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732

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THE GENUS *EUCRATE* (CRUSTACEA: GONEPLACIDAE) IN EASTERN AUSTRALIA AND THE INDO-WEST PACIFIC

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ABSTRACT

Five species are recorded from the Queensland coast; *Eucrate sexdentata* Haswell and *E. affinis* Haswell are redescribed, *E. australiensis* (Miers) being considered a synonym of the latter; *E. affinis*: Alcock is regarded as a synonym of *E. tripunctata* sp. nov.; *E. haswelli* sp. nov. is described from a single specimen similar to *E. transversa*; and smaller specimens of *E. dorsalis* White are shown to differ markedly from published figures and descriptions, which are based on large specimens. *E. crenata* de Haan is described and figured. A tentative key to nine Indo-West Pacific species is included.

While carrying out routine identifications for a faunal list of the sublittoral crabs of Moreton Bay (Campbell and Stephenson in MS.; Griffin and Campbell, 1969) it was inevitable that some specimens should require more thorough investigation. Three specimens of *Eucrate dorsalis*, readily identifiable from published figures, nevertheless initiated a comparison with additional material of this genus in the Queensland Museum and the Australian Museum. The presence of an undescribed species among this material showed the need for a more detailed study of the genus. Five species are here described from Australia, and a specimen of *E. crenata* from Japan is described and figured for comparative purposes.

All drawings have been made with the aid of a camera lucida. Those of the male abdomens are a composite of several drawings made perpendicular to the surface to eliminate parallax.

Genus *Eucrate* de Haan, 1835

TYPE SPECIES: *Cancer (Eucrate) crenata* de Haan, 1835.

DIAGNOSIS: See Alcock, 1900, pp. 298-9. To this description can be added two features which are common to at least the six species examined:—

- (1) The front is transversely sulcate.
- (2) The male pleopod carries a terminal armature of numerous small spinules, many of which are bifid.

A considerable number of nominate species, subspecies and "varieties" have been proposed for this genus and almost as many different attempts have been made to synonymise these in a multiplicity of combinations. The problem is perpetuated partly because of the inadequacies of many published descriptions and figures and perhaps partly because of the considerable growth polymorphism which appears to exist in some species (see below, *E. dorsalis*) and which demands for its investigation a larger range of specimens than has been available in many cases. A fuller study of this growth polymorphism may result in a reduction of the number of valid species in this genus, but at the present time it seems necessary to recognise nine in the Indo-West Pacific.

The most recent comprehensive treatment of this genus is that of Tesch (1918). Tesch failed to recognise *E. hamiltoni* McCulloch as a synonym of *E. dorsalis* White, to recognise *E. sexdentata* as belonging to this genus, and to appreciate the distinctness of two other Australian species which he synonymised with *E. sulcatifrons* (Stimpson). The following key to the Indo-West Pacific species is proposed as a tentative replacement for that given by Tesch (1918, p. 158).

#### KEY TO THE INDO-WEST PACIFIC SPECIES OF EUCRATE

(Species in **bold face** are described in this paper; in the case of other species a reference is given to a recent description.)

- |        |   |   |
|--------|---|---|
| 1.     | Anterolateral margins of carapace without teeth, with or without low rounded lobes. (Carapace width greater than 35 mm; carapace with anterior speckling and usually a single central dorsal spot)..... |   |
|        | ..... <b>E. dorsalis</b> White  |   |
|        | Anterolateral margins with distinct teeth.....  | 2 |
| 2 (1). | Only three anterolateral teeth (including the external orbital angle); carapace with <i>c.</i> 20 large regular spots on its anterior two thirds.....   |   |
|        | ..... <b>E. sexdentata</b> Haswell  |   |
|        | Four anterolateral teeth, the fourth possibly small but always distinct.....  | 3 |
| 3 (2). | Carapace with short but very distinct ridges mesiad to, but separated from, third and fourth anterolateral teeth; a short beaded posterolateral ridge.....  |   |
|        | ..... <b>E. affinis</b> Haswell   |   |
|        | Carapace without very distinct ridges.....  | 4 |
| 4 (3). | Second and third anterolateral teeth of similar shape and size, both well developed.....  | 5 |
|        | Third anterolateral tooth much more acute, more prominent, or much more raised than the second tooth, which may have a longer outer margin.....   | 8 |

- 5 (4). Carapace width less than 25 mm..... 6  
 Carapace width greater than 25 mm..... 7
- 6 (5). Median longitudinal groove deep, dividing on the gastric region; carapace dark reddish-brown with distinct pale margin anteriorly and laterally ..... *E. sulcatifrons* (Stimpson)  
 Hong Kong, Japan; ?Timor, Celebes, NW. New Guinea. (See Stimpson, 1907, pp. 90-1; Sakai, 1965, p. 169, pl. 83, fig. 3.; this paper, p. 126)  
 Median longitudinal groove shallow carapace with 2-4 dorsal spots or a single irregular blotch..... 7
- 7 (6, 5). Carpus of cheliped with only a narrow fringe of hair distally on its upper border; propodus of last leg broad,  $l/w = 2.0-2.4$ ; carapace with one central and two lateral spots which are sometimes coalesced to form an irregular blotch..... *E. tripunctata* sp. nov.  
 Carpus of cheliped with a broad patch of hair distally on its outer surface; propodus of last leg  $l/w = 2.6-2.8$ ; carapace without a central spot ..... *E. crenata* de Haan  
 Japan, Hong Kong, ?Red Sea.
- 8 (4). Carapace broad, carapace width more than 1.30 times carapace length; fronto-orbital width greater than carapace length..... 9  
 Carapace width less than 1.30 times carapace length; fronto-orbital width less than carapace length..... 10
- 9 (8). Second anterolateral tooth distinct..... *E. haswelli* sp. nov.  
 Second anterolateral tooth nearly obsolete..... *E. transversa* (Stimpson)  
 Hong Kong. (See Stimpson, 1907, p. 95)
- 10 (8). Frontal notch minute or absent; cheliped with patch of hair distally on outer face of carpus; no large central spot on carapace.....  
 ..... *E. dentata* (Stimpson)  
 Hong Kong, Palk Str. (See Stimpson, 1907, pp. 94-5; Chhappgar, 1957, pp. 437-8, pl. 11, figs. j, k, l; this paper, p. 135.)  
 Frontal notch small but distinct; cheliped with only a narrow fringe of hair distally; carapace usually with central reddish spot (carapace width *c.* 1.5 times frontal width; second anterolateral tooth not markedly less conspicuous than first)..... *E. dorsalis* White

The brevity of many of the existing descriptions and the lack of illustrations of some features have made it impossible to give complete synonymies at this time.

***Eucrate sexdentata* Haswell**

(Fig. 1.)

*Eucrate sexdentatus* Haswell, 1881, p. 548; 1882, p. 86.[non] *Pseudorhombilia vestita* (de Haan), var. *sexdentata*, Haswell: Miers, 1884, pp. 240-1, pl. 24B.*Eucrate sexdentata* Haswell: Alcock, 1900, p. 301.**MATERIAL EXAMINED**

Queensland Museum: Four males (6.5-18 mm), four females (12-23.5 mm), Moreton B., W2648, W2715, W2726, W2806, W2808, W2817, W2818, W2909. Ovig. female (17.5 mm) off Jumpin Pin, SE. Qd, W2812.

Australian Museum: Male (20 mm), female (20 mm), ovig. female (16 mm), Moreton B., P15246, P15258, P15253. Male (23.5 mm), 12-15 miles NNE. of Cape Moreton, 80-100 fms, D. Harris, 1965.

**DESCRIPTION**

**CARAPACE:** Broader than long (1.10-1.20 times); surface microscopically granulate and punctate, without ridges, with the regions not defined; median frontal groove not discernable. Frontal width half fronto-orbital width; front with two broad square-cut lobes, their anterior margins straight, transverse, and sulcate. Anterolateral margins with three teeth including external orbital angle; first two broad, rounded, well separated from third which is slightly more dorsal, very acute, forwardly projecting, and forming broadest part of carapace.

**BASAL ANTENNAL JOINT:** Antero-external angle produced to meet front so that flagellum is excluded from orbit; frontal margin of projection much less than orbital margin.

**CHELIPED:** Merus granulate ventrally; with single prominent, rounded spine dorsally. Carpus with prominent flattened conical spine on inner angle and tuft of hairs distally on outer face. Propodus smooth and rounded dorsally, with longitudinal carina on ventral edge of outer surface extending back from tip of fixed finger to proximal third of chela.

**AMBULATORY LEGS:** Long, third distinctly longer than twice carapace width. Propodus of last leg 3.6 to 4.2 times as long as broad.

**MALE ABDOMEN:** First, second, and third segments expanded laterally to meet coxae of last legs.

**MALE PLEOPOD:** Curved and tapering throughout length; terminal armature with some spinules bifid; tip slightly flared.

