ (MNHN-B 30116). — Stn CP 2649, 21°31'S, 162°33'E, 775-792 m, 23.X.2005, 1 pre-adult ♀, 1 ♀ (MNHN-B 30130). — Stn CP 2650, 21°27'S, 162°33'E, 825-894 m, 23.X.2005, 1 ♀ (MNHN-B 30141).

**New Caledonia.** BIOCAL, stn CP 75, 22°19'S, 167°23'E, 825-860 m, 4.IX.1985, 1 ♂ (MNHN-B 10411).

**BATHUS 1**, stn CP 651, 21°41.8'S, 166°40.1'E, 1080-1180 m, 11.III.1993, 2 ♀♀ (MNHN-B 29424).

**BATHUS 2**, stn CP 751, 22°24.35'S, 166°12.83'E, 1300-150 m, 15.V.1993, 1 ♀ (MNHN-B 29349).

**Fiji.** BORDAU 1, stn CP 1490, 18°51'S, 178°32'W, 785-820 m, 11.III.1999, 1 ♀ (MNHN-B 29361). — Stn CP 1491, 18°50'S, 178°27'W, 777-787 m, 11.III.1999, 6 ♂♂, 2 ♀♀ (MNHN-B 29501). — Stn CP 1493, 18°43'S, 178°24'W, 429-440 m, 11.III.1999, 1 ♀ (MNHN-B 29367). — Stn CP 1502, 18°21'S, 178°27'W, 640-660 m, 13.III.1999, 1 ♂ (MNHN-B 29360).

**Tonga.** BORDAU 1, stn CP 1565, 20°58'S, 175°16'W, 869-880 m, 9.VI.2000, 2 ♂♂, 1 ♂ parasitised by *Sacculina*, 1 ♀ (MNHN-B 29562). — Stn CP 1625, 23°28'S,

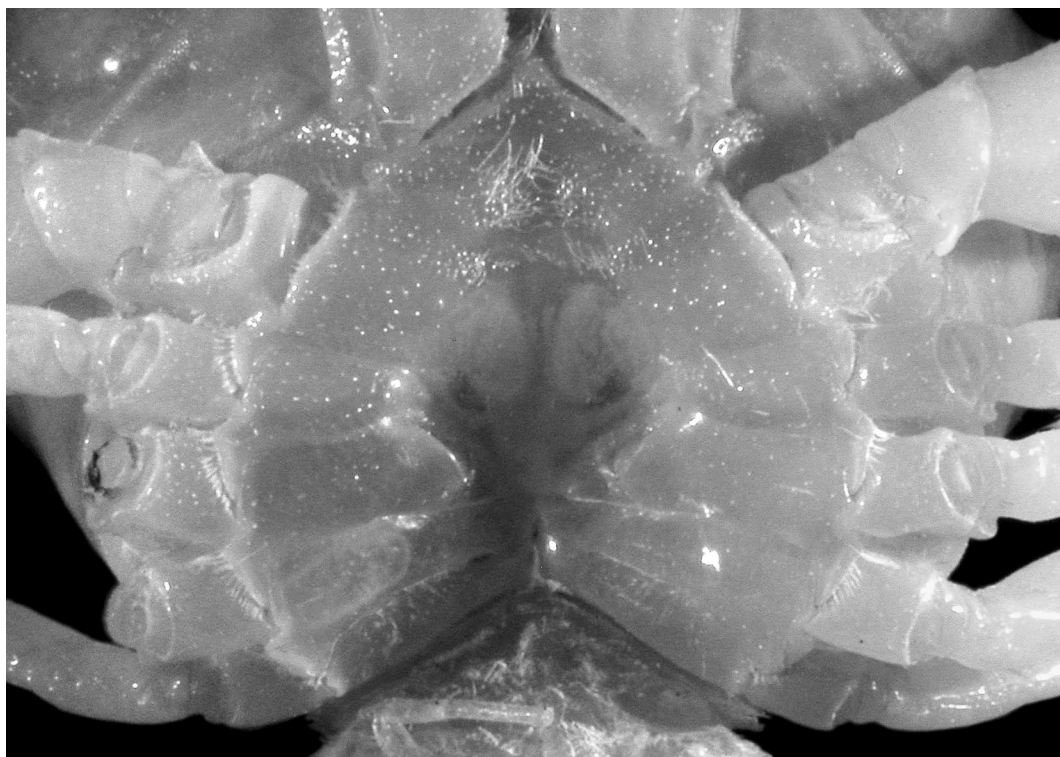


FIG. 12. — *Menoplax longispinosa* (Chen, 1984) n. comb., ♀, cl 10.0 mm, cw 13.7 mm, Chesterfield Is, MUSORSTOM 5, stn CP 324, 970 m (MNHN-B 30055), thoracic sternum and vulva.

176°22'W, 824 m, 19.VI.2000, 5 ♂♂, 3 ♀♀, 1 ovig. ♀, 1 ♀ parasitised by *Sacculina*, 1 ♀ parasitised by bopyrid (MNHN-B 29557).

**DISTRIBUTION.** — Madagascar (Guinot 1989) and the western Pacific Ocean from East and South China seas (Chen 1984) to the Philippine Is (Guinot 1989) and now from Indonesia (Tanimbar Is), Solomon Is, Vanuatu, Chesterfield Is, New Caledonia, Fiji, and Tonga. Depth: 429-1300 m. Also dredged from stations recorded at 65-660 m and 150-1300 m.

#### COLOUR

Photographs of freshly collected specimens from the Chesterfield Is showed an almost transparent light-pink male (MNHN-B 29428) and a light orange-pink female (MNHN-B 29362).

#### REMARKS

*Menoplax longispinosa* n. comb. shows a marked sexual dimorphism in the shape of the carapace,

which is unusual for a carcinoplicine crab. The first anterolateral tooth is reduced in females (see Guinot 1989: pl. 13, figs D, E, as *Carcinoplax longispinosa*), while the conspicuous, acute second tooth tends to be slightly shorter than that in males (see Guinot 1989: fig. 40, pl. 13, figs A, B, as *C. longispinosa*). The length and orientation of the second, horn-like tooth, however, varies among individuals of both sexes, even between the right and left teeth in some specimens.

The morphology of two small females (MNHN-B 10207, 10208) from Madagascar, also examined by Guinot (1989: 312), does not depart from other specimens collected elsewhere in the Indo-West Pacific region. The species has not yet been recorded from elsewhere in the Indian Ocean but it is most probably found in deep water across the ocean.

There is a superficial resemblance between the carapaces of *M. longispinosa* n. comb. and *C. ischurodous*

(Stebbing, 1923). *Carcinoplax ischurodous* has a long anterolateral tooth somewhat similar to the second anterolateral tooth of *M. longispinosa* n. comb. There is only one anterolateral tooth in *C. ischurodous*, however, and its G1, G2, and vulva are characteristic of *Carcinoplax*: slender G1, G2 with long flagellum (see Guinot & Richer de Forges 1981b: fig. 10A-D), and an enlarged, oval vulva covered by a soft membrane.

### Genus *Pycnoplax* n. gen.

*Carcinoplax* – Tesch 1918: 154 (part). — Sakai 1939: 555 [in key], 555; 1969: 269; 1976: 523 [in key] (part). — Chen 1984: 188; 1998: 266 (part). — Serène 1968: 89 [in list] (part). — Serène & Lohavanijaya 1973: 62, 63 [in key to species] (part). — Dai *et al.* 1986: 366 [in key to species] (part). — Guinot 1989: 273 (part). — Dai & Yang 1991: 394 [in key to species] (part). — Hsueh & Huang 2002: 116 [in key] (part). — Davie 2002: 193 (part). — Karasawa & Kato 2003b: 130 [in list], 140 [in list], 141 [in table] (part). — Poore 2004: 434 (part).

TYPE SPECIES. — *Carcinoplax surugensis* Rathbun, 1932 (by present designation; gender feminine).

SPECIES INCLUDED. — *Pycnoplax bispinosa* (Rathbun, 1914) n. comb.; *P. latifolia* n. sp.; *P. meridionalis* (Rathbun, 1923) n. comb.; *P. surugensis* (Rathbun, 1932) n. comb.; *P. victoriensis* (Rathbun, 1923) n. comb.

Most species are restricted to the Indo-West Pacific region; two species found in temperate areas contiguous to the Indo-West Pacific region.

ETYMOLOGY. — From *pycno*, Greek for “dense” or “thick”, in reference to the diagnostic thick G1, and *plax*, Greek for “plate” or “tablet”, which is derived from the generic name *Carcinoplax* (from *karkinos*, Greek for “crab”), to denote that four of the five species included in the new genus were formerly included in *Carcinoplax sensu lato*.

### DESCRIPTION

Carapace (Figs 13A, B; 16A; 17; Guinot 1989: pl. 12, fig. G, as *Carcinoplax meridionalis*, and pl. 12, fig. F, as *C. victoriensis*) transversely quadrate, slightly wider than long, widest at junction of anterolateral, posterolateral borders; front lamellar, straight, not marked by median notch or projection. Notch between front, inner edge of supraorbital border (absent or barely discernible in *P. bispinosa* n. comb.); orbits narrow, not expanded distally; supraorbital

borders slightly sinuous; suborbital borders rounded, with short, blunt inner tooth not visible dorsally; anterolateral borders convex; posterolateral borders long, arched. Dorsal surface of carapace smooth (2 slight horizontal ridges across carapace in *P. victoriensis* n. comb.; Guinot 1989: pl. 12, fig. F, as *Carcinoplax victoriensis*) strongly convex, without clear indication of regions. Outer orbital angle with short, triangular tooth (absent in *P. bispinosa* n. comb., see Fig. 13B); 2 anterolateral teeth on each side of carapace. Basal antennal article short, thick, distalmost (third) article reaches front. Eye peduncles (Figs 13A, B; 16A; 17) short, much shorter than front (0.2 front width); cornea spherical, only slightly expanded distally. Anterior border of endostome well demarcated from buccal cavern, ridges faint but clearly defined. Third maxillipeds completely close the buccal cavern. No obvious stridulating mechanism other than possible rubbing of proximal portion of cheliped (P1) merus against pterygostomial ridge. Thoracic sternum wide. Median sulcus on thoracic sternite 4 absent; sutures 4/5, 5/6, 7/8 interrupted medially, 6/7 complete (Figs 14; 15; 18). Anterior end of sterno-abdominal cavity anterior to thoracic sternite 4. Cheliped fingers moderately slender, shorter than propodus (longer in *P. latifolia* n. sp.), tips darker in colour (except *P. victoriensis* n. comb.; Poore 2004: pl. 24, fig. b). Carpus with tooth on inner margin. Dorsal margins of meri, carpi, propodi of ambulatory legs (P2-P5) unarmed; dactyli slender, smooth, setose. Male abdomen with 6 freely-movable somites plus telson, relatively wide, somites 4-6 gradually decreasing in length from somite 3 (widest somite). Telson wider than long. Somite 3 covers space between P5 coxae, somite 2 slightly narrower than or as wide as somite 3 so that thoracic sternite 8 not visible or only leaving small portion visible (in *P. bispinosa* n. comb. and *P. meridionalis* n. comb.). G1 (Fig. 16C; Zarenkov 1972: fig. 6-2; Serène & Lohavanijaya 1973: figs 158-162; Chen 1984: figs 4-5, 4-6; Guinot 1989: fig. 30A, as *Carcinoplax bispinosa*; Guinot 1969b: fig. 73; 1989: fig. 31A; Chen 1984: figs 3-5, 3-6; Dai & Yang 1991: fig. 192-1, as *C. surugensis*) stout, thick, proximally broad, diagonally oriented or straight with bent distal portion, with small spinules, pointed tip. G2 slender, slightly longer or noticeably longer than G1,

typically dark brown, flagellum shorter or almost as long as proximal part (peduncle); tip pointed (*P. surugensis* n. comb.), pointed with several spinules (*P. meridionalis* n. comb.), slightly-expanded with 2 terminal spinules (*P. bispinosa* n. comb., *P. latifolia* n. sp., *P. victoriensis* n. comb.). Penis arising from P5 coxa, moderate size; broad, soft proximal expansion. Female abdomen with 6 freely-movable somites, wide. Telson wider than long. Somite 3 covers space between P5 coxae, somite 2 narrower than somite 3 so that it leaves small portion of thoracic sternite 8 visible, or somite 2 as wide as somite 3 so that thoracic sternite 8 not visible. Vulva of full-grown, mature females (Figs 15; 18) relatively small, not greatly enlarged, extending from suture 5/6 to suture 6/7, oblong or triangular vulvar cover (no evidence of a vulvar cover in small *P. surugensis* n. comb.; Fig. 14).

REMARKS

Serène & Vadon (1981: 127) suggested the inclusion of *Carcinoplax bispinosa* and *C. surugensis* in a separate genus based on their characteristic G1. Guinot (1969b: 526) commented on the differences between *C. surugensis* and other *Carcinoplax* species: wide sternum and abdomen, stout G1, and a G2 with a flagellum that is almost as long as the proximal part (peduncle) and ending in a pointed tip. It was nevertheless kept in *Carcinoplax* in her subsequent revision of the genus (Guinot 1989).

*Carcinoplax surugensis* was considered closer to *C. meridionalis* based on the shape of the carapace (Guinot 1989: 303), even if the G1 of the latter, which proved to be similar, was not commented upon. Two species herein included in the new genus (*C. meridionalis* and *C. victoriensis*) were included by Guinot (1989: 314) in a list of eight “non-revised” species of *Carcinoplax* that are now, with only one exception, placed in other genera.

*Pycnoplax* n. gen. is similar in the general shape of its carapace to *Carcinoplax*. A case in point is the remarkable similarity between the carapaces of *P. bispinosa* n. comb. and *C. tenuidentata* n. sp. (see Remarks for *P. bispinosa* n. comb. below). The morphology of the G1 of *Pycnoplax* n. gen. (thick and stout, in contrast to slender and dorso-ventrally thin in *Carcinoplax*), male abdomen (wider than in *Carcinoplax*), and vulva (smaller and typically having a vulvar cover in *Pycnoplax* n. gen. in contrast to the greatly expanded vulva lacking a vulvar cover in *Carcinoplax*), and a complete 6/7 thoracic suture (incomplete in *Carcinoplax*), however, clearly separates the two genera. There are also slight differences in the basal antennal article (wider in *Pycnoplax* n. gen. than in *Carcinoplax*) and the G2 (distal part relatively longer than proximal portion in *Pycnoplax* n. gen., much shorter in *Carcinoplax*, and the presence of proximal denticles on the distal part in *Pycnoplax* n. gen., absent in most species of *Carcinoplax*).

KEY TO SPECIES OF *PYCNOPLAX* N. GEN.

1. Two acute, thin, spine-like anterolateral teeth (see Fig. 13B) ..... *Pycnoplax bispinosa*  
 — Two triangular anterolateral teeth which may have acute tips but never thin, spine-like ..... 2
2. Ambulatory legs (P2-P5) long, relatively slender, distal end of merus of folded P5 extending beyond tip of second anterolateral tooth (see Fig. 13A). G2 with pointed tip without terminal spinules (see Guinot 1969a: fig. 74; 1989: fig. 31B; Chen 1984: figs 3-7, 3-8, as *Carcinoplax surugensis*) ..... *Pycnoplax surugensis*  
 — Ambulatory legs (P2-P5) relatively short, distal end of merus of folded P5 only reaching or barely reaching tip of second anterolateral tooth. G2 with terminal spinules (see Fig. 16D) ..... 3
3. Leaf-like, granular, shallow tooth on each outer orbital angle (see Figs 16A; 17). Short tooth on each suborbital border ..... *Pycnoplax latifolia* n. sp.  
 — Triangular, pointed tooth on each outer orbital angle. Conspicuous tooth on each suborbital border ..... 4

4. Second anterolateral tooth curved, hook-like, acute tip (see Poore 2004: fig. 140c). Dorsal surface of carapace relatively smooth ..... *Pycnoplax meridionalis*  
 — Second anterolateral tooth triangular, obtuse tip (see Poore 2004: fig. 140d). Two shallow horizontal ridges on dorsal surface of carapace ..... *Pycnoplax victoriensis*

*Pycnoplax surugensis* (Rathbun, 1932) n. comb.  
 (Figs 13A; 14)

*Carcinoplax surugensis* Rathbun, 1932: 34 [Philippine Is]. — Sakai 1939: 722 [in list]; 1940: 57 [in list]; 1956: 46 [in list]; 1965: 167, fig. 21, pl. 83, fig. 1; 1969: 269 [in list]; 1976: 524 [in key], 525, pl. 188, fig. 3 [Japan]. — Serène 1968: 90 [in list]. — Guinot 1969b: 526 [discussion], figs 73, 74; 1971: 1081 [in list]; 1989: 301, figs 28, 31, pl. 9, figs G-I [Japan, Philippine Is]. — Takeda & Miyake 1969a: 458, fig. 2 [East China Sea]. — Serène & Lohavanijaya 1973: 62 [in list], 64 [in key]. — Chen 1984: 189 [in key], 192, 197, fig. 3 [East China Sea]; 1998: 266 [in key]. — Dai *et al.* 1986: 366 [in key], 369, fig. 192-1, pl. 53, fig. 7 [East China Sea]. — Dai & Yang 1991: 394 [in key], 397, fig. 192-1, pl. 53, fig. 7 [East China Sea]. — Rikuta 1991: 21 [Japan]. — Takeda 1997: 247, 248; 2001: 247, 251, 256, 259 [Japan]. — Ikeda 1998: 15, 42, 134, pl. 54 [Japan]. — Muraoka 1998: 47 [in list] [Japan]. — Ng *et al.* 2001: 33, fig. 7d [Taiwan]. — Hsueh & Huang 2002: 119 [in key], 121, fig. 2F [Taiwan]. — Takeda *et al.* 2006: 204 [in list] [Japan].

*Pilumnoplax* sp. — Takeda & Miyake 1968: 565, fig. 6.

*Carcinoplax surgensis* [sic] — Miyake 1991: 145, 220 [in list], pl. 49, fig. 3 [Japan]. — Ito & Honma 2001: 29 [in list] [Japan].

TYPE MATERIAL. — *Albatross*, stn 5073, ♂ holotype, cl 14.0 mm, cw 19.7 mm (USNM 46165).

TYPE LOCALITY. — Japan, Suruga Bay, 271 m.

MATERIAL EXAMINED. — **Japan.** Honshu, Boso Peninsula, off Kujyukuri, 146-147 m, RV *Tansei-maru*, KT89-3 cruise, stn TB-7, E. Tsuchida coll., 3.X.1989, 1 ovig. ♀ (CBM-ZC 651). — Suruga Bay, *Albatross*, stn 5073, 34°46'N, 138°21'E, 271 m, 16.X.1906, ♂ holotype (USNM 46165).

**Taiwan.** TAIWAN 2001, stn CP 73, 24°52.86'N, 122°00.98'E, 220-330 m, 7.V.2001, 1 ♂ (MMBA).

**Philippine Islands.** South China Sea, MUSORSTOM 2, stn CP 26, 13°50'N, 120°51'E, 299-320 m, 23.XI.1980, 1 ♀ (MNHN-B 10266); 1 ♀ (MNHN-B 30056).

**Indonesia.** Tanimbar Is, KARUBAR, stn CP 69, 08°42'S, 131°53'E, 356-368 m, 2.XI.1991, 1 ♂ (MNHN-B 29384).

Kai Is, DANISH KAI IS EXPEDITION, stn 50, 05°54'S, 132°25'E, 233 m, T. Mortensen coll., 4.V.1922, 1 ♂ (ZMUC).

**New Caledonia.** MUSORSTOM 4, stn CP 239, 22°14.8'S, 167°15.7'E, 470-475 m, 2.X.1985, 1 ♂ (MNHN-B 29415).

BATHUS 2, stn DW 715, 22°39.42'S, 167°10.99'E, 202-227 m, 11.V.1993, 1 ♂ (MNHN-B 29431). — Stn DW 719, 22°47.57'S, 167°14.58'E, 444-455 m, 11.V.1993, 2 ♂♂ (MNHN-B 29412).

NORFOLK 1, stn DW 2147, 22°50'S, 167°16'E, 496 m, 4.XI.2003, 1 ♂ (MNHN-B 29811).

NORFOLK 2, stn DW 2148, 22°44'S, 167°16'E, 386-391 m, 4.XI.2003, 1 ♂ (MNHN-B 29763).

DISTRIBUTION. — Western Pacific Ocean: Japan (see Sakai 1976; Guinot 1989), East China Sea (Chen 1984), Taiwan (Ng *et al.* 2001; Hsueh & Huang 2002), Philippine Is (Guinot 1989), and now Indonesia (Tanimbar Is) and New Caledonia. Depth: 65-496 m.

REMARKS

Diagnostic for *P. surugensis* n. comb. among the species of *Pycnoplax* n. gen. is the long ambulatory legs (P2-P5) (the distal end of the merus of the folded P5 reaching well beyond the second anterolateral teeth) and the nearly straight margin of the carapace between the two anterolateral teeth (Fig. 13A). The G1 is typical of *Pycnoplax* n. gen. in being stout and spinous (see Guinot 1969b: fig. 73; 1989: fig. 31A; Chen 1984: figs 3-5, 3-6; Dai & Yang 1991: fig. 192-1, as *Carcinoplax surugensis*). The distal part of the G2 is almost as long as the proximal part (peduncle) and, unique for the genus, the tip is pointed without terminal spinules (see Guinot 1969a: fig. 74; 1989: fig. 31B; Chen 1984: figs 3-7, 3-8, as *Carcinoplax surugensis*).

The vulva (Fig. 14) has been examined in only three small but sexually mature females (cl 9.7 mm, cw 13.7 mm, cl 10.0 mm, cw 14.5 mm, MNHN-B 10266; ovigerous, cl 9.3 mm, cw 13.6 mm, CBM-ZC 6651). It extends from the 4/5 suture to the median portion of thoracic sternite 6. The inner margins are rounded, the outer V-shaped. The vulva is covered by a membrane and there is no evidence of a vulvar cover, although the inner edge of the thoracic sternite 5 overhangs the anterolateral margin of the aperture (Fig. 14). The



FIG. 13. — **A**, *Pycnoplax surugensis* (Rathbun, 1932) n. comb., ♂, cl 14.7 mm, cw 20.6 mm, off southern coast of New Caledonia, BATHUS 2, stn DW 719, 22°47.57'S, 167°14.58'E, 444-455 m (MNHN-B 29412); **B**, *Pycnoplax bispinosa* (Rathbun, 1914) n. comb., ♀, cl 9.0 mm, cw 11.2 mm, off Rendova I., SALOMON 2, stn CP 2287, 253-255 m (MNHN-B 30088); **C**, *Thyraplax crosnieri* (Guinot & Richer de Forges, 1981) n. comb., ♀, cl 10.6 mm, cw 13.5 mm, off southern coast of New Caledonia, MUSORSTOM 4, stn DW 222, 410-440 m (MNHN-B 29422).



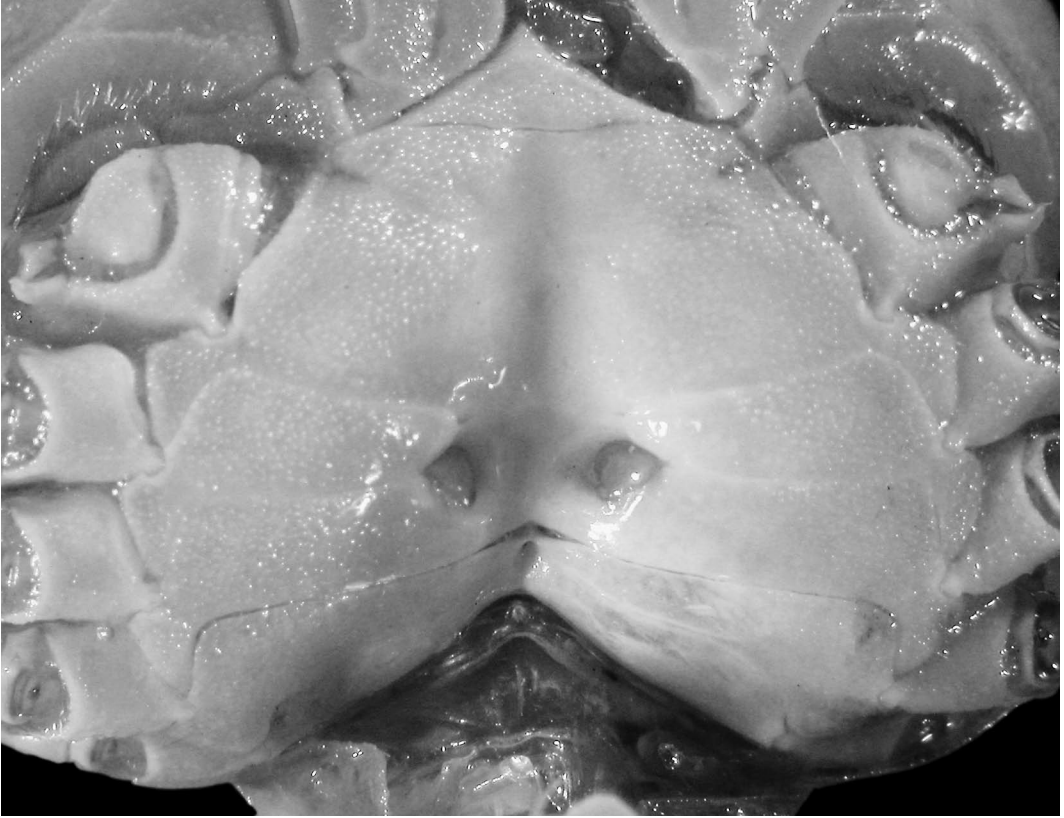


FIG. 14. — *Pycnoplax surugensis* (Rathbun, 1932) n. comb., ♀, cl 10.0 mm, cw 14.5 mm, South China Sea off Philippine Is, MUSORSTOM 2, stn CP 26, 299-320 m (MNHN-B 30056), thoracic sternum and vulva.

posterior margin is thickened (but thin along the edge) and elevated.

There are some superficial similarities with *Carcinoplax inaequalis* Yokoya, 1933 in the general shape of the carapace, the morphology of the G2, and in the presence of long and slender ambulatory legs (see Remarks for *C. inaequalis* above).

*Pycnoplax bispinosa* (Rathbun, 1914) n. comb.  
(Figs 13B; 15)

*Carcinoplax bispinosa* Rathbun, 1914: 137 [Philippine Is]. — Tesch 1918: 154 [in list]. — Estampador 1937: 533 [in list]; 1959: 89 [in list] [Philippine Is]. — Serène 1968: 90 [in list]. — Sakai 1969: 269 [in list], fig. 15a [holotype]. — Zarenkov 1972: 241, fig. 6-2 [Vietnam]. — Serène & Lohavanijaya 1973: 62 [in list], 64 [in key], 66,

figs 156-165, pl. 15, fig. C [South China Sea]. — Serène & Vadon 1981: 118-120, 123, 127 [Philippine Is]. — Chen 1984: 188 [in key], 194, 197, fig. 4, pl. 1, fig. 7; 1998: 266 [in key], 271, 310 [in list], fig. 5 [South China Sea]. — Guinot 1989: 307 [discussion], figs 23, 30, pl. 11, figs A-F [Philippine Is, Indonesia]. — Davie *et al.* 2002: 332 [Andaman Sea coast of Thailand]. — Ng & Davie 2002: 378 [Andaman Sea coast of Thailand].

TYPE MATERIAL. — ♂ holotype, cl 13.2 mm, cw 15.5 mm, *Albatross*, stn 5376 (USNM 46163).

TYPE LOCALITY. — Philippine Islands, Marinduque I., Verde Island Passage between Luzon and Mindoro, 13°42.8'S, 121°51.5'E, 165 m.

MATERIAL EXAMINED. — **Philippine Islands.** South China Sea, MUSORSTOM 1, stn CP 9, 14°02'N, 120°18'E, 180-194 m, 19.III.1976, 2 ♂♂ (MNHN-B 10181). — Stn CP 10, 14°00'N, 120°18'E, 187-205 m, 19.III.1976, 1 ♂ (MNHN-B 10178). — Stn CP 24, 14°00'N, 120°18'E,

189-209 m, 22.III.1976, 1 ♀ (MNHN-B 10180). — Stn CP 25, 14°03'N, 120°20'E, 191-200 m, 22.III.1976, 1 ♂ (MNHN-B 10183). — Stn CP 30, 14°01'N, 120°19'E, 177-186 m, 22.III.1976, 3 ♂♂, 1 pre-adult ♀, 2 ♀♀ (MNHN-B 10176). — Stn CP 31, 14°00'N, 120°16'E, 187-195 m, 22.III.1976, 2 ♂♂ (MNHN-B 10177). — Stn CP 51, 13°49'N, 120°04'E, 170-200 m, 25.III.1976, 5 ♂♂, 1 ♀ (MNHN-B 10173). — Stn CP 71, 14°09'N, 120°26'E, 174-204 m, 28.III.1976, 1 pre-adult ♀, 1 ♀ (MNHN-B 10179).

MUSORSTOM 2, stn CP 20, 14°01'N, 120°18'E, 185-192 m, 22.XI.1980, 1 ♂ (MNHN-B 10185). — Stn CP 21, 14°00'N, 120°18'E, 191-192 m, 22.XI.1980, 1 ♂ (MNHN-B 10310). — Stn CP 62, 14°00'N, 120°17'E, 186-189 m, 29.XI.1980, 1 ♂ (MNHN-B 10174). — Stn CP 68, 14°02'N, 120°19'E, 195-199 m, 29.XI.1980, 1 pre-adult ♀ (MNHN-B 10175). — Stn CP 80, 13°45'N, 120°38'E, 178-205 m, 1.XII.1980, 1 ♂ (MNHN-B 10186).

MUSORSTOM 3, stn CP 100, 14°00'N, 120°18'E, 189-199 m, 1.VI.1985, 1 ♂ (MNHN-B 13811). — Stn CP 101, 14°00'N, 120°19'E, 194-196 m, 1.VI.1985, 2 ♂♂, 1 ♀ (MNHN-B 13809). — Stn CP 108, 14°01'N, 120°18'E, 188-195 m, 2.VI.1985, 1 ♂ (MNHN-B 16934). — Stn CP 112, 14°00'N, 120°19'E, 187-199 m, 2.VI.1985, 1 pre-adult ♀ parasitised by *Sacculina* (MNHN-B 13815).

Verde Island Passage, Marinduque I., *Albatross*, stn 5376, 13°42.8'S, 121°51.5'E, 165 m, 2.III.1909, ♂ holotype (USNM 46163).

Tablas Strait, W of Mindoro, MUSORSTOM 3, stn CP 120, 12°06'N, 121°15'E, 219-220 m, 3.VI.1985, 2 ♂♂ (MNHN-B 13808); 1 ♀ (MNHN-B 30058).

Bohol, Panglao I., Maribohoc Bay, tangle nets of local fishermen, 100-300 m, T. J. Arbasto coll., XI.2003-IV.2004, 2 ♂♂, 1 ovig. ♀ (ZRC 2004.0778); 1 ♂ (MNHN-B 29736).

PANGLAO 2005, stn CP 2407, Maribohoc Bay, 09°41.3'N, 123°48.5'E, 256-268 m, 1.VI.2005, 1 pre-adult ♀ parasitised by sacculinid (ZRC 2006.0208). — Stn CP 2409, Maribohoc Bay, 09°44.8'N, 123°44.8'E, 220-257 m, 1.VI.2005, 1 ♀ (ZRC 2006.0219).

**Vietnam.** Gulf of Tonkin, *Orlik*, stn 69, 138 m, 6.XI.1960, N. Zarenkov leg., 1 pre-adult ♀ (MNHN-B 11101).

**Indonesia.** Makassar Strait, CORINDON 2, stn BT 271, 01°57.8'S, 119°15.0'E, 215 m, 7.XI.1980, 1 ♂ (MNHN-B 11579). — Stn BT 273, 01°56.0'S, 119°16.0'E, 220-180 m, 7.XI.1980, 1 pre-adult ♀, 1 ♀ (MNHN-B 10182).

Tanimbar Is, KARUBAR, stn CP 65, 09°14'S, 132°27'E, 176-174 m, 1.XI.1991, 1 ♀ (MNHN-B 29379).

**Solomon Islands.** SALOMON 2, stn CP 2284, 08°38.4'S, 157°21.5'E, 195-197 m, 6.XI.2004, 1 ♂ parasitised by bopyrid, 1 ♀ (MNHN-B 30101). — Stn CP 2287, 08°40.8'S, 157°24.6'E, 253-255 m, 6.XI.2004, 1 ♂ parasitised by bopyrid, 1 ♀ (MNHN-B 30088).

**DISTRIBUTION.** — South China Sea off China (Chen 1984) to the Andaman Sea coast of Thailand (Davie *et al.* 2002; Ng & Davie 2002) and Indonesia (Guinot 1989), and now from the Solomon Is. Depth: 42-268 m. Specimens were also obtained from tangle nets of local fishermen in the Philippines at estimated depths of 100-300 m.

#### REMARKS

The dorsal surface of the carapace of *P. bispinosa* n. comb. (Fig. 13B) is nearly undistinguishable from that of *Carcinoplax tenuidentata* n. sp. (Figs 4A; 5). Both share a quadrate and globose carapace, thin anterolateral teeth, and the absence of a tooth or prominence at the outer orbital angle (see description of *C. tenuidentata* n. sp. above). One clear difference is on the ventral surface of the carapace, where in *P. bispinosa* n. comb. the pterygostomial region is much higher than the subhepatic region and separated from each other by a conspicuous pterygostomial ridge. In *C. tenuidentata* n. sp. the subhepatic region is more inflated so that both regions are about the same relative height and the pterygostomial ridge is much weaker than in *P. bispinosa* n. comb. More significant differences are in the G1. It is thick, stout, and curved in *P. bispinosa* n. comb. (Zarenkov 1972: fig. 6-2; Serène & Lohavanijaya 1973: figs 158-162; Chen 1984: figs 4-5, 4-6; Guinot 1989: fig. 30A, as *C. bispinosa*) but slender and thin in *C. tenuidentata* n. sp. (Fig. 4C). The male abdomen is much wider in *P. bispinosa* n. comb. than in *C. tenuidentata* n. sp. (Zarenkov 1972: fig. 6-2; Serène & Lohavanijaya 1973: fig. 157; Chen 1984: fig. 4-4, as *C. bispinosa*), and there is a relatively small vulva, which is covered with a thick, round vulvar cover in *C. bispinosa* (Fig. 15) in contrast to the enlarged vulva that is not covered by a vulvar cover in *C. tenuidentata* n. sp.

The vulvar cover is spherical, thick, and covers most of the vulva, leaving only the outer periphery of the vulva exposed (Fig. 15). There was no clear correlation between the presence of a vulvar cover on the vulva and body size. The vulvar cover was found in females ranging from cl 10.4 mm, cw 12.9 mm (MNHN-B 10176) to cl 13.0 mm, cw 16.1 mm (MNHN-B 10180) but absent in two larger females (cl 14.4 mm, MNHN-B 10176; cl 15.9 mm, cw 20.5 mm, MNHN-B 10173) as well as in smaller pre-adult females.

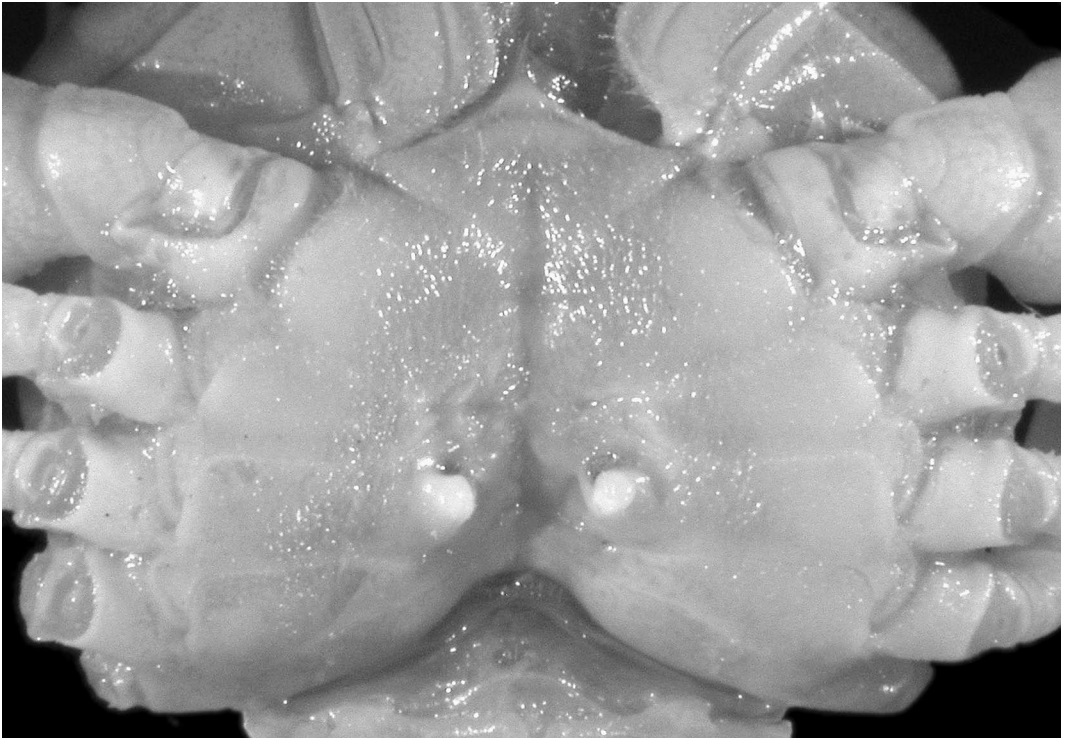


FIG. 15. — *Pycnoplax bispinosa* (Rathbun, 1914) n. comb., ♀, cl 11.2 mm, cw 13.4 mm, Tablas Strait, west of Mindoro, Philippine Is., MUSORSTOM 3, stn CP 120, 219-220 m (MNHN-B 30058), thoracic sternum, vulva, vulvar cover, and remains of sperm plug.

*Pycnoplax latifolia* n. sp.  
(Figs 16; 17)

TYPE MATERIAL. — *Shinnyo-maru*, cruise SY96, ♂ holotype, cl 6.2 mm, cw 7.8 mm; 4 ♂♂ paratypes (cl 7.0 mm, cw 8.9 mm; cl 6.7 mm, cw 8.7 mm [parasitised by bopyrid]; cl 4.7 mm, cw 5.9 mm [parasitised by bopyrid]; cl 4.7 mm, cw 6.0 mm); 1 pre-adult ♀ paratype, cl 4.1 mm, cw 5.0 mm; 1 pre-adult female ♀ paratype cl 4.0 mm, cw 4.9 mm (CBM-ZC 4624).

TYPE LOCALITY. — Japan, Izu Is, Hyotan-se Bank, 34°20.75'N, 139°20.00'E, 275-350 m.

MATERIAL EXAMINED. — Japan, Izu Is, Hyotan-se Bank, 34°20.75'N, 139°20.00'E, 275-350 m, *Shinnyo-maru*, cruise SY96, stn 6, 22.X.1996, ♂ holotype, 4 ♂♂ paratypes, 1 ♂, 2 pre-adult ♀♀ paratypes (CBM-ZC 4624).

ETYMOLOGY. — From *latus*, Latin for “side”, and *folium*, Latin for “leaf”, for the rounded, leaf-like outer orbital teeth that are characteristic of the species.

DISTRIBUTION. — Known only from Japan. Depth: 275-350 m.

DESCRIPTION

Carapace (Figs 16A; 17) quadrate, slightly wider than long (1.3 as wide as long in holotype). Carapace slightly convex, without clear indication of regions. Front lamellar, straight, not marked by median notch, bordered by tomentum. Slight notch between front, inner edge of supraorbital border. Supraorbital borders sinuous, margins granular. Suborbital borders granular, each with short, blunt inner tooth not visible dorsally. Outer orbital angle with blunt, granular tooth; 2 granular anterolateral teeth on each side of carapace; first triangular, dorso-ventrally flat, second acute, oriented dorsally; margin between anterolateral teeth nearly straight. Posterolateral borders arched.

Subhepatic, pterygostomial regions, pterygostomial crest, merus of third maxilliped endopod with short, conspicuous granules.

Eye peduncles (Figs 16A; 17) short (0.2 front width), dorsal surface granular, cornea slightly expanded distally.

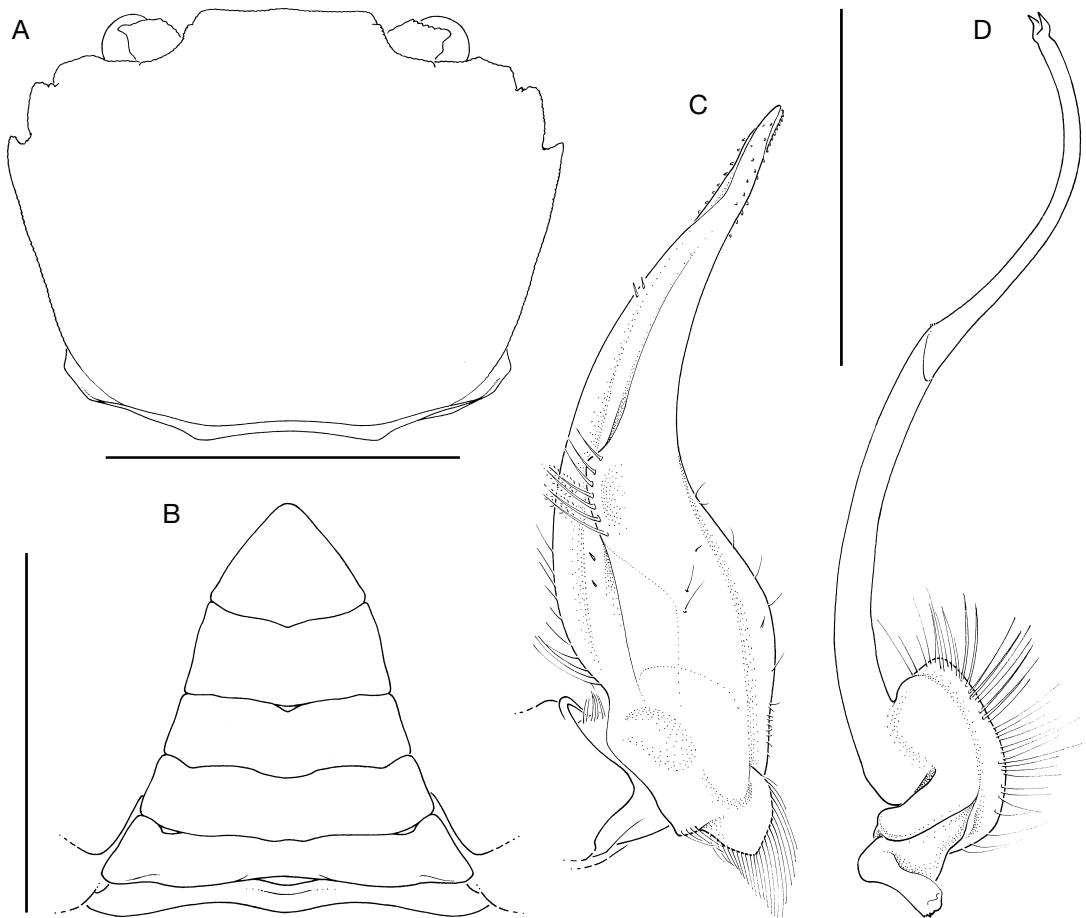


FIG. 16. — *Pycnoplax latifolia* n. sp., ♂ holotype, cl 6.2 mm, cw 7.8 mm, Izu Is, Japan, *Shinnyo-maru*, cruise SY96, 275–350 m (CBM-ZC 4624): **A**, dorsal surface of the carapace; **B**, abdomen; **C**, left G1, dorsal view; **D**, left G2, ventral view. Scale bars: A, 5 mm; B, 3 mm; C, D, 1 mm.

Chelipeds (P1) (Fig. 17) nearly equal in males, females; fingers slender, longer than propodus, with blunt teeth, fingers dark brown in males except short proximal portion of dactylus, about two-thirds dark brown in females. Dactylus, propodus, carpus, merus with short granules in small specimens (granules only on merus of holotype, largest specimens); dactylus, propodus, merus with some setae in small specimens; broad, curved, acute-tipped tooth on inner (ventral), proximal margin of carpus. Ambulatory legs (P2–P5) relatively short, broad articles, smooth; long, short, simple setae along inner, outer

margins of articles. P5 dactylus relatively slender, smooth; length of P5 merus 0.6 cl.

Male abdomen (Fig. 16B) narrowly triangular, with 6 freely-movable somites plus telson; telson slightly wider than long. Somite 3 covers space between P5 coxae; somites 1, 2 as wide as somite 3, small portion of thoracic sternite 8 visible. G1 (Fig. 16C) stout, bent in outer direction; slender, spinous, pointed tip. G2 (Fig. 16D) slender, slightly longer than G1, slightly curved flagellum shorter than proximal part (peduncle), tip with 2 lateral spinules.



FIG. 17. — *Pycnoplax latifolia* n. sp., ♂ holotype, cl 6.2 mm, cw 7.8 mm, Izu Is, Japan, *Shinnyo-maru*, cruise SY96, 275–350 m (CBM-ZC 4624).

Female abdomen wide. Telson slightly wider than long. Somites 2, 3 cover space between P5 coxae, thoracic sternite 8 not visible. Vulva of mature female extending from edge of slightly deflected suture 5/6 to suture 6/7; oblong vulvar cover along the outer half of the vulva.

#### REMARKS

*Pycnoplax latifolia* n. sp. is a small-size species (cl 4.1 mm, cw 4.9 mm to cl 7.0 mm, cw 8.9 mm,  $n = 8$ ). The G1 and G2 were fully developed and the P1 smooth and seemingly fully developed in the largest males, precluding the possibility that only pre-adult specimens were available. None of the two females examined was ovigerous but one (cl 4.1 mm, cw 5.0 mm) had fully developed pleopods and a vulvar cover, suggesting that it was a mature individual. The small number of specimens collected, all from one locality, does not exclude the possibility, however, that the species attains a larger size.

It differs from its congeners by the relative size of the anterolateral teeth, particularly the second one, which is smaller and less salient than in any of the species of *Pycnoplax* n. gen. The overall body size of the know specimens is also much smaller than in the other species.

The specimens were first identified as a possible new species of *Carcinoplax* by T. Komai (CBM), who generously allowed me to describe them as part of this work.

#### *Pycnoplax meridionalis* (Rathbun, 1923) n. comb.

*Carcinoplax meridionalis* Rathbun, 1923: 99, pl. 18 [Australia]. — McNeill 1929: 150 [Australia]. — Serène 1968: 89 [in list]. — Serène & Lohavanijaya 1973: 62 [in list], 64 [in key], 67, figs 166–173, pl. 15, fig. D [Australia]. — Guinot 1969b: 524 [discussion]; 1971: 1081 [in list]; 1989: 314 [in list], pl. 12, fig. G. — Griffin & Brown 1976: 255 [Australia]. — Springthorpe & Lowry 1994: 106 [in list]. — Davie 2002: 189 [unnumb. fig.],

194 [in list]. — Poore 2004: 434 [in key], 436, fig. 140c, pl. 24, fig. a [Australia].

*Pilumnoplax abyssicola* – Whitelegge 1900: 158 (not *Carcinoplax abyssicola* (Miers, 1886)).

*Carcinoplax meridionalis* [sic] – Sakai 1969: 269 [in list].

*Carcinoplex* [sic] *meridionalis* – Griffin 1972: 84 [Australia].

Not *Carcinoplax meridionalis* – Chen 1984: 189 [in key], 194, fig. 5; 1998: 266 [in key] (unknown species).

*Carcinoplax victoriensis* – McLay 1988: 258, fig. 57 [New Zealand].

?*Carcinoplax victoriensis* – Dell 1960: 4, pl. 1 [Chatham Is]; 1963b: 251; 1968a: 25 [in list]; 1968b: 234, 238 [New Zealand]. — Bennett 1964: 73 footnote [New Zealand]. — Takeda & Miyake 1969b: 172 [New Zealand]. — Dawson 1984: 215, pl. 2, fig. e [New Zealand]. — Wear & Fielder 1985: 10 [in list], 62 [larvae] [New Zealand].

TYPE MATERIAL. — Australia, *Endeavour*, ♂ holotype (AM E2233); ♂ paratype (AM E5159); 2 undetermined paratypes (AM E6487).

TYPE LOCALITY. — Australia, Victoria, off Rame Head, 37°58'S, 149°17'E, 139 m.

MATERIAL EXAMINED. — **Australia.** New South Wales, off Newcastle, 82-91 m, XI.1931, 5 ♂♂ (ZRC 1965.11.24.4). — Stn SS01/00 141, 37°20.99'S, 150°93.63'E, 15.IV.2000, 2 ♂, 1 ♀, 1 pre-adult ♀, 1 pre-adult (NMV J52135). — Off Botany Bay, leg. M. Ward, X.1924, 1 ♀ (BPBM S1851).

Victoria, stn SS01/00 237, 38°11.26'S, 149°33.59'E, 320 m, 26.IV.2000, 3 ♂♂, 1 pre-adult ♂ (NMV J52128).

South Australia, stn SS01/00 351, 33°16.00'S, 130°43.15'E, 10.V.2000, 1 ♀ (NMV J52131).

**New Zealand.** *Tangaroa*, stn TAN0107/02, 35°44.38'S, 178°29.83'E, 382 m, 19.V.2001, 3 ♂♂, 1 pre-adult ♂ (NIWA). — Stn TAN0107/05, 35°44.38'S, 178°29.85'E, 420 m, 19.V.2001, 1 ♀ (NIWA). — Stn TAN0707/50, 35°44.38'S, 178°29.92'E, 430 m, 19.V.2001, 2 pre-adult (NIWA). — Stn TAN0107/122, 35°44.31'S, 178°29.79'E, 939 m 20.V.2001, 1 ♂, 1 pre-adult (NIWA). — Stn TAN0107/223, 35°44.26'S, 178°30.45'E, 1045 m, 23.V.2001, 1 ♀ (NIWA). — Stn TAN0107/224, 35°44.35'S, 178°29.74'E, 200 m, 23.V.2001, 1 ♂, 7 ♀♀, 8 pre-adult (NIWA). — Stn TAN0107/229, 36°08.35'S, 178°11.55'E, 501 m, 25.V.2006, 3 ♂♂, 2 ♀♀ (NIWA). — Stn TAN107/324, 1 ♀ (NIWA).

Off Banks Peninsula, from Port Lyttleton fishermen, Christchurch, 2004, 2 ♂♂, 1 ♀ (NIWA).

DISTRIBUTION. — Known only from Australia (Western Australia to New South Wales, including Tasmania and Tasmanian seamounts [Poore 2004]), and New Zealand, including the Chatham Is (Dell 1968b). Depth: 46-1045 m.

#### COLOUR

Carapace pink (see Poore 2004: pl. 24, figs a, b, as *C. meridionalis*). The carapace of specimens from New Zealand has been described as “pale vermillion, darker anteriorly” (McLay 1988: 258, as *C. victoriensis*).

#### REMARKS

Guinot (1969b: 524) placed *Carcinoplax meridionalis* by itself in one of three groups of *Carcinoplax* species because of a sternum that was narrower, particularly between the P1 (“plastron sternal moins élargi, notamment entre les p1”). Serène & Lohavanijaya (1973: 67) considered the species as “close” to *Carcinoplax angusta* (Rathbun, 1914), actually not belonging in *Carcinoplax* but a euryplacid (see Remarks for *Carcinoplax*), on account of the “stout and smooth” P1 and the narrow male abdomen and G1. The similarities in these last two characters are erroneous since both the male abdomen and the G1 are much narrower in than in *P. meridionalis* n. comb.

Diagnostic of the species is a second anterolateral tooth that is acute and has a curved tip (see Rathbun 1923: pl. 18, fig. 1; Guinot 1989: pl. 12, fig. G; Poore 2004: fig. 140c, as *C. meridionalis*). The inner suborbital tooth is conspicuous and visible dorsally as in *P. victoriensis* n. comb. The G1 is proximally thick and spinous but the distal part is narrow (Serène & Lohavanijaya 1973: figs 168-170, as *C. meridionalis*). The G2 is longer than the G1, its distal part almost as long as the proximal part (peduncle), the tip is not expanded and it has several minute spinules (Serène & Lohavanijaya 1973: figs 171-173, as *C. meridionalis*). The vulva has a thick, oblong vulvar cover on its outer margin. Differences with *P. victoriensis* n. comb., with which it is apparently sympatric, are given in the Remarks section of *P. victoriensis* n. comb. (see below).

The East China Sea specimens identified as *C. meridionalis* by Chen (1984: 194, 197) do not belong to the species, which is known only from temperate



FIG. 18. — *Pycnoplax victoriensis* (Rathbun, 1923) n. comb., ♀, cl 12.1 mm, cw 14.6 mm, off Victoria, Australia, stn SS01/00 187, 500 m (NMV J52213), thoracic sternum, vulva, vulvar cover, and remains of sperm plug.

Australia and New Zealand. The general shape of the carapace is similar to that of *P. surugensis* n. comb. but the ambulatory legs (P2-P5) are shorter than in the latter. The East China Sea specimens were not available for examination.

Records of *Pycnoplax victoriensis* (Rathbun, 1923) n. comb. from New Zealand most probably belong instead to *P. meridionalis* n. comb. The material, however, should be re-examined.

*Pycnoplax victoriensis* (Rathbun, 1923) n. comb.  
(Fig. 18)

*Carcinoplax victoriensis* Rathbun, 1923: 101, pl. 19 [Australia]. — Serène 1968: 89 [in list]. — Sakai 1969: 269 [in list]. — Guinot 1969b: 526 [discussion]; 1971: 1081 [in list]; 1989: 314 [in list], pl. 12, fig. F. — Serène & Lohavanijaya 1973: 62 [in list], 64 [in key]. — Griffin & Brown 1976: 254 [Australia]. — Springthorpe & Lowry

1994: 115 [in list]. — Davie 2002: 194 [in list]. — Poore 2004: 434 [in key], 436, fig. 140d, pl. 24, fig. b [Australia].

Not *Carcinoplax victoriensis* – McLay 1988: 258, fig. 57 [New Zealand] (= *Pycnoplax meridionalis* (Rathbun, 1923) n. comb.).

?Not *Carcinoplax victoriensis* – Dell 1960: 4, pl. 1 [Chatham Is]; 1963b: 251; 1968a: 25 [in list]; 1968b: 234, 238 [New Zealand]. — Bennett 1964: 73 footnote [New Zealand]. — Takeda & Miyake 1969b: 172 [New Zealand]. — Dawson 1984: 215, pl. 2, fig. e [New Zealand]. — Wear & Fielder 1985: 10 [in list], 62 [larvae] [New Zealand] (= *Pycnoplax meridionalis* (Rathbun, 1923) n. comb.).

TYPE MATERIAL. — Australia, *Endeavour*, ♂ holotype, cl 24.4 mm, cw 34 mm (AM E4395); 2 pre-adult paratypes (AM E5196).

TYPE LOCALITY. — Australia, Victoria, south of Gabo I., 38°09'S, 149°55'E, 281-503 m.

MATERIAL EXAMINED. — **Australia.** Victoria, 55 km east of Gabo I., 37°41.5'S, 150°14.0'E, 458 m, *Soela*, 4.II.1985, 1 ♂ (NMV J53153). — Stn SS01/00 187, 38°14.91'S, 149°38.67'E, 500 m, 21.IV.2000, 6 ♂♂, 4 ♀♀, 4 pre-adult ♀♀ (NMV J52213).

DISTRIBUTION. — Known only from temperate south-eastern Australia, including Tasmania (see Poore 2004). Records from New Zealand, including the Chatham Is, are questionable. Depth: 125-765 m.

#### COLOUR

Carapace of live individuals with large pink blotches, dark-red bands on the meri of the ambulatory legs.

#### REMARKS

*Pycnoplax victoriensis* n. comb. is close to *P. meridionalis* n. comb. in the general shape of the carapace. Both species appear to be sympatric to southeastern Australia. They can be easily distinguished because the second anterolateral tooth is short and triangular in *P. victoriensis* n. comb. but curved and conspicuously acute in *P. meridionalis* n. comb. (see Rathbun 1923: pl. 18, fig. 1, pl. 19, fig. 1; Guinot 1989: pl. 12, figs F, G; Poore 2004: fig. 140c, d, as *C. victoriensis* and *C. meridionalis*). The carapace has two slight horizontal ridges across (see Rathbun 1923: pl. 19, fig. 1; Guinot 1989: pl. 12, fig. F, as *C. victoriensis*), which are absent in *P. meridionalis* n. comb. The telson of the male abdomen has a rounded margin whereas it is more pointed in *P. meridionalis* n. comb. The G1 is stout, spinous, and narrower distally, although not as narrow as in *P. meridionalis* n. comb. (see Serène & Lohavanijaya 1973: figs 168-170, as *C. meridionalis*); the G2 is longer than the G1, its flagellum shorter than the proximal part (peduncle), and the tip with two terminal spinules. The vulva of adult females has a conspicuous triangular vulvar cover (Fig. 18), whereas it is oblong in *P. meridionalis* n. comb. The carapace of live *P. victoriensis* n. comb. has large pink blotches, dark-red bands on the ambulatory leg meri, and white fingers that can be dark brown at the tips, whereas in *P. meridionalis* n. comb. the carapace is similarly pink without the red bands on the ambulatory legs and dark brown fingers (see Poore 2004: pl. 24, figs a, b, as *C. meridionalis*).

