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(Heller, 1865) (Crustacea: Decapoda: Brachyura:
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臺灣產地蟹科之新記錄種 *Epigrapsus notatus* (Heller, 1865)
(甲殼綱：十足目)

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**A newly recorded land crab, *Epigrapsus notatus* (Heller, 1865)
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摘要

本文首次報導臺灣的一種地蟹科陸蟹 *Epigrapsus notatus* (Heller, 1865), 並詳細比對同屬的 *E. politus* Heller, 1862。 *E. notatus* 的頭胸甲和雄性腹部的形狀會隨著成長的過程逐漸改變，頭胸甲形狀會從方形變成橫卵圓形。文中也敘述了本種蟹的體色及生態。

關鍵詞：*Epigrapsus notatus*、地蟹科、臺灣新記錄、甲殼類。

Abstract

The gecarcinid land crab, *Epigrapsus notatus* (Heller, 1865), is recorded from Taiwan for the first time. Detailed comparisons with its congener, *E. politus* Heller, 1862, are provided. The carapace and male abdominal form of *E. notatus* changes substantially with growth, with the carapace shape varying from squarish to transversely ovate. Notes on its colour and ecology are also provided.

Key words: Land crab, *Epigrapsus notatus*, Gecarcinidae, Decapoda, Crustacea, new record, Taiwan.

Introduction

Four species of gecarcinid land crabs are currently known from Taiwan, viz. *Cardisoma carnifex* (Herbst, 1796), *C. hirtipes* Dana, 1851, *C. rotundum* (Quoy & Gaimard, 1824), and *Gecarcoidea lalandii* H. Milne Edwards, 1837 (Ho et al., 1992). Among

the recent specimens collected from southern Taiwan was an interesting species of land crab (Gecarcinidae) of the genus *Epigrapsus* Heller, 1862. Crabs of the genus *Epigrapsus* are unusual among gecarcinids with regards to their relatively small size, and two species are currently recognized, *E. notatus* (Heller, 1865) and *E. politus*

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Heller, 1862 (see Türkay, 1974). The Taiwanese specimens, while referable to *E. notatus*, vary remarkably with regards to the carapace shape, physiognomy and male abdomen shape. The present note serves to record this species from Taiwan for the first time.

Notes on the taxonomy and variation evident in Taiwanese specimens of *E. notatus*, as well as its affinities with *E. politus*, form the text of the present paper. Specimens examined are deposited in the Taiwan Museum (TMCD), Taipei, Taiwan; Zoological Reference Collection (ZRC), Department of Biological Sciences, National University of Singapore; and Natur-Museum und Forschungs-Institut Senckenberg (SMF), Frankfurt am Main. Measurements provided are of the carapace widths and lengths respectively. The abbreviations G1 and G2 are used for the male first and second pleopods respectively.

Taxonomy

Epigrapsus Heller, 1862

Epigrapsus notatus (Heller, 1865)

(Figs. 1-5)

Grapsodes notatus Heller, 1865: 58, p1. 5 fig. 2.

Epigrapsus notatus -Tesch, 1918: 134, p1. 6, fig. 3.

Epigrapsus notatus punctatus Sandler, 1923: 28.

Epigrapsus wolffi Sandler, 1923: 28, fig. 3, p1. 21, fig. 4.

(see Türkay, 1974: 251, for complete synonymy)

Material examined

1 male (34.0 by 27.2 mm) (ZRC), Heng-Chun Peninsula, Pingtung County, Taiwan, coll. H.-C. Liu, 2 VI 1997. --- 2 males (24.4 by 19.5mm, 36.4 by 29.6 mm) (ZRC), Heng-Chun Peninsula, Pingtung County, coll. H.-C. Liu, 2 VIII 1994. --- 1 male (33.3 by 28.0 mm) (ZRC), 1 male (30.0 by 25.0 mm) (TMCD 3261), Siang-Chiao-Wan, Heng-Chun Peninsula, Pingtung County, coll. H.-C. Liu,

19 I 1988. --- 2 females (ovigerous) (28.6 by 23.1 mm, 21.1 by 18.9 mm) (ZRC), Long-Keng, Heng-Chun Peninsula, Pingtung County, coll. H.-C. Liu, 21 IX 1997. --- 1 male (25.4 by 20.3 mm), 2 females (18.3 by 15.3 mm, 29.5 by 23.5 mm) (ZRC), Heng-Chun Peninsula, Pingtung County, coll. H.-C. Liu & S. H. Tan, 20 V 1998. --- 2 males (25.7 by 21.1 mm, 28.2 by 22.9 mm), 1 female (28.2 by 23.2 mm) (ZRC), Heng-Chun Peninsula, Pingtung County, coll. H.-C. Liu & S. H. Tan, 22V 1998. --- 1 male (29.7 by 23.4 mm) (TMCD), Mei-Ren-Tong, Little Riu-Kiu Island, Pingtung County, coll. C.-H. Wang, 19 IV 1995. --- 1 male (32.2 by 25.2 mm) (carapace removed) (TMCD 3260), Lutao (Green Island), Taitung County, coll. H.-C. Liu, 11 VIII 1997. --- 1 male (23.4 by 20.1 mm) (TMCD 3271), Lanyu Island, Taitung County, coll. C.-H. Wang, 9 X 1996. All localities in Taiwan.

