Three new genera of Indo-West Pacific Xanthidae (Crustacea, Decapoda, Brachyura, Xanthoidea)

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ABSTRACT
Cycloxanthops angustus Rathbun, 1906, *C. cavatus* Rathbun, 1907, and *Medaeus noelensis* Ward, 1934, are three Indo-West Pacific small cryptic species of xanthid crabs with extensive distributions ranging from the western Indian Ocean to Hawaii and Polynesia. Their generic status has long been uncertain. *Cycloxanthops angustus* has several distinctive characters that exclude this species from *Cycloxanthops* or *Neoxanthops* as currently defined, including the relatively quadrate and flattened carapace; form of the carapace areolation; structure of the anterolateral teeth and a serrulate merus on ambulatory legs. *Cycloxanthops cavatus* has many basic differences in morphology such as the anterolateral margin of the carapace, its frontal margin and the distinctly sculptured dorsal surface; the fingers of the chelipeds short and not pigmented black, and the distal structure of first pleopod. *Medaeus noelensis* too possesses diagnostic features: the narrow and rectangular basal antennular segment that fits tightly into the orbital hiatus, the short carapace frontal margin that folds downwards and inwards and a special peeling tooth on the right chela for opening gastropods. This present study reappraises the taxonomic position of these three enigmatic species and shows that they are not related to the genera they are currently assigned. Consequently, three new monotypic genera are established *Marratha* n. gen., with *M. angusta* n. comb.; *Jacforus* n. gen., with *J. cavatus* n. comb.; and *Danielea* n. gen., with *D. noelensis* n. comb., and their relationship with each other as well as affiliated taxa are discussed.

KEY WORDS
Crustacea,
Decapoda,
Brachyura,
Xanthoidea,
Xanthidae,
Indo-West Pacific,
new genera,
new combinations.

RÉSUMÉ

Trois nouveaux genres de Xanthidae de l'Indo-Ouest Pacifique (Crustacea, Decapoda, Brachyura, Xanthoidea).

Cycloxanthops angustus Rathbun, 1906, *C. cavatus* Rathbun, 1907 et *Medaeus noelensis* Ward, 1934 sont trois petites espèces cryptiques de crabes Xanthidae de l'Indo-Ouest Pacifique dont la répartition s'étend de l'océan Indien occidental aux îles Hawaï et à la Polynésie. Leur statut générique a longtemps été incertain. *Cycloxanthops angustus* a plusieurs caractères distinctifs qui excluent cette espèce des genres *Cycloxanthops* ou *Neoxanthops* tels qu'ils sont couramment définis, dont la carapace à peu près carrée et aplatie, la forme et l'aréolation de la carapace, la forme des dents antéro-latérales et le mérus denticulé des pattes ambulatoires. *Cycloxanthops cavatus* présente plusieurs différences morphologiques comme le bord antéro-latéral et le bord frontal de la carapace, ainsi que sa surface dorsale distinctement sculptée, les doigts des chélipèdes courts et non colorés en noir et l'ornementation du premier pléopode mâle. *Medaeus noelensis* possède également des caractères diagnostiques : l'article basal antennulaire, rectangulaire, bien inséré dans le hiatus orbitaire, le bord frontal de la carapace court et qui se replie vers le bas et l'intérieur et la présence d'une dent spéciale sur la pince permettant d'ouvrir la coquille des gastéropodes. La présente étude reprécise la position systématique de ces trois espèces énigmatiques et montre qu'elles n'ont pas de relations avec les genres auxquels elles sont habituellement attribuées. En conséquence, trois nouveaux genres monotypiques, *Marratha* n. gen. avec *M. angusta* n. comb., *Jacforus* n. gen. avec *J. cavatus* n. comb., *Danielea* n. gen. avec *D. noelensis* n. comb., sont établis et comparés et leurs relations avec les taxons les plus proches sont discutées.

MOTS CLÉS
Crustacea,
Decapoda,
Brachyura,
Xanthoidea,
Xanthidae,
Indo-Ouest Pacifique,
nouveaux genres,
nouvelles combinaisons.

INTRODUCTION

Among the Indo-West Pacific Xanthidae MacLeay, 1838 *s.s.*, *Cycloxanthops angustus* Rathbun, 1906, *C. cavatus* Rathbun, 1907, and *Medaeus noelensis* Ward, 1934 are problematic species. Their precise systematic placement has been unsettled, with them being moved between genera and, sometimes, subfamilies.

In a footnote, Guinot (see Guinot-Dumortier 1960: 155) first questioned the homogeneity of *Cycloxanthops* Rathbun, 1897, and afterwards (Guinot 1962b: 8, 9) compared the similarities of *C. cavatus* and *M. noelensis*. Later, she revised *Cycloxanthops* and established *Neoxanthops* for a number of Indo-West Pacific species, but Guinot (1968: 700) did not attribute *C. angustus* or *C. cavatus* to either of these genera. Instead, her only remark (Guinot 1968: 700) was that *C. angustus* probably belonged to another genus. This systematic uncertainty was only partially resolved when Serène (1968), in a checklist of Indo-West Pacific Brachyura, tentatively placed *C. angustus* and *C. cavatus* in *Neoxanthops*. Although adopted by Sakai (1976), Serène (1984: 211) subsequently challenged the inclusion of both species within *Neoxanthops* but refrained from creating new genera. Likewise while Ng (1993) argued that *C. cavatus* was unlikely to be a true *Cycloxanthops* species, he too differed from any action.

Guinot (1967a: 374) revised *Medaeus* Dana, 1851, and established *Paramedaeus* to accommodate *Medaeus simplex* A. Milne Edwards, 1873 and *M. planifrons* Sakai, 1965. But *M. noelensis* Ward, 1934 was retained in its original genus by

Guinot, a decision that she was not entirely satisfied with because in her opinion this species possessed some affinities with *Paramedaeus* (see Guinot 1967a: 373). Nevertheless *M. noelensis* was tentatively listed by Serène (1968: 76), under *Paramedaeus* Guinot, 1967, but he later (Serène 1984) considered this inclusion dubious. Although the taxonomic problem was discussed subsequently (see Serène 1984), albeit rather briefly, *P. noelensis* was never formally assigned to a new genus and has merely been retained in *Paramedaeus* with doubt.

The purpose of this study is to review the morphology of *Cycloxanthops angustus*, *Cycloxanthops cavatus*, and *Medaeus noelensis*, and in the light of current knowledge, resolve the taxonomic en passe. The specimens used in the present study are deposited in the Muséum national d'Histoire naturelle, Paris (MNHN); The Natural History Museum, London (NHM); Bernice P. Bishop Museum, Honolulu (BPBM); Zoological Reference Collection, Raffles Museum, National University of Singapore (ZRC); National Taiwan Ocean University, Keelung (NTOU); and US Museum of Natural History, Washington DC (USNM). All measurements are of the carapace length (cl) and width (cw) respectively. The abbreviations G1 and G2 are for the male first and second pleopods (gonopods) respectively.

The zones of the carapace (1M, 2M, 3M, 1F, 2F, 1-4L, and 2P) are divided according to Dana (1853) and Serène (1984).

SYSTEMATICS

Order DECAPODA Latreille, 1802
Family XANTHIDAE MacLeay, 1838
sensu Serène 1984
Subfamily XANTHINAE MacLeay, 1838

Genus *Marratha* n. gen.

TYPE SPECIES. — *Cycloxanthops angustus* Rathbun, 1906, by present designation.

ETYMOLOGY. — The genus is named after Mary J. Rathbun (1860-1943), the name derived from an arbitrary abbreviation of her name. Gender feminine.

