A review of *Macrophthalmus sensu lato* (Crustacea: Decapoda: Macrophthalmidae) from Australia, including two new species and new records

Peter J.F. Davie
Queensland Museum, PO Box 3300, South Brisbane, Qld 4101, Australia

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ABSTRACT

Nineteen species of *Macrophthalmus sensu lato* from Australia and its Territories are reviewed, diagnosed and illustrated. One new species *M. gagudju* is described from the Northern Territory. It differs from its nearest allies by carapace shape, armature and granulation, thick setae on the inner face of the palm of the male cheliped, and the lack of a tooth on the fixed finger of the male claw. Five species are newly recorded for the Australian fauna, *Macrophthalmus* (*Paramareotis*) *erato* De Man, 1888, from the vicinity of Darwin, and in Kakadu National Park; *M.* (*Macrophthalmus*) *dentatus* Stimpson, 1858, from Moreton Bay; *M.* (*M.*) *ceratophorus* Sakai, 1969, from the Great Barrier Reef; *M.* (*M.*) *serenei* Takeda & Komai, 1991, from the Great Barrier Reef and Cocos-Keeling Is.; and *M.* (*M.*) *graeffei* A. Milne-Edwards, 1873, from coastal waters off eastern Cape York. The record of *M.* (*M.*) *graeffei* is the first from the Western Pacific since the original type description; a neotype is designated. It is demonstrated that specimens recorded from the Indian Ocean under this name are not conspecific with *M.* (*M.*) *graeffei*, and a new species name, *M.* (*M.*) *indicus* is provided. The geographic range of *Macrophthalmus* (*Mareotis*) *abercrombiei* has been extended westwards from the Gulf of Carpentaria to Kakadu National Park, on the western edge of Arnhem Land; *M.* (*Mareotis*) *darwinensis* is now known from northeastern Australia and New Caledonia. *Chaenostoma* and *Tasmanoplax*, previously considered subgenera of *Macrophthalmus*, are formally treated as full genera. *Tasmanoplax latifrons* is recorded from the Hunter River, central New South Wales, considerably extending northwards its known distribution. The typically subtropical species *Chaenostoma punctulatus* is newly recorded from Port Augusta, South Australia, and it is speculated that this has been a recent introduction. Keys to the genera and species of Australian Macrophthalminae are presented. ❐ *Crustacea, Decapoda, Brachyura, Ocypodidae,* Macrophthalmus, *Australia, Northern Territory, Queensland, New South Wales, new species, intertidal.*

Davie (2009), in erecting a new Australian macrophthalmine genus, *Lutogemma*, followed Ng *et al.* (2008) in recognizing the family Macrophthalmidae, containing the nominal subfamily, along with the Ilyograpsinae Števčić, 2005, and the Tritodynamiinae Števčić, 2005. Barnes (2010) has given an excellent review of the broader family Macrophthalmidae including a key to the subfamilies and keys to all genera and species. The Macrophthalminae *sensu stricto*

now contains seven genera: *Macrophthalmus* Desmarest, 1823, *Chaenostoma* Stimpson, 1858, and four endemic Australian monotypic genera, viz., *Australoplax* Barnes, 1966 (with *A. tridentata* (A. Milne-Edwards, 1873)), and *Enigmaplax* Davie, 1993 (with *E. littoralis* Davie, 1993); *Lutogemma* (with *L. sandybrucei* Davie, 2009); and *Tasmanoplax* Barnes, 1967 (including *Macrophthalmus latifrons* Haswell, 1881), and the endemic New Zealand genus *Hemiplax* Heller, 1865 (including *Hemiplax hirtipes* (Hombron & Jacquinot, 1846)), although there is strong evidence that this last genus should be removed to the Varunidae (see Kitaura *et al.* 2010).

The Australian species of *Macrophthalmus sensu lato* were revised by Barnes (1967). This was one of the earliest papers of what was to become a series revising the genus throughout the Indo-West Pacific (Barnes 1966, 1967, 1970, 1971, 1973, 1976, 1977). Barnes (1967) introduced four new subgenera, making a total of six subgenera under *Macrophthalmus* (subsequently increased to eight, see Ng *et al.* 2009)). These subgenera have been a basis for ongoing interest and study of the phylogenetic relationships within this diverse genus (see Kitaura *et al.* 2006, 2010; Mendoza & Ng 2007; Davie 2009; McLay *et al.* 2010). Davie (2009) and McLay *et al.* (2010) have indicated that *Chaenostoma* Stimpson, 1858 (=*Macrophthalmus* (*Mopsocarcinus*) Barnes, 1967), *Hemiplax* Heller, 1865, and *Tasmanoplax* Barnes, 1967, should be recognised as distinct genera in their own right (see also Kitaura *et al.* 2010). Davie (2009) argued that the 'broad-fronted' forms, *Chaenostoma, Hemiplax* and *Tasmanoplax* form a separate lineage that is more akin to *Australoplax*, and seem quite separate from the other typically narrow-fronted *Macrophthalmus* subgenera. Kitaura *et al.* (2010) present strong genetic evidence that the monotypic New Zealand genus *Hemiplax* (*H. hirtipes*) is in fact not a macrphthalmid at all, but should be transferred to the Varunidae. In my opinion it is very likely that many of the macrophthalmid subgenera will prove to need generic status, but this should await more genetic analyses including a greater range of species and genera, and involving more genes than just 16s rRNA. Mendoza & Ng (2007) and Barnes (2010) have discussed some of the complex aspects of the subgenera and provided a key to identify them.

There have been some important recent nomenclatural changes. Barnes (1967) erected the subgenus, *Macrophthalmus* (*Mopsocarcinus*) (type species *Macrophthalmus boscii* Audouin, 1826), unaware that there was an earlier name, *Chaenostoma* Stimpson, 1858 (type species *C. orientale* Stimpson, 1858). Since *Chaenostoma orientale* Stimpson, 1858, is now regarded as a junior synonym of *Macrophthalmus boscii* Audouin, 1826, the name *Chaenostoma* Stimpson, 1858, must have priority as the subgeneric name (see Stimpson 1858; Ng *et al.* 2001). *Euplax* H. Milne Edwards, 1852, was synonymised under *Macrophthalmus* (*Venitus*) Barnes, 1967, by Barnes (1977) (see also Barnes 1966), but was regarded as a good subgenus by Mendoza & Ng (2007). In any case, if *Euplax* and *Venitus* are regarded as synonyms, *Euplax* has priority, as first pointed out by Karasawa & Matsuoka (1992), and see also Ng *et al.* (2008). McLay *et al.* (2010) stated that Ng *et al.* (2008) had suggested that '*Euplax* H. Milne Edwards, 1852, and *Venitus* Barnes, 1967, could be treated as good genera', and tentatively recognised generic status for both genera following those earlier authors despite the fact that their molecular phylogeny included *M.* (*Venitus*) *latreillei* within their *Macrophthalmus* clade as we currently understand it. In fact Ng *et al.* (2008) did not suggest generic status for either subgenus, and as no new evidence has been presented, I here continue to treat *Euplax* and *Venitus* as subgenera following Davie (2009) and Barnes (2010). Barnes (2010) has provided diagnoses for genera and subgenera within the Macropthalmidae, so these have been not repeated here except for *Chaenostoma* and *Tasmanoplax* which are treated in the present work as full genera.

The present paper is based on collections I have made from northern Australia over many years, supplemented by specimens made as part of environmental studies by Dr Russell Hanley, and Ms Melanie Burke, of the Northern Territory Museum of Arts and Sciences, and the Queensland Museum and Western Australian Museum collections. Several species could not be identified using the key to Australian species in Barnes (1967), and closer scrutiny led to the identification of four species new to the Australian fauna, and two species new to science from the Northern Territory and Western Australia. One of these, *M.* (*Mareotis*) *pistrosinus* Barnes & Davie, 2008, has been described separately.

The following is a list of currently recognised *Macrophthalmus* (*sensu lato*) species occurring in Australia (* = new Australian record):

M. (*Macrophthalmus*) *ceratophorus* Sakai, 1969*
M. (*M.*) *convexus* Stimpson, 1858
M. (*M.*) *crassipes* H. Milne Edwards, 1852
M. (*M.*) *deutatus* Stimpson, 1858*
M. (*M.*) *graeffei* A. Milne-Edwards, 1873*
M. (*M.*) *milloti* Crosnier, 1965
M. (*M.*) *serenei* Takeda & Komai, 1991*
M. (*M.*) *telescopicus* Owen, 1839
M. (*Mareotis*) *abercrombiei* Barnes, 1966
M. (*M.*) *darwinensis* Barnes, 1971
M. (*M.*) *gagudju* sp. nov.
M. (*M.*) *pacificus* Dana, 1851
M. (*M.*) *pistrosinus* Barnes & Davie, 2008
M. (*M.*) *setosus* H. Milne Edwards, 1852
M. (*Paramareotis*) *erato* De Man, 1888*
M. (*Venitus*) *latreillei* (Desmarest, 1822)
Chaenostoma boscii Audouin, 1826
Chaenostoma punctulatus Miers, 1884
Tasmanoplax latifrons Haswell, 1882

Macrophthalmus (*Mareotis*) *definitus* Adams & White, 1848, is sometimes cited as being recorded from Queensland (e.g. Barnes 2010: 36), but this seems to be an error. Barnes included this species in his 1967 paper on the 'Macrophthalminae of Australasia'. However, the only specimens that he examined in that paper were from the Solomon Islands, and I can find no subsequent confirmed record of this species from the Australian region.

Abbreviations used in the text are: NHM, The Natural History Museum, London; NTM, Northern Territory Museum; QM, Queensland Museum; WAM, Western Australian Museum; G1, male first gonopod. Measurements given in the text are of the carapace breadth (measured at the widest point) followed by length, and are in millimetres (mm).

MACROPHTHALMIDAE DANA, 1851

Macrophthalminae Dana, 1851

Diagnosis. Carapace usually markedly broader than long, quadrilateral, more or less flattened; dorsal, surface with regions usually well defined; anterolateral margins either straight or slightly arched, usually armed with one to several teeth, but may be entire. Front variable but never very broad. Interantennular septum very narrow. Antennules folding transversely or slightly obliquely; flagellum well developed. Eyestalks usually elongate, often remarkably long. Third maxilliped typically more-or-less closing buccal cavern, but may be widely gaping (*Lutogenuua*); exopod visible, moderately broad, flagellum well developed. Chelipeds subequal, chelae usually distinctly larger in males; dactylus of males often with subproximal tooth; chelae of females weaker, more slender. No brush of long setae edging pouch at base of pereiopods. Thoracic sternum broad posteriorly. Male genital openings sternal. Free-living, intertidal to shallow subtidal, usually in estuaries or mangroves but may extend into sandier coastal waters; mostly inhabiting burrows (Davie 2009).

KEY TO GENERA OF MACROPHTHALMINAE

(The endemic New Zealand monotypic genus *Hemiplax* is now considered to belong to the Varunidae following the recent work of Kitaura *et al.* (2010), and is not included in this key)

1. Third maxillipeds broadly gaping, ischium narrow with inner margin deeply excavated, palp with long setae reaching to sternum; legs subcylindrical . . *Lutogemma*
   [Monotypic; restricted to north Australia; *L. sandybrucei* Davie, 2009, inhabits inshore soft sediments in shallow subtidal seagrass meadows].
   – Third maxillipeds largely closing bucal cavity, ischium subrectangular, inner border not excavated, palp normal, without very long setae; legs flattened 2
2. Front very narrow or moderately narrow, lateral margins not markedly diverging, strongly to slightly constricted between bases of ocular peduncles. Merus of third maxilliped markedly smaller than ischium. . . . . *Macrophthalmus*
   – Front broad, lateral margins moderately to markedly divergent, without constriction between bases of ocular peduncles. Merus of third maxilliped subequal or only slightly smaller than ischium 3
3. Male abdomen broad; sixth somite markedly elongated, c. 1.5 times wider than long, lateral margins markedly convergent distally towards telson; distal margin of fifth somite markedly concave. Third maxilliped with transverse row of setae above base; adult male chela with fingers broadly gaping, but gape obscured by thick matt of long setae extending along most of the length of both fingers . . . . . *Australoplax*
   [Monotypic; east coast of Australia; *A. tridentata* (A. Milne Edwards, 1873) inhabits intertidal muds typically around mangroves].
   – Male abdomen relatively narrow, sixth somite not markedly elongated; sutures between somites relatively straight. Third maxillipeds and male chelae otherwise . . 4
4. Carapace subquadrate, c. 1.1–1.2 times wider than long; ocular peduncles relatively short and stout 5
   – Carapace broader, breadth equal to c. 1·5 x length; ocular peduncles relatively slender and elongated . . . . . *Tasmanoplax*
5. Frontal width c. 0.4 times fronto-orbital width; merus of third maxilliped slightly smaller than ischium; fingers of male chela pointed. . . . . *Enigmaplax*
   [Monotypic, *E. littoralis* Davie, 1993; east coast of Australia; in intertidal and shallow subtidal seagrass meadows, in algal mats, and under rocks].
   – Frontal width c. 0.25–0.3 times fronto-orbital width; merus of third maxilliped subequal to ischium; fingers of male chela spooned . . . . . *Chaenostoma*

KEY TO AUSTRALIAN *MACROPHTHALMUS*

(modified after Barnes 2010; based on adult males)

1. Short horny ridge present on inner surface near inner margin of merus of cheliped; lower orbital border with small number of large triangular protuberances occupying at least one fifth of the margin [inner surface of palm of chela with large spine near articulation with carpus]. . . . . *M. (Paramareotis) erato*
   – No horny ridge on merus of cheliped; lower orbital border regularly serrated by granules or smooth, but without any large triangular protuberances. 2
2. Ocular peduncles with a long, thin, segmented filament (style) projecting distally beyond the tip of the cornea; upper margins of palm and dactylus of chela with strong spines . . . . . *M. (Macrophthalmus) ceratophorus*
   – Ocular peduncles without an obvious long style 3
3. Ocular peduncle extended beyond lateral carapace margin by at least half length of cornea (may be extremely elongate). . . . 4

– Ocular peduncle not extended beyond lateral carapace margin by half length of cornea, if at all. 7

4. Cornea projecting beyond tip of exorbital tooth for only half its length. . . . . *M.* (*Macrophthalmus*) *graeffei*

– Ocular peduncle projecting beyond lateral carapace margin for at least 25% of its length, so that comea located beyond lateral carapace margin for more than its own length 5

5. Ocular peduncles extend beyond tip of exorbital tooth for < 36% of their length and for less than a distance equal to twice length of cornea . . . . *M.* (*Macrophthalmus*) *milloti*

– Ocular peduncles extend beyond tip of exorbital tooth for > 36% of their length and for more than a distance to twice the length of the cornea. 6

6. Exorbital tooth triangular, sharp, not projecting beyond second anterolateral tooth. Poorly differentiated tooth on cutting margin of dactyl of chela; lower margin of index concave; may attain a carapace breadth of > 35 mm. . . . . *M.* (*Macrophthalmus*) *telescopicus*

– Exorbital tooth spiniform, projecting beyond second anterolateral tooth. Prominently differentiated teeth on cutting margins of both fingers of chelae; lower margin of fixed finger straight; carapace breadth <25 mm . . . . *M.* (*Macrophthalmus*) *serenei*

7. Carapace with four or five anterolateral teeth, exorbital tooth largest and marking position of greatest carapace breadth; carapace surface generally smooth and shiny. . . . . *M.* (*Macrophthalmus*) *dentatus*

– Carapace with two to four anterolateral teeth; if fourth present then carapace surface heavily granular and greatest breadth behind the exorbital angle 8

8. Central region of epistome with a protuberance 9

– Central region of epistome straight or excavated. 10

9. Inner surface of palm of chela with one or more spines near articulation with carpus; exorbital angle narrower than second lateral tooth and projecting about the same distance . . . *M.* (*Macrophthalmus*) *crassipes*

– Inner surface of palm of chela without spines; exorbital angle larger than, and projecting beyond, second lateral tooth . . . . . *M.* (*Macrophthalmus*) *convexus*

10. Inner surface of palm of chela without mats of setae [no longitudinal rows of granules on branchial regions; carapace markedly narrowed anteriorly]. . . . . *M.* (*Mareotis*) *abercrombiei*

– Inner surface of palm of chela with mat of setae concealing at least part of surface. . 11

11. Greatest carapace breadth across exorbital angles; outer surface of palm and index of chela with longitudinal ridge near lower margin; index deflexed . . . . . *M.* (*Mareotis*) *setosus*

– Carapace with greatest breadth situated posterior to exorbital angles; if longitudinal ridge present on outer surface of palm and index of chela, then index undeflexed. . 12

12. Inner surface of palm of chela with longitudinal band of setae along upper half; index of chela deflexed. . . . . *M.* (*Mareotis*) *pistrosinus*

– Setae on inner surface of palm of chela not as described above; index of chela scarcely or not at all deflexed. 13

13. Cutting margin of index of chela of adult males with a differentiated tooth; carapace breadth less than 40 mm [carapace surface not coarsely granular, with thick lateral setae, and with longitudinal rows of setae on branchial regions . . . . . *M.* (*Mareotis*) *darwinensis*

– Cutting margin of index of chela of adult males without a differentiated tooth (except in specimens of more than 45 mm carapace breadth). 14

14. Carapace surface smooth; inner surface of palm of chela without dense setae . . . . . *M.* (*Mareotis*) *pacificus*

— Carapace surface granular; inner surface of palm of chela with dense setae 15

15. Carapace surface with relatively small granules; third anterolateral teeth inconspicuous or absent [medium sized species reaching < 20 mm c.b.]. . . . . *M. (Mareotis) gagudju* sp. nov.

— Carapace surface heavily granular; third anterolateral teeth prominent and projecting [anterolateral teeth all projecting and acute; large species reaching 60 mm c.b.]. . . . . *M. (Venitus) latreillei*

TAXONOMY

Macrophthalmus (Macrophthalmus) ceratophorus Sakai, 1969

(Figs 1, 2)

Macrophthalmus (Macrophthalmus) ceratophorus Sakai, 1969: 280, pl. 2, figs 3a–d; 1976: 611–613, text-figs 335a–d; Barnes 1976: 140–143, fig. 5; 1977: 276, 279; Fransen 1997: 341–345, figs 1–3; Ng & Davie 2002: 378, 382–383; Ng, Guinot & Davie 2008: 237.

Macrophthalmus ceratophorus — Wada 1978: 20; Nagai 1990: 117; Takeda & Komai 1991: 166; Ho 1995: 21–24; Ng *et al.* 2001: 38.

Material examined. QM-W27081, ♂ (39.9 × 24.4 mm); 2 ♀ (47.7 × 28.8, 42.2 × 26.6 mm), Magnetic Passage, North of Helix Reef, East of Slashers complex, off Townsville, Qld, 18°27'S, 147°16'E, 07.07.1980. QM-W27080, ♂ (35.5 × 21.04 mm); ♀ (33.3 × 25.5 mm), north of Ile Desnoeufs, Amirante Is., 6°08'S, 53° 02'E, 54 m, soft bottom amongst sponges & seagrass, Dutch Oceanic Reefs' Expedition, 2.01.1993.

Diagnosis. Carapace smooth and punctate centrally, pitted, scattered large rounded granules present laterally, particularly on branchial regions; front deflexed, markedly constricted between bases of ocular peduncles, with smooth margins, clearly bilobed distally, median furrow narrow. Lateral margins granulate, slightly convergent posteriorly, exorbital angle moderately prominent, followed by two poorly defined antero-lateral teeth. Ocular peduncles long and narrow, cornea extending well (about half length of eyestalk) beyond tip of exorbital angle, a slender, terminal segmented filament present beyond cornea. Central region of epistome pointed. Merus of third maxilliped noticeably smaller than ischium. Palm of adult male cheliped elongate, outer face with medium-sized, scattered, rounded or pointed granules, inner face with rounded or pointed granules medioventrally, with distinct and discrete thick patch of setae near base of dactylus; fixed finger straight or slightly deflexed, cutting edge lined with pointed granules but without differentiated tooth; cutting edge of dactylus proximally with a large, quadrangular, crenulated tooth, distally with a row of pointed granules; dorsal margin of dactylus with about four prominent spines. Meri of ambulatory legs with pointed granules on both margins, and a row of setae along upper margin; carpi of P2–4 with two longitudinal rows of spinules, that extend less prominently onto proximal end of propodi.

Colour. Porcelain white speckled with fine red dots on pereiopods. Red dots largest and most conspicuous on carpus and distal part of merus in male specimens. Elongate patch of dense setae in centre of proximal surface of dactylus usually dark brown to black. (Fransen 1997).

Remarks. These specimens agree closely with the description and figures of Sakai (1969) and Barnes (1976), as well as those of Fransen (1998), and they have been directly compared with specimens studied by Fransen from the Amirante Islands, and donated to the Queensland Museum. This large species of sublittoral *Macrophthalmus* is remarkable because of the long segmented filament at the tip of the eyestalk. Originally described from Japan, it is now reported from a number of localities through to the western Indian Ocean.

Habitat. Appears to prefer offshore soft substrates in depths of 20–50 m; has been found on bottoms amongst seagrass roots, sponges, and foraminiferan and bryozoan rubble.

Distribution. New record for Australia. Range: Japan—Gokasho Bay, Mie Prefecture, and Shimogusui, Kii Province (Sakai 1976); Taiwan (Ho 1995); South China Sea (Chen 1998); western Thailand (Ng & Davie 2002); Amirante Is.,

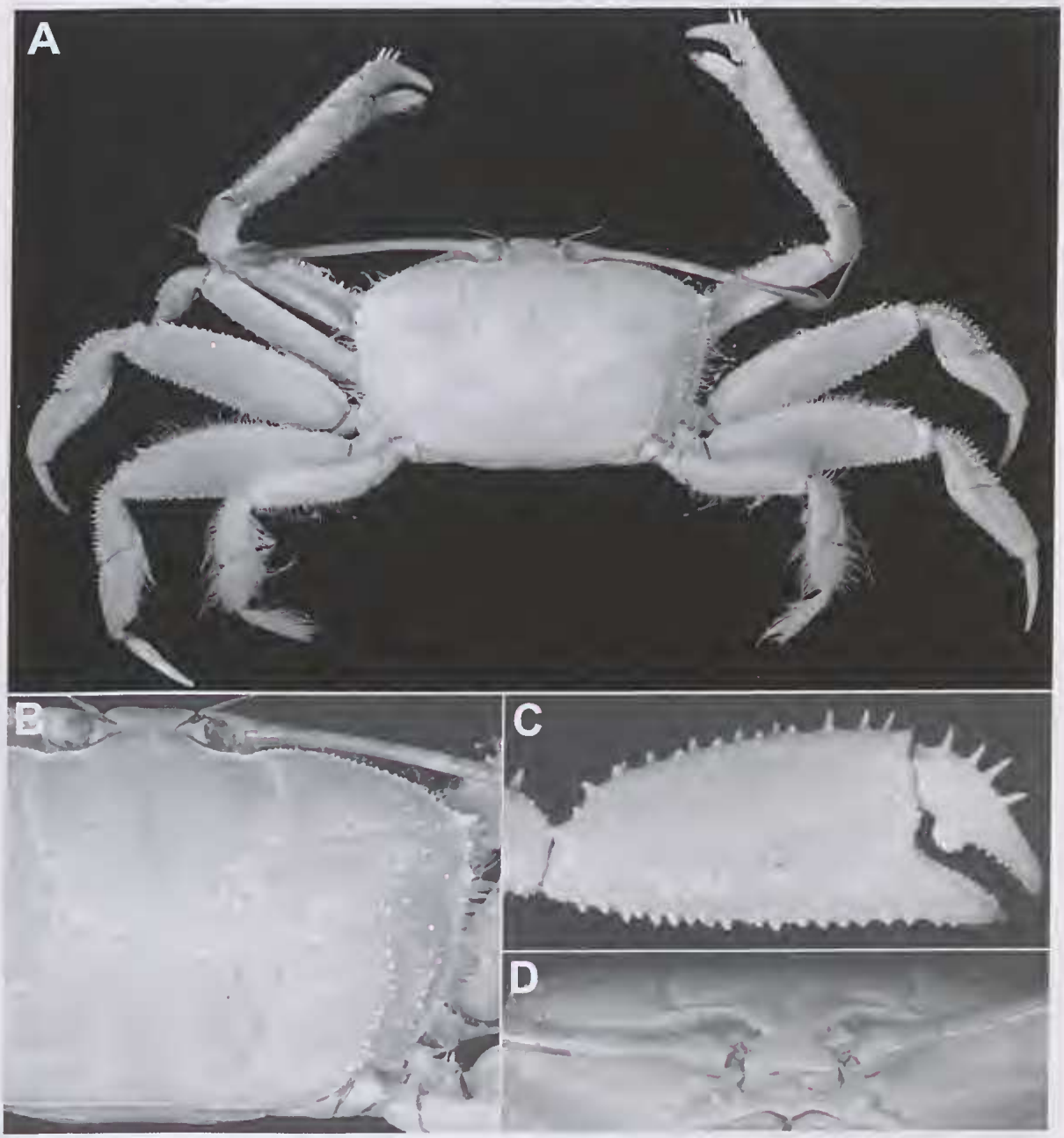
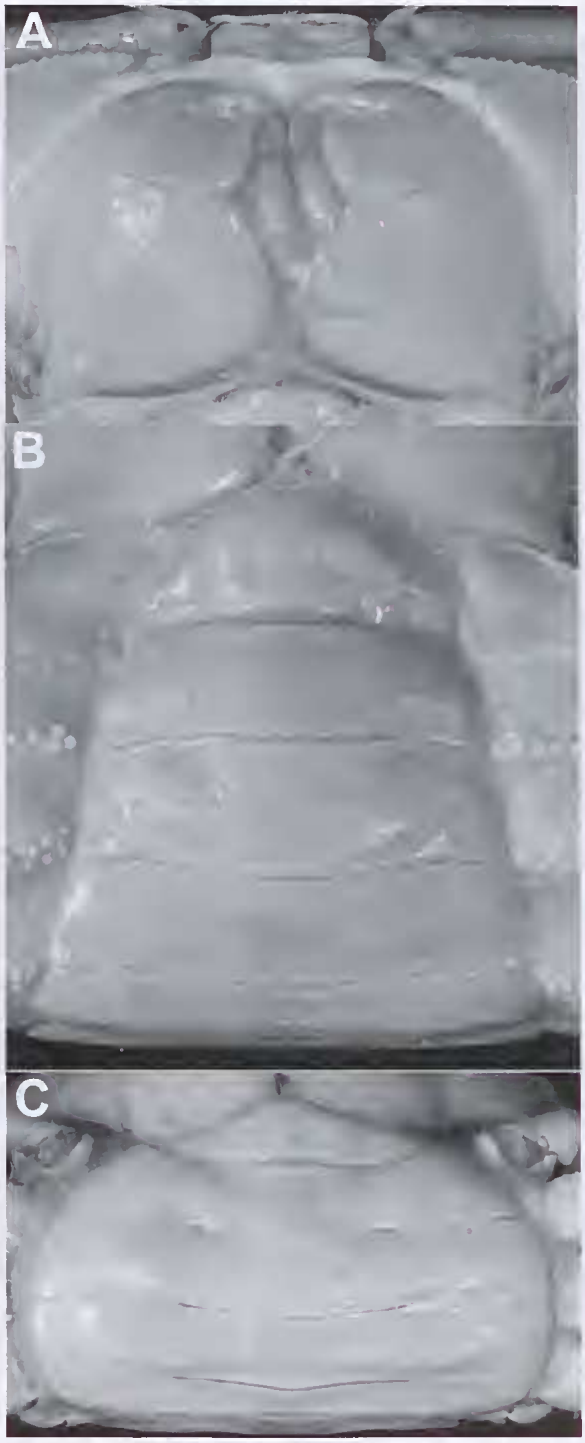


FIG. 1. *Macrophthalmus* (*M.*) *ceratophorus* Sakai, 1969. QM-W27081, ♂ (39.9 × 24.4 mm), Magnetic Passage, off Townsville, Qld. **A**, Dorsal view; **B**, enlarged view of carapace; **C**, frontal view of chela; **D**, frontal margin and orbits.



Seychelles (Fransen 1997); and now from Magnetic Passage off Townsville, Qld.

Macrophthalmus (Macrophthalmus) convexus Stimpson, 1858

(Figs 3, 4)

Macrophthalmus convexus Stimpson, 1858; 97; Miers 1880b: 307; Haswell 1882a: 89; de Man 1888b: 354, pl. 15, fig. 4; 1902: 493, pl. 19, figs. 6, 6a; Ortmann 1894a: 745; 1897: 343; Alcock 1900b: 378; Stimpson 1907: 97, pl. 13, fig. 2; Rathbun 1910a: 323, pl. 2. fig. 3; Tesch 1915: 154 (key), 175 (part), pl. 7, fig. 8; 1918: 59; Kemp 1919: 389, pl. 24, fig. 2; Balss 1922: 145; Maki & Tsuchiya 1923; Boone 1934: 210, pls. 104–106; Shen 1936: fig. 3g–i; Shen & Dai 1964: 113; Chopra & Das 1937: 427; Tweedie 1937: 163; Sakai 1939: 625, fig. 97; Lin 1949: 27; Barnard 1954a: 98; Barnes 1977: 277 (key); Takeda 1982: 210; Davie 1992: 348 (key); Ng *et al.* 2001: 38.

Macrophthalmus inermis A. Milne-Edwards, 1867: 286; 1873: 277, pl. 12, fig. 5; Rathbun 1906: 834.

Macrophthalmus (*Macrophthalmus*) *convexus* — Barnes 1967: 211, fig. 3, pl. 1c; 1970: 222; 1971: 9; Lundoer 1974: 8 (list); Sakai 1976: 613, fig. 336; Takeda 1981: 71; Miyake 1983: 167, pl. 56, fig. 4; Tai & Song 1984: 81 (key); Dai *et al.* 1986: 431, pl. 59 (8), fig. 240 (1); Dai & Yang 1991: 472, fig. 240 (1), pl. 59 (8); Huang *et al.* 1992: 147, fig. 6, pl. 1F; Komai *et al.* 1995: 110, figs. 3–4; Wada 1995: 416, pl. 118, fig. 1; Shokita *et al.* 1998: 66 (list); 2000: 658 (list); Ng *et al.* 2008: 237 (list).

Not *Macrophthalmus* (*Macrophthalmus*) *convexus* — Tesch 1915: 175 (part) [= *M. graeffi* A. Milne-Edwards, 1873].

Material examined. QM-W21292, ♀ (8.6 × 5.3 mm), Sandy I., Cape Talbot, Kimberley Coast, 13°45'S, 126°48'E, intertidal muddy sand flat, 28.11.1995, P. Davie & J. Short. QM-W29104, 6 ♂ (13.3 × 6.3 – 24.0 × 11.9 mm), 4 ♀ (15.7 × 8.7 – 24.3 × 12.7 mm), Portland Roads, Cape York, NE Qld, sandflat, P. Davie, 12.11.1982. QM-W8196, 2 ♀ (27.7 × 15.4, 26.6 × 14.3 mm), ♂ (29.9 × 14.3 mm), Murray River, NQ, 18°1'S, 145°53'E, estuarine, littoral, shallow pools, open mud bank, 21.05.1978, P. Davie. QM-W1251, 2 ♀ (22.2 × 10.1, 23.4 × 11.2 mm), 5 ♂ (26.6 × 13.3, 24.4 × 10.1, 19.9 × 9.9, 19.8 × 9.9, 22.2 × 10.1 mm), Cockle Bay,

FIG. 2. *Macrophthalmus* (*M.*) *ceratophorus* Sakai, 1969. QM-W27081, ♂ (39.9 × 24.4 mm); ♀ (47.7 × 28.8 mm), Magnetic Passage, off Townsville, Qld. **A**, third maxillipeds; **B**, male abdomen; **C**, female abdomen.

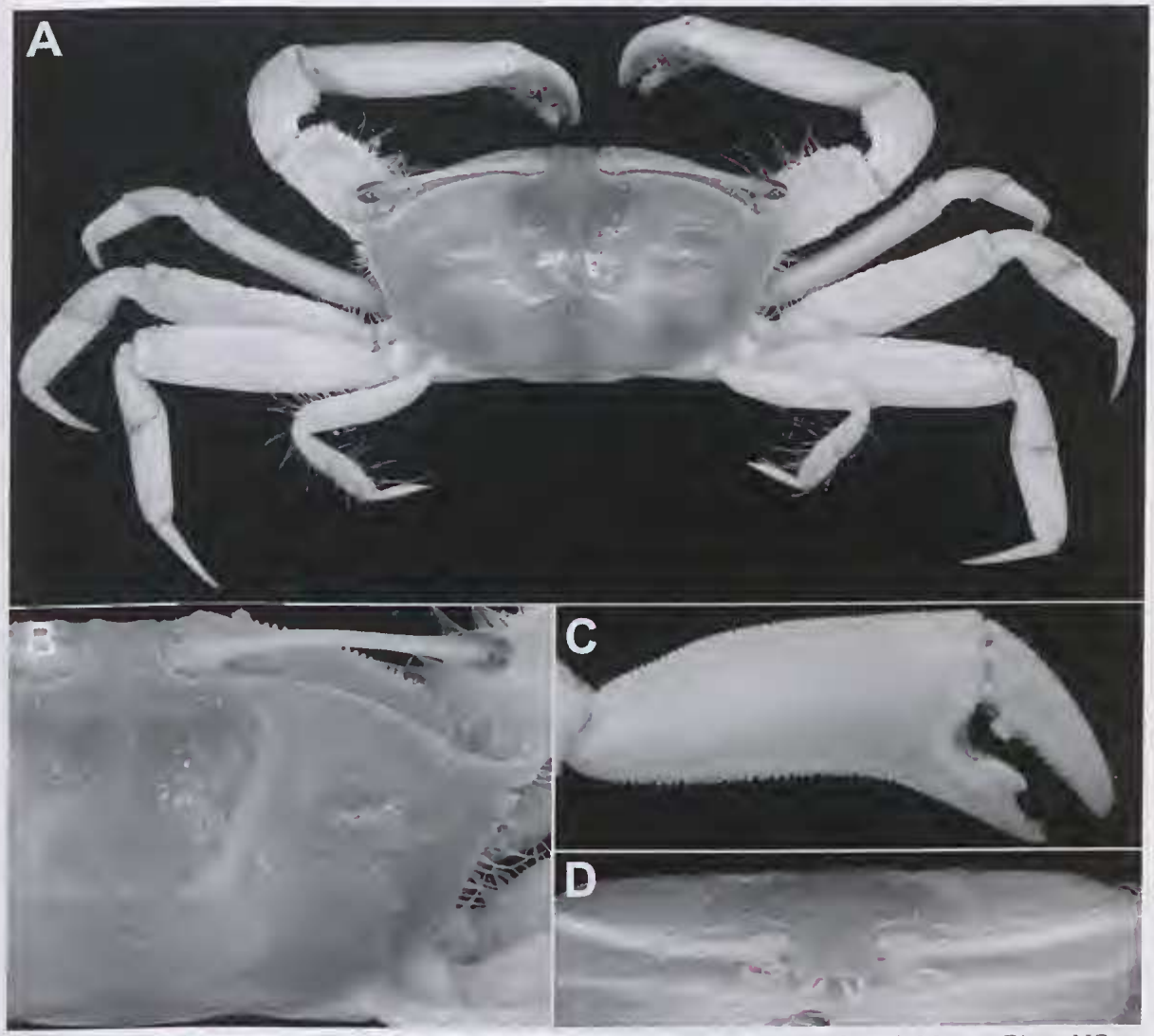


FIG. 3. *Macrophthalmus (M.) convexus* Stimpson, 1858. QM-W8196, ♂ (29.9 × 14.3 mm), Murray River, NQ. **A**, Dorsal view; **B**, enlarged view of carapace; **C**, frontal view of chela; **D**, frontal margin and orbits.

19°11'S, 146°49'E, 19.03.1998, R. Barnes. QM-W10469, ♂ (25.5 × 10.1 mm), Ross R., Townsville, 19°22'S, 146°44'E, estuarine, sandy mud flat, lower estuary, July 1983, P. Davie. QM-W11921, ♀ (17.3 × 9.2 mm), Shoal Water Bay, ME Qld, 22°23'S, 150°31'E, Nov. 1982. QM-W11920, ♂ (12.9 × 7.3 mm), Triangular I., Shoal Water Bay, ME Qld, 22°23'S, 150°31'E, Nov. 1982.

Diagnosis. Carapace smooth except for raised clumps of granules on branchial regions; front deflexed, constricted between bases of ocular peduncles, with smooth margins, slightly bilobed distally, median furrow distinct; greatest breadth across exorbital regions; lateral margins posteriorly convergent, 3 anterolateral teeth, first two well defined, third poorly defined. Ocular peduncles long and narrow, cornea extending to tip of exorbital angle and sometimes slightly

overreaching it. Central region of epistome with a protuberance. Merus of third maxilliped markedly smaller than ischium. Palm of male cheliped elongate, outer face smooth above longitudinal ridge, granular below, inner face finely granular, no spine near carpus articulation; fixed finger markedly deflexed in adults, cutting edge with a long, low, crenulate tooth; cutting edge of dactylus proximally with a small quadrangular tooth near base and granules distally. Meri of ambulatory with some fine setae on upper margins.

Habitat. Occurs at low tide levels, burrowing in wet muddy, and sandy mud, substrates, often amongst mangroves.

Distribution. Widely distributed throughout the Indo-West Pacific Ocean from Mauritius, the west coast of Thailand, through Indonesia, and further east to Japan, Hawaii and French Polynesia. Within Australia *M. convexus* is found along the north-west coast of Western Australia, the Northern Territory, and extending south along the eatern coast of Queensland to about Shoalwater Bay. Previous Australian records include: Torres Straits (Barnes 1970); unspecified localities (Miers 1880b; Boone 1934), Roebuck Bay, north-western WA, and from Cooktown to Port Curtis (Barnes 1967), Low Isles, Great Barrier Reef (Barnes 1970).

Macrophthalmus (Macrophthalmus) crassipes H. Milne Edwards, 1852

(Figs 5, 6)

Macrophthalmus crassipes Milne Edwards, H., 1852: 157, pls. 3, 4; Hess 1865: 142; Haswell 1882a: 89; de Man 1890: 76, pl. 4, Fig. 7; Ortmann 1894a: 744; 1897: 345; Rathbun 1910a: 323; Tesch 1915: 174, pl. 7; Rathbun 1924: 12; Tweedie 1937: 164; Dai & Yang 1991: 474, figs 241(1–3), pl. 60(2); Tai & Song 1984, 78–79. figs 1b, 2b, 3e, f; Poore 2004: 495, fig. 156g; Davie 2011: 242, colour picture.

FIG. 4. *Macrophthalmus* (*Macrophthalmus*) *convexus* Stimpson, 1858. QM-W8196, ♂ (29.9 × 14.3 mm), ♀ (27.7 × 15.4 mm), Murray River, N. Qld. **A**, third maxillipeds; **B**, male abdomen; **C**, female abdomen.