Description of male

Carapace squarish to distinctly broader than long, transversely ovate (Figs. 1a, 2, 3a), dorsal surface very smooth, glabrous, without distinct cristae or rugae, gently to strongly inflated transversely and longitudinally (Figs. 1a, 2, 3a). Frontal margin entire, median part depressed. External orbital tooth acutely triangular, distinctly separated from anterolateral margin by small but distinct cleft; first epibranchial tooth small but distinct; second epibranchial tooth frequently low to almost undiscernible (more prominent in smaller specimens); rest of anterolateral margin not cristate, gently convex to strongly arcuate; posterolateral margins gently convex, subparallel to strongly converging towards straight posterior carapace margin. Suborbital margin entire, subparallel with frontal margin, not connected to orbit; inner edge with very low tooth, outer edge ending abruptly (Fig. 1b). Pterygostomial region with dense, soft pubescence which completely ob-

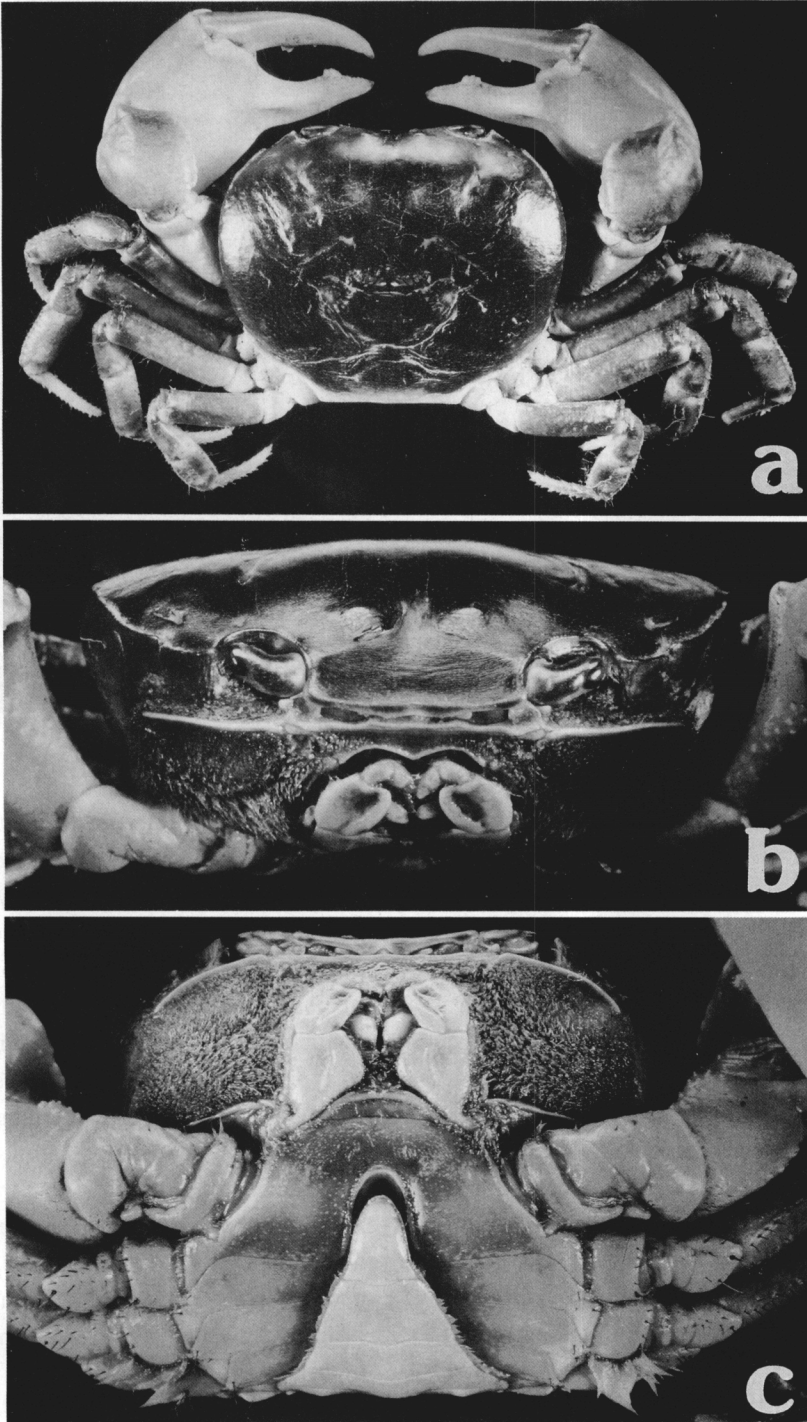


Fig 1. *Epigrapsus notatus*. Male (34.0 by 27.2 mm) (ZRC). a, dorsal view; b, frontal view; c, ventral view.



