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A RE-APPRAISAL OF *HETEROPANOPE* STIMPSON, AND *PILUMNOPEUS* A. MILNE EDWARDS (CRUSTACEA : DECAPODA : PILUMNIDAE) WITH DESCRIPTIONS OF NEW SPECIES AND NEW GENERA.

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The type species of *Heteropanope* Stimpson, *H. glabra* Stimpson, and *Pilumnopeus* A. Milne Edwards, *P. serratifrons* (Kinahan), are redescribed and the genera redefined. *Heteropanope* differs from *Pilumnopeus* by the lack of regional definition on the carapace; the shape of the front; the lack of an internal tooth on the lower orbital margin; and by sternite eight not being visible laterally beside the male abdomen. A new genus *Benthopanope* is described which differs from the other two genera most conspicuously by the shape of the sternal plastron. *Heteropanope convexa* Maccagno is redescribed and assigned to *Pilumnopeus*. *Heteropanope sexangula* Rathbun is redescribed and assigned to *Benthopanope* gen. nov. Two new species, *Heteropanope longipedes* and *Benthopanope estuarius*, are described. *Heteropanope vincentiana* Rathbun, 1929, is re-examined and a neotype designated. It is made the type species of a new genus *Flindersoplax*, which is tentatively placed in the subfamily Carcinoplacinae of the Goneplacidae because of the wide sternal plastron, wide abdomen and structure of the first and second male pleopods. Affinities with other groups are discussed.
☐*Crustacea, Decapoda, Pilumnidae, Goneplacidae, Heteropanope, Pilumnopeus, Benthopanope, Flindersoplax, genus nov., species nov.*

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26 January, 1989.

The status of the genera *Heteropanope* Stimpson, 1858, and *Pilumnopeus* A. Milne Edwards, 1863, has long been the subject of debate. De Man (1887) and Alcock (1898) considered *Pilumnopeus* to be a junior synonym of *Heteropanope*, but Balss (1933) separated them suggesting that *Pilumnopeus* had a more convex and narrower carapace and the front was rounded rather than truncated. Monod (1956) cast doubt on the constancy of the characters that Balss had used and felt that only the shape of the front was of any value. He suggested that *Pilumnopeus* be treated as a subgenus of *Heteropanope*. Dell (1968) pointed out that the type species of the two genera — *H. glabra* Stimpson, 1858, and *P. serratifrons* (Kinahan, 1856) — had not been compared critically and that this was of major importance before the large group of species allied to them could be properly evaluated and assigned. Takeda and Miyake (1969) followed Dell's (1968) example in maintaining them both as separate genera pending critical examination. Lim, Ng and Tan (1984) examined the larvae of *H. glabra* and after comparison with published accounts of *P. serratifrons* and other species of *Pilumnopeus* felt that no useful larval characters could be discerned to separate the two genera and that this supported Monod's (1956) contention (although, in 1986, they treated the genera separately).

During studies of Australian species of Pilumnidae both *H. glabra* and *P. serratifrons* and two new species were identified in the Queensland Museum collections. Close examination resulted in the conclusion that *Heteropanope* and *Pilumnopeus* were indeed generically distinct. In addition, one of the new species also proved to be sufficiently distinct to warrant the description of a new genus to accept it and several other species that had been attributed to *Pilumnopeus*. The only other species of *Heteropanope* to be recorded from Australia, *H. vincentiana* Rathbun, 1929, was re-examined and found not to belong to the Pilumnidae at all, but to represent a new genus which must be placed in the Goneplacidae.

Unless otherwise stated measurements given in the text are of carapace breadth. Abbreviations are as follows: QM = Queensland Museum; NTM = Northern Territory Museum of Arts and Sciences, Darwin. Illustration have been prepared with the aid of a camera lucida.

PILUMNIDAE Samouelle, 1819

Heteropanope Stimpson, 1858

Heteropanope Stimpson, 1858, p. 33; A. Milne Edwards, 1863, p. 288; 1867, p. 277; de Man, 1887, pp. 52–3 (in part); Alcock, 1898, p. 207 (in part); Balss, 1933, pp. 31,32.

DIAGNOSIS

Carapace rather convex fore and aft; dorsal surface more or less smooth, regions poorly defined. Front broadly bilobed, each lobe being convex; no lateral lobule distinct from supra-orbital angle. Anterolateral margin cut into four teeth or lobes, which may be pointed but not spinous, first tooth a broad lobe confluent with the outer orbital angle. Sub-orbital margin relatively flat and without a strong tooth developed internally which can be seen from above. Sternal plastron with the fused segments 3–4 relatively long such that the telson reaches noticeably less than half the distance towards suture 2/3; sternite 8 not visible laterally beside male abdomen. Male abdomen seven segmented; first male pleopods slender, sinuous, with tip recurved.

REMARKS

Type species: *Heteropanope glabra* Stimpson, 1858, by subsequent selection by Balss, 1933, p. 32. Gender is feminine. Name 1627 on *Official List*.

Included here in *Heteropanope* are: *H. glabra* Stimpson, 1858; *H. longipedes* sp. nov. and *H. changensis* (Rathbun, 1909). The West African species *H. tuberculidens* Monod, 1956 and *H. acanthocarpus* Crosnier, 1967, are considered to probably be themselves congeneric, but not true *Heteropanope* species. *H. hilarula* (de Man, 1928) is clearly not a *Heteropanope* species but no generic allocation is attempted here without examination of specimens. *H. convexa* Maccagno, 1936, is transferred to *Pilumnopeus*. *Heteropanope vincentiana* Rathbun, 1929, is removed from the Pilumnidae altogether and placed in a new genus, *Flindersoplax*, provisionally within the Goneplacidae, and described later in this paper.

No specimens of *Eurycarcinus* species have been examined by the author. On available definitions it is impossible to distinguish this genus from *Heteropanope*, and it remains to be critically appraised. For this reason, new species assignable to *Heteropanope* should also be checked against described *Eurycarcinus* species.

Heteropanope differs from *Pilumnopeus* in the following characters: *Heteropanope* has the carapace regions more poorly defined; the front lacks a pre-orbital tooth; the inferior orbital margin lacks a strongly developed tooth at the inner end; the basal antennal article is comparatively much shorter and broader and its outer anterior angle projects above the level of the inner sub-orbital border; and sternite 8 is not visible laterally beside the male abdomen.

Heteropanope glabra Stimpson, 1858
(Figs 1A–J, 2)

Heteropanope glabra Stimpson, 1858, p. 35; 1907, p. 63, pl. 8, fig. 1; Parisi, 1916, p.186; Yokoya, 1933, p.184; Balss, 1933, p. 32; 1938, pp. 57,58, fig. 2; Serène, 1973, pp. 121, 123, 124, figs 3,4, pl. 1B,D.

non *Heteropanope glabra*: Sakai, 1939, p. 545, pl.99, fig. 6; 1976, p. 503, text-fig. 269 (= *H. longipedes* sp. nov.).

Pilumnopeus maculatus A. Milne Edwards, 1867, p. 277; 1868, p. 82, pl. 4, figs 17–19.

Eurycarcinus maculatus: de Man, 1887, p. 44, pl. 2, figs 2,3 (not 4, 5 as indicated in the text); Ortmann, 1893, p. 435; Alcock, 1898, p. 212; Lanchester, 1900, p. 744; McCulloch, 1908, p.7; Roux, 1917, p. 603; Sankarankuty, 1962, p. 146, fig. 51.

Actumnus nudus: Grant and McCulloch, 1906, pp. 17–18. (not *A. nudus* A. Milne Edwards, 1867).

MATERIAL EXAMINED

QM W14835, 1 ovig. ♀ (10.3×6.9 mm), Lim Chu Kang Rd. end, NW Singapore, in mangroves, P. Davie and P. Ng, 6.ix.1987. QM W810, 1 ♂ (11.4x8.3 mm) 2 ♀ (11.6×7.9; 10.2×6.9 mm), Goat Is, SEQ, 27°31'S, 153°23'E, Mud and Rock, High Water, Biol. Dept. U. of QLD, Jan, 1938. QM W5131, 3 ♂ (14.3×9.9; 9.8×7.0; 4.6×3.6 mm), 5 ♀ (12.3×8.7; 10.3×7.1; 9.0×6.2; 6.0×4.2; 5.9×4.4 mm), Serpentine Ck, SEQ, 27°24'S, 153°07'E, log litter sample, Campbell *et al.* 3.viii.1972. QM W5161, 1 ♂ (11.9×8.4 mm), Serpentine Ck, SEQ, 27°24'S, 153°07'E, Campbell *et al.*, 23.viii.1972. QM W5173, 1 ♂ (21.5×14.9 mm), 4 ♀ (17.2×11.6; 16.5×11.1; 16.1×11.1, 15.7×10.3 mm), Serpentine Ck, SEQ, 27°24'S, 153°07'E, Campbell *et al.*, 20.ix.1972. QM W5200, 2 ♂ (15.1×11.0; 11.1×7.9 mm), Jackson's Ck, SEQ, 27°24'S, 153°06'E, Campbell *et al.*, Oct.1972. QM W5228, 1 ♂ (18.1×12.6 mm); 1 ♀ (6.9×5.2 mm), Jacksons Ck, Cribb Is, SEQ, 27°23'S, 153°05'E, Campbell *et al.*, Oct.1972. QM W5237, 2 ♂ (18.0×12.6; 13.0×9.2 mm), Jacksons Ck, Cribb Is, SEQ, 27°23'S, 153°05'E, Campbell *et al.*, 12.x.1972. QM W5267, 2 ♂ (15.3×10.7; 10.8×7.6 mm), 1 ♀ (9.6×6.7 mm), Serpentine Ck, Cribb Is, SEQ, 27°24'S, 153°07'E, Campbell, *et al.*, 20.ix.1972. QM W5273, 1 ♂ (14.2×9.6 mm), Serpentine Ck, Cribb Is, SEQ, 27°24'S, 153°07'E, Campbell *et al.*, 20.ix.1972. QM W5283, 1 ♀ (9.5×6.7 mm) Serpentine Ck, Cribb Is, SEQ, 27°24'S, 153°07'E, Campbell *et al.*, 20.ix.1972. QM W5307, 1 ♂ (10.2; ×7.4 mm), 2 ♀ (10.6×7.4; 6.3×4.6 mm), Mary R., Northhead, Hervey Bay, SEQ, 25°26'S, 152°07'E, P. Davie, R. Timmins, 25.vii.1975. QM W5340, 1 ♀ (7.7×5.4 mm) Pulgul Ck, Hervey Bay, SEQ, 25°19'S, 152°54'E, R. Timmins, 23.vii.1975. QM W5354, 1 ♂ (11.7×8.4 mm) Moon Ck, Fraser Is, SEQ, 25°11'S, 153°04'E, near Wreck on sand bank, R. Timmins, 20.vii.1975. QM W5363, 2 ♀ (14.3×9.9; 5.3×3.8 mm) Pulgul Ck, sth of Urangan, Hervey Bay, SEQ, P. Davie, 19.vii.1975. QM W5371, 1 ♂ (5.1×3.7 mm), 2 ♀ (13.1×8.9; 7.0×5.4 mm) Moon Ck, Fraser Is, SEQ, 25°11'S, 153°04'E, P. Davie 21.vii.1975. QM W6788, 1

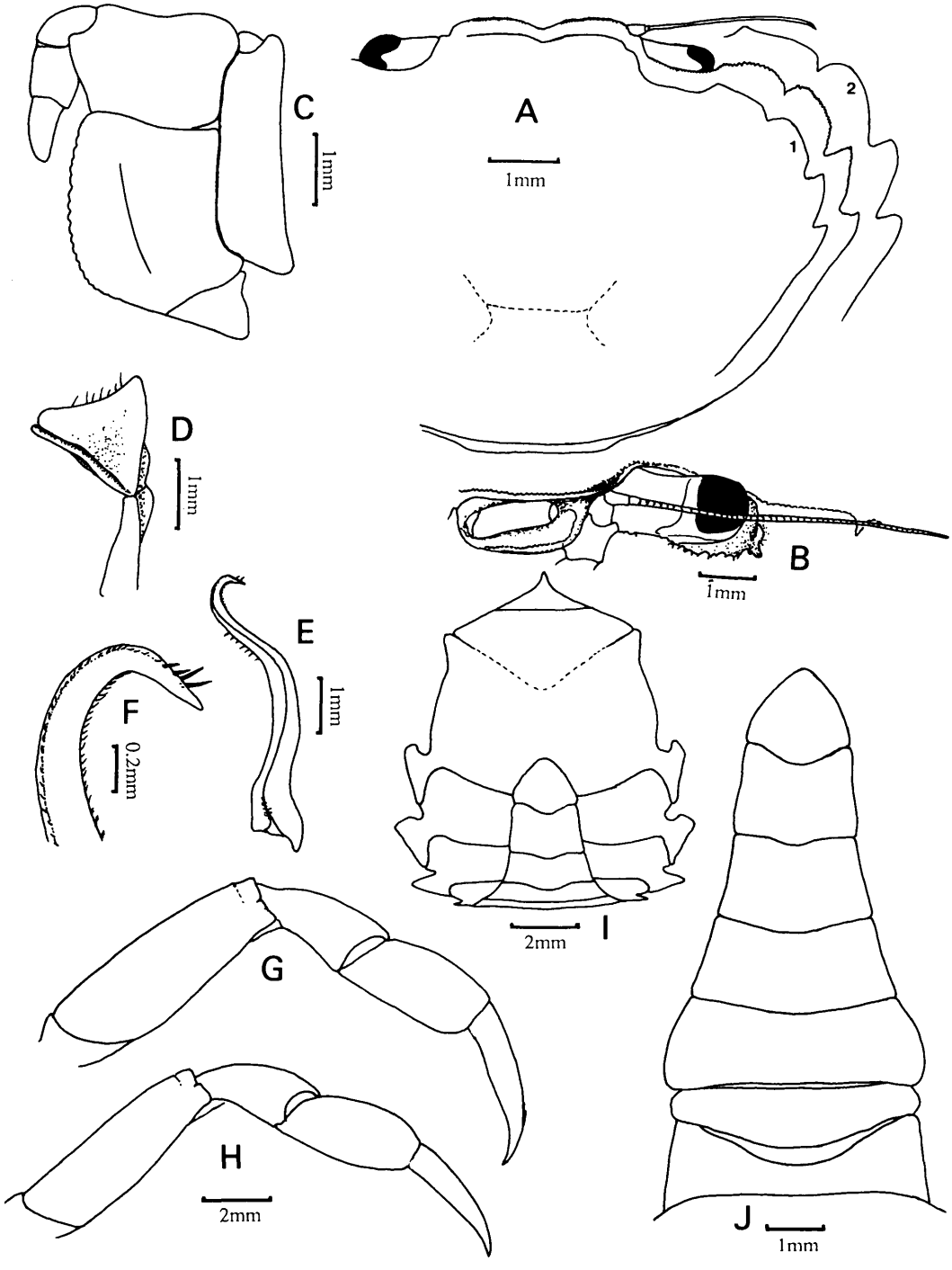

FIG. 1. *Heteropanope glabra* Stimpson, 1858 (Male, QM W5228). A, carapace outline and secondary outlines (1,2) of male and female specimens (QM W5173); B, frontal view of orbit and antennal peduncle; C, third maxilliped; D, endopod of first maxilliped (male, QM W5228); E, F, first pleopod; G, H, fourth and fifth legs respectively; I, sternum and abdomen *in situ*; J, abdomen.

