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Crustacea Decapoda : The genus *Platepistoma* Rathbun, 1906 (Cancridae) with the description of three new species

Peter J. F. DAVIE

Queensland Museum P.O. Box 300
South Brisbane, Qld. Australia

ABSTRACT

The genus *Platepistoma* Rathbun, 1906, is reviewed and considered to be valid and not a subgenus of *Cancer* Linnaeus, 1758. Three new species are described *viz. P. nanum*, *P. kiribatiense* and *P. seychellense*. They are mainly separated on the distinctness of the carapace regions, extent of dorsal granulation of the carapace, and shape of the telson of the male abdomen. The genus is considered to contain seven species, and a key is provided. The name *Platepistoma anaglyptum* Balss, 1922, is resurrected and the synonymy clarified. *Cancer balssii* Zarenkov, 1990, is placed in *Platepistoma*. *Cancer* (*Glebocarcinus*) Nations, 1975, is also considered a valid taxon and provisionally allowed to remain as a subgenus of *Cancer* ; it contains at least *Cancer oregonensis* Rathbun, 1898, and *C. amphioetus* Rathbun, 1898. *Platepistoma* is restricted to deeper water, mostly greater than 350 m, in the Indo-West Pacific Oceans, and this is briefly discussed in relation to recent biogeographic theories.

RÉSUMÉ

Le genre *Platepistoma*, après un réexamen, est considéré comme étant un genre valide et non un sous-genre de *Cancer* Linné, 1758. Trois nouvelles espèces sont décrites : *P. nanum*, *P. kiribatiense* and *P. seychellense*. Elles se distinguent les unes des autres principalement par la netteté plus ou moins grande des régions de la carapace, le développement de la granulation de la face dorsale de la carapace, ainsi que la forme du dernier segment de l'abdomen mâle. Sept espèces, pour lesquelles une clé d'identification est proposée, sont considérées comme appartenant à ce genre. *Platepistoma anaglyptum* Balss, 1922, est rétabli et sa synonymie clarifiée. *Cancer balssii* Zarenkov, 1990, est placé dans le genre *Platepistoma*. *Glebocarcinus* Nations, 1975, est considéré comme un sous-genre valide de *Cancer* en l'attente d'une future révision; il renferme au moins *Cancer oregonensis* Rathbun, 1898, et *C. amphioetus* Rathbun, 1898. *Platepistoma* ne se trouve que dans les eaux profondes, presque toujours à plus de 350 mètres, dans la zone indo-ouest pacifique; ceci est discuté brièvement en relation avec les récentes théories biogéographiques.

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INTRODUCTION

The collection reported on here has gradually accrued over several years from collections made by a number of different French surveys of deep-water sites in the Indian and Pacific Oceans. J. POUPIN of the French Service Mixte de Contrôle Biologique (SMCB) aboard the F.R.V. "*Marara*" has collected throughout French Polynesia, using traps set on the outer slopes of the islands in depths ranging from 100 to 1000 m. Other expeditions have been conducted by the Institut Français de Recherche Scientifique pour le Développement en Coopération (ORSTOM) in the vicinity of New Caledonia and the Norfolk Ridge; and to the Seychelles Archipelago, in the southwestern Indian Ocean. Finally, TAAF (Terres Australes et Antarctiques Françaises) have undertaken collecting voyages to the south of Madagascar using the R.V. "Marion Dufresne". A. CROSNIER of ORSTOM has sorted the material and entrusted it to me for study.

Platepistoma macrophthalmus Rathbun, 1906, the type species of *Platepistoma* Rathbun, 1906, was described from a very small juvenile female. This species and genus remained very poorly known until the work of TAKEDA (1977), who described the adult crab for the first time and revealed that one of the generic characters *viz.* the alternating large and small, slender, anterolateral spines with broad bases, was in fact a juvenile feature. He felt that adult *P. macrophthalmus* could not be definitively separated from *Cancer* (*sensu lato*) and elected to consider it merely a subgenus of *Cancer*. In addition he placed the subgenus *Glebocarcinus* Nations, 1975 (type species *C. oregonensis* Rathbun, 1898) into the synonymy of *Platepistoma* Rathbun.

NATIONS (1975, 1979) considered the four subgenera of *Cancer* — *Cancer, Glebocarcinus, Metacarcinus* and *Romaleon* — to be independent phylogenetic groups, and in particular, he believed that *Glebocarcinus* evolved as an offshoot from the *Romaleon-Metacarcinus-Cancer* lineage. KARASAWA (1990) also remarked that *Glebocarcinus* had its origin in the Early Miocene of the Indo-West Pacific. This is strong evidence that a separate evolutionary line has developed and the group must be given generic status. While only a few species from the North Pacific were known TAKEDA's (1977) action in relegating *Platepistoma* to a subgenus was reasonable (he was unaware at the time of the description of *C. guezei* Crosnier, 1976, from the Indian Ocean), but with the discovery of so many new species from deep water it is clear that the generic status of *Platepistoma* must be re-evaluated. The widespread distribution of the species in this group, and the strong internal homogeneity of appearance, also support the idea that it is monophyletic and therefore must be given full generic status.

Abbreviations used in the text are: AM, Australian Museum, Sydney; MNHN, Muséum national d'Histoire naturelle, Paris; QM, Queensland Museum, Brisbane. The descriptions for this paper were prepared using the DELTA computer system for generating taxonomic descriptions (DALLWITZ & PAINE, 1986).

Measurements given in the text are of carapace breadth (measured at the widest point including lateral spines) followed by length. Leg segments were measured along the top margin and so these were not always the maximum possible length, and this should be borne in mind when using the ratios. The exact limits of the width of the hind margin are also sometimes difficult to determine and in this work they were defined by the point at which the lateral carapace suture meets the rear margin.

Genus *PLATEPISTOMA* Rathbun, 1906

Platepistoma Rathbun, 1906 : 876.
Cancer (Platepistoma) - TAKEDA, 1977 : 35-38.
Not *Cancer (Glebocarcinus)* Nations, 1975 : 22-23; 1979 : 183.

TYPE SPECIES. — *Platepistoma macrophthalmus* Rathbun, 1906, by monotypy. Gender is neuter.

DIAGNOSIS. — Carapace ovoid; 1.2-1.4 times broader than long; convex in both directions. Regions moderately to strongly defined; surface granulate, granules not in grooves separating regions; a thick short tomentum usually present over most of surface; lateral margins strongly convex, divided into 10 teeth, including outer orbital angle,

first 9 of similar shape and size; tenth lateral tooth smaller, situated on posterolateral border, followed posteriorly by a few small spines or granules which may continue nearly to lateral edge of hind margin. Front *c.* 0.2-0.25 times carapace width; moderately projecting, tri-lobed, lateral lobes broad, medial lobe on a lower level, projecting upwards; a deep pre-orbital concavity present in which the antenna lies. Lower orbital border inner angle formed by a triangular tooth; with narrow notch laterally. Antennal flagellum moderately long and not entering orbit, peduncle with brushes of long setae on inner distal edge of last two segments; accessory setae encircling each segment distally and projecting outwards. Orbital hiatus closed. Basal antennal segment broadly in contact with front. Basal antennular segment swollen, antennule folds almost up and down. Inter-antennular septum narrow.

Third maxilliped with merus distinctly shorter than ischium; antero-external angle produced; palp articulates at inner distal margin of merus.

Chelipeds subequal; large and robust; outer surface of palm coarsely granular, always with 3 prominent rows behind the gape. Legs relatively long; cylindrical; slender; first three pairs all of similar length. Meri of walking legs with erect spines on anterior margin. Dactyli with two deep longitudinal grooves laterally; terminating in an acute chitinous recurved tip.

Third to fifth segments of male abdomen fused; third segment the widest. Segments three-six tapering. Telson longer than preceding segments, bluntly pointed. First male gonopod stout, straight, tapering to a bluntly pointed tip; second male gonopod of similar length, slender, slightly sinuous, not much tapering.

Platepistoma macrophthalmus Rathbun, 1906

Platepistoma macrophthalmus Rathbun, 1906 : 876, fig. 33.
Cancer (Platepistoma) macrophthalmus - TAKEDA, 1977 : 35-38, fig. 4B.
? *Cancer guezei* - SAKAI, 1980 : 76, frontispiece II, fig. 2, pl. 5, fig. 3.