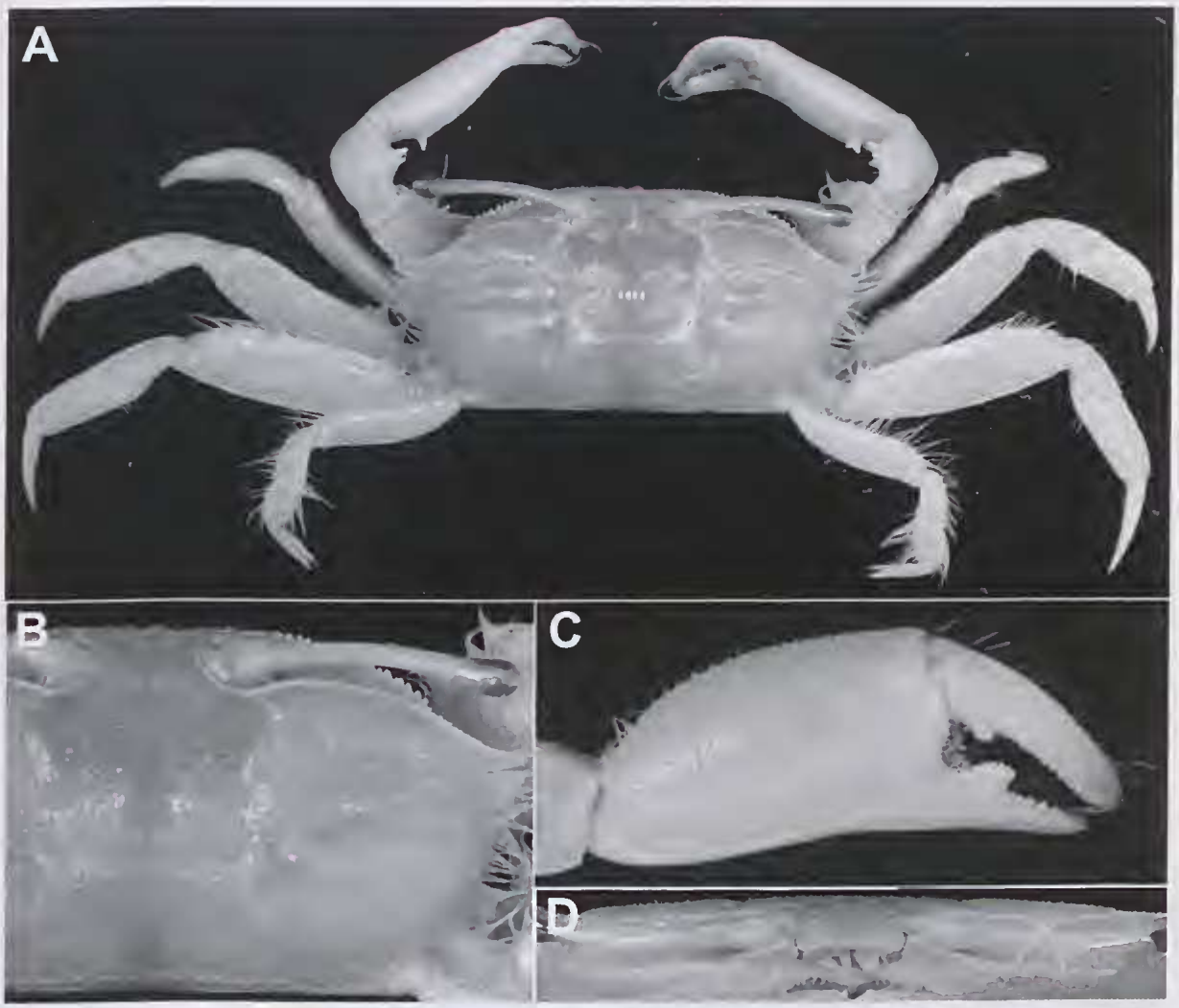


FIG. 5. *Macrophthalmus* (*Macrophthalmus*) *crassipes* H. Milne Edwards, 1852. QM-W3842, ♂ (28.8 × 13.3 mm), Dunwich, North Stradbroke Island, SE Qld. **A**, Dorsal view; **B**, enlarged view of carapace; **C**, frontal view of chela; **D**, frontal margin and orbits.

Macrophthalmus carinimanus — Haswell 1882a: 88; McNeill 1962: 41, pl. 2, fig. 2 [not *Macrophthalmus carinimanus* H. Milne Edwards, 1837: 65].

? Macrophthalmus sundakani — Rathbun 1924: 12, Pl. 1, Fig. 3.

Macrophthalmus (Macrophthalmus) crassipes — Barnes 1967: 208–211, pl. 1(b), figs. 2; Morgan 1990: 60; Davie 2002: 352; Ng *et al.* 2008: 237 (list).

Material examined. WAM-C22609, ♂ (13.4 × 7.2 mm), Exmouth Gulf, NE coast of Tent Point, WA, 22 00.0'S, 114 30.5'E, stn 3, M. Hewitt, 18.08.1995. QM-W21034, 2 ♂ (21.7 × 9.6, 12.7 × 5.7 mm), ♀ (12.2 × 6.7 mm), Turtle Bay and Unnamed Bay to S. Lacrosse I., Cambridge Gulf, WA, 14°45'S, 128°18'E, marine, littoral, mud flat near mangroves, 20.11.1995, P. Davie & J. Short. QM-W18170, ♀ (12.1 × 6.6 mm), 2 ♂ (22.5 × 11.9, 17.8 × 9.8 mm), Starke River, FN Qld, 14°47'S, 145°1'E, marine, littoral, upper mud flat, in burrows salinity 35 ppt, 11.11.1992, P. Davie & J. Short. QM-W20245, 2 ♀ (14.7 × 6.8, 11.8 × 5.8 mm),

FIG. 6. *Macrophthalmus (M.) crassipes* H. Milne Edwards, 1852. QM-W3842, ♂ (28.8 × 13.3 mm), Dunwich, North Stradbroke I., SE Qld; QM-W15330, ♀ (25.4 × 10.1 mm), Brisbane R. mouth, SE Qld. **A**, third maxillipeds; **B**, male abdomen; **C**, female abdomen.

Gregory I., Kimberley Coast, WA, 16°8.'S, 123°18.'E, intertidal flat, 19.11.1994, J. Short. QM-W20269, ♀ (18.4 × 8.2 mm), Bedford I., Kimberley Coast, WA, 16°08'S, 123°18'E, intertidal flat, 19.11.1994, J. Short. QM-W20251, ♂ (9.7 × 5.4 mm), Gregory I., Kimberley Coast, WA, 19°19'S, 123°19'E, mud flat near mangroves, *Sonneratia*, 19.11.1994, J. Short. QM-W19186, 6 ♀ (15.5 × 7.7, 10.0 × 5.4, 11.1 × 5.5, 10.0 × 5.5, 10.0 × 5.4, 10.0 × 5.5 mm); 2 ovig. ♀ (15.4 × 6.6, 15.5 × 6.8 mm); 5 ♂ (17.7 × 7.7, 5.6 × 3.3, 12.2 × 5.5, 8.3 × 4.3, 12.1 × 5.5 mm), Lee Point, Darwin, NT, 12°27'S, 130°50'E, sand flat, 27.06.1982, P. Davie. QM-W15171, ♂ (18.3 × 9.8 mm), 8km north of Old Doomadgee, Gulf of Carpenteria, NW Qld, 16°50'S, 138°50'E, 11.04.1988, J. Covacevich & P. Couper. QM-W20696, 2 ♂ (19.6 × 8.7, 14.80 × 6.1 mm), Karumba Point, NW Qld, 17°28'S, 140°49'E, mud flat, 23.06.1995, P. Davie & J. Short. QM-W10468, ♂ (19.9 × 9.7 mm), Ross River, Townsville, 19°22'S, 146°44'E, sandy mud flat, lower estuary, July 1983, P. Davie. QM-W11925, ♀ (13.1 × 5.5 mm), Triangular Bay, ME Qld, 22°23'S, 150°31'E, Nov. 1982, B. Campbell. QM-W4817, ♀ (13.4 × 6.4 mm), Round Hill, North of Bundaberg, 24°9'S, 151°53'E, 25.04–26.04.1975, P. Davie. QM-W5396, 2 ♂ (21.9 × 10.0, 21.2 × 9.9 mm), Hervey Bay Harbour, SE Qld, 25°18'S, 152°55'E, muddy shore, 23.07.1975, P. Davie. QM-W15330, ♀ (25.4 × 10.1 mm), Brisbane River mouth, SE Qld, 27°22'S, 153°10'E, mudflats in burrows, 07.07.1988, P. Lawless & J. Short. QM-W5139, ♂ (17.5 × 7.9 mm), Serpentine Creek, Cribb I. 27°24'S, 153°7'E, August 1972, B. Campbell *et al.* QM-W5293, 2 ♀ (18.1 × 8.3, 15.8 × 7.5 mm), Juno Point, Cribb I., SE Qld, 27°24'S, 153°0'E, B. Campbell. QM-W1077, ♀ (21.7 × 10.4 mm), Green I., Moreton Bay, SE Qld, 27°26'S, 153°14'E, surface of sand, 07.06.1940. QM-W21739, ♂ (25.8 × 11.9 mm), Myora Springs, Stradbroke I., 27°29'S, 153°25'E, marine, littoral, mud flat, 08.03.1996, A. Humpherys. QM-W3842, 4 ♂ (28.8 × 13.3, 25.5 × 11.9, 26.3 × 12.1, 24.5 × 11.5 mm), Dunwich, North Stradbroke I., 27°30'S, 153°24'E, 04.05.1973; S. Cook. QM-W21461, ♂ (31.6 × 14.5 mm), Dunwich, North Stradbroke I., 27°30'S, 153°24'E, marine, littoral, mud flat, 16.06.1996, P. Davie. QM-W24987, 3 ♂ (24.4 × 11.2, 20.7 × 9.9, 22.5 × 10.5 mm), Dunwich, North Stradbroke I., SE Qld, 27°30'S, 153°24'E, marine, littoral, flats, 09.03.1998, P.Davie *et al.* QM-W2368, ♀ (19.5 × 9.2 mm), Victoria Point, SE Qld, 27°35'S, 153°19'E, 11.10.1962, R. Barnes. QM-W3188, ♀ (25.9 × 11.7 mm), ♂ (21.1 × 11.4 mm), Victoria Point, SE Qld, 27°35'S, 153°19'E, adjacent to *Zostera* in burrows to 10–15 cms, 26.03.1968, B. Campbell.

Diagnosis. Front deflexed, bilobed; markedly constricted between bases of ocular peduncles;

upper orbital border strongly curved and markedly sloping. Exorbital angle narrow, elongate, bluntly pointed, separated from second lateral tooth by deep, narrow incision; third lateral tooth small or almost obsolete. Carapace covered in small to medium sized granules; distinct clumps of granules on branchial regions. Lateral margins markedly convergent posteriorly. Ocular peduncles long and narrow; cornea not protruding beyond tip of exorbital angle. Third maxilliped with merus markedly smaller than ischium. Male cheliped with inner surface of carpus with large spine and tubercular granules dorsally. Palm elongate, strongly marked longitudinal ridge near lower margin extending onto fixed finger; inner surface heavily hairy granular; setae densely concealing most or all of surface; with large spine or spines antero-proximally, directed towards carpus. Fixed finger moderately deflexed; cutting margin with large, crenulated, quadrangular or hemispherical tooth. Dactylus cutting margin with small quadrangular tooth near base. Pereiopod meri with setae along upper margins concealing subterminal spines.

Colour. Large males with distal half of cheliped fingers reddish brown, and reddish brown pterygostome and ventral surface. Spines on carpus and inner upper proximal face of palm of male cheliped are bright orange.

Remarks. Adult males are easily identified in the field by the bright orange spines on the carpus and inner upper proximal face of the palm of the cheliped. Interestingly, there are a lack of reports of this species south of Singapore, and through the Indonesian region. This apparent disjunct distribution between the Australian and Asian populations warrants further investigation as to whether the Asian representatives of this species are truly conspecific.

Habitat. Common; burrows, mostly on open soft sandy-mud to muddy flats, and low on river and creek banks, but also around fringes of mangroves (Davie 2011).

Distribution. Type locality: Australia (as 'Nouvelle-Hollande'). Appears to have a central Indo-West Pacific distribution: Malaysia (Tweedie 1937), Gulf of Thailand (Rathbun 1910), China (Dai & Yang 1991), and the Caroline Islands (de Man 1890). In Australia it is common across northern Australia, and extending to the southern coast of New South Wales.

Macrophthalmus (Macrophthalmus) dentatus Stimpson, 1858

(Fig. 7)

Macrophthalmus dentatus Stimpson, 1858: 97, 1907: 96; Rathbun 1910a: 22; Tesch 1915: 184; Barnes 1971: 9–13, fig. 2; 2010: 40; Dai & Yang 1991: 471–472, pl. 59 (7); fig. 239 (2–6).

Macrophthalmus (Macrophthalmus) dentatus — Barnes 1966: 203 (in list).

Material Examined. QM-W3252, ♀ (8.0 × 4.6 mm), 500 m off SE rocks, Moreton Bay, 27°30'S, 153°21'E, mud, 5.5 m, March 1970, grab, B. Campbell.

Diagnosis. Carapace surface smooth, except for short granular rows on branchial regions; 1.7 to 1.9 times broader than long. Front narrow, markedly constricted; upper orbital border curved, backwardly sloping; exorbital spine prominent, followed by four smaller lateral teeth, last tooth close to poterolateral margin and may be inconspicuous. Lateral margins moderately convergent. Ocular peduncles long, cornea extending to middle of exorbital angle. Third maxilliped merus smaller then ischium; proximal part of external margin with distinct lateral convexity; central region of epistome with broad, low protruberance. Male cheliped with merus markedly elongate; carpus elongate Palm elongate, without setae except on anterior margin between bases of fingers; outer surface smooth except for very fine granules near upper and lower margins, without longitudinal ridge near lower margin; inner surface with some very fine granules near upper and lower margins, especially proximally, without spine near joint with carpus; fixed finger short, slightly deflexed, cutting margin with large, central triangular tooth, slightly crenulated or smooth at tip, proximal slope much the longer, with 1–2 smaller lobular

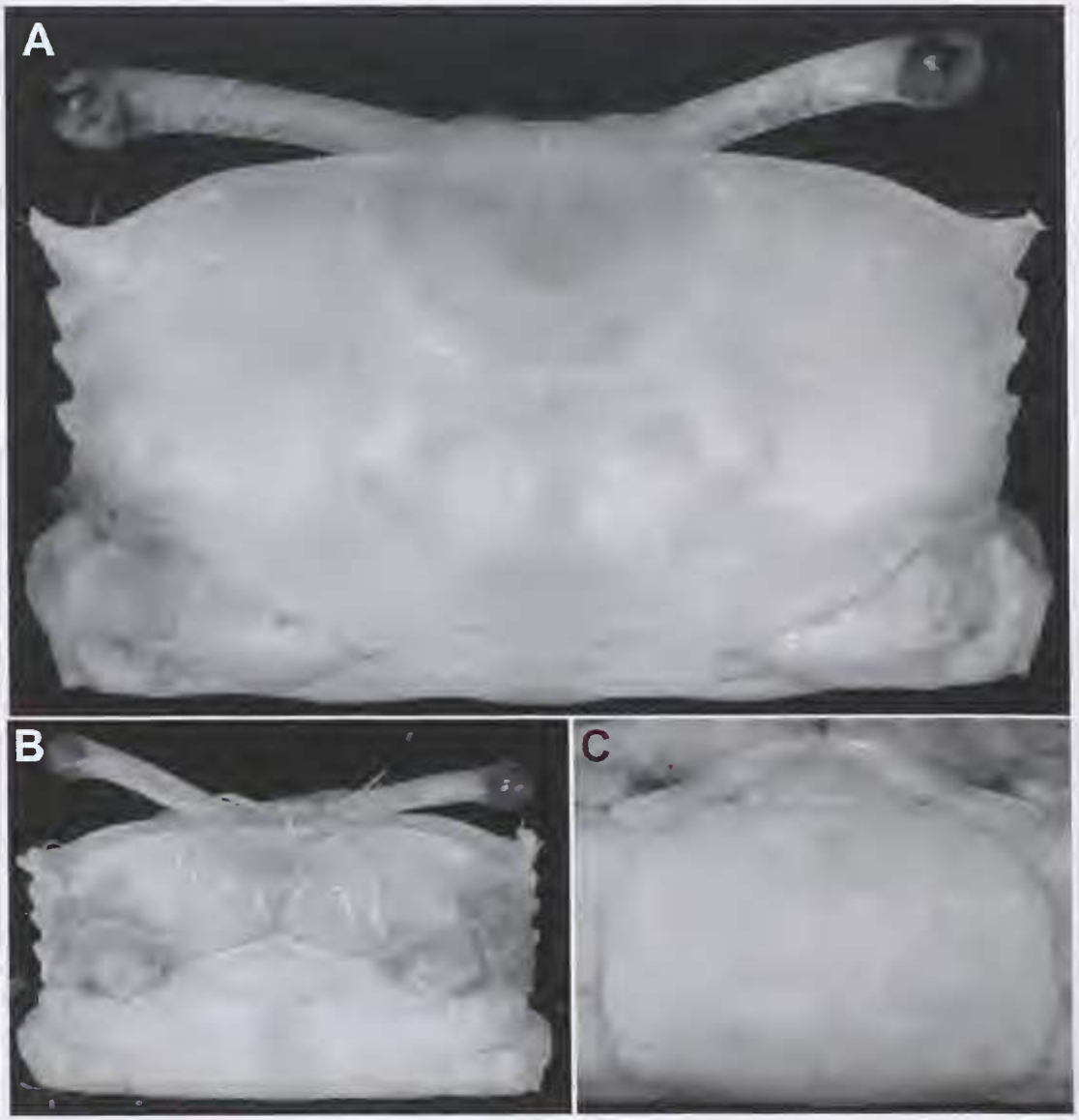


FIG. 7. *Macrophthalmus (M.) dentatus* Stimpson, 1858. QM-W3252, ♀ (8.0 × 4.6mm), Moreton Bay, SE Qld. **A**, dorsal view of carapace; **B**, third maxillipeds, lower orbital margins, and pterygostome; **C**, abdomen.

protuberances distad; dactylus strongly curved, cutting margin with small, flat tipped, quadrangular tooth near base. Walking legs elongate, especially meri; meri with rows of small, pointed granules along upper margin, curved subterminal spine.

Remarks. There is still very little material of this species known. It was redescribed in detail by Barnes (1971). The lateral dentition of the carapace (four small teeth occupying nearly all the lateral border behind the exorbital angle) is the most obvious characteristic of this peculiar

sublittoral species. However it is also atypical among *Macrophthalmus* by having a markedly broad convex lobe over the proximal half of the outer margin of the merus of the third maxilliped. Only one other species of *Macrophthalmus* (*Macrophthalmus*) is known to have five lateral teeth (including the exorbital tooth), and that is *M. pentaodon* Mendoza & Naruse, 2009, from the Philippines. That species is known from only a single female, but the realative sizes and disposition of the lateral teeth are different to *M. dentatus*, the supraorbital margins are significantly more obliquely sloping backwards, and the shape of the female abdomen has the telson more deeply sunken into somite 6. However, *M. pentaodon* seems likely to be closely related, and is also apparently a sublittoral species, as it was collected by a vacuum suction device working in depths of 4–12 m, in muddy to silty sediment.

The discovery of this small female in Moreton Bay marks a significant range extension; and indicates that this species should prove to be more widespread in Australia. The present specimen has relatively short exorbital teeth compared with the long acute teeth of a larger male figured by Barnes (1971: fig. 1a), although the tips of both teeth are slightly damaged; however the presence of 4 teeth on the lateral margin preclude it being any other described species. Unfortunately the present specimen is a small female, and lacks claws. It seems quite possible that the length of the exorbital tooth may be variable according to sex and size, but more specimens will be required before this can be adequately assessed. It is possible that the Moreton Bay specimen represents a related new species, but without further material, and particularly a mature male specimen, this decision must be deferred.

Habitat. Muddy sand bottoms on shallow coastal waters 8–20 m deep. The present specimens, like those of Rathbun (1910), were collected using a benthic grab.

Distribution. Type locality: Hong Kong. New Australian record and major southerly range extension. Previously known from Guangdong, China; Timor; and the Gulf of Thailand. Within Australia only known from Moreton Bay, south-east Queensland.

Macrophthalmus (Macrophthalmus) graeffei A. Milne-Edwards, 1873

(Figs 8, 9, 10A–C, 11D, 12B)

Macrophthalmus graeffei A. Milne-Edwards, 1873: 257, pl. 2, fig. 5.

Not *Macrophthalmus graeffei* — Guinot 1967: 283 (in list); Titgen 1982: 253 (in list); Naderloo, Türkay & Apel 2011: 19–23, figs 11 a–e, 12a–d, 17a, b. [= *Macrophthalmus indicus* sp. nov.]

Not *Macrophthalmus* (*Macrophthalmus*) *graeffei* — Barnes 1970: 225; 1971: 13, 36 (in key), fig. 3; 1977: 276 (in key), 279 (in list); 2010: 34 (in key), 39; Apel 2001: 108; Ng, Guinot & Davie 2008: 237 (list). [= *Macrophthalmus indicus* sp. nov.]

Material Examined. NEOTYPE: QM-W29105, ♂ (19.1 × 10.6 mm), off Princess Charlotte Bay, Cape York, 13°32′42"S, 144°04′30"E, Great Barrier Reef Seabed Biodiversity Study, Spp. code SBD2009274, 23 m depth, sandy-mud sparse coverage of algae/*Halimeda* and seagrass, 18.01.2005. QM-W29106, 2 ♂ (14.6 × 8.4; 15.4 × 8.9 mm), same data as neotype. QM-W29107, ♀ (7.5 × 4.4 mm), NE of Townsville, Qld, 18°57′18"S, 146°53′42"E, Great Barrier Reef Seabed Biodiversity Study, Spp code SBD2000306, 24 m depth, sandy-mud bottom covered with algae/*Halimeda*, 18.09.2003.

Diagnosis. Carapace c. 1.8 times wider than long; small patch of rounded granules on epibranchial region; regions relatively well defined, furrows delimiting gastric region deep. Front deflexed, narrow, constricted medially, lateral angles pointed. Lateral margin with two distinct teeth behind exorbital tooth; exorbital tooth slender, most protruding, separated from second tooth by very deep, narrow, V-shaped notch, directed laterally or slightly posteriorly; second tooth broad, equilateral triangular, directed laterally, base at top and bottom of tooth vertically aligned; third tooth smallest; lateral margins slightly convergent. Ocular peduncle narrow, long, extending slightly less than half of cornea beyond exorbital angle, no apical 'style', but at most a very low, blunt, prominence; cornea

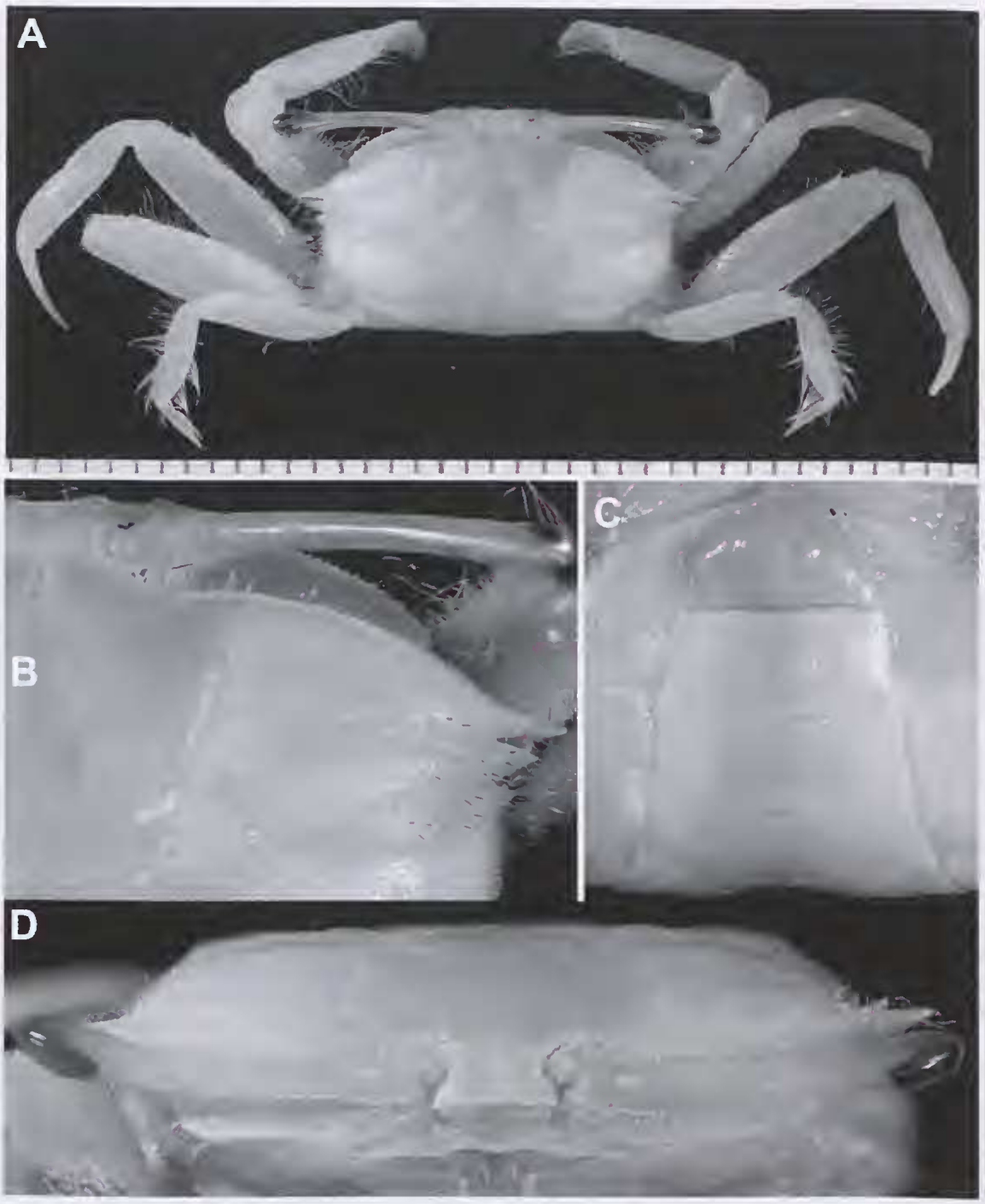


FIG. 8. *Macrophthalmus* (*Macrophthalmus*) *graeffei* A. Milne-Edwards, 1873. QM-W29105, neotype ♂ (19.1 × 10.6 mm), off Princess Charlotte Bay, Cape York. **A**, Dorsal view; **B**, enlarged view of carapace; **C**, frontal view of chela; **D**, frontal margin and orbits.

relatively bulbous; upper orbital margin strongly convex, markedly sloping laterally. Third maxilliped large, ischium about twice as long as merus; merus subquadrate, wide, about 1.7 times as wide as long. Chelipeds subequal. Merus with outer margin bearing large denticles along entire length, denticles slightly larger medially. Palm relatively long, about 1.6 times as long as high in distal portion; longitudinal ridge parallel to lower margin, continuing along most of fixed finger; inner surface without patch of setae. Dactylus relatively long, curved strongly inward, upper margin with large denticles along proximal two thirds, larger distally, small granules proximally; cutting edge with small differentiated tooth subproximally. Fixed finger short, cutting edge elevated medially. Walking legs medium length, relatively narrow; merus of third walking leg about 3.4 times as long as wide; merus of second, third with large subdistal tooth; anterior, posterior margins finely serrated; margins of carpus, dactylus smooth; dactylus of third walking leg shorter than propodus. Posteromedian margin of epistome moderately convex. Male abdomen with segments 5, 6 of same length; lateral margin of segment 6 noticeably swollen proximally, weakly converging distally; telson semicircular, about as long as segment 6. Male G1 relatively long, narrow, slightly curved; apical chitinous process short, narrow, turned 90° to stem, projecting directly laterally with upper margin flat; subdistal dorsal palp weakly developed, not forming prominent lobe in lateral view.

Remarks. Barnes (1971) redesribed and partially illustrated what he believed to be *Macrophthalmus graeffei* based on two males collected in the eastern Indian Ocean off West Timor, in southern Indonesia. In his synonymy he also cited the earlier record of Stephensen (1945) based on one male and one juvenile from the east coast of Kharg I., off Iran in the Persian Gulf, which Stephensen had originally tentatively identified as '*Macrophthalmus* (*convexus* Stimpson?)'. Apel (2001) examined the Kharg I. specimen and agreed that it was identical with

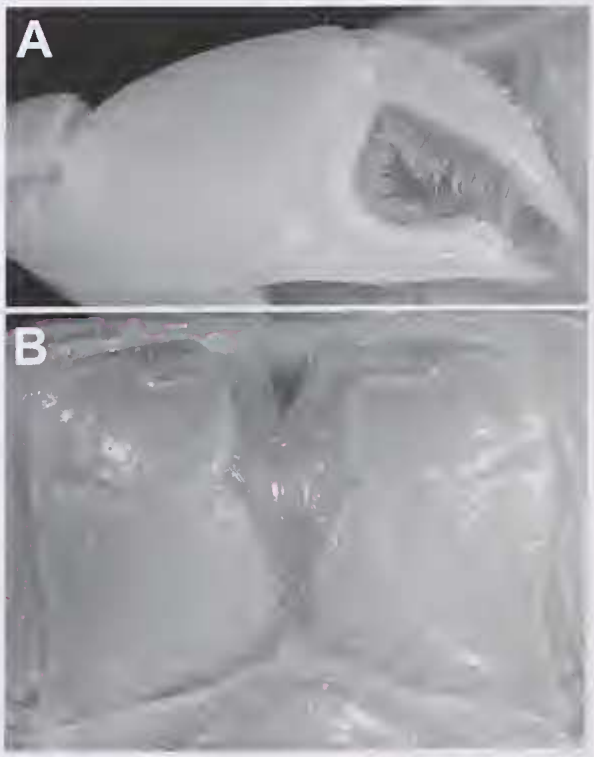


FIG. 9. *Macrophthalmus* (*M.*) *graeffei* A. Milne-Edwards, 1873. QM-W29105, neotype ♂ (19.1 × 10.6 mm), off Princess Charlotte Bay, Cape York. **A**, frontal view of chela; **B**, third maxillipeds.

M. graeffei sensu Barnes. This same material has also formed the basis for the thorough redesription by Naderloo *et al.* (2011), although they also examined three other females from the Red Sea. While our modern conception of *M. graeffei* has followed that of Barnes (1971), unfortunately the type specimens of *M. graeffei* originally from Samoa have not been critically reexamined and therefore, the identity of the true Pacific Ocean *M. graeffei* has never been positively established.

The type specimen (or specimens) of *M. graeffei* was originally deposited in the Godeffroy Museum, Hamburg (1861–1885), Germany, however in 1885, the zoological collections were sold to various other European museums, and there is now no information as to the

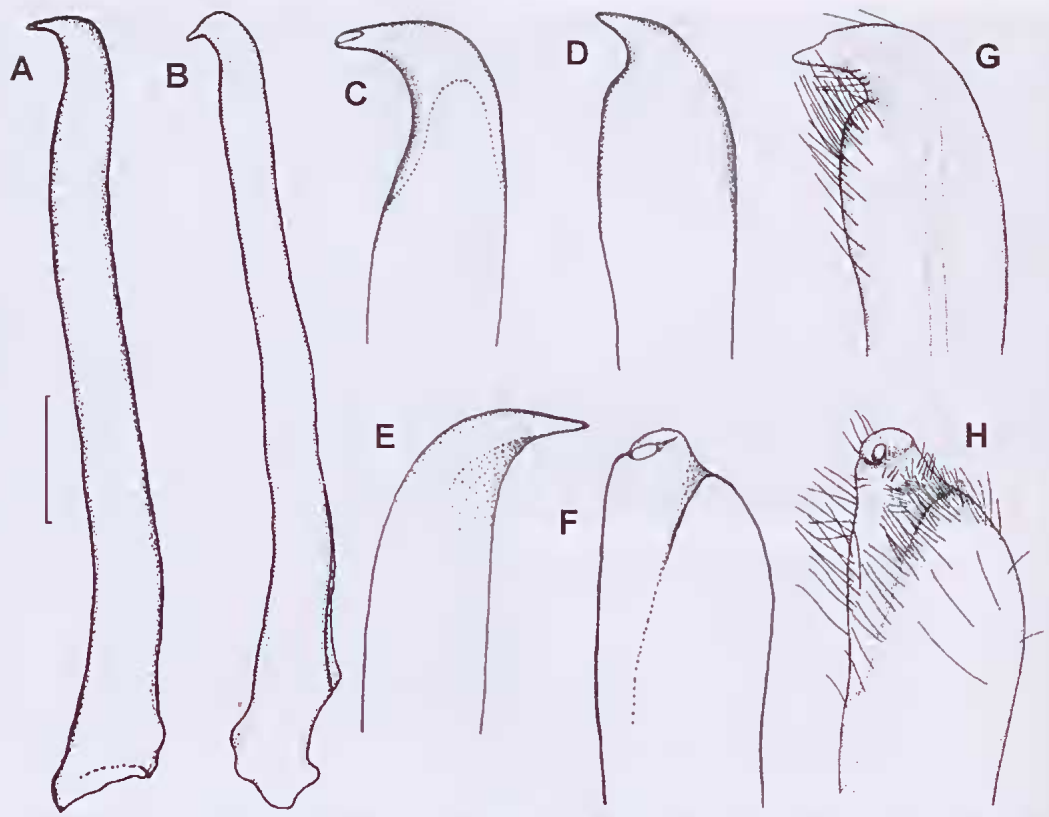


FIG. 10. *Macrophthalmus* (*Macrophthalmus*) *graeffei* A. Milne-Edwards, 1873. QM-W29105, neotype ♂ (19.1 × 10.6 mm), off Princess Charlotte Bay, Cape York. **A**, **C–F**, male G1; **B**, **G**, **H**, *Macrophthalmus* (*Macrophthalmus*) *indicus* sp. nov., after Naderloo *et al.* (2011: fig. 12a, c, d; original figure reversed for easier comparison with present figure of opposite G1). Scale line = 1mm.

whereabouts of any *M. graeffei* types. It is likely that they have been lost. It is unclear how many specimens of *M. graeffei* were in the original type series. The caption for the original Fig. 5 states it is of a male, but Fig 5e is clearly that of an immature female. The main figure of the complete crab also appears to be of a female based on the small undeveloped claws, which do not look like they could be the same as the left and right male claws shown in Figs 5b, c, which look like a typical adult male. It must therefore be assumed that there were at least two syntypes, one male and one female, even though measurements for only one specimen were given.

The present specimens from the Great Barrier Reef region off north Queensland, are the first Pacific Ocean samples to have been found since the original specimens from Samoa. The very good descriptions and figures of crabs identified as *M. graeffei* from the Indian Ocean (Barnes 1971; Naderloo *et al.* 2011) have made it possible to clearly identify the present neotype of *M. graeffei* (here designated) as belonging to a distinct species, thus requiring a new name for the Indian Ocean crabs that have been treated under this name.

The west Pacific *M. graeffei* differs from the Indian Ocean *M. indicus* sp. nov. by the following characters:

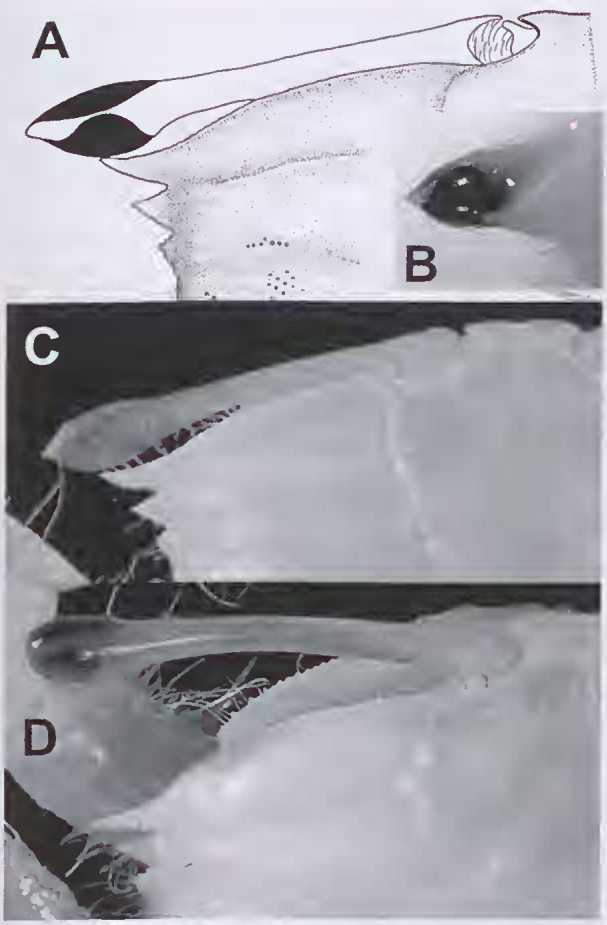


FIG. 11. Comparison views of superior orbital margins and ocular peduncles of: **A**, **B**, **C**, *Macrophthalmus* (*M.*) *indicus* sp. nov. (**A**, C after Naderloo *et al.*, 2011: fig. 11a, 17a — B, from Pancucci-Papadopoulou *et al.* 2010: fig. 3). **D**, *Macrophthalmus* (*M.*) *graeffei* A. Milne-Edwards, 1873, QM-W29105, neotype ♂.

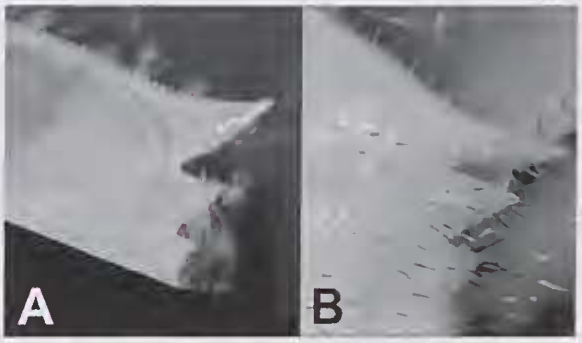


FIG. 12. Detail view of exorbital tooth and lateral teeth of **A**, *Macrophthalmus* (*M.*) *indicus* sp. nov. (from Pancucci-Papadopoulou *et al.* 2010: fig. 4). **B**, *Macrophthalmus* (*M.*) *graeffei* A. Milne-Edwards, 1873, QM-W29105, neotype ♂.

1) The present specimens lack development of a style at the end of the cornea (Fig. 11A–C) as described by Laurie (1915: 471) and Barnes (1971: 14), and illustrated by Pancucci-Papadopoulou *et al.* (2010: figs 2, 3), and Naderloo *et al.* (2011: fig. 11a). This style was neither figured nor described as part of the original description and figures (A. Milne-Edwards (1873: 257, pl. 2, fig. 5), and as the original specimen measured 12 × 7 mm, it should have been apparent on a crab that size as it is already clearly evident the 11 mm crapace breadth Mediterranean specimen photographed by Pancucci-Papadopoulou *et al.* (2010: fig. 3).

2) The shape of the supraorbital margin differs between the two species. In *M. graeffei* (Fig 11D) the supraorbital margin is markedly more convex and more backwardly sloping laterally than in *M. indicus* (Fig 11A, C) which is comparatively flatter. The original figure of *M. graeffei* by A. Milne-Edwards (1873: pl. 2 fig. 5), clearly shows the strongly convex supraorbital margin that is characteristic of the neotype.

