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(Crustacea, Decapoda, Brachyura)

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**Notes on the Enigmatic Genus *Pseudozius* Dana, 1851  
(Crustacea, Decapoda, Brachyura)**

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**摘要**

**黃祺麟、王嘉祥 假團扇蟹屬 (*Pseudozius* Dana, 1851) 之分類** 臺灣省立博物館半年刊 47(1):83-99

本文重新考量一種扇蟹——礁石假團扇蟹 (*Pseudozius caystrus* (Adams and White, 1849)) 的分類地位，並加以詳細論述。以往，假團扇蟹屬 (*Pseudozius* Dana, 1851) 雖然被歸屬於團扇蟹科 (Oziidae) (Menippidae aut.)，但仍然存有一些疑點，如觸角的特殊位置和雄性的第一、二對腹肢的結構，就和團扇蟹科不盡符合。本文將已知的三種假團扇蟹屬螃蟹列入長腳蟹科 (Goneplacidae) 之假團扇蟹亞科 (Pseudoziinae Alcock, 1898, stat. nov.)。Ward (1932) 曾指定 *Pseudozius caystrus* (Adams and White, 1849) 為該屬的模式種，此與命名法規相抵觸，應屬無效。依照命名法規，*Pseudozius* 的模式種應為 *Pseudozius planus* Dana, 1852。為保持原有之用法，本文重新指定 *Pseudozius caystrus* (Adams and White, 1849) 的選模為 *P. planus* Dana, 1852，的新模，如此二者則成為客觀的同種異名。文中且報導一採集自臺灣的特異 *P. caystrus* 標本，此標本的背甲具有特殊的相貌。

**關鍵詞：**假團扇蟹屬，團扇蟹科，哲蟹科，長腳蟹科，分類學。

**Abstract**

The taxonomy of the enigmatic xanthoid crab *Pseudozius caystrus* (Adams and White, 1849) is considered and is redescribed in detail. The genus *Pseudozius* Dana, 1851, was previously placed in the family Oziidae (Menippidae aut.) with some uncertainty. The unusual positioning of its antennae, as well as the structure of the male first and second pleopods however, argue against including the genus in the Oziidae. The genus *Pseudozius*, with three recognised species, is here referred to the Goneplacidae, in the subfamily Pseudoziinae Alcock, 1898, stat. nov. *Pseudozius caystrus* (Adams and White, 1849) was incorrectly designated as the type species of the genus by Ward (1932), which should be *Pseudozius planus* Dana, 1852, instead. To maintain current usage, the lectotype of *Pseudozius caystrus* (Adams and White, 1849), is designated as the neotype of *P. planus* Dana, 1852, to make the two names objective synonyms. An aberrant Taiwanese specimen of *P. caystrus* with an unusual carapace physiognomy is also reported.

**Key words:** *Pseudozius*, Oziidae, Menippidae, Goneplacidae, taxonomy.

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## Introduction

Among the collections of the Taiwan Museum is a series of an interesting and poorly known crab, *Pseudozius caystrus* (Adams and White, 1849), most of which have been recently collected from southern Taiwan. Some of the specimens of *P. caystrus* in the museum had been incorrectly referred to a superficially very similar species, *Epixanthus frontalis* H. Milne Edwards, 1834 (family Oziidae), and it is possible that some or part of the older records of *E. frontalis* (e.g. Maki and Tsuchiya, 1923; Lin, 1949; Chang, 1963) or *Epixanthus* sp. (Horikawa, 1940; Lin, 1949) actually refer to *Pseudozius caystrus* instead. Other than *P. caystrus*, the only other known congeners are the poorly known *Pseudozius inornatus* Dana, 1852 (from Sandwich Islands and Hawaii) and *P. pacificus* Balls, 1938 (from Gilbert Islands) (see Guinot, 1968).

The taxonomic position of the genus *Pseudozius* Dana, 1852, in the Brachyura has been debated for some years, and it is currently provisionally placed in the family Oziidae (= Menippidae aut.) (see Holthuis, 1993), superfamily Xanthoidea. Unfortunately, the species has never been described or figured in detail. Crosnier (in Serène, 1984), had commented that the late Raoul Serène had considered establishing a new family for the genus. Alcock (1898) had in fact, already established a new "alliance", Pseudozioida, in the Menippinae (present Oziidae) for the genus *Pseudozius*.

The opportunity is taken here to define and place Pseudoziinae stat. nov. in the family Gonoplacidae sensu lato, and to redescribe in detail the type genus, *Pseudozius*, as well as *Pseudozius caystrus*. The nomenclature of the genus its supposed type species, *P. caystrus*, is also discussed.

Specimens used in the present study are deposited in the Taiwan Museum (TMCD), Taipei, Taiwan, Republic of China; the Zoological Reference Collection (ZRC), Department of Zoology, National University of Singapore; the Natural History Museum (NHM), London, U.K., and the Zoological Museum of the Humboldt University, Berlin (ZMB), Germany. The male

first and second pleopods are abbreviated as the G1 and G2 respectively. Measurements, in millimetres, provided are of the carapace width and length respectively.

## Family Gonoplacidae MacLeay, 1838, sensu lato

Subfamily Pseudoziinae Alcock, 1898, stat. nov.  
*Pseudozioida* Alcock, 1898: 176.

## *Pseudozius* Dana, 1851

*Pseudozius* Dana, 1851: 127; Dana, 1852: 81; Miers, 1886: 141; Alcock, 1898: 180; Borradaile, 1902: 241; Balss, 1938: 63; Ward, 1932: 251, 252; Balss, 1957: 1651; Edmundson, 1962: 283; Sakai, 1976: 471; Guinot, 1968: 330.

### Type species

*Pseudozius planus* Dana, 1852, subsequent designation by Ward (1932: 252) (not *Panopeus caystrus* Adams and White, 1849) (see later).

### Diagnosis

Carapace oval, regions poorly defined; median part of frontal margin strongly deflexed downwards; inner supraorbital tooth and lateral part of frontal margin forming laterofrontal cleft which third antennal segment is lodged. Posterior margin of epistome medially clefted, forming median triangular part; endostomial ridges low but discernible. Sternites 1 and 2 fused, no suture visible; suture between sternites 2 and 3 deep, suture between sternites 3 and 4 interrupted medially. G1 long and slender with short spines on distal margins, no long plumose hairs; G2 short, basal segment well developed but distal segment absent. Male abdomen 7-segmented, all segments freely movable.

### Remarks

The classification of the genus *Pseudozius* has posed problems for some time. While most workers placed *Pseudozius* in the Oziidae (as Menippidae or as the subfamily Menippinae in

the Xanthidae sensu lato) (see Balss, 1957; Holthuis, 1993), many (e.g. Tweedie, 1950; Forest and Guinot, 1961; Edmondson, 1962; Guinot, 1968; Crosnier, 1984) have noted that the G2s of *P. caystrus* are short and quite unlike the elongate and often whip-like G2s of typical oziids. Alcock (1898) had in fact, separated *Pseudozius* from other menippids (as a subfamily, Menippinae) when he established a separate alliance, Pseudozioida, within his Menippinae, Xanthidae sensu lato, for the genus. Crosnier (1984) also noted that Serène had proposed the establishment of a separate family for *Pseudozius* in an unpublished manuscript.

There are certainly very good grounds for Alcock's and Serène's suggestions for recognising *Pseudozius* as a separate group. While the G1s of *Pseudozius* species resemble that of some oziids and carpiiliids (cf. Guinot, 1968; Crosnier, 1984); the G2 is much shorter, with the basal segment short and the distal segment very reduced. The inner supraorbital tooth is strongly deflexed like the front, and the edge of the front and the inner supraorbital tooth forms a rounded laterofrontal cleft in which the second and third antennal segments sit. The antenna is thus not lodged in the orbital hiatus at all. From the dorsal view, the antenna seems to be wedged in the laterofrontal cleft. Guinot (1968), in her review of *Pseudozius*, had specifically mentioned this unusual character in the two species she studied, *P. inornatus* and *P. pacificus*.

Davie (1989) established a new genus *Flindersoplax* for *Heteropanope vincentiana* Rathbun, 1929, and discussed the affinities of this species with several xanthoid and "goneplacid" taxa. He felt that although *Pseudozius* and *Flindersoplax* had the same type of G2 and its sternite 8 is completely hidden laterally by the male abdomen, the broad oval sternum and wide male abdomen of *Flindersoplax* placed it closer to the Carcinoplacinae in the Goneplacidae sensu lato. The carapaces of *Pseudozius* and *Flindersoplax*, structures of their frontal margins and antennae, as well as relative shorter proportions of their G2s however, suggest a close relationship.