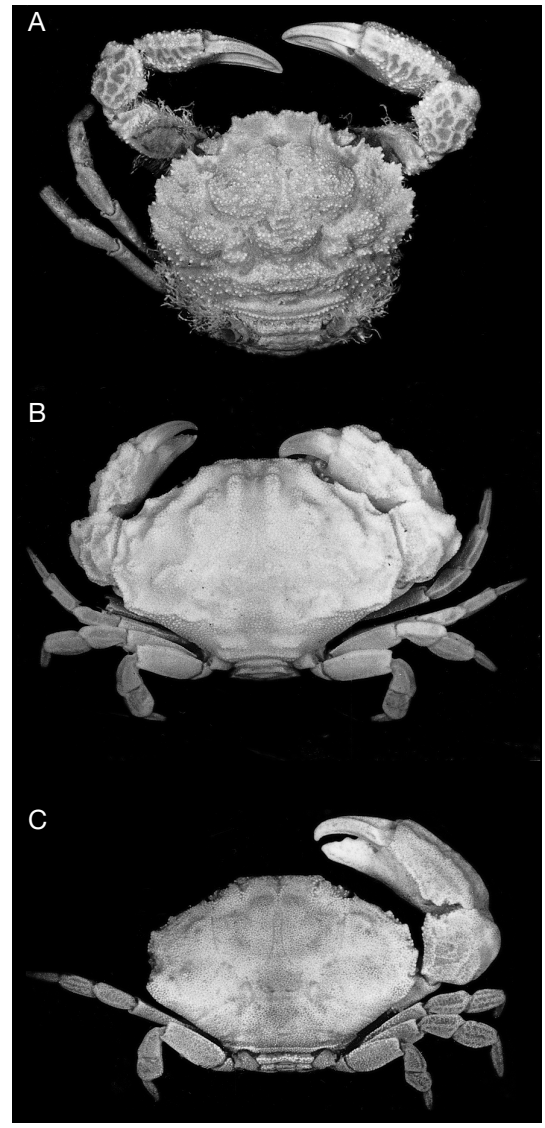

FIG. 1. — **A**, *Marratha angusta* (Rathbun, 1906) n. comb., ♀ cl 7.2 mm, cw 8.6 mm, Macclesfield Bank, *c.* 15°50'N, 114°20'E, South China Sea, HMS *Penguin*, det. D. Guinot 1967, pres. Lords of the Admiralty (NHM 1967.5.3.1.1); **B**, *Jacforus cavatus* (Rathbun, 1907) n. comb., ♀ cl 5.7 mm, cw 8.3 mm, NW Island, Capricorn Group, Queensland, Australia, coll. and det. M. Ward (NHM 1931.4.14.17); **C**, *Danielea noelensis* (Ward, 1934) n. comb., holotype ♂ cl 6.4 mm, cw 4 mm, Christmas Island, pres. Raffles Museum (NHM 1935.5.21.9).

DIAGNOSIS. — Carapace quadrate, regions well defined, with prominent grooves separating most regions; all regions appear swollen, with scattered

granules, those on 2M and 3M arranged in uneven transverse rows, does not appear eroded or rugose. Front produced, separated into two broad lobes by prominent V-shaped cleft, margin uneven to sinuous, serrulate; separated from acutely triangular inner supraorbital tooth by deep V-shaped cleft; subparallel with frontal margin. External orbital tooth acutely triangular, confluent with subcristate anterolateral margin; anterolateral margin arcuate, with four low but prominent lobes, first smallest, margins of lobes prominently granular to tubercular. Posterolateral margin gently convex to almost straight, lined with tubercles. Chelipeds long, slender; outer surfaces rugose, appears partially eroded in parts; fingers elongate, slightly shorter than palm, tips sharp; larger chela with well-developed, broad molariform basal tooth on cutting edge of dactylus. Merus of ambulatory leg serrulate but not cristate. Lateral margins of fused male abdominal segments 3-5 entire, continuous; telson semicircular, lateral margins gently convex, tip rounded. Distal part of G1 with numerous long plumose setae.

REMARKS

The generic affinities of the type species *Cycloxanthops angustus* were first placed in doubt when Guinot (1968) suggested it probably belonged to another genus and Serène (1968) in compiling his checklist of Brachyura for the Indo-West Pacific region tentatively referred the species to *Neoxanthops*? *angustus*. This species has a number of characters including the relatively quadrate and flattened carapace; form of the carapace areolation; structure of the anterolateral teeth and ambulatory legs that are so distinctive that this crab does not belong to *Cycloxanthops* or *Neoxanthops* as defined currently. Neither can it be assigned to any other known xanthid genera. Serène (1984) had already implied as much when he referred to the species as "Aff. *Neoxanthops angustus*". In its unique overall morphology, *C. angustus* has to be referred to its own genus.

Marratha angusta (Rathbun, 1906) n. comb. (Figs 1A; 2A-E)

Cycloxanthops angustus Rathbun, 1906: 849, text-fig. 13, pl. 9 fig. 6; 1911: 217. — Edmondson 1962: 233, fig. 4b-d. — Guinot 1967b: 262.

Neoxanthops? *angustus* – Serène 1968: 78.

Aff. *Neoxanthops angustus* – Serène 1984: 212, fig. 128bis, pl. 29E.

TYPE MATERIAL. — **Hawaii.** Southeast coast of Molokai, *Albatross*, stn 3850, 23-66 fathoms, 1 ♀ cl 8.8 mm, cw 11.6 mm, holotype (USNM 29453b). — Auau Channel, *Albatross*, stn 3847, 21-28 fathoms, 1 ♂ cl 7.8 mm, cw 10.9 mm, paratype (USNM).

OTHER MATERIAL EXAMINED. — **South China Sea.** Macclesfield Bank, HMS *Penguin*, *c.* 15°50'N, 114°20'E, 1 ♀ cl 7.2 mm, cw 8.6 mm, det. D. Guinot 1967, pres. Lords of the Admiralty (NHM 1967.5.3.1.1).
Hawaii. Waikiki, Oahu, 12.IX.1963, coll. D. P. Fellows, 1 ♂ cl 7.7 mm, cw 10.8 mm (ZRC ex BPBM-S 6905). — King Expedition, stn 195, 1959, 1 ♀ cl 7.9 mm, cw 11.0 mm (BPBM-S 6815); stn 238, 1959, 1 ♀ (broken) cl 4.4 mm, cw 6.7 mm (BPBM-S 6621). — Brock Expedition, "Mala No. 2", 2.I.1949, 1 ♂ cl 7.8 mm, cw 10.8 mm (BPBM-S 5511).

DISTRIBUTION. — Amirantes (Guinot 1967b); Hawaii (Rathbun 1906; Edmondson 1962; Serène 1984); South China Sea (present study).