#### Genus *Thyraplax* n. gen.

*Carcinoplax* –Tesch 1918: 154 (part). — Guinot 1969b: 520, 524; 1971: 1081; 1989: 273 (part). — Serène 1968: 89 [in list] (part). — Serène & Lohavanijaya 1973: 62, 63 [in key to species] (part).

TYPE SPECIES. — *Carcinoplax crosnieri* Guinot & Richer de Forges, 1981 (by present designation; gender feminine).

SPECIES INCLUDED. — *Thyraplax cooki* (Rathbun, 1906) n. comb.; *T. crosnieri* (Guinot & Richer de Forges, 1981); *T. cristata* n. sp.; *T. digitodentata* n. sp.; *T. truncata* n. sp.

All species are restricted to the Indo-West Pacific region.

ETYMOLOGY. — From *thyra*, Greek for “door”, in reference of the presence of a vulvar cover that covers part of the vulva like a door, and *plax*, Greek for “plate” or “tablet”, which is derived from the generic name *Carcinoplax* (from *karkinos*, Greek for “crab”), to denote that two of the species in the new genus were formerly included in the latter.

#### DESCRIPTION

Carapace (Figs 20A; 21; 23A; 24; 25A; 26) transversely rectangular, wider than long, widest at junction of anterolateral, posterolateral borders; front lamellar, straight, not marked by median notch or projection. Notch between front, inner edge of supraorbital border slight or absent; orbits narrow, not expanded distally; supraorbital borders short, sinuous; suborbital borders rounded, with short, blunt inner tooth not visible dorsally; anterolateral borders short, conspicuously sinuous, with slight carina; posterolateral borders long, arched, maximum width of carapace below anterolateral tooth. Dorsal surface of carapace smooth, slightly or moderately convex, without clear indication of regions. Outer orbital angle with triangular, moderately acute prominence; single anterolateral tooth on each side of carapace; low prominence or notch between outer orbital angle and anterolateral tooth. Basal antennal article short, wide, distalmost (third) article reaches front. Eye peduncles (Figs 20A; 21; 23A; 24; 25A; 26) short, much shorter than front (0.2-0.3 front width); cornea spherical, only slightly expanded distally. Anterior border of endostome well demarcated from buccal cavern, ridges faint but clearly defined. Third



maxillipeds completely close the buccal cavern. No obvious stridulating mechanism other than possible rubbing of proximal portion of cheliped (P1) merus against pterygostomial ridge. Thoracic sternum wide. Median sulcus on thoracic sternite 4 absent; sutures 4/5, 5/6, 7/8 interrupted medially, suture 6/7 complete (Figs 19; 22; Guinot & Richer de Forges 1981b: fig. 9A, as *Carcinoplax crosnieri*). Anterior end of sterno-abdominal cavity anterior to thoracic sternite 4. Cheliped fingers moderately slender or thick, shorter than propodus, darker in colour; carpus with tooth on inner margin. Dorsal margins of meri, carpi, propodi of ambulatory legs (P2-P5) unarmed; dactyli slender, carinated (smooth in *T. cooki* n. comb., *T. digitodentata* n. sp.), setose. Male abdomen with 6 freely-movable somites plus telson, narrowly triangular, somites 4-6 gradually decreasing in length from somite 3 (widest somite). Telson approximately as long as wide. Somite 3 covers space between P5 coxae, somite 2 slightly narrower than or as short as somite 3 so that somites 1, 2 leave small, often triangular portion of thoracic sternite 8 visible, or no portion is visible (Guinot & Richer de Forges 1981b: fig. 9A). G1 (Figs 20C; 23D; 25C) sinuous or curved, slightly broadened proximally, stout; truncated or pointed tip. G2 (Figs 20D; 23E; 25D) slender, slightly or moderately longer than G1, flagellum shorter than proximal part (peduncle), tip pointed or with 2 spinules. Penis arising from P5 coxa, moderate size; broad, soft proximal expansion. Female abdomen (female of *T. digitodentata* n. sp. unknown) with 6 freely-movable somites, wide. Telson triangular. Somite 3 covers space between P5 coxae, somite 2 only slightly narrower than somite 3, thoracic sternite 8 not visible or only small portion visible (Guinot 1969b: fig. 60, as *Carcinoplax cooki*). Vulva of mature females (Figs 19; 22) small, extending from suture 5/6 to suture 6/7, vulvar cover present.

#### REMARKS

*Thyraplax crosnieri* n. comb. and *T. cooki* n. comb. were originally included in the genus *Carcinoplax*. The distinct morphology of these species in relation to other *Carcinoplax* species was noted by other authors. Rathbun (1906: 835) remarked that the nature of the anterolateral teeth and the convexity

of the carapace of *T. cooki* n. comb. (as *Pilumnoplax cooki*) distinguished the species "from all others". Guinot (1989: 314) included this two species in a list of eight "non-revised" species of *Carcinoplax* that proved, with only one exception, to belong to other genera. In describing *Carcinoplax crosnieri*, Guinot & Richer de Forges (1981b: 252) "provisionally" included the species in *Carcinoplax* awaiting revision of the genus since it did not resemble any known species in the genus ("dans l'attente de sa révision, ne nous paraît ressembler à aucune autre espèce connue de ce genre"). Serène & Vadon (1981: 126) placed *T. cooki* n. comb. (as *C. cooki*) as "probably" in a group of species of *Carcinoplax sensu lato* where the outer orbital teeth appear as an extension of the orbit itself. Indeed, the shape of the carapace, with rounded and short anterolateral margins, a single anterolateral tooth, and long posterolateral borders that are markedly arched so that the widest portion of the carapace is actually below the anterolateral teeth are in sharp contrast to the carapace of *Carcinoplax*, with two teeth (one in *C. ischurodous*) on each of the slightly longer anterolateral borders and posterolateral borders that decrease in width behind the last anterolateral teeth. There is also a slight carina or prominence along the anterolateral borders of the carapace, which is absent in *Carcinoplax*.

Some characters more significant than the general shape of the carapace provide evidence to support a separation of these two species, plus three new ones, from *Carcinoplax sensu lato*. The G1 varies in shape but it is never as slender and thin as in *Carcinoplax*; the G2 is slightly but clearly longer than the G1, a rare occurrence in *Carcinoplax*; the vulva is reduced in size and has a vulvar cover (absent in *Carcinoplax*); and the 7/8 thoracic suture is clearly complete (Figs 19; 22) in contrast to *Carcinoplax*, although it is shown as incomplete by Guinot & Richer de Forges (1981b: fig. 9A, as *Carcinoplax crosnieri*). The P2-P5 dactyli of some of the species is carinated but they have smooth surfaces in *Carcinoplax*.

Four of the five species of *Thyraplax* n. gen. have been found only on the eastern and southern limits of the Indo-West Pacific region, areas where species of *Carcinoplax* are absent or are fewer in number than in the western Pacific Ocean.

KEY TO SPECIES OF *THYRAPLAX* N. GEN.

1. Entire fingers dark in colour (see Fig. 24). P5 dactylus with denticulate margins (see Fig. 23B) ..... *Thyraplax digitodentata* n. sp.  
— Fingers with only the tips dark in colour. P5 dactylus with smooth margins ..... 2
2. P5 propodus wide (see Fig. 21); low carina on each side ..... *Thyraplax cristata* n. sp.  
— P5 propodus narrow; smooth surfaces ..... 3
3. Anterolateral teeth slender; acute tip (see Figs 25A; 26). G1 with broad, truncated tip (see Fig. 25C) ..... *Thyraplax truncata* n. sp.  
— Anterolateral teeth prominent, triangular, broad; obtuse tip. G1 with slender, pointed tip ..... 4
4. Anterolateral borders with slight carina (see Fig. 13C), sometimes marked by median notch. Male telson of large individuals with broad, posterior tooth-like tubercle on each side ..... *Thyraplax crosnieri*  
— Anterolateral borders with slight, tooth-like prominence (see Guinot 1989: fig. 42, pl. 11, fig. G, as *Carcinoplax cooki*). Male telson without lateral tooth-like tubercles ..... *Thyraplax cooki*

*Thyraplax crosnieri*

(Guinot & Richer de Forges, 1981) n. comb.  
(Figs 13C; 19)

*Carcinoplax crosnieri* Guinot & Richer de Forges, 1981a: 1113, 1115, pl. 6, figs 4, 4a, 4b (*nomen nudum*).

*Carcinoplax crosnieri* Guinot & Richer de Forges, 1981b: 251: figs 9A, B, 10I-L, pl. 6, figs 4, 4a, 4b [Loyalty Is]. — Guinot 1989: 314 [in list], fig. 43, pl. 13, fig. G [Loyalty Is]. — Ikeda 1998: 15, 43, 137, pl. 57 [Japan]. — Takeda *et al.* 2006: 204 [in list] [Japan].

TYPE MATERIAL. — ♂ holotype, cl 31.8 mm, cw 38.1 mm (MNHN-B 6834).

TYPE LOCALITY. — Loyalty Islands, between Jouan Reef and Ouvéa, 20°40.2'S, 166°58.5'E, trap, 400 m.

MATERIAL EXAMINED. — **Philippine Islands.** Bohol, Balicasag I., off Panglao I., tangle nets of local fishermen, 50-500 m, 28.XI.2001, 1 ♂, 2 ♀♀ (ZRC 2004.0718). — 200-300 m, VI.2002, 2 ♂♂ (ZRC 2002.0652). — 25-30.VII.2003, 1 ♂ (ZRC 2004.0719). — XII.2003, 1 ♂ (ZRC 2004.0779). — 50-500 m, 2.III.2004, 1 ♂, 1 ♀ (ZRC 2004.0720).

PANGLAO 2004, stn P4, tangle nets of local fishermen, 31.V.2004, 1 ♂ (ZRC 2006.0177); 1 ♂, 1 ♀ (ZRC 2006.0181).

PANGLAO 2005, stn CP 2359, Bohol/Sulu seas sill, 08°49.9'N, 123°34.9'E, 437-476 m, 26.V.2005, 2 ♂♂, 2 ♀♀, 1 pre-adult ♀ (ZRC 2006.0199). — Stn CP 2362, Bohol/Sulu seas sill, 08°56.5'N, 123°32.7'E, 679-740 m, 26.V.2005, 2 ♀♀ (ZRC).

**Solomon Islands.** SALOMON 1, stn DW 1788, 09°19.4'S, 160°15.4'E, 341-343 m, 30.IX.2001, 1 ♂ (MNHN-B 29399).

**New Caledonia.** BIOCAL, stn CP 45, 22°47'S, 167°15'E, 430-465 m, 30.VIII.1985, 1 ♀ (MNHN-B 29544).

MUSORSTOM 4, stn DW 222, 22°57.6'S, 167°33.0'E, 410-440 m, 30.IX.1985, 1 ♀ (MNHN-B 29422).

BIOGEOGAL, stn DW 291, 20°34.47'S, 166°54.33'E, 800 m, 24.VII.1987, 1 ♀ (MNHN-B 29471).

BATHUS 4, stn DW 929, 18°51.55'S, 163°23.27'E, 502-516 m, 7.VIII.1994, 1 ♀ (MNHN-B 29416).

NORFOLK 2, stn DW 2053, 23°40'S, 168°16'E, 670-708 m, 24.X.2003, 1 pre-adult ♀ (MNHN-B 29766). — Stn DW 2081, 25°54'S, 168°22'E, 500-505 m, 28.X.2003, 1 ♀ (MNHN-B 29787).

**Loyalty Islands.** Between Jouan Reef and Ouvéa, 20°40.2'S, 166°58.5'E, trap, 400 m., 3.III.1977, ♂ holotype (MNHN-B 6834).

DISTRIBUTION. — Loyalty Is (Guinot & Richer de Forges 1981b) and now from the Philippine Is, Solomon Is, and New Caledonia. Depth: 341-800 m. Specimens were also obtained from tangle nets of local fishermen in the Philippines that obtained material from estimated depths of 50-500 m.

## COLOUR

Photographs of freshly collected material from the Philippine Is (PANGLAO 2005) showed an orange carapace. Recently-preserved material also from the Philippine Is had irregular, thin, bright-orange lines and irregular spots on the carapace, chelipeds,

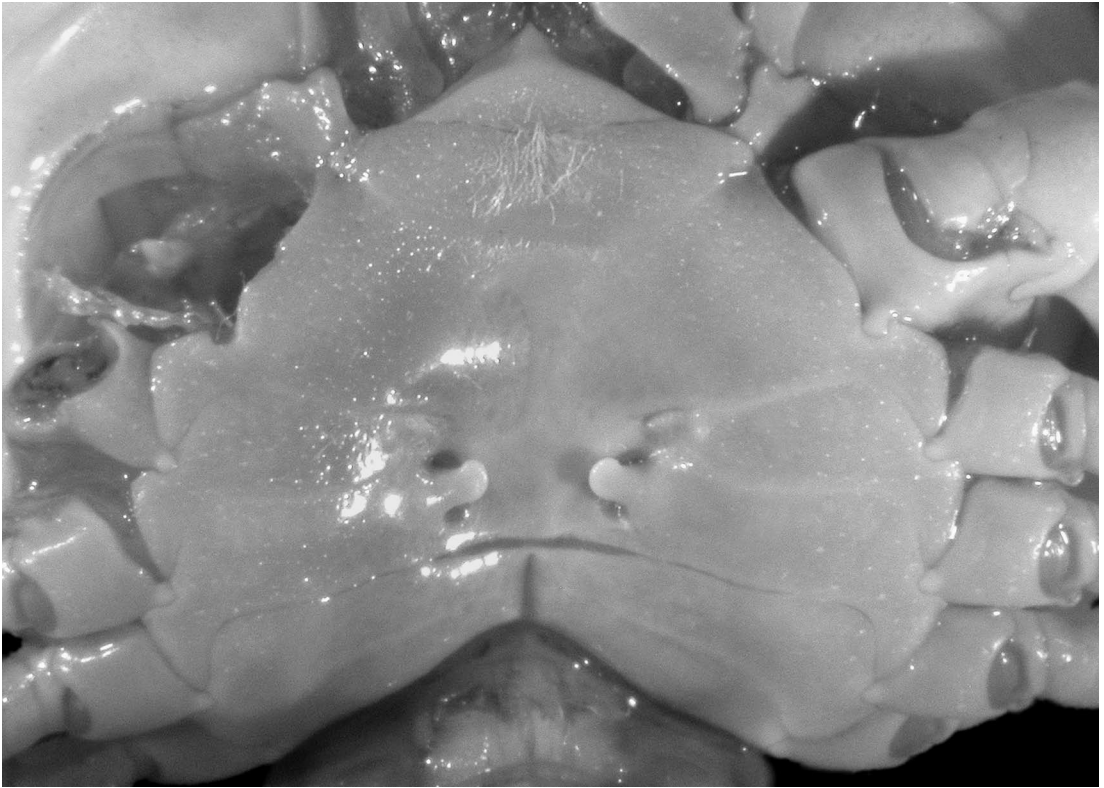


FIG. 19. — *Thyraplax crosnieri* (Guinot & Richer de Forges, 1981) n. comb., ♀, cl 16.7 mm, cw 21.9 mm, Balicasag I., off Panglao I., Philippine Is, 50-500 m (ZRC 2004.0720), thoracic sternum, vulva, and vulvar cover.

and the meri of the ambulatory legs. The specimen from Japan shown by Ikeda (1998), however, is mostly orange.

#### REMARKS

The large size of the male holotype (cl 31.8 mm, cw 38.1 mm, MNHN-B 6834), which was collected from traps, exhibits some important differences from the rest of the material available for examination, which was dredged. The additional material includes eight much smaller males varying from cl 13.9 mm, cw 18.1 mm (New Caledonia, MNHN-B 29399) to cl 21.4 mm, cw 27.0 mm (Philippine Is, ZRC 2004.0720). The tooth-like tubercles at the base of the telson of the holotype (Guinot & Richer de Forges 1981b: 252) are obsolete or much smaller and obtuse in smaller males. More significant are differences in the G1 and G2. The distal portion of

the G1 of the holotype (Guinot & Richer de Forges 1981b: fig. 10I-K) is thicker, straighter, and provided with more denticles and the basal portion slightly wider than in the smaller males, where the distal third is bent outwardly. A short row of plumose setae was found on the outer margin of the base of the distal portion in a small male (cl 16.5 mm, cw 21.5 mm, ZRC 2004.0720). The G1 is nearly straight, however, in a medium size individual (cl 12.5 mm, cw 15.7 mm; ZRC 2006.0199). The G2 of the holotype is similarly straighter than in the smaller males. These differences appear to be due to size rather than species-specific. The examination of the G1 and G2 of specimens that are intermediate in size between the males examined here and the holotype should confirm or reject this assumption.

The vulva of small females is oval, extending from suture 5/6 to suture 6/7, and partially covered

with a triangular vulvar cover on the postero-lateral margin. In larger females (Fig. 19) the vulva is crescent-shaped and the vulvar cover is thicker and larger than in small females. The vulvar cover overhangs the vulva to almost reach the inner margin, thus creating two apertures, an anterior and a posterior one.

*Thyraplax crosnieri* n. comb. is close to *T. cooki* (Rathbun, 1906) n. comb. Differences between the two species are outlined in the Remarks section for the latter (see below); differences between all five species of *Thyraplax* n. gen. are summarized in Table 3.

*Thyraplax cooki* (Rathbun, 1906) n. comb.

*Pilumnoplax cooki* Rathbun, 1906: 830 [in list], 835, pl. 7, fig. 3 [Hawaiian Is]. — Tesch 1918: 155 [in list]. — Edmondson 1962: 3, fig. 1a [Hawaiian Is]. — Serène 1968: 90 [in list].

*Carcinoplax cooki* – Guinot 1969b: 524 [discussion], figs 60, 77, 78; 1971: 1081 [in list]; 1989: 314 [in list], fig. 42, pl. 11, figs G, H [Hawaiian Is]. — Serène & Lohavanijaya 1973: 62 [in list], 64 [in key].

TYPE MATERIAL. — *Albatross*, stn 3866, ♂ holotype, cl 12.7 mm, cw 14.9 mm (USNM 29364).

TYPE LOCALITY. — Hawaiian Islands, Pailolo Channel between Moloka'i and Maui, 468-538 m.

MATERIAL EXAMINED. — **Hawaiian Islands.** Pailolo Channel, between Moloka'i and Maui, *Albatross*, stn 3866, 21°12'N, 156°35'W, 468-538 m, 10.IV.1902, ♂ holotype (USNM 29364). — Pailolo Channel, Mokuikoni islet, *Albatross*, stn 3865, 21°09'N, 156°35'W, 468 m, 10.IV.1902, California Academy of Sciences leg., 1 ♂ (MNHN-B 10557).

**New Caledonia.** BERYX 11, stn DW 09, 24°52'S, 168°22'E, 635-680 m, 15.X.1992, 1 ♂, 1 pre-adult ♀ (MNHN-B 29564).

NORFOLK 2, stn DW 2055, 23°39'S, 168°16'E, 900-950 m, 24.X.2003, 1 ♀ (MNHN-B 29765).

**French Polynesia.** Austral Is, BENTHAUS 2002, stn DW 1889, 27°36.8'S, 144°15.7'W, 600-620 m, 7.XI.2002, 1 ♀ (MNHN-B 29789). — Stn DW 1957, 23°18.8'S, 149°29.3'W, 558-1000 m, 18.XI.2002, 1 pre-adult ♀ (MNHN-B 29782). — Stn DW 1961, 23°29.9'S, 149°33.5'W, 470-800 m, 19.XI.2002, 1 pre-adult ♀ (MNHN-B 29783). — Stn DW 1965, 23°21.3'S, 149°33.9'W, 500-1200 m, 19.XI.2002, 1 ♀ (MNHN-B 29785). — Stn DW 2004, 22°27.7'S, 151°18.7'W,

430-850 m, 24.XI.2002, 1 pre-adult ♀ (MNHN-B 29788). — Stn DW 2010, 22°32.4'S, 151°20.8'W, 520-950 m, 24.XI.2002, 2 ♂♂ (MNHN-B 29781). Marquesas Is, MUSORSTOM 9, stn DW 1275, 07°53'S, 140°38'W, 627 m, 5.IX.1997, 1 ♂ (MNHN-B 29548). — Stn CP 1276, 07°52'S, 140°37'W, 800-805 m, 5.IX.1997, 2 ♂♂ (MNHN-B 29549).

DISTRIBUTION. — Hawaiian Is (Rathbun 1906) and now French Polynesia, Fiji, and New Caledonia. Depth: 430-1000 m. Also dredged from a station recorded at 500-1200 m.

REMARKS

Guinot (1969b: 524) placed *T. cooki* n. comb. by itself in one of three groups of *Carcinoplax sensu lato*. Several characters were given for this classification: G1 “analogous” to those of *C. longimana* (de Haan, 1833), relatively narrow sternum (particularly near the chelipeds and on the posterior portion), and narrow male abdomen.

*Thyraplax cooki* n. comb. is close to *T. crosnieri* n. comb. in the shape of the carapace, the size of the chelipeds (P1), and in the relative length of the ambulatory legs (P2-P5). The anterolateral margin of *T. cooki* n. comb. has a slight tooth-like eminence (see Guinot 1989: fig. 42, pl. 11, fig. G), which was described as a “blunt obtuse-angled tooth” in the original description (Rathbun 1906: 835). In contrast, the margin of *T. crosnieri* n. comb. has a slight carina that is sometimes marked by a median notch (Fig. 13C). The anterolateral teeth are dorsally oriented (although more conspicuously so in *T. cooki* n. comb.) and obtuse in both species, but were nevertheless found to be acute in some specimens of *T. cooki* n. comb. The main differences that separate the two species are in the morphologies of their G1, G2, and vulvae respectively. The G1 of *T. cooki* n. comb. is slender, straight, and its distal portions provided with small teeth (Guinot 1969b: fig. 77a, b) whereas that of *T. crosnieri* n. comb. is stouter and the distal third portion bent outwardly (Guinot & Richer de Forges 1981b: fig. 10I). The G2 of *T. cooki* n. comb. is straight, with two equal apical spinules (Guinot 1969b: fig. 78) whereas that of *T. crosnieri* n. comb. is slightly bent distally and the tip has two unequal spinules (Guinot & Richer de Forges 1981b: fig. 10L). The vulva of *T. cooki* n. comb. is large, round, and it extends from su-

TABLE 3. — Morphological differences between the species of *Thyraplax* n. gen.

Characters	<i>Thyraplax crosnieri</i> (Guinot & Richer de Forges, 1981) n. comb.	<i>Thyraplax cooki</i> (Rathbun, 1906) n. comb.	<i>Thyraplax cristata</i> n. sp.	<i>Thyraplax digitodentata</i> n. sp.	<i>Thyraplax truncata</i> n. sp.
Anterolateral margin of carapace	Slight carina; median notch sometimes present	Slight tooth-like eminence	Slight notch; conspicuous carina	Smooth	Slight notch
Anterolateral tooth	Prominent, obtuse tip, dorsally oriented	Prominent, obtuse, dorsally oriented	Mostly slender, acute tip	Slender, acute tip	Slender, acute tip
Notch between front and supraorbital border	Present	Present (large specimens)	Present	Absent	Present
Fingers	Slender, dark brown tip	Slender, dark brown tip	Slender, dark brown tip (Fig. 21)	Thick, entirely dark brown (Fig. 24)	Slender, dark brown tip (Fig. 26)
P5 propodus	Slender, smooth	Slender, smooth	Wide, two low carinae	Slender, smooth	Wide, smooth
P5 dactylus	Long, slender, wide carina, smooth margins	Relatively short, smooth surfaces, setose margins	Long, slender, carina, smooth margins	Relatively short, smooth surfaces, denticulate margins (Fig. 23B)	Long, slender, smooth surfaces, smooth margins
Telson of male abdomen	Slightly wider than long; broad posterior tooth-like tubercle on each side (large individuals only)	Slightly wider than long, unarmed	Slightly wider than long, unarmed (Fig. 20B)	Longer than wide, unarmed (Fig. 23C)	Slightly wider than long, unarmed (Fig. 25B)
G1	Slender, distal part curved	Slender, distal part straight	Broad, denticulated distal part (Fig. 20C)	Slender tip, denticles only along borders of distal part (Fig. 23D)	Broad, truncated tip (Fig. 25C)
Tip of G2	One lateral spinule	Lateral spinule at each end	Pointed (Fig. 20D)	One lateral spinule (Fig. 23E)	One lateral spinule, broad tip (Fig. 25D)
Vulva	Posterior vulvar cover, large and salient in large specimens (Fig. 19)	Narrow vulvar cover on outer side of vulva	Wide vulvar cover on outer side of vulva, large and salient in large specimens (Fig. 22)	Unknown	Unknown

ture 5/6 to suture 6/7 of thoracic sternite 6. Each vulva has a small, spherical, low vulvar cover on its postero-external margin that does not reach the anterior margin of the vulva. The vulva of *T. crosnieri* n. comb. (Fig. 19) is in the same position but the opening is oval, smaller than in *T. cooki* n. comb., and the vulvar cover is large and triangular.

Somite 6 of the abdomen of the male holotype (USNM 29364) and of a second male from the type locality (MNHN-B 10557) showed a slight triangular eminence on the outer margin of each distal end, a character not observed among the males from French Polynesia and New Caledonia that were examined. Otherwise, all other characters of the two Hawaiian specimens agreed with those from southern localities.

*Thyraplax cristata* n. sp.  
(Figs 20-22)

*Carcinoplax* aff. *cooki* – Poupin 1996a: 98 [in list]; 1996b: pl. 16, fig. b [French Polynesia].

TYPE MATERIAL. — French Polynesia, SMSRB collections, ♂ holotype, cl 15.1 mm, cw 19.2 mm (MNHN-B 29801). — SMSRB collections, stn 258, ♀ paratype, cl 14.2 mm, cw 19.1 mm (MNHN-B 29805). — French Polynesia, SMSRB collections, ♀ paratype, cl 14.9 mm, cw 19.9 mm (MNHN-B 29806). — French Polynesia, SMSRB collections, ♂ paratype, cl 16.0 mm, cw 20.7 mm (MNHN-B 16572).

TYPE LOCALITY. — French Polynesia, Tuamotu Archipelago, Fangataufa Atoll, 22°11.7'S, 138°44.3'W, 500 m.

MATERIAL EXAMINED. — French Polynesia. Society Is, SMSRB collections, J. Poupin coll., stn 258, Moorea,

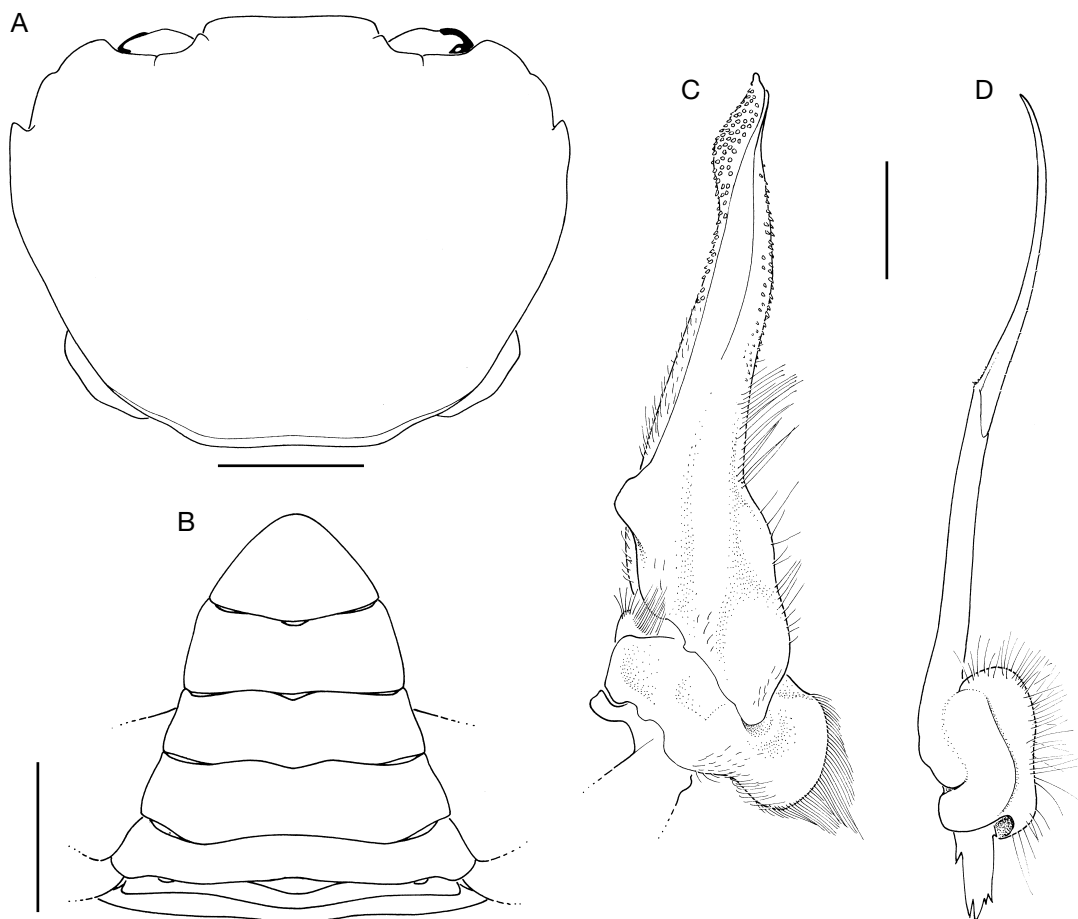


FIG. 20. — *Thyraplax cristata* n. sp., ♂ holotype, cl 15.1 mm, cw 19.2 mm, Fangataufa Atoll, French Polynesia, SMSRB collections, stn 485, 500 m (MNHN-B 29801): **A**, dorsal surface of the carapace; **B**, abdomen; **C**, left G1, dorsal view; **D**, left G2, ventral view. Scale bars: A, 5 mm; B, 3 mm; C, D, 1 mm.

17°31.9'S, 149°53.3'W, trap, 430 m, 18.VI.1990, 1 paratype ♀ (MNHN-B 29805).

Tuamotu Archipelago, SMSRB collections, Moruroa Atoll, 1984, ♂ paratype (MNHN-B 16572). — SMSRB collections, J. Poupin coll., stn D 53, Moruroa Atoll, 21°51.45'S, 139°01.98'W, dredging, 439 m, 17.X.1990, 1 ♀ (MNHN-B 29804). — Stn 317, Moruroa Atoll, 21°53.8'S, 139°01.6'W, trap, 500 m, 19.X.1990, 1 ♀ (MNHN-B 29802). — Stn 320, Moruroa Atoll, 21°53.7'S, 138°59.3'W, trap, 510 m, 21.X.1990, 1 ♂ (MNHN-B 29800). — Stn 323, Fangataufa Atoll, 22°13.2'S, 138°42.7'W, trap, 500 m, 13.X.1990, 2 ♀♀ (MNHN-B 29817). — Stn 234, Fangataufa Atoll, 22°15.0'S, 138°46.0'W, trap, 250 m,

22.V.1990, 2 ♀♀ (MNHN-B 29803). — Stn 473, Moruroa Atoll, 21°47.0'S, 138°55.5'W, trap, 465 m, 10.IV.1995, 1 ♀ (MNHN-B 29807). — Stn 476, Moruroa Atoll, 21°51.3'S, 139°01.2'W, trap, 470 m, 11.IV.1995, ♀ paratype (MNHN-B 29806). — Stn 485, Fangataufa Atoll, 22°11.7'S, 138°44.3'W, trap, 500 m, 24.IV.1995, ♂ holotype (MNHN-B 29801).

ETYMOLOGY. — From *crista*, Latin for “ridge” or “crest”, in reference to the carina-like ridges along the anterolateral borders of the carapace.

DISTRIBUTION. — Known only from French Polynesia (Society Is and Tuamotu Archipelago). Depth: 250–510 m.



FIG. 21. — *Thyraplax cristata* n. sp., ♂ holotype, cl 15.1 mm, cw 19.2 mm, Fangataufa Atoll, French Polynesia, SMSRB collections, stn 485, 500 m (MNHN-B 29801).

#### DESCRIPTION

Carapace (Figs 20A; 21; Poupin 1996b: pl. 16, fig. b, as *Carcinoplax* aff. *cooki*) transversely rectangular, slightly wider than long (1.3 as wide as long in holotype), anterolateral borders arched, with thin carina-like crest. Carapace slightly convex, nearly flat, without clear indication of regions. Front lamellar, straight, not marked by median notch. Distinct notch between front, inner edge of supraorbital border. Supraorbital borders sinuous, orbits low on anterior border. Suborbital borders smooth, each with short, blunt inner tooth not visible dorsally. Outer orbital angle with triangular, moderately acute prominence continuing as a carina-like crest to just above anterolateral tooth; weak notch (may be absent on one side) on each anterolateral border halfway between outer orbital angle and anterolateral tooth; thick to slender, acute-tipped anterolateral tooth on each side of carapace. Posterolateral borders long, arched, widest portion of carapace below anterolateral teeth.

Eye peduncles (Figs 20A; 21) short (0.3 front width), smooth, cornea slightly expanded distally.

Chelipeds (P1) (Fig. 21; Poupin 1996b: pl. 16, fig. b, as *Carcinoplax* aff. *cooki*) nearly equal in males, females, slightly heavier in males; fingers slender, as long as propodus, with blunt teeth, less than half to about three-quarters of distal portion of fingers dark brown. Broad, blunt tooth on inner (ventral), proximal margin of carpus. Ambulatory legs (P2-P5) moderately long, slender, smooth, very few simple setae; length of P5 merus 0.7-0.8 cl; P5 propodus wide, with 2 low carinae on both surfaces; dactyli long, slender, wide carina along both surfaces.

Male abdomen (Fig. 20B) broadly triangular, with 6 freely-movable somites plus telson; telson slightly wider than long. Somites 3, 4 slightly inflated near outer margins, somite 3 covers space between P5 coxae; somites 1, 2 slightly narrower than somite 3, thoracic sternite 8 not visible. G1 (Fig. 20C) stout, small teeth along outer margin

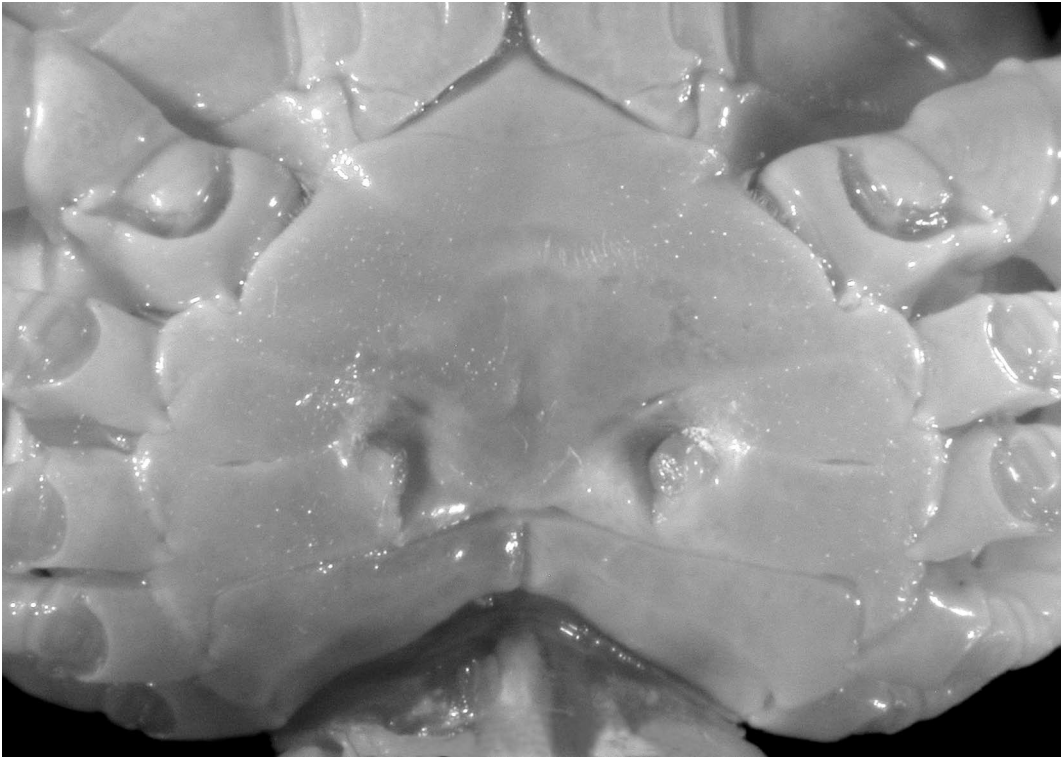


FIG. 22. — *Thyraplax cristata* n. sp., ♀ paratype, cl 14.9 mm, cw 19.9 mm, Moruroa Atoll, French Polynesia, SMSRB collections, strn 476, 470 m (MNHN-B 29806), thoracic sternum, vulva, and vulvar cover.

of distal portion; thick, straight, pointed tip. G2 (Fig. 20D) slender, slightly longer than G1, slightly curved flagellum slightly shorter than proximal part (peduncle), pointed tip.

Female abdomen wide. Telson triangular. Somite 3 covers space between P5 coxae, somite 2 only slightly narrower than somite 3, thoracic sternite 8 not visible. Vulva of mature females (Fig. 22) large, extending from edge of anteriorly deflected suture 5/6 to suture 6/7; slightly vaulted (salient in larger females) vulvar cover over outer third of aperture, membrane covers rest of aperture leaving narrow space open along inner margin.

#### COLOUR

Carapace orange with irregular white spots; chelipeds mostly orange, tips of fingers dark brown, ambulatory legs white, each with two irregular orange spots (Poupin 1996b: pl. 16, fig. b, as *Carcinoplax* aff. *cooki*).

#### REMARKS

The new species is closest to *T. crosnieri* n. comb. from which it can be easily distinguished by its much smaller, more slender, and anteriorly oriented anterolateral teeth (obtuse and dorsally oriented in *T. crosnieri* n. comb.; Fig. 13C), ambulatory leg propodi much broader than in *T. crosnieri* n. comb., straight G1 (bent outwardly in *T. crosnieri* n. comb.; Guinot & Richer de Forges 1981b: fig. 10I), straight G2 with pointed tip (bent with two spinules in *T. crosnieri* n. comb.; Guinot & Richer de Forges 1981b: fig. 10L), vulva with a vaulted vulvar cover on its outer margin (in *T. crosnieri* n. comb. the vulvar cover is large and salient, covering most of the crescent-shaped vulva; triangular and posterior in small mature females; Fig. 19).

Differences between the *T. cristata* n. sp. and *T. truncata* n. sp., a similar but small-size species, are discussed in the description of the latter. Differ-



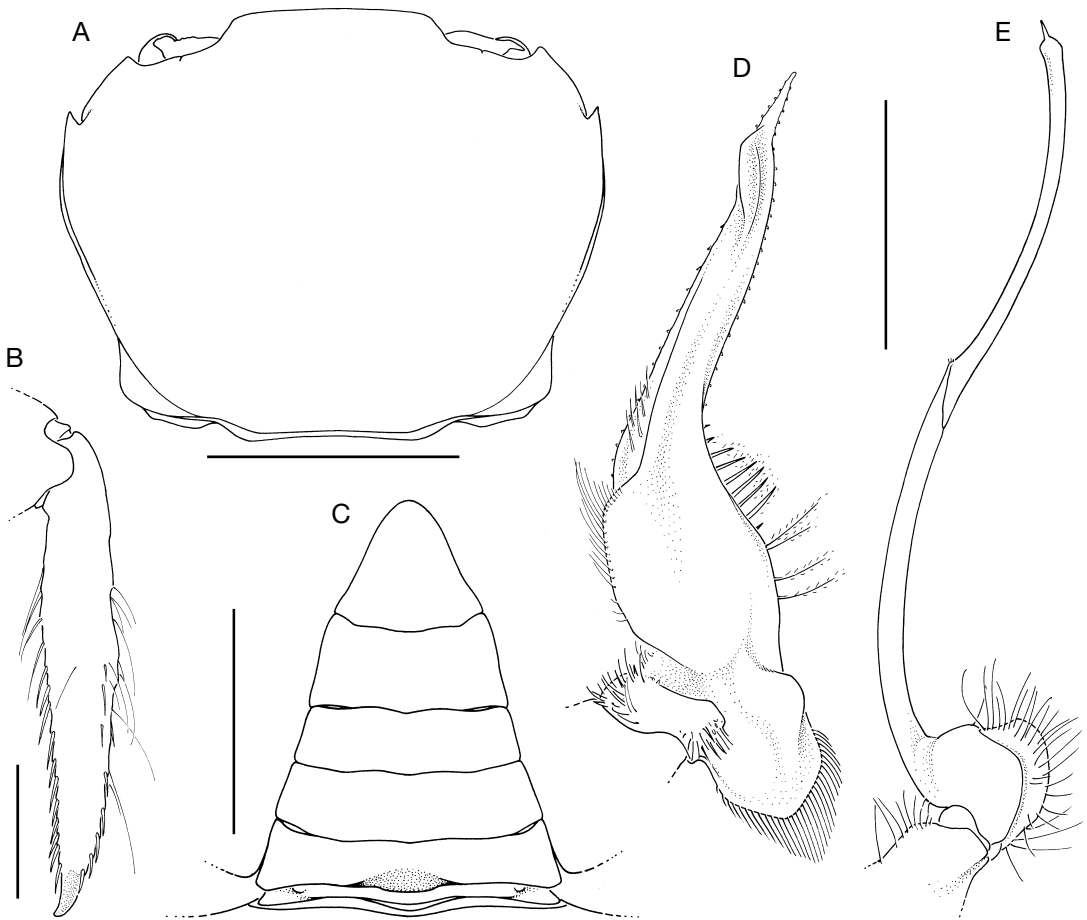


FIG. 23. — *Thyraplax digitodentata* n. sp., ♂ holotype, cl 8.8 mm, cw 10.8 mm, SMSRB collections, Moruroa Atoll, French Polynesia, 560 m (MNHN-B 29433): **A**, dorsal surface of the carapace; **B**, right P5 dactylus; **C**, abdomen; **D**, left G1, dorsal view; **E**, left G2, ventral view. Scale bars: A, 5 mm; B, 1 mm; C, 3 mm; D, E, 1 mm.

ences between all five species of *Thyraplax* n. gen. are summarized in Table 3.

*Thyraplax digitodentata* n. sp.  
(Figs 23; 24)

*Carcinoplax* aff. *croisneri* – Poupin 1996a: 98 [in list]; 1996b: pl. 16, fig. c [French Polynesia].

TYPE MATERIAL. — ♂ holotype, cl 8.8 mm, cw 10.8 mm, SMSRB collections, French Polynesia (MNHN-B 29433); ♂ paratype, cw 11.3 mm, SMSRB collections, French Polynesia (MNHN-B 29799).

TYPE LOCALITY. — French Polynesia, Tuamotu Archipelago, Moruroa Atoll, 21°47.7'S, 138°56.1'W, 560 m, 2.XII.1989.

MATERIAL EXAMINED. — **French Polynesia.** Tuamotu Archipelago, SMSRB collections, J. Poupin coll., Moruroa Atoll, 21°47.7'S, 138°56.1'W, cage, 560 m, 2.XII.1989, ♂ holotype (MNHN-B 29433). — Stn 242, Maria Is, 22°00.0'S, 136°12.0'W, cage, 670 m, 30.V.1990, ♂ paratype (MNHN-B 29799).

ETYMOLOGY. — From *digitus*, Latin for “finger”, and *dens*, Latin for “tooth”, in reference to the diagnostic P5 dactylus that is armed with minute teeth.

DISTRIBUTION. — Known only from the Tuamotu Archipelago, French Polynesia. Depth: 560–670 m.



FIG. 24. — *Thyraplax digitodentata* n. sp., ♂ holotype, cl 8.8 mm, cw 10.8 mm, SMSRB collections, Moruroa Atoll, French Polynesia, 560 m (MNHN-B 29433).

#### DESCRIPTION

Carapace (Figs 23A; 24; Poupin 1996b: pl. 16, fig. c, as *Carcinoplax* aff. *crosnieri*) transversely rectangular, slightly wider than long (1.2 as wide as long in holotype), anterolateral borders arched, with a slight carina-like crest. Carapace slightly convex, without clear indication of regions. Front lamellar, straight, not marked by median notch. Notch between front, inner edge of supraorbital border absent. Supraorbital borders sinuous, orbits low on anterior border. Suborbital borders granular, each with short, blunt inner tooth not visible dorsally. Outer orbital angle with triangular, moderately acute prominence continuing as a slight carina-like crest to just above anterolateral tooth; anterolateral border without notch or slight tooth between outer orbital angle and anterolateral tooth; single short, slender, acute-tipped anterolateral tooth on each side of carapace. Posterolateral borders long, arched, widest portion of carapace below anterolateral teeth.

Eye peduncles (Figs 23A; 24) short (0.3 front width), smooth, cornea slightly expanded distally.

Chelipeds (P1) (Fig. 24; Poupin 1996b: pl. 16, fig. c, as *Carcinoplax* aff. *crosnieri*) nearly equal (female unknown); fingers thick, as long as thick

propodus, with blunt teeth, completely dark brown. Carpus, merus short, thick; broad, blunt tooth on inner (ventral), proximal margin of carpus. Ambulatory legs (P2-P5) moderately long, slender, smooth, very few simple setae; length of P5 merus 0.7 cl (holotype); propodi narrow, smooth; dactyli long, slender; P5 dactylus (Fig. 23B) with slender spines along anterior, posterior borders.

Male abdomen (Fig. 23C) narrowly triangular, with 6 freely-movable somites plus telson; telson longer than wide. Somite 6 longer than 5, somite 3 slightly inflated near outer margins, somite 3 covers space between P5 coxae, somites 1, 2 slightly narrower than somite 3, thoracic sternite 8 not visible. G1 (Fig. 23D) stout but slender distally, minute teeth along margins; bent, keel-like distal portion, pointed tip. G2 (Fig. 23E) slender, slightly longer than G1, slightly curved flagellum shorter than basal part, tip with long, lateral spinule.

Female unknown.

#### COLOUR

Carapace, chelipeds, and ambulatory legs white, tips of fingers black (Poupin 1996b: pl. 16, fig. c, as *Carcinoplax* aff. *crosnieri*).

## REMARKS

The new species is known from only two male specimens, in one of which the dorsal surface of the carapace is damaged. The two specimens are so different from the other four known species of *Thyraplax* n. gen., however, that they warrant their description as a new species.

*Thyraplax digitodentata* n. sp. is closest to *T. cristata* n. sp. in the general shape of the carapace. The P5 dactylus of *T. digitodentata* n. sp. has a smooth surface with minute teeth along the margins (Fig. 23B) (carinated surface without teeth or setae in *T. cristata* n. sp.), the suborbital border is granular (smooth in *T. cristata* n. sp.), G1 with thin distal portion with denticles only along margins (Fig. 23D) (thick tip with denticles along surface of distal portion in *T. cristata* n. sp.; Fig. 20C), G2 with one pointed, lateral spinule on its tip (Fig. 23E) (tip pointed in *T. cristata* n. sp.; Fig. 20D), and noticeably narrower male abdomen (Fig. 23C) than in *T. cristata* n. sp., the telson being longer than wide in contrast to wider than long in *T. cristata* n. sp. (Fig. 20B).

Differences between the new species and the other species of *Thyraplax* n. gen. are summarized in Table 3.

*Thyraplax truncata* n. sp.  
(Figs 25; 26)

TYPE MATERIAL. — BORDAU 1, stn CP 1481, ♂ holotype, cl 8.7 mm, cw 11.6 mm (MNHN-B 29547). Specimens with a rhizocephalan parasite (*Thompsonia* sp.) on P1-P4 and gonopods. Paratypes: 4 ♂♂ (including 1 pre-adult) from New Caledonia as listed under Material examined.

TYPE LOCALITY. — Fiji, Lau submarine ridge, 20°57'S, 178°45'W, 441-506 m.

MATERIAL EXAMINED. — New Caledonia. SMIB 3, stn DW 22, 23°03'S, 167°19.1'E, 503 m, 24.V.1987, 1 ♂ paratype, cl 7.0 mm, cw 8.9 mm; 1 ♂ paratype, parasitised by *Sacculina*, cl 7.2 mm, cw 9.2 mm (MNHN-B 29473).

BERYX 11, stn CP 21, 24°44'S, 168°07'E, 430-450 m, 17.X.1992, 1 ♂ paratype, cl 7.1 mm, cw 9.1 mm (MNHN-B 29545).

BATHUS 2, stn DW 719, 22°47.57'S, 167°14.58'E, 444-445 m, 11.V.1993, 1 pre-adult ♂ paratype, cl 5.6 mm, cw 7.0 mm (MNHN-B 29546).

Fiji. BORDAU 1, stn CP 1481, 20°57'S, 178°45'W, 441-506 m, 9.III.1999, ♂ holotype, parasitised by *Thompsonia*, cl 8.7 mm, cw 11.6 mm (MNHN-B 29547).

ETYMOLOGY. — From *truncus*, Latin for something that has been "maimed" or "cut off", in reference to the attenuated shape of the G1 diagnostic of the species.

DISTRIBUTION. — Known only from New Caledonia and Fiji. Depth: 430-500 m.

## DESCRIPTION

Carapace (Figs 25A; 26) transversely rectangular, slightly wider than long (1.3 as wide as long in holotype), anterolateral borders arched, with thin carina-like crest. Carapace slightly convex, nearly flat, without clear indication of regions. Front lamellar, straight, not marked by median notch. Distinct notch between front, inner edge of supraorbital border. Supraorbital borders sinuous, orbits low on anterior border. Suborbital borders smooth, each with short, blunt inner tooth not visible dorsally. Outer orbital angle with triangular, moderately acute prominence continuing as a short carina-like crest to just above anterolateral tooth; slight notch on each anterolateral border halfway between outer orbital angle and anterolateral tooth; slender, acute-tipped anterolateral tooth on each side of carapace. Posterolateral borders long, arched, widest portion of carapace behind anterolateral teeth.

Eye peduncles (Figs 25A; 26) short (0.3 front width), smooth, cornea slightly expanded distally.

Chelipeds (P1) (Fig. 26) nearly equal (female unknown); fingers slender, about half propodus length, with blunt teeth, less than half to about three-quarters of distal portion of fingers dark brown. Broad, blunt, slightly curved tooth on inner (ventral), proximal margin of carpus. Ambulatory legs (P2-P5) moderately long, slender, smooth, very few simple setae; length of P5 merus 0.6-0.7 cl; P5 propodi wide, smooth; dactyli long, slender, smooth.

Male abdomen (Fig. 25B) broadly triangular, with 6 freely-movable somites plus telson; telson slightly wider than long. Somite 3 covers space between P5 coxae; somites 1, 2 slightly narrower than somite 3, thoracic sternite 8 not visible. G1 (Fig. 25C) stout, minute teeth along margins of

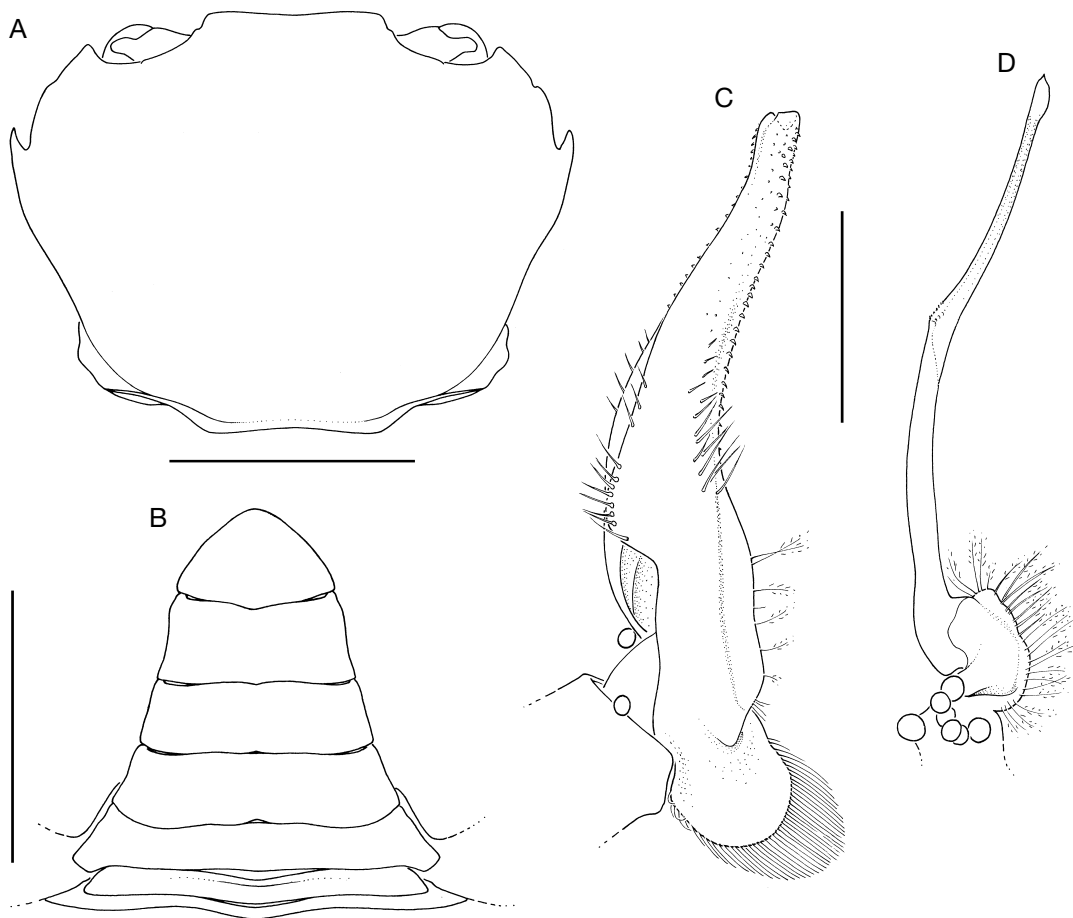


FIG. 25. — *Thyraplax truncata* n. sp., ♂ holotype, cl 8.7 mm, cw 11.6 mm, Fiji, BORDAU 1, stn CP 1481, 441-506 m (MNHN-B 29547): **A**, dorsal surface of the carapace; **B**, abdomen; **C**, left G1 (with rhizocephalan parasite, *Thompsonia* sp.), dorsal view; **D**, left G2 (with rhizocephalan parasite, *Thompsonia* sp.), ventral view. Scale bars: A, 5 mm; B, 3 mm; C, D, 1 mm.

distal portion; truncated tip. G2 (Fig. 25D) slender, slightly longer than G1, slightly curved flagellum shorter than proximal part (peduncle), tip slightly expanded with 1 lateral spinule.

Female unknown.

REMARKS

The new species is known from only five small males from New Caledonia and Fiji. They are all close to *T. cristata* n. sp., which is known from larger specimens from French Polynesia, except for some significant characters: G1 with numerous, minute teeth along the distal portion and a truncated tip

(Fig. 25C) (G1 of *T. cristata* n. sp. with many denticles along the distal portion and a thick, pointed tip; Fig. 20C), G2 having a tip with one long, lateral spinule (Fig. 25D) (G2 of *T. cristata* n. sp. with a simple, pointed tip; Fig. 20D), and smooth P5 propodus and dactylus (propodus and dactylus with two low carinae on both surfaces in *T. cristata* n. sp.). Abdominal somites 3 and 4 lack the slightly inflated region near the outer margins characteristic of *T. cristata* n. sp. The fully formed G1 (which is simpler in the smallest specimen, cl 5.6 mm, cw 7.0 mm [MNHN-B 29546]) and the presence of different G2 precludes the possibility



FIG. 26. — *Thyraplax truncata* n. sp., ♂ holotype, cl 8.7 mm, cw 11.6 mm, Fiji, BORDAU 1, stn CP 1481, 441–506 m (MNHN-B 29547), specimen with a rhizocephalan parasite (*Thompsonia* sp.) on P1–P4.

that the new species may actually represent the pre-adult of *T. truncata* n. sp.

Differences between *T. truncata* n. sp. and the remaining four species of *Thyraplax* n. gen. are summarized in Table 3.