Fig. 2. *Epigrapsus notatus*. Male (24.4 by 19.5 mm) (ZRC).

scures surface (Fig. 1b). Surface of thoracic sternites 1-3 with scattered short pubescence which does not obscure surface, rest of thoracic sternites glabrous (Fig. 1c). Epistome distinct, posterior margin triangular medially (Fig. 1c).

Buccal cavity as broad as long. Third maxillipeds forming distinct rhomboidal median gap when closed (Figs. 1c, 3c). Merus slightly longer than broad, medially depressed. Ischium with shallow submedian sulcus, inner margin gently crenulate (Fig. 4a). Exopod narrow, reaching to about one-third length of merus, with vestigial flagellum (Fig. 4a).

Chelipeds subequal in males (Figs. 1a, 3a). Merus short, with several granules along antero-distal margin (increasing in size distally). Carpus smooth, inner distal angle low, not dentiform or spiniform, inner proximal angle with flattened granules (Fig. 4e). Chela strongly inflated in

adults; fingers shorter than smooth palm, inner median surface of palm with scattered rounded granules; fingers gaping proximally; cutting edge of dactylus with large tooth subproximally and denticles distally; proximal half of cutting edge of pollex unarmed, with submedian tooth and denticles along distal one-third (Fig. 4f).

Ambulatory legs relatively slender (Figs. 4c, d), second and third legs longest (Figs. 1a, 3a). Anterior and posterior margins of merus and carpus smooth to rugose. Anterior and posterior margins of propodus uneven or gently crenulate, never distinctly serrated (Figs. 4c, d). Dactylus gently curved, with numerous stout spines along margins. Surfaces of all segments (including coxa), especially dactylus, propodus and carpus covered with numerous short, stiff, black setae but not sufficiently dense to obscure margins (Figs. 1a, 3a). Coxae of third and fourth ambulatory legs

