

A WORLDWIDE REVISION OF THE  
RECENT AND FOSSIL SAND CRABS OF  
THE ALBUNEIDAE STIMPSON AND  
BLEPHARIPODIDAE, NEW FAMILY  
(CRUSTACEA: DECAPODA:  
ANOMURA: HIPPOIDEA)

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## ABSTRACT

The anomuran sand crab family Albuneidae *sensu stricto* was previously known worldwide from 41 validly described Recent species in eight genera and four fossil taxa of the genus *Albunea*. A worldwide revision is presented based on a comprehensive survey of the literature and examination of more than 1700 specimens representing all known species. The state of taxonomic knowledge regarding the Albuneidae is summarized; the family is divided into two new subfamilies; two new genera and six new species of albuneids are described; and new information on species' ranges and biology is presented. Additionally, the genera *Blepharipoda* Randall and *Lophomastix* Benedict are removed from the Albuneidae and placed in a new family, based in part on characters of the gill formula and morphology. This new family contains six Recent species and one fossil taxon. Although there is some doubt about its hippoid affinities, it is retained in the Hippoidea as the most basal taxon, pending further cladistic phylogenetic analyses.

*Here and there are people with eyes which can see, minds which can correlate. They say to themselves: "If the science of the day before yesterday is rejected by the people of yesterday, and that of yesterday by us of today, is it not possible that what we call science now will be rejected by the men of tomorrow?" And the bravest of them answer, "It is possible."*

Wassily Kandinsky, 1911, Concerning the Spiritual in Art

## 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. The first described genus was *Albunea* Weber, 1795, a heterogeneous assemblage that included an albuneid (fig. 1C, although the species was *Cancer symmysta* Linnaeus rather than *C. carabus* Linnaeus) and two raninids (fig. 1D, E). Later authors also included thiid (fig. 1A) and corystid (fig. 1B) brachyurans in the Albuneidae, due to the convergently evolved sand-burrowing morphology of these taxa as well as to misinterpretations of early species descriptions. Most nonalbuneid taxa have long since been removed from this family (see under Blepharipodidae, n. fam., and appendix 2), but little work has been done in the Albuneidae at the alpha-taxonomic level or in elucidating the phylogenetic relationships of the species and higher taxa both within the family and within the Anomura and Decapoda. Historically, there has been little systematic work in either previously recognized hippoid family (i.e., the Albuneidae and the Hippidae) on a regional or worldwide basis. Prior to 1938, publications exclusively on albuneids were limited to those of Miers (1878) and Ortmann (1896), in which both authors listed the

known taxa but were unable to examine specimens of many taxa firsthand. Later, Gordon (1938) presented the first modern compilation of albuneid taxa, based mainly on material in the British Museum of Natural History and the Smithsonian Institution, and discussed the relationships among the known genera.

Subsequent to Gordon (1938), the few publications on albuneids were mostly of a regional nature (e.g., Serène and Umali, 1965 for Philippine albuneids; Boyko, 1999 for Hawaiian albuneids; Boyko, 2000a for Marques hippoids). These papers were necessarily limited to a descriptive capacity and added only a little to our understanding of the relationships among species and higher taxa in the family. In the Albuneidae *sensu lato*, there was no comprehensive worldwide study of any genus outside of Schmitt's (1942) review of *Blepharipoda* Randall, 1840, and Efford's (1971) revision of *Lepidopa* Stimpson, 1858. Although Efford's (1971) species concepts were perhaps too narrow, as he described several species that are synonymized herein, his work contained taxonomic keys as well as a discussion of morphological characters useful for the identification of species. Serène's (1977, 1979) review and description of *Paralbunea* Serène was by his own admission incomplete, as he



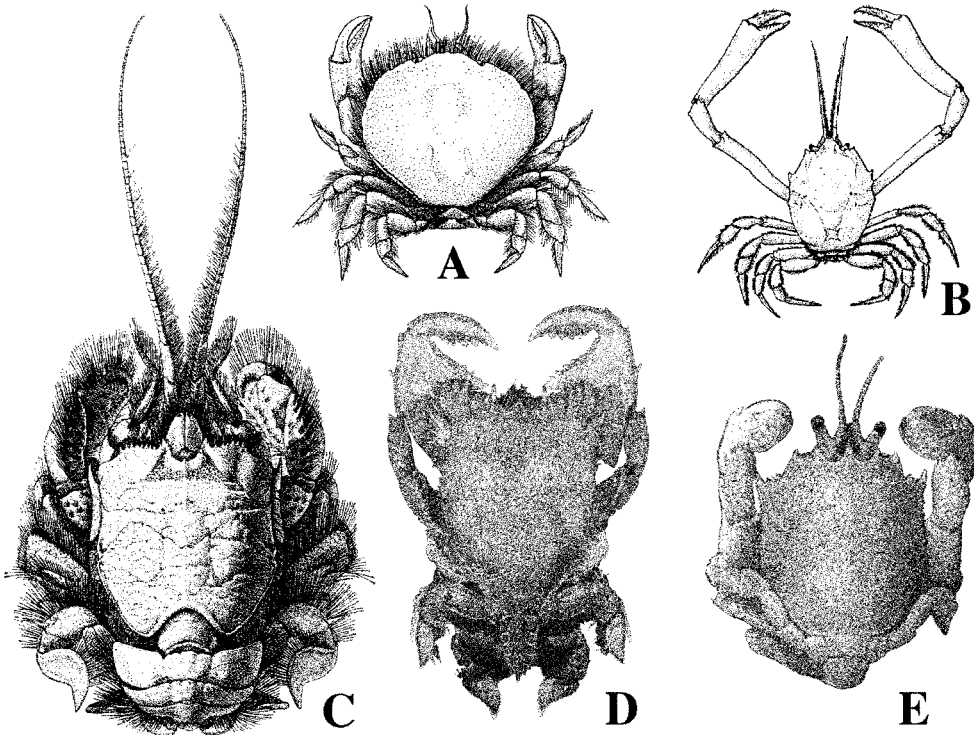


Fig. 1. Convergent crabs: **A.** *Thia scutellata* (Fabricius, 1793). **B.** *Corystes cassivelaunus* (Pennant, 1777). **C.** *Albunea carabus* (Linnaeus, 1758). **D.** *Ranina ranina* (Linnaeus, 1758). **E.** *Notopus dorsipes* (Fabricius, 1787). A, B, after Hayward et al. (1995), C, after Zariquiey Alvarez (1968), D, after Tinker (1965), E, specimen from Madagascar (MNHN). Figures not given to scale.

did not examine specimens of all relevant taxa.

Although Calado (1995) purported to review the taxonomy of all worldwide Albuneidae and Hippidae in her doctoral dissertation, this work is unsatisfactory for several reasons apart from its general unavailability. She examined only single specimens of most non-Brazilian taxa and based her redescrptions on these specimens alone. Additionally, she apparently accepted the identifications on all museum labels as correct, when in fact many specimens were wrongly identified. This led to several situations where an incorrectly identified specimen was used as the basis for the redescription and illustration of species (e.g., a specimen of *Lepidopa mexicana* was described by her as *L. mearnsi*, and her descriptions of *L. californica* and *L. myops* were both based on specimens of *L. californica*). In addition, Calado (1995) saw no material of nine albuneid species and

merely repeated the original descriptions of those taxa (translated into Portuguese) and introduced several misspellings of taxon names. The net result is that Calado's (1995) keys are misleading and serve no practical use for identifying albuneids. These shortcomings also prevent her work from being used for obtaining characters for phylogenetic analyses.

Most recently, Boyko and Harvey (1999) compiled a species list of all the tropical Indo-Pacific hippoids. They gave a key for their identification, described two new species of albuneids, and resolved several occurrences of confusion between similar taxa.

As little as has been written about the hippoid crabs in the realm of alpha-taxonomy, even less is known about the phylogenetic relationships among the species and genera in this superfamily. Efford (1969) proposed a phylogeny for the albuneid genera and later (Efford, 1971) presented a preliminary tree

for the genus *Lepidopa*, but these were based on relatively few morphological characters. To generate a comprehensive phylogeny for the Hippoidea, a better understanding of the taxonomy for the species involved is required. This comprehensive worldwide revision of the Albuneidae sensu lato is the first step toward understanding the relationships not only among the species and genera in this group, but between albuneids and the other hippoids and anomurans (Boyko and Harvey, in prep.).

The Albuneidae sensu stricto was previously known worldwide from 41 valid Recent species in eight genera and four fossil taxa of the genus *Albunea*. In the present work, I have made a comprehensive survey of the literature and examined 1052 cataloged lots (more than 1750 specimens) of albuneids from museums worldwide. Based on these data, I summarize the current state of taxonomic knowledge regarding the Albuneidae, divide the family into two new subfamilies, describe two new genera and six new species of albuneids, and present new information on species ranges and biology. Additionally, I remove the genera *Blepharipoda* Randall and *Lophomastix* Benedict from the Albuneidae and place them in their own new family, the Blepharipodidae, based primarily on characters from gill number and morphology. This new family contains six Recent species and one fossil taxon. Although there is some doubt about the hippoid affinities of the Blepharipodidae, it is retained in the Hippoidea, albeit basal to the Albuneidae and Hippidae, pending further cladistic phylogenetic analyses (Boyko and Harvey, in prep.).

#### ABBREVIATIONS

|      |   |        |  |
|------|---|--------|--|
| AHF  | Allan Hancock Foundation (now in LACM)                                    | BPBM   | Bernice P. Bishop Museum, Honolulu, Hawaii   |
| AM   | Australian Museum, Sydney   | CASIZ  | California Academy of Sciences, Invertebrate Zoology, San Francisco                                    |
| A&M  | Texas A&M University, College Park,                                       | CBB    | Christopher B. Boyko collection  |
| ANSP | Academy of Natural Sciences of Philadelphia, Pennsylvania                 | CBM-ZC | Chiba Museum (Zoology, Crustacea), Chiba, Japan  |
| AMNH | American Museum of Natural History  | GSU    | Georgia Southern University, Statesboro, United States of America                                      |
| BMNH | British Museum (Natural History) (now the Natural History Museum), London | HBOM   | Harbor Branch Oceanographic Museum, Fort Pierce, Florida   |
|      |   | HNHM   | Hungarian Natural History Museum, Budapest   |
|      |   | ICZN   | International Commission on Zoological Nomenclature  |
|      |   | LACM   | Natural History Museum of Los Angeles County, California   |
|      |   | MACN   | Museo Argentino de Ciencias Naturales "Bernardino Rivadavia," Buenos Aires                             |
|      |   | MCZ    | Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts                            |
|      |   | MNB    | Museum für Naturkunde, Berlin  |
|      |   | MNHN   | Muséum National d'Histoire Naturelle, Paris  |
|      |   | MNRJ   | Museu Nacional, Rio de Janeiro   |
|      |   | MOV    | Museum of Victoria, Abbotsford, Australia  |
|      |   | MRAC   | Musée Royal de l'Afrique Centrale, Tervuren, Belgium   |
|      |   | NMCR   | Philippine National Museum, Manila   |
|      |   | NTOU   | National Taiwan Ocean University   |
|      |   | QM     | Queensland Museum, South Brisbane, Australia   |
|      |   | RMNH   | Rijksmuseum van Natuurlijke Historie (now Nationaal Natuurhistorisch Museum), Leiden, The Netherlands  |
|      |   | TU     | Tulane University, Belle Chasse, Louisiana   |
|      |   | UFES   | Coleção Zoológica do Departamento de Biologia, Universidade Federal do Espírito Santo, Vitória, Brazil |
|      |   | UMZC   | University Museum of Zoology, Cambridge, England   |
|      |   | UPRC   | University of Panama Reference Collection  |
|      |   | URI    | University of Rhode Island, Kingston   |
|      |   | USLZ   | University of Louisiana at Lafayette   |
|      |   | USNM   | National Museum of Natural History, Smithsonian Institution, Washington, D.C.                          |
|      |   | WAM    | Western Australian Museum, Perth   |

|       |   |
|-------|---|
| YPM   | Yale Peabody Museum, New Haven, Connecticut                                     |
| ZLKU  | Zoological Laboratory, Kyushu University, Kita-Kyushu, Japan                    |
| ZMH   | Zoologisches Institut und Zoologisches Museum der Universität, Hamburg, Germany |
| ZMO   | Zoologisk Museum, Oslo  |
| ZMTAU | Zoological Museum, Tel-Aviv University  |
| ZMUC  | Zoological Museum, University of Copenhagen                                     |
| ZRC   | Zoological Reference Collection, National University of Singapore               |

#### MORPHOLOGICAL CHARACTERS AND TERMINOLOGY

During this study, several important diagnostic morphological features were encountered that have not been described previously for albuneids or blepharipodids (see also Boyko and Harvey, 1999).

The setal field is a broad mat of very short, dense, simple setae (Boyko and Harvey, 1999) on the front of the carapace of albuneids and blepharipodids. The setal field varies in shape and extent across genera and species, but it appears to be relatively invariant within species. The carapace also possesses numerous transverse, setose grooves. Although carapace grooves (CG) have been scarcely mentioned by previous authors, I have identified 11 major grooves (numbered 1–11, fig. 2A) that can be recognized across albuneid and blepharipodid genera. Variability in the presence and the degree of fragmentation of grooves, in the anterior-posterior displacement of individual fragments, and in the texture of the grooves (e.g., smooth, crenulate) tends to be conservative 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 frontal area. In some genera and species, the curved lateral elements of CG1 are often displaced posteriorly (as in fig. 2A). 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 two well-separated lateral fragments, but in some genera (e.g., *Austrolepidopa* Efford and Haig, 1968 and *Lepidopa*) CG7 merges medially with CG6. CG8–11 are relatively short medial grooves arranged anteriorly to posteriorly in the cardiac region.

The gill type and number are very different in the two families. All blepharipodids possess filamentous trichobranch gills (fig. 2B), two arthrobranches on the second maxilliped, and one pleurobranch on pereopods II–IV. They also lack an epipod on the third maxilliped and an arthrobranch on the fifth pereopod. These gills are similar to those found on some other anomurans, such as aeglids, but are not the biserial or quadriserial phyllobranch gills as found in paguroids that have been misinterpreted as trichobranch (see McLaughlin and de Saint Laurent, 1998). In contrast, all albuneids have lamellar phyllobranch gills (fig. 2C), one arthrobranch on the second maxilliped, an arthrobranch on the fifth pereopod, an epipod on the third maxilliped, and lack pleurobranches on pereopods II–IV.

The ocular peduncles of albuneids and blepharipodids are composed of three segments (fig. 2D; cf. Powar, 1969; terminology herein slightly modified from Boyko and Harvey, 1999, to better conform to Powar's usage). The proximal segments are fused to form the ocular plate, which is the name used herein for this structure. The median peduncular segments are either a pair of small free calcified elements or are fused to the ocular plate. The distal peduncular segments contain the corneas, where those structures have not been lost. The apparent division of the distal peduncular segment in *Blepharipoda* is not a true segmentation, but is only a weak calcification separating the segment into two pseudosegments. The presence in albuneids of ocular acicles has been controversial (e.g., McLaughlin, 1983; Martin and Abele, 1986). However, Boyko and Harvey (1999) conclusively showed that albuneids have no ocular acicles, only a calcified ocular plate and median peduncular segments; this is also true of blepharipodids.

As observed by previous workers, the third maxilliped (fig. 2E) contains a number of morphological characters useful for distin-

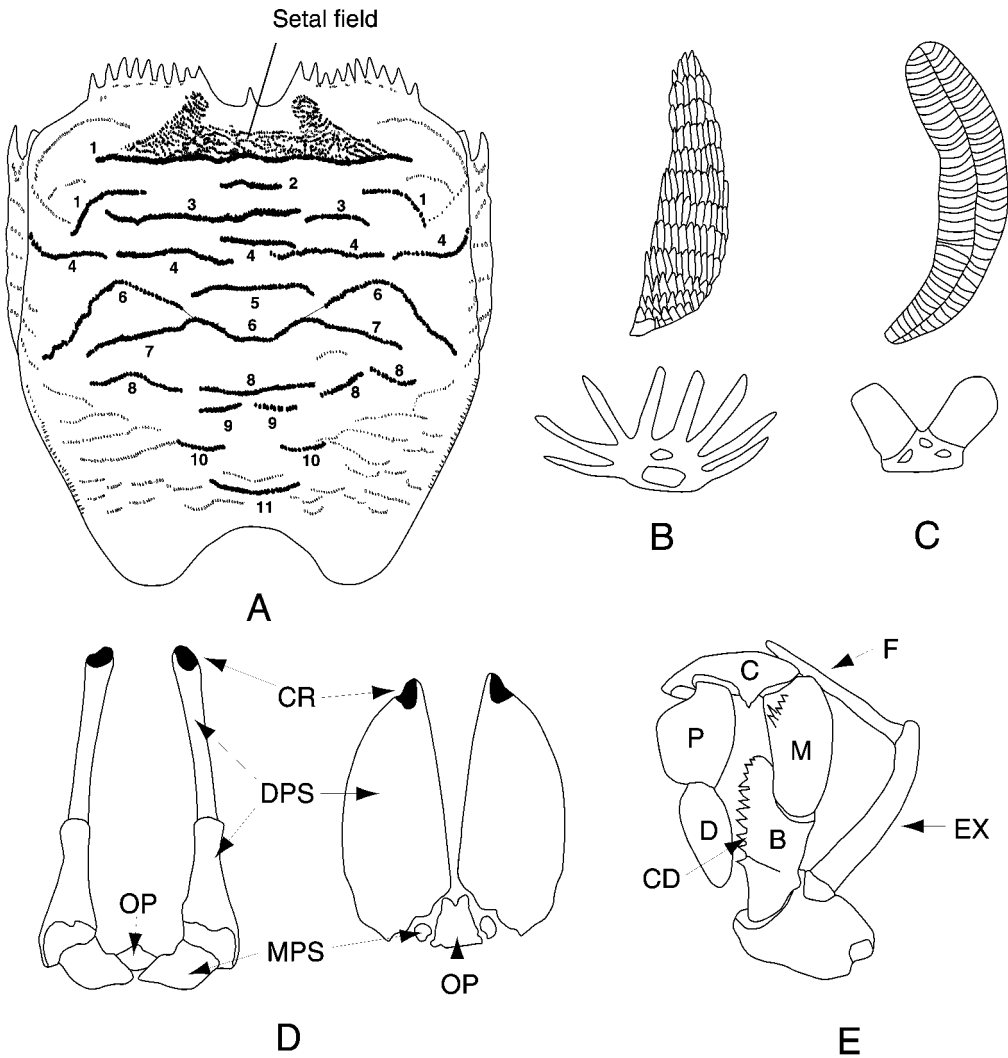


Fig. 2. **A.** Diagrammatic albuneid carapace based on *Albunea microps* Miers, 1878, showing setal field and setose carapace grooves (CG1–11) discussed in text. **B.** Diagrammatic trichobranch gill, whole (upper) and cross-section (lower) (after McLaughlin, 1980). **C.** Diagrammatic phyllobranch gill, whole (upper) and cross-section (lower) (after McLaughlin, 1980). **D.** Ocular peduncles of *Blepharipoda liberata* Shen, 1949 (left) and *A. symmysta* (Linnaeus, 1758) (right). **E.** Maxilliped III of *B. liberata*. Abbreviations: B, basis/ischium; C, carpus; CD, crista dentata; CR, cornea; D, dactylus; DPS, distal peduncular segment; EX, exopod; F, flagellum; M, merus; MPS, medial peduncular segment; OP, ocular plate; P, propodus.

guishing among hippoid genera and species. In most anomurans, the ischium bears a medial row of teeth, termed the crista dentata. Among the hippoids, only the blepharipodids are thought to possess a crista dentata (Martin and Abele, 1986; McLaughlin and Lemaitre, 1997). However, I have observed a

very reduced crista dentata on several species of *Albunea*.

The shape of the dactylus of the pereopod, particularly the third pereopod, has been used to distinguish among species of albuneids. To facilitate the description of the complex shape of this segment, several terms are used



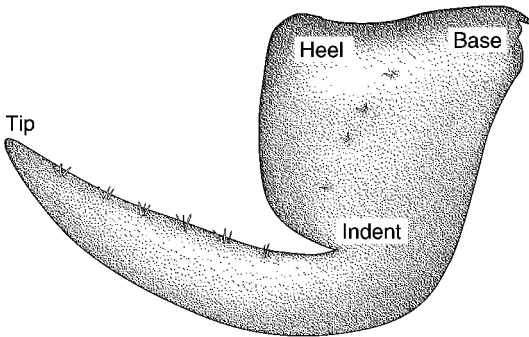


Fig. 3. Pereopod II dactyl of *Albunea* sp., lateral view, showing terms used in species accounts for landmarks on pereopod dactyli.

to refer to important landmarks (fig. 3; see also Boyko and Harvey, 1999). The “base” of the dactylus is the ventroproximal angle; 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 has a distinct angle, the apex of which is referred to as an “indent”. The dactylus terminates in a “tip”, which is somewhat rounded and lacks a corneous nail. As with all anomurans, the fifth pereopods are reduced. The morphology of the fifth pereopods varies little among species and, consequently, it is not included in the species descriptions.

In some species of albuneids and blepharipodids, certain segments of the pereopods bear a large transparent, decalcified area, hereafter called the “window,” that has only recently been reported in this family (Boyko and Harvey, 1999). This area, when present, is most prominent on the lateral surface of the merus (e.g., see fig. 27C), where it is comparable to the “leg membranes” of porcelain crabs (Porcellanidae) discussed in detail by Stillman and Somero (1996). If these windows are homologous with those of the porcelain crabs, they most likely function as respiratory structures. Similar structures, called “gas windows”, with a demonstrable respiratory effect, have been reported from the pereopods of certain ocypodid crabs (Brachyura: Ocypodidae) (Maitland, 1986), but these are almost certainly analogous, convergently evolved structures to the ones found on anomurans, rather than being ho-

mologous ones. These windows can also be found to a lesser degree on other pereopod segments of albuneids and blepharipodids, both laterally and mesially.

As in all 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 and species (e.g., *Lepidopa*), males also have a small pore on the coxa of the third pereopod in a position analogous to that of the female gonopore. The precise nature and function of this pore are unknown. Male blepharipodid crabs never possess a pore on the third pereopod coxae.

In albuneids, females have well-developed uniramous pleopods on abdominal somites II–V. Male albuneids have traditionally been considered to lack pleopods (Efford and Haig, 1968). However, I have found rudimentary to small pleopods on abdominal somites II–V of male specimens with well-developed gonopores on the fifth pereopods in species of several albuneid genera (e.g., *Lepidopa*). In some *Albunea* species (e.g., *A. microps*, *A. speciosa*), specimens with large pores on the fifth pereopods, and with small pores on the coxae of the third pereopods, show no signs of pleopod development. In those species in which the third pereopod pore occurs in the male, 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 by the rudimentary degree of development of the pleopods or lack thereof. In small specimens, however, the presence or absence of the male fifth pereopod gonopore is a more reliable indicator of sex than is pleopod development because both males and females may have small pleopod buds as juveniles. Male blepharipodid crabs have no trace of pleopod development. Male sand crabs and spiny sand crabs are typically subequal in size to, or slightly smaller than, females, except in *Blepharipoda occidentalis* where males are significantly larger (Boyko and Mikkelsen, 2002). There is no evidence of any species of albuneid or blepharipodid with dwarf or neotenous males, as found in



nose. Pereopods II–IV dactyli laterally compressed and dorsoventrally expanded; dorsal margins of carpi spinose. Pereopod V reduced, chelate. Abdomen with pleura on somites II–V. Females with uniramous, paired pleopods on somites II–V; males without pleopods. Uropods present. Telson entire, ovate, laterally expanded. Telson sexual dimorphism weak to absent.

Gill formula (podobranch/arthrobranch/pleurobranch): maxilliped I, 0/0/0; maxilliped II, 0/0/0; maxilliped III, 0/0/1+1 rudimentary; pereopod I, 0/2/0; pereopod II, 0/2/1; pereopod III, 0/2/1; pereopod IV, 0/2/1; pereopod V, 0/0/0.

DISTRIBUTION: Eastern and western Pacific Ocean, also southwestern Atlantic Ocean. Exclusively antitropical.

TYPE GENUS: *Blepharipoda* Randall, 1840.

INCLUDED GENERA: *Blepharipoda* Randall, 1840; *Lophomastix* Benedict, 1904.

REMARKS: These two genera form a monophyletic unit that is either basal to the Hippidae and Albuneidae within the Hippoidea, or is one of the basal families of the Galatheaidea. Current evidence is equivocal as to the correct placement of this group at the superfamily level, and it is retained in the Hippoidea pending further study (Boyko and Harvey, in prep.). There is no doubt, however, that the retention of these two genera in the Albuneidae results in that family being paraphyletic, and so this new family is erected to contain them. The suggested common name for this family is “spiny sand crabs.”

#### KEY TO GENERA

- 1 Carapace with two hepatic lateral spines, distal segment of ocular peduncle subdivided into two pseudosegments . . . *Blepharipoda*  
 – Carapace with one hepatic lateral spine, distal segment of ocular peduncle entire . . . . .  
 . . . . . *Lophomastix*

#### LOPHOMASTIX BENEDICT, 1904

*Blepharopoda* [sic]: Duruflé, 1889: 92–95 (part).—Bouvier, 1898a: 566.—Bouvier, 1898b: 337 (part) (not *Blepharipoda* Randall, 1840).

*Blephacopoda* [sic]: Duruflé, 1889: unnumbered fig. (not *Blepharipoda* Randall, 1840).

*Lophomastix* Benedict, 1904: 621. – Balss, 1927: 1011. – Shen, 1949: 160–162. – Balss, 1957:

1599. – Miyake, 1978: 157. – Wicksten, 1980: 209 (list). – Coêlho and Calado, 1987: 41. – Calado, 1995: 225. – Sun and Wang, 1996: 35–36. – Boyko and Harvey, 1999: 383. – Schweitzer and Boyko, 2000: 631–632.

*Blepharipoda*: Balss, 1914: 92 (part). – Makarov, 1938: 110–111 (not *Blepharipoda* Randall, 1840).

*Lophomastrix* [sic]: Urita, 1934: 149, 153.

*Lophopmastrix* [sic]: Sun and Wang, 1996: 36.

*Lophmastix* [sic]: Sun and Wang, 1996: fig. 6.

DIAGNOSIS: Hepatic anterolateral spine present; anterior gastric spine absent; branchios-tegite weakly to moderately spinose. Distal segment of ocular peduncle entire. Dorsal flagellum with 18–54 articles, ventral flagellum with 6–13 articles. Antennal flagellum with 8–12 articles. Pereopod I dactylus dorsal margin smooth. Pereopods II–IV dactyli with produced, rounded heels.

DISTRIBUTION: Known from Russia; Japan; China; Korea; Baja California, Mexico; and California, USA (Recent); also from Washington, USA (fossil).

TYPE SPECIES: *Lophomastix diomedea* Benedict, 1904, by monotypy.

INCLUDED SPECIES: *L. japonica* (Duruflé, 1889); *L. diomedea* Benedict, 1904; *L. antiqua* Schweitzer and Boyko, 2000.

REMARKS: Bouvier (1898a) remarked on the primitive nature of the gill formula of *Blepharipoda fauriana*, a synonym of *Lophomastix japonica*. He also noted that the gill type (trichobranch) resembled that of other primitive anomurans such as the paguroids *Pylocheles* A. Milne Edwards and *Mixtopagurus* A. Milne Edwards, and the freshwater galatheid *Aegla* Leach. In this, Bouvier was not entirely correct, as McLaughlin and de Saint Laurent (1998) subsequently showed that the gill type of paguroids is actually biserial or quadriserial, rather than trichobranch. However, those of the aeglids and the blepharipodids are truly trichobranch. Subsequent authors took little notice of Bouvier’s (1898a) statements and continued to place *Lophomastix*, and its sister taxon *Blepharipoda*, within the Albuneidae. *Lophomastix* and *Blepharipoda* share trichobranch gill structure and identical gill formulas, as well as similar overall carapace, abdomen, and pereopod morphology. Both genera are antitropical in distribution (i.e.,

occurring both to the north and south of tropical waters).