**COLOUR:** Pale cream with purple-pink spots on the dorsal surface of the carapace disposed as in fig. 2B, or with two additional posterior spots. Upper surfaces of carpus, propodus, and dactyl of chelipeds sometimes with fainter pink blotches which may coalesce leaving cream spots between a purplish network.

**DISTRIBUTION:** Port Denison (type locality, Haswell, 1881); India (Alcock, 1900); Moreton B.

## DISCUSSION

Haswell's brief description is sufficient to confidently assign the present specimens to this species, but it was not sufficiently detailed to prevent subsequent conjecture as to the relationships of the species.

Miers (1884, pp. 240-1) described specimens from the Arafura Sea under the name "*Pseudorhombilia vestita* (de Haan), var. *sexdentata*, Haswell". He doubtfully synonymised *Eucrate sexdentatus* Haswell, but suggested that these might be distinct

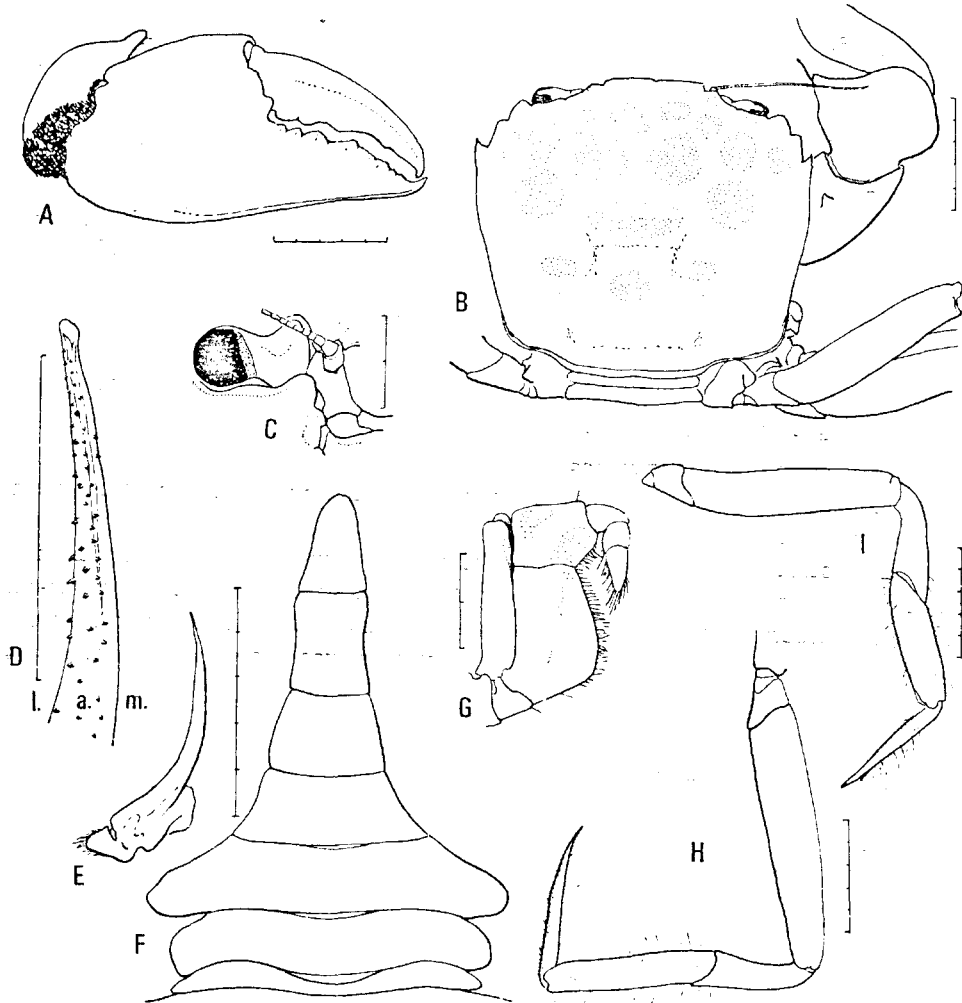


FIG. 1: *Eucrate sexdentata*. A, C-F: male, Qd Mus. W2817. A, chela; C, basal antennal joint; D, E, male pleopod (l. = lateral, a. = abdominal, m. = median faces); F, male abdomen. B, G-I: female Qd Mus., W2818. B, carapace; G, third maxilliped; H, third right ambulatory leg; I, last right ambulatory leg. Scale divisions 1 mm.

and proposed the name *Pseudorhombilia haswelli* to be used if this should be proved so. These two species are, in fact, quite distinct. Miers's specimens differ from *E. sexdentata* in that the carapace is pubescent, the typical pinkish spots are not present on the carapace, the front is entire, the basal antennal joint is not produced to meet the front, and the second and third abdominal segments do not meet the bases of the fifth legs.

Rathbun (1915, p. 146) designated *P. haswelli* Miers as type species of a new genus *Homoioplax*, in the subfamily Prionoplacinae, distinguished by having a male abdomen with the first and second segments, but not the third, covering the entire breadth of the sternum.

Tesch (1918, pp. 190-3, pl. 10, fig. 1) described and figured material which he referred to *H. haswelli* (Miers), and suggested (p. 158, footnote) that *E. sexdentata* Haswell should also belong to the genus *Homoioplax*. This suggestion was apparently based on the erroneous assumption that the male abdomen of *E. sexdentata* is similar to that of *H. haswelli*. The third segment of the abdomen of *E. sexdentata* is, in fact, fully expanded laterally to meet the bases of the last legs and this species is correctly placed in the genus *Eucrate*, subfamily Carcinoplacinae.

### *Eucrate affinis* Haswell

(Figs. 2, 3.)

*Eucrate affinis* Haswell, 1881, p. 547; 1882, p. 86. Stebbing, 1921, p. 458, pl. 15.

*Pseudorhombilia sulcatifrons* (Stimpson), var. *australiensis* Miers, 1884, pp. 242-3, pl. 24, fig. C.

*Eucrate sulcatifrons* (Stimpson): Barnard, 1950, pp. 295-6, fig. 54d, e.

[non] *Pilumnoplax sulcatifrons* Stimpson, 1858, p. 93; 1907, p. 90.

[non] *Eucrate sulcatifrons* (Stimpson): Sakai, 1965, p. 169, pl. 83, fig. 3.

[non] *Eucrate affinis* Haswell: de Man, 1887, pp. 89-93, pl. 5, figs. 5-7. (= *E. tripunctata*)

[non] *Eucrate crenata* var. *affinis* Haswell: Alcock, 1900, pp. 300-1. (= *E. tripunctata*)

### MATERIAL EXAMINED

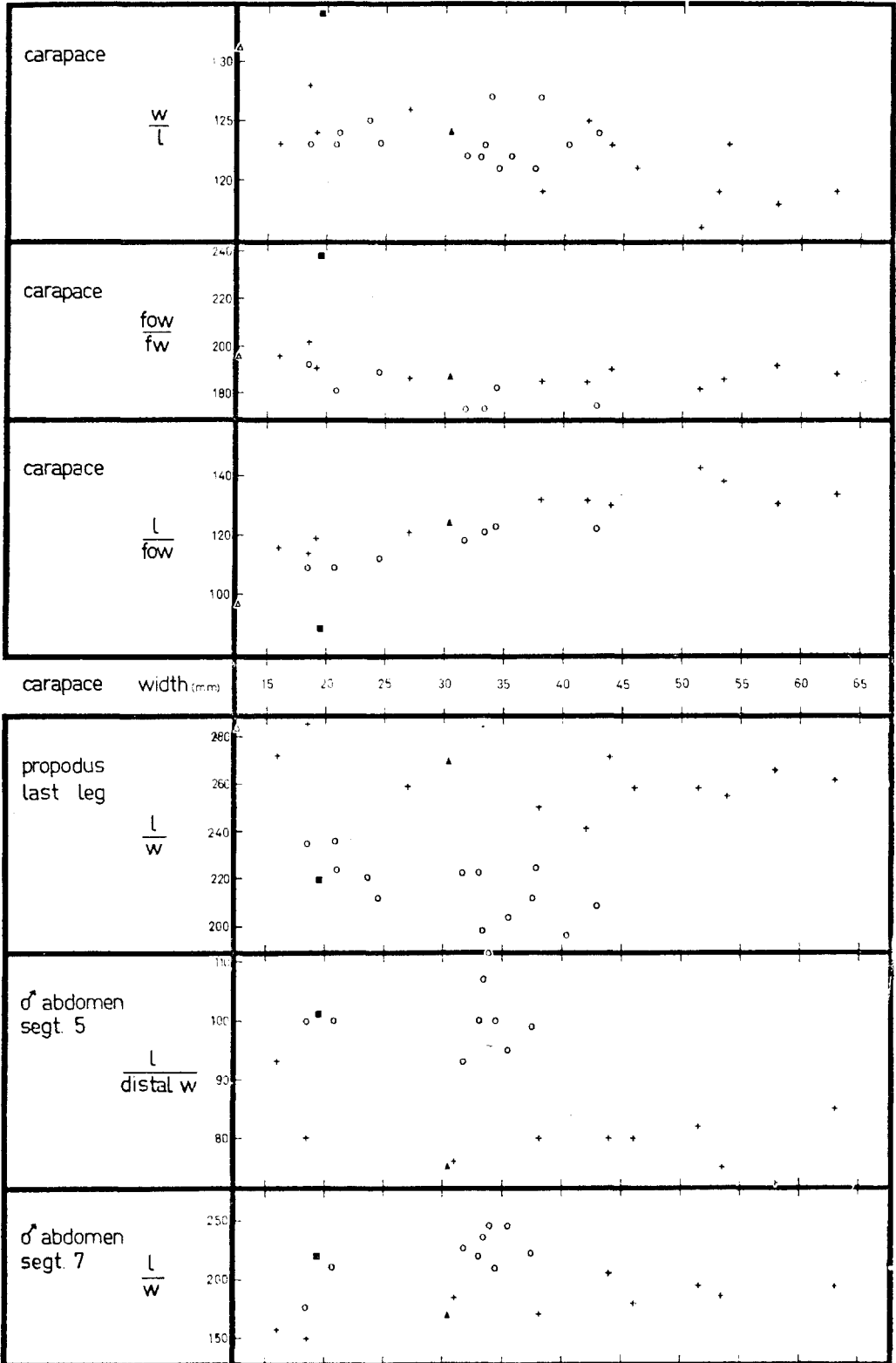
Australian Museum: Male (8.7 mm), female (12.4 mm), Holborn I., off Port Denison, Qd, P2972, dry preservation, syntypes of *E. affinis* Haswell. The male is here designated lectotype, the female becomes a paralectotype.