DESCRIPTION

Carapace quadrate, wider than broad; dorsal surface appears rough, all regions appears swollen, covered with granules, those on 2M and 3M arranged in uneven transverse rows. Front produced, separated into two broad lobes by prominent V-shaped cleft, margin of each lobe serrulate, with two or three spinules longer than rest, uneven to sinuous; separated from acutely triangular inner supraorbital tooth by deep V-shaped cleft, margins granulate to gently serrulate; orbits subparallel with frontal margin, lined with small granules, those on submedian part sharper, dentiform. External orbital tooth acutely triangular, sharp, confluent with subcristate anterolateral margin; anterolateral margin arcuate, with four low but prominent cristate lobes, first low, smallest, second and third lobes broad, fourth lobe small, almost dentiform, directed laterally; margins of all lobes prominently granular, saw-like. Posterolateral margin gently convex to almost straight, lined with tubercles. Posterior carapace margin gently convex, subequal in length to frontal margin, surface rugose. Subhepatic, suborbital and sub-branchial regions

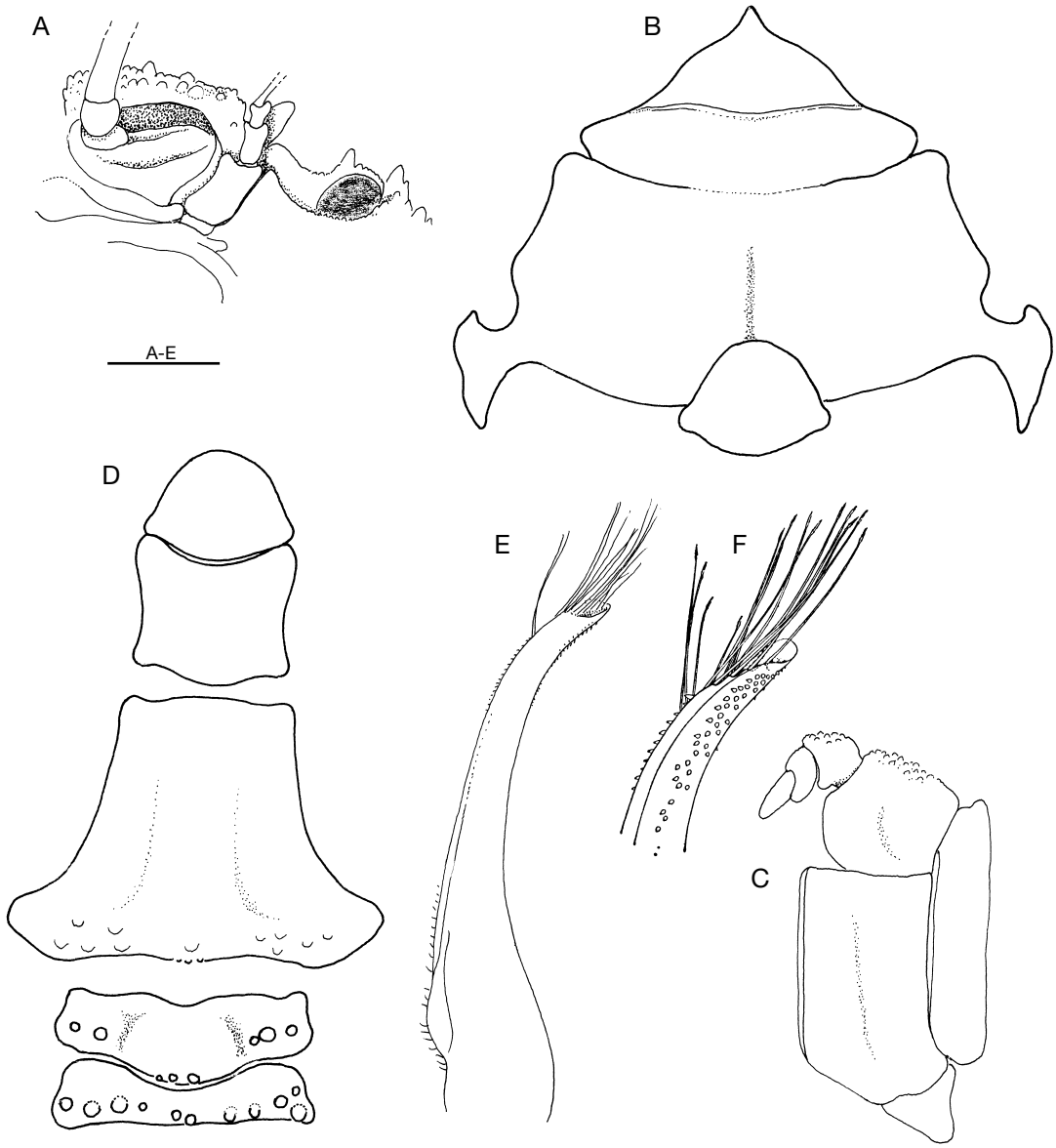

FIG. 2. — *Marratha angusta* (Rathbun, 1906) n. comb., ♂ cl 7.7 mm, cw 10.8 mm (ZRC, ex BPBM-S 6905), Hawaii; **A**, orbit and antennae; **B**, anterior thoracic sternites; **C**, left third maxilliped (setae not drawn); **D**, abdomen; **E**, left pleopod 1; **F**, distal part of pleopod 1 (after Serène 1984). For all structures, minute granules not drawn. Scale bar: A-D, 1.0 mm; E, 0.5 mm.

granular, covered with scattered long, soft setae which partially obscures surface. Infraorbital margin granular, without clefts. Eyestalk with four or five relatively larger granules at dorsal junction of cornea. Basal antennal segment stout, subrectangular, closing orbital hiatus, with short flagellum entering orbit. Antennules folding laterally; fossa relatively large. Endostomial ridges not discernible. Surface of third maxilliped with scattered granular, denser at distal end of merus;

merus squarish, anteroexternal angle not auriculiform; ischium elongate, rectangular, with shallow but clearly visible oblique median sulcus; exopod relatively broad, not reaching anterior edge of merus, with well-developed flagellum.

Chelipeds elongate, relatively slender; all outer surfaces granular, appears very rough, somewhat eroded especially on inner surface, which has prominent uneven tranverse depressions. Dorsal margin of merus granular, without obvious tooth. Carpus rounded, inner angle with one prominent sharp tooth and several tubercles anterior to and uneven granules posterior to it, outer angle conspicuously rounded, forming prominent bulge, margin posterior to it covered with sharp granules. Chela with inner surface prominently rugose; fingers slender, long, shorter than palm, tips sharp; palm without obvious crest, longitudinal depression evident from dorsal view; outer surface granular, especially on proximal surfaces. Major (usually right) chela with two or three teeth and pronounced broad molariform basal tooth on cutting edge of dactylus; cutting edge of pollex with three or four teeth; dorsal margin of dactylus tricarinate, median carina highest with proximal part cristiform. Minor (usually left) chela with fingers more slender, cutting edges blade-like, with two or three teeth and two or three denticles each. Ambulatory legs with merus not cristate, dorsal margin serrulate; carpus with distal part of dorsal margin subcristate, produced into rounded tooth, margin unevenly serrulate, lined with soft setae which partially obscures margins.

Thoracic sternum relatively broad, surface relatively smooth; suture between sternites 1 and 2 not discernible; suture between sternites 2 and 3 well-developed, complete medium part shallower; suture between sternites 3 and 4 prominent but interrupted medially; sutures between sternites 4 and 5, 5 and 6, and 6 and 7 incomplete; abdomen reaching to imaginary line joining median part of bases of chelipeds. Male gonopore coxal, conceled and opening below abdominal segment 3.

Abdomen with segments 3-5 completely fused, sutures separating segments not discernible, lateral margins entire, without clefts; segments 1-3 trapezoidal, segment 6 squarish, lateral margins straight and parallel to gently concave; telson semicircular, lateral margins convex, tip rounded; surfaces of all segments finely granular.

G1 relatively stout, distal part gently curving outwards, tapering to rounded, slightly flared tip; lateral margins lined with short spines and long plumose setae on dorsal margin. G2 short, slender, distal part with subpetaloid process.

