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Crustacea Decapoda: Albuneidae and Hippidae of the tropical Indo-West Pacific region

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ABSTRACT

Based primarily on samples collected during French expeditions to New Caledonia and nearby regions, two new species of the sand crab family Albuneidae Stimpson, 1858 are described from the tropical Indo-West Pacific Ocean: *Albunea holthuisi*, from Tanzania, Madagascar, and Indonesia, and *Austrolepidopa caledonia*, from New Caledonia. Two closely related, and often synonymized, species of *Albunea*: *A. microps* Miers, 1878 and *A. elioti* Benedict, 1904 are found to be distinct. Several important diagnostic morphological features, not previously described in the Albuneidae, are discussed. In addition, we provide diagnoses for three Indo-West Pacific species of mole crabs in the family Hippidae Latreille, 1825, including the very similar *Hippa pacifica* Dana, 1852 and *H. celaeno* (de Man, 1896). An annotated list of the 37 species of Hippoidea reported from the Indo-West Pacific region is provided, along with a diagnostic key to these species.

RÉSUMÉ

Crustacea Decapoda: Albuneidae et Hippidae de l'Indo-Ouest Pacifique tropical.

En se basant, au départ, sur les récoltes faites durant diverses expéditions françaises au large de la Nouvelle-Calédonie et dans des régions voisines, deux nouvelles espèces appartenant à la famille des Albuneidae Stimpson, 1858 sont

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décrites de l'Indo-Ouest Pacifique: *Albunea holthuisi* sp. nov., connue de la Tanzanie, de Madagascar et de l'Indonésie et *Austrolepidopa caledonia* sp. nov., connue de la Nouvelle-Calédonie. Le réexamen de deux espèces d'*Albunea*, proches et souvent mises en synonymie, *A. microps* Miers, 1878 et *A. elioti* Benedict, 1904 a montré qu'elles sont distinctes. Plusieurs caractères morphologiques distinctifs, qui n'avaient pas encore été décrits chez les Albuneidae, sont discutés. Des diagnoses pour trois espèces de la famille des Hippidae Latreille, 1825, comprenant les espèces *Hippa pacifica* Dana, 1852 et *H. celaeno* (de Man, 1896), très proches l'une de l'autre, sont publiées. Enfin, une liste commentée des 37 espèces d'Hippoidea signalées de l'Indo-Ouest Pacifique est proposée, accompagnée d'une clé d'identification de ces espèces.

INTRODUCTION

Crustaceans in the anomuran superfamily Hippoidea Latreille, 1825 are specialized burrowing crabs that live in sandy habitats in shallow waters, predominantly in the tropics. Historically, there has been little systematic work in either hippoid family (i.e., the Albuneidae and the Hippidae) on a regional or worldwide basis. In the Albuneidae, there has been no comprehensive study of any genus outside of SCHMITT's (1942) review of *Blepharipoda* Randall, 1839 and EFFORD's (1971) revision of *Lepidopa* Stimpson, 1858. SERÈNE's (1979) review of *Paralbunea* Serène, 1979 was by his own admission incomplete, as he did not examine specimens of all the taxa during the study. For *Hippa* Fabricius, 1787, the largest genus in the Hippidae, there have been regional reviews (EFFORD, 1972; HAIG, 1974b). A list of *Hippa* species has been prepared (HAIG *et al.*, 1986), but the genus has not been reviewed comprehensively since the work of DE MAN (1896; 1898). EFFORD (1976) summarized worldwide distributional data for the genus *Emerita* Scopoli, 1777. None of the other seven genera in these families have been well studied systematically.

Even less is known about the phylogenetic relationships among the species and genera in the Hippoidea. EFFORD (1969) proposed a phylogeny for the albuneid genera and later (1971) presented a preliminary tree for the genus *Lepidopa*, but these were based on relatively few morphological characters. TAM *et al.* (1996) presented a molecular phylogeny for American species of *Emerita*. We plan to generate a comprehensive phylogeny for the Hippoidea, but this first requires better understanding of the taxonomy for the species involved.

The Hippoidea is represented in the tropical Indo-West Pacific region by 37 described species. In the present paper we summarize the current state of taxonomic knowledge regarding the tropical Indo-West Pacific species of Hippoidea, describe two new species of albuneids, present new information on species ranges and biology, and discuss the morphological differences that allow the separation of two closely related species of *Hippa*. In addition, we provide a dichotomous key to facilitate the identification of Indo-West Pacific hippoids.

MATERIALS AND METHODS

Since 1976, ORSTOM (Institut français de Recherche scientifique pour le Développement en Coopération) and the Muséum national d'Histoire naturelle, Paris, have participated in a joint study of the bathyal fauna of the southwest Indo-Pacific. Several cruises have been undertaken but they have been mostly interested in the deep-water environment and few have collected Hippoidea which live in shallow water, rarely down to 225 m.

The cruises that have collected Hippoidea are:

- CORINDON 2 in the Makassar Strait, Indonesia, from 29 October to 12 November 1980 (see MOOSA, 1984).
- SMIB 6, which from 28 February to 12 March 1990 explored the "grand passage" north of New Caledonia (see RICHER DE FORGES, 1993).

In addition, collections were made by the MONTROUZIER EXPEDITION, which from 23 August to 5 November 1993 explored the lagoon and reef environments of two sites on North Caledonia: Touho on the east coast and Koumac on the west coast (see BOUCHET, 1994).

Other collections made by ORSTOM scientists in New Caledonia and Madagascar were also examined.

All this material is deposited at the Muséum national d'Histoire naturelle (MNHN).

Additionally, we examined material from the following institutions: the Academy of Natural Sciences of Philadelphia, Pennsylvania, USA (ANSP), the American Museum of Natural History, New York, USA (AMNH), the British Museum (Natural History) (now The Natural History Museum), London, England (BMNH), the Museum of Comparative Zoology, Massachusetts, USA (MCZ), the Musée Royal de l'Afrique Centrale, Tervuren, Belgium (MRAC), the Nationaal Natuurhistorisch Museum (formerly Rijksmuseum van Natuurlijke Historie), Leiden, The Netherlands (RMNH), the University Museum of Zoology, Cambridge, England (UMZC), the National Museum of Natural History, Washington, D.C., USA (USNM), the Western Australian Museum, Perth, Australia (WAM), and the Zoological Museum, University of Copenhagen, Denmark (ZMUC). The type specimens are deposited as specified in the species entries.

In the lists of material examined, measurements are given for carapace length (CL), as measured from the midline of the anterior margin (including rostrum, if any) to the midline of the posterior concavity. The names of cruises are in all capital letters, whereas the names of vessels are in both italics and quotation marks. In the lists of synonyms, asterisks indicate those publications that refer to materials re-examined by us during the present study.

For illustrations, we first captured specimen images on a Macintosh™ computer with a digital camera connected to a Wild M8 dissecting microscope. These images were then prepared for publication using the programs Adobe Photoshop™ and Adobe Illustrator™. We attempted to accurately record the position and size of setae in these drawings but, for clarity of presentation, excluded plumules of plumose setae.

SYSTEMATIC ACCOUNT

HIPPOIDEA Latreille, 1825

ALBUNEIDAE Stimpson, 1858

REMARKS. — During the course of this study, we encountered several diagnostic morphological features that have not been described previously for albuneids. For example, the carapace (Fig. 1) bears a broad mat of very short, dense, simple setae just behind the front. This mat, hereafter called the setal field, varies in shape and extent across genera and species, but appears to be relatively invariant within species.

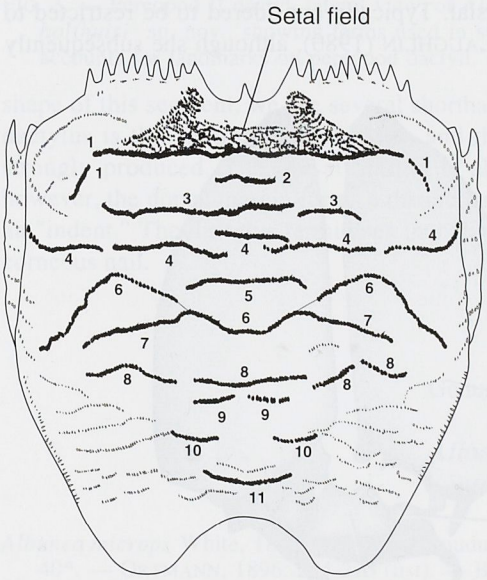

FIG. 1. — Diagrammatic albuneid carapace, based on *Albunea microps*, showing setal field behind front, and 11 setose carapace grooves discussed in species accounts.

The carapace of albuneids typically possesses numerous transverse, setose grooves. Although carapace grooves (CG) have been scarcely mentioned by previous authors, we have identified at least eleven major grooves (numbered 1–11 in Fig. 1) the homology of which can be recognized across albuneid genera. Variability in the presence and the degree of fragmentation of specific grooves, in the anterior-posterior displacement of individual fragments, and in the texture of the grooves (e.g., smooth, crenulate) tends to be conserved within species, and thus carapace grooves are useful in recognizing species.

The median element of CG1 forms the posterior margin of the setal field and also of the front. In some genera, the curved lateral elements of CG1 are often displaced posteriorly (as in Fig. 1). The metagastric region contains the short, anterior CG2 and the longer, posterior CG3. CG4 spans the width of the carapace and marks the border of the metagastric and mesogastric regions. CG5 is a fairly short groove that occurs medially in the mesogastric region. CG6 corresponds to the cervical groove in other

Anomura. CG7 is usually divided into 2 well-separated lateral fragments, but in some genera (e.g., *Austrolepidopa* Efford & Haig, 1968 and *Lepidopa*), CG7 merges medially with CG6. CG8–11 are relatively short medial grooves arranged anteriorly to posteriorly in the cardiac region.

In several genera of albuneids, nearly transparent and presumably decalcified "windows" can be found on various locations on the crab, including lateral and mesial surfaces of the second through fourth pereopods and on the dorsal surface of the first and second abdominal somites. Such decalcified windows have not been reported previously for any albuneid. Similar "windows" occur on the mesial surface of the merus in several genera in the anomuran family Porcellanidae Haworth, 1825, and on the mesial surface of the coxa of the first pereopods in the hippid genus *Emerita*, but are lacking in *Hippa* and *Mastigochirus* Stimpson, 1858 (HARVEY, in press).

As is typical in decapod crustaceans, albuneid females have gonopores on the coxae of the third pereopods, whereas males have gonopores on the coxae of the fifth pereopods. However, in some albuneid genera (e.g., *Austrolepidopa* and *Lepidopa*), males also have a small pore on the coxa of the third pereopod (hereafter referred to as the "male pore"), in a position analogous to that of the female gonopore. The precise nature and function of this male pore is unknown.

In albuneids, females have well developed uniramous pleopods on abdominal somites II-V, whereas pleopods are thought to be completely lacking in males (e.g., MARTIN & ABELE, 1986). However, we have found, in specimens with well developed pores on the fifth pereopods, rudimentary to small pleopods on abdominal somites II-V in several albuneid genera (e.g., *Austrolepidopa* and *Lepidopa*). The existence of the "male pore" and of small pleopods in males were not previously recognized in albuneids, which we suspect has led to the incorrect sexing of crabs and contributed to a probably erroneous impression that males are exceedingly rare or even absent in many species of albuneids. For example, the holotype of *Austrolepidopa trigonops* Efford & Haig, 1968 was described as an immature female with incompletely developed pleopods and gonopores, but we have examined this specimen and determined that it is in fact a male. In those species in which the male pore occurs, it is always smaller than gonopores of same-sized females; likewise, the pleopods of females are always much more developed than those of males. Males are most reliably recognized by the presence of a gonopore on the fifth pereopod and the rudimentary degree of development of the pleopods. In small specimens, however, the presence or absence of the male gonopore is a more reliable indicator of sex than is pleopod development because both males and females have small pleopod buds as juveniles.

The presence in albuneids of ocular acicles has been controversial. Typically considered to be restricted to hermit crabs, ocular acicles were first reported in albuneids by MCLAUGHLIN (1980), although she subsequently

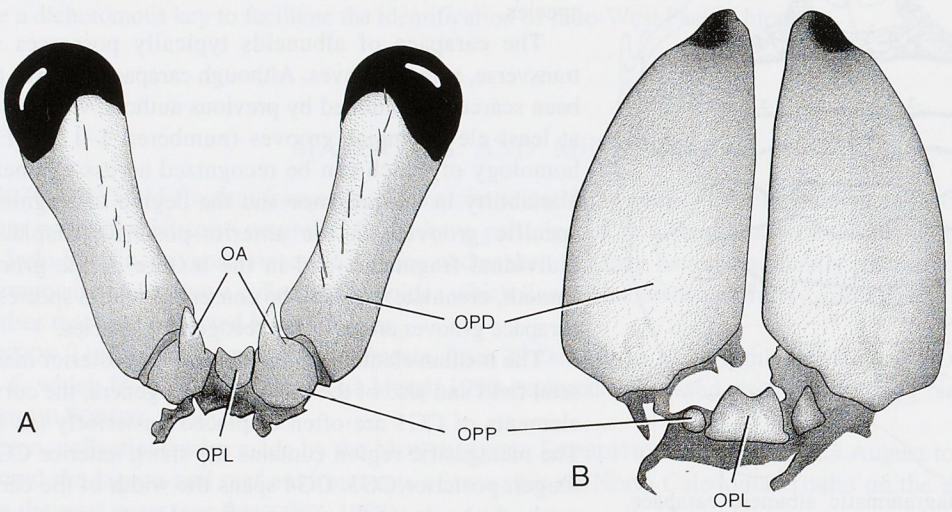

FIG. 2. — Diagrammatic anomuran eyes, showing relationship between proximal ocular peduncle segments (PS), distal ocular peduncle segments (DS), ocular acicles (AC) and ocular plates (OP): **A**, *Sympagurus dimorphus* (Studer, 1883), a typical hermit crab; **B**, *Albunea* sp. undescribed, a typical albuneid.

concluded that the structures on albuneids were "not acicles, but rather, calcified portions of the hippoid ocular plate" (McLAUGHLIN, 1983: 615). Nonetheless, MARTIN and ABELE (1986: 578) scored the Albuneidae as having ocular acicles, remarking that they were "unsure about the differences between small ocular acicles and pieces of the ocular plate". The distinction is straightforward. In decapod crustaceans, the ocular peduncle typically consists of a proximal segment and a distal segment; in rare cases, one or both of these segments may be secondarily subdivided (POWAR, 1969). The ocular plate is the medial calcified acron to which the ocular peduncles are attached. Based on muscle site attachments, POWAR (1969) clearly established the homology of the proximal and distal ocular segments, as well as the ocular plate, across the Decapoda. True ocular acicles are not part of the ocular plate, but rather are spinous or platelike anterodorsal extensions of the proximal segment of the ocular peduncle (Fig. 2).