### DESCRIPTION

CARAPACE: Broader than long (1.29, 1.32 times), regions not defined; median frontal groove shallow, but distinct in both specimens, dividing on gastric region; shallow concave depression behind orbits extending laterally to first and second anterolateral teeth, forward to antennal notches and across the carapace well back on

FIG. 2: Variation in proportion of six features with carapace width. Each point represents a single specimen. w. = width; l. = length; fow. = fronto-orbital width; fw. = frontal width.

△ = *E. affinis*; ○ = *E. tripunctata*; ■ = *E. haswelli*; + = *E. dorsalis*; ▲ = *E. crenata*.



the post-frontal region; low rounded epigastric prominences barely discernable. Fronto-orbital width 1.97, 1.96 times frontal width; front with two broad square-cut lobes, their anterior margins straight, transverse, and sulcate. Infra-orbital margin well defined by a raised rim which ends medially as a rounded tooth which is separated from the prominent inner sub-orbital tooth by a deep sinus. Anterolateral margins with four teeth including the external orbital angle; the third the largest, acute, prominent, and distinctly raised above the second; the fourth the smallest; the first rounded with a faint dorsal carina; the second more acute with a more distinct dorsal carina. Mesial to the third tooth, but separated from it by a deep groove there is a very distinct, short, almost tooth-like ridge; mesial to the fourth tooth there is a longer but slightly less distinct carina separated from the fourth tooth by a broader, shallower groove. Posterolateral corners of carapace with distinct, irregularly granulate ridge running almost parallel with posterolateral borders for short distance in male, longer in larger female.

**BASAL ANTENNAL JOINT:** With antero-external angle produced to meet front so that flagellum is excluded from orbit; frontal margin of projection much shorter than orbital margin.

**CHELIPED:** Upper border of merus with strong subdistal spine. Intermediate lobe between subdistal spine and prominence for upper carpal articular condyle large, tooth-like, intermediate in size between subdistal spine and prominence when viewed in profile sighting across bases of maxillipeds. Inner angle of carpus with low short median carina ending in spine; few scattered hairs between this spine and upper articulation with propodus, dense patch of long hairs between upper and lower articulations and covering distal quarter of outer face of carpus. Propodus smooth and rounded; with deep longitudinal groove near ventral edge of outer face, extending back from near tip of finger for half length of chela.

**AMBULATORY LEGS:** Of moderate length, third twice carapace length. Propodus of last leg (only right last leg of female available) with length 2.83 times width.

**MALE ABDOMEN:** First, second, and third segments expanded laterally to meet coxae of last legs; third and fourth segments rapidly tapering to base of fifth; length of fifth segment less than width of distal margin (0.82 times); [sixth segment obscured by mounting medium;] terminal segment with rounded tip, length 1.9 times width.

**MALE PLEPOD:** Not available for examination.

**COLOUR:** After prolonged preservation bleached to uniform pale cream.

**DISTRIBUTION:** Port Denison, Qd (type locality, Haswell, 1881); Port Molle (Miers, 1884).

#### DISCUSSION

The most distinctive and characteristic feature of this species is probably the presence of the short strong ridges at the bases of the third and fourth anterolateral teeth. These are well shown in the South African specimens of Stebbing (1921, pl. 15) and Barnard (1950, fig. 54d) and there is little doubt that these are conspecific with Haswell's type



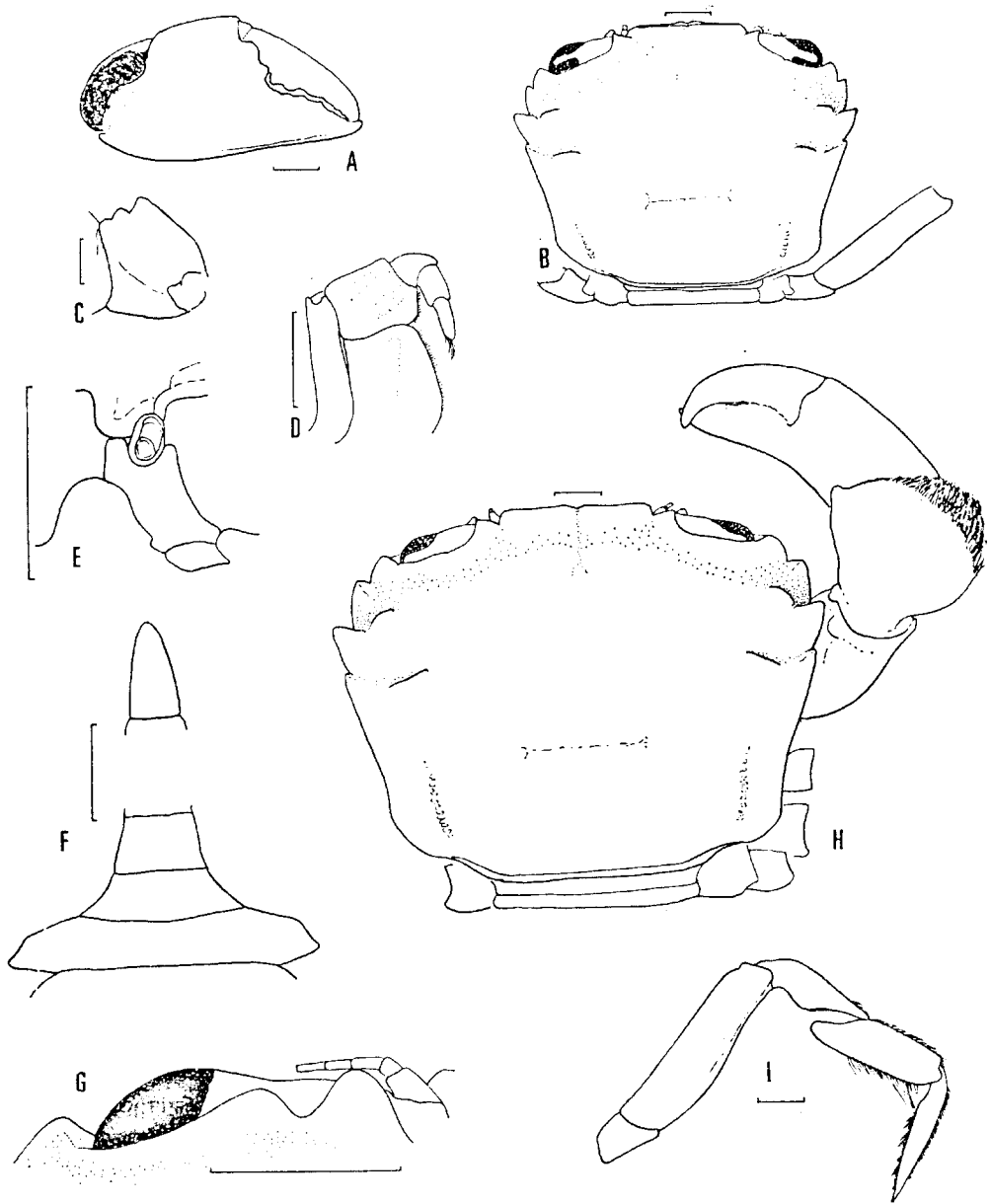


FIG. 3: *Eucrate affinis*. A-G: lectotype, male, Aust. Mus. P2972. A, chela; B, carapace; C, merus of cheliped (see text); D, third maxilliped; E, basal antennal joint; F, male abdomen (sixth segment obscured by mounting medium); G, suborbital rim.