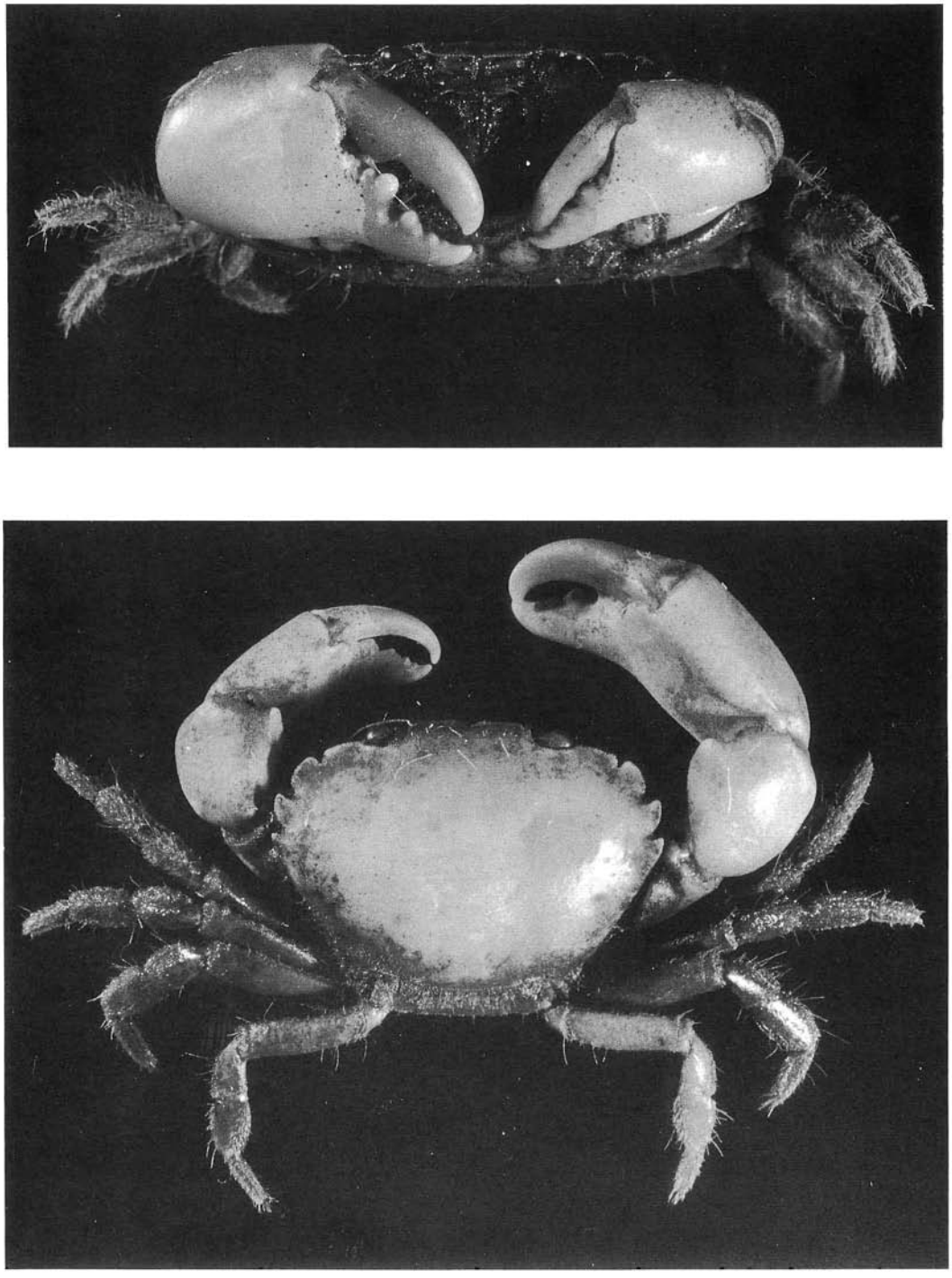

FIG. 2. *Heteropanope glabra* Stimpson, 1858. Male, QM W5173, from Serpentine Creek, Moreton Bay, SEQ. Scale line in mm.

♂ (10.6×7.5 mm), Curtis Is, near Tide Is, SEQ, 23°46'S, 151°15'E, on mud in *Rhizophora*, P. Saenger, 17.xii.1975. QM W6793, 2 ♂ (15.4×10.8; 14.0×10.1 mm), 2 ♀ (11.1×7.7; 9.2×6.2 mm) Curtis Is, near Tide Is, SEQ, 23°46'S, 151°15'E, on mud in *Rhizophora*, P. Saenger, 17.xii.1975. QM W9459, 1 ♂ (12.9×9.0 mm), Susan R., SEQ, 25°26'S, 152°56'E, Holes in mud in roots, detritus etc. 26.xii.1971. QM W12391, 1 juv. (3.6×.7 mm), Pt Farewell, East Alligator R. mouth, Kakadu, N.T., 12°07'S, 132°33'E, open mud site bordering creek in rotting roots of *Camptostemon*, P. Davie, 18.vi.1982. QM W12395, 1 ♂ (9.5×6.7 mm), Between South and East Alligator Rivers, Kakadu, N.T., 12°08'S, 132°29'E, Mangrove fringe, from rotten trunk near back edge of *Camptostemon/Sonneratia* zone, P. Davie, 2.v.1979. QM W12396, 2 ♀ (13.6×9.6; 10.0×7.2 mm, ovig), South Alligator R., Kakadu, N.T., 12°15'S, 132°23'E, West bank of mouth, Mud bank of *Brugiera* fringe, Intertidal, P. Davie, 12.v.1979. QM W12397, 1 ♂ (11.1x8.0 mm) S.W. edge of Field Is, Kakadu, N.T., 12°07'S, 132°22'E, inside base of rotting log *Rhizophora* zone, Australian Littoral Society, 3.v.1979. QM W15019, 2 ♂ (7.1×4.7; 5.1×3.6 mm), 2 ♀ (12.3×8.5; 10.8×6.7 mm), Port Douglas, NEQ, in rotting logs in harbour, P. Davie, 23.x.1982. QM W15021, 1 ♂ (9.3×6.2 mm), 2 ♀ (10.5×6.8 ovig; 9.7×6.3 mm), Portland Roads, NEQ, log infauna, seaward edge of *Rhizophora*, P. Davie, 12.xi.1982. QM W15578, 1 ♂ (10.1×7.2 mm) Murray R., NEQ, R. Timmins, May, 1978. QM W15580, 1 ♂ (12.7×8.8 mm) Redland Bay, SEQ, K. Wilson, 1.xii.1935. NTM Cr 1870, 1 ♂ (17.5×12.2 mm) Cameron's Beach, Darwin N.T., LWS Mangroves, R. Hanley, 26.ii.1982. NTM 6522, 1 ♂ (12.6×9.0 mm) Wanggi Wangji Cove, Port Essington, N.T., inside rotting bark in mud, in *Rhizophora stylosa* zone, R. Hanley, C. Watson-Russell, M. Burke, 13.ix.1985.

Description

Carapace wider than long (*c.* 1.4–1.5 times), convex along the mid-line and moderately convex from side to side across the branchial regions. Regions poorly defined: slight anterior branchial depression; gastro-cardiac grooves weakly defined; surface generally smooth although sometimes finely granular towards margins; with a few short scattered setae, and often a row of short setae on each frontal region. Frontal margin consisting of two broad, flat lobes separated by a wide V-shaped depression; granulate; with a row of very short setae just behind the edge of each lobe; separated from supra-orbital margin by an obtuse angled shoulder. Supra-orbital margin finely granular; usually without indication of median or lateral fissures; outer orbital angle slightly produced and confluent with the first anterolateral tooth. Sub-orbital margin with large granules laterally becoming smaller towards the basal antennal segment; a well defined lateral sulcus below the exorbital angle; without an internal tooth developed. Sub-hepatic and pterygostomial regions granular; covered by short setae adjacent to maxillipeds and orbit, becoming long and feathered adjacent to merus of cheliped.

Anterolateral margin finely granular; about two-thirds length of posterolateral. Cut into four teeth: the first confluent with the outer orbital angle, broad, usually obliquely angled backwards but sometimes almost horizontal; the second a similarly broad lobe, directed anteriorly; the third slightly smaller, well separated from the second, pointed anteriorly; the fourth the smallest and also pointed. Greatest carapace breadth between the fourth pair. Posterolateral margins oblique, straight and with a line of thick feathered setae from the sub-branchial regions.

Basal antennal joint sub-rectangular; inner distal angle well separated from front; outer distal angle produced as a small lobe into the orbital hiatus; antennal flagellum relatively long and with free access to the orbit. Third maxilliped with merus much smaller than ischium (*c.* 0.55 times length); merus a little broader than long (*c.* 1.5 times), outer distal margin noticeably expanded, anterior margin concave; ischium with oblique longitudinal depression, inner margin crenellated; exopod does not reach to anterior margin of merus, and has large subdistal tooth on inner margin; surface of all segments finely granular and with short stout setae; longer bristles on inner margins of merus and ischium and on palp.

Chelipeds unequal, massive. Major cheliped with merus short, trihedral; upper posterior margin carinate with a blunt subdistal lobe; anterior margin distinctly granular proximally, becoming finer distally; lower margin smooth and rounded; a narrow fringe of longer feathered setae proximally on posterior margin, otherwise with only very short scattered setae. Carpus with a strong blunt tooth on inner margin, otherwise rounded, smooth and glabrous. Palm swollen, smooth and glabrous; superior margin rounded; length (including fixed finger) about 1.8 times height; fingers pointed, immovable finger noticeably deflexed, with very large proximal molar, and 2–3 smaller teeth reducing in size distally; dactyl strongly curved so as to leave a gape, armed with only 2–3 quite small, low teeth in proximal half; fingers both darkly coloured, except for band at base of dactyl, and colour does not extend onto palm. Smaller cheliped of similar form although less massive, no gape formed between the fingers; armed with teeth that are more triangular and sharply edged.

Walking legs of moderate length, unarmed; first and second pairs subequal in length and a little longer than the third pair; merus of third pair from 2.7–3.0 times longer than wide and of the fourth pair 2.8–3.1; dactylus about equal to length of lower margin of propodus, and terminating in an acute chitinous tip. All legs with relatively long scattered setae which become thicker on the propodus and dactylus.

Male abdomen relatively narrow: first, second and third segments of similar width; segments four to seven of similar length, tapering; telson about as wide as broad at base, bluntly pointed. Sternite eight hidden laterally beneath the second abdominal segment. First male pleopod sinuous, with downturned pointed beak; a fine line of short fringing setae distally on the inside curve and along the outer suture line; 3–4 longer, stouter setae on the top of the beak.

HABITAT

Intertidal, in muddy and mangrove environments, usually inside rotting logs or stumps, or in crevices in the substrate. Tolerates lower estuarine salinity conditions. *H. longipedes* sp. nov. occurs sympatrically in Australia.

DISTRIBUTION

Hong Kong (type locality), Mergui Archipelago, Singapore, Zanzibar, New Caledonia and northern Australia. The record from Japan of Yokoya (1933) is doubtful (see remarks).

REMARKS

The present specimens agree closely with the description and figures of Stimpson (1858, 1907). Serène (1973) notes that the holotype can be presumed lost, destroyed with most of Stimpson's specimens in the Chicago fire of 1871. He mentions that a neotype should be erected and appears to suggest that the type of *Pilumnopeus maculatus* A. Milne Edwards, 1867, if it is in good condition, should be given that status. This would be inadvisable as although it almost certainly belongs to this species it would create a difficult situation if differences could be demonstrated. Further the Zanzibar locality is far removed from Hong Kong and recommended practise is to choose a specimen from as close as possible to the type locality. For this reason I have chosen not to erect a neotype at this time although this must be done as soon as a suitable specimen becomes available.

Comparing the figures of the first male pleopod (Sankarankutty, 1962, fig. 51; Serène, 1973, figs 3,4; present paper) it is apparent there is some variation in the degree of deflection and the length of the tip, and in the setation. These differences are slight however, and unlikely to be of significance.

Grant and McCulloch's (1906) errant record of *Actumnus nudus* was probably caused by the misnumbering of figures in de Man (1887) (see synonymy).

The record of Yokoya (1933) from a depth of 126 m in Tosa Bay, Japan must be considered as doubtful as all other records indicate this species to belong to the shallow subtidal or intertidal muddy shore.

Heteropanope longipedes sp. nov.
(Figs 3A–K,4)

Heteropanope glabra: Sakai, 1939, p. 545, pl. 99, fig. 6; 1976, p. 503, fig. 269. (non *Heteropanope glabra* Stimpson, 1858).

MATERIAL EXAMINED

HOLOTYPE: QM W5352, ♂ (22.6×15.0 mm), Moon Ck, Fraser Island, SEQ, 21.vii.1975, P. Davie and R. Timmins.

PARATYPES: QM W15656, 1 ♂ (12.8×9.0 mm), Susan River, Hervey Bay, SEQ, from mud and detritus in mangroves, 26.xii.1971, R. Timmins. QM W5356, ♀ (11.5×7.9 mm), northern tip of Stewart Island, Hervey Bay, in logs and on mud around mangroves, 6.vii.1975, P. Shanco. QM W8229, 1 ♂ (16.1×10.8 mm) 1 ♀ (11.9×8.3 mm), Murray River, north of Cardwell, NEQ. Mangrove covered island near mouth, log infauna, 14.x.1978, P. Davie. QM W8231, ♂ (16.0×11.3 mm), Murray River, north of Cardwell, NEQ, May 1978, R. Timmins. QM W8232, ♂ (13.7×9.5 mm), Murray River, north of Cardwell, NEQ, log infaunal, 19.v.1978, R. Timmins. NTM Cr 3710, 1 ♂ (12.4×8.7 mm), Creek 'H', East Arm, Darwin, Northern Territory, 4 m in mangrove creek, 31.x.1984, R. Hanley. NTM Cr 1700, ♂ (8.7×6.1 mm), juv. ♀ (6.4×4.7 mm), 12°34.2'S, 130°56.3'E, N.T., in mangroves at low water spring, 17.v.1984, J.R. Hanley. NTM Cr 3074, juv. ♀ (9.8×6.8 mm), Creek 'H', East Arm, Darwin Harbour, N.T., in mangroves at low water spring, 4.ii.1985, R. Hanley. NTM Cr 3713, 1 ♀ (7.9×5.6 mm) East Arm, Darwin, NT, Ck 'H', mangrove creek 4 m, 31.x.1984, R. Hanley.