In some taxa (e.g., the diogenid hermit crab genus *Dardanus* Paulson, 1875, and many albuneids), the ocular plate is exposed, that is, not covered by the anterior carapace. In some albuneids, this exposed ocular plate is also deeply indented medially, perhaps consistent with the hypothesis that the ocular plate represents the fusion of primitively paired basal eyestalk segments (POWAR, 1969). This deeply indented ocular plate gives an impression superficially similar, but clearly not homologous, to the ocular acicles on the proximal ocular segment of hermit crabs, which we presume to be the source of confusion among earlier workers.

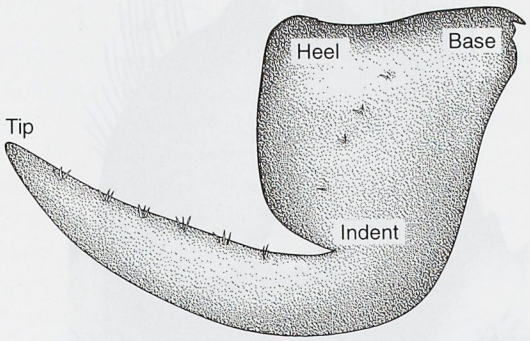

FIG. 3. — Pereopod II dactyl, lateral view, of *Albunea holthuisi* sp. nov., showing terms used in species accounts for landmarks on pereopod dactyli.

As observed by previous workers, the third maxilliped contains a number of morphological characters for distinguishing among albuneid genera and species. In most anomurans, the basis bears a medial row of teeth, termed the crista dentata. Among the albuneids, only two aberrant genera, *Blepharipoda* and *Lophomastix* Benedict, 1904, are thought to possess a crista dentata (MARTIN & ABELE, 1986; McLAUGHLIN & LEMAITRE, 1997). However, we have observed a very reduced crista dentata on several species of *Albunea*. Other than the third maxilliped, the mouthparts of albuneids tend to lack distinguishing features and so are not described herein.

The shape of the dactylus of the pereopods, particularly the third pereopod, has been used widely to distinguish among species of albuneids. To describe the complex shape of this segment, we use several shorthand terms to refer to important landmarks (Fig. 3). The "base" of the dactylus is the ventroproximal angle, and the "heel" corresponds to the dorsoproximal angle, which is often strongly produced. The dorsal margin is almost always concave, sometimes smoothly so; in most species, however, the dorsal margin forms a distinct angular incision proximally, the apex of which is herein referred to as an "indent." The dactylus terminates in a "tip," which in hippoids is at least somewhat rounded and lacking in a corneous nail.

Genus ***ALBUNEA*** Weber, 1795

Albunea microps Miers, 1878

Figs 1, 4

Albunea microps White, 1847: 129 (nomen nudum)*. — MIERS, 1878: 328-329, pl. 5, figs 12-13*. — HENDERSON, 1888: 40*. — ORTMANN, 1896: 224-225 (list). — BORRADAILE, 1904: 751*. — GORDON, 1938: 187, fig. 3c*. — SERÈNE & UMALI, 1965: 95-97, pl. 6, figs 1-6, text fig. 12c. — THOMASSIN, 1969: 140-143 (part), text figs 2, 3b. — MIYAKE, 1978: 154-155, fig. 60b.

Albunea [sp.] Gordon, 1938: 189-190, fig. 1d*.

Not *Albunea microps* - THOMASSIN, 1969: 140-143 (part), pl. 2, figs 1-9 (= *Albunea elioti* Benedict, 1904).

MATERIAL EXAMINED. — **Philippines**. *Sulu Archipelago*. "Sooloo Islands" [= Sulu Archipelago], coll. unknown: 1 ♂ 11.3 mm (BMNH 1937.6.7.3).

"Challenger": stn 212, 06°54'N, 122°18'E, 3-6 m, 30.01.1875 : 1 ♂ 9.5 mm (ZMUC 2715).

Indonesia. *"Gloria Maris"*: stn 549, east coast of Rouw Island, Aoeri Group, west "Geelvinck" (= Cenderawasih) Bay, "New Guinea" (= Irian Jaya), coll. A. J. OSTHEIMER, 23.02.1956: 1 ♂ 11.2 mm (RMNH 23641).

CORINDON 2: stn DR 293, 02°37.7'S, 117°49.4'E, Sulawesi, Makassar Strait, 45 m, 11.11.1980: 1 ov. ♀ 12.1 mm (MNHN-Hi 201).

Andaman Islands. Port Blair, coll. unknown: 2 ♂ 6.2-6.7 mm (BMNH 1956.1.14.20).

Maldive Islands. Mahlosmadulu Atoll, 37 m, coll. J. S. GARDINER: 2 juv. ♀ 4.6-4.7 mm (UMZC).

Oman. Muscat, 12-27 m, coll. unknown: 1 ♂ 7.8 mm (BMNH 1901.4.20.10).

Seychelles. Mahé, coll. Mission Zoologique MRAC-ULB, July-Aug. 1972: 2 ♀ 6.0-10.2 mm (MRAC 53.604).

Tanzania. Stn 650, dredged in shell and sponge, about 1.5 mi (= 2.5 km) east of Puopu Island, northwest Zanzibar, 13-16 m, coll. A. J. OSTHEIMER III, 20.02.1957: 1 ♀ 12.8 mm (ANSP CA4647). — Dredged in muddy sand, around Bawi and Change Islands, off Zanzibar City, Zanzibar, 11-29 m, coll. A. J. OSTHEIMER III, 27.02.1957: 1 ♀ 10.9 mm (ANSP CA4646).

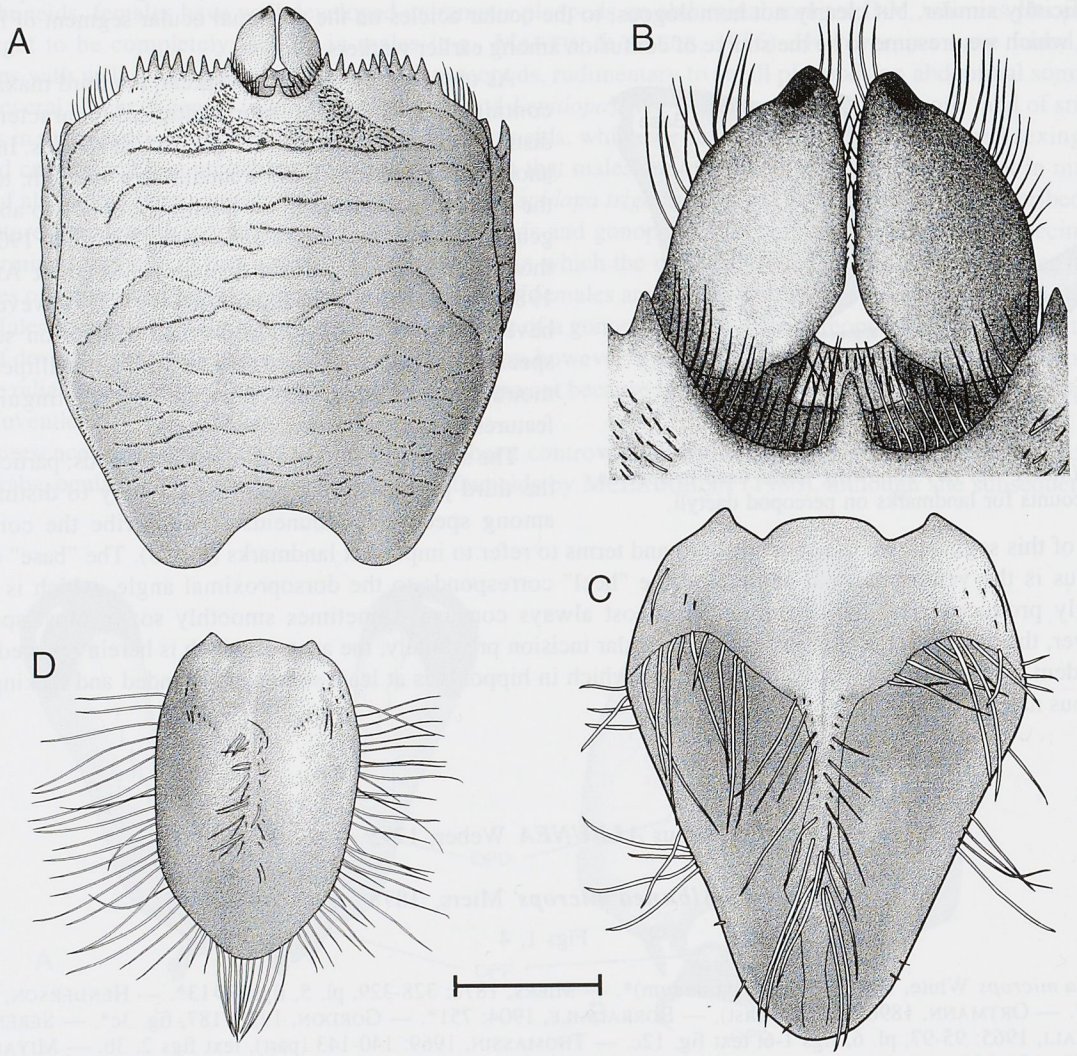

FIG. 4. — *Albunea microps* Miers, 1878, ov. ♀ 12.1 mm (MNHN-Hi 201) (A, B, D); ♂, holotype, 11.3 mm (BMNH 1937.6.7.3) (C). **A**, carapace, dorsal view; **B**, eyes, dorsal view; **C**, telson of male, dorsal view; **D**, telson of female, dorsal view. Scale = 0.75 mm (B), 1.0 mm (C), 2.0 mm (D), and 4.0 mm (A).

TYPE. — *Holotype*: ♂ 11.3 mm, "Sooloo Islands" [= Sulu Archipelago, Philippines] (BMNH 1937.6.7.3).

DIAGNOSIS. — Carapace (Fig. 4A) slightly longer than wide, covered with strongly setose grooves. Anterior margin with about 9 teeth on either side of ocular sinus. Setal field with thick anterolateral projections and truncate anteromedial margin. CG1 with lateral elements separated, displaced posteriorly from median element; CG4 fragmented, median element displaced anteriorly; CG5 entire; CG6 and CG7 united; CG 11 present. Rostrum present, exceeding posterior margin of ocular plate by about half length of ocular plate. Ocular plate subquadrate (Fig. 4B). Ocular peduncles (Fig. 4B) dorsoventrally flattened and oblong in shape, rounded at tip, approximated along distal 2/3 of mesial margin; lateral margin convex except at concave tip; mesial margin convex. Cornea on lateral margin at tip. Dactyli of pereopods II and III with heels smoothly rounded. Dactylus of pereopod IV sinuous from base to tip; indent slight. Telson of male (Fig. 4C) broadly triangular, inflated dorsally, broadly rounded at tip, strongly calcified proximally; large decalcified windows on either side of thin medial calcified strip; long thin setae medially and along anterior margin of windows. Telson of female (Fig. 4D) flattened, ovate, longitudinal row of short, thin setae medially.