H, I: paralectotype, female, Aust. Mus. P2972. H, carapace; I, last right ambulatory leg.

Scale divisions 1 mm.

material. It should be noted that the carapace as illustrated by Barnard is relatively narrower than in the type material although the proportions of Stebbing's illustrated specimen compare more favourably.

Miers described *Pseudorhombilia sulcatifrons* var *australiensis* from an 8 mm male. Photographs of the holotype, a dried specimen in good condition at the British Museum, have been received from Mr. R. W. Ingle and these show the following inaccuracies in Miers's figure and description. (a) The front of the holotype is not entire, but has a faint median notch. (b) The basal antennal joint is in contact with the front. (c) The third anterolateral teeth are larger and more projecting than is shown in Miers's figure, the first teeth are more rounded, and the second are slightly smaller. (d) The dactyli, particularly those of the last legs, are not as slender as shown in the figure and the propodi do not taper strongly distally.

Although Miers's holotype does not appear to have the outer face of the carpus of the cheliped hirsute and the strongly granular posterolateral ridges are not present in the photograph, it can be referred to the present species with some confidence because of the following features. (a) Ridges mesiad to the third and fourth anterolateral teeth are shown in the photographs and were mentioned by Miers. (b) All ratios shown in fig. 2 for *E. affinis* are in very close agreement with those taken from the photograph of the holotype. (c) The projection of the basal antennal joint is long and slender, agreeing well with fig. 3E. (d) The suborbital crest as figured by Miers is similar to that of the present species (fig. 3G). (e) Haswell's specimens and Miers's were collected from localities only 45 miles apart (Port Denison and Port Molle respectively).

No distinct carapace ridges are mentioned by Stimpson in his description of "*Pilumnoplax*" *sulcatifrons* and it is not probable that he would have failed to describe them had they been present. There seems little justification for synonymising *E. affinis* and *E. sulcatifrons*. The "slight longitudinal ridge or angle on each side above and parallel with the posterolateral margin" that Stimpson mentions could well be only the break in curvature that is found in most species of this genus—it is significant that Stimpson did not mention any granulation or beading of this posterolateral ridge, also characteristic of *E. affinis*.

**E. SULCATIFRONS:** The absence of type material, the incompleteness of the original description, and the loss of Stimpson's subsequently prepared figures have enabled any material which proved difficult to identify, and any surplus nominate species, to be referred to *E. sulcatifrons*. The deep median longitudinal groove to which Stimpson (1907, p. 90) refers, an unusual feature for this genus, provides a distinguishing character. Sakai (1965, pl. 33, fig. 3) has illustrated a specimen which he refers to *E. sulcatifrons* and his illustration shows this deep median groove. His description (Japanese Part, p. 73) mentions that this species is smaller than *E. crenata*, has a marked concavity posterior to the orbit, a well developed inner orbital spine, four anterolateral teeth which are more acute than those of *E. crenata*, the hand of the cheliped is much enlarged, and the colour is variable but many specimens have paler carapace margins. It is not

possible to refer with certainty descriptions that mention neither the deep median groove nor the colouration (see Sakai), but the material described by Tesch (1918, pp. 158-60) does not carry the distinct lateral carapace ridges of *E. affinis* and it seems possible that his material has been correctly referred to *E. sulcatifrons*.

*Pseudozius (Platyzius) laevis* Borradaile, as illustrated by Rathbun (1906, pl. 11, fig. 7) bears little resemblance to this species. The Hawaiian "*E. sulcatifrons*" as illustrated and described by Edmondson (1962) differs quite markedly from *E. sulcatifrons*, and indeed from all other species of *Eucrate*, in having the front divided by a broad shallow depression in place of the usual small distinct notch. The Hawaiian material could well represent a tenth species of this genus which could be separated from the others in the key by the form of the frontal notch.

Tozzetti (1877) described and illustrated a specimen from Yokohama which he identified as *Pilumnoplax sulcatifrons*. This specimen is here referred to *E. crenata* (see p. 136).

#### ***Eucrate tripunctata* sp. nov.**

(Figs. 2, 4.)

*Eucrate affinis*, Haswell: de Man, 1887, pp. 89-93, pl. 5, figs. 5-7.

*Eucrate crenata* var. *affinis*, Haswell: Alcock, 1900, pp. 300-1.

[non] *Eucrate affinis* Haswell, 1881, p. 547; 1882, p. 86.

#### MATERIAL EXAMINED

Queensland Museum: Ten males (8-35 mm), nine females (21-40.5 mm), Moreton B. (Mud I., Woody Pt., dredged), W385, W1070, W1190, W1214, W1496, W1514, W3029, W3030, W3034, W3035.

Australian Museum: Male (c. 34 mm), Magazine I., Pt. Denison, in burrow in muddy sandbank, P6990; male (35 mm), Sandgate, Moreton B., P7914; male (12.5 mm), Masthead I., G5884.

Holotype: Male (33.3 mm), Mud I., Moreton B., 26. V. 1964, V. F. Collin, Qd Mus. W3034 (part).

#### DESCRIPTION

**CARAPACE:** Broader than long (1.20-1.28 times, see fig. 2); surface microscopically punctate; regions not defined; median frontal groove very shallow or barely discernable; concave depression behind orbits extending laterally to second anterolateral tooth, forward to antennal notches and across post-frontal region as a shallow concavity bordered posteriorly by faintly indicated post-frontal lobes. Fronto-orbital width 1.7-1.95 times frontal width (see fig. 2); front with two broad square-cut lobes, their anterior margins straight, transverse, and sulcate. Infra-orbital margin well defined by a raised rim ending abruptly laterally, and with a small tooth medially which is similar in shape to, and separated by a deep concavity from, the much larger inner suborbital tooth. Anterolateral margins with four teeth including external orbital angle, all of similar shape, fourth smallest, first three subequal; a short low ridge running postero-mesiad from the fourth tooth. Posterolateral margins rounded and only vaguely defined.

**BASAL ANTENNAL JOINT:** Antero-external angle produced to meet front so that flagellum is excluded from orbit; frontal margin of projection almost equal to orbital margin.

**CHELIPED:** Upper border of merus usually with small sharp granular spine in middle of length, always with strong subdistal spine. Intermediate lobe between subdistal spine and prominence for upper carpal articular condyle subequal to articular prominence when viewed in profile sighting across base of the maxillipeds. Carpus with strong median spine and band of hairs between this and upper articulation with propodus. Propodus smooth and rounded, with longitudinal groove near ventral edge of outer surface extending back from near tip of fixed finger for half length of chela.

**AMBULATORY LEGS:** Of moderate length, third less than twice carapace length in larger specimens, twice or slightly more than twice in specimen of under 20 mm cw. Propodus of last leg broad, length 1.9–2.4 times width (see fig. 2).

**MALE ABDOMEN:** First, second, and third segments expanded laterally to meet coxae of last legs; third and fourth segments rapidly tapering to base of fifth; length of fifth segment equal to (0.9–1.12 times) width of distal margin; sixth segment with concave or sinuous, subparallel sides; terminal segment long, slender, pointed (length 1.75–2.5 times width, see fig. 2).

**MALE PLEOPOD:** Moderately long, quite distinctly extending past point where first sternal groove meets abdomen. Maximum curvature in proximal third followed by straight, slender, tapering shank gently curving in distal sixth; terminal armature with some spinules bifid; tip rounded.

**COLOUR:** After alcohol preservation pale cream with three large reddish spots on carapace, a broadly oval median spot of variable extent, sometimes coalescing with the two smaller lateral spots. These spots are usually discrete and rounded but in some specimens are in the form of irregular blotches.

**DISTRIBUTION:** Mergui Archipelego (de Man, 1887; Alcock, 1900); Moreton B.

#### DISCUSSION

de Man (1887) described specimens from the Mergui Archipelago as *E. affinis* Haswell. His description and figure are not entirely in agreement, but the restriction of the patch of hair on the upper border of the wrist of the cheliped, the proportions of the propodus of the last leg, and the subequal anterolateral teeth place these specimens in the present species. Although de Man refers to two transverse ridge-like elevations near the third and fourth teeth these are not described as strongly developed and the illustration shows the usual low elevations of *E. tripunctata*. While de Man's description and figure of "*E. affinis*" can be referred to this species with certainty those of other authors present some difficulties although Alcock (1900) provides a special case in that his description is based on the same specimen as that of de Man.