DESCRIPTION

Carapace strongly convex front to back and from side to side across the branchial regions. Regions poorly defined with only the gastrocardiac grooves and the longitudinal median frontal groove which is bifid posteriorly around the anterior extension of 3M. Surface appearing smooth and glabrous but evenly microscopically

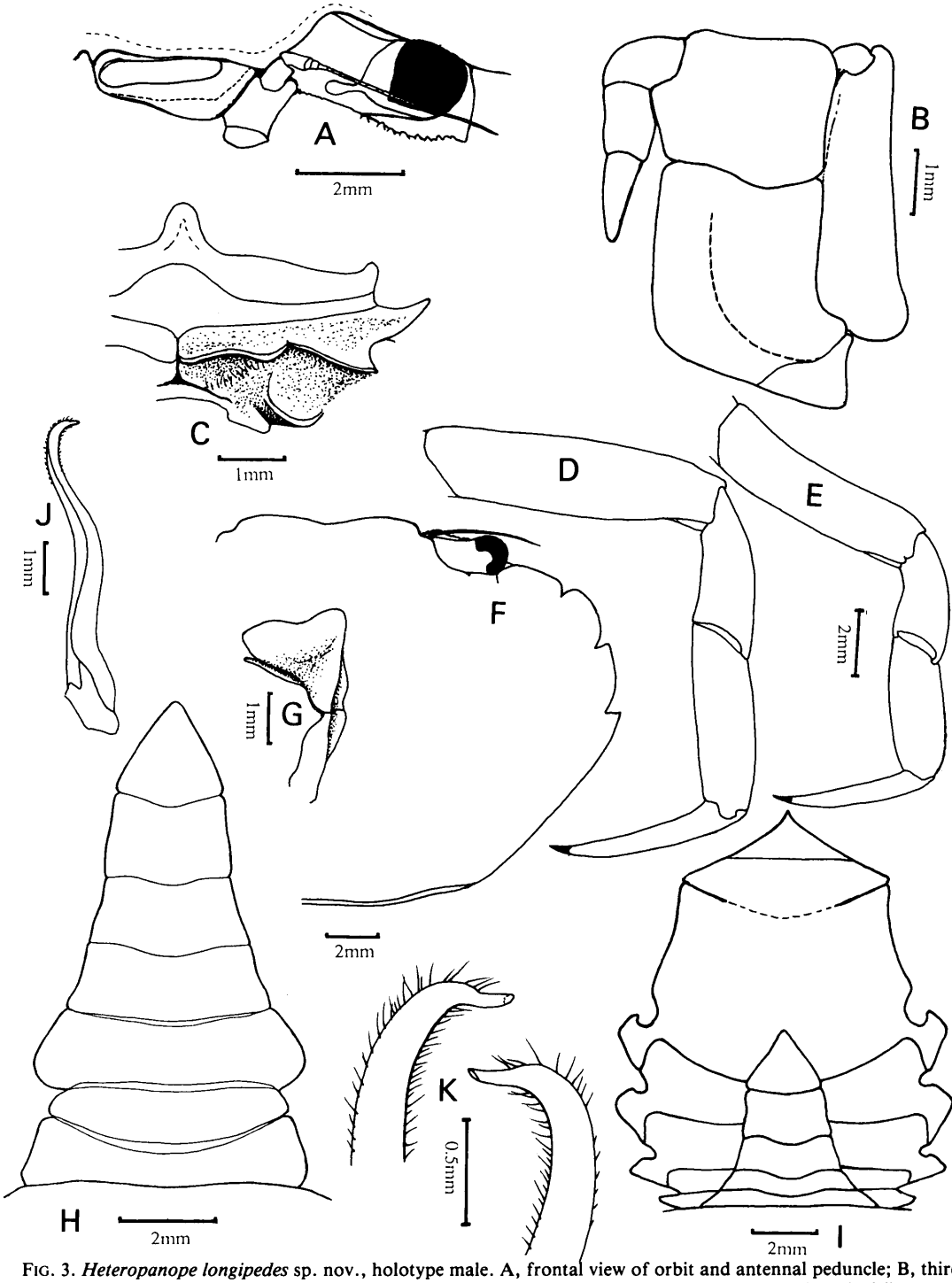

FIG. 3. *Heteropanope longipedes* sp. nov., holotype male. A, frontal view of orbit and antennal peduncle; B, third maxilliped; C, epistome; D, E, fourth and fifth legs respectively; F, carapace outline; G, endopod of first maxilliped; H, abdomen; I, sternum and abdomen in situ; J, first pleopod; K, abdominal and sternal views of tip of first pleopod.

granular; without any dorsal setation. The front is moderately produced with a broad shallow median emargination; no preorbital lobes; margin microscopically beaded. Supra-orbital border clearly separated from front by a rounded, obtuse, angle; vestiges of orbital fissures noticeable, one about mid-margin, the other about half-way to the external orbital edge. Infra-orbital margin relatively straight, without an inner lobe or tooth being developed and ending in a smooth sulcus laterally below the first anterolateral tooth; finely tuberculate on inner third becoming coarsely tuberculate on outer two- thirds before the sulcus.

Sub-hepatic and pterygostomial regions granulate and evenly covered in short close setae anteriorly, becoming abruptly long and shaggy posteriorly in a curving line from above the coxa of the cheliped to the anterior edge of the third anterolateral tooth.

Anterolateral margins cut into four teeth: the first a broad flat lobe confluent with the outer orbital margin; the second of similar size and rounded; the third also of similar size, bluntly pointed anteriorly, flat almost perpendicular margin; the fourth much smaller and subacute; greatest carapace breadth between the fourth anterolateral teeth.

Basal antennal joint broad, subquadrate; inner distal edge approaching but not touching the front, outer distal edge prolonged as a short rounded lobe into the orbital hiatus; antennal flagellum with free access to the orbit. Third maxilliped with merus much smaller than ischium (*c.* 0.6 times length); merus a little broader than long (*c.* 1.3 times); surface of both segments and exopod regularly covered in short setae, inner margin of ischium with a row of longer bristles; exopod reaching to anterior margin of merus and with a large rounded inner subdistal lobe.

Chelipeds very unequal. Major cheliped massive, merus trihedral, unarmed except for strong, blunt, subdistal lobe on upper posterior margin; lower margin rounded, upper anterior and posterior margins edged with long feathery setae; carpus with a blunt tooth medially on inner margin, otherwise rounded; palm swollen rounded, length (including fixed finger) about 1.8 times height; fingers bluntly pointed, length of dactyl about equal to superior margin of palm, fixed finger slightly deflexed, small gape, fingers armed with large molariform teeth. Smaller cheliped similar but palm more slender and teeth on fingers more triangular and cristate. Dark colouring on fingers confined to distal three-quarters of dactyl and about the distal half of the fixed finger.

Walking legs relatively slender, unarmed; first three pairs subequal in length, fourth pair the smallest; meri about 3.8–3.9 times longer than wide. Dactyli relatively long and slender, a little longer than the propodi and terminating in acute chitinous tips. Legs sparsely setose.

Male abdomen relatively narrow; first segment slightly wider than the third, second a little constricted; penultimate segment about two thirds as long as wide; telson triangular, sharply pointed, as long as broad at base. First male pleopod sinuous, with recurved, narrowed tip; a line of setae on upper and lower surfaces (as figured).

Habitat

Lives intertidally in muddy environments usually inside rotting logs or stumps, or in crevices in the substrate. Tolerates lower estuarine conditions. Habitat and distribution overlap with *H. glabra* Stimpson.

Distribution

Known from northern Australia from south-eastern Queensland to Darwin in the Northern Territory; and from Palau Is., east of the Philippines (Sakai, 1939, 1976).

Remarks

Heteropanope longipedes sp. nov. is most closely related to *H. glabra* Stimpson, from which it can be easily separated by the noticeably longer, more slender, relatively naked walking legs; the different shape of the anterolateral teeth, and in particular the third tooth which is longer and less protruding; and the structure of the first male pleopod.

H. longipedes differs from *Eurycarcinus natalensis* (Krauss, 1843) by the different shapes of the anterolateral angles and first male pleopod. It differs from both *Eurycarcinus integrifrons* (de Man, 1879) and *E. orientalis* A. Milne Edwards, 1868, by the longer more slender legs (particularly the slender propodi) which are almost naked. In particular it differs from *E. integrifrons* by having a strongly bilobed front (*E. integrifrons* has a straight front which may be slightly emarginate in the middle); and in the shape of the anterolateral teeth. De Man (1879) describes the last two teeth of *E. integrifrons* as being dentiform whereas only the last tooth of *H. longipedes* can be considered dentiform. De Man also describes them as 'projecting much less than in *Euryc. Grandidieri* or in *Euryc. Natalensis* Krauss'. This is shown in Nobili

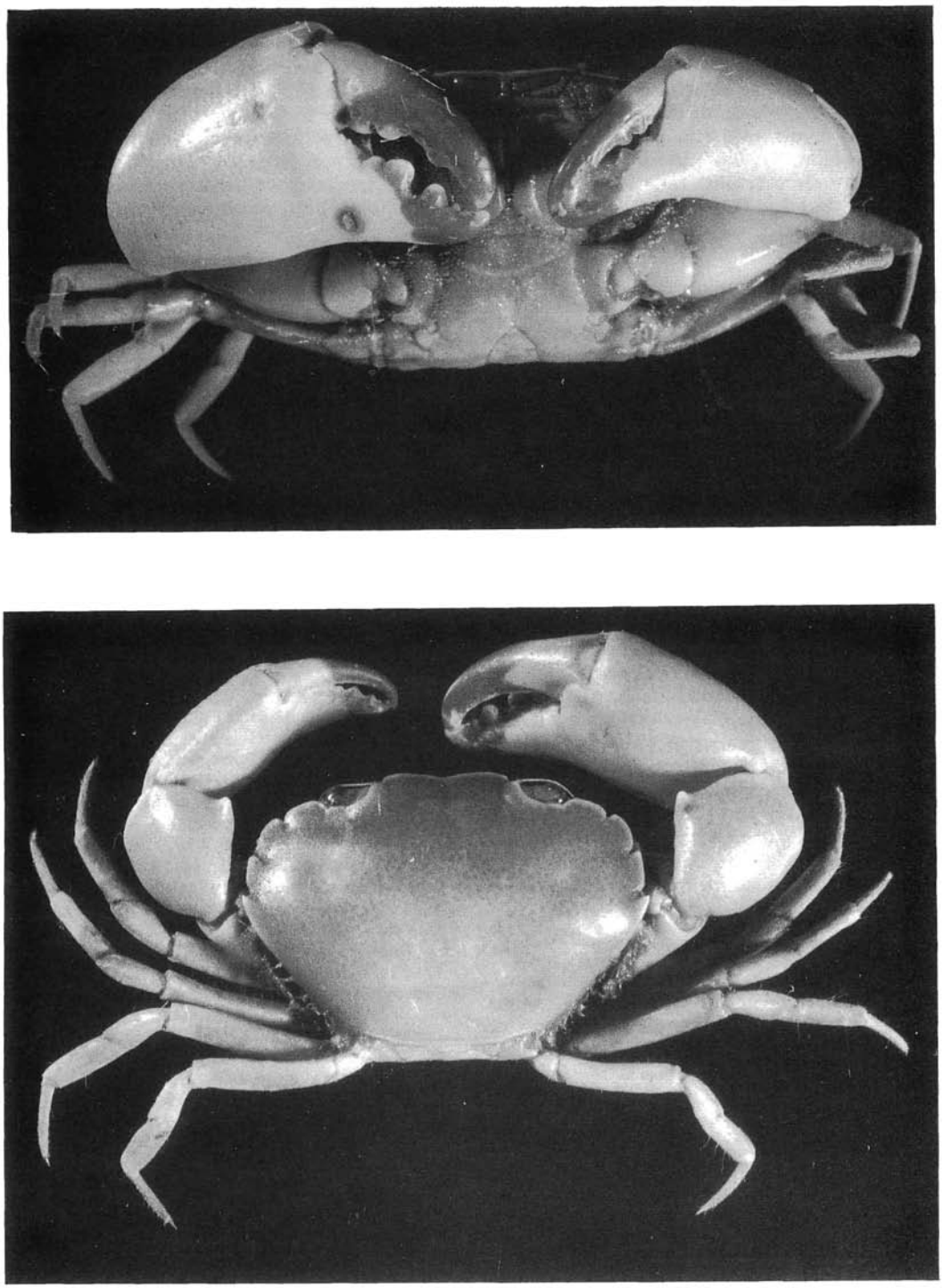

FIG. 4. *Heteropanope longipedes* sp. nov., holotype male. Scale line in mm.

(1906b, pl. xi, fig. 2) and in small specimens these teeth are apparently even less distinct (see discussion in Balss, 1938, p. 58).

In *E. orientalis* the anterolateral border is distinctly less than two-thirds the length of the posterolateral border, while in *H. longipedes* it is about two-thirds (*c.* 0.67) and in adult *E. orientalis* the length to breadth ratio is about 1.65 as opposed to *c.* 1.5 in *H. longipedes*.

Pilumnopeus A. Milne Edwards, 1863

Pilumnopeus A. Milne Edwards, 1863, p. 289; Balss, 1933, p. 33; Sakai, 1939, p. 542; Dell, 1968, pp. 18,19; Takeda and Miyake, 1969, pp. 120–21 (in part); Manning and Holthuis, 1981, p. 151.

Heteropanope (in part): de Man, 1887, p. 52; Alcock, 1898, p. 207.

Heteropanope (*Pilumnopeus*): Monod, 1956, p. 264.

DIAGNOSIS

Carapace rather convex fore and aft; dorsal surface marked, more or less, by hairy granular crests, and regions moderately defined. Front bilobed with each lobe more or less convex; a distinct lateral lobule defined, separate from the supra-orbital angle. Anterolateral margin cut into four teeth or lobes, which may be pointed but not spinous; first tooth a broad lobe confluent with the outer orbital angle. Sub-orbital margin with a very large tooth at inner end which is visible in dorsal view. Sternal plastron with the fused segments 3–4 relatively long such that the telson reaches noticeably less than half the distance towards suture 2/3; sternite 8 is visible laterally beside male abdomen. Male abdomen seven segmented; first male pleopod slender, sinuous with tip recurved.