Guinot (1968) reviewed the genus *Pseudo-*

*zius* and clarified many outstanding points about its composition. She restricted *Pseudozius* for three species (*P. caystrus*, *P. ornatus* and *P. pacificus*) and figured the G1s and G2s of *P. ornatus* and *P. pacificus* for the first time, the latter on the basis of the types of Balss (1938). The G1s and G2s of these species conform with the basic pattern for *P. caystrus*.

The continued retention of *Pseudozius* in the family Oziidae is inadvisable. Other than superficial similarities, it is clear that *Pseudozius* does not belong to the Oziidae as currently recognised. Its affinities in fact, appear to be more "goneplacid" and is related to genera like *Flindersoplax* and possibly *Eucrate* as well. It would be useful to tentatively recognise Alcock's (1898) "Pseudozioidae" as a subfamily, Pseudoziinae, within the family Goneplacidae, which for the moment, contains the genera *Pseudozius*, and possibly *Flindersoplax* as well. In time, once the problems with the higher classification of the Goneplacidae are resolved, it may be necessary to recognise the grouping as a separate family.

In general appearance, *Pseudozius* is very similar to the oziid genus *Epixanthus*, especially to *E. frontalis*, and the two species are sympatric in southern Taiwanese waters. They are however easily separated by the form of their antenna, front and structure of the pincers.

The differences between *P. caystrus*, *P. inornatus* and *P. pacificus* have already been discussed by Guinot (1968). The gonopods of *P. inornatus* and *P. pacificus* have been well figured by Guinot (1968) (Fig. 9), and those of *P. caystrus* are figured here in detail (Figs. 1 c-f; 4b-h; 8a-g).

#### Nomenclature

Ward's (1932: 252) designation of *Pseudozius caystrus* as the type species of *Pseudozius* poses some nomenclatural problems. Dana (1851: 127), in establishing *Pseudozius*, did not designate a type species or list any species he regards as belonging to this genus. Dana (1852a: 81) subsequently described three new species in *Pseudozius*, viz. *P. planus*, *P. inornatus* and *P. dispar* (in order of description). Article 69(a)(i)(1) of the International Code

of Zoological Nomenclature (1985) states that "If no nominal species was included at the time the nominal genus or subgenus was established, the nominal species that were first subsequently and expressly included in it in any of the ways referred to it in this Subsection are deemed to be the originally included nominal species" [see also Article 67 (g)]. Under these articles, a type species should thus be selected from among *Pseudozius planus* Dana, 1852, *P. inornatus* Dana, 1852, and *P. dispar* Dana, 1852, following Dana's (1852a) paper. Dana (1852a, b) was not aware of Adams and White's (1849) description of *Panopeus caystrus* (which is now regarded as a senior synonym of *P. planus*) and made no mention of this species in any of his papers. Ward's (1932) choice of *Panopeus caystrus* as type species thus contravenes the Code and is invalid. In his type designation however, Ward (1932) had written "Type, *Pseudozius caystrus* (Adams and White) "Maria Orientalia" = *P. planus* Dana, Waterland Island, Raraka Island, Paumotu Arch. and Wakes Island, North Pacific" (p. 252). Since Ward mentioned *Pseudozius planus* Dana, 1852, as a synonym of *Pseudozius caystrus* (Adams and White, 1849), *Pseudozius planus* Dana, 1852, has to be regarded as the type species of *Pseudozius*. The correct citation for the genus should thus be: *Pseudozius* Dana, 1851, type species by subsequent selection by Ward (1932), *Pseudozius planus* Dana, 1852.

The types of *P. planus* however, are lost, and the figures of the species by Dana (1852) are rather small and schematic by modern standards. To ensure stability in the use of the genus *Pseudozius* as currently understood, we hereby select the lectotype male of *Panopeus caystrus* Adams and White, 1849 (see later), to be the neotype of *Pseudozius planus* Dana, 1852. This would make *Panopeus caystrus* Adams and White, 1849, the objective senior synonym of *Pseudozius planus* Dana, 1852.

***Pseudozius caystrus* (Adams and White, 1849)**  
(Figs. 1–8)

*Panopeus caystrus* Adams and White, 1849: 42, pl. 9, fig. 2 [Eastern Seas].

*Pseudozius planus* Dana, 1852a: 81; Dana, 1852b: 233; Dana, 1855: pl. 13, fig. 6 [Tuamotu and Wake Island].

*Pseudozius microphthalmus* Stimpson, 1858: 35 [Bonin Islands].

#### Material examined

Lectotype (here designated) – Male (12.3 by 7.5 mm) (NHM 1847.21), "Eastern Seas", H.M.S. SAMARANG [also here designated as neotype of *Pseudozius planus* Dana, 1852].

Paralectotypes – 2 females (both ovigerous, 20.9 by 12.5 mm, 14.5 by 8.8 mm) (NHM 1847.21), same data as lectotype.

#### Others

- 1 male (21.0 by 12.9 mm), 1 female (20.2 by 12.3 mm) (TMCD 2366), Little Liu-Kiu Island, Taiwan, 17 V 1988, J. -C. Lin.
- 1 female (15.3 by 9.2 mm) (TMCD 2278), Little Liu-Kiu Island, Taiwan, 15 X 1987, C. -H. Wang.
- 1 male aberrant (16.5 by 9.5 mm), 1 male (16.8 by 10.3 mm), 1 female (mature, 11.5 by 7.0 mm) (TMCD 2498), 1 male (16.1 by 10.0 mm), 1 female (17.3 by 10.3 mm) (ZRC), Taiwan, 11 IV 1989, C. -H. Wang.
- 1 male (ZMB 8886), Jaluit, Pacific, coll. Steinbach.
- 3 females (ZMB 16323), Jaluit, Pacific, coll. Finsch Pacific Expedition.
- 3 females (ZMB 8200), Jaluit, Pacific, coll. Finsch Pacific Expedition.
- 10 males (largest 25.3 by 15.0 mm), 4 females (largest 16.3 by 10.0 mm) (ZRC 1965.11.16. 28 – 37), 1 male, 1 female (ZMB), Cocos-Keeling Islands, coll. C. A. Gibson-Hill, 1941.
- 9 males (largest 24.2 by 14.5 mm), 13 females (largest 20.2 by 12.4 mm, ovigerous) (ZRC 1965.11.17. 1–10), 1 male, 1 female (ZMB), Christmas Island, coll. C. A. Gibson-Hill, 1939.
- 3 males, 4 females (ZMB 11723), Red Sea, Gulf of Aden, coll. Brown.
- 4 males, 8 females (ZMB 6684), Aden, coll. Hildebrandt.
- 9 males, 16 females (ZMB 15623), 1 male (21.0 by 12.9 mm), 1 female (19.4 by 12.0 mm) (ZRC), Djibouti, Gulf of Aden, coll.

- Wache, III 1909. 7 males, 34 females (ZMB 11981), 1 male (17.1 by 10.6 mm), 1 female (13.1 by 8.2 mm) (ZRC), Aden, coll. Hildebrandt, 19 III 1879.
- 14 males, 19 females (ZMB 12913). Aden, coll. S. Fritsch, 1868.
  - 1 male (ZMB 5875), Aden, coll. Hildebrandt.

### Description

Carapace oval, regions poorly defined, grooves separating epigastric discernible but shallow (Figs. 1a, b; 2a, h; 5; 7h); gastric grooves separating cardiac and gastric regions very shallow, indistinct; most of dorsal surfaces very smooth and glabrous; frontal region narrow, slightly to distinctly rugose (Figs. 1a, b; 2a, b, h; 5a, b). Front short, gently sinuous, median part strongly deflexed downwards; lateral part of margin distinctly bilobed, forming distinct laterofrontal cleft (Figs. 1a, b; 2a, b, c; 3a; 5a, b; 6b; 7h). Supra- and infraorbital margins entire, smooth. Orbita oval (broader than long) or almost round (Figs. 2c; 6b). Anterolateral margin strongly convex, clearly demarcated from gently convex, distinctly converging postero-lateral margin; external orbital tooth very low, rounded, but separated from rest of margin by distinct groove; rest of margin with three broad, convex lobes, separated from each other by small, shallow notches. Posterior margin of carapace gently sinuous (Figs. 1a, b; 2a, h; 3i; 5a, b; 7h). Antennules folding almost transversely, antennular fossae rectangular (Figs. 2c; 3a; 6b). Antennal flagellum well developed, basal segment stout, itself and subsequent two segments (excluding antennal peduncle) not entering narrow orbital hiatus, with third segment lodged in laterofrontal cleft of frontal margin (Figs. 2b, c; 3a; 6b). Anterior part of epistome clearly demarcated from posterior part, with median part distinctly sunken in; posterior margin with sharp triangular median structure (Figs. 2c; 3a, b; 6b). Endostome with low but distinct longitudinal ridge on each side (Figs. 3b; 6a). Outer surfaces of third maxilliped; ischium rectangular, median oblique sulcus distinct but shallow; merus quadrangular; carpus rounded, subpediform; exopod-

stout, reaching anterior edge of merus, with rounded subdistal tooth on inner margin, flagellar long (Figs. 2d; 6c).