Although close to *E. crenata* the present species is distinguished by the features provided in the key by the proportions of the fifth and seventh segments of the male abdomen (see fig. 2), by the shape of the orbital projection on the basal antennal joint,

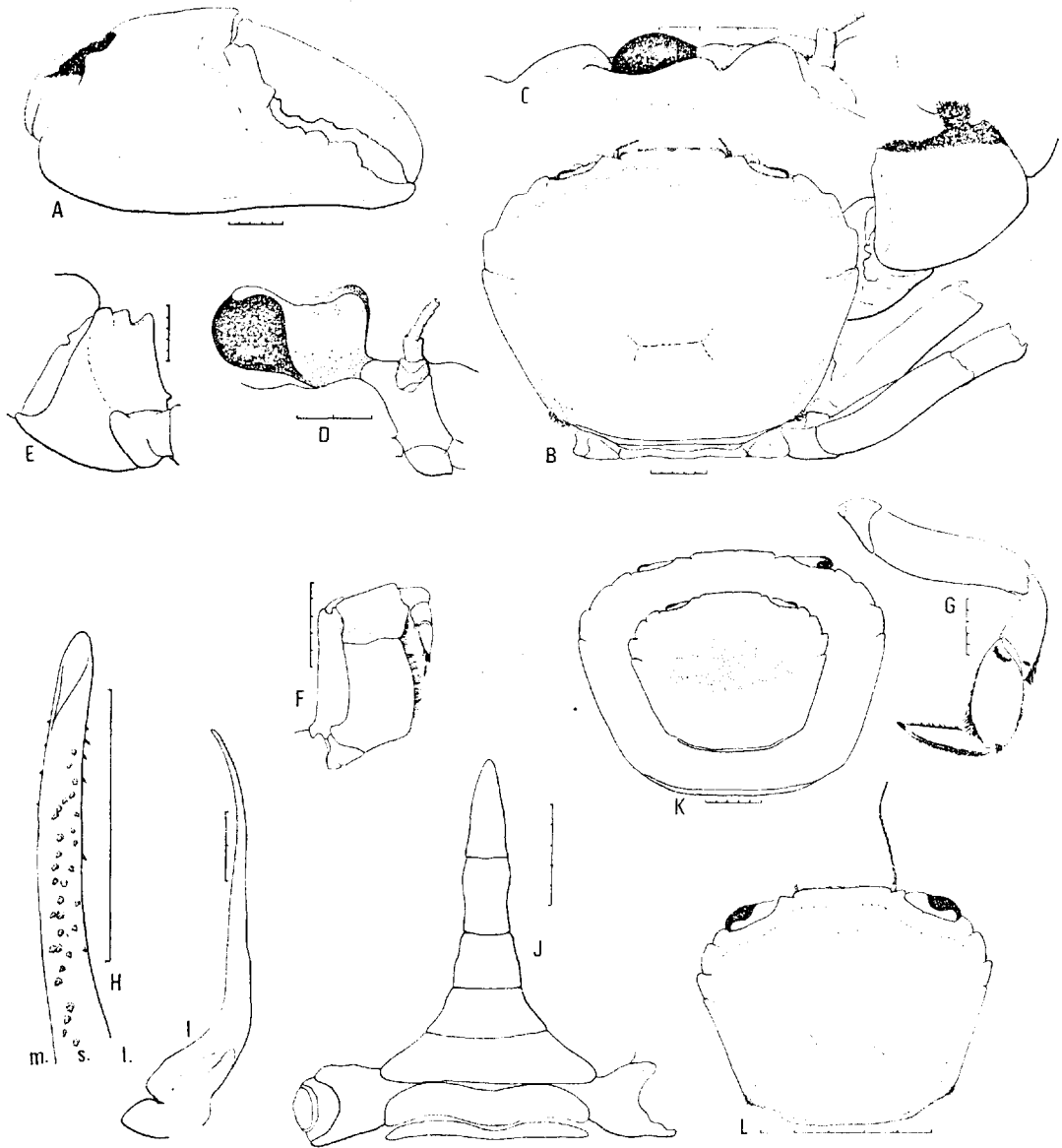


FIG. 4: *Eucrate tripunctata*. A-J: holotype, 33.3 mm male, Qd Mus. W3034 (part). A, chela; B, carapace; C, suborbital rim; D, basal antennal joint; E, merus of cheliped, (see text); F, third maxilliped; G, last right ambulatory leg; H, I, male pleopod (m. = median, s. = sternal, l. = lateral faces); J, male abdomen.

K: carapaces of 15 mm male and 27 mm female, Qd Mus. W3034 (part).

L: carapace of 8 mm male, Qd Mus. W3034 (part).

Scale divisions 1 mm.

by the suborbital ridge, and by the shape of the male pleopods. The apparent overlap of the two species in the Indian region does not permit *E. tripunctata* to be regarded as a subspecies of *E. crenata*.

***Eucrate haswelli* sp. nov.**

(Figs. 2, 5.)

**MATERIAL EXAMINED**

Holotype: Male, 19.5 mm, Port Denison, Qd, between tide marks, E. H. Rainford, Australian Museum P6991.

**DESCRIPTION**

**CARAPACE:** Much broader than long (1.34 times); surface microscopically punctate; regions not defined; median frontal groove very shallow, dividing on gastric region; very shallow concave depression behind orbits extending laterally to second anterolateral teeth, forward to antennal notches. Fronto-orbital width 2.38 times frontal width; front with two broad square-cut lobes, their anterior margins straight, transverse, and sulcate. Infra-orbital margin well defined by a raised rim which ends medially with a rounded lobe well separated by a broad concavity from the larger inner suborbital tooth. Anterolateral margins with four teeth including the external orbital angle, third much the largest, fourth smallest, first large, rounded, and with distinct ventral carina running to meet suborbital ridge.

**BASAL ANTENNAL JOINT:** Antero-external angle produced to meet front so that flagellum is excluded from orbit; frontal margin of projection approximately equal to orbital margin.

**CHELIPED:** Upper border of merus with single sharp granular spine in middle of length, and strong subdistal spine. Intermediate lobe between subdistal spine and prominence for upper carpal articular condyle subequal to articular prominence when viewed in profile sighting across base of maxillipeds. Inner angle of carpus with strong short median carina ending in spine; few scattered hairs between this spine and upper articulation with propodus, dense patch of long hairs between upper and lower articulations and covering distal fifth of outer face of carpus. Propodus smooth and rounded, with deep longitudinal groove marking distinct ridge near ventral edge of outer surface, extending back from tip of fixed finger for half length of chela.

**AMBULATORY LEGS:** Of moderate length, third twice carapace length. Propodus of last leg broad, length 2.2 times width.

**MALE ABDOMEN:** First, second, and third segments expanded laterally to meet coxae of last legs; third and fourth segments rapidly tapering to base of fifth; length of fifth segment equal to width of distal margin; sixth segment with sinuous, subparallel sides; terminal segment triangular, length 2.3 times width.

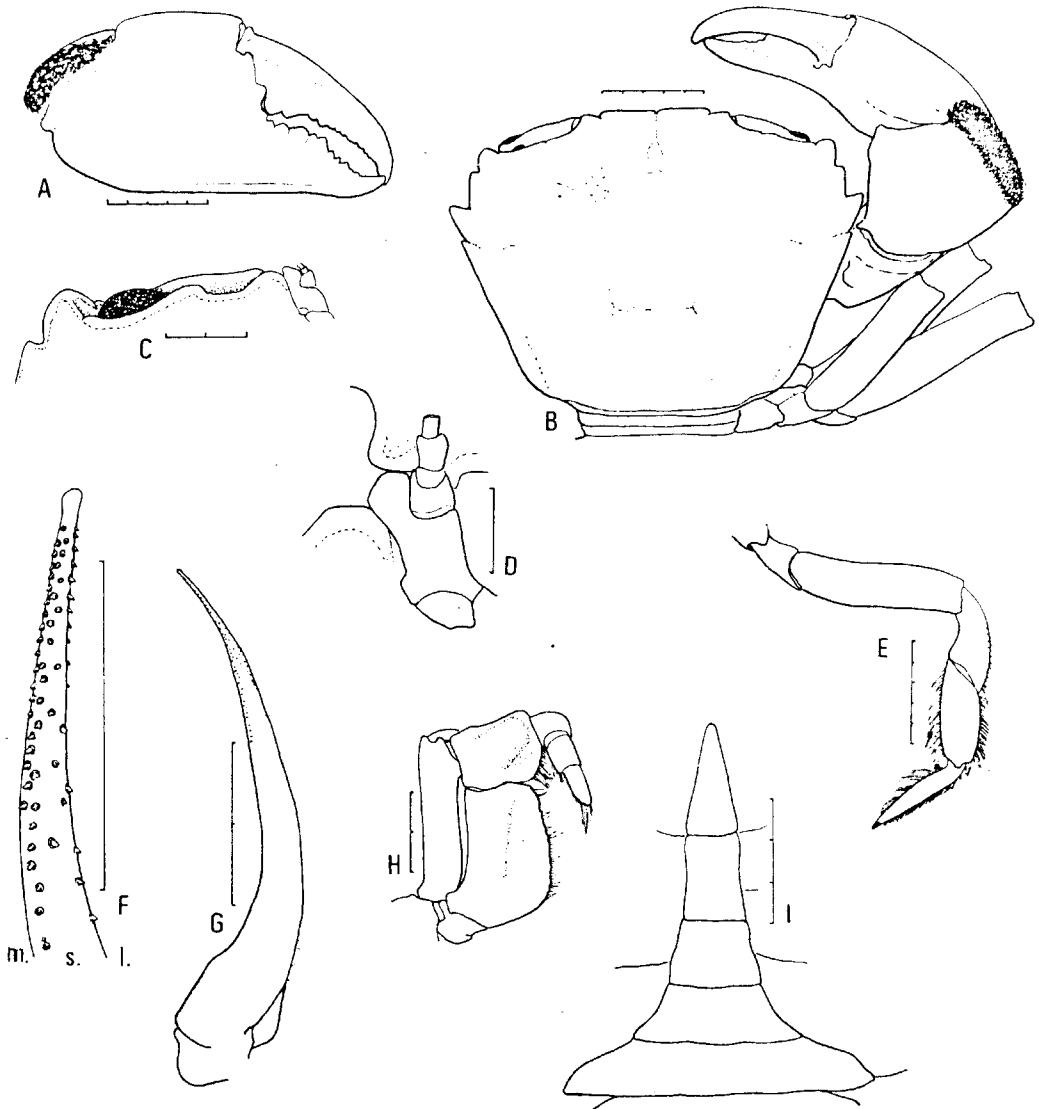


FIG. 5: *Eucrate haswelli*. Holotype, male, Aust. Mus. P6991. A, chela; B, carapace; C, suborbital rim; D, basal antennal joint; E, last right ambulatory leg; F, G, male pleopod (m. median, s. sternal, l. lateral faces); H, third maxilliped; I, male abdomen.