3) The shape of the lateral teeth, and in particular the exorbital tooth, differs between the two species (compare Fig. 12A & B). In *M. graeffei* (Fig 12B) the exorbital tooth is very narrow and slender, directed laterally, and separated from the first lateral tooth by a deep narrow v-shaped sulcus; in *M. indicus* (Fig 12A), by contrast, the exorbital tooth is noticeably broader at its base, somewhat forwardly directed, and separated from the first lateral tooth by a widely open v-shaped sulcus. The shape of the narrow fissure between the first two teeth, such that the first lateral tooth appears to closely abut the exorbital angle agrees exactly with the original figure by A. Milne-Edwards (1973) of the syntype from

Samoa. Also, in *M. graeffei* the second tooth forms a broad, equilateral triangular, is directed laterally, and the base at the top and bottom of the tooth is vertically aligned; however in *M. indicus* though the tooth is still broadly, triangular, the posterior margin is longer than the anterior margin, it is directed slightly more anteriorly, and there is a tendency for the base of the tooth to slightly recede (cf. figs 11A, C & 11D).

4) The male G1 is different: in *M. graeffei* (Fig. 10A–C), the tip is a little more slender and bent at a right-angle to the stem; however in *M. indicus* (Fig 10D–F), the apical part is more convexly rounded and the tip more deflexed downwards, to give more of a 'birds-head' appearance. Also the subdistal dorsal palp is much more strongly developed and prominent in lateral view in *M. indicus* (Fig. 10F).

5) The Indian Ocean material has now been discovered from a number of localities across a wide geographic range, even to the extent of becoming established in the Mediterranean. So far the largest specimen recorded is a male specimen (14.8 × 8.4 mm) from the Persian Gulf. The present neotype specimen of *M. graeffei* is significantly larger (19.1 mm carapace breadth), and this suggests that the Pacific *M. graeffei* probably obtains a larger size than the Indian Ocean *M. indicus* sp. nov.

Habitat. Present material came from sandy-mud bottoms with coverage of algae/*Halimeda* and seagrass. To at least 24 m depth.

Distribution. Indo-West Pacific: Upolu (Samoa) (original type locality); Cape York, eastern Qld (present record).

Macrophthalmus (Macrophthalmus) indicus sp. nov.

(Figs 10D–F, 11A–C, 12A)

Macrophthalmus (*Macrophthalmus*) *graeffei* — Barnes 1970: 225; 1971: 13, 36 (in key), fig. 3; 1977: 276 (in key), 279 (in list); 2010: 34 (in key), 39; Apel 2001: 108; Naderloo *et al.*, 2011: 19–23, figs 11 a–e, 12a–d, 17a, b [not *M. graeffei* A. Milne-Edwards, 1873].

Macrophthalmus graeffei — Laurie 1915: 470–472, fig. 5; Guinot 1967: 283 (in list); Pancucci-Papadopoulou *et al.* 2010: 195–200.

Macrophthalmus (*convexus* Stimpson?) — Stephensen 1945: 191 [not *M. convexus* Stimpson, 1858].

Macrophthalmus convexus — Guinot 1967: 282 (in list; in part) [not *M. convexus* Stimpson, 1858].

Material. HOLOTYPE: ZMUC-CRU-1782, ♂ (CL = 14.8, CB = 8.4 mm), DSII St. 26, Kharg I., Iran, Persian Gulf, sand and shells, 18 m deep, 15.03.1937, G. Thorson, identified as *Macrophthalmus* (*convexus* Stimpson?) by Stephensen (1945). PARATYPE: ♂ (juv.) (ZMUC-CRU-1782), data as for holotype. [Not examined here, but these are the specimens upon which Naderloo *et al.* (2011) based their description and figures].

Diagnosis. Carapace c. 1.8 times wider than long; small patch of rounded granules on epibranchial region; regions relatively well defined, furrows delimiting gastric region remarkably deep. Front deflexed, narrow, constricted medially, lateral angles pointed. Lateral margin with two distinct teeth behind exorbital tooth; exorbital tooth slender, most protruding, separated from second tooth by deep V-shaped notch, directed laterally and slightly anteriorly; second tooth broad, triangular but posterior margin longer than anterior margin, directed slightly posteriorly, bottom of tooth receding backwards and base not vertically aligned with base of top of tooth; third tooth smallest; lateral margins slightly convergent. Ocular peduncle narrow, long, extending slightly less than half of cornea beyond exorbital angle, continued apically as a small but distinct 'style'; cornea relatively narrow and elongated; upper orbital margin moderately convex, weakly sloping laterally. Third maxilliped large, ischium about twice as long as merus; merus subquadrate, wide, about 1.7 times as wide as long. Chelipeds subequal. Merus with outer margin bearing large denticles along entire length, denticles slightly larger medially. Palm relatively long, about 1.6 times as long as high in distal portion; longitudinal ridge parallel to lower margin, continuing along most of fixed finger; inner surface without patch of setae. Dactylus relatively long, curved strongly inward, upper

margin with large denticles along proximal two thirds, larger distally, small granules proximally; cutting edge with small differentiated tooth subproximally. Fixed finger short, cutting edge elevated medially. Walking legs medium length, relatively narrow; merus of third walking leg about 3.4 times as long as wide; merus of second, third with large subdistal tooth; anterior, posterior margins serrated; margins of carpus, dactylus smooth; dactylus of third walking leg about as long as propodus. Posteromedian margin of epistome moderately convex. Male abdomen with segments 5, 6 of same length; lateral margin of segment 6 noticeably swollen proximally, weakly converging distally; telson semicircular, about as long as segment 6. Male G1 relatively long, narrow, slightly curved; convexly rounded apically, chitinous process short, narrow, turned 90° to stem, tip slightly deflexed downwards, to give 'birds-head' appearance; subdistal dorsal palp strongly developed and forming prominent lobe in lateral view. (After Naderloo *et al.* 2011).

Remarks. This species has been recently fully described and illustrated by Naderloo *et al.* (2011) under the name *Macrophthalmus* (*Macrophthalmus*) *graeffei* A. Milne-Edwards, 1873. It differs from *M.* (*M.*) *graeffei* by the characters already listed and discussed under that species.

I follow Barnes (2010) in considering both *M. graeffei* and *M. indicus* sp. nov. to be most closely related to the *M. telescopicus* species-group. This group typically has long eyestalks with the cornea extending beyond the exorbital tooth; the carapace is moderately narrow and broad, with three lateral teeth; the male cheliped carpus lacks spines on the distal margin, the fingers are short, and the fixed finger is not deflexed. Most species of this group are sublittoral.

Habitat. Substrates of sand and shell, mud, and fine sandy mud. Subtidal; 5-74 m depth (Stephensen 1945; Galil *et al.* 2002; Naderloo *et al.* 2011).

Distribution. Indian Ocean — Red Sea, Gulf of Oman, Persian Gulf, Indonesia (West Timor). *Macrophthalmus indicus* (as *M. graeffei*) is the only species of the genus that has spread into the eastern Mediterranean through the Suez Canal. It is known from southern Turkey (Enzenross & Enzenross 1995); Haifa Bay, Israel (Ksiunin & Galil 2004; Galil 2007), Lebanon (Lakkis & Novel-Lakkis 2005), Gökova Bay, the Aegean coast of Turkey (Ateş *et al.* 2007), the Bay of Iskenderun, SE Turkey (Galil *et al.* 2002/2009) and from off Rhodes Island, Greece (Pancucci-Papadopoulou *et al.* 2010).

Macrophthalmus (Macrophthalmus) milloti Crosnier, 1965

(Figs 13–15)

Macrophthalmus milloti Crosnier, 1965: 112, figs. 217–220, 222–223, 228, pl. 11, fig. 4; 1975: 737; Barnes 1977: 276 (key); Takeda & Komai 1991: 166, fig. 1.

Macrophthalmus (Macrophthalmus) milloti — Barnes 1967: 203 (list); Seréne 1973: 112, pl. 4, figs. A–C; Harnoll 1975: 309 (list); Barnes 1976: 135, fig. 3; Takeda & Nunomura 1976: 81; Morgan 1990: 60; Komai *et al.*, 1995: 116, fig. 6. Davie 2002: 352–353; Nagai *et al.* 2006: 8, figs. g. H, 13 (key); Ng *et al.* 2008: 237 (list).

? Macrophthalmus (Macrophthalmus) telescopicus — Barnes 1967: 205 (part), pl. 1, fig. a; 1970: 219.

? Macrophthalmus podophthalmus — Lanchester 1900: 760. [not *M. podophthalmus* Souleyet, 1841].

Macrophthalmus telescopicus — Kemp 1919: 387 (part), pl. 24, fig. 11 (not pl. 24, fig. 10). [not *M. telescopicus* Owen, 1839].

Macrophthalmus cf *telescopicus* — Tweedie 1937: 164; 1950, 128 (part).

Material examined. WAM-C14615, 2 ♀ (18.2 × 11.3; 18.6 × 11.6 mm), 3 ♂ (14.4 × 8.8; 15.8 × 9.2; 15.2 × 9.0 mm), Tanimbah I., Timor Laut, Indonesia, Mariel King Memorial Expedition, Stn T34, V. Semenuik, 26.06.1970.

Morgan (1990) recorded the following material as being present in the Western Australian Museum, but it was not re-examined as part of the present study: WAM-108-89, ♂ (damaged), Descartes I., NW Western Australia, intertidal, 20.07.1988. WAM-25-89, ♂ (8.7 × 15.8 mm), Shirley I., NW Western Australia, intertidal sand, 26.07.1988.

Diagnosis. Carapace almost smooth, but with feeble clumps of granules on branchial regions; front deflexed, constricted between bases of

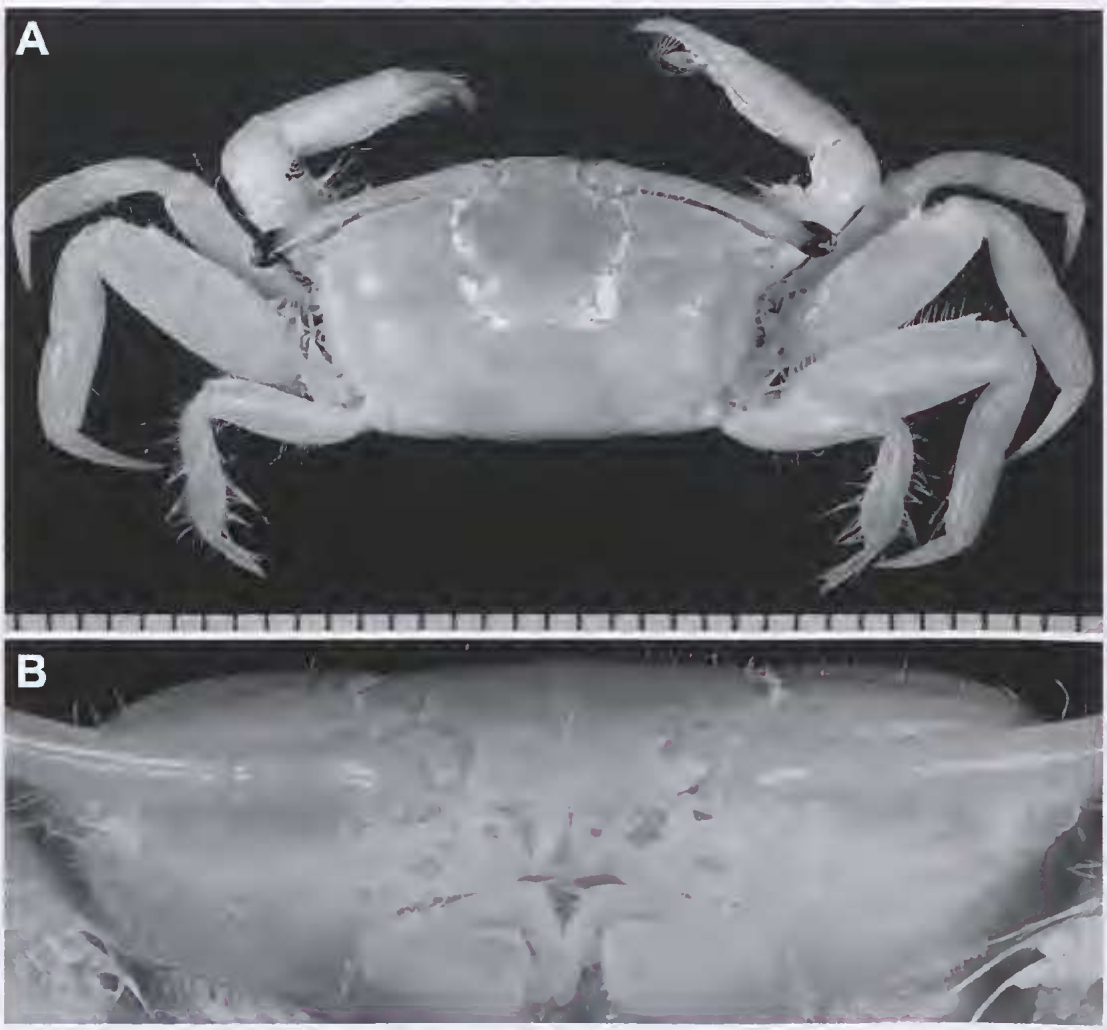
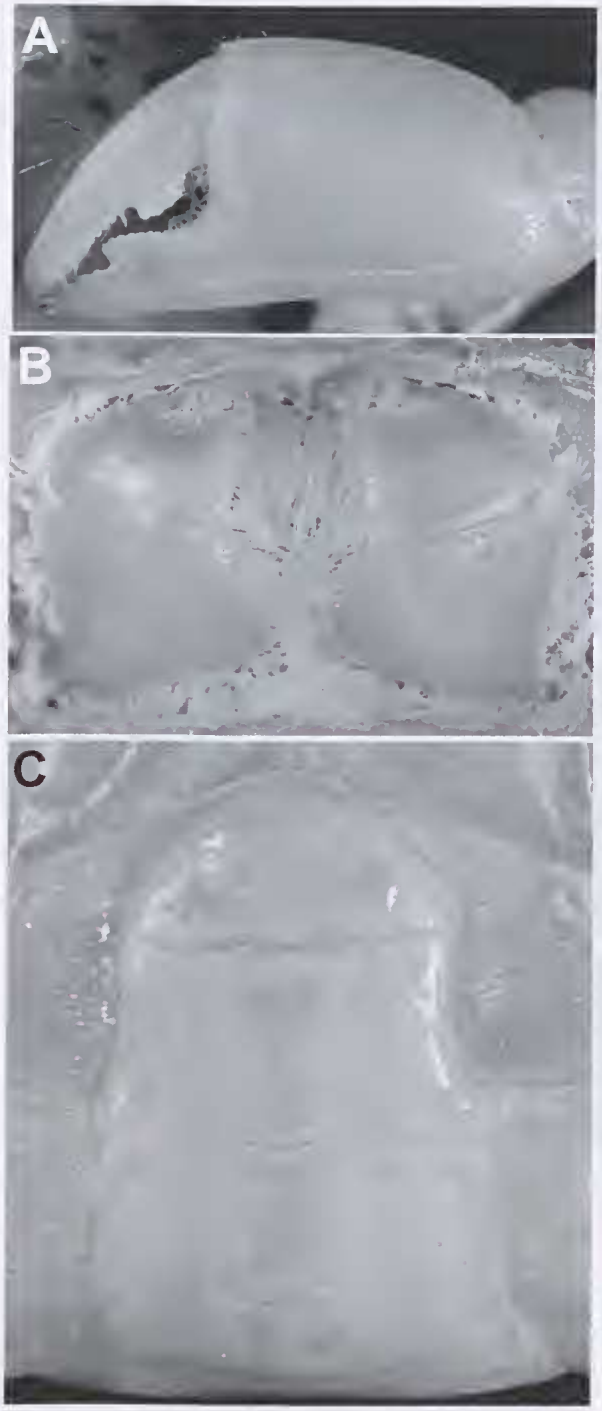


FIG. 13. *Macrophthalmus* (*M.*) *milloti* Crosnier, 1965. WAM-C14615, ♂ (15.8 × 9.2 mm), Tanimbah I., Timor Laut, Indonesia. **A**, dorsal view; **B**, frontal view of frontal margin and orbits.

ocular peduncles, bilobed distally, shallow median furrow; 3 well defined anterolateral teeth, greatest carapace with between exorbital teeth. Ocular peduncles long and narrow, cornea extending beyond tip of exorbital angle for less than twice its length. Central region of epistome with a pointed protuberance. Merus of third maxilliped smaller than ischium. Length of merus of male cheliped less than carapace length; palm stout, outer face mostly smooth, except for row of minute granules along inferior margin, inner face with a mat of setae at base of fixed finger; fixed finger straight, not deflexed, cutting margin with a strong, subacute tooth at about half its length; cutting edge of dactylus proximally with a large, quadrangular tooth. Meri of walking legs with granular margins, and finely granular surfaces, a row of setae along upper margin. Male G1 with a short terminal process.

FIG. 14. *Macrophthalmus* (*M.*) *milloti* Crosnier, 1965. WAM-C14615, ♀ (18.6 × 11.6 mm), Tanimbah I., Timor Laut, Indonesia. **A**, dorsal view; **B**, ventral view showing female abdomen.

Remarks. Serène (1973) suggested that both *M. milloti* and the similar *M. telescopicus* (Owen) would be found in Australia. This prediction was confirmed by the records of Morgan (1990) from north-western Australia. *M. milloti* differs from the other species with extremely long eyes (*M. telescopicus*, *M. serenei* Takeda & Komai, 1991 and *M. microfylacas* Nagai, Watanabe & Naruse, 2006) by possessing numerous sharp spines on the mesial face of the cheliped palm,



and by the characteristic shape of the apex of the male G1 (see Crosnier 1965: text-fig. 228).

Habitat. Low intertidal shallow pools on sheltered sand and sandy-mud flats; fully marine.

Distribution. From eastern Madagascar to the Andaman Islands; Indonesia; Singapore; northwestern Australia. Type locality: NW coast of Anorotsanga, Madagascar.

Macrophthalmus (Macrophthalmus) serenei Takeda & Komai, 1991

(Figs 16, 17)

Macrophthalmus serenei Takeda & Komai, 1991: 168, fig. 3 [replacement name for *M. kempi* Serène, 1981]; Ng *et al.* 2001: 38.

Macrophthalmus kempi Serène, 1981: 1140 (not Gravely, 1927) [type-locality: Red Sea].

Macrophthalmus verreauxi — ? De Man 1880: 184–87; Alcock 1900: 237; ? Borradaile 1903: 433; Nobili 1906a: 317; Rathbun 1910a: 332, fig. 6; Laurie 1915: 472, fig. 5; Yamaguchi *et al.* 1987: 38, pl. 18, fig. 5 (not *M. verreauxi* H. Milne Edwards, 1848 = *M. telescopicus*).

Macrophthalmus telescopicus — Tesch 1915: 161, pl. 5, fig. 2 (in part); 1918: 58 (in part); Kemp 1919: 387 (in part), pl. 24, fig. 10; Crosnier 1965: 126 (in part), fig. 227.

Macrophthalmus cf. *telescopicus* — Tweedie 1950: 128.

Macrophthalmus (*Macrophthalmus*) *telescopicus* — Barnes 1967: 205 (part), fig. 1 (? in part); Barnes 1970: 219.

Macrophthalmus (*Macrophthalmus*) *verreauxi* — Serène 1973: 107, text-figs. 2a, d, pl. 3, figs. C, D; Lundoer 1974: 8 (list); Barnes 1976: 135, fig. 2; Vannini & Valmori 1981: 217, fig. 9C; Takeda 1981: 70; Dai *et al.* 1986: 433, pl. 60(3), fig. 242(1) (7 in part); Dai & Yang 1991: 475, pl. 60(3), fig. 242(1) (7 in part); Davie 2002: 353.

Macrophthalmus (*Macrophthalmus*) cf. *verreauxi* — Hartnoll 1975: 309 (list).

Macrophthalmus (*Macrophthalmus*) *serenei* — Komai, Goshima & Murai 1995: 122–125, fig. 9.

Material Examined. QM-W29108, 2 ♂ (15.9 × 9.4; 12.1 × 7.2 mm), juv. ♀ (8.9 × 5.5 mm), ♀ (18.9 × 11.3 mm), 2 ovig. ♀ (21.8 × 12.3; 19.2 × 11.5 mm), sandy

FIG. 15. *Macrophthalmus* (*M.*) *milloti* Crosnier, 1965. WAM-C14615, ♂ (15.8 × 9.2 mm), Tanimbah I., Timor Laut, Indonesia. **A**, male chela; **B**, third maxillipeds; **C**, male abdomen.

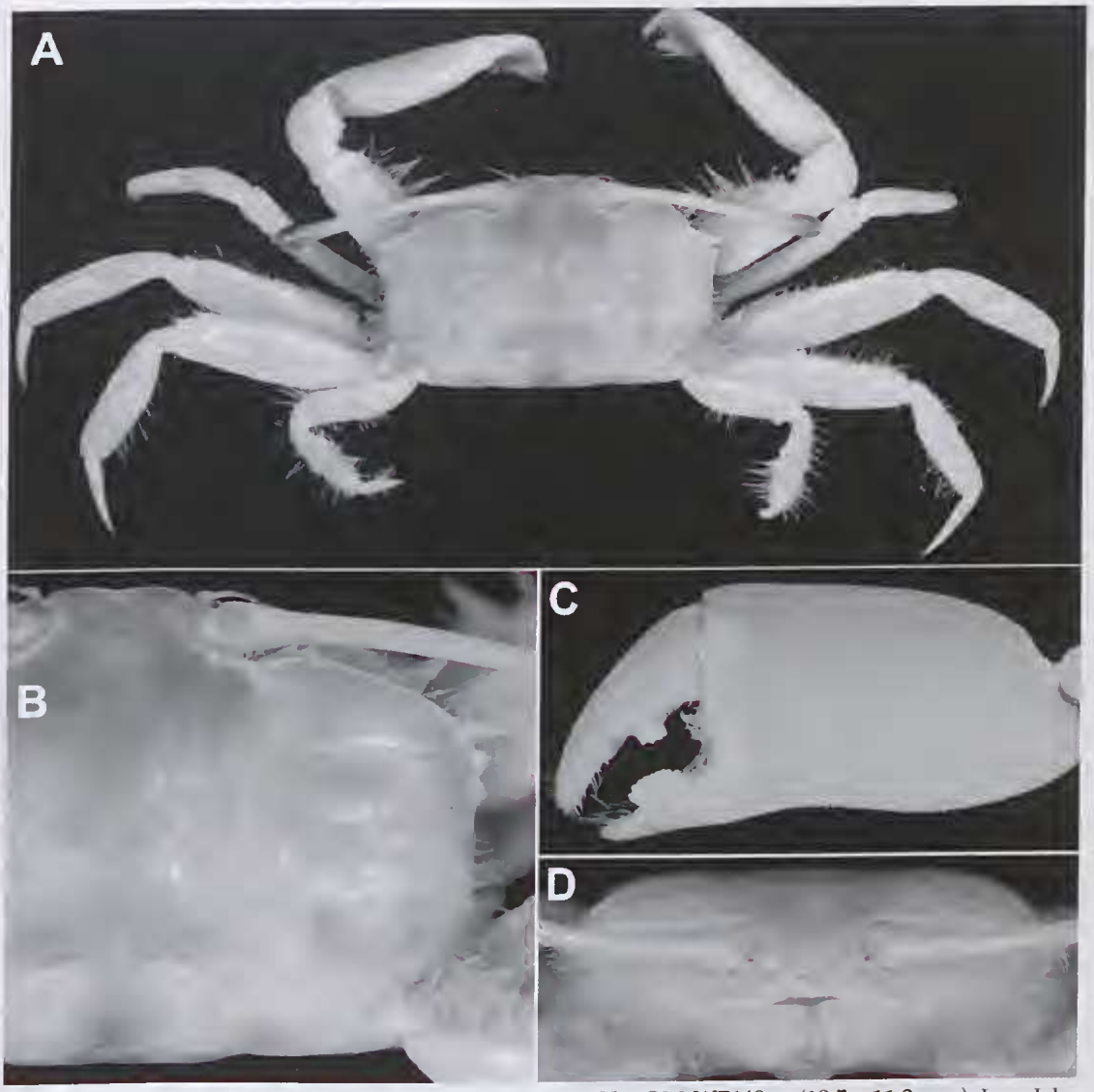


FIG. 16. *Macrophthalmus* (*M.*) *serenei* Takeda & Komai, 1991. QM-W7448, ♂ (18.5 × 11.3 mm), Low Isle, NE Qld. **A**, dorsal view; **B**, enlarged view of carapace; **C**, frontal view of chela; **D**, frontal margin and orbits.

mud flat in lagoon, West I., Cocos-Keeling Is., Stn CK3, P. Davie & P. Ng, March 2011. WAM-C19783, West I., Cocos-Keeling Is., G.J. Morgan, 6.02.1989. QM-W7448, ♂ (18.5 × 11.3 mm), Low Isle, NE Qld, 16°23′S, 145°34′E, east of main drainage channel, 27.07.1973, B. Campbell.

Diagnosis. Carapace greatest width across exorbital teeth, c. 1.6–1.7 times wider than long; surface lacking setae; branchial region covered in small granules on lateral half, lacking distinct ridge or clumps of granules except for

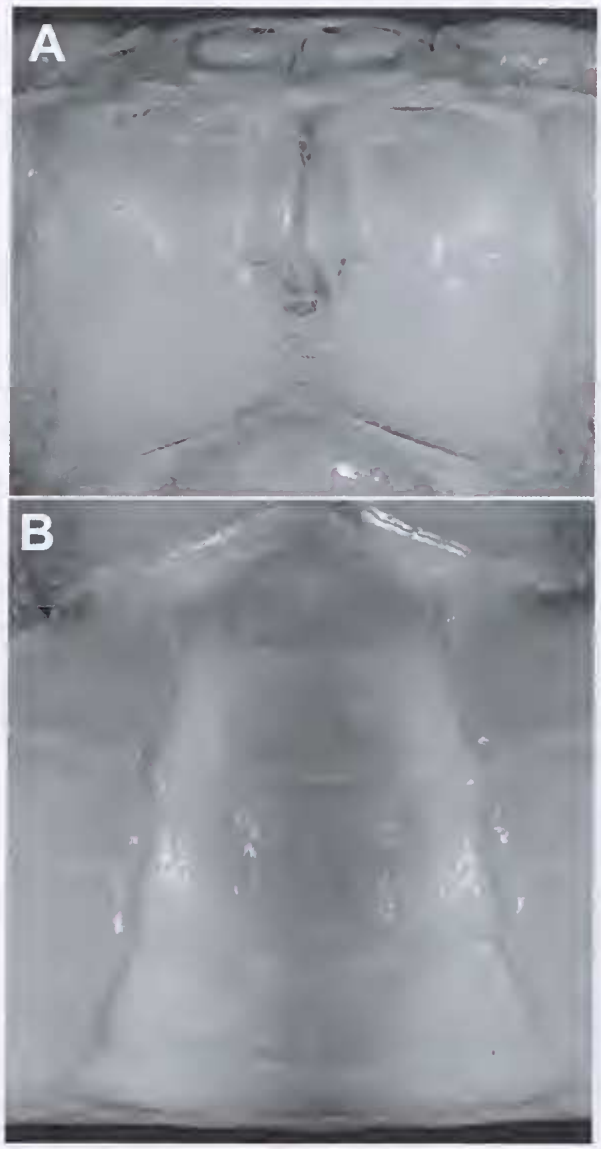


FIG. 17. *Macrophthalmus* (*M.*) *serenei* Takeda & Komai, 1991. QM-W7448, ♂ (18.5 × 11.3 mm), Low Isle, NE Qld. **A**, third maxillipeds; **B**, male abdomen.

short posterolateral ridge; intestinal ridge absent. Postero-median margin of epistome convex. Front moderately broad, markedly contricted between bases of ocular peduncles; median groove obvious. Ocular peduncle narrow, very long, about 1.1–1.2 times as long as carapace, projecting beyond exorbital tooth by 1/3 to 2/5 of its length. Upper orbital border strongly sinuous, obliquely receding backwards. Lateral margins slightly convergent posteriorly; exorbital tooth very narrow, spine-like, wider than second anterolateral tooth, and separated by broad V-shaped sulcus; second tooth broadly triangular; third tooth small, but distinct, blunt. Chelipeds stout, elongated; palm of male about 1.6 times longer than high, finely granular on ventral and dorsal faces; fixed finger weakly deflexed, with high broad crenulated tooth occupying central third; dactylus with strong square-shaped differentiated tooth placed in proximal third. Pereiopods stout; third pereopod with dactylus slightly shorter than propodus, lacking patch of setae on flexor surface. Male abdomen moderately narrow; sixth somite with lateral margins distinctly expanded near base; telson distinctly shorter than sixth abdominal somite, c. twice as wide as long, with distolateral margins convex. Male first gonopod moderately compressed; terminal process strongly elongate, curved outward, with row of spinules laterally, subdistal process rather thin, clearly separated.

Remarks. Previously reported from Australia under the misidentification of *Macrophthalmus* (*Macrophthalmus*) *verreauxi* (= *M. telescopicus* Owen, 1839) by Serène (1973). Komai *et al.* (1995) provided a redescription and illustrations.

Habitat. Burrows in shallow pools on low intertidal soft sandy mud to mud substrates. Can occur in coral reef lagoonal areas, on dead coral reef platforms, and on rocky shores; usually in areas with little freshwater influence.

Distribution. Widely distributed in tropical Indo-West Pacific from African coast (Madagascar to Red Sea) to western Thailand (Komai *et al.* 1995), and northward to Kyushu, Japan (Yamaguchi *et al.* 1987). First recorded from the eastern coast of Australia by Serène (1973).

Macrophthalmus (Macrophthalmus) telescopicus Owen, 1839

(Figs 18, 19)

Gelasimus telescopicus Owen, 1839: 78, pl. 24, fig. 1.
Macrophthalmus compressipes Randall, 1840: 123; Gibbes 1850: 180.
Macrophthalmus podophthalmus Souleyet, 1841: 241, pl. 3, fig. 67; Milne Edwards H. 1852: 155; Stimpson 1858: 96; Crosnier 1965: fig. 225.
Macrophthalmus verreauxi Milne Edwards H., 1848: 358; 1852: 155, pl. 4, fig. 25; Haswell 1882b: 89; Crosnier 1965, fig. 226.
Macrophthalmus telescopicus Milne Edwards H., 1852: 155; Dana 1852: 314; Ortmann 1894a: 744; Rathbun 1906: 834; Balss 1922: 146; Chopra & Das 1937: 423; Edmondson 1946: 311, fig. 185a; 1962: 20, fig. 8b; Holthuis 1958: 53; Crosnier 1965, fig. 229; Wada 1978; Takeda 1979: 155; Nagai 1990; Takeda & Komai 1991: 169.
? *Macrophthalmus podophthalmus* — Haswell 1882b: 88; Miers 1886: 249; Lanchester 1900b: 760.
Macrophthalmus (Macrophthalmus) telescopicus — Barnes 1970: 219 (part); Serène 1973a: 109, fig. 2c–e, pl. 3A–B, pl. 4D; Takeda 1977: 133, fig. 4D; Tai & Song 1984: 81(key).
Not *Macrophthalmus telescopicus* — Stimpson 1907: 95; Tesch 1915: 161, pl. 5, fig. 2; 1918: 58; Kemp 1919: 387, pl. 24, fig. 10 (in part, not fig. 11); Sakai 1935: 73; Shen 1936: 70; 1940: 73, 94 [= *M. serenei* Takeda & Komai, 1991.
Not *Macrophthalmus telescopicus* — Sakai 1939: 623 (part?), pl. 73, fig. 1 [= *M. microfylacas* Nagai, Watanabe & Naruse, 2006],
Not *Macrophthalmus telescopicus* — Kemp 1919: fig. 11 [= *M. milloti* Crosnier, 1965].
Not *Macrophthalmus verreauxi* — Crosnier 1965, fig. 227 [= *M. serenei* Takeda & Komai, 1991].
Not *Macrophthalmus (Macrophthalmus) telescopicus* — Barnes 1967: 205 (part), fig. 1 (not pl. 1a); Barnes 1970: 219 [= *M. serenei* Takeda & Komai, 1991].
Not *Macrophthalmus (Macrophthalmus) telescopicus* — Barnes 1967: 205 (part), pl. 1a [= *M. milloti* Crosnier, 1965].
Not *Macrophthalmus (Macrophthalmus) verreauxi* — Sakai 1976: 610, fig. 334, pl. 210, fig. 3; Yamaguchi *et al.* 1976: 40 [= *M. microfylacas* Nagai, Watanabe & Naruse, 2006, or *M. serenei* Takeda & Komai, 1991].

Material examined. WAM-C16830, ♂ (36.8 × 23.7 mm), Shark Bay, WA, 'Flinders' Stn 11, 5.05.1986. WAM-C16832, ♂ (34.1 × 21.9 mm), ♀ (33.8 × 21.2 mm), data as for preceding. QM-W2400, ♂ (14.9 × 9.0 mm), Cape York, FN Qld, 11°48'S, 142°21'E, 1884. QM-W28480, ♂ (12.2 × 7.9 mm), Percy I., central Qld, 21°40'S, 150°18'E, 15.06.01. QM-W11898, 3 juv. ♂ (4.7 × 3.1, 4.0 × 2.7, 8.4 × 5.8 mm), Triangular I., Shoalwater Bay, ME Qld, 22°23'S, 150°31'E, Feb. 1981, M.R.L. Survey. QM-W11899, ♀ (6.0 × 4.5 mm), Triangular I., Shoalwater Bay, ME Qld, 22°23'S, 150°31'E, Nov. 1982, M.R.L. Survey. QM-W19537, ♂ (6.1 × 4.3 mm), Moreton Bay, SE Qld, 27°31'S, 153°22'E, 03.06.1993, P. Davie & J. Short.

Diagnosis. Carapace relatively smooth, except for low clumps of granules on branchial regions; front deflexed, margins smooth, bilobed distally, markedly constricted between bases of ocular peduncles, median furrow distinct; lateral margins slightly converging, subparallel posteriorly, 3 well defined antero-lateral teeth, exorbital angle projecting in line with following teeth. Ocular peduncles long and narrow, cornea extending beyond tip of exorbital angle for more than one third (up to 60%) of peduncle length. Central region of epistome with pointed protuberance. Merus of third maxilliped smaller than ischium. Palm of male cheliped stout, outer face granular; fixed finger not deflexed, cutting edge with distinct, broad, medio-distal, differentiated tooth; cutting edge of dactylus with small tooth proximally. Meri of ambulatory legs with granular margins, and finely granular surfaces, fringing rows of setae along upper and lower margins.

Remarks. The taxonomy of the *M. telescopicus* (Owen, 1839) group of related species has seen some interest over the last 40 years since the first attempt at a revision by Serène (1973). A number of new species have been described, along with some old names both resurrected and sunk into synonymy (also see Barnes 1976; Serène 1981; Takeda & Komai 1991; Nagai, Watanabe & Naruse 2006; Naruse & Kosuge 2008). The *Macrophthalmus telescopicus* species-group now comprises ten species: *M. ceratophorus* Sakai, 1969, *M. graeffei* A. Milne Edwards, 1873, *M. indicus* sp. nov., *M. latipes* Borradaile, 1903, *M. microfylacus* Nagai, Watanabe & Naruse, 2006, *M. milloti* Crosnier, 1965, *M. philippinensis* Serene, 1971, *M. ryukyuanus* Naruse & Kosuge,

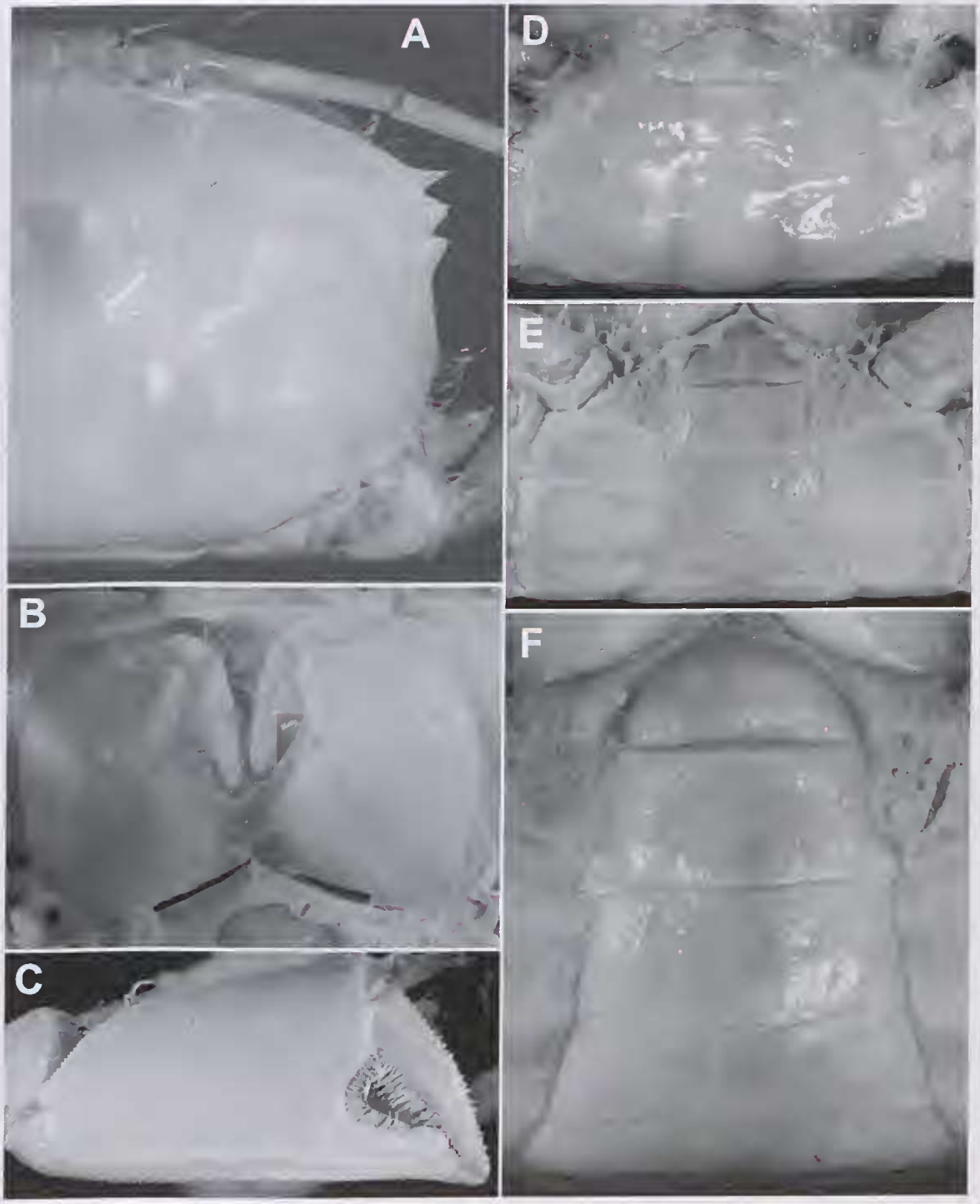
FIG. 18. *Macrophthalmus* (*M.*) *telescopicus* Owen, 1839. WAM-C16830, ♂ (36.8 × 23.7 mm), Shark Bay, WA. **A**, dorsal view; **B**, frontal margin and orbits.