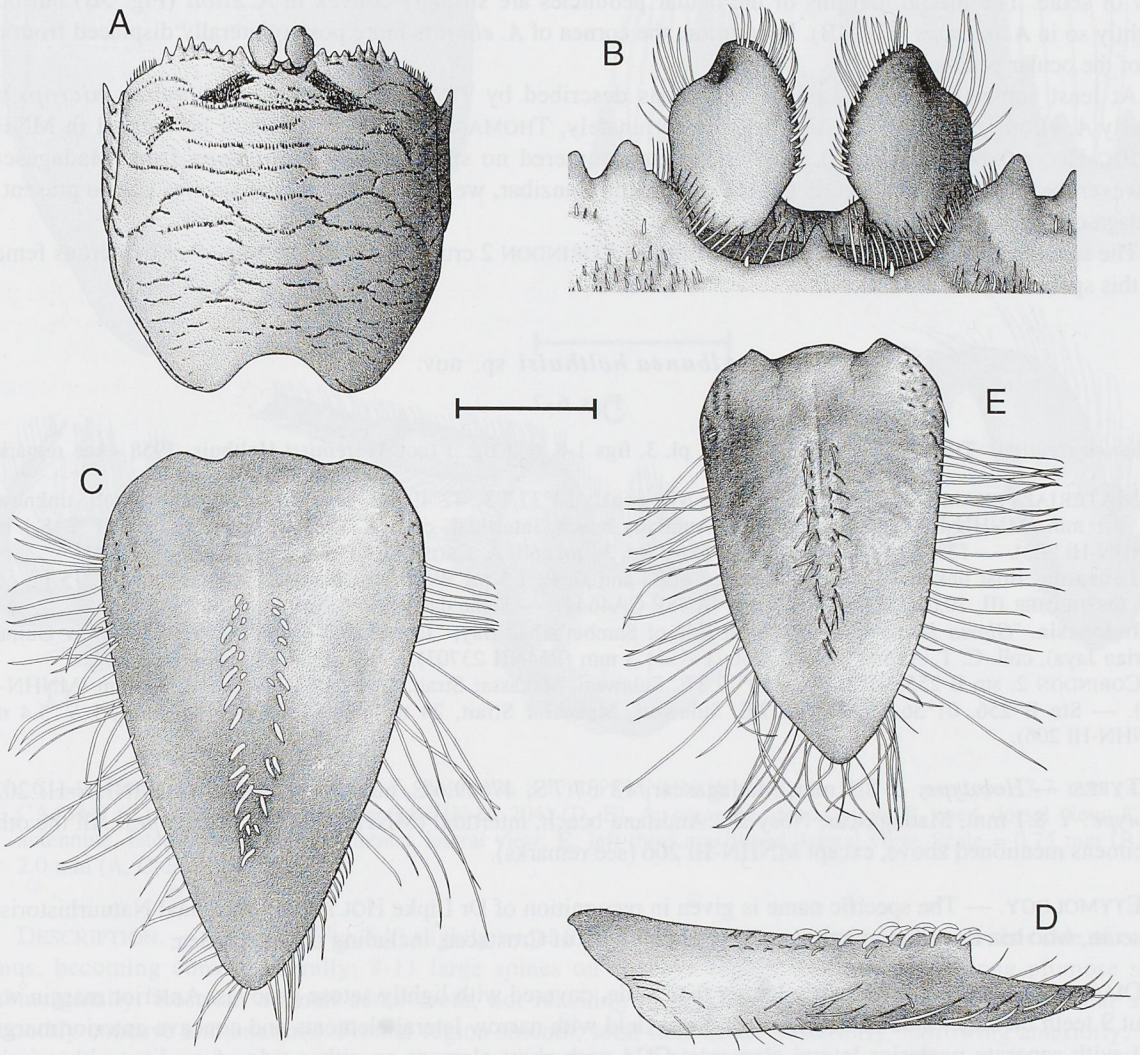

FIG. 5. — *Albunea elioti* Benedict, 1904, ♀, holotype, 16.2 mm (USNM 26169) (A, B, E); ♂, 16.5 mm (USNM 281472) (C, D). **A**, carapace, dorsal view; **B**, eyes, dorsal view; **C**, telson of male, dorsal view; **D**, telson of male, lateral view; **E**, telson of female, dorsal view. Scale = 0.75 mm (B), 2.0 mm (E), 3.0 mm (C, D), and 4.0 mm (A).

DISTRIBUTION. — Widely distributed in the Indo-West Pacific from the east coast of Africa to Indonesia and the Philippines and north to southern Japan; 3-45 m depth.

REMARKS. — *Albunea microps* has been confused with *A. elioti* Benedict, 1904, previously known only from the holotype female, from Samoa (USNM 26169, 16.2 mm ; Fig. 5A, B, E). GORDON (1938) first suggested that *A. elioti* was perhaps the same as *A. microps*, and other authors (SERÈNE & UMALI, 1965; THOMASSIN, 1969; MIYAKE, 1978) have treated her suggestion as definitive. From our examinations of the holotype of *A. elioti* and two additional male specimens we discovered from Tonga (USNM 281472, 16.5 mm ; Fig. 5C, D) and Madagascar (MNHN-Hi-88, 10.4 mm), we have determined that this species is distinct from *A. microps*. The shape of both the telson of the male and the eyes can be used to tell the two species apart. The telson of the male of *A. microps* (Fig. 4C) is heavily calcified and somewhat inflated proximally, but partially decalcified distally and narrowing to a produced tip. An oblique row of long setae is present just proximal to the demarcation line between the calcified and decalcified regions on each side of the median line. In *A. elioti*, the telson of the male is narrowly triangular (Fig. 5C), fully calcified, with short thick setae on a strong medial ridge (Fig. 5D), and lacks the oblique row of setae. The mesial margins of the ocular peduncles are strongly convex in *A. elioti* (Fig. 5B) but only slightly so in *A. microps* (Fig. 4B). In addition, the cornea of *A. elioti* is more posterolaterally displaced from the tip of the ocular peduncle.

At least some of the Madagascar specimens described by THOMASSIN (1969) as *Albunea microps* are clearly *A. elioti* (e.g., his pl. 2, figs 1-9). Unfortunately, THOMASSIN's material cannot be located in MNHN (NGOC-HO, personal commun.), and we have encountered no specimens of *A. microps* from Madagascar. However, because we have recorded *A. microps* from Zanzibar, we do suspect that the species is also present in Madagascar.

The specimen of *A. microps* collected during the CORINDON 2 cruise is the first report of an ovigerous female for this species.

Albunea holthuisi sp. nov.

Figs 6–7

?*Albunea steinitzi* - THOMASSIN, 1969: 143-146, pl. 3, figs 1-8, text fig. 3 (not *A. steinitzi* Holthuis, 1958 - see remarks).

MATERIAL EXAMINED. — **Madagascar**. *NW coast*: 13°37.7'S, 47°49.6'E, near Nosy Be, 25 m, coll. unknown: 1 ♂ 8.1 mm (MNHN-Hi 202). — Nosy Be, Andilana beach, intertidal, coll. A. CROSNIER, Sept. 1959: 1 ♀ 8.1 mm (MNHN-Hi 203). — 13°38.3'S, 42°49.6'E, near Nosy Be, 34 m, coll. A. CROSNIER : 1 ♂ 8 mm (MNHN-Hi 204).

Tanzania. Boat unknown: stn 651, dredged grass and shell, 1.5 mi WSW Ros Nungwa, north Zanzibar, 15 m, coll. A. J. OSTHEIMER III, 20.02.1957: 1 ♂ 7.7 mm (ANSP CA4644). — Same data: 1 ♀ 6.7 mm (ANSP CA4645).

Indonesia. *"Gloria Maris"*: stn 522, west side of Samberbaban Bay, "Japen" (= Yapen) Island, "West New Guinea" (= Irian Jaya), coll. C. T. ABBOT , 14.02.1956: 1 ♂ 11.3 mm (RMNH 23703).

CORINDON 2: stn B 255, 01°56.5'S, 119°17.3'E, Sulawesi, Makassar Strait, 13 m, 6.11.1980: 1 ♀ 7.1 mm (MNHN-Hi 205). — Stn B 256, 01°56.5'S, 119°17.2'E, Sulawesi, Makassar Strait, 24 m, 6.11.1980: 1 ♂ 4.9 mm ; 1 ♀ 5.4 mm (MNHN-Hi 206).

TYPES. — *Holotype*: ♂ 8.1 mm, Madagascar, 13°37.7'S, 47°49.6'E, near Nosy Be, 25 m (MNHN-Hi 202). *Allotype*: ♀ 8.1 mm, Madagascar, Nosy Be, Andilana beach, intertidal (MNHN-Hi 203). *Paratypes*: All the other specimens mentioned above, except MNHN-Hi 206 (see remarks).

ETYMOLOGY. — The specific name is given in recognition of Dr Lipke HOLTHUIS, Nationaal Natuurhistorisch Museum, who has contributed immeasurably to the study of Crustacea, including the Hippoidea.

DIAGNOSIS. — Carapace slightly longer than wide, covered with lightly setose grooves. Anterior margin with about 9 teeth on either side of ocular sinus. Setal field with narrow lateral elements and concave anterior margin. CG1 with separate posterior lateral elements; CG4 with short element on either side of median with missing elements at midline and between median and laterals; CG5 present only as short lateral elements; CG6 and CG7 separate; CG8 complete; CG11 present. Rostrum present, not reaching posterior margin of ocular plate. Ocular

plate triangular. Ocular peduncles dorsoventrally flattened and oblong in shape, tapering at tip, approximated along distal 2/3 of mesial margin; lateral margin convex except slightly concave at tip; mesial margin convex. Cornea at tip. Dactylus of pereopod II with heel slightly produced, low and rounded. Dactylus of pereopod III with heel slightly projecting, acute. Dactylus of pereopod IV sinuous from base to tip, with slight indent. Telson of male spatulate; tip broadly truncate; dorsal surface with elevated median longitudinal ridge bearing short thick setae proximally and long thick setae distally. Telson of female flattened and spatulate, longitudinal row of short, thin setae medially.

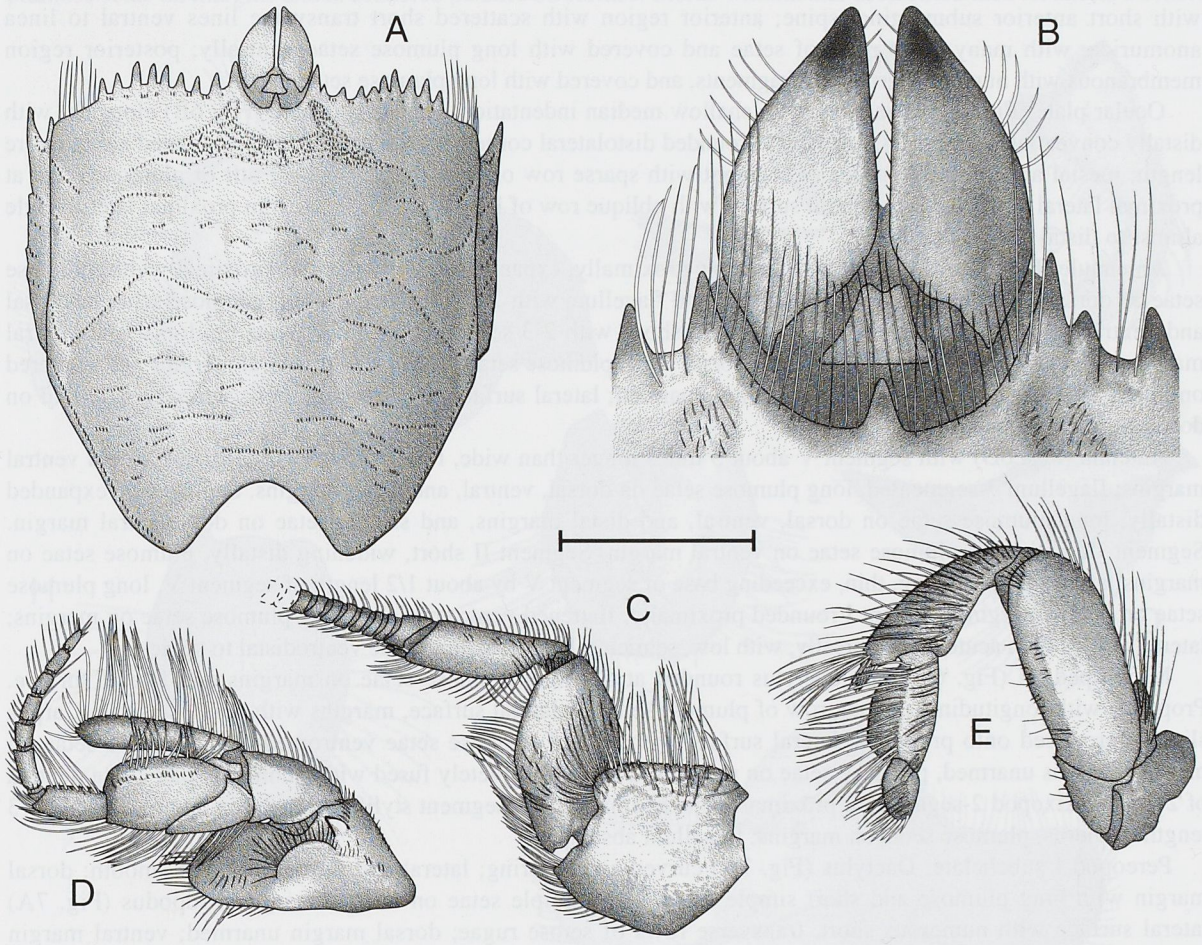

FIG. 6. — *Albunea holthuisi* sp. nov., ♂, holotype, 8.1 mm (MNHN-Hi 202) (A, B); ♂, paratype, 7.7 mm (ANSP CA4644) (C); ♂, paratype, 8.0 mm (MNHN-Hi 204) (D, E). **A**, carapace, dorsal view; **B**, eyes, dorsal view; **C**, left antennule, lateral view; **D**, left antenna, lateral view; **E**, left third maxilliped, lateral view. Scale = 0.75 mm (B) and 2.0 mm (A, C–E).

DESCRIPTION. — Carapace (Fig. 6A) slightly wider than long. Anterior margin concave on either side of ocular sinus, becoming convex laterally; 8-11 large spines on concave region; ventral row of long plumose setae submarginally. Rostrum a small acute tooth, not reaching to proximal margin of ocular plate. Ocular sinus smoothly concave and unarmed. Frontal region smooth; setal field broad posteriorly, narrowing anteriorly, with narrow lateral elements and concave anterior margin. CG1 parallel to anterior margin of carapace, sinuous, slightly crenulate, divided into medial fragment and curved lateral elements that are displaced posteriorly. Mesogastric region smooth; CG2 short; CG3 broken into 6 short elements approximately equally spaced between posterior

elements of CG1; CG4 fragmented into four elements with gap at midline and between median and lateral elements. Hepatic region smooth, with short setose groove at median of lateral margin. Epibranchial region roughly triangular, smooth; posterolateral margin with short row of setae. Metagastric region smooth; CG5 present only as short lateral elements directly posterior to median elements of CG4; CG6 slightly crenulate, strongly concave medially and sloping out to convex lateral thirds; CG7 transverse and separate from CG6. Cardiac region smooth; CG8 uninterrupted; CG9 present only as lateral short lines; CG10 present in two fragments, separated by length of single fragment; CG11 present. Branchial region with numerous short, transverse rows of setae. Posterior margin deeply and evenly convex, with submarginal groove interrupted medially. Branchiostegite with short anterior submarginal spine; anterior region with scattered short transverse lines ventral to linea anomurica, with many short rows of setae and covered with long plumose setae ventrally; posterior region membranous with numerous, irregular fragments, and covered with long plumose setae.