Scale divisions 1 mm.

MALE PLEPOD: Of moderate length, not extending past point where first sternal groove meets abdomen. Curved, with thick tapering shank and flared tip; some terminal spinules bifid.

COLOUR: After prolonged alcohol preservation bleached to uniform pale cream.

DISTRIBUTION: Port Denison, mid east Queensland.

#### DISCUSSION

This species shows some agreement with Stimpson's (1907, p. 95) description of *Heteroplax* [- *Eucrate*] *transversa*. This brief description is composed largely of comparisons with his *E. dentata* so that some of the supposed agreements are based on inference, the lack of a statement to the contrary being taken as adequate grounds to assume that *E. transversa* shared a certain feature with *E. dentata*. On this basis, the significant points of agreement are as follows:—

- (1) The carapace is little broader than the fronto-orbital width.
- (2) The anterolateral and posterolateral regions are nearly continuous, the former very short.
- (3) The outer orbital angle is prominent.
- (4) The ocular peduncles are long.
- (5) There is a tuft of pubescence on the outer surface of the carpus of the cheliped.
- (6) The carapace is very broad.

These features suggest a very close relationship between the present specimen and that of Stimpson, and together serve to distinguish both from other species of *Eucrate*. Opposed to this there are the following points of disagreement:—

- (1) The carapace of *E. transversa* is much broader (cw 1.46 x cl) than in the present specimen (cw 1.34 x cl).
- (2) The second anterolateral tooth of *E. transversa* is almost obsolete. In *E. haswelli* this tooth is very distinct, much larger than the fourth.
- (3) The median frontal notch of *E. transversa* is presumed, by inference, to be absent as in *E. dentata*. In *E. haswelli* it is quite distinct.

In spite of the many points of agreement these differences cannot at present be reconciled. Until the discovery of specimens that can be referred unquestionably to Stimpson's description of *E. transversa* indicates that the variability of this species is adequate to encompass these differences, it seems necessary to regard the present specimen as belonging to a species distinct from *E. transversa*. Haswell described two species of *Eucrate* but both were subsequently considered junior synonyms of established species. They have been reinstated in this paper and it is fitting that his name should be used for this species.



***Eucrate dorsalis* (White)**

(Figs. 2, 6.)

*Cancer (Galene) dorsalis* White, 1848, p. 144, pl. Annulosa 6.

*Eucrate hamiltoni* McCulloch, 1908, pp. 58-9, pl. 12, figs. 1, 1a. Tesch, 1918, p. 158 (in key).

*Eucrate dorsalis* White: McCulloch, 1909, p. 314.

**MATERIAL EXAMINED**

Queensland Museum: Eight males (16-63 mm), four females (19-54 mm), Moreton B. (Cleveland, Hayes Inlet, Mud I, Otter Rock, trawled, 4-5 fms), W76, W414, W1257, W1430, W1465, W1472, W2661, W2717, W3031, W3032, W3033.

Australian Museum: Male, 31 mm, Moreton B., P7914; male, 44 mm, Gulf of Carpentaria, P6793; five males (29-47 mm), eight females (18-50 mm), Gulf of Carpentaria.

**DESCRIPTION**

**CARAPACE:** Broader than long (1.16 to 1.28 times, see fig. 2); surface microscopically punctate; regions not defined; median frontal groove imperceptible; concave depression behind orbits extending laterally to second anterolateral teeth, forward to antennal notches, and across post-frontal region as a very shallow concavity. Fronto-orbital width 1.80-2.05 times frontal width (see fig. 2); front with two broad square-cut lobes, their anterior margins straight or slightly concave, transverse, and sulcate. Infra-orbital margin defined by a slightly raised rim which ends medially with a low, rounded, very obtuse lobe separated by a shallow concavity from the larger, more acute inner suborbital tooth. Anterolateral margins with four teeth including external orbital angle. In smaller specimens the very acute third tooth is much the more prominent, the second has the longest outer margin, the fourth is the smallest, sometimes only demarcated by a fine groove. With increase in carapace width the teeth are much reduced (see fig. 6K), becoming gradually indistinguishable (see McCulloch, pl. 12, fig. 1.) in large specimens.

**BASAL ANTENNAL JOINT:** Antero-external angle produced to meet front so that flagellum is excluded from orbit; frontal margin of projection shorter than orbital margin.

**CHELIPED:** Upper border of merus usually with one or two small sharp granular spines in middle of length, always with strong subdistal spine. Intermediate lobe between subdistal spine and prominence for upper carpal articular condyle poorly developed or absent, always much smaller than articular prominence when viewed in profile, sighting across base of maxillipeds. Carpus with strong median spine, and narrow band of hairs between this and upper articulation with propodus, sometimes carried right to lower articulation, but only as narrow fringing band (covering less than one seventh of outer face). Propodus smooth and rounded, with longitudinal groove near ventral edge of outer surface extending back from tip of fixed finger for half length of chela.

**AMBULATORY LEGS:** Of moderate length, third ambulatory less than twice carapace length. Propodus of last leg moderately slender, length 2.4-2.9 times width (see fig. 2).

**MALE ABDOMEN:** First, second, and third segments expanded laterally to meet coxae of last legs; third and fourth segments rapidly tapering to base of fifth; length of fifth segment less than (0.75–0.85 times) width of distal margin; sixth segment with concave subparallel sides; terminal segment triangular, length 1.5 to 2.0 times width (see fig. 2).

**MALE PLEPOD:** Of moderate length, not distinctly extending past point where first sternal groove meets abdomen. Curved and tapering throughout length; tip rounded; some terminal spinules bifid.

**COLOUR:** After alcohol preservation pale cream, usually with single large reddish central spot on carapace, reddish speckling anterior to this extending on to pterygostome and maxillipeds and on upper surfaces of chelipeds; central spot sometimes paler, or replaced by a complete or incomplete ring of close-set speckles with or without more sparsely distributed speckles inside this ring.

**DISTRIBUTION.** Queensland coast from Gulf of Carpentaria to Moreton B.

#### DISCUSSION

Large specimens of this species are quite distinctive, having greatly reduced anterolateral teeth, very large chelae, and a characteristic colour pattern. Smaller specimens (c. 10–40 mm) differ quite markedly from these in having strongly developed teeth, the third being markedly prominent.

These small specimens of *E. dorsalis* show some similarity to Stimpson's (1907) description of *E. dentata*, but differ most notably in the ratio of the carapace width to the fronto-orbital width. According to Stimpson the carapace width is a little greater whereas in *E. dorsalis* it is c. 1.5 times. *E. dorsalis* further differs in having no frontal notch, a tuft of pubescence on the outer surface of the wrist, and in the colouration which is given as "Carapax gray or brown, whitish posteriorly, and with a transverse narrow white band behind the eyes. The frontal region and feet punctate with red. The species presents little or no variation in colour." Stimpson states that *E. dentata* is found in considerable numbers near Hong Kong so that the absence of large specimens similar to *E. dorsalis* is a further argument for not synonymising the two.

Chhapgar (1957, pp. 437–8, pl. 11, figs. j, k, l) refers eight specimens from Bombay to *E. dentata*. In these specimens the frontal notch is present, but almost obsolete (as was also reported by Alcock, 1900, p. 301 in his two specimens from Palk Str. and Hong Kong) and the second, as well as the fourth, anterolateral tooth is quite inconspicuous. Chhapgar's figure also differs from Stimpson's description in that the fronto-orbital width appears markedly less than the carapace width, and the colouration of his specimens is "bright yellow with minute red spots scattered throughout. One of the specimens has two black squarish patches on the outer sides of the gastric region." Chhapgar's material differs from *E. dorsalis* in the absence of any indication of a central patch on the carapace; in the extent of the pubescence on the wrist of the cheliped, which covers about one third of the outer surface; in the second anterolateral tooth being inconspicuous; and in the abrupt curve at the distal quarter of the male pleopod.