REMARKS

No nominal species were included in this genus. Type-species: *Pilumnopeus crassimanus* A. Milne Edwards, 1867, a subjective junior synonym of *Ozius serratifrons* Kinahan, 1858, by subsequent designation by Balss, 1933 pp. 33, 34. Gender is masculine. Name 1643 on Official List, there dated 1867 in error.

Pilumnopeus is separated from *Heteropanope* by the characters discussed under that genus.

Included in *Pilumnopeus* are: *P. serratifrons* (Kinahan, 1858); *P. convexa* (Maccagno, 1936); *P. salomonensis* Ward 1942 (? = *P. convexa*); *P. granulata* Balss, 1933; *P. makiana* (Rathbun, 1929); *P. marginatus* (Stimpson, 1858); and tentatively *P. vauquelini* (Audouin, 1826), *P. sinensis* Balss, 1933, and the West African species *P. caparti* (Monod, 1956). Other species have been referred to *Benthopanope*.

The identity of *P. salomonensis* is in question. It is impossible to distinguish from *P. convexa* on the basis of Ward's short description and poor figure. The type, from the Desjardins Museum in Mauritius, was unavailable for examination in time to be included in this manuscript.

Pilumnopeus serratifrons (Kinahan, 1856) (Figs 5A–I,6)

Ozius (?) *serratifrons* Kinahan, 1856, p. 118, pl. 4, fig. 1.

Pilumnopeus crassimanus A. Milne Edwards, 1867, p. 278.

Pilumnopeus serratifrons: Miers, 1876, p. 20; Haswell, 1882, p. 70, pl. 2, fig. 1; Miers, 1884, p. 228; Filhol, 1885, p. 379; Fulton and Grant, 1906, p. 18; Chilton and Bennett, 1929, p. 749; Balss, 1933, p. 34; Richardson, 1949, p. 130; Dell, 1968, pp. 19–20; Takeda and Miyake, 1969, pp. 94, 120, 130; Griffin and Yaldwyn, 1971, pp. 56–7.

Sphaerozius (?) *serratifrons*: Miers, 1886, p. 144.

Heteropanope serratifrons: de Man, 1890, p. 56, pl. 3, fig. 2; Hale, 1927, p. 161, fig. 162.

MATERIAL EXAMINED

QM W15096, 4 ♂ (8.6×6.5, 20.0×14.8; 22.1×16.4; 27.6×20.2 mm), 2 ♀ (14.0×10.1; 17.6×12.7 mm), Cudgera Creek, Hastings Point, northern N.S.W., under oyster rocks, 15.v.1988, P. Davie. QM W1066, 1 juv. ♀ (7.0×5.3 mm) Stradbroke Is, N. of Myora, SEQ, mud and sand; University of Queensland Science Student Association, 16.vii.1939. QM W2319, 8 ♂ (16.2×12.4; 12.6×9.6 [with Sacculina]; 10.5×8.0; 10.0×7.2, 8.6×6.2, 7.9×6.0 [with Sacculina]; 7.7×5.7; 6.8×4.9 mm), 1 ♀ (6.5×4.9 mm), Dunwich, SEQ, from Sponge, F.C. Vohra. QM W2372, 2 ♂ (19.2×14.6; 18.2×14.0 mm), Dunwich, SEQ, Zostera, F.C. Vohra. QM W4753, 1 ♂ (14.1×10.9 mm) Coomera Is, near Southport, SEQ, R. Timmins (Aust. Litt. Soc.) 28.vii.1974. QM W5278, 1 ♀ (10.2×7.6 mm) Serpentine Ck, Cribb Is, SEQ, Campbell *et al.* 20.ix.1972. QM W5301, 1 ♀ (6.8×5.0 mm) Moon Ck, Fraser Is, SEQ, from log on bank of channel close to mouth, P. Davie, R. Timmins, 20.vii.1975. QM W5343, 1 ♀ (9.2×6.8 mm), Moon Ck, Fraser Is, SEQ, P. Davie, 21.vii.1975. QM W5347, 1 ovig. ♀ (11.1×8.1 mm), Eli Ck, Hervey Bay, SEQ, in rotting wood, below low water mark in channel, P. Davie, 26.vii.1975. QM W5401, 1 ♂ (4.2×3.0 mm), 4 ♀ (11.6×8.7; 7.5×5.5 ovig.; 7.2×5.3 ovig; 5.6×4.2 mm) Moon Ck, Fraser Is, SEQ, from wreck about 1 km from mouth, R. Timmins 20.vii.1975. QM W6422, 1 ♂ (11.0×8.3 mm), 1 ovig ♀ (10.9×7.8 mm), Bogimbah Ck, Fraser Is, SEQ, rotting log on mudflats in front of creek, P. Davie, 22.vii.1975. QM W6423, 1 ♂ (8.1×6.2 mm) 1

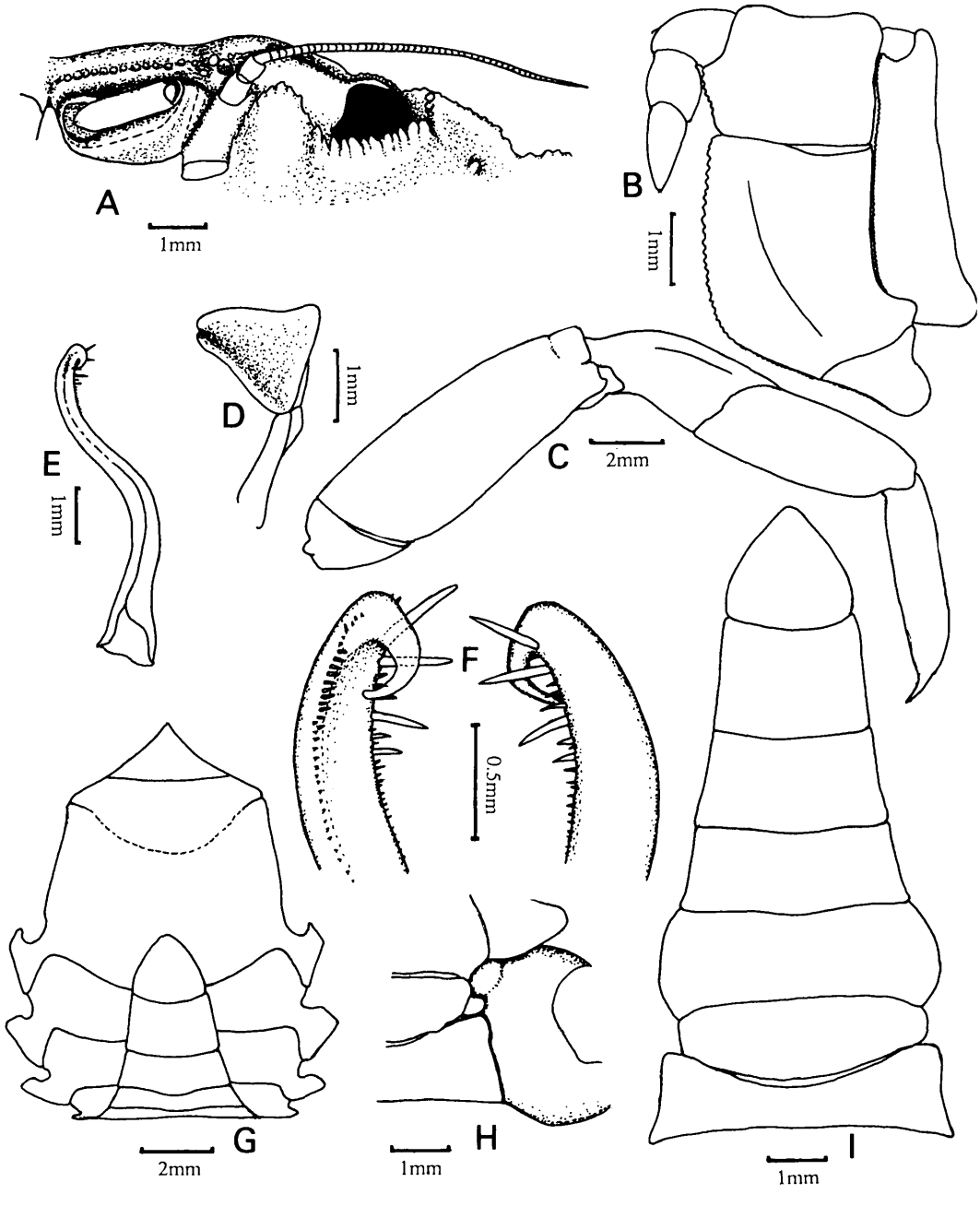

FIG. 5. *Pilumnopeus serratifrons* (Kinahan, 1856), QM W15096, A, D–I of male 20.0 mm c.b., B and C of male 22.1 mm c.b. A, frontal view of orbit and antennal peduncle; B, third maxilliped; C, fourth leg; D, endopod of first maxilliped; E, first pleopod; F, abdominal and sternal views of first pleopod; G, sternum and abdomen in situ; H, lateral view of abdomen and coxa of last leg showing sternite eight visible beside abdomen; I, abdomen.

ovig. ♀ (8.3×6.2 mm) Moon Ck, Fraser Is, SEQ, log infauna, R. Timmins 20.vii.1975. QM W15541, 1 ♀ (12.7×9.3 mm) Bulwer Is, Brisbane R., SEQ, under rocks on mud at low tide, coll. Short *et al.*, 12.vii.1988. QM W15547, 1 ♂ (9.8×6.0 mm) Boggy Ck, Myrtletown, SEQ, under rocks near low tide mark, Short *et al.*, 12.vii.1988. QM W15576, 1 ♀ (22.7×17.1 mm) Melbourne, Vic., C. Noone, 12.ii.1982.

DESCRIPTION

Carapace wider than long (*c.* 1.3–1.4 times), convex along the mid-line, particularly in the frontal third, and moderately convex from side to side across the branchial regions. Regions moderately well defined with short granular, hairy, crests on frontal and epigastric regions, and longer ones on protogastric and epibranchial regions; gastro-cardiac grooves distinct. 3M distinguishable although not strongly defined; a medial furrow joins 3M to frontal margin. Dorsal surface with small rounded granules laterally, which vary in extent of cover between specimens, but usually most obvious behind the epibranchial teeth and posterolaterally. Frontal margin sharply granular, prominently projecting, deeply declivous, borders oblique, receding to strong, lateral pre-orbital spines. Supra-orbital margin elevated, evenly concave, separated from pre-orbital spine by a broad shoulder; lined by rounded granules; median and lateral fissures vestigial but more-or-less obvious; outer orbital angle confluent with first anterolateral tooth. Sub-orbital margin with coarse pointed granules; distinct narrow lateral sulcus; internally with very strongly developed, tuberculate lobe, clearly visible dorsally. Sub-hepatic and pterygostomial regions granular, thickly covered in long feathered setae adjacent to merus of cheliped and below anterolateral margins; a strong, prominent sub-hepatic tubercle present below the margin of the first anterolateral tooth and slightly below the level of the lateral suborbital notch.

Anterolateral margin granular, a little shorter than posterolateral, cut into four teeth: the first confluent with the outer orbital angle; the second, the largest, forwardly directed and bluntly rounded; the third similar, but smaller and acute; the fourth much smaller and also acute. Greatest carapace breadth between the fourth anterolateral teeth. Posterolateral margins oblique, straight and becoming thickly covered in feathered setae posteriorly

Basal antennal joint sub-rectangular, inner distal angle just touching front; outer distal edge produced as a thin lobe into the orbital hiatus (sometimes this prolongation is more-or-less hidden behind the tubercles of the large inner orbital lobe); antennal flagellum with free access to the orbit. Third maxilliped with merus much smaller than ischium (*c.* 0.55 times length); merus a little broader than long (*c.* 1.3 times), outer distal margin slightly expanded, rounded, anterior and outer lateral margins slightly concave; ischium with oblique longitudinal depression; internal margins of both segments with a series of large rounded granules hidden by a row of stout bristles, outer surface smooth or microscopically granular and with short scattered setae; exopod does not quite reach to anterior margin of merus, with large rounded triangular subdistal tooth on inner margin, internal edge adjacent to merus and ischium with a line of granules.

Chelipeds unequal, massive. Major cheliped with merus short, trihedral, armed with a strong, acute subdistal spine on upper posterior margin; lower margin rounded; upper anterior and posterior margins granulate and with long feathered setae which also extend onto the upper half of the posterior face. Carpus with strong acute tooth on inner margin, with an oblique downwardly directed crest proximal to it which usually terminates in a sharp tubercle; the main tooth has a low granular crest running behind it back to the articulation, which defines a downturned, oblong facet internally; upper surface slightly uneven with some microscopically granular patches distally and posteriorly. Palm swollen, in larger specimens the surface is microscopically granular, slightly coarser towards superior and proximal margins, but this is variable, and on smaller specimens particularly, the granulation may be quite coarse; superior margin rounded; length (including fixed finger) about 1.6–1.7 times height; fingers bluntly pointed, both armed with 2–3 large molariform teeth, dactyl short, about equal to length of superior margin of palm, closes behind tip of fixed finger; fixed finger slightly deflexed; fingers are both coloured entirely dark brown, and colour does not extend onto palm. Smaller cheliped less massive; fingers longer, more sharply pointed and of the same length; armed with about four teeth which are relatively small, and cristiform.

Walking legs of moderate length, unarmed; second and third pairs subequal in length and slightly longer than first pair; merus of third walking leg about 2.8 times as long as wide, dactylus slightly longer than propodus, terminating in an acute chitinous tip. All legs fringed with long feathered setae, extending onto upper face of the propodus, and dactylus covered in a short thick tomentum from which chitinous claw protrudes.