#### Genus *Goneplax* Leach, 1814, emend.

*Goneplax* Leach, 1814: 393, 430. — Ortmann 1898: 1176 [in list] (part). — Tesch 1918: 181 (part). — Rathbun 1897: 167 [nomenclature]; 1918: 25 [diagnosis, key to species] (part). — Stebbing 1902: 15 [discussion]. — Sakai 1939: 562 [in key], 563; 1976: 537 (part). — Barnard 1950: 282 [in key], 283 [diagnosis] (part). — Balss 1957: 1656 (part). — Glaessner 1969: R524 (part) [diagnosis]. — Guinot 1969b: 520 [discussion]; 1971: 1081 [list of species] (part). — Serène 1964: 189, 190 (part), 190 [key to species]. — Zariquiey Álvarez 1968: 413. — Manning & Holthuis 1981: 163 [synonymy, references]. — Karasawa & Kato 2003b: 130 [in list], 140 [in list], 141 [in table] (part). — Komatsu & Takeda 2003: 1243 (part). — Karasawa & Schweitzer 2006: 40 (part). — Guinot & Castro 2007: 18 [discussion]. — Ng & Manuel-Santos 2007: 42 [discussion].

*Goneplat* [*sic*] Leach, 1814: 393, 430 (invalid original spelling of *Goneplax*; see Rathbun 1897: 167; Melville & Smith 1987: 99).

*Gonoplax* [*sic*] Leach, 1816a: 409, 413. — De Haan 1833: 6, 19 [as subgenus]. — Dana 1851: 285 [diagnosis]; 1852: 310 [diagnosis], 1493 [in list]. — H. Milne Edwards 1852: 162. — Miers 1886: xiv, 237 [in list], 245 (part). — Alcock 1900: 293 [in list], 316 (part). — Lebour 1928: 487 [in key], 488, 491 [in key] [larvae] (invalid spelling of *Goneplax* Leach, 1814; see Rathbun 1897: 167; Melville & Smith 1987: 99).

Not *Gonoplax* [*sic*] – Miers 1886: xiv, 237 [in list], 245 (part) (= *Hadroplax* n. gen.).

Not *Goneplax* – Tesch 1918: 181 (part). — Serène 1964: 189, 190 [key to species]; 1968: 89 [list of species] (part). — Guinot 1969b: 522 [discussion]; 1971: 1081 [in list] (part). — Komatsu & Takeda 2003: 1244 [in list] (part) (= *Hadroplax* n. gen., *Neogoneplax* n. gen., and *Microgoneplax* n. gen.).

Not *Goneplax* – Dai *et al.* 1986: 376 [key to species]. — Dai & Yang 1991: 406 (= *Neogoneplax* n. gen., and *Singhaplax* Serène & Soh, 1976).

Not *Goneplax* – Takeda 1973b: 51 (= *Singhaplax* Serène & Soh, 1976).

TYPE SPECIES. — *Ocypoda bispinosa* Lamarck, 1801 (gender feminine). Name placed in Official List of Names in Zoology (with the officially designated type species) in Opinion 85, Direction 37 (see Melville & Smith 1987: 99).

EXTANT SPECIES INCLUDED. — *Goneplax rhomboides* (Linnaeus, 1758); *G. barnardi* (Capart, 1951) n. comb.; *G. clevai* Guinot & Castro, 2007; *G. sigsbei* (A. Milne-Edwards, 1880).

All species are restricted to the Western and Eastern Atlantic regions; one species (*G. rhomboides*) is also found in the Mediterranean Sea. *Goneplax clevai* is found in the Eastern Atlantic and the southeastern coast of South Africa, thus ranging into the Indo-West Pacific region.

FOSSIL SPECIES INCLUDED (Karasawa & Kato [2003b]). — Seven species are listed by Karasawa & Kato (2003b): *Goneplax arenicola* (Glaessner, 1960), *G. craverii* Crema, 1895, *G. formosa* Ristori, 1886, *G. meneghinii* Ristori, 1886, *G. gulderi* Bachmayer, 1853, *G. saccoi* Crema, 1895, and *Goneplax* sp. cf. *G. saccoi* Crema, 1895.

SPECIES NOT INCLUDED IN *GONEPLAX*. — *Goneplax maldivensis* Rathbun, 1902 (in family Euryplacidae Stimpson, 1871; *Otmaroplax maldivensis* nomen nudum in Štević 2005).

*Goneplax marivenae* Komatsu & Takeda, 2003 (and junior synonym, *Goneplax megalops* Komatsu & Takeda, 2003; in *Goneplacoides* n. gen.).

*Goneplax nipponensis* Yokoya, 1933 (?in *Hadroplax* n. gen.).

*Goneplax renoculis* Rathbun, 1914 (in *Neogoneplax* n. gen.).

*Goneplax serenei* Zarenkov, 1972 (in *Paragoneplax* n. gen.).

*Goneplax sinuatifrons* Miers, 1886 (in *Hadroplax* n. gen.).

*Goneplax wolffi* Serène, 1964 (in *Singhaplax* Serène & Soh, 1976).

DIAGNOSIS. — Carapace (Fig. 27A, B) transversely rectangular to trapezoidal, much wider than long; widest at anterolateral teeth posterior to conspicuous outer orbital teeth; front slightly deflected ventrally, slightly concave or straight, not marked by slight median notch or projection. Notch between front, inner edge of supraorbital border distinct, slight, or absent; orbits wide, greatly expanded distally (moderately expanded in *G. barnardi* n. comb.); supraorbital borders conspicuously sinuous; suborbital borders sinuous, with slight, wide obtuse inner tooth not visible dorsally; anterolateral borders short, straight or slightly convex. Dorsal surface of carapace smooth, with slight horizontal ridges, moderately convex, without clear indication of regions. Outer orbital angle with conspicuous, acute tooth; single acute anterolateral tooth on each side of carapace (short, obtuse, or obsolete in some specimens of *G. rhomboides*; see Macpherson 1983: fig. 18). Basal

antennal article short, distalmost (third) article reaches front. Eye peduncles (Fig. 27A, B) long, shorter than as long as front (0.4–1.0 front width); cornea spherical to elongated. No obvious stridulating mechanism other than possible rubbing of proximal portion of cheliped (P1) merus against pterygostomial ridge. Thoracic sternum wide. Median sulcus on thoracic sternite 4 absent; sutures 4/5, 5/6, 7/8 interrupted medially, 6/7 complete. Anterior end of sterno-abdominal cavity anterior to thoracic sternite 4. Cheliped fingers (Fig. 27A, B) long, slender, straight or slightly curved, shorter than elongated propodus; variable portion of dactylus darker in colour, tip light; carpus with tooth on inner margin (absent in large individuals). Dorsal margins of ambulatory leg (P2–P5) meri (Fig. 27A, B) with acute distal tooth; dactyli slender, with carina on each side, setose. Male abdomen with 6 freely-movable somites plus telson, narrowly triangular, somites 4–6 gradually decreasing in width from somite 3 (widest somite). Telson slightly longer than wide. Somite 3 covers space between P5 coxae, somite 2 much narrower than somite 3 so that somites 1, 2 leave relatively large portion of thoracic sternite 8 visible (Guinot 1969b: figs 63, 64, 68). G1 (Capart 1951: figs 10–12; Türkay 1976: fig. 28; Guinot 1969b: fig. 71a, b; 1989: fig. 46A, as *Carcinoplax barnardi*; Guinot & Castro 2007: fig. 3C) long, slender, thin, slightly sinuous, only slightly broadened proximally; pointed, thin tip. G2 (Capart 1951: figs 4, 5, 12; Guinot 1969b: fig. 72; 1989: fig. 46B, as *Carcinoplax barnardi*; Guinot & Castro 2007: fig. 3D) slender, slightly longer or slightly shorter than G1, flagellum shorter than proximal part (peduncle), curved; slightly-expanded tip with 1 or 2 spinules. Penis arising from P5 coxa, moderate size; broad, soft proximal expansion. Female abdomen with 6 freely-movable somites, wide. Telson much wider than long. Somite 3 covers space between P5 coxae, somite 2 slightly narrower than somite 3 but somites 1, 2 leave relatively large portion of thoracic sternite 8 visible. Vulva of mature females round, extending from oblique 5/6 suture to 6/7 suture or to median portion of thoracic sternite 6, covered by soft membrane, vulvar cover absent.

#### REMARKS

Examination of numerous specimens of the type species of *Goneplax*, *G. rhomboides* (Linnaeus, 1758), plus three other species sharing several important characters with the type species, clearly shows that *Goneplax* should be restricted to these four species. All four species are found in the Atlantic Ocean although one species (*G. rhomboides*) is also found in the Mediterranean Sea, while another (*G. clevai* Guinot & Castro, 2007), spans the Atlantic and Indian Ocean coasts of Africa and hence is found in both the Eastern Atlantic and Indo-West Pacific regions.

The implication that *Goneplax* should be restricted to species found outside the Indo-West Pacific region was first expressed by Guinot (1969b: 520). Serène & Vadon (1981: 126) suggested the creation of “one or two new genera” for two Indo-West Pacific species, *Goneplax renoculis* Rathbun, 1914, and *G. sinuatifrons* Miers, 1886. Serène & Soh (1976) had previously erected the genus *Singhaplax* for two Indo-West Pacific species previously attributed to *Goneplax*: *G. nipponensis* Yokoya, 1933, and *G. ockelmanni* Serène, 1971 (see Remarks for *Singhaplax* below). More recently, Štević (2005) included two of the Indo-West Pacific species of *Goneplax sensu lato* (*G. maldivensis* Rathbun, 1902, actually a euryplacid, and *G. sinuatifrons*) in two new genera. The taxa were listed without giving descriptions or definitions to differentiate them from other genera, therefore they must be considered *nomina nuda* (ICZN 1999: Article 13a).

The six Indo-West Pacific species of *Goneplax sensu stricto* remaining after the description of *Singhaplax* Serène & Soh, 1976, are herein placed in five separate genera, *Goneplacoides* n. gen., *Hadroplax* n. gen., *Microgoneplax* n. gen., *Neogoneplax* n. gen., and *Paragoneplax* n. gen. A seventh species, *G. maldivensis*, is being placed in the family Euryplacidae.

The five new genera, as well as *Ommatocarcinus* White, 1852, and *Neommatocarcinus* Takeda & Miyake, 1969, share with *Goneplax sensu stricto* and *Singhaplax* elongated orbits and eye peduncles and wide, transversely rectangular and relatively short carapaces with conspicuous, often acute outer orbital teeth. Also included in this group is *Frevillea* A. Milne-Edwards, 1880, and *G. maldivensis*, both euryplacids. The use of carapace shape to separate between *Goneplax sensu stricto* and *Carcinoplax sensu stricto* is only a matter of convenience (see Remarks for subfamily Goneplacinae above). The evolution of elongated eye peduncles among brachyuran crabs was suggested by Barnes (1968) as an adaptation to a burrowing mode of life and the avoidance of predators while feeding on the surface of the sediment. Other characters that separate *Goneplax sensu stricto* from the six Indo-West Pacific genera containing species that were formerly included in *Goneplax sensu lato* are summarized in Table 4.

Rathbun (1897: 167) clarified the validity of the original name *Goneplax* over *Goneplat* or *Gonoplax*, which are considered typographical errors (also see Melville & Smith 1987: 99).

#### KEY TO SPECIES OF *GONEPLAX* LEACH, 1814

1. Outer orbital and anterolateral teeth close to each other (see Rathbun 1918: pl. 4, figs 2, 4; Guinot 1969b: fig. 68) ..... *Goneplax sigsbei*
- Outer orbital and anterolateral teeth separate enough from each other so that there is a well defined space between the outer orbital and anterolateral teeth ..... 2
2. Rounded anterolateral borders, conspicuous tubercles on subhepatic region (see Fig. 27B). Short orbits, eye peduncles (0.4 front width) (see Fig. 27B) ..... *Goneplax barnardi*
- Straight or nearly straight anterolateral borders, subhepatic region not armed with tubercles. Long eye peduncles (almost as long, as long as, or longer than front width) ..... 3
3. Eye peduncles long, as long as or slightly longer than front width (see Fig. 27A; Guinot & Castro 2007: fig. 4B) ..... *Goneplax rhomboides*
- Eye peduncles shorter, approximately 0.8 of carapace length (see Guinot 1989: fig. 45, as [*Carcinoplax*] *barnardi*; Guinot & Castro 2007: fig. 4A) ..... *Goneplax clevai*

*Goneplax rhomboides* (Linnaeus, 1758)  
(Fig. 27A)

See Guinot & Castro (2007) for complete synonymy; Clark (1986) and d'Udekem d'Accoz (1999) for additional references.

*Cancer rhomboides* Linnaeus, 1758: 626 [Mediterranean Sea]. — Herbst 1782: 84, pl. 1, fig. 12.

*C.[ancer] Angulatus* Pennant, 1777: 5, fig. 10 [England]. — Herbst 1782: 85, pl. 1, fig. 13.

*Ocyroda bispinosa* Lamarck, 1801: 150 [no location].

*Ocipode [sic] longimana* Latreille, 1803: 44, pl. 45, fig. 3 [Mediterranean Sea].

*Goneplax bispinosa* – Leach 1815: 323 [England].

*Gonoplax [sic] bispinosa* – Leach 1816a: 413 [England]; 1816b: pl. 13 [England].

*Goneplax rhomboïdalis* Risso, 1827: 13 [Mediterranean Sea].

*Gelasimus bellii* Couch, 1838: 72 [England].

*Gonoplax [sic] angulata* – White 1847: 37; 1850: 18; 1857: 57, pl. 4, fig. 2 [England]. — Dana 1852: 1568 [in list].

*Gonoplax [sic] rhomboides* – Miers 1886: 246. — Lebour 1928: 502, 534, pl. 2, fig. 6, pl. 11, fig. 10, pl. 12, figs 1–4 [larvae] [England].

*Goneplax rhomboides* – Stebbing 1893: 35, 91. — Capart 1951: pl. 3, fig. 11. — Hartnoll 1968: 296 [female genital ducts]. — Zariquiey Álvarez 1968: 414, fig. 138a, b. — Guinot 1969b: 521, 522 [discussion], fig. 64; 1971: 1081 [in list]. — Türkiye 1976: 38, fig. 28. — Rice & Williamson 1977: 55, fig. 29 [larva]. — Ingle 1980: 14, 15 [table], 17, 18 [table], 20 [table], 22, 109 [references], fig. 50, pl. 17, fig. a [UK]. — Manning & Holthuis 1981: 164 [Madeira to Angola] (part). — Ingle & Clark 1983: 345 [larvae]. — Macpherson 1983: 31, fig. 18 C, D [Mediterranean Sea, Namibia] (part). — Clark 1986: 88 [references, discussion]. — Ingle 1991: 229 [larvae]. — Fransen *et al.* 1997: 185 [Mediterranean Sea]. — Muraoka 1998: 47 [in list]. — D'Udekem d'Acoz 1999: 242 [references, discussion]. — Sakai 1999: 37, pl. 19, fig. F. — Karasawa & Kato 2003b: 130 [in list]. — Garassino *et al.* 2004: 274, fig. 14 [references]. — Guinot & Castro 2007: 19, 24 [synonymy, references, discussion], fig. 4B [France, Algeria, Morocco].

*Goneplax angulata* — Boone 1930: 197, pl. 66B [Tunisia]. — Monod 1956: 354, figs 462–465 [Senegal]. — Bourdillon-Casanova 1960: 140 [in key], 142 [in key], 180, fig. 57 [larvae] [France].

Not *Goneplax angulata* – Stebbing 1902: 15 [South Africa]. — Barnard 1950: 283, fig. 53a; 1954: 126; 1955: 4 [in list] [South Africa]. — Kensley 1981: 46 [in list] [South Africa] (= *Goneplax clevai* Guinot & Castro, 2007).

Not *Goneplax angulatus* – Stebbing 1914: 264 [South Africa] (= *Goneplax clevai* Guinot & Castro, 2007).

*Goneplax angulatus* – Sakai 1999: 36, pl. 19, fig. E.

*Goneplax romboïdes [sic]* — Karasawa & Kato 2003b: 141 [in list].

TYPE MATERIAL. — Most probably not extant.

TYPE LOCALITY. — Mediterranean Sea.

MATERIAL EXAMINED. — **United Kingdom.** Dry material from several localities, some without labels, 11 ♂♂, 6 ♀♀ (BMNH). — Loch Torridon, Scotland, 25 m, A. L. Rice coll., 21.VIII.1971, 1 ♀ (BMNH 1973.229). — Off Hengistbury Head, 1 ♂ (BMNH). — Plymouth, R.W. Ingle coll., 1 ♂, 1 ♀ (BMNH 1974.220). — Shoalstone Point, Brixham, Devon, 18 m, D. George, H. Platt & P. Clark coll., 33 ♂♂, 2 ♀♀ (BMNH 1981.539).

**North Atlantic Ocean.** Porcupine Bank, PROCEL T2, stn L203, 51°44'N, 13°56'W, 410–417 m, 20.V.1985, 1 ♂ (BMNH 2007.55). — Stn L222, 52°35'N, 13°46'W, 296–300 m, 26.V.1985, 6 ♂♂ (BMNH 2007.56–61).

**France.** Mediterranean Sea, Banyuls-sur-Mer, 35 m, J. M. Amouroux leg., 21.IX.1999, 3 ♂♂, 5 ♀♀ (USU 1426); 50 m, XII.1999, 1 ♂ (MZUSP 1591).

**Spain.** Catalonia, Cadaqués, I. Gordon coll., 1 ♀ (BMNH 1955.2.28.234). — Golf de Roses, Catalonia, I. Gordon coll., brought in by fishermen, 17.VIII.1954, 1 ♂, 1 ♀ (BMNH 1954.11.IV.147–148).

**Italy.** Sardinia, 1 ♂ dry (BMNH 1856.42). — Fiumicino, 41°46'N, 12°14'E, Centro Subacqueo Romano coll., X.1976, 1 ♂ (BMNH 1978.216).

DISTRIBUTION. — Mediterranean Sea and Eastern Atlantic Ocean from the North Sea coast of the UK to the west coast of Africa (see Guinot & Castro 2007). Depth: intertidal to 700 m.

#### REMARKS

There has been much confusion over the status of a second species, *G. angulata* (Pennant, 1777), purportedly characterized by weak or obsolete anterolateral teeth. The morphology of the anterolateral teeth, however, is highly variable in *G. rhomboides* and clearly not species-specific (see Macpherson 1983; d'Udekem d'Acoz 1999; Guinot & Castro 2007). Although some of the specimens identified as *G. angulata* that are deposited at BMNH are labeled as types, the authenticity of the information is highly questionable (P. Clark pers. comm.).

*Goneplax rhomboides* is known from the Atlantic and North Sea coasts of Europe and the Mediterranean Sea, as well as along the coasts of western Africa. It is apparently found in West Africa living sympatrically with a similar species, *G. barnardi* (Capart, 1951) n. comb. *Goneplax barnardi* n. comb. is known from Western Sahara to Angola (see be-



TABLE 4. — Morphological differences between *Goneplax* Leach, 1814 *sensu stricto* and the six Indo-West Pacific genera described from species previously included in *Goneplax sensu lato*.

Characters	<i>Goneplax</i> Leach, 1814 <i>sensu stricto</i>	<i>Goneplacoides</i> n. gen.	<i>Hadroplax</i> n. gen.	<i>Neogoneplax</i> n. gen.	<i>Paragoneplax</i> n. gen.	<i>Singhaplax</i> Serène & Soh, 1976	<i>Microgoneplax</i> n. gen.
Anterolateral teeth	Present (sometimes obsolete in <i>G. rhomboides</i> )	Present	Absent	Present (absent or obsolete in <i>N. costata</i> n. sp.)	Absent	Absent	Absent
Suborbital tooth	Small	Small	Small	Small, 1 or 2	Absent	Short or absent	Broad
Eye peduncle	0.4-1.0 front width	0.5 front width	0.8 front width	0.8-1.1 front width	0.8-0.9 front width	1.0-1.2 front width	1.0-1.2 front width
Cornea	Elongated to slightly swollen	Reniform	Reniform	Reniform	Reniform	Elongated	Elongated
Fingers	Dark portion on dactylus	No dark colour	No dark colour	No dark colour	No dark colour	No dark colour (dark spot on pollex of specimen of <i>S. pelecis</i> n. sp.)	No dark colour
Tooth on inner margin of carpus	Acute	Acute	Acute	Acute	Acute	Obtuse	Obtuse
Teeth on distal edge of meri of ambulatory legs (P2-P5)	Present	Absent	Present	Present (absent in <i>N. costata</i> n. sp.)	Present	Absent	Absent
P5 dactylus	Slender	Flattened, broad, long setae	Slender	Slender	Slender	Slender (flattened, broad in <i>S. platypoda</i> n. sp.)	Slender
Male abdomen	Narrow	Wide	Wide	Wide	Wide	Wide	Narrow (wide in <i>M. elegans</i> (Chen, 1998) n. comb.)
Area of sternite 8 left exposed by male abdomen	Large	Small	Large	Large	Large	Small	Large
G1	Slender	Slender	Slender	Slender or stout	Bent	Slender	Slender
G2	Long, slightly curved flagellum	Long, coiled tip of flagellum	Long, slightly curved flagellum	Long, slightly curved flagellum	Short, slightly curved flagellum	Long, slightly curved flagellum	Short, slightly curved flagellum
Vulvar cover	Absent	Absent	Absent	Present	Absent	Absent	Present

low) but the southern limit of the distribution of *G. rhomboides* is not clear. The southern African populations, which extend into the Indian Ocean coasts of South Africa (Barnard 1950; Kensley 1969), have been described as a new species, *G. clevai* Guinot & Castro, 2007. It is a common species in subtidal soft bottoms.

*Goneplax rhomboides* is morphologically contrasted with *G. barnardi* n. comb. and *G. clevai* in the Remarks sections of these two species (see below).

*Goneplax barnardi* (Capart, 1951) n. comb.  
(Fig. 27B)

*Carcinoplax barnardi* Capart, 1951: 170, fig. 65, pl. 3, figs 5, 12 [Gabon, Angola]. — Monod 1956: 340 [in key], 351, figs 456-461 [Senegal]. — Forest 1963: 627, 628 [in list] [Ivory Coast]. — Maurin 1968: 484 [in list] [Western Sahara]. — Guinot 1969b: 526 [discussion]; 1971: 1081 [in list]. — Manning & Holthuis 1981: 160 [Ivory Coast, Nigeria, Gabon]. — Guinot & Castro 2007: 25 [discussion] [Congo, Angola].

[*Carcinoplax*] *barnardi* – Guinot 1989: 314 [in list] fig. 46 (part).

TYPE MATERIAL. — 1 ♂, 1 pre-adult ♂, 2 ♀♀ syntypes (IRSNB 16808).

TYPE LOCALITY. — Off northern coast of Angola, 350-420 m.

MATERIAL EXAMINED. — **Congo (Democratic Republic)**. Pointe Noire, 05°00'S, 11°19'E, 405-410 m, A. Crosnier coll., 15.III.1967, 3 ♂♂, 2 ♀♀ (MNHN-B 10107). — 05°06'S, 11°26'E, 345-355 m, 18.III.1967, 3 ovig. ♀♀ (MNHN-B 10108).

**Angola**. Campagne ZAIANGO-BIOL 2, stn CP 09, 07°17.67'S, 12°04.67'E, 360-367 m, 29.VIII.2000, 2 ♂♂, 4 ♀♀ (MNHN-B 27933).

DISTRIBUTION. — Western Atlantic along the west coast of Africa from Western Sahara and Cabo Verde Is to Angola. Depth: 200-586 m.

#### REMARKS

Capart (1951: 172) described *Goneplax barnardi* n. comb. under *Carcinoplax* on account of the shape of the carapace, the relatively short eye peduncles, and “the other characteristics of the genus”. He agreed that *Carcinoplax* was nevertheless close to *Goneplax* and that the male first pleopods of his new species were difficult to be used as a diagnostic character. In contrast to *Carcinoplax*, *G. barnardi* n. comb. has longer eye peduncles, the dorsal margins of the ambulatory leg (P2-P5) meri are armed with an acute distal tooth (although present in *C. spinosissima* Rathbun, 1914), and the dactyli are slender and have a carina on each side. Sakai (1976: 531, as *Carcinoplax barnardi*) mentioned that the species “seems to belong to *Psopheticus*, near *P. insignis*” but without giving any explanations.

*Goneplax barnardi* n. comb. may be distinguished from *G. rhomboides* and *G. clevai*, which are also found along the West African coast, by the rounded anterolateral borders of its carapace and the presence of conspicuous tubercles on the subhepatic region (Fig. 27B). The borders are straight or nearly straight and the subhepatic region lacks large tubercles in *G. rhomboides* (Fig. 27A) and *G. clevai* (see Guinot 1989: fig. 45, as [*Carcinoplax*] *barnardi*; Guinot & Castro 2007: figs 1-3). Also diagnostic is the length of its eye peduncles. They are much shorter in *G. barnardi* n. comb. (0.4 front width; Fig. 27B) than in *G. rhomboides*, where it is as long as or slightly longer than the front width (Fig. 27A), or in *G. clevai*, where

they are slightly shorter than the front width (0.8 front width). There are also probable differences in colour. *Goneplax barnardi* n. comb. was described as “rose bistre” (dark-brown pink) (Capart 1951: 172), while *G. rhomboides* is known to have a “yellow to pale red, sometimes fringed with violet” carapace and “yellow to orange” chelipeds and ambulatory legs (Ingle 1980: 109). *Goneplax clevai* was described by Barnard (1950: 285, as *G. angulata*) as “pale pink, or salmon, or pinky-cream, carapace and chelipeds more or less vermiculate or mottled”. A freshly preserved specimen had irregular, purple-pink reticulations on the anterior portion of the carapace; the dorsal surfaces of the chelipeds and eye peduncles were light purple-pink (see Guinot & Castro 2007: fig. 2B).

#### *Goneplax clevai* Guinot & Castro, 2007

*Goneplax* new species – Ng & Manuel-Santos 2007: 47, figs 6A, 7 [South Africa].

*Goneplax clevai* Guinot & Castro, 2007: 19 [synonymy, references], figs 1-3, 4A [Ivory Coast, D. R. Congo, Angola, Namibia, South Africa].

[*Carcinoplax*] *barnardi* – Guinot 1989: 314 [in list] fig. 45 (part).

TYPE MATERIAL. — ♂ holotype, cl 24 mm, cw 40 mm, Angola, 6°18'S, 11°34'E, 140-150 m, 17-21.IX.1948 (IRSNB 13599). Paratypes: 1 ♂ (IRSNB 13597), 1 ♂ (MNHN-B 19584), 1 ♂ (IRSNB 13602), 5 ♂♂ (IRSNB 13601), 1 pre-adult (IRSNB 13597), Angola.

MATERIAL EXAMINED. — **South Africa**. Algoa Bay, H. A. Spencer coll., 4 ♂♂ (BMNH 1896.5.19.5.8). — Port Elizabeth, H. A. Spencer coll., 1 ♂ (BMNH 1891.10.22.2). — Port Elizabeth, local trawlers, 1.XII.2003, 1 ♂ (ZRC 2004.0700).

26 km northeast of Bird I., 73 m, Natal Government Museum leg., 1 ♂ (BMNH 1917.619.29) (also see material examined in Guinot & Castro 2007).

TYPE LOCALITY. — Off northern coast of Angola, 140-150 m.

DISTRIBUTION. — From Western Atlantic coast of Ivory Coast to the Indian Ocean coast off KwaZulu-Natal, South Africa. Depth: approximately 10-700 m.

#### REMARKS

*Goneplax clevai*, which is restricted to the southern Atlantic Ocean and the Indian Ocean coast of South

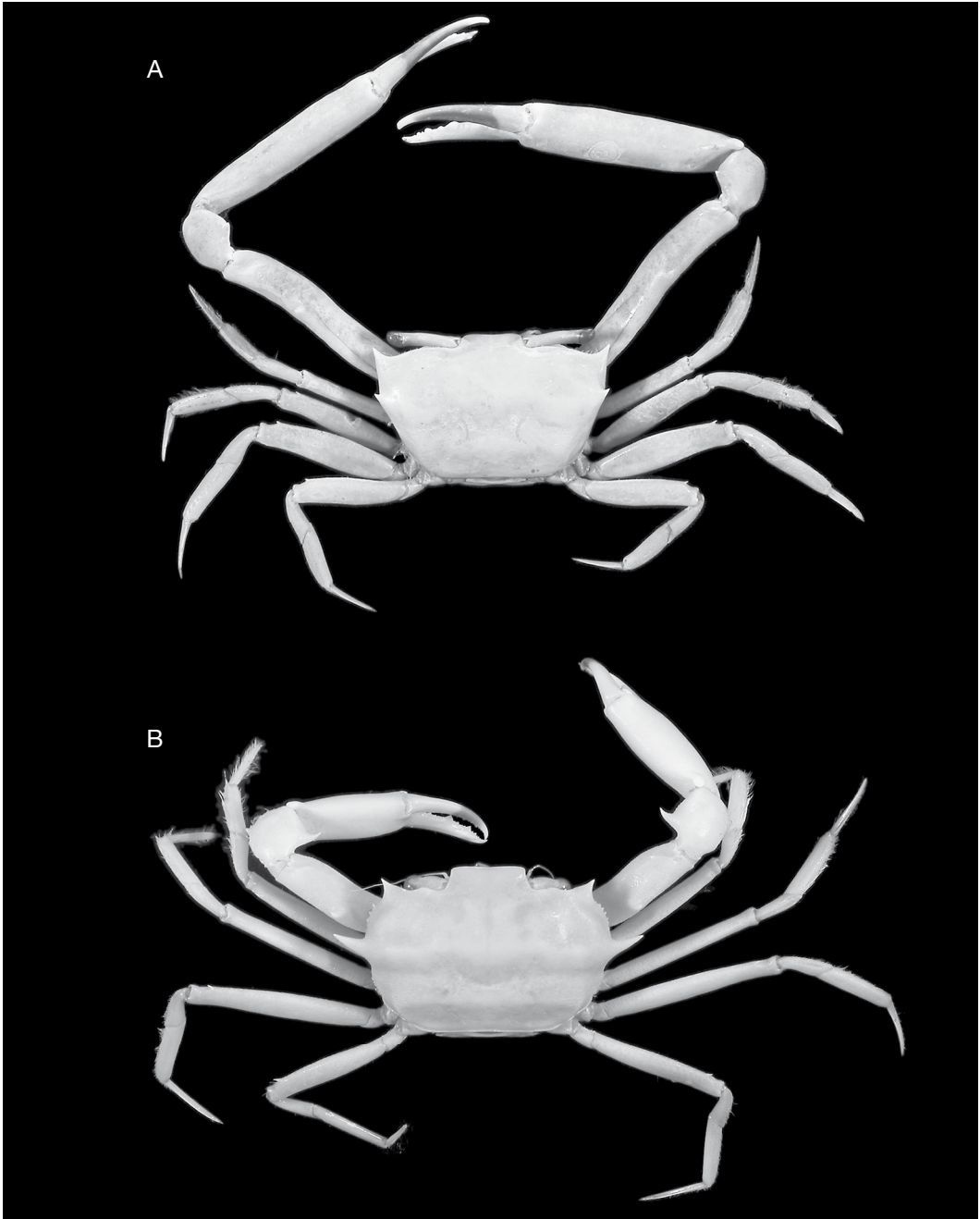


FIG. 27. — **A**, *Goneplax rhomboides* (Linnaeus, 1758), ♂, cl 21.6 mm, cw 34.7 mm, Shoalstone Point, Brixham, Devon, UK, D. George *et al.* coll., 18 m (BMNH 1981.539); **B**, *Goneplax barnardji* (Capart, 1951) n. comb., ♂, cl 14.1 mm, cw 25.1 mm, off northern coast of Angola, Campagne ZAIANGO-BIOL 2, stn CP 09, 360-367 m (MNHN-B 27933).

Africa, was long confused with *G. rhomboides*. The two species are sympatric along the coast of West Africa but the extent of their overlap remains unknown because many African records of *G. rhomboides* in the literature are most probably from misidentified specimens.

*Goneplax clevai* is best distinguished from *G. rhomboides* and *G. barnardi* n. comb. by the length of its eye peduncles, which is somewhat intermediate between its two congeners: 0.8 of the front width (see Guinot 1989: fig 45, as [*Carcinoplax*] *barnardi*; Guinot & Castro 2007: fig. 4A), not as long as in *G. rhomboides* (where it is as long or slightly longer than the front width; see Fig. 27A; Guinot & Castro: fig. 4B) but much longer than that of *G. barnardi* n. comb. (0.4 of the length of the front; see Fig. 27B). There is some variation in the shape of the anterolateral borders and the outer orbital and anterolateral teeth among specimens of *G. rhomboides* so that these characters are not always reliable for differentiating between the two species (see Guinot & Castro 2007). The anterolateral borders of *G. clevai* are straight but rounded in *G. barnardi* n. comb. There are also differences in the morphologies of the front, chelipeds, overall shape of the carapace, and colour between the three species (see Guinot & Castro 2007).

### *Goneplax sigsbei* (A. Milne-Edwards, 1880)

*Frevillea sigsbei* A. Milne-Edwards, 1880: 16 [Grenada]. — A. Milne-Edwards & Bouvier 1923: 337, fig. 3, pl. 6, fig. 2 [diagnosis; Grenada].

*Goneplax sigsbei* – Rathbun 1918: 25 [in key], 26, pl. 4, figs 2, 4 [Grenada]. — Guinot 1969b: 520 [discussion], figs 63, 68, 71a, b, 72; 1971: 1081 [in list]. — Williams *et al.* 1968: 54 [Atlantic coast of US]. — Nizinski 2003: 137 [in list] [Atlantic coast of US].

TYPE MATERIAL. — 1 ♂ syntype, cl 8.2 mm, cw 13.0 mm; 1 ovig. ♀ syntype, cl 7.3 mm (MNHN-B 10199).

TYPE LOCALITY. — West Indies, southwest of Grenada, 11°27.00'N, 62°11.00'W–11°25.00'N, 62°04.25'W, 120–300 m.

MATERIAL EXAMINED. — West Indies. Blake, stn 287, 14–91 m, 1 ♂, 1 ovig. ♀ syntypes (MNHN-B 10199).

DISTRIBUTION. — Western Atlantic Ocean from North Carolina, USA to the southeastern West Indies. Depth: 14–300 m.

### REMARKS

*Goneplax sigsbei*, which is restricted to the eastern Atlantic Ocean, is distinguished from the other three species of *Goneplax sensu stricto* by anterolateral teeth that are close to the outer orbital teeth, shorter and stouter G1, and conspicuously curved G2 (see A. Milne-Edwards & Bouvier 1923: fig. 3, pl. 6, fig. 2; Rathbun 1918: pl. 4, figs 2, 4; Guinot 1969b: figs 68, 71, 72). The eye peduncles (0.6 front width) are shorter than in *G. rhomboides*, but not as short as in *G. barnardi* n. comb. The vulva of mature females, as in other species of *Goneplax sensu stricto*, is small, round, and lacking a vulvar cover. It extends from the 5/6 suture to the median portion of somite 6.

### Genus *Goneplacoides* n. gen.

*Goneplax* – Komatsu & Takeda 2003: 1243 (part).

TYPE SPECIES. — *Goneplax marivenae* Komatsu & Takeda, 2003 (by present designation and by monotypy; gender feminine).

SPECIES INCLUDED. — *Goneplacoides marivenae* (Komatsu & Takeda, 2003) n. comb.

The genus is restricted to the Indo-West Pacific region.

ETYMOLOGY. — From *-oides*, Greek suffix for having the form of, and the generic name *Goneplax*, to indicate that although the species included in the new genus superficially resembles *Goneplax* in the shape of its carapace and its elongated eye peduncles, it actually belongs to a separate genus.

### DESCRIPTION

Carapace (Fig. 28A) transversely rectangular, much wider than long; widest at conspicuous outer orbital teeth; front slightly deflected ventrally, sinuous, marked by 2 slight emarginations, small median projection between emarginations. Notch between front, inner edge of supraorbital border slight or absent; orbits wide, greatly expanded distally; supraorbital borders conspicuously sinuous; suborbital borders sinuous, with slight, obtuse inner tooth not visible dorsally; anterolateral borders short, straight. Dorsal surface of carapace smooth, moderately convex, without clear indication of regions. Outer orbital angle with conspicuous, acute tooth; acute anterolateral tooth

on each side of carapace. Basal antennal article short, distalmost (third) article nearly reaches front. Eye peduncles (Fig. 28A) relatively long, shorter than front (0.5 front width); cornea strongly reniform, dorso-ventrally flattened, nearly divided into anterior and posterior portions. Anterior border of endostome well demarcated from buccal cavern, ridges faint but clearly defined. Third maxillipeds nearly completely close the buccal cavern. No obvious stridulating mechanism other than possible rubbing of proximal portion of cheliped merus (P1) against pterygostomial ridge. Thoracic sternum wide. Median sulcus on thoracic sternite 4 absent; sutures 4/5, 5/6, 7/8 interrupted medially, 6/7 complete (Fig. 29; Komatsu & Takeda 2003: fig. 3a, as *Goneplax marivenae*). Anterior end of sterno-abdominal cavity anterior to thoracic sternite 4. Cheliped fingers (Fig. 28A) long, slender, shovel-like, curved, shorter than elongated propodus; dactylus light in colour, without dark portion. Dorsal margins of ambulatory leg (P2-P5) meri (Fig. 28A) unarmed; dactyli of P2-P4 slender, without carina on each side, setose; P5 dorso-ventrally flattened, wide, without carina, bordered by long, simple setae (Fig. 28A). Male abdomen (Komatsu & Takeda 2003: fig. 3b, as *Goneplax marivenae*, fig. 6a, b, as *G. megalops*; Ng & Manuel-Santos 2007: fig. 9B, as "*Goneplax*" *marivenae*) with 6 freely-movable somites plus telson, wide, somites 4-6 gradually decreasing in width from somite 3 (widest somite). Telson wide, only slightly longer than wide. Somite 3 covers space between P5 coxae, somite 2 narrower than somite 3; somites 1, 2 leave small portion of thoracic sternite 8 visible (Ng & Manuel-Santos 2007: figs 10B, 11B, as "*Goneplax*" *marivenae*). G1 (Komatsu & Takeda 2003: fig. 3c, d, as *Goneplax marivenae*, fig. 6c, d, as *G. megalops*) long, slender, slightly sinuous, slightly broadened proximally. G2 (Komatsu & Takeda 2003: fig. 3e, as *Goneplax marivenae*, fig. 6e, as *G. megalops*) slender, slightly longer than G1, flagellum slightly longer than proximal part (peduncle), nearly coiled, tip pointed. Penis arising from P5 coxa (Komatsu & Takeda 2003: fig. 3a, as *Goneplax marivenae*; Ng & Manuel-Santos 2007: fig. 13B, as "*Goneplax*" *marivenae*), moderate size; broad, soft proximal expansion. Female abdomen with 6 freely-movable somites, wide. Telson much wider than long. Somite 3 covers space between P5 coxae,

somite 2 slightly narrower than somite 3; somites 1, 2 leave small portion of thoracic sternite 8 visible. Vulva (Fig. 29) of mature females not expanded, small, round, extending from 5/6 suture to median portion of thoracic sternite 6, vulvar cover absent, covered by soft membrane.

#### REMARKS

The new genus consists of an Indo-West Pacific species originally described as *Goneplax marivenae*.

Several characters separate *Goneplacoides* n. gen. from *Goneplax sensu stricto* and from *Hadroplax* n. gen., *Microgoneplax* n. gen., *Neogoneplax* n. gen., *Paragoneplax* n. gen., and *Singhaplax* Serène & Soh, 1976, the five Indo-West Pacific genera derived from *Goneplax sensu lato* (see Table 4).

Characteristic of *Goneplacoides* n. gen. is a G2 that is coiled distally (Komatsu & Takeda 2003: figs 3e, 6e, as *Goneplax megalops*), not straight or slightly curved as in the other genera. The male abdomen is wide and the vulva lacks a vulvar cover. The eye peduncle is shorter (0.5 of the front width) than in the remaining five genera. The propodus and dactylus of P2-P5 are broadened, fringed by conspicuous setae (Fig. 28A), and the dactylus lacks a carina on each side instead of having a more slender propodus and a long and slender dactylus with a carina on each side and no conspicuous setae as in *Goneplax sensu stricto* (Fig. 27) and the other five genera (Figs 28B, C; 31; 34; 42; 46). The dactylus, however, is similarly broadened in *Singhaplax platypoda* n. sp. (Fig. 37).

#### *Goneplacoides marivenae*

(Komatsu & Takeda, 2003) n. comb.  
(Figs 28A; 29)

?*Goneplax maldivensis* – Tesch 1918: 35, pl. 9, fig. 1 [Indonesia].

?*Singhaplax nipponensis* – Ho *et al.* 2004: 659, fig. 6E (as *Goneplax nipponensis* Yokoya, 1933) [Taiwan].

*Goneplax marivenae* Komatsu & Takeda, 2003: 1244, figs 1-3, 7A [Philippine Is].

*Goneplax megalops* Komatsu & Takeda, 2003: 1250, figs 4-6, 7B [Japan].

"*Goneplax*" *marivenae* – Ng & Manuel-Santos 2007: 47, figs 6B, 9B, 10B, 11B, 12B, 13C [Philippine Is].

TYPE MATERIAL. — *Goneplax marivenae* Komatsu & Takeda, 2003: tangle nets of local fishermen, ♂ holotype (NSMT-Cr 15531); 1 ♂, 2 ♀♀ paratypes (NSMT-Cr 15532).

*Goneplax megalops* Komatsu & Takeda, 2003: *Tansei Maru*, cruise KT02-03, ♂ holotype cl 6.0 mm, cw 9.1 mm; 1 pre-adult ♂ paratype, 5 pre-adult ♀♀ paratypes, 2 ovig. ♀♀ paratypes from various localities in Japan (see Komatsu & Takeda 2003: 1250) (CBM-ZC 7031).

TYPE LOCALITY. — *Goneplax marivenae*: Philippine Islands, Bohol, Balicasag I., off Panglao I., unrecorded depth. *Goneplax megalops*: Kerama Is, Ryukyu Is, Japan, 182-169 m.

MATERIAL EXAMINED. — **Japan**. Ryukyu Is, Kerama Is, 26°18.86'N, 127°09.01'E, 182-169 m, RV *Tansi*-maru, cruise KT02-3, stn E5-2, T. Komai coll., 19.IV.2002, ♂ holotype of *Goneplax megalops*, cl 6.0 mm, cw 9.1 mm (CBM-ZC 7031).

**Taiwan**. TAIWAN 2000, stn CP 35, 22°01.8'N, 120°36.5'E, 228-222 m, 31.VII.2000, 1 ♂ (ZRC 2001.2218), 1 ♂ (MMBA), 1 ♂ (NTOU).

**Philippine Islands**. Bohol, Balicasag I., off Panglao I., tangle nets of local fishermen, 50-500 m, 28.XI.2001, 2 ♂♂ (ZRC 2001.0534); 200-300 m, VI.2002, 8 ♂♂, 2 ovig. ♀♀ (ZRC 2002.0648); 25-30.VII.2003, 2 ♂♂, 1 ovig. ♀ (ZRC 2004.0724); 50-500 m, III.2004, 3 ♂♂ (ZRC 2004.0725).

**Indonesia**. Kai Is, KARUBAR, stn DW 01, 05°46'S, 132°10'E, 156-305 m, 22.X.1991, 4 ♂♂, 2 ♀♀ (MNHN-B 29217). — Stn DW 18, 05°18'S, 133°01'E, 205-212 m, 24.X.1991, 1 ♂ (MNHN-B 29386).

**Chesterfield Islands**. MUSORSTOM 5, DW 266, 25°20.20'S, 159°45.70'E, 240 m, 8.X.1986, 1 ♀ (MNHN-B 29314).

**New Caledonia**. BIOCAL, stn DW 64, 24°48'S, 168°09'E, 250 m, 3.IX.1985, 1 pre-adult ♂ (MNHN-B 10300); 1 ovig. ♀ (MNHN-B 29253).

CHALCAL 2, stn DW 71, 24°42.26'S, 168°09.52'E, 230 m, 27.X.1986, 1 ♂ (MNHN-B 29234). — Stn DW 80, 23°26.7'S, 168°01.8'E, 180 m, 30.X.1986, 1 undet. sex (MNHN-B 29235).

SMIB 3, stn DW 10, 24°42.0'S, 168°07.2'E, 235 m, 21.V.1987, 1 ♂, 1 ovig. ♀ (MNHN-B 29221).

VOLSMAR, stn DW 59, 20°59.9'S, 170°16.9'E, 320 m, 6.VII.1989, 2 ♂♂, 1 ♀ (MNHN-B 29222); 1 ♂ (MNHN-B 24447).

BATHUS 2, stn DW 726, 22°47.3'S, 167°28.7'E, 241-260 m, 12.V.1993, 1 ♂ (MNHN-B 29290).

SMIB 5, stn DW 77, 23°40.8'S, 168°01.1'E, 270 m, 7.IX.1989, 1 ovig. ♀ (MNHN-B 29223). — Stn DW 91, 22°18.4'S, 168°41.1'E, 340 m, 13.IX.1989, 1 ♂ (MNHN-B 29224). — Stn DW 96, 23°00.0'S, 168°18.7'E, 245 m, 14.IX.1989, 1 ♂ (MNHN-B 29225).

BERYX 11, stn DW 11, 23°44'S, 168°10'E, 320-350 m, 16.X.1992, 1 pre-adult ♂, 1 ♂, 1 pre-adult ♀, 1 ♀, 1 ovig.

♀ (MNHN-B 29324) — Stn DW 18, 24°48'S, 168°09'E, 250-270 m, 16.X.1992, 1 pre-adult ♂ (MNHN-B 29346).

SMIB 8, stn DW 165, 24°47.6'S, 168°09.6'E, 372-660 m, 28.I.1993, 1 ♂ (MNHN-B 29347). — Stn DW 177, 23°39'S, 168°00'E, 320-370 m, 29.I.1993, 1 ♀ (MNHN-B 29262), 1 ♂ (MNHN-B 29323). — Stn DW 178, 23°45.1'S, 168°17'E, 400 m, 30.I.1993, 1 ♀ (MNHN-B 29291).

NORFOLK 1, stn DW 1658, 23°26'S, 167°50'E, 320-336 m, 19.VI.2001, 1 ♂ (MNHN-B 29340). — Stn DW 1726, 23°18'S, 168°15'E, 185-207 m, 27.VI.2001, 1 ♀ (MNHN-B 293441).

NORFOLK 2, stn DW 2123, 23°18'S, 168°15'E, 185-197 m, 2.XI.2003, 1 pre-adult ♂ (MNHN-B 29764).

**Loyalty Islands**. MUSORSTOM 6, stn DW 399, 20°41.8'S, 167°00.2'E, 282 m, 14.II.1980, 1 ♀ (MNHN-B 29220). — Stn DW 473, 21°08.8'S, 167°55.3'E, 236 m, 22.II.1980, 1 ♀ (MNHN-B 29219).

DISTRIBUTION. — Ryukyu Is, Japan (Komatsu & Takeda 2003, as *Goneplax megalops*), Philippine Is (Komatsu & Takeda 2003, as *Goneplax marivenae*), and now from Taiwan, Indonesia (Kai Is), Chesterfield Is, New Caledonia, and Loyalty Is. Depth: 156-400 m. Also dredged from a station recorded at 372-660 m.

#### COLOUR

A photograph of a freshly collected female specimen from New Caledonia (MNHN-B 29262) showed a mottled light red carapace, chelipeds, and ambulatory legs. Two dark red spots showed on each cheliped, one on the dactylus and one on the distal end of the outer margin of the propodus.

#### REMARKS

Most of the unique characters of *Goneplacoides marivenae* n. comb. are discussed in the Description and Remarks for *Goneplacoides* n. gen. (see above).

Komatsu & Takeda (2003) described *Goneplax marivenae* from the Philippine Is and *G. megalops* from Japan (type locality: Kerama Is, Ryukyu Is). *Goneplax megalops* was described as "most similar" to *Goneplax marivenae* except that: 1) the outer orbital teeth projected beyond the anterolateral teeth in *G. megalops* (Komatsu & Takeda 2003: figs 4a, 7B) but not in *Goneplax marivenae*, where both teeth have about the same length (Komatsu & Takeda 2003: figs 4a, 7A); 2) the mesial margins of the G1 of *G. megalops* were fringed with short simple



FIG. 28. — **A**, *Goneplacoides marivenae* (Komatsu & Takeda, 2003) n. comb., ♀, cl 7.6 mm, cw 11.6 mm, off southern coast of New Caledonia, SMIB 8, stn DW 177, 320-370 m (MNHN-B 29262); **B**, *Neogoneplax renoculis* (Rathbun, 1914) n. comb., ♂, cl 10.1 mm, cw 16.0 mm, South China Sea off Philippine Is, MUSORSTOM 3, stn CP 108, 188-195 m (MNHN-B 10334); **C**, *Paragoneplax serenei* (Zarenkov, 1972) n. comb., ♂, cl 8.6 mm, cw 14.9 mm, north of New Caledonia, BATHUS 1, stn CP 669 (MNHN-B 29327).

setae in contrast with the plumose setae that were found along the entire border of the G1 of *Goneplax marivenae*; 3) the tip of the G1 of *G. megalops* was narrower in *G. megalops* than in *Goneplax marivenae*; and 4) *Goneplax marivenae* was “about twice as large as *G. megalops*” (Komatsu & Takeda 2003: 1249). All of these differences are explained by the relative size of the specimens used in the two descriptions. *Goneplax megalops* was described from nine small specimens (cl 3.4 mm, cw 4.6 mm to cl 7.4 mm, cw 11.2 mm; male holotype, cl 6.0 mm, cw 9.1 mm, CBM-ZC 7031) whereas *Goneplax marivenae* was described from four larger specimens (cl 10.2 mm, cw 15.7 mm to cl 12.3 mm, cw 19.1 mm). Among the specimens from one station in the Kai Is, Indonesia (MNHN-B 29217), the five smaller individuals (four males and one female, cl 4.5 mm, cw 6.5 mm to cl 5.0 mm, cw 7.4 mm) had outer orbital teeth that projected beyond the anterolateral teeth as in *G. megalops*, while in the largest one (female, cl 6.8 mm, cw 10.1 mm) the outer orbital teeth did not as in *Goneplax marivenae*. All of the remaining 53 specimens examined (including the holotype of *G. megalops*) during this study, which varied from a pre-adult female (cl 3.4 mm, cw 4.2 mm, MNHN-B 29346) to a female (cl 8.7 mm, cw 13.6 mm, MNHN-B 29223) confirmed that in the smaller individuals (cl shorter than 6.5 mm) the outer orbital teeth always projected beyond the anterolateral teeth but not in the larger individuals. The differences between the G1 of both species are also a function of relative size, the number and type of setae and the relative width of the tip vary according to size. *Goneplax megalops*, is therefore a synonym of *Goneplax marivenae*. Both descriptions appear in the same publication but the name *Goneplax marivenae* is selected as it appears first in the publication, and to prevent confusion since the epithet *megalops* has already been used in another species.

An incomplete male specimen from Taiwan (NTOU) appears to be identical to *G. marivenae*. The specimen is supposedly the same identified as a female of *Singhaplax nipponensis* (Yokoya, 1933) (but *Goneplax nipponensis* in Fig. 6) by Ho *et al.* (2004: 659). The figure, however, shows a slender P5 dactylus instead of the broad dactylus of *G. marivenae*.

Two pre-adult males from Indonesia identified as *Goneplax maldivensis*, by Tesch (1918: 183, pl. 9, fig. 1) do not belong to this species (actually in Euryplacidae), an observation previously made by Guinot (1969b: 518). The specimens could belong to *G. marivenae* instead. The rounded outer orbital angle as depicted by Tesch is not characteristic of *G. marivenae* but the broad P5 dactylus, the general shape of the carapace, eye peduncles, and abdomen are indeed diagnostic of the species. The specimen (ZMA De 241733) was unfortunately damaged beyond recognition.

A photograph of a specimen with a completely red carapace had strong resemblance to *G. marivenae* n. comb. The specimen, collected from the Gemini seamounts east of New Caledonia, was unfortunately lost. It may represent a yet undescribed species of *Goneplacoides* n. gen.

#### Genus *Hadroplax* n. gen.

*Goneplax* [*sic*] – Miers 1886: 245 (part).

*Goneplax* – Tesch 1918: 181 (part). — Balss 1957: 1656 (part). — Serène 1964: 189, 190; 1968: 89 (part). — Guinot 1969b: 520; 1971: 1081 (part). — Dai *et al.* 1986: 376 (part). — Dai & Yang 1991: 406 (part). — Karasawa & Kato 2003b: 130 [in list], 140 [in list], 141 [in table] (part). — Komatsu & Takeda 2003: 1243 (part).

*Teschia* Števcíć, 2005: 134 (*nomen nudum*).

TYPE SPECIES. — *Goneplax sinuatifrons* Miers, 1886 (by present designation and by monotypy; gender feminine).

SPECIES INCLUDED. — *Hadroplax sinuatifrons* (Miers, 1886) n. comb.

The genus is restricted to the Indo-West Pacific region.

ETYMOLOGY. — From *hadros*, Greek for “well developed” or “bulky”, in reference to the large basal antennular articles that do not fit into the antennular fossae, a characteristic of the type species, and *plax*, Greek for “plate” or “tablet”, derived from the generic name *Goneplax* to denote that the type species of the new genus was formerly included in *Goneplax*.

#### DESCRIPTION

Carapace (Miers 1886: pl. 20, fig. 2, as *Goneplax* [*sic*] *sinuatifrons*) transversely rectangular, wider





FIG. 29. — *Goneplacoides marivenae* (Komatsu & Takeda, 2003) n. comb., ovig. ♀, cl 8.0 mm, cw 12.5 mm, New Caledonia, VOLSMAR, stn DW 59, 320 m (MNHN-B 29222), thoracic sternum and vulva.

than long; widest at conspicuous outer orbital teeth; front slightly deflected ventrally, sinuous, may be marked by slight median emargination. Notch between front, inner edge of supraorbital border absent. Orbits wide, greatly expanded distally; supraorbital borders conspicuously sinuous; suborbital borders sinuous, with short, wide inner tooth not visible dorsally. Dorsal surface of carapace smooth, moderately convex, without clear indication of regions. Outer orbital angle with conspicuous, anteriorly directed, acute tooth. Nearly straight lateral borders without anterolateral teeth. Basal antennular articles large so they cannot be folded into enlarged fossae (Serène & Umali 1972: fig. 73). Basal antennal article short, distalmost (third) article nearly reaches front. Eye peduncles (Miers 1886: pl. 20, fig. 2b, as *G. sinuatifrons*) relatively long, only slightly shorter than front (0.8 front width); cornea reniform, dorso-ventrally flattened, nearly divided into anterior, posterior portions. Anterior border of endostome well demarcated from buccal cavern,

ridges faint but clearly defined. Third maxillipeds nearly completely close the buccal cavern. No obvious stridulating mechanism other than possible rubbing of proximal portion of cheliped (P1) merus against pterygostomial ridge. Thoracic sternum wide. Median sulcus on thoracic sternite 4 absent; suture 2/3 fused but visible in some specimens; sutures 4/5, 5/6, 7/8 interrupted medially, 6/7 complete. Anterior end of sterno-abdominal cavity anterior to thoracic sternite 4. Cheliped fingers long, slender, shovel-like, curved, shorter than elongated propodus; carpus with conspicuous, acute tooth on inner margin; merus with conspicuous tooth on inner (ventral) margin. Dorsal margins of ambulatory leg (P2-P4) meri with acute distal tooth, P5 unarmed; dactyli of P2-P4 slender, with carina on each side. Male abdomen (Tesch 1918: pl. 9, fig. 2; Serène & Umali 1972: fig. 77, as *G. sinuatifrons*) with 6 freely-movable somites plus telson, wide, somites 4-6 gradually decreasing in width from somite 3 (widest somite). Telson wide, wider than long. Somite 3

covers space between P5 coxae, somite 2 narrower than somite 3; somites 1, 2 leave large portion of thoracic sternite 8 visible. G1 (Serène & Umali 1972: figs 78, 79, as *G. sinuatifrons*) long, slender, slightly broadened proximally, bent outwardly at distal end. G2 (Serène & Umali 1972: figs 80, 81, as *G. sinuatifrons*) slender, slightly longer than G1, flagellum slightly longer than proximal part (peduncle), expanded. Penis arising from P5 coxa, moderate size, soft proximal expansion. Female abdomen with 6 freely-movable somites, wide. Telson much wider than long. Somite 3 covers space between P5 coxae, somite 2 slightly narrower than somite 3; somites 1, 2 leave small portion of thoracic sternite 8 visible. Vulva of mature females small, ovoid, extending from 5/6 suture to median portion of thoracic sternite 6, vulvar cover absent, covered by soft membrane.

#### REMARKS

*Teschia* Števc̆ić, 2005, created for *Goneplax sinuatifrons* Miers, 1886, was included in a list of “new genera *incertae sedis*” (Števc̆ić 2005: 134) without any indications as to their inclusion in any particular supra-generic taxa. The generic name is unavailable since it was not accompanied by a description or definition to differentiate it from other genera (ICZN 1999: Article 13.1).