MATERIAL EXAMINED. — **Hawaiian Islands**. U.S. FISH. COMM. : north coast of Maui, 238-235 fms, 21.07.1902 : 1 juv. ♀ holotype (USNM-29791).

REMARKS. — TAKEDA (1977) has refigured and discussed the adult of this species. The juvenile female type differs markedly from the adult; in particular the adult is considerably wider, and the lateral teeth form a regular convex arc, each tooth being similar in form, not alternating large and small spines as on the juvenile. A similar pattern of anterolateral spines as on the juvenile type has been observed on a juvenile *P. nanum* sp. nov. in the present study, and this confirms its status as a juvenile character. As a consequence it is not, in itself, useful as part of the generic concept unless it proves unique for all the included species. It seems that although *Platepistoma* has undergone considerable speciation, each species is uniquely represented in a particular area. Given this, it is almost completely certain that the adult specimen from Hawaii identified by TAKEDA (1977) truly belongs to *Platepistoma macrophthalmus*. The specimen from the Emperor Seamounts recorded by SAKAI (1980) as *Cancer guezei* is very similar to *P. macrophthalmus*, and is discussed further under *P. guezei*.

Platepistoma anaglyptum Balss, 1922

Platepistoma anaglyptum Balss, 1922a : 2; 1922b : 96, pl. 1, fig. 4. — SAKAI, 1939 : 440.
Cancer anaglyptus - SAKAI, 1965 : 105, pl. 48, fig. 3.
Cancer sakaii Takeda & Miyake, 1972, p. 253. — NATIONS, 1975 : 43; 1979 : 154, 183. — SAKAI, 1976 : 320, pl. 108, fig. 3.
Cancer balssi Nations, 1975, fig. 30, 5 and 6 [an invalid replacement name, not *Cancer balssii* Zarenkov, 1990 = *Platepistoma balssii* (Zarenkov, 1990)].
Cancer margaritarius Crosnier, 1976 : 246. — ZARENKOV, 1990, p. 230.

REMARKS. — No specimens of this species have been examined but as the synonymy has become rather confused an opportunity is taken here to correct the problems. SAKAI (1965) noticed that H. MILNE EDWARDS (1849) had used the genus *Cancer* for his species described as *Etisus anaglyptus* H. Milne Edwards, 1834, and he said that therefore *Cancer anaglyptus* (Balss, 1922), described originally as a *Platepistoma*, required a new name.

This new name *Cancer sakaii* was supplied by TAKEDA and MIYAKE (1972). In 1975, NATIONS used the name *Cancer balssi* in a caption to his figure of *P. anaglyptum* although elsewhere in the text he had used the name *C. sakaii* Takeda and Miyake. *Cancer balssi* was a manuscript name that SAKAI had proposed to use himself for this species before TAKEDA and MIYAKE had published their replacement name (SAKAI, 1983, discussed this problem), however as it was mistakenly applied in a publication by NATIONS it must go into the synonymy of *Platepistoma anaglyptum*. Nonetheless, *Cancer balssi* is still an available name and the species described under that name by ZARENKOV (1990) is valid under Article 13(a)(i)-(ii) of the International Code of Zoological Nomenclature. Finally, CROSNIER (1976) also heeding SAKAI's (1965) recommendation, and unaware of TAKEDA and MIYAKE's (1972) action, further proposed the replacement name *C. margaritarius*.

Unfortunately, a replacement name was never required for *Platepistoma anaglyptum* even if it had been correctly placed in *Cancer*. The situation is explicitly covered by Article 59 (c) and (d) of the International Code of Zoological Nomenclature (1985 : 112, 113). Firstly 59(c) states that "If, in a case of secondary homonymy, the junior species-group name has not been replaced [Art. 60], and the taxa in question are no longer considered congeneric, the junior name is not to be rejected, even if one name was originally proposed in the current genus of the other." This means that the action to replace the name was unnecessary.

Then 59(d) "A species-group name rejected after 1960 on grounds of junior secondary homonymy is to be reinstated by anyone who believes that the two species-group taxa in question are not congeneric, unless it is invalid for some other reason." *Etisus anaglyptus* is now firmly anchored away from the genus *Cancer* and there is no likelihood that *Platepistoma anaglyptum* Balss, 1922, and *Etisus anaglyptus* H. Milne Edwards, 1834, being in different families, will ever be considered congeneric. Therefore under Article 59(d) it is necessary to reinstate *Platepistoma anaglyptum* as the correct name.

Platepistoma guezei (Crosnier, 1976)

Fig. 1a, 2a

Cancer guezei Crosnier, 1976 : 243-246, figs 7, 8, pl. I, fig. 1.
Not *Cancer guezei* - SAKAI, 1980 : 76, frontispiece II, fig. 2, pl. 5, fig. 3 (= ? *P. macrophthalmus* Rathbun, 1906).

MATERIAL EXAMINED. — **Réunion Island. P.** GUÉZÉ **coll.** : Le Port, 650 m, trapped, 11.09.1973 : 1 ♂ 53.0 x 39.5 mm, holotype (MNHN-B 6345). — *Ibidem* : 3 ♀ 48.7 x 36.0, 50.0 x 36.1, 48.8 x 37.0 mm, paratypes (MNHN-B 6342). — Le Port : 1 ♀ 56.6 x 42.8 mm; 2 ♂ 45.3 x 34.4, 53.3 x 39.3 mm (MNHN-B 8800). — Le Port, 350-500 m, trapped, 2.2.1974 : 2 ♀ 46.0 x 34.7, 53.8 x 40.9 mm; 2 ♂ 48.7 x 36.9, 49.6 x 36.6 mm (MNHN-B 17232).

Madagascar. "*Vauban*" : stn CH 38, 12°50.0'S, 48°09.1'E, 580-585 m, trawled, 14.09.1972 : 1 ♀ 46.8 x 36.7 mm, paratype (MNHN-B 6341).

"*Marion Dufresne*". MD/08 : stn 5/CC 26, 27°44.8'S, 46°24.5'E, 700 m, trapped, 13-14.03.1976 : 3 ♀ 26.5 x 19.5, 33.5 x 24.5, 33.5 x 25.5 mm; 1 ♂ 28.3 x 21.0 mm (MNHN-B 21595). — Stn 5/CC 27, 27°45.1'S, 46°24.5'E, 720 m, trapped, 14.03.1976 : 1 ♀ 37.6 x 28.6 mm; 2 ♂ 26.7 x 19.8, 35.2 x 27.3 mm (MNHN-B 8060).

REMARKS. — A large series of this species is now present in the collections of the Paris Museum. The appearance differs little with size, although small specimens have slightly spinier lateral teeth. Characters to distinguish it from the other species of the genus can be found in the Key and in the Discussion. The specimen recorded by SAKAI (1980) from the Emperor Seamounts, in the northern Central Pacific is not *P. guezei*; its identity cannot be determined with certainty from the figures given by Sakai, but it more closely resembles *P. macrophthalmus* Rathbun, 1906, from Hawaii, the geographically closest known species to the Emperor Seamounts. Unlike *P. guezei*, the granulation on the carapace appears much more strongly through the tomentum, extending almost to the posterior margin, and in this it strongly resembles *P. macrophthalmus*; however the carapace regions are comparatively poorly defined and from the figure given by TAKEDA (1977) the regions on *P. macrophthalmus* are more strongly marked. It is probably necessary to obtain further material, so as to assess variability, before specific status can be properly evaluated.

DISTRIBUTION. — Known only from Réunion Island and Madagascar in the southwestern Indian Ocean. Bathymetric range : 350-720 m.

Platepistoma kiribatiense sp. nov.
Figs 1b, 2b, 3a, 4a

MATERIAL EXAMINED. — **Kiribati**. Trapped, 400 m, Aprit 1987 : 1 ♂ 46.0 x 36.0 mm (MNHN-B 22198); 1 ♀ 41.5 x 32.0 mm (MNHN-B22199).

TYPE SPECIMENS. — The male is the holotype, the female a paratype.