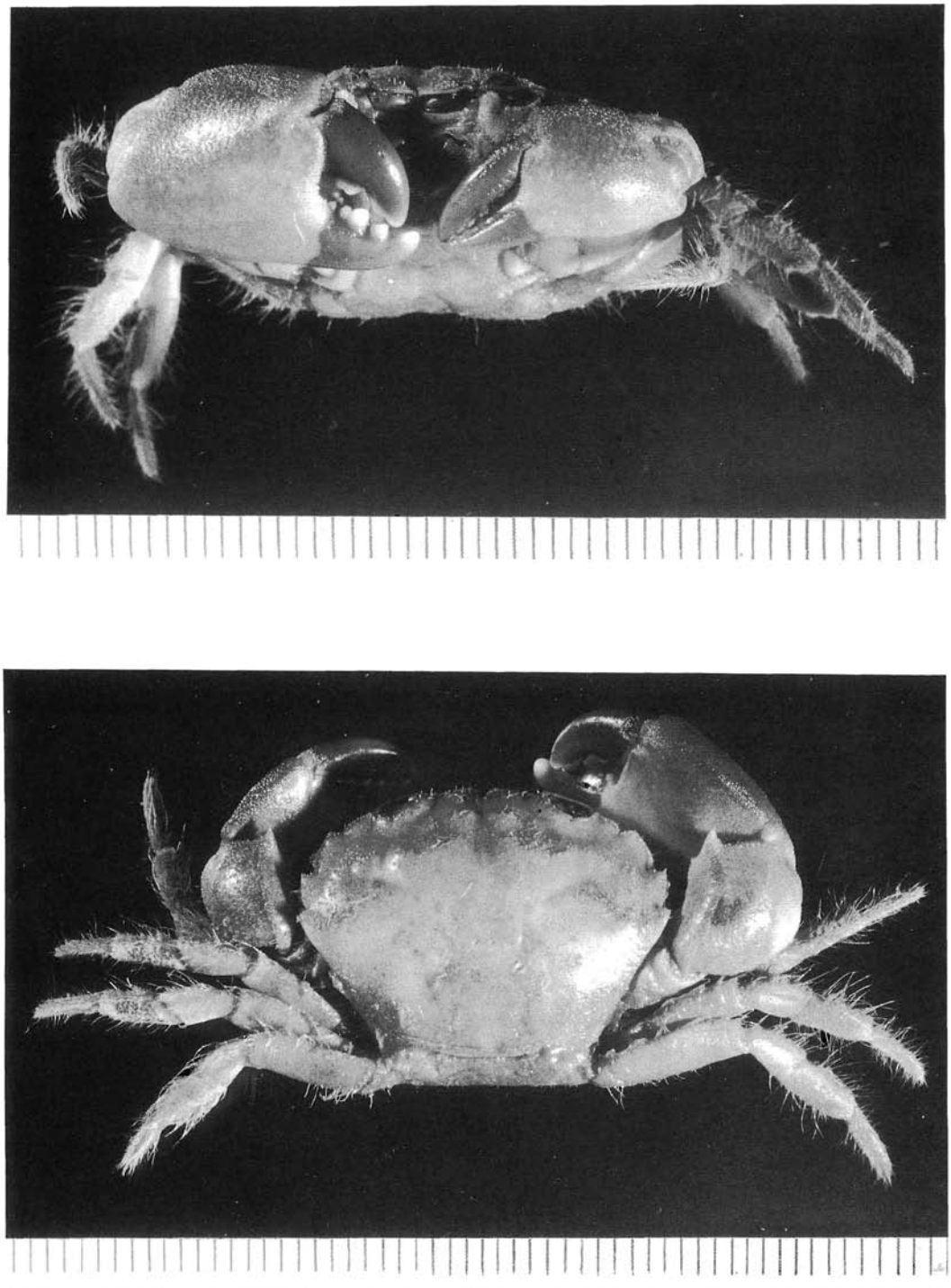

FIG. 6. *Pilumnopeus serratifrons* (Kinahan, 1856). Male, QM W15096 from Cudgera Creek, Hastings Point, northern NSW. Scale line in mm.

Male abdomen relatively narrow: first and third segments subequal in width and wider than other segments; second segment constricted but wider than segments 4–7; segments 4–7 become progressively longer, telson rounded triangular, with length about equal to width at base. Sternite eight is just visible beside the second abdominal segment although not prominent, usually being almost hidden by fringing hairs on abdomen. First male pleopod markedly sinuous, tip strongly recurved and thin; several very large, stout setae along the inside edge near the tip.

HABITAT

Usually found in the lower estuary or on sandy mud flats, living under stones and debris resting on the substrate, from about half tide level to low water.

DISTRIBUTION

Temperate to sub-tropical Australia from South Australia around to about Fraser Island in southern Queensland; and in New Zealand.

REMARKS

This is a distinctive and common Australian species. Larval development has been described by both Wear (1968) and Greenwood and Fielder (1984a).

Pilumnopeus convexa (Maccagno, 1936)
(Fig. 7A–C)

Heteropanope convexa Maccagno, 1936, pp. 176–7.

(?) *Pilumnopeus indica*: Barnard, 1955, pp. 30, 31, fig. 12 (not *Pilumnopeus indica* (de Man, 1887)).

MATERIAL EXAMINED

LECTOTYPE: 1 ♀ (8.0×5.3 mm), Aseb (= Assab), Ethiopia, collected by Barone Raimondo Franchetti Exped., 1928–1929. Specimen housed in the Museo Civico di Storia Naturale "Giacomo Doria", Genova.

DESCRIPTION

Unfortunately the specimen has been subjected to dehydration so surface detail is difficult to accurately appreciate.

Carapace strongly convex anteriorly and from side to side across the branchial regions. Regions moderately well indicated, with the inner orbital regions being strongly elevated. Surface is finely granular across the front, laterally behind the anterolateral teeth, and to a slight extent posterolaterally. Sparse rows of plumose setae are evident across the frontal regions on the edge of the orbit, on the lateral branchial regions at about the level of 2L–3L, medially towards the level of the anterior margin of 2M, around the base of the last anterolateral tooth, and running along the slightly raised and curved epibranchial ridge; and thicker postero-laterally and across the posterior margin.

The front is slightly produced and cut into two oblique lobes by a broad shallow V-shaped notch; laterally with small but clearly defined pre-orbital lobes; margin is smooth or microscopically granular. The supra-orbital border is clearly separated from the front by a small sinus; traces

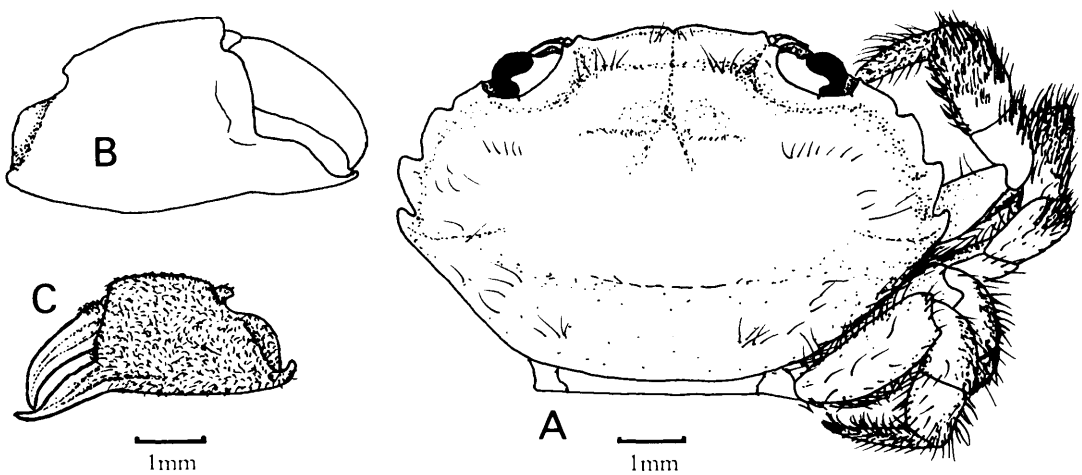

FIG. 7. *Pilumnopeus convexa* (Maccagno, 1936), lectotype female. A, dorsal view of carapace and walking legs; B, C, major and minor chelae.

of two notches are evident on the outer half; regularly curved. Both supra- and infra-orbital borders microscopically granular although slightly more prominent on the infra-orbital border. Infra-orbital margin with a deep notch laterally and with a broad rounded lobe at the inner angle which is visible dorsally.

The anterolateral border is armed with four teeth; the first is low, broad, sinuous, and confluent with the external orbital angle; the second to fourth are all directed forwards; the second is broad with the outer margin convex, the third of similar form but narrower and more acute, the fourth is a more regular blunt spine. The sub-hepatic region has a blunt protruberance below the first anterolateral tooth; and is regularly covered in short setae.

Third maxilliped covered in short setae. Merus shorter than ischium; sub-quadrate, and expanded at the antero-external angle.

Chelipeds unequal. Merus short, trihedral, unarmed except for short subdistal spine on posterior margin. Carpus coarsely granulated on the outer surface and, on the lectotype female, with inner angle acute rather than spinous; a broad groove present parallel to the distal margin. The larger palm is stout and granulated both on the upper surface, and proximally around the articulation with the carpus; fingers pointed and with sharp cutting margins; immovable finger down-turned and about a half as long as the lower border of the palm. Smaller palm of similar overall appearance except more slender and, with the exception of the fingers, evenly covered in short setae.

Ambulatory legs are comparatively short and stout; the length of the merus of the fourth pair *c.* 0.29 times the breadth of carapace and about 2.6 times longer than wide. All are thickly covered with short plumose or simple setae, especially the propodus and dactylus.

DISTRIBUTION

Aseb, southern Red Sea (type locality); and questionably from Durban Bay, South Africa (Barnard (1955) as *Pilumnopeus indica*.

REMARKS

This species has not been recorded since its description. As a holotype was not designated originally, the female examined above is designated the lectotype.

Unfortunately the present specimen has suffered a period of dessication and although it has been returned to a wet state, fine wrinkling obscures some of the surface detail (such as fine granulation) and the hairs have become clumped which makes it difficult to appreciate their fresh appearance. Also the regions seem to be somewhat more accented than they would probably be in fresh specimens.

This species is very closely related to *P. serratifrons* from which is differs by the length/breadth ratio (1.47–1.51 as opposed to 1.34–1.38) and the less projecting front with a shallower central notch. The disposition of setae on the carapace and legs is very similar in both species although *P. convexa* has a good coverage of short setae on the minor chela (at least on the lectotype female).

Takeda and Miyake (1969) have already indicated that Barnard's (1955) record of *Pilumnopeus indica* from South Africa was erroneus. They suggested that its true identity may be *P. salomonensis* Ward. *P. salomonensis* is very poorly known and may well itself be a junior synonym of *P. convexa*. The type of *P. salomonensis* was requested from the Desjardins Museum, Mauritius, but it was unavailable as it was already on loan. Ng (in litt.) has examined the type of *P. salomonensis* and is of the opinion that the two species should remain separate until a greater range of specimens has been examined. There appear to be some differences in the larger chela but these may prove to be size related.

Barnards' (1955) figure of the dorsal surface of his '*Pilumnopeus indica*' is almost identical to the lectotype of *P. convexa*, and the length/breadth ratios are also very similar (1.47–1.50 in his specimens, 1.51 in the lectotype of *P. convexa*). The major chela agrees with his description of the granulation i.e. upper surface and on outer surface near wrist. The palm of the minor chela of the female lectotype is covered in short setae but this has not been figured or described by Barnard. Setation could be variable depending on size and sex.

Benthopanope gen. nov.

DIAGNOSIS

Carapace convex in the mid-line; regions strongly defined by granular dorsal crests; gastro-cardiac grooves clearly indicated; more or less finely granular. Frontal margin protruding with prominent median lobes, more or less sinuous laterally with distinct lateral lobules. Anterolateral margin cut into four or sometimes five teeth (the first lobe may develop a secondary tooth separate from the outer orbital angle). Sub-orbital margin with a large triangular tooth at the inner

end which is visible in dorsal view. Sternal plastron with the fused segments 3–4 relatively short and broad such that the telson reaches much more than half the distance towards suture 2/3; sternite 8 is clearly visible laterally beside the male abdomen. Male abdomen seven segmented; first male pleopod slender, sinuous, with tip recurved.

REMARKS

Type-species is *Benthopanope estuarius* sp. nov.; gender is feminine. Species I believe should be included, besides the type-species, are: *B. sexangula* (Rathbun, 1909); *B. eucratoides* (Stimpson, 1858); *B. indica* (de Man, 1887); *B. pharaonica* (Nobili, 1906); and the West African species *B. africanus* (de Man, 1902). Of these however all except *B. sexangula* still await critical examination.

Benthopanope differs markedly from *Heteropanope* and *Pilumnopeus* by the strong regional definition on the carapace and the unusual shape of the sternal plastron in having sternites 3–4 relatively much shorter and broader. It differs in particular from *Heteropanope* by having sternite 8 visible laterally beside the male abdomen.

Benthopanope estuarius sp. nov.
(Figs 8A–K,9)

Heteropanope sexangula: Rathbun, 1924, pp. 21–22. (Not *Heteropanope sexangula* Rathbun, 1909).

MATERIAL EXAMINED

HOLOTYPE: QM W15587, ♂ (18.5 × 14.0 mm), Calliope R., SEQ, 14.i.1977, P. Saenger.

PARATYPES: QM W13196, 4 ♂ (15.0 × 11.4; 17.2 × 12.9; 19.4 × 14.8; 20.2 × 15.2 mm), 1 ovig. ♀ (11.8 × 8.6 mm), Embley River, 1 mile upstream of junction with Hay River, Gulf of Carpentaria, Beam trawled, 13 p.p.t. salinity, 4.iii.1987, T. Wassenburg. QM W 6844, ♂ (6.8 × 5.3 mm), Lower Anabranch, Calliope River, Port Curtis, edge of channel, Aug. 1976, P. Saenger. QM W6845, ♂ (4.8 × 3.8 mm), Lower Anabranch, Calliope River, Port Curtis, mid-channel, Aug. 1976, P. Saenger. QM W6843, ♂ (4.7 × 3.7 mm), imm. ♀ (4.6 × 3.5 mm), 5 km from Alexandra Inlet mouth, edge of channel, Port Curtis, Aug. 1976, P. Saenger. QM W6822, imm. ♀ (4.6 × 3.6 mm), Lower Anabranch, Calliope River, Port Curtis, May 1976, P. Saenger. QM W15657, ♂ (10.6 × 8.1 mm), under coral rubble on sandflat, south of mouth of Stewart River, Port Stewart, NEQ, 7.xi.1982, P. Davie. QM W15044, ♂ (10.1 × 7.7 mm), ovig. ♀ (9.5 × 7.1 mm), Rocky Point, Weipa, under rocks on muddy sand above M.T.L., 29.v.1973, B. Campbell. QM W13109, ♂ (15.2 × 11.3 mm), ovig. ♀ (11.1 × 8.0 mm), Murray River, north of Cardwell, NEQ, 19.v.1978, P. Davie. QM W13108, imm. ♀ (13.9 × 9.9 mm), Murray River, north of Cardwell, NEQ, 21.v.1978, R. Timmins. NTM Cr 3049, juv. (3.9 × 2.9 mm), Adelaide River, mouth, N.T., 5–8 m, shell grit, pebbles, silt, dredge sample, 21.v.1985, R. Hanley. NTM Cr 1291, ovig. ♀ (9.7 × 7.2 mm), Northern Territory, N.T. Fisheries. NTM Cr 3589, ♂ (16.9 × 12.8 mm), Barrow Bay, Pt Essington, N.T., mudflat, L.W.S., 18.ix.1985, R. Hanley. NTM Cr 6523, ovig. ♀ (8.3 × 6.2 mm), West side of Barrow Bay, Port Essington, N.T., mudflat in front of mangrove on west side of Bay, L.W.S., R. Hanley *et al.*, 18.ix.1985. NTM Cr 6524, ovig. ♀ (12.3 × 8.9 mm), West Bay, Port Essington, in mud on mudflat in front of mangroves, M.L.W., R. Hanley *et al.* 14.ix.1985. NTM Cr6525, ♂ (15.8 × 11.9 mm), Gove, N.T., Weed zone, 20.iv.1972, N.T. Fisheries Service.