Ambulatory legs short, surfaces smooth, unarmed. Fourth ambulatory leg very short; propodus flattened, with straight or uneven ventral margin and scattered short stiff hairs on distal margins; propodus cylindrical, lined with numerous short and stiff hairs which partially obscures margins of proximal three-quarters (Figs. 2f; 3h; 6e), tip relatively sharp, cornaceous, distinctly turned upwards (Figs. 2g; 6f).

Chelipeds distinctly asymmetrical, right larger (Figs. 3c, d; 7a, b); outer surfaces of merus, carpus and chelae smooth; carpus short, rounded, inner distal angle with distinct low, rounded tooth (Figs. 3f, g; 7e, f); fingers shorter or subequal to palm, pigmented dark brown, quickly appearing greyish in preservative (Figs. 3c, d; 7a–c); larger cheliped with pronounced submolariform basal cutting tooth on cutting edge of dactylus and rounded teeth on proximal part of cutting edges of both fingers (Figs. 3d, e; 7c, d); cutting edges of smaller cheliped with numerous teeth and denticles (Figs. 3c; 7a).

Sternum broad, surface smooth; suture between sternites 1 and 2 absent; suture between sternites 2 and 3 distinct, deep; suture between sternites 3 and 4 marginal only, medially interrupted; sternite 4 broad (Figs. 2e; 6d); sternite 8 completely covered by last male abdominal segment (Fig. 3i). Male gonopore coxal.

Abdomen with 7-segmented, all segments freely movable; segments 3–5 trapezoidal, segment 6 rectangular, lateral margins gently concave; segment 7 triangular with gently convex lateral margins (Figs. 3i; 4a; 7g).

G1 long, slender, sinuous, distal part armed with short spines, tip slightly to distinctly flared, appearing triangular (Figs. 1c–e; 4b–e, g, h; 8a–d, f, g). G2 short, slender, distal part with petaloid process, no distal segment (Figs. 1f; 4f; 8e).

### Colour

The colour of the South African *P. caystrus* was described as “Dark blackish brown, somewhat castaneous posteriorly with dark ver-

mculate markings, 2 pale dots on each antero-brachial region, chelipeds blackish above, castaneous below, finger and thumb black, the black colour not extending on to palm, legs castaneous, setate golden" (Barnard, 1950: 253). Tweedie (1950: 123) describes the colour of the Cocos-Keeling specimens as "Off-white with the carapace finely mottled with brown along its anterior border, fingers black, walking legs pinkish purple. The carapace may lack the brown markings and be entirely off white or, occasionally, light orange brown, in which specimens the chelae are faintly suffused with purple. Found only under stones in shallow pools near high tide mark along the landward border of the seaward reef." In the freshly preserved Taiwanese specimens, the colour varies from white to light brown.

#### Distribution

The species seems to have an oceanic distribution, with a wide range in the Indo-West Pacific, ranging from south Africa to Aden, Mauritius, the Andamans, Laccadives, Philippines, Taiwan, southern Japan, and through to Micronesia, French Polynesia and Hawaii (see Ward, 1934; Forest and Guinot, 1961; Sakai, 1976; Hwang and Yu, 1980; Dai *et al.*, 1986; Dai and Yang, 1991).

#### Remarks

*Pseudozius planus* Dana, 1852, and *Pseudozius microphthalmus* Stimpson, 1858, have been generally regarded as junior subjective synonyms of *P. caystrus*, and there is as yet no reason to doubt this. There is no real way to be sure as the types of Dana's and Stimpson's species are lost. At least from the descriptions and figures by Dana (1852) and Stimpson (1858, 1907), there seems to be little doubt that the three are conspecific. Stimpson (1858) only had one specimen of *P. microphthalmus* from the Bonin Islands (present Ogasawara Islands, Japan), and we have specimens from nearby Taiwan. The Taiwanese specimens agree very well with both Stimpson's descriptions of *P. microphthalmus* as well as that of *P. caystrus* by Adams and White (1849).

There are three type specimens (one male

and two females) of *Panopeus caystrus* in the NHM. All are syntypes. The only male specimen is here designated as the lectotype. As mentioned earlier in the Remarks on the genus, this lectotype male is also designated as the neotype of *Pseudozius planus* Dana, 1852, to ensure *Panopeus caystrus* Adams and White, 1849, and *Pseudozius planus* Dana, 1852, become objective synonyms.

In the series of specimens of *P. caystrus* examined, there are some variations associated with size and sex, especially in the carapace and chela. The anterolateral dentition is very variable, with the teeth being low but distinct (Figs. 1a; 2a; 5a, b) in some specimens but very low and indistinct in others (Fig. 1b), even from one locality. The Taiwanese specimens tend to be slightly more pitted and eroded in the frontal and anterolateral regions compared to those from other localities, but other than these, there are no important differences. The orbits and eyes of larger specimens tend to be proportionately smaller (relative to carapace width), appearing rounded and not oval when viewed frontally, although this is also sometimes the case even for smaller specimens. The good series of specimens from the Red Sea, Christmas and Cocos-Keeling Islands however, demonstrate that this character is of little taxonomic use. The fingers of the larger chela gape very strongly in larger males, but this is not the case for the females. The basal cutting tooth present at the proximal part of the dactylus is very pronounced in most of the specimens (Fig. 3d, e), although it tends to be rather weak in smaller ones. In the largest specimens, the tooth also seems to be proportionately smaller and less prominent. The basal cutting tooth in typical adults is probably used to peel gastropods as has been reported by Shoup (1956) and Ng and Tan (1984, 1985).

The specimens from the Indian Ocean (including Christmas Island) in the ZRC and ZMB agree with those from the western Pacific except that the distal part of their adult G1s are more distinctly flared (Figs. 1d, e, 4d, e, g, h, vs. 8c, d, f, g); Barnard, 1950: 253, Fig. 47j-1; Crosnier, 1984: 313, text fig. 242, 243). Although this difference is quite distinct in the