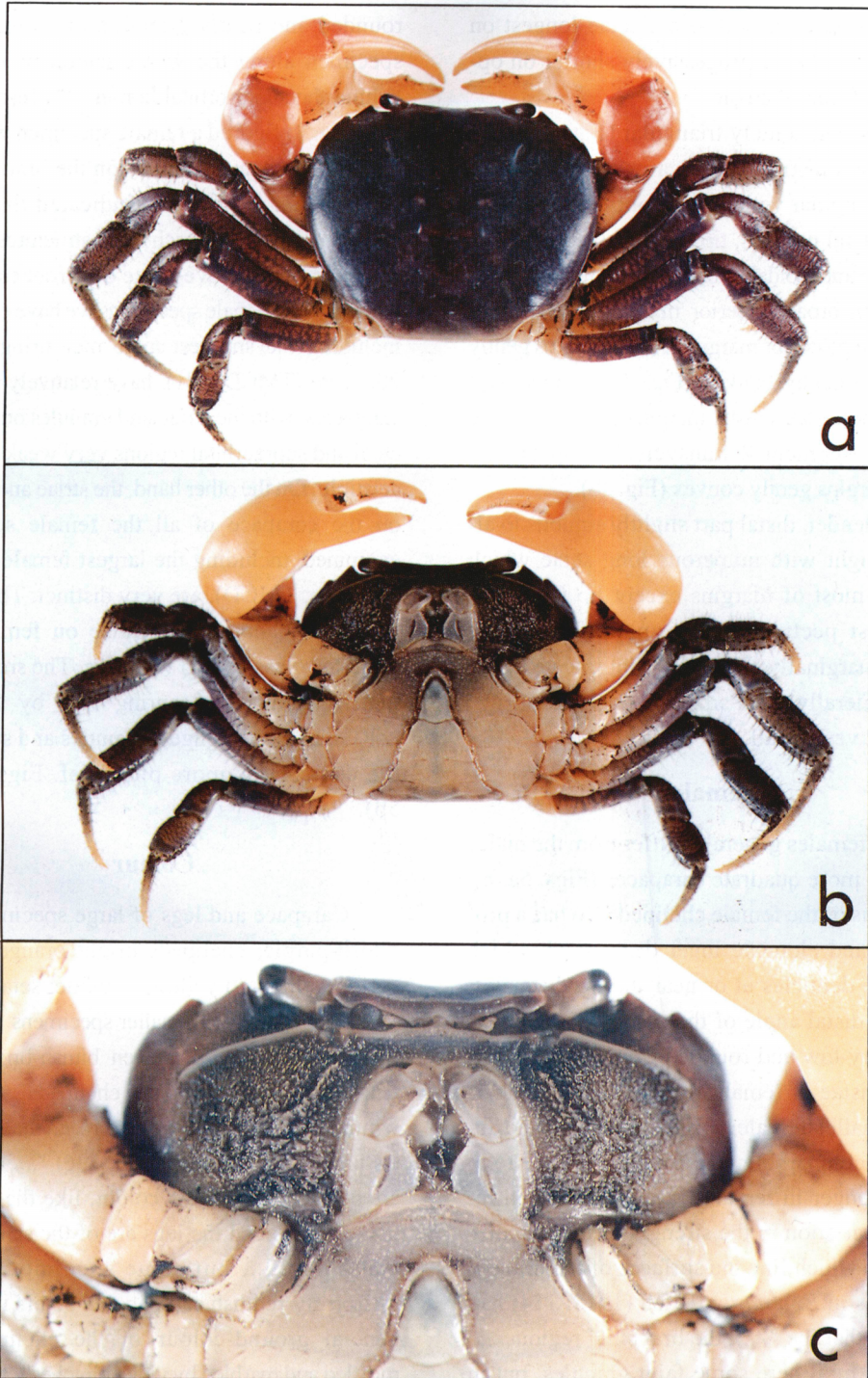


Fig. 3. *Epigrapsus notatus*. Male (34.0 by 27.2 mm) (ZRC). Live colours.

with dense tufts of soft setae; setae longest on outer surface, being progressively shorter on opposing surfaces of coxae.

Abdomen acutely triangular (Figs. 1c, 4b), all segments distinct, freely articulating. Telson evenly triangular with gently concave to slightly convex lateral margins, tip rounded (Figs. 1c, 4b). Segment 6 trapezoidal, broader than long to slightly longer than broad, anterior margin 1.5-2.0 times longer than posterior margin; lateral margins gently concave to gently convex (Fig. 4b). Segments 4 and 5 trapezoidal, lateral margins gently concave (Fig. 4b). Segment 2 transversely trapezoidal, lateral margins gently convex (Fig. 4b).

G1 slender, distal part slightly sinuous to almost straight with numerous long setae which obscures most of margins except tip (Fig. 4g). Distalmost pectinated part spatuliform when viewed marginally (Fig. 4i), subtruncate when viewed laterally, with small median cleft (Figs. 4h, j). G2 very small.

Female

The females generally differ from the males in having more quadrate carapaces (Figs. 5a, b). The carpus of the female cheliped also has a pronounced and elongate inner distal tooth which may have denticles at or near the tip. In males, the inner distal angle of the carpus of the cheliped is very low and rounded (Fig. 4e). The epigastric cristae of females is also generally sharper in smaller females. Even for males and females of comparable sizes, the cristae are relatively stronger in females. There have been reports of variation in the strength of the granules and striae which line the surfaces of the branchial regions in *E. notatus*. Tesch (1918: 134) had observed that the "..... the branchial regions..... usually exhibit here some faint granules, but in the specimen figured these granules are very large, arranged in obscure and oblique lines

rounded and pearly granules, are found in this specimen along the whole lateral margins and behind the supra-orbital border.....". Tesch (1918: p1. 6 fig. 3) figured a female specimen which has distinct striae and granules on the branchial and supraorbital regions and indicated that he had seen a specimen in which these structures are even stronger. We believe these differences are sex-related. All the male specimens we have examined, including the smallest male measuring 23.4 by 20.1 mm (TMCD3271), have relatively smoother carapaces, with the striae and granules on the branchial and supraorbital regions very weak to undiscernible. On the other hand, the striae and granules on the carapace of all the female specimens examined, including the largest female (28.6 by 23.1 mm, TMCD), are very distinct. The strength of the granules and striae on females also seem to be associated with size. The smallest female specimen, measuring 18.3 by 15.3 mm (ZRC), has the strongest granules and striae, and the carapace is more pitted (cf. Figs. 5a and 5b).

Colour

Carapace and legs of large specimens dark bluish-purple; chelipeds bright orange; ventral surfaces dirty- to yellowish-white; setae on sternum and legs black. Smaller specimens with dirty white carapace with uneven bluish-brown blotches and marmorations; chelipeds yellowish-white (Fig. 3). This agrees well with the colour notes provided by Tesch (1918: 136) "..... chelipeds are of a reddish-yellow colour, like the sternum; the carapace and the legs are of the same violet-bluish tint but some specimens have a uniformly-reddish carapace, in others it is of the general ground-colour of the chelipeds, but mottled and marbled by violet blotches". The colour of *E. politus* on the other hand, is "..... a uniform reddish-yellow" (Tesch, 1918: 133).