DESCRIPTION. — *Carapace* : Ovoid; *c.* 1.28-1.3 times broader than long; convex in both directions. Regions are distinct and separated by broad deep furrows; 2M separated from 3M and 2M partially longitudinally divided; urogastric, cardiac, and intestinal regions all strongly defined by sinuous lateral grooves, but not clearly divided transversely from each other; a large sub-triangular region defined on the inner part of the mesobranchial area lateral to gastro-cardiac region, strongly demarcated posteriorly by a broad deep groove, connected at inner posterior end with rest of mesobranchial region; a smaller well-defined sub-triangular region on metabranchial area adjacent intestinal region; lateral hepatic and epibranchial grooves strongly indicated. Carapace surface granulate, granules rounded, not in grooves separating regions; restricted to anterior two-thirds of carapace; do not project through tomentum which forms a thick covering over entire dorsal surface. Lateral margins strongly convex, divided into 10 teeth, including outer orbital angle, first 9 of similar shape and size although those nearer orbit slightly smaller; sub-triangular, apically pointed, and with margins spinulate; tenth smaller, situated on posterolateral border, followed posteriorly by several small sharp spines. Front *c.* 0.2-0.25 times carapace width; moderately projecting, trilobed, lateral lobes broad, armed with small sharp tubercles, medial lobe on a lower level, projecting upwards as a moderately long spine, armed with small sharp accessory granules; a deep pre-orbital concavity present in which the antenna lies. Upper orbital border irregularly granular, prominent sharp granules clustered particularly on broad, truncate, intercalated lobe, and also on inner lateral margin. Inner angle of lower orbital border formed by a triangular tooth; with V-shaped notch laterally, narrow, confluent with outer orbital tooth for most of its length. Antennal flagellum very long and not entering orbit, peduncle with brushes of long setae on inner distal edge of last two segments; accessory setae encircling each segment distally and projecting outwards. Basal antennal segment armed with sharp tubercles.

Third maxillipeds : Merus distinctly smaller than ischium. Merus quadrate, *c.* 0.9 times as long as wide; antero-external angle produced, rounded, bluntly pointed; inner margin with medial angle sharply pointed; *c.* 0.6 times length of ischium. Ischium rectangular, *c.* 1.9 times longer than wide; inner margin granular.

Chelipeds : Subequal; large and robust; merus with posterior border granulate; with distinct subdistal spine; lower border minutely granulate; anterior border minutely granulate; carpus with a broad tooth at inner angle tipped with sharp tubercle; upper surface bearing rounded granules, just projecting through tomentum, more-or-less arranged into *c.* 5 longitudinal rows; granules present on inner face of carpus just below inner angle, ending in spine tipped swollen tubercle ventrally. Outer surface of palm coarsely granular, arranged in 3 distinct rows across medial and medio-ventral part behind gape, below these ventrally, granules smaller, more random, but in 2 relatively distinct rows; upper outer face with well-separated blunt granules, with tips only just visible through thick tomentum; palm high, *c.* 0.5-0.6 times length of palm including fixed finger. Inner surface of palm microscopically granular. Immovable finger with a ventral and medial ridge; moderately long; length cutting edge *c.* 0.35-0.38 times length propodus. Ventral border of chela concave at base of fixed finger. Dorsal surface of dactyl granular near base, becoming smooth distally. Fingers pointed; a narrow gape between cutting margins near base.

Walking legs : Relatively long; cylindrical; slender; first three pairs all of similar length. Merus of third leg *c.* 3.5-3.8 times as long as wide. Carpus *c.* 2.7-2.9 times as long as wide. Propodus *c.* 2.4-2.6 times as long as wide. Dactyli *c.* 1.4 times length of propodus. Dactyli slender and straight; terminating in an acute chitinous recurved tip. Merus anterior margin terminating in an acute spine, and with a series of small erect spines along upper margin, longer distally, continuing along carpus and onto propodus on anterior two pairs of legs; posterior margin minutely granular. Dactyli with two deep longitudinal grooves laterally. Setae stiff, medium length, covering entire surface, longer marginally.

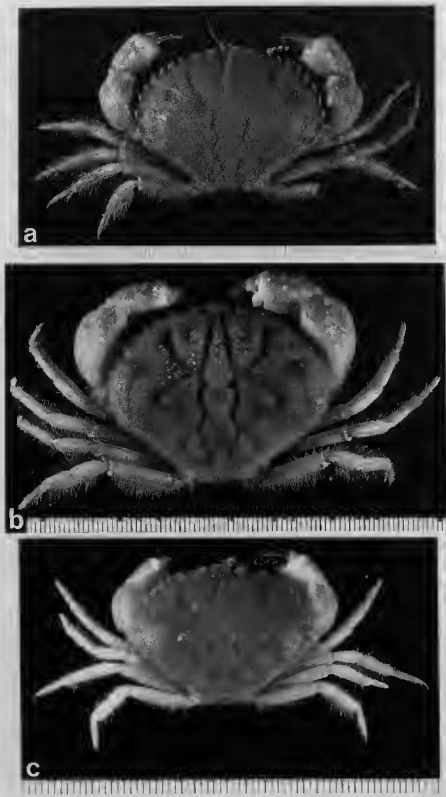

FIG. 1. — Dorsal views of : a, *Platepistoma guezei* (Crosnier, 1976), ♂ 53.3 x 39.3 mm, Réunion Island (MNHN-B 8800); b, *P. kiribatiense* sp. nov., holotype, ♂ 46.0 x 36.0 mm, Kiribati, West Pacific (MNHN-B 22198); c, *P. nanum* sp. nov., holotype, ♂ 28.8 x 21.4 mm, Norfolk Ridge (MNHN-B 22201).

FIG. 2. — Frontal views of specimens in Fig. 1 : **a**, *Platepistoma guezei* (Crosnier, 1976), ♂; **b**, *P. kiribatiense* sp. nov., holotype, ♂; **c**, *P. nanum* sp. nov., holotype, ♂.

Male abdomen : First segment 0.8 times width third segment. Segments three-six tapering. Segment six *c.* 1.8 times wider than long. Telson longer than preceding segments; (telson broken but because of long, deep, sternal cleft it appears it would have reached *c.* three-quarters of distance to suture between sternites 3 and 4).

Gonopods : First gonopod of male as figured.

ETYMOLOGY. — Named in reference to the type locality.

DISTRIBUTION. — Known only from the type locality, Kiribati, southwestern Pacific Ocean. Bathymetric range : *c.* 400 m.

Platepistoma nanum sp. nov.

Figs 1c, 2c, 3b-c, 4c

MATERIAL EXAMINED. — **Norfolk Ridge.** SMIB 4 : stn DW 34, 24°55.0'S, 168°22.0'E, 515 m, 07.03.1989 : 1 ♀ 28.1 x 21.4 mm (MNHN-B 22200). — Stn DW 37, 24°54.5'S, 168°22.3'E, 540 m, 07.03.1989 : 1 ♂ 28.8 x 21.4 mm (MNHN-B 22201). — Stn DW 39, 24°56.2'S 168°21.5'E, 560 m, 07.03.1989 : 1 ♀ 26.7 x 20.5 mm (MNHN-B 22202). — Stn DW 60, 23°00.1'S, 167°21.6'E, 535 m, 10.03.1989 : 1 ♂ 25.4 x 19.9 mm (MNHN-B 22203). — Stn DW 60, 23°00.1'S, 167°21.6'E, 535 m, 10.03.1989°: 1 ovig. ♀ 19.5 x 15.2 mm (MNHN-B 22204).

New Caledonia. AZTÈQUE : stn 6, 23°37.9'S, 167°42.5'E, trawled, 425-470 m, 14.02.1990 : 1 ♂ 30.4 x 23.5 mm; 1 ♀ 26.0 x 19.5 mm (MNHN-B 22205).

SMIB 2 : stn DC 26, 22°59'S, 167°23'E, 500-535 m, 21.09.1986 : 1 ♀ 17.7 x 13.9 mm; 2 ♂ 19.3 x 14.8, 21.0 x 16.2 mm (USNM). — Stn DW 10, 22°55'S, 167°16'E, 490-495 m, 18.09.1986 : 1 ♂ 25.2 x 19.8 mm (USNM). — Stn DW 18 bis, 22°58'S, 167°20'E, 530-535 m, 19.09.1986 : 2 ♀ 20.1 x 15.4, 19.7 x 15.2 mm; 1 ♂ 23.7 x 18.9 mm (QM-W 8028).

MUSORSTOM 4 : stn 216, 22°59.5'S, 167°22.0'E, 490-515 m, 29.09.1985 : 2 ♀ 17.4 x 13.3; 20.0 x 15.7 mm (MNHN-B 22206). — Stn 221, 22°58.6'S, 167°36.8'E, 535-560 m, 29.09.1985 : 1 ♀ 20.3 x 15.5 mm (MNHN-B 22207).