#### KEY TO SPECIES

- 1 Spine on anterior margin lateral to ocular sinus needlelike . . . . . *L. antiqua*
- Spine on anterior margin lateral to ocular sinus broad . . . . . 2
- 2 Rostrum and lateral spines subequal in length, merus of pereopods II–IV spinose on lower margin, pereopod III dactylus with single heel lobe . . . . . *L. diomedea*
- Rostrum approximately half the length of lateral spines, merus of pereopods II–IV smooth on lower margin, pereopod III dactylus with bifurcated heel lobe . . . . . *L. japonica*

#### *Lophomastix japonica* (Duruflé, 1889)

Figures 4, 5

- Blepharopoda* [sic] *japonica* Duruflé, 1889: 93–95.
- Blephacopoda* [sic] *japonica*: Duruflé, 1889: unnumbered fig.
- Blepharopoda* [sic] *fauriana* Bouvier, 1898a: 566–567. – Bouvier, 1898b: 337–342, figs. 1–5.
- Blepharipoda japonica*: Balss, 1914: 92 (list). – Makarov, 1938: 111–113, fig. 41. – Kobyakova, 1955: 153, pl. 38, fig. 2 (1966: 208, pl. 38, fig. 2).
- Lophomastrix* [sic] *brevirostris* Urita, 1934: 149–154, figs. 1, 2. – Nishimura, 1939: 383, unnumbered fig. – Urita, 1942: 53–54. – Kamita, 1957: 91–94, figs. 37, 38.
- Lophomastix tchangsi* Yü, 1935: 51.
- Lophomastix japonica*: Shen, 1949: 162–165, pls. 16, 17. – Miyake, 1960: 89, pl. 44, fig. 2. – Kim, 1964: 8 (list), 11–12. – Miyake, 1965: 652, fig. 1112\*. – Miyake, 1978: 157–158, fig. 62\*. – Yang and Sun, 1979: 203. – Konishi, 1987: 123–138, figs. 2–9. – Wang, 1989: 39 (list). – Miyake, 1991: 158, pl. 53, fig. 3. – Asakura, 1995: 376, pl. 100, fig. 6. – Calado, 1995: 233–236, pl. 76, fig. a, pl. 77, figs. a–j. – Sun and Wang, 1996: 36. – Boyko and Mikelsen, 2002: 155.
- Lophomastix brevisrostris*: Yamaguti and Yamada, 1955: 133 (list). – Miyake, 1957: 91\*. – Kamita, 1958: 70 (list). – Kim, 1963: 308 (list). – Kim, 1970: 6 (list). – Kim, 1973: 196–197, 563, 568, 595, pl. 3, fig. 17, text fig. 33. – Kim, 1977: 203.
- Blepharipoda fauriana*: Miyake, 1957: 91.
- Blepharipoda liberata*: Kurata, 1964: 13–14, figs. 22–31 (not *Blepharipoda liberata* Shen, 1949).

*Lophomastix fauriana*: Coêlho and Calado, 1987: table 1.

*Lophomastrix* [sic] *japonica*: Sun and Wang, 1996: 36.

*Lophomastix* [sic] *japonica*: Sun and Wang, 1996: fig. 6.

not *Blepharipoda fauriana*: Kurata, 1964: 11–13, figs. 1–21 (= *Blepharipoda liberata* Shen, 1949).

not *Lophomastix japonica*: Igarashi, 1970: 3, pl. 7, fig. 23 (= *Blepharipoda liberata* Shen, 1949).

**MATERIAL EXAMINED: Russia:** Saghalien (now Sakhalin), Nov. 27, 1926, coll. T. Urita: 1 ♀, 32.2 mm cl (USNM 104659); Saghalien, coll. T. Urita: 1 ♂, 21.2 mm cl (USNM 260864); Korsakov (= Odomari), Saghalien, Sept. 1943, coll. T. Urita: 1 ♂, 23.6 mm cl (ZLKU 3302), 1 oviger, 32.9 mm cl (ZLKU 3303).

**Japan:** Off Aomori, Oct. 1943, coll. Tanabe: 1 fragmented specimen (label indicates ♀), unmeasurable (ZLKU 3304); off Oshoro, Hokkaido, 50 m, July 6, 1954, coll. M. Yamada: 1 fragmented specimen, unmeasurable (ZLKU 3846); Oshoro, Hokkaido, coll. M. Sasaki: 1 ♀, 31.9 mm cl (USNM 54544); Cap Ainin-Kanmuri, Attukeshi, Hokkaido, May 30, 1962, coll. F. Iwata: 1 ♀, 29.8 mm cl (ZLKU 8864).

**DIAGNOSIS:** Outer-ocular spines triangular; rostrum not produced anteriorly as far as anterolateral spines; branchiostegite weakly spinose. Dorsal flagellum of antennule with 39–54 articles, ventral flagellum with 10–13 articles. Antennal flagellum with 8–12 articles. Pereopod II dactylus with tapered rounded heel. Pereopod III dactylus with bifurcated heel. Pereopod IV dactylus with produced acute heel.

**DESCRIPTION:** Carapace (fig. 4A) approximately 1.2 times longer than wide; gently keeled medially. Anterior margin with proximally broad and distally narrowing rugose outer-ocular spines on either side of ocular sinus, concave medially, becoming convex, then concave laterally; large spines and margin all armed with numerous small spinules. Rostrum large, rugose, dentate, triangular carapace extension, extending anteriorly approximately one-half length of outer-ocular spines; medial line depressed. Ocular sinus smoothly concave and armed with numerous



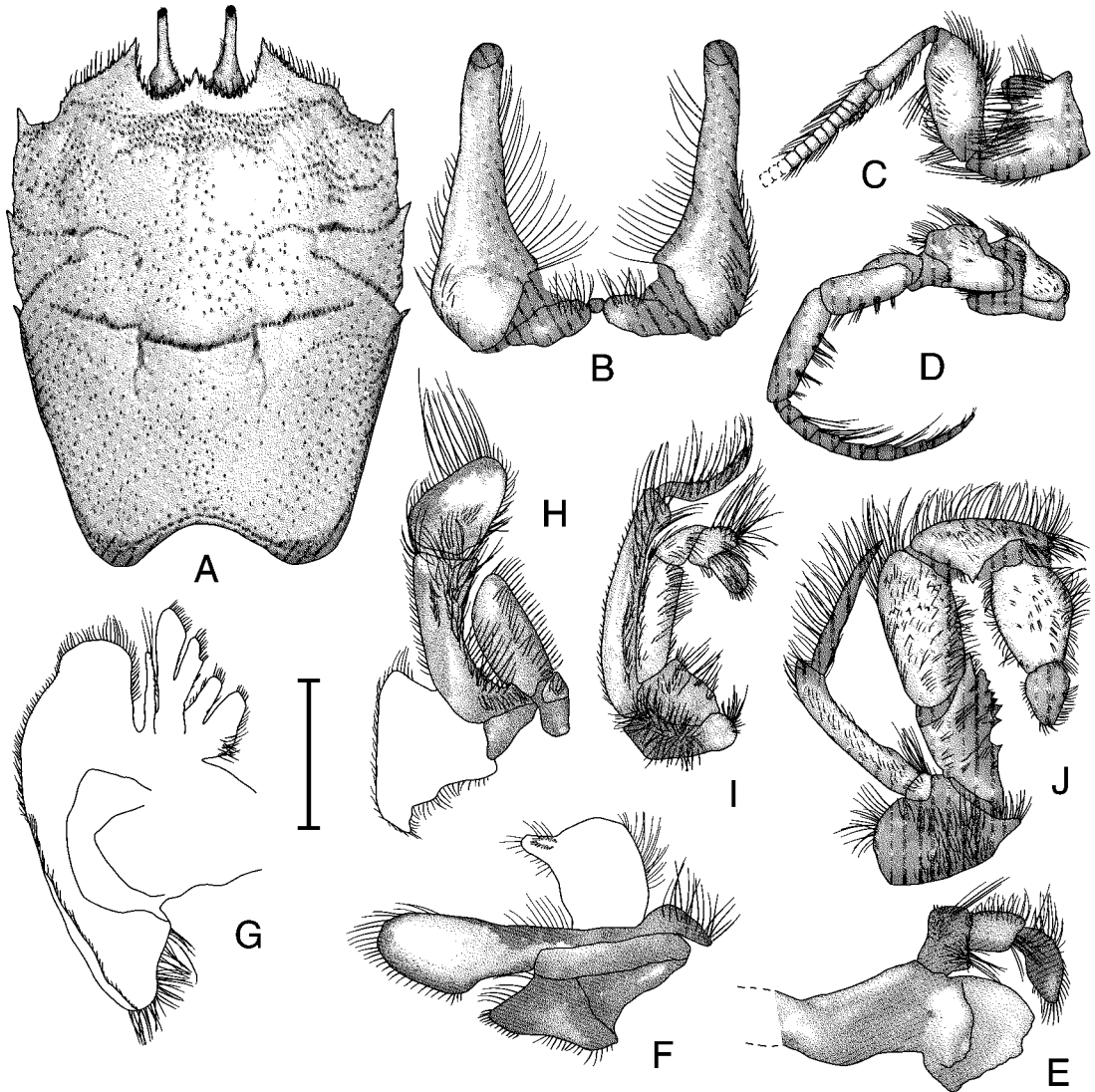


Fig. 4. *Lophomastix japonica* (Duroufflé, 1889): A, ♀, 31.9 mm cl, USNM 54544; B–J, oviger, 32.9 mm cl, ZLKU 3303. A. Carapace and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Right maxilla, lateral view. H. Right maxilliped I, lateral view. I. Right maxilliped II, lateral view. J. Right maxilliped III, lateral view. Scale = 3.0 mm (B), 3.3 mm (F), 4.4 mm (E), 5.9 mm (C, H–J), 6.7 mm (D), 8.9 mm (G), and 10.6 mm (A).

small spines. Frontal region smooth medially with few setose rugose lines laterally behind outer-ocular spines; setal field wide, slightly curved, band anterior to CG1, without lateral elements. CG1 parallel to anterior margin of carapace, convex and produced dorsally, indented medially, armed with numerous small, rounded, corneous teeth along length;

no anterogastric median spine present. Mesogastric region smooth laterally with medial triangle of jagged, setose, corneous grooves; CG2 absent; CG3 absent; CG4 with two sinuous, crenulate lateral elements each approximately one-third carapace width, armed with rounded corneous teeth. Hepatic region with scattered, transverse, corneous lines, few

oblique grooves on lateral margin, and one anterolateral strong, anteriorly directed, corneous-tipped spine, spine surface with corneous grooves. Epibranchial region roughly triangular, smooth, with four to six corneous grooves mediolaterally, armed with one strong anterolateral spine approximately three-fourths length of hepatic spine. Metagastric region strongly carinate, covered in short corneous grooves; CG5 absent. CG6 sinuous and strongly crenulate, with corneous rounded teeth, oblique lateral elements separate from posteromedial and deeply indented concave element. CG7 absent. Cardiac region smooth laterally, with triangle of setose punctae medially; CG8 faint, paralleling medial portion of CG6 but extending more laterally. CG9–11 absent. Branchial region covered with numerous setose punctae; anterolateral margin with one short spine distally, numerous very small, acute spines proximally along margin. Posterior margin deeply and evenly convex; submarginal groove entire across posterior margin of carapace, setose. Branchiostegite without large spine; anterior region rugose and with numerous small spinules and many short rows of setae, sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 4B) small, ovate, ventromedial to median ocular segments, subsumed under anterior carapace margin. Median peduncular segments oblong, joined ventromedially by ocular plate; dorsomedial margin with short plumose setae. Distal peduncular segments elongate, entire, cylindrical, proximally inflated, distally tapering, somewhat laterally compressed with distinct ocular pore on medioventral surface just distal to base of segment; mesial margins widely separated along length; plumose setae along proximal half of lateral margins, in small proximolateral area, and on proximal four-fifths of mesial margins; long plumose setae on proximal three-fourths of ventromedial margins; distinct rounded cornea covering distolateral end of segment.

Antennule (fig. 4C) with segment III narrow proximally, expanding distally to 1.5 times proximal width; simple setae on dorsal margin, plumose setae on ventral margin;

dorsal exopodal flagellum with 39–54 articles ( $n = 4$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with 10–13 articles ( $n = 4$ ), plumose setae on dorsal and ventral margins. Segment II slightly medially inflated from dorsal view, almost cylindrical, plumose setae on dorsal and ventral margins and scattered on ventrolateral third of surface. Segment I longer than wide, unarmed; distolateral surface with scattered long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 4D) with segment V approximately three times longer than wide, with seven short transverse lines of long simple setae on either side of ventral medial line, two tufts of setae on ventral midline; flagellum with 8–12 articles ( $n = 5$ ), long simple setae at ventrodistal margin of each article. Segment IV subcylindrical, approximately 2.5 times longer than wide; four transverse rows of short simple setae on ventral margin either side of medial line. Segment III decalcified and produced mesiodistally. Segment II short, subcylindrical; antennal acicle short, rounded, rugose with few scattered setae. Segment I dorsally rounded, ventrally rectangular; few scattered setae on serrate distal margin and rugose surface; segment with ventromesial antennal gland pore.

Mandible (fig. 4E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 4F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin, thin setae on dorsal margin. Proximal endite with thick simple setae on distal margin and decalcified dorsoventral lobe between calcified regions. Endopodal external lobe rounded distally and curled under; internal lobe produced distally with approximately 18 thick setae at distolateral margin; entire endopod subrectangular with mesiodistal narrow lobe (“mitten-shaped” where the mesiodistal lobe is the “thumb”).

Maxilla (fig. 4G) exopod evenly rounded and narrow, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 4H) epipod short, sub-

triangular, with plumose setae on margins. Endite tapered distally and approximately three-fourths as long as first exopodal segment. Exopod with two segments; proximal segment narrow, margins parallel with plumose setae; distal segment spatulate, longer than wide, broadest medially, margins and proximal mesiodorsal surface with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment; plumose setae on margins.

Maxilliped II (fig. 4I) dactylus evenly rounded, length equal to width, with long simple setae on lateral surface; distal margin with thick simple setae. Propodus 2.5 times wider than long, plumose setae on distal margin and long simple setae at dorsodistal margin. Carpus not produced dorsodistally, approximately two times longer than wide; long simple setae on distal margin and scattered on lateral surface. Merus approximately 3.5 times longer than wide, margins parallel; with long plumose setae on lateral and mesial margins and scattered on mesiodorsal surface. Basis-ischium incompletely fused with deep suture, plumose setae on margins and on surface. Exopod one-half longer than merus, produced proximolaterally, lateral and mesial margins with short plumose setae; flagellum with six articles and long plumose setae.

Maxilliped III (fig. 4J) dactylus longer than wide, tip rounded; thick simple setae on distal margin, few thin simple setae on dorsal surface. Propodus dorsomedially inflated; scattered plumose setae on lateral surface; dorsal and ventral margins with plumose setae. Carpus slightly produced onto propodus, with small spine at distoventral margin; lateral surface with scattered plumose setae; plumose setae on dorsal and ventral margins. Merus with few strong corneous spines and numerous small spinules on distolateral third of surface; mediobasal margin unarmed; plumose setae on dorsal and ventral margins and scattered on lateral surface. Basis-ischium incompletely fused with deep suture, subequal to merus in length, produced mesiodistally; strong crista dentata of 9 or 10 large and small corneous teeth; ventral surface with one small acute tooth at distolateral margin. Exopod two-segmented: proximal segment small; second segment styliiform, slightly

longer than merus; plumose setae on margins and surface; flagellum with one elongate article and long plumose setae.

Pereopod I (fig. 5A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with numerous low, rounded teeth in proximal half, with long plumose setae; ventral margin unarmed, with submarginal tufts of short plumose setae. Propodal lateral surface with numerous short, raised, corneous lines, some with short setae; dorsal margin unarmed, with long plumose setae; ventral margin distally produced into acute spine, with long plumose setae; cutting edge with five to seven subequal corneous teeth, lined with long plumose setae; lateral surface of propodus unarmed; mesial surface rugose, with scattered long and short plumose setae. Carpus increasingly rugose dorsodistally, dorsodistal angle produced into strong corneous-tipped spine with small spinules on dorsal and ventral margins; distal margin with numerous spines; distoventral margin with strong spines and one or two small spines behind; dorsal and distal margins with long plumose setae; mesial surface rugose, with few scattered rows of short simple setae. Merus with short spine at distodorsal angle, distal submarginal crest of small corneous spines and large corneous spine at ventrodorsal margin; long plumose setae along subdistal crest on dorsal margin, scattered on dorsal half of lateral surface, and behind distoventral spine; mesial surface with few short rows of setae. Basis-ischium incompletely fused, unarmed. Coxa with small spine at proximal anterior margin.

Pereopod II (fig. 5B) dactylus smooth; base to heel proximally convex, becoming distally concave, heel smoothly rounded and produced, heel to tip with broad, subacute indent, tip subacute, tip to base broadly convex distally, becoming concave proximally; lateral surface smooth, with several small punctations in roughly straight line across medioproximal surface; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae. Propodal dorsal surface smooth, with ventral margin inflated and rounded; long plumose setae on ventral margin and scattered on surface; dorsolateral surface as narrow, oblique, flattened shelf, with short setae on dorsal



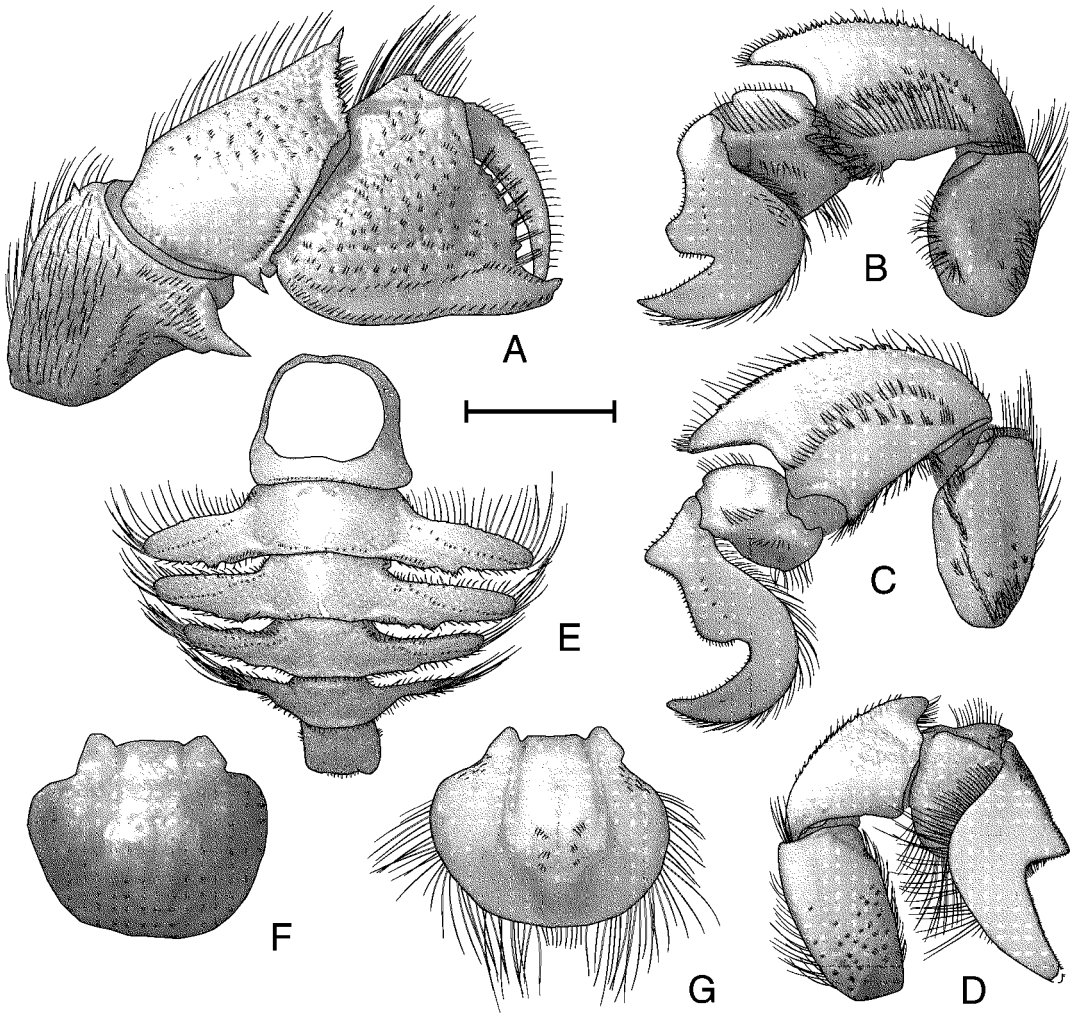


Fig. 5. *Lophomastix japonica* (Duroufflé, 1889): A, D, oviger, 32.9 mm cl, ZLKU 3303; B, C, G, ♀, 31.9 mm cl, USNM 54544; E, ♀, 32.2 mm cl, USNM 104659; F, ♂, 23.6 mm cl, ZLKU 3302. A. Right pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Right pereopod IV, lateral view. E. Abdominal somites I–VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 3.3 mm (F), 4.4 mm (G), and 9.5 mm (A–E).

margin and long plumose setae on ventral margin; mesial surface with elevated, curved setose ridge extending from ventral junction with dactylus almost to ventral proximal junction with carpus. Carpus strongly produced and subacute dorsodistally, dorsal margin serrated along distal four-fifths; lateral surface smooth, with triangular patch of rugae on distoventral third of surface extending into dorsomedial two-thirds of surface; submarginal elevated ridge ventrally, with long plumose setae; dorsal, ventral, and dis-

tal margins with short plumose setae; mesial surface smooth, dorsal, ventral, and distal margins with short simple setae; transverse line of short simple setae across surface. Merus with large median decalcified window covering nearly all of lateral surface, long plumose setae on dorsodistal and ventral margins; small acute spine at dorsodistal margin, ventral margin unarmed; mesial surface with few scattered patches of long plumose setae on surface and along dorsal and ventral margins. Basis-ischium incompletely

fused and unarmed. Coxa with two small spines on anterior margin.

Pereopod III (fig. 5C) dactylus with base to heel slightly concave, heel produced and rounded, heel to tip concave, with strong medial, rounded, produced lobe, tip subacute, tip to base smoothly convex; lateral surface smooth, row of small setose punctae proximal to medial lobe between heel and tip, dorsal margin with tufts of short setae; ventral margin with long plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus. Propodus not much inflated dorsoventrally; lateral surface smooth, simple setae on dorsal margin and in oblique row on surface; dorsolateral surface narrow, oblique, flattened with ventral row of long setae; ventral margin with long plumose setae; mesial surface with scattered long setae on and near ventral margin. Carpus strongly produced dorsodistally, reaching proximal margin of dactylus, tip subacute; distal four-fifths of dorsal margin with small corneous teeth; lateral surface rugose in medial third, with two distally merging medial transverse rows of short setae; mesial surface smooth, with row of long plumose setae on medial distal margin; dorsal and ventral margins with long plumose setae. Merus smooth, with large decalcified window covering nearly all of lateral surface; distodorsal margin with small spine; ventromedial margin unarmed; ventral and dorsodistal margins with long plumose setae; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa with medially directed anterior spine in males and females. Female with large gonopore on posterior mesial margin of coxa (not opposing the other coxa), without setae; male without pore.

Pereopod IV (fig. 5D) dactylus with base to heel straight, heel pointed and subacute, heel to tip wide and broadly rounded, tip subacute, tip to base broadly convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface smooth, small patch of plumose setae between heel and articulation with propodus. Propodus expanded dorsoventrally; ventral expansion almost reaching ventral margin of dactylus, ventral margin with long plumose setae; dorsal expansion with long plumose setae; lateral and

mesial surfaces smooth; mesial section of dorsal expansion incompletely fused to surrounding surface. Carpus produced dorsodistally; medial two-thirds of dorsal margin serrate; medial third of lateral surface with few setose rugae; long plumose setae on dorsal margin; mesial surface smooth with long simple and plumose setae on distal margin. Merus unarmed; dorsal and ventral margins with long plumose setae; few short setae scattered on proximoventral surface. Basis-ischium incompletely fused and unarmed. Coxa with small tubercle or spine at anterior margin.

Abdomen (fig. 5E) somite I wider than long, widest posteriorly; dorsal surface with anterior margin convex; posterior margin convex, with submarginal row of setose punctae; medial surface decalcified, with two short transverse calcified lines. Somite II anterior margin with punctations either side of midline, midline weakly produced, posterior margin concave, with incomplete setose punctate line along margin, lobular swellings on posterolateral corners; pleura expanded and directed posterolaterally; anterior margin with few, small, medial spines and long plumose setae; incomplete short line of simple setae running from anteromesial to posterolateral margins; posterior margin with two low spinose lobes, margin lateral to lobes with few short spines and short simple setae, mesial to lobes with short simple setae. Somite III similar to somite II, but narrower, shorter; pleura thinner and shorter than on somite II, directed laterally, anterior margin with few low spines, posterior margin with two low spinose lobes; posterior margin with short simple setae. Somite IV similar to somite III, but thinner and shorter, anterolateral lobular swellings smaller, posterior margin with row of short simple setae; pleura shorter than on somite III, directed anterolaterally; anterior margin with few, low, medial spines, posterior margin smooth with one low smooth lobe medially; margins with long plumose setae. Somite V subequal to somite IV, little to no lobular swelling anterolaterally, posterior margin with row of short simple setae; pleura approximately three-fourths length of somite IV pleura and directed anterolaterally; margins smooth, surface of pleura and margins with long plumose setae,

especially at distal tip. Somite VI subequal to somite V; anterolateral margin with short plumose setae; posteromedial margin with row of short simple setae; pleura absent.

Telson of male (fig. 5F; specimen illustrated damaged and without setae) subcircular, approximately as long as wide, with smoothly rounded distal tip; medial third heavily calcified, dorsally inflated, and tapering distally, lateral third weakly calcified; demarcation of calcified and uncalcified regions marked by low ridge; median longitudinal groove on distal two-thirds of calcified area, three to five short transverse rows of short simple setae on either side of median groove. Margins with long simple setae. Telson of female (fig. 5G) nearly identical to male, but slightly wider.

DISTRIBUTION: Known from Russia, Japan, China, and Korea, to 50 m depth.

MAXIMUM SIZE: Males: 23.6 mm cl; females: 32.9 mm cl.

TYPE SPECIMENS: The three syntypes of *Blepharopoda* [sic] *japonica* Duruflé, 1889 are not present in MNHN (Boyko, personal obs.) and are likely lost. *Blepharopoda* [sic] *fauriana* Bouvier, 1898a was based on the same three specimens (see below), and they are therefore lost as well. An unknown number of syntypes of *Lophomastix* [sic] *brevirostris* Urita, 1934 are not present in Tokyo Imperial University (K. Sakai, personal commun.) and are likely lost. The repository of the type (or types) of *Lophomastix tchangsii* Yü, 1935 is unknown.

TYPE LOCALITIES: Hakodate, Japan (*B. japonica* and *B. fauriana*); Enoura, Nagahama, Aniwa Bay, Japan; Tôbusi, Honto, Japan; Rakuma, Randomari, Japan; west coast of Saghalien (now Sakhalin), Japan (now Russia) (*L. brevisrostris*); Cheefoo, China (*L. tchangsii*).

REMARKS: Because both species were based on the same number of specimens from the same locality, donated by the same person, it is almost certain that the descriptions of *Blepharopoda* [sic] *japonica* and *Blepharopoda* [sic] *fauriana* were based on the same three specimens from Hakodate, Japan, donated to the MNHN by the Abbot Faurie in 1887. The specimens must have been left unlabeled by Duruflé and, when later examined by Bouvier, were thought to be

undescribed. The two taxa are therefore objective synonyms. It is remarkable that this could have occurred when both men worked in the same museum and published these descriptions less than 10 years apart. Balss (1914) was the first to recognize this species as a *Lophomastix*.

Although Urita (1934) repeatedly indicated that he had only a single specimen, he gave four different localities for the species, indicating that more than one specimen was known to him. The Japanese name for this species was “Urita-Kudahigegani” (Miyake, 1957), based on the belief that Urita’s *L. brevisrostris* was the correct name for this taxon. This species is now called “Kita-Kudahigegani” (Urita, 1942; Asakura, personal commun.).

Shen (1949) examined a large series of specimens from Chefoo, China, and concluded that *L. tchangsii* was synonymous with *L. japonica*. I was unable to obtain a copy of Yü’s (1935) abstract, but Shen (1949) was clearly correct in his conclusion, based on his comparison of Yu’s (1935) description with that of Duruflé (1889). Shen (1949) also synonymized *L. brevisrostris* with *L. japonica*. The text and illustrations of Shen (1949) served as the basis for the redescription of Calado (1995), who saw no material of this species.

Kurata (1964) described the stage I and II zoeae of this species (erroneously as *Blepharipoda liberata*) from the Japanese plankton. Konishi (1987) described the complete larval development (from ovigerous females) of three zoeal stages and one megalopal stage lasting 30–35 days at 18°C and 30‰ salinity.

Based on the color illustration of Miyake (1991) and the color photograph of Asakura (1995), this species is a uniform chestnut-brown with light tan highlights on the carapace margins and grooves. The setae are tan.

This species is closest to *L. antiqua*, which also has narrow outer-ocular spines and punctae, rather than short transverse lines, on the branchial region of the carapace.

*Lophomastix antiqua* Schweitzer and Boyko, 2000

Figure 6

*Lophomastix antiqua* Schweitzer and Boyko, 2000: 632–633, figs. 3, 4\*.