REMARKS

Rathbun (1906) described *Cycloxanthops angustus* on the basis of one holotype female and one paratype male from the southern coast of Molokai in Hawaii. It has since been reported from various parts of the Indo-West Pacific. The present series of specimens are remarkably consistent in the various characters described although they originate from a very large area in the Indo-West Pacific. The G1 structures of this species, first figured by Serène (1984), agree with those from Hawaii in all key aspects.

Genus *Jacforus* n. gen.

TYPE SPECIES. — *Cycloxanthops cavatus* Rathbun, 1907, by present designation.

ETYMOLOGY. — The genus name is named for Professor Jacques Forest. Gender masculine.

DIAGNOSIS. — Carapace quadrate, regions well defined, with deep grooves separating most regions; entire dorsal surface covered with very small granules. Front weakly produced, gently deflexed, appearing almost entire from dorsal view, inner supraorbital tooth weak, rounded; orbits sloping posteriorly. External orbital tooth low, with distinct granulated crest joining rest of anterolateral margin; anterolateral margin strongly arcuate, with four low but prominent lobes, first smallest. Posterolateral margin distincly shorter than anterolateral margin, deeply concave. Third maxilliped and anteromedian margin deeply concave and the anteroexternal angle prominently auriculiform. Chelipeds short, stout; outer surfaces covered with very small granules, deeply excavated with numerous uneven depressions, appears eroded; fingers shorter than palm, tips sharp; larger (usually right) chela with large gently curved basal cutting tooth on cutting edge of dactylus. Ambulatory legs short, dorsal margins of merus, carpus and propodus

cristate. Lateral margins of fused male abdominal segments 3-5 entire, continuous; telson semicircular, lateral margins gently convex, tip rounded. G1 distal part with only short, stout spines and short simple setae, without long setae or processes.

REMARKS

The taxonomy of the type species of *Jacforus* n. gen., *Cycloxanthops cavatus*, has an interesting history, and clearly reflects the uncertainties regarding its generic placement. It was originally assigned to *Cycloxanthops* Rathbun, 1897. This species was subsequently described twice from the Pacific, under separate genera and species by Edmondson: *Euxanthus minutus* Edmondson, 1925, and *Megametope sulcatus* Edmondson, 1931.

Guinot (1962b: 8, 9) noted that *C. cavatus* was closer to species in *Medaeus* Dana, 1851, particularly *M. noelensis* Ward, 1934, with regards to the form of the carapace, anterolateral margin, and eroded surfaces of the chelipeds. Further, Edmondson (1962), in discussing *C. cavatus*, citing a letter by Jacques Forest, commented that the genus *Cycloxanthops* should perhaps be split. This genus was formally split by Guinot (1968) into *Cycloxanthops* Rathbun, 1897 *s.s.*, and a new genus, *Neoxanthops*. However, she did not place *C. cavatus* in either of these taxa. Takeda & Miyake (1968) also commented on the similarity between *C. cavatus* and *M. noelensis*, however, they noted that there were basic differences in the form of the anterolateral margin and structure of the G1 between *Cycloxanthops* [*s.l.*] and *Paramedaeus* where *M. noelensis* had been classified. Serène (1968) provisionally referred *C. cavatus* to *Neoxanthops*, a decision accepted by Sakai (1976). Serène (1984: 211), however, later indicated his uncertainty concerning the taxonomic position of this species in commenting that *N. cavatus* was problematical at the genus level and consequently it was provisionally assigned near to *Neoxanthops*. Serène (1984: 212) further highlighted this issue by identifying the species as "Aff. *Neoxanthops cavatus* (Rathbun, 1907)".

Ng (1993: 706), in describing a new genus, *Cranaothus*, from New Caledonia, briefly observed that *Neoxanthops cavatus* is not a typical member of *Neoxanthops* and should probably be transferred to a new genus. It differs markedly from the type species of the genus, *N. lineatus* A. Milne Edwards, 1867, in many aspects.

The placement of *C. cavatus* in *Neoxanthops* is clearly unsatisfactory. Direct comparisons of *C. cavatus* with *N. lineatus* show the following differences which are significant and these include: the anterolateral margin gradually becomes lower and gently curves below the orbits, ending just below the suborbital region, and does not meet the external orbital angle or supraorbital margin; the frontal margin is not distinctly produced beyond the internal angle of the supraorbital margin; the anterolateral margin is not distinctly cristiform; the surface is more domed, distinctly sculptured and appears eroded, and not gently convex and completely smooth; and the fingers of the chelipeds are very short and not pigmented black.

The similarity between *Jacforus cavatus* n. comb. and *Medaeus noelensis* has already been noted by Guinot (1962b), Takeda & Miyake (1968) and Serène (1984), but the affinities of the two species are actually superficial. These species resemble each other in having an eroded carapace (although more so in *J. cavatus* n. comb.), a short, non-produced front, and the anterolateral margin gradually curving to the suborbital region and not joining the external orbital angle and supraorbital margin. There are, however, several marked differences between *J. cavatus* n. comb. and *M. noelensis* which suggest that they are not congeneric, *viz*. the carapace proportions are quite different, with *J. cavatus* n. comb. being a more squarish animal; the carapace is more convex with higher ridges and deeper grooves in *J. cavatus* n. comb.; the anterolateral margin of *J. cavatus* n. comb. is much longer than the posterolateral margin (margins subequal in length in *M. noelensis*); the posterolateral margin of *J. cavatus* n. comb. is strongly concave (straight or gently convex in *M. noelensis*); the cheliped fingers are proportionately shorter in *J. cavatus* n. comb.; thoracic sternites 1-3 are completely fused without trace of any sutures (suture between sternites

2 and 3 are still distinct in *M. noelensis*; and the G1 is much stouter in *J. cavatus* n. comb. (see Serène 1984: fig. 128), the subdistal part without any trace of the distinctive long plumose setae characteristic of *M. noelensis* (see Serène 1984: fig. 51).

Although some of the above listed characters are probably important only at the specific level, features like the proportions of the antero- and posterolateral margins, structure of the anterior sternal plastron and form of the G1 strongly suggest that two distinct genera should be recognised (see also discussion for *Danielea* n. gen., where *M. noelensis* is now assigned).

Like *Danielea* n. gen., *Jacforus* n. gen. has the special cutting (peeling) tooth present on the right chela and probably functions in the same manner as calappids (Ng & Tan 1984, 1985).

Jacforus n. gen. can be separated from *Marratha* n. gen. by the shapes of their carapaces as well as the form and armature of the antero- and posterolateral margins, the proportionally narrower anterior thoracic sternum, the relatively shorter and stouter third maxilliped with the anteromedian margin of the merus deeply concave and the anteroexternal angle prominently auriculiform (vs squarish merus), and the G1 lacking long plumose setae.

Jacforus cavatus (Rathbun, 1907) n. comb.
(Figs 1B; 3)

Cycloxanthops cavatus Rathbun, 1907: 41, pl. 5 fig. 8, pl. 6 fig. 3-3a. — Balss 1938: 43. — Guinot-Dumortier 1960: 155 (footnote). — Edmondson 1962: 233, fig. 5c. — Takeda & Miyake 1968: 2, fig. 1, pl. 1 fig. B. — Ng 1993: 706.

Euxanthus minutus Edmondson, 1925: 46, fig. 8a-d, pl. 3B.

Megametope sulcatus Edmondson, 1931: 11, fig. 3e-f, pl. 4A.

Cycloxanthops cavata – Ward 1932: 244.

Cycloxanthops(?) *cavatus* – Guinot 1962b: 8, figs 9, 10.

Neoxanthops? *cavatus* – Serène 1968: 78.

Neoxanthops cavatus – Sakai 1976: 437, fig. 230b.