Guinot (1969b: 522) questioned the inclusion of *G. sinuatifrons* in *Goneplax sensu lato*, and Serène & Vadon (1981: 126) suggested its elevation as a new genus. Serène & Umali (1972: 82) similarly explained that their new species, *Singhaplax ockelmanni* (Serène, 1971), was not congeneric with *G. sinuatifrons* on account of the structure of their respective antennules and G1. Apparently unique among the Goneplacidae *sensu stricto* is the presence of basal antennular articles that are so long that they do not fit into the fossae, even if the fossae are enlarged (see Serène & Umali 1972: fig. 73). Also unique is the shape of the G2, with an enlarged tip (see Serène & Umali 1972: figs 80, 81) and an unusually large portion of thoracic sternite 8 left visible by the male abdomen. The nearly square appearance of the carapace, without anterolateral teeth, is similar to that of *Paragoneplax serenei* (Zarenkov, 1972) n. comb., but in the lat-

ter the G2 is much shorter than in *H. sinuatifrons* n. comb. and the G1 is uniquely twisted. The 2/3 thoracic suture was fused but still visible in all eight specimens (including five pre-adults) collected in Indonesia by the Siboga Expedition (largest female, cl 6.1 mm, cw 9.2 mm; ZMA De 241737) but not fused in a small female (cl 4.3 mm, cw 6.4 mm; MNHN-B 10306). The suture was not fused in the female holotype (cl 6.3 mm, cw 9.7 mm; BMNH 18.84.31) and in a large male (cl 7.5 mm, cw 11.2 mm; MNHN-B 10322). Other characters that separate *Hadroplax* n. gen. from *Goneplax sensu stricto* and the five Indo-West Pacific genera containing species formerly included in *Goneplax sensu lato* are summarized in Table 4.

*Goneplax nipponensis* Yokoya, 1933 could also represent a second species of *Hadroplax* n. gen. (see Remarks for *Singhaplax styra* n. sp. below).

#### *Hadroplax sinuatifrons* (Miers, 1886) n. comb.

*Goneplax* [*sic*] *sinuatifrons* Miers, 1885: 588 [Indonesia] (*nomen nudum*).

*Goneplax* [*sic*] *sinuatifrons* Miers, 1886: 246, pl. 20, figs 2, 2a-c [Indonesia].

*Goneplax sinuatifrons* – Stebbing 1893: 92. — Tesch 1918: 182 [in key], 182, pl. 9, fig. 2<sup>a</sup> [Indonesia]. — Serène 1964: 190 [in key]; 1968: 89 [in list]. — Guinot 1969b: 522 [discussion]; 1971: 1081 [in list]. — Serène & Umali 1972: 78 [in key], 79, figs 73-81, pl. 8, figs 7, 8 [Philippine Is]. — Zarenkov 1972: 233 [in list]. — Serène & Vadon 1981: 120, 123, 126 [discussion] [Philippine Is]. — Komatsu & Takeda 2003: 1244 [in list].

*Teschia sinuatifrons* – Števc̆ić 2005: 134.

TYPE MATERIAL. — *Challenger*, ♀ holotype, cl 6.3 mm, cw 9.7 mm (BMNH 18.84.31).

TYPE LOCALITY. — Indonesia, Sulawesi, Ambon, 27-46 m.

MATERIAL EXAMINED. — **Philippine Islands.** Bohol, Balicasag I., off Panglao I., PANGLAO 2004, stn T32, Bohol I., 09°36.4'N, 123°53.8'E, muddy sand, 60-62 m, 3.VI.2004, 1 ♂ cl 3.3 mm, cw 4.9 mm (ZRC 2006.0184).

**Indonesia.** Makassar Strait, CORINDON 2, stn 263, 01°56.8'S, 119°16.7'E, 80 m, 6.XI.1980, 1 ♂ cl 7.5 mm, cw 11.2 mm (MNHN-B 10322). — Stn 295, 01°26.5'S, 117°02.1'E, 54-51 m, 11.XI.1980, 1 ♀ cl 4.3 mm, cw

6.4 mm (MNHN-B 10306).

Sulawesi, Ambon, *Challenger*, 27-46 m, ♀ holotype cl 6.3 mm, cw 9.7 mm (BMNH 18.84.31). — Siboga Expedition, stn 181, 36-54 m, 4 pre-adult ♂♂, 2 ♂♂, 1 pre-adult ♀, 1 ♀ (ZMA De 241737).

**Vanuatu.** BOA1, stn DW 2441, 15°09'S, 166°55'E, 72-147 m, 10.IX.2005, 1 ♂ cl 4.2 mm, cw 6.6 mm (MNHN-B 30452).

**DISTRIBUTION.** — Philippine Is (Serène & Umali 1972; Serène & Vadon 1981), Indonesia (Ambon [Miers 1886; Tesch 1918] and now Makassar Strait), and now Vanuatu. Depth: 27-134 m; also collected from a station at a depth of 72-147 m.

#### REMARKS

The diagnostic characters of the species are listed and discussed in the description of *Hadroplax* n. gen. (see above).

#### Genus *Neogoneplax* n. gen.

*Goneplax* — Tesch 1918: 181 (part). — Sakai 1939: 562 [in key], 563; 1976: 537 (part). — Balss 1957: 1656 (part). — Guinot 1969b: 520; 1971: 1081 (part). — Serène 1964: 189, 190; 1968: 89 (part). — Dai *et al.* 1986: 376 (part). — Dai & Yang 1991: 406 (part). — Karasawa & Kato 2003b: 130 [in list], 140 [in list], 141 [in table] (part). — Komatsu & Takeda 2003: 1243 (part).

**TYPE SPECIES.** — *Goneplax renoculis* Rathbun, 1914 (by present designation; gender feminine).

**SPECIES INCLUDED.** — *Neogoneplax costata* n. sp.; *N. renoculis* (Rathbun, 1914) n. comb.; *N. serratipes* n. sp.

All species are restricted to the Indo-West Pacific region.

**ETYMOLOGY.** — From *neos*, Greek for “new”, and the generic name *Goneplax*, to indicate that although the species included in the new genus superficially resemble *Goneplax* in the general shape of their carapaces and the elongated eye peduncles, they actually belong to a separate new genus.

#### DESCRIPTION

Carapace (Figs 28B; 30A; 31; 33A; 34; Chen 1998: fig. 11-1) transversely rectangular, much wider than long; widest at conspicuous outer orbital teeth; front slightly deflected ventrally, sinuous, marked by 2 slight emarginations, small to minute median projection between emarginations. Slight notch between front,

inner edge of supraorbital border; orbits wide, greatly expanded distally; supraorbital borders conspicuously convex; suborbital borders convex, with 1 or 2 slight, obtuse inner teeth not visible dorsally; anterolateral borders short, straight. Dorsal surface of carapace smooth or with slight horizontal ridges, moderately convex, without clear indication of regions. Outer orbital angle with conspicuous, acute tooth; acute anterolateral tooth on each side of carapace (much reduced in *N. costata* n. sp.). Basal antennal article short, distalmost (third) article nearly reaches front. Eye peduncles (Figs 28B; 30A; 31; 33A; 34) long, shorter than or longer than front (0.8-1.1 front width); cornea strongly reniform, dorso-ventrally flattened, nearly divided into anterior and posterior portions. Anterior border of endostome well demarcated from buccal cavern, ridges faint but clearly defined. Third maxillipeds nearly completely close the buccal cavern. No obvious stridulating mechanism other than possible rubbing of proximal portion of cheliped (P1) merus against pterygostomial ridge. Thoracic sternum wide. Median sulcus on thoracic sternite 4 absent; sutures 4/5, 5/6, 7/8 interrupted medially, 6/7 complete (Fig. 32). Anterior end of sterno-abdominal cavity anterior to thoracic sternite 4. Cheliped fingers (Figs 28B; 31; 34) long, slender, shovel-like, curved, pollex higher than dactylus in large individuals, shorter than elongated propodus; dactylus light in colour, without dark portion; carpus with conspicuous tooth on inner margin. Dorsal margins of ambulatory leg (P2-P5) meri unarmed (*N. costata* n. sp.; Fig. 31), with acute distal tooth (*N. renoculis* n. comb.; Fig. 28B), or several teeth (*N. serratipes* n. sp.; Figs 33B, 34); dactyli slender, with carina on each side, non-setose. Male abdomen (Figs 30B; 33C; Chen 1998: fig. 11-3, as *G. renoculis*) with 6 freely-movable somites plus telson, wide, somites 4-6 gradually decreasing in width from somite 3 (widest somite). Telson wide, clearly longer than wide. Somite 3 covers space between P5 coxae, somite 2 narrower than somite 3; somites 1, 2 leave small to large portion of thoracic sternite 8 visible. G1 varies from long, slender, slightly sinuous, slightly broadened proximally (Fig. 30C) to stout, short, with obtuse tip (Fig. 33D; Chen 1998: fig. 11-4, as *G. renoculis*). G2 (Figs 30D; 33E) slender, slightly shorter to slightly longer than G1, flagellum slightly

longer than proximal part (peduncle), tip curved or straight, pointed. Penis arising from P5 coxa, moderate size; broad, soft proximal expansion. Female abdomen (Dai & Yang 1991: fig. 198-2, as *G. renoculis*) with 6 freely-movable somites, wide. Telson much wider than long. Somite 3 covers space between P5 coxae, somite 2 slightly narrower than somite 3; somites 1, 2 leave small portion of thoracic sternite 8 visible. Vulva of mature females (Fig. 32) small, oval, extending from 5/6 suture to median portion of thoracic sternite 6, vulvar cover present.

REMARKS

The new genus is described for *Goneplax renoculis* Rathbun, 1914, which is different from the four mostly Atlantic species of *Goneplax sensu stricto*. The polyphyletic nature of *Goneplax sensu lato* and the questions surrounding the position of the Indo-West Pacific species of the genus are discussed in the Remarks section for *Goneplax* (see above).

Characters that separate *Neogoneplax* n. gen. from *Goneplax sensu stricto* and the five Indo-West Pacific genera that were formerly included in *Goneplax sensu lato* are summarized in Table 4.

KEY TO SPECIES OF *NEOGONEPLAX* N. GEN.

1. No anterolateral teeth (see Figs 30A; 31), with slight prominence on anterolateral margin in some individuals. Meri of ambulatory legs (P2-P5) smooth, without dorsal, distal tooth (see Fig. 31) ..... *Neogoneplax costata* n. sp.
- One well developed, acute anterolateral tooth below each outer orbital tooth (see Figs 28B; 33A; 34). Meri of ambulatory legs (P2-P5) with one or more dorsal teeth ..... 2
2. Merus of each ambulatory leg (P2-P5) with one dorsal, distal tooth (see Fig. 28B) ..... *Neogoneplax renoculis*
- Merus of each ambulatory leg (P2-P5, particularly P4, P5) with several dorsal teeth (see Figs 33B; 34) ..... *Neogoneplax serratipes* n. sp.

*Neogoneplax renoculis*  
(Rathbun, 1914) n. comb.  
(Fig. 28B)

*Goneplax renoculis* Rathbun, 1914: 145 [Philippine Is]. — Tesch 1918: 182 [in key]. — Sakai 1934: 314 [in list]; 1935: 186, pl. 54, fig. 4; 1939: 563, 722, pl. 67, fig. 4; 1940: 38, 39 [in list]; 1956: 46 [in list]; 1965: 169, pl. 84, fig. 2; 1976: 537, pl. 188, fig. 1 [Japan]. — Estampador 1937: 533 [in list]; 1959: 90 [in list] [Philippine Is]. — Kamita 1941a: 241 [in list] [Korea]; 1963: 23 [in list] [Japan]. — Serène 1964: 190 [in key]; 1968: 89 [in list]. — Takeda & Miyake 1968: 566, fig. 8c-e; 1969a: 460 [Japan]. — Guinot 1969b: 522 [discussion]; 1971: 1081 [in list]. — Serène & Umali 1972: 78 [in key]. — Kim 1970: 17 [in list]; 1973: 412, 637, pl. 85, fig. 126; 1977: 206 [in list] [Korea]. — Takeda 1978: 77 [in list] [Japan]. — Serène & Vadon 1981: 119, 120, 123, 126 [Philippine Is]. — Dai *et al.* 1986: 377 [in key], 377, fig. 198, pl. 55, fig. 1 [East China Sea]. — Dai & Yang 1991: 406 [in key], 406, fig. 198, pl. 55, fig. 1 [East China Sea]. — Miyake 1991: 149, 220 [in list], pl. 50, fig. 3 [Japan]. — Chen 1998: 282, 310 [in list], fig. 11. — Muraoka 1998: 47 [in list] [Japan]. — Karasawa & Kato 2003b: 130 [in list]. — Komatsu & Takeda 2003: 1243 [in list]. — Ho

*et al.* 2004: 659, fig. 6D. — Takeda *et al.* 2006: 205 [in list] [Japan].

*Goneplax [sic] renoculis* – Yokoya 1933: 196.

TYPE MATERIAL. — *Albatross*, stn 5278, ovigerous ♀ holotype, cl 8.1 mm, cw 12.3 mm (USNM 46307).

TYPE LOCALITY. — Philippine Islands, southern Luzon, Malavatuán Island, 14°00.00'N, 120°17.25'E, 146-187 m.

MATERIAL EXAMINED. — **Taiwan.** TAIWAN 2000, stn CP 11, 22°18.6'N, 119°14.8'E, 262 m, 28.VII.2000, 1 ♀ (MMBA), 1 ♂ (MNHN-B 29681).

**Philippine Islands.** South China Sea, *Albatross*, stn 5278, 14°00.00'N, 120°17.25'E, 146-187 m, 17.VII.1908, ovig. ♀ holotype (USNM 46307).

MUSORSTOM 1, stn CP 9, 14°02'N, 120°18'E, 180-194 m, 19.III.1976, 1 ♂ (MNHN-B 10298). — Stn CP 10, 14°00'N, 120°18'E, 187-205 m, 19.III.1976, 2 ♂♂, 1 ♀ (MNHN-B 10305). — Stn DR 15, 14°00'N, 120°18'E, 188-192 m, 21.III.1976, 1 ♂, 1 ♀, 2 pre-adults (MNHN-B 10330). — Stn CP 18, 13°56'N, 120°16'E, 150-159 m, 20.III.1976, 7 ♂♂, 5 ♀♀, 1 pre-adult ♀ (MNHN-B 10278). — Stn CP 19, 13°58'N, 120°18'E, 167-187 m, 21.III.1976, 1 ♀ (MNHN-B 10337). — Stn CP 20, 13°59'N, 120°20'E, 208-222 m, 21.III.1976,

- 7 ♂♂, 1 pre-adult ♀, 8 ♀♀, 4 ovig. ♀♀ (MNHN-B 10293). — Stn CP 24, 14°00'N, 120°18'E, 189-209 m, 22.III.1976, 4 ♂♂, 4 ♀♀ (MNHN-B 10324). — Stn CP 25, 14°03'N, 120°20'E, 191-200 m, 22.III.1976, 4 ♂♂, 3 ♂♂ parasitised by bopyrid, 4 ♀♀, 5 pre-adult ♀♀ (MNHN-B 10285). — Stn CP 26, 14°00.9'N, 120°16.8'E, 189 m, 22.III.1976, 2 ♂♂, 1 ♀ (MNHN-B 10288). — Stn CP 27, 14°00'N, 120°19'E, 188-192 m, 22.III.1976, 4 ♀♀ (MNHN-B 10299). — Stn CP 30, 14°01.3'N, 120°18.7'E, 186-177 m, 22.III.1976, 8 ♂♂, 8 ♀♀, 4 ovig. ♀♀ (MNHN-B 10315). — Stn CP 31, 14°00'N, 120°16'E, 187-195 m, 22.III.1976, 3 ♀♀, 1 pre-adult ♀, 1 pre-adult (MNHN-B 10297). — Stn CP 34, 14°01'N, 120°16'E, 188-191 m, 22.III.1976, 1 ♂, 1 ♀ (MNHN-B 10287). — Stn CP 36, 14°01'N, 120°20'E, 187-210 m, 23.III.1976, 1 ♂, 1 pre-adult ♀ (MNHN-B 10331). — Stn CP 51, 13°49'N, 120°04'E, 170-200 m, 25.III.1976, 1 ♂ (MNHN-B 10336). — Stn CP 55, 13°55.0'N, 120°12.5'E, 200-294 m, 26.III.1976, 4 ♂♂, 1 ♀ (MNHN-B 10292). — Stn CP 56, 13°53'N, 120°09'E, 129-134 m, 26.III.1976, 1 ♀ (MNHN-B 10304). — Stn CP 61, 14°02'N, 120°18'E, 184-202 m, 27.III.1976, 1 ♂, 1 ♀ (MNHN-B 10333). — Stn CP 63, 14°01'N, 120°16'E, 191-195 m, 27.III.1976, 1 ♀ (MNHN-B 10335). — Stn CP 71, 14°09'N, 120°26'E, 174-204 m, 28.III.1976, 2 ♀♀ (MNHN-B 10314).
- MUSORSTOM 2, stn CP 1, 14°00'N, 120°19'E, 188-198 m, 20.XI.1980, 1 ♂, 1 ovig. ♀ (MNHN-B 10329). — Stn CP 2, 14°01.0'N, 120°17.1'E, 174-172 m, 20.XI.1980, 2 ♂♂, 4 ovig. ♀♀ (MNHN-B 10303). — Stn CP 4, 14°01'N, 120°18'E, 183-190 m, 20.XI.1980, 3 ♂♂ (MNHN-B 10283). — Stn CP 10, 14°00'N, 120°18'E, 188-191 m, 22.XI.1980, 2 ♂♂, 1 ♀ (MNHN-B 10281). — Stn CP 11, 14°00'N, 120°20'E, 194-196 m, 22.XI.1980, 5 ♂♂, 3 ♀♀ (MNHN-B 10318). — Stn CP 13, 14°00.5'N, 120°20.7'E, 188-181 m, 22.XI.1980, 4 ♂♂, 2 ♀♀, 1 ovig. ♀ (MNHN-B 10319). — Stn CP 19, 14°00'N, 120°16'E, 189-192 m, 22.XI.1980, 1 ♂, 1 pre-adult (MNHN-B 10296). — Stn CP 21, 14°00.2'N, 120°17.8'E, 191-192 m, 22.XI.1980, 6 ♂♂, 2 ♀♀, 2 ovig. ♀♀ (MNHN-B 10307). — Stn DR 34, 13°28'N, 121°12'E, 155-167 m, 24.XI.1980, 1 ♂, 2 ♀♀ (MNHN-B 10289). — Stn CP 35, 13°28'N, 121°12'E, 160-198 m, 24.XI.1980, 5 ♂♂, 1 ♀ (MNHN-B 10294). — Stn CP 51, 14°00'N, 120°17'E, 170-187 m, 27.XI.1980, 3 ♂♂, 1 ovig. ♀ (MNHN-B 16941). — Stn CP 62, 14°00'N, 120°17'E, 186-189 m, 29.XI.1980, 2 ♀♀ (MNHN-B 10323). — Stn CP 64, 14°01.5'N, 120°18.9'E, 181-177 m, 29.XI.1980, 7 ♂♂, 7 ♀♀, 1 ovig. ♀ (MNHN-B 10284). — Stn CP 67, 14°00'N, 120°18'E, 193-199 m, 29.XI.1980, 5 ♂♂, 6 ♀♀, 5 ovig. ♀♀ (MNHN-B 10301). — Stn CP 68, 14°01.9'N, 120°18.8'E, 185-195 m, 29.XI.1980, 7 ♂♂, 4 ♀♀, 9 ovig. ♀♀ (MNHN-B 10321). — Stn CP 72, 14°00.7'N, 120°19.4'E, 183-168 m, 30.XI.1980, 4 ♂♂ (MNHN-B 10280). — Stn CP 71, 14°00'N, 120°18'E, 189-197 m, 30.XI.1980, 1 ♀ (MNHN-B 10327).
- MUSORSTOM 3, stn CP 88, 14°01'N, 120°17'E, 183-187 m, 31.V.1985, 1 ♀ (MNHN-B 16601). — Stn CP 90, 14°03'N, 120°12'E, 224 m, 31.V.1985, 4 ♂♂, 1 ♀ (MNHN-B 10311). — Stn CP 92, 14°00'N, 120°19'E, 195 m, 31.V.1985, 4 ♂♂, 1 ♀ (MNHN-B 16600). — Stn CP 96, 14°00'N, 120°18'E, 190-194 m, 1.VI.1985, 4 ♂♂ (MNHN-B 10328). — Stn CP 97, 14°00'N, 120°18'E, 189-194 m, 1.VI.1985, 2 ♂♂, 1 ♀ with stalked cirriped, 2 ovig. ♀♀ (MNHN-B 16592), 2 ♂♂ (MNHN-B 17841). — Stn CP 98, 14°00'N, 120°18'E, 194-205 m, 1.VI.1985, 4 ♂♂, 1 ♀, 1 ovig. ♀ (MNHN-B 10291). — Stn CP 99, 14°01'N, 120°19'E, 196-204 m, 1.VI.1985, 13 ♂♂, 6 ♀♀, 5 ovig. ♀♀ (MNHN-B 10277). — Stn CP 100, 14°00'N, 120°18'E, 189-199 m, 1.VI.1985, 3 ♂♂, 3 ♀♀, 4 ovig. ♀♀ (MNHN-B 10282). — Stn CP 101, 14°00'N, 120°19'E, 194-196 m, 1.VI.1985, 7 ♂♂, 1 ♂ with stalked cirriped, 1 ♂ parasitised by bopyrid, 13 ♀♀, 6 ovig. ♀♀ (MNHN-B 10279). — Stn DR 102, 14°01'N, 120°18'E, 192 m, 1.VI.1985, 2 ♂♂, 1 ♀ (MNHN-B 16599). — Stn CP 103, 14°00'N, 120°18'E, 193-200 m, 1.VI.1985, 1 ♀, 2 ovig. ♀ (MNHN-B 10316). — Stn CP 108, 14°01'N, 120°18'E, 188-195 m, 2.VI.1985, 1 ♂, 1 ovig. ♀ (MNHN-B 10334). — Stn CP 112, 14°01'N, 120°18'E, 187-199 m, 2.VI.1985, 1 ♂, 1 ovig. ♀ (MNHN-B 10325).
- Bohol, Balicasag I., off Panglao I., tangle nets of local fishermen, 50-500 m, 28.XI.2001, 1 ♂ (MNHN, ex ZRC 2004.0726); XI.2003, 1 ♀, 1 ovig. ♀ (ZRC 2004.0780); I.2004, 2 ♂♂ (ZRC 2004.0781). — Maribohoc Bay, tangle nets of local fishermen, 100-300 m, T. J. Arbusto coll., XI.2003-IV.2004, 32 ♂♂, 1 ♀, 1 ovig. ♀ (ZRC 2004.0782).
- PANGLAO 2004, stn T15, Bohol I., Cortes, 09°41.2'N, 123°49.0'E, 180 m, muddy bottom, 18.VI.2004, 1 ♂ (ZRC 2006.0182). — Stn P2, 09°39.00'N, 123°43.80'E, 400 m, tangle nets of local fishermen, 20.VI.2004, 1 ♂ (MNHN-B 29736). — Stn L42, Balicasag I., 09°31.222'N, 123°40.74'E, 80-90 m, 2.VII.2004, 1 ♂, 1 ♀ (ZRC 2004.0783).
- PANGLAO 2005, stn CP 2331, Maribohoc Bay, 09°39.2'N, 123°47.5'E, 255-268 m, 22.V.2005, 13 ♂♂, 2 ♀♀, 1 ovig. ♀, 1 pre-adult (ZRC 2006.0195). — Stn CP 2348, off Pamilian I., 09°31.6'N, 123°55.7'E, 219-240 m, 24.V.2005, 1 ♂ (ZRC 2006.0193). — Stn CP 2349, off Maribohoc Bay, 09°31.6'N, 123°55.7'E, 219-240 m, 24.V.2005, 1 ♂, 1 ♀ (ZRC 2006.0189). — Stn CP 2395, Maribohoc Bay, 09°36.2'N, 123°43.8'E, 382-434 m, 31.V.2005, 1 ♀, 1 ovig. ♀ (ZRC 2006.0201). — Stn CP 2406, Maribohoc Bay, 09°40.6'N, 123°46.8'E, 334-387 m, 1.VI.2005, 1 ♂ (ZRC 2006.0203). — Stn CP 2407, Maribohoc Bay, 09°41.3'N, 123°48.5'E, 256-268 m, 1.VI.2005, 9 ♂♂, 2 ♀♀, 4 ovig. ♀♀ (ZRC 2006.0209). — Stn CP 2409, Maribohoc Bay, 09°44.8'N, 123°44.8'E, 220-257 m, 1.VI.2005, 1 ♂ (ZRC 2006.0192).

**Indonesia.** Makassar Strait, CORINDON 1, stn CP 271, 1°57.8'S, 119°15.0'E, 215 m, 7.XI.1980, 2 ♀♀ (MNHN-B 10276).

Tanimbar Is, KARUBAR, stn CP 65, 09°14'S, 132°27'E, 176-174 m, 1.XI.1991, 1 ♂ (MNHN-B 29365).

Kai Is, KARUBAR, stn DW 29, 05°36'S, 132°56'E, 181-184 m, 26.X.1991, 1 pre-adult ♂ (MNHN-B 29213).

**Solomon Islands.** SALOMON 1, stn CP 1845, 10°24.2'S, 161°49.4'E, 273-298 m, 6.X.2001, 1 ♀ (MNHN-B 29204). — Stn DW 1850, 10°28.1'S, 161°59.0'E, 139-261 m, 6.X.2001, 1 ovig. ♀ (MNHN-B 29205).

SALOMON 2, stn CP 2287, 08°40.8'S, 157°24.6'E, 253-255 m, 6.XI.2004, 1 ♂ (MNHN-B 30088).

**Vanuatu.** MUSORSTOM 8, stn DW 1061, 16°14.54'S, 167°20.12'E, 458-512 m, 2.X.1994, 1 ♀ (MNHN-B 29292).

BOA 1, stn CP 2416, 15°04.6'S, 166°53.5'E, 400-350 m, 6.IX.2005, 5 ♂♂ (MNHN-B 30128). — Stn CP 2428, 15°03.6'S, 166°52.2'E, 323-397 m, 8.IX.2005, 3 ♂♂ (MNHN-B 30125). — Stn CP 2448, 15°06.6'S, 166°50.8'E, 297-387 m, 10.IX.2005, 1 ♀ (MNHN-B 30118).

**New Caledonia.** BATHUS 1, stn DW 642, 21°51.7'S, 166°49.5'E, 302-305 m, 10.III.1993, 1 ♀ (MNHN-B 29293). — Stn DW 652, 21°17.4'S, 165°57.1'E, 110-190 m, 12.III.1993, 1 ♂ (MNHN-B 29294).

?BATHUS 3, stn DW 839, 23°01'S, 168°58'E, 400-402 m, 30.XI.1993, 1 pre-adult ♂ (MNHN-B 29252).

?BATHUS 4, stn DW 901, 19°02.72'S, 163°15.39'E, 297 m, 4.VIII.1994, 1 pre-adult ♂ (MNHN-B 30060).

?**French Polynesia.** Austral Is, BENTHAUS 2002, stn DW 1979, 23°21.7'S, 150°43.9'E, 176-340 m, 21.XI.2002, 1 ♂ (MNHN-B 29780).

**DISTRIBUTION.** — Western Pacific Ocean from Korea and Japan (see Sakai 1976) to the Philippine Is (Rathbun 1914; Serène & Vadon 1981) and now from Indonesia (Makassar Strait, Tanimbar and Kai islands), Solomon Islands, Vanuatu, New Caledonia, and questionably from French Polynesia. Depth: 80-512 m. Specimens were also obtained from tangle nets of local fishermen in the Philippines that obtained material estimated to be at least 50 m.

#### COLOUR

A photograph of freshly collected female specimen from the Solomon Is (MNHN-B 29204) showed red orange to red reticulations and dots on the carapace and red dots on the chelipeds, similar to those illustrated by Sakai (1976: pl. 188, fig. 1) and Miyake (1991: pl. 50, fig. 3) from Japan, and Ho *et al.* (2004: fig. 6D) from Taiwan. Colour photographs of freshly collected specimens from

the Philippine Is (PANGLAO 2005) confirm this colour pattern.

#### REMARKS

The abundant material from Taiwan to New Caledonia that was examined agrees well with the female holotype of *Goneplax renoculis*. Diagnostic characters of the species is an acute, anteriorly curved, anterolateral tooth that is in a straight line below the base of the similarly acute and anteriorly curved but longer outer orbital tooth (Fig. 28B). The anterolateral tooth emerges after a short, straight portion of the anterolateral border of the carapace. Also diagnostic is a small tooth on the dorsal, distal end of the merus of each ambulatory leg (P2-P5) (Fig. 28B). The propodi of the P5 may have some sparse setae but are not fringed by them. The carapace front is deflexed, and the eye peduncle is 1.2-1.3 of the front width. The eyes are strongly reniform. Large males have two slightly raised horizontal ridges across the width of the carapace.

The G1 is stout, short, and with a truncate tip (Chen 1998: fig. 11-4, as *Goneplax renoculis*). The G2 is slightly shorter than the G1, with the flagellum shorter than the basal part, and a pointed tip. The vulva of mature females extends from the margin of suture 5/6 to the margin of suture 6/7. It is covered by a large, salient, globular vulvar cover that leaves a large, semi-circular anterolateral opening. Suture 6/7 ends at the vulva, leaving a large, flat area between suture 5/6 and complete suture 6/7 that connects directly with the anterior portion of the thoracic sternum.

No specimens from Japan could be examined during this study. The anterolateral teeth of Japanese specimens illustrated by Sakai (1935: pl. 54, fig. 4; 1939: pl. 67, fig. 4; 1965: pl. 84, fig. 2; 1976: pl. 188, fig. 1, as *G. renoculis*) are close to each other very much as in *Goneplacoides marivenae* n. comb. (Fig. 28A), which is found in Japan, instead of being separated by a straight margin as in *N. renoculis* n. comb. (Fig. 28B). The meri of the ambulatory legs (P2-P5) of Sakai's specimens, however, were each armed with a distal tooth unlike the smooth meri of *G. marivenae* n. comb. (Fig. 28A). The colour of Sakai's illustration (Sakai 1976: pl. 188, fig. 1, as *Goneplax renoculis*) does

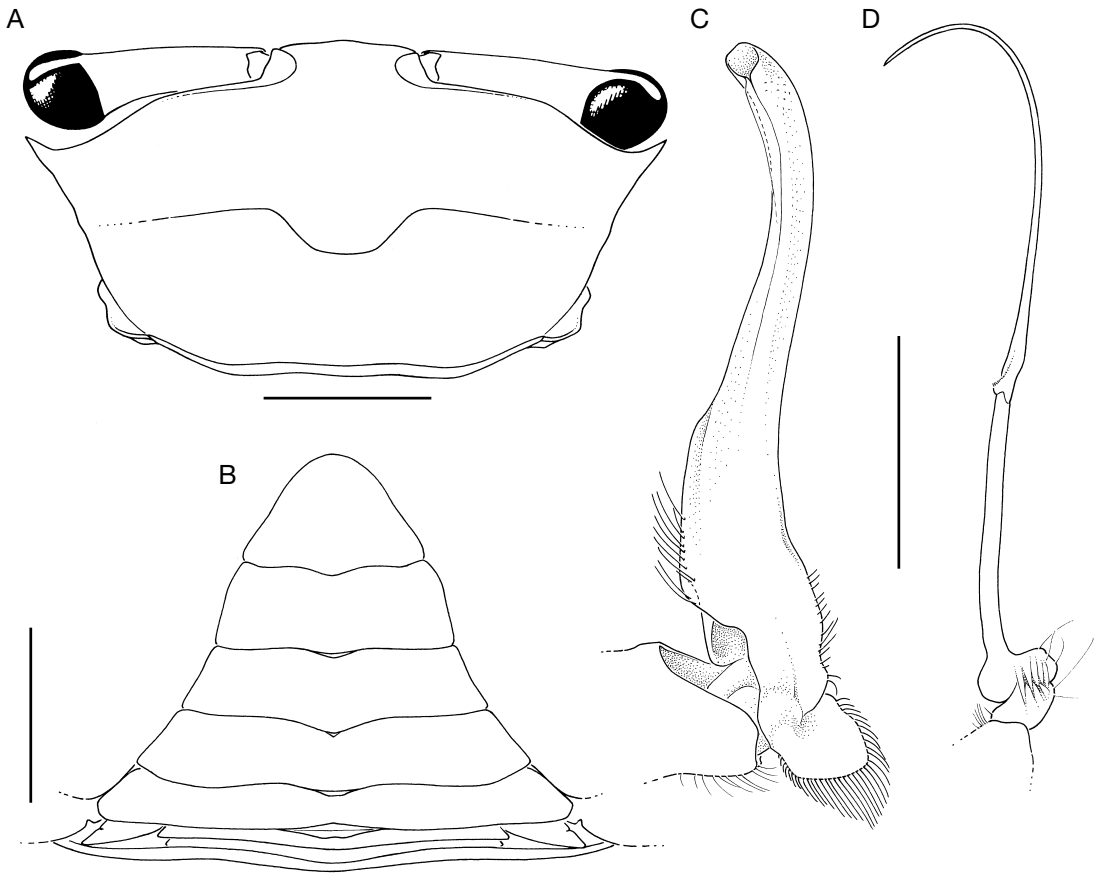


FIG. 30. — *Neogoneplax costata* n. sp.: **A, B**, ♂ holotype, cl 10.4 mm, 19.1 mm, Balicasag I., off Panglao I., Philippine Is (ZRC 2004.0723); **A**, dorsal surface of the carapace; **B**, abdomen; **C, D**, ♂ paratype, cl 12.8 mm, cw 24.5 mm (ZRC 2004.0721); **C**, left G1, dorsal view; **D**, left G2, ventral view. Scale bars: A, 5 mm; B, 3 mm; C, D, 1 mm.

agree with the photograph of a freshly collected specimen from the Solomon Is (see below). The G1 of a small specimen (cl 5.2 mm, cw 7.3 mm; maximum size of males: cl 11.3 mm, cw 17.2 mm; maximum size of females: cl 10.1 mm, cw 16.0 mm) illustrated by Takeda & Miyake (1968: fig. 8c, d, as *G. renoculis*) had a spade-like tip different from almost all specimens examined during this study and that illustrated by Chen (1998). The only exception was the G1 of a pre-adult male from the Kai Is, Indonesia (cl 4.0 mm, cw 5.0 mm, MNHN-B 29213), which was similar to that illustrated by Takeda & Miyake (1968).

An incomplete specimen from the Austral Is, French Polynesia (male, cl 9.8, cw 16.7 mm;

MNHN-B 29780), the only one from French Polynesia examined, had a carapace, eye peduncles, and P2-P4 (P5 missing) similar to those of *N. renoculis* n. comb. The only cheliped remaining, however, had an unusually high pollex, and the G1 had a conspicuously pointed tip. It may represent a new species.

*Neogoneplax costata* n. sp.  
(Figs 30-32)

TYPE MATERIAL. — Tangle nets of local fishermen, ♂ holotype, cl 10.4 mm, 19.1 mm (ZRC 2004.0723). Paratypes: three other male and female specimens from the Philippine Is as listed under Material examined.



FIG. 31. — *Neogoneplax costata* n. sp., ♂ holotype, cl 10.4 mm, 19.1 mm, Balicasag I., off Panglao I., Philippine Is (ZRC 2004.0723).

TYPE LOCALITY. — Philippine Islands, Bohol, Balicasag I., off Panglao I., unrecorded depth.

MATERIAL EXAMINED. — **Philippine Islands.** Bohol, Balicasag I., off Panglao I., tangle nets of local fishermen, 200-300 m, VI.2002, 1 ♂ paratype, cl 9.4 mm, cw 17.9 mm (ex ZRC 2004.0722; MNHN-B 30064). — 25-30.VII.2003, 1 ♂ holotype, cl 10.4 mm, 19.1 mm (ZRC 2004.0723). — 50-500 m, III.2004, 2 ♂ paratypes, cl 9.8 mm, cw 18.2 mm, cl 12.8 mm, cw 24.5 mm (ZRC 2004.0721). — 29.V.2004, 1 ovig. ♀ paratype, cl 11.9 mm, cw 22.8 mm (ZRC 2004.0784).

?**New Caledonia.** LAGON, stn 500, 19°04'S, 163°60'E, 225 m, 1 ♂ (MNHN-B 29777).

ETYMOLOGY. — From *costa*, Latin for “rib” or “ridge”, in reference to the two slight diagnostic ridges across the dorsal surface of the carapace.

DISTRIBUTION. — Known from the Philippine Is and questionably from New Caledonia. Depth: 225 m and from estimated depths of 50-500 m from tangle nets of local fishermen.

#### DESCRIPTION

Carapace (Figs 30A; 31) transversely rectangular, wider than long, anterolateral borders oblique from outer orbital tooth to posterior border. Carapace slightly convex, without clear indication of regions; ridge across anterior third portion; second, less conspicuous ridge on posterior third portion. Front sinuous, slightly deflected ventrally, marked by 2 slight emarginations, small median projection between emarginations. Notch between front, inner edge of supraorbital border absent. Supraorbital borders conspicuously bilobed; bordered by raised, finely granular edge, wider, sinuous along front; reduced, obtuse inner tooth. Suborbital borders granular, each with short, blunt inner tooth not visible dorsally. Long, slender, acute-tipped tooth on outer orbital angle; reduced anterolateral teeth appearing as slight prominence (obsolete in holotype) below outer orbital angle corresponding with outer margin of anterior ridge of carapace. Posterolateral borders oblique, nearly straight.





FIG. 32. — *Neogoneplax costata* n. sp., 1 ovig. ♀ paratype, cl 11.9 mm, cw 22.8 mm, Balicasag I., off Panglao I., Philippine Is, 200-300 m (ZRC), thoracic sternum, vulva, and vulvar cover.

Eye peduncles (Figs 30A; 31) long (1.1 front width), cornea reniform.

Chelipeds (P1) (Fig. 31) slightly unequal in males, nearly equal in female paratype; fingers shovel-like, curved, slightly shorter than propodus, much shorter in heavier P1 of males, with blunt teeth, heavier P1 of males with fewer teeth on dactylus, large cutting edge on fixed finger; no dark colour on fingers. Broad, acute-tipped tooth on inner (ventral), proximal margin of carpus; row of conspicuous, simple setae along inner (ventral) margin of dactylus, propodus, merus; outer margin of merus with 12-24 small, triangular teeth in small male (reduced to large, blunt tubercles in larger holotype and paratypes). Ambulatory legs (P2-P5) (Fig. 31) stout, without teeth; varying number of setae on dorsal margins of carpus, propodi (P5 of female paratype with row of dense setae on dorsal margin of propodus, distal margin of carpus; proximal, ventral margin

of dactylus); dactyli long, slender, each with carina along each side; length of P5 merus 0.7 cl.

Male abdomen (Fig. 30B) wide, short, triangular; telson much wider than long. Somite 3 covers space between P5 coxae, carinated; somite 2 narrower than somite 3, leaving large portion of thoracic sternite 8 visible. G1 (Fig. 30C) slender, sinuous, distal part curved, inwardly oriented; obtuse tip. G2 (Fig. 30D) slender, slightly longer than G1, curved flagellum longer than proximal part (peduncle), pointed tip.

Female abdomen wide, outer margin of thoracic sternites not visible. Telson much wider than long. Somite 3 covers space between P5 coxae, somites 1, 2 narrower than somite 3, leaving small portion of thoracic sternite 8 visible. Vulva (Fig. 32) of mature paratype narrow, elongated, extending along edge of suture 5/6 to median portion of thoracic sternite 6; median, triangular vulvar cover.

## COLOUR

Photographs of freshly preserved material from the Philippine Is showed small red spots on the carapace and legs.

## REMARKS

The new species is closest to *N. serratipes* n. sp. (see below). Both species can be easily differentiated by the absence or reduction of the anterolateral tooth in *N. costata* n. sp. (Figs 30A; 31) while there is a conspicuous, acute tooth in *N. serratipes* n. sp. (Figs 33A; 34); smooth meri of ambulatory legs (Fig. 31) in contrast to many teeth in *N. serratipes* n. sp. (Figs 33B; 34); the presence of a small, acute tooth on the outer (dorsal), distal margin of each of the chelipeds (Fig. 31) in contrast to a larger, blunt tooth in *N. serratipes* n. sp. (Fig. 34); the telson of the male abdomen is much shorter in *N. serratipes* n. sp. (Fig. 33C) than in *N. costata* n. sp. (Fig. 30B), smooth G1 (Fig. 30C) in contrast to a stout G1 with a bilobed tip with distinct denticles and setae in *N. serratipes* n. sp. (Fig. 33D).

A damaged, incomplete specimen from New Caledonia (♂, cw 14.8 mm; MNHN-B 29777) also appears to belong to the new species. It was the only specimen from outside the Philippine Is examined.

*Neogoneplax serratipes* n. sp.  
(Figs 33; 34)

TYPE MATERIAL. — HALIPRO 1, stn CP 851, ♂ holotype, cl 8.3 mm, cw 11.9 mm (MNHN-B 29836); ♀ allotype, cl 8.0 mm, cw 11.4 mm (MNHN-B 29837). — MUSORSTOM 10, stn CP 1320, ♂ paratype, cl 7.6 mm, cw 9.7 mm (MNHN-B 29259). — BATHUS 2, stn DW 742, ♂ paratype, cl 7.1 mm, cw 9.7 mm (MNHN-B 29286). — BATHUS 1, stn CP 713 ♀ paratype, cl 7.0 mm, cw 10.1 mm (MNHN-B 29344).

TYPE LOCALITY. — New Caledonia, off east coast, 21°45'S, 168°37'E, 241-250 m.

MATERIAL EXAMINED. — **Solomon Islands.** SALOMON 2, stn DW 2271, 08°32.4'S, 157°44.2'E, 290-440 m, XI.2004, 1 pre-adult ♂, 1 pre-adult ♀ (MNHN-B 30108).

**Vanuatu.** MUSORSTOM 8, stn CP 1136, 15°40.62'S, 167°01.60'E, 398-400 m, 11.X.1994, 1 ♂ (MNHN-B 29282)

**New Caledonia.** BIOCAL, stn CP 108, 22°03'S, 167°06'E, 335 m, 9.IX.1985, 2 ♂♂, 1 ♀ (MNHN-B 29218). BATHUS 1, stn DW 641, 21°52.18'S, 166°49.06'E, 240-258 m, 10.III.1993, 2 ♂♂ (MNHN-B 29552). — Stn DW 643, 21°50.1'S, 166°47.8'E, 383 m, 10.III.1993, 1 ♂, 1 ♀ (MNHN-B 29283). — Stn CP 645, 21°51.9'S, 166°48.6'E, 250-258 m, 10.III.1993, 2 ♂♂ (MNHN-B 29284). — Stn CP 650, 21°47.52'S, 166°40.53'E, 246-269 m, 11.III.1993, 2 ♂♂, 2 ♀♀ (MNHN-B 29345). — Stn CP 654, 121°17.11'S, 165°56.77'E, 237-298 m, 12.III.1993, 2 ♂♂ (MNHN-B 29354). — Stn DW 687, 20°34.62'S, 165°07.30'E, 408-440 m, 16.III.1993, 1 ♀ (MNHN-B 29350). — Stn CP 708, 21°43.05'S, 166°38.57'E, 550-580 m, 19.III.1993, 1 pre-adult ♂ (MNHN-B 29285). — Stn CP 700, 20°57.22'S, 165°34.60'E, 162-222 m, 18.III.1993, 1 pre-adult ♂ (MNHN-B 29353). — Stn CP 713, 21°45.28'S, 166°36.83'E, 250 m, 19.III.1993, 1 ♀ paratype (MNHN-B 29344). BATHUS 2, stn DW 742, 22°33.4'S, 166°25.9'E, 340-470 m, 14.V.1993, 5 ♂♂ (MNHN-B 29326). — Stn DW 758, 22°18.4'S, 166°10.5'E, 377-386 m, 16.V.1993, 1 ♂ paratype (MNHN-B 29286). HALIPRO 1, stn CP 851, 21°45'S, 168°37'E, 241-250 m, 19.III.1994, 1 ♂ (MNHN-B 29196); 6 ♂♂, 3 ♀♀, 1 ♀ parasitised by *Sacculina* (MNHN-B 29195), 1 ♂ holotype (MNHN-B 29836), 1 ♀ allotype (MNHN-B 29837). — Stn CP 852, 21°44'S, 168°36'E, 253-266 m, 19.III.1994, 9 pre-adult ♂♂, 5 ♀♀ (MNHN-B 29197); 1 ♂ (MNHN-B 29249). — Stn CP 853, 21°45'S, 168°37'E, 241-250 m, 19.III.1994, 6 ♂♂, 4 ♀♀ (MNHN-B 29194); 1 ♂ (MNHN-B 29191). BATHUS 4, stn CP 883, 22°03.43'S, 165°56.03'E, 450-600 m, 1.VIII.1994, 1 ♂ (MNHN-B 29413). — Stn CP 885, 22°05.03'S, 165°58.28'E, 250-300 m, 1.VIII.1994, 2 ♂♂ (MNHN-B 29193). — Stn CP 887, 21°06.67'S, 164°27.62'E, 320-344 m, 2.VIII.1994, 1 ♀ (MNHN-B 29348). — Stn DW 896, 20°15.92'S, 163°51.70'E, 315-350 m, 3.VIII.1994, 1 ♂, 1 ovig. ♀ (MNHN-B 29250). — Stn CP 899, 20°16.68'S, 163°50.26'E, 500-600 m, 3.VIII.1994, 1 ♀ (MNHN-B 29192). — Stn CP 906, 19°1.07'S, 163°14.51'E, 339-350 m, 4.VIII.1994, 1 ♀ (MNHN-B 29248). **Fiji.** MUSORSTOM 10, stn CP 1320, 17°16.8'S, 177°53.6'E, 290-300 m, 6.VIII.1998, 5 ♂♂, 2 ♀♀, 1 ovig. ♀, 1 ♀ parasitised by *Sacculina* (MNHN-B 29287); 1 ♂ paratype (MNHN-B 29259). — Stn CP 1325, 17°16.1'S, 177°49.8'E, 283-322 m, 7.VIII.1998, 1 ♂, 1 ♀ (MNHN-B 29358). — Stn CP 1348, 17°30.3'S, 178°39.6'E, 353-390 m, 11.VIII.1998, 1 ♂ (MNHN-B 29288). — Stn CP 1349, 17°31.1'S, 178°38.8'E, 244-252 m, 11.VIII.1998, 1 ♂ (MNHN-B 29356). — Stn CP 1351, 17°31.1'S, 178°40.0'E, 292-311 m, 11.VIII.1998, 1 ♂ (MNHN-B 29289). **Tonga.** BORDAU 2, stn SH 1596, 19°06'S, 174°18'W, 371-437 m, 14.VI.2000, 1 ♀ (MNHN-B 29556).

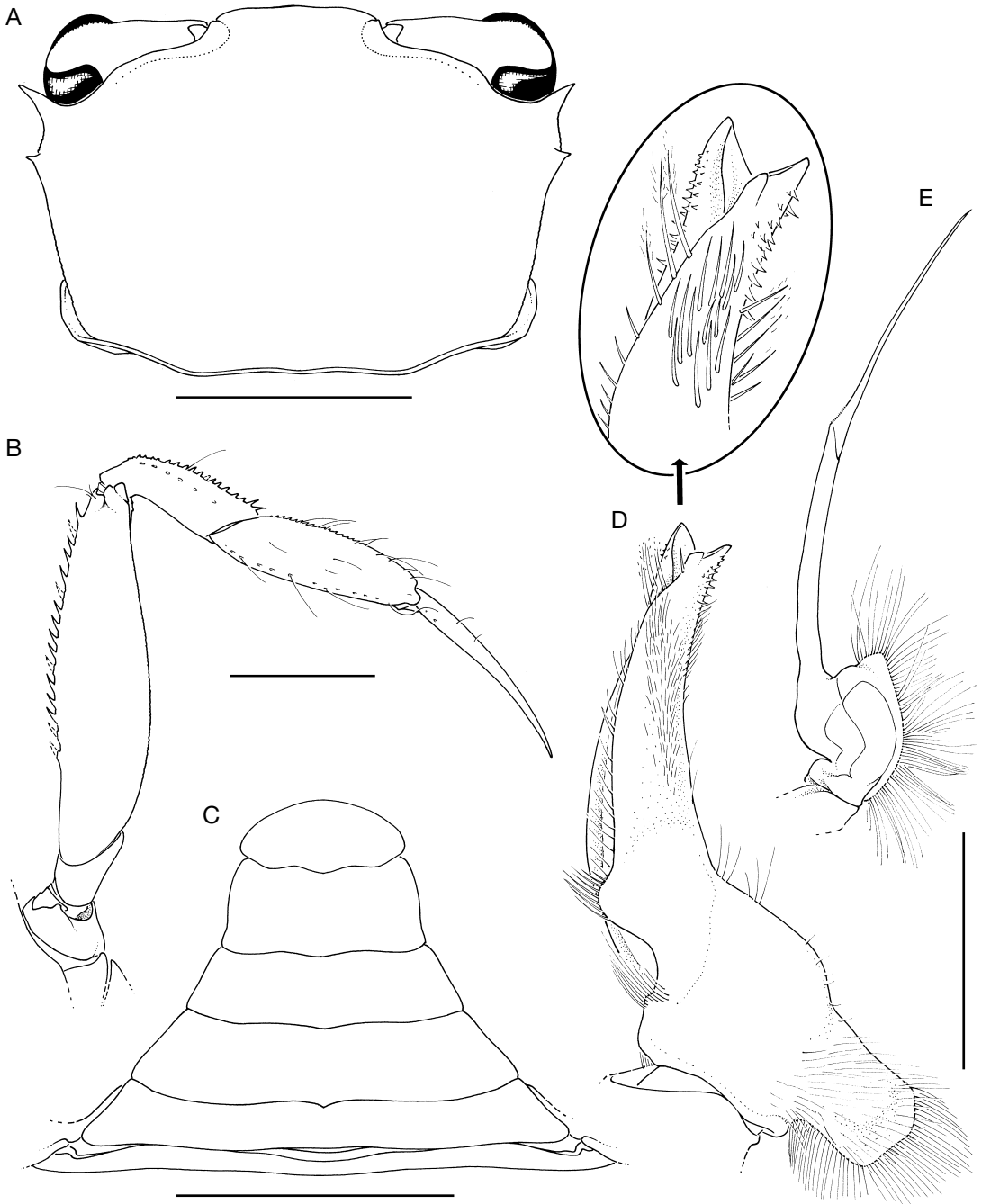


FIG. 33. — *Neogoneplax serratipes* n. sp., ♂ holotype, cl 8.3 mm, cw 11.9 mm, off eastern coast of New Caledonia, HALIPRO 1, strn CP 851, 241-250 m (MNHN-B 29836): **A**, dorsal surface of the carapace; **B**, right P5; **C**, abdomen; **D**, left G1, dorsal view; **E**, left G2, ventral view. Scale bars: A, 5 mm; B, C, 3 mm; D, E, 1 mm.

ETYMOLOGY. — From *serra*, Latin for “saw”, and *pes*, Latin for “feet”, in reference to the diagnostic row of teeth along the dorsal margin of the meri and carpi of the ambulatory legs (P2-P5) and the carpi of the chelipeds (P1).

DISTRIBUTION. — Southwestern Pacific Ocean: Solomon Is, Vanuatu, New Caledonia, Fiji, and Tonga. Depth: 162-600 m.

#### DESCRIPTION

Carapace (Figs 33A; 34) transversely rectangular, wider than long (1.4 as wide as long in holotype), anterolateral borders straight. Carapace slightly convex, without clear indication of regions. Front sinuous, marked by 2 slight median emarginations, small median projection between emarginations. Notch between front, inner edge of supraorbital border absent. Supraorbital borders conspicuously bilobed; bordered by raised, finely granular edge, wider, sinuous along front, long setae along expanded distal portion. Suborbital borders granular, each with short, obtuse inner tooth not visible dorsally. Slender, acute tooth on outer orbital angle; smaller, short, narrowly triangular, acute-tipped anterolateral tooth on each side of carapace; carapace border between outer orbital, anterolateral teeth conspicuously tuberculated. Posterolateral borders oblique, nearly straight.

Subhepatic, pterygostomial regions, pterygostomial crest, merus, ischium of third maxilliped endopod with short granules.

Eye peduncles (Figs 33A; 34) long (1.1 front width), cornea reniform.

Chelipeds (P1) (Fig. 34) slightly unequal in males, females; fingers slender, shovel-like, curved, particularly in heavier cheliped of males, slightly shorter than propodus, much shorter in heavier cheliped of males, with blunt teeth, heavier cheliped of males with fewer teeth on dactylus, large cutting edge on fixed finger; no dark colour on fingers. Broad, curved, acute-tipped tooth, row of slender teeth (progressively larger distally) on inner (ventral), proximal margin of carpus, smaller tooth on outer (dorsal), distal margin. Ambulatory legs (P2-P5) (Fig. 34) moderately long, slender; varying number of slender teeth (holotype: 1 on right P2, blunt tooth on left P2, 9 on right P3, 8 on left P3, 14 on right P4, 13

on left P4, 11 on right P5, 14 on left P5), varying number of low tubercles on dorsal margin of meri; varying number of short, slender teeth on dorsal margin of carpi; few long, simple setae along inner, outer margins of meri, carpi, propodi; dactyli long, slender, each with 2 carinae along each side; length of P5 merus 0.9 cl.

Male abdomen (Fig. 33C) wide, short, triangular, with 6 freely-movable somites plus telson; telson much wider than long. Somite 3 covers space between P5 coxae, carinated, somite 1 not visible; somite 2 narrower than somite 3, leaving large portion of thoracic sternite 8 visible. G1 (Fig. 33D) short, stout, wide basal part, straight distal part; truncated tip with 2 large, broadly pointed teeth with acute spinules on surfaces. G2 (Fig. 33E) slender, nearly equal or slightly shorter than G1, slightly curved flagellum shorter than proximal part (peduncle), pointed tip.

Female abdomen wide, outer margin of thoracic sternites visible. Telson much wider than long. Somite 3 covers space between P5 coxae, somites 1, 2 narrower than somite 3, leaving large portion of thoracic sternite 8 visible. Vulva of mature females long, extending from edge of suture 5/6 to near edge of suture 6/7, covered by globular vulvar cover, leaving large, semi-circular anterolateral opening.

#### COLOUR

Photographs of two freshly collected specimens from Vanuatu (Santo 2006 expedition; ZRC) show irregular orange lines and spots on the carapace, chelipeds, and walking legs.

#### REMARKS

Differences between *N serratipes* n. sp. and *N. costata* n. sp. are given in the description of the latter species (see above). The many teeth along the dorsal margins of the meri and carpi of the ambulatory legs of the new species and the short, triangular anterolateral teeth (Figs 33B; 34) are in sharp contrast with the single, distal tooth on each of the meri of the ambulatory legs and the well developed, acute anterolateral teeth of *N. renoculis* n. comb. (Fig. 28B).

The number of teeth on the meri and carpi of the ambulatory legs (P2-P5) varies widely among



FIG. 34. — *Neogoneplax serratipes* n. sp., ♂ holotype, cl 8.3 mm, cw 11.9 mm, off eastern coast of New Caledonia, HALIPRO 1, strn CP 851, 241-250 m (MNHN-B 29836).

specimens, even on the opposite sides of the same pair of legs of the same specimen. The number of teeth is lowest on the P2, the highest on the P5. Smaller, regenerated legs may have fewer teeth, and small individuals have a smaller number of teeth. Low tubercles are usually present in addition to the teeth.

A male, apparently pre-adult, from the Solomon Is (cl 7.4 mm, cw 9.8 mm; MNHN-B 30108) had a slender G1 with a truncated tip that only showed a slight bifurcation.

#### Genus *Paragoneplax* n. gen.

*Goneplax* – Komatsu & Takeda 2003: 1243 (part).

TYPE SPECIES. — *Goneplax serenei* Zarenkov, 1972 (by present designation and by monotypy; gender feminine).

SPECIES INCLUDED. — *Paragoneplax serenei* (Zarenkov, 1972) n. comb.

The genus is restricted to the Indo-West Pacific region.

ETYMOLOGY. — From *para*, Greek for “beside” or “near”, and the generic name *Goneplax*, to indicate that although

the species included in the new genus superficially resembles *Goneplax* in the general shape of its carapace and its elongated eye peduncles, it actually belongs to a separate genus.