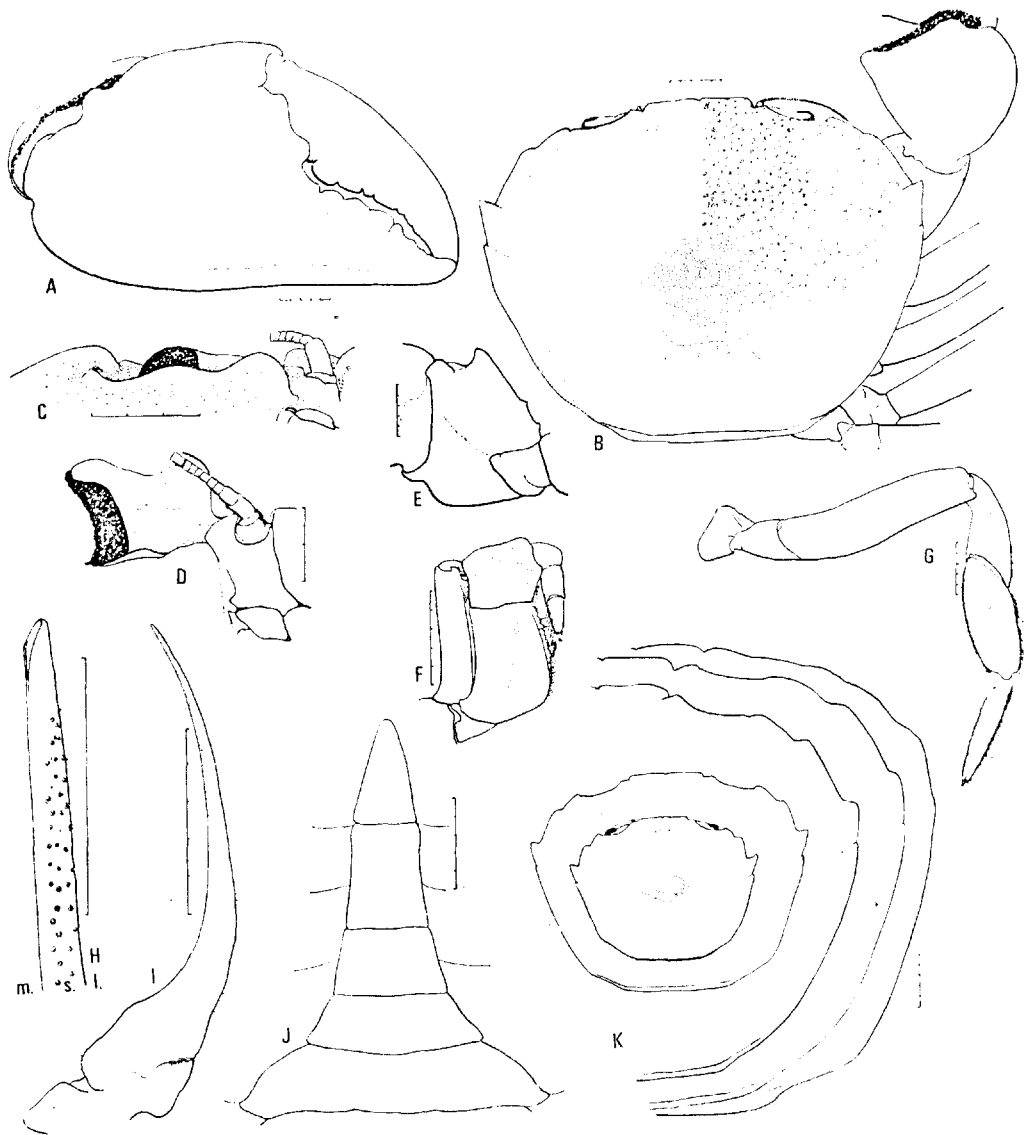


FIG. 6: *Eucrate dorsalis*. A-G: female, Qd Mus. W2661. A, chela; B, carapace; C, suborbital rim; D, basal antennal joint; E, merus of cheiped (see text); F, third maxilliped; G, last right ambulatory leg.

H-J: male, Qd Mus. W1430. H, I, male pleopod (m. - median, s. - sternal, l. - lateral faces); J, male abdomen.

K: carapace outlines of Qd Mus. W1519 (male, 18.5 mm); W1472 (female, 27.0 mm); W1430 (male, 46.1 mm); W2717 (female, 53.9 mm); W414 (male, 53.5 mm).

Scale divisions 1 mm.

***Eucrate crenata* de Haan**

(Figs. 2, 7.)

*Cancer (Eucrate) crenatus* de Haan, 1835, p. 51 pl. 15, fig. 1.*Pilumnoplax sulcatifrons* Stimpson: Tozzetti, 1877, pp. 102-6, pl. 7, figs. 2 a-e.[non] *Pilumnoplax sulcatifrons* Stimpson, 1858, p. 93.*Eucrate crenata* de Haan: Alcock, 1900, p. 300. Shen, 1932, pp. 114-7, pl. 5, fig. 2. Sakai, 1939, p. 562, pl. 102, fig. 1; 1965, pp. 186-9, p. 83, fig. 4.

Although *E. crenata* does not occur in Australia a specimen from Japan in the Australian Museum collections has been used to give description and figures comparable with those of the Australian species.

**MATERIAL EXAMINED**

Australian Museum: Male, 30.5 mm, Japan, P720.

**DESCRIPTION**

**CARAPACE:** Broader than long (1.24 times); surface microscopically punctate; regions not defined; median frontal groove very shallow, barely discernable; a shallow concave depression behind orbits extending laterally to second anterolateral tooth, forward to deep antennal notches and across post-frontal region as a very shallow concavity. Fronto-orbital width 1.87 times frontal width; front with two broad square-cut lobes, their anterior margins transverse and sulcate. Infra-orbital margin defined by a slightly raised rim which ends medially in a rounded lobe well separated from the much larger inner suborbital tooth. Both inner suborbital tooth and terminal lobe have smaller subsidiary lobes lateral to them. Anterolateral margins short, curving (ratio of distance between last teeth and fronto-orbital width 1.55 : 1); with four teeth including external orbital angle all of similar shape, fourth smallest, first three subequal; a short low ridge running postero-mesiad from the fourth tooth. Posterolateral margins without distinct ridge.

**BASAL ANTENNAL JOINT:** Antero-external angle produced to meet front; frontal margin of projection distinctly shorter than orbital margin.

**CHELIPED:** Upper border of merus with small spine in middle of length and strong subdistal spine. Intermediate lobe between subdistal spine and prominence for upper carpal articular condyle subequal to articular prominence when viewed in profile sighting across base of maxillipeds. Inner angle of carpus with short median carina ending in low proximal lobe and prominent distal spine. Tapering band of hairs running from this spine to upper articular condyle and expanding to cover one third outer surface of carpus. Propodus smooth and rounded with raised longitudinal ridge near ventral edge of outer surface extending back for half length of chela.

**AMBULATORY LEGS:** Of moderate length, third ambulatory 1.8 times carapace length. Propodus of last leg moderately slender, length 2.7 times width.

**MALE ABDOMEN:** First, second, and third segments expanded laterally to meet middle of last legs; third and fourth segments rapidly tapering to base of fifth; length of fifth segment much less than (0.75 times) width of distal margin; terminal segment triangular, length 1.7 times width.