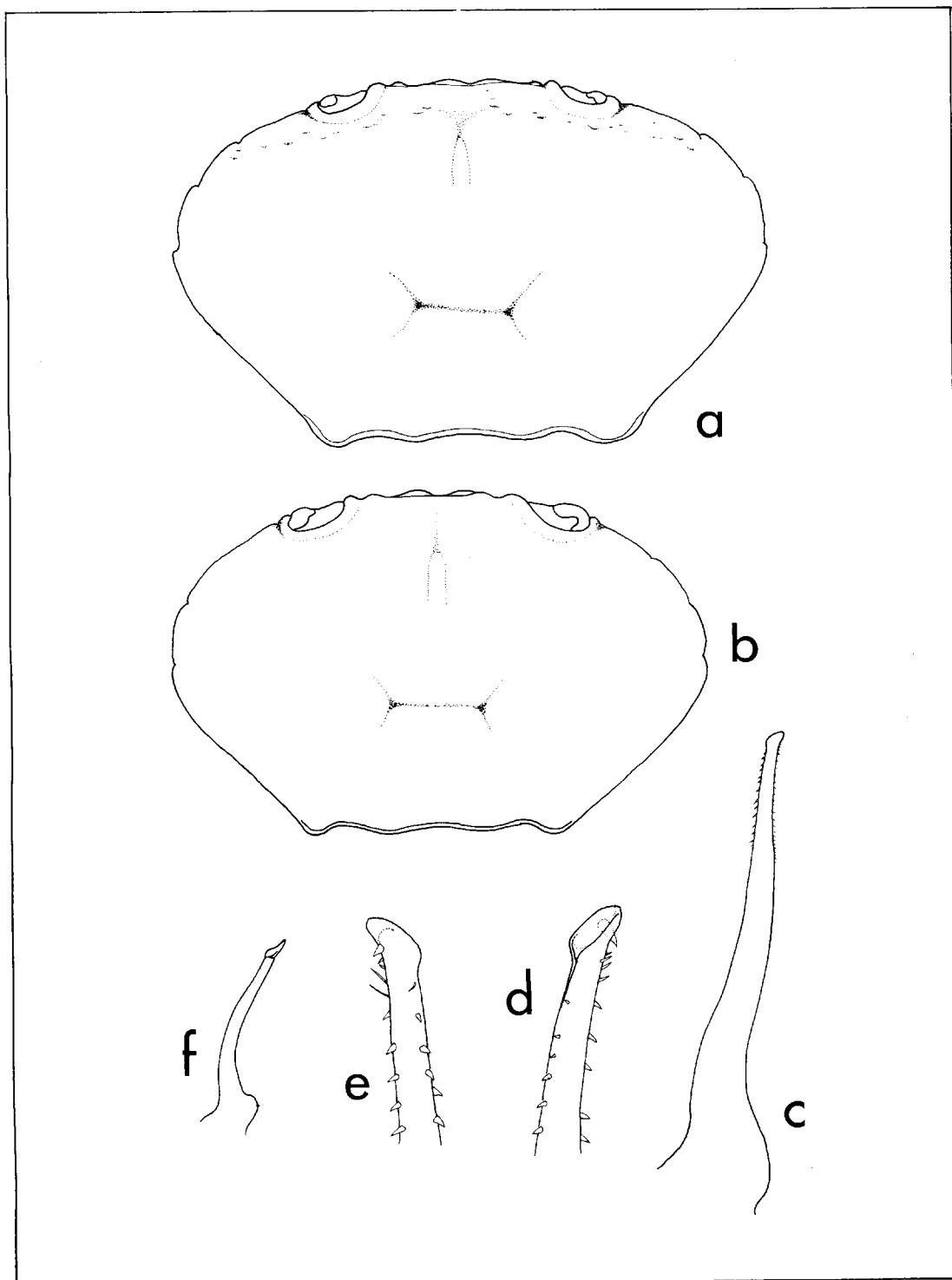


Fig. 1. *Pseudozius caystrus*, "Eastern Seas". a, paralectotype female (20.9 by 12.5 mm) (NHM 1847.21); b-f, lectotype male (12.3 by 7.5 mm) (NHM 1847.21). a, b, dorsal view of carapace; c, left G1; d, e, distal part of left G1; f, left G2. c, d, f, ventral view; e, dorsal view.

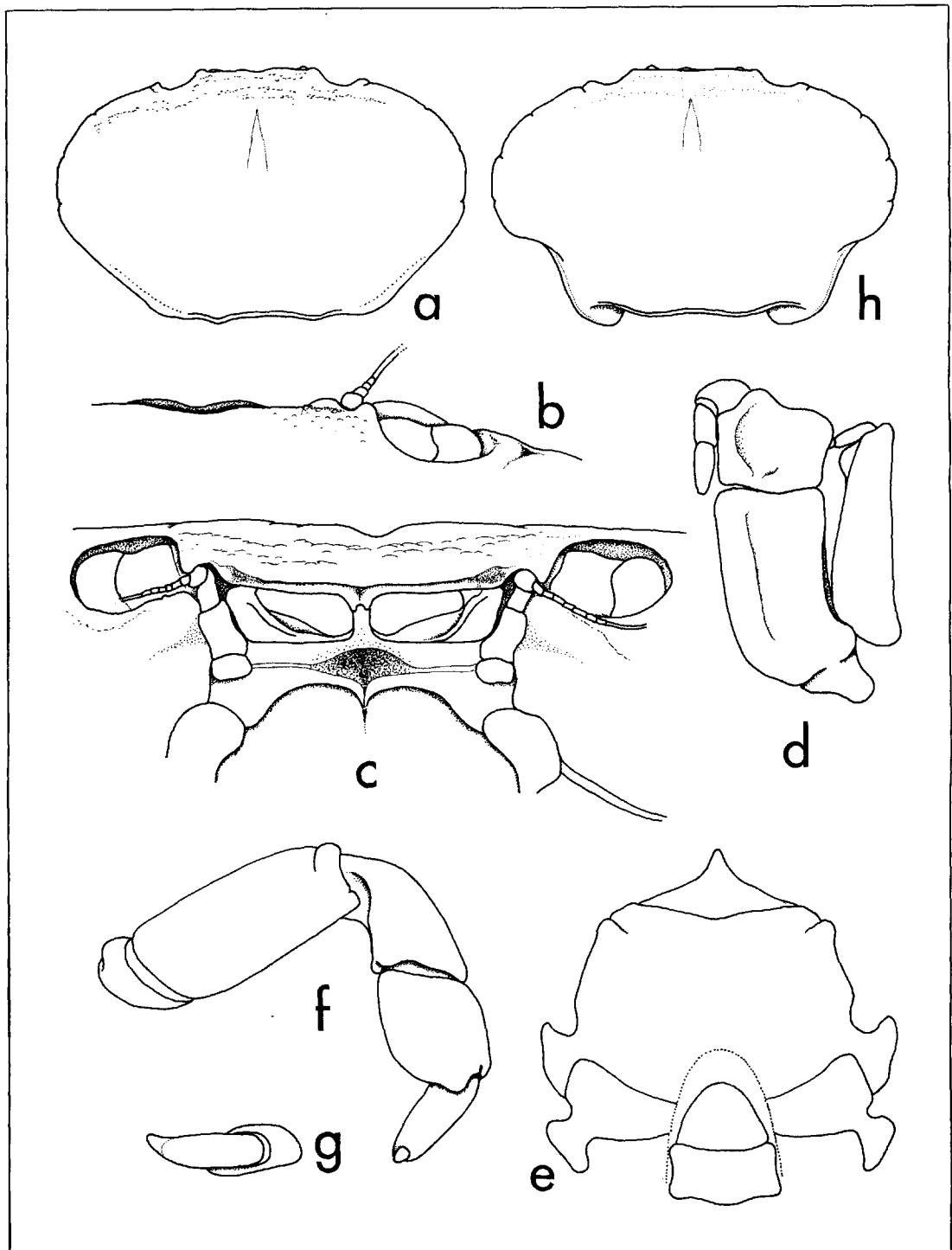


Fig. 2. *Pseudozius caystrus*, Taiwan. a-g, male (16.8 by 10.3 mm) (TMCD 2498); h, male (aberrant, 16.5 by 9.5 mm) (TMCD 2498). a, h, dorsal view of carapace; b, frontal margin; c, frontal view of epistome and antennules; d, left third maxilliped; e, thoracic sternum; f, right fourth ambulatory leg (hairs denuded, tip of dactylus upturned); g, dorsolateral view of fourth ambulatory dactylus (hairs denuded).