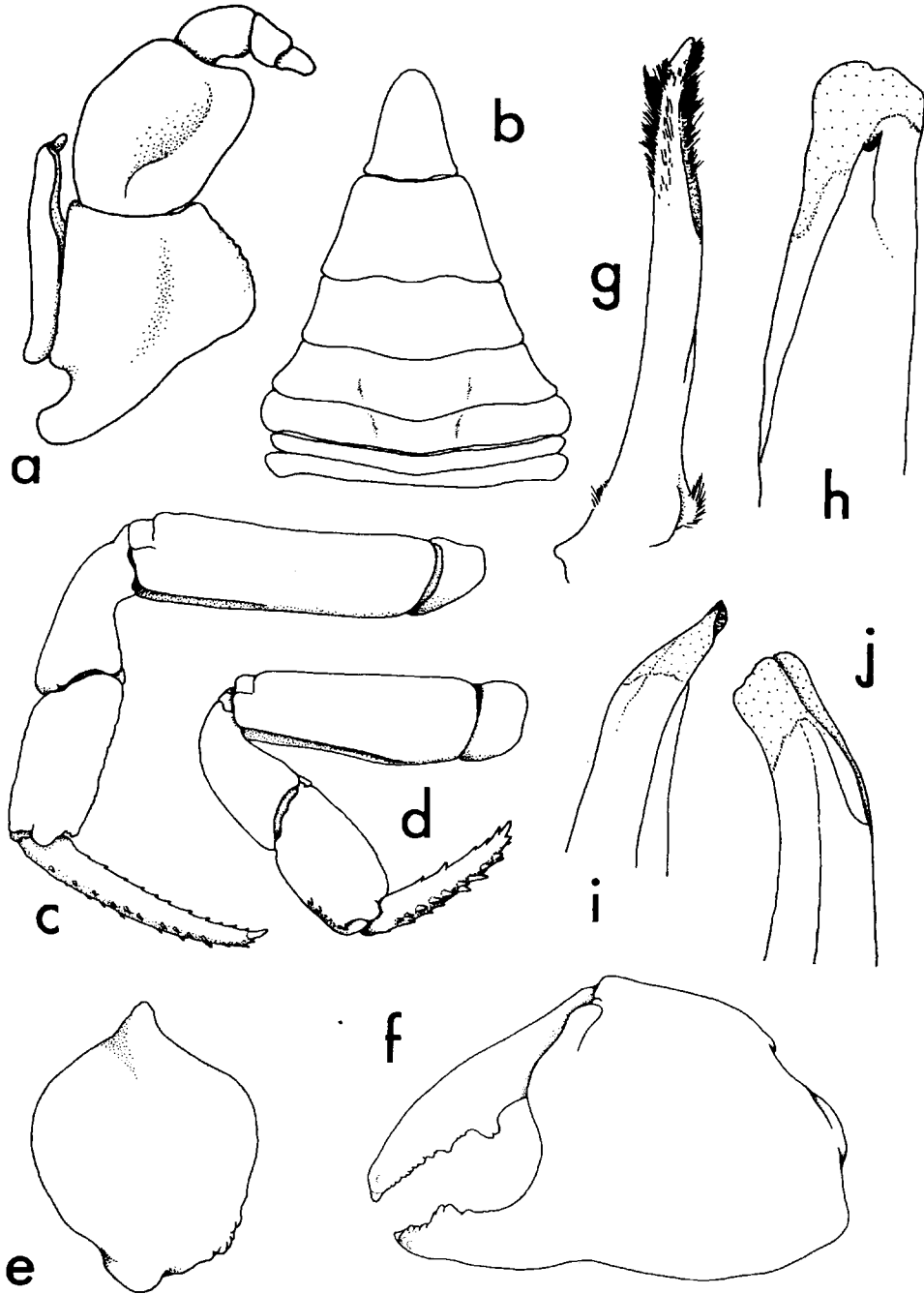


Fig. 4. *Epigrapsus notatus*. Male (34.0 by 27.2 mm) (ZRC). a, left third maxilliped; b, abdomen; c, left third ambulatory leg; d, left fourth ambulatory leg; e, left carpus of cheliped (dorsal view); f, left chela; g-j, left G1. a-d, setae not drawn; h, i, j, setae denuded.