CHALCAL 2 : stn DW 72, 24°54.5'S, 168°22.3'E, 527 m, 28.10.1986 : 1 juv. ♂ 5.1 x 4.3 mm (MNHN-B 22208). — Stn DW 76, 23°40.5'S, 167°45.2'E, 470 m, 30.10.1986: 1 ♀ 24.5 x 19.1 mm (MNHN-B 22209). — Stn DW 76, 23°40.5'S, 167°45.2'E, 470 m, 30.10.1986 : 7 ♀ 18.8 x 14.5 - 25.3 x 19.9 mm (MNHN-B 22210).

Britannia Seamount, W. Tasman Sea. "*Franklin*" : stn FRO 589-46, 28°17.04'S, 155°36.46'E, 425 m, 1.2 m sled, limestone and coarse coral sand bottom. J. LOWRY *et al.* coll., 10.05.1989 : 1 ♀ 25.1 x 19.4 mm, (AM-P 39430).

TYPE SPECIMENS. — The male of 28.8 x 21.4 mm (MNHN-B 22201) from cruise SMIB 4, Stn DW 37, 24°54.5'S, 168°22.3'E, Norfolk Ridge, is designated as holotype. All other specimens are paratypes.

DESCRIPTION. — *Carapace* : Ovoid; 1.25-1.35 times broader than long (mean 1.29); convex in both directions. Regions moderately defined, partially obscured by thick short tomentum; 2M separated from 3M and 2M partially longitudinally divided, but only slightly indicated; urogastric, cardiac, and intestinal regions all strongly defined by sinuous lateral grooves, but not clearly divided transversely from each other; a large sub-triangular region defined on the inner part of the mesobranchial area lateral to gastro-cardiac region, poorly demarcated posteriorly; a smaller sub-triangular region on metabranchial area adjacent intestinal region similarly poorly defined; lateral hepatic and epibranchial grooves indistinct. Carapace surface granulate, granules sharp, not in grooves separating regions; cover most of surface but reduce in size posteriorly and disappear near hind margin; tips just project through tomentum in anterior half; tomentum typically forms thick covering over entire dorsal surface although on some large specimens it is lower and less enveloping, and the granules are blunter and lower. Lateral margins strongly convex, divided into 10 teeth, including outer orbital angle, first 9 of similar shape and size although slightly smaller nearer orbit; typically sub-triangular and well separated but can be truncated and nearly abutting basally on large specimens, apically spinulate with one spine more prominent; tenth lateral tooth smaller, situated on posterolateral border, followed posteriorly by a line of granules demarcating the posterolateral border and terminating in a single larger, more prominent granule above lateral edge of hind margin. Front *c.* 0.2-0.25 times carapace width; moderately projecting, tri-lobed, lateral lobes broad, armed with small sharp tubercles, medial lobe on a lower level, not very prominent, projecting upwards only slightly as a granular knob; a deep pre-orbital

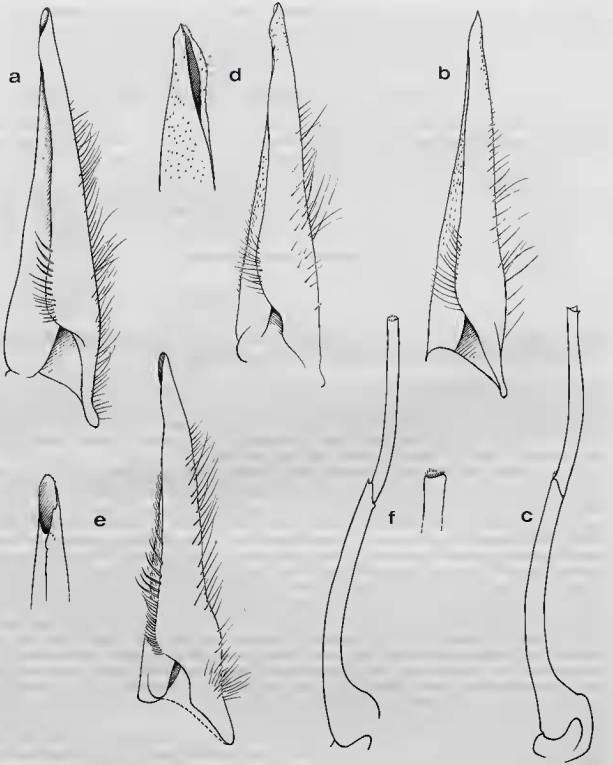

FIG. 3. — a-c, male gonopods of *Platepistoma* species (see Figs 1 & 6 for data on specimens) : **a**, *P. kiribatiense* sp. nov., holotype; **b-c**, *P. nanum* sp. nov.,' holotype; **d**, *P. balssii* (Zarenkov, 1990) (MNHN-B 22211) (with tip enlarged, in sternal view); **e-f**, *P. seychellense* sp. nov., holotype (first and second gonopods, both with tips enlarged).

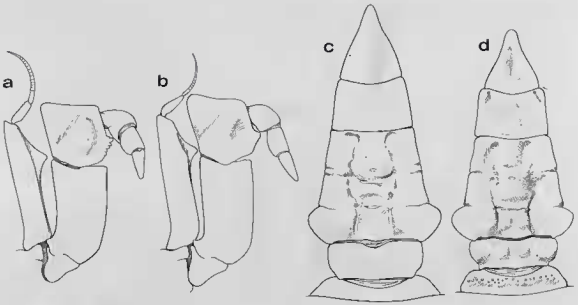

FIG. 4. — Third maxillipeds of : a, *P. kiribatiense* sp. nov., holotype; b, *P. seychellense* sp. nov., holotype. Male abdomens of : c, *P. nanum* sp. nov., holotype; d, *P. seychellense* sp. nov., holotype.

concavity present in which the antenna lies. Upper orbital border with irregular small sharp granules. Lower orbital border inner angle formed by a triangular tooth; with V-shaped notch laterally, narrow, confluent with outer orbital tooth for most of its length. Antennal flagellum moderately long and not entering orbit, peduncle with brushes of long setae on inner distal edge of last two segments; accessory setae encircling each segment distally and projecting outwards. Basal antennal segment armed with sharp tubercles.

Third maxilliped : Merus distinctly smaller than ischium. Merus quadrate, *c.* 0.9 times as long as wide; antero-external angle produced, rounded, bluntly pointed; *c.* 0.65 times length of ischium. Ischium rectangular, *c.* 1.8-1.9 times longer than wide; inner margin granular.

Chelipeds : Subequal; large and robust; merus with posterior border granulate, bearing a few spinules distally; with 2-3 distinct subdistal spines; armed with small spines distally around joint; lower, and anterior, borders minutely granulate; carpus with broad tooth at inner angle tipped with small spine; inner margin armed with small spines, upper surface covered in sharp granules, sparser distally, not arranged into obvious longitudinal rows; granules present on inner face of carpus just below inner angle, sharp, ending in sharp spinule ventrally. Outer surface of palm coarsely granular, arranged in 5 moderately distinct rows, the 3 rows behind the gape being most prominent, a row continuing behind ridge on fixed finger for *c.* half length of palm; upper outer face more irregularly granulate; superior margin with characteristic strongly marked concavity in distal half, with a sharp spinule at its proximal and distal ends; sharp granules mostly project through tomentum; palm high, *c.* 0.5-0.6 times length of palm including fixed finger. Inner surface of palm microscopically granular. Immovable finger with a ventral and medial ridge; moderately long; length cutting edge *c.* 0.4 times length propodus. Ventral border of chela concave at base of fixed finger. Dorsal surface of dactyl granular near base, becoming smooth distally. Fingers pointed; a narrow gape between cutting margins near base.

Walking legs : Relatively long; cylindrical; slender; first three pairs all of similar length. Merus of third leg *c.* 3.3-3.9 times as long as wide. Carpus *c.* 2.7-3 times as long as wide. Propodus *c.* 2.5-2.9 times as long as wide. Dactyli *c.* 1.3-1.4 times length of propodus. Dactyli slender and straight; terminating in an acute chitinous recurved tip. Merus anterior margin terminating in an acute spine and with a series of small erect spines along upper margin, longer distally, continuing along carpus and propodus; posterior margin minutely granular. Dactyli with two deep longitudinal grooves laterally. Setae on legs stiff, of medium length, covering entire surface, longer marginally.

Male abdomen : First segment *c.* 0.8-0.9 times width third segment. Segments three-six tapering. Segment six *c.* 1.6-1.7 times wider than long. Telson longer than preceding segments; *c.* 1.3-1.4 times longer than wide; bluntly pointed, reaching a little more than half distance towards suture between sternites 3 and 4.