**MATERIAL EXAMINED: USA: Washington:** Late Eocene (Refugian) Quimper Sandstone at RB40, located in the SE¼ NE¼ sec. 18, T29N, R7E, Nordland Quadrangle, 7.5' series, East Jefferson Co., along the west shore of Oak Bay on the Quimper Peninsula, south of Port Townsend, coll. R. E. and M. Berglund: 1 specimen, 38.2 mm cl, holotype (USNM 501834), 1 specimen, not measured, paratype (USNM 501835).

**DIAGNOSIS:** Carapace longer than wide; rostrum triangular, broad proximally, needle-like distally, approximately as long as wide; triangular and distally needlelike extra-ocular spines; ocular sinuses concavely rounded; frontal region of carapace with lateral margins nearly perpendicular to anterior margin; carapace with numerous, deeply incised grooves; CG1, CG4, CG6 ornamented with scabrous granules; CG8 deeply incised, transverse, parallel to CG6 posterolaterally; branchiostegite with spines and coarse granules.

**DESCRIPTION:** Carapace (fig. 6) longer than wide, strongly vaulted transversely and weakly vaulted longitudinally; broadly keeled axially; carapace smooth axially, becoming increasingly granular toward lateral margins. Anterior margin weakly convex, rostrum as triangular spine ornamented with small spines, broad proximally, narrowing distally; ocular sinuses convexly rounded, armed with small spines; outer angles of ocular sinuses armed with proximally broad and triangularly serrate lobes tapering distally to long, attenuated, smooth, sharp spines; spines almost as long as rostrum; remainder of anterior margin not well known, appearing to be straight. Frontal region with two grooves; first groove deeply incised, transverse, parallel to anterior margin, groove more weakly developed at base of rostrum, corresponding to anterior margin of setal field in Recent species; second groove (CG1) sinuous, composed of three segments, two lateral segments convex-forward arcs, central segment a weakly convex arc with central concavity, ornamented with scabrous granules. Mesogastric region smooth, broadly keeled axially, CG2 absent, CG3 absent. CG4 with two sinuous lateral elements each approximately one-third carapace width; oblique groove sinuous, extending obliquely

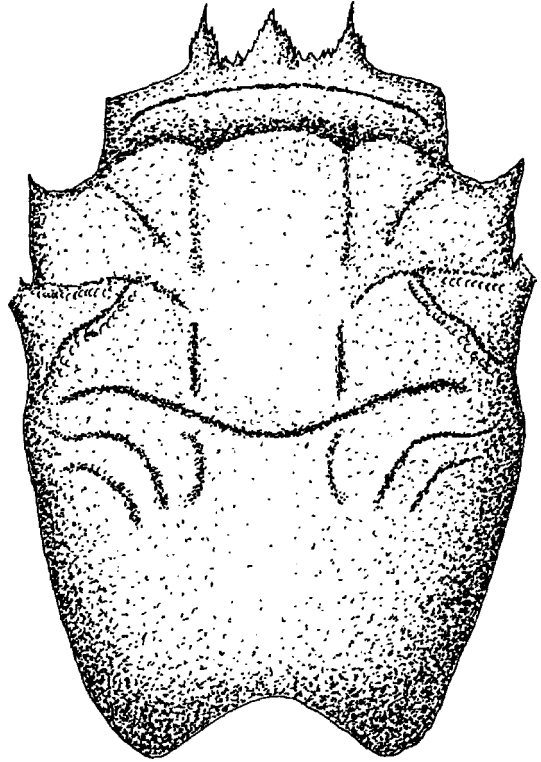


Fig. 6. *Lophomastix antiqua* Schweitzer and Boyko, 2000. 38.2 mm cl specimen, USNM 501834, holotype.

from base of first anterolateral spine posteriorly and toward axis of carapace. Anterolateral margin weakly convex, ornamented with two large spines; first hepatic lateral spine, broadly triangular, sharp, directed anterolaterally; second epibranchial lateral spine, not well known, appearing to be small, sharply triangular, directed weakly anterolaterally, located just posterior to intersection of CG4 with lateral margin of carapace. Posterolateral margin nearly straight, convergent posteriorly. Posterior margin strongly concave centrally, with broad, bluntly rounded projections at posterolateral corners. Epibranchial region triangular, granular, ornamented with second anterolateral spine, bounded anteriorly by CG4 and posteriorly by CG6. CG6 sinuous, lateral elements sharply oblique, medial element posteriorly displaced and sinuous, elements not continuous across carapace, ornamented with scabrous granules. CG7 fused with CG6. CG8

deeply incised, sinuous, curved anteriorly from lateral margins, concave centrally, incomplete medially, ornamented with scabrous granules. Cardiac region weakly granular, especially along lateral margins; CG9–11 absent. Branchiostegite with two sharp, narrow submarginal spines anterodorsally, coarsely granular posteriorly.

Propodus and carpus of right first pereopod (not illustrated) present, oriented anterolaterally to outer-ocular spine. Segments damaged, but appear typical of genus. Carpus of right second pereopod present, well preserved and with typical shape and serrate upper margin as for genus.

Abdominal somites (not illustrated) strongly vaulted transversely; first somite posterior margin straight, with submarginal row of punctae; remainder of segment obscured by carapace. Second somite with convexly rounded lateral margins; pleura broken, partially present on right side, upper and lower margins nearly straight, narrowing distally, distal margin nearly straight. Third somite broken, apex directed posteriorly; pleura missing. Fourth through sixth somites and telson missing.

**DISTRIBUTION:** Known only from the type locality.

**TYPE SPECIMENS:** USNM 501834 (holotype), USNM 501835 (paratype).

**TYPE LOCALITY:** Late Eocene (Refugian) Quimper Sandstone at RB40, located in the SE¼ NE¼ sec. 18, T29N, R7E, Nordland Quadrangle, 7.5' series, East Jefferson Co., along the west shore of Oak Bay on the Quimper Peninsula, south of Port Townsend, Washington, USA.

**REMARKS:** This fossil species differs in several features from the two Recent species of *Lophomastix*. The frontal region of *L. antiqua* has lateral edges that extend posteriorly almost perpendicular to the anterior margin. The lateral edges of the frontal region in the Recent species are much more gently rounded and extend at an oblique angle of approximately 45° to the anterior margin of the carapace in *L. japonica* and approximately 75° in *L. diomedae*. The rostrum of *L. antiqua* is narrowly triangular and the anterolateral spines are distally narrow and needlelike; the rostrum and those spines are shorter and more broadly triangular in the two Recent

species. Both the rostrum and outer-ocular spines are proportionally much longer than in Recent species. The fossil species displays a moderately deeply incised groove extending obliquely posteriorly from the base of the hepatic anterolateral spine; this groove is much more weakly developed in the Recent species. The cardiac region of the Recent species is better developed than that of the fossil. Finally, the dorsodistal region of the branchiostegite bears at least two strong acute submarginal spines in *L. antiqua*; this region is weakly spinose in Recent species. Characters of the pereopods and abdominal somites of *L. antiqua* are limited, due to the poor condition of the material examined, and cannot now be used to separate the species from the others in the genus.

*Lophomastix antiqua* appears closest to *L. japonica* in both the narrow shape of the outer-ocular spines and the presence of punctae, rather than short transverse lines, on the branchial region of the carapace. Discovery of pereopod material for *L. antiqua* would allow a clearer understanding of its relationships within the genus.

*Lophomastix diomedae* Benedict, 1904

Figures 7, 8

*Lophomastix diomedae* Benedict, 1904: 621–623, fig. 1\*. – Haig and Wicksten, 1975: 100–101. – Luke, 1977: 31. – Wicksten, 1980: 209 (list). – Coêlho and Calado, 1987: table 1. – Williams et al., 1989: 35. – Calado, 1995: 226–230, pl. 74, figs. a–e, pl. 75, figs. a–d\*. – Boyko and Mikkelsen, 2002: 155, 158.

**MATERIAL EXAMINED: USA: California:** AHF Sta. 1120–40, off San Nicholas Island, 29–33 fms (= 53.0–60.4 m), April 11, 1940, coll. R/V “Velero III”: 2 ♂, 15.3–16.0 mm cl, 1 ♀, 19.3 mm cl (LACM-AHF 15188); AHF Sta. 1120–40, off San Nicholas Island, 30 fms (= 54.9 m), April 11, 1940, coll. R/V “Velero III”: 1 ♂, 12.4 mm cl, 1 ♀, 21.4 mm cl, 1 ♀, unmeasurable (LACM-AHF 1122–40); 0.5 mi off Castle Rock, San Clemente Island, 22–37 fms (= 4.02–67.7 m), June 8, 1941, coll. R/V “Velero III”: 1 ♀, 21.0 mm cl (LACM-AHF 1327–41).

**Mexico:** Sta. 2913, Cortez Banks, Baja California Norte, 26 fms (= 47.6 m), Jan. 1889, coll. “Albatross”: 1 ♀, 7.7 mm cl, lec-



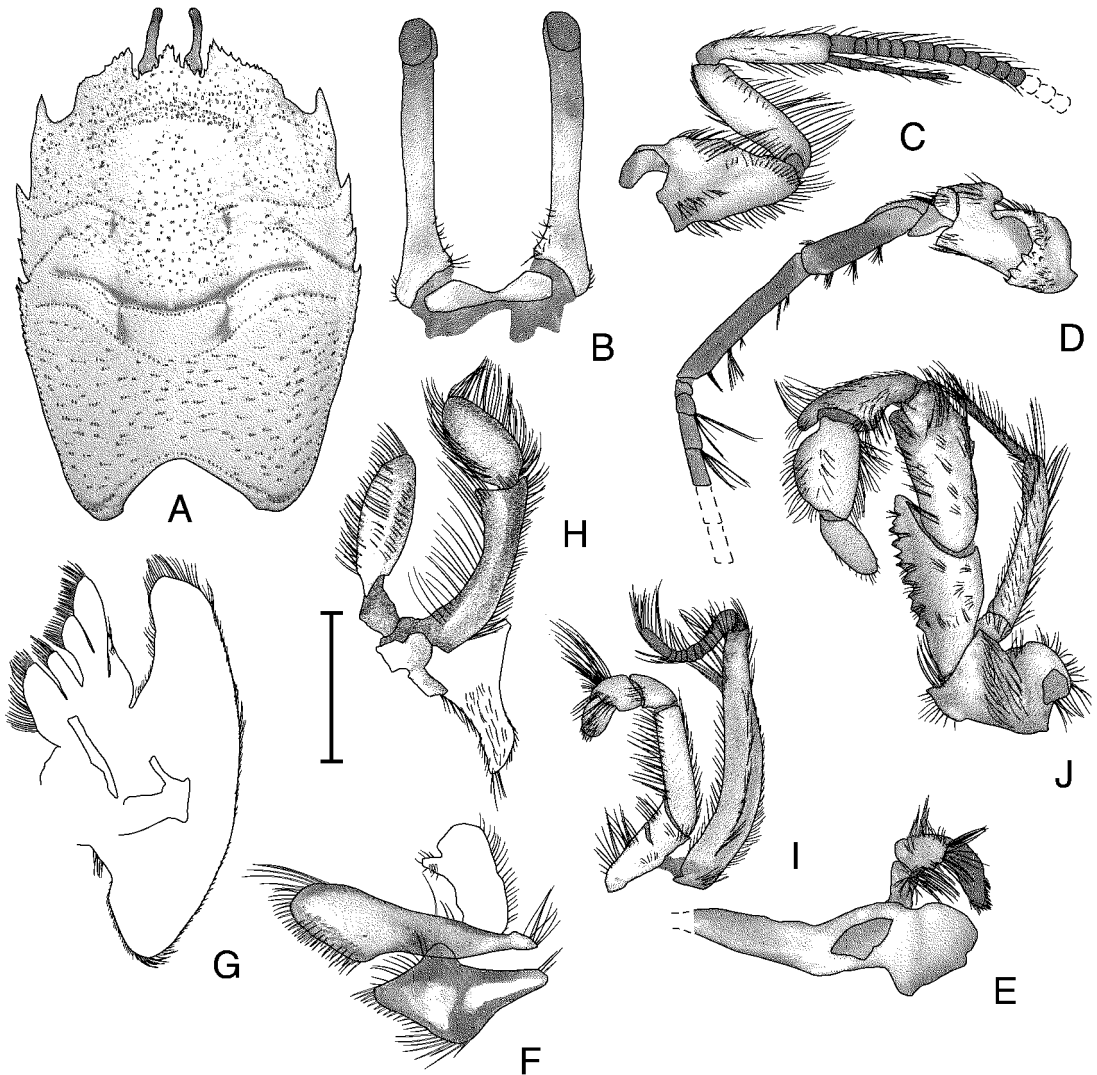


Fig. 7. *Lophomastix diomedeeae* Benedict, 1904: A, C–J, ♂, 16.0 mm cl, LACM-AHF 15188; B, ♀, 21.4 mm cl, LACM-AHF 1122–40. **A.** Carapace and ocular peduncles, dorsal view. **B.** Ocular peduncles, dorsal view. **C.** Right antennule, lateral view. **D.** Left antenna, lateral view. **E.** Left mandible, mesial view. **F.** Left maxillule, lateral view. **G.** Left maxilla, lateral view. **H.** Left maxilliped I, lateral view. **I.** Left maxilliped II, lateral view. **J.** Left maxilliped III, lateral view. Scale = 1.6 mm (B), 2.2 mm (F), 3.0 mm (C), 3.3 mm (D, E, G–J), and 5.8 mm (A).

totype (USNM 28771), 1 ♀, 5.5 mm cl, 1 broken and unsexable specimen, 14.0 mm cl, paralectotypes (USNM 310380).

**DIAGNOSIS:** Outer-ocular spines triangular; rostrum produced anteriorly as far as antero-lateral spines; branchiostegite weakly spinose. Dorsal flagellum with 18–30 articles, ventral flagellum with 6–8 articles. Antennal flagellum with 8–10 articles. Pereopod II

dactylus with low rounded heel. Pereopod III dactylus with single low rounded heel. Pereopod IV dactylus with produced rounded heel.

**DESCRIPTION:** Carapace (fig. 7A) approximately 1.2 times longer than wide; gently keeled medially. Anterior margin with large rugose spine on either side of ocular sinus; concave medially becoming convex laterally;

large spines and margin all armed with numerous small spinules. Rostrum as large rugose dentate triangular carapace extension, extending anteriorly as lateral anterior spines; medial line depressed. Ocular sinus acutely concave and armed with numerous small spines. Frontal region covered with numerous transverse, raised zigzag lines, anterior margins of raised lines corneous, lines with small simple setae; setal field a wide, slightly curved band anterior to CG1, without lateral elements. CG1 parallel to anterior margin of carapace, convex and produced dorsally, armed with numerous small rounded corneous teeth along length; no antero-gastric median spine present. Mesogastric region smooth laterally with medial triangle of jagged setose corneous grooves; CG2 absent; CG3 absent; CG4 with two sinuous crenulate lateral elements each approximately one-third carapace width, armed with rounded corneous teeth. Hepatic region with scattered transverse corneous lines and one anterolateral strong anteriorly directed corneous-tipped spine; spine surface with corneous grooves. Epibranchial region roughly triangular, smooth with three corneous grooves mediolaterally, armed with one strong anterolateral spine approximately one-half length of hepatic spine; two small lateral spinules behind large spine. Metagastric region covered in short corneous grooves; CG5 absent. CG6 sinuous and strongly crenulate with corneous rounded teeth, oblique lateral elements separate from medial and deeply indented concave element. CG7 absent. Cardiac region smooth; CG8 paralleling medial portion of CG6 but extending more laterally. CG9–11 absent. Branchial region covered with numerous transverse corneous-tipped setose grooves; anterolateral margin with numerous very small acute spines. Posterior margin deeply and irregularly convex; submarginal groove entire across posterior margin of carapace, setose. Branchiostegite without large spine; anterior region rugose and with numerous small spinules and many short rows of setae, sparsely covered with long plumose setae ventrally; posterior region membranous with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 7B) subsumed under an-

terior carapace margin. Median ocular segments oblong; dorsal margin with short plumose setae. Distal peduncular segments elongate, entire, cylindrical, somewhat laterally compressed with distinct ocular pore on medioventral surface just distal to base of segment; mesial margins widely separated along length; plumose setae along proximal quarter of ventrolateral margins and in small proximolateral area; long plumose setae on proximal three-fourths of ventral margins; rounded cornea distinct and covering distolateral end of segment.

Antennule (fig. 7C) with segment III narrow proximally, expanding distally to 1.5 times proximal width; simple setae on dorsal margin, plumose setae on ventral margin and sparsely scattered on lateral surface; dorsal exopodal flagellum with 18–30 articles ( $n = 6$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with six to eight articles ( $n = 4$ ), plumose setae on dorsal and ventral margins. Segment II slightly medially inflated in dorsal view, almost cylindrical, plumose setae on dorsal and ventral margins and scattered on ventrolateral fourth of surface. Segment I longer than wide, unarmed; lateral surface with scattered long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 7D) with segment V approximately 7.5 times longer than wide, with four short transverse lines of long simple setae on either side of ventral medial line; flagellum with 8–10 articles ( $n = 6$ ), long simple setae at ventrodorsal margin of each article. Segment IV subcylindrical, approximately 4.5 times longer than wide; tuft of setae at dorsodorsal margin; two transverse rows of short simple setae on ventral margin either side of medial line. Segment III decalcified and produced mesiodorsally. Segment II short, subcylindrical; antennal acicle short, rounded, rugose, with few scattered setae. Segment I dorsally rounded, ventrally rectangular; few scattered setae on distal margins and surface; segment with ventromesial antennal gland pore.

Mandible (fig. 7E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 7F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin. Proximal endite with thick simple setae on distal margin and decalcified dorsoventral lobe between calcified regions. Endopodal external lobe rounded distally and curled under; internal lobe produced distally, with three thick setae at distolateral margin; entire endopod "mitten-shaped."

Maxilla (fig. 7G) exopod evenly rounded and narrow with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 7H) epipod with plumose setae on margins, distolateral surface, and mesial surface. Endite tapered distally and approximately three-fourths as long as first exopodal segment. Exopod with two segments; proximal segment narrow, margins parallel, margins with plumose setae; distal segment spatulate, longer than wide, broadest medially, margins and proximal mesiodorsal margin with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment; plumose setae on margins.

Maxilliped II (fig. 7I) dactylus evenly rounded, length equal to width, with long simple setae on lateral surface; distal margin with thick simple setae. Propodus 1.5 times wider than long, plumose setae on distal margin and long simple setae at dorsodistal margin. Carpus not produced dorsodistally, approximately two times longer than wide; long simple setae on distal margin. Merus approximately four times longer than wide, margins parallel; with long plumose setae on lateral and mesial margins. Basis-ischium incompletely fused with deep suture, plumose setae on margins and on surface. Exopod one-third longer than merus, produced proximolaterally, flagellum with six articles; lateral and mesial margins with short plumose setae, submarginal dorsolateral ridge with short setae, flagellum with long plumose setae.

Maxilliped III (fig. 7J) dactylus longer than wide, tip rounded; thick simple setae on distal margin. Propodus dorsodistally inflated, with longitudinal median row of plumose setae on lateral surface; dorsal and ventral margins with plumose setae. Carpus slightly

produced onto propodus with small spine at distoventral margin; lateral surface with row of plumose setae ventromedially; plumose setae on dorsal and ventral margins. Merus with few strong corneous spines and numerous small spinules on distolateral third of surface; one large spine on mediolateral margin; plumose setae on dorsal and ventral margins and scattered on lateral surface. Basis-ischium incompletely fused with deep suture and subequal to merus in length, produced mesiodistally; strong crista dentata of 9 or 10 large and small corneous teeth; ventral surface with one small, acute tooth at distolateral margin. Exopod two-segmented: proximal segment small; second segment styli-form, approximately as long as merus; plumose setae on margins and surface; flagellum with one article and long plumose setae.

Pereopod I (fig. 8A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with numerous, low, rounded teeth, with long plumose setae; ventral margin unarmed, with row of short plumose setae. Propodal lateral surface with numerous short, raised, corneous lines, some with short setae; dorsal margin unarmed, with long plumose setae; ventral margin distally produced into acute spine, with long plumose setae; cutting edge with six subequal corneous teeth, and lined with long plumose setae; lateral surface of propodus unarmed. Carpus increasingly rugose dorsodistally, dorsodistal angle produced into strong corneous-tipped spine, with small teeth on dorsal surface of spine; dorsal and ventral margins of spine armed with numerous small spinules; dorsal margin with long plumose setae; mesial surface with few scattered rows of short simple setae. Merus with distal submarginal crest of corneous spines and large corneous spine at ventrodorsal margin; long plumose setae along subdistal crest, in sinuous line one-third from proximal margin of segment, and scattered on mesioproximal third; mesial surface with few short rows of setae. Basis-ischium incompletely fused, unarmed. Coxa with small spine/tubercle at proximal anterior margin.

Pereopod II (fig. 8B) dactylus smooth; base to heel proximally convex becoming distally straight, heel smoothly rounded and low, heel to tip with narrow, rounded indent,



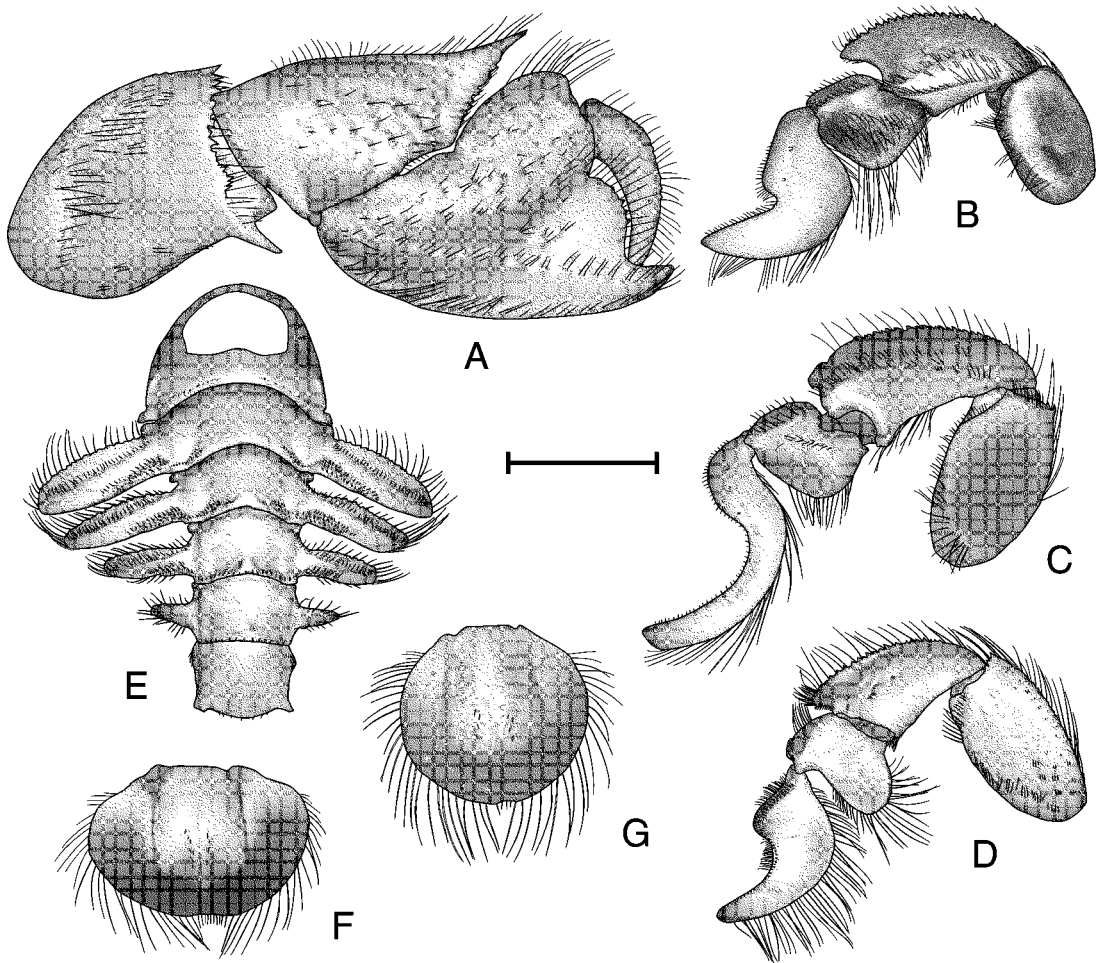


Fig. 8. *Lophomastix diomedeeae* Benedict, 1904: A, B, D-F, ♂, 16.0 mm cl, LACM-AHF 15188; C, G, ♀, 21.4 mm cl, LACM-AHF 1122-40. A. Right pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I-VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 2.2 mm (G), 3.3 mm (A, F), 4.4 mm (E), 5.9 mm (C, D), and 6.7 mm (B).

tip subacute, tip to base broadly convex distally becoming concave proximally; lateral surface smooth, with several small punctations in roughly straight line across medio-proximal surface; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae. Propodal dorsal surface smooth, with ventral margin inflated and rounded; long plumose setae on ventral margin and scattered on surface; dorsolateral surface as narrow, oblique, flattened shelf, with 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 strongly produced and subacute dorso-distally, dorsal margin serrated along distal four-fifths; lateral surface smooth, with triangular patch of rugae on distoventral third of surface extending into dorsomedial two-thirds of surface; submarginal elevated ridge ventrally, with long plumose setae; dorsal, ventral, and distal margins with short plumose setae; mesial surface smooth, dorsal, ventral, and distal margins with short simple

setae; transverse line of short simple setae across surface. Merus with large median decalcified window covering nearly all of lateral surface, long plumose setae on dorsodistal and ventral margins; small acute spine at dorsodistal margin, one large and none to three small acute spines medially on ventral margin; mesial surface with few scattered patches of long plumose setae on surface on along dorsal and ventral margins. Basis-ischium incompletely fused and unarmed. Coxa with two small spines on anterior margin.

Pereopod III (fig. 8C) dactylus with base to heel straight, heel broadly rounded and low, heel to tip with broadly concave indent, tip subacute, tip to base smoothly convex; lateral surface smooth, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface smooth, simple setae on dorsal margin and in oblique row on surface; dorsolateral surface narrow, oblique, flattened with ventral row of long setae; ventral margin with long plumose setae; mesial surface with scattered long setae on and near ventral margin. Carpus slightly produced dorsodistally, exceeding proximal margin of propodus by approximately one-fourth length of propodus, rounded; proximal four-fifths of dorsal margin with small corneous teeth; lateral surface rugose in medial third, with short setae and row of setae ventrally; mesial surface smooth, with row of long plumose setae on medial distal margin; dorsal and distal margins with long simple plumose setae. Merus smooth, with large decalcified window covering nearly all of lateral surface; distodorsal margin with small spine; ventromedial margin with one to three large and one or two small spines; ventral and dorsodistal margins with long plumose setae; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa with medially directed anterior spine in males and females. Female with large gonopore on posterior mesial margin of coxa (not opposing the other coxa), without setae; male without pore.

Pereopod IV (fig. 8D) dactylus with base to heel slightly concave, heel low and round-

ed, heel to tip wide and broadly rounded, tip subacute, tip to base broadly convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface smooth, small patch of plumose setae between heel and articulation with propodus. Propodus expanded dorsoventrally; ventral expansion almost reaching ventral margin of dactylus, ventral margin with long plumose setae; dorsal expansion with long plumose setae; lateral and mesial surfaces smooth; mesial section of dorsal expansion incompletely fused to surrounding surface. Carpus slightly produced dorsodistally; distal two-thirds of dorsal margin serrate; medial third of lateral surface with few setose rugae; long plumose setae on dorsal margin; mesial surface smooth, with long simple and plumose setae on distal margin. Merus with one large and one to three small spines at distolateral margin; dorsal and ventral margins with long plumose setae; few short setae scattered on proximoventral surface. Basis-ischium incompletely fused and unarmed. Coxa with small tubercle or spine on anterior margin.

Abdomen (fig. 8E) somite I wider than long, widest posteriorly; dorsal surface with anterior margin convex; posterior margin convex, with submarginal row of setose punctae; medial surface decalcified, with two short transverse calcified lines. Somite II anterior margin with punctations on either side of midline, midline weakly produced, posterior margin concave, with incomplete setose punctate line along margin, lobular swellings on posterolateral corners; pleura expanded and directed posterolaterally; anterior margin serrate, with long plumose setae; incomplete short line of simple setae running from anteromesial to posterolateral margins; posterior margin with two low smooth lobes, margin lateral to lobes smooth, mesial from lobes with short simple setae. Somite III similar to somite II, but narrower, shorter; pleura thinner and shorter than on somite II, anterior margin with low spines, posterior margin without well-defined lobes; posteromesial margin with short simple setae. Somite IV similar to somite III, but thinner and shorter, anterolateral lobular swellings smaller; pleura shorter than on somite III, directed laterally; anterior margin with

few low spines, posterior margin smooth with one low lobe mesially; margins with long plumose setae. Somite V subequal to somite IV, little to no lobular swelling anterolaterally; pleura approximately half length of somite IV pleura and directed laterally; margins smooth, surface of pleura with long plumose setae, especially at distal tip. Somite VI subequal to somite V; anterolateral margin with long plumose setae; posterior margin with row of short setae; pleura absent.