Ocular plate (Fig. 6B) triangular, with shallow median indentation. Ocular peduncle (Fig. 6B) elongate, with distally convex lateral margins, tapering to rounded distolateral cornea; mesial margins approximated along entire length; mesial and ventral margins of segment with sparse row of long plumose setae; tuft of plumose setae at proximal lateral ventral angle; ventral surface with oblique row of long plumose setae from proximal lateral angle almost to distal mesial margin.

Antennule (Fig. 6C) with segment III narrow proximally, expanding distally to twice proximal width; plumose setae on dorsal and ventral margins; dorsal exopod flagellum with 76-104 segments, long plumose setae on dorsal and ventral margins; ventral endopod flagellum short, with 2-3 segments, plumose setae on dorsal and ventral margins. Segment II medially inflated from dorsal view, plumose setae on dorsal and ventral margins and scattered on lateral surface. Segment I wider than long, unarmed; lateral surface with long plumose setae dorsally and on dorsal and ventral margins.

Antenna (Fig. 6D) with segment V about 3 times longer than wide, long plumose setae on dorsal and ventral margins; flagellum 7-segmented, long plumose setae on dorsal, ventral, and distal margins. Segment IV expanded distally, long plumose setae on dorsal, ventral, and distal margins, and simple setae on dorsolateral margin. Segment III with long plumose setae on ventral margin. Segment II short, widening distally, plumose setae on margins; antennal acicle long, thin, exceeding base of segment V by about 1/2 length of segment V, long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventromesially, long plumose setae on margins; lateral surface with acute spine dorsally, with low, semicircular dorsolateral lobe ventrodistal to spine.

Maxilliped III (Fig. 6E) with dactylus rounded at tip, long plumose setae on margins and lateral surface. Propodus with longitudinal median row of plumose setae on lateral surface, margins with plumose setae. Carpus slightly produced onto propodus, lateral surface with row of plumose setae ventromedially; plumose setae on margins. Merus unarmed, plumose setae on margins. Basis incompletely fused with ischium; weak crista dentata of 2-3 teeth. Exopod 2-segmented, proximal segment small, distal segment styliform, tapering, approximately 1/3 length of merus, plumose setae on margins; flagellum absent.

Pereopod I subchelate. Dactylus (Fig. 7A) curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose and short simple setae, short simple setae on ventral margin. Propodus (Fig. 7A) lateral surface with numerous short, transverse rows of setose rugae; dorsal margin unarmed; ventral margin distally produced into acute spine; cutting edge lacking teeth, lined with long plumose setae; lateral, mesial and ventral margins with long setae. Carpus (Fig. 7A) with dorsodistal angle produced into small corneous spine; dorsal and distal margins with long plumose setae; lateral surface with distal rugose area, few transverse setose ridges on distal 2/3 of surface; mesial surface smooth with scattered rows of long plumose setae, margins with long plumose setae. Merus unarmed; lateral surface with scattered transverse rows of long plumose setae, margins with long plumose setae; mesial surface with few short rows of setae. Basi-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopods II-IV with dactyli laterally compressed and dorsoventrally expanded.

Pereopod II dactylus (Fig. 7B) smooth; base to heel concave, heel with smoothly rounded low spur, heel to tip acutely indented and narrow, tip acute, tip to base broadly convex; lateral surface smooth, several small tufts of short setae in roughly straight line across medioproximal surface, several widely spaced submarginal tufts of short setae dorsodistally; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short

plumose setae, patch of long plumose setae at base (not illustrated). Propodus dorsal surface smooth, ventral margin inflated and rounded; oblique row of long plumose setae on distal margin of lateral surface; distal and ventral margins with long plumose setae; dorsolateral surface a narrow, oblique, flattened shelf, short setae on dorsal margin and long plumose setae on ventral margin; mesial surface with elevated, curved, setose ridge from ventral junction with dactylus almost to ventral proximal junction with carpus. Carpus slightly produced, gently rounded; lateral surface nearly smooth, with irregular, broken row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae, margins with long plumose setae; mesial surface smooth, long plumose setae on margins and in scattered patches on surface. Merus with medial decalcified area on lateral surface,

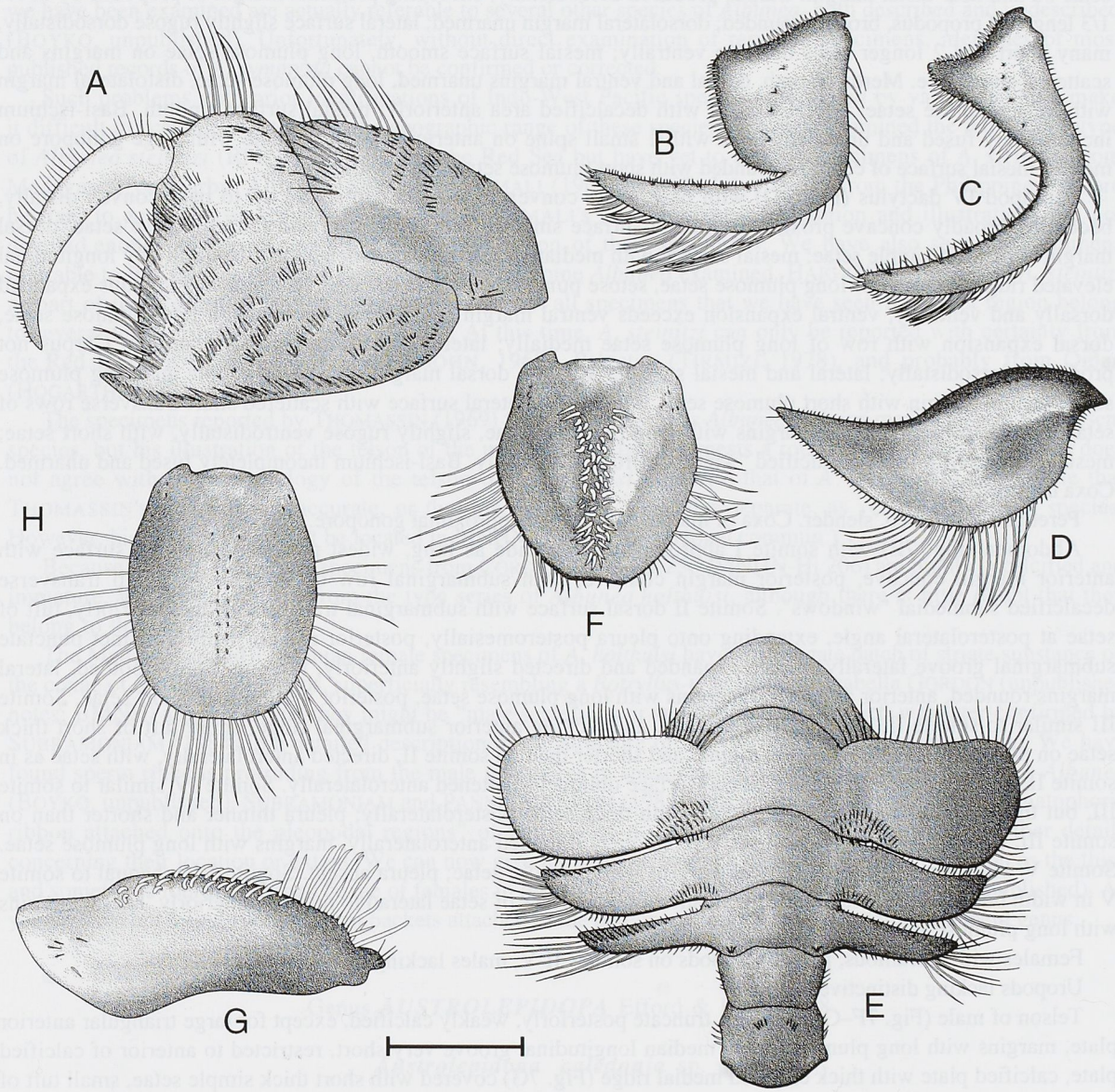

FIG. 7. — *Albunea holthuisi* sp. nov., ♂, holotype, 8.1 mm (MNHN-Hi 201) (A–G); ♀, allotype, 8.1 mm, MNHN-Hi 203 (H). **A**, left chela, lateral view; **B**, left pereopod II dactyl, lateral view; **C**, left pereopod III dactyl, lateral view; **D**, left pereopod IV dactyl, lateral view; **E**, abdomen, dorsal view; **F**, telson of male, dorsal view; **G**, telson of male, lateral view; **H**, telson of female, dorsal view. Scale = 1.0 mm (**H**), 1.5 mm (F, G), and 2.0 mm (A–E).

long plumose setae on lateral margins; mesial surface nearly smooth, with few setae. Basi-ischium incompletely fused and unarmed. Coxa with 1 small spine on anterior margin.

Pereopod III dactylus (Fig. 7C) with base to heel concave, heel produced in short, acute spur, heel to indent nearly straight, indent broadly concave, tip acute, tip to base smoothly convex to straight; lateral surface smooth, dorsodistal margin with tufts of short setae, ventromesial margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, plumose setae proximally at junction with propodus. Propodus weakly inflated; lateral surface smooth, long plumose setae distally, simple setae on margins, long plumose setae on ventral margin, dorsolateral surface narrow, oblique, flattened; mesial surface with scattered long setae on and near distal margin. Carpus produced dorsodistally, exceeding proximal margin of propodus by about 1/3 length of propodus, broadly rounded; dorsolateral margin unarmed; lateral surface slightly rugose dorsodistally, many short and 2 longer rows of setae ventrally; mesial surface smooth, long plumose setae on margins and scattered on surface. Merus smooth, dorsal and ventral margins unarmed, long plumose setae, distolateral margin with long plumose setae; lateral surface with decalcified area anteriorly; mesial surface smooth. Basi-ischium incompletely fused and unarmed. Coxa with 1 small spine on anterior margin. Female with large gonopore on median mesial surface of coxa, surrounded with short plumose setae; male without pore.

Pereopod IV dactylus (Fig. 7D) with base to tip convex to straight, tip acute, tip to base convex distally, becoming broadly concave proximally; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with median decalcified area, demarcated ventrally by longitudinal elevated ridge with row of long plumose setae, setose punctae ventral to decalcified window. Propodus expanded dorsally and ventrally, ventral expansion exceeds ventral margin of dactylus, margin with long plumose setae, dorsal expansion with row of long plumose setae medially; lateral and mesial surfaces smooth. Carpus not produced dorsodistally; lateral and mesial surfaces smooth, dorsal margin with short simple and long plumose setae, ventral margin with short plumose setae. Merus with lateral surface with scattered short transverse rows of setae, dorsal and ventrodistal margins with long plumose setae, slightly rugose ventrodistally, with short setae; mesial surface with large decalcified "window" proximoventrally. Basi-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod V reduced, slender. Coxa of male with large mesioproximal gonopore.

Abdomen (Fig. 7E) with somite I approximately as wide as long, widest posteriorly; dorsal surface with anterior margin concave, posterior margin concave, with submarginal row of short setae, small transverse decalcified submedial "windows". Somite II dorsal surface with submarginal transverse ridge anteriorly, tuft of setae at posterolateral angle, extending onto pleura posteromesially, posterior margin with indistinct punctate submarginal groove laterally; pleura expanded and directed slightly anteriorly, margins finely toothed, lateral margins rounded, anterior and lateral margins with long plumose setae, posterior margin with short setae. Somite III similar to somite II, but narrower, shorter, and lacking anterior submarginal ridge, small tuft of short thick setae on posterolateral angle; pleura thinner and shorter than on somite II, directed anterolaterally, with setae as in somite II, anterolateral angle acute, dorsal surface obliquely flattened anterolaterally. Somite IV similar to somite III, but thinner and shorter; dorsal surface with thick setae posterolaterally; pleura thinner and shorter than on somite III, directed laterally, dorsal surface obliquely flattened anterolaterally, margins with long plumose setae. Somite V wider than somite IV, lateral margins with plumose setae; pleura absent. Somite VI subequal to somite V in width but longer, dorsal surface with short oblique rows of setae laterad to midline anteriorly, lateral margins with long plumose setae; pleura absent.

Females with uniramous, paired pleopods on somites II-V, males lacking pleopods.

Uropods lacking distinctive features.

Telson of male (Fig. 7F–G) spatulate, truncate posteriorly, weakly calcified, except for large triangular anterior plate, margins with long plumose setae; median longitudinal groove very short, restricted to anterior of calcified plate, calcified plate with thick elevated medial ridge (Fig. 7G) covered with short thick simple setae, small tuft of setae at anterolateral margin. Telson of female (Fig. 7H) ovate, longer than wide, slightly truncate posteriorly, dorsal surface smooth, with median longitudinal groove anteriorly, row of setose punctae lateral to midline from median of longitudinal groove almost to posterior margin; margins with long plumose setae.

DISTRIBUTION. — Known from Madagascar, Tanzania, and Irian Jaya and Makassar, Indonesia; 0-34 m depth.