Gonopods : First and second gonopods of male as figured.

ETYMOLOGY. — Named in reference to the diminutive size of this species.

REMARKS. — The juvenile male of only 5.4 mm carapace breadth is considerably less broad in relation to length than mature specimens, and shows the characteristic pattern of alternating large and small spines on the lateral margins that RATHBUN (1906) described for *P. macrophthalmus*.

DISTRIBUTION. — From New Caledonia (*c.* 23°S), south along the Norfolk Ridge, to Britannia Seamount, W. Tasman Sea (28°S). Bathymetric range : 425-560 m.

Platepistoma balssii (Zarenkov, 1990)

Figs 3d, 5a, 6a-b, 7a-b

Cancer balssii Zarenkov, 1990 : 228-229, fig. 8.

MATERIAL EXAMINED. — **Sala-y-Gomez Ridge** : holotype ♂ 61.6 x 48.0 mm (Zool. Mus. Moscow State Univ.).

French Polynesia. SMCB (J. POUPIN coll.) : **Marquises Islands** : ***Eiao***, 7°58.5'S, 140°44.5'W, 415 m, trapped, 19.01.1991 : 1 ♀ 64.0 x 50.4 mm (MNHN-B 22214). — 8°00.1'S, 140°45.1'W, 320 m, 04.09.1989 : 1 ♂ 58.4 x 44.9 mm (MNHN-B 2215); 1 ♀ 53.1 x 40.1 mm (USNM).

Austral Islands : ***Rurutu***, 550 m, trapped, 03.09.1988 : 1 ♂ 50.5 x 40.9 mm (MNHN-B 22211). — ***Rimatara***, 22°37.6'S, 152°49.3'W, 470-480 m, trapped, 11.03.1989 : 2 ♀ 48.4 x 37.6, 46.3 x 35.0 mm (MNHN-B 22212). — ***Ropa***, 550 m, trapped, 26.08.1988 : 1 ♀ 55.3 x 43.0 (MNHN-B 22213); 1 ♀ 53.8 x 42.5 mm (QM-W 8029). — ***Raivavae***, 23°50.0'S, 147°43.4'W, 550 m, trapped, 01.03.1989 : 1 ♂ 48.1 x 38.2 mm (length estimated as rostrum broken) (MNHN-B 22221). — ***Raivavae***, trapped, 500 m, 24.8.1988 : 1 ♂ 47.3 x 36.1 mm (USNM).

DESCRIPTION (after Polynesian specimens). — *Carapace* : Ovoid; 1.23-1.32 times broader than long (mean 1.28); convex in both directions. Regions moderately defined, partially obscured by thick short tomentum; 2M separated from 3M and 2M partially longitudinally divided, but only slightly indicated; urogastric, cardiac, and intestinal regions all strongly defined by sinuous lateral grooves, but not clearly divided transversely from each other; a large sub-triangular region defined on the inner part of the mesobranchial area lateral to gastro-cardiac region, poorly demarcated posteriorly; a smaller sub-triangular region on metabranchial area adjacent intestinal region similarly poorly defined; lateral hepatic and epibranchial grooves indistinct. Carapace surface granulate, granules sharp, not in grooves separating regions; restricted to anterior half of carapace; do not project through tomentum which forms a thick covering over entire dorsal surface. Lateral margins strongly convex, divided into 10 teeth, including outer orbital angle, first 9 of similar shape and size although slightly smaller nearer orbit; sub-triangular, apically pointed, and with margins spinulate; tenth smaller, situated on posterolateral border, followed posteriorly by several small sharp spines. Front *c.* 0.2-0.25 times carapace width; moderately projecting, tri-lobed, lateral lobes broad, armed with small sharp tubercles, medial lobe on a lower level, projecting upwards as a moderately long spine, armed with small sharp accessory granules; a deep pre-orbital concavity present in which antenna lies. Upper orbital border irregularly granular, prominent sharp granules clustered particularly on broad, truncate, intercalated lobe, and also on inner lateral margin. Inner angle of lower orbital border formed by a triangular tooth; with V-shaped notch laterally, narrow, confluent with outer orbital tooth for most of its length. Antennal flagellum very long and not entering orbit, peduncle with brushes of long setae on inner distal edge of last two segments; accessory setae encircling each segment distally and projecting outwards. Basal antennal segment armed with sharp tubercles.

Third maxilliped : Merus distinctly smaller than ischium. Merus quadrate, *c.* 0.9 times as long as wide; antero-external angle produced, rounded, bluntly pointed; inner margin with medial angle sharply pointed; *c.* 0.65 times length of ischium. Ischium rectangular *c.* 1.7 times longer than wide; inner margin granular.

Chelipeds : Subequal; large and robust; merus with posterior border granulate, bearing a few small spines distally; with distinct subdistal spine; lower border minutely granulate; anterior border minutely granulate; carpus with a broad tooth at inner angle bearing minute spinules; upper surface with 6 longitudinal rows of small spines in proximal half, including lines of spinules on inner and outer margins; more unevenly granulate in distal half; sharp granules present on inner face of carpus just below inner angle, ending in small sharp spinule ventrally. Outer surface of palm coarsely granular, arranged in 3 distinct rows across medial and medio-ventral part behind gape, below these ventrally, granules smaller, more random, sometimes in 1 or 2 more-or-less distinct rows especially on females; upper outer face with well-separated sharp granules, with tips only just visible through thick tomentum; palm high, *c.* 0.6 times length of palm including fixed finger. Inner surface of palm microscopically granular. Immovable finger with a ventral and medial ridge; moderately long; length cutting edge *c.* 0.35-0.38 times length propodus. Ventral border of chela concave at base of fixed finger. Dorsal surface of dactyl granular near base, becoming smooth distally. Fingers pointed; a narrow gape between cutting margins near base.

Walking legs : Relatively long; cylindrical; slender; first three pairs all of similar length. Merus of third leg *c.* 3.8-4 times as long as wide. Carpus *c.* 2.6 times as long as wide. Propodus *c.* 2.3-2.7 times as long as wide. Dactyli *c.* 1.4-1.5 times length of propodus. Dactyli slender and straight; terminating in an acute chitinous recurved tip. Merus anterior margin terminating in an acute spine, and with a series of small erect spines along upper margin, longer distally, continuing along carpus and propodus; posterior margin minutely granular. Dactyli with two deep longitudinal grooves laterally. Setae stiff, of medium length, covering entire surface of legs, longer marginally.

Male abdomen : First segment 0.8-0.85 times width third segment. Segments three-six tapering. Segment six *c.* 1.6-1.7 times wider than long. Telson longer than preceding segments; *c.* 1.3-1.35 times longer than wide; bluntly pointed; reaching three-quarters distance to suture between sternites 3 and 4.

Gonopods : First gonopod of male as figured.

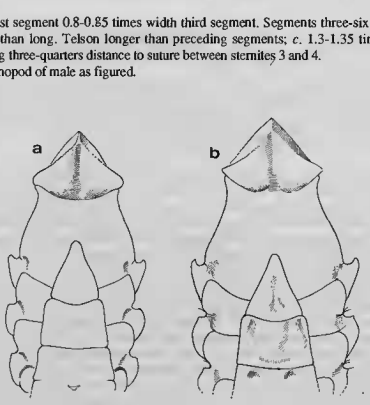

FIG. 5. — Anterior part of sternum and last two segments of male abdomen of : a, *P. balssii* (Zarenkov, 1990), ♂ (MNHN-B 22211); b, *P. seychellense* sp. nov., holotype.

REMARKS. — The specimens from the Marquises Islands differ slightly from typical *P. balssii*, two specimens (MNHN-B 22215, Fig. 6b, 7b, and USNM unreg.) have a much sparser tomentum, particularly medially; and many fewer, less acute tubercles, which do not extend as far posteriorly; in particular the posterior of

3M lacks tubercles whereas it is typically strongly tuberculate in *P. balssii* similarly the narrow anterior projection of 3M has a single line of well-separated granules, but normally has a band several granules wide of closely-set granules. These two specimens initially made me suspect that another species was represented, but then I received a further specimen, also from the Marquises Islands, which is intermediate in all respects, so the differences noted must be attributed to wear and depilation between moults, and intra-populational variation.