Telson of male (fig. 8F) subcircular, approximately as long as wide, with slight notch at distal tip; medial third heavily calcified, dorsally inflated, and tapering distally, lateral third weakly calcified; demarcation of calcified and uncalcified regions marked by low ridge; median longitudinal groove on distal two-thirds of calcified area, three to five short transverse rows of short simple setae on either side of median groove. Margins with long simple setae. Telson of female (fig. 8G) similar to male, with narrower uncalcified regions.

DISTRIBUTION: Known only from southern California, USA, and Baja California Norte, Mexico, in 40.2–67.7 m depth.

MAXIMUM SIZE: Males: 16.0 mm cl; females: 21.0 mm cl.

TYPE SPECIMENS: USNM 28774 (lectotype, designated herein), USNM 310380 (2 paratypes).

TYPE LOCALITY: "Albatross" Sta. 2913, off Cortes Bank, [Baja] California [Norte], [Mexico], in 26 fms [47.6 m] depth.

REMARKS: Calado (1995) selected the intact ♀ syntype as the lectotype in her dissertation, which is not considered a publication under the ICZN. No formal designation of this specimen as lectotype has subsequently been published, nor is any planned by Calado (de Melo, personal comm.) Therefore, the same ♀ specimen is herein selected as the lectotype to avoid confusion regarding the type status of this specimen.

#### BLEPHARIPODA RANDALL, 1840

*Blepharipoda* Randall, 1840: 130–131. – Ortmann, 1892: 535. – Ortmann, 1896: 222. – Holmes, 1900: 103. – Ortmann, 1901: 1153, 1271. – Balss, 1914: 92 (part). – Porter, 1915a:

78. – Porter, 1915b: 13. – Porter, 1916: 280. – Schmitt, 1921: 172. – Rathbun, 1926: 126 (part). – Balss, 1927: 1011. – Schmitt, 1942: 1. – Fesquet, 1942: 111. – Garcia Mendes, 1945: 118. – Shen, 1949: 154–155. – Snodgrass, 1952: 31. – Haig, 1955: 9. – Balss, 1957: 1599. – Castro, 1967: 1. – Glaessner, 1969: R483. – Epelde-Aguirre and Lopez, 1975: 165. – Miyake, 1978: 155. – Wicksten, 1980: 209 (list). – Boschi, 1981: 714, 739. – Calado, 1987: 86–87. – Coêlho and Calado, 1987: 41. – Manning, 1988: 626 (list). – Seridji, 1988: 1298–1299. – Calado et al., 1990: 747. – Calado, 1995: 98–99. – Sun and Wang, 1996: 33.

*Albunhippa* H. Milne Edwards and Lucas, 1841: 474–477. – Dana, 1852: 404. – Dana, 1853: 1429. – Boas, 1880: 134–136.

*Albunhippe* [sic]: Agassiz, 1845b: 1.

*Abrote* Philippi, 1857: 124.

*Blepharopoda* [sic]: Stimpson, 1858: 230. – Miers, 1878: 333–334. – Cano, 1889b: 263. – Duruflé, 1889: 92–95 (part). – Bouvier, 1898b: 337 (part). – Berg, 1900: 225.

*Albunhippa* (*Abrote*): Ortmann, 1901: 862–863, 1112.

*Blefaripoda* [sic]: Porter, 1936a: 153.

"*Lepidopa*": Kamita, 1957: 94–96 (not *Lepidopa* Stimpson, 1858).

*Blepharipoda* [sic]: Turner and Sexsmith, 1964: 50.

*Albunhipa* [sic]: Calado, 1987: 85. – Calado, 1995: 19.

not *Blepharopoda* [sic]: Duruflé, 1889: 92–95 (part). – Bouvier, 1898a: 566. – Bouvier, 1898b: 337 (part) (= *Lophomastix* Benedict, 1904).

not *Blephacopoda* [sic]: Duruflé, 1889: unnumbered fig. (= *Lophomastix* Benedict, 1904).

not *Blepharipoda* Brauer and Bergenstamm, 1889: 96. – Sabrosky and Arnaud, 1965: 1083 (Diptera: Tachinidae) (nom. preocc.) (= *Blepharipa* Rondani, 1856 fide Sabrosky and Arnaud, 1965).

not *Blepharipoda*: Balss, 1914: 92 (part). – Makarov, 1938: 110–111 (= *Lophomastix* Benedict, 1904).

not *Blepharipoda*: Rathbun, 1926: 126 (part) (= *Pagurus* Fabricius, 1775, *sensu lato*).

DIAGNOSIS: Outer-ocular spines triangular; two hepatic anterolateral spines present; anterior gastric spine present (except in *B. liberata*). Distal peduncular segments appearing two-segmented (pseudosegments). Antennular dorsal flagellum with 28–85 articles, ventral flagellum with 10–21 articles. Antennal flagellum with 11–44 articles. Pereopod I dactylus dorsal margin spinose; distodorsal

carpal spine present; cutting edge spinose. Pereopods II–IV dactyli with produced, rounded heels.

DISTRIBUTION: Known from Russia; China; Japan; Korea; central California, USA, south to Baja California, Mexico; Peru to Chile; and southern Brazil to Argentina.

TYPE SPECIES: *Blepharipoda*: *Blepharipoda occidentalis* J. W. Randall, 1840, by monotypy. *Albunhippa*: *Albunhippa spinosa* H. Milne Edwards and Lucas, 1841, by monotypy. *Abrote*: *Abrote spinimana* Philippi, 1857, by monotypy.

INCLUDED SPECIES: *B. occidentalis* J. W. Randall, 1840; *B. spinosa* (H. Milne Edwards and Lucas, 1841); *B. doelloi* Schmitt, 1942; *B. liberata* Shen, 1949.

REMARKS: *Blepharipoda* is an apparently difficult genus name to spell correctly (see above synonymy list). The precedence of *Blepharipoda* over *Albunhippa* has been a matter of some debate (e.g., Dana, 1852). The date of publication for volume 8(1) of the Proceedings of the Academy of Natural Sciences of Philadelphia, which contained Randall's description of *Blepharipoda*, is not known with certainty, but it was presented to the Academy at a meeting on May 5, 1840 (see Fox, 1913). Although the date is generally accepted to be 1840, whether this volume was published in 1839 or 1840 is irrelevant as far as priority of this genus name is concerned, as H. Milne Edwards and Lucas' paper describing the new genus *Albunhippa* was not published until sometime in 1841 (A. Crosnier, personal commun.), contrary to the statement of Dana (1852). *Blepharipoda* Randall is therefore the senior synonym and correct name for this genus. Randall (1840) considered this genus as the missing link between *Ranina* and *Albunea*, but these genera are in different decapod suborders and share only convergently evolved characters.

There is a junior homonym for this genus name in the Diptera (Insecta), but that name has long been synonymized, regardless of occasional recent citations as valid in the entomological literature (Sabrosky and Arnaud, 1965).

*Blepharipoda* and *Lophomastix* share trichobranch gill structure, the same gill formula, and similar overall carapace, abdomen, and pereopod morphology. Both are also an-

titropical in distribution. The apparent segmentation of the distal peduncular segments in *Blepharipoda* is, as in the hippid *Emerita*, the result of nonsclerotization of the membranous area, not true segmentation (see Pöw, 1969, for "*Hippa*" = *Emerita*).

The sole fossil species formerly placed in *Blepharipoda*, *B. brucei* Rathbun, 1926, was based on claw fragments and has recently been removed to the Paguridae (Schweitzer and Boyko, 2000).

#### KEY TO SPECIES

- 1 Basis-ischium of pereopod I with spine(s), meri of pereopods II–IV not all armed with small spine on distodorsal margin . . . . . 2
- Basis-ischium of pereopod I without spine(s), meri of pereopods II–IV all armed with small spine on distodorsal margin . . . . . 3
- 2 Anterior gastric spine present, posterior margin of abdominal somite II pleura toothed . . . . . *B. occidentalis*
- Anterior gastric spine absent, posterior margin of abdominal somite II pleura smooth . . . . . *B. liberata*
- 3 Coxae of pereopod II with one spine, distal margin of telson with notch . . . . . *B. spinosa*
- Coxae of pereopod II with two spines, distal margin of telson smoothly rounded . . . . . *B. doelloi*

#### *Blepharipoda occidentalis* Randall, 1840

Figures 9–11

*Blepharipoda occidentalis* Randall, 1840: 131–132, pl. 6\*. – Gibbes, 1850a: 24, 27\*. – Gibbes, 1850b: 187\*. – Ortmann, 1896: 222 (part). – Holmes, 1900: 104–105. – Rathbun, 1904: 14 (list), 167. – Rathbun, 1911: 594 (list) (part). – Baker, 1912: 102. – Balss, 1914: 92 (list). – Porter, 1915a: 78–82 (part). – Porter, 1915b: 14–17 (part). – Porter, 1916: 280–282 (part). – Caldwell, 1918: 71. – Schmitt, 1921: 172, pl. 31, fig. 6. – Johnson and Snook, 1927: 346–349, fig. 295. – Porter, 1936b: 254–255 (part). – MacGinitie, 1938: 474. – Porter, 1940a: 312 (part). – Porter, 1940b: 146 (part). – Porter, 1941: 460 (part). – Schmitt, 1942: 2–9, pl. 1, figs. 4–6\*. – Fesquet, 1942: 111–113. – Johnson and Lewis, 1942: 82–86, pls. 3, 4. – MacGinitie and MacGinitie, 1949: 304–305. – Snodgrass, 1952: 31–32, fig. 11b, c. – Smith et al., 1954: 186 (list). – Schuster-Dieterichs, 1956: 51 (list) (part). – Carlisle et al., 1960: 49. – Hedgpeth, 1961: 21, fig. 40. – Seilacher, 1961: 263–264, figs. 5–8. – Turner and Se-



- xsmith, 1964: 48. – Knight, 1968a: 337–367, figs. 1–61\*. – Knight, 1968b: 63–93, figs. 1–61\*. – Fonseca, 1970: 35 (part), fig. 71. – Carlton and Kuris, 1975: 410 (list). – Turner and Sexsmith, 1975: 46, 48, unnumbered fig. – Luke, 1977: 31. – Haig and Abbott, 1980: 582, fig. 24.5. – Wicksten, 1980: 209 (list). – Paul, 1981a: 159–168, figs. 1–3. – Paul, 1981b: 169–187, figs. 1d–f, 2a, 3, 4, 5b–d, 6b, c, 7, 8b, d, 10, 11d, f, g. – Coêlho and Calado, 1987: 42, table 1. – Williams et al., 1989: 35. – Faulkes et al., 1991: 1245. – Faulkes and Paul, 1993: 1600. – Calado, 1995: 113–116, pl. 34, figs. a–b, pl. 35, figs. a–d\*. – Faulkes and Paul, 1997a: 162, 165–175. – Faulkes and Paul, 1997b: 793–804. – Faulkes and Paul, 1997c: 161–168. – Faulkes and Paul, 1997d: ii. – Dugan et al., 2000: 230–244. – Boyko and Mikkelsen 2002: 149–150, 152–153, 155, 158, fig. 1a.
- Blepharopoda* [sic] *occidentalis*: Stimpson, 1857: 486\*. – Stimpson, 1858: 230. – Miers, 1878: 334–335. – Duruflé, 1889: 93, 95. – Bouvier, 1898b: 342.
- Blephoripoda* [sic] *occidentalis*: Turner and Sexsmith, 1964: 50, unnumbered fig.
- not *Blepharipoda occidentalis*: Ortmann, 1896: 222 (part). – Lenz, 1902: 749. – Rathbun, 1911: 594 (list) (part). – Porter, 1915a: 78–82 (part), fig. 10. – Porter, 1915b: 14–17 (part), fig. 3. – Porter, 1916: 280–282 (part), unnumbered fig. – Porter, 1936b: 254–255 (part). – Porter, 1936c: 338 (list). – Porter, 1940a: 312 (part). – Porter, 1940b: 146 (part). – Porter, 1941: 460 (part). – Schuster-Dieterichs, 1956: 52. – Fonseca, 1970: 35 (part) (= *Blepharipoda spinosa* (H. Milne Edwards and Lucas, 1841)).
- not *Blepharopoda* [sic] *occidentalis*: Berg, 1900: 225–227 (= *Blepharipoda doelloi* Schmitt, 1942).
- not *Blepharipoda occidentalis*: Porter, 1911: 17. – Porter, 1915a: 78–82 (part). – Porter, 1915b: 14–17 (part). – Porter, 1916: 280–282 (part). – Porter, 1936b: 254–255 (part). – Porter, 1940a: 312 (part). – Porter, 1940b: 146 (part). – Porter, 1941: 460 (part). – Barattini, 1957: 63–65, fig. 1. – Zolessi and Philippi, 1995: 10 (list). – Boschi, 1997: 224 (= *Blepharipoda doelloi* Schmitt, 1942).
- not *Blefaripoda* [sic] *occidentalis*: Porter, 1936a: 153 (= *Blepharipoda spinosa* (H. Milne Edwards and Lucas, 1841)).
- not *Blepharipoda occidentalis*: Schuster-Dieterichs, 1956: 52.– 29, 34, 36–37, 40, 45, 47–48, 51 (list, part) (= sp. indet.).
- not *Blepharipoda occidentalis*: Schram, 1986: 293, fig. 24–3 (= *Emerita* sp. [Hippidae]).
- “Southern California,” coll. C. A. Whiting: 2 ♂, 43.2–47.9 mm cl (USNM 24813); “West coast of America,” coll. unknown: 2 ♂, 60.6–66.1 mm cl (MCZ 19653); *San Francisco Co.*: Ocean Beach, San Francisco, March 1962, coll. C. Daiss: 1 ♂, 42.6 mm cl (CASIZ 109335); San Francisco, 1880, coll. D. S. Jordan: 1 ♂, 22 mm cl, 1 ♀, 47.8 mm cl (USNM 3091); near end of Lincoln Ave., Ocean Beach, San Francisco, March 7, 1984, coll. D. Alexander: 1 ♂, 56.4 mm cl (CASIZ 50641); *Monterey Co.*: Pacific Grove, Monterey, coll. unknown: 1 ♂, 58.8 mm cl (CASIZ 109239); Pacific Grove, Monterey, coll. H. Heath: 1 oviger, 49.8 mm cl (ANSP 566); Monterey Bay, 15 fms (= 27.4 m), coll. unknown: 1 ♂, 69.1 mm cl (CASIZ 109334); off Del Monte, Monterey Bay, 8 fms (= 14.6 m), Aug. 7, 1931, coll. G. E. MacGinitie: 1 megalopa, 3.4 mm cl; *San Luis Obispo Co.*: Cayucos, coll. H. F. F. Merrill: 2 ♂, 40.0–44.4 mm cl (CASIZ 109333); beach near Morrow Bay, coll. C. L. Hubbs: 3 ♂, 48.7–69.9 mm cl (CASIZ 109249); sand bar, Morro Bay, Aug. 1938, coll. T. and J. Q. Burch: 1 ♂, 58.2 mm cl, 1 oviger, 46.3 mm cl (AMNH 9048); coll. E. Deichmann: 1 ♂, 49.3 mm cl, 1 oviger, 57.5 mm cl (MCZ 9419); *Santa Barbara Co.*: Jalama Beach, north of Point Concepcion, June 3, 1999, coll. J. Diehl: 4 ♂, 36.9–47.8 mm cl, 2 ♀, 38.1–41.8 mm cl, 1 oviger, 32.6 mm cl (AMNH 18076); near Carpinteria, June 2, 1916, coll. C. L. Hubbs: 1 ♀, 26.1 mm cl (CASIZ 109244); Santa Barbara, coll. D. S. Jordan: 1 ♂, 37.0 mm cl (USNM 3047); from beach near East Point, Santa Rosa Island, Channel Islands, California, Feb. 4, 1954, coll. unknown: 1 oviger, 43.2 mm cl (CASIZ 3755); *Los Angeles Co.*: San Pedro, March 3, 1898, coll. “Albatross”: 1 ♂, 33.2 mm cl (USNM 21813); San Pedro, 1901, coll. T.D.A. Cockerell: 2 ♂, 35.2–52.5 mm cl (USNM 42201); caught on baited line, Manhattan Beach, Aug. 5, 1933, coll. V. Williams: 4 ♂, 48.2–50.7 mm cl (USNM 267780); Venice, coll. Venice Marine Biological Station: 1 ♂, 39.7 mm cl (USNM 43345); Hyperion, Oct. 25, 1921, coll. E. J. Brown: 1 ♂, 53.5 mm cl (USNM 56389); Long Beach, coll. H. N. Lowe: 4 ♂, 34.5–42.6 mm cl, 2 ♀, 38.9–44.8 mm cl, 3 ovigers, 38.0–44.3 mm cl (USNM 42102), 1 ♂,

MATERIAL EXAMINED: USA: California:



39.1 mm cl (BMNH 1937.6.1.6 ex USNM 42102), 1 ♂ 29.9 mm cl, 1 oviger, 36.2 mm cl (USNM 79389 ex USNM 42102); Long Beach, coll. H. N. Lowe: 1 oviger, 42.7 mm cl (USNM 42202); Long Beach, June 1905, coll. J. E. Benedict: 2 ♂, 45.2–46.6 mm cl, 3 ♀, 35.3–40.9 mm cl, 2 ovigers 35.4–38.3 mm cl (USNM 42203), 2 ♂, 45.2–50.0 mm cl (BMNH 1976.288 ex USNM 42203); Long Beach, coll. H. N. Lowe: 1 ♂, 51.8 mm cl (USNM 23057); *Orange Co.*: Corona del Mar, July 10, 1937, coll. G. E. and N. MacGinitie: 2 ♂, 33.4–34.9 mm cl, 1 ♀, 39.4 mm cl, 1 oviger, 36.6 mm cl (USNM 267781), 1 ♂ 40.5 mm cl, 1 ♀, 38.5 mm cl (RMNH 14644 ex USNM 267781), 6 ♂, 37.5–46.0 mm cl, 2 ♀, 38.1–43.1 mm cl, 2 ovigers, 32.6–37.4 mm cl (USNM 89482); Corona del Mar beach, July 1946, coll. G. E. and N. MacGinitie: 1 ♂, 52.6 mm cl (USNM 89496); Seal Beach, Spring 1919, coll. E. P. Chace: 1 ♀, 39.9 mm cl (USNM 54050); *San Diego Co.*: San Diego, coll. T. Nuttall and J. K. Townsend: 1 ♀, 49.5 mm cl, holotype (ANSP 3656); La Jolla, coll. Scripps Institute of Oceanography: 1 ♂, 38.0 mm cl, 1 ♀, 43.0 mm cl (BMNH 1959.8.5.65–66); La Jolla, 1927, coll. W. R. Coe: 1 ♀, 34.3 mm cl (YPM 21131); La Jolla, July 13, 1916, coll. unknown: 2 ♂, 33.8–46.9 mm cl, 1 ♀, 39.6 mm cl (AMNH 6157); La Jolla, 2 ♂, 44.5–57.7 mm cl (AMNH 9666); La Jolla, coll. unknown, 1 ♂, 10.0 mm cl (USNM uncataloged); San Diego, Jan. 17, 1905, coll. Davis: 1 ♂, 46.7 mm cl (USNM 104652); Mission Bay, Jun. 5, 1946, coll. unknown: 2 ♂, 46.7–48.2 mm cl, 1 oviger, 43.4 mm cl (CASIZ 109336); Coronado, Sept. 7, 1901, coll. H. E. Stockwell: 1 ♂, 56.8 mm cl (USNM 29021).

**Mexico: Baja California Norte:** Rosalia Bay, coll. A. W. Anthony: 1 ♂, 42.8 mm cl (USNM 19526); “Lower” [= Baja] California, Mexico, coll. T. H. Streets: 1 ♂, 45.3 mm cl (USNM 2298); San Pedro, coll. University of California Department of Biology: 1 oviger, 42.7 mm cl (USNM 267782).

**No data/limited data:** 1 ♂, 41.6 mm cl, 1 ♀, 42.2 mm cl (USNM 104651); “on the beach, cast up during reign of peridinium,” July 22, 1901, coll. unknown: 1 ♂, 44.3 mm cl, 1 ♀, 50.1 mm cl, 3 ovigers, 49.7–55.6 mm cl (USNM acc. 207824); Aug. 29, 1933,

coll. unknown: 1 ♂, 58.4 mm cl (USNM acc. 207834); 1 ♀, 17.5 mm cl (USNM 42200); [no data]: 1 ♂, 33.7 mm cl (USNM 5228); 1 ♂, 53.4 mm cl (USNM uncataloged).

**Incorrect locality data:** “Australia”, coll. H. A. Ward: 1 ♂, 44.4 mm cl (USNM 21743).

**DIAGNOSIS:** Carapace with anterior gastric spine. Antennular dorsal flagellum with 65–85 articles, ventral flagellum with 15–21 articles. Antennal flagellum with 24–44 articles. Pereopod I dactylus with two or three large spines on dorsal margin; carpus with one to three large spines proximal to dorso-distal spine; basis-ischium with spine(s). Pereopod II coxa with one spine (or one spine plus small tubercle). Abdominal somite II pleura spinose.

**DESCRIPTION:** Carapace (fig. 9A) approximately 1.3 times longer than wide; strongly keeled medially. Anterior margin with large rugose spine on either side of ocular sinus, convex laterally; large spines and margin all armed with numerous small spinules; large spine armed with strong low tooth on mesio-distal margin. Rostrum as large acute spine, extending nearly one-half length of proximal pseudosegment of distal peduncular segments. Ocular sinus acutely concave and armed with numerous small spines. Frontal region smooth; setal field as thin transverse line with anteriorly produced lateral elements. CG1 parallel to anterior margin of carapace, convex and produced dorsally, armed with numerous small rounded teeth along length and large anterogastric median spine. Mesogastric region smooth laterally, with row of medial punctae; CG2 absent; CG3 absent; CG4 with two long crenulate lateral elements approximately one-third carapace width. Hepatic region smooth, with scattered small punctae and two strong, slightly curved, anteriorly directed spines; anteriormost spine approximately one-half larger than posterior. Epibranchial region roughly triangular, smooth, armed with one strong spine subequal in length to posterior hepatic spine; three short setose grooves mediolaterally. Metagastric region smooth, with medial and posterior punctae; CG5 absent. CG6 strongly crenulate, with oblique anterolateral elements separate from medial concave element. CG7 absent. Cardiac region

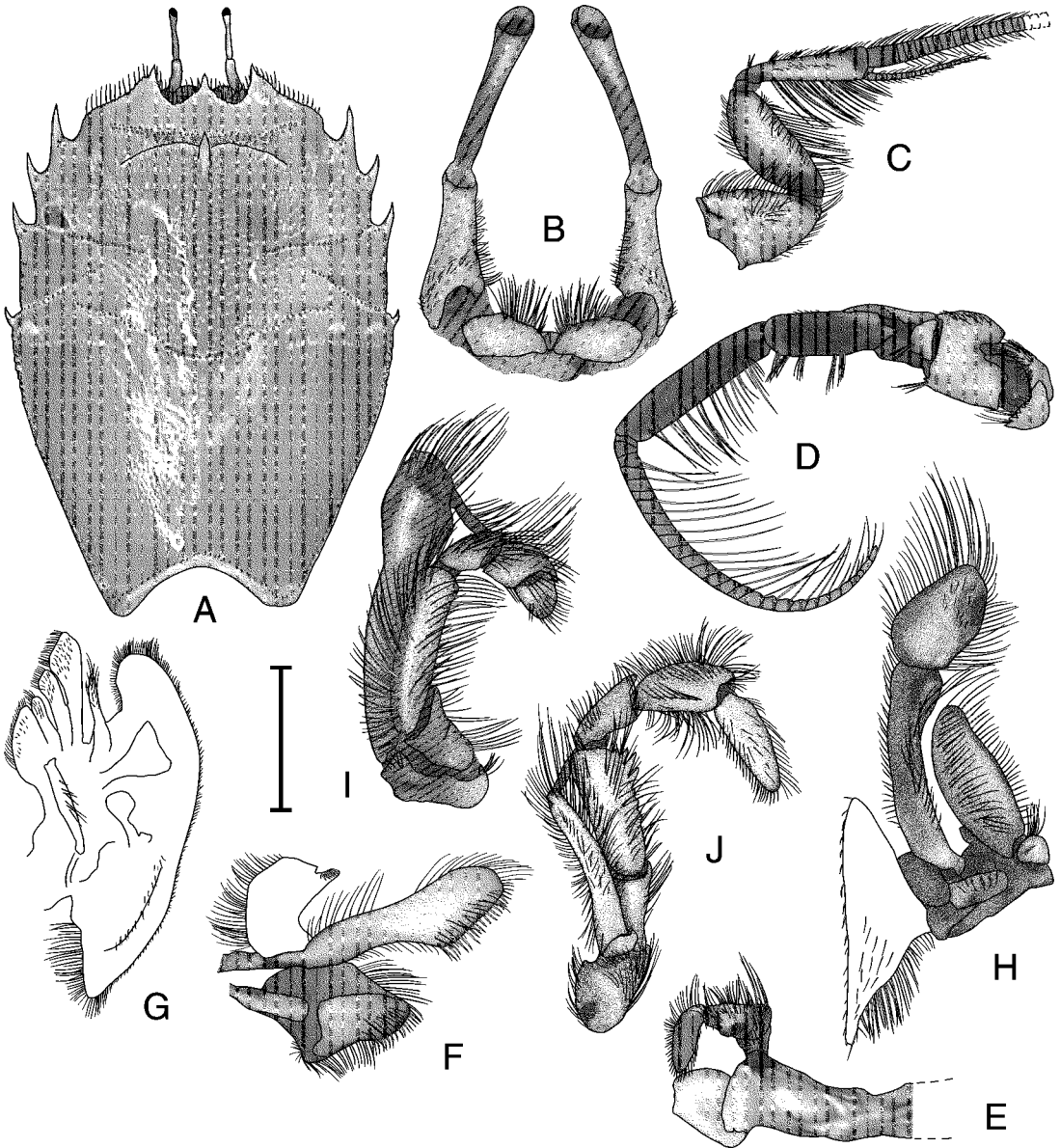


Fig. 9. *Blepharipoda occidentalis* J. W. Randall, 1840: A, ♂, 58.2 mm cl, AMNH 9048; B–J, ♂, 33.8 mm cl, AMNH 6157. A. Carapace and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Right antennule, lateral view. D. Left antenna, lateral view. E. Right mandible, mesial view. F. Right maxillule, lateral view. G. Left maxilla, lateral view. H. Right maxilliped I, lateral view. I. Right maxilliped II, lateral view. J. Right maxilliped III, lateral view. Scale = 3.3 mm (B, F), 4.4 mm (E, H, I), 5.9 mm (C, D, G), 6.7 mm (J), and 17.2 mm (A).

smooth, with few scattered punctae; CG8–11 absent. Branchial region smooth, with numerous scattered punctae and small spine on anterolateral margin; anterolateral margins spinose. Posterior margin deeply and evenly

convex; submarginal groove unbroken. Branchiostegite unarmed; anterior region with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous ir-

regular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 9B) subovate, located between median peduncular segments. Median peduncular segments oblong; dorsal margin with long plumose setae. Distal peduncular segments elongate, subdivided into proximal and distal pseudosegments; proximal pseudosegment tapering to distal end, with spiral band of plumose setae along mesial margin and ocular pore on ventromesial surface; distal pseudosegment cylindrical with distal rounded cornea; mesial margins widely separated along length.

Antennule (fig. 9C) segment III narrow proximally, expanding distally to twice proximal width; simple and plumose setae on dorsal margin, plumose setae on ventral margin and sparsely scattered on mediolateral surface; dorsal exopodal flagellum with 6585 articles ( $n = 7$ ) [42 in megalopa], long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with 15–21 articles ( $n = 7$ ) [3 in megalopa], plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins and scattered on ventrolateral half of surface. Segment I width subequal to length, unarmed; dorsolateral surface with long plumose setae; long plumose setae on dorsal and distoventral margins.

Antenna (fig. 9D) segment V approximately three times longer than wide, with 10 or 11 short transverse lines of long simple setae on either side of ventral medial line; flagellum with 24–44 articles ( $n = 7$ ) [10 in megalopa], long simple setae at ventrodial margin of each article. Segment IV subcylindrical, approximately three times longer than wide; tuft of setae at dorodistal margin; two transverse rows of short simple setae on ventral margin either side of medial line. Segment III decalcified and produced mesiodistally. Segment II short, subcylindrical; antennal acicle short, rounded, with low spines on distal margin and few scattered setae. Segment I dorsally rounded, ventrally rectangular with distolaterally produced toothed lobe; few scattered setae on distal margins and surface; segment with ventromesial antennal gland pore.