2008, *M. serenei* Takeda & Komai, 1991 (= *M. verreauxi* H. Milne Edwards, 1848, in Barnes, 1976, 1977) and *M. telescopicus* (Owen, 1839). Naruse & Kosuge (2008) and Barnes (2010) have provided keys to enable their identification (with the exception of *M. indicus* sp. nov. described here.

Habitat. Sublittoral, offshore, muddy sand substrates. Members of the broader species-group have been recorded from depths to 80 m.

Distribution. Mergui Archipelago (Chopra & Das 1937); Japan — Ogasawara-shoto (Takeda 1977), Tanabe Bay (Wada 1978), Shiono-misaki (Takeda 1979), Kushimoto (Nagai 1990), Ogasawara and Kushimoto (Takeda & Komai 1991); Torres Strait (Miers 1886); Caroline Islands —

FIG. 19. *Macrophthalmus* (*M.*) *telescopicus* Owen, 1839. **A**, enlarged view of carapace; **B**, third maxillipeds; **C**, frontal view of chela; **D**, female abdomen; **E**, male sternum; **F**, male abdomen. A, F: WAM-C16832, ♂ (34.1 × 21.9 mm), Shark Bay, WA.; B, C, E: WAM-C16830, ♂ (36.8 × 23.7 mm), Shark Bay, WA.; D: ♀ (33.8 × 21.2 mm), Shark Bay, WA.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Ponape (Ortmann 1894a); Fiji (Barnes 1970); Hawaii — (Barnes 1970; Serène 1973), Sandwich Islands (Souleyet 1841; Dana 1852; Crosnier 1965), Honolulu Harbor (Rathbun 1906).

Macrophthalmus (Mareotis) abercrombiei Barnes, 1966
(Figs 20, 21)

Macropthalmus abercrombiei Barnes 1966a: 43–47, pl. 8, fig. 1; Barnes 1967: 216.

Material Examined. QM-W2493, paratype ♂ (24.9 × 17.2 mm), SE corner of Gulf of Carpentaria, offshore between the Leichardt and Bynoe Rivers, RV *Rama* Stn 482, 17 36'S, 140 09'E, 3.2 m, 16.12.1963, CSIRO Prawn Survey. QM-W19305, 2 ♂ (24.2 × 16.8; 20.9 × 14.7 mm), East Alligator River mouth, Kakadu National Park, NT, 12 05'06"S, 132 33'24"E, estuarine littoral mudflat, 21.06.1982, P.Davie.

Diagnosis. Carapace moderately broad, regions well defined, much of surface granulate except for smooth patches on gastric and cardiac regions; lateral margins convex, greatest carapace breadth occurring across posterior part of second lateral teeth; short concave granular row just above insertion of fourth pereiopod, ill-defined broken row vertically on postero-branchial. Front narrow, with deep longitudinal medial furrow, lateral margins markedly constricted between ocular peduncles. Ocular peduncles long and narrow; eyes reaching to bases of external orbital angles. Supraorbital border transverse, moderately sinuous, studded with rounded granules increasing in size towards exorbital tooth. Outer quarter of infra-orbital border without granules. Exorbital angle large, broad, acute, pointed anteriorly, separated from second tooth by deep V-shaped sulcus; second lateral tooth large, broad, bluntly pointed, directed forwards, third lateral tooth very small, separated by shallow incision. Third maxilliped with merus markedly smaller than ischium; ischium external margin straight, antero-external angle pronounced. Male cheliped distinctly elongated. Merus long, inner margin produced into long ridge for most of its length, completely covered in mat of setae, under surface completely covered with thick setae. Carpus long and narrow, lacking setae, outer surface smooth; inner surface with numerous large granules. Palm elongate, narrow, mostly smooth or microscopically granular only, except for sparse granules along proximal half of upper margin, and clump of forwardly directed tubercles, near joint with dactylus, on both inner and outer surfaces, no longitudinal ridge on outer surface. Fingers long and thin; fixed finger markedly deflected downwards, cutting margin with large, wedge-shaped, serrated tooth, occupying proximal half; dactylus lacking a differentiated tooth on cutting margin. Pereiopods relatively slender; lateral anterior and posterior margins of meri subparallel, under surface covered with 'felt' of small setae, well developed subdistal spines on upper margins of first to third meri. Male abdomen with fourth and fifth segments with straight, convergent lateral margins. Sixth segment with convex lateral margins. Sternum granulated near abdomen. Male G1 straight; tip with shield-like projection externally.

Remarks. *M. abercrombei* was originally described from only three specimens from the south-eastern Gulf of Carpentaria in Queensland. Subsequently, several specimens from south-western New Guinea were discovered in the collections of the Snellius Expedition (Barnes 1971). The present material from Kakadu National Park marks a significant westerly range extension. It is separable from other species by the characters given in the key. The adult male chela with its strongly deflexed fingers is particularly diagnostic (Fig. 21A).

Habitat. The type material was collected from the mouth of the Norman River, while the two paratype males were caught in a prawn trawl in about 3 m depth from SE corner of the Gulf of Carpentaria (possibly from a mudbank capable of being exposed at low water). This part of the Gulf is typically very muddy, with much sediment washed down during the annual monsoons. The present males from the mouth of the East Alligator were collected from very

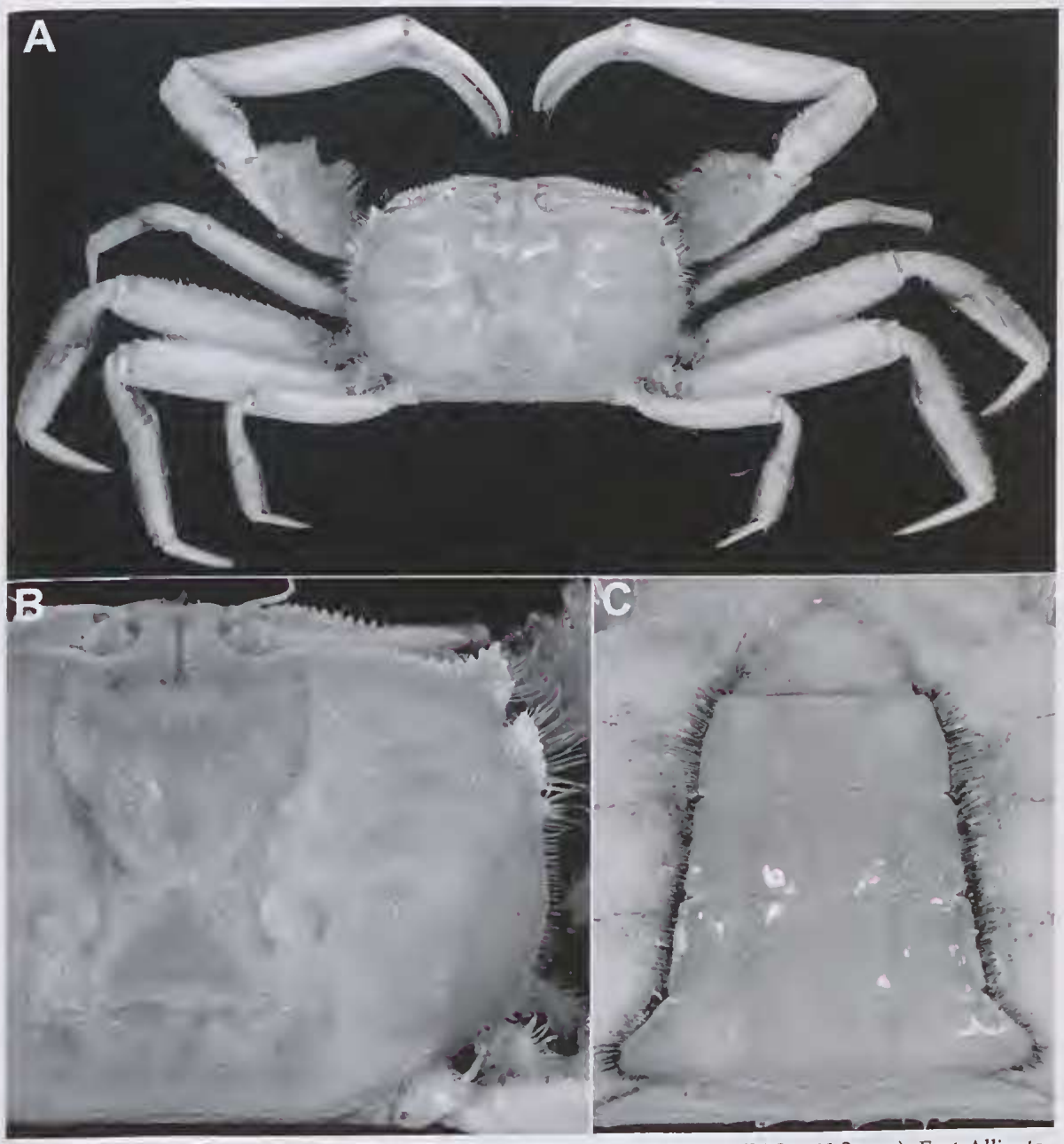


FIG. 20. *Macrophthalmus* (*Mar.*) *abercrombiei* Barnes, 1966. QM-W19305, ♂ (24.0 × 11.3 mm), East Alligator River mouth, Kakadu National Park, NT **A**, dorsal view; **B**, enlarged view of carapace; **C**, male abdomen.

FIG. 21. *Macrophthalmus* (*Mar.*) *abercrombiei* Barnes, 1966. QM-W19305, ♂ (24.0 × 11.3 mm), East Alligator River mouth, Kakadu National Park, NT **A**, frontal view of chela; **B**, frontal margin and orbits; **C**, third maxillipeds.

soft mud at the waters edge at low water neap. It can be presumed that this species prefers soft mud at extreme low water, or perhaps even in the shallow subtidal.

Distribution. Northern Australia: from Gulf of Carpentaria and East Alligator River; south-western New Guinea.

Macrophthalmus (Mareotis) darwinensis Barnes, 1971

(Figs 22, 23)

Macrophthalmus (*Mareotis*) *darwinensis* Barnes, 1971: 25, figs 1-7; Davie 2002: 353; Ng *et al*. 2008: 237.

Macrophthalmus (*Mareotis*) *crinitus* — Barnes 1967: 221, pl. 2c, fig. 7 [not *Macrophthalmus* (*Mareotis*) *crinitus* Rathbun, 1913].

Macrophthalmus darwinensis — Poupin & Junker 2010: 96–97 (colour figs C, D on p. 97).

Material Examined. QM-W19304, 8 ♂ (20.5 × 14.6, 21.9 × 16.5, 20.6 × 14.8, 20.3 × 13.8, 20.8 × 15.3, 14.1 × 11.1, 13.0 × 10.4, 10.3 × 7.9), 7 ♀ (21.0 × 16.3, 23.1 × 17.5, 19.9 × 14.6, 17.8 × 13.9, 12.5 × 9.5, 11.1 × 9.0, 14.2 × 11.2 mm), small creek south of Bohle River mouth near Townsville NEQ, 19°11.5'S 146°32.7'E, P. Davie, J. Short, A. Humpherys, estuarine, littoral, mudflat in burrows 27.10.1993. QM-W10597, ♂ (21.8 × 15.9 mm), Ross River, Townsville, North Bank, near mouth, 19°22.0'S, 146°44'0 E, July 1983; estuarine, littoral, sandy mud flat, lower estuary, P. Davie. QM-W10907, ♂ (11.4 × 8.2 mm), Ross River, Townsville, North Bank, near mouth, 19°17.0'S, 146°49.0'E, estuarine, littoral, sandy mud flat, lower estuary, July 1983, P. Davie. QM-W7423, ♂ (18.3 × 13.6 mm), Bessie Point, Trinity Inlet, Cairns, 16°54.0'S, 145°49.0'E, 15.12.1975; R. Timmins. QM-W18171, 5 ♂ (15.1 × 11.6, 12.0 × 9.2, 14.0 × 11.0, 13.9 × 10.2, 9.4 × 7.5 mm), 4 ♀ (15.2 × 11.5, 13.3 × 10.2, 12.0 × 10.5, 11.0 × 8.5 mm), Starcke River, inlet just south of mouth, N. Qld. 11.11.1992, P. Davie & J. Short. NTM-Cr010920, ♂ (12.9 × 10.0 mm), Channel I., Darwin Harbour, NT, 4.3.1992, Melanie Burke. NTM-Cr 010921, 2 ♂ (16.9 × 12.6, 13.7 × 10.6 mm), ♀ (15.6 × 11.7mm), Channel I., Darwin Harbour, NT, 17.3.1992, Melanie Burke. QM-W19190, 7 ♂ (19.1 × 13.8, 15.2 × 10.8, 16.9 × 12.1, 8.9 × 6.3, 10.5 × 8.3, 14.1 × 10.3, 13.9 × 10.4 mm), 2 ♀ (11.7 × 8.0, 10. 6 × 7.3 mm), 4 ovig. ♀ (14.3 × 10.7, 15.7 × 11.0, 13.8 × 10.2, 12.9 × 9.0 mm), Channel I., Darwin Harbour, NT, 12°33'S, 130°52'E, marine littoral, mangrove, in mud under *Sonneratia*, 07.05.1993, P. Davie. QM-W21037, ♂ (6.8 × 5.1 mm), Turtle Bay & unnamed bay to south, Lacrosse I., Cambridge Gulf, WA, 14°45'S, 128°18'E, littoral, mudflat near mangroves, 20.11.1995, J. Short. QM-W20993, 4 ♀ (9.8 × 6.7, 8.0 × 5.7, 7.3 × 5.8, 8.9 × 6.8 mm), Myrmidon ledge, Vancover Point, Cambridge Gulf, Kimberley Coast, WA, 14°50'S, 128°11'E, littoral, mangroves under *Sonneratia*/*Zostera* in mud, 18.11.1995, J. Short. QM-W20268, ovig. ♀ (13.8 × 10.5 mm), Bedford I., Kimberley Coast, WA, 16°08'S, 123°18'E; littoral flat, 19.11.1994,

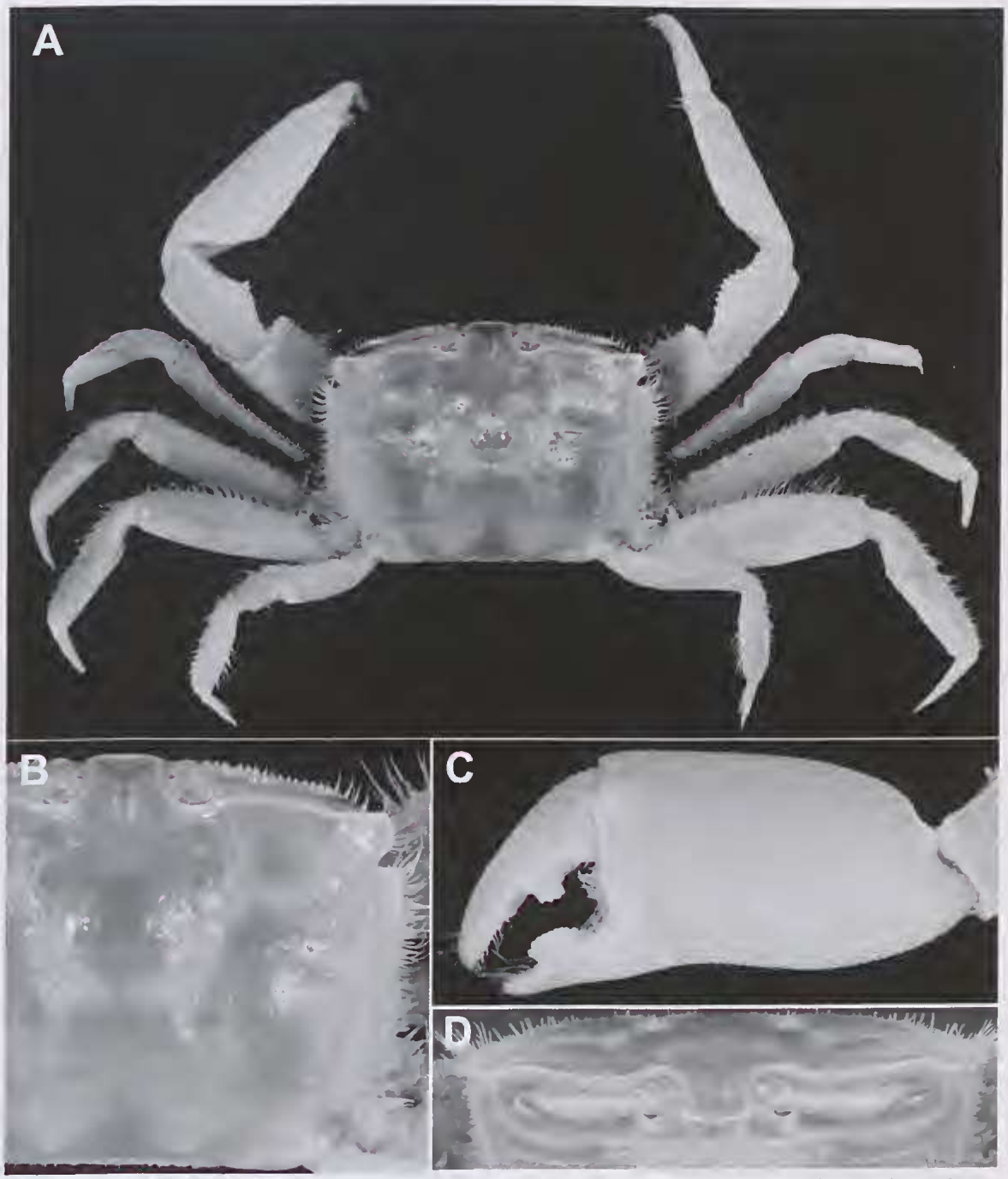
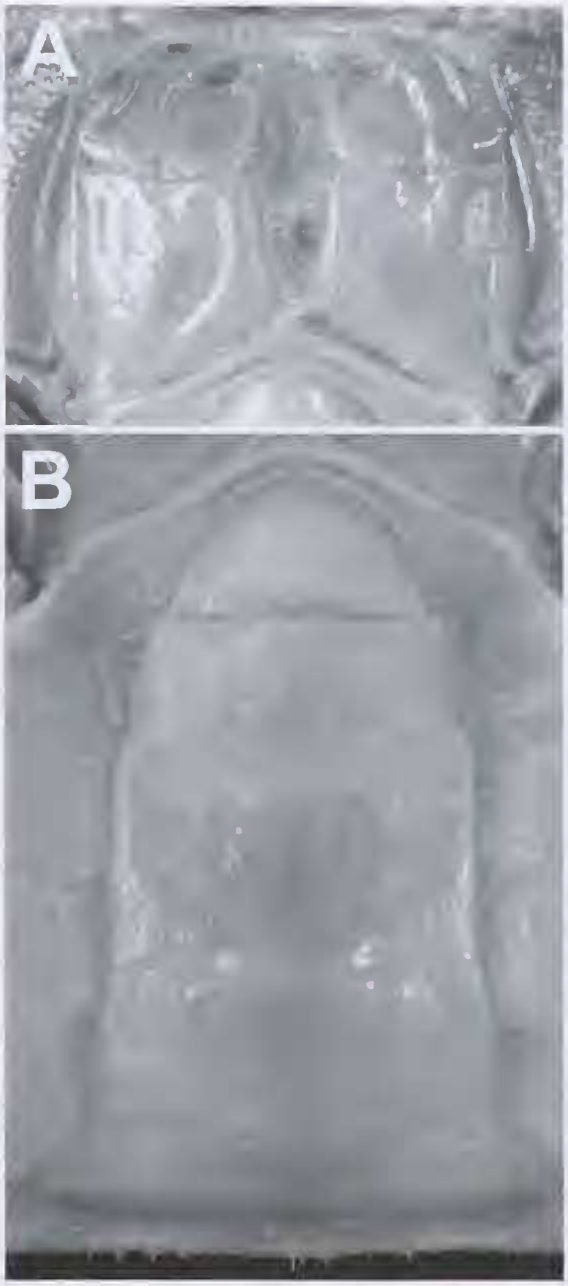


FIG. 22. *Macrophthalmus* (*Mar.*) *darwinensis* Barnes, 1971. QM-W19190, ♂ (19.1 × 13.8 mm), Darwin Harbour, NT. **A**, dorsal view; **B**, enlarged view of carapace; **C**, frontal view of chela; **D**, frontal margin and orbits.



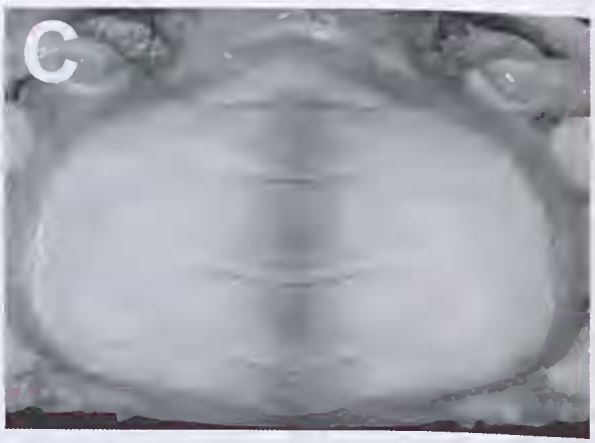


FIG. 23. *Macrophthalmus* (*Mar.*) *darwinensis* Barnes, 1971. **A**, third maxillipeds; **B**, male abdomen; **C**, female abdomen. A, B: QM-W19190, ♂ (19.1 × 13.8 mm), Darwin Harbour, NT.; C: QM-W20268, ovig. ♀ (13.8 × 10.5 mm), Bedford Island, Kimberley Coast, WA.

J. Short. WAM-C21023, 2 ♀ (13.2 × 10.0; 13.1 × 9.9 mm), 3 ♂ (10.8 × 8.3; 13.6 × 9.9; 14.0 × 9.9 mm), between Lord and Byron Is., 16°10′S, 123°28′E, Stn 40, D.S. Jones, 25.06.1991. MNHP-Unreg., ♂ (15.9 × 12.0 mm), ♀ (16.1 × 12.1 mm), Ouémo mangrove, Nouméa, New Caledonia, 22°16′49"S, 166°28′21"E, Stn 5, low tide mangrove next to public pathway, J. Poupin, 8.03.2009. MNHP-Unreg., ♂ (16.3 × 12.2 mm), ♀ (17.5 × 12.8 mm), IFREMER mangrove, Ouémo mangrove, Koné, Nouméa, New Caledonia, 21°5′51"S, 164°49′2"E, Stn 6, low tide mangrove, J. Poupin, 9.03.2009. MNHP-Unreg., 3 ♂ (21.6 × 15.6; 13.8 × 10.3; 8.1 × 6.4 mm), ♀ (15.9 × 12.0 mm), 2 juv. ♀ (10.2 × 7.7; 7.3 × 5.6 mm), Oundjo mangrove, Voh, New Caledonia, 21°3′4"S, 164°44′31"E, Stn 8, J. Poupin & M. Juncker, 11.03.2009.

Diagnosis. Carapace subrectangular; 3 anterolateral teeth, exorbital tooth broad, separated from second tooth by wide sulcus, second tooth blunt, slightly wider than exorbital, third small, often poorly defined; surface granulation restricted to branchial and hepatic regions; frontal margins smooth, anterior margin straight to faintly bilobed, distinct medial furrow; upper orbital border sinuous. Merus of male cheliped with inner margin bearing long setae and tubercular granules at distal angle, outer margin with row of large pointed granules, largest distally, without mat of setae, lower surface with large rounded granules beneath mat of setae. carpus with several prominent tubercular spines present along inner medial edge. Outer surface of palm and fixed finger

lacking longitudinal ridge or row of granules in adult, but present in juveniles; cutting margin of fixed finger with large, long, central crenulated tooth in adults; lateral margins of sixth segment of male abdomen straight. Third maxillipeds merus smaller than ischium; with internal margin of ischium straight. Male G1 with well developed terminal process.

Remarks. *Macrophthalmus darwinensis* was originally referred to *M. crinitus* with which it shares a superficial similarity. Previous records of this species have been confined to the Northern Territory, mostly within the Darwin/Kakadu National Park region, but careful comparison of specimens from north-eastern Queensland has demonstrated these specimens to be inseparable from those of the Northern Territory. As well I have recently examined specimens from New Caledonia which are unquestionably this species (see Poupin & Junker 2010), so this marks a significant easterly range extension into the Coral Sea.

Habitat. Burrows in soft mud; usually seaward fringes especially near pools and drainage channels; often associated with mangroves, but can extend out onto mud flats. Always regularly inundated sites.

Distribution. Northern Australia, between Darwin and Townsville; New Caledonia.

Macrophthalmus (Mareotis) gagudju sp. nov.

(Figs 24, 25, 26)

Material Examined. HOLOTYPE: QM-W19918, ♂ (16.3 × 11.8 mm), Kakadu National Park, Northern Territory, mudflat, P. Davie. PARATYPES: QM-W19094, 3 ♂ (10.8 × 8.1, 12.1 × 8.9, 10.8 × 8.0, 8.0 × 6.3), Camerons Beach, Shoal Bay, Northern Territory, 12°21′S, 130°59.6′E, 23.06.1982, soft mud flat under *Avicennia*, P. Davie. QM-W19188, 2 ♂ (12.2 × 8.9, 11.5 × 8.4 mm), 2 ♀ (10.5 × 7.9, 9.5 × 7.2 mm) Ludmilla Creek, Northern Territory, 12°44′S, 130°50′E, mangroves, edge of channel, 07.05.1993, P. Davie. QM-W19189, 31 ♂ (9.1 × 6.6, 11.6 × 8.1, 10.7 × 8.0, 11.2 × 8.0, 10.6 × 7.4, 10 × 7.1, 10.8 × 7.2, 10.1 × 7.1, 8.0 × 6.0, 10.1 × 7.3, 10.0 × 7.3, 8.6 × 6.3, 9.0 × 6.6, 11.6 × 8.0, 13.8 × 9.8, 10.1 × 7.5, 8.8 × 6.6, 8.0 × 6.0, 7.8 × 5.5, 7.9 × 6.1, 7.7 × 5.6, 9.0 × 6.8, 7.5 × 5.8, 7.2 × 5.5, 7.4 × 5.5, 6.9 × 5.1, 6.0 × 5.1, 7.0 × 5.3, 6.5 × 5.2, 9.6 × 6.7, 11.7 × 8.4 mm), 21♀ (11.4 × 8.3, 9.0 × 7.6, 12.0 × 8.9, 10.2 × 7.5, 11.0 × 8.5, 10.0 × 7.5, 11.3 × 8.6, 9.8 × 7.4, 10.8 × 7.9, 9.2 × 6.8, 8.2 × 6.6, 10.3 × 8.0, 10.1 × 7.5, 7.5 × 5.9, 7.1 × 5.4, 7.3 × 6.1, 8.6 × 6.8, 6.8 × 5.2, 10.3 × 7.2, 6.8 × 5.2, 6.7 × 5.1, 12.9 × 9.9, 11.2 × 8.6), Channel I., Darwin Harbour, 12°33′S, 130°52′E, marine littoral soft mud, P. Davie. QM-W19192, 4 ♂ (12.2 × 8.5, 12.5 × 9.0, 14.2 × 9.9, 9.9 × 6.0 mm), 2 ♀ (8.3 × 5.4, 9.5 × 7.0 mm), ovig. ♀ (12.0 × 8.8 mm), East Alligator river mouth, Kakadu, NT, 12°07′S, 132°32′E, 16.06.1982, P. Davie. QM-W20270, ♀ (9.8 × 7.2 mm), Bedford I., Kimberley Coast, WA, 16°08′S, 123°18′E, marine, littoral flat, 19.11.1994, J. Short. QM-W20394, 2 ♂ (10.1 × 7.8, 6.8 × 5.3 mm), 2 ♀ (13.1 × 10.4, 6.4 × 5.0 mm), ovig. ♀ (10.4 × 7.4 mm), Talbot Bay, Unnamed Island, Kimberley Coast, WA, 16°12′S, 123°51′E, estuarine, littoral, mudbank, 24.11.1994, J. Short. QM-W20243, ♀ (8.2 × 6.4 mm), 3 ♂ (12.2 × 8.2, 11.5 × 8.5, 9.7 × 7.0 mm), Gregory I., Kimberley Coast, WA, 16°19′S, 123°19′E, marine, littoral, mudflat near mangroves, *Sonneratia*, 19.11.1994, J. Short.

Description. Carapace. Front deflexed, constricted between bases of ocular peduncles; margins smooth with well defined median groove. Upper orbital border curved; margin bearing tubercular granules. Ocular peduncle of moderate length, comparatively stout and not projecting beyond tip of exorbital angle. Central region of epistome distinctly concave. Margin of carapace anteriorly narrowed; the lateral margin convex. Three anterolateral teeth, first two distinct, third indistinct. Exorbital angle not pronounced, somewhat blunt, directed outwards and slightly forward; broadly separated from second lateral tooth; second tooth triangular, projecting outwards and slightly forwards, slightly wider than exorbital angle. Third tooth ill-defined, scarcely more than small notch with raised tubercle; positioned well rearward of second lateral tooth and often obscured by setae. Greatest carapace breadth across third lateral teeth behind which lateral margins somewhat parallel; only slightly forward of the mid-point on the lateral margin. Dorsal surface extensively covered with rounded granules; somewhat flattened, regions moderately well defined, with variable, but sparse, covering of setae laterally and posteriorly.

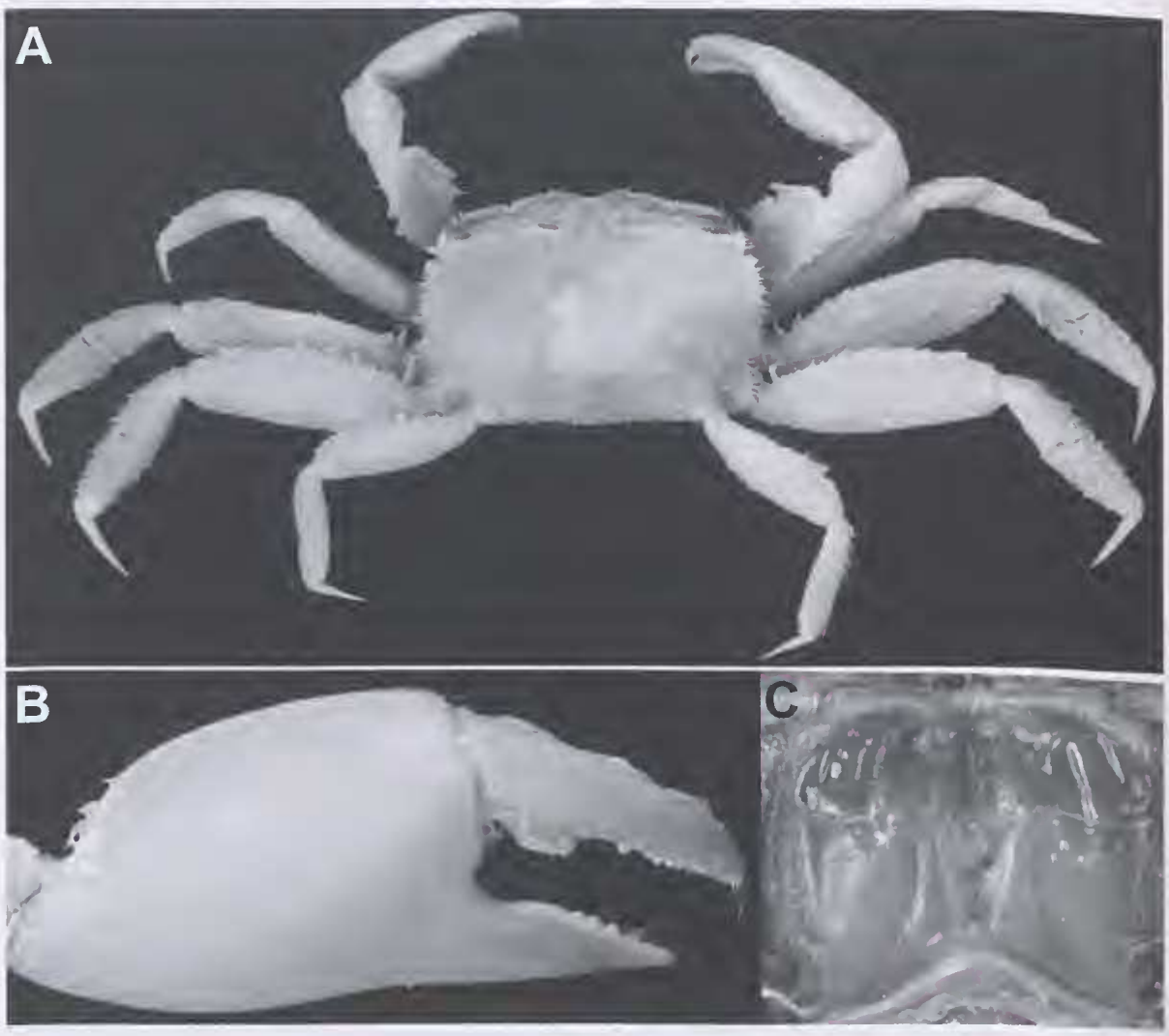


FIG. 24. *Macrophthalmus* (*Mar.*) *gagudju* sp. nov. Holotype, QM-W19918, ♂ (16.3 × 11.8 mm), Kakadu National Park, NT. **A**, dorsal view; **B**, chela; **C**, third maxillipeds.

Anterolateral and mid-lateral margins thickly fringed with fine setae. Third Maxilliped: merus markedly smaller than ischium; internal and external margins of ischium straight or nearly so; internal margin of merus convex.

Male Cheliped. Merus: inner and outer margins covered with a mat of fine setae; row of long setae bordering upper and lower margins. Carpus: outer surfaces appearing smooth, with only sparse setae; inner surface below oblique median line, densely covered with setae. Oblique median line composed of a row of blunt tubercles. Surface above median line appearing smooth (without setae) or nearly so. Palm with inner surface lacking spine near carpus; upper and median two-thirds covered

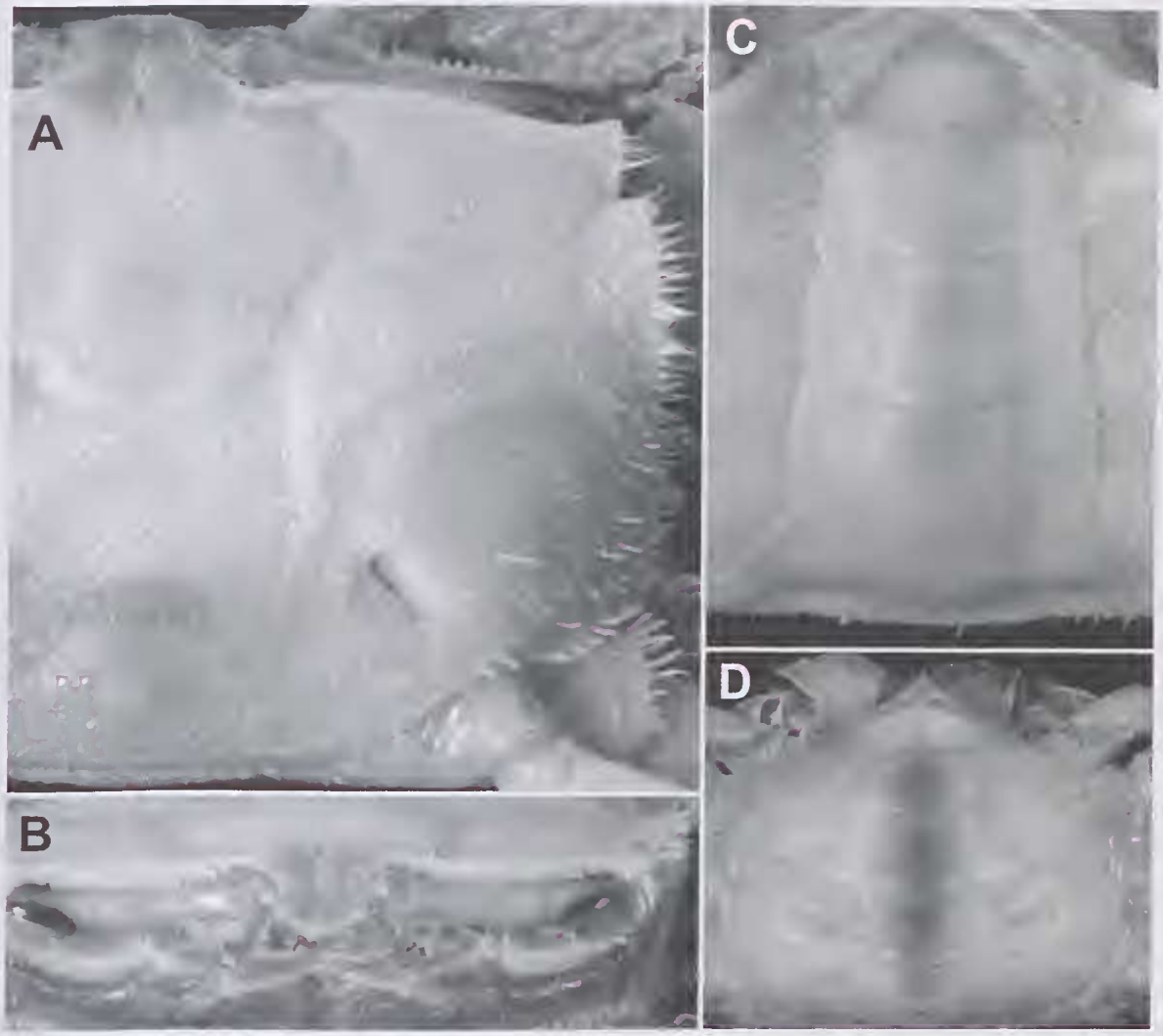


FIG. 25. *Macrophthalmus* (*Mar.*) *gagudju* sp. nov. QM-W19192, ♂ (14.2 × 9.9 mm), ♀ (9.5 × 7.0 mm), East Alligator river mouth, Kakadu, NT. **A**, enlarged view of carapace; **B**, frontal view of chela; **C**, male abdomen; **D**, female abdomen.

with a thick mat of setae; lower third without setae and sparsely granular; outer surface appearing smooth with only sparse rows of fine granules on upper and lower margins and supramarginal regions; lower margins with fine granular rows. Fixed finger slightly deflexed; outer surface appearing smooth with line of fine granules on lower margins; inner surface densely setose; cutting margin with series of pointed granules extending almost full length of finger. Dactylus curved; outer surface smooth or finely granular in part; upper margin finely granular with a fringe of setae close to inner surface; cutting margin with large crenulated tooth proximal to centre, with a series of tooth-like granules distally. Walking

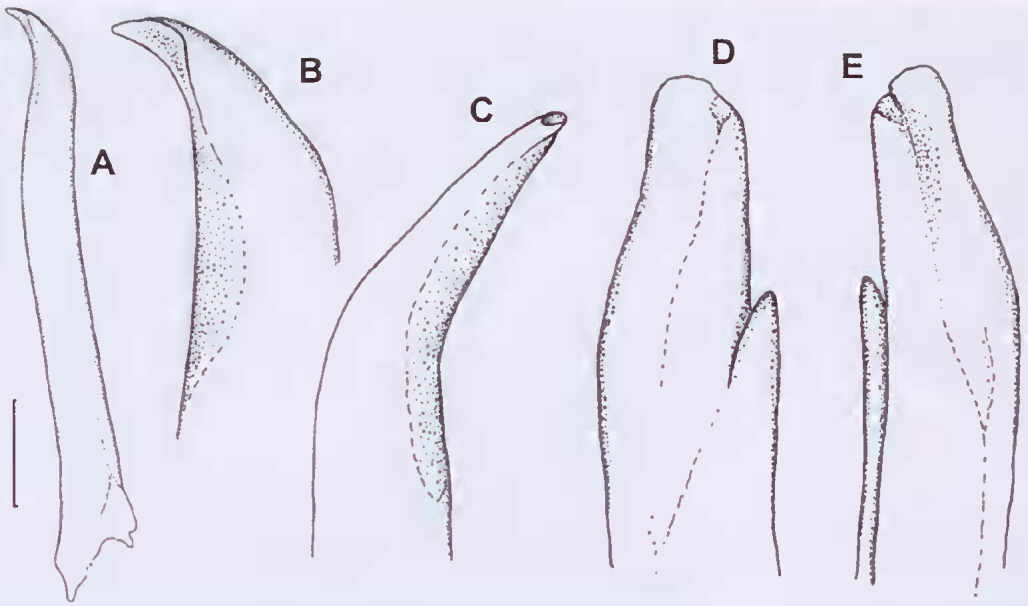


FIG. 26. *Macrophthalmus (Mar.) gagudju* sp. nov. Holotype, QM-W19918, ♂ (16.3 × 11.8 mm), Kakadu National Park, NT. Male first gonopod various views. Scale = 1 mm.

legs stout, thickly covered in fine close setae; meri with subdistal spine on upper margin.