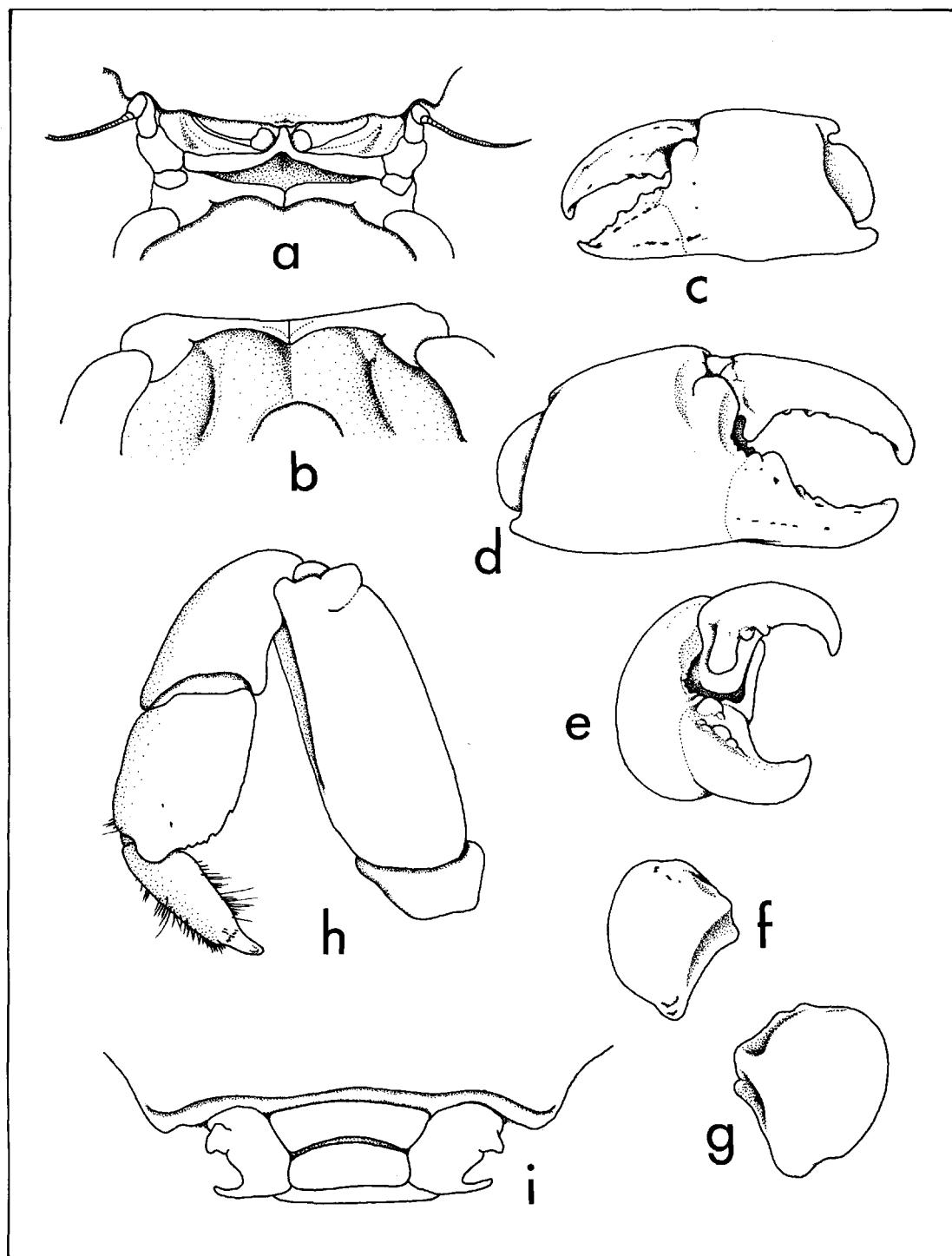


Fig. 3. *Pseudozius caystrus*, Taiwan. Male (16.1 by 10.0 mm) (ZRC). a, frontal view of epistome and antennules; b, endostome; c, left chela (outer view); d, right chela (outer view); e, right chela (frontal view); f, left carpus of cheliped (dorsal view); g, right carpus of cheliped (dorsal view); h, left fourth ambulatory leg; i, posterior margin of carapace, abdominal segments 1–3 and coxae of fourth ambulatory legs.

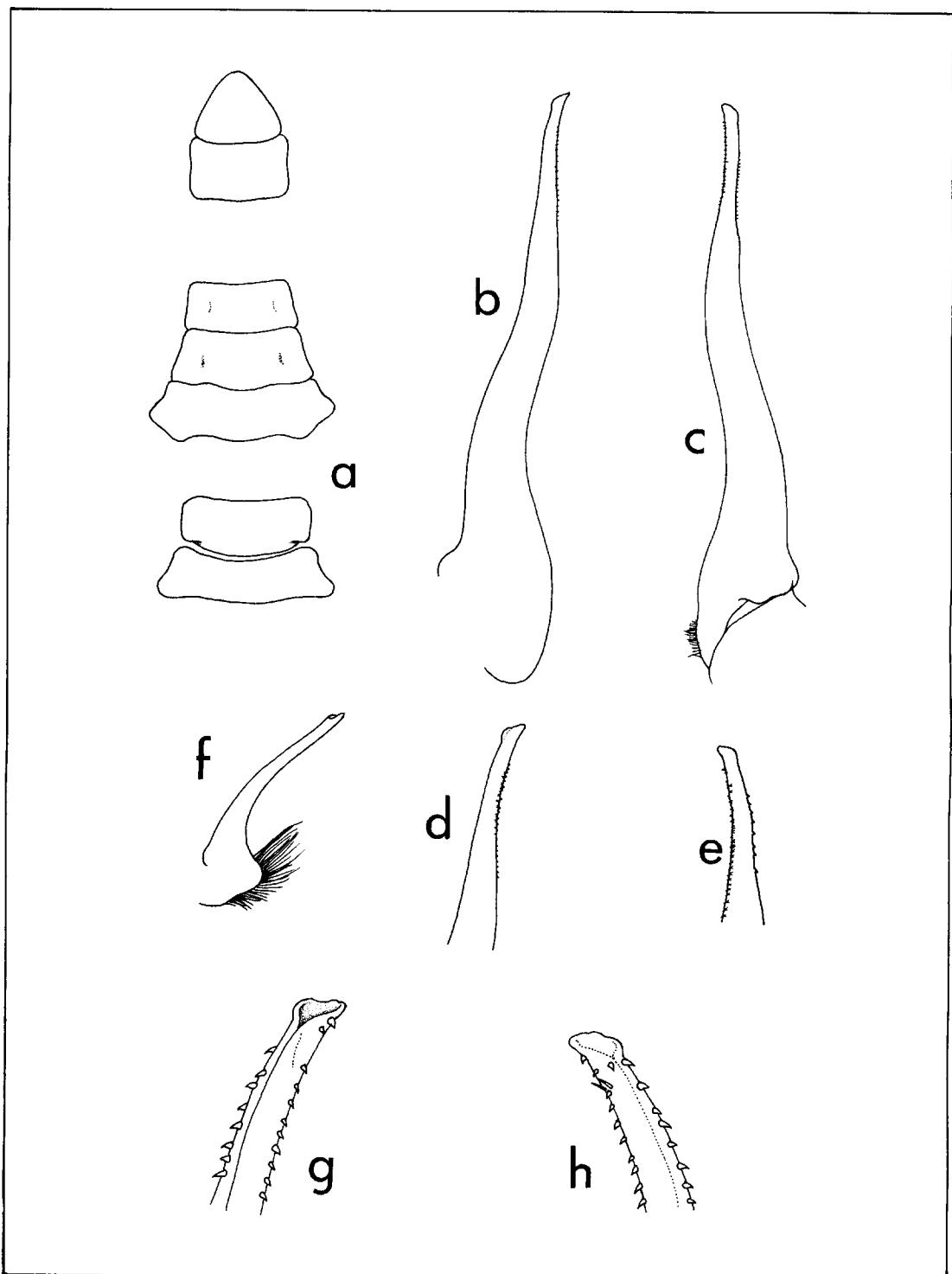


Fig. 4. *Pseudozius caystrus*, Taiwan. a, g, h, male (16.1 by 10.0 mm) (ZRC); b-f, male (16.8 by 10.3 mm) (TMCD 2498). a, male abdomen; b, c, left G1; d, e, g, h, distal part of left G1; f, left G2. b, d, f, g, ventral view; c, e, h, dorsal view.

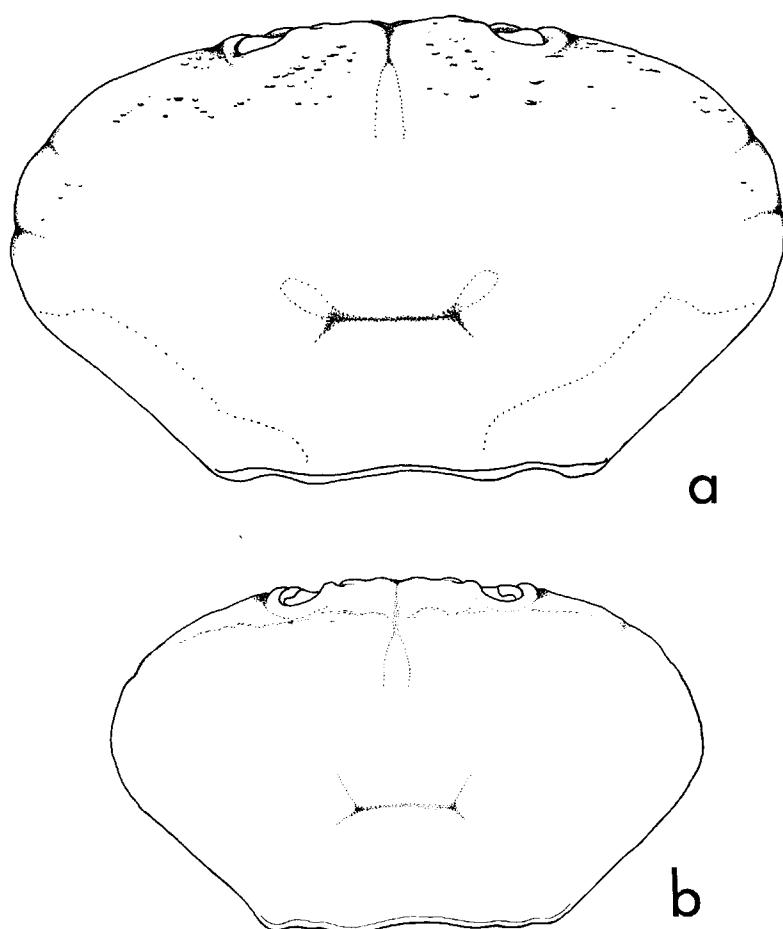


Fig. 5. *Pseudozius caystrus*, Christmas Island. a, male (24.2 by 14.5 mm) (ZRC 1965.11.17. 1); b, male (19.4 by 11.9 mm) (ZRC 1965.11.17. 2). Dorsal view of carapaces.