Mandible (fig. 9E) incisor process with

two teeth; cutting edge lacking tooth or with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 9F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin plumose setae on dorsal margin. Proximal endite with thick simple setae on distal margin and decalcified dorsoventral lobe between calcified regions. Endopod external lobe rounded distally and curled under; internal lobe produced distally with nine thick setae at distolateral margin; entire endopod "mitten-shaped."

Maxilla (fig. 9G) exopod evenly rounded with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 9H) epipod with plumose setae on margins, distolateral surface and mesial surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, margins and surface with plumose setae; distal segment spatulate, longer than wide, broadest medially, margins with long plumose setae, few short setae scattered on mediolateral region. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment; plumose setae on margins.

Maxilliped II (fig. 9I) dactylus evenly rounded, length equal to width, with long simple setae on lateral surface; distal margin with thick serrate setae. Propodus 1.5 times wider than long, slightly overreaching margin of dactylus, plumose setae on dorsal margin and long simple setae at dorsodistal margin. Carpus not produced dorsodistally, approximately two times longer than wide; long simple setae on dorsal and distal margins and scattered on surface. Merus approximately 4.5 times longer than wide, margins parallel; with long plumose setae on lateral and mesial margins and on mesial half of surface. Basis-ischium incompletely fused with deep suture and plumose setae on margins. Exopod one-third longer than merus, produced mesiodistally, flagellum with six articles.

Maxilliped III (fig. 9J) dactylus longer

than wide, tip rounded; long plumose setae on dorsal and ventral margins and scattered on surface; thick serrate setae on distal margin. Propodus with longitudinal median row of plumose setae on lateral surface; dorsal and ventral margins with plumose setae. Carpus slightly produced onto propodus, with small spine at distoventral margin; lateral surface with row of plumose setae ventromedially; plumose setae on dorsal and ventral margins. Merus with three or four strong corneous teeth and few small teeth on ventral surface, plumose setae on dorsal and ventral margins and scattered on lateral surface. Basis-ischium incompletely fused with deep suture, approximately one-half length of merus, with strong crista dentata of 11 large and small corneous teeth. Exopod two-segmented: proximal segment small; second segment styliform, tapering, approximately one-fourth longer than merus; plumose setae on margins and surface; flagellum with three indistinct subdivisions.

Pereopod I (fig. 10A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin armed with two or three strong corneous spines ( $n = 7$ ) and none to two small proximal spines ( $n = 7$ ) (no spines on dactylus in megalopa), with long plumose and short simple setae; ventral margin unarmed with submarginal row of short simple setae. Propodal lateral surface with numerous short, transverse patches of rugae, some with short setae; dorsal margin with one or two small spines and long plumose setae; ventral margin distally produced into acute spine and with strong acute spine arising from midpoint of margin, with long plumose setae; cutting edge with four to six large corneous teeth ( $n = 6$ ) increasing in size from junction with dactylus (no spines in megalopa), lined with long plumose setae; lateral surface of propodus with two large spines; distal spine just behind junction with dactylus approximately one-third down palm; proximal spine just anterior to junction with carpus at midpoint of propodus/carpus margin; mesial surface rugose with short and long plumose setae in rugose patches. Carpus with dorsodistal angle produced into strong corneous-tipped spine with small teeth on dorsal surface of spine; dorsal margin behind spine armed with one to three large spines and

none to two small spines ( $n = 6$ ) and with small teeth on distal two-thirds of dorsal margin; dorsal margin with long plumose setae; lateral surface with few transverse setose rugae on medial surface; mesial surface with rugae and short simple setae, margins with long plumose setae. Merus with large spine at two-thirds length of ventral margin and large spine at dorsodistal angle; sinuous, submarginal raised, setose line running between two spines, lined with small spines; second sinuous line running parallel and proximal to first, but one-third from proximal margin; long plumose setae on distoventral angle, dorsal margin, and in oblique patch across surface; mesial surface with few short rows of setae. Basis-ischium incompletely fused, small spine (rarely two) in anterolateral margin. Coxa unarmed.

Pereopod II (fig. 10B) dactylus smooth; base to heel slightly concave, heel smoothly rounded and produced, heel to tip with narrow, subacute indent, tip subacute, tip to base broadly convex; lateral surface smooth, with several small punctations in roughly straight line across medioproximal surface; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae. Propodal dorsal surface smooth, ventral margin inflated and rounded; oblique row of long plumose setae from dorsal junction with dactylus to ventral junction with carpus, distal and ventral margins with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with 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 strongly produced and subacute dorsodistally, almost reaching distal margin of propodus, dorsal margin serrated along distal four-fifths; lateral surface with patches of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; dorsal margin with short plumose setae; mesial surface smooth with long plumose setae in scattered patches on dorsal half of surface and on margins. Merus with small medial decalcified window ventral to median line, unarmed, with long plumose setae on proximal surface and margins; mesial surface nearly smooth



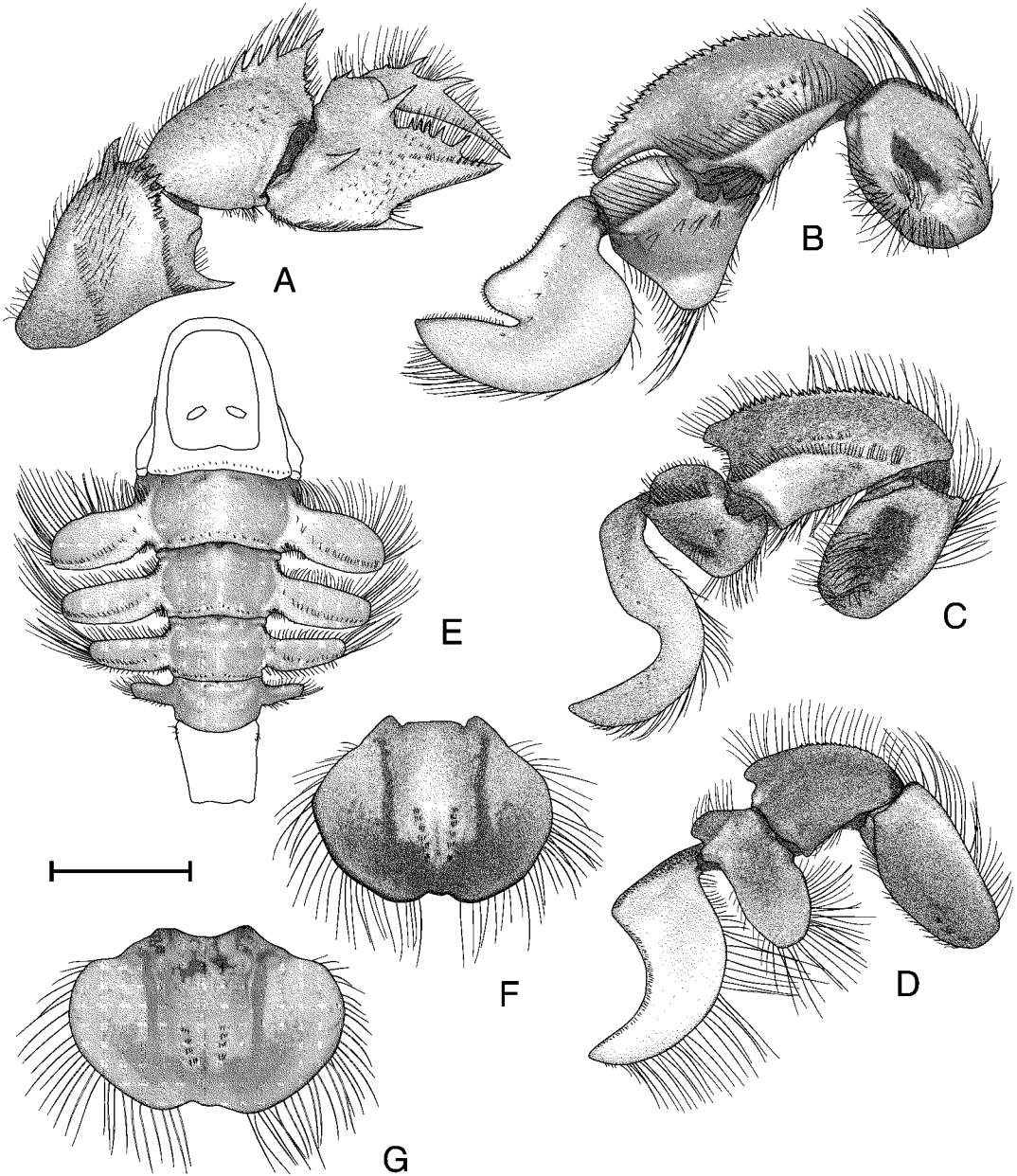


Fig. 10. *Blepharipoda occidentalis* J. W. Randall, 1840: A–F, ♂, 33.8 mm cl, AMNH 6157; G, ♀, 39.6 mm cl, AMNH 6157. A. Right pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I–VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 4.4 mm (F, G), 6.7 mm (E), and 8.9 mm (A–D).

with few setae. Basis-ischium incompletely fused and unarmed. Coxa with one small spine or small spine plus a tubercle on anterior margin.

Pereopod III (fig. 10C) dactylus with base to heel straight, heel subquadrate, broad and low, heel to tip with broadly concave indent, tip subacute, tip to base smoothly convex;

lateral surface smooth, sinuous row of short setose punctations from median of heel to approximately one-half distance along distal blade; ventral margin with long plumose setae; mesial surface smooth with plumose setae proximally at junction with propodus. Propodus inflated dorsoventrally; lateral surface smooth, long plumose setae on ventral margin and in oblique submarginal row distally; dorsolateral surface narrow, oblique, flattened with ventral row of long plumose setae and dorsal row of short simple setae; mesial surface with scattered long setae on and near ventral margin. Carpus produced dorsodistally, exceeding proximal margin of propodus by approximately one-third length of propodus, rounded; medial three-fourths of dorsal margin spinose; lateral surface rugose in medial third, with short scattered setae and long row of setae ventral to rugose region; mesial surface smooth, with row of long plumose setae on distal margin. Merus smooth, with large decalcified window covering nearly all of lateral surface; unarmed; proximolateral margin and dorsodistal margin with long plumose setae, long plumose setae scattered on medioproximal surface; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa with medially directed spine, tubercle, or spine plus tubercle in males and females on anterior margin. Female with large gonopore on posterior mesial margin of coxa, not opposing or obscured by other coxa, without setae; male without pore.

Pereopod IV (fig. 10D) dactylus with base to heel straight, heel low and subacute, heel to tip broadly rounded in smooth arc, tip subacute, tip to base broadly convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface smooth, small patch of plumose setae between heel and articulation with propodus. Propodus expanded dorsally and ventrally; ventral expansion not reaching ventral margin of dactylus, ventral margin with long plumose setae; dorsal expansion with long plumose setae dorsally; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; proximal two-thirds of dorsal margin serrate; medial third of lateral surface with rugae. Merus unarmed; dorsal and ventral margins with long plumose setae;

few short setae scattered on proximoventral surface. Basis-ischium incompletely fused and unarmed. Coxa with curved spine or tubercle at anterior margin.

Abdomen (fig. 10E) somite I longer than wide, widest posteriorly; dorsal surface with anterior margin convex; posterior margin straight with submarginal row of setose punctae; medial surface decalcified with two short transverse calcified lines on either side of midline. Somite II dorsal surface with strong medial keel; anterior margin straight, posterior margin concave; anterior margin with short decalcified areas either side of midline, posterior margin with submarginal row of short setae; pleura expanded and directed posterolaterally, anterolateral angle rounded, posterolateral angle more acute, posterior margin with row of low teeth; margins with long plumose setae; patch of setae at posterior junction with somite; row of short setose punctae running along surface from posterolateral margin of pleura to anteromesial margin. Somite III similar to somite II, but narrower, shorter, strongly convex medially; pleura thinner and shorter than on somite II, directed less posterolaterally, with setae as in somite II, posterior margin with short row of low teeth. Somite IV similar to somite III, but thinner and shorter; pleura shorter than on somite III, directed laterally; posterior margin smooth, margins with long plumose setae. Somite V subequal to somite IV; pleura approximately one-half length of somite IV pleura and directed laterally; margins and surface of pleura with long plumose setae. Somite VI subequal to somite V in width but longer; anterolateral margin with short plumose setae; posterior margin with few short setae; pleura absent.

Telson of male (fig. 10F) ovate, laterally expanded, wider than long, notch at distal tip with small medial rounded projection; medial third heavily calcified, dorsally inflated, and tapering distally, lateral third weakly calcified; demarcation of calcified and uncalcified regions marked by low ridge; median longitudinal groove on distal half of calcified area, six short transverse rows of short simple setae on either side of median groove. Margins with long simple setae. Telson of female (fig. 10G) nearly identical to male, but with

broader notch at tip and more laterally expanded uncalcified lobes.

DISTRIBUTION: San Francisco, California, USA, south to Baja California Norte, Mexico, lower intertidal to 27.4 m depth.

MAXIMUM SIZE: Males: 69.9 mm cl; females: 57.5 mm cl.

TYPE SPECIMEN: ANSP 3656 (holotype).

TYPE LOCALITY: San Diego, California, USA.

REMARKS: Color notes were made by the author on live animals (AMNH 18076): carapace bluish-brown, browner posteriorly, bluer anteriorly, spines white with hint of salmon; proximal pseudosegment of distal peduncular segments bluish, distal pseudosegment salmon proximally, white distally; antennular flagellum with alternating bands of light and dark articles (more than one article per band); antennal articles bluish-gray-brown with salmon highlights at joints; pereopod I dactylus salmon medially, white on edges, propodus brown proximally, salmon distally; pereopods II–IV bluish-brown, dactyli of pereopods II and III salmon in median, white on edges, dactyli of pereopod IV salmon-brown; abdominal somites bluish-brown with bluish pleural tips; uropods salmon; tip of telson salmon, remainder bluish-white; setae golden-yellow; eggs bright red.

*Blepharipoda occidentalis* is the only species of spiny sand crab that occurs in high densities and whose biology is fairly well known. It is common enough to be collected and used as a bait fish in California (Turner and Sexsmith, 1964), and is a known prey item of the black seabass, *Stereolepis gigas* Ayres (Luke, 1977), and the barred surfperch, *Amphistichus argenteus* Agassiz (Carlisle et al., 1960). According to MacGinitie and MacGinitie (1949), these animals are scavengers and do not eat live animals (e.g., *Emerita*, polychaetes). Ovigerous females are typically found from April to August (with exceptions, e.g., CASIZ 3755), with almost 100% of females being ovigerous in late June to early July (MacGinitie and MacGinitie, 1949). The duration of egg-carrying appears to be between 6 and 8 weeks (MacGinitie and MacGinitie, 1949). The complete larval development of this species (from ovigerous females) was described by Knight (1968a, 1968b) with five or six zoeal

stages and one megalopal stage reached in 34–52 days at 16–18°C and 32.9–33.7‰ salinity.

Extensive observations on the tail-flipping locomotory technique of this species, as well as the tailfan neuromusculature, were made by Paul (1981a, 1981b). The digging behavior in this species has also been studied in detail (Faulkes and Paul, 1993; 1997b; 1997c).

A commensal clam of the genus *Mysella* (Bivalvia: Lasaeidae), most frequently identified as *M. pedroana* Dall, 1889 (Turgeon et al., 1998), is often found attached by byssal threads in the branchial chambers of *B. occidentalis* (fig. 11). Approximately two-thirds of the specimens of *B. occidentalis* examined were infested with this clam, typically with 1 or 2 clams per branchial chamber, but some specimens contained up to 22 clams in a single branchial chamber (Boyko and Mikkelsen, 1999; 2002). Gill clams are almost always found at the anterior end of the branchial chambers, primarily on the first pereopod arthrobranchs. No clams were found in any of the other three species of *Blepharipoda* or in species of *Lophomastix*.

Schram's (1986) photograph of a "*Blepharipoda occidentalis*" is not only actually a specimen of an *Emerita* sp., but is also cited in the text (Schram, 1986: 294) as an example of a brachyuran endoskeleton!

This species is most closely related to *B. liberata* from the northwest Pacific Ocean.

#### *Blepharipoda liberata* Shen, 1949

Figures 12, 13

*Blepharipoda liberata* Shen, 1949: 156–160, pls. 14, 15. – Kamita, 1958: 70 (list). – Miyake, 1960: 89, pl. 44, fig. 3. – Miyake, 1961: 12\*. – Miyake et al., 1962: 125. – Kim, 1963: 295, 308 (list), fig. 11. – Kim, 1964: 8 (list), 11–12. – Miyake, 1965: 652, fig. 1113\*. – Kim, 1970: 5–6 (list). – Suzuki, 1971: 97, pl. 34, fig. 8. – Kim, 1973: 194–196, 563, 568, 594, pl. 3, fig. 16, text-fig. 32. – Kim, 1977: 203. – Kikuchi and Miyake, 1978: 31 (list). – Miyake, 1978: 155–157, fig. 61\*. – Yang and Sun, 1979: 203. – Coelho and Calado, 1987: 42, table 1. – Wang, 1989: 39 (list). – Miyake, 1991: 158. – Asakura, 1995: 376, fig. 21–286. – Calado, 1995: 107–110, pl. 32, fig. a, pl. 33, figs. a–j. – Sun and Wang, 1996: 33–35. – Boyko and Mikkelsen, 2002: 155.





Fig. 11. Lateral view of the left branchial chamber of a 44.9 mm cl ♂ *Blepharipoda occidentalis*, showing the placement of a 6.9 mm specimen of *Mysella pedroana* (and a smaller clam located to the upper left of the larger specimen). The lateral carapace wall has been removed from the host. Note the matting of the gill filaments caused by the clam.

“*Lepidopa* sp.” Kamita, 1957: 94–96, figs. 40, 41.

*Blepharipoda fauriana*: Kurata, 1964: 11–13, figs. 1–21 (not *Blepharipoda fauriana* Bouvier, 1898 = *Lophomastix japonica* (Duroufflé, 1889)).

*Lophomastix japonica*: Igarashi, 1970: 3, pl. 7, fig. 23 (not *Lophomastix japonica* (Duroufflé, 1889)).

*Blepharipoda libeata* [sic]: Sun and Wang, 1996: fig. 5.

not *Blepharipoda liberata*: Kurata, 1964: 13–14, figs. 22–31 (= *Lophomastix japonica* (Duroufflé, 1889)).

**MATERIAL EXAMINED:** **Japan:** Beach, Tomioka-3 Chome Higata, Amakusa Island, Kumamoto Prefecture, Kyusu Island, Aug. 1948, coll. S. Miyake: 1 ♂, 17.3 mm cl (ZLKU 3301); “Japan,” Oct. 1943, coll. I. Kubo: 1 oviger, 23.7 mm cl (ZLKU 3306); Karo Harbor, Tottori-city, Sea of Japan, July 31, 1950, coll. T. Kishida: 1 ♀, 30.4 mm cl (ZLKU 3335); Noda, Kii Prefecture, May 1938, coll. K. Okamoto: 1 ♂, 20.8 mm cl (ZLKU 3336); Oshima-Konominato, Fukuoka Prefecture, Kyushu Island, March 1959, coll. Motomatu: 1 ♂, 23.3 mm cl, 1 ♀, 28.9 mm cl (ZLKU 7247–7248); Yoichi-city, Hokkaido, Feb. 13, 1952, coll. H. Kurata: 1 ♀, 34.7 mm cl (ZLKU 8688).

**DIAGNOSIS:** Carapace without anterior gastric spine. Antennular dorsal flagellum with 37–40 articles, ventral flagellum with 10–12 articles. Antennal flagellum with 11–13 articles. Pereopod I dactylus dorsal margin with one or two large spines; carpus with none to three large spines proximal to dorsodistal spine; basis-ischium with spine(s). Pereopod II coxa with two spines. Abdominal somite II pleura smooth.

**DESCRIPTION:** Carapace (fig. 12A) approximately 1.3 times longer than wide; strongly keeled medially. Anterior margin with large rugose spine on either side of ocular sinus; convex laterally; large spines and margin all armed with numerous small spinules; large spines armed with produced rounded tooth on mesiodistal margin. Rostrum as large smooth acute spine, extending nearly one-half length of proximal pseudosegment of distal peduncular segments, three-fourths size of outer-ocular spines. Ocular sinus concave, sharply angled laterally and armed with numerous small spines. Frontal region smooth with few low teeth posterior to rostrum; setal field as thin, concave, transverse line, broadest medially, with posteriorly produced lateral elements widely separated from



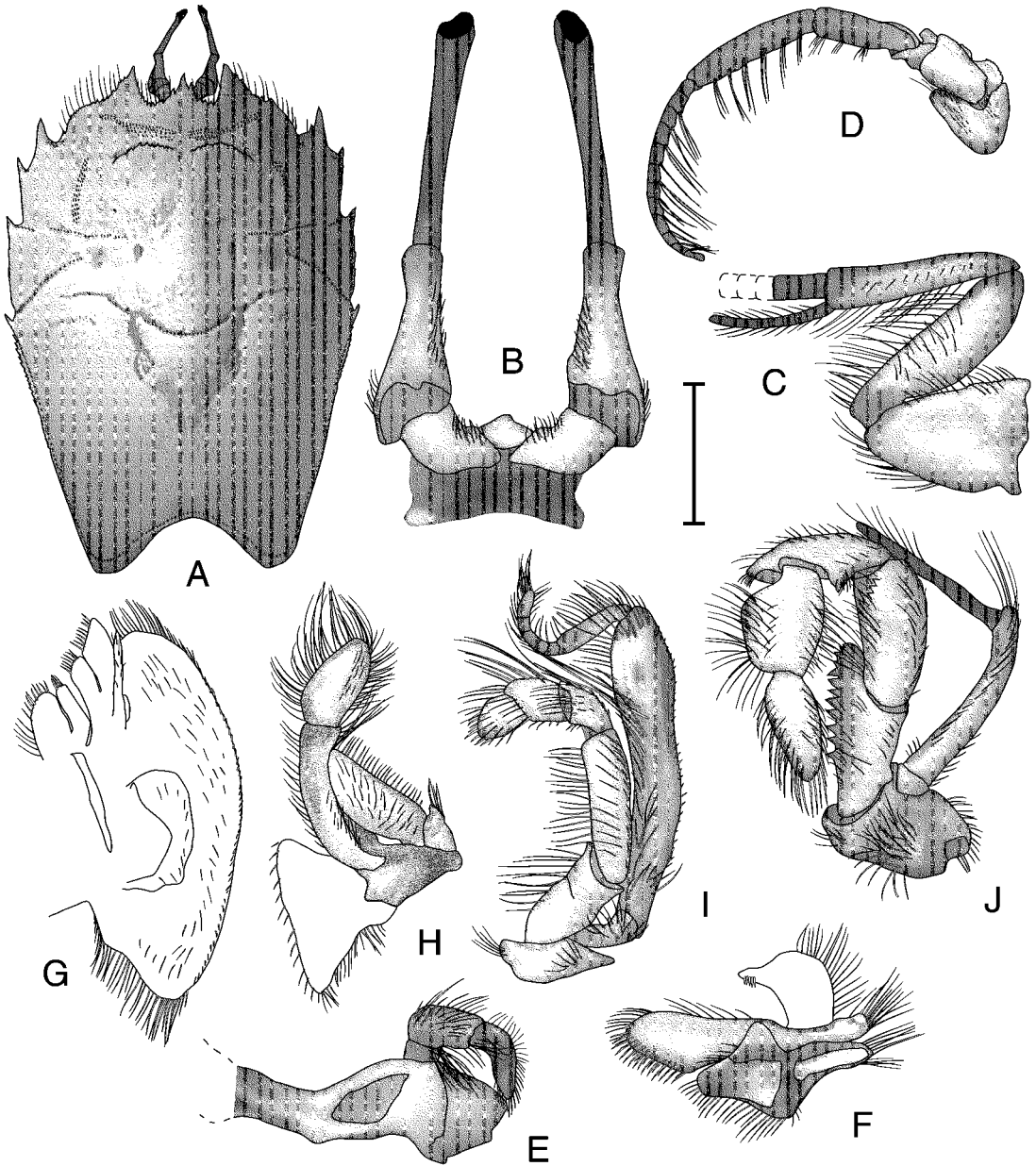


Fig. 12. *Blepharipoda liberata* Shen, 1949: A, ♀, 34.7 mm cl, ZLKU 8688; B–J, ♀, 28.9 mm cl, ZLKU 7247. A. Carapace and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Right maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 2.2 mm (B), 3.0 mm (C, F), 3.3 mm (E, I), 4.4 mm (G, H, J), 6.7 mm (D), and 11.2 mm (A).

anterior element. CG1 parallel to anterior margin of carapace, convex and produced dorsally, armed with numerous small rounded teeth along length, smooth area at midline with at most a small tubercle (no strong anterogastric median spine). Mesogastric region smooth laterally, with row of medial punctae; CG2 absent; CG3 absent; CG4 with two long crenulate lateral elements approximately one-third carapace width, faintly setose. Hepatic region smooth, with scattered small punctae and two strong, slightly curved, anteriorly directed spines; anterior-most spine approximately two times larger than posterior. Epibranchial region roughly triangular, smooth, armed with one strong spine subequal in length to posterior hepatic spine. Metagastric region smooth, carinate, with medial and posterolateral punctae; CG5 absent. CG6 strongly crenulate, with oblique setose anterolateral elements separate from medial concave element that is setose only in median third. CG7 absent. Cardiac region carinate, smooth with few scattered punctae; CG8–11 absent. Branchial region smooth, with numerous scattered punctae and strong spine on distolateral margin; anterolateral margins spinose. Posterior margin deeply and evenly convex; submarginal groove unbroken. Branchiostegite unarmed; anterior region finely toothed, with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 12B) subovate, located between medial peduncular segments. Median peduncular segments oblong; dorsal margin with long plumose setae. Distal peduncular segments elongate, subdivided into proximal and distal pseudosegments; proximal pseudosegment tapering to distal end with spiral band of plumose setae along mesial margin and ocular pore on ventromesial surface; distal pseudosegment cylindrical with distal rounded cornea; mesial margins widely separated along length.

Antennule (fig. 12C) segment III narrow proximally, expanding distally to twice proximal width; short simple setae on dorsal margin, plumose setae on ventral margin and sparsely scattered on mediolateral surface;

dorsal exopodal flagellum with 37–40 articles ( $n = 3$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with 10–12 articles ( $n = 3$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins and scattered on ventrolateral half of surface. Segment I width subequal to length, unarmed; dorsolateral surface with long plumose setae; long plumose setae on dorsal and distoventral margins.

Antenna (fig. 12D) segment V approximately 4.5 times longer than wide, with 11 short transverse lines of long simple setae on either side of ventral medial line; flagellum with 11–13 articles ( $n = 6$ ), long simple setae at ventrodiscal margin of each article. Segment IV subcylindrical, approximately 3.5 times longer than wide; two transverse rows of short simple setae on ventral margin either side of medial line. Segment III decalcified and produced mesiodisally. Segment II short, subcylindrical; antennal acicle short, rounded, with low spines on distal margin and few scattered setae. Segment I dorsally rounded, ventrally rectangular with distolaterally produced toothed lobe; few scattered setae on distal margins and surface; segment with ventromesial antennal gland pore.

Mandible (fig. 12E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 12F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin plumose setae on dorsal margin. Proximal endite with thick simple setae on distal margin and decalcified dorsoventral lobe between calcified regions. Endopod external lobe rounded distally and curled under; internal lobe produced distally, with five thick setae at distolateral margin; entire endopod “mitten-shaped.”

Maxilla (fig. 12G) exopod evenly rounded with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with medial indentation; plumose setae on margins and scattered on surface.

Maxilliped I (fig. 12H) epipod with short

plumose setae on margins, distolateral surface, and mesial surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, margins and surface with plumose setae; distal segment spatulate, longer than wide, broadest medially, margins with long plumose setae, few short setae scattered on mediodistal region. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment; plumose setae on margins.

Maxilliped II (fig. 12I) dactylus evenly rounded, length equal to width, with long simple setae on lateral surface; distal margin with thick serrate setae. Propodus length and width subequal, slightly overreaching margin of dactylus, plumose setae on dorsal margin and long simple setae at dorsodistal margin. Carpus not produced dorsodistally, length and width subequal; long simple setae on dorsal and distal margins and scattered on surface. Merus approximately three times longer than wide, margins parallel; long plumose setae on lateral and mesial margins and medially on surface. Basis-ischium incompletely fused, with deep suture with plumose setae on margins. Exopod over two times longer than merus, produced mesiodistally, flagellum with six articles and long plumose setae.

Maxilliped III (fig. 12J) dactylus longer than wide, tip rounded; long plumose setae on dorsal and ventral margins and scattered on surface; thick serrate setae on distal margin. Propodus inflated dorsodistally with longitudinal median row of plumose setae on lateral surface; dorsal and ventral margins with plumose setae. Carpus slightly produced onto propodus with small spine at distoventral margin; lateral surface with row of plumose setae ventromedially; plumose setae on dorsal and ventral margins. Merus with four or five strong corneous teeth and few small teeth on distoventral surface, plumose setae on dorsal and ventral margins and scattered on lateral surface. Basis-ischium incompletely fused with deep suture, subequal in length to of merus, with strong crista dentata of 10 or 11 large and small corneous teeth. Exopod two-segmented: proximal segment small; second segment styliform, tapering, approximately one-fourth longer than merus; plu-

mose setae on margins and surface; flagellum with two indistinct subdivisions.