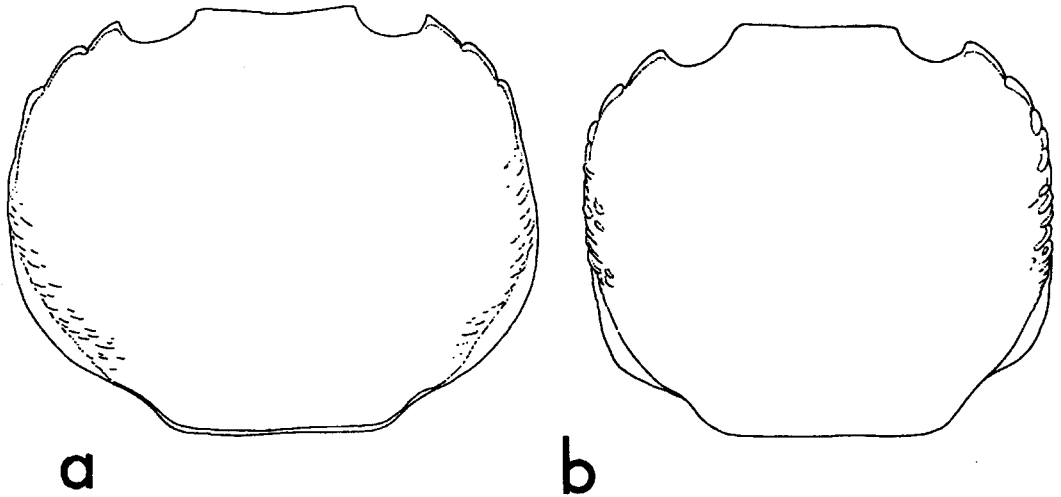


Fig. 5. *Epigrapsus notatus*. Schematic carapace shapes. a, ovigerous female (28.6 by 23.1 mm) (ZRC); b, ovigerous female (21.1 by 18.9 mm) (ZRC).

Remarks

Epigrapsus notatus differs from *E. politus* in its relatively more arcuate lateral margins (when large), stronger anterolateral margin armature, a more elongate ischium of the third maxilliped which is longer than broad, smoother anterior and posterior margins of the ambulatory merus, more setose and proportionately slender ambulatory segments, broader than long male abdominal segment 6, acutely triangular male telson (against evenly triangular telson) and its relatively more slender G1 (Table 1; Figs. 1, 4, 6)

Epigrapsus notatus is a much larger species compared to *E. politus*. The largest specimens of *E. notatus* to date measure 32.5 by 28.0 mm (male) and 29.0 by 26.0 mm (female) (Tesch, 1918: 136). The largest Taiwanese specimen (a male, ZRC) measures 36.4 by 29.6 mm. On the other hand, specimens of *E. politus* as small as 11.0 by 9.4 mm (male, SMF 5869) are already fully mature and a

small female specimen 14.4 by 11.7 mm (SMF 5869) is already ovigerous (see also Türkay, 1974). The two ovigerous specimens of *E. notatus* we have examined measure 28.6 by 23.1 mm and 21.1 by 18.9 mm (ZRC).

The larger specimens of Taiwanese *E. notatus* (ca. 25 mm and above in carapace width) differ from specimens of *E. notatus* previously reported (Heller, 1865; Tesch, 1918; Sandler, 1923; Türkay, 1973; Türkay, 1974) in its distinctly transversely ovate carapace shape, more arcuate lateral margins, distinctly converging posterolateral margins, generally more swollen carapace physiognomy, weaker anterolateral margin armature, relatively stouter ambulatory legs, much smoother anterior and posterior margins of the ambulatory merus, broader than long male abdominal segment 6 and its relatively more slender G1. Examination of specimens 24 mm in carapace width and less indicate, however, that the carapace shape is extremely variable. Most of the smaller males tend to have more quadrate