Male abdomen with lateral margins of somites sub-parallel or slightly convex; margins of sixth somite often small medial concavity; thoracic sternites conspicuously granulate. Male first gonopod slightly curved, apical part in the form of a flattened flange, projecting obliquely upwards; well developed narrow subdistal palp; stiff setae present distally on inner and outer margin.

Remarks. Based on overall morphology *Macropthalmus gagudju* has its closest affinities with the subgenus *Mareotis* Barnes, 1967. This subgenus is characterised by having a very narrow front, a moderately broad carapace (1.4–1.5 times wider than long), lateral teeth broad based and rectangular, cornea extending to base of exorbital angles, and the central region of the epistome with a concave excavation. Of the species in *Mareotis*, *Macrophthalmus gagudju* most closely resembles *M. darwinensis*, *M. depressus*, *M. definitus*, *M. pistrosinus*, M. *bauzai*, *M. japonicus* and *M. pacificus*. The new species bears a superficial resemblance to *M. latreillei* and *M. laeviuanus* in the subgenus *Venitus* Barnes, 1967, but they are not close allies.

Macrophthalmus gagudju can be distinguished from allied species by:

1. The overall shape of the carapace, is subquadrate and anteriorly narrowed. *M. pistrosinus* and *M. japonicus* have a proportionately broader carapace, whilst in *M. depressus* the anterior of the carapace does not appear to narrow appreciably (*cf* figure in Barnes (1970)).

2. The anterolateral teeth in *M. gagudju* are conspicuously less acute and do not project as far outwards or forwards as most of its congeners. Its similarities in this regard lie with *M. darwinensis*, *M. definitus* and *M. pacificus* and less closely with *M. pistrosinus and M. japonicus*. The third lateral tooth is among the least conspicuous of any species examined. This feature allows it to be distinguished from *M. definitus* and *M. pacificus* and in most cases from *M. darwinensis*.

3. The carapace granulation is marked in the new species and reliably differentiates it from *M. darwinensis* and *M. pacificus*, both of which appear smooth to the naked eye. The surface granulation of *M. pistrosinus*, *M. japonicus* and *M. depressus*, although similar to the new species, is noticeably coarser and in some specimens examined, less extensive overall.

4. The presence of thick setae on the inner surface of the palm effectively distinguishes it from *M. pistrosinus*, *M. japonicus* and *M. pacificus* in which the setal covering is significantly sparser or non-existent.

5. The lack of a defined 'tooth' on the index of the chela in *M. gagudju* is an important distinguishing character. *M. pistrosinus*, *M. darwinensis*, *M. japonicus* and *M. definitus* all have a more or less defined crenulated tooth, whilst there is no defined tooth-like structure on the new species. Whilst there is also no well-defined tooth on the index in *M. pacificus*, the shape and arrangement of tubercles on the cutting margin differentiates it from *M. gagudju*.

6. A well defined, though shallow, deflection in the index of the chela helps distinguish the new species from *M. darwinensis*, *M. japonicus*, *M. pacificus* and *M. definitus* which have straight or less deflexed indexes. In contrast the indexes of *M. pistrosinus* and *M. banzai* are markedly more deflected. In addition, the chela of *M. japonicus* appears proportionately smaller than the new species.

7. *Macrophthalmus gagudju* is a comparatively small species which helps distinguish it from adult *M. definitus*, *M. pistrosinus*, *M. banzai*, *M. japonicus* and *M. pacificus* which are all considerably larger. Only *M. darwinensis* and *M. depressus* are of somewhat similar size. Male specimens of *M. darwinensis* examined are on average slightly larger than their *M. gagudju* counterparts. Unfortunately no specimens of *M. depressus* were available for study but based on dimensions given in Barnes (1970) it would appear that that species may be slightly smaller than the new species.

8. Male G1. The terminal process of the male gonopod is more elongate and projects further laterally in *Macrophthalmus gagudju* than in *M. darwinensis*, *M. definitus* and *M. pacificus*.

Etymology. *Gagudju*, from which the name for Kakadu National Park was derived, is a language of the aboriginal people of the East Alligator Region of the Northern Territory. The species was first found during an ecological survey of the East Alligator estuary. It is used as a noun in apposition.

Habitat. Prefer soft mud flats or mud banks on the edge of channels, often under or near seaward mangroves (*Avicennia*, *Sonneratia*).

Distribution. Known only from the Northern Territory to the Kimberley coast of north-western Australia.

Macrophthalmus (Mareotis) pacificus Dana, 1851

(Figs 27, 28)

Macrophthalmus pacificus Dana, 1851a: 248; Dana 1852: 314; Dana 1855: pl. 19, fig. 4a–c; Stimpson 1858: 97; de Man 1890: 79, pl. 4, fig. 10; de Man 1895: 579; Ortmann 1897: 342; Stimpson 1907: 97; Tesch 1915: 155(key), 190, pl. 8, fig. 11; Kemp 1919: 391; Rathbun 1924: 13; Sakai 1939: 628; Kamita 1941: 168; Tweedie 1950: 359; Chhapgar 1957: 52, pl. 15 a–d; Kim 1970: 18; Starobogatov 1972: 345; Barnes 1977: 278 (key); Davie 1992: 348 (key).

? *Macrophthalmus bicarinatus* Heller, 1865: 36, pl. 4, fig. 2; de Man 1902: 496.

Macrophthalmus depressus — Lanchester 1900a: 259. [not *M. depressus* Rüppell, 1830]

Macrophthalmus (Mareotis) pacificus — Barnes 1967: 218, 221, pl. 2b, fig. 6; Barnes 1970: 232; Kim 1973: 452, 645, fig. 192, pl. 90, fig. 147a–b; Lundoer 1974: 8(list); Sakai 1976: 614, fig. 337; Takeda 1981: 72; Miyake 1983: 167, pl. 56, fig. 2; Dai *et al.* 1986: 435, fig. 242(3–4), pl. 60(5); Dai & Yang 1991: 476, fig. 242(3–4), pl. 60(5); Komai *et al.* 1995: 128, fig. 11; Muraoka 1998: 50; Rahayu & Setyadi 2009: 119, 1 colour fig.

Not *Macrophthalmus pacificus* — Rathbun 1910b: 307, pl. 1, fig. 3 (= *M. crinitus* Rathbun, 1913); Snelling 1959: 70 (= *M. setosus* H. Milne Edwards, 1852).

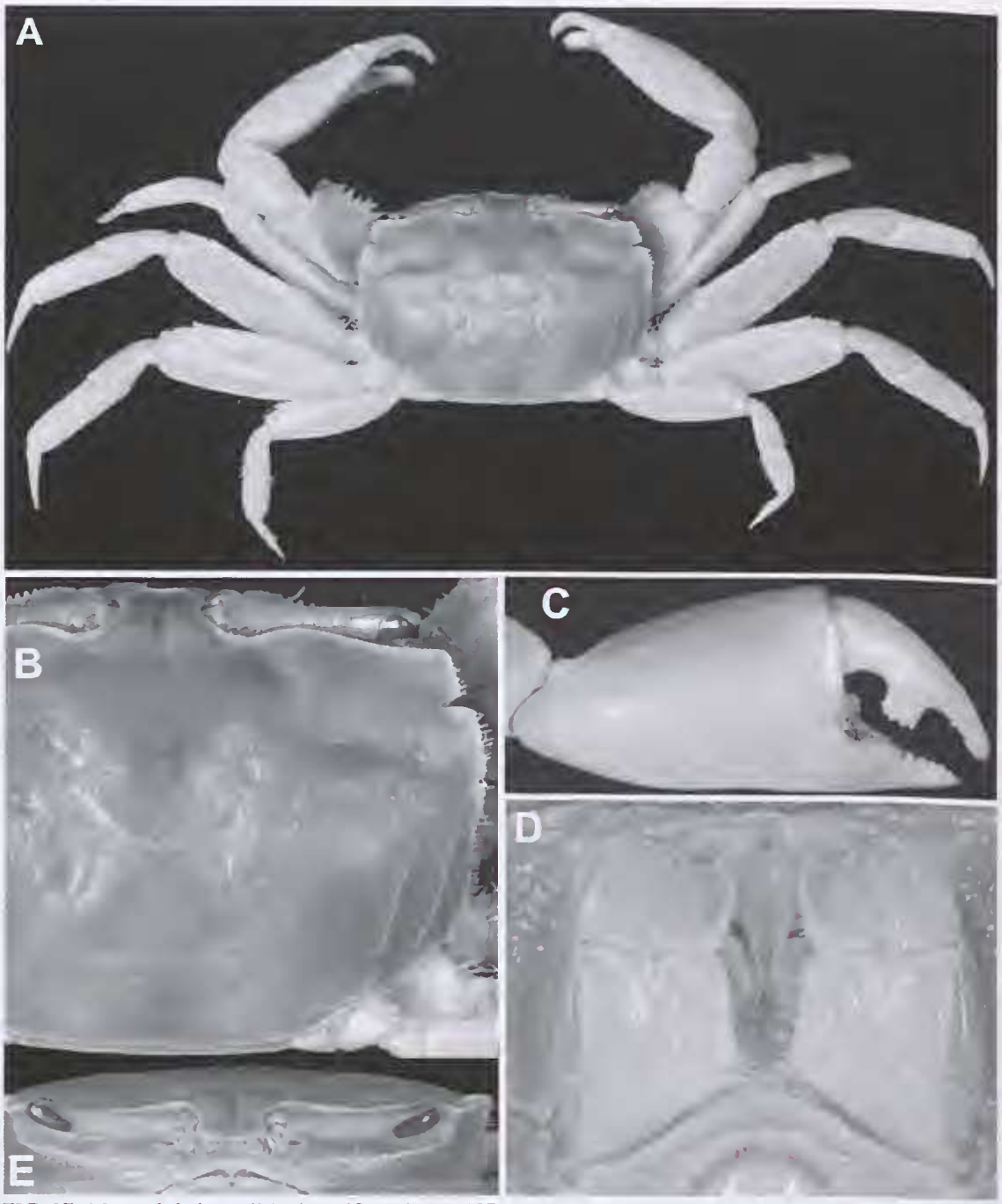


FIG. 27. *Macrophthalmus* (*Mar.*) *pacificus* Dana, 1851. QM-W5394, ♂ (22.2 × 16.1 mm), Hervey Bay, SE Qld. **A**, dorsal view; **B**, enlarged view of carapace; **C**, frontal view of chela; **D**, third maxillipeds; **E**, frontal margin and orbits.

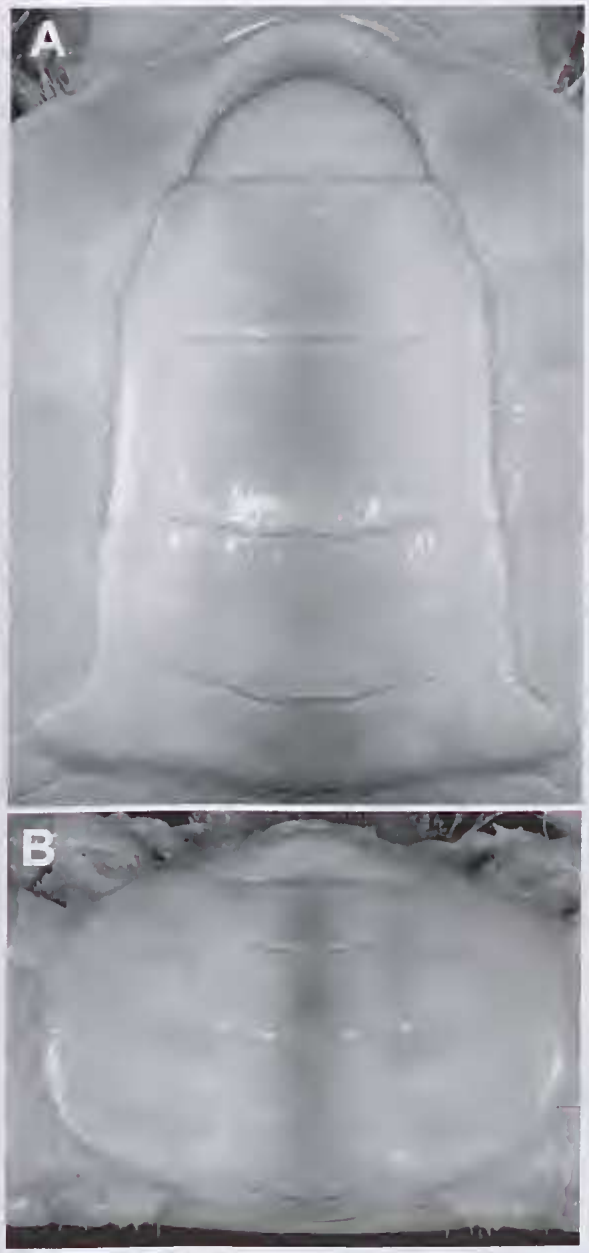


FIG. 28. *Macrophthalmus* (*Mar.*) *pacificus* Dana, 1851. QM-W5394, ♂ (22.2 × 16.1 mm), Hervey Bay, SE Qld. QM-W18171, ♀ (12.0 × 9.2 mm), south of mouth of Starke R., N Qld. **A**, male abdomen; **B**, female abdomen.

Material Examined. QM-W5394, 2 ♂ (22.2 × 16.1, 18.6 × 13.2 mm), Eli Creek, North Urangan, Hervey Bay, SE Qld, 25°17′S, 152°49′E, thick mud, mangrove patch on terrestrial fringe, 26.10.1975, P. Davie. QM-W3994, 2 ♀ (15.5 × 12.2, 12.8 × 9.6 mm), ♂ (10.3 × 7.5 mm), Port Douglas, NE Qld, 16°29′S, 145°28′E, 17.02.1966, L. Curlis. QM-W16872, ♀ (12.5 × 9.2 mm), Red Beach, near Weipa, FN Qld, 12°35′S, 141°52′E, estuarine, 03.11.1990, P. Davie & J. Short. QM-W4592, ♂ (15.5 × 11.1 mm), Trinity Inlet, Cairns, NE Qld, 16°58′S. 145°47′E, in low *Avicennia* stand, rocky mud, 07.05.1952, P. Davie & J. Short. QM-W19230, ♂ (10.7 × 7.8 mm), creek off road to AIMS, near Townsville, NE Qld, 19°17′S, 147°01′E, estuarine, mangroves, in *Rhizophora*, 28.10.1993, P. Davie, J. Short & A. Humphreys. QM-W18171, 5 ♀ (12.0 × 9.2, 9.4 × 7.1, 13.0 × 10.2, 14.9 × 10.9, 10.9 × 7.9 mm), 4 ♂ (13.9 × 10.4, 11.7 × 8.9, 14.9 × 11.0, 13.7 × 10.4 mm), south of mouth of Starke River inlet, FN Qld, 14°47′S, 145°01′E, marine, littoral, lower mudflat in burrows, salinity 35 ppt, 11.11.1992, P. Davie & J. Short. QM-W16765, 2 ♂ (7.7 × 6.0, 6.9 × 5.5 mm), ♀ (8.8 × 6.8 mm), ovig. ♀ (13.0 × 9.5 mm), Muddy Bay, FN Qld, 10°44′S, 142°33′E, estuarine, in burrows near *Rhizophora* forest, mid-tide, mud, 26.10.1990, P. Davie & J. Short. WAM-C42680, ♂ (15.3 × 11.0 mm), NE end of Coolgra Pt., east of Onslow, Western Australia, Site 44, B.R. Wilson, 9.05.2009.

Diagnosis. Carapace surface smooth and shiny, except for long, slightly oblique rows of granules on branchial regions; front deflexed, slightly constricted between bases of ocular peduncles, lateral margins smooth, straight distally, median furrow deep; carapace margins subparallel posteriorly, convergent anteriorly, widest point across third antero-lateral teeth; exorbital tooth broadly triangular, blunt, second lateral tooth similarly large with long outer margin, third tooth tiny but clearly defined. Ocular peduncles moderately long, cornea extending not quite to base of exorbital angle. Central region of epistome excavated. Merus of third maxilliped markedly smaller than ischium. Palm of male cheliped stout, outer face smooth, inner face with dense patch of setae centrally near distal margin continuous with setae on fixed finger, with small scattered granules; fixed finger not deflexed, cutting edge with a series of large rounded granules, but without differentiated tooth, inner surface

with dense mat of setae near cutting margin; dactylus cutting margin with large, distally enlarged, crenulated tooth proximally. Meri, carpi and propodi of ambulatory legs finely granular, with sparse setae along upper margins; meri of first two pairs with thicker elongated patch of setae anteroproximally.

Remarks. One of the most distinctive *Macrophthalmus* species because of its smooth, rounded, carapace, and the pretty sky-blue claws of the adult males.

Habitat. Appears to prefer lower estuarine habitats, making burrows in thicker firm mud, and rocky mud, often associated with more open mangrove forest (low *Avicennia*, *Rhizophora*), from lower-tidal level nearly to the terrestrial fringe.

Distribution. Type locality: Upolu, Samoa. India—Okha (Chhapgar 1957); Nicobar Islands (Heller, 1865); Thailand—Phuket (Komai *et al.* 1995); Penang (de Man, 1895); Japan—Okinawa (Stimpson 1907), Ishigaki-jima and Iriomote-jima (Sakai 1976), Ishigaki-jima (Miyake 1983); Korea Strait (Kamita 1941); Taiwan (Barnes 1970); Hong Kong (Barnes 1970); Malaysia—Buntal (Barnes 1970); Philippines (Barnes 1970, Komai *et al.* 1995); Borneo—(Tweedie 1950), Pontianak (de Man, 1895); New Guinea—Kaimare and Dru I. (Barnes 1967); Solomon Islands—Ysabel I. (Barnes 1967); Upolu, Samoa (Dana, 1852). In Australia from Onslow and Broome, WA (present record; Rathbun 1924), around tropical Australia south to Hervey Bay, with unconfirmed report that can reach Moreton Bay (Barnes 1967; present records and pers. obs.).

Macrophthalmus (Mareotis) pistrosinus Barnes & Davie, 2008

(Figs 29, 30)

Macrophthalmus (*Mareotis*) *pistrosinus* Barnes & Davie, 2008: 63–68, figs 1–4.

Macrophthalmus (*Mareotis*) *japonicus* — Barnes 1967: 224–226, fig. 8, pl. 2(d) [not *Macrophthalmus* (*Mareotis*) *japonicus* (De Haan, 1835)].

Macrophthalmus (*Mareotis*) aff. *japonicus* — Kitaura *et al.* 2002: 1–8; 2006: 46.

Material Examined. HOLOTYPE: WAM 655-65, ♂ (30.9 × 20.4 mm), Teggs Channel, Shark Bay, WA, 14.8.1963, R. Slack-Smith. PARATYPES: WAM 655-65, 2 ♀ (26.6 × 14.1, 22.0 × 15.1 mm), same data as holotype. WAM 651-65, ♀, Denham Hummock, Shark Bay, WA from burrow near mangrove creek, 9.1.1963, R. Slack-Smith.

Diagnosis. Carapace surface, excepting small central area, entirely covered by large granules; regions well defined; transverse granular and setal row extending across anterior branchial region from level of third lateral tooth; similar transverse row above insertion of fourth pereiopod; two subparallel longitudinal rows of granules and setae branchially. Greatest carapace breadth across second lateral teeth. Front deflexed, constricted between bases of ocular peduncles; anterior margin bilobed with deep median furrow. Upper orbital border with slightly oblique, sinuous margin; edged with large tubercular granules. Three anterolateral teeth. Exorbital angle pronounced, large, broad, rectangular, pointed anteriorly, directed outwards and slightly forwards; second lateral tooth large, broad, subtriangular, projecting beyond exorbital angle by wide U-shaped sulcus; third lateral tooth small, conical, separated by small but distinct incision. Posterolateral margins subparallel. Ocular peduncles long and narrow; cornea extending almost to tip of exorbital angle. Central region of epistome distinctly concave. Third maxilliped with merus markedly smaller than ischium; internal margin of merus slightly convex; external margin with marked posteroexternal convexity. Merus of male cheliped elongate, upper margin with distal row of tubercular granules; outer margin finely granular. Carpus inner superior margin with crest of pointed tubercules, highest medially. Palm elongate; upper and lower margins markedly granulate; outer surface finely granular, granules increasing in size towards carpus, without longitudinal ridge near lower margin, with slight depression near base of fixed finger; fixed finger deflexed, cutting margin with large, wedge-shaped, crenulated tooth occupying proximal half;

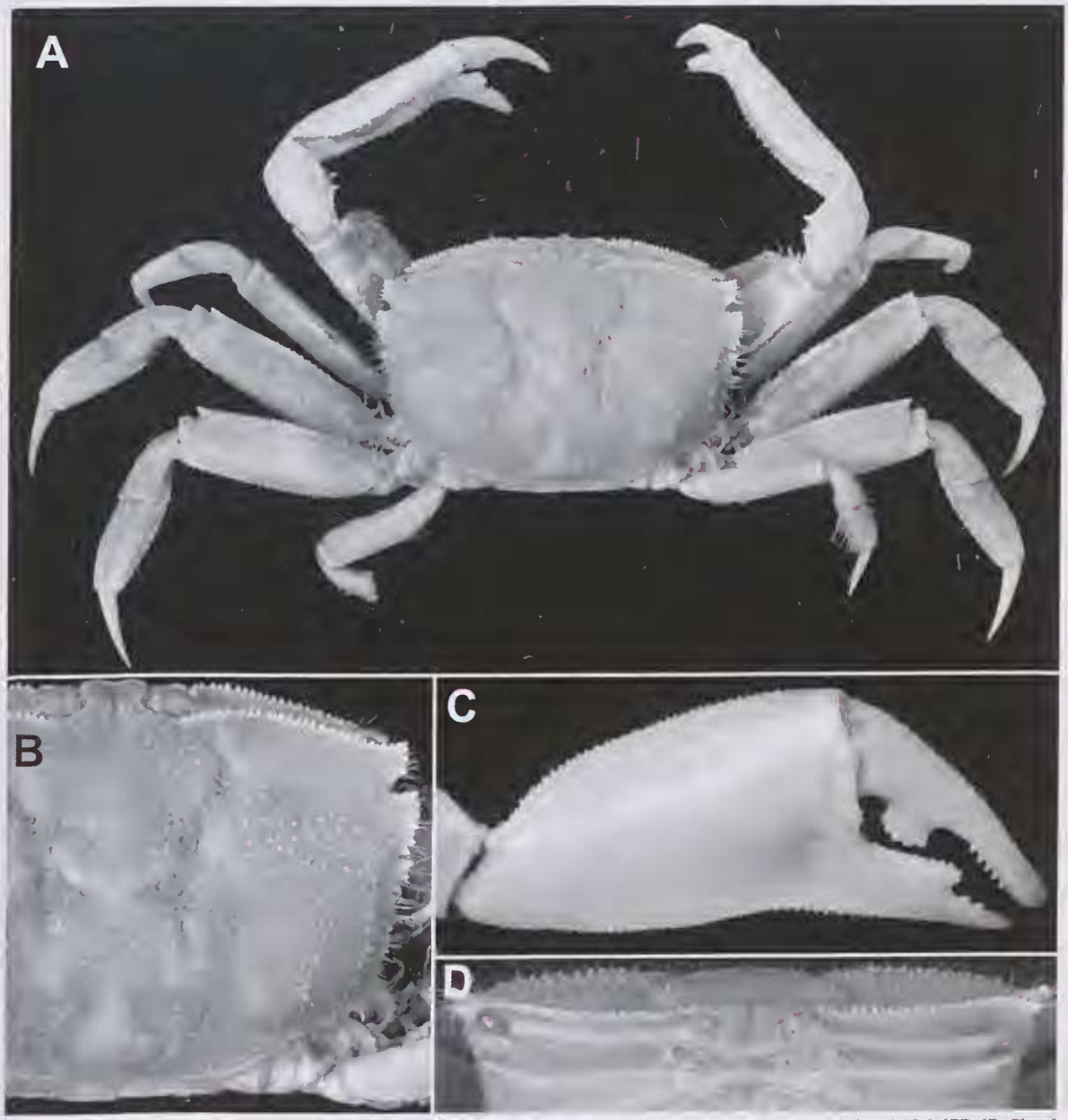


FIG. 29. *Macrophthalmus* (*M.*) *pistrosinus* Barnes & Davie, 2008. Holotype, ♂ (30.9 × 20.4 mm), WAM 655-65, Shark Bay, WA. **A**, dorsal view; **B**, enlarged view of carapace; **C**, frontal view of chela; **D**, frontal margin and orbits.

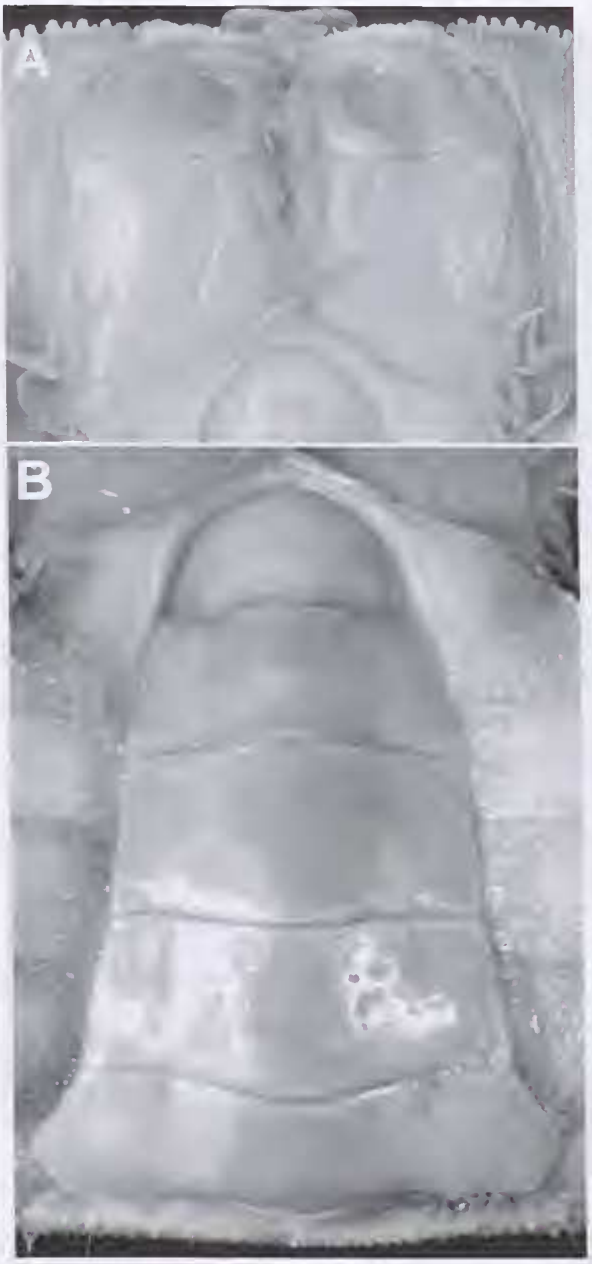


FIG. 30. *Macrophthalmus* (*Mar.*) *pistrosinus* Barnes & Davie, 2008. Holotype, ♂ (30.9 × 20.4 mm), WAM 655-65, Shark Bay, WA. **A**, third maxillipeds; **B**, male abdomen; **C**, female abdomen (WAM 651-65, Shark Bay, WA).

dactylus curved, cutting margin with large, quadrangular, crenulated tooth subproximally.

Pereiopods relatively stout; meri elongate, upper and lower margins subparallel, armed with large granules; lower surfaces granular. Male abdomen. Lateral margins of segments 4–6 almost straight; lower margins of telson and 6th segment almost straight, lower margins of 5th and 4th segments concave. Male G1 slightly curved, with marked torsion; well-developed terminal lobe.

Remarks. Specimens of *Macrophthalmus pistrosinus* were originally recorded from Australia as *M. japonicus* by Barnes (1967), to which it is morphologically similar. A similar species *M. bauzai* Wada & Sakai, 1989, has also since been described from NE Asia. Differences between all three species have been given by Barnes & Davie (2008). An account of the waving display, fighting behaviour, and courtship in *M. pistrosinus* has been given by Kitaura *et al.* (2002). *M. pistrosinus* differs behaviourally from both of the Asian species by showing burrow-plugging (Kitaura *et al.* 2002).

Habitat. In burrows in well-drained sandy and muddy sediments adjacent to both salt-marsh and mangroves.

Distribution. Only known from the type locality, Shark Bay, WA, from Carnarvon (24°9' S, 113°7' E) to Long Point (25°5' S, 113°9' E).

Macrophthalmus (Mareotis) setosus H. Milne Edwards, 1852

(Figs 31, 32)

Macrophthalmus setosus H. Milne Edwards, 1852: 159, pls. 3, 4; Haswell 1882a: 89; de Man 1888b: 356, pl 9, figs 2, 2(a); Ortmann 1897: 343; Tesch 1915: 189; Etheridge & McCulloch 1916: 12, pls 5–6; Snelling 1959: 70; McNeill 1962: 42; Poore 2004: 496, fig. 156e; Davie 2011: 243, colour picture.

Macrophthalmus (Mareotis) setosus — Barnes 1967: 216–218, pl. 2(a), fig. 5; Ng *et al.* 2008: 238; Davie 2002: 354.

Macrophthalmus pacificus — Snelling 1959: 70.

Material examined. QM-W5334, ♀ (11.0 × 7.0 mm), ♂ (12.7 × 7.8 mm), Moon Creek, Fraser I., SE Qld, 25°11′S, 153°4′E, 20.07.1975, R. Timmins. QM-W5345, 2 ♂ (13.5 × 17.8, 9.5 × 5.1 mm), south of Urangan boat harbour, Hervey Bay, 25°18′S, 152°55′E, marine, littoral, mudflat, superficial and infaunal, 23.01.1975, P. Davie & R. Timmins. QM-W5385, ♂ (20.2 × 13.0 mm), Pulgul Creek, south of Urangan, Hervey Bay, 25°19′S, 152°54′E, 19.07.1975, P. Davie. QM-W2394, 5 ovig. ♀ (30.0 × 17.8, 22.4 × 14.0, 16.4 × 10.5, 20.3 × 12.8, 20.5 × 12.7 mm), 4 ♀ (18.7 × 12.0, 21.6 × 12.9, 19.8 × 12.0, 19.5 × 12.2 mm), 4 ♂ (24.1 × 13.6, 19.6 × 11.9, 17.6 × 11.0, 23.4 × 14.1 mm), Brisbane River, SE Qld, 27°14′S, 152°30′E, May 1884. QM-W5256, 2 ovig. ♀ (23.0 × 13.4, 16.2 × 9.9 mm), ♀ (11.7 × 7.2 mm), Jacksons Ck, Cribb I., 27°23′S, 153°5′E, 12.10.1972, B. Campbell *et al.* QM-W15342, 3 ♀ (22.0 × 13.4, 21.2 × 12.4, 14.9 × 9.1 mm), 2 ovig. ♀ (20.6 × 12.6, 16.0 × 9.7 mm), 2 ♂ (21.8 × 12.7, 11.0 × 16.8 mm), Boggy Creek, Myrtletown, SE Qld, 27°24′S, 153°8′E, in burrows in mudbank near walking bridge, 12.07.1988, J. Short, J. Johnson & P. Lawless. QM-W15344, 3 ♂ (24.5 × 14.7, 17.7 × 10.7, 14.9 × 8.4 mm), 2 ovig. ♀ (19.9 × 12.1, 15.9 × 9.6 mm), Bulwer I., Brisbane River, SE Qld, 27°25′S, 153°8′E, in burrows in mud at low tide, 12.07.1988, J. Short, J. Johnson & P. Lawless. QM-W15521, ♂ (25.5 × 14.7 mm), Bulwer I., Brisbane River, SE Qld, 27°25′S, 153°8′E, estuarine, 12.07.1953, J. Short, J. Johnson & P. Lawless. QM-W23946, ♂ (22.0 × 12.3 mm), Dunwich, North Stradbroke I., SE Qld, 27°30′S, 153°08′E, estuarine, littoral, 29.07.1997, P. Davie & J. Short. QM-W4752, ♂ (15.2 × 8.7 mm), Coomera I., near Southport, SE Qld, 27°58′S, 153°25′E, 28.12.1974, Australian.Littoral Society. QM-W23888, ♂ (22.0 × 12.3 mm), Boggy Creek, Myrtletown, SE Qld, 27°74′S, 153°08′E, estuarine, littoral, 29.07.1988, P. Davie. QM-W1934, ovig. ♀ (23.9 × 14.7 mm), Port Stephens, NSW, 32°42′S, 152°6′E, 26.09.1953, I. Filmer.

Diagnosis. Carapace surface finely but distinctly granular, except for smooth central regions; regional grooves moderatly well defined; setal covering short but variable variable in extent and may completely cover carapace; two longitudinal subparallel rows on branchial region adjacent posterolateral margins. Ocular peduncles long and narrow; cornea extending to base of exorbital angle. Front deflexed, constricted between bases of ocular peduncles, with median furrow, smooth surface; anterior margin almost straight. Upper orbital border moderately curved, sloping backward; distinctly granulate; lower orbital border serrated by tubercular granules. Exorbital angle large, somewhat rectangular, outer margin convex; separated from second lateral tooth by narrow fissure; marking greatest carapace width. Second lateral tooth similar in shape but smaller; third lateral tooth small and completely hidden in thick setae; lateral margins weakly convergent. Third maxilliped with inner margin of ischium markedly concave; merus external margin with marked posteroexternal convexity. Male cheliped merus with inner and upper margins heavily setose; lower surface and upper parts of inner and outer surfaces heavily granulated. Carpus with inner surface bearing large granules; row of tubercles near articulation with palm. Inner surface of palm densely setose; weakly developed longitudinal ridge subparallel to lower margin; fixed finger moderately deflexed, cutting margin without distinctly enlarged differentiated tooth; dactylus cutting margin with large, long, crenulated tooth occupying proximal quarter. Pereiopod meri and carpi densely setose, anterior subdistal spine small. Male abdomen with lateral margins of segments 4–6 more or less straight, weakly convergent. Male G1 with marked terminal lobe.

Remarks. As mentioned by Barnes (1967), juveniles less than about 7.5 mm carapace breadth differ from adults in being proportionately narrower, and by having narrower exorbital

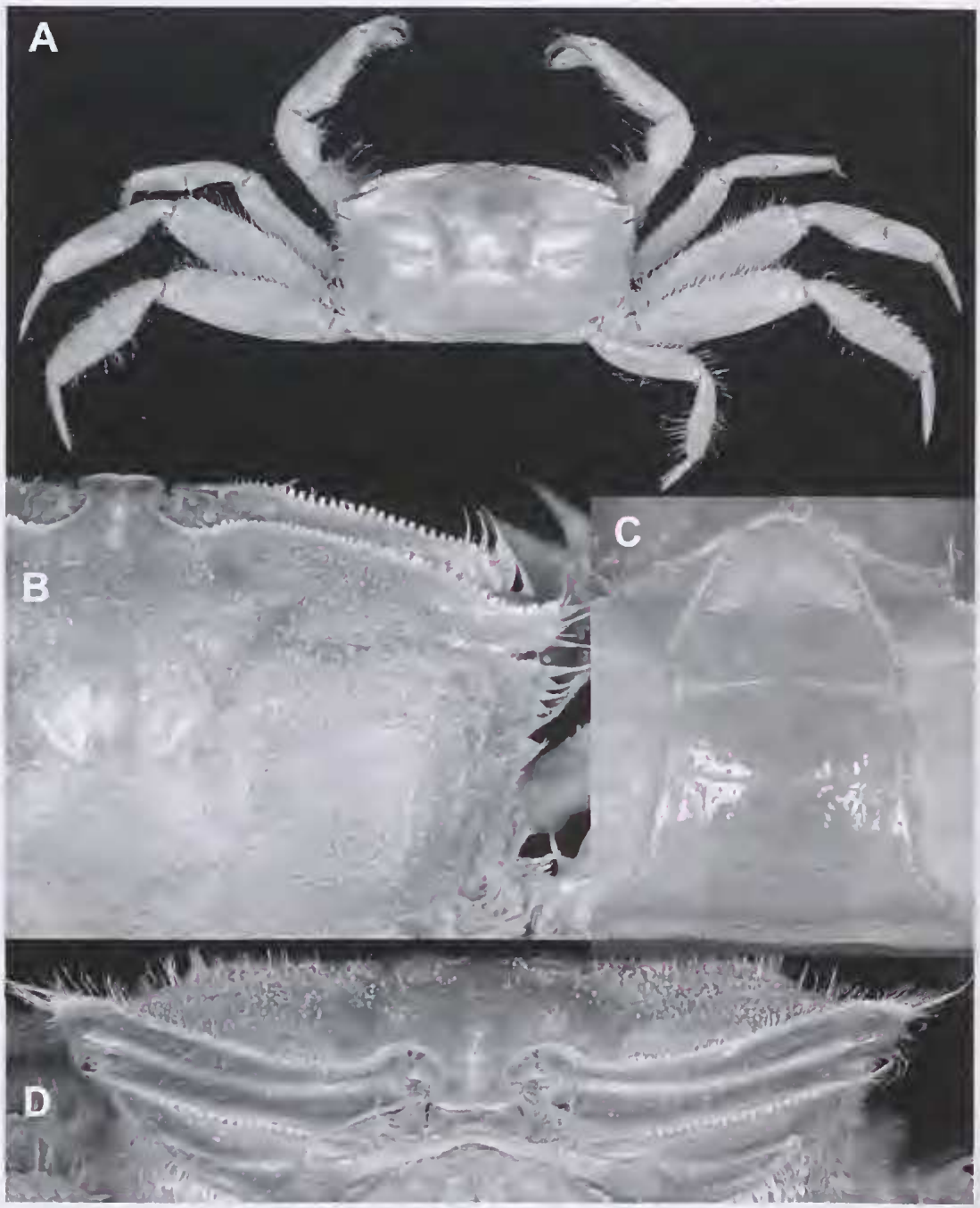


FIG. 31. *Macrophthalmus* (*Mar.*) *setosus* H. Milne Edwards, 1852. QM-W15521, ♂ (25.5 × 14.7 mm), Bulwer I., Brisbane R., SE Qld. **A**, dorsal view; **B**, enlarged view of carapace; **C**, male abdomen; **D**, frontal margin and orbits.