Aff. *Neoxanthops cavatus* – Serène 1984: 212, fig. 128, pl. 29F.

MATERIAL EXAMINED. — **Australia.** NW Island, Capricorn Group, Queensland, coll. and det. M. Ward, 1 ♀ cl 5.7 mm, cw 8.3 mm (NHM 1931.4.14.17).

Kenya. Mombassa, 4°14.1'S, 38°36.5'E, intertidal, 28.II.1971, coll. A. J. Bruce, 1 ♀ (MNHN MP-B 7942).

Hawaii. Makena, Maui, among dead coral near shore, 1926, coll. J. K. Skinner, 1 ♀ cl 5.2 mm, cw 7.1 mm (BPBM-S 2588) (holotype of *Megametope sulcatus* Edmondson, 1931). — Oahu, 7.VII.1952, 1 ♂ cl 2.8 mm, cw 3.4 mm (BPBM-S 5824). — Kawela Bay, Oahu, 25-28.VI.1934, 1 ♂ cl 4.3 mm, cw 6.1 mm. — Napoopoo, I.1987, 1 ♀ cl 4.4, cw 6.2 mm (BPBM-S 510412); 1 ♀ cl 4.5 mm, cl 6.6 mm (BPBM-S 5140411). — Kahala, Oahu, II.1930, 1 badly damaged specimen (BPBM-S 3590). — Kawela Bay, Oahu, 15-17.VII.1935, coll. C. H. Edmondson, 1 ♂ cl 4.2 mm, cw 6.0 mm (ZRC ex BPBM-S 4053); 10.VII.1937, 1 ♀ cl 5.0 mm, cw 7.0 mm (BPBM-S 4346). — Kahala, Oahu, 1931, coll. C. H. Edmondson, 1 ♂ (damaged) cl 4.0 mm, cw 6.4 mm (BPBM-S 3434).

Christmas Island. South of Hawaii, Whipp Poor Will Expedition, 1924, 2 ♂♂ cl 2.5 and 3.1 mm, cw 3.9 and 4.7 mm respectively; 1 ♀ cl 3.9 mm, cw 6.5 mm (BPBM-S 2316).

Wake Island. Tanager Expedition, 1923, 1 ♀ cl 3.5 mm, cw 4.5 mm (BPBM-S 1808) (holotype of *Euxanthus minutus* Edmondson, 1925); 2 ♀♀ cl 1.3 and 2.0 mm, cw 2.5 and 3.3 mm respectively (BPBM-S 1809).

DISTRIBUTION. — Mombasa, Kenya (Serène 1984); NW Island, Capricorn Group, Queensland, Australia (Ward 1932); Ishigaki-jima, Okinawa-jima, Japan (Takeda & Miyake 1968); Ryukyus, Japan (Sakai 1976); Fakarava Island, Paumotus (Rathbun 1907); Aranuka and Apamama, Gilbert Island (Balss 1938); North West and Gilbert islands (Guinot 1962b), Wake, Hawaii (Edmondson 1925); Maui, Hawaii (Edmondson 1931); Christmas, Washington, Wake, Maui and Oahu Islands, Hawaii (Edmondson 1962).

DESCRIPTION

Carapace quadrate, wider than broad, appears rounded due to strongly arcuate margins; entire dorsal surface covered with very small granules; regions well defined, with deep groove separating most regions; 1F, 2F, 1M recognisable, sometimes appearing almost confluent with 2M; 2M prominent, longitudinal median groove prominent to shallow; lateral regions (1-4L) relatively prominent; 2P narrow but distinct. Front weakly

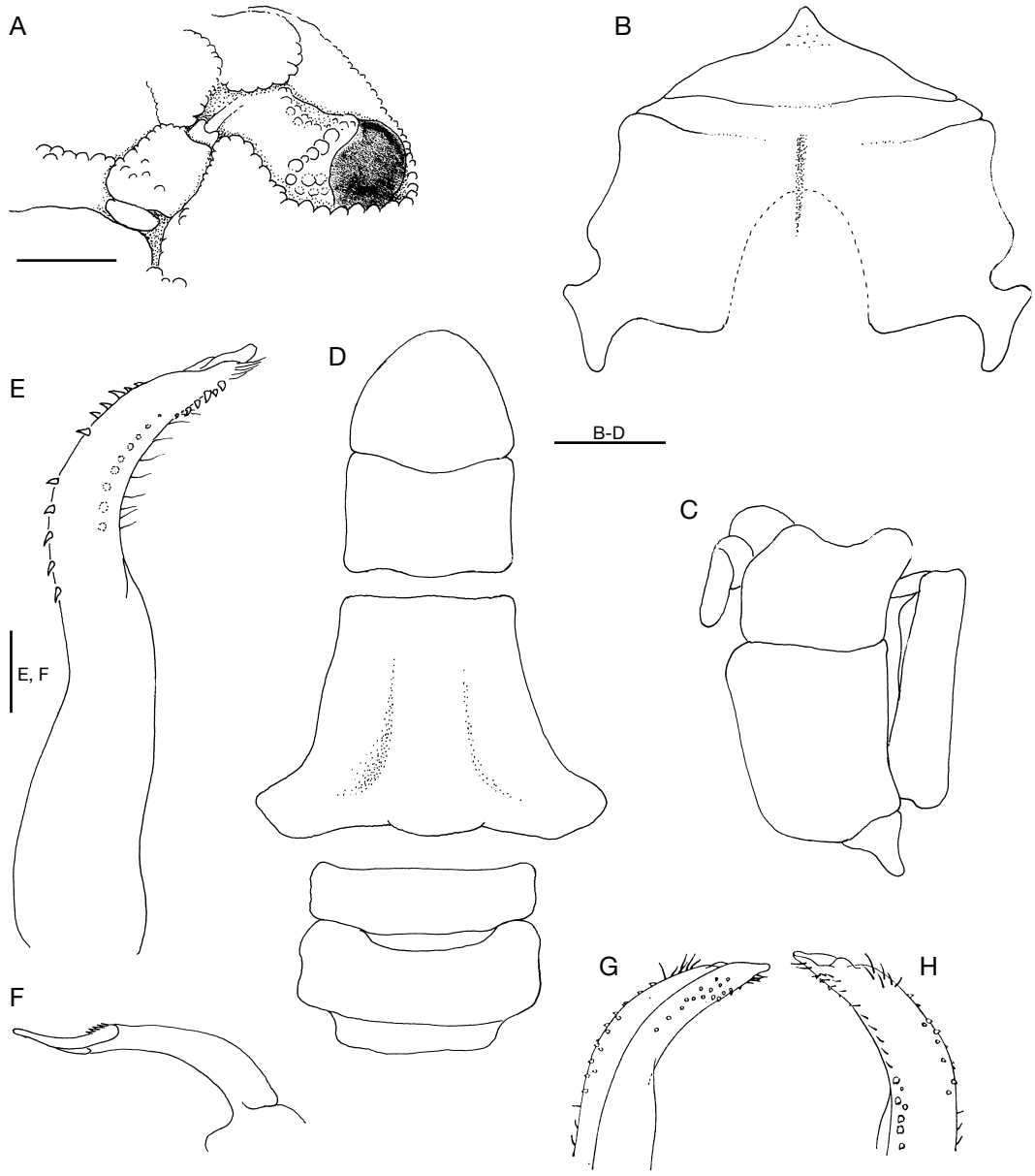

FIG. 3. — *Jacforus cavatus* (Rathbun, 1907) n. comb.; **A**, ♀ cl 5.7 mm, cw 8.3 mm, Australia (NHM 1931.4.14.17), orbit and antennae; **B**-**F**, ♂ cl 4.2 mm, cw 6.0 mm, Hawaii (ZRC, ex BPBM-S 4053); **B**, anterior thoracic sternites; **C**, left third maxilliped (setae not drawn); **D**, abdomen; **E**, left pleopod 1; **F**, left pleopod 2; **G**, **H**, distal part of pleopod 1 (after Takeda & Miyake 1968). For all structures, minute granules not drawn. Scale bars: A-D, 0.5 mm; E, F, 0.01 mm.