DESCRIPTION

Carapace convex along the mid-line, almost flat from side to side across the branchial regions but depressed laterally before the upturned anterolateral teeth; approx. 1.3 times broader than long in adults (1.32 in the holotype, 1.26–1.37 in paratypes). Regions strongly defined by granular dorsal crests; transverse on frontal, epigastric and protogastric regions; obliquely curved hepatic; curved anterior branchial; slightly divergent longitudinal crests on the posterior branchial regions forming the outer borders of lateral, flat, oblong areas. The gastro-cervical and cardiac grooves are clearly indicated and the region 3M and the cardiac region are clearly defined. Dorsal surface finely granular. Frontal margin protruding with prominent, narrow, rounded central lobes, laterally becoming flat or slightly sinous, before the small rounded outer lobes; clearly separated from supra-orbital border by a rounded obtuse angle. Supra-orbital border with clearly defined vestigial fissures, in the form of sulci, one medially and one laterally before the prominent outer orbital angle. Infra-orbital border with small but distinct sulcus laterally; and with very strong triangular lobe on inner half which is clearly visible in dorsal view. Sub-hepatic and pterygostomial regions granular, longer setae adjacent merus of cheliped and along groove separating sub-hepatic region and pterygostome.

Anterolateral margins cut into five teeth including the external orbital angle: the second, the smallest, a small evenly rounded lobe confluent with but clearly separated from the external orbital angle; the third a large, forwardly directed flat lobe; the fourth smaller, rounded; the fifth about the same size as the second but more pointed and swollen dorsally; sometimes a raised granulate crest is present on the posterolateral margin just behind the last anterolateral tooth. Greatest

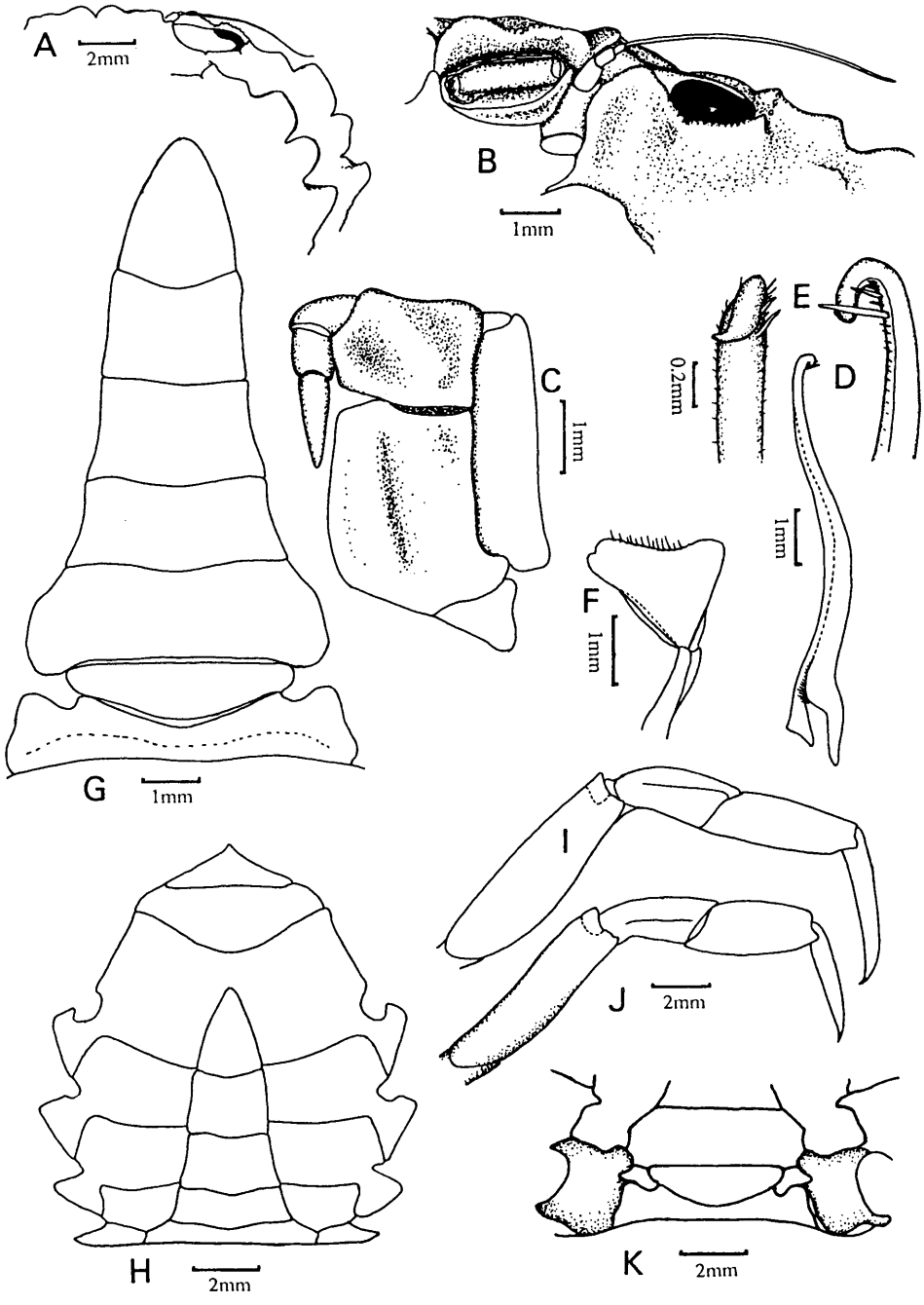

FIG. 8. *Benthopanope estuarius* sp. nov., A, G, holotype male, B–F, H–K, paratype male (QM W13196). A, outline of frontal and anterolateral border, and secondary outline of anterolateral border of male paratype; B, frontal view of orbit and antennal peduncle; C, third maxilliped; D, first pleopod; E, tip of first pleopod; F, endopod of first maxilliped; G, abdomen; H, sternum and male abdomen *in situ*; I, J, fourth and fifth legs respectively; K, first three segments of abdomen and coxae of last pair of legs, showing sternite eight visible laterally beside abdomen.

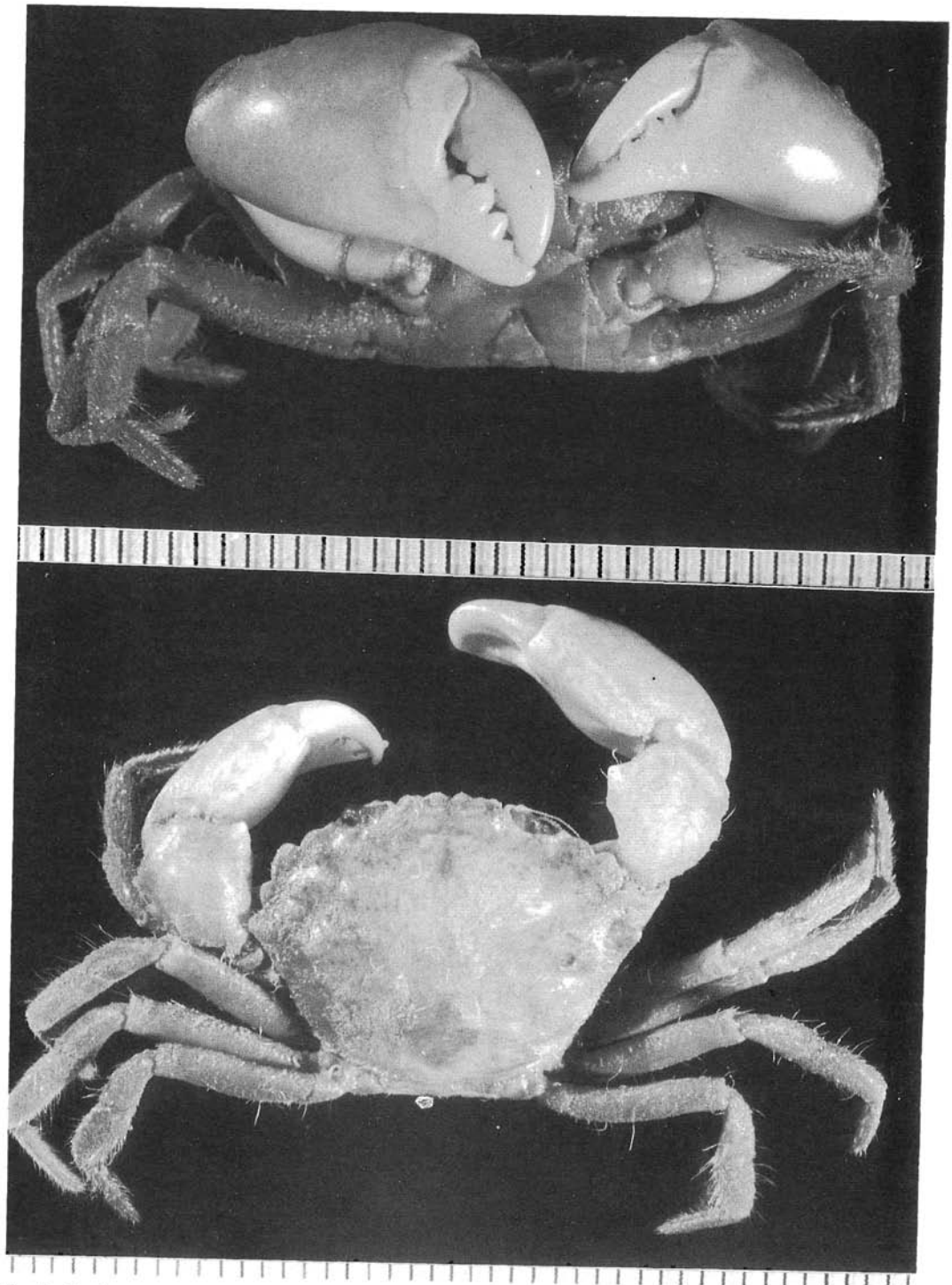

FIG. 9. *Benthopanope estuarius* sp. nov., holotype male. Scale in mm.

carapace breadth between the last anterolateral teeth.

Basal antennal joint sub-rectangular, inner distal angle clearly separated from the front; outer distal edge prolonged a short distance into the orbital hiatus; antennal flagellum with free access to the orbit. Third maxilliped with merus much smaller than ischium (*c.* 0.55 times length); merus a little broader than long (*c.* 1.3 times), slightly expanded at outer distal angle, and slightly concave on anterior margin; ischium with a deep slightly oblique longitudinal groove; surface of both segments granulate, with only a few scattered setae, inner margin of ischium with a row of longer bristles; exopod does not quite reach to anterior margin of merus, with large triangular subdistal tooth on inner margin.

Chelipeds unequal, robust. Major cheliped with merus short, trihedral, armed with strong, subdistal tooth on upper posterior margin; lower margin rounded, upper anterior and posterior margins granulate; carpus with a small blunt tooth medially on inner margin with a downwardly directed rounded crest proximal to it, otherwise with dorsal surface made uneven by about seven low granular elevations which almost become low carinae on the outer margin; palm swollen, relatively smooth, superior margin with poorly defined granulate crest proximally, rounded distally, length (including fixed finger), about 1.75 times height, fingers pointed, length of dactyl about 1.3 times length of superior margin of palm, fixed finger slightly deflexed armed with several large blunt teeth proximally, dactyl with comparatively much smaller rounded teeth proximally. Smaller cheliped of similar form but less robust and with the fingers more strongly deflexed. Dactyl (except for some darkening proximally) and the distal two thirds of the fixed finger, entirely white.

In smaller specimens the chelae are not always smooth, being variably granular, and sometimes with the granules covering the whole outer surface except for the area behind the gape, and the fingers, although the granules can extend in a line along most of the fixed finger.

Walking legs of moderate length, unarmed, second pair the longest; merus of third walking leg about 3.4 times as long as wide; datcyli about the same length as propodi and terminate in acute chitinous tips. Legs covered in a short tomentum, longer on propodus and dactylus.

Male abdomen relatively narrow: first segment the widest; second segment constricted; third segment nearly as wide as first, small median concavity on lateral margins; fourth segment about the same length but much narrower; fifth and sixth segments progressively longer and narrower; telson very elongated and triangular (*c.* 1.4 times longer than broad at base). Sternite eight is clearly visible adjacent to the second segment of the abdomen. First male pleopod long, thin, and sinuous with the tip very thin and completely curled back on itself; several stout bristles at base of distal curve.

HABITAT

Estuarine sub-tidal muddy bottoms; shell grit, pebbles and silt bottom; under coral rubble on sandflat; under rocks on muddy sand; mudflat. Found in salinities from 13 p.p.t. to full seawater.

DISTRIBUTION

From Port Curtis, SE Queensland around northern Australia to Broome in the northwest.

REMARKS

B. estuarius sp. nov. is most closely allied to *B. sexangula* (Rathbun, 1909) and *B. eucratoides* (Stimpson, 1858). It is readily separable from these species because: the anterolateral margin is cut into five teeth rather than four (the crest behind the external orbital angle has developed a supplementary tooth); the second last anterolateral tooth is much longer, broader, and more prominent; the front is more prominent and sinuous; and there is a subhepatic tubercle developed.

Benthopanope sexangula (Rathbun, 1909) (Fig. 10A–H)

Heteropanope sexangula Rathbun, 1909, p. 114; 1910, p.358, pl. 2, fig. 6, text. fig. 43.

Non *Heteropanope sexangula*: Rathbun, 1924, pp. 21–22 (= *B. estuarius* sp. nov.).

Pilumnopeus sexangulus: Balss, 1933, pp. 33, 34; Takeda and Miyake, 1969, p. 120.

(?) *Pilumnopeus eucratoides*: Balss, 1938, p. 59 (not *P. eucratoides* Stimpson, 1858).