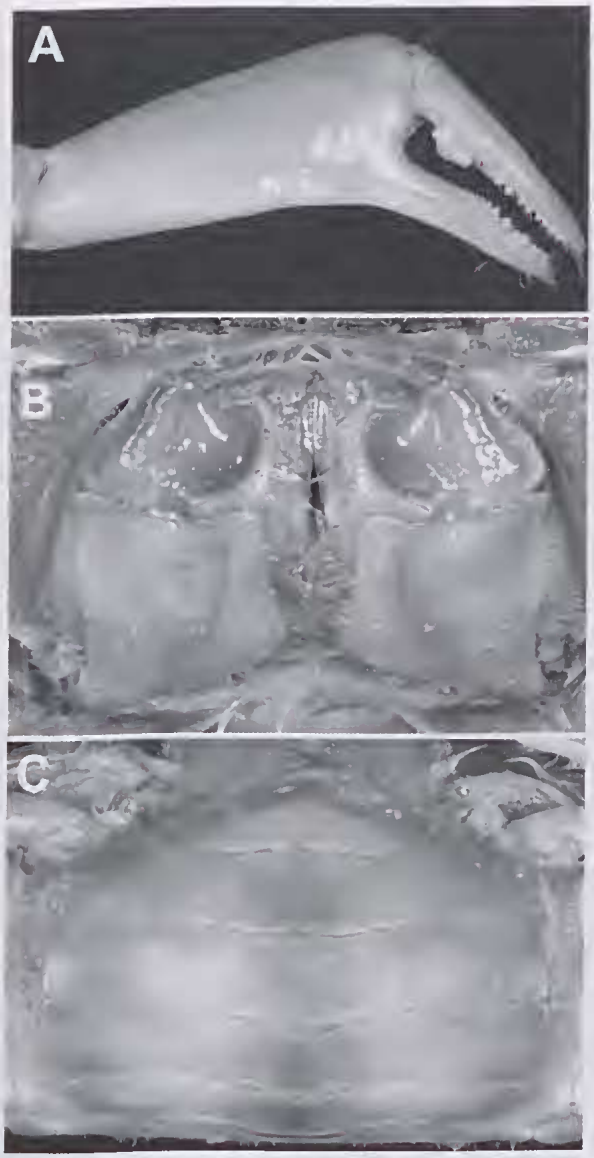


FIG. 32. *Macrophthalmus* (*Mar.*) *setosus* H. Milne Edwards, 1852. QM-W15521, ♂ (25.5 × 14.7 mm), Bulwer I., Brisbane R., SE Qld. A, male chela; B, third maxillipeds; C, female abdomen (QM-W15342, ♀ (22.0 × 13.4 mm), Boggy Ck, Myrtletown, SE Qld).

angles, such that the greatest breadth occurs between the second and third lateral teeth. It is these differences that led Snelling (1959) to misidentify juveniles from the Brisbane River as *M. pacificus*.

Habitat. Prefers mid-littoral zone. Commonly found burrowing in sandy-mud to mud substrates on intertidal flats, within exposed seagrass areas, low on river and creek banks, and sometimes alongside and amongst open mangroves.

Distribution. Type locality: Australia (as 'Nouvelle-Hollande'). Indigeneous to eastern Australia, known only from about Sydney, NSW, north to Port Curtis, Qld.

Macrophthalmus (Paramareotis) erato De Man, 1888

(Figs 33, 34)

Macrophthalmus erato De Man, 1888a: 125, pl. 8, figs 12–14; 1895: 579; Alcock 1900: 381; Rathbun 1910: 323; Tesch 1915; Kemp 1919: 390; Tweedie 1937: 163–164; Chopra & Das 1937: 424–425; Barnes 1970: 232–235; 1971: 22; Dai & Yang 1984: 479; Rahayu & Setyadi 2009: 120, 1 colour fig.

Material Examined. QM-W19191, 3 ♂ (10.4 × 7.5, 7.5 × 5.2, 7.3 × 5.5 mm), 2 ♀ (11.1 × 8.0, 8.9 × 5.9 mm), Channel I., Darwin Harbour, NT, 07.05.1993, P. Davie. NTM-CR010922, 2 ♂ (9.4 × 6.7, 6.7 × 5.0 mm), Ludmilla Creek, Darwin, NT., 03.03.1992, M. Burke.

Description. Carapace with front deflexed, narrow, no marked constriction between bases of ocular peduncles; margins smooth with a defined median groove. Upper orbital border curved; margin marked with line of small granules. Lower orbital border with ridge of six small granular on inner third followed externally by short deep concavity; outer two-thirds with smooth lobiform protuberance and horny rim, ending in swollen protuberance on extreme outer section of lower border. Central region of epistome with wide, shallow concavity. 'Woolly' setae extensively fringing lower margins of pterygostomian region and upper borders of thoracic sternites. Two clearly defined anterolateral teeth. The exorbital angle with a broad, triangular, sharply pointed tooth, directed outwards and forwards; separated from second tooth by wide U-shaped sulcus; second lateral

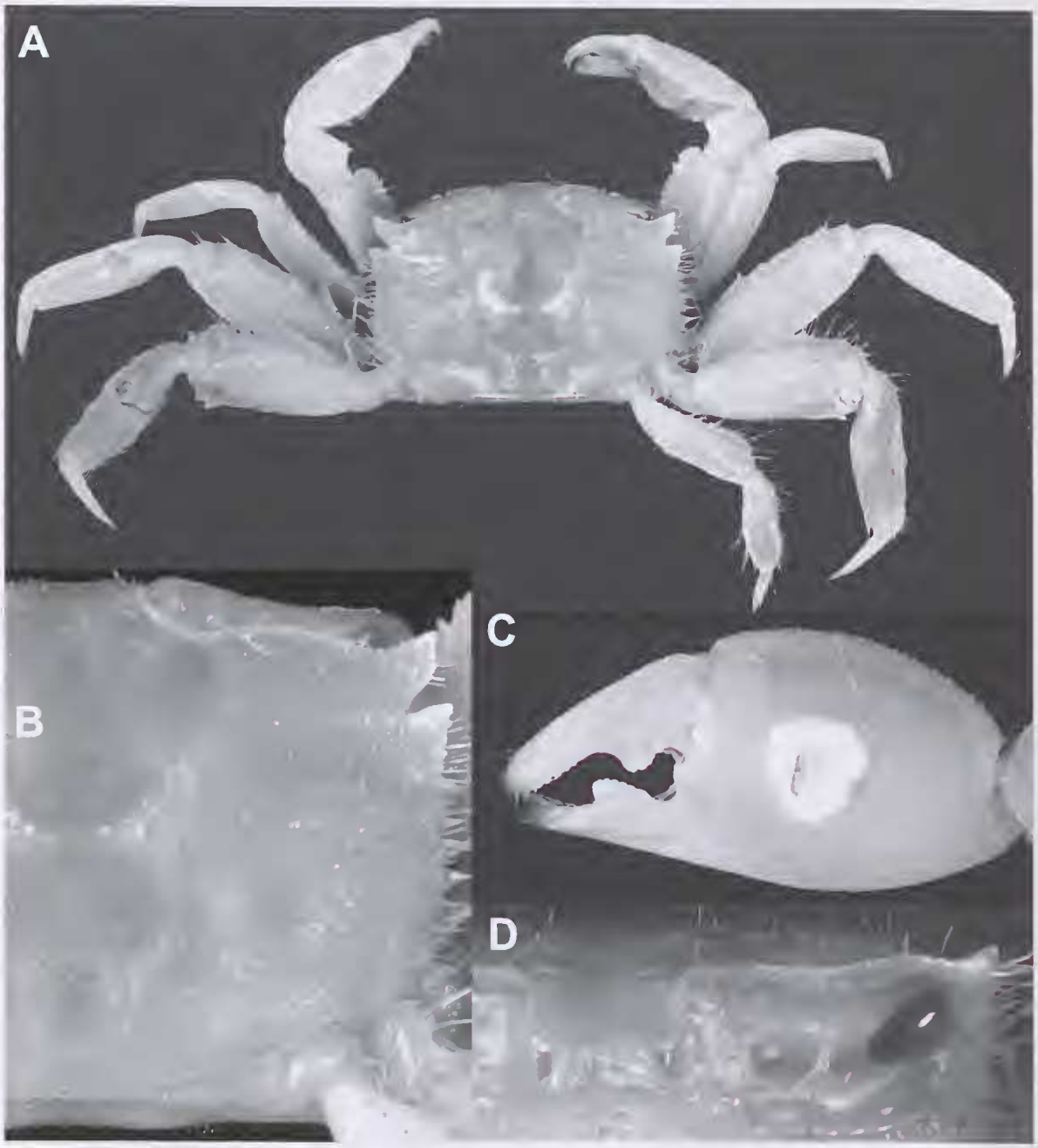


FIG. 33. *Macrophthalmus* (*P.*) *erato* De Man, 1888. QM-W19191, ♂ (10.4 × 7.5 mm), Darwin Harbour, NT. **A**, dorsal view; **B**, enlarged view of carapace; **C**, frontal view of chela; **D**, frontal margin and orbits.

FIG. 34. *Macrophthalmus* (*P.*) *erato* De Man, 1888. QM-W19191, ♂ (10.4 × 7.5 mm), ♀ (11.1 × 8.0 mm), Darwin Harbour, NT. **A**, third maxillipeds; **B**, male abdomen; **C**, female abdomen.

tooth acute, projecting further laterally; third lateral tooth absent. Lateral margin granulate marked with shallow concavity and fringe of fine setae. Surface of carapace smooth centrally, with hirsute, finely granular patches on branchial and hepatic regions. Increasing concentrations of stiff, bristle-like setae laterally and posteriorly, variably sparse elsewhere. Carapace convex laterally, posteriorly convergent. Greatest carapace breadth across second lateral teeth, posterior to which margins are granular and fringed with fine setae. Ocular peduncles short and stout, cornea not projecting beyond tip of exorbital angle. Third Maxilliped merus markedly smaller than ischium; external margin of ischium straight or nearly so; internal margin with shallow median concavity. Internal and external margins of merus convex, the external margin more markedly so.

Male Cheliped. Merus with outer surface granular with variable overlay of fine, woolly setae; inner surface smooth with only occasional sparse setae, more conspicuous in distal half; pronounced oblique horny ridge, 'musical crest', mounted on short flange, close to lower margin, together with tuft of long, stiff setae which partially obscures it; ventral surface covered with a mat of fine, woolly, setae. Carpus with outer surface finely granular; convex row of slightly raised granules present close to upper margin; inner surface partially obscured by mat of woolly setae over lower

two-thirds; upper one-third without setae except for fringe around upper border; 3 large dentiform tubercles on inner supra-marginal area. Palm with outer surface closely covered in minute granules, upper margin with bordering row of tubercles; inner surface covered in dense mat of setae in median and distal two-thirds extending into, and obscuring proximal portion of gape of chela; small patches of setae on upper inner surface below margin; lower marginal, sub-marginal and proximal third, smooth or finely granulate and without setae. Fixed finger slightly deflexed; almost straight; outer surface finely granulate with row of long, fine setae on distal portion close to cutting edge; inner surface densely setose proximally; distal two-thirds smooth with median row of long, fine setae; lower margin with row of small granules; cutting margin with large wedge shaped, crenulated tooth in centre extending backwards towards base; single raised granule close to distal end. Dactylus curved; outer surface smooth or finely granulate; upper surface more densely and coarsely granulate; cutting margin with large crenulated tooth proximal to centre with series of tooth-like granules distally; row of long, fine, brush-like setae present on lower distal margin close to cutting edge and partially covering distal half of same.

Upper surfaces of walking legs: covered with a mat of woolly setae interspersed with sparse rows of stiff, bristle-like setae on upper marginal and sub-marginal parts.

Male abdomen with abdominal somites 1-5 parallel or nearly so; sixth somite converging distally. Male G1 curved; chitinous terminal process obscured by thick brush-like setae.

Remarks. *Macrophthalmus erato* has been previously known only from South-East Asia. It is one of a group of five species which possess a horny stridulatory ridge, the so called `musical crest', on the merus of the cheliped, and an adjacent row of protuberances on the infero-orbital border. The other species in this group, *M. pectinipes*, *M. tomentosus*, *M. quadratus*, *M. boteltobago* are as yet unknown from Australia.

Habitat. Soft mud around mangroves, mid intertidal.

Distribution. Mergui, Johore, Canton (Barnes 1970), Soerabaja, E. Java (Barnes 1971), Guangdong (including Hainan Is.) Fujian (China); Indonesia, Gulf of Siam, India (Dai & Yang 1984). Within Australia currently known from Darwin Harbour, Northern Territory.

Macrophthalmus (Venitus) latreillei (Desmarest, 1822)

(Figs 35–37)

Gonoplax latreillei Desmarest, 1822: 99, pl. 9, figs 1, 4.

Macrophthalmus Latreillei — H. Milne Edwards 1837: 66; A. Milne-Edwards 1865: 193; 1873: 278, pl. 13, fig. 3.

Macrophthalmus latreillei — Ortmann 1894: 747; Laurie 1906: 427; fig. 12, pl. 2, fig. 3; Rathbun 1910: 306; Tesch 1915: 154 (key), 181; 1918: 59; Kemp 1919: 385; Tweedie 1937: 163; Sakai 1939: 626, pl. 105, fig. 2; Suvatti 1950: 154; Barnard 1955: 22; Chhapgar 1957: 51, pl. 14u–y; Kaneko 1958: 331–339; Kesling 1958: 207–263; Crosnier 1965: 131, figs 239–242; Barnes 1966: 46; Hashmi 1969: 42; Idris 1989a: 207; 1989b: 45; Davie 1992: 348 (key); Ng *et al.* 2001: 38; Poore 2004: 496, fig. 156d; Davie 2011: 242, colour picture; Ng *et al.* 2008: 238 (list); McLay *et al.* 2010: 487.

Macrophthalmus desmaresti Lucas, 1839: 567, pl. 20.

Macrophthalamus serratus — Adams & White 1848: 51; H. Milne Edwards 1852: 159; Stimpson 1858: 97; Meirs 1886: 250, pl. 20, fig. 1; Stimpson 1907: 96, pl. 13, fig. 3; Rathbun 1910: 323; Etheridge & McCulloch 1916: 11, pl. 4.

Macrophthalmus polleni Hoffmann, 1874: 19, pl. 4, figs 27–30; de Man 1879: 66; Lenz & Richters 1881: 424, figs 24–27.

Macrophthalmus laniger Ortmann, 1894: 746, pl. 23, fig. 15.

Macrophthalmus granulosus de Man, 1904: 266, pl. 10, fig 5; Ward 1941: 3.

Macrophthalmus latreillei — Rathbun 1924: 12; Hashmi 1969: 42.

Macrophthalmus (Venitus) latreillei — Barnes 1967: 232, fig. 11, pl. 3c; 1970: 236; Sakai 1976: 616, pl. 210, fig. 2; Tai & Song 1984: 79, figs 1c, 2c, 3g–h; Dai & Yang 1991: 480, fig. 245, pl. 61(2); Ng *et al.*

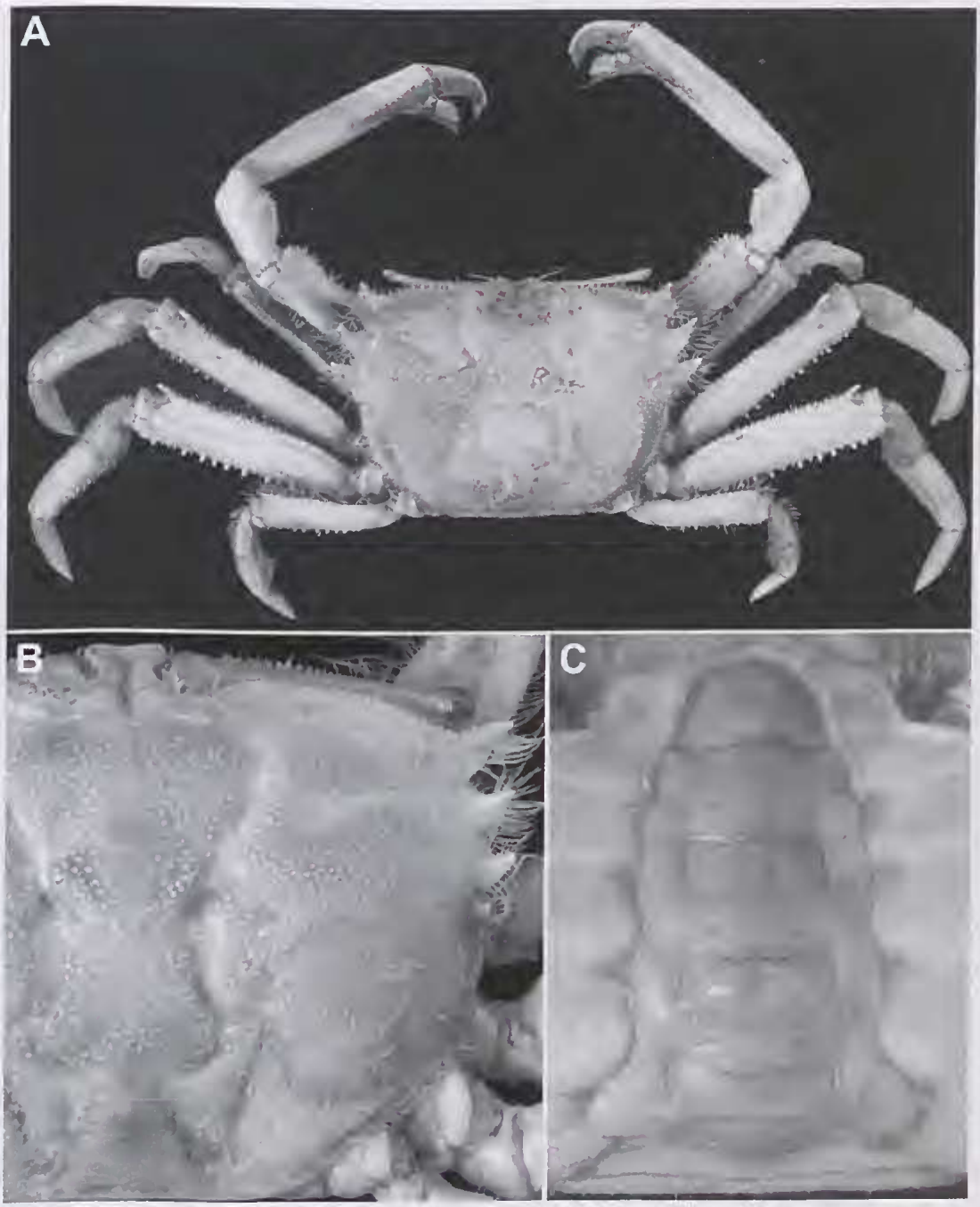


FIG. 35. *Macrophthalmus* (*V.*) *latreillei* (Desmarest, 1822). A, dorsal view; B, enlarged view of carapace; C, male abdomen. A, QM-W4030, ♂ (52.1 × 38.5 mm), Calliope River, Gladstone, SEQ; B, QM-W15234, ♂(59.9 × 43.4 mm), Gladstone, SEQ; QM-W4561, ♂ (45.3 × 34.0 mm), Trinity Inlet, Cairns, NQ.

2008: 238 (list); Rahayu & Setyadi 2009: 123, 2 colour figs.

Macrophthalmus (*Euplax*) *latreillei* — Wada 1995: 417, pl. 118, fig. 6.

Macrophthalmus (*Ventius*) *latreillei* — Ghani 2002: 633–635, fig. 1.

Material Examined. QM-W8893, ♂ (42.0 × 33.1 mm), Victoria Point, Moreton Bay, SE Qld, 27°35′S, 153°19′E, 20.06.1980, J. Moverly. QM-W5335, ♂ (27.4 × 21.0 mm), ♀ (30.9 × 22.8 mm), Bogimbah Ck, Fraser I., 25°19′S, 153°05′E, Intertidal, from burrows in creek bed, 22.07.1975, R. Timmins. QM-W5375, ♂ (42.0 × 30.5 mm), ♀ (34.3 × 25.1 mm), Mary R., South Head, Hervey Bay, 25°26′S, 152°56′E, mudbank in 50 cm burrow, 04.07.1975, P. Shanco. QM-W16409, ovig. ♀ (57.5 × 42.5 mm), Port Curtis, Curtis I., 23°38′S, 151°10′E, estuarine, mudflats, 22.11.1989, R. Morton, Queensland Fisheries Service. QM-W4033, ♂ (34.8 × 27.1 mm), Calliope R., The Loop, Gladstone, 23°55′S, 151°01′E, lower mud bank, 03.04.1974, B. Campbell. QM-W4030, ♂ (52.1 × 38.5 mm), Calliope R., near The Loop, Gladstone, 23°55′S, 151°01′E, mud bank, 03.04.1974, B. Campbell. QM-W15216, 2 ♂ (37.3 × 27.8, 10.7 × 8.3 mm), 2 ♀ (18.6 × 13.7, 15.8 × 12.1 mm), ovig. ♀ (27.4 × 20.5mm), Gladstone Queensland Electricity Commision Survey 1974–1983, 23°51′S, 151°16′E, P. Saenger. QM-W11525, 2 ♂ (40.9 × 29.5, 29.2 × 22.2 mm), The Narrows between Curtis I. & mainland, Gladstone, 23°40′S, 151°07′E, estuarine, mudflats, in burrow 20 cm beneath surface, P. Shanco, 08.04.1979, Australian Littoral Society. QM-W15234, ♂ (59.9 × 43.4 mm), The Narrows, between Curtis I. and mainland, Gladstone, 23°40′S, 151°06′E, estuarine, mudbank, 08.04.1979, P. Davie. QM-W11931, ♂ (7.0 × 5.6 mm), Triangular I., Shoalwater Bay, 22°23′S, 150°31′E, M.R.L survey, Sep 1981. QM-W11930, ♂ (7.5 × 6.3 mm), Triangular I., Shoalwater Bay, 22°23′S, 150°31′E, M.R.L Survey, Nov. 1982. QM-W4762, ♂ (41.2 × 29.5 mm), Corio Bay, Nth of Yeppoon, NQ, 22°56′S, 150°46′E, 06.07.1974, P. Shanco. QM-W8179, 2 ♀ (14.8 × 11.6, 19.7 × 14.7 mm), 2 ♂ (11.7 × 8.9, 15.8 × 12.0 mm), Murray R., NQ, 18°01′S, 145°53′E, marine, littoral, sandy shore, 19.05.1978, P. Davie. QM-W8600, ♀ (43.8 × 33.1 mm), ♂ (21.8 × 16.7 mm), Murray R., north of Cardwell, 18°01′S, 145°53′E, estuarine, littoral open mud flat, 21.05.1978, R. Timmins. QM-W2399, 2 ♂ (34.0 × 25.3, 36.1 × 27.3 mm), Mackay, ME Qld, 21°9′S, 149°11′E, 1924. QM-W4561, ♂ (45.3 × 34.0 mm), Trinity Inlet, Cairns, NE Qld, 16°58′S, 145°47′E, 10.12.1974, R. Timmins. QM-W3998, ♂ (41.2 × 30.7 mm), Cairns, NQ, 16°55′S, 145°46′E, burrowing in mud on mudflats, 10.02.1966, L. Curlis. QM-W4560, 3 ♂ (32.9 × 25.2, 31.2 × 23.6, 31.5 × 24.1 mm), Trinity Inlet, Cairns, NQ, 11.12.1974, R. Timmins. QM-W6431, 3 ♂ (44.5 × 34.1, 44.0 × 32.4, 44.7 × 33.4 mm), Barron R., Cairns, NQ, 16°52′S, 145°42′E, 16.12.1975, R. Timmins. QM-W6434, 2 ♂ (34.4 × 25.3, 27.0 × 20.2 mm), Barron R., Cairns, 16°52′S, 145°42′E, 16.12.1975, R. Timmins. QM-W16764, ♀ (18.5 × 13.3 mm), Muddy Bay, NQ, 10°44′S, 142°33′E, estuarine, 26.10.1998, P. Davie & J. Short.

Diagnosis. Carapace surface markedly granular, granules large and rounded; front deflexed, markedly constricted between bases of ocular peduncles, small granules on margins, distally bilobed, median furrow deep; lateral margins subparallel or slightly convex, 3 prominent anterolateral teeth and sometimes fourth smaller tooth. Ocular peduncles long and narrow, cornea extending to base of exorbital angle. Central region of epistome straight. Merus of third maxilliped smaller than ischium. Palm of male cheliped stout, outer face smooth, inner face with dense setae in upper and distal portions, heavily granular in lower and proximal portions; index finger not deflexed, cutting edge without differentiated tooth except in large individuals; cutting edge of dactylus proximally with a large, quadrangular, and crenulated tooth, and a few widely spaced cylindrical granules distally. Meri of ambulatory legs heavily granular and with variable setae.

Remarks. The largest species of *Macrophthalmus* found in Australia. Barnes (1967) has discussed the variability of this species, and earlier records and proable misidentifications. Allometric growth changes are marked for this species, with juveniles relatively more quadrate; similarly the anterolateral teeth are small and poorly defined in smaller crabs (Fig. 37a), and become progressively more prominent, such that the second and third teeth in particular become spinous and more laterally projecting (Fig. 37c).

Habitat. Burrows on open mudflats in very soft mud. In Queensland, at least, it is commonly found as a sub-fossil (1000–5000 years-old) during channel dredging of estuarine and inshore environments (Davie 2011). Literature

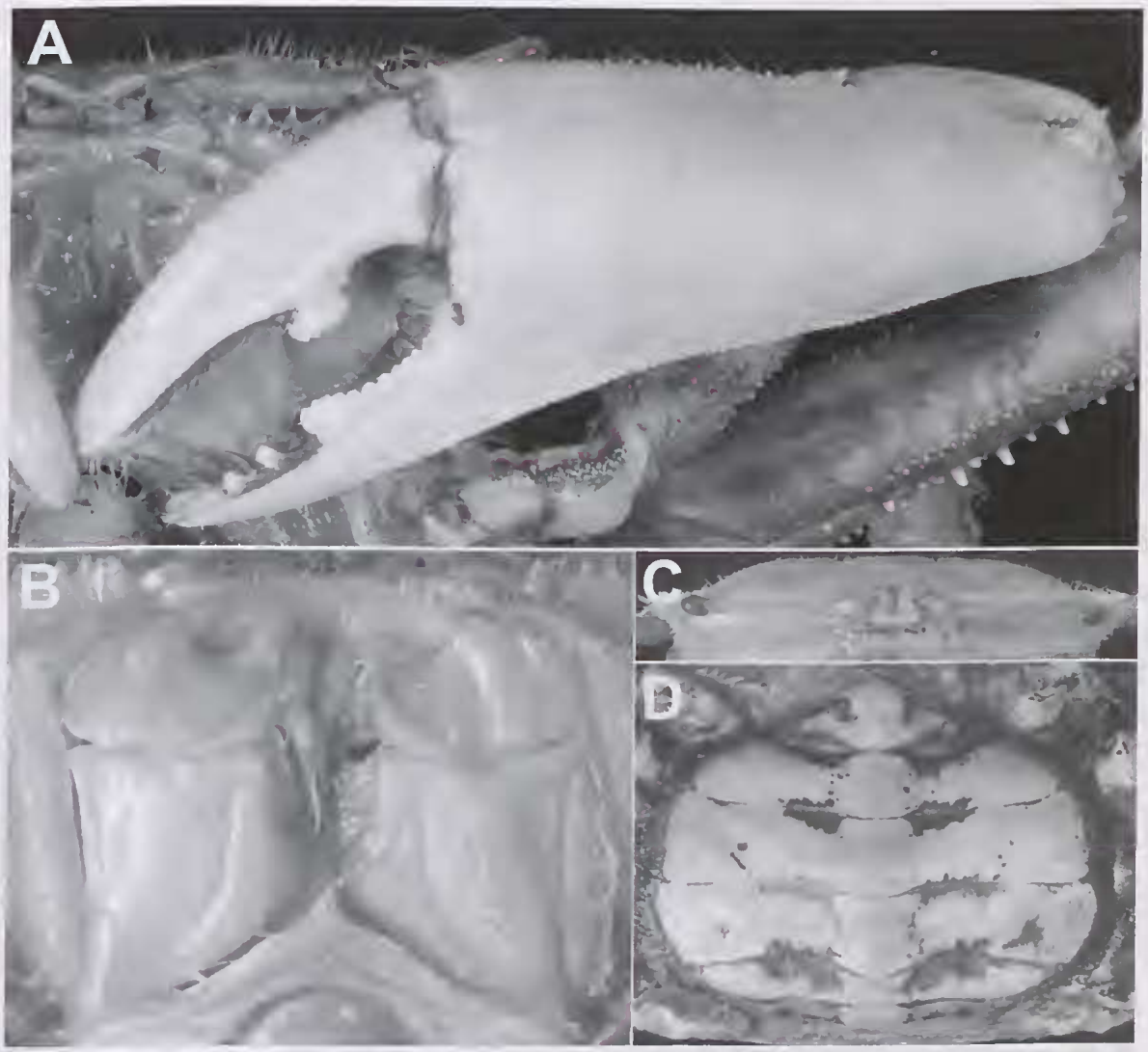


FIG. 36. *Macrophthalmus* (*V.*) *latreillei* (Desmarest, 1822). **A**, male chela; **B**, third maxillipeds; **C**, frontal margin and orbits; **D**, female abdomen. A, QM-W4030, ♂ (52.1 × 38.5 mm), Calliope River, Gladstone, SEQ; B, C, QM-W4561, ♂ (45.3 × 34.0 mm), Trinity Inlet, Cairns, NQ; D, QM-W8600, ♀ (43.8 × 33.1 mm), Murray R., NQ.

records to 20 m depth, but this seems unlikely as it is an animal of the low intertidal zone. Subtidal records presumably refer to trawls or dredges over intertidal flats taken at high tide.

Distribution. Broadly distributed in the Indo-west Pacific Oceans from South Africa to Japan, Philippines and New Caledonia. In Australia it has been previously noted from Fremantle, WA. (Barnes 1967), Broome (Rathbun 1924; Barnes 1967), Darwin (McLay *et al.* 2010), and is here recorded from the tip of Cape York to Moreton Bay on the eastern coast. Although it reaches Moreton Bay, it is rare there, and this could be considered its southern limit.

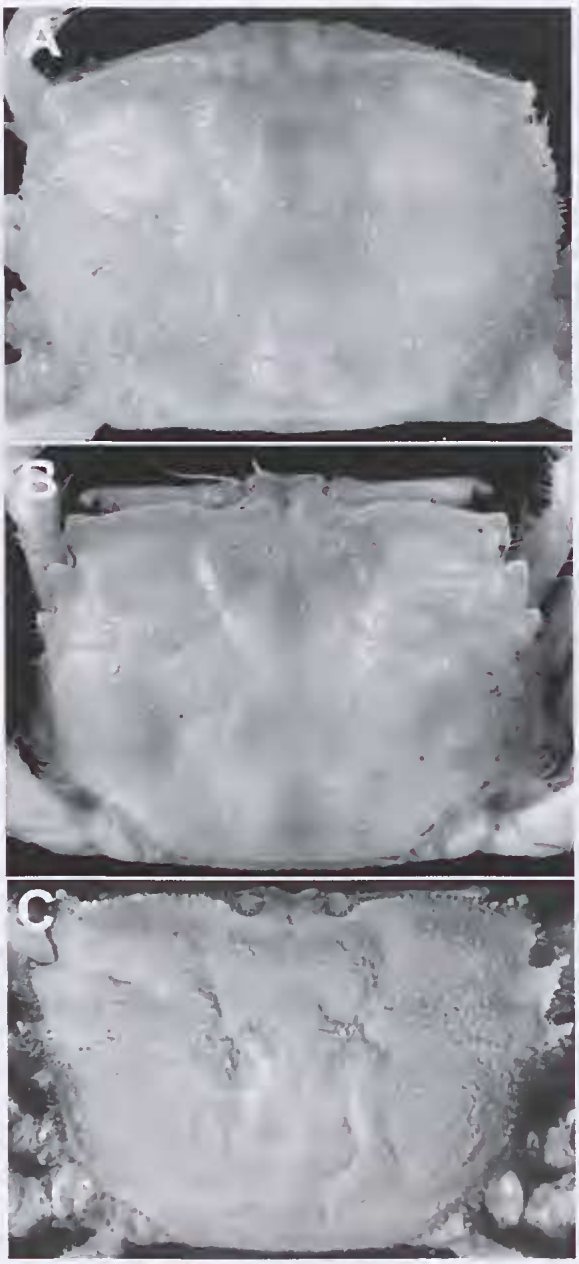


FIG. 37. *Macrophthalmus* (*V.*) *latreillei* (Desmarest, 1822). Allometric change in carapace proportions with growth. **A**, QM-W11931, ♂ (7.0 × 5.6 mm), Triangular I., Shoalwater Bay; **B**, QM-W8179, ♂ (15.8 × 12.0 mm), Murray R., N Qld; **C**, QM-W4561, ♂ (45.3 × 34.0 mm), Trinity Inlet, Cairns, N. Qld.

Chaenostoma Stimpson, 1858

Macrophthalmus (*Chaenostoma*) Stimpson, 1858: 97; Davie 2002: 351; Ng *et al.* 2008: 237 (list). Type species: *Chaenostoma orientale* Stimpson, 1858, (= *Macrophthalmus boscii* Audouin, 1826) by monotypy; gender neuter.

Macrophthalmus (*Mopsocarcinus*) Barnes, 1967: 203; Komai *et al.* 1995: 136. Type species: *Macrophthalmus boscii* Audouin, 1825 by original designation; gender masculine.

Chaenostoma — Davie 2009: 817; McLay 2010: 495.

Diagnosis. Small, carapace breadth <15 mm; not markedly broadened, c. 1.1–1.4 times wider than long; ocular peduncles short and stout, not projecting beyond lateral carapace margins, subequal in length to breadth of front or shorter; front broad, not constricted between bases of ocular peduncles, where its breadth is 0.2-0.30 times distance between exorbital angles; ischium of third maxilliped c. 1.25 times length of merus; carapace breadth < 1.3 times length, lateral margins parallel, broad-based subrectangular anterolateral teeth, without conspicuous rows or clumps of granules on branchial regions; central region of posterior border of epistome straight (*C. boscii*, *C. lisae*) or distinctly convex (*C. punctulatus*); males without stridulatory apparatus; fingers of male chela short with index straight or slightly deflexed, dentition variable, without an enlarged tooth differentiated on either finger (*C. lisae*), a tooth only on dactylus (*C. boscii*), or a tooth on both fingers (*C. punctulatus*). Intertidal. (Modified after Barnes, 2010: 37).

Remarks. Davie (2009) and McLay *et al.* (2010) have indicated that *Chaenostoma* Stimpson, 1858, should be elevated to a distinct genus in its own right, and this is formally followed here. As discussed earlier, Barnes (1967) erected *Macrophthalmus* (*Mopsocarcinus*) (type species *Macrophthalmus boscii* Audouin, 1826), unaware that there was an earlier name, *Chaenostoma* Stimpson, 1858 (type species *C. orientale* Stimpson, 1858). Since *Chaenostoma orientale* Stimpson, 1858, is now regarded as a junior synonym of *Macrophthalmus boscii*

Audouin, 1826, the name *Chaenostoma* Stimpson, 1858, must have priority as the subgeneric name (see Stimpson 1858; Ng *et al.* 2008).

Chaenostoma contains three species: *C. boscii* (Audouin, 1826), *C. punctulatus* Miers, 1884, and *C. lisae* Poupin & Bouchard, 2010.

Barnes (2010) commented that the central region of the epistome is straight for *Chaenostoma*, however this is not true for *C. punctulatus* which has a distinct convexity (see 'Remarks' under that species for further elaboration). He also commented 'but unusually for *Macrophthalmus*, mainly associated with rocky or stony habitats'. While this is true for *C. boscii* it is not true for the other two species: *C. punctulatus* is found burrowing into firm mud or muddy-sand on the upper shore; and similarly *C. lisae* digs burrows on sandy mudflats 'on the upper part of the intertidal area' (Poupin & Bouchard 2010: 65).

Chaenostoma boscii (Audouin, 1826)
(Figs 38, 39)

Macrophthalmus boscii Audouin, 1826: 77-98, pl. 2. fig. 1; Krauss 1843: 40, pl. 2, fig. 5; Lenz & Richters 1881: 425; Nobili 1906: 319; Kemp 1919: 383, pl. 24, fig. 6; Balss 1935: 141; Barnard 1950: 103, fig. 20f-i; Barnard 1950: 10, fig. 20; Fourmanoir 1954: 3, fig. 3; Holthuis 1958: 53; Crosnier 1965: 134, figs. 244-248; Barnes 1966b: 371; 1977: 277 (key), 279 (list); Sakai 1976, 1-773, 1-16, pls. 251; Seréne & Vadon 1981: 125; Takeda 1982: 211; Yang 1991: 479-480, fig. 244; Jeng 1997; Ng *et al.* 2001: 38; Sakai *et al.* 2004: 1224, 6 figs.

Euplax (*Chaenostoma*) *boscii* — A. Milne-Edwards 1852: 160; 1873: 281; de Man 1880d: 71; 1888b: 357; Miers 1884: 540; 1886: 252; Ortmann 1894b: 58; Lenz 1905: 367; Nobili 1906: 319; Stebbing 1910: 329; Tesch 1918, 60; Sakai 1939: 630, fig. 100.

Cleistomostoma boscii — Dana 1852: 313, pl. 19, fig. 3; 1855: pl. 19, figs. 3a-d.

Chaenostoma orientale Stimpson, 1858: 97; 1907: 98.

Chaenostoma crassimanus Stimpson, 1858: 97; 1907: 98.

Euplax Boscii — H. Milne Edwards 1852: 160; de Man 1888b: 357; Ortmann 1894b: 58; Lenz 1905: 367; Stebbing 1910: 329.

Euplax boscii — Tesch 1918: 60; Sakai 1939: 630, fig. 100; 1955: 111; Lin 1949: 27.

Euplax (*Chaenostoma*) *boscii* — A. Milne-Edwards 1873: 281; Miers 1884: 542; Miers 1886: 252; Nobili 1906: 319.

Macrophthalmus franchettii Maccagno, 1936: 177.

Macrophthalmus (*Euplax*) *bosci* (sic) — Guinot 1967: 282.

Macrophthalmus franchettii — Guinot 1967: 283 (list); Froglia 1978: 222, fig. 1 (synonomized with M. boscii).

Macrophthalmus (*Mopsocarcinus*) *boscii* — Barnes 1967: 227, pl. 3, fig. 9; 1971: 30; Lundoer 1974: 9 (list); Hartnoll 1975, 309 (list); Sakai 1976: 615 pl. 211, figs 9E-F, 10B; Lewinsohn 1977: 76; Chen 1980: 136, fig. 19; Takeda 1981: 74; Miyake 1983: 168, pl. 56, fig. 2; Dai *et al.* 1986: 437, pl. 61(1), fig. 244; Dai & Yang 1991: 479, fig. 244, pl. 61(1); Huang *et al.* 1992, 149, fig. plate 1H; Komai *et al.* 1995: 136, fig.1; Kitaura & Wada 2005: 71-73.