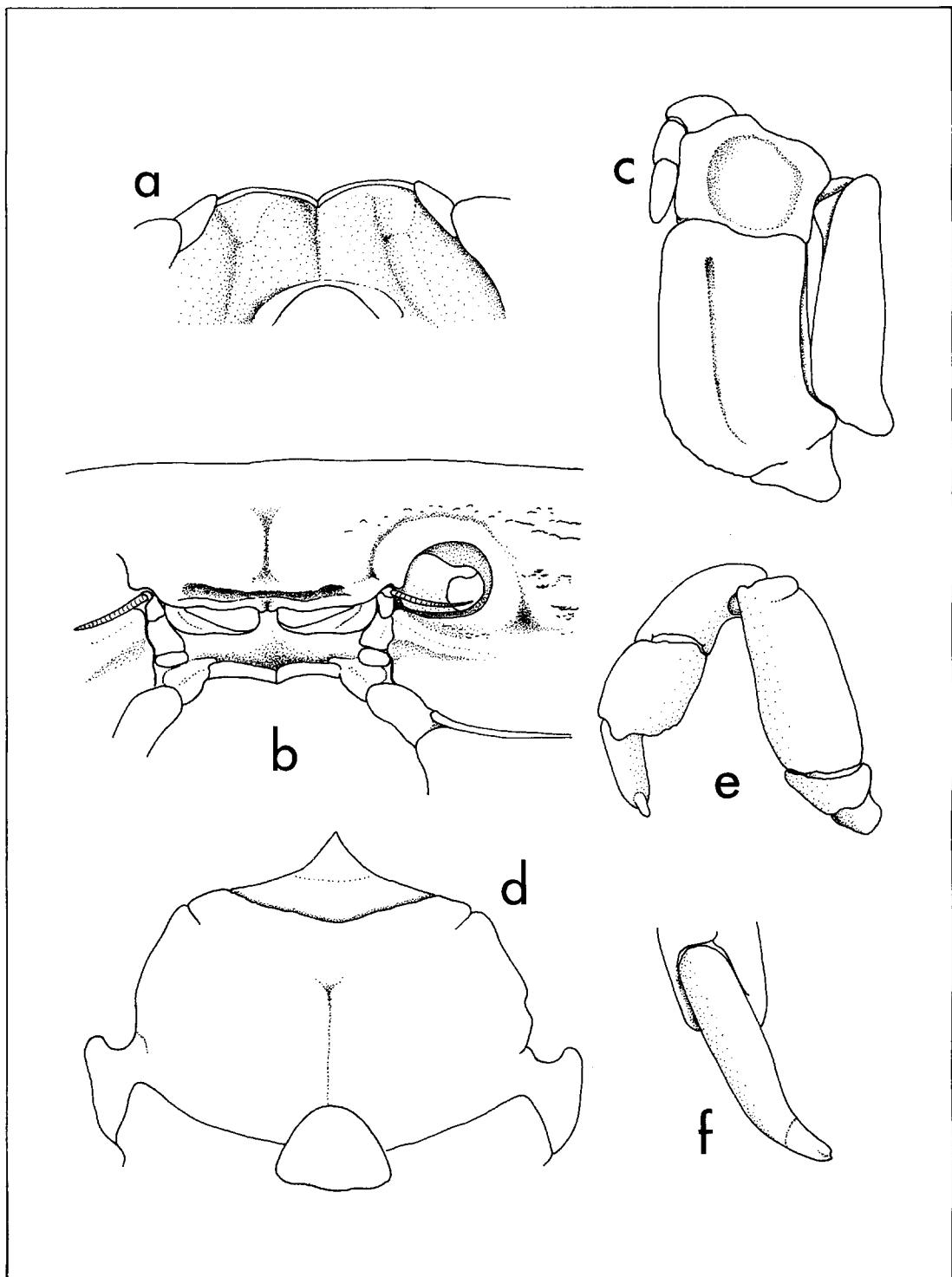


Fig. 6. *Pseudozius caystrus*, Christmas Island. Male (24.2 by 14.5 mm) (ZRC 1965.11.17. 1). a, endostome; b, frontal view of epistome and antennules; c, left third maxilliped; d, thoracic sternum; e, left fourth ambulatory leg; f, dactylus of left fourth ambulatory leg (dorso-marginal view).

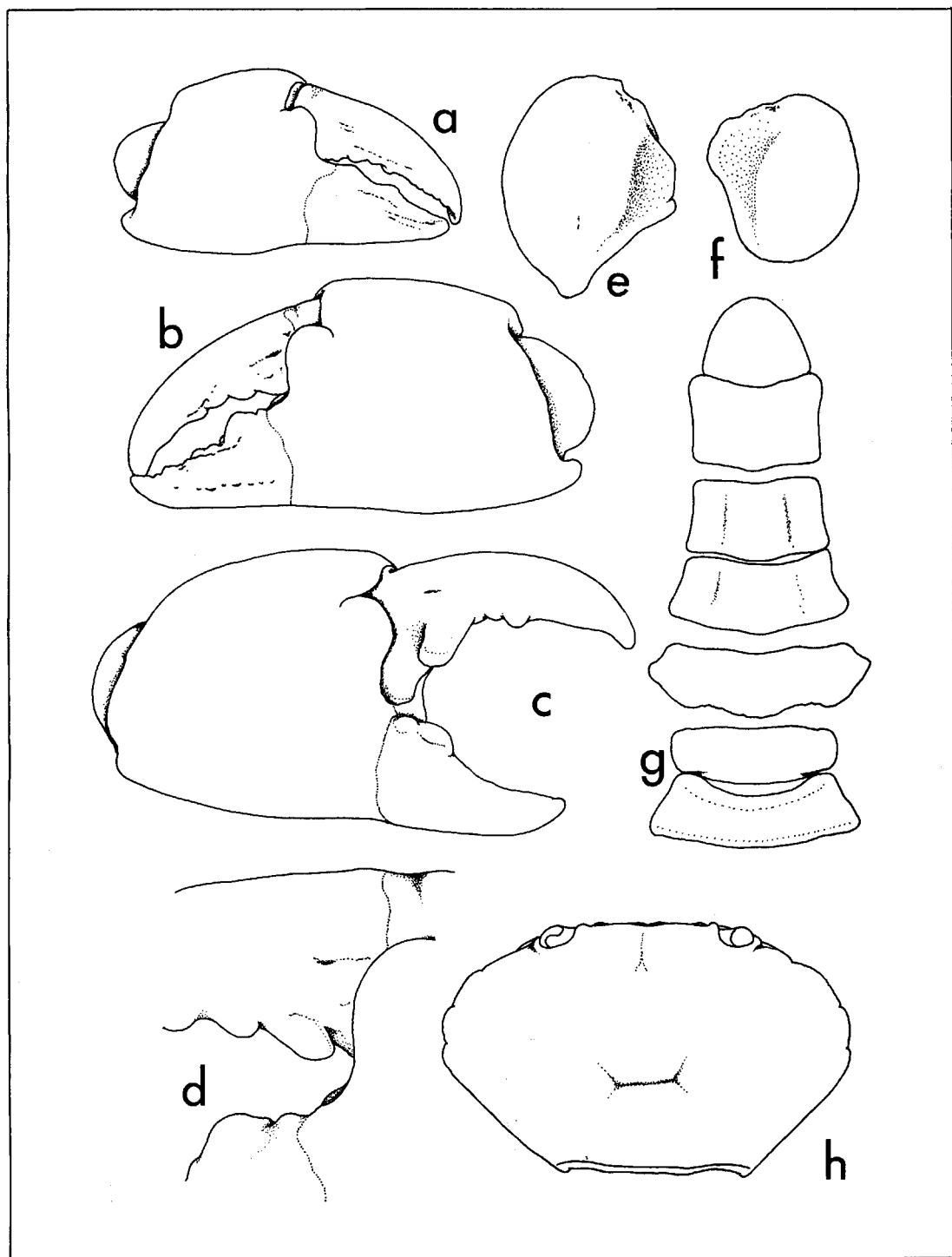


Fig. 7. *Pseudozius caystrus*, Christmas Island. a, b, e–g, male (24.2 by 14.5 mm) (ZRC 1965.11.17. 1); c, d, h, male (16.1 by 10.0 mm) (ZRC 1965.11.17. 1). a, right (minor) chela; b, left (major) chela; c, right (major) chela; d, inner view of major chela showing basal cutting tooth; e, left carpus of cheliped (dorsal view); f, right carpus of cheliped (dorsal view); g, abdomen; h, dorsal view of carapace.