#### DESCRIPTION

Carapace (Fig. 28C) transversely rectangular, much wider than long; widest at conspicuous outer orbital teeth; front deflected ventrally, sinuous, with small median projection in larger individuals. Notch between front, inner edge of supraorbital border absent; orbits wide, greatly expanded distally; supraorbital borders conspicuously sinuous; suborbital borders sinuous, without inner tooth; nearly straight lateral borders. Dorsal surface of carapace with slight horizontal ridge, moderately convex, without clear indication of regions. Outer orbital angle with conspicuous, acute, tooth; no anterolateral teeth. Basal antennal article short, distalmost (third) article nearly reaches front. Eye peduncles (Fig. 28C) long, slightly shorter than front (0.8-0.9 front width); cornea strongly reniform, dorso-ventrally flattened, nearly divided into anterior and posterior portions.

Anterior border of endostome well demarcated from buccal cavern, ridges faint but clearly defined. Third maxillipeds nearly completely close the buccal cavern. No obvious stridulating mechanism other than possible rubbing of proximal portion of cheliped (P1) merus against pterygostomial ridge. Thoracic sternum wide. Median sulcus on thoracic sternite 4 absent; sutures 4/5, 5/6, 7/8 interrupted medially, 6/7 complete. Anterior end of sterno-abdominal cavity anterior to thoracic sternite 4. Cheliped fingers (Fig. 28C) long, slender, shovel-like, curved, pollex higher than dactylus in large individuals, shorter than elongated propodus; dactylus light in colour, without dark portion; carpus with conspicuous tooth on inner margin. Dorsal margins of ambulatory leg (P2-P5) meri (Fig. 28C) with acute distal tooth; dactyli slender, with carina on each side, non-setose. Male abdomen (Zarenkov 1972, fig. 7-2, as *Geneplax [sic] serenei*; Chen 1998: fig. 12-5, as *Goneplax serenei*) with 6 freely-movable somites plus telson, wide, somites 4-6 gradually decreasing in width from somite 3 (widest somite). Telson wide, clearly wider than long. Somite 3 covers space between P5 coxae, somite 2 narrower than somite 3; somites 1, 2 leave large portion of thoracic sternite 8 visible. G1 distally bent in fully grown males but straight in pre-adults (Zarenkov 1972: fig. 7-2, as *Geneplax [sic] serenei*; Chen 1998: fig. 12-6, 12-7, as *G. serenei*). G2 (Chen 1998: fig. 12-8, 12-9, as *G. serenei*) slender, much shorter than G1, flagellum slightly curved, shorter than proximal part (peduncle), pointed tip. Penis arising from P5 coxa, long, soft; broad, soft proximal expansion. Female abdomen with 6 freely-movable somites, wide. Telson much wider than long. Somite 3 covers space between P5 coxae, somite 2 slightly narrower than somite 3; somites 1, 2 leave relatively large portion of thoracic sternite 8 visible. Vulva of mature females not greatly expanded, small, round, extending from 5/6 suture to median portion of thoracic sternite 6, vulvar cover absent, covered by soft membrane leaving anterior margin free.

#### REMARKS

Characteristic of *Paragoneplax* n. gen. is a G2 that is short, much shorter than the G1, in sharp contrast to the G2 of typical goneplacids, where the G2 is

about the same length (or slightly longer or slightly shorter in some species) as the G1. The short size of the G2 is very puzzling. A short G2, considered the most derived character (Guinot 1979: 243), is also present in *Microgoneplax* n. gen. (see description of the new genus below), as well as among most members of the families Euryplacidae Stimpson, 1871, and Pseudoziidae Alcock, 1898, taxa which were once included in the Goneplacidae *sensu* Bals 1957. The hypothesis that both *Paragoneplax* n. gen. and *Microgoneplax* n. gen. should be grouped as a separate subfamily within the Goneplacidae *sensu stricto* is rejected as the species grouped in these two genera differ in some important characters such as the shape of the G1 (distally bent in *Paragoneplax* n. gen. but slender and straight in *Microgoneplax* n. gen.), shape of the male abdomen (unusually broad in *Paragoneplax* n. gen., more slender in *Microgoneplax* n. gen.), and the absence of a vulvar cover in *Paragoneplax* n. gen. (absent in *Microgoneplax* n. gen.). An alternate hypothesis is to consider both taxa as independent subfamilies, an arrangement that is rejected at this time. In any case, it seems prudent to speculate that a shorter G1 evolved independently among goneplacids.

Some additional characters of the new monotypic genus are discussed in the Remarks section for *P. serenei* n. comb. (see below). Other characters that separate *Paragoneplax* n. gen. from *Goneplax sensu stricto* and the five Indo-West Pacific genera that include species that were formerly included in *Goneplax sensu lato* are summarized in Table 4.

#### *Paragoneplax serenei*

(Zarenkov, 1972) n. comb.

(Fig. 28C)

*Goneplax serenei* Zarenkov, 1972: 231, figs 3, 7-2, 7-3 (as *Geneplax [sic] serenei*) [Vietnam]. — Komatsu & Takeda 2003: 1243 [in list]. — Chen 1998: 283, 310 [in list], fig. 12 [South China Sea].

TYPE LOCALITY. — Vietnam, Gulf of Tonkin.

TYPE MATERIAL. — Deposit unknown (ZMMU?).

MATERIAL EXAMINED. — **Philippine Islands.** South China Sea, MUSORSTOM 1, stn CP 45, 13°46.0'N, 120°23.8'E, 100-108 m, 24.III.1976, 1 ♂ (MNHN-B 10295). — Stn

CP 56, 13°53.1'N, 120°08.9'E, 134-129 m, 26.III.1976, 12 ♂♂, 12 ♀♀ (MNHN-B 10290). — Stn CP 72, 14°11.8'N, 120°28.7'E, 127-122 m, 28.III.1976, 5 ♀♀ (MNHN-B 10332).

Bohol, off Cortez, tangle nets of local fishermen, 180 m, T. J. Arbasto coll., 25.III.2004, 1 ♂ (ZRC 2004.0785).

PANGLAO 2005, stn CP 2408, Maribohoc Bay, 09°43.5'N, 123°47.1'E, 121-137 m, 1.VI.2005, 1 ♂ (ZRC 2006.0220).

**Solomon Islands.** SALOMON 2, stn CP 2284, 08°38.4'S, 157°21.5'E, 195-197 m, 6.XI.2004, 1 ♂ (MNHN-B 30102).

**Vanuatu.** MUSORSTOM 8, CP 1071, 15°36.63'S, 167°16.34'E, 180-191 m, 4.X.1994, 1 pre-adult ♂ (MNHN-B 29295). — CP 1077, 16°04.00'S, 167°06.09'E, 180-210 m, 5.X.1994, 1 pre-adult ♂ (MNHN-B 29296). — CP 1086, 15°36.58'S, 167°16.32'E, 182-215 m, 5.X.1994, 1 ♂ (MNHN-B 29297); 1 ♂ (MNHN-B 30140).

**New Caledonia.** LAGON, stn DW 829, 20°46.5'S, 165°18.4'E, 160-200 m, 10.I.1987, 1 ♂ (MNHN-B 29779). — Stn DW 835, 20°46.8'S, 165°17.3'E, 135-150 m, 11.I.1987, 1 ♂, 1 ♀ (MNHN-B 29776); 1 ♀ (MNHN-B 29778). — Stn DW 1147, 19°07.5'S, 163°30.4'E, 210 m, 28.X.1989, 1 ♀ (MNHN-B 29298).

BATHUS 1, stn CP 667, 20°57.2'S, 165°34.6'E, 205-212 m, 14.III.1993, 1 ♀ (MNHN-B 29299). — Stn CP 668, 20°57.21'S, 165°34.57'E, 205-219 m, 14.III.1993, 1 ♂, 1 ♀ (MNHN-B 29352). — Stn CP 669, 20°57.3'S, 165°35.3'E, 255-280 m, 14.III.1993, 1 ♂ (MNHN-B 29327).

**Fiji.** MUSORSTOM 10, stn CP 1323, 17°16.1'S, 177°45.7'E, 143-173 m, 7.VIII.1998, 1 ♂, 1 ♀ (MNHN-B 29257). — Stn DW 1334, 16°51.4'S, 178°13.9'E, 251-257 m, 9.VIII.1998, 1 ovig. ♀ (MNHN-B 29258). — Stn DW 1349, 17°32.5'S, 178°37.5'E, 198-200 m, 11.VIII.1998, 1 ♂ (MNHN-B 29355). — Stn DW 1350, 17°31.1'S, 178°38.8'E, 244-252 m, 11.VIII.1998, 1 ♂ (MNHN-B 29300). — Stn DW 1359, 17°49.7'S, 178°47.8'E, 183-188 m, 13.VIII.1998, 1 ovig. ♀ (MNHN-B 29260).

BORDAU 1, stn CP 1403, 16°40'S, 179°36'E, 220-224 m, 25.II.1999, 1 ♀ (MNHN-B 29301).

**DISTRIBUTION.** — South China Sea (Zarenkov 1972; Chen 1998) and now from the Philippine Is, Solomon Is, Vanuatu, New Caledonia, and Fiji. Depth: 53-280 m.

#### COLOUR

A photograph of a freshly collected male from Vanuatu (Santo 2006 expedition; ZRC) shows a light-orange carapace, slightly lighter on the posterior half. The anterior and anterolateral margins of the

carapace, as well as a thin, curved band on the cardiac region of the carapace, are dark orange. The chelipeds are light orange with dark orange margins.

#### REMARKS

The abundant material from the Philippine Is to Fiji that was examined agrees with the description. Zarenkov's illustration of the distal part of the G1 (Zarenkov 1972: fig. 7-2, as *Goneplax serenei*), however, departs from that of the material examined. The tip is shown as broad (almost leaf-like) and bordered by small spines on one side and by short setae on the other. The morphology of the G1 of the specimens examined varies according to size. It is slender in pre-adults (Chen 1998: fig. 12-7, as *G. serenei*) but uniquely bent distally (Chen 1998: fig. 12-6, as *G. serenei*). The tip, although often slightly expanded distally has never shown a broad, leaf-like expansion bordered by setae and small spines as that illustrated by Zarenkov 1972. The type material (presumably at ZMMU) could not be examined so this particular character could not be verified. It is possible that Zarenkov's figure was mislabelled as in some of the other figures in his paper (see Castro 2000: 523, 551).

Also characteristic of *P. serenei* n. comb. are the flattened, shovel-like chelipeds (P1), the absence of anterolateral teeth, and the presence of a distal tooth on the ambulatory leg (P2-P5) meri (Fig. 28C). Also characteristic is an iridescent region at the distal end of the peduncles. It remains visible in specimens that have been preserved for almost thirty years. Other diagnostic characters of the species are given in the description of *Paragoneplax* n. gen. (see above).

#### Genus *Singhaplax* Serène & Soh, 1976

*Ommatocarcinus* – Tesch 1918: 186 (not *Ommatocarcinus* White, 1852).

*Goneplax* – Sakai 1939: 562 [in key], 563; 1976: 537 (part). — Balss 1957: 1656 (part). — Guinot 1969b: 520; 1971: 1081 (part). — Serène 1964: 189, 190; 1968: 89 (part); 1971: 915. — Serène & Umali 1972: 77 (part). — Dai *et al.* 1986: 376 (part). — Dai & Yang 1991: 406 (part).

*Singhaplax* Serène & Soh, 1976: 17. — Karasawa & Kato 2003b: 140 [in list]. — Komatsu & Takeda 2003: 1243 [in list].

TYPE SPECIES. — *Goneplax ockelmanni* Serène, 1971 (by original designation; gender feminine).

SPECIES INCLUDED. — *Singhaplax dichotoma* n. sp.; *S. ockelmanni* (Serène, 1971); *S. orientalis* (Tesch, 1918); *S. platypoda* n. sp.; *S. rhamphe* n. sp.; *S. styrax* n. sp.; *S. wolffi* (Serène, 1964).

All species are restricted to the Indo-West Pacific region.

DIAGNOSIS. — Adults of small size (cw rarely more than 4.5 mm). Carapace (Figs 35A; 37; 38A; 39A; Tesch 1918: pl. 10, fig. 2, as *Ommatocarcinus orientalis*; Takeda & Miyake 1968: fig. 7a, as *Goneplax nipponensis*; Serène & Umali 1972: fig. 82, as *G. ockelmanni*) transversely rectangular, much wider than long, relatively wider in larger individuals; widest at conspicuous outer orbital teeth; front slightly deflected ventrally, straight to slightly convex, not marked by median emargination. Notch between front, inner edge of supraorbital border; orbits wide, greatly expanded distally; supraorbital borders conspicuously sinuous, smooth; suborbital borders sinuous, inner tooth short or absent (Tesch 1918: pl. 10, fig. 2<sup>a</sup>, as *O. orientalis*); lateral borders sinuous, no anterolateral angle or tooth. Dorsal surface of carapace smooth, moderately convex, without clear indication of regions. Outer orbital angle with conspicuous, outwardly oriented, acute tooth; tooth placed medially or anteriorly on carapace. Basal antennal article short, distalmost (third) article does not reach front. Eye peduncles (Figs 35A; 37; 38A; 39A; Tesch 1918: pl. 10, fig. 2, as *O. orientalis*; Takeda & Miyake 1968: fig. 7a, as *G. nipponensis*; Serène & Umali 1972: fig. 82, as *G. ockelmanni*) long, shorter or longer than front (0.8–1.2 front width); cornea elongated, spherical distal margin, not reniform (not conspicuously dorso-ventrally flattened, not clearly divided into anterior, posterior portions). No obvious stridulating mechanism other than possible rubbing of proximal portion of cheliped (P1) merus against pterygostomial ridge. Thoracic sternum wide. Median sulcus on thoracic sternite 4 absent; sutures 4/5, 5/6, 7/8 interrupted medially, 6/7 complete. Anterior end of sterno-abdominal cavity anterior to thoracic sternite 4. Cheliped fingers (Fig. 37; Tesch 1918: pl. 10, fig. 2<sup>d</sup>, as *O. orientalis*) long, slender, shovel-like, slightly curved (strongly curved in large males), shorter than elongated propodus; dactylus without dark portion; inner (ventral) margin of propodus smooth or with low tubercles in large males; carpus without defined tooth on inner margin; merus with conspicuous tubercles on outer (dorsal) margin, long simple setae. Dorsal margins of ambulatory leg (P2–P5) meri (Fig. 37) unarmed; dactyli of ambulatory legs slender, with carina on each side, setose (P5 propodus, dactylus of *S. platypoda* n. sp. broad, flat; Fig. 37). Male abdomen

(Fig. 36A; Tesch 1918: pl. 10, fig. 2<sup>e</sup>, as *O. orientalis*; Serène & Umali 1972: fig. 85, as *G. ockelmanni*; Serène & Soh 1976: fig. 15A) with 6 freely-movable somites plus telson, wide (more slender in *S. styrax* n. sp.), somites 4–6 gradually decreasing in width from somite 3 (widest somite). Telson wide, slightly wider than long (slightly longer than wide in *S. dichotoma* n. sp., *S. platypoda* n. sp., and *S. styrax*). Somite 3 covers space between P5 coxae, somite 2 narrower than somite 3; somites 1, 2 leave small portion of thoracic sternite 8 visible. G1 (Figs 35B; 36B; 38B; 39B; 40A; Takeda & Miyake 1968: fig. 7d–f, as *G. nipponensis*; Serène & Umali 1972: figs 86, 87, as *G. ockelmanni*; Serène & Soh 1976: fig. 15B, B') long, slender, or stout; slightly sinuous, slightly broadened proximally. G2 (Figs 35C; 36C; 38C; 39C; 40B; Tesch 1918: pl. 10, fig. 2<sup>e</sup>, as *O. orientalis*; Serène & Umali 1972: figs 88, 89, as *G. ockelmanni*; Serène & Soh 1976: fig. 15C) slender, slightly longer than or as long as G1, flagellum longer than proximal part (peduncle); tip curved, pointed, or slightly enlarged with terminal spinule. Penis arising from P5 coxa, moderate size; broad, soft proximal expansion. Female abdomen with 6 freely-movable somites, wide. Telson much wider than long. Somite 3 covers space between P5 coxae, somite 2 slightly narrower than somite 3; somites 1, 2 leave small portion of thoracic sternite 8 visible. Vulva of two mature females reliably identified as belonging to genus (*S. styrax* n. sp. and *S. wolffi*) relatively large, extending from edge of suture 5/6 (displaced, arched to make contact with suture 4/5 in *S. styrax* n. sp.; slightly arched in small *S. wolffi* female) to median portion of thoracic sternite 6, vulvar cover absent.

#### REMARKS

Serène & Soh (1976: 17) described their new genus *Singhaplax* to include two Indo-West Pacific species that did not conform to the description of *Goneplax sensu lato*: *G. nipponensis* Yokoya, 1933, and *G. ockelmanni* Serène, 1971. Guinot (1969b: 522) had previously questioned the inclusion of *G. nipponensis* (= *Singhaplax styrax* n. sp.) in the genus *Goneplax* since its description did not give enough information on the ventral surface. Serène (1971: 915) and Serène & Umali (1972: 82) also commented that *S. ockelmanni* (as *Goneplax ockelmanni*) was not congeneric with another species of *Goneplax sensu lato* (*G. sinuatifrons* Miers, 1886 = *Hadroplox sinuatifrons* n. comb.) on account of the structure of their antennules and G1.

The discovery of additional species of *Singhaplax* has provided the opportunity to further characterize the genus. It is nearly identical to *Microgoneplax* n. gen. in terms of the shape of the carapace but



it differs from the latter by the presence of a long G2 that is as long as or slightly longer than the G1 in contrast to *Microgoneplax* n. gen., where the G2 is much shorter than the G1 (see description of *Microgoneplax* n. gen. below). A long G2 was the key character used by Serène & Umali (1972) to define *Singhaplax*. Other characters that separate *Singhaplax* from *Goneplax sensu stricto* and the five

Indo-West Pacific genera that include species that were formerly included in *Goneplax sensu lato* are summarized in Table 4.

There are seven described species of *Singhaplax*, including four being described herein. Two yet undescribed species have been recently discovered in the Philippine Is and will be described jointly with T. Naruse.

#### KEY TO SPECIES OF *SINGHAPLAX* SERÈNE & SOH, 1976

1. P5 dactylus broad, dorso-ventrally flattened, wide, without carina, bordered by many long, simple setae (see Fig. 37) ..... *Singhaplax platypoda* n. sp.  
— P5 dactylus slender, laterally flattened, narrow, with carina, not bordered by setae ..... 2
2. G1 with bilobed apical process ..... 3  
— G1 with simple tip, not bilobed, although tip may be grooved (see Fig. 38B) ..... 4
3. Two apical processes of G1 large, conspicuous, beak-like (see Serène & Umali 1972: figs 86, 87, as *Goneplax ockelmanni*; Serène & Soh 1976: fig. 15B, B'). G2 with pointed tip (see Serène & Umali 1972: fig. 88, as *Goneplax ockelmanni*; Serène & Soh 1976: fig. 15C) ..... *Singhaplax ockelmanni*  
— Two apical processes of G1 small (see Fig. 35B); tip broad, truncated appearance. G2 tip with terminal spinule (see Fig. 35C) ..... *Singhaplax dichotoma* n. sp.
4. G1 with rounded, grooved tip (see Fig. 38B) ..... *Singhaplax rhamphe* n. sp.  
— G1 with slender, non-grooved tip ..... 5
5. Conspicuous curved tooth on median portion of inner margin of cheliped (P1) merus. Male abdomen wide ..... *Singhaplax wolffi*  
— Median portion of inner margin of cheliped (P1) merus without tooth. Male abdomen narrow (see Tesch 1918: pl. 10, fig. 2<sup>e</sup>, as *Ommatocarcinus orientalis*) ..... 6
6. G1 with obtuse tip (see Fig. 39B). G2 with pointed tip (see Fig. 39C) ..... *Singhaplax styraux* n. sp.  
— G1 with acute tip. G2 with terminal spinule (see Tesch 1918: pl. 10, fig. 2<sup>e</sup>) ..... *Singhaplax orientalis*

#### *Singhaplax ockelmanni* (Serène, 1971)

*Goneplax ockelmanni* Serène, 1971: 915, pl. 4, fig. D [Thailand]. — Serène & Umali 1972: 78 [in key], 82, figs 82-89 [Thailand]. — Davie *et al.* 2002: 331 [Andaman Sea coast of Thailand]. — Ng & Davie 2002: 377 [Andaman Sea coast of Thailand].

*Singhaplax ockelmanni* – Serène & Soh 1976: 18, fig. 15, pl. 6, fig. A [Thailand].

TYPE MATERIAL. — ♂ holotype, cl 3.0 mm, cw 5.2 mm (ZMUC).

TYPE LOCALITY. — Thailand, Andaman Sea coast.

MATERIAL EXAMINED. — **Philippine Islands.** Bohol, Balicasag I., off Panglao I., PANGLAO 2004, stn T5, Bohol

I., west of Balayon, 09°35.3'N, 123°52.2'E, 84-87 m, coarse muddy sand, 2.VI.2004, ♂ cl 4.0 mm, cw 8.7 mm, ♀ cl 4.0 mm, cw 8.5 mm (ZRC 2004.0786). — Stn T28, Panglao I., 09°35.0'N, 123°51.4'E, 80 m, muddy sand, 1.VII.2004, ♂ cl 3.9, cw 8.0 mm (ZRC 2004.0787).

DISTRIBUTION. — Andaman Sea coast of Thailand (Serène 1971; Serène & Umali 1972; Serène & Soh 1976; Davie *et al.* 2002; Ng & Davie 2002) and now from the Philippine Is.

#### REMARKS

Although very briefly described (Serène 1971: 915, as *Goneplax ockelmanni*), additional information

and detailed illustrations on *S. ockelmanni* were given by Serène & Umali (1972: 82, figs 82-89, as *Goneplax ockelmanni*) and Serène & Soh 1976: 18, fig. 15, pl. 4, fig. A). The holotype of the species was unfortunately not examined.

The male specimens from the Philippine Is and Indonesia examined, however, have the characteristic wide abdomen, the bilobed and beak-like G1, and the long G2 illustrated for *S. ockelmanni*. The spinules on the G1, however, are not as conspicuous as those shown by Serène & Umali (1972: figs 86, 87) and particularly by Serène & Soh (1976: fig. 15B, B'). The G2 is not as long as that shown by Serène & Umali (1972: fig. 88) but it is similar to that illustrated by Serène & Soh (1976: fig. 15C). The chelipeds (P1) meri and propodi of two males (cl 4.0 mm, cw 8.7 mm, cl 3.9, cw 8.0 mm; ZRC) were longer than those of the smaller male holotype. The chelipeds of the third specimen, a female (cl 4.0 mm, cw 8.5 mm), nevertheless agree with those of the holotype as illustrated by Serène & Umali (1972: figs 83, 84).

The teeth are slender and placed approximately on the medial axis of the carapace (Serène & Umali 1972: fig. 82), similar to their position in *S. dichotoma* n. sp., *S. rhamphe* n. sp., and *S. orientalis* (Tesch, 1918). In the remaining three described species of *Singhaplax*, however, the teeth are in a more anterior position on the carapace (see Figs 37; 39).

*Singhaplax dichotoma* n. sp.  
(Fig. 35)

TYPE MATERIAL. — KARUBAR, stn DW 29, ♂ holotype, cl 4.0 mm, cw 6.1 mm (MNHN-B 30069). — MUSORSTOM 1, stn CP 25, ♂ paratype, cl 3.2 mm, cw 5.0 mm (MNHN-B 30070). — MUSORSTOM 2, stn DR 34, ♂ paratype, cl 3.8 mm, cw 5.9 mm (MNHN-B 10286).

TYPE LOCALITY. — Indonesia, Kai Islands, 05°36'S, 132°56'E, 181-184 m.

MATERIAL EXAMINED. — **Philippine Islands.** South China Sea, MUSORSTOM 1, stn CP 25, 14°03'N, 120°20'E, 191-200 m, 22.III.1976, 1 ♂ paratype, cl 3.2 mm, cw 5.0 mm (MNHN-B 30070).

MUSORSTOM 2, stn DR 34, 13°27.0'N, 121°12.0'E, 167-155 m, 24.XI.1980, 1 ♂ paratype, cl 3.8 mm, cw

5.9 mm (MNHN-B 10286).

**Indonesia.** Kai Is, KARUBAR, stn DW 29, 05°36'S, 132°56'E, 181-184 m, 26.X.1991, ♂ holotype, cl 4.0 mm, cw 6.1 mm (MNHN-B 30069).

ETYMOLOGY. — From *dichotomus*, Greek for “cut in two”, in reference to the bilobed tip of the G1 characteristic of the species.

DISTRIBUTION. — Philippine Is and Indonesia (Kai Is). Depth: 155-200 m.

DESCRIPTION

Carapace (Fig. 35A) transversely rectangular, much wider than long (1.5 as wide as long in holotype). Carapace convex, without clear indication of regions. Front straight to slightly sinuous. Slight notch between front, inner edge of supraorbital border. Supraorbital borders broad, conspicuously sinuous, smooth, with long simple setae. Suborbital borders conspicuously sinuous, with short, acute granules; short, wide inner tooth not visible dorsally. Long, slender, acute tooth on outer orbital angle; tooth medially placed on carapace. Lateral borders beyond outer orbital teeth slightly curved, no anterolateral teeth.

Subhepatic, pterygostomial regions, with low, round tubercles.

Eye peduncles (Fig. 35A) long (equal to front width), cornea elongated, spherical distal margin.

Chelipeds (P1) unequal (female unknown); fingers slender, dactylus curved, slightly shorter than propodus, with blunt teeth; no dark colour on fingers; inner (ventral) margin of propodus smooth. Broad tooth on inner (ventral), proximal margin of carpus; outer (dorsal) margin of merus with low tubercles, long simple setae. Ambulatory legs (P2-P5) long, slender, unarmed, varying number of long, plumose setae; dactyli long, slender, each with 2 carinae along each side; length of P5 merus 0.8 cl.

Male abdomen wide (see abdomen of *S. platypoda* n. sp., Fig. 36A), with 6 freely-movable somites plus telson; telson slightly longer than wide. Somite 3 covers most of space between P5 coxae; somite 2 only slightly narrower than somite 3, leaving small portion of thoracic sternite 8 visible. G1 (Fig. 35B) long, relatively stout, slightly wider basal part, straight distal part with large denticles; wide, truncated tip with 2 divergent, nearly triangular processes. G2

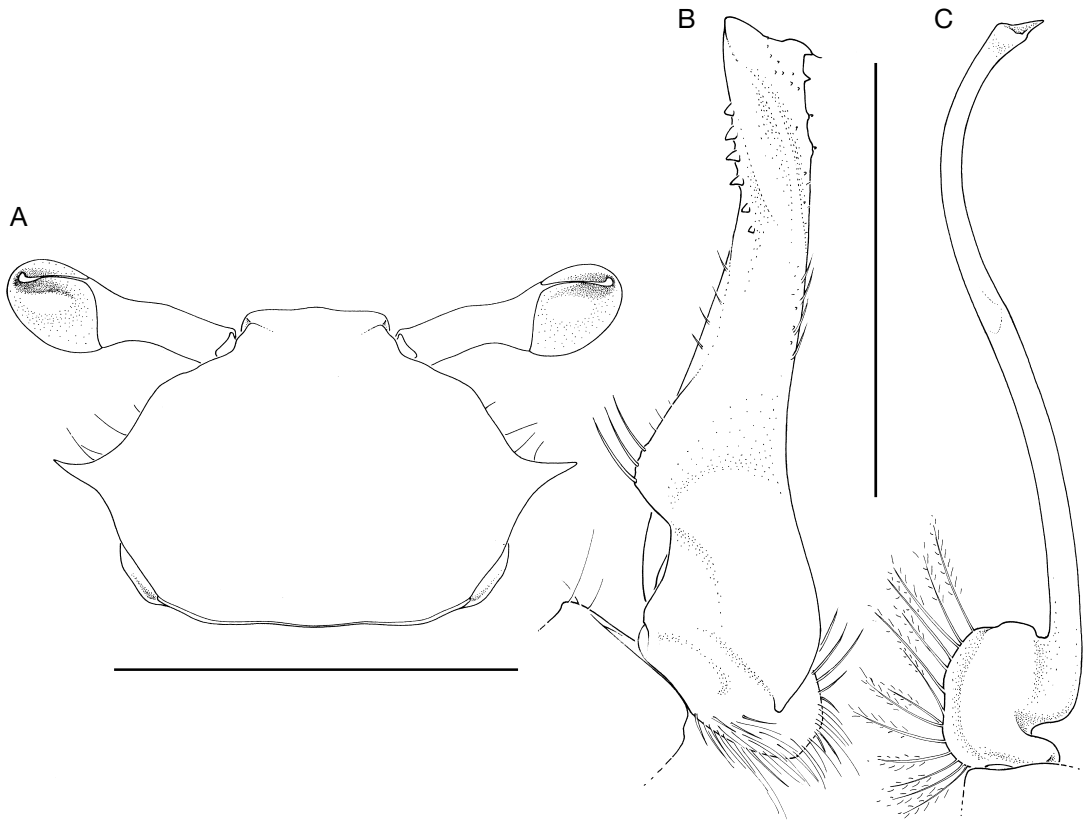


FIG. 35. — *Singhaplax dichotoma* n. sp., ♂ holotype, cl 4.0 mm, cw 6.1 mm, Kai Is, Indonesia, KARUBAR, stn DW 29 (MNHN-B 30069): **A**, dorsal surface of the carapace; **B**, left G1, ventral view; **C**, right G2, ventral view. Scale bars: A, 5 mm; B, C, 1 mm.

(Fig. 35C) slender, long, nearly equal or slightly longer than G1, curved flagellum slightly shorter than proximal part (peduncle), tip with terminal spinule.

Female unknown.

#### REMARKS

The new species is closest to *Singhaplax ockelmanni* (Serène, 1971). The G1 is bilobed in both species but the apical processes are different. They are large and beak-like in *S. ockelmanni* (Serène & Umali 1972: figs 86, 87; Serène & Soh 1976: fig. 15B, B') but they are much smaller in the new species (Fig. 35B). Specimens from the Philippine Is and Indonesia identified here as *S. ockelmanni* are of the same size range of the type material of *S. dichotoma*

n. sp., which precludes the possibility that the new species represents the pre-adult of *S. ockelmanni*. Another difference is the G2, with a pointed tip in *S. ockelmanni* (Serène & Umali 1972: fig. 88; Serène & Soh 1976: fig. 15C) but with a conspicuous terminal spinule in the new species (Fig. 35C). The male telson is different from that of other species of *Singhaplax*, except *S. platypoda* n. sp. and *S. styrax* n. sp., by being slightly longer than wide.

#### *Singhaplax orientalis* (Tesch, 1918) n. comb.

*Ommatocarcinus orientalis* Tesch, 1918: 186, pl. 10, figs 2, 2<sup>a</sup>-2<sup>e</sup> [Indonesia]. — Barnard 1950: 286 [discussion]. — Serène 1968: 89 [in list]. — Takeda & Miyake 1969b: 174 [discussion]. — Guinot 1971: 1082 [in list].

TYPE MATERIAL. — *Siboga*, stn 260, ♂ holotype, cl 2.3 mm, cw 4.5 mm (ZMA De 103.007).

TYPE LOCALITY. — Indonesia, Kai Islands, 05°36.5'S, 132°55.2'E, 90 m.

MATERIAL EXAMINED. — **Indonesia.** Kai Is, *Siboga* Expedition, stn 260, 05°36.5'S, 132°55.2'E, 90 m, 16-18.XII.1899, ♂ holotype, cl 2.3 mm, cw 4.5 mm (ZMA De 103.007).

DISTRIBUTION. — Known only from Indonesia (Kai Is). Depth: 90 m.

#### REMARKS

*Ommatocarcinus orientalis* Tesch, 1918 is known from only one specimen, the male holotype. It was collected by the *Siboga* Expedition from the Kai Is, Indonesia (Tesch 1918: 186). The long G2 clearly shown in Tesch's illustration (Tesch 1918: pl. 10, fig. 2<sup>c</sup>, as *Ommatocarcinus orientalis*), the length of the eye peduncles (much shorter than *Ommatocarcinus*), the general morphology of the carapace and pereopods, and the small overall size clearly show that Tesch's species does not belong to *Ommatocarcinus* but to *Singhaplax*.

Tesch unfortunately did not include the G1 (nor the G2, even if it was illustrated) in the extensive description of his new species. The holotype (ZMA De 103.007) still has the intact G1 even if the abdomen was detached. The G1 is slender and nearly straight, with a scarcely wider proximal part (peduncle). The tip is pointed and acute, and there is a row of small, obtuse denticles along the inner margin of the distal part. The G2, as shown by Tesch (1918: 186, pl. 10, fig. 2e, as *O. orientalis*), is long and slender and has one terminal spinule.

The morphologies of the G1 and G2 plus other characters (narrow male abdomen, absence of a tooth on the median portion of the cheliped meri) demonstrate that *S. orientalis*, even if known from only one specimen, is distinct from the other four species of *Singhaplax* (*S. dichotoma* n. sp., *S. platypoda* n. sp., *S. rhamphe* n. sp., and *S. styrax* n. sp.) plus a similar small-size species (*Microgoneplax pelecis* n. sp.) that are being described from apparently similar habitats in the Kai Is. These six species of *Singhaplax* and *Microgoneplax* n. gen. appear to be sympatric, although it is possible that there are dif-

ferences in their particular microhabitats (sediment size, relative position in the sediment) or behaviours (feeding habits, activity patterns, association with other species).

Barnard (1950: 286) commented that the small holotype of *S. orientalis* "appears to be a juvenile", but his assumption was most probably wrong. The G1 and G2 of the holotype are clearly fully formed.

#### *Singhaplax platypoda* n. sp. (Figs 36; 37)

TYPE MATERIAL. — KARUBAR, stn DW 22, ♂ holotype, cl 2.8 mm, cw 5.1 mm (MNHN-B 29215). — MUSORSTOM 7, stn DW 495, pre-adult ♀ paratype, cl 3.3 mm, cw 6.0 mm (MNHN-B 30068).

TYPE LOCALITY. — Indonesia, Kai Islands, 05°22'S, 133°01'E, 85-124 m.

MATERIAL EXAMINED. — **Indonesia.** Kai Is, KARUBAR, stn DW 22, 05°22'S, 133°01'E, 124-85 m, 25.X.1991, ♂ holotype, cl 2.8 mm, cw 5.1 mm (MNHN-B 29215). **Futuna Island.** MUSORSTOM 7, stn DW 495, 14°19'S, 178°04'W, 180-210 m, 10.V.1992, pre-adult ♀ paratype, cl 3.3 mm, cw 6.0 mm (MNHN-B 30068).

ETYMOLOGY. — From *platys*, Greek for "broad" or "wide," and *podus*, Greek for "foot," in reference to the flat, broad propodus and dactylus of the P5 characteristic of the species.

DISTRIBUTION. — Indonesia (Kai Is) and Futuna I. (southwestern Pacific Ocean). Depth: 85-210 m.

#### DESCRIPTION

Carapace (Figs 36A; 37) transversely rectangular, much wider than long (1.8 as wide as long in holotype). Carapace convex, without clear indication of regions. Front straight. Notch between front, inner edge of supraorbital border absent. Supraorbital borders broad, conspicuously sinuous, smooth, with long simple setae. Suborbital borders conspicuously sinuous, slightly granular, inner tooth absent. Long, slender, acute tooth on outer orbital angle; tooth medially placed on carapace. Lateral borders beyond outer orbital teeth slightly curved, slight swelling immediately below teeth in pre-adult female paratype, no anterolateral teeth.

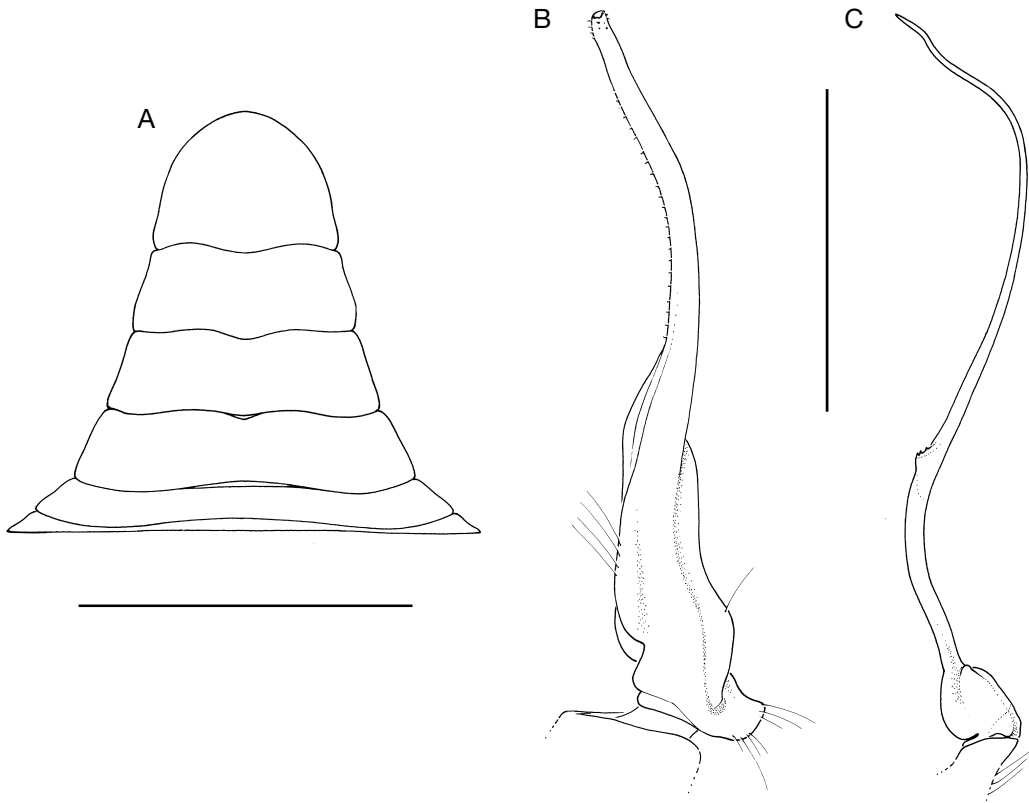


FIG. 36. — *Singhaplax platypoda* n. sp., ♂ holotype, cl 2.8 mm, cw 5.1 mm, Kai Is, Indonesia, KARUBAR, stn DW 22 (MNHN-B 29215): **A**, abdomen; **B**, right G1, ventral view; **C**, right G2, ventral view. Scale bars: A, 2 mm; B, C, 1 mm.

Subhepatic, pterygostomial regions, with low, round tubercles.

Eye peduncles (Figs 36A; 37) long (equal to front width), cornea elongated, spherical distal margin, not reniform.

Chelipeds (P1) of pre-adult female paratype (missing in male holotype) nearly equal (Fig. 37); fingers slender, slightly curved, slightly shorter than propodus, with blunt teeth; no dark colour on fingers; inner (ventral) margin of propodus smooth. Broad tooth on inner (ventral), proximal margin of carpus; outer (dorsal) margin of merus with low tubercles, long simple setae. P2-P4 (Fig. 37) long, slender, unarmed, varying number of long simple setae; dactyli long, slender, each with 2 carinae along each side; P5 (Fig. 37) propodus, dactylus broad, dorso-ventrally flattened, wide,

without carina, bordered by many long, simple setae; dactylus ending in acute tooth; length of P5 merus 0.7 cl.

Male abdomen (Fig. 36A) wide, with 6 freely-movable somites plus telson; telson slightly longer than wide. Somite 3 covers space between P5 coxae; somite 2 only slightly narrower than somite 3, leaving small portion of thoracic sternite 8 visible. G1 (Fig. 36B) long, slender, tubular in appearance, slightly wider basal part, straight distal part; slender, truncated tip. G2 (Fig. 36C) slender, long, slightly longer than G1, curved flagellum longer than proximal part (peduncle), pointed tip.

Abdomen of pre-adult female paratype narrow, outer margin of thoracic sternites visible. Vulva of pre-adult paratype barely visible, near edge of suture 5/6.



FIG. 37. — *Singhaplax platypoda* n. sp., pre-adult ♀ paratype, cl 3.3 mm, cw 6.0 mm, Futuna I., MUSORSTOM 7, stn DW 495 (MNHN-B 30068).

#### REMARKS

The species is being described as new, even if only two specimens are available, on account of the flat, broad P5 dactylus (Fig. 37), a unique feature in *Singhaplax* and related genera, with the exception of *Goneplacoides marivenae* n. comb. (Komatsu & Takeda, 2003). Both specimens are small. The female is clearly a pre-adult, but the G1 and G2 of the male appear fully formed. The shape of the male telson, like that of *S. dichotoma* n. sp., departs from that of other species of *Singhaplax*, except *S. dichotoma* n. sp. and *S. styrax* n. sp., by being slightly longer than wide. The outer orbital teeth are medially placed on the carapace, in contrast to *S. styrax* n. sp., where they are more anteriorly placed on the carapace.

#### *Singhaplax rhamphe* n. sp. (Fig. 38)

TYPE MATERIAL. — KARUBAR, stn DW 29, ♂ holotype, cl 4.4 mm, cw 7.6 mm (MNHN-B 30071); ♂ paratype feminized by *Sacculina*, cl 4.0 mm, cw 6.7 mm; ♂ paratype, cl 2.3 mm, cw 4.2 mm (MNHN-B 30072).

TYPE LOCALITY. — Indonesia, Kai Islands, 05°36'S, 132°56'E, 181-184 m.

MATERIAL EXAMINED. — Indonesia, Kai Is, KARUBAR, stn DW 29, 05°36'S, 132°56'E, 181-184 m, 26.X.1991, ♂ holotype, cl 4.4 mm, cw 7.6 mm (MNHN-B 30071); 1 ♂ paratype feminized by *Sacculina*, cl 4.0 mm, cw 6.7 mm, 1 ♂ paratype, cl 2.3 mm, cw 4.2 mm (MNHN-B 30072).

ETYMOLOGY. — From *rhamphe*, Greek for “curved knife”, noun in apposition, in reference to the curved G1 characteristic of the species.

DISTRIBUTION. — Known only from Indonesia (Kai Is). Depth: 181-184 m.

#### DESCRIPTION

Carapace (Fig. 38A) transversely rectangular, much wider than long (1.7 as wide as long in holotype). Carapace convex, without clear indication of regions. Front slightly convex, almost straight. Slight notch between front, inner edge of supraorbital border. Supraorbital borders broad, conspicuously sinuous, smooth, with long simple setae. Suborbital borders conspicuously sinuous, with short, acute granules;

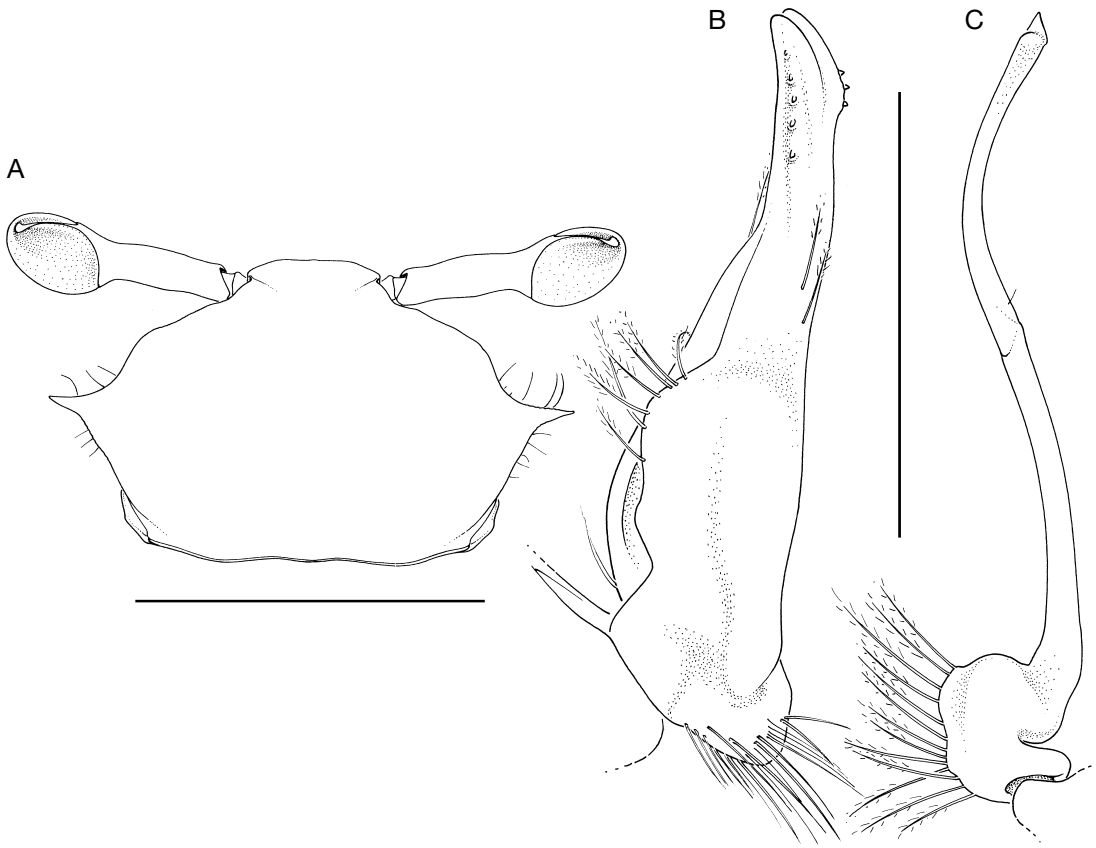


FIG. 38. — *Singhaplax rhamphe* n. sp., ♂ holotype, cl 4.4 mm, cw 7.6 mm, Kai Is, Indonesia, KARUBAR, stn DW 29 (MNHN-B 30071): **A**, dorsal surface of the carapace; **B**, left G1, ventral view; **C**, right G2, ventral view. Scale bars: A, 5 mm; B, C, 1 mm.

conspicuous, triangular inner tooth. Long, slender, acute tooth on outer orbital angle; tooth medially placed on carapace. Lateral borders beyond outer orbital teeth slightly convex, no anterolateral teeth.

Subhepatic, pterygostomial regions, with low, round tubercles.

Eye peduncles (Fig. 38A) long (0.9 front width), cornea elongated, spherical distal margin, not reniform.

Chelipeds (P1) slightly unequal (female unknown); fingers slender, dactylus curved, slightly shorter than propodus, with blunt teeth; no dark colour on fingers; inner (ventral) margin of propodus smooth. Broad tooth on inner (ventral), proximal margin of carpus; outer (dorsal) margin

of merus with low tubercles, long simple setae. Ambulatory legs (P2–P5) long, slender, unarmed, varying number of long simple setae; dactyli long, slender, each with 2 carinae along each side; length of P5 merus 0.8 cl.

Male abdomen wide (see abdomen of *S. platypoda* n. sp., Fig. 36A), with 6 freely-movable somites plus telson; telson slightly wider than long. Somite 3 covers most of space between P5 coxae; somite 2 only slightly narrower than somite 3, leaving relatively small portion of thoracic sternite 8 visible. G1 (Fig. 38B) long, slightly wider basal part, curved distal part with small denticles along outer margin; slightly pointed, grooved tip. G2 (Fig. 38C) slender, long, nearly equal or slightly longer than G1, curved flagellum about as long

as proximal part (peduncle), tip with terminal spinule.

Female unknown.

#### REMARKS

*Singhaplax rhamphe* n. sp. was collected from the same station in the Kai Is, Indonesia as *S. dichotoma* n. sp. Four other species of *Singhaplax* were also collected from different stations but in a similar habitat from the same region. All four are morphologically close species that appear to be sympatric (see Remarks for *S. orientalis* above).

The new species is distinguished from the other described species of *Singhaplax* by its characteristic G1, which has a curved distal part with small denticles along the outer margin and a grooved tip (Fig. 38B). The tip of the G2 has a terminal spinule (Fig. 38C).

#### *Singhaplax styrax* n. sp.

(Fig. 39)

*Goneplax nipponensis* – Takeda & Miyake 1968: 567, fig. 7 [East China Sea]. — Guinot 1971: 1081 [in list] (part). — Serène & Umali 1972: 82 [discussion]. — Takeda 1973a: 13 [in list]; 1973b: 52; 1982: 19 [in list]; 2001: 248, 251, 259 [in list] [Japan]. — Dai *et al.* 1986: 377 [in key] (part). — Dai & Yang 1991: 406 [in key] (part). — Miyake 1991: 220 [in list] [Japan] (part). — Takeda *et al.* 2006: 205 [in list] [Japan] (not *Goneplax [sic] nipponensis* Yokoya, 1933).

*Singhaplax nipponensis* – Serène & Soh 1976: 18 [discussion].

TYPE MATERIAL. — KARUBAR, stn DW 18, ♂ holotype, cl 4.1 mm, cw 6.7 mm (MNHN-B 29211). Paratypes: two other males, one mature female, and one pre-adult female specimen from the type locality as listed under Material examined (MNHN-B 30073).

TYPE LOCALITY. — Indonesia, Kai Islands, 05°18'S, 133°01'E, 205-212 m.

MATERIAL EXAMINED. — **Indonesia.** Kai Is, KARUBAR, stn DW 18, 05°18'S, 133°01'E, 205-212 m, 24.X.1991, ♂ holotype, cl 4.1 mm, cw 6.7 mm (MNHN-B 29211); 2 ♂ paratypes (cl 4.4 mm, cw 7.4 mm; cl 2.4 mm, cw 3.9 mm), 1 pre-adult ♀, cl 3.0 mm, cw 4.6 mm, 1 ♀, cw 5.6 mm (MNHN-B 30073).

ETYMOLOGY. — From *styrax*, Greek name for the spike at the end of a spear, noun in apposition, in reference to

the pointed tip of the G1 characteristic of the species.

DISTRIBUTION. — Japan (Takeda & Miyake 1968, as *Goneplax nipponensis*) and now Indonesia (Kai Is). Depth: 110-212 m.

#### DESCRIPTION

Carapace (Fig. 39A; Takeda & Miyake 1968: fig. 7a, as *Goneplax nipponensis*) transversely rectangular, much wider than long (1.6 as wide as long in holotype). Carapace convex, without clear indication of regions. Front slightly convex. Slight notch between front, inner edge of supraorbital border in most specimens (missing in holotype male). Supraorbital borders broad, conspicuously sinuous, smooth, without conspicuous setae (short simple setae in some paratypes). Suborbital borders conspicuously sinuous, with short, acute granules; inner tooth short not visible dorsally or absent. Long, slender, acute tooth on outer orbital angle; tooth anteriorly placed on carapace. Lateral borders beyond outer orbital teeth slightly convex, no anterolateral teeth.

Subhepatic, pterygostomial regions, with low, round tubercles; long plumose setae on pterygostomial region.

Eye peduncles long (0.8 front width), cornea elongated, spherical distal margin, only slightly reniform (not dorso-ventrally flattened, not clearly divided into anterior, posterior portions).

Chelipeds (P1) (Takeda & Miyake 1968: fig. 7b, c, as *Goneplax nipponensis*) unequal in males, equal in pre-adult female (only female with P1); fingers slender, dactylus curved, conspicuously curved in larger chelae of males, slightly shorter than propodus, with blunt teeth; no dark colour on fingers; inner (ventral) margin of propodus smooth. Broad tooth on inner (ventral), proximal margin of carpus; outer (dorsal) margin of merus with conspicuous low to acute tubercles, long plumose setae. Ambulatory legs (P2-P5) long, slender, unarmed, varying number of long simple setae; dactyli long, slender, each with 2 carinae along each side; length of P5 merus 0.5 cl.

Male abdomen narrow, with 6 freely-movable somites plus telson; telson slightly longer than wide. Somite 3 covers most of space between P5 coxae; somite 2 only slightly narrower than somite 3, leaving relatively small portion of thoracic sternite 8 visible. G1 (Fig. 39B; Takeda & Miyake 1968:



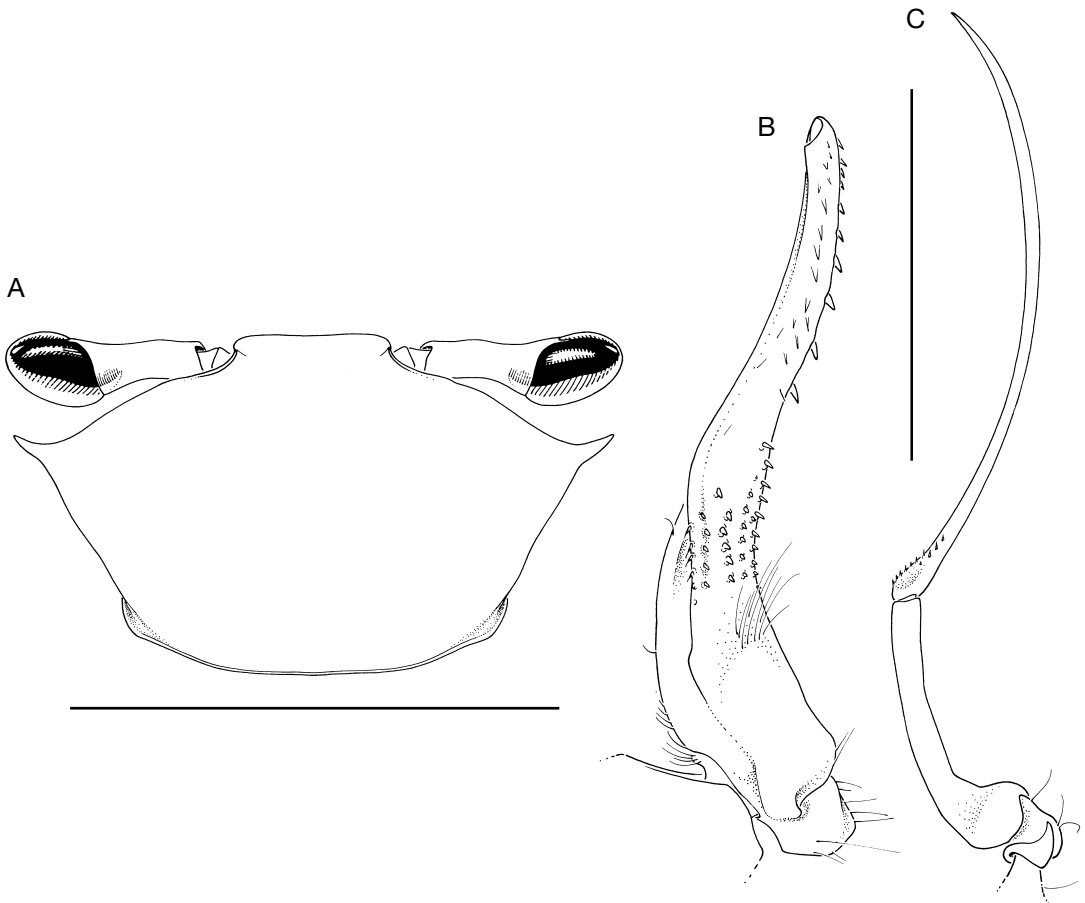


FIG. 39. — *Singhaplax styrax* n. sp., ♂ holotype, cl 4.1 mm, cw 6.7 mm, Kai Is, Indonesia, KARUBAR, stn DW 18 (MNHN-B 29211); **A**, dorsal surface of the carapace; **B**, left G1, ventral view; **C**, left G2, ventral view. Scale bars: A, 5 mm; B, C, 1 mm.

fig. 7d, e, as *Goneplax nipponensis*) long, slender, slightly wider basal part with many small denticles, straight distal part with large denticles along outer margin, slightly pointed tip. G2 (Fig. 39C) slender, long, slightly longer than G1, curved flagellum longer than proximal part (peduncle), pointed tip.

Mature female paratype abdomen wide, outer margin of thoracic sternites visible. Telson much wider than long. Somite 2 covers space between P5 coxae, somites 1, 2 narrower than somite 3, leaving small portion of thoracic sternite 8 visible. Vulva of mature female paratype round, relatively large, extending from edge of suture 5/6 (displaced, arched to make contact with suture 4/5) to median

portion of thoracic sternite 6, vulvar cover absent but slightly thicker outer posterior margin.

#### REMARKS

Serène & Soh (1976) included *Goneplax nipponensis* Yokoya, 1933 (as *Gonoplax [sic] nipponensis*) in the genus *Singhaplax* on account of a G2 longer than the G1 and presumably on the general shape of the carapace. They did not examine any material of this species and based their conclusion on observations by Takeda & Miyake (1968). Although the carapace of the specimen illustrated by Takeda & Miyake (1968: fig. 7a) does agree with the characteristic morphology of the carapace and eye peduncles of

*Singhaplax*, the illustration shown in the description of *G. nipponensis* (Yokoya 1933: fig. 64) does not. The outer orbital teeth in Yokoya's illustration are much smaller and shorter than in *Singhaplax*, and the orbits and supraorbital borders are straight instead of the conspicuously sinuous borders of *Singhaplax*. The type material of Yokoya's species appears to be lost. His species clearly belongs to a different genus, possibly *Hadroplax* n. gen. from the general shape of the carapace. Yokoya (1933: 198) actually placed his new species as "near" *Goneplax sinuatifrons* Miers, 1886 (= *Hadroplax sinuatifrons* n. comb.).