I was able to examine the holotype of *P. balssii* through the help of Dr V.A. SPIRIDONOV. Like the present specimens the spiny granules on the dorsal carapace are almost completely hidden by a tomentum of short stiff setae, however several differences were described. From ZARENKOV's figure the carapace regions do not seem to be as deeply and sharply defined as is typical on the Polynesian specimens; and from the description it seems that the 9 anterolateral teeth are followed posteriorly by 2-3 low rounded tubercles, whereas there are in reality several sharp spines in this position. ZARENKOV also described setae and small spines on both the superior and inferior borders of the meri of the walking legs of *P. balssii*, whereas only the superior borders of the meri have spines, and the inferior borders are merely granular. These described differences in conjunction with the fact that *P. balssii* is found in a rather remote locality (Sala-y-Gomez Ridge, southeastern Pacific), and all the other known species have relatively limited distributions, initially led me to believe the Polynesian specimens were a new species, but after examination of the holotype I find that they are clearly conspecific.

DISTRIBUTION. — French Polynesia, between the Marquises Islands (7°S) and the Austral Islands (22°S). Sala-y-Gomez Ridge, S.E. Pacific (type locality). Bathymetric range : 295-550 m.

Platepistoma seychellense sp. nov.

Figs 3e-f, 4b, d, 6c, 7c

MATERIAL EXAMINED. — **Seychelles Archipelago.** CEPROS : stn 4/22, 04°46.5'S, 56°38.4'E, 420-430 m, trapped, 23.10.1987 : 1 ♂ 55.0 x 42.7 mm (MNHN-B 19012).

TYPE SPECIMEN. — The unique specimen, a male, is the holotype.

DESCRIPTION (of holotype). — *Carapace* : Ovoid; 1.29 times broader than long; convex in both directions. Regions distinct and separated by broad deep furrows; 2M separated from 3M, and 2M partially longitudinally divided; urogastric, cardiac, and intestinal regions all strongly defined by sinuous lateral grooves, but not clearly divided transversely from each other; a large sub-triangular region defined on the inner part of the mesobranchial area lateral to gastro-cardiac region, strongly demarcated posteriorly by a broad deep groove, connected at inner posterior end with rest of mesobranchial region; a smaller well-defined sub-triangular region on metabranchial area adjacent intestinal region; lateral hepatic and epibranchial grooves strongly indicated. Carapace surface granulate, granules blunt, not in grooves separating regions, larger on anterior half of carapace, but reduced in size and continuing to posterior margin; tips just project through tomentum anteriorly; tomentum forms a thick covering over entire dorsal surface. Lateral margins strongly convex, divided into 10 teeth, including outer orbital angle, first 9 of similar shape and size although slightly smaller nearer orbit; sub-triangular, apically pointed, and with margins spinulate; tenth smaller, situated on posterolateral border, followed posteriorly by several small sharp tubercles and with a larger tubercle posterolaterally above outer edge of hind margin. Front 0.2 times carapace width; moderately projecting, tri-lobed, lateral lobes broad, armed with small sharp tubercles, medial lobe on a lower level, projecting upwards as a moderately long spine, armed with small sharp accessory granules; a deep pre-orbital concavity present in which antenna lies. Upper orbital border with blunt granules. Lower orbital border inner angle formed by a blunt tooth; with narrow V-shaped notch laterally, abutting outer orbital tooth for most of its length. Antennal flagellum very long and not entering orbit, peduncle with brushes of long setae on inner distal edge of last two segments; accessory setae encircling each segment distally and projecting outwards. Basal antennal segment armed with sharp tubercles.

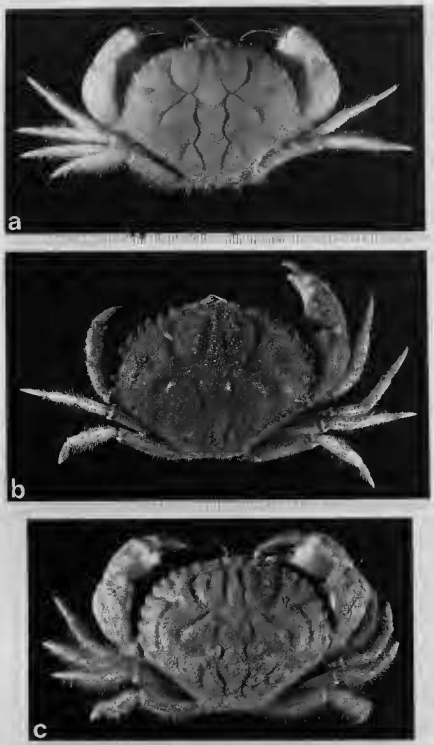

FIG. 6. — Dorsal views of : a, *Platepistoma balssii* (Zarenkov, 1990), ♂ 50.5 x 40.9 mm, Rurutu, Austral Islands, French Polynesia (MNHN-B 22211); b, *P. balssii* (Zarenkov, 1990), ♂ 58.4 x 44.9 mm, Eiao, Marquises Islands (MNHN-B 22215); c, *P. seychellense* sp. nov., holotype, ♂ 55.0 x 42.7 mm, Seychelles Archipelago (MNHN-B 19012).

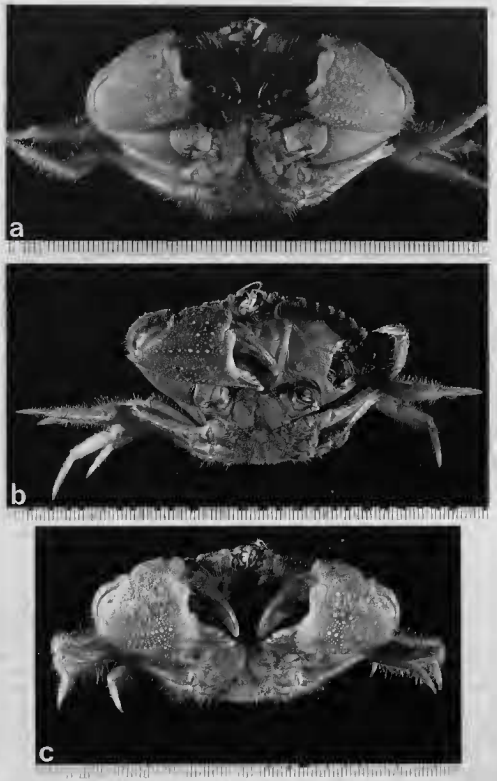

FIG. 7. — Frontal views of specimens in Fig. 6 : a, *Platepistoma balssii* (Zarenkov, 1990), ♂ (MNHN-B 22211); b, *P. balssii* (Zarenkov, 1990), ♂ (MNHN-B 2215); c, *P. seychellense* sp. nov., holotype, ♂.

Third maxilliped : Merus distinctly smaller than ischium. Merus quadrate; antero-external angle produced, rounded, bluntly pointed; inner margin with medial angle sharply pointed; 0.65 times length of ischium. Ischium rectangular, 1.9 times longer than wide; inner margin granular.

Chelipeds : Subequal; large and robust; merus with posterior border granulate; with distinct subdistal spine; lower border minutely granulate; anterior border minutely granulate; carpus with a broad tooth at inner angle; upper surface granular, granules just noticeable, most not projecting through tomentum; more-or-less in rows in proximal half; granules present on inner face of carpus just below inner angle, sharp, ending in a large swollen tubercle ventrally. Outer surface of palm coarsely granular, arranged in 3 distinct rows across medial and medio-ventral part behind gape, below these ventrally, granules smaller, more random, in 1 or 2 more-or-less distinct rows; upper outer face with well-separated blunt granules, with tips only just visible through thick tomentum; palm high, 0.67 times length of palm including fixed finger. Inner surface of palm microscopically granular. Immovable finger with a ventral and medial ridge; moderately long; length cutting edge 0.38 times length propodus. Ventral border of chela concave at base of fixed finger. Dorsal surface of dactyl granular near base, becoming smooth distally. Fingers pointed; a moderate gape between cutting margins.

Walking legs : Relatively long; cylindrical; slender; first three pairs all of similar length. Merus of third leg 3.2 times as long as wide. Carpus 2.6 times as long as wide. Propodus 2.1 times as long as wide. Dactyli 1.4 times length of propodus. Dactyli slender and straight; terminating in an acute chitinous recurved tip. Merus anterior margin terminating in an acute spine, and with a series of small erect spines along upper margin, longer distally, continuing along carpus and with a few spines proximally on propodus, especially on anterior legs; posterior margin minutely granular. Dactyli with two deep longitudinal grooves laterally. Setae stiff, of medium length, covering entire surface, longer marginally.