Macrophthalmus (*Mopsocarcinus*) *bosci* — Barnes 1970: 242.

Macrophthalmus (*Mopsocarcinus*) *franchettii* — Barnes 1967: 203 (list).

Macrophthalmus quadratus — McNeill 1968: 84, pl. 2, figs 2-4. [not *M. quadratus* A. Milne-Edwards, 1873].

Macrophthalmus (*Mareotis*) *quadratus* — Takeda & Nunomura 1977: 82. [not *M. quadratus* A. Milne-Edwards 1873].

Macrophthalmus (*Chaenostoma*) *boscii* — Davie 2002: 351; Ng *et al.* 2008: 237, 238 (list), 239 fig. 183 (photo of *M.* aff. *boscii*). Barnes 2010: 36, 37; Poupin & Bouchard 2010: 65.

Material examined. QM-W3995, ♂ (11.1 × 9.8 mm), North of Rocky Point, North of Mossman, 16°23'S, 145°25'E, in sand, 01.05.1966, L. Curlis. QM-W22637, ♂ (7.6 × 5.5 mm), Coringa-Herald Nature Reserve, Coral Sea, NE Qld, 16°56'S, 149°11'E, marine, reef, beach rock, on algal turf, RGSQ Herald Cay Expedition, 23.06.1997, P. Davie. QM-W1101, ♂ (11.2 × 9.8 mm), ♀ (9.7 × 6.5 mm), Orpheus I., 18°40'S, 146°30'E, in sand, 26.11.1987, P. Davie. QM-W14543, 2 ♀ (10.0 × 8.8, 10.0 × 8.7 mm), 4 ♂ (9.8 × 6.6, 8.7 × 6.5, 9.8 × 7.6, 9.8 × 7.6 mm), Coconut Beach, west side of Lindeman I.; intertidal, 20°27'S, 149°2'E, marine, fringing reef, under rocks and dead coral, 26.03.1987, P. Davie & J. Short. QM-W14496, ♂ (7.6 × 4.4 mm), entrance to a small creek, west side of Lindeman I., 20°27'S, 149°2'E, estuarine, littoral, mud bank, under rocks, 23.03.1987, P. Davie & J. Short. QM-W14542 ♂ (9.9 × 7.6 mm), 2 ♀ (9.9 × 8.7, ovig, 8.7 × 6. 6 mm), Lindeman I., 20°27'S, 149°2'E, estuarine, littoral, mud bank, under rocks; burrow in mud, 23.03.1987, P. Davie & J. Short. QM-W14484, ♂ (9.9 × 8.7 mm),

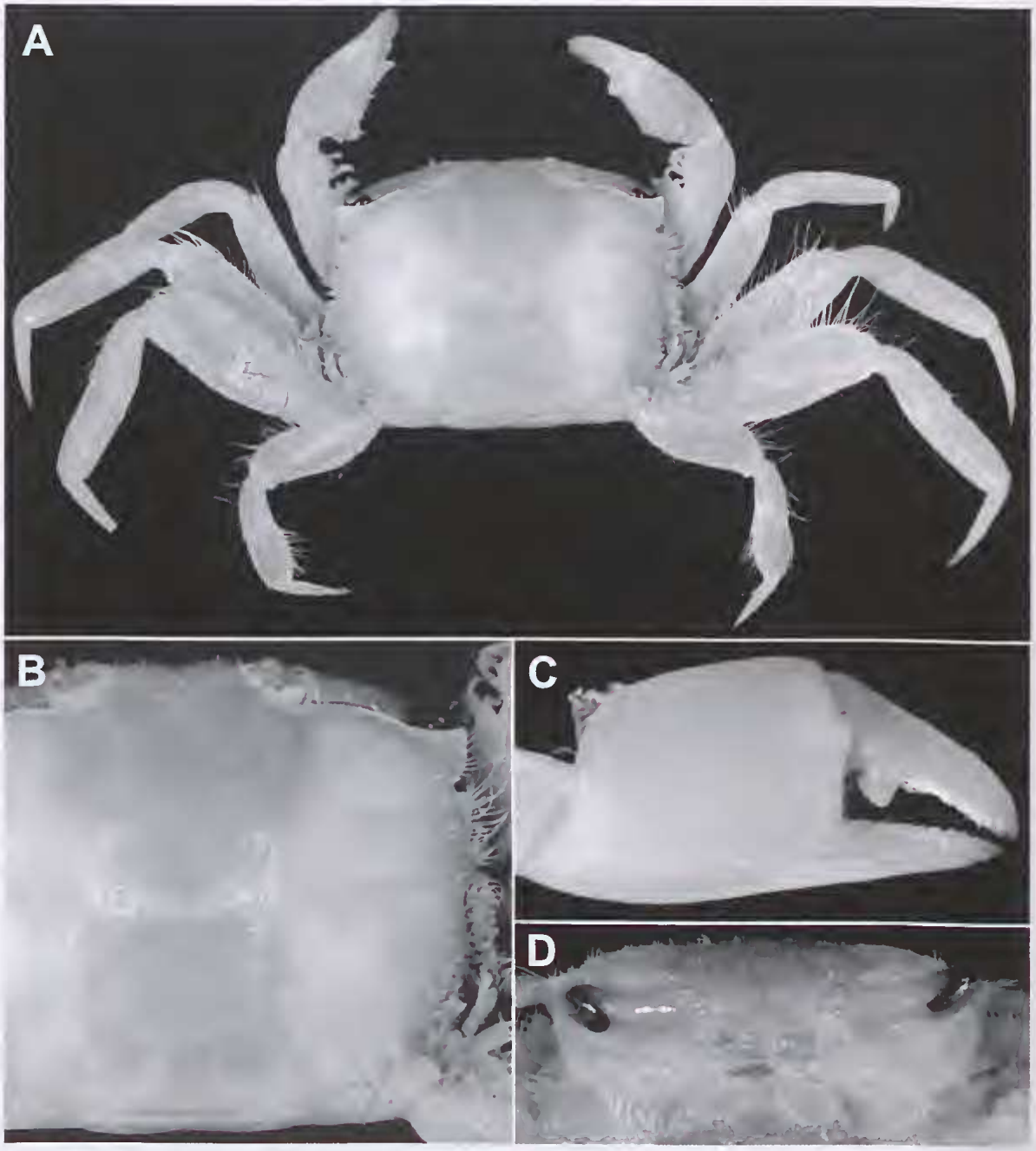


FIG. 38. *Chaenostoma boscii* Audouin, 1826. QM-W14484, ♂ (9.9 × 8.7 mm), Seaforth I., ME Qld. **A**, dorsal view; **B**, enlarged view of carapace; **C**, frontal view of chela; **D**, frontal margin and orbits.

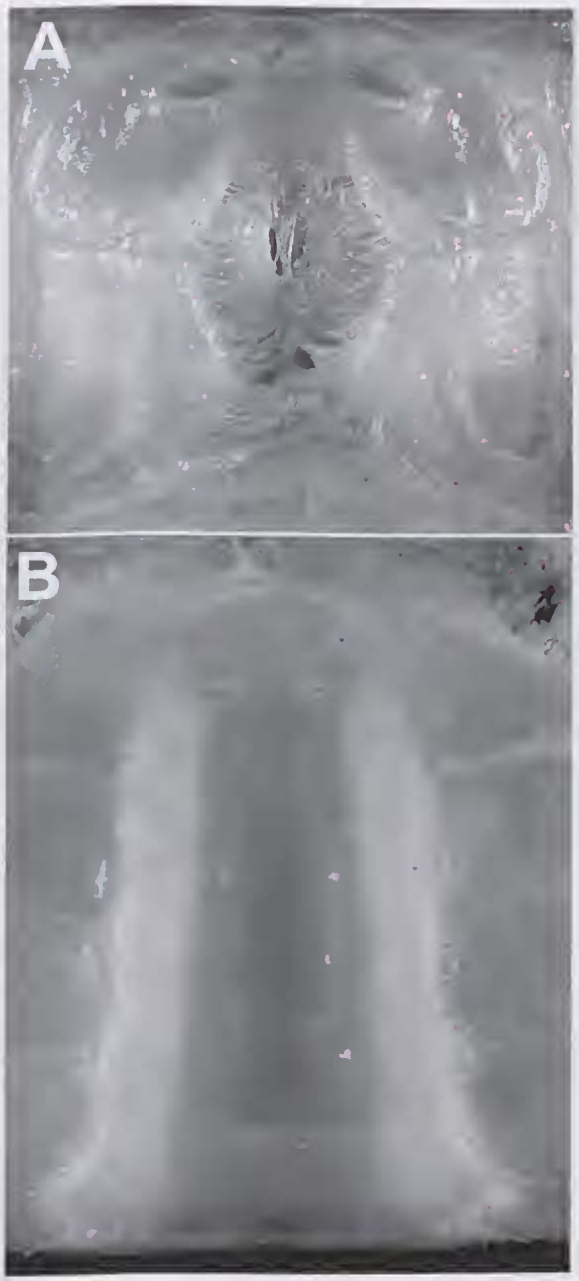


FIG. 39. *Chaenostoma boscii* Audouin, 1826. **A**, third maxillipeds; **B**, male abdomen; **C**, female abdomen. A, B: QM-W14484, ♂ (9.9 × 8.7 mm), Seaforth I., ME Qld; C, QM-W14543, ♀ (10.0 × 8.8 mm), Lindeman I., ME Qld.

Seaforth I., 20°28′S, 149°2′E, marine, fringing reef, under rocks and dead coral, 24.03.1987, P. Davie & J. Short. QM-W21538, ♂ (5.5 × 3.3 mm), Kings Headland, Caloundra, 26°48′S, 153°9′E, rocky shore, under rocks, 27.09.1996, P. Davie.

Diagnosis. Carapace covered by small evenly spaced granules, few scattered setae on branchial regions; 3 anterolateral teeth, two large, third indistinct; greatest breadth between exorbital teeth; front deflexed, slightly constricted between bases of ocular peduncles, with smooth margins, clearly bilobed distally, median furrow deep; postero-lateral longitudinal rows, absent, branchial transverse rows, absent but two indistinct small longitudinal rows of granules with setae present. Eyestalks stout not projecting beyond exorbital angle. Upper orbital border: sinuous, bordered by small tubercular granules. Lower orbital margin studded with wide tubercular granules along entire length. Central region of epistome straight. Third maxilliped, merus subequal to ischium. Male cheliped with palm inflated, outer face appearing smooth, with longitudinal, feebly granular, ridge on lower third, inner face with dense setae, covering scattered granules; immovable finger slightly deflexed, cutting edge without a larger tooth, granulate from base to beginning of spooned tip; cutting edge

of dactylus with large quadrangular tooth in distal third, distally denticulate. Merus lacking horny ridge on inner margin; inner, outer and upper surfaces with longitudinal rows of large tubercular granules; dense setae concealing most or all of surface. Upper margins of meri of ambulatory legs with long setae.

Remarks. *Chaenostoma boscii* was most likely originally described from the Red Sea. Its identity has been considered relatively unproblematic, though the recent discovery of a sister species, *C. lisae* Poupin & Bouchard, 2010, from Mayotte Island in the western Indian Ocean, and the possibility of other new cryptic species being described from the western Pacific, indicates a neotype designation will be important as part of future revisionary work. Barnes (1967: 227) gave a redescription of Australian specimens. McNeill (1968) recorded *Macrophthalmus quadratus* A. Milne-Edwards, 1873, from Low Isles and Three Isles, in north Queensland, and noted that it was common on intertidal sandy reef flats of a number of islands along the tropical Queensland coast. Barnes (1970: 242) examined McNeill's material of *M. quadratus*, lodged in the Natural History Museum, and reidentified it as *M. boscii*, Indeed, McNeill's figures (1968: pl. 2, figs 2–4) clearly agree with the present material of *C. boscii*.

Habitat. Typically, short shallow burrows in well drained sandy and slightly muddy substrates on lower tidal levels of coastal marine habitats. Commonly burrows in algal turf on rocky shores, and on beach rock on coral cays. Litulo (2005) gave an interesting account of the life history of this species based on his study area in southern Mozambique.

Distribution. Broad Indo-west Pacific range: east Africa to Japan, and south to Solomon Islands, Santa Cruz Islands, New Caledonia and Fiji. In Australia: known to extend along the eastern coast, and on the Great Barrier Reef, southward from Cooktown to Caloundra, Moreton Bay (Barnes 1967; present study); and from Monte Bello I., WA (Barnes 1970).

Chaenostoma punctulatus Miers, 1884
(Figs 40, 41)

Macrophthalmus (*Chaenostoma*) *punctulatus* Miers, 1884: 237, pl. 25 fig. a; Tesch 1915: 187; Snelling 1959: 70; Davie 2002: 352; Ng *et al.* 2008: 237 (list); Morgan & Jones 1991: 494; Poore 2004: 496, fig. 156b; Davie 2011: 242, colour picture.

Macrophthalmus (*Mopsocarcinus*) *punctulatus* — Barnes 1967: 229, pl. 3(b), fig. 10.

Material Examined. QM-W5166, ♂ (8.8 × 6.4 mm), QM-W5174, ♂ (9.6 × 7.1 mm), QM-W5280, QM-W5285, ♂ (9.9 × 6.8 mm), Serpentine Ck, SE Qld, 27°24'S, 153°7'E, B. Campbell *et al.*, Aug.–Sept. 1972. QM-W5246, QM-W5271, 2 ♀ (5.5 × 4.2, 4.8 × 3.6 mm), ♂ (5.8 × 4.6 mm), Jacksons Ck, SE Qld, 27°23'S, 153°5'E, B. Campbell *et al.*, Sept.–Oct. 1972. QM-W5295, ♂ (6.9 × 5.0 mm), Juno Pt., mouth of Serpentine Ck, SE Qld, 27°24'S, 153°7'E, B. Campbell *et al.*, 13.12.1972. QM-W15551, 2 ♀ (6.3 × 5.5, 5.1 × 3.9 mm), ♂ (6.3 × 5.0 mm), QM-W15569, 3 ♂ (6.5 × 4.6, 6.3 × 4.3, 5.8 × 4.3 mm), 2 ♀ (6.4 × 4.5, 4.5 × 3.2 mm), Bulwer I., near boat ramp, Brisbane R. mth, SE Qld, 27°25'S, 153°8'5" E, J.W. Short, J. Johnson, P. Lawless, 12.07.1988. QM-W15571, Fishermen Is., Brisbane R. Mouth, SE Qld, 27°22' 5"S, 153°10'E, J.W. Short, J. Johnson, P. Lawless, 12.07.1988. QM-W15528, ♂ (10.7 × 8.0 mm), QM-W15550, 3 ♂ (10.8 × 8.0, 10.5 × 7.8, 9.5 × 7.0 mm), 2 ovig. ♀ (10.5 × 7.7, 8.2 × 6.3 mm), ♀ (8.6 × 6.2 mm), Boggy Ck., nr walk bridge to BP refinery, Myrtletown, SE Qld, 27°24' 5"S, 153°8'E, J.W. Short, J. Johnson, P. Lawless, 12.07.1988. QM-W23894, 2 ♂ (11.2 × 8.3, 9.5 × 7.1 mm), Boggy Ck, Myrtletown, SE Qld, 27°24'S, 153°8'E, P. Davie, J.W. Short, 29.07.1997. QM-W24035, 2 ♂ (9.8 × 7.3, 7.6 × 5.5 mm), Fisherman I., nr mth of Brisbane R, Moreton Bay, SE Qld, 27°22'S, 153°10'E, P. Davie, 02.06.1998, sandy mud, upper shore. QM-W5300, 4 specs, Moon Ck., Fraser I., SE Qld, 25°11'S, 153°4'E, P. Davie, R. Timmins, 21.07.1975. QM-W5304, ♂ (5.0 × 3.3 mm), Pulgul Ck., Hervey Bay, SE Qld, 25°19'S, 152°54'E, P. Davie, R. Timmins, 23.07.1975. QM-W5307, 2 ♀ (7.7 × 5.1, 5.8 × 4.2 mm), QM-W5329, ♀ (6.6 × 4.8 mm), Mary R., Nth Head, Hervey Bay, SE Qld, 25°26'S, 152°56'E, P. Davie, R. Timmins, 25.07.1975. QM-W5366, ♂ (7.9 × 5.7mm), Moon Ck., Fraser I., SE Qld, 25°11'S, 153°4'E, R. Timmins, 21.07.1975. QM-W5369, ♂ (6.6 × 5.1 mm), ovig. ♀ (7.9 × 6.6 mm), Pulgul Ck. mth, S. of Urangan, Hervey Bay, SE Qld, 25°19'S, 152°54'E, P. Davie, 25.07.1975. QM-W5384, QM-W5386, 6 ♂ (7.9 × 5.8, 7.5 × 5.8, 7.2 × 5.6, 6.6 × 5.6, 6.0 × 4.0, 7.4 × 5.6 mm), QM-W6400, 13 specs, mouth of Pulgul Ck., S. of Urangan, Hervey Bay, SE Qld, 25°19'S, 152°54'E,

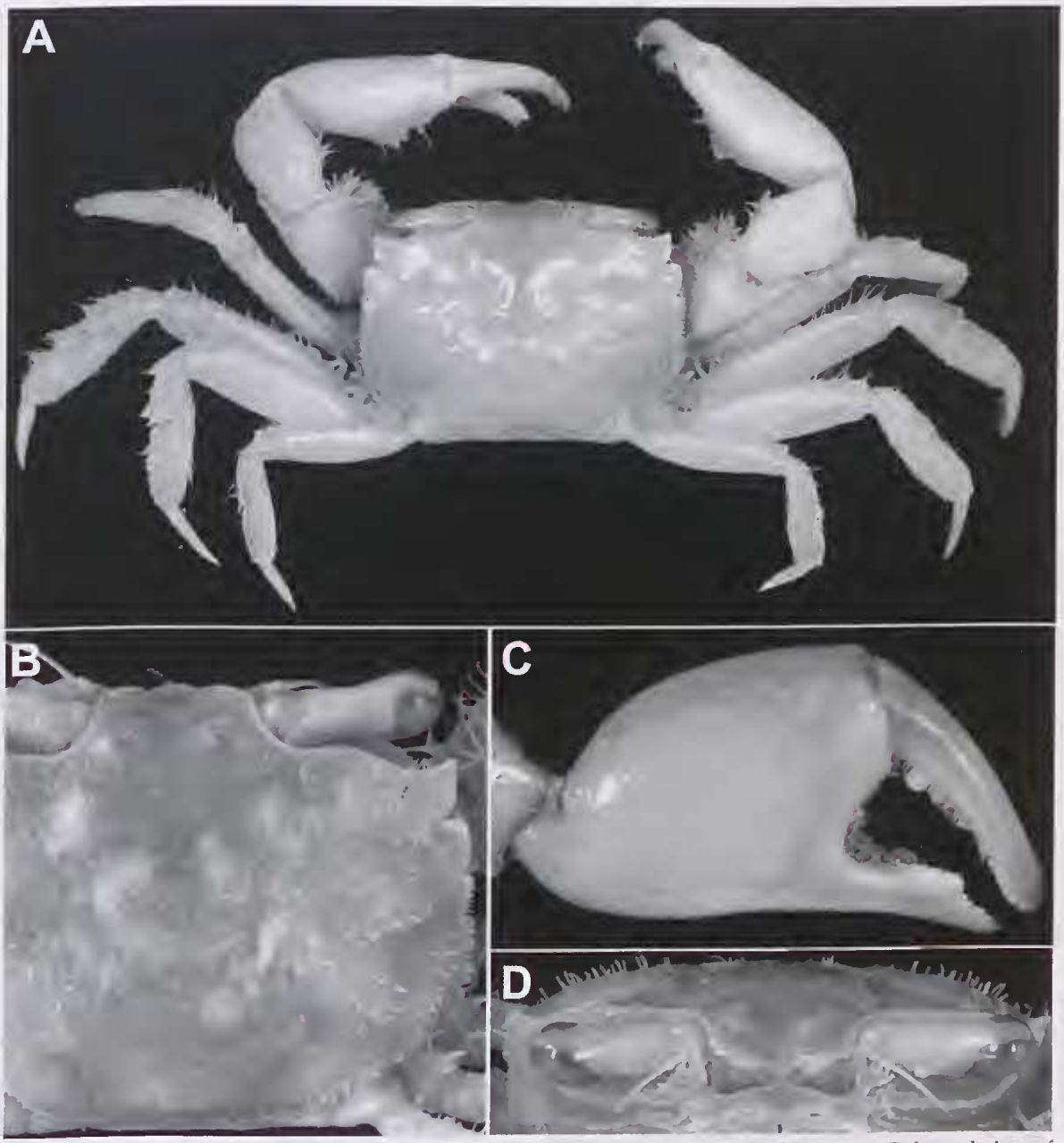


FIG. 40. *Chaenostoma punctulatus* Miers, 1884. **A**, dorsal view; **B**, enlarged view of carapace; **C**, frontal view of chela; **D**, frontal margin and orbits. A, B, C: QM-W15550, ♂ (10.8 × 8.0 mm), Boggy Ck., SE Qld; D, QM-W19271, ♂ (9.8 × 7.6 mm), Hervey Bay, SE Qld.

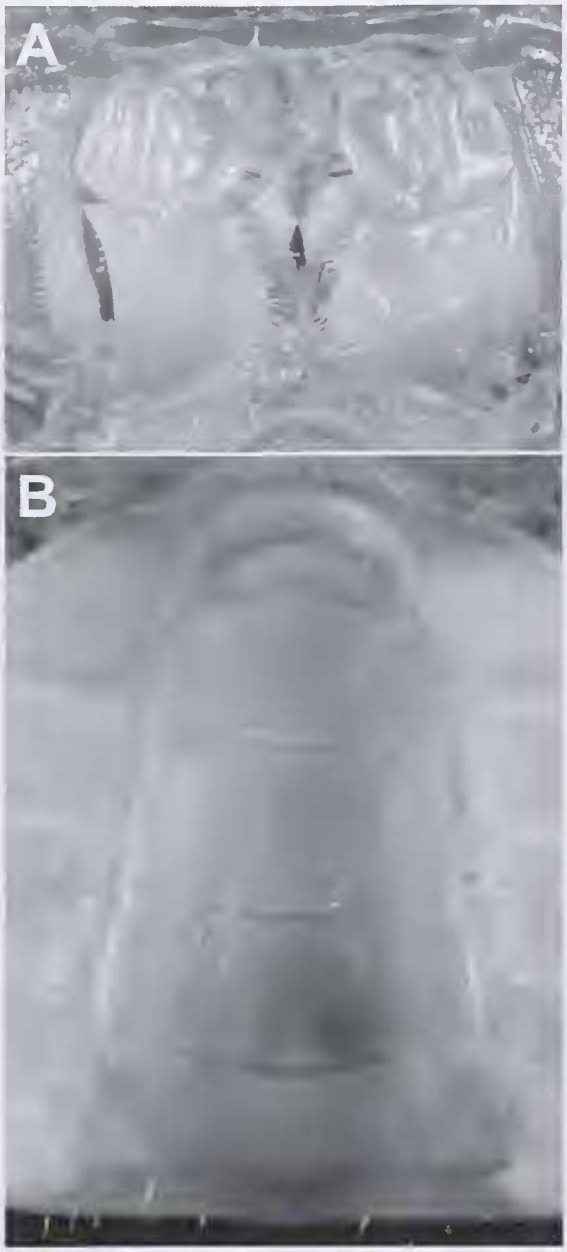


FIG. 41. *Chaenostoma punctulatus* Miers, 1884. **A**, third maxillipeds; **B**, male abdomen; **C**, female abdomen. A: QM-W15550, ♂ (10.8 × 8.0 mm), Boggy Ck., SE Qld; B, QM-W19271, ♂ (9.8 × 7.6 mm), Hervey Bay, SE Qld; C, QM-W5369, ovig. ♀ (7.9 × 6.6 mm), Hervey Bay, SE Qld.

P. Davie, R. Timmins, 23.07.1975. QM-W19271, ♂ (9.8 × 7.6 mm), Urangan boat harbour, Hervey Bay, SE Qld, 25°17'S, 152°54'E, P. Davie, J.W. Short, A. Humpherys, 25.10.1993, mudflat, under stones. QM-W6901, 10.5 km from mouth of Calliope R. Qld, 23°55'S, 151°11'E, P. Saenger, Oct. 1976. QM-W11926, ♂ (6.9 × 5.3 mm), QM-W11927, ovig. ♀ (4.5 × 3.8mm), Triangular I., Shoalwater Bay Qld, 22°23'S, 150°31'E, M.R.L. Survey, Sep. 1981. QM-W29109, 2 ♂ (9.5 × 6.9; 10.8 × 7.9 mm), ovig. ♀ (10.4 × 7.6 mm), juv. ♀ (5.9 × 4.6 mm), Port Augusta, Spencer Gulf, SA, around mangroves, October 2008, Sabine Dittman. WAM-C1051, ♂ (14.0 × 10.4 mm), Canning Bridge, Swan River, Perth, WA, P.N. Chalmer, 3.01.1973.

Diagnosis. Carapace smooth; 3 anterolateral teeth, first triangular, pointed forward, not projecting beyond second tooth, second broad, third indistinct; greatest breadth situated between third antero-lateral teeth; branchial and lateral margins setose; postero-lateral longitudinal rows absent; branchial transverse rows absent. Eyestalks not projecting beyond exorbital angle. Front: anterior margin bilobed, median furrow present. Lower orbital margin with tubercular granules along entire length. Upper orbital border finely granular, sinuous. Epistome medially convex. Third maxilliped merus and ischium subequal. Male cheliped with palm relatively swollen, slightly longer than broad; inner surface setose, outer surface with longitudinal ridge subparallel with lower margin. Dactylus slightly deflexed, with small,

strong, quadrate tooth proximally on cutting margin. Index with broad differentiated tooth. Merus: horny ridge on inner margin absent; setae concealing most or all of surface. Upper margins of meri of ambulatory legs with long setae.

Remarks. I have examined a range of specimens from Queensland to Perth, and all agree precisely with Miers' original illustration (1884: pl. 25 A); the claw in particular is identical. Barnes (2010) says that *Chaenostoma* claws have a 'differentiated tooth only on the dactylus', however Miers' figure of *Macrophthalmus punctulatus* clearly shows a very strong tooth on the index as well. The figure of the chela (Fig. 10a) in Barnes's 1967 Australian paper is a little unusual, and I think it can be assumed that the index finger of that specimen was damaged, with the cutting margin unusually serrated, and the tip broken off. Also, Barnes illustration of the abdomen of *M. punctulatus* (fig. 10c) is somewhat broader and more divergent than is typical, and perhaps was a problem of parallax; his figure of the male G1 (fig. 10d) is also drawn at an unusual angle, and needs care in interpreting. Most importantly, the degree of protruberance of the epistome is unreliable. For *Chaenostoma*, Barnes (2010) states: 'central region of posterior border of epistome straight'. This is true for *C. boscii* but not for *C. punctulatus*. Sometimes some smaller specimens of *C. punctulatus* can appear almost straight if viewed from the front, but certainly not from dorsal view. Joseph Poupin (in lit.) has examined the holotype male (5.65 × 7.32 mm) in the Natural History Museum. London (BM 1881.31), originally described from Port Jackson. He confirmed, 'The central region of epistome is distinctly convex, with a short longitudinal carina beneath, as for Australian specimens. Other characters, aspect of carapace, chelae, and ambulatory legs are also similar to your Australian specimens.'

Habitat. A very common component of the upper shore zone mangrove fauna of southern Queensland. Typically burrows into firm mud or muddy-sand, and often around rocks.

Distribution. An Australian endemic: originally described from Port Jackson, it is found along the central eastern coast from about Shoalwater Bay, at least to Sydney; it also has a patchy southern distribution being known from St Vincent Gulf, SA, and from southwestern WA (Swan River, Perth; Albany). Interestingly, it was never previously recorded from South Australia, despite the fauna of these coasts being well studied and thoroughly reported by Hale (1927). It seems that the upper part of Spencer Gulf and Gulf St Vincent, have relatively warmer pockets of water that allow the survival of otherwise more subtropical or warm temperate species. The presence of ovigerous females indicates a self-sustaining population is present. Of course, this is also one of the last areas of muddy habitat before reaching the southwestern coast of Western Australia, where *Chaenostoma punctulatus* has also only relatively recently been reported (Morgan & Jones 1991: 494).

Tasmanoplax Barnes, 1967

Macrophthalmus (*Tasmanoplax*) Barnes, 1967: 204.
Tasmanoplax — Davie 2009: 817; McLay 2010: 495.

Type species: *Macrophthalmus latifrons* Haswell, 1882, by original designation; gender feminine).

Diagnosis. Medium-sized, to about 30 mm carapace breadth; carapace 1.5–1.6 times wider than long; lateral margins subparallel, large, broad-based, subrectangular anterolateral teeth; branchial regions with transverse and longitudinal rows of granules; ocular peduncles elongate but not projecting beyond lateral carapace margins, longer than breadth of front; front moderately narrow, not constricted between bases of ocular peduncles, breadth c. 0.2 times distance between exorbital angles; central region of posterior border of epistome with large convexity; ischium of third maxilliped c.1.2 times length of merus. Male chelipeds lacking stridulatory apparatus; fingers

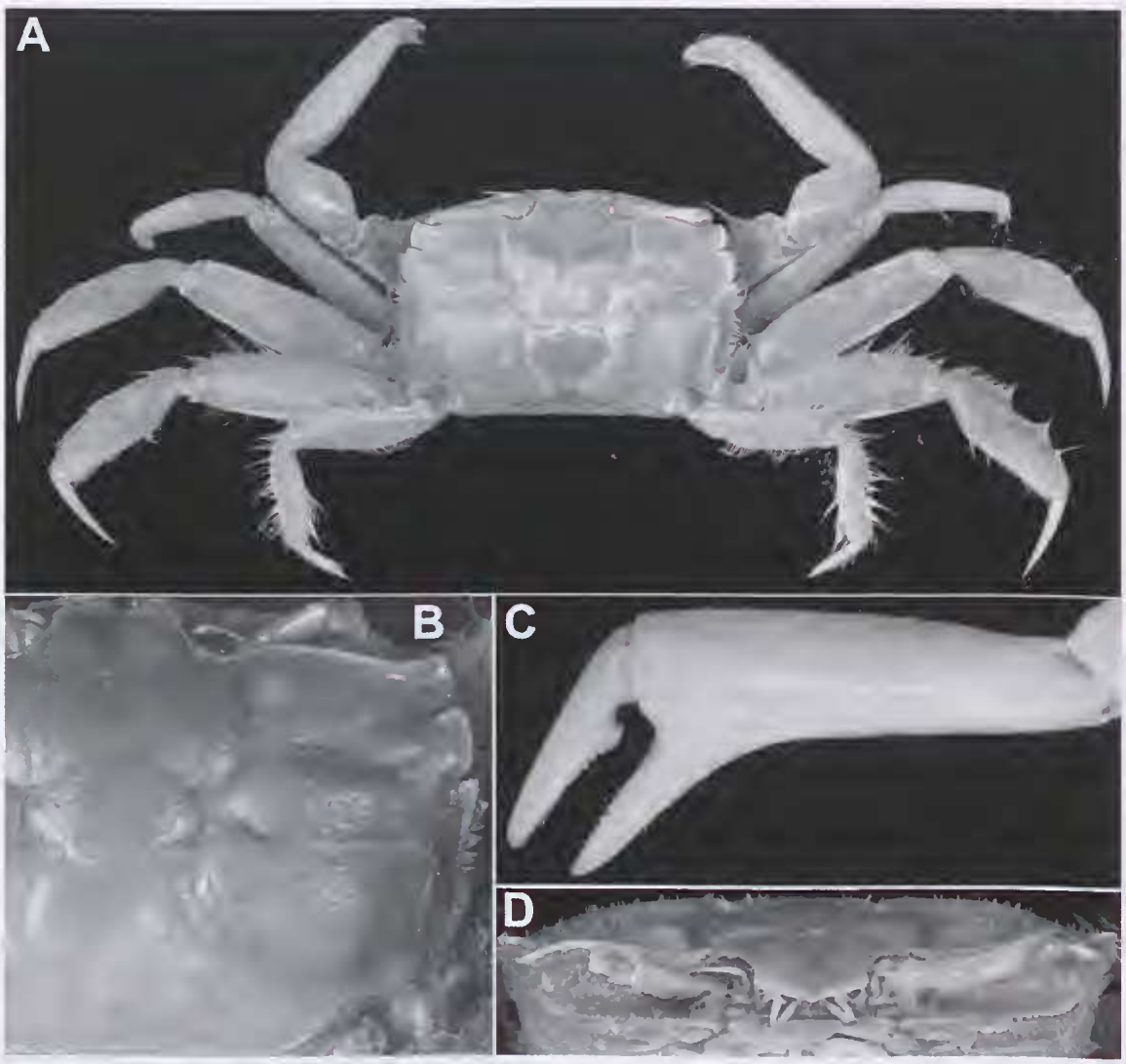


FIG. 42. *Tasmanoplax latifrons* Haswell, 1882. **A**, dorsal view; **B**, enlarged view of carapace; **C**, frontal view of chela; **D**, frontal margin and orbits. A, B: QM-W19925, ♂ (19.8 × 12.2 mm) Hunter River, NSW; C, D: QM-W19927, ♂ (24.1 × 15.3 mm), Hunter River, NSW.

of chelae elongate with index deflexed; differentiated tooth on dactylus only. Intertidal in soft sediments. (After Barnes 2010).

Remarks. Davie (2009) and McLay *et al.* (2010) have both indicated that *Tasmanoplax* Barnes, 1967, should be recognised as a distinct genus in its own right.

Tasmanoplax latifrons Haswell, 1882

(Figs 42, 43)

Macrophthalmus latifrons Haswell, 1882a: 549: 1882b: 90; Tesch 1915: 189; Poore 2004: 495, fig. 156c, f.
Micropthalmus [sic] *latifrons* — Fulton & Grant 1906: 19.

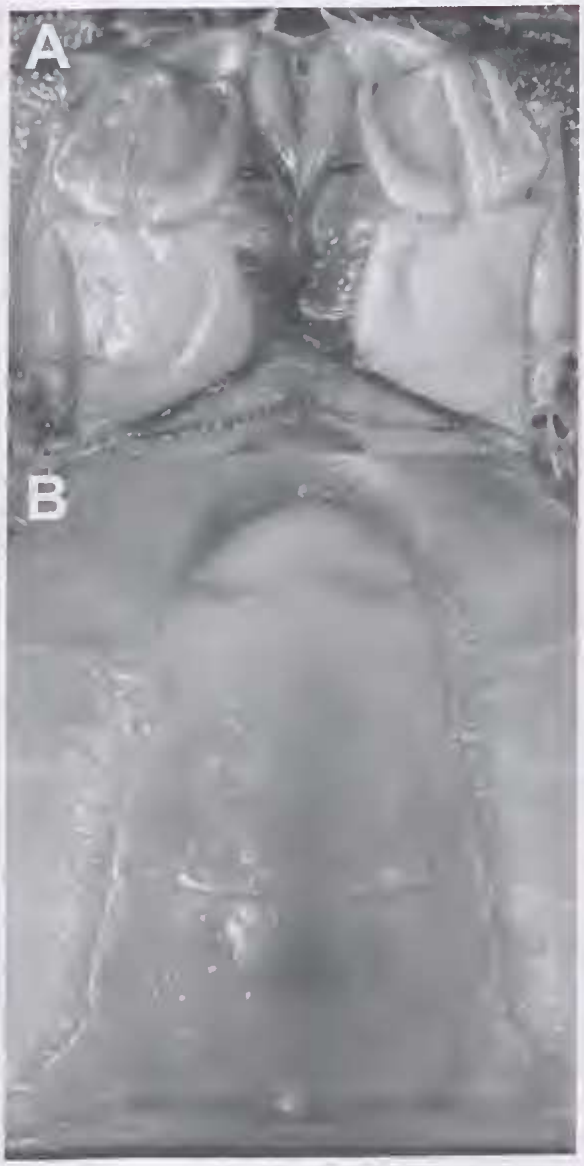


FIG. 43. *Tasmanoplax latifrons* Haswell, 1882. **A**, third maxillipeds; **B**, male abdomen; **C**, female abdomen. A: QM-W19927, ♂ (24.1 × 15.3 mm), Hunter River, NSW; B, QM-W19925, ♂ (19.8 × 12.2 mm) Hunter River, NSW; C, QM-W10954, ♀ (22.8 × 15.2 mm), Snug River, SE Tasmania.

Hemiplax latifrons — Etheridge & McCulloch 1916: 13, pls 4, 6; Hale 1927: 186, fig. 187; Tweedie 1941: 25, fig. 10; Griffin 1968: 291.

Tasmanoplax latifrons — McLay, Kitaura & Wada 2010: 496, fig. 5.

Macrophthalmus (*Tasmanoplax*) *latifrons* — Barnes 1967: 239, pl. 4a, fig. 13; Ng, *et al.* 2008: 238 (list).

Material Examined. QM-W10954, ♂ (26.7 × 18.0 mm), 2 ♀ (22.8 × 15.2, 21.4 × 14.3 mm), mouth of Snug River, Snug, North West Bay, SE Tasmania, in burrows on mudflats, 25.3.1973, T.M. Walker. QM-W19927, ♂ (24.1 × 15.3 mm), Kooragang I., Hunter River, near Newcastle, NSW, 07.03.94, D.B. Conroy. QM-W19926, 2 ♂ (12.5 × 8.3, 10.9 × 7.3 mm), ♀ (10.7 × 7.0 mm), data as for W19927. QM-W19925, ♂ (19.8 × 12.2 mm) data as for W19927.

Remarks. *Tasmanoplax* is a monotypic genus indigeneous to Australia, and *T. latifrons* is the only species of Australian macrophthalmid that has an exclusively temperate distribution. Its range is here considerably extended northwards as a result of recent collections from the Hunter River, near Newcastle, NSW. Previously, this species was known only from Tasmania, South Australia, and central, southern Victoria (Hale 1927; Tweedie 1955; Barnes 1967; Phillips *et al.* 1984). It is surprising that such a comparatively large species has been overlooked for so long in this well collected region so close to Sydney.

Habitat. Found on intertidal mudflats and sea grass beds in Victoria, South Australia and Tasmania (Poore 2004).

Distribution. Southern Australia: from Gulf of St. Vincent, S.A., eastwards to Hunter River, NSW, and Tasmania.

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LITERATURE CITED

Adams, A. & A. White, 1848. Crustacea. Part 1. *In*, A. Adams (Ed.), The zoology of the voyage of H.M.S. *Samarang*, under the command of Captain Sir Edward Belcher, during the years 1843–1846, 1–32, pls 1–6. (Benham & Reeve: London).

Alcock, A. 1900. Materials for a Carcinological Fauna of India. No. 6. The Brachyura Catametopa, or Grapsoidea. *Journal of the Asiatic Society of Bengal* 69(Pt.2 No.3): 279–456.

Apel, M. 2001. Taxonomie und Zoogeographie der Brachyura, Paguridea und Porcellanidae (Crustacea: Decapoda) des Persisch-Arabischen Golfes unpublished Ph.D. Thesis, Johann Wolfgang Goethe-Universität, Frankfurt am Main 268 pp.