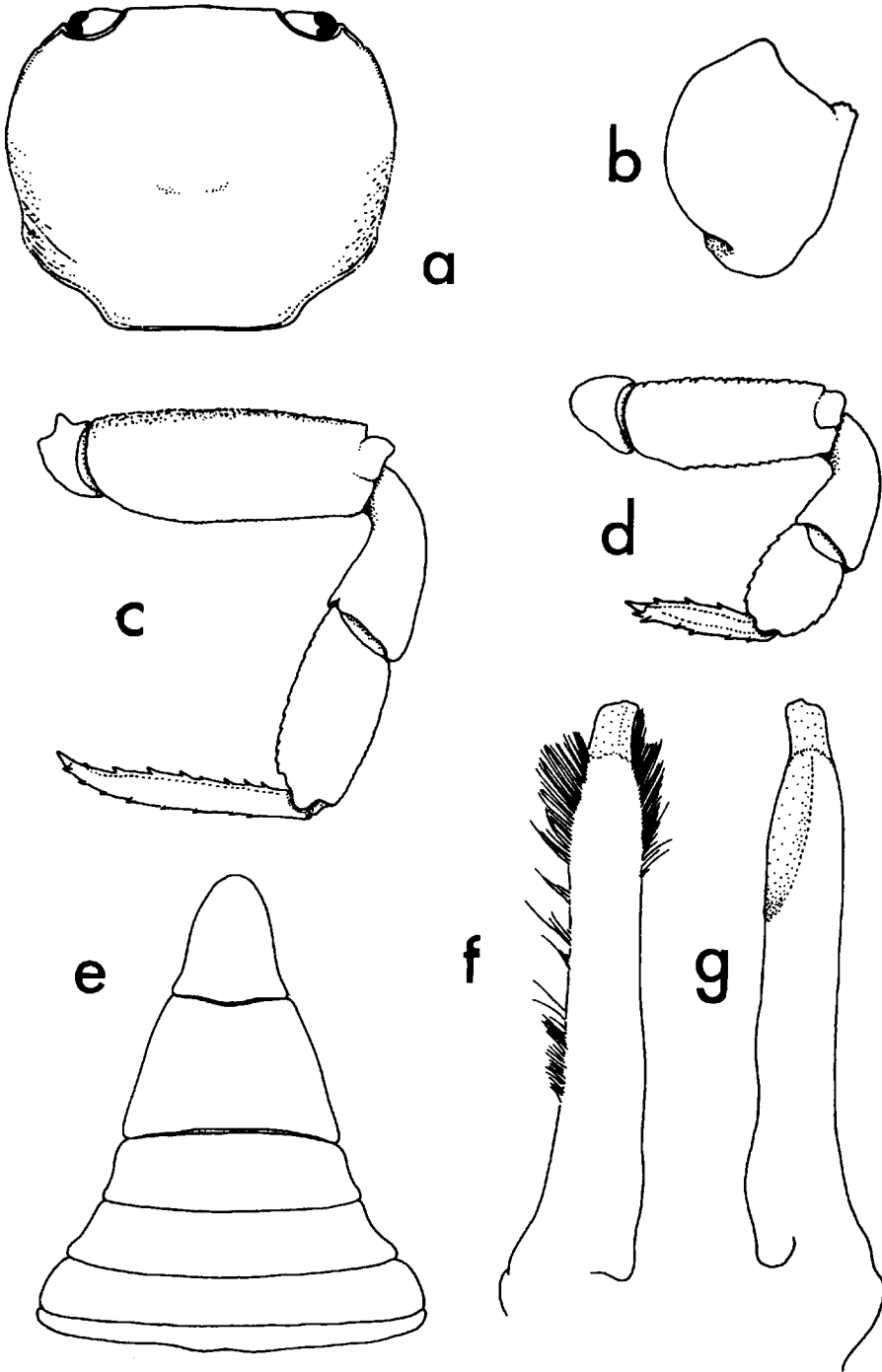


Fig. 6. *Epigrapsus politus*. Male (11.0 by 9.4 mm) (SMF 5869). a, carapace; b, left carpus of cheliped (dorsal view); c, left third ambulatory leg; d, left fourth ambulatory leg; e, abdomen; f, left G1; g, left G1. c, d, e, setae not drawn; g, setae denuded.

Table 1. Differences between *Epigrapsus notatus* and *E. politus*

	<i>Epigrapsus notatus</i>	<i>Epigrapsus politus</i>
Carapace	squarish to transversely ovate (larger specimens); lateral margins gently convex to strongly arcuate (larger specimens), posterolateral margins subparallel to converging towards posterior carapace margin (larger specimens); dorsal surface gently to strongly convex; grooves distinct (Figs. 1a, 5)	transversely ovate always; lateral margins arcuate, posterolateral margins distinctly converging towards posterior carapace margin; dorsal surface gently convex, gently swollen; grooves shallow (Fig. 6a)
Anterolateral margin	margin with 1 distinct epibranchial tooth and sometimes one very low, weak and broad tooth; first tooth separated from external orbital tooth by distinct V-shaped notch, second tooth when discernible, separated from first tooth by very shallow notch (Figs. 1a, 5)	margin with 1 very low, indistinct epibranchial tooth (often absent with margin appearing entire); when discernible, separated from external orbital tooth by very small notch (Fig. 6a)
Third maxilliped	rectangular, distinctly longer than broad (Fig. 4a)	squarish, as broad as long (Sendler, 1923: Fig. 1)
Ambulatory legs	merus and dactylus of all legs relatively more slender and proportionately longer; anterior margin of merus smooth to gently granulated, posterior margin of merus crenulate; dactylus with numerous distinct spines; surfaces (especially dactylus) with numerous short, stiff setae (Figs. 4c, d)	merus and dactylus of all legs relatively stouter and proportionately shorter; anterior and posterior margins of merus rugose, squamate to gently serrate; dactylus with scattered spines; surfaces with few or no setae, dactylus with only scattered setae (Figs. 6c, d)
Male telson	triangular (Fig. 4b)	acutely triangular (Fig. 6e)
G1	relatively short, stout; distal part almost straight to bending slightly inwards (towards median longitudinal suture of thoracic sternum) (Figs. 4g-j)	relatively elongate, slender; distal part almost straight to distinctly bent inwards (towards median longitudinal suture of thoracic sternum) (Figs. 6f, g)