MATERIAL EXAMINED

HOLOTYPE: ♀ (7.0×5.2 mm), Gulf of Siam, Th. Mortensen, in the collections of the Zoologisk Museum, University of Copenhagen, Denmark.

OTHER: QM W14827, ♂ (9.8×7.4 mm), end of Lim Chu Kang Rd, northwestern Singapore, in fouling on rocks, 6.ix.1987, P. Davie and P. Ng.

DESCRIPTION OF HOLOTYPE

Carapace wider than long (1.35 times), convex along the mid-line, flat from side to side across the

branchial regions but depressed laterally before the anterolateral teeth giving a plateau-like appearance. Regions moderately well indicated; transverse granular crests on frontal, epigastric and protogastric regions; a short oblique crest on the anterior branchial region, longitudinal crests laterally on the postero-branchial regions; gastro-cardiac and cervical grooves clearly indicated and the 3M and cardiac regions are defined. Dorsal surface microscopically granular. Frontal margin moderately protruding, with slightly more prominent, small median lobes, bluntly rounded laterally; separated from the orbit by a strong shoulder. Supra-orbital margins with median and lateral vestigial fissures; finely granular; outer orbital angle strongly produced. Infra-orbital border without a strong lateral sulcus, being merely deeply angled; vestigial fissure is apparent; broad, bluntly rounded triangular lobe on inner half visible dorsally. Sub-hepatic and pterygosto-

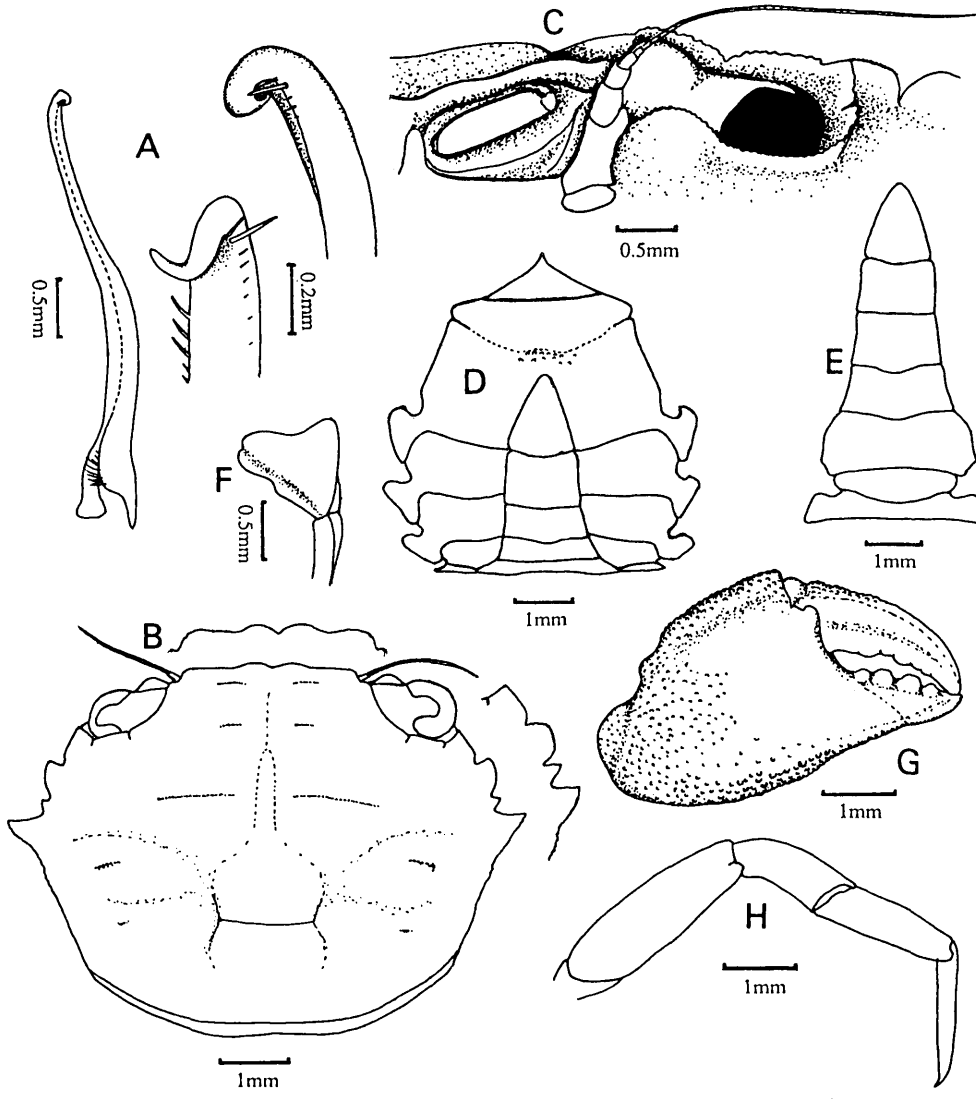

FIG. 10. *Benthopanope sexangula* (Rathbun, 1909). A, C–F of male (QM W14827) from Singapore; B, G, H, of holotype female. A, first pleopod; B, dorsal view of carapace, and secondary outline of front and right anterolateral border of male from Singapore; C, frontal view of orbit and antennal peduncle; D, sternum and abdomen in situ; E, male abdomen; F, endopod of first maxilliped; G, right chela; H, fourth leg (denuded).

mial regions granular and covered with short setae; longer feathered setae adjacent merus of chelipeds.

Anterolateral margins much shorter than posterolateral, divided into four teeth including the external orbital angle: the first and second are subequal in size, forwardly directed; the third is minute but clearly defined; the fourth, the longest, is a broad, acute, laterally directed spine, and is at a level slightly above the other three teeth.

Basal antennal joint sub-rectangular; inner distal angle clearly separated from the front; outer distal edge prolonged as a rounded lobe into the orbital hiatus; antennal flagellum with clear access to the orbit. Third maxilliped with merus much smaller than ischium (*c.* 0.55 times length); merus broader than long (*c.* 1.45 times), outer distal angle broadly rounded, anterior margin very slightly concave, almost straight; ischium with a deep slightly oblique longitudinal groove; exopod does not quite reach anterior margin of merus, with large triangular subdistal tooth on inner margin.

Chelipeds unequal, robust. Major cheliped with merus, short, trihedral, armed with strong, subdistal tooth on upper posterior margin; all margins granulate; carpus with a small blunt tooth medially on inner margin, upper surface with 6–7 small elevated granular patches; palm swollen, distinctly granular along upper and lower margins, extending for about proximal half of fingers, and across proximal half of outer face, length (including fixed finger) about 1.75 times height, fingers pointed, length of dactyl about 1.6 times length of superior margin of palm, both fingers armed with 3–4 larger, bluntly rounded teeth. Smaller cheliped of similar form but less robust and a little more coarsely granular; cutting margins of fingers much sharper and more cristate. Fingers of the preserved specimen are not particularly darkened but may have been a pale brown in life.

Walking legs of moderate length, unarmed, second pair the longest; merus of third walking leg about 3.3 times as long as wide; dactylus a little longer than propodus and terminating in an acute chitinous tip. Legs fringed with short setae, longer on the margins of the propodi and dactyli.

HABITAT

In fouling on rocks and wood.

DISTRIBUTION

Gulf of Siam (Rathbun 1909); Singapore (present study).

REMARKS

It is possible that *B. sexangula* may prove to be

TABLE 1. Major differences between the larvae of *Heteropanope glabra, Pilumnopeus serratifrons, Benthopanope indica* and *B. eucratoides*. Information from Greenwood and Fielder (1984a,b) and Lim, Ng and Tan (1984, 1986).

Heteropanope glabra	• Lateral carapace spines large • Rostrum large in all stages • Third abdominal segment with lateral papillae • Four zoeal stages
Pilumnopeus serratifrons	• Lateral carapace spines relatively small • Rostrum is very tiny in the first zoea and shorter than antennal processes in later stages • Third abdominal segment with lateral papillae • Three zoeal stages
Benthopanope indica	• Lateral carapace spines lacking on at least the first zoea • Rostrum not evident • Third abdominal segment lacks lateral papillae • Number of zoeal stages not known
Benthopanope eucratoides (? = *B. sexangula*)	• Lateral carapace spines absent • Rostrum small • Third abdominal segment lacks lateral papillae • Three zoeal stages

a synonym of *B. eucratoides* Stimpson. Rathbun (1909,1910) separated the two species on the following characters: *eucratoides* was described as having a smooth carpus on the cheliped, whereas *sexangula* has raised granular patches; *eucratoides* has smooth sub-hepatic and sub-branchial regions whereas in *sexangula* these are granular (in her 1924 paper Rathbun further said that *sexangula* had a sub-hepatic tubercle but this is not present on her type, and is true only of specimens of *B. estuarius* sp. nov. which she confused with *sexangula*); *eucratoides* has smooth chelae whereas on *sexangula* they are granular; in *eucratoides* the external orbital hiatus is obsolete whereas in *sexangula* it is defined.

The value of most of these characters is arguable although the first, the smooth versus granular carpus on the cheliped, does seem to be a strong character. The raised granular patches are clearly evident on the small type female and on the larger male from Singapore, and are present on all of the specimens of *B. estuarius*, so it does not appear to be a character subject to much variation. The degree of granulation of the chelipeds otherwise seems variable from smooth to quite coarse and is considered of little use. The male specimen from Singapore has a less clearly defined external orbital hiatus than the type, but this is a matter of degree only. The type material of *B. eucratoides* was apparently destroyed in the great Chicago fire of October 1871 (Manning, *in litt.*; Evans, 1967) and therefore fresh material needs to be collected from the type-locality (Hong Kong) and a neotype erected before the problem of the synonymy of *eucratoides* and *sexangula* can be resolved. Until that time it is advisable to maintain *B. sexangula* as a separate species.

LARVAL STUDIES

Larval descriptions exist for *Heteropanope glabra* (Greenwood and Fielder, 1984b; Lim, Ng and Tan, 1984); *Pilumnopeus serratifrons* (Wear, 1968; Greenwood and Fielder, 1984a); *Benthopanope eucratoides* (? = *B. sexangula*) (Lim, Ng and Tan, 1986); and *Benthopanope indica* (Takeda and Miyake, 1968; ? Aikawa, 1929). Table 1 summarises the main points of difference between the larvae of these four species.

Although only a small number of species have been investigated there do appear to be differences between the three genera. For example, *Benthopanope* lacks lateral carapace spines, the rostrum is small or absent, and there are no lateral papillae on the third abdominal segment. *Pilumnopeus serratifrons* has, in common with *Benthopanope* species, only three zoeal stages, but on the contrary has a pair of lateral papillae on the third abdominal segment, a character shared with *Heteropanope glabra*. *Heteropanope* differs from the other two genera by having four zoeal stages, a large rostrum and large lateral carapace spines. The investigation of additional species is necessary before these conclusions can be properly validated.

GONEPLACIDAE Dana, 1852

Flindersoplax gen. nov.

DIAGNOSIS

Carapace markedly broader than long, flat or slightly convex posteriorly, moderately convex anteriorly; regions very poorly defined. Anterolateral margins cut into four blunt teeth, the first tooth commencing behind the unarmed outer-orbital margin. Front produced, bilobed, separated laterally from orbits by small rounded sinuses. Antenna lies in the orbit, basal antennal segment just touches the front at the inner edge and is produced into the orbital hiatus at the outer edge. Third maxillipeds close the buccal cavity; merus wider than long and about half the length of the ischium. Chelipeds unequal, stout, with bluntly pointed fingers; major chela particularly, armed distally with a large, backwardly directed molariform tooth. Legs of moderate length, the second pair about twice the length of the carapace. Male abdomen broad, of seven free segments, and completely covering sternum between coxae of fifth walking legs. Sternal plastron relatively wide. First male pleopod relatively straight, stout, bluntly pointed, little ornamented. Second male pleopod about a half the length of first, with a short recurved tip.

ETYMOLOGY

Named in honour of Mathew Flinders for his exploration of the Australian coast and after the biogeographic region already named for him and in which it was found. This is combined with the Greek, *plax*, meaning broad and flat. Gender is feminine.

Flindersoplax vincentiana (Rathbun, 1929) (Figs 11, 12)

Heteropanope vincentiana Rathbun, 1929, pp. 37–38, Pl. IV.

MATERIAL EXAMINED

NEOTYPE: USNM 62042, ♂ (24.2×15.7 mm), Port Willunga, Gulf St. Vincent, South Australia, Feb. 1895, W.J. Kimber. (Dry specimen restored to spirit with ethylene glycol in 1967).