produced, gently deflexed, appearing almost entire from dorsal view; from frontal view, front clearly separated into two broad, truncate lobes, separated by shallow V-shaped cleft; inner supraorbital tooth low, rounded, distinctly posterior to front; orbits distinctly sloping posteriorly; separated from external orbital tooth by shallow groove. External orbital tooth low, rounded,

joined to rest of anterolateral margin by distinct granulated crest. Anterolateral margin strongly arcuate, with four low but prominent lobes; first lobe smallest; second and third lobes broadest, from dorsal view, second lobe joins first as an incomplete crest which ends above the first lobe, forming prominent, deep depression between them; fourth lobe directed obliquely posteriorly. Posterolateral margin distinctly shorter than anterolateral margin, deeply concave. Posterior carapace margin very short, shorter than frontal margin, distinctly granulated. Subhepatic region with prominent excavation, but not interrupting coalition of anterolateral margin with external orbital tooth. Suborbital and sub-branchial regions covered with prominent granules. Infraorbital margin granulated, short, entire. Eyes short, eyestalk granulated, with two or three relatively larger granules at dorsal junction of cornea, appears beaded. Basal antennal segment stout, rectangular, closing orbital hiatus, with relatively short flagellum entering orbit. Antennules folding laterally; fossa relatively large. Endostomial ridges not discernible. Third maxilliped relatively short, surface finely granular; merus auriculiform at anteroexternal angle, anteromedian margin deeply concave, inner margin serrulate; ischium with very shallow, almost undiscernible oblique median sulcus; exopod relatively broad, not reaching anterior edge of merus, with well-developed flagellum.

Chelipeds short, stout; all outer surfaces densely covered with very small granules, deeply excavated with numerous uneven depressions, appears eroded to varying degrees. Merus short, with short submedian tooth on dorsal margin. Carpus rounded, inner angle with one prominent rounded tooth and one lobe anterior to it; outer angle with one low tooth and one lobe posterior to it. Chela very short, stout; inner surface finely granular; fingers distinctly shorter than palm, tips sharp; palm with prominent uneven dorsal crest, with weaker crest on inner subdorsal surface; outer surface with three low crests, median one most prominent, subdorsal crest most uneven, may appear weakly dentiform, most ventral crest weakest, gradually extending to base of pollex which has additional short weak crest. Major (usually right) chela with two or three teeth and pronounced molariform basal cutting tooth on cutting edge of dactylus; cutting edge of pollex with two or three teeth; dorsal margin of dactylus bicarinate. Minor (usually left) chela with fingers more slender, cutting edges blade-like, with three or four denticles each. Ambulatory legs short, surfaces finely granular, almost glabrous, unarmed; dorsal margins of merus, carpus and propodus cristate, entire, with weak submedian longitudinal carina.

Thoracic sternum relatively narrow, entire surface covered with small granules; suture between sternites 1 and 2 poorly demarcated, suture between sternites 3 and 4 more pronounced laterally, medium part somewhat shallower, sutures between sternites 4 and 5, 5 and 6, and 6 and 7 incomplete; abdomen reaching to imaginary line joining posterior bases of chelipeds. Gonopore coxal, opening below abdominal segment 3.

Abdomen with segments 3-5 completely fused, sutures separating segments not discernible, lateral margins entire, without clefts; segments 1-3 trapezoidal, segment 6 squarish, lateral margins almost straight and parallel or gently sinose telson semicircular, lateral margins convex, tip rounded; surfaces of all segments finely granular.

G1 relatively short, stout, proximal part relatively stouter, distal part gently bent outwards, gently tapering to rounded tip; lateral margins lined with short spines or simple setae, without trace of long plumose setae, long spines or other processes.

G2 short, slender, distal part with subpetaloid process.

Remarks

Cycloxanthops cavatus Rathbun, 1907 was described from one male specimen (cl 4.7 mm, cw 6.6 mm, USNM 32848) from "Fakarava Island, Paumotus" (= Tuamotu, Polynesia). *Euxanthus minutus* Edmondson, 1925 was described on the basis of only one female holotype specimen from Wake Island in the Pacific. There are two other female specimens in the BPBM (No. 1809) apparently collected at the same time as the holotype but they were not

mentioned, and as such, are not paratypes. *Megametope sulcatus* Edmondson, 1931 was described from a single female from near Maui, Hawaii. Edmondson (1931: 11) gave the measurements of the specimen as cl 6.0 mm and cw 8.0 mm but our measurements are 5.2 and 7.1 mm respectively. We have no doubt this is the holotype as it agrees with his figures. All three names are without doubt synonyms. While we have not examined the type of *Cycloxanthops cavatus*, her description and excellent figures leave no doubt about its identity. In comparing the types of *Euxanthus minutus*, and *Megametope sulcatus* (all females), we find no major differences between them, other than those of *E. minutus* are much larger than those of *M. sulcatus*, and the grooves on the chelae somewhat deeper.

There is some variation in the strength of the granules on the carapace, which in some specimens appear to be somewhat larger. In a few specimens, the carapace may be encrusted with calcareous deposits which makes the carapace appear rougher and more eroded. In larger specimens, the regions on the carapace appear more prominent, with the grooves delineating them somewhat deeper; and the longitudinal grooves on the chelae are also slightly deeper. These differences, however, are not significant. The strength of the anterolateral teeth does not vary much with size.

Takeda & Miyake (1968) first figured the G1 of this interesting species on the basis of a male from southern Japan. The G1s of the present male specimens from Hawaii agree with their figures in all major aspects.

Subfamily EUXANTHINAE Alcock, 1898

Genus *Danielea* n. gen.

TYPE SPECIES. — *Medaeus noelensis* Ward, 1934, by present designation.

ETYMOLOGY. — The genus is named after Danièle Guinot, whose exemplary work on xanthoids formed the basis of the present study. Gender feminine.

DIAGNOSIS. — Carapace quadrate, regions defined, with shallow grooves separating most regions; entire dorsal surface covered with small uniformly sized rounded to squamate granules, surface appears squamiform. Front weakly produced, bent downwards and inwards, inner supraorbital tooth low, rounded; orbits subparallel to frontal margin. External orbital tooth very low, almost undiscernible, no crest or row of granules connecting it to rest of anterolateral margin; anterolateral margin arcuate, with first lobe very low, uneven and three more low but more prominent triangular lobes, separated by shallow clefts. Posterolateral margin gently convex to almost straight. Basal antennal segment relatively narrow, rectangular, fitting tightly in orbital hiatus. Chelipeds with outer surfaces covered with uniformly sized rounded to squamate granules, surface appears pearliform, neither eroded or rugose; fingers shorter than palm, tips sharp; larger (usually right) chela with large, gently curved basal cutting tooth on cutting edge of dactylus. Ambulatory legs short, merus not cristate. Lateral margins of fused male abdominal segments 3-5 entire, continuous; telson semicircular, lateral margins gently convex, tip rounded. G1 distal part lined with long plumose setae.