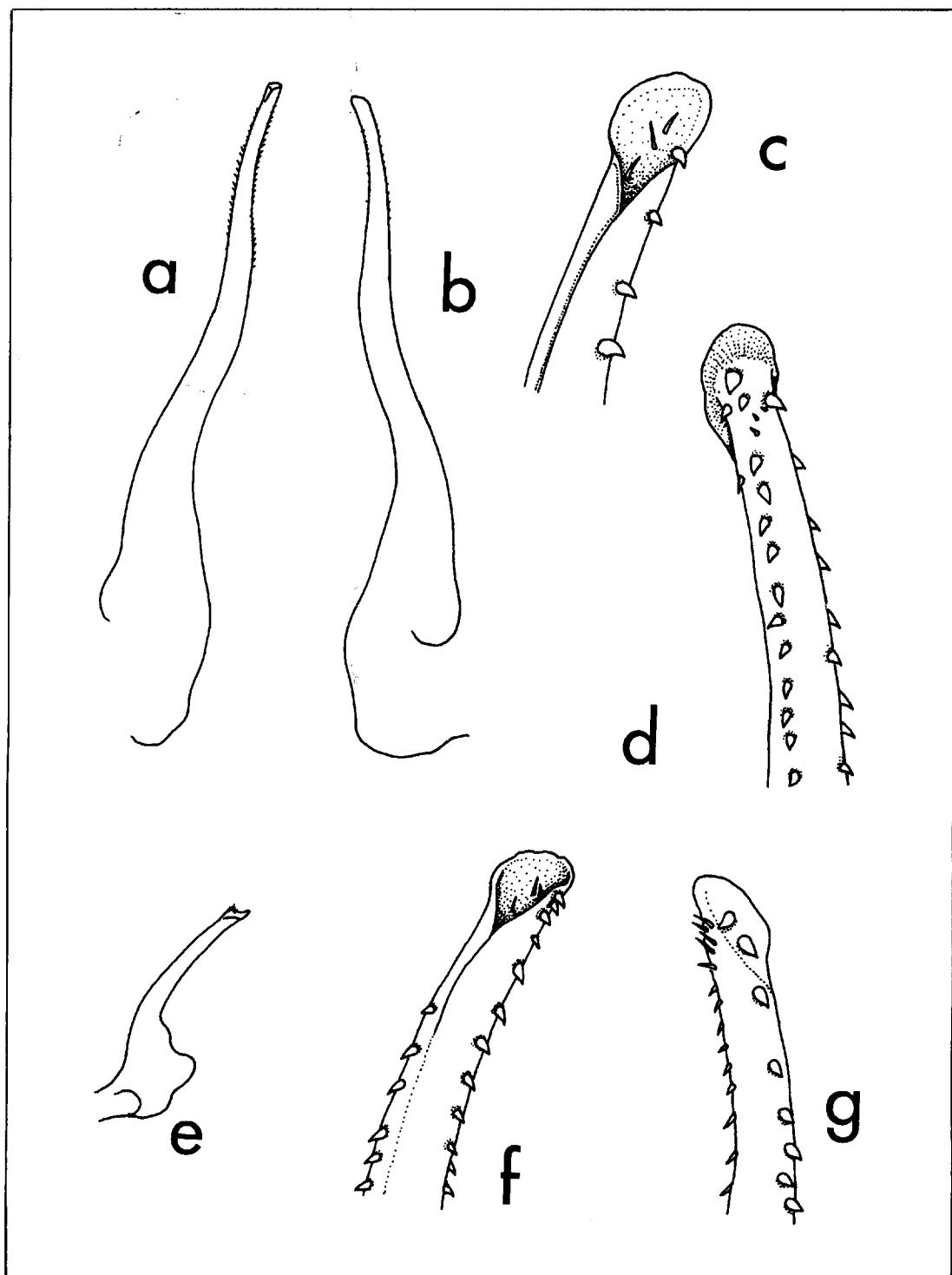


Fig. 8. *Pseudozius caystrus*, Christmas Island. a–e, male (24.2 by 14.5 mm) (ZRC 1965.11.17. 1); f, g, male (16.1 by 10.0 mm) (ZRC 1965.11.17. 1). a, b, left G1; c, d, f, g, distal part of left G1; e, left G2. a, c, e, f, ventral view; b, d, g, dorsal view.

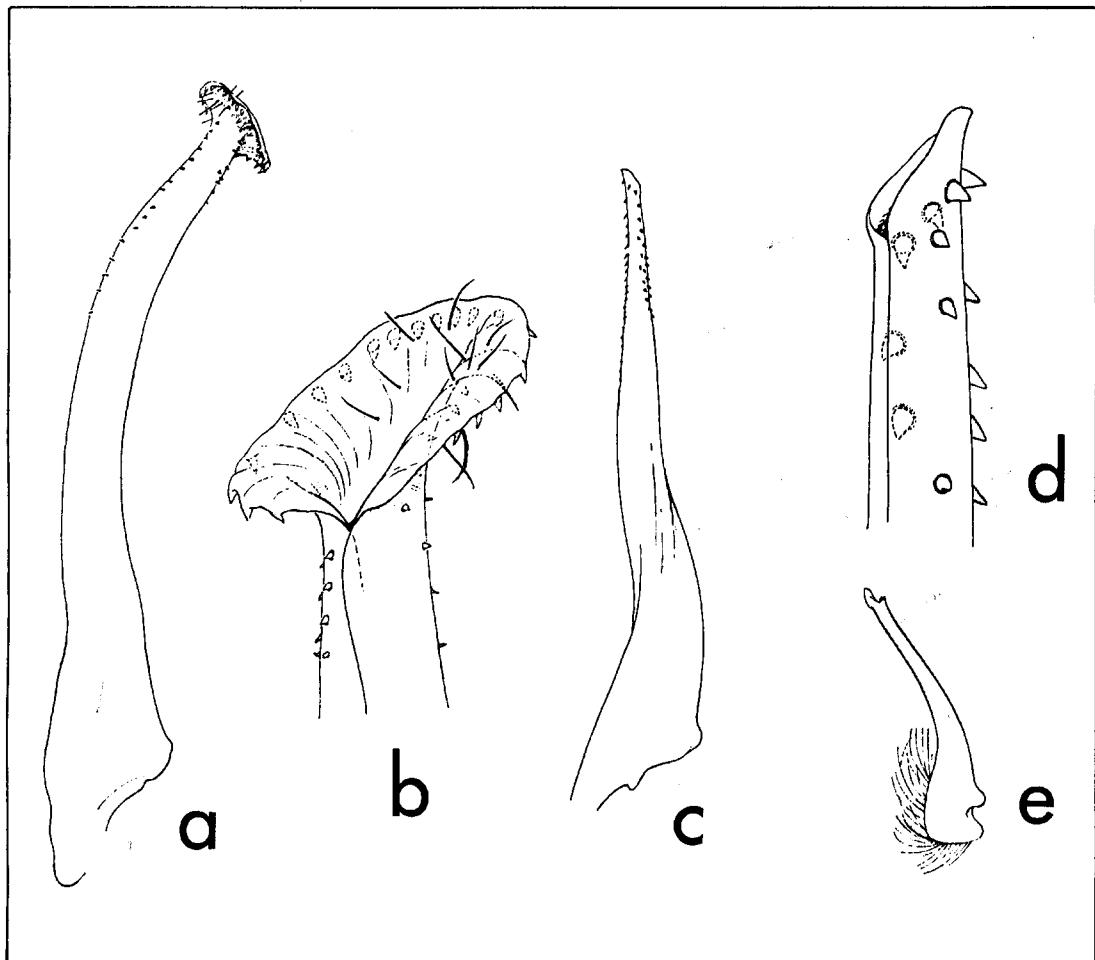


Fig. 9. a, b, *Pseudozius ornatus*, male 16.0 by 10.0 mm, Samoa (after Guinot, 1968: 332, Fig. 12); c–e, *Pseudozius pacificus*, syntype male 14.0 by 9.0 mm, Jaluit, Marshall Islands. a–d, G1; e, G2 (after Guinot, 1968: 332, Fig. 13, 14).

specimens examined, in lieu of other characters, the authors prefer not to recognise the Indian Ocean population as a separate taxon for the moment.