TYPE STATUS

The female holotype of *Heteropanope vincentiana* Rathbun is apparently no longer extant as searches conducted at the author's request have failed to locate it at either the South Australian

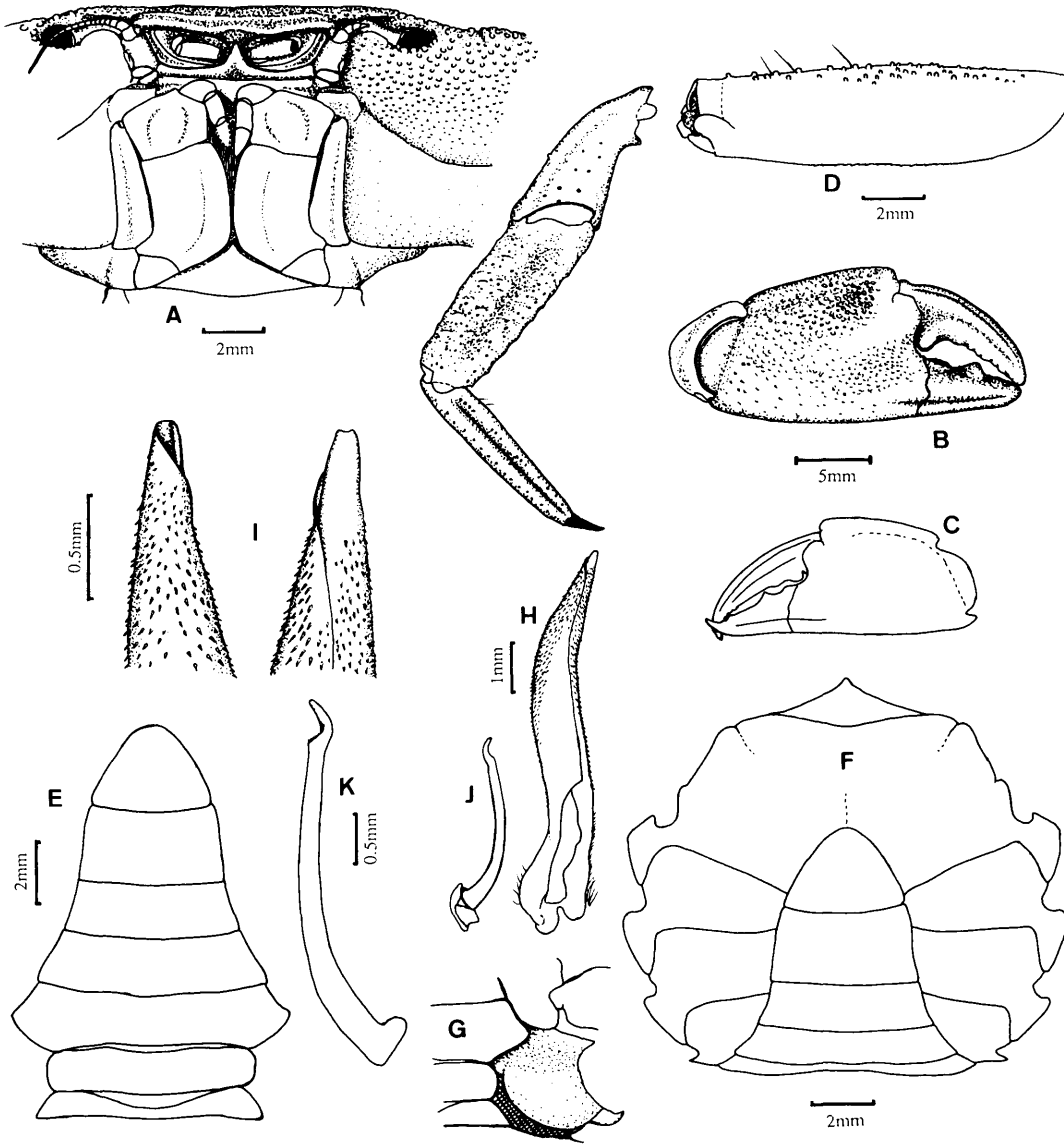

FIG. 11. *Flindersoplax vincentiana* (Rathbun) neotype male: A. frontal view showing maxillipeds and antennal and antennular regions; B. right chela; C. left chela; D. third left walking leg; E. abdomen; F. sternal plastron and abdomen; G. configuration of abdominal segments 1, 2, and 3 and coxa of fifth walking leg; H. first pleopod; I. magnifications of tip of first pleopod; J, K. second pleopod.

Museum or the United States National Museum (Drs W. Ziedler and R. Manning, *in litt.*). Therefore I designate the male paratype (USNM 62042) as the neotype. This specimen was collected from the type locality.

DESCRIPTION

Carapace 1.54 times broader than long, broadest at level of last anterolateral tooth. Anterolateral margins shorter than posterolateral, cut into four blunt teeth; no tooth present at the outer orbital margin, the first anterolateral tooth is well separated from the orbit and is a broad, low, blunt lobe; the second and third teeth are subequal and subacute, the fourth tooth is much smaller and also sub-acute. Front deflexed, with oblique lateral borders in dorsal view, but with a strong median convexity; a narrow shallow furrow, backed by a line of close set granules, runs parallel and just posterior to the margin; separated laterally from inner superior border of orbit by a small rounded sinus.

Orbital cup rounded, inner superior margin smooth becoming coarsely granular laterally and on to outer half of lower margin; inner part of lower border produced into a broad blunt lobe.

Dorsal surface of carapace nearly flat in its posterior half but becoming noticeably convex anteriorly. Regions are poorly defined except for the narrow, anterior part of the mesogastric, with a small furrow anterior to it; a faint gastro-cardiac groove; and faint epibranchial grooves. Across the front, from about the level of the second anterolateral teeth and behind the orbit, is an irregular broad transverse furrow. The whole anterior half is strongly granulate, being coarsest laterally behind the orbits and first and second anterolateral teeth, becoming smaller posteriorly and medially. For most of the posterior half the surface is smooth and punctate. Subhepatic regions also coarsely granular, but becoming smooth lower down on the pterygostomian.

Basal antennal article quadrate, just touching the front at its inner edge, outer margin produced and entering the orbit a little way; antennal flagellum lies within the orbital hiatus, and extends a little beyond the orbit laterally. The ridges defining the efferent branchial channels are strong

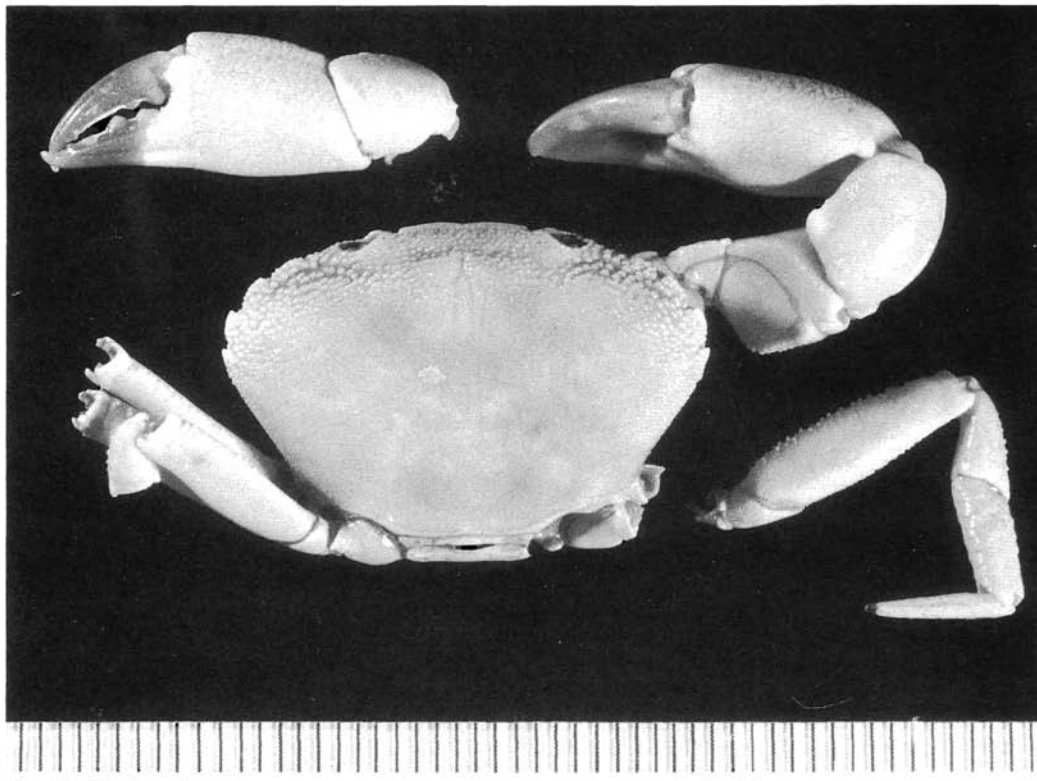

FIG. 12. *Flindersoplax vincentiana* (Rathbun) neotype male, USNM 62042. Scale in mm.

and extend to the margin of the epistome. The third maxillipeds completely close the buccal cavity; exognath reaches to the outer angle of the Merus and has a strong subdistal triangular tooth on the inner margin which is normally hidden beneath the merus; merus wider than long and about half the length of the ischium, finely granular; ischium about 1.5 times longer than wide, smooth and punctate.

Chelipeds stout, unequal, the right the larger in the Lectotype; merus of major cheliped separated from basis-ischium, trihedral, nearly as broad as its greatest length; lower border rounded; superior, anterior, and posterior borders defined and granulate; carpus heavy, a little longer than wide, with a strong triangular tooth on the inner margin just posterior to the middle; palm swollen, length, including fixed finger, about twice height, upper half distinctly but minutely granulate and eroded, lower half smoother and more punctate; dactyl slightly longer than superior margin of palm, curved with a large distal backwardly directed molariform tooth, otherwise only minutely toothed; immoveable finger with small medial triangular tooth; fingers brown in preserved specimen; both fingers grooved for most of their length. Smaller cheliped of similar form but more slender; fingers without gape, with sharper cutting margins, and each finger with two alternating proximal teeth, one of these the proximal molar of the dactyl is much less pronounced than on the larger cheliped.

Legs of moderate length, the second pair the longest and about twice as long as carapace; quite narrow, the merus of the third leg about 3.4 times longer than wide, although the fourth leg much wider than the others; meri with irregular coarse tubercles along upper margins and finer granulation on lower borders, particularly on the anterior legs (Rathbun (1929) describes a row of short blunt spines above, which are no longer evident); carpi, propodi, and dactyli with rough uneven surfaces (according to Rathbun (1929) the articulation sockets are provided with long hairs — these are no longer evident, although the surfaces appear to have follicular structures which suggest they were originally clothed with strong setae); dactyli nearly straight, with deep furrows on each side, and terminating with slender, bent, horny tips.

The male abdomen is rather broad, and consists of seven free segments; third segment the widest, with bluntly triangular margins; first segment narrow and slightly wider than second; second about 5 times wider than long; segments 3 to 5 tapering and of similar length; sixth segment much longer being only twice as wide as long; telson the longest segment, bluntly rounded. The abdomen completely covers the sternum between the fifth pair of legs such that sternite eight is not visible. Sternal plastron comparatively wide.

The first male pleopod stout, only slightly sinuous, with bluntly pointed simple apex, and with a good covering of minute spinules on most of the distal half. Second male pleopod almost half the length of the first, curved, ending in a short recurved tip, unarmed except for a few microscopic hairs on the rim at the base of the recurved tip.

Distribution

Only known from the type locality in Gulf St Vincent, South Australia.

Habitat

No habitat information is available although it can be assumed to be a shallow subtidal species. If it occurred intertidally it would almost certainly have been re-collected subsequently. A preliminary search of the collections of Xanthoidea from the South Australian Museum have failed to reveal any more specimens.

Remarks

Although this species is xanthoid at first appearance it cannot belong to that superfamily as it is presently defined. The shapes of the first and second male pleopods are striking features of *Flindersoplax* and are important characters when looking for related groups. Those groups that must be considered are:

1. The Pilumnoidinae Guinot and Macpherson, 1987. This new subfamily of the Xanthidae is characterised by: carapace rounded, much wider than long; sternal plastron long and narrow with the sutures 4/5 and 7/8 complete and subparallel; the presence of a 'press-stud' locking mechanism for the abdomen; the male genital orifice coxal, without sternite eight being visible; abdomen of male composed of seven distinct segments; endostomial crests complete; ischium and merus of chelipeds fused; first male pleopod nearly straight, with the apex having little ornamentation; second male pleopod neither very short nor sigmoid, and with the peduncle well developed and terminating in a short flagellum. Factors against placing *Flindersoplax* in this subfamily are that the sternum is broad and not of the typical narrow form as figured by Guinot and Macpherson (1987, fig. 1) and on the cheliped, the ischium is clearly separated from the merus.

2. *Pseudozius*: this genus is also currently difficult to place in the existing family structure. It is very close to the Menippidae but is generally excluded because of the comparatively very small second male pleopod. This pleopod is of the same type as *Flindersoplax* although in *Flindersoplax* it is much longer. *Pseudozius* has a slightly wider sternal plate than is typical in the Menippidae but nevertheless is very similar to members of that family by the shape of the relatively narrow male abdomen, and the proportions of the segments, which in the author's experience are quite similar throughout all the genera of that family. In *Flindersoplax*, as in *Pseudozius* and the members of the Menippidae, sternite 8 is completely hidden below the abdomen laterally, but *Flindersoplax* has a relatively much broader, oval, sternal plate and also has an exceptionally wide abdomen.

3. The genus *Platychelonion* Crosnier and Guinot, 1969. The West African species *P. planissimum* Crosnier and Guinot, 1969, is the only representative. The systematic position of this genus is uncertain. The fact that sternite 8 is left exposed laterally between the abdomen and the fifth leg suggests relationships with the Goneplacidae, and as well with *Neopilumnoplax* with which it shows other superficial likenesses. The second male pleopod of *Neopilumnoplax* (see Guinot, 1969, figs 84, 89) is however very much longer and it is equipped with a long flagellum. This suggests that its relationship is not very close with either *Platychelonion* or *Flindersoplax*. The sternite 8 of *Flindersoplax* is not exposed laterally and this contradicts a close relationship with *Platychelonion* although there are many other similarities, notably very similar male pleopods, abdomen shapes, and carapace shape.

4. The Geryonidae: the status of this family is uncertain (see Manning and Holthuis, 1981). Guinot (1971) questionably attributed *Platychelonion* to this family without arguing her position although Crosnier and Guinot (1969) originally felt it to be most closely related to the Carcinoplacinae-Goneplacinae. *Findersoplax* shows no marked resemblance to any of the central genera of the Geryonidae (*Geryon, Progeryon, Platypilumnus*) in the overall shape, or in the configurations of the front, antennular, or antennal regions, or of the sternal plate. It does show some superficial resemblance to *Paragalene longicrura* (Nardo) but cannot be closely related as that species has the male abdominal segments 3 and 4 fused, and the flagellum of the second male pleopod bears spinules towards its apex which is also peculiar. Most authors seem in agreement that *Paragalene* is misplaced in the Geryonidae (Guinot, 1969; Manning and Holthuis, 1981).

5. Carcinoplacine and goneplacine Goneplacidae (*sensu* Guinot, 1971). In the shape of the sternal plate, and in the male abdomen, *Flindersoplax* is very close to genera such as *Carcinoplax, Neopilumnoplax, Mathildella* and *Beuroisia*. The two characters which make placement here difficult are: a, sternite 8 is not visible laterally beside the abdomen; and b, the second male pleopod is much shorter than any species so far attributed to this group. With regard to the first, *Beuroisia* species have sternite 8 completely covered by the male abdomen and some species of *Carcinoplax* have the visible lateral portion of sternite 8 much reduced (c.f. *C. cooki* (Rathbun)). Secondly it could be considered that it is mainly the flagellum of the second male pleopod that is so dramatically reduced and that this could be a derived character which would not necessarily remove it far from the other genera of the Carcinoplacinae-Goneplacinae. *F. vincentiana* cannot be assigned to *Beuroisia* as the sternal plastron is comparatively wider; the configuration of the antennae and antennules is quite different (c.f. Fig. 1a in this paper with Fig. 6B,C in Guinot and Richer de Forges (1981)) and the second male pleopod is so much shorter.

It is impossible to confidently place *Flindersoplax* into the existing systematic structure. A complete re-evaluation of the relationships of the genera described above is urgently needed. Nevertheless I consider the configuration of the broad, oval sternum and the wide abdomen to be of major importance in determining its closest relatives, and on this basis I place it tentatively within the Carcinoplacinae of the Goneplacidae.

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