and less distinctly transversely ovate carapaces, and the lateral margins are gently convex and less strongly arcuate (Fig. 2). The carapace is also proportionately less inflated. A small male from Lanyu (23.4 by 20.1 mm, TMCD), has a subrectangular carapace with the lateral margins gently convex and subparallel. This male strongly resembles the specimens figured by Sendler (1923: Fig. 1), Türkay (1974: Fig. 18), Tesch (1918: pl. 6 Fig. 3), Türkay (1973: Fig. 5) and Türkay (1974: Fig. 19) of *E. notatus*. Of the two ovigerous females examined, one female (28.6 by 23.1 mm, ZRC) has a somewhat more rounded carapace (Fig. 5a) whilst the smaller specimen (21.1 by 18.9 mm, ZRC) (Fig. 5b) has a distinctly squarish one. The carapace form of *E. notatus* thus appears to be associated with size, with smaller specimens being more squarish and larger ones transversely ovate.

In addition, there is variation in the depth of the cervical and gastro-cardiac grooves on the carapace. Smaller specimens generally tend to have more shallow grooves but in larger ones which are also more inflated, these grooves are distinctly deeper. One of the specimens (the largest male, 36.4 by 29.6 mm, ZRC), has the median parts of the carapace markedly depressed in several parts, with the grooves appearing deep. But the depressions are uneven in position and depth, suggesting that they were the result of an improper moult. In the carapace shape and other characters, however, it agrees very well with the other specimens.

The shape of the sixth male abdominal segment also varies considerably with age and size. In smaller male specimens (less than 25 mm carapace width), the sixth male abdominal segment is about as long as broad, and the anterior margin is about twice the length of the posterior margin. The lateral margins are almost straight to gently convex or gently concave. This form agrees with the male abdomens figured by Sen-

der (1923: Fig. 3), Türkay (1973: Fig. 6; 1974: Fig. 19). In larger specimens, however, the sixth segment is more trapezoidal in shape, broader than long, the anterior margin is about 1.5 times longer than the posterior margin and the lateral margins are gently but distinctly convex.

The transversely ovate and highly inflated carapace as well as the lack of a flagellum on the exopod of the third maxilliped of larger specimens of *E. notatus* gives them the appearance of young *Gecarcoidea lalandii*, a species which also occurs in the same area. They are, however, easily distinguished by the pterygostomial region of *Gecarcoidea* species being glabrous and their frontal margin very narrow (see Türkay, 1974).

Sakai (1976: 678, text-fig. 373) reported a small female specimen (16.2 by 13.3 mm) (see also Sakai, 1954: 200) of *E. notatus* from Borawazawa on Hachijo Island, some 300 km south of Tokyo in Japan. Curiously, Türkay & Sakai (1976) did not mention Sakai's (1955, 1976) record in their review of the Japanese Gecarcinidae.

Ecology

Epigrapsus notatus was collected from sheltered forests with numerous limestone rocks. The animals normally come out to forage only when there is light rain, and even then, do not wander far from their burrows. In the same area, three other species of gecarcinids may be found, viz. *Cardisoma hirtipes*, *C. rotundum* and *Gecarcoidea lalandii*. In addition, the sesarmine grapsid *Metasesarma aubryi* was common and specimens of the rare *Labuanium rotundum* was also found climbing trees. In captivity, *E. notatus* prefers to stay out of water and hides under rocks. Sakai (1954: 200) commented that on Hachijo Island in Japan, the species "..... lives in the crevices or the rock, not far from the beach where the fresh water is dropping down".

Distribution

Epigrapsus notatus has been recorded from the Nicobar Islands, Talaut Islands (Moluccas), Papua-New Guinea, Solomon Islands, Bismarck Archipelago (type locality), Admiral Islands, Bonin (= Ogasawara) Islands and Hachijo Islands (Japan), and now southern Taiwan. *Epigrapsus politus* has been reported from Tahiti (type locality), Tuamotu, Caroline Islands, Bertrand Island (Papua-New Guinea) and northern Sumatra.

Comparative material

Epigrapsus politus: 1 lectotype male (19.0 by 15.0 mm), 1 paralectotype female (NMW 1825), Tahiti. — 1 male (11.0 by 9.4 mm), 1 ovigerous female (14.4 by 11.7mm) (SMF 5869), Bertrand Island, New Guinea, coll. E. Wolff, Hanseat Südsee Expedition, 16 IV 1909.

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