Pereopod I (fig. 13A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin armed with one or two strong corneous spines ( $n = 6$ ), none to four small proximal spines ( $n = 6$ ); with long plumose and short simple setae; ventral margin unarmed, with submarginal row of short simple setae. Propodus lateral surface with numerous short, transverse patches of rugae, some with short setae; dorsal margin with none to two small spines ( $n = 6$ ), with long plumose setae; ventral margin distally produced into acute spine and with strong acute spine arising from midpoint of margin, with long plumose setae; cutting edge with three or four large and one or two small corneous teeth ( $n = 6$ ) increasing in size from junction with dactylus, lined with long plumose setae; lateral surface of propodus with one or two large spines; distal spine just behind junction with dactylus approximately one-third down palm (this spine not always present); proximal spine just anterior to junction with carpus at midpoint of propodus/carpus margin; mesial surface rugose with short and long plumose setae in rugose patches. Carpus with dorsodistal angle produced into strong smooth corneous-tipped spine; dorsal margin behind spine armed with none to three large spines and none to two small spines ( $n = 6$ ) and with small teeth on distal two-thirds of dorsal margin; dorsal margin with long plumose setae; lateral surface with few transverse setose rugae on medial surface; mesial surface with rugae and short simple setae, margins with long plumose setae. Merus with large spine at two-thirds length of ventral margin and large spine at dorsodistal angle; sinuous submarginal raised setose line running between two spines, lined with strong spines dorsodistally becoming smaller proximally; second sinuous line running parallel and proximal to first, but one-third from proximal margin, not spinose; long plumose setae on distoventral angle, dorsal margin, and in oblique patch across surface; mesial surface with few short rows of setae. Basis-ischium incompletely fused, one or two spines on distomesial margin ( $n = 5$ ). Coxa unarmed.

Pereopod II (fig. 13B) dactylus smooth;



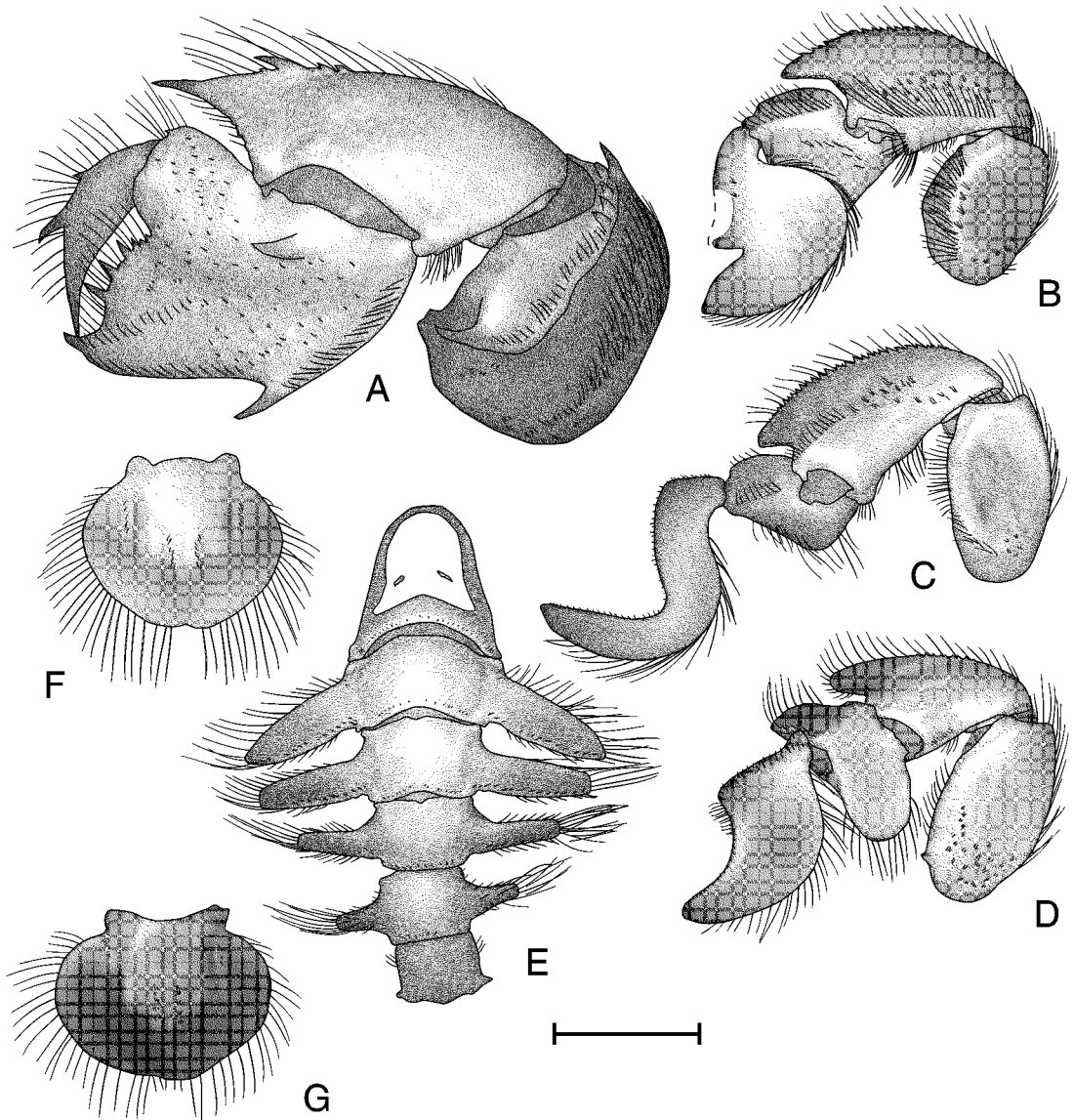


Fig. 13. *Blepharipoda liberata* Shen, 1949: A–E, G, ♀, 28.9 mm cl, ZLKU 7247; F, ♂, 17.3 mm cl, ZLKU 3301. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I–VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 3.0 mm (F), 4.4 mm (A, G), 5.9 mm (E), and 6.7 mm (B–D).

base to heel slightly concave, heel smoothly rounded and produced, heel to tip with narrow, subacute indent, tip subacute, tip to base broadly convex; lateral surface smooth, with several small punctations in roughly straight line across medioproximal surface; mesial surface smooth, ventral margin with long

plumose setae, dorsal margin with short simple setae. Propodal dorsal surface smooth, ventral margin inflated and rounded; distal and ventral margins with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with 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 strongly produced and subacute dorsodistally, reaching one-half length of propodus, dorsal margin serrated along distal four-fifths; lateral surface with patches of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; dorsal margin with long plumose setae; mesial surface smooth with long plumose setae on ventral margin, short simple setae on dorsal and distal margins. Merus with medial decalcified window; mesiodistal margin unarmed; long plumose setae on margins; mesial surface nearly smooth, with few setae. Basis-ischium incompletely fused and unarmed. Coxa with two small spines on anterior margin.

Pereopod III (fig. 13C) dactylus with base to heel almost straight, heel subquadrate, broad and low, heel to tip with broadly concave indent, tip subacute, tip to base smoothly convex; lateral surface smooth, sinuous row of short setose punctations from median of heel to approximately one-half distance along distal blade; ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface smooth with plumose setae proximally at junction with propodus. Propodus inflated dorsoventrally; lateral surface smooth, long plumose setae on ventral and distal margins; dorsolateral surface narrow, oblique, flattened with ventral row of long plumose setae and dorsal row of short simple setae; mesial surface with scattered long setae on and near ventral margin. Carpus produced dorsodistally, exceeding proximal margin of propodus by approximately one-half length of propodus, rounded; distal four-fifths of dorsal margin spinose; lateral surface rugose in medial third, with short scattered setae and long row of setae ventral to rugose region; mesial surface smooth, with row of long plumose setae on distal and dorsal margins. Merus smooth, with large decalcified window covering nearly all of lateral surface; dorsodistal margin unarmed; proximolateral margin and dorsodistal margin with long plumose setae, long plumose setae scattered on medioproximal surface; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa

with medially directed spine (rarely two), tubercle, or spine plus tubercle on anterior margin. Female with large gonopore on posterior mesial margin of coxa, not opposing or obscured by other coxa, without setae; male without pore.

Pereopod IV (fig. 13D) dactylus with base to heel straight, heel low and rounded, heel to tip broadly rounded in smooth arc, tip rounded, tip to base broadly convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface smooth, small patch of plumose setae between heel and articulation with propodus. Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, ventral margin with long plumose setae; dorsal expansion with long plumose setae dorsally; lateral and mesial surfaces smooth. Carpus produced dorsodistally; dorsal margin spinose in medial third; medial third of lateral surface with rugae. Merus distodorsal margin unarmed; dorsal and ventral margins with long plumose setae; few short setae scattered on proximoventral surface. Basis-ischium incompletely fused and unarmed. Coxa with curved spine at anterior margin.

Abdomen (fig. 13E) somite I as long as wide, widest posteriorly; dorsal surface with anterior margin convex; posterior margin irregularly concave with submarginal row of setose punctae; medial surface decalcified with two short transverse calcified lines on either side of midline. Somite II dorsal surface with strong medial keel; anterior margin irregularly convex, posterior margin irregularly concave; anterior margin with short decalcified areas either side of midline, posterior margin with submarginal row of short setae; pleura expanded and directed posterolaterally, anterolateral and posterolateral angles rounded, anterior and posterior margins smooth; anterior margins with long plumose setae, posterior margins with short simple setae; patch of setae at posterior junction with somite; row of short setose punctae on lateral surface running parallel to posterior margin. Somite III similar to somite II, but narrower, shorter, strongly convex medially; pleura thinner and slightly shorter than on somite II, directed laterally, with setae as in somite II, margins smooth. Somite IV similar to somite

III, but thinner and shorter; pleura shorter than on somite III, directed slightly anterolaterally; margins smooth, margins with long plumose setae. Somite V subequal to somite IV; pleura approximately one-half length of somite IV pleura and directed laterally; margins and surface of pleura with long plumose setae. Somite VI subequal to somite V in width but longer; mediolateral margin with short plumose setae; posterior margin without setae; pleura absent.

Telson of male (fig. 13F) ovate, laterally expanded, wider than long, distal tip with small medial indentation; medial third heavily calcified, dorsally inflated, and tapering distally, lateral third weakly calcified; demarcation of calcified and uncalcified regions marked by low ridge along length and short row of setae proximally; median longitudinal groove on distal half of calcified area, five or six short transverse rows of short simple setae on either side of median groove. Margins with long simple setae; no setae on proximalateral corners. Telson of female (fig. 13G) nearly identical to male, but with less indented distal margin tip and more inflated proximalateral lobes.

**DISTRIBUTION:** Known from Japan, China, and Korea; depth range unknown.

**MAXIMUM SIZE:** Males: 23.3 mm cl; females: 34.7 mm.

**TYPE SPECIMENS:** The repository of the two syntypes cited by Shen (1949) is unknown.

**TYPE LOCALITY:** Tungshan, Cheefoo, China.

**REMARKS:** This species was named "to commemorate the glorious and victorious liberalization of Chinese people by the People's Liberal Army under the direction of the Communist Party of China" (Shen, 1949). The Japanese name for this species is "Fushime-Kudahigegani" (Asakura, personal commun.). Kurata (1964) described zoal stages I, II and V of this species (erroneously identified as *B. fauriana*) from the Japanese plankton.

This species is most closely related to *B. occidentalis* from the eastern Pacific.

*Blepharipoda doelloi* Schmitt, 1942

Figures 14, 15

*Blepharopoda* [sic] *occidentalis*: Berg, 1900: 225–227 (not *Blepharipoda occidentalis* Randall, 1840).

*Blepharipoda occidentalis*: Porter, 1911: 17. – Porter, 1915a: 78–82 (part). – Porter, 1915b: 14–17 (part). – Porter, 1916: 280–282 (part). – Porter, 1936b: 254–255 (part). – Porter, 1940a: 312 (part). – Porter, 1940b: 146 (part). – Porter, 1941: 460 (part). – Barattini, 1957: 63–65, fig. 1. – Zolessi and Philippi, 1995: 10 (list). – Boschi, 1997: 224 (not *Blepharipoda occidentalis* Randall, 1840).

*Blepharipoda doelloi* Schmitt, 1942: 2–8, pl. 1, figs. 1–3. – Fesquet, 1942: 111–113. – Castro, 1967: 2, figs. 1–12\*. – Boschi et al., 1968: 293–305, figs. 1–16. – Coêlho and Ramos, 1972: 176 (list). – Boschi, 1979: 137. – Boschi, 1981: 714, 739, fig. 241–69, 241–70, 241–71. – Calado, 1987: 88–94, pls. 1–5\*. – Coêlho and Calado, 1987: 43, table 1. – Manning, 1988: 626–627 (list). – Calado et al., 1990: 747, fig. 1\*. – Boschi et al., 1992: 18 (list), 56–57, fig. 59. – Calado, 1995: 102–105, pl. 1, figs. a–e, pl. 2, figs. a–m, pl. 3, fig. a, pl. 30, figs. a–d, pl. 31, figs. a, b. – Zolessi and Philippi, 1995: 10 (list). – Spivak, 1997: 74, 79, 81. – Boschi, 1997: 224. – Calado, 1998: 407. – Tablado and Venerus, 2000: 225 (types listed). – Boyko and Mikkelsen, 2002: 155.

**MATERIAL EXAMINED:** **Brazil:** Cabo São Tomé, Rio de Janeiro, Feb. 11, 1969, coll. Navio Oceanográfico "Prof. Besnard": 1 ♂, 7.6 mm cl (UFES 1165), 1 ♂, 9.0 mm cl, 1 ♀, 5.7 mm cl, 1 unsexable specimen, 9.7 mm cl, 2 unsexable and unmeasurable specimens (MNRJ 3853); Ilha do Pai, Rio de Janeiro, 30 m, March 24, 1962, coll. B. Tursch: 3 ♂, 9.3–11.7 mm cl (MNRJ 1555).

**Argentina:** Mar del Plata, Buenos Aires, Feb. 1924, coll. Franceschi and Leloir: 1 ♂, 22.0 mm cl, 1 ♀, 30.5 mm cl (MACN 14303); Playa Bristol, Mar del Plata, Feb. 2, 1962, coll. E. E. Boschi: 1 ♀, 23.1 mm cl, 1 oviger, 26.7 mm cl (AMNH 17527); Punta Hogotes, Mar del Plata, 1967, coll. E. E. Boschi: 1 ♀, 24.2 mm cl (AMNH 17528); Mar del Plata, Buenos Aires, coll. J. B. Llanos: 1 ♂, 23.9 mm cl (MACN 5081); Quequén Harbor, Buenos Aires, Jan. 1926, coll. G. Haedo: 1 ♀, 25.5 mm cl (MACN 16329); Quequén Harbor, Buenos Aires, Feb. 1, 1962, coll. unknown: 1 ♀, 28.3 mm cl (MACN 33636); Tres Arroyos, Balneario Reta, Dec. 9, 1963, coll. Daguerre: 1 ♀, 23.4 mm cl (USNM 260863); Necochea, 1926, coll. G. Haedo: 2 ♀, 24.7–28.6 mm cl (USNM 267783); Bahía Blanca, 1911, coll.

C. Porter: 1 ♂, 22.0 mm cl (MNHN-Hi 170); Sta. V-17-72, off Bahía Blanca, 39°21'S, 61°08'W, 15 m, May 19, 1961, coll. R/V "Vema": 2 juveniles, 5.3–5.3 mm cl (AMNH 15188).

**DIAGNOSIS:** Carapace with anterior gastric spine. Antennular dorsal flagellum with 28–42 articles, ventral flagellum with 11–14 articles. Antennal flagellum with 13–20 articles. Pereopod I dactylus dorsal margin with two large spines; carpus with one large spine proximal to dorsodistal spine; basis-ischium without spines. Pereopod II coxa with two spines. Pereopod IV coxa with one spine. Distal margin of telson smoothly rounded.

**DESCRIPTION:** Carapace (fig. 14A) approximately 1.3 times longer than wide; strongly keeled medially. Anterior margin with large rugose spine on either side of ocular sinus; convex laterally; large spines and margin all armed with numerous small spinules; large spine armed with produced, rounded tooth on mesiodistal margin. Rostrum as large smooth acute spine, extending nearly one-half length of proximal pseudosegment of distal peduncular segments; one-half to three-fourths size of outer-ocular spines. Ocular sinus evenly concave and armed with numerous small spines. Frontal region smooth; setal field as thin transverse line with posteriorly produced lateral elements widely separated from anterior element. CG1 parallel to anterior margin of carapace, convex and produced dorsally, armed with numerous small rounded teeth along length and large smooth anterogastric median spine. Mesogastric region smooth laterally, with row of medial punctae; CG2 absent; CG3 absent; CG4 with two long crenulate lateral elements each approximately one-third carapace width, not setose. Hepatic region smooth, with scattered small punctae and two strong, slightly curved, anteriorly directed spines; anteriormost spine approximately one-half larger than posterior. Epibranchial region roughly triangular, smooth, armed with one strong spine subequal in length to posterior hepatic spine. Metagastric region smooth, carinate, with medial and posterolateral punctae; CG5 absent. CG6 strongly crenulate, with oblique setose anterolateral elements separate from medial setae-free concave element. CG7 absent. Cardiac region carinate, smooth, with

few scattered punctae; CG8–11 absent. Branchial region smooth, with numerous scattered punctae and strong spine on anterolateral margin; anterolateral margins spinose. Posterior margin deeply and evenly convex; submarginal groove unbroken. Branchiostegite unarmed; anterior region finely toothed, with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 14B) subovate, located between median peduncular segments. Median peduncular segments oblong; dorsal margin with long plumose setae. Distal peduncular segments elongate, subdivided into proximal and distal pseudosegments; proximal pseudosegment tapering to distal end with spiral band of plumose setae along mesial margin and ocular pore on ventromesial surface; distal pseudosegment cylindrical with distal rounded cornea; mesial margins widely separated along length.

Antennule (fig. 14C) segment III narrow proximally, expanding distally to twice proximal width; simple and plumose setae on dorsal margin, plumose setae on ventral margin and sparsely scattered on mediolateral surface; dorsal exopodal flagellum with 28–42 articles ( $n = 7$ ) [17 in megalopa; 21 in juvenile], long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with 11–14 articles ( $n = 7$ ) [4 in megalopa; 7 in juvenile], plumose setae on dorsal and ventral margins. Segment II medially inflated from dorsal view, with plumose setae on dorsal and ventral margins and scattered on ventrolateral half of surface. Segment I width subequal to length, unarmed; dorsolateral surface with long plumose setae; long plumose setae on dorsal and distoventral margins.

Antenna (fig. 14D) segment V approximately 3.5 times longer than wide, with 10 or 11 short transverse lines of long simple setae on either side of ventral medial line; flagellum with 13–20 articles ( $n = 7$ ) [12 in megalopa], long simple setae at ventrodistal margin of each article. Segment IV subcylindrical, approximately 3.5 times longer than wide; tuft of setae at dorsodistal margin; two transverse rows of short simple setae on

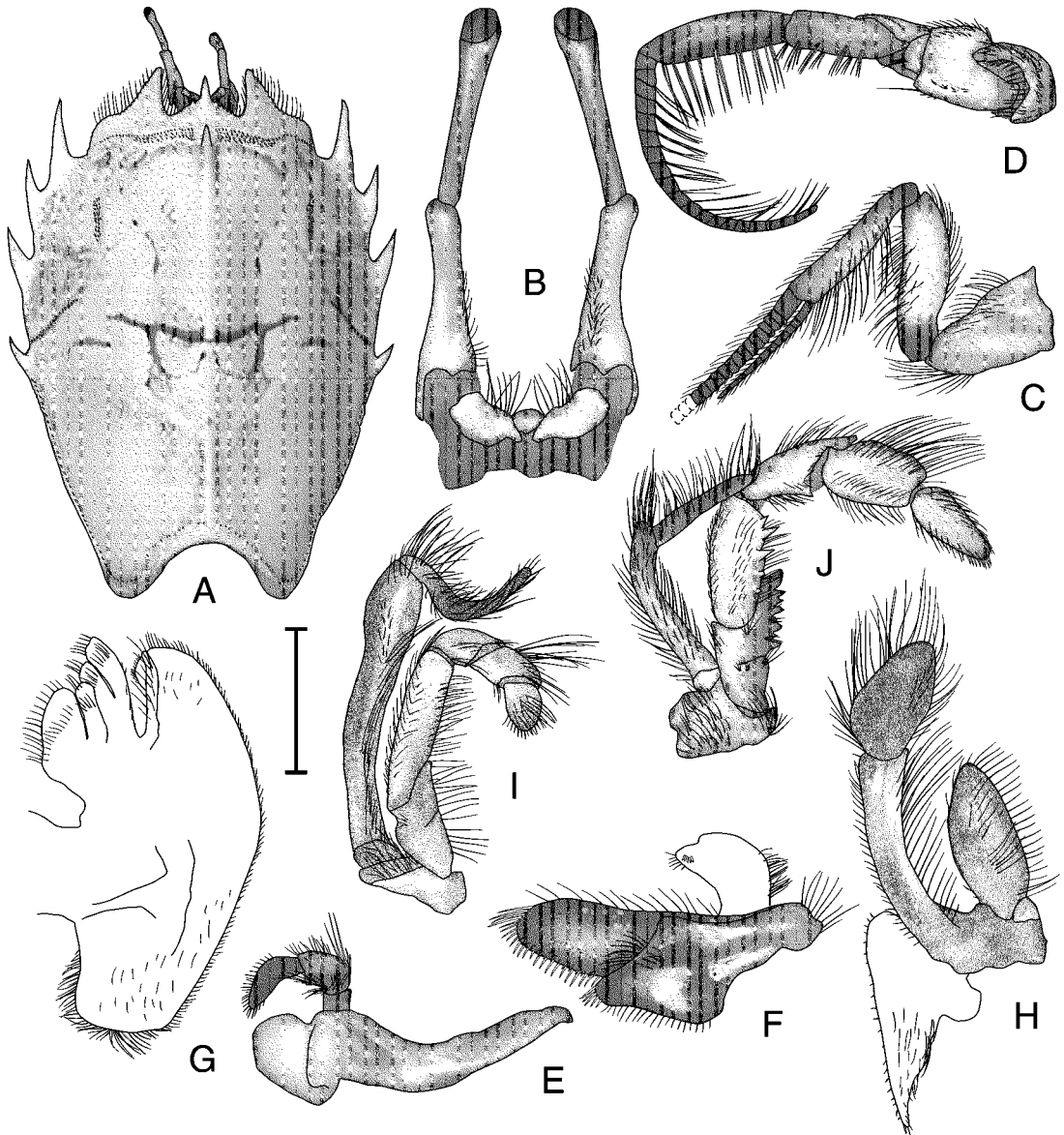


Fig. 14. *Blepharipoda doelloi* Schmitt, 1942: A, ♀, 28.6 mm cl, USNM 267783; B–J, ♀, 23.1 mm cl, AMNH 17527. A. Carapace and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Right mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Right maxilliped I, lateral view. I. Right maxilliped II, lateral view. J. Right maxilliped III, lateral view. Scale = 2.2 mm (B, F), 3.0 mm (H, I), 3.3 mm (C, E, G), 4.4 mm (D, J), and 9.0 mm (A).

ventral margin either side of medial line. Segment III decalcified and produced mesio-distally. Segment II short, subcylindrical; antennal acicle short, rounded, with low spines on distal margin and few scattered setae.

Segment I dorsally rounded, ventrally rectangular with distolaterally produced toothed lobe; few scattered setae on distal margins and surface; segment with ventromesial antennal gland pore.



Mandible (fig. 14E) incisor process with two teeth; cutting edge smooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 14F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin plumose setae on dorsal margin. Proximal endite with thick simple setae on distal margin and decalcified dorsoventral lobe between calcified regions. Endopod external lobe rounded distally and curled under; internal lobe produced distally, with five thick setae at distolateral margin; entire endopod "mitten-shaped."

Maxilla (fig. 14G) exopod evenly rounded with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 14H) epipod with short plumose setae on margins, distolateral surface, and mesial surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, margins and surface with plumose setae; distal segment spatulate, longer than wide, broadest medially, margins with long plumose setae, few short setae scattered on mediodistal region. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment; plumose setae on margins.

Maxilliped II (fig. 14I) dactylus evenly rounded, length equal to width, with long simple setae on lateral surface; distal margin with thick serrate setae. Propodus two times wider than long, slightly overreaching margin of dactylus, plumose setae on dorsal margin and long simple setae at dorsodistal margin. Carpus not produced dorsodistally, approximately 1.5 times longer than wide; long simple setae on dorsal and distal margins and scattered on surface. Merus approximately 3.5 times longer than wide, margins parallel; with long plumose setae on lateral and mesial margins and on mesial half of surface. Basis-ischium incompletely fused with deep suture with plumose setae on margins. Exopod almost two times longer than merus, produced mesiodistally, flagellum with six articles and long plumose setae.

Maxilliped III (fig. 14J) dactylus longer

than wide, tip rounded; long plumose setae on dorsal and ventral margins and scattered on surface; thick serrate setae on distal margin. Propodus with longitudinal median row of plumose setae on lateral surface; dorsal and ventral margins with plumose setae. Carpus slightly produced onto propodus, with small spine at distoventral margin; lateral surface with row of plumose setae ventromedially; plumose setae on dorsal and ventral margins. Merus with two or three strong corneous teeth and few small teeth on ventral surface, plumose setae on dorsal and ventral margins and scattered on lateral surface. Basis-ischium incompletely fused with deep suture, subequal in length to merus, with strong crista dentata of 8–11 large and small corneous teeth. Exopod two-segmented; proximal segment small; second segment styliform, tapering, approximately one-fourth longer than merus; plumose setae on margins and surface; flagellum with three indistinct subdivisions.