REMARKS. — *Albunea holthuisi* is most similar to *A. steinitzi* Holthuis, 1958. *Albunea holthuisi* differs from *A. steinitzi* in that CG8 is entire, and CG11 is present; additionally, the telson of the male has a pronounced ridge, and has shorter medial setae. *Albunea symmysta* (Linnaeus, 1758) *sensu stricto* differs from both of these species by having laterally inflated ocular peduncles, a strongly spurred heel on the dactylus of the third pereopod, and a distinctively flat and broadly triangular male telson with only a few short setae on either side of the midline.

No records in the literature can be ascribed definitively to *A. holthuisi*. However, given the excessively wide range of variability that has been incorrectly attributed to *A. symmysta*, it is possible that some published records assigned to *"A. symmysta"* may in fact be *A. holthuisi*. Many of the specimens published as "*A. symmysta*" that we have been examined are actually referable to several other species of *Albunea*, both described and undescribed (BOYKO, unpublished). Unfortunately, without direct examination of reported specimens, identities of most published records of *A. symmysta* cannot be confirmed or corrected.

Such problems with prior identifications of Indo-West Pacific species of *Albunea* by various authors make it difficult to accurately determine the geographic range of these species. We have examined the female holotype of *Albunea steinitzi* (RMNH 11847) from the Red Sea but have yet to see any specimens of *A. steintizi* from Madagascar or nearby. Although SERÈNE and UMALI (1965) identified *A. steinitzi* from the Philippines, we are hesitant to accept those records as SERÈNE and UMALI's (1965) written description and illustrations are not detailed enough to permit unambiguous identification of their specimens. We have also seen no specimens referable to this species among a large series of Philippine *Albunea* examined. HAIG (1974a) included *A. steintizi* as part of the Western Australia anomuran fauna, but all specimens that we have seen from that region belong to several undescribed species in this genus. At this time, *A. steinitzi* can only be reported with certainty from the Red Sea (HOLTHUIS, 1958; LEWINSOHN, 1969), Pakistan (TIRMIZI, 1978), and probably from Oman (HOGARTH, 1988).

The specimens reported by THOMASSIN (1969) from Madagascar as *Albunea steinitzi* may belong to the present species, but his illustration of the telson of the male in text fig. 4 suggests a rounded, produced tip, which does not agree with the morphology of the telson of *A. holthuisi*, nor with that of *A. steinitzi*. It is possible that THOMASSIN's figures are inaccurate, or that his specimens were of a separate, as yet unrecognized, species. However, his specimens cannot be located in MNHN (NGOC HO, personal commun.).

Because the two Indonesian specimens from CORINDON 2 stn B 256 (MNHN-Hi 206) are highly decalcified and immature, we excluded them from the type series of *Albunea holthuisi*, although there is little doubt that they belong to this taxon.

The Madagascar and Tanzanian female specimens of *A. holthuisi* have an elongate patch of striate substance on the coxae of the third pereopods, superficially resembling a *Botryllus*-type tunicate. Isabella GORDON (unpublished notes; BMNH) suggested that they might be "male secretions or spermatophores," which was later confirmed by SUBRAMONIAM (1984) in a detailed description of the structure of the spermatophore in *A. symmysta*. We have found sperm ribbons protruding from the male gonopores in specimens of several species in the genus *Albunea* (BOYKO, unpublished). SUBRAMONIAM and PANNEERSELVAM (1985) subsequently alluded to the "spermatophoric ribbon attached onto the pleopodal regions" of females of *A. symmysta*, but did not provide further details concerning their location or extent. We can now give the specific location of sperm ribbon deposition as the third and sometimes fourth pereopod coxae of females in this species and others in the genus (BOYKO, unpublished). As yet we have not found similar sperm packets attached to the pereopods of females in any other albuneid genus.

Genus ***AUSTROLEPIDOPA*** Efford & Haig, 1968

Austrolepidopa caledonia sp. nov.

Fig. 8-9

MATERIAL EXAMINED. — **New Caledonia**. SMIB 6: stn DW 107, 19°07.6'S, 163°30.2'E, Grand Passage, 205 m, 2.03.1990: 1 ♂ 9.2 mm (MNHN-Hi 207); 1 ♀ 11.5 mm (MNHN-Hi 208). — Stn DW 109, 19°05.7'S, 163°29.7'E, 225 m, 2.03.1990: 1 ♀ 8 mm (MNHN-Hi 209).

TYPES. — *Holotype*: ♂ 9.2 mm, New Caledonia, SMIB 6, stn DW 107, 19°07.6'S, 163°30.2'E, Grand Passage, 205 m (MNHN-Hi 207). *Allotype*: ♀ 11.5 mm, same data as the holotype (MNHN-Hi 208). *Paratype*: ♀ 8 mm, New Caledonia, SMIB 6, stn 109, 19°05.7'S, 163°29.7'E, 225 m (MNHN-Hi 209).

ETYMOLOGY. — The specific name is given after the type locality, New Caledonia, and is treated as a noun in apposition.

DIAGNOSIS. — Carapace longer than wide, covered with strongly setose grooves. Setal field with straight anterior margin and narrow lateral elements directed posteriorly. CG1 with contiguous posterior lateral elements; CG4 nearly entire, with median section slightly displaced anteriorly; CG5 absent; CG6 merged with CG4 laterally and with CG7 medially to form two separate hybrid grooves; CG8 complete; CG11 absent. Anterior margin of carapace with finely toothed lobe lateral to ocular sinus. Rostrum absent, rostral region truncate anteriorly, finely toothed. Ocular plate completely concealed dorsally by rostral region. Ocular peduncles dorsoventrally flattened and triangular in shape, separated by slightly more than length of ocular peduncle, lateral margin slightly convex, mesial margin slightly concave. Cornea not visible. Dactylus of pereopod II with heel slightly produced, low and rounded. Dactylus of pereopod III with heel slightly projecting, rounded. Dactylus of pereopod IV deeply concave from base to tip, with smoothly rounded indent. Telson of male and female similar; flattened and ovate, medially with tufts of short, thin setae in paired longitudinal rows.

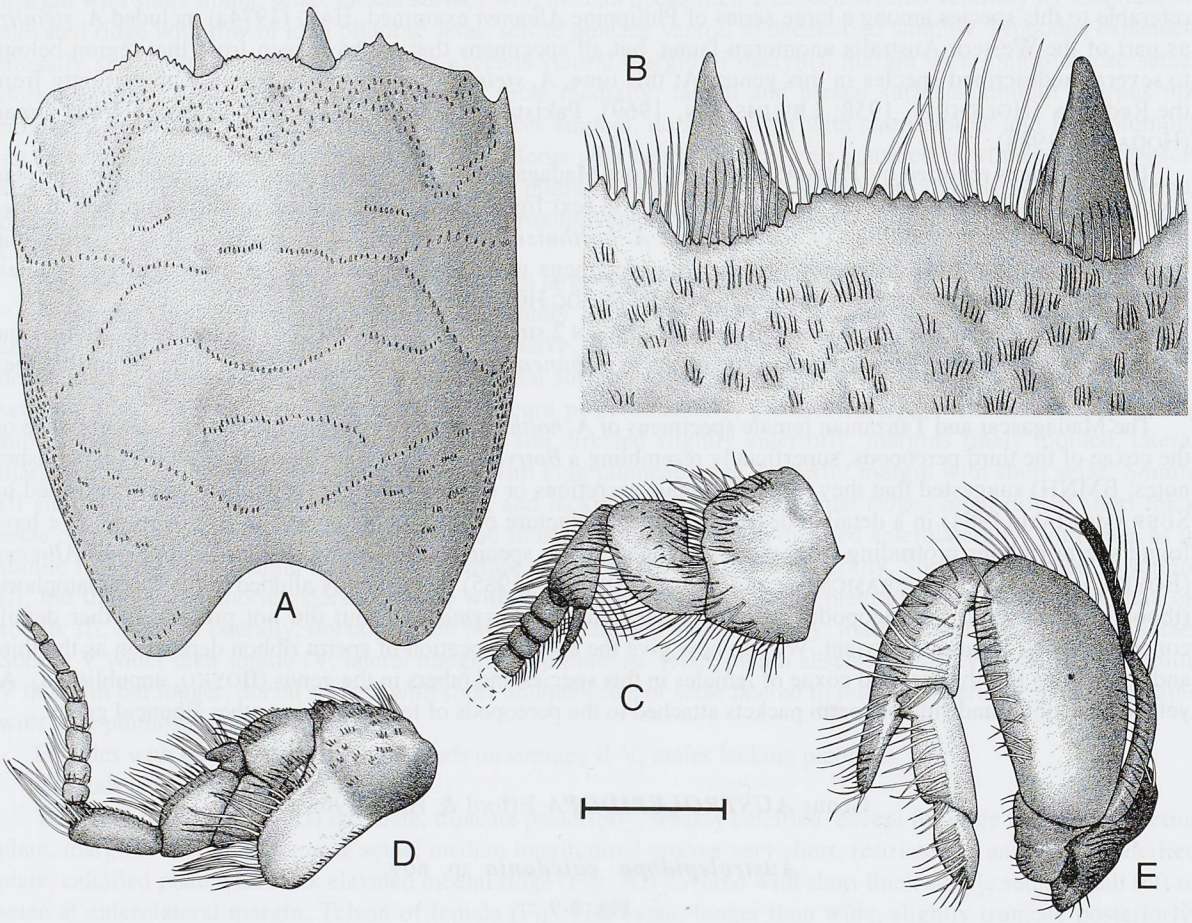

FIG. 8. — *Austrolepidopa caledonia*, sp. nov., ♀, allotype, 11.5 mm (MNHN-Hi 208) (A, B); ♀, paratype, 8.0 mm (MNHN-HI 209) (C–E). **A**, carapace, dorsal view; **B**, eyes, dorsal view; **C**, left antennule, lateral view; **D**, left antenna, lateral view; **E**, left third maxilliped, lateral view. Scale = 1.0 mm (B), 1.5 mm (C–E), and 4.0 mm (A).

DESCRIPTION. — Carapace (Fig. 8A) about as wide as long. Anterior margin dentate between ocular peduncles, submarginal ventral row of long plumose setae. Rostrum absent, rostral area truncate, overreaching base of ocular peduncles and exceeded by anterolateral lobes. Ocular sinus concave, dentate. Anterolateral lobe broadly triangular, dentate on margin, with mesial margin convex and lateral margin concave. Frontal region smooth, setal field with anterior and posterior margins subequal in length, narrow lateral elements directed posteriorly, straight anterior margin. CG1 sinuous, slightly crenulate, bearing short setae, connected to posterior lateral elements. Mesogastric region smooth, CG2 absent; CG3 present only as short lateral grooves; CG4 nearly entire, median element slightly displaced anteriorly. Hepatic region rugose anteriorly and anteromesially, otherwise smooth, with short rugose and setose lateral spine present on anterolateral margin. Epibranchial region roughly triangular, smooth, posterior lateral margin with short row of setae. Metagastric region smooth; CG5 absent; CG6 slightly crenulate, median concave element merging with CG7 to form hybrid groove, lateral fragments of CG6 connecting with CG4; CG7 transverse, merging with median third of CG6. Cardiac region smooth; CG8 uninterrupted; CG9 absent; CG10 present as oblique grooves almost meeting in median; CG11 absent. Branchial region with 8-9 short, transverse rows of setae. Posterior margin deeply and evenly convex, with short lateral submarginal groove. Branchiostegite unarmed, covered with long golden plumose setae, anterior region with many short rows of setae, posterior region well calcified dorsally, membranous ventrally, with numerous irregular fragments.

Ocular plate completely concealed by front of carapace (Fig. 8B). Ocular peduncle (Fig. 8B) triangular (almost ovate in smallest specimen), broadly separated, margins without setae, cornea not apparent but ocular pigment visible in mesiodistal area.

Antennule (Fig. 8C) with segment III narrow proximally, expanding distally to twice proximal width, produced distoventrally, simple setae on dorsal margin and few long plumose setae on distoventral margin; dorsal exopod flagellum with 67 segments (only 1 specimen with intact flagella), long plumose setae on dorsal and ventral margins; ventral endopod flagellum short, usually of 3 segments (proximal pair sometimes fused), plumose setae on dorsal and ventral margins. Segment II with plumose setae on dorsal and ventral margins, and scattered on lateral surface. Segment I wider than long, small tubercle on proximoventral margin, lateral surface with long plumose setae dorsally and ventrally, and on dorsal, ventral and distal margins.

Antenna (Fig. 8D) with segment V about twice longer than wide, long plumose setae on dorsomesial margin, and long simple setae on dorsolateral margin; flagellum with 7–8 segments, long simple setae on dorsal, ventral, lateral and distal margins. Segment IV with long plumose setae on dorsomesial margin, and long simple setae on dorsolateral margin. Segment III with long plumose setae on ventral margin, and scattered long simple setae on proximodorsal margin. Segment II short, widening distally, with long simple setae on dorsolateral margin; antennal acicle short, rounded, exceeding base of segment IV by about 1/4 length of segment IV, long plumose setae on dorsal margin and long simple setae on lateral margin. Segment I rounded dorsally, flattened ventrally, long plumose setae on margins, lateral surface rugose and with long setae dorsally, produced ventrally into oblong flattened plate.

Maxilliped III (Fig. 8E) with dactylus with rounded tip, long simple setae on margins and lateral surface. Propodus with longitudinal median row of simple setae, margins with simple setae. Carpus produced nearly to distal end of propodus; lateral surface and margins with plumose setae. Merus inflated, unarmed, with plumose setae on margins. Basis incompletely fused with ischium, without crista dentata. Exopod 2-segmented, proximal segment small, distal segment styliform, tapering, approximately 1/2 length of merus, plumose setae on margins; flagellum 1-segmented, almost reaching distal end of merus.