REMARKS

The current generic position of *Medaeus noelensis* is unclear. Workers subsequent to Guinot (1967a, b, 1968) have discussed the problem but did not systematically resolve it. Serène (1968), Sakai (1976), Takeda (1978), Ribes (1978) and Thomassin (1978) have all wrongly regarded it as a species of *Paramedaeus* Guinot, 1967. This species was however excluded from a list of species of *Paramedaeus* by Guinot (1971) and Serène (1984: 87, 90), while retaining the taxon in *Paramedaeus*, questioned its generic validity by discussing the similarities of *P. noelensis* with *Cycloxanthops cavatus*. Recently Ng (1993: 712), in comparing *P. noelensis* to *Cranaothus deforgesi* Ng, 1993, noted that while it could not be referred to *Cranaothus* it was possibly not a true *Paramedaeus* species either.

Direct comparisons of specimens with *P. simplex* (A. Milne Edwards, 1873), the type of *Paramedaeus*, confirm the necessity of separating *M. noelensis* into a new genus. The carapace shapes and various structures of the two species differ significantly, with *P. simplex* (see Serène 1984: pl. XIIC) being a more squarish species compared with the rectangular carapace of *M. noelensis* (see Serène 1984: pl. XIIF). The basal antennular segment in *P. simplex* is broad

and squarish, whereas that of *M. noelensis* is narrow and rectangular. The basal antennal segment in *P. simplex* does not completely fill the orbital hiatus but in *M. noelensis*, the basal antennal segment fits tightly into the hiatus. The front of *M. noelensis* is short because the frontal margin folds downwards and inwards, giving the margin a folded appearance. In *P. simplex*, the front is flat, lamelliform and not folded. The male abdomen of *P. simplex* and *P. noelensis* differ markedly, with segment 7 in *P. simplex* being narrow, distinctly triangular, and the lateral margins gently concave or almost straight, while in *P. noelensis*, it is proportionately broader, the lateral margins are distinctly convex, and is more rounded. There is also a distinct cleft on each side present between segments 3 and 4 in *P. noelensis* absent in *P. simplex*. The G1 of *M. noelensis* (Fig. 4E-G) (Serène 1984: fig. 51) is also proportionately shorter and slightly stouter than that of *P. simplex* and does not have the elongated distal part characteristic of the species (Serène 1984: fig. 50). Although the anterior thoracic sternal plastron of both *P. simplex* and *M. noelensis* are similar, the other differences observed here strongly suggest that *P. simplex* and *M. noelensis* are not congeneric. Therefore a new genus *Danielea* n. gen. is here established for *Medaeus noelensis*.

As noted by Ng (1993), *Danielea noelensis* n. comb. seems to be allied to *Cranaothus deforgesi*, but the two cannot be regarded as congeneric mainly because in *Danielea noelensis* n. comb., there a proportionately distinctly wider space between thoracic sternal sutures 2 and 3, and 3 and 4; the second male abdominal segment has no transverse ridges; and the male telson is distinctly triangular in shape (against rounded). In addition, other differences include the generally smoother carapace surface of *Danielea noelensis* n. comb. which has no granulated vermiculations with the regions more distinct; the front is normal in *D. noelensis* n. comb. (against lamellar, strongly produced anteriorly with a deep median fissure in *Cranaothus*); the posterolateral margin is almost straight to gently convex (against prominently concave in *Cranaothus*); the outer surfaces of the chelipedal carpus are less rugose; the lateral edges of the fused male abdominal segments 3 and 4 have a distinct cleft on each side (against entire in *Cranaothus*); and the distal part of the G1 does not possess a long projection.

Paramedaeus noelensis was assigned by Serène (1984: 20) to the Euxanthinae. The form of the anterolateral margin (with the anterior part gradually sloping downwards via the subhepatic region to meet the infraorbital margin) suggests that *Danielea* n. gen. should be attributed to subfamily Euxanthinae as defined by Serène (1984: 72).

Danielea noelensis (Ward, 1934) n. comb.
(Figs 1C; 4A-E)

Medaeus noelensis Ward, 1934: 17, pl. 1 figs 1, 1a. — Forest & Guinot 1961: 56, fig. 42, 43, 44a, b, pl. 1 fig. 1. — Sakai 1965: 134, pl. 69 fig. 1. — Guinot 1967b: 266.

Lophozozymus (*Lophoxanthus*) *bellus leucomanus* – Miers 1886: 115, pl. 11 figs 1, 1a, 1b (non *Xanthodes leucomanus* Lockington, 1876).

Xantho distinguendus – Klunzinger 1913: 203(107) (*partim*), pl. 1, fig. 7 (non *Xantho distinguendus* de Haan, 1835).

Medaeus granulosus – Balss 1934: 507 (*partim*) (non *Medaeops granulosus* (Haswell, 1882)).

Paramedaeus ?*noelensis* – Serène 1968: 76.

Paramedaeus noelensis – Sakai 1976: 426, fig. 224. — Ribes 1978: 127. — Takeda 1978: 39. — Thomassin 1978: annexe 3, p. 64. — Serène 1984: 90, fig. 51, pl. 12F. — Ho *et al.* 2000: 114.

Non *Paramedaeus noelensis* – Serène & Umali 1972: 68, pl. 7 figs 7-9 (= *Cranaothus deforgesi* Ng, 1993).

TYPE MATERIAL. — **Christmas Island.** Pres. Raffles Museum, ♂ cl 6.4 mm, cw 4 mm, holotype (NHM 1935.5.21.9.).

OTHER MATERIAL EXAMINED. — **Taiwan.** Ma-Kang, Taipei County, 11.V.1990, coll. P.-H. Ho, 2 ♂♂ cl 7.9 and 8.5 mm, cw 12.2 and 12.6 mm (NTOU 9005-02-34).

DISTRIBUTION. — Red Sea (Klunzinger 1913); Madagascar (Thomassin 1978; Serène 1984); Christmas Island (Ward 1934); Tahiti (Forest & Guinot 1961); Japan (Sakai 1965, 1976; Takeda 1978); 34°38'0"N 135°1'0"E, Japanese Seas (Miers 1886); Mauritius (Balss 1934); Réunion (Ribes 1978).