Ateş, A.S., Katağan, T. & Kocataş, A., 2007. Decapod crustaceans on the coast of Gökova Bay (the Southeastern Aegean Sea). *E.U. Journal of Fisheries & Aquatic Sciences* **24** (1-2): 159-164.

Audouin, V. 1826. Explication sommaire des planches de Crustacés de l'Égypte et de la Syrie, publiées par Jules-César Savigny, Membre de l'Institut; offrant un exposé des caractères naturels des genres, avec la distinction des espèces. *In*, *Description de l'Égypte, ou recueil des observations et des recherches qui ont été faites en Égypte pendant l'expédition de l'armée française, publiée par les ordres de Sa Majesté l'Empereur Napoléon le Grand. Histoire naturelle*. Imprimerie impériale, Paris. Animaux invertébrés 1(4): 77–98.

Balss, H. 1922. Östasiatische Decapoden. IV. Die Brachyrhynchen (Cancridea). *Archiv für Naturgeschichte* 88A(11): 94–166, figs 1–2, pls 1–2.

1935. Brachyura of the Hamburg Museum Expedition to south-western Australia, 1905. *Journal and Proceedings of the Royal Society of Western Australia* **21**: 113–151, figs 1–5, pl. 13.

Barnard, K.H. 1950. Descriptive catalogue of South African Decapod Crustacea (Crabs and Shrimps). *Annals of the South African Museum* **38**: 1–837, figs 1–154.

1955. Additions to the fauna-list of South African Crustacea and Pycnogonida. *Annals of the South African Museum* **43(1)**: 1–107, figs 1–53.

Barnes, R.S.K. 1966a. A new species of the genus *Macrophthalmus* Latreille, 1829 (Decapoda: Brachyura: Ocypodidae) from the Gulf of Carpentaria, Queensland. *Proceedings of the Royal Society of Queensland* 78(4): 43–47, fig. 1, pl. 8.

1966b. The status of the genus *Euplax* H. Milne Edwards, 1852; and a new genus *Australoplax* of the subfamily Macrophthalminae Dana, 1851 (Brachyura: Ocypodidae). *Australian Zoologist* **13**: 370–376, pl. XXIV.

1967. The Macrophthalminae of Australasia; with a review of the evolution and morphological diversity of the type genus *Macrophthalmus* (Crustacea: Brachyura). *Transactions of the Zoological Society of London* **31**(2): 195–262, fig. 1–16, pl. 1–4.

1970. The species of *Macrophthalmus* (Crustacea: Brachyura) in the collections of the British Museum (Natural History). *The Bulletin of the British Museum (Natural History) Zoology* **20**(7): 205–251, fig. 1–10.

1971. Biological results of the Snellius Expedition XXIII. The genus *Macrophthalmus* (Crustacea, Brachyura). *Zoologische Verhandelingen. Leiden* **115**: 1–40, fig. 1–7.

1973. A rediscription of *Macrophthalmus latipes* Borradaile, 1903: An ocypodid crab with portunid-like paddles (Decapoda: Brachyura). *Crustaceana. International Journal of Crustacean Research* **25**: 292–296.

1976. Contribution towards a revision of *Macrophthalmus* (Crustacea: Brachyura), VIII. A re-examination of the *M. telescopicus* (Owen) complex; the status of *M. laevis* A. Milne Edwards; and the affinities of *M. holthuisi* Serène. *Zoölogische Mededeelingen. Leiden* **50**(10): 133–151.

1977. Concluding contribution towards a revision of, and key to, the genus *Macrophthalmus* (Crustacea: Brachyura). *Journal of Zoology. Proceedings of the Zoological Society of London* **182**: 267–280, fig. 1–3.

2010. A review of the sentinel crabs (Crustaceaa: Brachyura: Macrophthalmidae), with particular reference to the genus *Macrophthalmus*. *Raffles Bulletin of Zoology* **58**(1): 31–49.

Barnes, R.S.K. & Davie, P.J.F. 2008. A new species of sentinel crab *Macrophthalmus* (*Mareotis*) Barnes, 1967 (Crustacea: Brachyura: Macrophthalmidae) from Western Australia. *Zootaxa* **1807**: 63–68.

Chen, H. 1980. Studies on the crabs of the Xisha Islands, Guangdong Province, China. II. *Studia Marina Sinica* **17**: 117–147, figs 1–25, pls 1–4. [In Chinese with English summary].

Chhapgar, B.F. 1957. Marine Crabs of Bombay State. *Taraporevala Marine Biological Station, Contribution number* **1**: v + 89 pp., pls A, B, 1–16.

Chopra, B. & Das, K. N. 1937. Further Notes on Crustacea Decapoda in the Indian Museum. IX. On Three Collections of Crabs from Tavoy and Mergui Archipelago. *Records of the Indian Museum. Calcutta* **39**(4): 377–434, pl. 6 and 463–514, 18 text-figs, pl. 9.

Crosnier, A. 1965. Crustacés Décapodes. Grapsidae et Ocypodidae. *Faune de Madagascar* **18**: 1–143, figs 1–260, pls 1–11.

Dai, A. & Yang, S. 1991. *Crabs of the China Seas*, i–iv, 1–608, figs 1–295, pls 1–74. (China Ocean Press: Beijing & Springer-Verlag, Berlin Heidelberg). English edition. [Translation from Chinese of Dai *et al.* 1986].

Dai, A.-Y. & Song, Y.-Z. 1984. *Macrophthalmus* (Decapoda, Brachyura) of the Seas of China. *Crustaceana* **46**: 76–86.

Dai, A., Yang, S., Song, Y. & Chen, G. 1986. *Crabs of Chinese Seas*, i–iv, 1–642, figs 1–295, pls 1–74. (Ocean Press: Beijing). [In Chinese].

Dana, J. D. 1851a. Conspectus Crustacearum quae in Orbis Terrarum circumnavigatione, Carolo Wilkes e classe Reipublicae Foederatae Duce, lexit et descriptsit J.D. Dana. *Proceedings of the Academy of Natural Sciences of Philadelphia* **5**: 247–254.

1851b. Conspectus Crustaceorum quae in Orbis Terrarum circumnavigatione, Carolo Wilkes e classe Reipublicae Faederatae Duce, lexit et descripsit. *American Journal of Science and Arts* Ser **2, V 11**: 268–274.

1851c. On the classification of the Crustacea Grapsoidea. *American Journal of Science and Arts* Ser **2, V 12**: 283–290.

1852. Crustacea. *United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842, under the command of Charles Wilkes, U.S.N.* **13**(1): i–viii, 1–685, pl. 8.

1855. Crustacea. *United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842 under the command of Charles Wilkes, U.S.N.* **14**(Atlas): 1–27, pls 1–96.

Davie, P.J.F. 1992. A new species and new records of intertidal crabs (Crustacea: Brachyura) from Hong Kong. *In*, Moreton, B. (Ed.), The marine flora and fauna of Hong Kong and southern China III. Proceedings of the Fourth International Marine Biological Workshop: The Marine Flora and Fauna of Hong Kong and Southern China, Hong Kong: 345–359, fig. 1, pls 1–2.

1993. A new genus of macrophthalmine crab (Crustacea: Decapoda: Ocypodidae) from eastern Australia. *Records of the Australian Museum* **45**: 5–9.

2009. A new genus and species of Macrophthalmidae (Crustacea: Brachyura: Ocypodoidea) from the Northern Territory, Australia. *Crustaceana* **82**(7): 815–827.

2011. Crustaceans. Pp. 196–253, in, Davie, P.J.F. *et al., Wild Guide to Moreton Bay and Adjacent Coasts*. Queensland Museum, Brisbane. Vol. 2, pp. i–x, 1–322.

Desmarest, A.-G. 1817. Crustacés fossiles. Nouveau Dictionnaire d'Histoire naturelle, appliquée aux arts, l'agriculture, l'economie rurale et domestique, la médicine, etc. 8: 495–519.

Desmarest, A.G. 1822. Les Crustacés proprement dits. *In*, Brongniart, A. & Desmarest, A.G., *Histoire naturelle des crustacés, sous les rapports zoologiques et géologiques*: 67–142, pls 5–11. Paris.

Edmondson, C.H. 1946. Reef and shore fauna of Hawaii. *Special Publications of the Bernice P. Bishop Museum*, Honolulu **22**: i–iii, 1–381, figs 1–223. (Revised edition of 1933.)

1962. Hawaiian Crustacea: Goneplacidae, Pinnotheridae, Cymopoliidae, Ocypodidae, and Gecarcinidae. *Occasional Papers of the Bernice P. Bishop Museum* **23**(1): 1–27, figs 1–10.

Enzenross, R. & Enzenross, L., 1995. Erstnachweis indopazifischer Brachyura (Crustacea: Decapoda) von der turkischen Mittelmeerkuste. *Stuttgarter Beiträge zur Naturkunde, Serie A (Biologic)* **521**: 1-4.

Etheridge, R. & McCulloch, A.R. 1916. Sub-fossil Crustacea from the coasts of Queensland. *Records of the Australian Museum* **11**(1): 1–14, pls 1–7.

Fourmanoir, P. 1954. Crabes de la côte ouest de Madagascar. *Le Naturaliste Malgasche* **6**(1/2): 1–16, figs 1–12.

Fransen, C.H.J.M. 1998. *Macrophthalmus* (*Macrophthalmus*) *ceratophorus* Sakai, 1969 (Crustacea: Decapoda: Brachyura: Ocypodidae) recorded from the Amirante Islands, western Indian Ocean. *Zoologische Verhandelingen* **323**: 341–348.

Froglia, C. 1978. The identity of *Macrophthalmus franchettii* Maccagno, 1936 (Decapoda, Ocypodidae). *Crustaceana* **34**(2): 222–224, illustr.

Fulton, S.W. & Grant, F.E. 1906a. Census of the Victorian decapod Crustacea. Part I. (Brachyura). *Proceedings of the Royal Society of Victoria* (Ser. 2) **19**(1): 16–20.

Galil, B. 2007. Seeing Red: Alien species along the Mediterranean coast of Israel. In, Boxshall, G., Boero, F. and Olenin, S. (Eds), *Alien species in European coastal waters. Aquatic Invasions* **2**(4): 281-312.

Galil, B., Froglia, C. & Noël, L.P. 2002. *CIESM Atlas of Exotic Crustaceans in the Mediterranean Sea*. http://www.ciesm.org/atlas/appendix2.html (Updated in 2009).

Ghani, N. 2002. Redescription of *Macrophthalmus* (*Ventius*) *latreillei* Desmarest, 1822 with a note on its identification. *Pakistan Journal of Biological Sciences* **5**(5): 633–635.

Gibbes, L.R. 1850. On the carcinological collections of the cabinets of natural history in the United States with an enumeration of the species contained therein, and descriptions of new species. *Proceedings of the Third Meeting of the American Association for Advancement of Science* **3**: 167–201.

Griffin, D.J.G. 1968. Social and maintenance behaviour in two Australian ocypodid crabs (Crustacea: Brachyura). *Journal of Zoology, London* **156**: 291–305.

Guinot, D. 1967. La faune carcinologique (Crustacea Brachyura) de l'Océan Indien Occidental et de la Mer Rouge: Catalogue, remarques biogéographiques et bibliographiques. *In*, Réunion de Spécialistes C.S.A. sur les Crustacés, Zanzibar 1964. *Mémoires de l'Institut fondamental d'Afrique Noire* **77** (1966): 235–352, pls 1–26, 1 table.

Hale, H.M. 1927. *The Crustaceans of South Australia. Part I.* (Government Printer: Adelaide). Pp. 1–201, 1–202 pls.

Hartnoll, R.G. 1975. The Grapsidae and Ocypodidae (Decapoda: Brachyura) of Tanzania. *Journal of Zoology*, London 177(3): 305–328, 8 figs, 3 tabs.

Haswell, W.A. 1882a. On some new Australian Brachyura. *Proceedings of the Linnean Society of New South Wales* **6**(3): 540–551.

1882b. *Catalogue of the Australian stalk- and sessile-eyed Crustacea*. (Australian Museum: Sydney). Pp. i–xxiv, 1–324 + 2 p. addenda, figs 1–8, pls 1–4.

Heller, C. 1865. Die Crustaceen. 1. *In, Reise der österreichischen Fregatte Novara um die Erde in den Jahren 1857–1859 under den Befehlen des Commodors B. von Wüllerstorf-Urbair, Zoologischer Theil* **2**(3): 1–280, pls 1–25. (Wien).

Ho, P.-H. 1995. Sentinels of the muddy shore — big-eyed crabs (*Macrophthalmus*) (1). *Fisheries Extension*, Taipei **104**: 21–24. [in Chinese]

Hoffmann, C.K. 1874. Crustacés et Echinodermes de Madagascar et de l'île de la Réunion. In, Pollen, F.P.L. & van Dam, D.C., *Recherches sur la faune de Madagascar et de ses dépendances d'après les découvertes de François* 5(2): 1–58, pls 1–10.

Holthuis, L.B. 1958. Crustacea Decapoda from the northern Red Sea (Gulf of Aqaba and Sinai Peninsula). II. Hippidea and Brachyura (Dromiacea, Oxystomata, and Grapsoidea). Contribution to the knowledge of the Red Sea. *Bulletin Sea Fisheries Research Station*, Israel, 17(9): 41–54, 4 figs.

Huang, J.-F., Yu, H.-P. & Takeda, M. 1992. A review of the Ocypodid and Mictyrid crabs (Crustacea: Decapoda: Brachyura) in Taiwan. *Bulletin of the Institute of Zoology, Academia Sinica* 31(3): 141–161, figs 1–18, pls 1–2.

Jeng, M.-S, 1997. Studies on the land and aquatic decapod crustacean fauna of the Kenting National Park (II) Communities of decapod crustaceans around the sea. ii+66 pp. Ministry of the Interior, Taipei. (in Chinese with English abstract)

Kamita, T. 1941. Studies of the Decapod Crustaceans of Chosen. Pt. I. Crabs. *The Fisheries Society of Chosen, Keijo*: 1–289, figs 1–147, 2 pls, 1 map.

Karasawa, H. & Matsuoka, K. 1992. *Euplax* H. Milne Edwards, 1852, the senior subjective synonym of *Venitus* Barnes, 1967. *Science Report of the Toyohashi Museum of Natural History* 2: 57–58.

Kemp, S. 1919. Notes on Crustacea Decapoda in the Indian Museum. XIII: The Indian species of *Macrophthalmus*. *Records of the Indian Museum. Calcutta* XVI (Part 5, No. 25): 383–396, pl. 24.

Kim, H.S. 1970. A checklist of the Anomura and Brachyura (Crustacea, Decapoda) of Korea. *Seoul University Journal, Biology and Agriculture* (Series B) 21: 1–34, fig. 1, pls 1–5.

1973. A Catalogue of Anomura and Brachyura from Korea. In, *Illustrated Encyclopedia of Fauna and Flora of Korea*, Vol. 14: 1–694, figs 1–265, pls 1–112, tables 1–2, 1 map. (Samhwa Publishing Company: Seoul). [In Korean with English summary].

Kitaura, J., Nishida, M. & Wada, K. 2002. Genetic and behavioural diversity in the *Macrophthalmus japonicus* species complex (Crustacea: Brachyura: Ocypodidae). *Marine Biology, Berlin* 140: 1–8.

2006. The evolution of social behaviour in sentinel crabs (*Macrophthalmus*): implications from molecular phylogeny. *Biological Journal of the Linnean Society* 88: 45–59.

Kitaura, J., Wada, K., Fukui, Y. & Mclay, C.L. 2010. Molecular phylogenetic position of the New Zealand sentinel crab, *Macrophthalmus* (*Hemiplax*) *hirtipes* (Jacquinot, in Hombron & Jacquinot, 1846) (Decapoda, Brachyura, Macrophthalmidae). *Crustaceana* 83(11): 1315–1326.

Komai, T., Goshima, S. & Murai, M. 1995. Crabs of the genus *Macrophthalmus* of Phuket, Thailand (Crustacea: Decapoda: Ocypodidae). *Bulletin of marine Science* 56(1): 103–149.

Krauss, G. 1843. *Die Südafrikanischen Crustaceen. Eine Zusammenstellung aller bekannten Malacostraca, bemerkungen über deren Lebensweise und geographische Verbreitung, nebst beschreibung und abbildungmehrer neuen Arten.* (E. Schweizerbartsche: Stuttgart). 137 pp., pls. 1–4.

Ksiunin, G. & Galil, B.S. 2004. A new record of an Indo-West Pacific crab (Crustacea: Decapoda) from the Mediterranean coast of Israel. *Israel Journal of Zoology* 49(4): 316-317.

Lakkis, S. & Novel-Lakkis, V., 2005. Benthic populations diversity of soft substratum along the Lebanese coast (Levantine Basin, Eastern Mediterranean). *In, Medcore Project International Conference, Firenze 10-14 Nov. 2005* (Firenze University Press: Italy).

Lanchester, W.F. 1900a. On some Malacostracous Crustaceans from Malaysia in the collection of the Sarawak Museum. *Annals and Magazine of Natural History* (7) 6(33): 249–265, pl. 12.

1900b. On a collection of Crustaceans made at Singapore and Malacca. Part I. Crustacea Brachyura. *Proceedings of the Zoological Society of London* 48(1): 719–770, pls 44–47.

Laurie, R.D. 1906. Report on the Brachyura collected by Professor Herdman, at Ceylon, in 1902. *In*, Herdman, W.A., *Report to the Government of Ceylon on the Pearl Oyster Fisheries of the Gulf of Manaar with supplementary reports upon the Marine Biology of Ceylon by other Naturalists*, part 5, suppl. Rep. 40: 349–432, figs 1–12, pls 1–2.

1915. Reports on the Marine Biology of the Sudanese Red Sea. XXI. On the Brachyura. *Journal of the Linnean Society of London Zoology* 31: 407–475, figs 1–5, pls 42–45.

Lenz, H. 1905. Ostafrikanische Dekapoden und Stomatopoden, gesammelt von Herrn Prof. Dr. A. Voeltzkow. *In*, Voeltzkow, A., Wissenschaftliche Ergebnisse der Reisen in Madagaskar und

Ostafrika in den Jahren 1889–1895. Vol. 3. *Abhandlungen der Senckenbergischen naturforschenden Gesellschaft* **27**(4): 341–392, pls 47–48.

Lenz, H. & Richters, F. 1881. Beitrag zur Crustaceenfauna von Madagascar. *Abhandlungen der Senckenbergischen naturforschenden Gesellschaft* **12**: 421–428, figs 20–27.

Lewinsohn, C. 1977. Die Ocypodidae des Roten Meeres (Crustacea Decapoda, Brachyura). *Zoologische Verhandelingen, Leiden* **152**: 43–84, illust.

Lin, C.C. 1949. A catalogue of Brachyurous Crustacea of Taiwan. *Quarterly Journal of the Taiwan Museum* **2**(1): 10–33.

Litulo, C. 2005. Life history of the crab, *Macrophthalmus boscii* (Audouin, 1826) (Decapoda, Brachyura, Ocypodidae). *Crustaceana* **78**: 665–676.

Lucas, H. 1839. Observations sur une nouvelle espèce de Crustacé fossile appartenant au genre *Macrophthalmus*. *Annales de la Société entomologique de France* **8**: 567–572.

Lundoer, S. 1974. A checklist of the marine Brachyura in the Reference Collection at PMBC, Thailand. *Phuket Marine Biological Center Research Bulletin* **4**: 1–11.

Maccagno, T. 1936. Crostacei di Assab. Decapodi, Stomatopodi, Anfipodi. Spedizione del Barone Raimondo Franchetti i Doncalia (1928–29). *Annali del Museo civico di Storia naturale di Genova* **59**: 171–186.

Man, J.G. de, 1879. On some new or imperfectly known Podophthalmous Crustacea of the Leyden Museum. *Notes from the Leyden Museum* **1**(19): 53–73.

1888a. Report on the Podophthalmous Crustacea of the Mergui Archipelago, collected for the Trustees of the Indian Museum, Calcutta, by Dr John Anderson, F.R.S., Superintendent of the Museum. Parts I–V. *Journal of the Linnean Society of London* **22**(136–140): 1–312, pls 1–19.

1888b. Bericht über die von Herrn. Dr. J. Brock im indischen Archipel gesammelten Decapoden und Stomatopoden. *Archiv für Naturgeschichte*, Berlin, **53**(1): 289–600, pls 11–22a.

1890. Carcinological studies in the Leyden Museum. No. 4. *Notes from the Leyden Museum* **12**: 49–126, pls 3–6.

1895. Bericht über die von Herrn Schiffscapitän Storm zu Atjeh, an den westlichen Küsten von Malakka, Borneo und Celebes sowie in der Java-See gesammelten Decapoden und Stomatopoden. (In 6 parts). *Zoologische Jahrbücher, Abteilung für Systematik, Geographie und Biologie der Thiere.* Vol. 8 (Part 1): 485–609, figs 1–15, pls 12–14.

1902. Die von Herrn Professor Kükenthal im indischen Archipel gesammelten Dekapoden und Stomatopoden. *In*, Kükenthal, W., Ergebnisse einer zoologischen Forschungsreise in den Molukken und Borneo, in Aufträge der Senckenberg. Naturforsch. Gesellschaft ausgeführt von Dr. Willy Kükenthal. *Abhandlungen der Senckenbergischen naturforschenden Gesellschaft* **25**(3): 465–929, pls 19–27.

1904. Beschreibung einiger Brachyuren Krebse aus post-tertiären Schichten der Minahassa, Celebes. *Sammlung des Geologischen Reichsmuseums in Leiden* (1) **7**: 254–277.

Mclay, C.L., Kitaura, J. & Wada, K. 2010. Behavioural and molecular evidence for the systematic position of *Macrophthalmus* (*Hemiplax*) *hirtipes* Hombron & Jacquinot, 1846, with comments on macrophthalmine subgenera (Decapoda, Brachyura, Macrophthalmidae). *In*, Fransen, C.H.J.M., De Grave, S. & Ng, P.K.L. (Eds), Studies on Malacostraca: Lipke Bijdeley Holthuis Memorial Volume. *Crustaceana Monographs* **14**: 483–503.

McNeill, F.A. 1968. Crustacea, Decapoda and Stomatopoda. *Scientific Reports Great Barrier Reef Expedition 1928–29* **7**(1): 1–98, figs 1–2, pls 1–2.

Mendoza, J.C.E. & Naruse, T. 2008. A new species of *Macrophthalmus* Desmarest, 1823 (Crustacea: Decapoda: Brachyura: Macrophthalmidae) from Bohol Island, The Philippines. *The Raffles Bulletin of Zoology* **57**(2): 475–480.

Mendoza, J.C.E. & Ng, P.K.L. 2007. *Macrophthalmus* (*Euplax*) H. Milne Edwards, 1852, a valid subgenus of ocypodoid crab (Decapoda: Brachyura: Macrophthalmidae), with description of a new species from the Philippines. *Journal of Crustacean Biology* **27**(4): 670–680.

Miers, E. J. 1884. Crustacea. *In, Report on the Zoological Collections made in the Indo-Pacific Ocean during the Voyage of H.M.S. `Alert' 1881–2. Part I. The collections from Melanesia. Part II. Collections from the western Indian Ocean*, 178–322, 513–575, pls 18–32, 46–51, table (British Museum: London).

1886. Report on the Brachyura collected by H.M.S. *Challenger* during the years 1873–1876. *In*,

Thompson, C.W. & Murray, J., *Report on the Scientific Results of the exploring Voyage of H.M.S. Challenger during the years 1873–1876, under the command of Captain George S. Nares, R.N., F.R.S. and the Late Captain Frank Tourle Thomson, R.N.*, Zoology **17**(2): i–xli, 1–362, pls 1–29.

Milne Edwards, H. 1837. Histoire naturelle des Crustacés, comprenant l'anatomie, la physiologie et la classification de ces animaux. Libraire Encyclopédique de Roret, Paris, Vol. 2: 1–532, pls 1–2, 7–8, 10, 14, 18–19, 21, 24. (See Holthuis, 1979, for dates of publication.)

1848. Note sur un Crustacé nouveau du genre Macrophthalme. *Annales des Sciences naturelles, Zoologie*, Paris, (3) **9**: 358.

1852. De la famille des ocypodides (*Ocypodidae*). Second Mémoire. *In*, Observations sur les affinités zoologiques et la classification naturelle des Crustacés. *Annales des Sciences Naturelles. Paris* Series 3 (Zoology), **18**: 128–166, pls 3, 4. [Reprinted with separate pagination in the undated *Mélanges Carcinologique* (pp. 73–128)].

Milne-Edwards, A. 1865. Note sur un Crustacé, décrit comme fossile et qui vit encore aujour d'hui dans l'océan Indien. *Annales des Sciences naturelles, Zoologie* (5) **3**: 193–196.

1873. Recherches sur la faune carcinologique de la Nouvelle-Calédonie. Deuxième Partie. Groupe des Cyclometopes Neptuniens. *Nouvelles Archives du Muséum d'Histoire Naturelle, Paris* **9**: 155-332, pls 4–18.

Miyake, S. 1983. *Japanese Crustacean Decapods and Stomatopods in color.* Vol. II. *Brachyura (Crabs)*, i–viii, 1–277, pls 1–64. Hoikusha, Osaka. [In Japanese; second edition in 1992]

Morgan, G.J. & Jones, D.S. 1991. Checklist of marine decapod Crustacea of Southern Western Australia. *Proceedings of the Third International Marine Biological Workshop: The Marine Flora and Fauna of Albany, Western Australia* **2**: 483–497.

Muraoka, K. 1998. Catalogue of the Brachyuran and Anomuran Crabs donated by Prof. Dr. Tune Sakai to the Kanagawa Prefectural Museum. *Catalogue of the Collection in the Kanagawa Prefectural Museum of Natural History* **11**: 5–67, pls 1–16.

Naderloo R., Türkay, M & Apel, M. 2011. Brachyuran crabs of the family Macrophthalmidae Dana, 1851(Decapoda: Brachyura: Macrophthalmidae) of the Persian Gulf. *Zootaxa* **2911**: 1–42.

Nagai, S. 1990. Brachyuran fauna of Wakayama Prefecture IV. *Nankiseibutu* **32**: 115–119. [In Japanese].

Nagai, T., Watanabe, T & Naruse, T. 2006. *Macrophthalmus* (*Macrophthalmus*) *microfylacas*, a new species of sentinel crab (Decapoda: Brachyura: Ocypodidae) from western Japan. *Zootaxa* **1171**: 1–16.

Naruse, T. & Kosuge, T. 2008. A new species of *Macrophthalmus* (Crustacea: Decapoda: Brachyura: Macrophthalmidae) from Iriomote Island, Ryukyu Islands, Japan. *Species Diversity* **13**: 117–122.

Ng, P.K.L., Guinot, D. & Davie, P.J.F. 2008. Systema Brachyurorum: Part I. An annotated checklist of extant brachyuran crabs of the world. *Raffles Bulletin of Zoology (Supplement)* **17**: 1–286.

Nobili, M.G. 1906. Faune carcinologique de la Mer Rouge. Décapodes et Stomatopodes. *Annales des Sciences naturelles, Zoologie* (9) **4**(1–3): 1–347, figs 1–12, pls 1–11.

Ortmann, A.E. 1894a. Die Decapoden-Krebse des Strassburger Museums mit besonderer Berücksichtigung der von Herrn Dr. Döderlein bei Japan und bei den Liu-Kiu-Inseln gesammelten und zur Zeit im Strassburger Museum aufbewahrten Formen. Theil VIII. Abtheilung: Brachyura (Brachyura genuina Boas), III. Unterabtheilung: Cancroidea. 2. Section: Cancrinea, 2. Gruppe: Catametopa. *Zoologische Jahrbücher, Abtheilung für Systematik, Geographie und Biologie der Thiere* **7**: 683–772, pl. 23.

1894b. Crustaceen. *In*, Semon, R. (Ed.), Zoologische Forschungsreisen in Australien und dem Malayischen Archipel ausgeführt in den Jahren 1891–93. V. *Denkschriften der medizinisch-naturwissenschaftlichen Gesellschaft, Jena* **8**: 1–80, pls 1–13.

1897. Carcinologische Studien. *Zoologischer Jahresbericht (Syst.)* **10**: 258–372, pl. 17.

Owen, R. 1839. Crustacea. Pp.77–92, pls 24–28. *In* Beechey, F.W. (Ed.), *The Zoology of Captain Beechey's Voyage ... to the Pacific and Behring's Straits Performed in H.M.S. Blossom under the Command of Captain F.W.Beechey....in the years 1825, 26, 27, and 28.* (H.G.Bohn: London).

Pancucci-Papadopoulou, M.A., Corsini-Foka, M. & Naletaki, M. 2010. *Macrophthalmus graeffei* A. Milne Edwards, 1873 (Crustacea: Brachyura: Macrophthalmidae): a new Indo-Pacific guest off

Rhodes Island (SE Aegean Sea, Greece). *Mediterranean Marine Science* **11**(1): 195-200.

Phillips, D.A.B., Handreck, C.P., Bock, P.E., Burn, R., Smith, B.J, & Staples, D.A. 1984. *Coastal Invertebrates of Victoria. An Atlas of selected species.* (Marine Research Group of Victoria in association with the Museum of Victoria: Melbourne). 168 pp., 1st edn.

Poupin J. & Juncker, M. 2010. *A guide to the decapod crustaceans of the South Pacific.* (CRISP & SPC: Noumea, New Caledonia). 320 pp., 366 photographs.

Rahayu, D.L. & Setyadi, G. 2009. *Mangrove Estuary Crabs of the Mimika Region – Papua, Indonesia.* (PT Freeport Indonesia: Timika, Papua). i-viii, 1-154 pp.

Randall, J.W. 1840. Catalogue of the Crustacea brought by Thomas Nuttall and J. K. Townsend, from the west coast of North America and the Sandwich Islands, with descriptions of such species as are apparently new, among which are included several species of different localities, previously existing in the collection of the Academy. *Journal of the Academy of Natural Sciences of Philadelphia*, (1839), 8(pt. 1): 106-147, pls 3-7.

Rathbun, M.J. 1906. The Brachyura and Macrura of the Hawaiian Islands. *Bulletin of the United States Fish Commission* **23**(3): i-viii, 827-930, figs 1-79, pls 1-24.

1910a. The Danish Expedition to Siam 1899-1900. V. Brachyura. *Kongelige Danske Videnskabernes. Selskabs Skrifter. Kjobenhavn* 7(4): 301-368 (1-68), text-figs 1-44, pls 1-2, 1 map.

1910b. Decapod Crustaceans collected in the Dutch East Indies and elsewhere by Mr. Th. Barbour in 1906-1907. *Bulletin of the Museum of Comparative Zoology at Harvard College* **52**(16): 305-317, pls 1-6.

1924. Brachyura, Albuneidae and Porcellanidae. *In*, Results of Dr. E. Mjöberg's Swedish Scientific Expeditions to Australia 1910-1913. 37. *Arkiv för Zoologi* 16(23): 1-33, figs 1-7, pl. 1.

Sakai, K., Davie, P. Guinot, D. & Türkay, M. 2004. *The Crabs of Japan* Version 1.0. (ETI CD-ROM: University of Amsterdam).

Sakai, T. 1935. List of marine animals around Shimoda area. *Biological report of Shimoda Marine Biological Station, Tokyo University of Literature and Science* **1**: 23-85, 3 pls, 2 maps [In Japanese].

1939. *Studies on the crabs of Japan. IV. Brachygnatha, Brachyrhyncha*, pp. 365-741, figs 1-129, pls 42-111, table 1. (Yokendo Co.: Tokyo).

1955. On some rare species of crabs from Japan. *Bulletin of the Biogeographical Society of Japan* **15-16**: 106-113, figs 1-6.

1969. Two new genera and twenty-two new species of crabs from Japan. *Proceedings of the Biological Society of Washington* **82**: 243-280, figs 1-20, pls 1-2.

1976. *Crabs of Japan and the Adjacent Seas.* (In 3 volumes: (1) English text: i-xxix, 1-773, figs 1-379, (2) Plates volume: 1-16, pls 1-251, (3) Japanese text: 1-461, figs 1-2, 3 maps.) (Kodansha Ltd: Tokyo).

Serène, R. 1973. Notes on Indo-west Pacific species of *Macrophthalmus* (Crustacea, Brachyura). *Zoölogische Mededeelingen, Leiden* 46(8): 99-116, figs 1-2, pls 1-4.

Serène, R. & Vadon, C. 1981. Crustacés Décapodes: Brachyoures. Liste préliminaire, description de formes nouvelles et remarques taxonomiques. *In*, Résultats des Campagnes MUSORSTOM, 1. Philippines (18-28 mars 1976), vol. 1, no. 5. *Mémoires ORSTOM* **91**: 117-140, figs 1-3, pls 1-4. (In French with English summary).

Shen, C.-J. 1932. Brachyuran Crustacea of North China. *Zoologica Sinica* 9: 1-320.

1936. On a collection of Brachyuran Decapoda from Hainan Island, with description of three new species. *Chinese Journal of Zoology* **2**: 63-80, figs 1-4.

1940. On the collection of Crabs of South China. *Bulletin of the Fan Memorial Institute of Biology (Zoology), Peiping* **10**(2): 69-104.

Snelling, B. 1959. The distribution of intertidal crabs in the Brisbane River. *Australian Journal of marine and Freshwater Research* **10**(1): 67-83, pls 1-3.

Souleyet, L.F.A. 1841. Crustacés. *In*, Eydoux, F. & Souleyet, L.F.A., *Voyage autour du monde exécuté pendant les années 1836 et 1837 sur la corvette La Bonite, commandée par M. Vaillant* **1**: 219-250.

Starobogatov, Y.I. 1972. Crabs of the Intertidal Zone of the Tonking Gulf. *In*, The Fauna of the Tonking Gulf and Conditions of Life in it. *Exploration of the Fauna of the Seas*, 10(old series vol. 18): 333-358. Leningrad. [In Russian].

Stebbing, T.R.R. 1910. General Catalogue of South African Crustacea. Part V of South African

Crustacea, for the Marine Investigations in South Africa. *Annals of the South African Museum* **6**(4): 281–593, pls 15–22. Ševèiæ

Ševčić, Z., 2005. The reclassification of Brachyuran Crabs (Crustacea: Decapoda: Brachyura). *Fauna Croatica* **14**(1): 1–159.

Stimpson, W. 1858. Prodromus descriptionis animalium evertebratorum, quae in Expeditione ad Oceanum Pacificum Septentrionalem, a Republica Federata missa, Cadwaladaro Ringgold et Johanne Rodgers Ducibus, observavit et descripsit W. Stimpson. Pars. V. Crustacea Ocypodoidea. *Proccedings of the Academy of Natural Sciences of Philadelphia* **10**: 93–110 (39–56).

Stimpson, W. 1907. Report on the Crustacea (Brachyura and Anomura) collected by the North Pacific Exploring Expedition, 1853–1856. *Smithsonian Miscellaneous Collections* **49**(3): 1–240, pls 1–26.

Suvatti, C. 1950. *Fauna of Thailand.* (Department of Fisheries: Bangkok, Thailand). Pp. ii, 1–1100, 1 pl.

Tai, A.-Y. & Song, Y.-Z. 1984. *Macrophthalmus* (Decapoda, Brachyura) of the seas of China. *Crustaccana* **46**(1): 76–85, illustr.

Takeda, M. 1977. Crabs of the Ogasawara Islands. 5. A collection made by dredging. *Memoirs of the National Science Museum, Tokyo* **10**: 113–140, figs 1–5, pls 12–17, tabl. 1. (Japanese summary.)

1981. *Macrophthalmus* (Crustacea, Brachyura, Ocypodidae) from the Ryukyu Islands. *In*, Yamaguchi, T. (Ed.), Ecological studies of coastal marine and freshwater crabs. Report for the Grant-in-Aid for Co-operative Research, 1978–1980, Ministry of Education: 69–77, figs 1–3. [In Japanese].

1982. *Keys to the Japancse and foreign crustaceans fully illustratcd in colors.* First edition, (Hokuryukan: Tokyo). Pp. i–iv, 1–58, 1–285, figs 1–779. [In Japanese].

1979. Systematic and biogeographic notes on the crabs obtained by dredging at the sea around Cape Shiono-misaki, Kii Peninsula. *Mcmoirs of the National Science Museum, Tokyo* **12**: 151–157, figs 1–3. [In Japanese with English summary].

Takeda, M. & Komai, T. 1991. Japanese species of the *Macrophthalmus telescopicus* complex (Crustacea: Decapoda: Brachyura: Ocypodidae). *Bulletin of the National Science Museum,* Tokyo, Series A (Zoology) **17**(4): 165–171, figs 1–3.

Takeda, M. & Nunomura, N. 1976. Crabs collected by the Melanesia Expedition of the Osaka Museum of Natural History, 1958. *Bulletin Osaka Museum of Natural History* **30**: 61–92, figs 1–3.

Tesch, J.J. 1915. The Catometopous genus *Macrophthalmus* as represented in the collection of the Leyden Museum. *Zoologische Mededeelingen, Leiden* **1**(3–4): 149–204, pls 5–9.

1918. The Decapoda Brachyura of the Siboga-Expedition. 1. Hymenosomidae, Retroplumidae, Ocypodidae, Grapsidae and Gecarcinidae. *Siboga Expeditie Monografie* 39C1(82): 1–148, pls 1–6.

Titgen, R.H. 1982. The Systematics and Ecology of the Decapods of Dubai, and their Zoogeographic Relationships to the Arabian Gulf and the Western Indian Ocean. Unpublished D. Phil. Thesis, Texas A & M University.

Tweedie, M.W.F. 1937. The crabs of the family Ocypodidae in the collection of the Raffles Museum. *Bullctin of tlie Raffles Museum. Singapore* **13**: 140–170.

1950. Grapsoid Crabs from Labuan and Sarawak. *Sarawak Museum Journal* **5**(2): 338–369, figs 1–9.

Vannini, M. & Valmori, P. 1981. Researches on the coast of Somalia. The shore and dune of Sar Uanle. 31. Ocypodidae and Gecarcinidae (Decapoda Brachyura). *Monitorc zoologico italiano (N.S.) suppl.* **14**(14): 199–226, illustr.

Wada, K. 1978. Notes on the ocypodid crabs (Crustacea: Ocypodidae) from Wakayama Prefecture and their distribution along the coast of the district. *Nankiseibutu* **20**(1): 18–22, illustr. [Japanese with English summary].

1995. Brachyura. *In*, Nishimura, S., *Guide to seashore animals of Japan with color pictures and keys.* Vol. 2: 379–418, pls 101–118. [In Japanese].

Wada, K. & Sakai, K. 1989. A new species of *Macrophthalmus* closely related to *M. japonicus* (de Haan) (Crustacea: Decapoda: Ocypodidae). *Senckenbergiana Maritima. Frankfurt a.M.* **20**(3/4): 131–146.

Ward, M. 1941. New Brachyura from the Gulf of Davao, Mindanao, Philippine Islands. *American Museum Novitates,* New York, **1104**: 1–15, figs 1–30.

Yamaguchi, T., Takeda, M. & Tokudome, K. 1976. A list of crabs collected in the vicinity of the Aitsu Marine Biological Station and a preliminary report on the cheliped asymmetry of the crabs. *Calanus* **5**: 31–46, figs., pl., 2 tabs.