The Japanese material examined and illustrated by Takeda & Miyake (1968), on which Serène & Soh (1976) based their conclusion, belongs instead to *S. styrax* n. sp. The material examined by Takeda & Miyake, a male and a female, was unfortunately not available for examination but the characteristic G1 of their material (Takeda & Miyake 1968: fig. 7d, e) is identical to that of *S. styrax* n. sp. (Fig. 39B) with the single exception that the apex is slightly more pointed in the Japanese material than in *S. styrax* n. sp. The G2 of the male, which was not illustrated by Takeda & Miyake, was described as being longer than the G1 as in *S. styrax* n. sp. All other characters described by Takeda & Miyake agree with those of the new species.

The Taiwan material identified as *Goneplax nipponensis* by Ho *et al.* (2004: 659, fig. 6E) appears to be referable to *Goneplacoides marivenae* (Komatsu & Takeda, 2003) n. comb. (see Remarks for the latter species).

*Singhaplax styrax* n. sp. departs from its other congeners by having a male abdomen that is narrower than in any of the species of *Singhaplax* where the shape of the abdomen is known, a characteristic of *Microgoneplax* n. gen. (see below). Another difference is that the supraorbital margins (Fig. 39A) are not as sinuous as in the remaining known species of *Singhaplax*. The G2 of the new species is nevertheless long in sharp contrast to the short G2 of *Microgoneplax* n. gen. and the supraorbital margins are smooth in contrast to the granular margins of *Microgoneplax* n. gen. The outer orbital teeth are more slender than those of its congeners. The teeth are placed slightly more anteriorly on the carapace than in most congeners, where they are more medi-

ally placed on the carapace. Also characteristic of the new species are the long plumose setae along the outer (dorsal) margin of the cheliped meri and on the pterygostomial region.

The vulva of the only mature female in the material examined (cw 5.6 mm; MNHN-B 30073), and the only mature female reliably identified as belonging to *Singhaplax*, was round and relatively large. It extended from the edge of suture 5/6, which was uniquely displaced and arched to make contact with suture 4/5, thus appearing as if the anterior edge of the vulva extended from suture 4/5. There was no vulvar cover but the outer posterior margin was slightly thicker than the rest of the margin. The vulva of the second female examined, a pre-adult (cl 3.0 mm, cw 4.6 mm; MNHN-B 30073), was barely visible and suture 5/6 was not displaced or arched.

*Singhaplax wolffi* (Serène, 1964) n. comb.  
(Fig. 40)

*Goneplax wolffi* Serène, 1964: 190 [in key], 191, pl. 16, fig. C; 1968: 89 [in list]. — Guinot 1969b: 522 [discussion]. — Serène & Umali 1972: 78 [in key]. — Zarenkov 1972: 233 [in list].

*Goneplax wolffi* [*sic*] – Komatsu & Takeda 2003: 1243 [in list].

TYPE MATERIAL. — *Dana* Expedition, stn 3612, ♀ holotype, cl 2.4 mm, cw 4.2 mm (ZMUC 8627).

TYPE LOCALITY. — New Caledonia, off east coast, 21°40'S, 165°24'E, 165-360 m.

MATERIAL EXAMINED. — **New Caledonia.** *Dana* Expedition, stn 3612, 21°40'S, 165°24'E, 165-360 m, 27.XI.1928, ♀ holotype, cl 2.4 mm, cw 4.2 mm (ZMUC 8627).

BATHUS 1, stn DW 687, 20°34.62'S, 165°07.30'E, 408-440 m, 16.III.1993, 1 ♂ cl 2.1 mm, cw 3.5 mm (MNHN-B 29351).

BATHUS 2, stn DW 715, 22°39.42'S, 167°10.99'E, 202-227 m, 11.V.1993, 1 ♀ cw 4.3 mm (MNHN-B 29432).

BATHUS 4, stn DW 896, 20°15.92'S, 163°51.70'E, 315-350 m, 3.VIII.1994, 1 ♂ cl 2.6 mm, cw 5.2 mm (MNHN-B 29251). — Stn CP 897, 20°15.93'S, 163°51.75'E, 305-350 m, 3.VIII.1994, 1 ♂ cl 2.4 mm, cw 5.0 mm (MNHN-B 29338).

?LAGON, stn 500, 19°04'S, 163°30'E, 225 m, 4.III.1985, 1 pre-adult ♀ (MNHN-B 29366).

DISTRIBUTION. — Known only from New Caledonia. Depth: 165–360 m.

#### REMARKS

Serène (1964) described *Goneplax wolffi* from only one specimen, a small incomplete female collected off New Caledonia and illustrated only by a poor photograph (Serène 1964: pl. 16, fig. C). Most of the description consisted of a comparison with *Goneplax sinuatifrons* (= *Hadroplax sinuatifrons* Miers, 1886), to which Serène believed it resembled. The description, however, gives two diagnostic characters unique for *Singhaplax* that were also present in several more recently collected specimens from New Caledonia: a recurved tooth (“une forte épine aigue [sic], longue et courbe”) on the median portion of the inner margin of the cheliped merus, and two small tubercles (“2 très petits tubercules”) at a prominence found at the anterolateral border of the carapace of the holotype (Serène 1964: 192).

The examination of the holotype (cl 2.4 mm, cw 4.2 mm; ZMUC 8627) confirmed Serène’s description. The holotype and the additional material from New Caledonia, which includes three males, have permitted a more complete characterization.

The G1 (Fig. 40A) has a slender distal part, a pointed tip, and a wide, nearly triangular basal part, with small denticles along the outer border. The G2 (Fig. 40B) is as long as the G1, slender, with a straight flagellum that is about as long as the proximal part (peduncle), and an expanded tip with a terminal spinule. The male abdomen is wide as in the other species of *Singhaplax* with the exception of *S. styrax* n. sp. The vulva of the only mature but small female (cw 4.3 mm; MNHN-B 29432) extended from the edge of a slightly arched suture 5/6 to median portion of thoracic sternite 6. There was no evidence of a vulvar cover.

Each of the anterolateral borders of the carapace of the largest male (cl 2.6 mm, cw 5.2 mm; MNHN-B 29251) had four small tubercles on a short prominence just posterior to the outer orbital teeth, while there were two in a slightly more pronounced prominence in the small female holotype as indicated by Serène. Two small tubercles were present in a small female (cw 4.3 mm; MNHN-B 29432) but the prominence of the holotype was absent. A varying number of tubercles



FIG. 40. — *Singhaplax wolffi* (Serène, 1964), ♂, cl 2.6 mm, cw 5.2 mm, north of New Caledonia, BATHUS 4, stn DW 896 (MNHN-B 29251): **A**, right G1, ventral view; **B**, right G2, ventral view. Scale bars: A, B, 0.5 mm.

and a prominence on each side of the carapace were found in two small males (cl 2.4 mm, cw 5.0 mm, MNHN-B 29338; cl 2.1 mm, cw 3.5 mm, MNHN-B 29351). There was a small triangular inner tooth on each suborbital border of the holotype as well as in the rest of the specimens that were examined.

The cheliped (P1) propodus was short in the holotype and in the small specimens that were examined. It was elongated, however, in the smallest cheliped of the largest male; its largest cheliped was thick and relatively smooth. There were conspicuous tubercles along the inner border of the propodus in the small cheliped of this male. There was a curved tooth on the median portion of the inner margin

of the cheliped merus, a character previously indicated for the holotype (Serène 1964: 192). The holotype and the small specimens examined had a small, acute tooth on the inner, distal angle of the carpus. It was missing in the largest male.

A relatively large yet sexually immature female from New Caledonia (cl 5.5 mm, cw 9.0 mm; MNHN-B 29366) had two acute teeth on the distal half of the inner margin of the cheliped merus, an acute and conspicuous tooth on the inner margin of the cheliped carpus, and a small tooth only on the posterior angle of the carpus of the left cheliped. The fingers were long and shovel-like, and the dactylus and propodus had long setae on the outer margins. The dorsal surface of the carapace had two shallow ridges and two slight prominences just posterior of each of the outer orbital teeth. The outer orbital tooth was similar to those of *Singhaplax* but not as prominent. These characters depart so much from those in the holotype and five other specimens of *S. wolffi* that were examined that it seems certain that they are not conspecific, perhaps not even congeneric.

#### Genus *Microgoneplax* n. gen.

*Ommatocarcinus* – Chen 1998: 285 (part).

TYPE SPECIES. — *Microgoneplax caenis* n. sp. (by present designation; gender feminine).

SPECIES INCLUDED. — *Microgoneplax caenis* n. sp.; *M. cope* n. sp.; *M. elegans* (Chen, 1998) n. comb.; *M. pelecis* n. sp.; *M. prion* n. sp.

All species are restricted to the Indo-West Pacific region.

ETYMOLOGY. — From *mikros*, Greek for “small,” in reference to the small size of the G2 (much shorter than the G1) and the small overall size of the known species, and the generic name *Goneplax*, to indicate that although the species included in the new genus superficially resemble *Goneplax* in the general shape of their carapaces and elongated eye peduncles, they actually belong to a separate genus.

#### DESCRIPTION

Adults of small size (cw rarely more than 4.5 mm). Carapace (Figs 41A; 42; 43A; 44A; 45A; 46; Chen 1998: fig. 14-1, as *Ommatocarcinus elegans*) transversely rectangular, wider than long, relatively wider in larger individuals; widest at conspicuous outer orbital

teeth; front slightly deflected ventrally, straight to slightly convex, not marked by median emargination (emargination described in *M. elegans* n. comb. [Chen 1998: fig. 14-2]). Notch between front, inner edge of supraorbital border. Orbits wide, greatly expanded distally; supraorbital borders conspicuously sinuous, with tubercles; suborbital borders sinuous, with wide inner tooth not visible dorsally. Dorsal surface of carapace smooth, moderately convex, without clear indication of regions. Outer orbital angle with conspicuous, outwardly oriented, acute tooth; tooth medially placed on carapace. Slightly convex lateral borders without anterolateral teeth. Basal antennal article short, distalmost (third) article nearly reaches front. Eye peduncles long (Figs 41A; 42; 43A; 44A; 45A; 46; Chen 1998: fig. 14-1, as *Ommatocarcinus elegans*), slightly shorter or as long as front (0.7-1.0 front width); cornea elongated, spherical distal margin, not reniform (not conspicuously dorso-ventrally flattened, not clearly divided into anterior, posterior portions). Subhepatic, pterygostomial regions, with low, round tubercles. Anterior border of endostome well demarcated from buccal cavern, ridges faint but clearly defined. Third maxillipeds nearly completely close the buccal cavern. No obvious stridulating mechanism other than possible rubbing of proximal portion of cheliped (P1) merus against tubercles of pterygostomial ridge. Thoracic sternum wide. Median sulcus on thoracic sternite 4 absent; sutures 4/5, 5/6, 7/8 interrupted medially, 6/7 complete. Anterior end of sterno-abdominal cavity anterior to thoracic sternite 4. Cheliped fingers (Figs 42; 46; Chen 1998: figs 14-3, 14-4, as *O. elegans*) long, slender, shovel-like, curved (conspicuously curved in large males), shorter than elongated propodus; inner (ventral) margin of propodus with large, round tubercles particularly in large males; carpus with blunt tooth on inner margin; merus typically with conspicuous tubercles on outer (dorsal) margin, long simple setae. Dorsal margins of ambulatory leg (P2-P5) meri (Figs 42; 46) unarmed, dactyli slender, with carina on each side. Male abdomen (Fig. 41B) with 6 freely-movable somites plus telson, narrowly triangular (relatively wide in *M. elegans* n. comb.; see Chen 1998: fig. 14-6, as *O. elegans*), somites 4-6 gradually decreasing in width from somite 3 (widest somite). Telson longer than wide. Somite 3 covers

most space between P5 coxae, somite 2 slightly narrower than somite 3; somites 1, 2 leave large portion of thoracic sternite 8 visible. G1 (Figs 41C; 43B; 44B; 45B; Chen 1998: fig. 14-7, as *O. elegans*) long, slender, slightly broadened proximally, distal end varies among species. G2 (Figs 41D; 43C; 44C; 45C; Chen 1998: fig. 14-8, as *O. elegans*) short, less than half G1 length; slightly curved, thick flagellum about same length of proximal part (peduncle), much expanded tip. Penis arising from P5 coxa, moderate size, soft proximal expansion. Female abdomen with 6 freely-movable somites, wide. Telson much wider than long. Somite 3 covers space between P5 coxae, somite 2 slightly narrower than somite 3; somites 1, 2 leave small portion of thoracic sternite 8 visible. Vulva of mature females not expanded, ovoid, extending from 5/6 suture to median portion of thoracic sternite 6, vulvar cover present.

## REMARKS

*Microgoneplax* n. gen. is being described as a new genus to accommodate the small-size species of *Goneplax sensu lato* where the G2 is much shorter than the G1, in contrast to *Singhaplax* where the G2 is longer or as long as the G1. Both genera share the basic morphology of the carapace and pereopods (see Remarks for *Singhaplax* above). There are, however, some additional differences. The male abdomen is wide (narrow in *Singhaplax*, except in one species),

the front is straight (slightly convex in *Singhaplax*), the suborbital tooth is conspicuous (short or obsolete in *Singhaplax*), and the inner (ventral) margin of the P1 merus has conspicuous tubercles (smooth or with short granules in *Singhaplax*). The outer orbital teeth are always medially placed on the carapace, whereas in some species of *Singhaplax* they are more anteriorly placed.

A short G2, the most derived character (Guinot 1979: 243), is also present in *Paragoneplax* n. gen., but absent in the remaining members of the Goneplacidae *sensu lato*. The significance of this character in the suprageneric classification of the Goneplacidae is discussed in the description of *Paragoneplax* n. gen. (see above).

Members of the species of *Microgoneplax* n. gen. are also characterized by their small size. Males of different species can be distinguished because of their characteristic G1 but females are difficult to identify, particularly if they are pre-adults, do not have a characteristic vulva, or lack both chelipeds (P1). Females have been collected together with males of two different species, so co-occurrence of males and females is not always a reliable way to identify females.

Other characters that separate *Microgoneplax* n. gen. from *Goneplax sensu stricto* and the five Indo-West Pacific genera that include species that were formerly included in *Goneplax sensu lato* are summarized in Table 4.

KEY TO SPECIES OF *MICROGONEPLAX* N. GEN.

1. G1 with pointed tip, without denticles, conspicuously bent median portion thicker than tip with row of large denticles along inner and outer margins (see Fig. 41C). G2 with two terminal spinules (see Fig. 41D) ..... *Microgoneplax caenis* n. sp.  
— G1 with pointed tip with denticles, median portion not bent. G2 with one terminal spicule or process ..... 2
2. G1 slender throughout its length, slightly sinuous, without broadened median portion ... 3  
— G1 with broadened median portion, not sinuous ..... 4
3. Male abdomen broad (see Chen 1998: fig. 14-6, as *Ommatocarcinus elegans*) .....  
..... *Microgoneplax elegans*  
— Male abdomen slender (similar to abdomen of *Microgoneplax caenis*: see Fig. 41B) .....  
..... *Microgoneplax prion* n. sp.
4. G1 with straight distal part; broadened, paddle-like median portion (see Fig. 43B) .....  
..... *Microgoneplax cope* n. sp.  
— G1 with conspicuously bent distal part bordered by sparse, large denticles (see Fig. 44B)  
..... *Microgoneplax pelecis* n. sp.

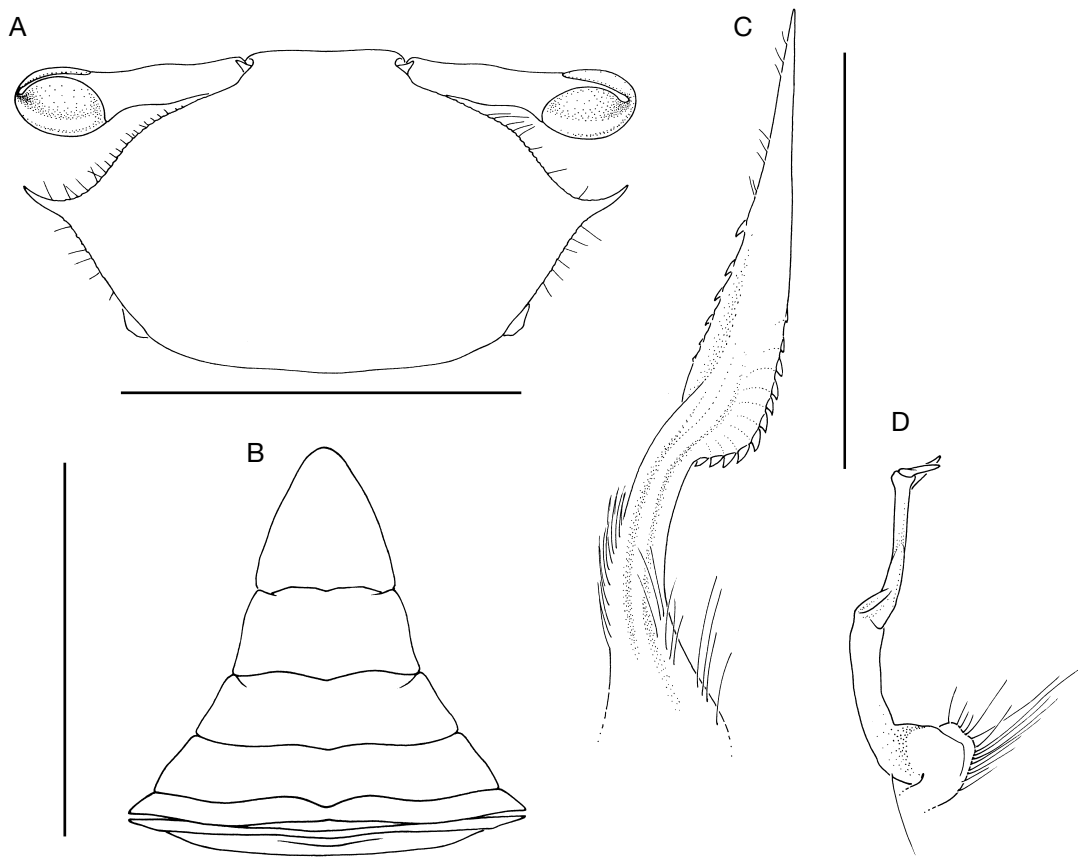


FIG. 41. — *Microgoneplax caenis* n. sp., ♂ holotype, cl 4.2 mm, cw 7.1 mm, between Panglao and Pamilacan islands, Philippine Is, PANGLAO 2004, stn T27 (NMCR 27014): **A**, dorsal surface of the carapace; **B**, abdomen; **C**, right G1, ventral view; **D**, right G2, ventral view. Scale bars: A, 5 mm; B, 2 mm; C, D, 1 mm.

*Microgoneplax caenis* n. sp.  
(Figs 41; 42)

TYPE MATERIAL. — PANGLAO 2004, stn T27, ♂ holotype, cl 4.2 mm, cw 7.1 mm (NMCR 27014). Paratypes: seven other males, four females, and one pre-adult specimen from the type locality as listed under Material examined.

TYPE LOCALITY. — Philippine Islands, between Panglao and Pamilacan islands, 09°33.4'N, 123°51.0'E, 106-137 m.

MATERIAL EXAMINED. — **Philippine Islands.** Bohol, Balicasag I., off Panglao I., PANGLAO 2004, stn T27, between Panglao and Pamilacan islands, 09°33.4'N, 123°51.0'E, 106-137 m, fine sand and mud, 25.VI.2004, 1 ♂ holotype cl 4.2 mm, cw 7.1 mm (NMCR 27014); 3 ♂ paratypes (cl 3.4 mm, cw 5.8 mm; cl 2.9 mm, cw

4.7 mm; cl 2.3 mm, cw 3.6 mm), 1 ♂ paratype feminized by two *Sacculina* parasites (cl 3.2 mm, cw 5.5 mm), 1 ♀ paratype (cl 3.4 mm, cw 6.3 mm), 2 pre-adult ♀ paratypes (cl 2.8 mm, cw 4.7 mm; cl 2.6 mm, cw 4.3 mm), 1 pre-adult paratype (cl 1.6 mm, cw 3.3 mm) (ZRC 2004.0788); 3 ♂ paratypes (cl 3.6 mm, cw 6.6 mm; cl 2.7 mm, cw 4.9 mm; cl 2.2 mm), 1 pre-adult ♀ paratype (cl 2.6 mm, cw 4.3 mm) (MNHN-B 30062). — Stn T9, Panglao I. off San Isidro, 09°33.5'-09°33.9'N, 123°49.5'-123°50.5'E, 97-120 m, fine sand with seagrass, 14.V.2004, 1 ♂ paratype (ZRC 2006.0171).

ETYMOLOGY. — From *caenis*, noun in apposition, Greek for “knife,” in reference to the knife-like G1 characteristic of the species.

DISTRIBUTION. — Known only from the Philippine Is. Depth: 106-137 m.



FIG. 42. — *Microgoneplax caenis* n. sp., ♂ holotype, cl 4.2 mm, cw 7.1 mm, between Panglao and Pamilacan islands, Philippine Is, PANGLAO 2004, stn T27 (NMCR 27014).

#### DESCRIPTION

Carapace (Figs 41A; 42) transversely rectangular, much wider than long (1.7 as wide as long in holotype). Carapace convex, without clear indication of regions. Front slightly convex, almost straight. Notch between front, inner edge of supraorbital border. Supraorbital borders broad, conspicuously sinuous, finely granular, with long simple setae. Suborbital borders conspicuously sinuous, with large granules, each with large, wide, rectangular inner tooth not visible dorsally. Long, slender, acute tooth on outer orbital angle. Lateral borders beyond outer orbital teeth slightly convex, no anterolateral teeth.

Subhepatic, pterygostomial regions, with low, round tubercles.

Eye peduncles (Figs 41A; 42) long (0.7 front width), cornea elongated, spherical distal margin, not reniform.

Chelipeds (P1) (Fig. 42) slightly unequal in males, nearly equal in females; fingers slender, slightly curved, shovel-like, slightly shorter than propodus, with blunt teeth, dactylus conspicuously curved in heavier chelipeds of large males; no dark colour on fingers; inner (ventral) margin of propodus with

large, round tubercles in large males. Broad tooth on inner (ventral), proximal margin of carpus; outer (dorsal) margin of merus with low, tooth-like tubercles, long simple setae. Ambulatory legs (P2-P5) (Fig. 42) long, slender, unarmed, varying number of long simple setae; dactyli long, slender, each with 2 carinae along each side; length of P5 merus 0.7 cl.

Male abdomen (Fig. 41B) narrowly triangular, with 6 freely-movable somites plus telson; telson longer than wide. Somite 3 covers most space between P5 coxae; somite 2 only slightly narrower than somite 3, leaving large portion of thoracic sternite 8 visible. G1 (Fig. 41C) long, slender, slightly wider basal part, straight distal part; median portion bent, thicker, with rounded inner margin, large denticles along inner, outer margins; slender, pointed tip. G2 (Fig. 41D) slender, short, less than half G1 length; slightly curved, thick flagellum about same length of proximal part (peduncle), expanded tip with 2 large terminal spinules.

Female abdomen wide, outer margin of thoracic sternites visible. Telson much wider than long. Somite 3 covers space between P5 coxae, somites 1,

2 narrower than somite 3, leaving large portion of thoracic sternite 8 visible. Vulva of mature female paratype small, extending from edge of suture 5/6 to median portion of thoracic sternite 6, covered by large, flat vulvar cover leaving semi-circular inner opening.

#### REMARKS

The relatively abundant material of specimens of varying sizes and belonging to both sexes, all collected from one station in the Philippine Is, allows the description of the new species. The species has not yet been collected elsewhere.

Diagnostic of the species is its characteristic G1. It has a slender and pointed tip, and the median portion is bent, thicker than the tip, and with a row of large denticles along the inner and outer margins (Fig. 41C). The G2 is also diagnostic, having an expanded tip with two large terminal spinules (Fig. 41D). The male abdomen is slender as in all congeners except *M. elegans* (Chen, 1998) n. comb.

### *Microgoneplax cope* n. sp. (Fig. 43)

TYPE MATERIAL. — MUSORSTOM 7, stn DW 513, ♂ holotype, cl 4.4 mm, cw 8.4 mm (MNHN-B 30063).

TYPE LOCALITY. — Southwestern Pacific Ocean, Futuna I., 14°13'S, 178°11'W, 260-300 m.

MATERIAL EXAMINED. — **Futuna Island.** MUSORSTOM 7, stn DW 513, 14°13'S, 178°11'W, 260-300 m, 12.V.1992, ♂ holotype, cl 4.4 mm, cw 8.4 mm (MNHN-B 30063).

ETYMOLOGY. — From *kope*, noun in apposition, Greek for "oar" or "paddle", in reference to the expanded, paddle-like G1 diagnostic of the species.

DISTRIBUTION. — Known only from Futuna I., southwestern Pacific Ocean. Depth: 260-300 m.

#### DESCRIPTION

Carapace (Fig. 43A) transversely rectangular, much wider than long (1.9 as wide as long in holotype). Carapace convex, without clear indication of regions. Front slightly convex, almost straight. Slight notch

between front, inner edge of supraorbital border. Supraorbital borders broad, conspicuously sinuous, smooth, with long simple setae. Suborbital borders conspicuously sinuous, finely granular, each with large, wide, rectangular inner tooth not visible dorsally. Long, slender, acute tooth on outer orbital angle. Lateral borders beyond outer orbital teeth slightly convex, no anterolateral teeth.

Subhepatic, pterygostomial regions, with low, round tubercles.

Eye peduncles (Fig. 43A) long (0.7 front width), cornea elongated, spherical distal margin, not reniform.

Chelipeds (P1) unequal in male holotype (female unknown); fingers slender, slightly curved, shovel-like, slightly shorter than propodus, with blunt teeth; no dark colour on fingers; inner (ventral) margin of propodus with round tubercles. Broad tooth on inner (ventral), proximal margin of carpus; outer (dorsal) margin of merus with low, tooth-like tubercles, long simple setae. Ambulatory legs (P2-P5) long, slender, unarmed, varying number of long simple setae; dactyli long, slender, each with 2 carinae along each side; length of P5 merus 0.8 cl.

Male abdomen narrowly triangular, with 6 freely-movable somites plus telson; telson longer than wide. Somite 3 covers most space between P5 coxae; somite 2 only slightly narrower than somite 3, leaving large portion of thoracic sternite 8 visible. G1 (Fig. 43B) long, slender, slightly wider basal part with long plumose setae, thick denticles along inner margin of distal part; slender, pointed tip. G2 (Fig. 43C) slender, short, less than half G1 length; slightly curved, thick flagellum about same length of proximal part (peduncle), much expanded, broad tip with terminal spinule.

Female unknown.

#### REMARKS

The species is being described from only one male specimen from Futuna I., southwestern Pacific Ocean. Its G1 (Fig. 43B), much broadened in the median portion and thus paddle-shaped and its median portion bordered by thick denticles, is unique among the species of *Microgoneplax* n. gen. The G2 (Fig. 43C) has only one terminal spinule.



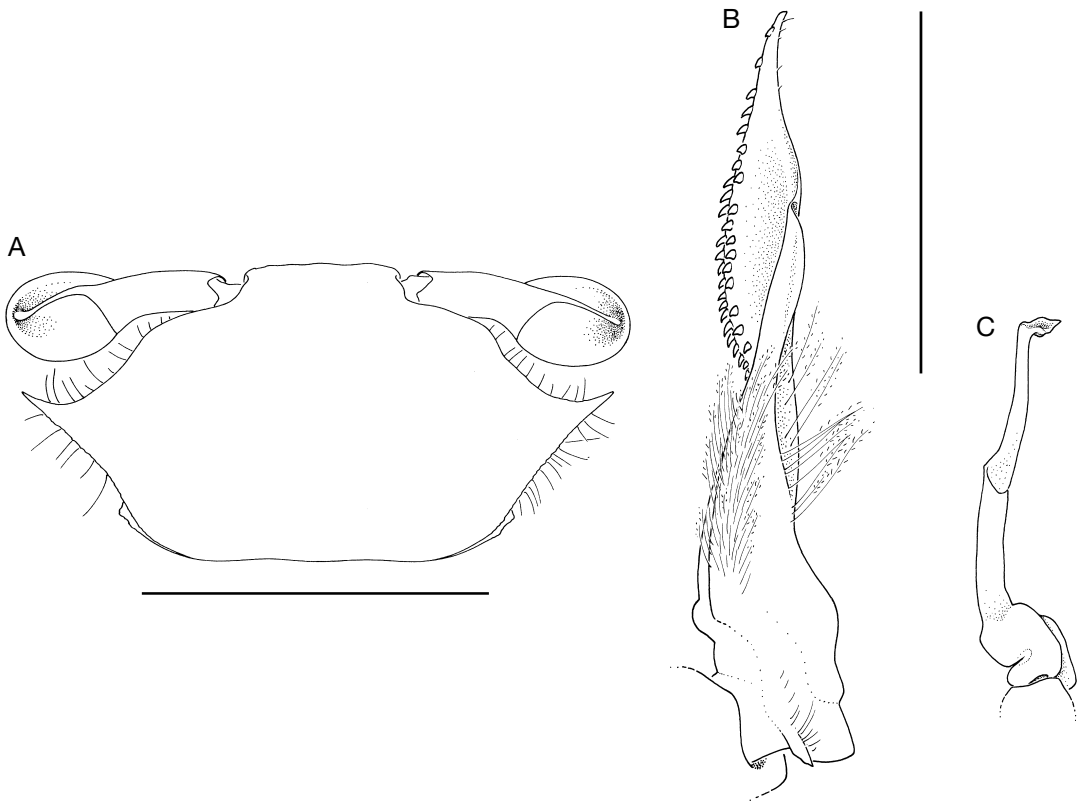


FIG. 43. — *Microgoneplax cope* n. sp., ♂ holotype, cl 4.4 mm, cw 8.4 mm, Futuna I., South Pacific, MUSORSTOM 7, stn DW 513 (MNHN-B 30063): **A**, dorsal surface of the carapace; **B**, left G1, ventral view; **C**, left G2, ventral view. Scale bars: A, 5 mm; B, C, 1 mm.

*Microgoneplax elegans* (Chen, 1998) n. comb.

*Ommatocarcinus elegans* Chen, 1998: 285, 310 [in list], 313, fig. 14.

TYPE MATERIAL. — ♂ holotype (IOAS SSB III-34); ♂ paratype (IOAS SSB 2-3-11).

TYPE LOCALITY. — South China Sea, Nansha Is, 07°02.14'N, 108°52.29'E, 138 m.

MATERIAL EXAMINED. — **Chesterfield Islands**. MUSORSTOM 5, stn DW 296, 23°12.61'S, 159°36.27'E, 278 m, 11.X.1986, 1 ♂, cl 5.1 mm (MNHN-B 29316).

DISTRIBUTION. — South China Sea (Chen 1998) and now Chesterfield Is. Depth: 138-278 m.

REMARKS

*Microgoneplax elegans* n. comb. was described from two males collected in the South China Sea and placed

in *Ommatocarcinus* White, 1852. It clearly does not belong to *Ommatocarcinus*, which is characterized by a G2 that is slender and slightly shorter or longer than the G1, by greatly elongated eye peduncles that may extend well beyond the outer orbital angles, and by much larger adults (see Remarks for *Ommatocarcinus* below). It belongs instead in *Microgoneplax* n. gen. on account of a G2 that is much shorter than the G1, eye peduncles that are long but slightly shorter or as long as front and not extending beyond the outer orbital angles, and a small carapace size (cl 4.0-4.3 mm). Characteristic of the species and not found among congeners, however, is a relatively wide male abdomen and a front with a small, pointed prominence (Chen 1998: figs 14-2, 14-6).

A male specimen from the Chesterfield Is (cl 5.1 mm, MNHN-B 29316) was tentatively identified

as belonging to this species. It shares the wide abdomen and the general morphology of the G1 and G2 with *M. elegans* n. comb. The ventral view of the G1 is nearly identical to that shown in Chen (1998: fig. 14-7) except that the setae along the median portion are longer in the Chesterfield Is specimen than the setae shown in the figure. Dorsally, however, the G1 shows a carina-like, crested thickening along its median portion that is not shown in the figure, which unfortunately only shows the ventral surface. Another difference is the front, shown by Chen (1998: fig. 14-2) to have a small median prominence that was not found in the Chesterfield Is specimen. The type material (at IOAS) was not available for examination.

*Microgoneplax pelecis* n. sp.  
(Fig. 44)

TYPE MATERIAL. — KARUBAR, stn DW 29, ♂ holotype, cl 3.9 mm, cw 6.7 mm (MNHN-B 30065), ♂ paratype, cl 3.5 mm, cw 5.8 mm (MNHN-B 30066).

TYPE LOCALITY. — Indonesia, Kai Is, 05°36'S, 132°56'E, 181-184 m.

MATERIAL EXAMINED. — Indonesia, Kai Is, KARUBAR, stn DW 29, 05°36'S, 132°56'E, 181-184 m, 26.X.1991, ♂ holotype (MNHN-B 30065); ♂ paratype (MNHN-B 30066).

ETYMOLOGY. — From *pelekys*, noun in apposition, Greek for "ax" or "hatchet", in reference to the hatchet-like G1 diagnostic of the species.

DISTRIBUTION. — Known only from Indonesia (Kai Is). Depth: 181-184 m.

DESCRIPTION

Carapace (Fig. 44A) transversely rectangular, much wider than long (1.7 as wide as long in holotype). Carapace convex, without clear indication of regions. Front slightly convex, nearly straight. Notch between front, inner edge of supraorbital border. Supraorbital borders broad, conspicuously sinuous, finely granular, with long simple setae. Suborbital borders conspicuously sinuous, granular, each with large, wide, rectangular inner tooth not visible dorsally. Long, slender, acute tooth on outer orbital angle. Lateral borders beyond outer orbital teeth slightly curved, no anterolateral teeth.

Subhepatic, pterygostomial regions, with low, round tubercles.

Eye peduncles (Fig. 44A) long (0.8 front width), cornea elongated, spherical distal margin, not reniform.

Chelipeds (P1) unequal in holotype, only specimen having both chelipeds; fingers slender, dactylus curved in male holotype, slightly shorter than propodus (heavier chela of male holotype much shorter than propodus), with blunt teeth; dark colour on median portion of pollex of cheliped (second cheliped being regenerated) of paratype male; inner (ventral) margin of propodus with round tubercles in holotype, lower tubercles in paratype. Broad tooth on inner (ventral), proximal margin of carpus; outer (dorsal) margin of merus with low, tooth-like tubercles (larger in male holotype), long simple setae. Ambulatory legs (P2-P5) long, slender, unarmed, varying number of long simple setae; dactyli long, slender, each with 2 carinae along each side.

Male abdomen narrowly triangular, with 6 freely-movable somites plus telson; telson longer than wide. Somite 3 covers most space between P5 coxae; somite 2 only slightly narrower than somite 3, leaving large portion of thoracic sternite 8 visible. G1 (Fig. 44B) long, slender, wide basal part; outwardly bent, broadened distal part with large denticles along borders, pointed tip. G2 (Fig. 44C) slender, short, less than half G1 length; slightly curved, thick flagellum about same length of proximal part (peduncle), much expanded, flattened tip with terminal spinule.

Female unknown.

REMARKS

*Microgoneplax pelecis* n. sp. can be easily differentiated from congeners by its characteristic hatchet-like G1. The medially-placed outer orbital teeth are slightly more slender than in the other species.

Five females (one pre-adult parasitised by a bopyrid, three mature, one ovigerous; MNHN-B 29212) collected from station DW 29 of KARUBAR Expedition to the Kai Is could not be reliably identified since males of *M. pelecis* n. sp. as well as males of five species of *Singhaplax* were also collected from the same station. Males of species of these two genera can be differentiated because of their G1 and G2. The identification

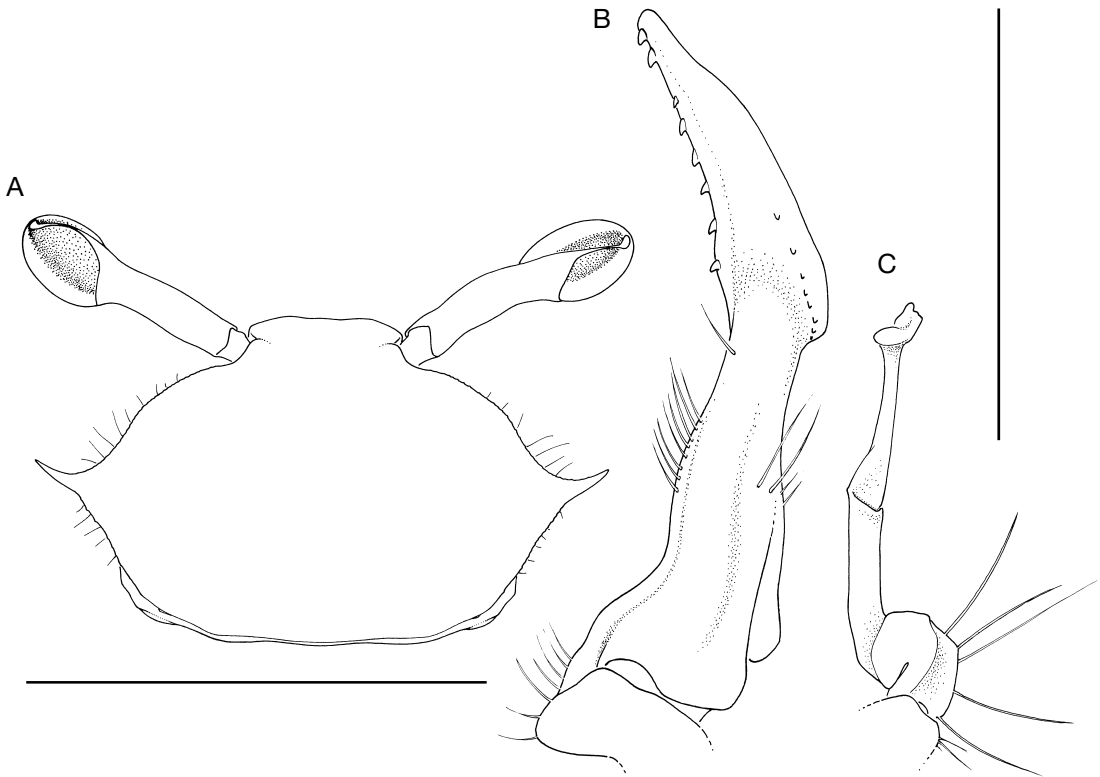


FIG. 44. — *Microgoneplax pelecis* n. sp., ♂ holotype, cl 3.9 mm, cw 6.7 mm, Kai Is, Indonesia, KARUBAR, stn DW 29 (MNHN-B 30065): **A**, dorsal surface of the carapace; **B**, left G1, ventral view; **C**, left G2, ventral view. Scale bars: A, 5 mm; B, C, 1 mm.

of females, on the other hand, is a difficult task. The vulvae of the four mature females of station DW 29 were all round, without a vulvar cover, and without the displaced suture 5/6 that has been identified in one mature female collected together with the males of *S. styrax* n. sp. (see above). The inner suborbital tooth was conspicuous (but blunt, not rectangular), which suggests their possible but highly questionable identification as *M. pelecis* n. sp.

*Microgoneplax prion* n. sp.  
(Figs 45; 46)

**TYPE MATERIAL.** — MUSORSTOM 5, stn DW 280, ♂ holotype, cl 3.9 mm, cw 7.3 mm (MNHN-B 29318). Paratypes: one male and six female specimens from the Chesterfield Is and New Caledonia as listed under Material examined.

**TYPE LOCALITY.** — Chesterfield Islands, 24°09.99'S, 159°35.75'E, 270 m.

**MATERIAL EXAMINED.** — **Chesterfield Islands.** MUSORSTOM 5, stn DW 280, 24°09.99'S, 159°35.75'E, 270 m, 10.X.1986, 1 ♂ holotype cl 3.9 mm, cw 7.3 mm (MNHN-B 29318). — Stn DW 281, 24°10.54'S, 159°34.32'E, 272 m, 10.X.1986, 1 ♀ paratype cl 3.6 mm (MNHN-B 29320). — Stn DW 299, 22°47.70'S, 159°23.70'E, 370-390 m, 11.X.1986, 1 pre-adult ♀ parasitised by bopyrid cl 4.6 mm, cw 8.9 mm (MNHN-B 29321). — Stn DW 334, 20°06.27'S, 158°47.62'E, 315-320 m, 15.X.1986, 1 ♀ paratype cl 4.8 mm, cw 9.1 mm (MNHN-B 29319). — Stn DC 376, 19°51.10'S, 158°29.80'E, 280 m, 20.X.1986, 1 ovig. ♀ paratype cl 6.4 mm, cw 11.7 mm (MNHN-B 29315). **EBISCO**, stn DW 2509, 24°08'S, 159°35'E, 265 m, 8.X.2005, 1 ♂ cl 4.6 mm (MNHN-B 30460). **New Caledonia.** BATHUS 4, stn CP 901, 19°02.72'S, 163°15.39'E, 297 m, 4.VIII.1994, 1 ♂ paratype cl 3.7 mm, cw 6.6 mm; 2 ♀♀ paratypes (cl 4.0 mm, cw 7.8 mm; cl 3.3 mm, cw 6.5 mm) (MNHN-B 29339).

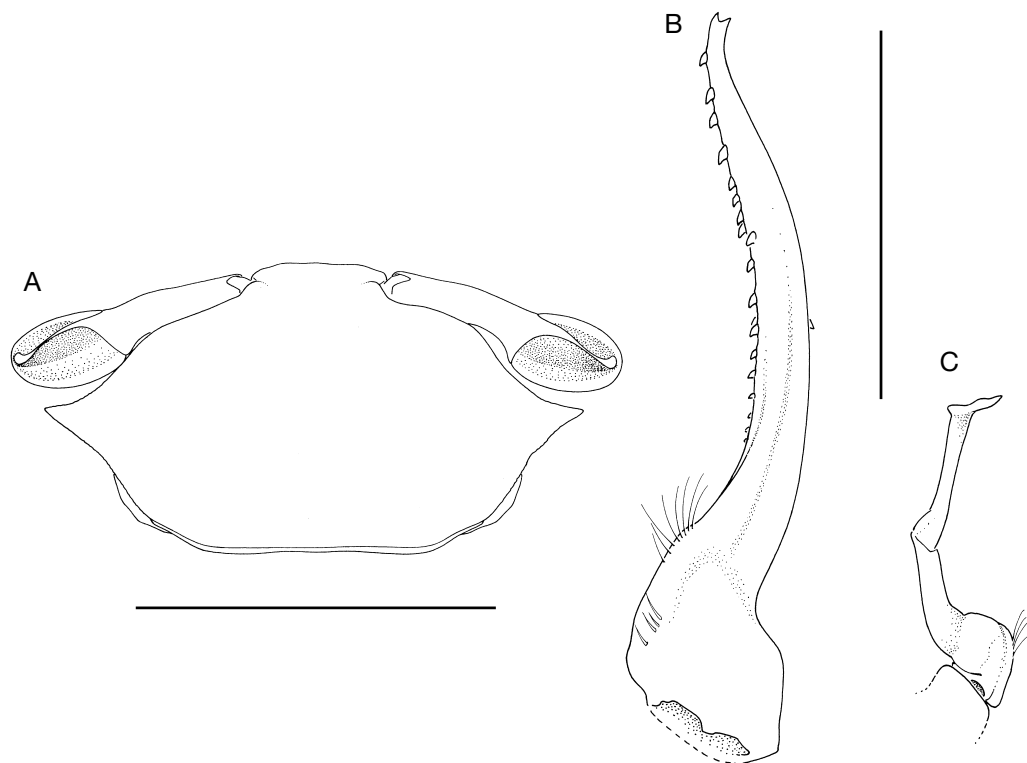


FIG. 45. — *Microgoneplax prion* n. sp., ♂ holotype, cl 3.9 mm, cw 7.3 mm, Chesterfield Is, MUSORSTOM 5, stn DW 280 (MNHN-B 29318); **A**, dorsal surface of the carapace; **B**, left G1, ventral view; **C**, left G2, ventral view. Scale bars: A, 5 mm; B, C, 1 mm.

**ETYMOLOGY.** — From *prion*, noun in apposition, Greek for “saw”, in reference to the thin, denticulated, saw-like G1 characteristic of the species.

**DISTRIBUTION.** — Chesterfield Is and New Caledonia. Depth: 265–297 m.

#### DESCRIPTION

Carapace (Figs 45A; 46) transversely rectangular, much wider than long (1.9 as wide as long in holotype). Carapace convex, without clear indication of regions. Front slightly convex, almost straight. Notch between front, inner edge of supraorbital border. Supraorbital borders broad, conspicuously sinuous, finely granular, with long simple setae. Suborbital borders conspicuously sinuous, granular, each with large, wide, rectangular inner tooth not visible dorsally. Relatively short, nearly triangular tooth on outer orbital angle. Lateral borders beyond outer orbital teeth slightly convex, no anterolateral teeth.

Subhepatic, pterygostomial regions, with low, round tubercles.

Eye peduncles (Figs 45A; 46) long (equal to front width), cornea elongated, spherical distal margin, not reniform.

Chelipeds (P1) (Fig. 46) unequal in both sexes; fingers slender, dactylus strongly curved in males, slightly curved in females, shovel-like, slightly shorter than propodus (heavier chela of male holotype much shorter than propodus), with blunt teeth; no dark colour on fingers; inner (ventral) margin of propodus with large, round tubercles in holotype, small tubercles in remaining specimens. Broad tooth on inner (ventral), proximal margin of carpus; outer (dorsal) margin of merus with low, tooth-like tubercles (larger in male holotype), long simple setae. Ambulatory legs (P2–P5) (Fig. 46) long, slender, unarmed, varying number of long simple setae; dactyli long, slender,



FIG. 46. — *Microgoneplax prion* n. sp., ♂ holotype, cl 3.9 mm, cw 7.3 mm, Chesterfield Is, MUSORSTOM 5, stn DW 280 (MNHN-B 29318) (photo by P. Laboute, IRD, Nouméa).

each with 2 carinae along each side; length of P5 merus 0.8 cl.

Male abdomen narrowly triangular, with 6 freely-movable somites plus telson; telson longer than wide. Somite 3 covers most space between P5 coxae; somite 2 only slightly narrower than somite 3, leaving large portion of thoracic sternite 8 visible. G1 (Fig. 45B) long, slender, thin, slightly wider basal part, sinuous distal part with denticles along inner margin; slender, pointed tip with 2 minute processes. G2 (Fig. 45C) slender, short, less than half G1 length; slightly curved, thick flagellum about same length of proximal part (peduncle), much expanded tip with terminal spinule.

Female abdomen wide, outer margin of thoracic sternites visible. Telson much wider than long. Somite 3 covers space between P5 coxae, somites 1, 2 narrower than somite 3, leaving small portion of thoracic sternite 8 visible. Vulva of mature females relatively large, oblong, extending from edge of suture 5/6 to median portion of thoracic sternite 6, covered by small, rounded vulvar cover on inner margin plus a small projection on pos-

terior margin; thin vulvar cover on enlarged vulva of large females.

#### COLOUR

The holotype, which was photographed soon after collection (Fig. 46), was transparent, with a few irregular orange-yellow marking on the carapace and chelipeds.

#### REMARKS

The G1 of the new species is similar to that of *Microgoneplax elegans* n. comb. (see Chen 1998: fig. 14-7, as *Ommatocarcinus elegans*). In both species the G1 is slender along the entire length without a broad median portion. It is nevertheless straighter and has larger denticles in the new species. A more diagnostic difference between the two species is the much wider male abdomen of *M. elegans* n. comb. (Chen 1998: fig. 14-6). The outer orbital tooth of *M. prion* n. sp. is relatively short and nearly triangular (Figs 45A; 46), not as slender as in *M. elegans* n. comb. and its congeners.

An unusually large female (cl 6.4 mm, cw 11.7 mm; MNHN-B 29315) agreed with all of the characters of the species except the vulva. It was large, reminiscent of that of *Carcinoplax* in its relative size. The vulva was oblong, with square anterior margins, slightly pointed posterior margins, and extending from 5/6 suture to 6/7 suture. Both sutures were slightly displaced, curving around the margins of the vulva. The vulva was covered by a thin, sclerified vulvar cover.

### Genus *Ommatocarcinus* White, 1852

*Ommatocarcinus* White, 1852: 393. — H. Milne Edwards 1852: 163. — Miers 1886: xiv, 237 [in list], 246. — Ortmann 1898: 1176 [in list]. — Alcock 1900: 293 [in list]. — Chilton & Bennett 1929: 757 (part). — Sakai 1939: 563 [in key], 564; 1940: 47, 48 [in list]. — Barnard 1950: 282 [in key], 285. — Bals 1957: 1656 (part). — Guinot-Dumortier & Dumortier 1960: 142, 144 [stridulating mechanism]. — Bennett 1964: 74 [discussion] (part). — Serène 1968: 89 [in list]. — Glaessner 1969: R525 [diagnosis]. — Guinot 1969b: 520, 523 [discussion]; 1971: 1081 [list of species] (part). — Takeda & Miyake 1969b: 174 [discussion] (part). — Dai *et al.* 1986: 377 [key to species]. — Yamaguchi *et al.* 1987: 23. — Chen 1998: 285 (part). — Davie 2002: 200 [diagnosis]. — Dai & Yang 1991: 407 [key to species]. — Karasawa & Kato 2003b: 130 [in list], 140 [in list], 141 [in table] (part). — Poore 2004: 438. — Karasawa & Schweitzer 2006: 40 (part).

Not *Ommatocarcinus* – Filhol 1885b: 384 (= *Neommatocarcinus* Takeda & Miyake 1969).

Not *Ommatocarcinus* – Tesch 1918: 186 (= *Singhaplax* Serène & Soh, 1976).

TYPE SPECIES. — *Ommatocarcinus macgillivrayi* White, 1852 (by monotypy, gender masculine). Name placed in Official List of Names in Zoology (with the officially designated type species) in Opinion 85, Direction 37 (see Melville & Smith 1987: 135).

EXTANT SPECIES INCLUDED. — *Ommatocarcinus fibriophthalmus* Yokoya, 1933; *O. granulatus* Chen, 1998; *O. macgillivrayi* White, 1852; *O. pulcher* Barnard, 1950

All species are restricted to the Indo-West Pacific region (one species has been recorded from temperate waters in New Zealand but this is most probably the result of misidentifications).

FOSSIL SPECIES INCLUDED (Karasawa & Kato [2003b]). — *Ommatocarcinus corioensis* (Creswell, 1886), *Ommatocarcinus* sp. cf. *O. macgillivrayi* White, 1852, *O. taiwanicus* Hu & Tao, 1996, *Ommatocarcinus* sp. of Feldmann & Keyes (1992).

SPECIES NOT INCLUDED IN *OMMATOCARCINUS*. — *Ommatocarcinus elegans* Chen, 1998 (in *Microgoneplax* n. gen.)

*Ommatocarcinus orientalis* Tesch, 1918 (in *Singhaplax* Serène & Soh, 1976)

DIAGNOSIS. — Carapace (Barnard 1950: fig. 53b; Poore 2004: fig. 141a) transversely rectangular, much wider than long; widest at conspicuous outer orbital teeth; front (Barnard 1950: 53d) deflected ventrally, slight median projection. Wide notch between front, inner edge of supraorbital border; orbits wide, greatly expanded distally; supraorbital borders sinuous, concave; suborbital borders slightly sinuous, with wide, obtuse inner tooth not visible dorsally; anterolateral borders convex. Dorsal surface of carapace smooth or conspicuously granular, with slight horizontal ridges, moderately convex, without clear indication of regions. Outer orbital angle with conspicuous, acute tooth; anterolateral tooth absent (obtuse prominence in *O. fibriophthalmus* Yokoya, 1933). Basal antennal article short, distalmost (third) article reaches front. Eye peduncles long, much longer than front (at least 3 times front width); cornea elongated, not reniform (not conspicuously dorso-ventrally flattened, not clearly divided into anterior and posterior portions). Stridulating mechanism of rubbing proximal portion of cheliped (P1) merus against pterygostomial ridge. Thoracic sternum wide. Median sulcus on thoracic sternite 4 absent; sutures 4/5, 5/6, 7/8 interrupted medially, 6/7 complete. Anterior end of sterno-abdominal cavity anterior to thoracic sternite 4. Cheliped fingers long, slender, slightly curved, shorter than elongated propodus; varying portion of fingers may be darker in colour, tip light; carpus with broad tooth on inner margin (merus with median tooth in *O. macgillivrayi*). Dorsal margins of ambulatory leg (P2-P5) meri smooth or with acute distal tooth; dactyli slender, dorso-ventrally flattened, with carina on each side, setose. Male abdomen with 6 freely-movable somites plus telson, relatively wide, somites 4-6 gradually decreasing in width from somite 3 (widest somite). Telson slightly longer than wide. Somite 3 covers space between P5 coxae, somite 2 much narrower than somite 3 so that somites 1, 2 leave small to large portion of thoracic sternite 8 visible. G1 (Barnard 1950: fig. 53f; Dai & Yang 1991: fig. 199-1, 199-2) long, slender, thin, slightly sinuous, only slightly broadened proximally; pointed, thin tip. G2 slender, slightly longer than G1, flagellum shorter than proximal part (peduncle); curved, slightly-expanded tip with 2 spinules. Penis arising from P5 coxa, moderate size; broad, soft proximal expansion. Female abdomen with 6 freely-movable somites, wide. Telson much wider than long. Somite 3 covers space between P5 coxae, somite 2 slightly narrower than somite 3 but somites 1, 2

leave relatively large portion of thoracic sternite 8 visible. Vulva of mature females ovoid, enlarged, extending from deflected 5/6 suture to close to 6/7 suture, covered by soft membrane, vulvar cover absent.

## REMARKS

The four species of *Ommatocarcinus* are characterised by greatly elongated eye peduncles and

orbits, which together with a wide, transversely rectangular carapace, and conspicuous, acute outer orbital teeth show striking convergence with species of *Microgoneplax* n. gen., *Neommatocarcinus*, *Singhaplax*, and in some ways with *Goneplax sensu stricto*. Species of these genera inhabit soft subtidal bottoms at moderate depths.

KEY TO SPECIES OF *OMMATOCARCINUS* WHITE, 1852

1. Conspicuous prominence on anterolateral borders of carapace. At least half of length of eye peduncles extends beyond outer orbital teeth (see Sakai 1976: fig. 286) ..... *Ommatocarcinus fibriophthalmus*  
— No prominence or teeth on anterolateral borders of carapace. Eye peduncles only extend slightly beyond outer orbital teeth or clearly extend beyond outer orbital teeth but by less than half (about third) of the length of peduncles (see Chen 1998: fig. 13-1) ..... 2
2. Meri of ambulatory legs (P2-P5) smooth, without dorsal, distal tooth ..... *Ommatocarcinus pulcher*  
— Merus of each ambulatory leg (P2-P5) with one dorsal, distal tooth ..... 3
3. Carapace wide (cw 2.3 times cl). Cheliped merus with dorsal, median tooth ..... *Ommatocarcinus macgillivrayi*  
— Carapace narrow (cw 1.8 times cl) (see Chen 1998: fig. 13-1). Cheliped merus smooth, without dorsal, median tooth ..... *Ommatocarcinus granulatus*

*Ommatocarcinus macgillivrayi* White, 1852

*Ommatocarcinus Mac-Gillivrayi* White, 1852: 393, pl. 5, fig. 1 [Australia].

*Ommatocarcinus macgillivrayi* – H. Milne Edwards 1852: 163. — Haswell 1882: 90 [Australia]. — Filhol 1885b: 385 [discussion]. — Stebbing 1893: 92. — Guinot-Dumortier & Dumortier 1960: 120 [stridulating mechanism], fig. 3. — Guinot 1969b: 523 [discussion], figs 69, 70; 1971: 1081 [in list]. — Griffin & Campbell 1969: 151, figs 4, 6D [Australia]. — Serène & Vadon 1981: 120, 122 [Philippine Is]. — Dai *et al.* 1986: 377 [in key], 377, fig. 199-1, pl. 55, fig. 2 [South China Sea]. — Dai & Yang 1991: 407 [in key], 407, fig. 199-1, pl. 55, fig. 2 (as *O. macgillivrayi* [sic]) [South China Sea]. — Karasawa & Kato 2003b: 130 [in list], 141 [in list]. — Poore 2004: 434 [in key], 438, fig. 141a [Australia].

Not *Ommatocarcinus macgillivrayi* – Miers 1886: xxiii, xxxvii, xlvi, 247 [New Zealand]. — Chilton 1911: 287 [in list], 292 [New Zealand]. — Thompson 1912: 237 [in list] [New Zealand]. — Thompson & Anderton 1921: 99, unnumb. figs [larvae] [New Zealand]. — Chilton & Bennett 1929: 757 [New Zealand]. — Richardson 1949: 36 [in key], fig. 21 [New Zealand]. — Dell 1960: 5; 1963a: 48, unnumb. fig.; 1968a: 26 [in list]; 1968b:

232, 233, 238 [New Zealand]. — Bennett 1964: 74, 88, figs 79-83 [New Zealand] (= *Neommatocarcinus huttoni* (Filhol, 1885)).