Pereopod I subchelate. Dactylus (Fig. 9A) curved and tapering; lateral and mesial surfaces smooth, dorsal margin with long plumose and short simple setae, ventral margin with short simple setae. Propodus (Fig. 9A) lateral surface with numerous short, transverse rows of setose rugae, dorsal margin unarmed, ventral margin distally produced into acute spine, cutting edge lacking teeth, lined with long plumose setae; lateral, mesial and ventral margins with long setae. Carpus unarmed, dorsal and distal margins with long plumose setae; lateral surface with few transverse rows of setae; mesial surface smooth, with scattered rows of long plumose setae, margins with long plumose setae. Merus unarmed; lateral surface with scattered transverse rows of long plumose setae, margins with long plumose setae; mesial side with few short rows of setae. Basi-ischium incompletely fused, unarmed. Coxa unarmed.

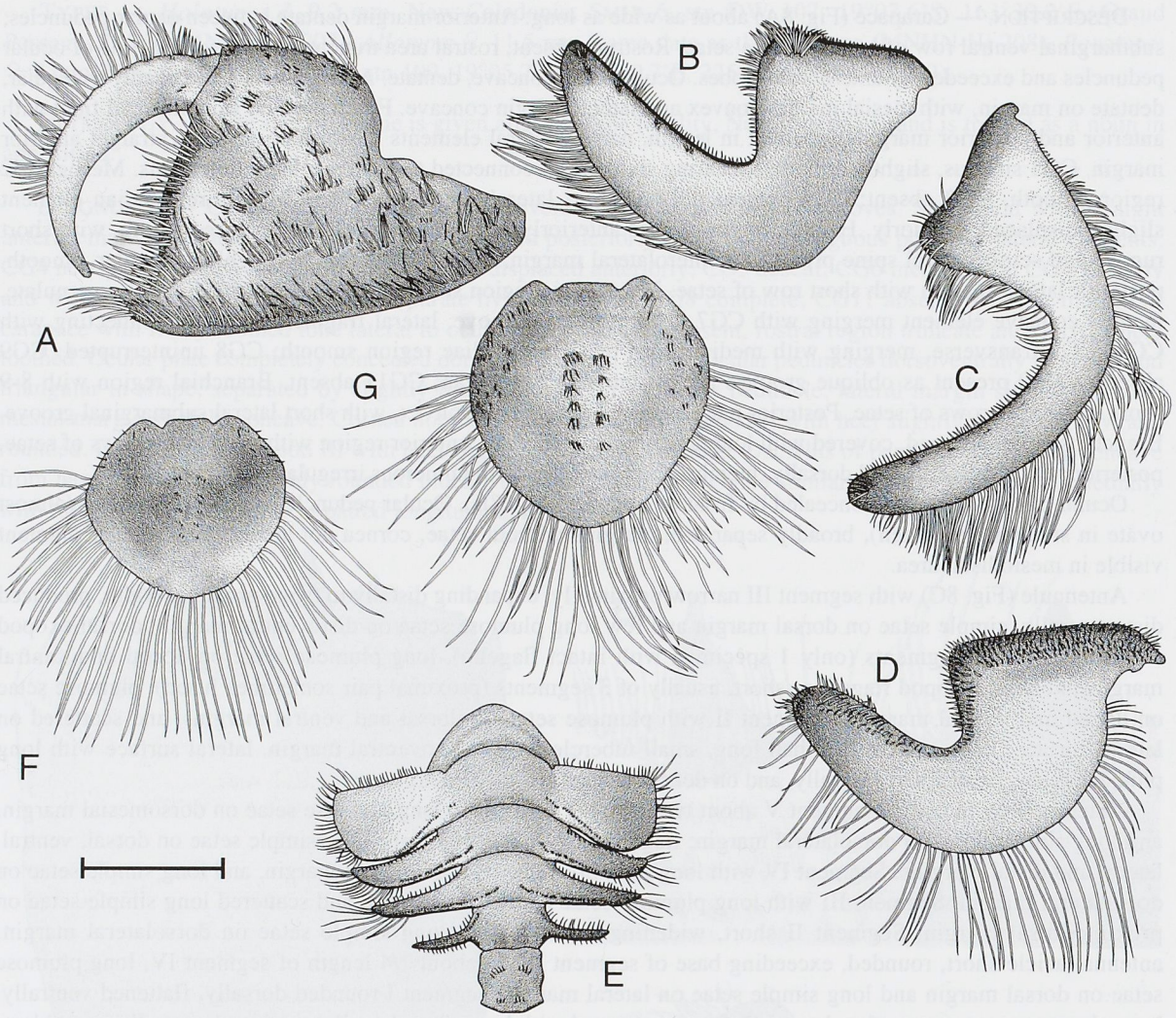

FIG. 9. — *Austrolepidopa caledonia* sp. nov., ♀, allotype, 11.5 mm (MNHN-Hi 208) (A–E, G); ♂, holotype, 9.2 mm (MNHN-Hi 207) (F). **A**, left chela, lateral view; **B**, left pereopod II dactyl, lateral view; **C**, left pereopod III dactyl, lateral view; **D**, left pereopod IV dactyl, lateral view; **E**, abdomen, dorsal view; **F**, telson of male, dorsal view; **G**, telson of female, dorsal view. Scale = 2.0 mm (A–D, F, G), and 4.0 mm (E).

Pereopods II-IV with dactyli laterally compressed and dorsoventrally expanded.

Pereopod II dactylus (Fig. 9B) smooth, base to heel slightly concave, heel with smoothly rounded low spur, heel to tip broadly indented and wide, tip rounded, tip to base broadly convex; lateral surface smooth, few setae along dorsal margin between heel and tip; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short plumose setae and a patch of long plumose setae between heel and base (not illustrated). Propodus dorsal surface smooth, ventral margin inflated and rounded, oblique open row of long plumose setae on lateral surface, distal and ventral margins with long plumose setae; dorsolateral surface a narrow, oblique, flattened shelf, short setae on dorsal margin and long plumose setae on ventral margin; mesial surface with curved row of simple setae from ventral junction with dactylus almost to ventral proximal junction with carpus. Carpus slightly inflated and produced, gently rounded; lateral surface nearly smooth, with irregular, broken row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae, margins with long plumose setae; mesial surface smooth, submarginal and marginal rows of long plumose setae dorsally. Merus lateral surface fully

calcified, long plumose setae on margins; mesial surface with row of long plumose setae below dorsal margin and row of setal patches 1/3 from ventral margin. Basi-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III dactylus (Fig. 9C) with base to heel slightly concave, heel low and rounded, heel to tip broadly concave, tip rounded, tip to base smoothly convex; lateral surface smooth, dorsal margin with few tufts of setae; mesial surface smooth, with plumose setae proximally between heel and junction with propodus, ventral margin with long plumose setae, dorsal margin with short simple and plumose setae. Propodus not much inflated; lateral surface smooth, dorsolateral surface a narrow, oblique, flattened shelf, long plumose setae distally, simple setae on margins, long plumose setae on ventral margin; mesial surface with scattered long setae on and near distal margin. Carpus produced, nearly reaching distal margin of propodus, broadly rounded and inflated distally, dorsolateral margin unarmed; lateral surface covered with numerous rows of short, simple setae forming a setal mat, increasingly prominent distally; mesial surface smooth, long plumose setae on margins. Merus smooth, ovate, dorsal and ventral margins unarmed, with long plumose setae, laterodistal margin with long plumose setae; lateral surface fully calcified; mesial surface smooth. Basi-ischium incompletely fused and unarmed. Coxa unarmed. Female with large gonopore on ventral surface of coxa, lacking setae, male with similar but smaller pore.

Pereopod IV dactylus (Fig. 9D) with base to heel straight, heel to tip broadly concave, tip rounded, tip to base evenly convex, heel and blade of dactylus subequal in length; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface smooth, plumose setae proximally. Propodus expanded dorsally and ventrally; ventral expansion equals ventral dactylus margin, numerous short simple setae at margins; dorsal expansion with row of long plumose setae; lateral and mesial surfaces smooth. Carpus not produced dorsodistally; lateral and mesial surfaces smooth, dorsal margin with short simple and long plumose setae, ventral margin with short plumose setae. Merus with scattered short transverse rows of setae on lateral surface, dorsal and ventrodistal margins with long plumose setae, ventrodistal angle slightly expanded, ventral surface fully calcified, smooth. Basi-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod V reduced, slender. Coxa of male with large mesiodistal gonopore.

Abdomen (Fig. 9E) with somite I approximately as wide as long, widest posteriorly, dorsal surface with anterior margin straight, small submarginal decalcified spots anteriorly, posterior margin slightly concave, submarginal row of short setae on elevated ridge, open row of setae anterior to ridge. Somite II anterior margin straight, with tuft of setae at posterolateral angle; pleura expanded and directed slightly anteriorly, lateral margins angled anteriorly and rounded posteriorly, anterior and lateral margins with long plumose setae, posterior margin with row of short setae, becoming submarginal posteromesially. Somite III similar to somite II, but shorter; pleura thinner and shorter than those of somite II, directed anteriorly, with setae as in somite II, anterolateral angle acute, dorsal surface obliquely flattened anterolaterally. Somite IV similar to somite III, but thinner and shorter; with posterior row of setae interrupted in median of posterior margin; pleura thinner and shorter than on somite III, directed laterally and slightly anteriorly, dorsal surface obliquely flattened anterolaterally, margins with long plumose setae. Somite V narrower than somite IV; pleura about 2/3 as long as on somite IV, directed posteriorly and laterally, with setae as in somite IV, except with posterior row setae terminating at posterolateral angle of somite. Somite VI subequal to somite V in width but longer, dorsal surface with short oblique rows of setae laterad to midline posteriorly and medially, anterolateral margins with scattered plumose setae; pleura absent.

Females with uniramous, paired pleopods on somites II-V, males with small pleopod buds on somites II-V.

Uropods lacking distinctive features.

Telson of male (Fig. 9F) ovate, slightly wider than long, smoothly rounded posteriorly, dorsal surface with 6 short transverse rows of setae laterad to midline in median 1/3 of segment, rugose near anterolateral angle, with short setae, margins with long plumose setae. Telson of female (Fig. 9G) similar to that of male, with larger rugose areas anterolaterally.

DISTRIBUTION. — Known from only New Caledonia; 205-225 m depth.

REMARKS. — *Austrolepidopa caledonia* is most closely related to the west Australian *A. trigonops* Efford & Haig, 1968, of which we have examined the holotype (WAM 62-62) and one of the paratypes (WAM 72-62). Besides the considerable differences in geographic location and bathymetric distribution (*A. trigonops* ranges from 11 to 36 m), *A. trigonops* differs from *A. caledonia* in having larger anterolateral spines, deeper ocular sinuses and

less anteriorly projected setal field. The carapace grooves also differ between the two species; for example, in *A. trigonops*, the median section of CG4 in the metagastric region is broken into four short elements, and CG8 is interrupted medially and less produced laterally.

As mentioned earlier, there has been some confusion regarding sexual characteristics in this genus. For example, the holotype of *A. trigonops* is not a female, as identified by EFFORD and HAIG (1968), but rather a male. In this genus, males not only possess gonopores on the coxae of the fifth pereopods, but also have small but distinct pores on the coxae of the third pereopods, as well as small pleopod buds on abdominal somites 2-5. Females have gonopores on only the third pereopod coxae and long, well developed pleopods on abdominal somites 2-5.

The present record from 225 m is the greatest depth reported for any species in the Albuneidae, considerably exceeding the previous record, 151 m for a specimen of *Albunea symmysta* (Linnaeus, 1758) from the Philippines (USNM 68613; previously unpublished). *Austrolepidopa caledonia* appears to live in a habitat at least partially composed of pteropod ooze, as evidenced by the small *Limacina*-type pteropods (Mollusca) found adhered to the holotype (P. MIKKELSEN, personal commun.).

Family HIPPIDAE Latreille, 1825

Genus *HIPPA* Fabricius, 1787

REMARKS. — Systematic literature on the genus *Hippa* is extensive but confusing, and in many cases it is impossible to determine which species are referred to without direct examination of specimens. As it is beyond the scope of this study to resolve these problems, we give only select references in the lists of synonyms for species in this genus.

Hippa pacifica (Dana, 1852)

Fig. 10

Remipes pacificus Dana, 1852: 407-408; 1855: pl. 25, figs 7a-g. — DE MAN, 1896: 462, 476-478; 1898: 705, pl. 33, figs 53, 53a-c; 1902: 690.

Remipes testudinarius - MIERS, 1878: 316-318 (in part), probably pl. 5, fig. 1 (not *R. testudinarius* Latreille, 1806 = *Hippa adactyla* Fabricius, 1787).

Hippa pacificus - THOMASSIN, 1969: 157-160, pl. 7, text figs 7c, 8c, 10.

Hippa pacifica - EFFORD, 1972: 119-121. — HAIG, 1974b: 181-183, fig. 3 (and references therein). — BAUCHAU, 1985: 313-314, pl. 4, pl. 5b-c.

Hippa pacific [sic] - SUN & WANG, 1996: 28-29, fig. 2.

MATERIAL EXAMINED. — **New Caledonia**. Islets Sainte-Marie, southwest lagoon, intertidal, coll. BARGIBANT, 14.02.1988: 1 ov. ♀ 16.4 mm (MNHN-Hi 211). — Poé beach, intertidal, coll. DANIGO: 2 ♀ 10.7-12.5 mm ; 2 ov. ♀ 16.5-17.9 mm (MNHN-Hi 215). — Vata cove, intertidal, coll. Rudo VON COSEL, 3.11.1993: 1 ♂ 14.6 mm ; 2 ov. ♀ 18.5-20.1 mm (MNHN-HI 216).