Male abdomen : First segment 0.8 times width third segment. Segments three-six tapering. Segment six 1.7 times wider than long. Telson longer than preceding segments; 1.2 times longer than wide; bluntly pointed, reaching about half distance towards suture between sternites 3 and 4.

Gonopods : First and second gonopods of male as figured.

ETYMOLOGY. — Named in reference to the type locality.

DISTRIBUTION. — Known only from the type locality, Seychelles Archipelago, southwestern Indian Ocean. Bathymetric range : 420-430 m.

DISCUSSION

Generic status

As TAKEDA (1977) states, it is difficult to find a single definitive character that will separate *Platepistoma* from *Cancer sensu lato*. There are however a number of characters, which when taken in combination, point to a natural monophyletic group worthy of generic status. **1.** The lateral teeth are all widely separated and not basally fused. **2.** The median tooth of the front is pointed, and placed ventral to the lateral teeth, and the ventral surface of each lateral tooth is deeply excavated to form the antennular fossa. In *Cancer* the frontal teeth are typically on the same plane from side-to-side, although as TAKEDA (1977) points out some species do have the medial tooth a little depressed. **3.** The walking legs of all the species considered here to belong to *Platepistoma*, have the anterior margins armed with a row of erect spines. In *Cancer* the anterior margins of the walking legs are typically smooth or slightly granular, although on *Cancer* (*Romaleon*) *nadaensis* Sakai, 1969, they are described as "obscurely spinulated", and on *Cancer luzonensis* Sakai, 1983, there are also some spinules. **4.** The anterolateral margin of the merus of the third maxilliped is noticeably produced laterally, and angular; this is not a typical condition in *Cancer* although a few species have developed this to a greater or lesser extent (notably *C. oregonensis*, *C. amphioetus* and *C. luzonensis*). **5.** The posterolateral margins are not obviously defined by a smooth or granulate ridge as in *Cancer*, which, in *Cancer*, continues as a strong ridge above the hind margin. In *Platepistoma* there

may be a series of spines more-or-less defining the posterolateral border but even when they are strongly developed they do not continue medially above the hind margin.

I disagree with the conclusions of NATIONS (1975, 1979) and TAKEDA (1977) that *Cancer oregonensis* Rathbun, 1898, and *C. amphioetus* Rathbun, 1898, are closely related to *Platepistoma sakaii* (= *P. anaglyptum* Balss, 1922) and thus to the other species of *Platepistoma* discussed here. RATHBUN (1930) showed that *C. oregonensis* is a remarkably variable species, but nevertheless, in none of its forms does it closely resemble the species of *Platepistoma* described here. As NATIONS (1975) made *Cancer oregonensis* the type of his subgenus *Glebocarcinus*, I consider *Glebocarcinus* must remain a valid taxon and not be placed into the synonymy of *Platepistoma* as TAKEDA (1977) suggests. Therefore *Cancer* (*Glebocarcinus*) Nations, 1975, is here considered to contain only two certain extant species, *viz. Cancer oregonensis* Rathbun, 1898, and *C. amphioetus* Rathbun, 1898. I agree with TAKEDA's (1977) doubts about the position of *Cancer tumifrons* Yokoya, 1933. It was included by NATIONS (1975) in *Glebocarcinus*, and perhaps should remain for the present in that subgenus; it certainly cannot be included in *Platepistoma* as it is here defined.

Glebocarcinus differs from *Platepistoma* by : 1. The carapace not covered in thick tomentum; 2. The development of the carapace regions is different, 2M is not divided, and other regions are more uneven and projecting, not broad and flat and moderately to well defined; 3. The walking legs are comparatively shorter; 4. The meri of the walking legs are without erect spines on their anterior margins; 5. The medial tooth of the rostrum is in more-or-less the same plane as the lateral teeth, not markedly displaced ventrally; 6. The posterolateral margins are strongly indicated and terminate in a strong ridge distinctly medial to the lateral edge of the hind costate margin.

I have examined the holotype female of *Cancer luzonensis* Sakai, 1983, and feel that its systematic position is problematical. It resembles *Platepistoma* in having strong carapace regions, in the shape of the third maxillipeds, and in the form of the posterolateral margins. It is however very different in lacking the dorsal tomentum on the carapace; by lacking the strong granulation of the carapace; and in having the lateral teeth fused over their basal half and then evenly triangular. SAKAI (1983) compared it most closely with *Cancer* (*Romaleon*) *nadaensis* Sakai, 1969, and it does indeed seem most closely related to that species, although I have not examined specimens of *C. nadaensis* in the present study. A larger more comprehensive study is needed of the species of *Romaleon* to determine if *C. luzonensis* and *C. nadaensis* are proper members of that subgenus.

I have also examined the fossil cancrid from Kerguelen Islands mentioned in the preliminary article of NOËL and LEMAIRE (1990) and don't believe it can be placed in the present genus as the carapace does not show the characteristic regional development and has a smooth, non-granulated surface.

MÜLLER (1984) and JANSSEN and MÜLLER (1985) described a new fossil genus of cancrid, *Tasadia* Janssen and Müller, 1985, with a single species *T. carniolica* (Bittner, 1884) which had previously been questionably assigned to *Cancer*. In most of the characters observable from the figures it seems very close to *Platepistoma* Rathbun, 1906, such that its separate generic status must be in doubt. *Tasadia carniolica* has stronger tuberculation on the dorsal margin of the finger than extant species; and the lateral carapace regions seem to differ slightly in having the hepatic region separated from the branchial region, whereas in *Platepistoma* these regions are connected in a more-or-less distinct, laterally rotated, V-shape.

The close relationship of *Tasadia* with the subgenus *Glebocarcinus* has already been noted by KARASAWA (1990) who felt that *Tasadia* should be considered a junior synonym of *Glebocarcinus* Nations, 1975. KARASAWA (1990, Addenda : 34) also believed that TAKEDA'S (1977) decision to make *Glebocarcinus* a junior synonym of *Platepistoma* was wrong because he doubted the correctness of TAKEDA's identification of his adult material of *P. macrophthalmus*. I am convinced that TAKEDA's identification was correct as one of my specimens of *P. nanum* was juvenile like the type of *P. macrophthalmus* and showed the same pattern of alternating large and small lateral spines which RATHBUN (1906) had used as a generic character. Nevertheless as discussed in this paper I elect to maintain *Glebocarcinus* as a separate taxon from *Platepistoma* and, for the present, as a subgenus of *Cancer*. It seems possible that the Japanese Miocene species *Cancer* (*Glebocarcinus*) *kaedei* Karasawa, 1990, is referable to *Platepistoma* as KARASAWA (1990) considers *C. kaedei* to be closely related to *Cancer sakaii* (= *Platepistoma anaglyptum* Balss, 1922).

Species differentiation

As now recognized *Platepistoma* contains the following species :

P. macrophthalmus Rathbun, 1906 — Hawaii; 370-465 m.
P. anaglyptum Balss, 1922 — Japan; 50-120 m.
P. guezei (Crosnier, 1976) — Réunion Is., and Madagascar; 350-720 m.
P. balssii (Zarenkov, 1990) — Sala-y-Gomez Ridge, southeastern Pacific, and french Polynesia ; 295-550 m.
P. kiribatiense sp. nov. — Kiribati, West Pacific; 400 m.
P. nanum sp. nov. — South-west Pacific from New Caledonia into the Tasman Sea; 425-560 m.
P. seychellense sp. nov. — Seychelles, Indian Ocean; 420-430 m.

The majority of the species occur in rather deep water, between about 300-720 m, with only one species *P. anaglyptum* from Japan occurring in water as shallow as 50 m, and this is probably related to cooler water temperatures.

All the species of *Platepistoma* have extremely similar facies and the major features to readily separate them are : density, coverage, and sharpness of the dorsal tubercles. Some other features are important for diagnosing particular species and are discussed in the following. The relatively small differences between some of the species beg the question as to whether sub-specific rank may be more suitable, i.e., are they just geographic variants. I consider full specific status should be given because although the differences in most cases are small, they are nevertheless very consistent within a restricted area of occurrence; this suggests that the gene pools are discrete and there is no evidence of the clinal variation that one might expect from simple geographic varieties. It is unclear what isolating factors would have operated to allow such speciation as there are no significant differences in bathymetric ranges.