Not *Ommatocarcinus macgillivrayi* – Sakai 1934: 314, fig. 22; 1935: 187, fig. 96; 1939: 564, 722, pl. 102, fig. 5; 1956: 47 [in list]; 1965: 170, pl. 84, fig. 3 [colour]; 1976: 538, pl. 188, fig. 2 [colour] [Japan]. — Kamita 1963: 23 [in list], 28, fig. 4 [Japan]. — Miyake 1961: 21 [in list] [Japan]; 1991: 149, 220 [in list], pl. 50, fig. 5 [colour] [Japan]. — Takeda & Miyake 1969b: 174 [in list] [Japan]. — Kikuchi & Miyake 1978: 42 [in list] [Japan]. — Muraoka 1998: 47 [in list] [Japan]. — Takeda 2001: 248, 251, 256, 257 [Japan]. — Ikeda & Takeda 2006: 180, fig. 2G [colour] [in list] [Japan]. — Takeda *et al.* 2006: 205 [in list] [Japan] (= *Ommatocarcinus pulcher* Barnard, 1950).

Not *Ommatocarcinus macgillivrayi* [sic] – Miyake *et al.* 1962: 130 [in list] [Japan] (= *Ommatocarcinus pulcher* Barnard, 1950).

?Not *Ommatocarcinus macgillivrayi* – Guinot 1979: fig. 54H (? = *Neommatocarcinus huttoni* (Filhol, 1885)).

Not *Ommatocarcinus macgillivrayi* – Davie 2002: 200 [in list], unnumb. fig. after *Ommatocarcinus* sp. of Yokoya (1933: fig. 65) (? = *Ommatocarcinus pulcher* Barnard, 1950).

TYPE MATERIAL. — ♂ dry holotype, cl 23.8 mm, cw 56.8 mm (BMNH 50.11).

TYPE LOCALITY. — Australia, Queensland, Port Curtis.

MATERIAL EXAMINED. — **Australia.** Queensland, Port Curtis, ♂ holotype (BMNH 50.11).

New South Wales, Sow & Pig Shoal, Port Jackson, 33°50.3'S, 151°16.2'E, 9 m, *Triton*, 1 ♂ (ZRC 2000.2378). — Port Jackson, 33°51'S, 151°16'E, E. S. Coles coll., 1 ♀ (ZRC 2000.2379).

Unknown locality, 1 ♂ dry (BMNH).

DISTRIBUTION. — Reliably known only from Australia (see Poore 2004); also recorded from the Philippine Is (Serène & Vadon 1981), South China Sea (Dai & Yang 1991), and questionably from Japan and New Zealand. Depth: subtidal to 100 m (Poore 2004).

#### REMARKS

*Ommatocarcinus macgillivrayi* has often been confused with *O. pulcher* Barnard, 1950 (see Remarks for this species below), and many if not all records of *O. macgillivrayi* from Japan appear to be referable to *O. pulcher*. Illustrations and photographs given by Sakai (1935: fig. 96; 1939: pl. 102, fig. 5; 1976: pl. 188, fig. 5), Kamita (1963: fig. 4), Miyake (1991: pl. 50, fig. 5), and Ikeda & Takeda (2006: fig. 2G) show that the eye peduncle extends slightly beyond the outer orbital teeth (or should extend, in illustrations and photographs where the peduncles are extended anteriorly), a characteristic of *O. pulcher*. In contrast, only the distal margin of the eye itself slightly extends beyond the outer orbital teeth in *O. macgillivrayi*. The eye-peduncle length in relation to frontal length, however, is similar in both species, varying between 3.3 and 3.4 front width. A more reliable character is the acute tooth present on the distal portion of the meri of the ambulatory legs (P2-P5) that is diagnostic for *O. macgillivrayi*. It is absent in all of the Japanese specimens shown in the literature. The tooth is small, however, and it may not show in photographs. In some specimens it may be missing in some (but not in all) of the legs. Nevertheless, a Japanese specimen previously identified as *O. macgillivrayi* by T. Sakai (BMNH 1961.6.5.85) belongs indeed to *O. pulcher*. Other Japanese specimens, however, must be properly identified to settle the question.

The presence of *O. macgillivrayi* in New Zealand is also questionable. *Neommatocarcinus huttoni* (Fig. 51), which is known only from New Zealand, has been confused with *O. macgillivrayi* so that the New Zealand records of this species where the specimens in question have not been examined are assumed to belong to *N. huttoni*. Differences between these two species are discussed in the Remarks section of *N. huttoni* (see below) and by Takeda & Miyake (1969b: 179).

#### *Ommatocarcinus fibriophthalmus* Yokoya, 1933

*Ommatocarcinus fibriophthalmus* Yokoya, 1933: 199, 217, fig. 66 [Japan]. — Sakai 1934: 314 [in list]; 1939: 565, 722; 1940: 57 [in list]; 1956: 47 [in list]; 1976: 539, fig. 286 [Japan]. — Takeda & Miyake 1969b: 174 [in list]. — Guinot 1971: 1082 [in list]. — Serène & Vadon 1981: 119, 122, 126, 134 [discussion], pl. 2, figs E, F [Philippine Is]. — Miyake 1991: 220 [in list] [Japan].

TYPE MATERIAL. — Unknown deposit.

TYPE LOCALITY. — Japan, Goto Is, 146 m.

MATERIAL EXAMINED. — **Philippine Islands.** Bohol, Balicasag I., off Panglao I., PANGLAO 2004, stn T27, Panglao I., Pamilacan, 09°33.421'N, 123°51.017'E, 106-137 m, fine sand and mud, 25.VI.2004, 1 ♂, 1 ♀ (ZRC 2004.0789), 1 ♂ parasitised by *Sacculina* (ZRC 2004.0790).

PANGLAO 2005, stn DW 2339, off Balicasag I., 09°31.9'S, 123°47.1'E, 164-176 m, 23.V.2005, 1 ♀ (MNHN-B 30248).

**Indonesia.** Kai Is, KARUBAR, stn DW 29, 05°36'S, 132°56'E, 181-184 m, 26.X.1991, 1 ♂ (MNHN-B 29214).

**Tonga.** BORDAU 2, stn CP 1545, 21°15'S, 175°14'W, 319-333 m, 5.VI.2000, 1 ♂ (MNHN-B 29565).

DISTRIBUTION. — Japan (Yokoya 1933) and the Philippine Is (Serène & Vadon 1981) and now from Indonesia (Kai Is) and Tonga. Depth: 106-333 m.

#### REMARKS

The material examined shares the key diagnostic characters of *O. fibriophthalmus* Yokoya, 1933: eye peduncles that extend a long distance beyond the distal margin of the orbits, granular surface of the quadrate carapace, presence of one anterolateral prominence on each side of the carapace, and the



absence of a distal tooth on the dorsal margin of the meri of the slender ambulatory legs (see Yokoya 1933: fig. 66; Serène & Vadon 1981: pl. 2, figs E, F). The G1 is slender, with a long, straight tip; the G2 slightly longer than the G1 and with a slightly curved flagellum.

The stridulating mechanism of the species has been described by Guinot-Dumortier & Dumortier (1960: 121, fig. 3).

### *Ommatocarcinus granulatus* Chen, 1998

*Ommatocarcinus granulatus* Chen, 1998: 285, 310 [in list], 312, fig. 13.

TYPE MATERIAL. — ♀ holotype (IOAS SSIVB45-30).

TYPE LOCALITY. — South China Sea, Nansha Is, 04°26.0'N, 111°0'E, 107 m.

DISTRIBUTION. — Known only from the South China Sea. Depth: 107 m.

#### REMARKS

Male specimens and additional material of *O. granulatus*, which is known only from the female holotype from the South China Sea, should be examined and compared to the other known species of *Ommatocarcinus*. The illustration and English description by Chen (1998: 312, fig. 13), however, show clear differences from *O. fibriophthalmus*: absence of anterolateral teeth or prominences, a wider carapace, and the presence of a small distal tooth on the meri of each of the ambulatory legs (P2-P5). These characters, however, are also present in *O. macgillivrayi*, and Chen (1998: 313) contrasts her new species with *O. pulcher* Barnard, 1950 but not with *O. macgillivrayi*. *Ommatocarcinus granulatus* can be differentiated from *O. macgillivrayi* by the relative length of their eye peduncles. The peduncles extend a considerable distance, about a third of its total length, beyond the outer orbital teeth in *O. granulatus* (Chen 1998: fig. 13-1) but only the distal margin of the eye itself extends beyond the outer orbital teeth in *O. macgillivrayi*. The cheliped (P1) merus has small teeth along the dorsal border and another small tooth on the distal border of the cheliped in *O. granulatus* (Chen 1998: fig. 13-4),

in contrast to a large obtuse tooth on the median portion of the outer (dorsal) margin of the merus in *O. macgillivrayi*. The carapace is noticeably narrower in *O. granulatus*: “1.82-1.86 times as broad as long” (Chen 1998: 313) but wider, carapace width 2.3 times carapace length, in *O. macgillivrayi*.

### *Ommatocarcinus pulcher* Barnard, 1950

*Ommatocarcinus macgillivrayi* – Sakai 1934: 314, fig. 22; 1935: 187, fig. 96; 1939: 564, 722, pl. 102, fig. 5; 1956: 47 [in list]; 1965: 170, pl. 84, fig. 3 [colour]; 1976: 538, pl. 188, fig. 2 [colour] [Japan]. — Miyake 1961: 21 [in list] [Japan]; 1991: 149, 220 [in list], pl. 50, fig. 5 [colour] [Japan]. — Takeda & Miyake 1969b: 174 [in list] [Japan]. — Kikuchi & Miyake 1978: 42 [in list] [Japan]. — Muraoka 1998: 47 [in list] [Japan]. — Ikeda & Takeda 2006: 180, fig. 2G [colour] [Japan]. — Davie *et al.* 2002: 331 [Andaman Sea coast of Thailand]. — Ng & Davie 2002: 377 [Andaman Sea coast of Thailand]. — Takeda *et al.* 2006: 205 [in list] [Japan] (not *Ommatocarcinus macgillivrayi* White, 1852).

*Ommatocarcinus* sp. – Barnard 1946: 365 [South Africa].

*Ommatocarcinus pulcher* Barnard, 1950: 286, fig. 53b-f. — Takeda & Miyake 1969b: 174 [in list]. — Guinot 1971: 1082 [in list]. — Dai *et al.* 1986: 377 [in key], 378, fig. 199-2, 199-3, pl. 55, fig. 3 [South China Sea]. — Dai & Yang 1991: 407 [in key], fig. 199-2, 199-3, pl. 55, fig. 3 [South China Sea]. — Ng *et al.* 2001: 33 [in list]. — Kensley 1981: 46 [in list]. — Hsueh & Huang 2002: 116, figs 2B, 3.

?*Ommatocarcinus* sp. – Yokoya 1933: 198, fig. 65 [Japan].

?“*Ommatocarcinus* sp. Yokoya?” – Zarenkov 1972: 234, figs 1, 2 [Vietnam].

?*Ommatocarcinus macgillivrayi* – Davie 2002: 200 [in list], unnumb. figure after *Ommatocarcinus* sp. of Yokoya (1933: fig. 65).

TYPE MATERIAL. — ♂ holotype from fish stomach (SAM A8322).

TYPE LOCALITY. — South Africa, Natal.

MATERIAL EXAMINED. — **Japan.** Unknown locality, T. Sakai leg., 1 ♂, cl 10.7 mm, broken (BMNH 1961.6.5.85). **Taiwan.** Tachi, Ilan County, commercial inshore trawlers, 100-400 m, P. K. L. Ng coll., 3-4.VIII.1996, 1 ♂ (ZRC 1997.0403).

DISTRIBUTION. — South Africa (Barnard 1950), Andaman Sea coast of Thailand (Davie *et al.* 2002; Ng & Davie 2002), Japan (Takeda & Miyake 1969b), Taiwan (Ng *et al.* 2001), South China Sea (Dai *et al.* 1986). Depth: shallow subtidal to at least 100 m.

## REMARKS

*Ommatocarcinus pulcher* was described from one large (cl 15 mm, cw 37 mm) male specimen collected from a fish stomach in South Africa (Barnard 1950: 286, fig. 53b-f). The holotype could not be examined during this study but the description and detailed illustrations (including the G1) in Barnard's description are clear and reasonably complete. The species is close to *O. macgillivrayi*, in terms of the shape of the carapace (anterolateral teeth are absent) and a similar G1. Takeda & Miyake (1969b: 174) had suggested that it was a synonym of White's species. One difference, however, is that the eye peduncles extend slightly beyond the outer orbital teeth in *O. pulcher* (Dai & Yang 1991: pl. 55, fig. 3), whereas in *O. macgillivrayi* only the distal margins of the eyes, not the eye peduncles, extend beyond the teeth (Dai & Yang 1991: pl. 55, fig. 2, as *O. macgillivrayi* [sic]). Other differences are the absence of the small distal tooth on the merus of each of the ambulatory legs (P2-P5) and of the median tooth on the cheliped merus that are characteristic of *O. macgillivrayi*. The G1 of *O. pulcher* is slightly less pointed than that of *O. macgillivrayi* (see Dai & Yang 1991: figs 199-1, 199-2; Hsueh & Huang 2002: figs 3F, G). The stridulating ridge on the proximal edge of the outer (dorsal) margin of the cheliped merus (Barnard 1950: fig. 53e; Dai & Yang 1991: fig. 199-3) is less pronounced in *O. pulcher* than in *O. macgillivrayi* although the difference may be due to size since only large specimens of the latter were examined.

The Japanese records of *O. macgillivrayi* appear to be referable to *O. pulcher* (see Remarks for *O. macgillivrayi* above). *Ommatocarcinus* sp. (Yokoya 1933), known from three Japanese specimens that could not be examined, also appears to represent *O. pulcher* since the meri of the ambulatory legs are similarly unarmed (Yokoya 1933: 198, fig. 65). Material from Vietnam identified by Zarenkov (1972: 234, fig. 1-2) as "*Ommatocarcinus* sp. Yokoya?" could not be examined or identified by the information provided.

Genus *Psopheticus* Wood-Mason, 1892

*Psopheticus* Wood-Mason, 1891: 20 (*nomen nudum*).

*Psopheticus* Wood-Mason, 1892: pl. 5, fig. 1. — Alcock 1899: 72 [diagnosis]; 1900: 292 [in list], 298 [in key], 308 (part). — Tesch 1918: 160 (part). — Sakai 1939: 555 [in key], 558 (part); 1976: 523 [in key], 529, 530 [key to species] (part). — Balss 1957: 1656 (part). — Guinot-Dumortier & Dumortier 1960: 142 [stridulating mechanism]. — Serène 1968: 90 [in list] (part). — Guinot 1969b: 528 [discussion] (part); 1971: 1081 [list of species] (part); 1990: 333 [revision] (part). — Hsueh & Huang 2002: 116 [in key] (part). — Karasawa & Kato 2003b: 130 [in list], 140 [in list], 141 [in table] (part). — Poore 2004: 438 (part). — Karasawa & Schweitzer 2006: 26 [in list], 40 (part).

TYPE SPECIES. — *Psopheticus stridulans* Wood-Mason, 1892 (by monotypy; gender masculine). Name placed in Official List of Names in Zoology (with the officially designated type species) in Opinion 85, Direction 37 (see Melville & Smith 1987: 158).

EXTANT SPECIES INCLUDED. — *Psopheticus crosnieri* Guinot, 1990; *P. musicus* Guinot, 1990; *P. stridulans* Wood-Mason, 1892; *P. vocans* Guinot, 1985.

All species are restricted to the Indo-West Pacific region.

FOSIL SPECIES INCLUDED (Karasawa & Kato [2003b]). — *Psopheticus shujenae* (Hu & Tao, 1996), *Psopheticus* sp. aff. *P. stridulans* Wood-Mason, 1892.

SPECIES NOT INCLUDED IN *PSOPHETICUS*. — *Psopheticus megalops* Takeda, 1989 (*incertae sedis*).

DIAGNOSIS. — Carapace subquadrate, only slightly wider than long; front straight, often slightly concave, not marked by median notch or projection. Slight notch between front, inner edge of supraorbital border; orbits wide distally to accommodate reniform eyes, supraorbital borders conspicuously sinuous; suborbital borders rounded, with conspicuous, blunt inner tooth not visible dorsally; anterolateral borders straight or nearly straight so that fronto-orbital border as wide as or slightly narrower than maximum width of carapace at junction of anterolateral, posterolateral borders. Dorsal surface of carapace smooth, slightly convex, without clear indication of regions. Outer orbital teeth strongly projecting outwardly, flattened, triangular or leaf-like; typically acute anterolateral tooth on each side of carapace. Basal antennal article short, slender, distalmost (third) article reaches front. Eye peduncles relatively short, much shorter than front (0.3-0.4 front width); eyes reniform, dorso-ventrally flattened, cornea greatly expanded distally, nearly divided into anterior, posterior portions. Stridulating mechanism of subocular, sinuous pterygostomial crest plus tooth on outer (dorsal)

margin of cheliped (P1) merus. Thoracic sternum wide. Median sulcus on thoracic sternite 4 absent; sutures 4/5, 5/6 interrupted medially, 6/7 almost complete, 7/8 complete (Fig. 47; Guinot & Richer de Forges 1981b: fig. 12D; 1990: fig. 24). Anterior end of sterno-abdominal cavity anterior to thoracic sternite 4. Cheliped fingers (Guinot 1990: figs 1-3, 19-23, 29-33, 35-38, 40) slender, shorter than propodus, not dark in colour; carpus with tooth on inner margin. Dorsal margin of merus of P2 (Guinot 1990: figs 4-9, 41-43) with 1 subdistal tooth; dorsal margins of meri of P3-P5 (Guinot 1990: figs 26-28, 34, 39) with several conspicuous, acuminate teeth; dorsal margins of carpi, propodi serrulated, with conspicuous teeth, or smooth; dactyli slender, carinated, setae absent. Male abdomen (Guinot 1990: fig. 24; Hsueh & Huang 2002: fig. 12C) with 6 freely-movable somites plus telson, triangular, relatively wide, somites 4-6 gradually decreasing in width from somite 3 (widest somite). Telson wider than long. Somite 3 covers space between P5 coxae, somite 2 longer than somite 3 so that somites 1, 2 leave small, often triangular portion of thoracic sternite 8 visible (Guinot & Richer de Forges 1981b: fig. 12D; Guinot 1990: fig. 24; Hsueh & Huang 2002: fig. 12G). G1 (Zarenkov 1972: fig. 6-5; Guinot & Richer de Forges 1981b: fig. F; Guinot 1990: figs 44, 45, 47, 48, 50, 52, 53; Hsueh & Huang 2002: fig. 12D, H) long, stout, sinuous, proximally broadened, nearly triangular in overall shape, truncated tip. G2 (Zarenkov 1972: fig. 6-5; Guinot & Richer de Forges 1981b: fig. G; Guinot 1990: figs 46, 49, 51, 54) slender, slightly longer than G1, flagellum slightly shorter than basal part, with basal spinules, slightly-expanded tip. Penis arising from P5 coxa, long, soft; narrow, soft proximal expansion. Female abdomen (Hsueh & Huang 2002: fig. 12E) with 6 freely-movable somites, wide. Telson subovate. Somite 3 covers space between P5 coxae, somite 2 narrower than somite 3 so that somites 1, 2 leave small, often triangular portion of thoracic sternite 8 visible. Vulva of mature females (Fig. 47) on margin of suture 5/6 posterior to large, oval depression on thoracic sternite 5; small, hook-like vulvar cover on posterior margin of vulva.

## REMARKS

Alcock (1899: 73) commented on the close similarities between *Psopheticus* and *Carcinoplax* H. Milne Edwards, 1852, adding that the genus should "perhaps ought rather to be regarded as a subgenus of *Carcinoplax*". Serène (1968: 90) included *Psopheticus* in a list of genera questionably included in the subfamily Carcinoplacinae. Guinot (1990) revised *Psopheticus* and recognized seven species, including four new ones. Števcic (2005) placed *Psopheticus sensu lato* in the tribe Psopheticini independent from the tribe Carcinoplacini of the subfamily Carcinoplacinae. *Psopheticus sensu lato* actually consists of two groups of different species as far as the reproductive structures are concerned. A new genus, *Exopheticus* n. gen., is erected herein to include one of the two groups.

Species of *Psopheticus* possess a conspicuous sound-making, or stridulating, mechanism that consists of a pterygostomial crest on inflated subocular and subhepatic regions that rubs against a large tooth on the distal margin of the P1 merus (see Alcock 1900: 309; Guinot 1990: 364, figs 55-57; Guinot-Dumortier & Dumortier 1960). The mechanism is found in both sexes and its function remains unknown.

*Psopheticus megalops* Takeda, 1989, which was described from Japan, clearly does not belong in *Psopheticus* or in *Exopheticus* n. gen. Its inclusion in *Psopheticus* by Takeda (1989: 174) was based on "rather arbitrary [*sic*] and tentative" reasons, mostly on the quadrate shape of its carapace. The morphology of its pointed G1 and G2 (Takeda 1989: fig. 17C-F) suggests its exclusion from the Goneplacidae *sensu stricto*.

KEY TO SPECIES OF *PSOPHETICUS* WOOD-MASON, 1892

1. Ambulatory legs (P2-P5) carpi and propodi smooth, without teeth ..... 2
- Ambulatory legs (P2-P5) carpi or propodi (or both carpi and propodi) with teeth ..... 3
2. Outer orbital and anterolateral teeth triangular, foliaceous, straight; western Pacific Ocean in distribution ..... *P. musicus*
- Outer orbital teeth typically slender and oriented outwardly; anterolateral teeth typically slender; western Indian Ocean in distribution ..... *P. crosnieri*
3. P3-P5 propodi smooth to the naked eye ..... *P. stridulans*
- P3-P5 propodi serrated, with small, clearly demarcated teeth ..... *P. vocans*

*Psopheticus stridulans* Wood-Mason, 1892  
(Fig. 47)

*Psopheticus stridulans* Wood-Mason, 1892: pl. 5, fig. 1 [Andaman Sea]. — Alcock 1894: 402; 1899: 73; 1900: 309 [in key], 309; 1902: 260, 274, fig. 52 [Andaman Sea]. — Doflein 1904: 118, 236, 306 (table), pl. 30, fig. 4 [Andaman Sea]. — Tesch 1918: 161 [in key], 161 [Indonesia]. — Guinot-Dumortier & Dumortier 1960: 126, 144 [stridulating mechanism]. — Serène 1968: 90 [in list]. — Guinot 1969b: 528; 1971: 1081 [in list]; 1990: 334 [in key], 334, 335 [in table]; figs 1, 4-6, 55. — Karasawa & Kato 2003b: 130 [in list]. — Karasawa & Schweitzer 2006: 27 [in list].

*Psopheticus insolitus* Guinot, 1990: 334 [in key], 335 [in table], 358, figs 40-43, 57 [Indonesia].

Not “*Psopheticus stridulans*” – Guinot 1969b: 528, figs 81, 82 (= *Psopheticus crosnieri* Guinot, 1990).

Not *Psopheticus stridulans* – Sakai 1955: 108, fig. 2; 1956: 46 [in list]; 1976: 530, pl. 193, fig. 3. — Zarenkov 1972: 231, figs 2, 6-5. — Miyake 1991: 149, 220 [in list], pl. 50, fig. 2. — Ikeda 1998: 15, 43, 138, pl. 58. — Muraoka 1998: 47 [in list] [Japan]. — Hsueh & Huang 2002: 126 [in key], 126, figs 8E, 12. — Takeda *et al.* 2006: 205 [in list] [Japan] (= *Psopheticus musicus* Guinot, 1990).

TYPE MATERIAL. — *Psopheticus stridulans* Wood-Mason, 1892: 344-402 m, 2 ♂♂, 1 ♀ syntypes, unknown deposit (Zoological Survey of India, Kolkata [Calcutta]); ♀ topotype, cl 13.8 mm, cw 19.2 mm (BMNH 1899.1.20.13) (see Guinot 1990: 337).

*Psopheticus insolitus* Guinot, 1990: ♀ holotype, cl 19.9 mm, cw 25.6 mm (MNHN-B 12630).

TYPE LOCALITY. — *Psopheticus stridulans*: Andaman Sea, 677-785 m.

*Psopheticus insolitus*: Indonesia, Makassar Strait, CORINDON 2, stn CH 211, 313 m.

MATERIAL EXAMINED. — **Andaman Sea.** Indian Museum leg., 677-767 m, 1 ♀ (BMNH 99.1.20.13).

**Indonesia.** Makassar Strait, CORINDON 2, stn CH 211, 00°12.8'S, 117°53.7'E, 313 m, 31.X.1980, ♀ holotype of *Psopheticus insolitus* (MNHN-B 12630).

Lombok, *Siboga* Expedition, stn 38, 07°35.4'S, 117°28.6'E, 521 m, 1.IV.1899, 1 ♂ (ZMA De 240141).

Tanimbar Is, KARUBAR, stn CP 35, 06°08'S, 132°45'E, 390-502 m, 27.X.1991, 1 ♂, 1 ♀ (MNHN-B 29175). —

Stn CC 40, 07°46'S, 132°31'E, 443-468 m, 28.X.1991, 1 ♂, 1 ♀ (MNHN-B 29170). —

Stn CP 69, 08°42'S, 131°53'E, 356-368 m, 2.XI.1991, 1 ♂, 3 ♀♀ (MNHN-B 29168). —

Stn CP 70, 08°41'S, 131°47'E, 413-410 m, 2.XI.1991, 1 ♂, 2 ♀♀ (MNHN-B 29167). —

Stn CP 71, 08°38'S, 131°44'E, 477-480 m, 2.XI.1991, 1 pre-

adult ♀ (MNHN-B 29173). — Stn CP 77, 08°57'S, 131°27'E, 352-346 m, 3.XI.1991, 3 ♂♂ (MNHN-B 29169); 1 ♀ (MNHN-B 30057). — Stn CP 78, 09°06'S, 131°24'E, 295-284 m, 3.XI.1991, 2 ♂♂ (MNHN-B 29176). — Stn CP 83, 09°23'S, 131°00'E, 285-297 m, 4.XI.1991, 2 ♂♂, 2 ♀♀ (MNHN-B 29174).

**Chesterfield Islands.** CORAIL 2, stn DE 15, 20°50.72'S, 160°55.76'E, 590-580 m, 21.VII.1988, 1 ♂, 1 ♀ (MNHN-B 29181).

**New Caledonia.** BATHUS 4, stn CP 910, 18°59.32'S, 163°08.47'E, 560-608 m, 5.VIII.1994, 2 ♂♂, 1 ♀ (MNHN-B 29189).

DISTRIBUTION. — Andaman Sea (Alcock 1900; Doflein 1904) and Indonesia (Makassar Strait, Lombok, Tanimbar Is; Tesch 1918; Guinot 1990, as *P. insolitus*) and now from Chesterfield Is and New Caledonia. Depth: 284-785 m. Also collected from a station at a depth of 720-900 m (Tesch 1918: 161).

#### REMARKS

The relatively large number of specimens of *P. stridulans* examined has permitted the study of individual variation. Guinot (1990) used the presence of a single dorsal, subdistal tooth in each P2 merus as a diagnostic character of the species. Nevertheless, one of the three topotype specimens, a female, was shown to actually have two teeth, the second being small and almost median (Guinot 1990: fig. 4). There is a great deal of variation in the ornamentation of the ambulatory legs (P2-P5). Most specimens had one dorsal, subdistal tooth on each P2 meri but there were some exceptions. A pre-adult female from Indonesia (cl 8.1 mm, cw 10.2 mm, MNHN-B 29173) had three teeth on the right leg and two (plus a short one) on the left leg. The carpus of the right P5 showed one tooth while that of the left P5 had one tooth and five short ones, which may categorize it as “spinulose,” another diagnostic character of the species. Another exception was a large male also from Indonesia (cl 24.8 mm, cw 31.7 mm, MNHN-B 29175) with three teeth on each P2 merus. One small male from the same station (cl 11.8 mm, cw 15.0 mm, MNHN-B 29175) had two teeth on each P2 merus while a small female (cl 10.9 mm, cw 14.5 mm, MNHN-B 29175) had one tooth on the right merus but two on the left one. Two females (cl 23.8 mm, cw 29.2 mm, cl 23.8 mm, cw 29.8 mm; MNHN-B 29168) had three dorsal teeth on each P2 merus.

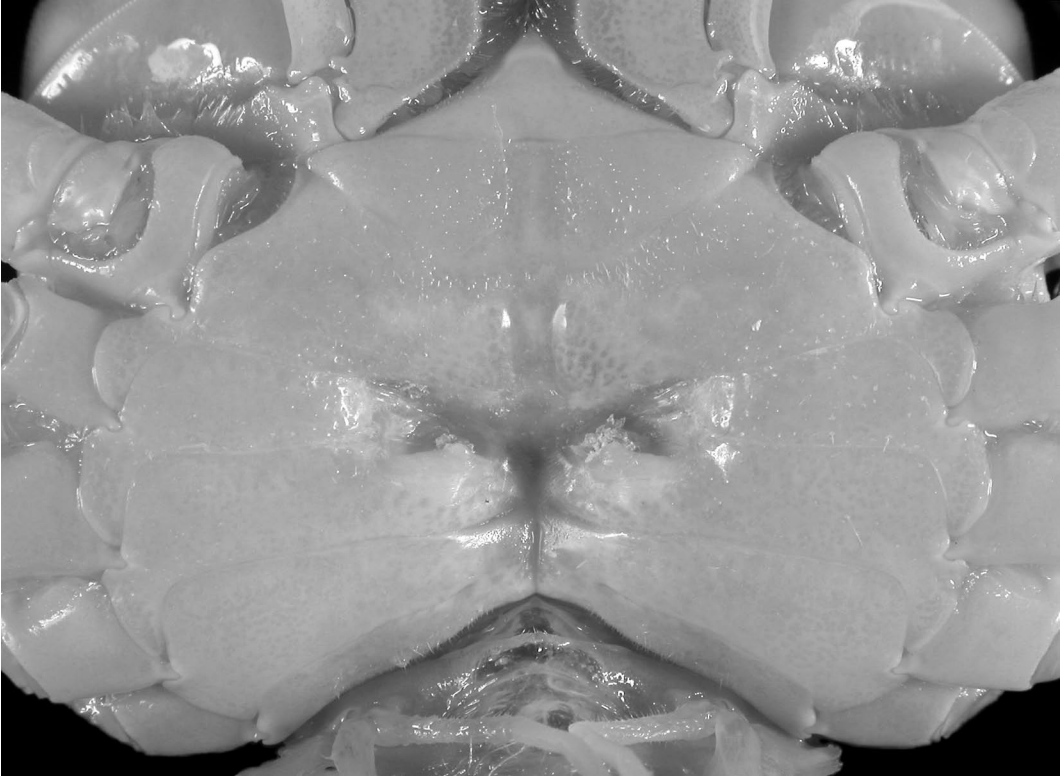


FIG. 47. — *Psoptheticus stridulans* Wood-Mason, 1892, ♀, cl 22.8 mm, cw 28.1 mm, Tanimbar Is, Indonesia, KARUBAR, stn CP 77, 352–346 m (MNHN-B 30057), thoracic sternum and vulva, vulvar cover, and remains of sperm plug.

The P3–P5 carpi typically showed two teeth. In several small specimens (male, cl 16.1 mm, cw 19.9 mm, MNHN-B 29170), however, the P4 carpi showed one large tooth and several smaller ones. Two females (cl 23.8 mm, cw 29.2 mm, cl 23.8 mm, cw 29.8 mm; MNHN-B 29168) showed the same ambulatory leg ornamentation, three dorsal teeth on P2, as *P. insolitus* Guinot, 1990, from Indonesia, which was described from only one female specimen from Indonesia.

All of the specimens with exceptions described above showed the acute, slender anterolateral teeth and the broad, triangular outer orbital teeth that characterize the species. *Psoptheticus insolitus* was described as a separate species because of its unusual ambulatory leg ornamentation, a situation that has also been found in specimens of *P. stridulans*. The anterolateral teeth of the holotype of *P. insolitus*,

however, are unusually blunt (Guinot 1990: fig. 40) in contrast to the acuminate ones of *P. stridulans*. Since the shapes of the outer orbital and anterolateral teeth are seemingly more stable characters than the ornamentation of the ambulatory legs, the morphology of the single specimen of *P. insolitus* is still puzzling. It is felt, however, that there are no clear, valid reasons to consider it a member of a separate species.

As pointed out by Guinot (1990: 337), specimens from Japan (Sakai 1955: 108, fig. 2; 1976: 530, pl. 193, fig. 3) and the South China Sea (Zarenkov 1972: 231, figs 2, 6–5) identified as *P. stridulans* do not belong to this species but to *P. musicus* Guinot, 1990, on account of the smooth, unarmed carpi and propodi of the ambulatory legs. A figure given by Sakai (1955: fig. 2), however, does show teeth on the right P3–P4 and the left P3 but none are shown in

another specimen (Sakai 1976: pl. 193, fig. 3). No teeth are shown in illustrations of other specimens from Japan (Ikeda 1998: 138, pl. 58) and Taiwan (Hsueh & Huang 2002: figs 8E, 12). The presence of *P. musicus* in Japan and Taiwan has now been confirmed (see below) but not that of *P. stridulans*.

The vulva of mature females (Fig. 47) has a small, hook-like vulvar cover on its posterior margin.

### *Psopheticus crosnieri* Guinot, 1990

?*Psopheticus stridulans* – Guinot 1969b: 528, figs 81, 82 [Comoro Is, Madagascar].

*Psopheticus* aff. *stridulans* – Guinot & Richer de Forges 1981b: 256 (part) [Madagascar]. — Guinot 1990: 334 [in key], 335 [in table], 338, figs 2, 3, 7-9, 44-46 [la Réunion].

*Psopheticus crosnieri* Guinot, 1990: 334 [in key], 335 [in table], 351, figs 29-34, 50, 51 [Madagascar].

TYPE MATERIAL. — Madagascar, trawling 46, ♂ holotype, cl 24.7 mm, cw 34.5 mm (MNHN-B 10344); 3 ♂♂ paratypes (cl 22.4 mm, cw 29.3 mm; cl 20.7 mm, cw 28.5 mm; cl 20.0 mm, cw 27.8 mm), ♀ paratype, cl 10.8 mm (MNHN-B 10345).

TYPE LOCALITY. — Madagascar, off northwestern coast, trawling 46, 15°19.1'S, 46°11.8'E, 400 m.

MATERIAL EXAMINED. — **Madagascar.** Trawling 46, 15°19.1'S, 46°11.8'E, 400 m, A. Crosnier coll., 7.XI.1972, ♂ holotype (MNHN-B 10344); 3 ♂♂, 1 ♀ paratypes (MNHN-B 10345).

**La Réunion.** MD 32, stn CP 60, 21°03.3'S, 55°09.5'E, 460-490 m, 1 ♂ (MNHN-B 10527). — Stn CP 130, 20°51.2'S, 55°36.8'E, 380-300 m, 1 ♀ (MNHN-B 10528). — Stn DS 178, 21°03.6'S, 55°09.8'E, 412-460 m, 1 pre-adult (MNHN-B 10529). — Stn CP 181, 20°57.5'S, 55°14.2'E, 300-410 m, 2 ♂♂, 1 ♀ (MNHN-B 10530).

DISTRIBUTION. — Southwestern Indian Ocean: Comoro Is (Guinot 1969b, as “*P. stridulans*”), Madagascar (Guinot 1969b, as “*P. stridulans*”; Guinot & Richer de Forges 1981b, *P. aff. stridulans*; Guinot 1990, as *P. crosnieri*), and la Réunion (Guinot 1990, as *P. aff. stridulans*). Depth: 300-510 m.

#### REMARKS

*Psopheticus crosnieri* is closest to *P. musicus*. The outer orbital teeth of *P. crosnieri* are oriented outwardly

and are typically much more slender and spiniform, and the anterolateral teeth similarly more slender (Guinot 1990: figs 29, 31, 33) than in *P. musicus* (Guinot 1990: figs 35, 37, 38). These characters, however, may vary among some specimens (see below). Another difference is that the P3-P5 carpi are feebly serrulated (but not to the naked eye) in *P. crosnieri* but smooth in *P. musicus*. Differences in the shape of the third maxilliped merus mentioned by Guinot in her key (Guinot 1990: 334) were found to be unsubstantiated.

Six specimens from la Réunion, southwestern Indian Ocean, identified as *Psopheticus* aff. *stridulans* by Guinot (1990) should be placed under *P. crosnieri* on account of their slender outer orbital and anterolateral teeth (Guinot 1990: fig. 2), even if the P3-P5 carpi may be armed with one or two teeth (none or one in P3, one or two in each P4 and P5; Guinot 1990: figs 7-9) but unarmed in *P. crosnieri*. The shape of the teeth on the carapace of *Psopheticus* is a much more stable character (even though not absolute, see Remarks for *P. musicus* below) than the ornamentation of the ambulatory legs, which may vary widely (see Remarks for *P. stridulans* above).

### *Psopheticus musicus* Guinot, 1990

*Psopheticus musicus* Guinot, 1990: 334 [in key], 335 [in table], 355, figs 35-39, 52-54, 56 [Philippine Is]. — Takeda *et al.* 2005: 112, fig. 3A [Japan].

*Psopheticus stridulans* – Sakai 1955: 108, fig. 2; 1976: 530, pl. 193, fig. 3 [Japan]. — Zarenkov 1972: 231, figs 2, 6-5 [Vietnam]. — Miyake 1991: 149, 220 [in list], pl. 50, fig. 2 [colour] [Japan]. — Ikeda 1998: 15, 43, 138, pl. 58 [Japan]. — Muraoka 1998: 47 [in list] [Japan]. — Hsueh & Huang 2002: 126 [in key], 126, figs 8E, 12 [Taiwan]. — Takeda *et al.* 2006: 205 [in list] [Japan] (not *Psopheticus stridulans* Wood-Mason, 1892).

TYPE MATERIAL. — MUSORSTOM 3, stn CP 125, ♂ holotype, cl 23.2 mm, cw 31.1 mm (MNHN-B 16582); 2 ♀♀ paratypes (cl 22.7 mm, cw 28.5 mm; cl 15.2 mm, cw 20.2 mm) (MNHN-B 16583).

TYPE LOCALITY. — Philippine Islands, Mindoro Strait, 11°57.7'N, 121°28.5'E, 388-404 m.

MATERIAL EXAMINED. — **Japan.** Honshu, Suruga Bay, Izu Peninsula, off Toi, stn C-010, 34°54.5'N, 138°44.2'E, 450-500 m, 21.III.2001, T. Komai coll., 1 ♂ (CBM-ZC

6276). — Tosa Bay, K. Sakai coll., T. Sakai leg., IV.1961, 1 ♂ (BMNH 1961.6.5.84).

**Taiwan.** TAIWAN 2000, stn CP 11, 22°18.6'N, 119°14.8'E, 262 m, 28.VII.2000, 1 ovig. ♀ (MNHN-B 29679). — Stn CP 49, 22°55.2'N, 121°21.5'E, 266 m, 2.VIII.2000, 3 ♂♂, 3 ♀♀ (MNHN-B 29670).

TAIWAN 2001, stn CP 77, 24°54.2'N, 122°02.5'E, 360-400 m, 7.V.2001, 2 ♂♂ (MMBA). — Stn CP 90, 24°53.6'N, 122°01.4'E, 300-330 m, 10.V.2001, 1 ♀ (MNHN-B 29682). — Stn CP 95, 24°55.8'N, 122°05.7'E, 269-360 m, 18.V.2001, 1 ovig. ♀ (MNHN-B 29662). — Stn CP 102, 24°48.4'N, 122°08.0'E, 326-331 m, 19.V.2001, 2 ♂♂, 4 ♀♀ (MNHN-B 29667). — Stn CP 103, 24°48.8'N, 122°06.0'E, 367-424 m, 19.V.2001, 1 ♂, 1 ♀ (MNHN-B 29684). — Stn CP 108, 24°48.2'N, 122°07.7'E, 295-337 m, 20.V.2001, 1 ♂, 1 ♀ (MNHN-B 29674). — Stn CP 109, 24°48.3'N, 122°08.0'E, 246-256 m, 20.V.2001, 1 ♂, 1 ♀ (MNHN-B 29677).

TAIWAN 2002, stn CP 160, 22°13.0'N, 120°28.8'E, 300 m, 24.V.2002, 1 pre-adult ♀ (MNHN-B 29673). — Stn CP 161, 22°09.6'N, 120°35.5'E, 302 m, 25.V.2002, 2 ♂♂, 1 pre-adult ♂, 1 ovig. ♀ (MNHN-B 29666). — Stn CP 162, 22°06.6'N, 120°37.9'E, 190-200 m, 25.V.2002, 1 ♂ (MNHN-B 29683).

Kaohsiung, Tungking fishing port, K. Lim & H. H. Tan coll., 23.XI.2001, 1 ♂ (ZRC 2001.0248).

**Philippine Islands.** Mindoro Strait, MUSORSTOM 3, stn CP 125, 11°57'N, 121°28'E, 388-404 m, 4.VI.1985, ♂ holotype (MNHN-B 16582), 2 ♀♀ paratypes (MNHN-B 16583).

Bohol, Balicasag I., off Panglao I., tangle nets of local fishermen, 200-300 m, XII.2000, 3 ♂♂, 2 ♀♀ (ZRC 2001.0367); 50-500 m, 28.XI.2001, 2 ♂♂ (ZRC 2001.0542); 25-30.VII.2003, 1 ♂ (ZRC 2004.0754). — XI.2003, 3 ♂♂ (ZRC 2004.0791); XII.2003, 3 ♂♂, 2 ♀♀, 2 ovig. ♀♀ (ZRC 2004.0792); I.2004, 2 ♂♂, 3 ♀♀ (ZRC 2004.0793); II.2004, 3 ♂♂, 1 ♀ (ZRC 2004.0794); 6 ♂♂, 4 ♀♀ (ZRC 2004.0795); 3.2004, 3 ♂♂, 1 ♀ (MNHN-B 29733); 29.V.2004, 1 ♂ (ZRC 2004.0796). — Panglao I., Maribohoc Bay, tangle nets of local fishermen, 100-300 m, T. J. Arbasto coll., 11.VIII.2003-4.IV.2004, 6 ♂♂, 1 ♀ (ZRC 2004.0797). — No data, 3 ♂♂ (ZRC 2004.0715).

PANGLAO 2004, stn P5, Pamilacan I., 09°30.0'N, 123°54.6'E, 100 m, tangle nets of local fishermen, 1.VI.2004, 1 ♂ (ZRC 2004.0798).

PANGLAO 2005, stn CP 2331, Maribohoc Bay, 09°39.2'N, 123°47.5'E, 255-268 m, 22.V.2005, 1 pre-adult ♂ (ZRC 2006.0196). — Stn CP 2332, Maribohoc Bay, 09°38.8'N, 123°45.9'E, 396-418 m, 22.V.2005, 1 ♀ (ZRC 2006.0212). — Stn CP 2349, off Maribohoc Bay, 09°31.6'N, 123°55.7'E, 219-240 m, 24.V.2005, 1 ♀ (ZRC 2006.0188). — Stn CP 2360, Bohol/Sulu seas sill, 08°48.9'N, 123°37.6'E, 357-372 m, 26.V.2005, 2 ♀♀ (ZRC 2006.0186). — Stn 2393, off Balicasag I.,

09°30.1'N, 123°41.6'E, 356-396 m, 30.V.2005, 1 ♂ (ZRC 2006.0191). — Stn CP 2395, Maribohoc Bay, 09°36.2'N, 123°43.8'E, 382-434 m, 31.V.2005, 1 ♂ (ZRC 2006.0200). — Stn CP 2405, Maribohoc Bay, 09°39.0'N, 123°46.1'E, 387-453 m, 1.VI.2005, 1 ♂ (ZRC 2006.0198). — Stn CP 2407, Maribohoc Bay, 09°41.3'N, 123°48.5'E, 256-268 m, 1.VI.2005, 1 ♀ (ZRC 2006.0204).

**DISTRIBUTION.** — Western Pacific Ocean: Japan (see Sakai 1976, as *P. stridulans*), Taiwan (Hsueh & Huang 2002, as *P. stridulans*), Vietnam (Zarenkov 1972, as *P. stridulans*), and the Philippine Is (Guinot 1990). Depth: 190-521 m. Sakai (1976) reports it (as *P. stridulans*), from depths of 75-150 m and Zarenkov (1972: 231) lists it (as *P. stridulans*) at a questionable depth of 925 m. Specimens were also obtained from tangle nets of local fishermen in the Philippines that obtained material from at least an estimated depth of 50 m.

#### REMARKS

Diagnostic of *P. musicus* are smooth, unarmed P3-P5 carpi and propodi as observed with the naked eye. In most specimens the outer orbital teeth are triangular, foliaceous, and straight, and the anterolateral teeth are relatively short and triangular, not conspicuously slender (Guinot 1990: figs 35, 37, 38). The shape and relative size of the outer orbital and anterolateral teeth, however, may vary as in other species of *Psopheticus*. Two of the characters used by Guinot (1990) to separate *P. musicus* from *P. crosnieri*, which is known only from Madagascar and la Réunion (outer orbital tooth that is oriented outwardly, anterolateral tooth that is slender, or spiniform, in *P. crosnieri*) were observed in a few of the specimens collected in Bohol, Philippine Is.

#### *Psopheticus vocans* Guinot, 1985

*Psopheticus* aff. *stridulans* – Guinot & Richer de Forges 1981b: 256 (part), fig. 12, pl. 5, figs 6, 7, 7a [New Caledonia].

*Psopheticus vocans* Guinot, 1985: 19, figs 3B<sub>1</sub>, B<sub>2</sub>, 4D-G, pl. 3, figs F, G; 1990: 334 [in key], 335 [in table], 346, figs 19-28, 47-49 [New Caledonia].

**TYPE MATERIAL.** — New Caledonia, ♂ holotype, cl 24.8 mm, cw 31.6 mm (MNHN-B 6805); ♀ paratype, cl 12.6 mm, cw 16.1 mm, same data as holotype (MNHN-B 10531) (paratype indicated, together with holotype, in

the specimen bottle but not in the published description [Guinot 1990] or in an earlier listing of the material [Guinot & Richer de Forges 1981b]).

**TYPE LOCALITY.** — New Caledonia, Boulari Pass, 400m.

**MATERIAL EXAMINED.** — **Vanuatu.** MUSORSTOM 8, stn 1083, 15°51.91'S, 167°19.42'E, 397-439 m, 5.X.1994, 1 ♀ (MNHN-B 29280).

BOA 1, stn CP 2479, 16°45.00'S, 167°51.80'E, 350-358 m, 15.IX.2005, 1 pre-adult ♂, 1 ovig. ♀ (MNHN-B 30094).

**Chesterfield Islands.** EBISCO, stn DW 2546, 21°06'S, 158°37'E, 488-493 m, 11.X.2005, 1 ♂♂ (MNHN-B 30119). — Stn DW 2548, 21°06'S, 158°35'E, 604-632 m, 11.X.2005, 2 ♀♀ (MNHN-B 30123).

**New Caledonia.** Passe de Boulari, trap, 400 m, ♂ holotype (MNHN-B 6805), ♀ paratype (MNHN-B 10531).

Passe de Poum, 400 m, 2 ♂♂, 1 ♀ (MNHN-B 29178).

LAGON, stn CP 1062, 20°14.9'S, 163°53.0'E, 300-320 m, 5.V.1988, 1 ♂, 1 ♀ (MNHN-B 29198).

BATHUS 1, stn DW 664, 20°57.34'S, 165°36.70'E, 650-700 m, 13.III.1993, 1 ♂ (MNHN-B 29343).

BATHUS 2, stn CP 738, 23°02.1'S, 166°56.6'E, 558-647 m, 13.V.1993, 1 ♀ (MNHN-B 29281). — Stn CP 770, 22°09'S, 166°04'E, 400-402 m, 18.V.1993, 1 ♂ (MNHN-B 29206).

HALIPRO 1, stn CP 868, 21°14.539'S, 165°55.847'E, 430-450 m, 23.III.1994, 1 ♂ (MNHN-B 29322). — Stn CP 869, 21°14.84'S, 165°55.49'E, 450-490 m, 23.III.1994, 1 ♂ (MNHN-B 29182).

BATHUS 4, stn DW 888, 21°00.84'S, 164°27.28'E, 430-436 m, 2.VIII.1994, 1 ♂ (MNHN-B 29209). — Stn CP 889, 21°00.83'S, 164°27.34'E, 416-433 m, 2.VIII.1994, 1 pre-adult ♀, 1 ovig. ♀ (MNHN-B 29190); 1 ♂ (MNHN-B 29210). — Stn CP 899, 20°16.68'S, 163°50.26'E, 500-600 m, 3.VIII.1994, 1 ♂ (MNHN-B 29187); 1 ♂ (MNHN-B 29208). — Stn CP 900, 20°16.74'S, 163°50.06'E, 580 m, 3.VIII.1994, 1 ♂ (MNHN-B 29180); 1 ♂ (MNHN-B 29207); 5 ♂♂ (MNHN-B 29183). — Stn CP 946, 20°33.81'S, 164°58.35'E, 386-430 m, 10.VIII.1994, 1 ♂ (MNHN-B 29179).

**Fiji.** MUSORSTOM 10, stn CP 1317, 17°12.0'S, 178°14.1'E, 471-475 m, 6.VIII.1998, 2 ♂♂ (MNHN-B 29255). — Stn CP 1327, 17°13.3'S, 177°51.6'E, 370-389 m, 7.VIII.1998, 1 ♂ (MNHN-B 29254).

BORDAU 1, stn CP 1411, 16°05'S, 179°28'W, 390-403 m, 26.II.1999, 2 ♀♀ (MNHN-B 29202). — Stn CP 1493, 18°43'S, 178°24'W, 429-440 m, 11.III.1999, 1 ♂ (MNHN-B 29201). — Stn CP 1500, 18°42'S, 178°26'W, 366-389 m, 12.III.1999, 1 ovig. ♀ (MNHN-B 29177). — Stn CP 1505, 18°12'S, 178°37'W, 420-450 m, 13.III.1999, 2 ♂♂ (MNHN-B 29199).

**Tonga.** BORDAU 2, stn CP 1528, 21°14'S, 174°59'W, 587-592 m, 3.VI.2000, 3 ♂♂ (MNHN-B 29256).

**DISTRIBUTION.** — New Caledonia (Guinot & Richer de Forges 1981b) and now Vanuatu, Chesterfield Is, Fiji, and Tonga. Depth: 300-700 m.

#### COLOUR

Photographs of a freshly collected male specimen from New Caledonia (MNHN-B 29322) and a female from Fiji (MNHN-B 29202) showed a light orange anterior half of the carapace divided from the white posterior half by two thin bands, one dark orange and the second white. The ambulatory legs were pinkish white. This colour pattern is similar to that given by Ikeda (1998: 138, pl. 58, as *P. stridulans*) for *P. musicus*.

#### REMARKS

Diagnostic to the species is the presence of small teeth along the P3-P5 carpi and propodi (Guinot 1990: figs 26-28), in contrast to a close species, *P. stridulans*, where the teeth are absent in the propodi, at least to the naked eye (Guinot 1990: figs 4-6). Other than the ornamentation of the ambulatory legs, the characters given by Guinot (1990: 348) to separate both species are not always consistent. The triangular outer orbital teeth and the relatively short and triangular anterolateral teeth of *P. vocans* are also characteristic of *P. musicus*. In contrast to *P. musicus*, however, the P3-P5 carpi and propodi of *P. vocans* are always dentate, at least one member of a particular pair of legs.

As in other species of *Psopheticus*, there is much variation in the ornamentation and on the development of teeth on the ambulatory legs. Some of the observed variation was between the right and left members of the same pair of ambulatory legs. A male (cl 22.6 mm, cw 28.4 mm, MNHN-B 29179) had a smooth P2 right merus (the characteristic dorsal, subdistal tooth on the left P2) and a relatively smooth (almost microscopic teeth) P3 right propodus, but there were well developed teeth on the left P3.

Three of nine specimens from Fiji (female, cl 20.6 mm, cw 27.6 mm, MNHN-B 29202; male, cw 25.3 mm, MNHN-B 29199; ovig. female, cl 20.3 mm, cw 25.0 mm, MNHN-B 29177) had two dorsal teeth on the P2 merus instead of one. Each of the P2 carpi of these specimens had a tooth



that was smaller than in the typical specimens. The ornamentation of P3-P5 in these three specimens was similar to the remaining specimens except that the teeth on the propodi were smaller. The P3-P5 carpi of the three males from Tonga (cl 17.9 mm, cw 23.5 mm, cl 12.7 mm, cw 17.2 mm, cl 12.4 mm, cw 16.8 mm; MNHN-B 29256), however, had one well developed tooth and many small teeth. There were no important differences in the shape and ornamentation of P1 and P2, carapace, G1, G2, and the relative length of the ambulatory legs (P2-P5) between the Fiji and Tonga specimens on one hand and those of *P. vocans* from New Caledonia, including the holotype (MNHN-B 6805) and paratype (MNHN-B 10531). The P3-P5 meri of the Tonga specimens are similar to those of *P. insolitus* Guinot, 1990 (= *P. stridulans* Wood-Mason, 1892), which was described from one specimen from Makassar Strait, Indonesia, and of a small female from New Caledonia (cl 10.4 mm, cw 14.2 mm; MNHN-B 29281) in having one well developed tooth and many small ones. The P2 merus, however, had three teeth in *P. insolitus* instead of the single tooth in *P. vocans* and the Tonga and New Caledonia specimens. It thus seems that the observed variations in the Fiji and Tonga specimens are part of the normal morphological variation of *P. vocans*. These specimens are treated here as members of populations of what appears to be the extreme eastern limit of the distribution of *P. vocans* rather than as a different species.

#### Genus *Exopheticus* n. gen.

*Psopheticus* – Alcock 1900: 292 [in list], 298 [in key], 308 (part). — Tesch 1918: 160 (part). — Sakai 1939: 555 [in key], 558 (part); 1976: 523 [in key], 529 (part). — Balss 1957: 1656 (part). — Serène 1968: 90 [in list] (part). — Guinot 1969b: 528 (part); 1971: 1081 (part); 1990: 333 (part). — Hsueh & Huang 2002: 116 [in key] (part). — Poore 2004: 438 (part).

TYPE SPECIES. — *Psopheticus hughi* (Rathbun, 1914) (by present designation; gender masculine).

SPECIES INCLUDED. — *Exopheticus hughi* (Rathbun, 1914) n. comb.; *E. insignis* (Alcock, 1900) n. comb.

All species are restricted to the Indo-West Pacific region.

ETYMOLOGY. — From *exo*, Greek for “out of”, and *pheticus*, derived from the generic name *Psopheticus*

(from *psophos*, Greek for “sound”), to denote that the type species of the new genus was formerly included in *Psopheticus* Wood-Mason, 1892.