MONTROUZIER EXPEDITION. *Touho Bay*: intertidal, 8.09.1993: 2 ov. ♀ 13.4-16.4 mm (MNHN-Hi 212). — Intertidal, 9.09.1993: 14 ♂ 5.5-11.8 mm ; 3 ♀ 12.9-16.5 mm ; 2 ov. ♀ 15.4-16.1 mm (MNHN-Hi 213). — Intertidal, 9.09.1993: 1 ♀ 12.0 mm ; 1 ov. ♀ 18.9 mm (MNHN-Hi 214).

Loyalty Islands. Niri Bay, intertidal, June 1986: 17 ♂ 5.0-11.6 mm ; 20 ♀ 6.1-18.7 mm ; 13 ov. ♀ 12.2-20.2 mm (MNHN-Hi 210).

Hawaii. Flag Poles, Kailua Beach, intertidal, coll. F. MAK, K. BUNNEY, Y. KIM, 27.05.1996: 6 ♂ 7.3-12.3 mm ; 6 ♀ 11.0-15.3 mm ; 1 ov. ♀ 13.7 mm (A. HARVEY personal coll.).

TYPES. — *Syntypes*: Hawaii and Fiji Islands. 1 specimen, Sandwich [= Hawaiian] Islands (MCZ 1406; not examined for this study). Whereabouts of syntypes from Fiji Islands unknown.

DIAGNOSIS. — Carapace (Fig. 10A) covered with wavy, transverse grooves. Frontal margin (Fig. 10B) with four rounded lobes, mesial pair slightly less projecting than lateral pair, separated by a shallow concavity, rarely

with a minute median denticle. Lateral margin of carapace (Fig. 10C) with submarginal row of 30–40 slightly elongate, setose pits. Antenna (Fig. 10D) normally with two-segmented flagellum. Dactylus of second and third pereopods with concave dorsal margin, indent obtuse. Telson (Fig. 10E) with lateral margins slightly convex, smoothly converging distally (modified from HAIG, 1974b).

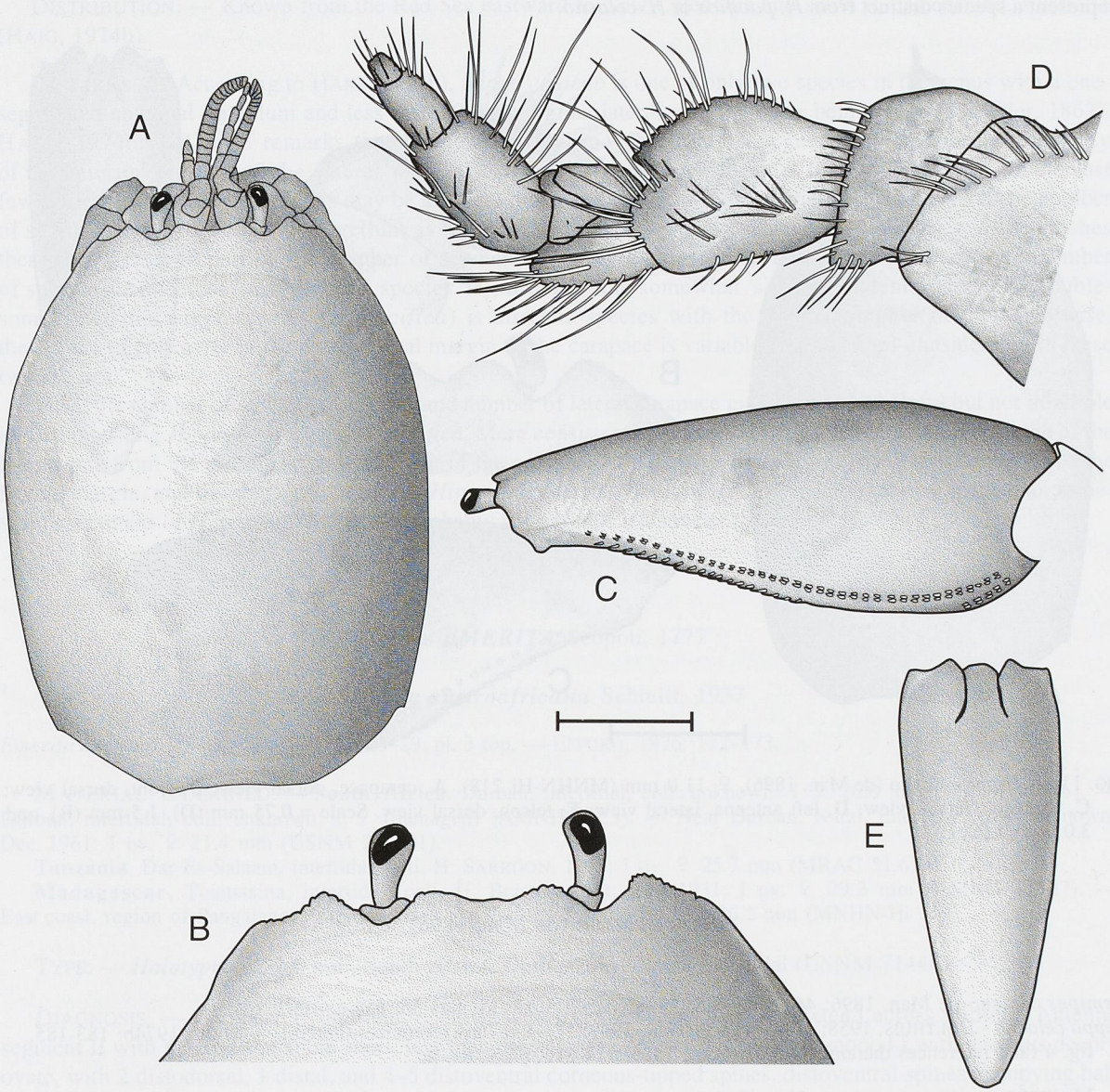

FIG. 10. — *Hippa pacifica* (Dana, 1852), ♀ 12.1 mm (MNHN-Hi 210). **A**, carapace, dorsal view; **B**, front, dorsal view; **C**, carapace, lateral view; **D**, left antenna, lateral view; **E**, telson, dorsal view. Scale = 0.75 mm (D), 1.5 mm (B), and 3.0 mm (A, C, E).

DISTRIBUTION. — One of the most widely ranging anomurans; known from Tanzania eastward to Australia, north to China and across to the Hawaiian Islands (HAIG, 1974b; SUN & WANG, 1996). It is also found in the east Pacific from the upper Gulf of California south to Panama as well as Socorro, Clipperton, Cocos, and the Galápagos Islands (EFFORD, 1972).

REMARKS. — One of the key diagnostic features of *Hippa pacifica* is the two-segmented antennal flagellum. Interestingly, in several of the New Caledonian specimens one of the antennal flagella has the normal two segments and the other has only one segment. In a more problematic specimen from Niri Bay (MNHN-Hi 210), both antennae are 3-segmented, and the frontal margin closely resembles that of *H. celaeno*, but in most other respects this specimen is characteristic of *H. pacifica*. Additional material may eventually show this specimen to represent a species distinct from *H. pacifica* or *H. celaeno*.

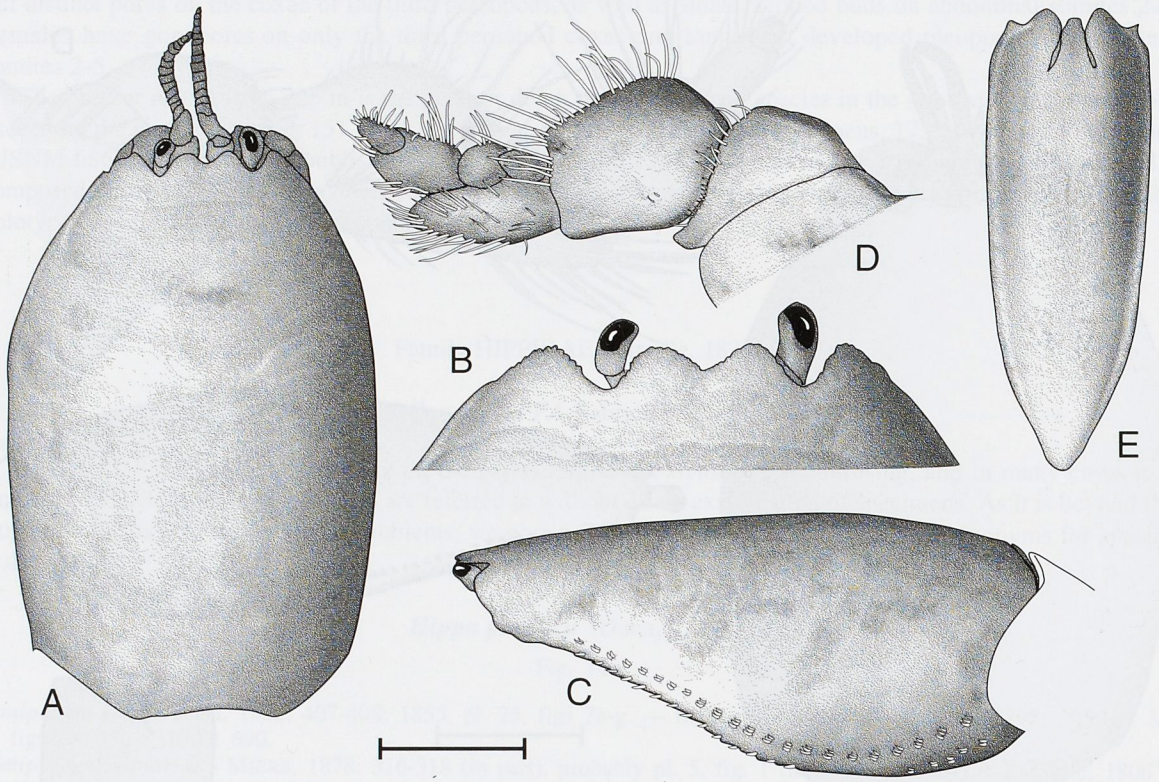

FIG. 11. — *Hippa celaeno* (de Man, 1896), ♀ 11.0 mm (MNHN-Hi 218). **A**, carapace, dorsal view; **B**, front, dorsal view; **C**, carapace, lateral view; **D**, left antenna, lateral view; **E**, telson, dorsal view. Scale = 0.75 mm (D), 1.5 mm (B), and 3.0 mm (A, C, E).

Hippa celaeno (de Man, 1896)

Fig. 11

Remipes celaeno de Man, 1896: 462, 483-488; 1898: 705-706, pl. 33, figs 55, 55a-e; 1902: 690.
Hippa celaeno - HOLTHUIS, 1958: 42. — LEWINSOHN, 1969: 173-174 (and references therein). — HAIG, 1974b: 183-185, fig. 4 (and references therein). — BAUCHAU, 1985: 314-315, pls 6, 8a, 9c.

MATERIAL EXAMINED. — **New Caledonia**. MONTROUZIER EXPEDITION. *Touho Bay*: intertidal, 8.09.1993: 1 ov. ♀ 9.9 mm. (MNHN-Hi 217). — Intertidal, 9.09.1993: 1 ♂ 5.9 mm ; 8 ov. ♀ 10.9-12.32 mm.(MNHN-Hi 218).

TYPES. — Indonesia: Makassar and Amboina. 3 syntypic lots are in the RMNH (D1641, D1751, D2618, see FRANSEN *et all.*, 1997) but they were not examined.

DIAGNOSIS. — Carapace (Fig. 11A) covered with wavy, transverse grooves. Frontal margin (Fig. 11B) with four dentate, rounded lobes, mesial pair as projecting as lateral pair, separated by a deep concavity. Lateral margin

of carapace (Fig. 11C) with submarginal row of 20–30 slightly elongate, setose pits, row sharply diverging from margin posteriorly. Antenna (Fig. 11D) with one-segmented flagellum. Dactylus of second and third pereopods with concave dorsal margin, obtuse indent. Telson (Fig. 11E) with lateral margins parallel proximally, slightly concave and with a noticeably constricted tip (modified from HAIG, 1974b).

DISTRIBUTION. — Known from the Red Sea eastward to New Caledonia and south to Queensland, Australia (HAIG, 1974b).

REMARKS. — According to HAIG (1974b), *Hippa celaeno* is one of only two species in the genus with a one-segmented antennal flagellum and less than 30 submarginal lateral pits, the other being *H. picta* (Heller, 1862). HAIG (1974b: 184) also remarks that "*Hippa celaeno* may be easily recognized by the abrupt concavity of the anterior portion of the lateral margin, and by the strong divergence from that margin of the last few setiferous pits". However, this may be an oversimplification. As mentioned under *Hippa pacifica*, the number of segments in the antennal flagellum is somewhat variable; indeed, HAIG's (1974b) key distinguishes these two species in part by the number of segments "normally" present. In addition, we find that the number of submarginal setose pits in both species is variable and somewhat size dependent, which is troublesome since the larger species (*H. pacifica*) is also the species with the greater number of pits. Likewise, the degree of concavity in the anterolateral margin of the carapace is variable, and overlaps considerably in these two species.

Thus, the number of antennal segments and number of lateral carapace pits seem to be helpful but not infallible in distinguishing *Hippa celaeno* and *H. pacifica*. More consistent characters include the degree of divergence of the lateral pits from the posterior lateral margin of the carapace, the relative depth of the median indentation of the frontal margin, and the shape of the telson. *Hippa celaeno* also has a relatively more slender carapace than same-sized specimens of *H. pacifica*, but this is probably too variable a character to be reliable.

Genus ***EMERITA*** Scopoli, 1777

Emerita austroafricana Schmitt, 1937

Emerita austroafricana Schmitt, 1937: 25–29, pl. 3 top. — EFFORD, 1976: 172–173.