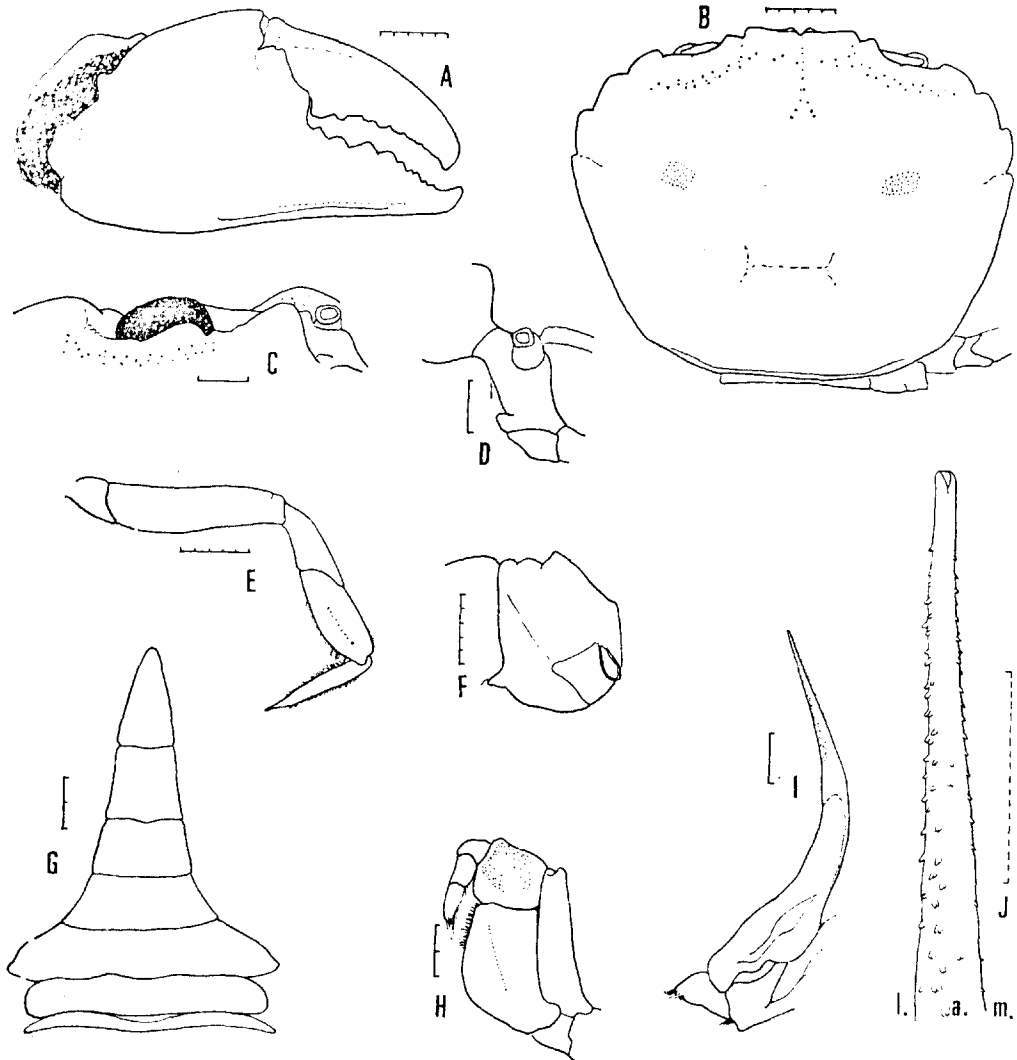


FIG. 7: *Eucrate crenata*. Aust. Mus. P720. A, chela; B, carapace; C, suborbital rim; D, basal antennal joint; E, last right ambulatory leg; F, merus of cheliped (see text); G, male abdomen; H, third maxilliped; I, J, male pleopod (l. = lateral, a. = abdominal, m. = median faces).

Scale divisions 1 mm, or 0.5 mm (broken line).

MALE PLEPOD: Curved in proximal two thirds with straight, evenly tapering, horny tip; some terminal spinules bifid.

COLOUR: Very faded but with two smallish spots still evident mesiad to fourth anterolateral teeth.

DISTRIBUTION: Japan (type locality, de Haan, 1835; Sakai, 1939; 1965); China (Shen, 1932); to India (Alcock, 1900).

#### DISCUSSION

It has often been suggested that *E. sulcatifrons* could represent a juvenile form of *E. crenata*, but the case for their distinctness is substantiated by Sakai's discovery of *E. sulcatifrons* in Japan and his recognition of it as a species distinct from *E. crenata*.

*E. crenata* appears closest to *E. tripunctata* and differences between the two are discussed under that species.

Alcock's description is not complete enough to provide, in itself, a definite record of this species from India but his reference to de Haan and Tozzetti in the synonymy increase the probability that his identification was correct.

Tozzetti's (1877) specimen from Yokohama agrees well in all respects with *E. crenata*, the short curving anterolateral margins, the proportions of the fifth and seventh segments of the male abdomen, and the extent of the hairy patch on the outer surface of the carpus of the cheliped being particularly significant.

#### DISCUSSION

In spite of the key given above it is to be expected that identification of some specimens of this genus will still prove difficult. The extensive growth polymorphism demonstrated in some species but only suspected in others, the probability of considerable geographical variation, and even the possibility of short term temporal variation in such things as colour patterns, are some of the expected complications. More attention must be paid to such features as male pleopods, suborbital margins, and basal antennal joints as, although the orbital lobes of the latter do shorten with increasing size of specimen, all three can provide useful information. Further information is needed on variability of material throughout the Indo-West Pacific and it is hoped that the present paper might provide a starting point for these investigations.

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## LITERATURE CITED

- ALCOCK, A., 1900. Materials for a carcinological fauna of India. No. 6. The Brachyura Catometopa, or Grapsoidea. *J. Asiat. Soc. Beng.* 69 (2): 279-456.
- BARNARD, K. H., 1950. Descriptive catalogue of South African decapod Crustacea (crabs and shrimps). *Ann. S. Afr. Mus.* 38: 1-824.
- CAMPBELL, B. M. and STEPHENSON, W. in MS. "Checklist of the sub-littoral Brachyura of Moreton Bay."
- CHHAPGAR, B. F., 1957. On the marine crabs (Decapoda: Brachyura) of Bombay State. Part I. *J. Bombay Nat. Hist. Soc.* 54 (2): 399-439, pl. A. 1-11.
- EDMONDSON, C. H., 1962. Hawaiian Crustacea: Goneplacidae, Pinnotheridae, Cymopoliidae, Ocypodidae, and Gecarcinidae. *Occ. Pap. Bishop Mus.* 23 (1): 1-27.
- GRIFFIN, D. J. G. and CAMPBELL, B. M., 1969. The sub-littoral Goneplacids and Pinnotherids (Crustacea: Brachyura) of Moreton Bay. *Mem. Qd Mus.* 15 (3): 141-63.
- DE HAAN, W., 1835. Crustacea. In P. F. VON SIEBOLD, "Fauna Japonica." (J. Müller and Sons: Amsterdam).
- HASWELL, W. A., 1881. On some new Australian Brachyura. *Proc. Linn. Soc. N.S.W.* 6: 540-51.
1882. "Catalogue of the Australian Stalk- and Sessile-eyed Crustacea." (Australian Museum: Sydney).
- MCCULLOCH, A. R., 1908. Studies in Australian Crustacea. No. 1. *Rec. Aust. Mus.* 7 (1): 51-59, pl. 12.
1909. Studies in Australian Crustacea. No. 2. *Rec. Aust. Mus.* 7 (4): 305-14, pl. 88.
- MAN, J. G. DE, 1887. 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. *J. Linn. Soc. Zool.* 22 (137): 65-128, pls. 4-8.
- MIERS, E. J., 1884. Crustacea. In "Report of the Zoological Collections made in the Indo-Pacific Ocean during the Voyage of H.M.S. Alert, 1881-1882." pp. 178-322, pls. 18-24. (London).
- RATHBUN, M. J., 1906. The Brachyura and Macrura of the Hawaiian Islands *Bull. U.S. Fish Com m.* 1903 (3): 827-930, pls. 1-24.
1915. (Scientific results of the Philippine cruise of the fisheries steamer "Albatross", 1907-1910.— No. 32). A new genus and some new species of crabs of the family Goneplacidae *Proc. U.S. Nat. Mus.* 48: 137-54.
- SAKAI, T., 1939. "Studies on the Crabs of Japan. IV. Brachygnatha, Brachyrhyncha." pp. 36-741, pls. 42-111. (Yokendo Ltd.: Tokyo.)
1965. "The Crabs of Sagami Bay" pp. i-xvi, 1-206, 1-92, 1-32, pls. 1-100. (Maruzen: Tokyo.)
- STEBBING, T. R. R., 1921. South African Crustacea (Part XI of S.A. Crustacea, for the Marine Investigations of South Africa). *Ann. S. Afr. Mus.* 18: 453-468, pls. 13-20.
- STEPHENSON, K., 1945. The Brachyura of the Iranian Gulf. *Dan. Sci. Invest. Iran*, Pt. 4: 57-237.

- SIMPSON, W., 1858. Prodromus descriptionis animalium vertebratorum quae in Expeditione ad Oceanum Pacificum Septentrionalem, a Republica Federata missa, Cadwaladaro Ringgold et Johanne Rodgers Ducibus observavit et descripsit. Pars V. Crustacea Ocyptoidea. *Proc. Acad. Nat. Sci. Philad.* **1858**: 93-110.
1907. Report on the Crustacea (Brachyura and Anomura) collected by the North Pacific Exploring Expedition, 1853-56. *Smithson. Misc. Coll.* **49** (1717): 1-240, pls. 1-26.
- TESCH, J. J., 1918. The Decapoda Brachyura of the Siboga-Expedition, V [erroneously numbered III]. Goneplacidae and Pinnotheridae. *Siboga Exped.*, Monogr. 39 cl, Livr. 84, pp. 149-296, pls. 7-18.
- TOZZETTI, A. T., 1877. Zoologia del Viaggio intorno al Globo della R. Pirocorvetta Magenta durante gli anni 1865-1868. Crostacei Brachyuri e Anomouri. *Publ. R. Ist. di Studi. Super. Firenze* **1**: i-xxix, 1-257, pls. 1-12.
- WHITE, A., 1848. Description of two new species of Crustacea. *Proc. Zool. Soc. London* **1848**: 144, pl. Annulosa 6.