There is one specimen of *P. caystrus* (TMCD 2498, partim) (Fig. 2h), which is very peculiar in having the posterolateral margin strongly concave, so much so that there seems to be a distinct "waist" present. It is also paler (especially the pigmentation on the fingers of the chelipeds) and has a relatively softer carapace than the other specimens in the lot, all of which are typical *P. caystrus*. It would appear that this is an aberrant specimen, the peculiar

features perhaps the result of an imperfect moult. In all other aspects, including the G1 and G2, this specimen is identical to typical *P. caystrus*.

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### References

- Adams, A. and A. White.** 1848–1849. Crustacea. *Zoology of the Voyage of the H.M.S. Samarang; under the command of Captain Sir Edward Belcher, C.B., F.R.A.S., F.G.S., during the years 1843–1846* (A. Adams, editor). Pp. 1–66, pls. 1–13. Published in two parts: Part I (pp. 1–32, pls. 1–6) is dated on the cover 1848; Part II (pp. 33–66, pls. 7–13) is dated 1849 on the front cover.
- Alcock, A.** 1898. Materials for a Carcinological Fauna of India. No. 3. The Brachyura Cyclometopa. Part I. The Family Xanthidae. *J. Asiat. Soc. Bengal* (Calcutta), 67(2), No. 1: 67–233.
- Balss, H.** 1938. Die Dekapoden Brachyura von Dr. Sixten Bocks Pazifik-Expedition 1917–1918. *Goteborgs K. Vetensk.-o. Vitterh-Samh. Handl.*, (B)5(7): 1–85, pls. 1–2.
- Balss, H.** 1957. Decapoda. In: *H. G. Bronns, Klassen und Ordnungen das Tierreichs*. 5. Band I. Abt. 7 Buch, Decapoda (Zehnfüßer). 12. Lieferung, pp. 1505–1672.
- Barnard, K. H.** 1950. Descriptive catalogue of South African Decapod Crustacea (Crabs and Shrimps). *Ann. S. Afr. Mus.*, 38: 1–837.
- Borradaile, L. A.** 1903. Crustacea. In: *Fauna and Geography of the Maldives and Laccadive Archipelagoes*. London, 1: 63–68, 191–208, 237–271, 424–443.
- Chang, C. -M.** 1963. A check-list of Taiwan crabs with descriptions of 19 new records. *Biol. Bull. Tunghai Univ.*, 14: 1–23.
- Crosnier, A.** 1984. Addendum Carpiliidae et Menippidae. In: Serène, R., Crustacés Décapodes Brachyoures de l'Océan Indien occidental et de la Mer Rouge. Xanthoidea: Xanthidae et Trapeziidae. *Faune Tropicale* (ORSTOM), 24: 1–400, pls. 1–48.
- Dai, A. -Y., S. -L. Yang, Y. -Z. Song and G. -X. Chen.** 1986. *Crabs of the China Seas*. China Ocean Press (Beijing) (in Chinese).
- Dai, A. -Y. and S. -L. Yang.** 1991. *Crabs of the China Seas*. Springer-Verlag Berlin Heidelberg New York Tokyo, 608 pp., 74 pls.
- Dana, J. D.** 1851. On the classification of the Cancroidea. *Amer. J. Sci. Arts*, (2)12(34): 121–131.
- Dana, J. D.** 1852a. Conspectus Crustaceorum, etc., Conspectus of the Crustacea of the Exploring Expedition under Capt. Wilkes, U.S.N., including the Crustacea Cancroidea Corystoidea. *Proc. Acad. nat. Sci. Philadelphia*, 6: 73–86.
- Dana, J. D.** 1852b. *Crustacea: United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842*. Part I, 13: i–viii, 1–685.
- Dana, J. D.** 1855. *Crustacea: United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842*. Atlas, 13: 1–27, pls. 1–96.
- Davie, P. J. F.**, 1989. A re-appraisal of *Heteropanope* Stimpson, and *Pilumnopeus* A. Milne Edwards (Crustacea: Decapoda: Pilumnidae) with descriptions of new species and genera. *Mem. Qd. Mus.* 27(2): 129–156.
- Edmondson, C. H.** 1962. Xanthidae of Hawaii. *Occ. Pap. Bernice P. Bishop Mus.*, 22(13): 215–309.
- Forest, J. and D. Guinot.** 1961. Crustacés Décapodes Brachyoures de Tahiti et des Tuamotu. In: *Expédition française sur les récifs coralliens de la Nouvelle-Calédonie*. Volume préliminaire. Paris, éditions de la Fondation Singer-Polignac, ix–xi + 1–195, figs. 1–178, pls. 1–18, tabls 1–3, 7 maps.
- Guinot, D.** 1968. Recherches préliminaires sur les groupements naturels chez les Crustacés Décapodes Brachyoures. VI. Les Carpilinae. *Bull. Mus. natn. Hist. Nat.*, Paris, (2)40(2): 320–334.
- Holthuis, L. B.** 1993. The non-Japanese new species established by W. de Haan in the Crustacea Volume of *Fauna Japonica* (1833–1850). In: *Von Siebold and Na-*

- tural History of Japan, Crustacea.* T. Yamaguchi Ed. Pp. 599–642.
- Hwang, J.-J. and H.-P. Yu.** 1980. A fauna-list of the Crustacea from Lan-Yu Island. *Ann. Taiwan Mus.*, 23: 151–180. (in Chinese).
- International Commission of Zoological Nomenclature, 1985.** *International Code of Zoological Nomenclature*. Third Edition. International Trust for Zoological Nomenclature, British Museum (Natural History), London, 338 pp.
- Lin, C.-C.** 1949. A catalogue of Brachyurous Crustacea of Taiwan. *Quart. J. Taiwan Mus.*, 2: 10–33.
- Maki, M. and H. Tsuchiya.** 1923. Illustrations of the Decapod Crustaceans of Formosa. *Report of the Agriculture Bureau, Government Research Institute of Taiwan*, 3: 1–251. (in Japanese).
- Miers, E. J.** 1886. Report on the Brachyura collected by H.M.S. 'Challenger' during the years 1873–1876. In: *Report on the Scientific Results of the Exploring Voyage of H.M.S. 'Challenger'*, Zoology, Part 49, 17: 1–362, 29 pls.
- Ng, P. K. L. and L. W. H. Tan.** 1984. The 'shell peeling' structure of the box crab *Calappa philargius* (L.) and other crabs in relation to mollusc shell architecture. *J. Singapore Natn. Acad. Sci.*, 13: 195–199.
- Ng, P. K. L. and L. W. H. Tan,** 1985. 'Right Handedness' in heterochelous calappoid and xanthoid crabs – suggestion for a functional advantage. *Crustaceana*, 49: 98–100.
- Sakai, T.** 1976. *Crabs of Japan and the adjacent Seas*. In three volumes: English Text, pp. xxix + 773 pp; Japanese Text, pp. 1–461; Plates Volume, pp. 1–16, pls. 1–251. Kodansha Ltd., Tokyo.
- Shoup, J. B.** 1956. Shell opening by crabs of the genus *Calappa*. *Science*, 160: 887–888.
- Stimpson, W.** 1858. Prodromus descriptionis animalium evertebratorum quo in Expeditione ad Oceanum Pacificum eptentriionalem a Republica Federata Missa, Cadwaladaro Ringgold et Johann Rodgers Ducibus, observavit et descripsit. Part IV Crustacea Cancroides and Corystidae, Cancridae. *Proc. Acad. nat. Sci., Philadelphia*, 10: 31–40.
- Stimpson, W.** 1907. Report on the Crustacea (Brachyura and Anomura) collected by the North Pacific Exploring Expedition 1853–1856. *Smithson. misc. Collns.*, part of 49 (1717): 1–240, 26 pls.
- Tweedie, M. W. F.** 1950. The fauna of Cocos-Keeling Islands, Brachyura and Stomatopoda. *Bull. Raffles Mus.*, 22: 105–148, pls. 16, 17.
- Ward, M.** 1932. The true crabs of the Capricorn Group, Queensland (Class Crustacea, Order Decapoda Brachyura). Part 1. Xanthidae. *Austr. Zool.*, 7(1): 237–255.
- Ward, M.** 1934. Notes on a collection of crabs from Christmas Island, Indian Ocean. *Bull. Raffles Mus.*, 9: 5–28, pls. 1–3.