MATERIAL EXAMINED. — **South Africa**. Durban, intertidal, coll. unknown: 1 ♀ 26.0 mm (USNM 71446). — Durban, intertidal, coll. unknown: 1 ♀ (damaged) (AMNH 1155). — Near Durban, Natal, intertidal, coll. unknown, Dec. 1961: 1 ov. ♀ 21.4 mm (USNM 267801).

Tanzania. Dar Es-Salaam, intertidal, coll. H. SARROON, 1965: 1 ov. ♀ 25.7 mm (MRAC 51.623).

Madagascar. Toamasina, intertidal, coll. H. BLUNTSCHLI, June 1931: 1 ov. ♀ 29.3 mm (AMNH 17537). — East coast, region of Pangalanes, intertidal, coll. A. KIENER, Sept. 1970: 1 ♀ 26.2 mm (MNHN-Hi 219).

TYPE. — *Holotype*: ♀ 26.0 mm, South Africa, Durban Bay, Natal, intertidal (USNM 71446).

DIAGNOSIS. — Carapace cylindrical, covered with transverse grooves that extend across midline. Antenna segment II with mediodistal spine short, less than twice length dorsodistal spine. Pereopod I with dactylus deeply ovate, with 2 distodorsal, 1 distal, and 4–5 distoventral corneous-tipped spines, distoventral spines occupying half to 2/3 ventral margin; carpus with pronounced anteromesial spine.

DISTRIBUTION. — Known from Madagascar and Mozambique south to Durban and Natal, South Africa (EFFORD, 1976). The above record from Dar-Es-Salaam represents an approximately 1000 km northward range extension.

REMARKS. — Scarcely more is known about this species since EFFORD (1976) summarized its distribution and commented that it is one of the least known members of the genus.

Annotated list of the tropical Indo-West Pacific species of the superfamily Hippoidea

(Taxa listed in bold-faced text are discussed in the main body of the paper).

ALBUNEIDAE

Albunea elioti Benedict, 1904 (see under *A. microps* in text).

Albunea holthuisi sp. nov.

Albunea madagascariensis Thomassin, 1973, known only from Madagascar.

Albunea microps Miers, 1878.

Albunea speciosa Dana, 1852, known with certainty only from Hawaii (SERÈNE, 1973). The identification of a specimen from the Maldives by BORRADAILE (1904) is questionable and needs reexamination.

Albunea steinitzi Holthuis, 1958 (see under *A. holthuisi* sp. nov. in text).

Albunea symmysta (Linnaeus, 1758), known from the west coast of Africa north into the Red Sea and east to the Philippines and Japan (THOMASSIN, 1969). However, many of these records are not *A. symmysta sensu stricto* (BOYKO, unpublished) and the true range of this species is not completely known.

Albunea thurstoni Henderson, 1893, known from India and the Red Sea (LEWINSOHN, 1969). THOMASSIN's (1969) specimens from Madagascar are referable to *A. madagascariensis* (see THOMASSIN, 1973).

Austrolepidopa caledonia sp. nov.

Austrolepidopa schmitti Efford & Haig, 1968, known from Queensland, Australia.

Austrolepidopa trigonops Efford & Haig, 1968, known from Western Australia (see under *A. caledonia* in text).

Leucolepidopa sunda Efford, 1969, known only from the holotype collected in the Sunda Strait between Sumatra and Java.

Paralbunea dayriti (Serène & Umali, 1965), known from the Philippines and China (SUN & WANG, 1996). HAIG (1974a) cited this species in a list of Western Australia anomurans, but we have seen no specimens from that region.

Paralbunea manihinei Serène, 1979, known only from the Seychelles.

Paralbunea mariellae (Serène, 1973), known from Indonesia. HAIG (1974a) cited this species in a list of Western Australia anomurans (as *Albunea* undescribed sp.), but we have seen no specimens from that region.

Paralbunea paradoxa (Gordon, 1938), known from Singapore and the Philippines (see SERÈNE & UMALI, 1965).

Stemonopa insignis Efford & Haig, 1968, known only from the holotype collected in Western Australia.

Zygopa nortoni Serène & Umali, 1965, known only from the Philippines.

HIPPIDAE

Emerita austroafricana Schmitt, 1937.

Emerita emeritus (Linnaeus, 1767), known from the west coast of India eastward to Vietnam and southward to Sumatra and Java, Indonesia (EFFORD, 1976).

Emerita holthuisi Sankolli, 1965, known from the southern Red Sea along the coast to the southern west coast of India (EFFORD, 1976).

Emerita karachiensis Niazi & Haque, 1974, known only from Karachi, Pakistan. A probable synonym of *E. holthuisi* (unpublished data).

Hippa adactyla Fabricius, 1787, known from the west coast of Madagascar to Australia, eastward to the Marquesas Islands, and northward to Japan (HAIG, 1974b).

Hippa admirabilis (Thallwitz, 1892), known from New Guinea and Indonesia (DE MAN, 1896).

Hippa alcimede (de Man, 1902), known only from Java, Indonesia. A possible synonym of *H. hirtipes*; the allometric features DE MAN used to distinguish the smaller *H. alcimede* from *H. hirtipes* are consistent with size-related allometric changes within other hippid species (unpublished data).

Hippa australis Hale, 1927, known from South and Western Australia (HAIG, 1974b).

Hippa celaeno (de Man, 1896).

Hippa granulatus (Borradaile, 1904) (not in key), known from the Maldives. This species is a possible synonym of *H. alcimede* (see HAIG *et al.*, 1986).

Hippa hirtipes (Dana, 1852), known from a few records in Indonesia and Papua New Guinea (BAUCHAU, 1985).

Hippa indica Haig, Murugan & Balakrishnan Nair, 1986, known only from the southwest coast of India.

Hippa marmoratus (Jacquinot, 1846) (not in key), known only from Raffles Bay, Australia (HAIG 1974b), is a possible synonym of *H. pacifica* (see HAIG *et al.*, 1986). For date see CLARK & CROSNIER (in press).

Hippa ovalis (A. Milne Edwards, 1862), known from the east coast of Africa eastward to Papua New Guinea (BAUCHAU, 1985).

Hippa pacifica (Dana, 1852).

Hippa picta (Heller, 1862), known from the Red Sea (HOLTHUIS, 1958).

Hippa truncatifrons (Miers, 1878), known from Japan and China (HAIG *et al.*, 1986).

Mastigochirus gracilis (Stimpson, 1858), known only from China (SUN & WANG, 1996).

Mastigochirus quadrilobatus Miers, 1878, known from India, the Philippines, Western Australia and Queensland, Australia (HAIG, 1974b).

Key to the tropical Indo-West Pacific species of the superfamily Hippoidea

1. Pereopod I dactylus subchelate ..... Albuneidae ... **2**
— Pereopod I dactylus simple ..... Hippidae ... **19**

2. Abdominal somite V with pleura **3**
— Abdominal somite V without pleura **6**

3. Antenna with 3 flagellar articles ..... *Leucolepidopa sunda* Efford, 1969
— Antenna with more than 3 flagellar articles ..... *Austrolepidopa* Efford & Haig, 1968 ... **4**

4. Ocular peduncles triangular in shape, rostral area margin dentate **5**
— Ocular peduncles ovate, rostral area margin smooth ..... *A. schmitti* Efford & Haig, 1968

5. Setal field projecting almost to base of ocular sinus, CG8 entire .....
..... ***A. caledonia*** sp. nov.
— Setal field projecting anteriorly on level with base of lateral carapace spine, CG8 broken
..... ***A. trigonops*** Efford & Haig, 1968 (see under *A. caledonia* sp. nov. in text)

6. Antennal segment I with spine ..... *Albunea* Weber, 1795 ... **7**
— Antennal segment I without spine **14**

7. Pereopod III dactylus heel acute **8**
— Pereopod III dactylus heel rounded **10**

8. CG 11 present ..... ***A. holthuisi*** sp. nov.
— CG 11 absent **9**

9. Telson of male spatulate, dorsoventrally compressed ..... *A. symmysta* (Linnaeus, 1758)
— Telson of male ovate with median setose ridge .....
.....***A. steinitzi*** Holthuis, 1958 (see under *A. holthuisi* sp. nov. in text)

10. Ocular peduncle mesial margin straight **11**
— Ocular peduncle mesial margin convex **13**

11. Ocular peduncle lateral margin convex ..... *A. thurstoni* Henderson, 1893
— Ocular peduncle lateral margin concave **12**

12. Rostrum not exceeding distal margin of ocular plate ..... *A. speciosa* Dana, 1852
— Rostrum exceeding distal margin of ocular plate .. *A. madagascariensis* Thomassin, 1973

13. Lateral indentation of cornea approximately 1/6 length of ocular peduncle ..... ***A. microps*** Miers, 1878
— Lateral indentation of cornea approximately 1/2 length of ocular peduncle ..... ***A. elioti*** Benedict, 1904 (see under *A. microps* in text)

14. Ocular peduncles fused ..... *Zygopa nortoni* Serène & Umali, 1965
— Ocular peduncles separate **15**

15. Ocular peduncles equal to or greater than carapace length ..... *Stemonopa insignis* Efford & Haig, 1968
— Ocular peduncles less than carapace length ..... *Paralbunea* Serène, 1979 ... **16**

16. Pereopod III dactylus heel acute **17**
— Pereopod III dactylus heel rounded **18**

17. Pereopod IV dactylus heel acute ..... *P. paradoxa* (Gordon, 1938)
— Pereopod IV dactylus heel rounded ..... *P. dayriti* (Serène & Umali, 1965)

18. Carapace nearly smooth ..... *P. manihinei* Serène, 1979
— Carapace coarsely granular ..... *P. mariellae* (Serène, 1973)

19. Antennal flagellum at least as long as carapace, densely covered ventrally with long plumose setae ..... *Emerita* Scopoli, 1777 ... **20**
— Antennal flagellum considerably shorter than carapace **22**

20. Pereopod I dactylus more than twice as long as wide, dorsal margin lacking spines ..... *E. holthuisi* Sankolli, 1965
— Pereopod I dactylus less than twice as long as wide, dorsal margin armed with spines. **21**

21. Pereopod I dactylus with spines along distal two-thirds or more of ventral margin ..... ***E. austroafricana*** Schmitt, 1937
— Pereopod I dactylus with spines along distal half of ventral margin ..... *E. emeritus* (Linnaeus, 1767)

22. Pereopod I dactylus nearly as long as carapace, multiarticulate ..... *Mastigochirus* Miers, 1878 ... **23**
— Pereopod I dactylus less than one-fourth length of carapace, nonarticulated ..... *Hippa* Fabricius, 1787... **24**

23. Frontal margin of carapace with 4 teeth; lateral margins of carapace unarmed ..... *M. quadrilobatus* Miers, 1878
— Frontal margin of carapace with 3 teeth; lateral margins of carapace with several spines ..... *M. gracilis* (Stimpson, 1858)

24. Frontal margin of carapace straight or slightly concave; lateral surface of carapace finely punctate; dactylus of pereopods II and III with anterior margin nearly straight ..... *H. indica* Haig, Murugan & Nair, 1986
— Frontal margin of carapace with 1–3 median lobes; lateral surface of carapace with submarginal row of pits or striations; dactylus of pereopods II and III with anterior margin concave **25**

25. Frontal margin of carapace with 2 or 3 median lobes, lateral frontal lobes well developed; lateral surface of carapace with submarginal row of setose pits **26**
— Frontal margin of carapace with 1 broad median lobe, lateral frontal lobes weakly developed; lateral margin of carapace with series of oblique striations or rows of pits **33**

26. Carapace lacking fine transverse grooves, finely punctate **27**
— Carapace covered with fine tranverse grooves **28**

27. Carapace with posterolateral margins oblique ..... *H. hirtipes* (Dana, 1852)
— Carapace with posterolateral margins nearly parallel ..... *H. alcimede* (de Man, 1902)

28. Lateral lobes of carapace front greatly exceed median lobes **29**
— All frontal lobes about equally projecting **30**

29. Dactylus of pereopods II and III with anterior margin cut into right angles; antennal flagellum with 3–6 articles ..... *H. adactyla* Fabricius, 1787
— Dactylus of pereopods II and III with anterior margin obtuse; antennal flagellum with 1–2 articles ..... *H. admirabilis* (Thallwitz, 1892)

30. Antennal flagellum with 1 article; lateral margin of carapace with less than 30 pits in submarginal row **31**
— Antennal flagellum with 2–3 articles; lateral margin of carapace with 30 or more pits in submarginal row **32**

31. Submarginal row of pits diverges from lateral margin of carapace posteriorly; frontal lobes broadly rounded, sinuses between lobes subequal in depth .....
..... ***H. celaeno*** (de Man, 1896)
— Submarginal row of pits does not diverge from lateral margin of carapace posteriorly; frontal lobes triangular, median sinus shallower than lateral sinuses .....
..... *H. picta* (Heller, 1862)

32. Lateral margin of carapace with 30–40 pits; antennal flagellum usually with 2 articles; median frontal lobes separated by shallow sinus, rarely with minute median denticle .....
..... ***H. pacifica*** (Dana, 1852)
— Lateral margin of carapace with 45–55 pits; antennal flagellum with 3 articles; median frontal lobes separated by pronounced, broadly rounded lobe .....
..... *H. ovalis* (A. Milne Edwards, 1862)

33. Dorsal antennular flagellum with 19–26 articles, gradually tapering from base to tip .....
..... *H. truncatifrons* (Miers, 1878)
— Dorsal antennular flagellum with 32–40 articles, tapering only near tip .....
..... *H. australis* Hale, 1927

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