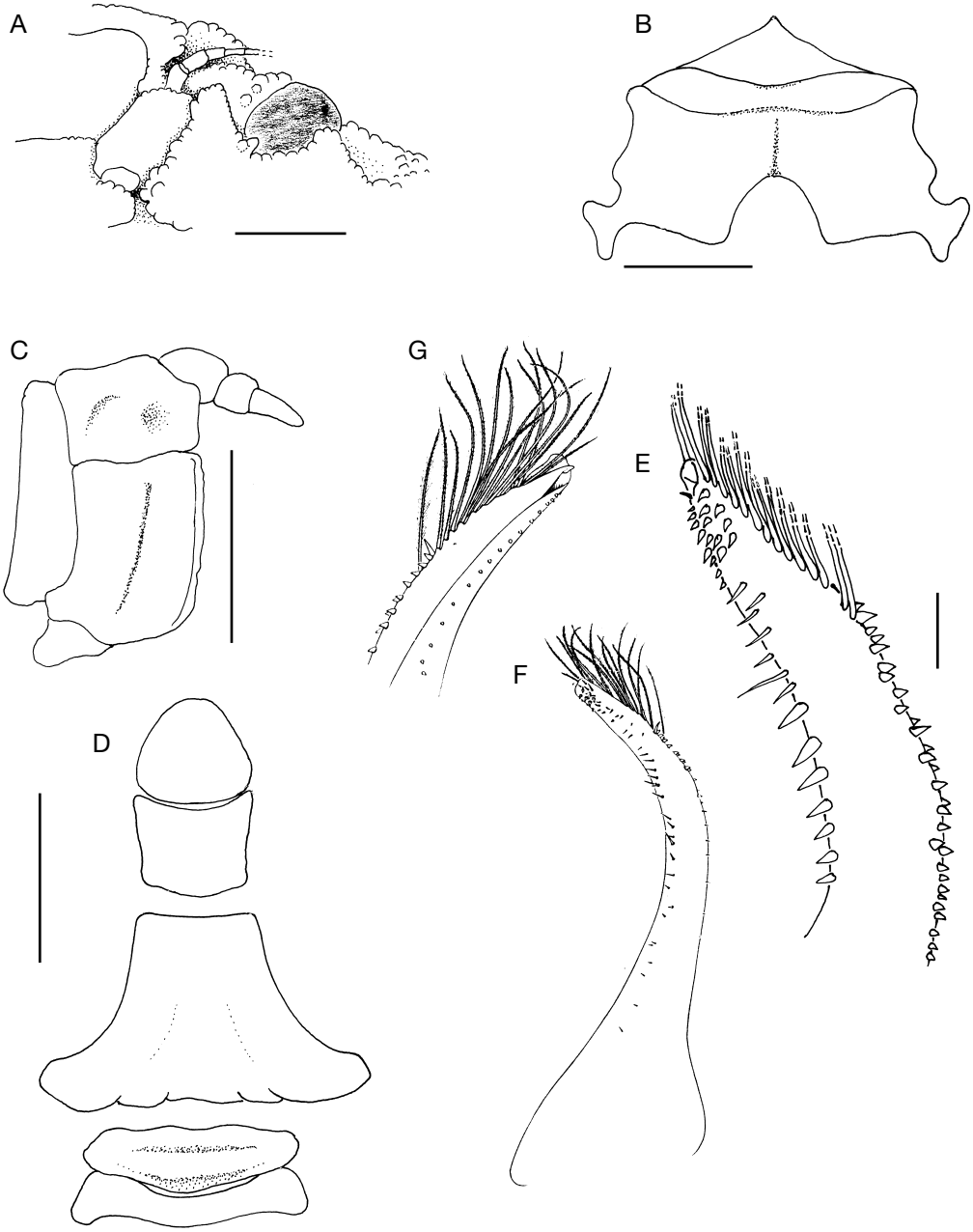

FIG. 4. — *Danielea noelensis* (Ward, 1934) n. comb., holotype ♂ 6.4 mm, cw 4 mm, Christmas Island (NHM 1935.5.21.9); **A**, orbit and antennae; **B**, anterior thoracic sternites; **C**, right third maxilliped (setae not drawn); **D**, abdomen; **E**, **G**, distal part of left pleopod 1; **F**, pleopod 1. For all structures, minute granules not drawn. Figures F and G after Forest & Guinot, 1961. Scale bars: A, 0.5 mm; B-D, 1.0 mm; E, 0.01 mm.

DESCRIPTION

Carapace quadrate, much wider than broad; dorsal surface gently convex, regions low, completely densely covered with small, evenly sized rounded to squamate granules, surface appearing squamiform. Front weakly produced, separated into two broad lobes by small, narrow fissure, lobes almost straight or slightly sinuous; margin folds downwards and inwards, appears folded. Inner supraorbital tooth very low, rounded; orbits subparallel with frontal margin. External orbital tooth very low, almost undiscernible, not confluent with rest of anterolateral margin. Anterolateral margin arcuate; first lobe very low, uneven, with two or three larger tubercles posterior to it; next three lobes low but more prominent, triangular, last lobe directed laterally; lobes separated from each other by narrow, short fissures which are discernible on sub-branchial region; region next to lobes with disinct punctae, appears somewhat eroded. Postero-lateral margin gently convex to almost straight. Posterior carapace margin almost straight, wider than frontal margin. Subhepatic, suborbital, pteryogostomial and sub-branchial regions densely covered with evenly sized small rounded granules; subhepatic region with distinct depression. Infraorbital margin granular, without obvious clefts, with one prominent submedian tubercle. Eyestalk granulated. Basal antennal segment stout, subrectangular, free but fills orbital hiatus, appears almost fused with suborbital region due to highly granulated inner margin of region, with short flagellum entering orbit. Antennules folding laterally; fossa relatively large. Endostomial ridges not discernible. Surface of third maxilliped densely covered with evenly sized small rounded granules; merus squarish, anteroexternal angle not auriculiform; ischium rectangular, with shallow but clearly discernible oblique median sulcus; exopod relatively broad, reaching anterior edge of merus, with well-developed flagellum.

Chelipeds elongate, relatively stout; all outer surfaces densely covered with evenly sized squamate granules. Dorsal margin of merus granular, without obvious tooth. Carpus rounded, inner angle with one prominent rounded tooth and several tubercles anterior to it, outer angle granular with uneven margin. Chela with inner surface granular; fingers slender, long, shorter than palm, tips sharp; palm with prominent uneven, almost subpetaloid crest on subdorsal inner surface; dorsal margin and outer subdorsal surface with two low, rounded carinae, forming shallow longitudinal depressions between them. Major (usually right) chela with two teeth and pronounced curved basal cutting tooth on cutting edge of dactylus; cutting edge of pollex with three or four teeth; dorsal margin of dactylus with a prominent carina on inner subdorsal margin. Minor (usually left) chela with fingers more slender, cutting edges blade-like, with two or three teeth and two or three denticles each. Ambulatory legs with all segments unarmed, almost glabrous; surfaces densely covered with evenly sized small rounded to squamate granules; merus not cristate, entire; carpus with distal part of dorsal margin subcristate, produced into rounded tooth, margin entire.

Thoracic sternum relatively broad, surface entirely covered with numerous small evenly sized granules except for sutures; suture between sternites 1 and 2 not discernible; suture between sternites 2 and 3 well-developed, complete; suture between sternites 3 and 4 prominent but becoming shallow medially; sutures between sternites 4 and 5, 5 and 6, and 6 and 7 incomplete; abdomen reaching to imaginary line joining posterior edges of the bases of chelipeds. Gonopore coxal, opening below abdominal segment 3.

Abdomen with segments 3-5 completely fused, sutures separating segments not discernible, lateral margins entire, without clefts; segments 1-3 trapezoidal, segment 6 rectangular, lateral margins gently concave, subparallel; telson semicircular, lateral margins distinctly convex, tip rounded; surfaces of all segments covered with numerous small evenly sized granules.

G1 relatively stout, gently curved, tip blunt; lateral margins lined with short spines and long plumose setae on dorsal margin. G2 short, slender, distal part with subpetaloid process.

REMARKS

Danielea noelensis n. comb. was described on the basis of only one male specimen from Christmas Island in the Indian Ocean. It has since been reported from many other areas. Ng (1993) clarified the record supposedly of this species by Serène & Umali (1972) and suggested that it should be referred to *Cranaothus deforgesi*, instead.

There is variation in the degree of erosion on the carapace and pereiopods of *D. noelensis* n. comb., although none of it is very significant. In no instance does the erosion form vermiculiform ridges or patterns on the carapace. In larger specimens, the front looks somewhat lamelliform when viewed from above, but the edge still folds downwards and inwards. The larval development has been reported by Suzuki (1978).

Danielea noelensis n. comb. has the special cutting (or peeling tooth) on the right chela present in calappids and some xanthids. It is probably used in the same manner as many species of *Calappa* Weber, 1795, i.e. to open gastropods (Ng & Tan 1984, 1985).

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