#### DESCRIPTION

Carapace (Fig. 48A; Guinot 1990: figs 10-12, as *Psopheticus insignis*; fig. 17, as *P. hughi*; Chen 1998: fig. 7-1, as *P. insignis*) subcircular; front straight, often slightly concave, not marked by median notch or projection. Notch between front, inner edge of supraorbital border absent (distinct in small specimens); orbits wide distally to accommodate eyes; eyes reniform, dorso-ventrally flattened, cornea greatly expanded distally, nearly divided into anterior, posterior portions. Supraorbital borders conspicuously sinuous; suborbital borders rounded, with short, blunt inner tooth (absent in small specimens) not visible dorsally; anterolateral borders arched so that fronto-orbital border is narrower than maximum width of carapace at junction of anterolateral, posterolateral borders. Dorsal surface of carapace smooth, slightly convex, without clear indication of regions. Outer orbital teeth strongly projecting, flattened, triangular; anterolateral tooth on each side of carapace (obsolete in large *E. insignis* n. comb.). Basal antennal article short, slender, distalmost (third) article reaches front. Eye peduncles (Fig. 48A; Guinot 1990: figs 10-12, as *P. insignis*; fig. 17, as *P. hughi*; Chen 1998: fig. 7-1, as *P. insignis*) relatively short to moderately long (0.2-0.5 front width; Fig. 48A; Guinot 1990: figs 10-12, as *P. insignis*; fig. 17, as *P. hughi*; Chen 1998: fig. 7-1, as *P. insignis*), shorter than front; eyes reniform, dorso-ventrally flattened, cornea greatly expanded distally. Anterior border of endostome well demarcated from buccal cavern, ridges faint but clearly defined. Third maxillipeds completely close the buccal cavern. Stridulating mechanism of subocular, elliptical pterygostomial crest rubbing against proximal portion of cheliped (P1) merus. Thoracic sternum wide. Median sulcus on thoracic sternite 4 absent; sutures 4/5, 5/6, 7/8 interrupted medially, 6/7 complete (Figs 49; 50; Guinot 1990: fig. 16, as *P. insignis*). Anterior end of sterno-abdominal cavity anterior to thoracic sternite 4. Cheliped fingers (Guinot 1990: figs 10-12, as *P. insignis*, figs 17, 18, as *P. hughi*; Chen 1998: fig. 7-2, as *P. insignis*) slender, shorter than propodus, dark

in colour (light colour in *E. hughi* n. comb.); carpus with tooth on inner margin; merus becomes greatly elongated with size (Guinot 1990: figs 11, 12) in *E. insignis* n. comb. Dorsal margin of merus of P2 (Guinot 1990: fig. 17, as *P. hughi*) with subdistal tooth (may be obsolete in *E. insignis* n. comb.); dorsal margins of meri of P3-P5 (Guinot 1990: figs 10-12, as *P. insignis*, fig. 17, as *P. hughi*) with subdistal tooth (may be obsolete in large specimens); dorsal margins of carpi, propodi of ambulatory legs (P2-P5) smooth; dactyli slender, smooth (carinated in small specimens), setose. Male abdomen (Fig. 48B; Chen 1998: fig. 7-5, as *P. insignis*; Hsueh & Huang 2002: fig. 13H, as *P. hughi*, fig. 14E, as *P. insignis*) with 6 freely-movable somites plus telson, relatively wide, somites 4-6 gradually decreasing in length from somite 3 (widest somite). Telson wider than long. Somite 3 covers space between P5 coxae; somite 2 much longer than somite 3 so that somites 1, 2 leave large, subquadrate to rectangular portion of thoracic sternite 8 visible in *E. insignis* n. comb. (Hsueh & Huang 2002: fig. 14C, as *P. insignis*; small triangular portion in *E. hughi* n. comb.); somite 1 mostly covered by carapace. G1 (Fig. 48C; Guinot 1990: figs 13, 14; Chen 1998: fig. 7-6, as *P. insignis*; Hsueh & Huang 2002: fig. 13D, as *P. hughi*, fig. 14F, as *P. insignis*) long, slender, sinuous, only slightly broadened proximally, truncated tip. G2 (Fig. 48D; Guinot 1990: fig. 15; Chen 1998: fig. 7-7, as *P. insignis*) slender, nearly equal or slightly longer than G1, flagellum slightly shorter than basal part, with basal spinules, slightly-expanded tip. Penis arising from P5 coxa, long, soft; wide, soft proximal expansion. Female abdomen with 6 freely-movable somites, wide. Telson subovate (Hsueh & Huang 2002: fig. 13I, as *P. insignis*). Somite 3 covers space between P5 coxae, somites 1, 2 slightly narrower than or as wide as somite 3, only small portion or no portion at all of thoracic sternite 8 visible. Vulva of mature females (Figs 49; 50) round, extending to sutures 5/6 and 6/7 of thoracic sternite 6, covered by soft membrane; vulvar cover absent.

#### REMARKS

*Exopheticus* n. gen. includes two species previously included in *Psopheticus*, as *P. hughi* Rathbun, 1914, and *P. insignis* Alcock, 1900. According to Alcock

(1900: 311) *Psopheticus insignis* “closely connects” *Psopheticus* and *Carcinoplax* H. Milne Edwards, 1852. Serène & Vadon (1981: 127) had also commented on the sharp differences (“totalement différent”) between the G1 of *E. insignis* n. comb. (as *Psopheticus insignis* Alcock, 1900), similar to that of *Carcinoplax*, and the G1 of its congener, *P. stridulans*. They also commented on the similarities between the carapace and chelipeds (P1) of *E. insignis* n. comb. and those of some species of *Carcinoplax*, particularly *C. longimana* (de Haan, 1833). Guinot (1969b: 528) remarked on the need of establishing a diagnosis for *Psopheticus* in order to determine if *P. insignis* and *P. hughi* belonged to the same genus as *P. stridulans*. Unfortunately, her revision of *Psopheticus* (Guinot 1990) did not include a diagnosis. Such a diagnosis would have undoubtedly demonstrated the peculiarities of *P. insignis* and *P. hughi* on one hand and *P. stridulans* (and three other species of *Psopheticus sensu lato*) on the other, with their subsequent separation as different genera.

*Exopheticus* n. gen. is characterized by a slender G1 (Fig. 48C; Guinot 1990: fig. 13; Chen 1998: fig. 7-6, as *P. insignis*) in contrast to a stout G1 with a broad, nearly triangular proximal part in *Psopheticus* (Zarenkov 1972: fig. 6-5; Guinot & Richer de Forges 1981b: fig. F; Guinot 1990: figs 44, 47, 50, 52). The vulva (Figs 49; 50) is large, extending between sutures 5/6 and 6/7 of thoracic sternite 6, with smooth margins lacking a vulvar cover, and covered by a soft membrane. This condition is in contrast to *Psopheticus*, where the vulva is much smaller, extending only along the margin of suture 5/6, in a large depression on thoracic sternite 5, and bordered on the posterior edge by a hook-like vulvar cover (barely visible in Fig. 47). The carapace is subcircular in *Exopheticus* n. gen. (subquadrate in *Psopheticus*), the dorsal margins of P3-P5 have only one distal tooth (Chen 1998: fig. 7-4, as *P. insignis*) but several teeth in *Psopheticus*, the first and second somites of the male abdomen leave a large subquadrate portion of thoracic sternite 8 visible (only a small triangular portion remains visible in *Psopheticus* and in *E. hughi* n. comb.; Guinot & Richer de Forges 1981b: fig. 12D; Guinot 1990: fig. 24, as *P. insignis*), and the inner margin of the suborbital border is only marked by a short tooth

not visible dorsally in larger individuals (conspicuous tooth in *Psopheticus*). The stridulating mechanism of *Exopheticus* n. gen. appears to involve only the rubbing of the cheliped merus against the subhepatic surface of the carapace (Guinot 1990: figs 58–60, as *P. insignis* and *P. hughi*) whereas teeth in the merus appear to be involved in *Psopheticus* (Guinot 1990: figs 55–57).

In comparing her new species, *P. hughi*, with *P. stridulans* and *P. insignis* (= *E. insignis* n. comb.), Rathbun (1914: 145) mentioned that in the latter two species the first and second somites of the male abdomen do not cover the thoracic sternites as in the holotype of *P. hughi* (USNM 46180), the only specimen she apparently examined. Practically all the male specimens of *E. hughi* n. comb. that were examined during this study, however, showed that the first and second somites leave a small triangular area of the thoracic sternite 8 exposed as in the species of *Psopheticus* and unlike *E. insignis* n. comb., where a much larger, square to rectangular portion is left exposed. In some small specimens of *E. hughi* n. comb., however, an even smaller portion of the

sternum is left exposed. The drawing of the posterior portion of the abdomen of *E. hughi* n. comb. in Hsueh & Huang (2002: fig. 13C, as *Psopheticus hughi*) is unfortunately not clear as to which portions of the thoracic sternum are left exposed.

In contrast to *Psopheticus*, *Exopheticus* n. gen. shares with *Carcinoplax* the structure of its G1, G2, and vulva. *Exopheticus* n. gen. is nevertheless distinguished from *Carcinoplax* in that its thoracic suture 6/7 is complete (interrupted medially in *Carcinoplax*), the first and second somites of the male abdomen leave a large subquadrate portion of thoracic sternite 8 visible (only a small portion of the thoracic sternite is visible in *Carcinoplax*), the orbits are wide distally to accommodate the reniform eyes (orbits not expanded and the cornea of the eyes are rounded in *Carcinoplax*), the supraorbital borders are sinuous (only slightly curved in *Carcinoplax*), there is an obvious, specialized stridulating mechanism (absent in *Carcinoplax*), and the dorsal margin of the carpi and propodi of the P3–P5 have a subdistal tooth (absent in *Carcinoplax*, except *C. spinosissima* Rathbun, 1914).

#### KEY TO SPECIES OF *EXOPHETICUS* N. GEN.

- Cheliped (P1) propodus, merus elongated, armed with only one dorsal tooth. G1 with straight margins (see Fig. 48C; Chen 1998: fig. 7–6; Hsueh & Huang 2002: fig. 14F, G, as *Psopheticus insignis*) ..... *E. insignis* n. comb.
- Cheliped (P1) propodus, merus not conspicuously elongated, armed with dorsal tooth plus row of 2 or 3 ventral teeth, 2 teeth on inner, distal margin. G1 with spur-like structure on inner margin (see Hsueh & Huang 2002: fig. 13D, E, as *P. hughi*) ... *E. hughi* n. comb.

#### *Exopheticus insignis* (Alcock, 1900) n. comb. (Figs 48; 49)

*Psopheticus insignis* Alcock, 1900: 309 [in key], 310 [Myanmar]. — Alcock & McArdle 1901: pl. 54, fig. 2. — Tesch 1918: 161 [in key]. — Serène 1968: 90 [in list]. — Guinot 1969b: 528; 1971: 1081 [in list]; 1990: 334 [in key], 335 [in table], 338, figs 10–16, 58 [Philippine Is, Indonesia]. — Sakai 1976: 530 [in key], 531, pl. 193, fig. 2 [Taiwan]. — Serène & Vadon 1981: 118–120, 123 [in list], 127, pl. 3, fig. F [Philippine Is]. — Chen 1998: 275, 310 [in list], fig. 7 [South China Sea]. — Ng *et al.* 2001: 33 [in list] [Taiwan]. — Hsueh & Huang 2002: 126 [in key], 127, figs 2H, 14 [Taiwan]. — Poore 2004: 434 [in key], fig. 140a [New South West, Australia?].

TYPE MATERIAL. — Unknown deposit (Zoological Survey of India, Kolkata [Calcutta]?)

TYPE LOCALITY. — Myanmar (Burma), Gulf of Martaban, 110–130 m.

MATERIAL EXAMINED. — **Philippine Islands.** South China Sea, MUSORSTOM 2, stn CP 20, 14°00.9'N, 120°18.1'E, 192–185 m, 22.XI.1980, 5 ♂♂, 8 ♀♀, 1 pre-adult (MNHN-B 10517); 1 ♀ (MNHN-B 30059). — Stn CP 64, 14°00.5'N, 120°18.9'E, 181–177 m, 29.XI.1980, 6 ♂♂, 2 ovig. ♀♀, 6 ♀♀ (MNHN-B 16474). MUSORSTOM 3, stn CP 99, 14°01'N, 120°19'E, 196–204 m, 1.VI.1985, 1 ♂ (MNHN-B 29371). Bohol, Panglao I., Maribohoc Bay, tangle nets of local fishermen, 100–300 m, T. J. Arbusto coll., 11.VIII.2003–4.IV.2004, 6 ♂♂, 5 ♀♀ (ZRC 2004.0799); 7 ♂♂ (ZRC 2004.0800). — Balicasag I., off Panglao I., 1.2004, 2 ♂♂ (MNHN-B 29734). — Bohol, off Cortez, 180 m, T. J. Arbusto coll., 25.V.2004, 1 ♂ (ZRC 2004.0801). PANGLAO 2005, stn CP 2344, off Pamilican I.

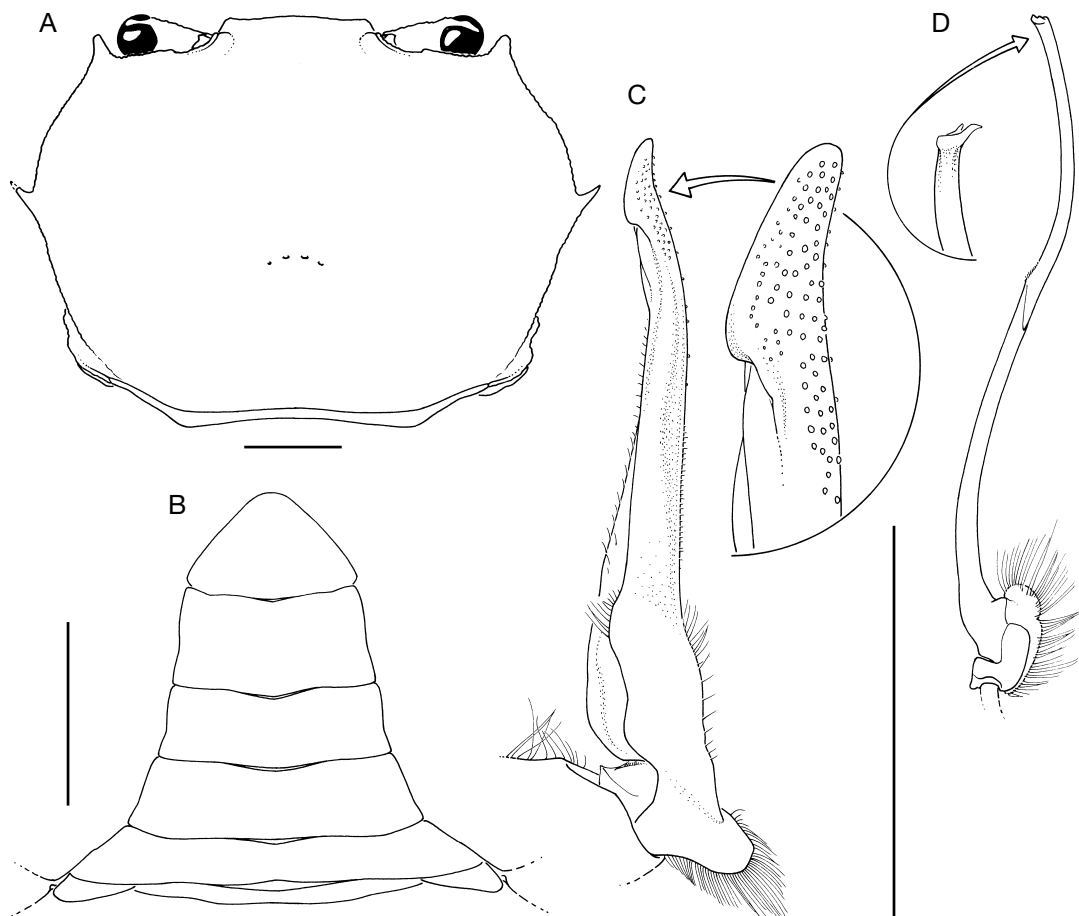


FIG. 48. — *Exopheticus insignis* (Alcock, 1900) n. comb., ♂ holotype, cl 22.4 mm, cw 30.9 mm, Bligh Water, Fiji, MUSORSTOM 10, stn CP 1320, 290–300 m (MNHN-B 29369): **A**, dorsal surface of the carapace; **B**, abdomen; **C**, left G1, dorsal view; **D**, left G2, ventral view. Scale bars: A, B, 5 mm; C, D, 1 mm.

09°28.4'N, 123°50.1'E, 128–142 m, 23.V.2005, 1 pre-adult (ZRC 2006.0185). — Stn 2349, off Maribohoc Bay, 09°31.6'N, 123°55.7'E, 219–240 m, 24.V.2005, 1 ♀ (ZRC 2006.0197). — Stn 2407, Maribohoc Bay, 09°41.3'N, 123°48.5'E, 256–268 m, 1.VI.2005, 1 ♂, 1 ♀ (ZRC 2006.0205).

**Solomon Islands.** SALOMON 2, stn CP 2284, 08°38.4'S, 157°21.5'E, 195–197 m, 6.XI.2004, 1 ♂ (MNHN-B 30103).

**Vanuatu.** BOA 1, stn CP 2447, 15°7.20'S, 166°52.0'E, 184–271 m, 10.IX.2005, ♀ paratype, cl 24.7 mm, cw 32.6 mm (MNHN-B 30115).

**Fiji.** MUSORSTOM 10, stn CP 1320, 17°16.8'S, 177°53.6'E, 290–300 m, 6.VIII.1998, ♂ holotype, cl 22.4 mm, cw 30.9 mm (MNHN-B 29369), ♂ paratype, cl 14.4 mm, cw 18.8 mm (MNHN-B 29550).

**BORDAU 1**, stn CP 1403, 16°40'S, 179°36'E, 220–224 m, 25.II.1999, ♂ paratype, cl 7.7 mm, cw 9.6 mm (MNHN-B 29551).

**DISTRIBUTION.** — Andaman Sea coast of Myanmar (Alcock 1900) and Western Pacific Ocean from Taiwan (Hsueh & Huang 2002) to the Philippine Is (Guinot 1969b), and Indonesia (Guinot 1990) and now the Solomon Is, Vanuatu, and Fiji. There is also an unconfirmed and probably erroneous record from New South Wales, Australia (Poore 2004). Depth: 110–300 m.

#### COLOUR

Large red-brown spot bordered by a thick, light yellow line (“deep-red shield with a milk-white

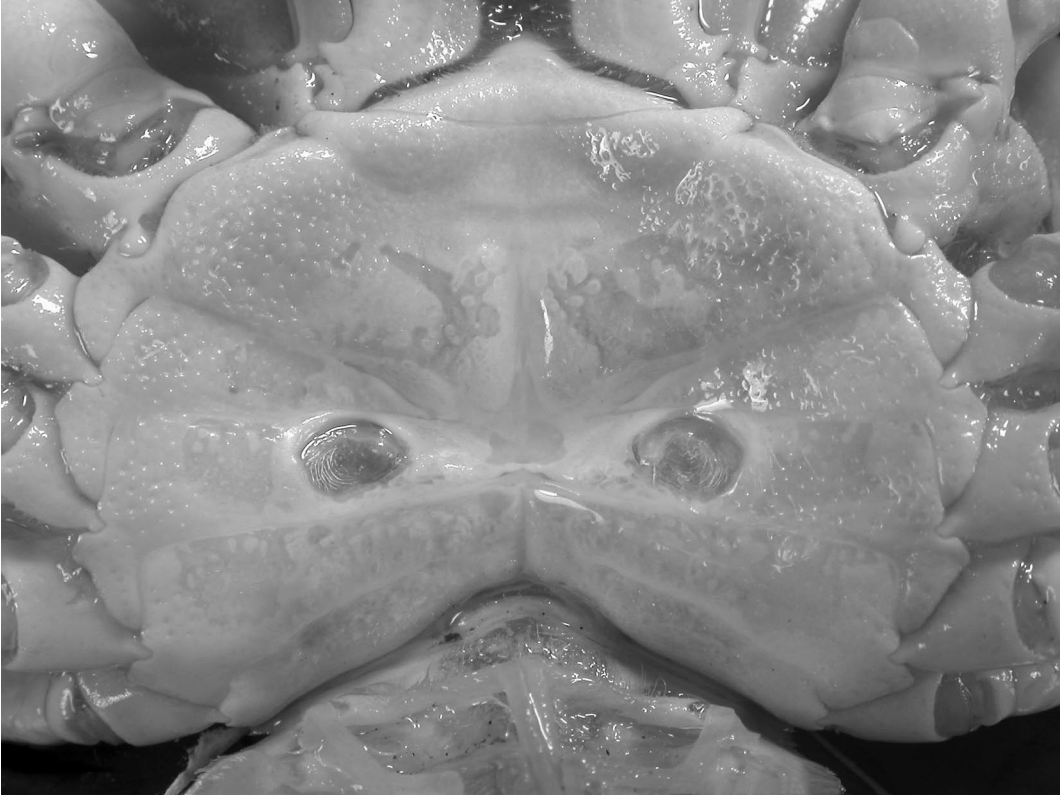


FIG. 49. — *Exopheticus insignis* (Alcock, 1900) n. comb., ♀, cl 22.7 mm, cw 31.5 mm, South China Sea off Philippine Is, MUSORSTOM 2, stn CP 20, 192-185 m (MNHN-B 30059), thoracic sternum and vulva.

edge” in Alcock 1900: 311, as *Psopheticus insignis*) on the dorsal surface of the carapace (Sakai 1976: pl. 193, fig. 2, as *P. insignis*). Its shape varies from round to oval to a large, irregular “O” in the larger specimens. Absent in some preserved specimens. The tip of the cheliped (P1) dactylus, but not of the pollex, is red-brown when fresh, black after preservation in alcohol.

#### REMARKS

The outer orbital and anterolateral teeth of *E. insignis* n. comb., which are conspicuous in the smaller individuals (Fig. 48A) become progressively smaller with increasing carapace size, the anterolateral teeth ultimately disappearing. The orbits and the eye peduncles similarly decrease in size with increasing carapace size (see Guinot 1990: figs 11, 12, as

*P. insignis*). The eye peduncles thus vary between 0.6 front width in small individuals to 0.2 front width in the large ones. The vulva is large and lacks a vulvar cover (Fig. 49).

Differences between *E. insignis* n. comb. and *E. hughi* n. comb., its only congener, are given in the Remarks of the latter (see below).

#### *Exopheticus hughi* (Rathbun, 1914) n. comb. (Fig. 50)

*Psopheticus hughi* Rathbun, 1914: 144 [Philippine Is]. — Tesch 1918: 160 [in key]. — Estampador 1937: 533 [in list]; 1959: 89 [in list] [Philippine Is]. — Sakai 1939: 558, 722, pl. 66, fig. 1; 1956: 46 [in list]; 1976: 530 [in key], 530, pl. 193, fig. 1 [Japan]. — Serène 1968: 90 [in list]. — Guinot 1969b: 528; 1971: 1081



FIG. 50. — *Exopheticus hughi* (Rathbun, 1914) n. comb., ♀, cl 30.5 mm, cw 41.4 mm, off northeastern Taiwan, TAIWAN 2001, stn CP 102, 326-331 m (MNHN-B 29668), thoracic sternum and vulva.

[in list] [Philippine Is]; 1990: 334 [in key], 335 [in table], 345, figs 17, 18, 59, 60. — Serène & Vadon 1981: 118, 123, 127 [Philippine Is]. — Miyake 1991: 149, 220 [in list], pl. 50, figs 1, 1 [sic] [colour] [Japan]. — Ikeda 1998: 15, 43, 139, pl. 59 [Japan]. — Muraoka 1998: 47 [in list] [Japan]. — Hsueh & Huang 2002: 126 [in key], 126, figs 8F, 13 [Taiwan]. — Karasawa & Kato 2003b: 130 [in list]. — Takeda *et al.* 2006: 205 [in list] [Japan]. — Karasawa & Schweitzer 2006: 26 [in list] (part).

TYPE MATERIAL. — *Albatross*, stn 5504-5505, ♂ holotype, cl 45.3 mm, cw 59.7 mm (USNM 46180).

TYPE LOCALITY. — Philippine Islands, Northern Mindanao, 08°35.5'S, 124°36'E, 366-403 m.

MATERIAL EXAMINED. — **Taiwan**. Kaohsiung, Tungking fishing port, K. Lim & H. H. Tan coll., 23.XI.2001, 1 ♂ (ZRC 2001.0249). — Kaohsiung, Tungking fishing

port, H. H. Tan & L. L. Koh coll., 6-9.XII.2001, 1 ♂, 2 ♀♀ (ZRC 2001.0277).

Tai-Chi fishing port, 7.XII.2004, P. Castro coll., 1 ♂ (MNHN-B 29769).

TAIWAN 2000, stn CP 11, 22°18.6'N, 119°14.8'E, 262 m, 28.VII.2000, 1 pre-adult ♂ (MNHN-B 29680). — Stn CP 49, 22°55.2'N, 121°21.5'E, 266 m, 2.VIII.2000, 2 ♀♀ (MNHN-B 29669).

TAIWAN 2001, stn CP 67, 24°51.3'N, 121°59.0'E, 259 m, 6.V.2001, 1 ♀ (MNHN-B 29652). — Stn CP 77, 24°54.2'N, 122°02.5'E, 360 m, 7.V.2001, 1 ♂, 1 ♀ (MNHN-B 29643). — Stn CP 95, 24°55.8'N, 122°05.7'E, 269-360 m, 18.V.2001, 4 ♂♂, 1 ♀ (MNHN-B 29661). — Stn CP 102, 24°48.4'N, 122°08.0'E, 326-331 m, 19.V.2001, 1 ♀ (MNHN-B 29668). — Stn CP 109, 24°48.3'N, 122°84.0'E, 246-256 m, 20.V.2001, 1 ♂ (MNHN-B 29676).

TAIWAN 2002, stn CP 159, 22°14.6'N, 120°59.9'E, 208 m, 24.V.2002, 3 ♂♂, 4 ♀♀, 1 pre-adult ♀ (MNHN-B 29664). — Stn CP 160, 22°13.0'N, 120°28.8'E, 300 m,

24.V.2002, 1 ♂, 1 ♀ (MNHN-B 29672). — Stn CP 161, 22°09.6'N, 120°35.5'E, 302 m, 25.V.2002, 1 ♂, 2 ♀♀ (MNHN-B 29665).

TAIWAN 2004, stn CP 264, 24°28.79'N, 121°55.39'E, 255–400 m, 1.IX.2004, 1 ♂, 3 ♀♀ (MNHN-B 29663).

**Philippine Islands.** Bohol, Balicasag I., off Panglao I., tangle nets of local fishermen, 50–500 m, 28.XI.2001, 2 ♂♂ (ZRC 2001.0529); 25–30.VII.2003, 1 ♂ (ZRC 2004.0753); XII.2003, 1 ♂ (ZRC 2004.0802); II.2004, 2 ♂♂, 2 ♀♀, 1 ovig. ♀ (ZRC 2004.0803); III.2004, 1 ♂ (ZRC 2004.0804). — Panglao I., Maribohoc Bay, tangle nets of local fishermen, 100–300 m, T. J. Arbusto coll., 11.VIII.2003–4.IV.2004, 1 ♂ (MNHN-B 29723). — Stn P2, Balicasag I., off Panglao I., tangle nets of local fishermen, X.2003, 1 ♂ (ZRC 2006.0178).

PANGLAO 2005, stn CP 2332, Maribohoc Bay, 09°38.8'N, 123°45.9'E, 396–418 m, 22.V.2005, 1 ♂ (ZRC 2006.0211).

Mindanao, *Albatross*, stn 5504–5505, 08°35.5'S, 124°36'E, 366–403 m, 5.VIII.1909, ♂ holotype (USNM 46189).

**DISTRIBUTION.** — Western Pacific Ocean: Japan (Sakai 1939), Taiwan (Hsueh & Huang 2002) and the Philippine Is (Rathbun 1914). Depth: 208–418 m. Specimens were also obtained from tangle nets of local fishermen in the Philippines that obtained material from estimated depths of 50–500 m.

#### REMARKS

Several characters separate *E. hughi* n. comb. from *E. insignis* n. comb. In *E. hughi* n. comb. the cheliped propodus and merus are much shorter than in *E. insignis* n. comb. and the merus is armed with a dorsal tooth plus a row of two or three ventral teeth plus two teeth on the inner, distal margin. The cheliped propodus and merus of large specimens of *E. insignis* n. comb. are greatly elongated (see Guinot 1990: figs 10–12, as *P. insignis*), and the merus is armed only with a dorsal tooth. There is no well defined colour spot on the dorsal surface of the carapace of *E. hughi* n. comb., a spot that is characteristic of *E. insignis* n. comb. (see Ikeda 1998: 139, pl. 59); the third somite of the male abdomen is only slightly wider than the second somite (see Hsueh & Huang 2002: fig. 13H, as *Psopheticus hughi*) while the second somite is noticeably narrower than the third in *E. insignis* n. comb. (see Hsueh & Huang 2002: fig. 14E, as *P. insignis*); and the G-1 has a spur-like structure near the tip (Hsueh & Huang 2002: fig. 13D, E, as *P. hughi*) that is absent

in *E. insignis* n. comb. (Hsueh & Huang 2002: fig. 14F, G, as *P. insignis*). As in *E. insignis* n. comb., the vulva (Fig. 50) is greatly expanded, covered by a soft membrane, and lacks a vulvar cover.

#### Genus *Neommatocarcinus*

Takeda & Miyake, 1969

*Neommatocarcinus* Takeda & Miyake, 1969b: 173. — Guinot 1971: 1082 [list of species]. — Karasawa & Kato 2003b: 140 [in list].

**TYPE SPECIES.** — *Ommatocarcinus buttoni* Filhol, 1885 (by monotypy, gender masculine).

**SPECIES INCLUDED.** — *Neommatocarcinus buttoni* (Filhol, 1885).

The genus is far known only from temperate waters in New Zealand.

**DIAGNOSIS.** — Carapace (Fig. 51; Takeda & Miyake 1969b: pl. 2, fig. A; McLay 1988: fig. 58a) transversely rectangular, much wider than long, widest at conspicuous outer orbital teeth; front narrow, deflected ventrally, slight median projection (Takeda & Miyake 1969b: fig. 5a). Dorsal surface of carapace granular, convex, without clear indication of regions. Anterolateral teeth absent. Wide notch between frontal margin, inner edge of supraorbital border. Orbits wide, greatly expanded distally, fissure absent. Eye peduncle (Fig. 51; Takeda & Miyake 1969b: pl. 2, fig. A; McLay 1988: fig. 58) long, much longer than front (1.4–1.6 front width), eyes beyond outer orbital tooth; cornea elongated, spherical distal margin, not reniform. Supraorbital borders convex, slight subproximal lobe; suborbital borders sinuous, with large, keel-like inner tooth; lateral borders convex; anterolateral tooth absent. Basal antennal article short, subcylindrical, distalmost (third) article reaches front, lying freely in orbital hiatus, not reaching front. Antennules not separated by septum. Buccal cavern narrow anteriorly, strongly crested. No obvious stridulating mechanism other than possible rubbing of proximal portion of cheliped (P1) merus against pterygostomial ridge. Thoracic sternum wide. Median sulcus on thoracic sternite 4 absent; sutures 4/5, 5/6, 7/8 interrupted medially, 6/7 complete. Anterior end of sterno-abdominal cavity anterior to thoracic sternite 4. Prolongation of male episternite 7 present; thoracic sternite 7 laterally covered with thoracic sternite 8; thoracic sternite 8 without supplementary plate. Chelipeds (Fig. 51; Takeda & Miyake 1969b: fig. 5b; McLay 1988: fig. 58) larger in males; fingers long, slender, slightly curved, light in colour, shorter than elongated propodus; carpus with broad tooth on inner (ventral) margin, acute tooth on outer (dorsal) margin; merus with 3 or 4 long, acute teeth

on distal, outer (dorsal) margin (short, obtuse in large specimens); short, acute tooth on each median portion of inner (ventral), outer (dorsal) margins. Ambulatory legs (P2-P5) (Fig. 51) compressed, dorsal margins of meri with acute distal tooth (obsolete in large individuals), row of tubercles increasing in size distally, sometimes acute; dactyli slender, dorso-ventrally flattened, with slight carina on each side, setose. Male abdomen (Takeda & Miyake 1969b: fig. 6a) narrowly triangular, narrower than sternum, somites 3-5 being narrower than thoracic sternite 7; with 4 freely-movable somites (somites 3-5 fused) plus telson, shallow carina along widest, proximal portion of fused somites 3-5. Telson slightly wider than long, rounded anterior margin. Posterior border of somites 3-5 (carinated portion) covers space between P5 coxae, somite 2 much narrower than somites 3-5 so that somites 1, 2 leave large portion of thoracic sternite 8 visible (Takeda & Miyake 1969b: fig. 6a). Locking mechanism with medium-size vulvar cover on edge of thoracic sternite 5, shallow socket on underside (ventral surface) of abdominal somite 6. Male opening coxal. Penis arising from P5 coxa, sclerified portion between thoracic somites 7, 8 before soft portion (Takeda & Miyake 1969b: fig. 6b). G1 (Takeda & Miyake 1969b: fig. 5d) long, slender, thin, nearly straight, only slightly broadened proximally; pointed, thin tip. G2 slender, longer than G1, flagellum shorter than proximal part (peduncle); curved, pointed tip. Female abdomen with 6 freely-movable somites, wide. Telson much wider than long. Somite 2 covers most space between P5 coxae, somite 2 narrower than somite 3 but somites 1, 2 leave relatively large portion of thoracic sternite 8 visible. Vulva of mature females ovoid, on large, sclerified prominence extending from deflected 5/6 suture to close to 6/7 suture, covered by soft membrane, vulvar cover absent.

#### REMARKS

Takeda & Miyake (1969b) separated *Ommatocarcinus buttoni* (Filhol, 1885) from the other known species of *Ommatocarcinus* by creating a new genus, *Neommatocarcinus*, on account of several unique characters. The male abdomen has only four somites plus telson, somites 3-5 being fused. This is unique among members of the family Goneplacidae, although somites 3-5 are distinct but immovable in the family Mathildellidae of the superfamily Goneplacoidea. Another unique character for a goneplacid is the absence of the antennular septum. The vulva is also distinct, being surrounded by a sclerified, elevated prominence, a structure that has never been described in other goneplacids. In contrast to other goneplacines, the penis has a sclerified proximal

portion that is externally visible (see Takeda & Miyake 1969b: fig. 6a, b). Although the male genital opening of the Euryplacidae has been described as sternal (Davie 2002), it is coxo-sternal, with the penis located in a groove or "canal" formed by the concave thoracic sternite 8. The flagellum of the G2 is long and with a distinctively curved, nearly coiled, tip, a character that is also observed in a goneplacine, *Goneplacoides marivenae* (Komatsu & Takeda 2003: fig. 3e, as *Goneplax marivenae*, fig. 6e, as *Goneplax megalops*).

All other morphological characters studied (thoracic sternum, female abdomen, relationship between abdomen and sternum in both sexes, and G1) are suggestive of strong goneplacine affinities. *Neommatocarcinus* is thus kept in the subfamily Goneplacinae rather than placing it in a new subfamily.

#### *Neommatocarcinus buttoni* (Filhol, 1885) (Fig. 51)

*Ommatocarcinus buttoni* Filhol, 1885a: 13, 50 [in list]; 1885b: 384, pl. 43, figs 1, 2, 5 [New Zealand]. — Dell 1951: 25 [in list] [New Zealand]. — Probert & Batham 1979: 381, 387 [in list] [New Zealand]. — Wear & Fielder 1985: 10 [in list], 62, 79 [in list], 84 [in key], figs 165-168 [larvae] [New Zealand]. — Guinot 1979: 219.

*Ommatocarcinus macgillivrayi* — Miers 1886: xxxiii, xxxvii, xlvi, 247 [New Zealand]. — Chilton 1911: 287 [in list], 292 [New Zealand]. — Thompson 1912: 237 [in list] [New Zealand]. — Thompson & Anderton 1921: 99, unnumb. figs [larvae] [New Zealand]. — Chilton & Bennett 1929: 757 [New Zealand]. — Richardson 1949: 36 [in key], fig. 21 [New Zealand]. — Dell 1960: 5; 1963a: 48, unnumb. fig.; 1968a: 26 [in list]; 1968b: 232, 233, 238 [New Zealand]. — Bennett 1964: 74, 88, figs 79-83 [New Zealand].

*Neommatocarcinus buttoni* — Takeda & Miyake 1969b: 174, 175, figs 5, 6, pl. 2, fig. A [New Zealand]. — Guinot 1971: 1082 [in list]. — Fenwick 1978: 208 [in list] [New Zealand]. — McLay 1988: 262, fig. 68 [references] [New Zealand].

TYPE MATERIAL. — Dry ♀ holotype, cl 15.4 mm, cw 34.0 mm (MNHN-B 4608).

TYPE LOCALITY. — New Zealand, South Island, Otago Harbour.

MATERIAL EXAMINED. — New Zealand. *Tangaroa*, stn 5364, 3 ♂♂, 2 ♀♀ (NIWA).





FIG. 51. — *Neommatocarcinus huttoni* (Filhol, 1885), ♀, dry holotype, cl 15.4 mm, cw 34.0 mm, Otago Harbour, New Zealand (MNHN-B 4608).

Otago Harbour, 1 dry ♀ holotype, cl 15.4 mm, cw 34.0 mm (MNHN-B 4608).

Queen Charlotte Sound, near Long I., *Challenger*, stn 167A, 18 m, 1 ♂, cl 6.7 mm, cw 15.5 mm, 2 ovig. ♀♀ (cl 8.9 mm, cw 18.8 mm; cl 10.5 mm, cw 23.1 mm) (BMNH 84.31).

DISTRIBUTION. — Known only from New Zealand. Depth: 18–260 m; also in a sample taken from 42–594 m.

#### COLOUR

Takeda & Miyake (1969b: 178) and McLay (1988: 262) described the dorsal surface of the carapace as “yellowish vermillion” with white and purple portions; parts of the ventral surface brick red, and chelipeds and ambulatory legs mostly “whitish or creamy white” with brick red, purplish red, yellow, purple, and pale orange portions.

#### REMARKS

*Neommatocarcinus huttoni* had previously been confused with *Ommatocarcinus macgillivrayi* White, 1852. Chilton (1911: 292) considered them to be conspecific, and confusion persisted among most carcinologists until Takeda & Miyake (1969b) pointed out the fusion of somites 3–5 in the male abdomen and other unique characters

of *O. huttoni* and placed in a new genus, *Neommatocarcinus*.

In addition to the male abdomen, *N. huttoni* can be distinguished from *O. macgillivrayi* by the absence of an antennular septum, the presence of 3 or 4 acute teeth (which become obtuse in large individuals; see Takeda & Miyake 1969b: pl. 2, fig. A) on the proximal margin of the cheliped merus (one median, obtuse tooth in *O. macgillivrayi*), the absence of an obvious stridulating mechanism, a G1 with a slender tip (broader and dorso-ventrally flattened in *O. macgillivrayi*), a G2 with a curved flagellum (straight in *O. macgillivrayi*), and the absence of a ridge across the width of the carapace (Fig. 51) (present in *O. macgillivrayi*). In contrast to *O. macgillivrayi*, which was described by Takeda & Miyake (1969b: 178) as “uniformly pinkish with darker spots”, the colour pattern of *N. huttoni* is rather striking (see Colour above).

*Neommatocarcinus huttoni*, which is known by the common name of “policeman crab”, lives in sandy bottoms in temperate waters in New Zealand. It makes temporary furrows in the sand, leaving the long eye peduncles protruding from the sediment (McLay 1988: 264).

Genus *Notonyx* A. Milne-Edwards, 1873

*Notonyx* A. Milne-Edwards, 1873: 269. — Miers 1886: xiv, 235. — Tesch 1918: 200 [in key], 219 [key to species].

TYPE SPECIES. — *Notonyx nitidus* A. Milne-Edwards, 1873 (by monotypy, gender masculine).

SPECIES INCLUDED. — *Notonyx gigacarcinicus* Clark & Ng, 2006; *N. nitidus* A. Milne-Edwards, 1873; *N. vitreus* Alcock, 1900.

DIAGNOSIS. — Carapace (Serène & Soh 1976: fig. 16D, E; Clark & Ng 2006: figs 1, 2, 3A, 4, 5A, 7) quadrate, slightly wider than long; widest at rounded anterolateral angles; front deflected ventrally, with two slight lobes, not marked by median emargination. Notch between front, inner edge of supraorbital border absent; orbits wide, deep, expanded distally (Clark & Ng 2006: figs 2C, 4C, 5B); supraorbital borders with slightly raised median portion, smooth; suborbital borders with slightly raised median portion, inner tooth absent; lateral borders rounded, without tooth. Dorsal surface of carapace smooth, moderately convex, without clear indication of regions. Outer orbital angle without tooth. Basal antennal article short, distalmost (third) article does not reach front. Eye peduncles (Clark & Ng 2006: figs 2A, C, 3A, 4A, C, 5A, B, 7) long, much shorter than front (0.3–0.4 front width); cornea small, spherical distal margin, not reniform (not conspicuously dorso-ventrally flattened, not clearly divided into anterior, posterior portions). No obvious stridulating mechanism other than possible rubbing of proximal portion of cheliped (P1) merus against pterygostomial ridge. Thoracic sternum wide. Median sulcus on thoracic sternite 4 absent; sutures 4/5, 5/6, 7/8 interrupted medially, 6/7 complete. Anterior end of sterno-abdominal cavity anterior to thoracic sternite 4. Cheliped fingers (Clark & Ng 2006: fig. 6) short to relatively slender, slightly curved, shorter than propodus; dactylus without dark portion; inner (ventral) margin of propodus smooth; carpus with or without defined tooth on inner margin; merus short. Dorsal margins of ambulatory leg (P2–P5) meri (Clark & Ng 2006: figs 2, 3E, 4, 5G, 7) unarmed; dactyli of ambulatory legs moderately slender, with carina on each side, with scattered setae. Male abdomen (Clark & Ng 2006: figs 3F, 5H) with 6 freely-movable somites plus telson, relatively slender, somites 4–6 gradually decreasing in width from somite 3 (widest somite). Telson long, longer than wide. Somite 2 narrower than somite 3; somites 2, 3 leave large portion of thoracic sternite 8 visible. G1 (Serène & Umali 1972: figs 92, 93; Serène & Soh 1976: figs B, B'; Clark & Ng 2006: figs 3H, I, 5J, K) relatively stout; elongated, bifurcated, or hooked tip; spinules on tip. G2 (Serène & Umali 1972: figs 94, 95; Serène & Soh 1976: figs C, C'; Clark & Ng 2006: figs 3G, 5I) slender, longer than G1, flagellum longer than

proximal part (peduncle); tip variously hooked, slightly enlarged tip without terminal spinule. Penis arising from P5 coxa, moderate size; broad, soft proximal expansion. Female abdomen with 6 freely-movable somites, relatively narrow, with relatively large distal portions of all thoracic sternites visible. Telson wider than long. Somite 2 slightly narrower than somite 3; somites 1, 2 leave large portion of thoracic sternite 8 visible. Vulva relatively large, round, extending from edge of suture 5/6 (displaced, slightly arched) to median portion of thoracic sternite 6, vulvar cover absent.

## REMARKS

*Notonyx* has often, but not always, been included in the Goneplacidae (see review by Clark & Ng 2006). Its carapace is uncharacteristically quadrate and lacks anterolateral teeth, hence its inclusion by Serène (1964) in the Chasmocarcinae Serène, 1964, as a subfamily of the Goneplacidae but now considered an independent family (see Table 1). In contrast to goneplacines, chasmocarcines have abdominal somites 3–5 fused in the male. The genus was nevertheless included in the family Notonyxidae of the superfamily Notonyxcoidea by Števcic (2005). Clark & Ng (2006) placed it in the Goneplacinae.

The cornea of the eyes of *Notonyx* is much smaller than in goneplacines but the orbits are large (and unusually deep) and the eye peduncles long as in many goneplacines. There are similarities between the general structure of the G1 of *Notonyx* and those of goneplacines as well. The long G2, longer than the G1, is uncharacteristically curved at the tip, a character it nevertheless shares in part with *Goneplacoides marivenae* (Komatsu & Takeda, 2003) (see Komatsu & Takeda 2003: fig. 3e, as *Goneplax marivenae*, fig. 6e, as *G. megalops*). The slender male abdomen is similar to that of most goneplacines. Unlike goneplacines, however, somites 2 and 3 of both the male and female abdomens leave a large portion of thoracic sternite 8 visible. *Notonyx* appears to be a somewhat aberrant goneplacine, perhaps the result of morphological adaptations (most apparent in the shape of the carapace, the absence of anterolateral teeth, and the reduced corneas) to live in coarse sediments. At least *N. gigacarcinicus* Clark & Ng, 2006 was collected from intertidal coral rubble.

The genus needs to be revised, a task not undertaken during this investigation. The characters

used by Clark & Ng (2006) to differentiate the three known species are not clearly defined and it is clear that there are more species than those listed by them. It is possible therefore that a meticulous revision of the species may prove that *Notonyx* does not belong to the Goneplacinae but to an independent subfamily within the Goneplacidae.

*Notonyx nitidus* A. Milne-Edwards, 1873

*Notonyx nitidus* A. Milne-Edwards, 1873: 269, pl. 12, figs 3, 3<sup>a</sup>-3<sup>c</sup> [New Caledonia]. — Miers 1886: 236 [New Guinea]. — Alcock 1900: 319 [Persian Gulf]. — Tesch 1918: 219 [in key], 219 [Indonesia]. — Balss 1938: 74 [Fiji]. — Stephensen 1946: 172, fig. 47A, B [Indonesia]. — Serène & Umali 1972: 82, figs 90-95, pl. 8, figs 9, 10 [Philippine Is]. — Serène & Soh 1976: fig. 16E [Thailand]. — Clark & Ng 2006: 541, figs 1-3, 6A [Indonesia, New Guinea, Chesterfield Is, New Caledonia].

TYPE MATERIAL. — M. Balansa coll., ♀ holotype, cl 9.2 mm, cw 6.6 mm (MNHN-B 10220).

TYPE LOCALITY. — New Caledonia.

MATERIAL EXAMINED. — **New Caledonia**. LAGON, stn 322, 22°30'S, 166°58'E, 71 m, 27.XI.1984, 1 ♂, 1 ♀ (ZRC 2005.0139).

DISTRIBUTION. — Indo-West Pacific region from the Persian Gulf (Alcock 1900) to Fiji (Balss 1938). Depth: 13-82 m (Clark & Ng 2006).

REMARKS

The variation in the morphology of the G1 observed by Clark & Ng (2006) among specimens identified as *N. nitidus* from the Philippine Is, Indonesia, and New Caledonia seems to indicate that they are not conspecific.

*Notonyx gigacarcinus* Clark & Ng, 2006

*Notonyx gigacarcinus* Clark & Ng, 2006: 544, figs 4, 5, 6B, 7 [colour] [Thailand].

TYPE MATERIAL. — P. Clark & P. K. L. Ng coll., ♂ holotype, cl 12.1 mm, cw 8.7 mm; ♀ paratype cl 13.7 mm, cw 8.9 mm (ZRC 2000.0981).

TYPE LOCALITY. — Thailand, Andaman Sea coast, Phuket I.

DISTRIBUTION. — Known only from the Andaman Sea coast of Thailand.

REMARKS

*Notonyx gigacarcinus* has so far only been collected living deep in coral rubble.

*Notonyx vitreus* Alcock, 1900

*Notonyx vitreus* Alcock, 1900: 319 [Andaman Is]. — Alcock & McArdle 1903: pl. 61, fig. 3 [Andaman Is]. — Tesch 1918: 219 [in key], 221 [Indonesia]. — Balss 1924: 14 [Red Sea]. — Serène & Soh 1976: 18, fig. 16A-D [Thailand].

?*Notonyx vitreus* – Takeda 1989: 170, fig. 15 [Japan].

TYPE MATERIAL. — Unknown deposit (Zoological Survey of India, Kolkata [Calcutta]?).

TYPE LOCALITY. — India, Andaman Is.

DISTRIBUTION. — Indo-West Pacific region from the Red Sea (Balss 1924) to New Guinea (Tesch 1918). Questionably from Japan (Takeda 1989). Depth: 32-91 m (Tesch 1918).

REMARKS

The identification of Japanese material as *N. vitreus* by Takeda (1989) is questionable (see Clark & Ng 2006).

REPRODUCTIVE STRUCTURES  
AND THE TAXONOMY  
OF THE GONEPLACIDAE

This reappraisal of the family Goneplacidae has emphasized the use of the external reproductive structures, both male and female, as taxonomic characters. Although the morphology of the brachyuran male gonopods, particularly the G1, and the male abdomen have been widely used by taxonomists for some time, practically no attention has been placed on the morphology of the female vulva as a taxonomic character. It is surprising, for instance, that few carcinologists have ever remarked on the conspicuously enlarged vulva of some goneplacids, particularly in *Carcinoplax*. An exception is Barnard

(1950: 287), who included “Genital openings in adult ♀ very large” as one of the characters listed in his diagnosis of *Carcinoplax*.

The morphology of the vulva and vagina among several groups of brachyurans was studied by Hartnoll (1968), who described two general arrangements (see also Guinot 1979): those having a vagina consisting of a simple tube with flexible walls and those with a vagina that is concave in cross section and localized muscles in the wall. A sclerified vulvar cover, mobile or immobile and referred to as an operculum, was found present among species belonging to the two groups. The vagina of *Goneplax rhomboides*, the only goneplacid studied by Hartnoll (1968: 296), was found to be intermediate between the two major groups, concave in outline but with flexible walls without localized muscles. The vulvar cover was absent.

The morphology of the external reproductive structures goes beyond being another morphological character of practical use to taxonomists. There seems to be a correlation between the general morphology of the vulva and that of the G1 among goneplacines.

It is speculated that this apparent correlation may be an adaptation to facilitate copulation (see discussion for other groups of brachyurans by Guinot 1979: 248). A large, greatly expanded vulva only protected by a soft membrane appears to be linked to a slender and thin (distinctly dorsoventrally compressed) G1. This is the case of eight goneplacine genera: *Carcinoplax* (see Fig. 1 for the vulva; Figs 2A; 4C; 6C; 9C for the G1), *Entricoplax* n. gen. (Fig. 11 for the vulva; Takeda & Miyake 1968: fig. 5f, as *Carcinoplax vestita*, for the G1), *Exopheticus* n. gen. (Figs 49; 50 for the vulva; Fig. 48C for the G1), *Goneplacoides* n. gen. (Fig. 29 for the vulva; Komatsu & Takeda 2003: fig. 3c, d, as *Goneplax marivenae*, for the G1), *Goneplax sensu stricto* (Capart 1951: figs 10-12, and Guinot 1969b: fig. 71a, b; 1989: fig. 46A, as *Carcinoplax barnardi*, for the G1), *Hadroplax* n. gen. (Serène & Umali 1972: figs 78, 79, as *Goneplax sinuatifrons*, for the G1), *Ommatocarcinus* (Barnard 1950: fig. 53f, and Dai & Yang 1991: figs 199-1, 199-2, for the G1), and *Paragoneplax* n. gen. (G1 slender but bent in larger males, Chen 1998: fig. 12-6, as *Goneplax*

*serenei*). The large size of the vulva in these genera, however, remains unexplained.

In contrast, a small, not expanded vulva typically covered in part by a vulvar cover and linked with a stout, thick, sometimes bent, often spinous G1, is characteristic of six genera: *Menoplax* n. gen. (Fig. 12 for the vulva; Chen 1984: fig. 7-4 to 7-6 and Guinot 1989: fig. 32A, as *Carcinoplax longispinosa*, for the G1), *Neogoneplax* n. gen. (Fig. 32 for the vulva; Fig. 33D and Chen 1998: fig. 11-4, as *Goneplax renoculis*, for the G1), *Notonyx* (Clark & Ng 2006: figs 3H, I, 5J, K for the G1), *Psopheticus* (Fig. 47 for the vulva; Zarenkov 1972: fig. 6-5, Guinot & Richer de Forges 1981b: fig. F, Guinot 1990: figs 44, 47, 50, 52, and Hsueh & Huang 2002: figs 12D, H, for the G1), *Pycnoplax* n. gen. (Figs 14; 15; 18 for the vulva; Fig. 16C and Zarenkov 1972: fig. 6-2, Serène & Lohavanijaya 1973: figs 158-162, Chen 1984: figs 4-5, 4-6, Guinot 1989: fig. 30A, as *C. bispinosa*; Guinot 1969b: fig. 73; 1989: fig. 31A, Chen 1984: figs 3-5, 3-6, Dai & Yang 1991: fig. 192-1, as *C. surugensis*, for the G1), and *Thyraplax* n. gen. (Figs 19, 22 for the vulva; Figs 20C; 23D; 25C for the G1).

Some of the species of *Microgoneplax* n. gen. and *Singhaplax* present conditions that deviate from those described above. In *Microgoneplax* n. gen. the vulva is small, the vulvar cover is present, the G1 is thick as in the genera listed above (Figs 41C; 43B; 44B), but it is nevertheless thin and slender in one species, *M. prion* n. sp. (Fig. 45B). In *Singhaplax* the vulva is large, the vulvar cover is absent, but the G1 may be regarded as stout and thick in two of the species (Figs 35B; 38B; Serène & Umali 1972: figs 86, 87, as *Goneplax ockelmanni* Serène & Soh 1976: figs 15B, B'). In these two genera, however, females are known in only some of the species and the relative thickness of the G1 is difficult to ascertain due to the small size of the individuals. There are two other notable exceptions among the remaining goneplacine genera. In *Neogoneplax costata* n. sp. the vulva is small and provided with a vulvar cover (Fig. 32) but the G1 is clearly slender (Fig. 30C), in contrast to the other two species of *Neogoneplax* n. gen., where the G1 is predictably stout. In *Neommatocarcinus huttoni*, the G1 is slender (Takeda & Miyake 1969b: fig. 5d) but the vulva, although

covered by a soft membrane and lacking a vulvar cover, is bordered by a sclerified prominence.

An alternative hypothesis is that the optimal size of the vulva is influenced more by its function as the opening through which eggs are released rather than as the location where the male pleopods deposit the sperm. Egg size, although not quantified among the goneplacines that were studied, does not seem to be noticeably or particularly larger in species with large vulvae than in those with small vulvae.

The morphology of the vulvar cover varies widely among carcinoplacines and several patterns may be observed. However, it is never as complex as the hinged operculum of some brachyurans (see Thompson & McLay 2005). The role and significance of the vulvar cover in the reproductive behavior of carcinoplacines remain unknown.

The G2 is similar among practically all goneplacines, being slender and about the same size as the G1, which was considered a more primitive character by Guinot (1979: 243). Such a long G2 is known to be involved in the insemination of the vulva in some brachyurans (see Brandis *et al.* 1999; Guinot & Quenette 2005). The notable exception, a G2 that is much shorter than the G1, is found in *Menoplax* n. gen. (Guinot 1989: fig. 32A, B, as *C. longispinosa*), *Microgoneplax* n. gen. (Figs 41C, D; 43B, C; 44B, C; 45B, C), and *Paragoneplax* n. gen. (Chen 1998: figs 12-6 to 12-9, as *Goneplax serenei*). There is no apparent correlation between the length of the G2 and the thickness, ornamentation, or general shape of the G1. In *Carcinoplax* (Figs 2A, B; 4C, D; 6C, D; 9C, D), *Entricoplax* n. gen. (Takeda & Miyake 1968: fig. 5f, g, as *Carcinoplax vestita*), *Exopheticus* n. gen. (Fig. 48C, D), *Goneplacoides* n. gen. (Komatsu & Takeda 2003: fig. 3c, d, e, as *Goneplax marivinae*, fig. 6c-e, as *G. megalops*), *Goneplax sensu stricto* (Guinot 1969b: figs 71a, b, 72; 1989: fig. 46A, B, as *Carcinoplax barnardi*), *Hadroplax* n. gen. (Serène & Umali 1972: figs 78-81, as *Goneplax sinuatifrons*), and *Ommatocarcinus* a long G2 is found together with a G1 that is thin, straight, and lacking conspicuous spines or teeth, a condition pointed out for *Carcinoplax* and several non-goneplacid genera by Guinot (1979: 241). The same basic type of long G2, however, is found in genera with thick, conspicuously spinous G1 as in *Notonyx* (Clark & Ng 2006: figs 3G, 5I),

*Psopheticus* (Guinot 1990: figs 44-54), *Pycnoplax* n. gen. (Fig. 16C, D), and *Thyraplax* n. gen. (Figs 20C, D; 23D, E; 25C, D). A long G2 is found together with a relatively slender G1 in *Neogoneplax serratipes* n. sp. (Fig. 33D, E) and four species of *Singhaplax* (Figs 36B, C; 39B, C; 40A, B), but with a thick and spinous G1 in *N. costata* n. sp. (Fig. 30C, D) and three species of *Singhaplax* (Figs 35B, C; 38B, C; Serène & Umali 1972: figs 86-88).

The goneplacine penis always arises directly from the male opening, which is found in the P5 coxa. It is uniformly soft but the proximal portion is sclerified in *Neommatocarcinus*. It was described as proximally sclerified in *Ommatocarcinus* by Guinot (1979: 219, fig. 54H) but this could not be verified.

Sperm plugs were present on the vulvae of specimens of *Pycnoplax bispinosa* n. comb. (Fig. 15), *P. victoriensis* n. comb. (Fig. 18), and *Psopheticus stridulans* (Fig. 47). They have also been reported in *Entricoplax vestita* n. comb. (Doi & Watanabe 2006). The role of sperm plugs in reproductive behaviour and sperm competition among goneplacines is unknown. Although sperm plugs are supposedly placed in the vagina by the first male to mate with soft-shelled females to prevent subsequent access to the spermatheca, in some species the plugs do not necessarily occlude the vulva nor prevent subsequent copulations (see Jensen *et al.* 1996).

The morphology of the external reproductive structures of both sexes is unfortunately rarely available for study by paleontologists. The morphologies of these structures are not studied and are therefore missing from the descriptions and, most significantly, the suggested phylogenetic relationships that have been given by paleontologists. The importance of these structures for neontologists working with at least members of the family Goneplacidae is evidenced by the impossibility of reliably distinguishing between *Microgoneplax* n. gen. and *Singhaplax*, between *Neommatocarcinus* and *Ommatocarcinus*, and between *Carcinoplax tenuidentata* n. sp. and *Pycnoplax bispinosa* n. comb. without examining the external reproductive structures. The likely role of the structure of copulatory organs as an isolating mechanism among the sympatric species of *Microgoneplax* n. gen. and *Singhaplax* provides evidence of the obvious biological significance of these structures.

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