The male first gonopods of all the species examined in this study (Fig. 3) are very similar but have some small differences. *Platepistoma nanum* (Fig. 3b) has the apex tapering quite evenly to an acute tip, whereas the other species have the tip comparatively more flanged and blunter. *P. seychellense* has the aperture broadly open (Fig. 3e) while on *P. balssii* it is longer and more slit-like (Fig. 3d), which is more like it is for *P. guezei* (see fig. 8e, in CROSNIER, 1976). The sub-apical flange on *P. kiribati* and *P. balssii* is very similar but on *P. seychellense* it is comparatively longer and a little less prominent. The second gonopod is very similar for all the species (Fig. 3c, f).

The produced anterolateral corner of the third maxilliped has been seen as an important generic character, but as has already been noted, it is not unique to *Platepistoma* among the cancrids. The precise form of the third maxilliped is however remarkably consistent within the genus with the species showing only minor differences. For example *P. kiribatiense* (Fig. 4a) differs from *P. seychellense* (Fig. 4b) by having the inner medial tooth of the merus more acute and armed with accessory granules; and by having the anterior margin of the merus flatter, and the anterolateral corner more angular. *P. nanum* is intermediate between the two forms, while *P. balssii* is almost identical with *P. kiribatiense*.

The male abdomens are also very similar and show only relatively minor differences — for example the telson of *P. nanum* (Fig. 4c) is slightly longer and more pointed than for *P. seychellense* (Fig. 4d). The slightly shorter telson of *P. seychellense*, and more especially its position on the sternum, is shared with *P. guezei*, and splits off the two Indian Ocean species from all the Pacific species examined in this study. On *P. guezei* and *P. seychellense* the telson only reaches about half the length of sternite 4, such that the anteromedial part of sternite 4 is not as deeply and broadly grooved, almost to the third sternite, as it is for *P. balssii* and *P. kiribatiense* (compare Fig. 5a and b). *P. nanum* is intermediate in this regard having a telson a little longer than the Indian Ocean species pair, but not as long as the other Pacific species.

P. nanum is clearly separated from all the other species by its small size (maximum c.b. = < 30 mm); poor regional definition; dorsal carapace tubercles not protruding through the tomentum, and only barely visible without

denudation; the relative shape and length of the telson and sternal segments; the posterolateral margins with a marked row of granules terminating in a moderately large tubercle laterally above hind margin (a similar but smaller granule is also present on *P. guezei* and *P. seychellense*); and a deep concavity on the distal half of the superior margin of the chela.

P. seychellense is only easily separated from *P. guezei* by the much stronger definition of carapace regions, the inter-regional furrows being in all cases relatively broader, deeper, and more sharply defined. This is particularly marked in the case of the deep longitudinal groove over the anterior two-thirds of 2M; the strong grooves almost splitting 3M from 4M; the strong definition of the triangular region on the inner part of the mesobranchial area lateral to gastro-cardiac region which is strongly demarcated posteriorly by a broad deep groove; and the strong curved mediolateral groove on the branchial region. The first impression of the carapace of *P. seychellense* is one of a strongly defined meandrine regional pattern, whereas the carapace of *P. guezei* presents a much less obvious impression of the regions. Despite having only a single specimen of *P. seychellense* I am convinced this difference is significant because a good series of *P. guezei*, from quite small to large, shows an identical bland regional pattern. Also the Pacific species are remarkably consistent within themselves in this character.

P. kiribatiense most closely resembles *P. macrophthalmus* in its strong regional definition and obvious granulation — it differs obviously in only having granules across the anterior two-thirds of the carapace, and not having them continue evenly across the whole surface to the posterior margin (see TAKEDA, 1977, fig. 4B). *P. balssii* is also similar to *P. kiribatiense* but the regions are not separated by such broad deep furrows, and the granules do not typically protrude through the tomentum.

P. anaglyptum most closely resembles *P. macrophthalmus* in having both strong regional definition and an entire covering of granules. In *P. anaglyptum* however the granules are larger and rounder, and according to TAKEDA (1977) the legs are also much more slender.

Key to the Indo-west Pacific species of *Platepistoma*

1. Small species (carapace breadth < 30 mm); posterolateral margins with a marked row of granules terminating in a moderately large tubercle laterally above hind margin; a deep concavity on distal half of superior margin of chela ..... ***P. nanum*** sp. nov.

— Large species (carapace attains breadth > 40mm); posterolateral margins with granules or small spines anteriorly, but not continuing as a marked row; sometimes with a small tubercle laterally above hind margin. **2**

2. Strong granulation visible over entire dorsal surface of carapace..... **3**

— Granulation confined primarily to the anterior two-thirds, or hidden by tomentum posteriorly **4**

3. Carapace granules relatively large, rounded and set closely together, walking legs relatively slender..... ***P. anaglyptum*** Balss, 1922

— Carapace granules pointed, not set closely together..... ***P. macrophthalmus*** Rathbun, 1906

4. Telson of male abdomen relatively short, reaching only about half distance towards suture between sternites 3 and 4 (Fig. 5b)..... **5**

— Telson of male abdomen relatively longer, reaching half to three-quarters distance towards sternite 3 (Fig. 5a)..... **6**

5. Carapace regions relatively poorly defined, 2M without obvious subdivision over anterior two-thirds..... ***P. guezei*** (Crosnier, 1976)

— Carapace with strongly defined, meandrine regional pattern, 2M obviously subdivided over anterior two-thirds..... ***P. seychellense*** sp. nov.

6. Regions strongly developed, separated by broad deep furrows; granules strongly evident over anterior two-thirds, protruding through tomentum..... ***P. kiribatiense*** sp. nov.

— Regions present but not separated by such broad deep furrows; granules not typically protruding through tomentum..... ***P. balssii*** (Zarenkov, 1990).

Biogeography

Until now biogeographers have treated *Cancer* as the only modern genus to represent the Cancridae, *Platepistoma* having been poorly known and ignored. The biogeography of *Cancer* has been thoroughly discussed and a North Pacific origin for *Cancer* has been postulated by EKMAN (1953), NATIONS (1975, 1979) and CARVACHO (1989). NATIONS suggested coastal migration routes to account for the present distribution. As NEWMAN (1991) outlines the theory — *Cancer* originated in the Miocene of the North Pacific where most species are found today. Radiation followed : 1) up and over the pole into the Atlantic; 2) down the East Pacific to South America; and hence, 3) to Australia and New Zealand via Antarctica (against the West Wind Drift). NEWMAN (1991) remarks that there are a number of difficulties with accepting this view; and they are well discussed in his paper. The Cancridae had a tropical/subtropical history in the Paleocene, before the tropics began to narrow in the Oligocene and to warm in the Miocene. This, along with other evidence, supports the idea of reliction of a previously wide ranging Tethyan complex. As NEWMAN also remarks, the record of a cancrid (not *Platepistoma*, as already discussed in this paper) in the Mio-Pliocene of Kerguelen, in the southern Indian Ocean (NOËL & LEMAIRE, 1990) is not compatible with a North Pacific radiation hypothesis. KARASAWA (1990) also reasons that *Glebocarcinus* (*sensu* NATIONS, 1975, 1979) had its origin in the Indo-West Pacific Ocean during the Early Miocene, and agrees with NEWMAN (1991) that *Cancer* evolved in the Tethys Sea during the Eocene to Oligocene.

Prior to NEWMAN (1991) biogeographers had not mentioned CROSNIER's (1976) description of *Cancer guezei* from Madagascar and Réunion Island, and only KARASAWA (1990) had briefly mentioned TAKEDA's (1977) report of *Cancer* (*Platepistoma*) from deep water off Hawaii. As NEWMAN (1991) points out, the latter could fit into a North Pacific origin and radiation hypothesis but the former does not. With the discovery of the three new species described in this paper from the tropical and sub-tropical Indo-West Pacific it is clear that at least for *Platepistoma* the distribution of species is compatible with a Tethyan rather than a North Pacific origin hypothesis. Caution must be exercised in generating hypotheses because it is clear that the species of *Platepistoma* have had a separate evolutionary history from the mainstream group of shallow water *Cancer* species, and it is potentially dangerous to look at the modern distribution patterns of both groups and expect them to reflect the same pattern of radiation and/or reliction. *Platepistoma* in particular appears to have been subject to a retreat into deep water as GLAESSNER (1969 : 425) states has been the case for a number of bathyal decapod groups that "have fossil representatives in assemblages which indicate shallow-water conditions".

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