Pereopod I (fig. 15A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin armed with two strong corneous spines ( $n = 7$ ), smooth proximally (two spines on dactylus of megalopa and juvenile); with long plumose and short simple setae; ventral margin unarmed, with submarginal row of short simple setae. Propodal lateral surface with numerous short, transverse patches of rugae, some with short setae; dorsal margin unarmed, with long plumose setae; ventral margin distally produced into acute spine and with strong acute spine arising from midpoint of margin, with long plumose setae; cutting edge with three large and one or two small corneous teeth ( $n = 7$ ) increasing in size from junction with dactylus (no spines in megalopa or juvenile), lined with long plumose setae; lateral surface of propodus with two large spines; distal spine just behind junction with dactylus approximately one-third down palm; proximal spine just anterior to junction with carpus at midpoint of propodus/carpus margin; mesial surface rugose, with short and long plumose setae in rugose patches. Carpus with dorsodistal angle produced into strong smooth corneous-tipped spine; dorsal margin behind spine armed with one large spine and no small spines ( $n = 7$ ) and with small teeth on

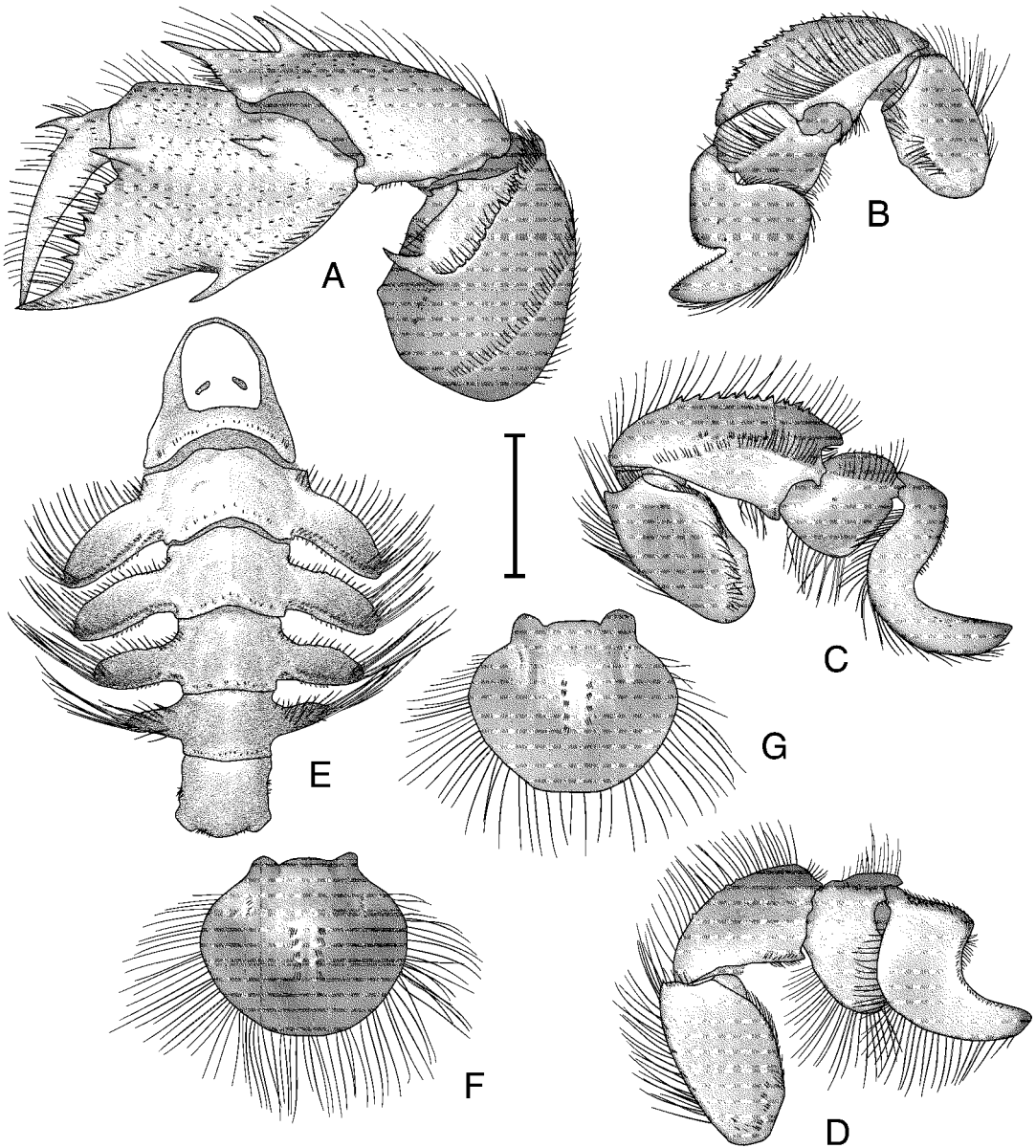


Fig. 15. *Blepharipoda doelloi* Schmitt, 1942: A-E, ♀, 23.1 mm cl, AMNH 17527; F, ♂, 22.0 mm cl, MACN 14303; G, ♀, 28.6 mm cl, USNM 267783. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Right pereopod III, lateral view. D. Right pereopod IV, lateral view. E. Abdominal somites I-VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 3.3 mm (F), 4.4 mm (A, E, G), and 5.9 mm (B-D).

distal two-thirds of dorsal margin; dorsal margin with long plumose setae; lateral surface with few transverse, setose rugae on medial surface; mesial surface with rugae and short simple setae, margins with long plu-

mose setae. Merus with large spine at two-thirds length of ventral margin and large spine at dorsodistal angle; sinuous submarginal raised setose line running between two spines, lined with strong spines dorsodistally

becoming smaller proximoventrally; second sinuous line running parallel and proximal to first, but one-third from proximal margin, not spinose; long plumose setae on distoventral angle, dorsal margin, and in oblique patch across surface; mesial surface with few short rows of setae. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 15B) dactylus smooth; base to heel straight, heel smoothly rounded and produced, heel to tip with narrow, rounded indent, tip subacute, tip to base broadly convex; lateral surface smooth, with several small punctations in roughly straight line across medioproximal surface; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae. Propodal dorsal surface smooth, ventral margin inflated and rounded; distal and ventral margins with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with 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 strongly produced and subacute dorsodistally, almost reaching distal margin of propodus, dorsal margin serrated along distal two-thirds; lateral surface with patches of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; dorsal margin with short plumose setae; mesial surface smooth with long plumose setae on ventral margin, short simple setae on dorsal and distal margins. Merus with medial decalcified window; small spine at mesiodistal margin; long plumose setae on margins; mesial surface nearly smooth with few setae. Basis-ischium incompletely fused and unarmed. Coxa with two small spines on anterior margin.

Pereopod III (fig. 15C) dactylus with base to heel slightly convex, heel subquadrate, broad and low, heel to tip with broadly concave indent, tip subacute, tip to base smoothly convex; lateral surface smooth, sinuous row of short setose punctations from median of heel to approximately one-half distance along distal blade; ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface smooth with plumose setae proximally at junction with pro-

podus. Propodus inflated dorsoventrally; lateral surface smooth, long plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened, with ventral row of long plumose setae and dorsal row of short simple setae; mesial surface with scattered long setae on and near ventral margin. Carpus produced dorsodistally, exceeding proximal margin of propodus by approximately one-third length of propodus, rounded; medial three-quarters of dorsal margin spinose; lateral surface rugose in medial third, with short scattered setae and long row of setae ventral to rugose region; mesial surface smooth, with row of long plumose setae on distal and dorsal margins. Merus smooth, with large decalcified window covering nearly all of lateral surface; small spine at dorsodistal margin; proximolateral margin and dorsodistal margin with long plumose setae, long plumose setae scattered on medioproximal surface; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa with two (males) or one (females) medially directed spine on anterior margin. Female with large gonopore on posterior mesial margin of coxa, not opposing or obscured by other coxa, without setae; male without pore.

Pereopod IV (fig. 15D) dactylus with base to heel straight, heel low and rounded, heel to tip broadly rounded in smooth arc, tip rounded, tip to base broadly convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface smooth, small patch of plumose setae between heel and articulation with propodus. Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, ventral margin with long plumose setae; dorsal expansion with long plumose setae dorsally; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; dorsal margin with few small medial teeth but almost smooth; medial third of lateral surface with rugae. Merus with small spine on distodorsal margin; dorsal and ventral margins with long plumose setae; few short setae scattered on proximoventral surface. Basis-ischium incompletely fused and unarmed. Coxa with curved spine at anterior margin.

Abdomen (fig. 15E) somite I as long as wide, widest posteriorly; dorsal surface with

anterior margin convex; posterior margin irregularly concave, with submarginal row of setose punctae; medial surface decalcified, with two short, transverse, calcified lines on either side of midline. Somite II dorsal surface with strong medial keel; anterior margin irregularly convex, posterior margin irregularly concave; anterior margin with short decalcified areas either side of midline, posterior margin with submarginal row of short setae; pleura expanded and directed posterolaterally, anterolateral and posterolateral angles rounded, anterior and posterior margins smooth; anterior margins with long plumose setae, posterior margins with short simple setae; patch of setae at posterior junction with somite; row of short setose punctae on lateral surface running parallel to posterior margin. Somite III similar to somite II, but narrower, shorter, strongly convex medially; pleura thinner and slightly shorter than on somite II, directed less posterolaterally, with setae as in somite II, anterior margin with few low teeth medially, posterior margin smooth. Somite IV similar to somite III, but thinner and shorter; pleura shorter than on somite III, directed laterally; anterior margin with few low teeth, posterior margin smooth, margins with long plumose setae. Somite V subequal to somite IV; pleura approximately one-half length of somite IV pleura and directed laterally; margins and surface of pleura with long plumose setae. Somite VI subequal to somite V in width but longer; mediolateral margin with short plumose setae; posterior margin row of few short setae either side of midline; pleura absent.

Telson of male (fig. 15F) ovate, laterally expanded, wider than long, distal tip smoothly rounded; medial third heavily calcified, dorsally inflated and tapering distally, lateral third weakly calcified; demarcation of calcified and uncalcified regions marked by low ridge; median longitudinal groove on distal half of calcified area, five short transverse rows of short simple setae on either side of median groove. Margins with long simple setae; few short setae on proximolateral corners. Telson of female (fig. 15G) nearly identical to male, but with blunter tip and more inflated proximolateral lobes.

DISTRIBUTION: Known from Rio de Janeiro,

Brazil, to Argentina, intertidal to 30 m depth.

MAXIMUM SIZE: Males: 23.9 mm cl; females: 30.5 mm cl. The largest specimens occur in the southern part of the range.

TYPE SPECIMENS: MACN 14303 (holotype, ♀, 21.8 mm cl), MACN 14189 (allotype, ♂, 15.0 mm cl), MACN 13946 (paratype, ♀, 18.8 mm cl).

TYPE LOCALITY: Mar del Plata, Buenos Aires, Argentina.

REMARKS: Although the types of this species were not available for direct examination, I was able to obtain color photographs of all three specimens. An additional two specimens (MACN 14303; see under Material Examined) were cited by Tablado and Venerus (2000) as paratypes, but they are not among the material cited by Schmitt (1942) and cannot be considered part of the type series despite their sharing of identical data with the holotype.

The complete larval development of this species (from ovigerous females) was described by Boschi et al. (1968). There are five zoeal stages and one megalopal stage obtained in 42–79 days at 20°C and 33.9–34.09‰ salinity (Boschi et al., 1968).

Calado (1987: figs. 1, 2a) made several errors in her illustrations of this species. The gastric spine was omitted (fig. 1), the carapace grooves were presented incorrectly and inconsistently (figs. 1, 2a), the flagellum of the exopod of maxilliped III was given as having two articles, and the mandibular palp was given as four-segmented.

This species is the Atlantic analogue of *B. spinosa*.

### *Blepharipoda spinosa*

(H. Milne Edwards and Lucas, 1841)

Figures 16, 17

*Albunea scabra*: Molina, 1810: 187 (not *Hippa scabra* Fabricius, 1787 = *Ranina ranina* (Linnaeus, 1758)).

*Albunhippa spinosa* H. Milne Edwards and Lucas, 1841: 477, pl. 28, figs. 1–13. – Dana, 1852: 406. – Boas, 1880: 134–136. *Abrote spinimana* Philippi, 1857: 124–129, pl. 8 (NEW SYNONYMY).

*Blepharopoda* [sic] *spinosa*: Stimpson, 1858: 230. – Miers, 1878: 335–336. – Cano, 1889a: 100. – Cano, 1889b: 263.



*Blepharopoda* [sic] *spinimana*: Stimpson, 1858: 230. – Miers, 1878: 335. – Duruflé, 1889: 93, 95. – Bouvier, 1898b: 342.

“*Dynomene?*” [sp.]: Cano, 1893: pl. 2, figs. 56–61 (not *Dynomene* Latreille in Desmarest, 1825).

*Blepharipoda occidentalis*: Ortmann, 1896: 222 (part). – Lenz, 1902: 749. – Rathbun, 1911: 594 (list) (part). – Porter, 1915a: 78–82 (part), fig. 10. – Porter, 1915b: 14–17 (part), fig. 3. – Porter, 1916: 280–282 (part), unnumbered fig. – Porter, 1936b: 254–255 (part). – Porter, 1936c: 338 (list). – Porter, 1940a: 312 (part). – Porter, 1940b: 146 (part). – Porter, 1941: 460 (part). – Schuster-Dieterichs, 1956: 52. – Fonseca, 1970: 35 (part) (not *Blepharipoda occidentalis* J. W. Randall, 1840).

*Blephaopoda* [sic] *speciosa*: Bouvier, 1898b: 342 (error for *Blepharipoda spinosa* (H. Milne Edwards and Lucas, 1841)).

*Blefaripoda* [sic] *occidentalis*: Porter, 1936a: 153 (not *Blepharipoda occidentalis* J. W. Randall, 1840).

*Blepharipoda spinosa*: Schmitt, 1942: 2.

*Blepharipoda spinimana*: Schmitt, 1942: 2–9, pl. 1, figs. 7, 8\*. – Fesquet, 1942: 111–113. – Haig, 1955: 9–11, fig. 1\*. – Knight, 1968a: 337–367, figs. 62–69\*. – Knight, 1968b: 63–93, figs. 62–69\*. – Fonseca, 1970: 35, fig. 70. – Del Solar et al., 1970: 23. – Epelde-Aguirre and Lopez, 1975: 165. – Coêlho and Calado, 1987: 43, table 1. – Carvacho and Saavedra, 1994: 174. – Calado, 1995: 119–121, pl. 36, figs. a–c, pl. 37, figs. a, b, pl. 38, figs. a–d\*. – Boyko and Mikelsen, 2002: 155.

Albuneidae: Báez, 1997: 173 (part). – Wehrmann and Báez, 1997: 269 (part).

**MATERIAL EXAMINED:** **Peru:** Barranca, Oct. 1949, coll. W. K. Weyrauch: 1 ♂, 23.5 mm cl (RMNH 6932); Ancon, 35 km north of Lima, coll. unknown: 1 ♀, 25.9 mm cl (BMNH 1913.12.10.127); Mollendo, Sept. 16, 1906, coll. R. Paessler: 1 ♂, 24.0 mm cl (ZMH K-5141).

**Chile:** Unknown [“Chili”], coll. unknown: 1 ♀, 25.8 mm cl, holotype of *B. spinosa* (MNHN-Hi 22); “Chili,” coll. unknown: 1 ♂, 27.9 mm cl (MNHN-Hi 194); Valparaiso, April 1930, coll. E. P. Reed: 1 ♀, 24.0 mm cl, 1 oviger, 32.8 mm cl (MACN 10811); Antofagasta, March 1940, coll. J. Herrera: 1 oviger, 29.0 mm cl, neotype of *B. spinimana* (USNM 79390); Bahia San Vicente, Concepcion, 6 m, May 3, 1960, coll. Jeldes: 1 ♀, 22.4 mm cl (ZMH K-27279).

**DIAGNOSIS:** Carapace with anterior gastric spine. Antennular dorsal flagellum with 56–64 articles, ventral flagellum with 12–14 articles. Antennal flagellum with 13–17 articles. Pereopod I dactylus dorsal margin with two or three large spines; carpus with none to three large spines proximal to dorsodistal spine; basis-ischium without spines. Pereopod II coxa with one spine. Pereopod IV coxa without spines. Distal margin of telson with notch.

**DESCRIPTION:** Carapace (fig. 16A) approximately 1.3 times longer than wide; strongly keeled medially. Anterior margin with large rugose spine on either side of ocular sinus, convex laterally; large spines and margin all armed with numerous small spinules; large spine armed with strong low tooth on mesio-distal margin. Rostrum as large acute tooth, extending nearly one-half length of proximal pseudosegment of distal peduncular segments. Ocular sinus acutely concave and armed with numerous small spines. Frontal region smooth; setal field as thin transverse line with anteriorly produced lateral elements. CG1 parallel to anterior margin of carapace, convex and produced dorsally, armed with numerous small, rounded teeth along length and large anterogastric median spine. Mesogastric region smooth laterally, with row of medial punctae; CG2 absent; CG3 absent; CG4 with two long crenulate lateral elements approximately one-fourth carapace width. Hepatic region smooth, with scattered small punctae and two strong, slightly curved, anteriorly directed spines; anteriormost spine approximately two times larger than posterior spine. Epibranchial region roughly triangular, smooth, armed with one strong spine subequal in length to posterior hepatic spine. Metagastric region smooth, with medial and posterior punctae; CG5 absent. CG6 strongly crenulate, with oblique lateral elements separate from medial concave element. CG7 absent. Cardiac region smooth, with few scattered punctae; CG8–11 absent. Branchial region smooth, with numerous scattered punctae and small spine on anterolateral margin. Posterior margin deeply and evenly convex; submarginal groove unbroken. Branchiostegite unarmed; anterior region with many short rows of setae and sparsely covered with long plumose se-

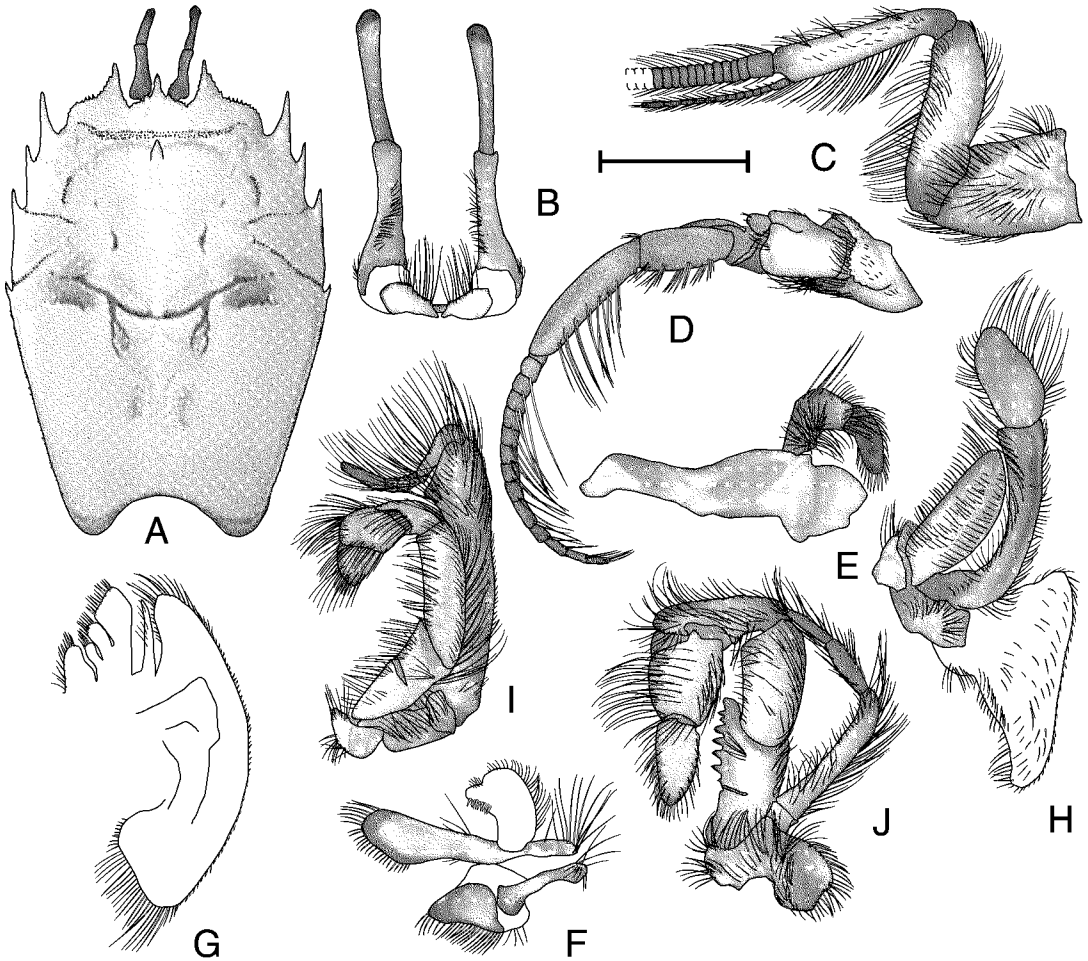


Fig. 16. *Blepharipoda spinosa* (H. Milne Edwards and Lucas, 1841): A, ♀, 22.4 mm cl, ZMH K-27279; B–J, ♀, 24.0 mm cl, MACN 10811. A. Carapace and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Left maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 3.3 mm (B, C, E, F, H, I), 4.4 mm (D, G, J), and 8.0 mm (A).

tae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 16B) subovate, located between median peduncular segments. Median peduncular segments oblong; dorsal margin with long plumose setae. Distal peduncular segments elongate, subdivided into proximal and distal pseudosegments; proximal pseudosegment tapering to distal end with spiral band of plumose setae along mesial margin and ocular pore on ventromesial surface; distal pseudosegment cylindrical

with distal rounded cornea; mesial margins widely separated along length.

Antennule (fig. 16C) with segment III narrow proximally, expanding distally to twice proximal width; simple setae on dorsal margin, plumose setae on ventral margin and sparsely scattered on lateral surface; dorsal exopodal flagellum with 56–64 articles ( $n = 4$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with 12–14 articles ( $n = 5$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated from dorsal view, with plumose setae

on dorsal and ventral margins and scattered on ventrolateral half of surface. Segment I width subequal to length, unarmed; lateral surface with long plumose setae; long plumose setae on proximodorsal and distoventral margins.

Antenna (fig. 16D) with segment V approximately four times longer than wide, with four short transverse lines of long simple setae on either side of ventral medial line; flagellum with 13–17 articles ( $n = 6$ ), long simple setae at ventrodorsal margin of each article. Segment IV subcylindrical, approximately 2.5 times longer than wide; tuft of setae at dorsodistal margin; two or three transverse rows of short simple setae on ventral margin either side of medial line. Segment III decalcified and produced mesiodistally. Segment II short, subcylindrical; antennal acicle short, rounded, with low spines on distal margin and few scattered setae. Segment I dorsally rounded, ventrally rectangular with distolaterally produced toothed lobe; few scattered setae on distal margins and surface; segment with ventromesial antennal gland pore.

Mandible (fig. 16E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 16F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin. Proximal endite with thick simple setae on distal margin and decalcified dorsoventral lobe between calcified regions. Endopodal external lobe rounded distally and curled under; internal lobe produced distally with nine thick setae at distolateral margin; entire endopod “mitten-shaped.”

Maxilla (fig. 16G) exopod evenly rounded with plumose setae along distal margin. Sca-phognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 16H) epipod with plumose setae on margins, distolateral surface, and mesial surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, margins and surface with plumose setae; distal segment spatulate, longer than wide, broadest medially,

margins with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment; plumose setae on margins.

Maxilliped II (fig. 16I) dactylus evenly rounded, length equal to width, with long simple setae on lateral surface; distal margin with thick serrate setae. Propodus 1.5 times wider than long, plumose setae on dorsal margin and long simple setae at dorsodistal margin. Carpus not produced dorsodistally, approximately two times longer than wide; long simple setae on dorsal and distal margins. Merus approximately 3.5 times longer than wide, margins parallel; with long plumose setae on lateral and mesial margins and on mesial third of surface. Basis-ischium incompletely fused with deep suture with plumose setae on margins and on surface. Exopod one-third longer than merus, produced mesiodistally, flagellum with five articles.

Maxilliped III (fig. 16J) dactylus longer than wide, tip rounded; long plumose setae on dorsal and ventral margins; thick serrate setae on distal margin. Propodus with longitudinal median row of plumose setae on lateral surface; dorsal and ventral margins with plumose setae. Carpus slightly produced onto propodus with small spine at distoventral margin; lateral surface with row of plumose setae ventromedially; plumose setae on dorsal and ventral margins. Merus with one or two strong corneous teeth and few small teeth on mesial surface, plumose setae on dorsal and ventral margins and scattered on lateral surface. Basis-ischium deeply incompletely fused and subequal to merus in length, with strong crista dentata of 10 large and small corneous teeth. Exopod two-segmented: proximal segment small; second segment styliform, tapering, approximately one-fourth longer than merus; plumose setae on margins and surface; flagellum with two articles.

Pereopod I (fig. 17A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin armed with two or three strong, and no small, corneous spines ( $n = 6$ ); with long plumose and short simple setae; ventral margin unarmed with submarginal row of short simple setae. Propodus lateral surface with numerous short patches of rugae, some with short setae; dorsal margin un-



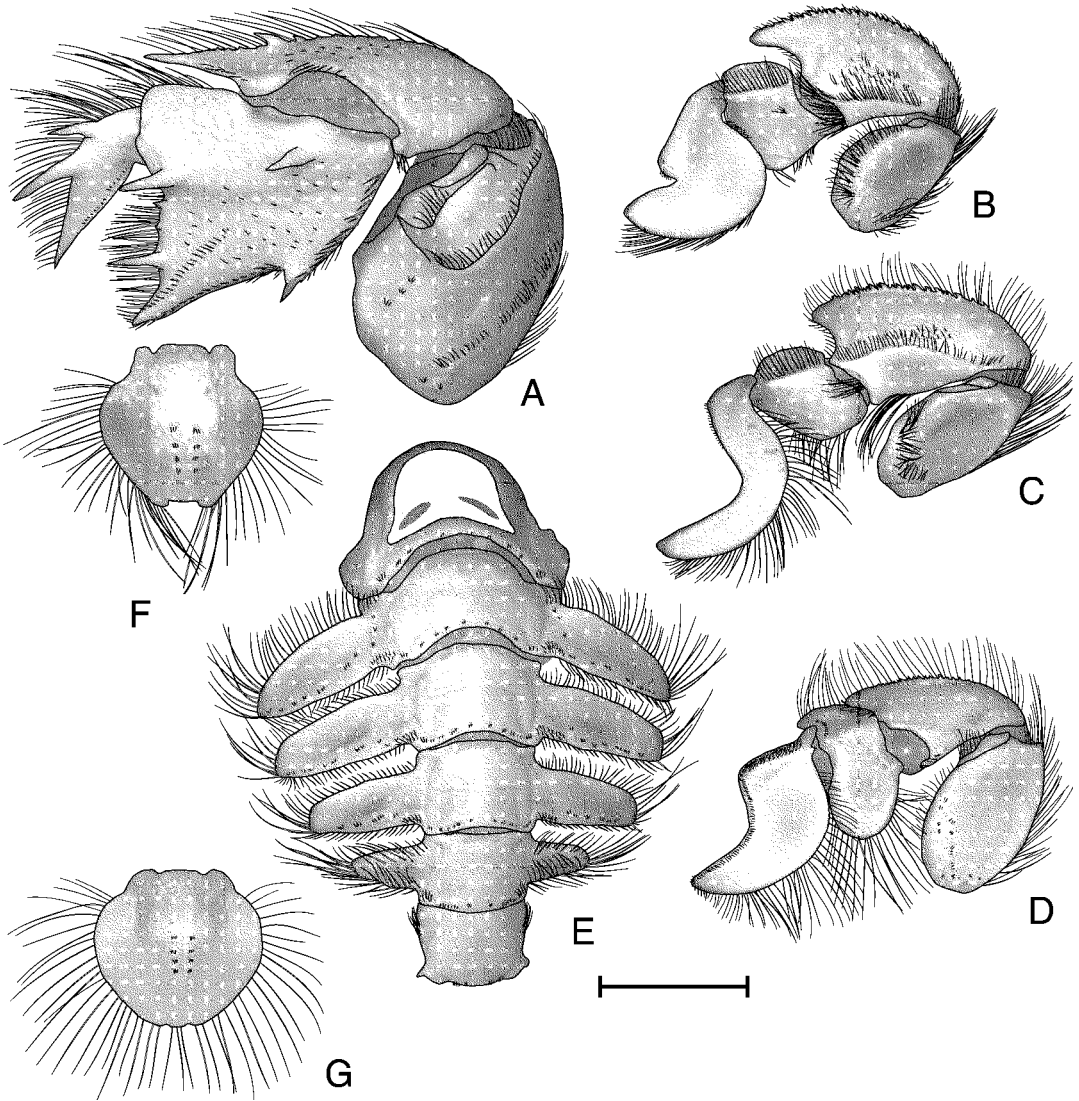


Fig. 17. *Blepharipoda spinosa* (H. Milne Edwards and Lucas, 1841): A-E, ♀, 24.0 mm cl, MACN 10811; F, ♂, 24.0 mm cl, ZMH K-5141; G, ♀, 22.4 mm cl, ZMH K-27279. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I-VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 4.4 mm (A, E-G) and 6.7 mm (B-D).

armed, with long plumose setae; ventral margin distally produced into acute spine and with strong acute spine arising from midpoint of margin, with long plumose setae; cutting edge with two or three large and two or three small corneous teeth ( $n = 6$ ) increasing in size from junction with dactylus, lined with long plumose setae; lateral surface of propodus with two large spines; distal spine

just behind junction with dactylus at approximately one-third dorsal to ventral margin of palm; proximal spine just behind junction with carpus at midpoint of propodal/carpal margin. Carpus with dorsodistal angle produced into strong corneous-tipped spine with small teeth on dorsal surface of spine; dorsal margin behind spine armed with none to three smaller spines ( $n = 6$ ) and with small



teeth on distal two-thirds of dorsal margin; dorsal margin with long plumose setae; lateral surface with few transverse, setose rugae on medial surface; mesial surface with rugae and short simple setae, margins with long plumose setae. Merus with two large spines; proximal spine at midpoint of mesial margin; distal spine at distomesial margin; sinuous raised setose line running between two spines, line with small spinules; second sinuous line running parallel and proximal to first; long plumose setae on distolateral angle, proximolateral margin, in oblique line across surface and scattered on surface; mesial surface with few short rows of setae. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 17B) dactylus smooth; base to heel straight, heel smoothly rounded, heel to tip with narrow, rounded indent, tip subacute, tip to base broadly convex; lateral surface smooth, with several small punctations in roughly straight line across medioproximal surface; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae. Propodal dorsal surface smooth, with ventral margin inflated and rounded; distal and ventral margins with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with 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 strongly produced and subacute dorsodistally, dorsal margin serrated along distal three-quarters; lateral surface smooth, with patches of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; dorsal margin with short plumose setae; mesial surface smooth with long plumose setae in scattered patches on dorsal half of surface and on margins. Merus with large median decalcified window covering nearly all of lateral surface, with long plumose setae on surface and margins; mesial surface nearly smooth with low tubercle or spine on distodorsal margin; few setae. Basis-ischium incompletely fused and unarmed. Coxa with one small spine on anterior margin.

Pereopod III (fig. 17C) dactylus with base to heel straight, heel broadly rounded and

low, heel to tip with broadly concave indent, tip subacute, tip to base smoothly convex; lateral surface smooth, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface smooth, simple setae on dorsal margins; dorsolateral surface narrow, oblique, flattened, with ventral row of long setae; mesial surface with scattered long setae on and near ventral margin. Carpus produced dorsodistally, exceeding proximal margin of propodus by approximately one-fourth length of propodus, rounded; proximal two-thirds of dorsal margin spinose; lateral surface rugose in medial third, with short setae and row of setae ventrally; mesial surface smooth, with long plumose setae on distal margin. Merus smooth, with large decalcified window covering nearly all of lateral surface; distolateral margin with small spine; proximolateral margin and dorsodistal margin with long plumose setae; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa with medially directed spine in males and small tubercle in females on anterior margin. Female with large gonopore on posterior mesial margin of coxa, without setae; male without pore.

Pereopod IV (fig. 17D) dactylus with base to heel straight, heel low and rounded, heel to tip broadly rounded, tip subacute, tip to base broadly convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface smooth, small patch of plumose setae between heel and articulation with propodus. Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, ventral margin with long plumose setae; dorsal expansion with long plumose setae dorsally; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; medial third of dorsal margin serrate; medial third of lateral surface with rugae. Merus with small spine at distolateral margin; dorsal and ventral margins with long plumose setae; few short setae scattered on proximoventral surface. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 17E) with somite I approximately as long as wide, widest posteriorly; dorsal surface with anterior margin convex; posterior margin convex with submarginal row of setose punctae; medial surface decalcified, with two short transverse calcified lines. Somite II dorsal surface with medial keel; anterior margin convex, posterior margin concave; pleura expanded and directed posterolaterally, tapered laterally; margins with long plumose setae; patch of setae at posterior junction with somite; row of short setose punctae running from posterolateral margin of pleura to anteromesial margin. Somite III similar to somite II, but narrower, shorter; pleura subequal in width but shorter than on somite II, directed less posterolaterally, with setae as in somite II, except row of setose punctae running submarginally ventrally. Somite IV similar to somite III, but thinner and shorter; pleura shorter than on somite III, directed laterally; margins with long plumose setae. Somite V subequal to somite IV; pleura approximately two-thirds length of somite IV pleura and directed laterally; margins and surface of pleura with long plumose setae. Somite VI subequal to somite V; anterolateral margin with long plumose setae; posterior margin with two short rows of setae; pleura absent.

Telson of male (fig. 17F) subcircular, approximately as long as wide, with truncate notch at tip; medial third heavily calcified, dorsally inflated and tapering distally, lateral thirds weakly calcified; demarcation of calcified and uncalcified regions marked by low ridge; median longitudinal groove on distal two-thirds of calcified area, four short transverse rows of short simple setae on either side of median groove. Margins with long simple setae. Telson of female (fig. 17G) nearly identical to male, but with less prominent notch at tip and broader uncalcified regions.

DISTRIBUTION: Peru to Chile, intertidal to 6 m depth.

MAXIMUM SIZE: Males: 27.9 mm cl; females: 29.0 mm cl.

TYPE SPECIMENS: MNHN-Hi 22 (holotype of *Albunhippa spinosa*), USNM 79370 (neotype of *Abrote spinimana*, designated by Schmitt, 1942). The holotype of *Abrote spinimana* is lost (fide Schmitt, 1942).

TYPE LOCALITIES: Unknown (*Albunhippa spinosa*); Province of Antofagasta, Chile (*Abrote spinimana*).

REMARKS: Direct comparison of the type specimens of *Albunhippa spinosa* and *Abrote spinimana* shows that these two specimens are identical in all but size. The two species are herein considered subjective synonyms. This species is known in Peru as “mui-mui chino” (Del Solar et al., 1970) or “muy-muy chino” (Fonseca, 1970).

Cano (1893, as “*Dynomene?*”) described a probable stage III zoea from the Chilean plankton. Knight (1968a, 1968b) described zoeal stages I–IV of this species from the Peruvian plankton, but the complete life history is still unknown.

Haig (1955) correctly concluded that Molina’s (1810) record of *Albunea scabra* could not be identical with that Indian Ocean taxon. Unfortunately, Haig (1955) was not aware that *Hippa scabra* Fabricius is a junior synonym of *Ranina ranina* (Linnaeus) (Brachyura: Raninidae), which does indeed have an exclusively tropical Indo-Pacific distribution. Had she made this connection, she would surely have realized that *B. spinosa* is the only species of decapod in Chile large enough and strongly convergent enough with raninid morphology to be the source of Molina’s (1810) record. No raninid species occur in Chile.

Although Calado (1995) included *Albunhippa spinosa* in synonymy with *Abrote spinimana*, she did not give any basis for this and continued to use the latter name for the species despite its junior synonym status. Calado (1995) also gave an incorrect type locality of “Tomé Bay de Talcahueno, Chile”. Although aware of the correct name for this species, Boyko and Mikkelsen (2002) maintained the usage of *B. spinimana* as their work was not an appropriate venue for correcting the nomenclature.

This species is the Pacific analogue of *B. doelloi*.

#### ALBUNEIDAE STIMPSON, 1858

DIAGNOSIS: Carapace subquadrate; epibranchial spine absent. Gills phyllobranch; gill formula given below. Distal peduncular segments entire. Antennule with three seg-

ments; dorsal flagellum with 17–250 articles, ventral flagellum with 0–7 articles. Antenna five-segmented; acicle present; flagellum with one to nine articles. Proximal maxillar endites narrower than distal endites. Mandible with three-segmented palp. Maxilliped I with epipod. Maxilliped III with epipod; merus unarmed; crista dentata absent or weak; exopod slender or lamellar. Pereopod I subchelate; dactylus dorsal margin smooth or crenulate; propodus cutting edge smooth or with blunt teeth. Pereopods II–IV dactyli laterally compressed and dorsoventrally expanded; dorsal margins of carpi smooth (except *Albunea speciosa*). Pereopod V reduced, chelate. Abdomen with pleura on somites II–IV or II–V. Uropods present. Telson entire.

Gill Formula (podobranch/arthrobranch/pleurobranch): maxilliped I, 0/0/0; maxilliped II, 0/0/0; maxilliped III, 0/0/1; pereopod I, 0/2/0; pereopod II, 0/2/0; pereopod III, 0/2/0; pereopod IV, 0/2/0; pereopod V, 0/0/1.

DISTRIBUTION: Worldwide in tropical, subtropical, and temperate waters.

TYPE GENUS: *Albunea* Weber, 1795.

INCLUDED SUBFAMILIES: Albuneinae Weber, 1795; Lepidopinae, n. subfam.

REMARKS: The family name Albuneidae Stimpson, 1858 (a correction of Alburnidae) is no. 242 on the “Official list of family-group names in zoology” (ICZN, 1958). The family name Alburnidae Stimpson, 1858 (invalid original spelling for Albuneidae) is no. 276 on the “Official list of rejected and invalid family-group names in zoology” (ICZN, 1958). The “official” name for this family has been given as “mole crabs” and that of the Hippidae as “sand crabs” (Williams et al., 1989). Unofficially, both names have been used essentially interchangeably in the literature. However, species of Hippidae bear a much more striking resemblance to moles (Mammalia) in the shape of their carapaces than do albuneids. I suggest that the “official” common names of albuneids and hippids be switched and that the Albuneidae be furthermore known as “sand crabs.”

Although there has been much speculation about the use of the elongated antennules of albuneids as a feeding device (e.g., Williams, 1965), this seems unlikely. The antennules almost always have one long and one short flagellum (Snodgrass, 1952, incorrectly cites

a single long flagellum, which is only true of *Leucolepidopa*), and the two long flagellae possess interlocking mesially directed setae on the dorsal and ventral surfaces along their length. The primary function of the antennules is to form a respiratory tube through the sand by means of the interlocking setae (Snodgrass, 1952; Boyko, personal obs.). Water is taken in through the respiratory tube, but little material is transported along with it. This observation, combined with the fact that all albuneids have moderately well-developed mandibles, suggests that they are scavengers or predators, rather than any type of filter feeder. Observations of their burrowing behavior also support a detritivore lifestyle for these animals (Howard, 1968). Although Hill (1979) suggested that at least one albuneid, *Lepidopa websteri*, switches between filter feeding and deposit feeding, no experimental data were given by him to support this. Observations of food scraping from the antennules by the mouth parts (Pearse et al., 1942) were most likely antennule cleaning behaviors, not feeding. Benedict (1903) first hypothesized that the antennules are used in maintaining the flow of water to the branchial chambers, based on an “experiment” with a specimen of *Albunea gibbesii*. What is surprising about Benedict’s (1903) “experiment” is that it was done with a dead specimen in a beaker of sand and alcohol! Nevertheless, the idea of albuneids as filter feeders remains entrenched in the literature, especially nonsystematic works (e.g., Howard, 1968; Hill, 1979). The only record in the literature regarding stomach content in albuneids was given by Benedict (1903), who reported annelid setae, synaptid holothurian skin, and small crustacean flagellae in the stomach of a *Lepidopa benedicti* from Florida. It seems highly unlikely that the two specimens of *Albunea steinitzi* reported by Tirmizi (1978) would have survived 47 days in an aquarium if they were filter feeders.

Speculation on the reason for the apparent rarity of albuneids in suitable habitats dates back as far as Benedict (1903), who suggested that they might live in higher densities in deeper waters, or perhaps deeper in the sand. Nearly 100 years later, all available evidence still suggests that albuneids are rarely common in any sandy beach habitat.

Chace and Kensley (1992) doubted the homology of the shallow incision at the posterolateral angle of the albuneid carapace with the cardiac notch of alpheid shrimp (Caridea). Indeed, these are certainly not homologous features and are likely not even in analogous positions on the cardiac region. Williams (1984) included the character "third maxillipeds without epipodites" in his diagnosis of the Hippoidea, but all albuneids possess these structures.

Ortmann (1892) presented a somewhat crude tree indicating his opinion on the relationships among the hippoids and between them and the galatheoids and paguroids, but most of his conclusions are unsupported by morphological evidence. Ortmann (1892) presented *Blepharipoda* as an intermediate between galatheids and the other hippoids, but both galatheids and the "higher" albuneids have phyllobranch gills, while *Blepharipoda* has trichobranch gills. It is difficult to envision a scheme by which the gill type easily transitions back and forth between these two states. Ortmann (1892) also indicated that *Lepidopa* is more derived than *Albunea*, but current analysis suggests that the opposite may be true (Boyko and Harvey, in prep.). Hippoids have generally been considered primitive anomurans (e.g., Ortmann, 1892; Martin and Abele, 1986), and, indeed, the characteristics of the spermatophores of hippoids are somewhat intermediate between those found in macrurans and those found in the higher Anomura (e.g., hermit crabs) (Subramoniam, 1984; Tudge et al., 1999).

Digging behavior in hippoids has been postulated as a derived character uniting the Hippoidea (Faulkes and Paul, 1997b). However, it is equally possible that the similarities observed by Faulkes and Paul (1997b) in *Blepharipoda*, *Lepidopa*, and *Emerita* are due to convergence in morphology for a sand-dwelling lifestyle. Additional evidence showing that digging behavior is different in other sand-dwelling crabs (e.g., raninids) is needed to support any statement of this behavior as a synapomorphy for the Hippoidea.

Efford's (1969) tree of evolutionary relationships in the Albuneidae is not highly informative. Although his basic groupings of taxa were sound (e.g., *Albunea* with *Stemonopa*, *Lepidopa* with *Austrolepidopa*), his tree

was based on rough ideas of relationships and is not a cladogram. His tree lacked resolution at the level of "ancestral Albuneidae," and some of his suggestions are untenable given additional evidence. For example, Efford (1969) placed *Austrolepidopa* and *Leucolepidopa* in a more derived position than *Lepidopa*, apparently on the strength of a single character (number of articles on the antennal flagellum), which he assumed should be reduced in the derived state. This logic, when applied to this one character, is not flawed, but when other characters, such as presence of leg membranes and flagellum on the exopod of maxilliped III, are examined, the overall pattern is reversed. It is unfortunate that this is the only tree of albuneid relationships available to date, particularly because it has been cited as if it were a true cladogram (e.g., Faulkes and Paul, 1997a).

#### KEY TO SUBFAMILIES

- 1 Abdominal somite V with pleura; antennal acicle short (less than length of antennal segment III) . . . Lepidopinae, n. subfam.
- Abdominal somite V without pleura; antennal acicle long (greater than or equal to length of antennal segment III) . . . . . Albuneinae

#### LEPIDOPINAE, new subfamily

TYPE GENUS: *Lepidopa* Stimpson, 1858, designated herein.

INCLUDED GENERA: *Lepidopa* Stimpson, 1858; *Austrolepidopa* Efford and Haig, 1968; *Leucolepidopa* Efford, 1969; *Paraleucolepidopa* Calado, 1996.

DIAGNOSIS: Carapace front broad, unarmed or weakly toothed; outer-ocular spines present (except in *Lepidopa haigae*); hepatic anterolateral spine present; branchiostegite unarmed. Rostrum present. Distal peduncular segment flattened; cornea absent. Antennule segment I unarmed; dorsal flagellum with 46–250 articles, ventral flagellum with 0–4 articles. Antenna acicle present, short; flagellum with three to nine articles. Maxilliped III carpal projection long; crista dentata absent. Pereopod I dactylus dorsal margin smooth; propodus cutting edge smooth; distodorsal carpal spine absent. Pereopod III male pore present (except in *Lepidopa cali-*



*formica*). Abdomen with pleura on somites II–V. Telson sexual dimorphism weak.

REMARKS: Although *Lepidopidae* Stammer (1936) (Crustacea: Mysidacea) is a senior family-level homonym of this new taxon, that name was placed on the “Official index of rejected and invalid family-group names in zoology” as name no. 398 (a family name based on a junior homonym of a genus) (ICZN, 1964).

The genera that comprise this new subfamily have always been considered to form a natural grouping within the Albuneidae (Efford and Haig, 1968; Efford, 1969), but that group was never formally named. The only genus that was questionably referred to this group was *Zygopa* (Holthuis, 1961), but as shown herein, that genus is allied to *Albunea* rather than to *Lepidopa*.

#### KEY TO GENERA

- 1 Antenna with three flagellar articles . . . . .  
     . . . . . *Leucolepidopa*
- Antenna with more than three flagellar articles  
     . . . . . 2
- 2 Pereopod IV merus with lateral surface calcified . . . . . 3
- Pereopod IV merus with lateral surface decalcified . . . . . *Lepidopa*
- 3 Rostral area with anterior margin rounded . . . . .  
     . . . . . *Paraleucolepidopa*
- Rostral area with anterior margin truncated  
     . . . . . *Austrolepidopa*

#### AUSTROLEPIDOPA EFFORD AND HAIG, 1968

*Austrolepidopa* Efford and Haig, 1968: 898. – Haig, 1974: 449 (list). – Coêlho and Calado, 1987: 43, table 1. – Calado, 1995: 85–86. – Boyko and Harvey, 1999: 382, 401 (key).

DIAGNOSIS: Carapace approximately as wide as long, anterior margin armed with low spines. Rostrum produced and truncated. Distal peduncular segment flattened, tapering. Antennular dorsal flagellum with 46–90 articles, ventral flagellum with 2–4 articles. Antennal segment I unarmed; flagellum with seven or eight articles. Maxilliped II exopod with flagellum. Abdominal somite V pleura well calcified. Telson of male elongate ovate, evenly but weakly calcified.

DISTRIBUTION: Known only from Western

Australia, Queensland, Australia, and New Caledonia.

TYPE SPECIES: *Austrolepidopa schmitti* Efford and Haig, 1968, by original designation.

INCLUDED SPECIES: *A. schmitti* Efford and Haig, 1968; *A. trigonops* Efford and Haig, 1968; *A. caledonia* Boyko and Harvey, 1999.

REMARKS: As first pointed out by Boyko and Harvey (1999), Efford and Haig (1968) incorrectly identified males of this genus as females. Like all members of the Lepidopinae, the males of *Austrolepidopa* species possess pores on the coxae of pereopods III and V, and males of two of the three species also have small, budlike pleopods. Females have gonopores on the coxae of pereopods III and long pleopods. All three species of *Austrolepidopa* have a glossy, porcelainlike quality and are easily damaged if handled roughly.

The range of this genus would be extended to New South Wales, Australia, if cataloged specimens purported to belong to *Austrolepidopa* could be located in the AM (see under *A. schmitti*).

This genus is the sister taxon to all other genera in the Lepidopinae.

#### KEY TO SPECIES

- 1 Maxilliped III exopod with two segments . . . . . 2
- Maxilliped III exopod with one segment . . . . .  
     . . . . . *A. schmitti*
- 2 Setal field projecting almost to base of ocular sinus, CG8 entire . . . . . *A. caledonia*
- Setal field projecting anteriorly on level with base of lateral carapace spine, CG8 broken  
     . . . . . *A. trigonops*

#### *Austrolepidopa schmitti* Efford and Haig, 1968

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*Austrolepidopa schmitti* Efford and Haig, 1968: 898–903, figs. 1–4\*. – Coêlho and Calado, 1987: table 1. – Springthorpe and Lowry, 1994: 91 (list). – Calado, 1995: 86–89, pl. 26, figs. a, b, pl. 27, figs. a–f. – Fransen et al., 1997: 79 (list). – Boyko and Harvey, 1999: 400 (list), 401 (key).

MATERIAL EXAMINED: **Australia: Queensland:** Noosa Head, Aug. 8, 1922, coll. A. A. Livingstone: 1 ♂, 5.7 mm cl, 1 ♀, 7.3 mm

cl, paratypes (USNM 122072), 1 ♀, 7.5 mm cl, paratype (AM 15342), 1 ♂, 5.9 mm cl, 1 ♀, 6.4 mm cl, paratypes (BMNH 1967.9.2.1–2), 1 ♂, 5.7 mm cl, 1 ♀, 6.4 mm cl, paratypes (RMNH 23281), 1 ♂, 5.1 mm cl, 1 ♀, 5.8 mm cl, paratypes (LACM-AHF 221), 2 ♂, 6.7–7.8 mm cl, 10 ♀, 5.4–9.1 mm cl, paratypes (AM P6369); Middle Banks, Moreton Bay, Nov. 1983, coll. P. Saenger and S. Cook: 2 ♀, 3.4–4.5 mm cl, 2 juveniles, 1.9–2.0 mm cl (QM W12515); Bramble Bay, Moreton Bay, 65 ft (= 19.7 m), March 1976, Zoology Department, University of Queensland: 1 ♂, 5.0 mm cl (QM W8294); Middle Banks, Moreton Bay, 88 ft (= 26.7 m), March 1973, Zoology Department, University of Queensland: 1 ♀, 5.2 mm cl (QM W8327)

**DIAGNOSIS:** Carapace wider than long, covered with strongly setose grooves. Setal field with concave anterior margin and narrow lateral elements directed posteriorly. CG1 with contiguous posterior lateral elements; CG4 present as two long elements connected medially to anterior end of CG6; CG5 absent; CG6 merged with CG4 laterally and with CG7 medially to form two separate hybrid grooves; CG8 present as two short medial elements; CG11 absent. Anterior margin of carapace with finely toothed lobe lateral to ocular sinus. Rostral region truncate anteriorly, finely toothed. Ocular plate completely concealed dorsally by rostral region. Distal peduncular segments dorsoventrally flattened and ovate/triangular in shape, separated by slightly more than length of distal peduncular segments, lateral margin slightly convex, mesial margin slightly concave. Maxilliped III exopod without flagellum. Dactylus of pereopod II with heel produced, rounded. Dactylus of pereopod III with heel produced, subacute. Dactylus of pereopod IV deeply concave in indent, heel acute. Males without pleopods. Telson of male and female similar; flattened and ovate, medially with tufts of short, thin setae in paired longitudinal rows.

**DESCRIPTION:** Carapace (fig. 18A) slightly wider than long. Anterior margin dentate between ocular peduncles, with submarginal ventral row of long plumose setae. Rostrum absent, rostral area truncate, overreaching base of distal peduncular segments and exceeded by anterolateral lobes. Ocular sinus

sharply concave, dentate. Anterolateral lobe broadly triangular, dentate on margins, with mesial margin straight and lateral margin concave. Frontal region smooth, setal field with anterior margin narrow and reaching anterior margin of carapace, posterior margin broad, narrow lateral elements directed posteriorly, anterior margin concave. CG1 sinuous, slightly crenulate, bearing short setae, connected to posterior lateral elements. Mesogastric region smooth, CG2 absent; CG3 absent; CG4 present as two long elements connected medially to anterior end of CG6. Hepatic region smooth, with short rugose and setose lateral spine present on anterolateral margin; long row of setae parallel to anterior margin of carapace. Epibranchial region roughly triangular, smooth, posterior lateral margin with three short rows of setae. Metagastric region smooth; CG5 absent; CG6 slightly crenulate, median sinuous element separate from lateral elements, lateral fragments of CG6 connecting with median of CG4; CG7 absent. Cardiac region smooth; CG8 present as two short medial elements; CG9 absent; CG10 present as two slightly oblique elements almost meeting in median; CG11 absent. Branchial region with transverse rows of setae. Posterior margin deeply and evenly convex, with short lateral submarginal groove. Branchiostegite unarmed, covered with long plumose setae, anterior region with many short rows of setae, posterior region well calcified dorsally, membranous ventrally, with numerous irregular fragments.

Ocular plate and median peduncular segments completely concealed by front of carapace (fig. 18B). Distal peduncular segments elongate, ovate, triangular, broadly separated, margins with short plumose setae, ocular pigment visible at tip.

Antennule (fig. 18C) segment III narrow proximally, expanding distally to twice proximal width, produced distoventrally, simple setae on dorsal margin and scattered on face, few long plumose setae on distoventral margin; dorsal exopodal flagellum with 71–90 articles ( $n = 6$ ), long plumose setae on dorsal and ventral margins, short simple setae on distolateral margins; ventral endopodal flagellum with two or three articles ( $n = 6$ ), plumose setae on dorsal and ventral margins. Segment II with plumose setae on dorsal and

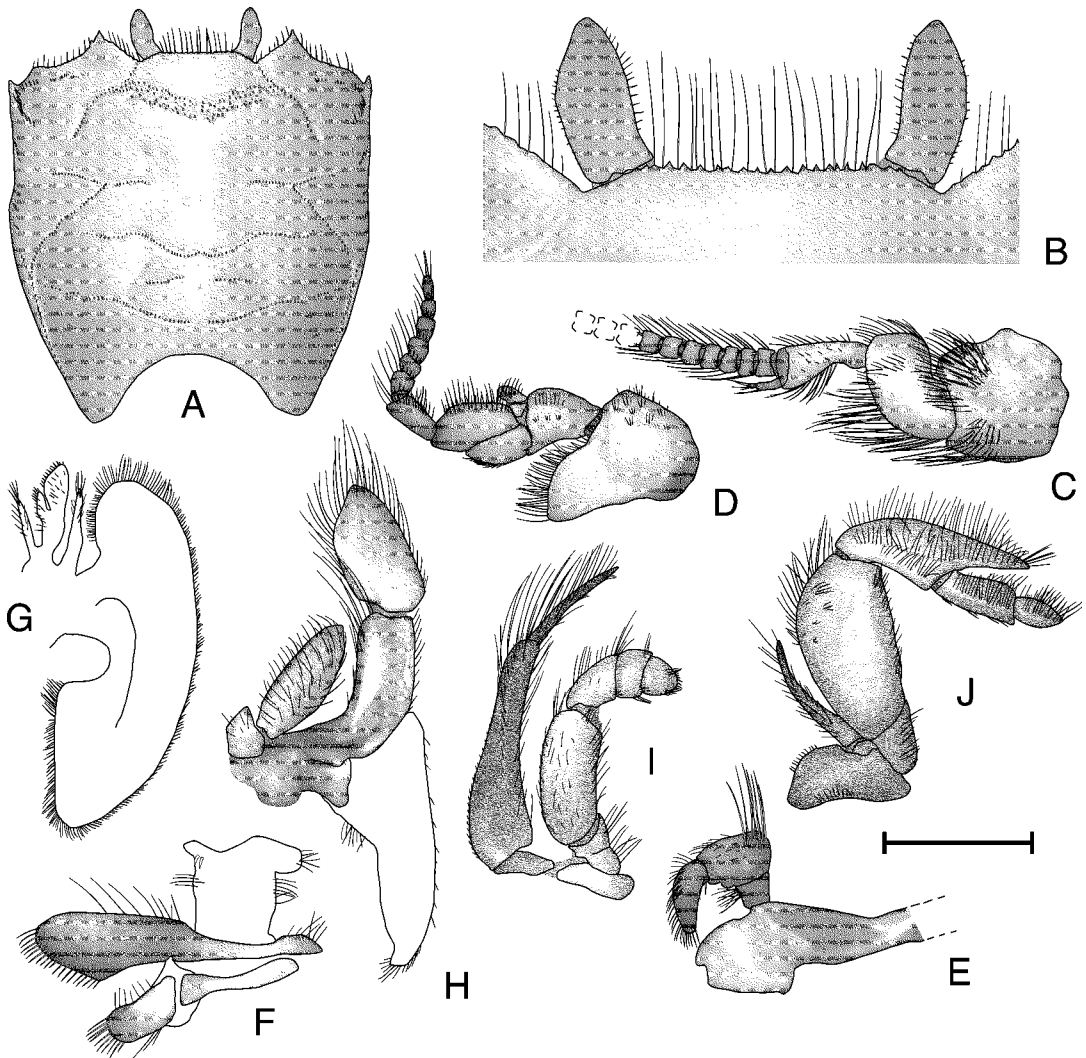


Fig. 18. *Austrolepidopa schmitti* Efford and Haig, 1968: A, B, ♂, 7.8 mm cl, AM P6369–6370, paratype; C–J, ♀, 7.5 mm cl, AM P15342, paratype. A. Carapace and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Right mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Left maxilliped I, lateral view. I. Right maxilliped II, lateral view. J. Right maxilliped III, lateral view. Scale = 1.1 mm (B, G), 1.6 mm (E, I), 1.7 mm (H), 2.2 mm (C, D, F, J), and 3.3 mm (A).

ventral margins, and scattered on distolateral surface. Segment I wider than long, distolateral and distoventral surface and distal margin with long plumose setae.

Antenna (fig. 18D) with segment V approximately twice longer than wide, long plumose setae on dorsal margin; flagellum with seven articles ( $n = 6$ ), long simple setae on dorsal, ventral, lateral, and distal margins.

Segment IV with long plumose setae on dorsal margin, and long simple setae on dorsolateral margin. Segment III with long plumose setae on ventral margin. Segment II short, widening distally, with long simple setae on dorsolateral margin and in short row ventromediolaterally; antennal acicle short, rounded, exceeding base of segment IV by approximately one-fourth length of segment

IV, long plumose setae on dorsal margin and long simple setae on lateral margin. Segment I rounded dorsally, with distoventral flattened plate, long plumose setae on ventrodorsal margin, dorsolateral surface rugose and with long simple setae in short rows.

Mandible (fig. 18E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 18F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin plumose setae on dorsal margin. Proximal endite with thick simple setae on distal margin and thin plumose setae on dorsal margin. Endopod external lobe truncate distally and curled under, rounded proximally; internal lobe reduced with two thick setae at distolateral margin.

Maxilla (fig. 18G) exopod evenly rounded with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 18H) epipod with plumose setae on margins. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, and with plumose setae; distal segment spatulate, approximately two times longer than wide, medial and proximal thirds of segment subequal in width, margins with long plumose setae, face of segment with few setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins and surface.

Maxilliped II (fig. 18I) dactylus evenly rounded, length equal to width, with thick simple setae distally. Propodus twice as wide as long, not produced dorsodistally, with plumose setae on dorsal margin and short simple setae on distal margin. Carpus not produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal margin and few scattered on surface. Merus approximately 2.5 times longer than wide, margins nearly parallel but slightly inflated, with plumose setae on dorsolateral margin, ventral margin, and scattered on surface. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-third

longer than merus, flagellum with one elongate article, approximately one-half length of exopod.

Maxilliped III (fig. 18J) dactylus elongate with rounded tip, long simple setae on dorsal margin and in row on lateral surface. Propodus with longitudinal median row of simple setae, dorsal and ventral margins with simple setae. Carpus produced beyond distal end of propodus, overreaching dactylus by one-fourth dactylus length; lateral surface and dorsal margin with rows of plumose setae. Merus inflated, unarmed, with plumose setae on dorsodistal and ventrodorsal margins. Basis incompletely fused with ischium, without crista dentata. Exopod two-segmented, proximal segment small, distal segment styliform, tapering, approximately one-half length of merus, plumose setae on margins and surface; flagellum absent.

Pereopod I (fig. 19A) dactylus curved and tapering; lateral and mesial surfaces smooth, dorsal margin with long plumose and short simple setae, ventral margin with short simple setae. Propodal 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 short 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 short plumose setae, margins with short plumose setae; mesial side with few short rows of setae. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 19B) dactylus smooth, base to heel almost straight, heel smoothly rounded and low, 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. Propodal dorsal surface smooth, ventral margin inflated and rounded, distal and ventral margins with long plumose setae; dorsolateral surface as narrow,



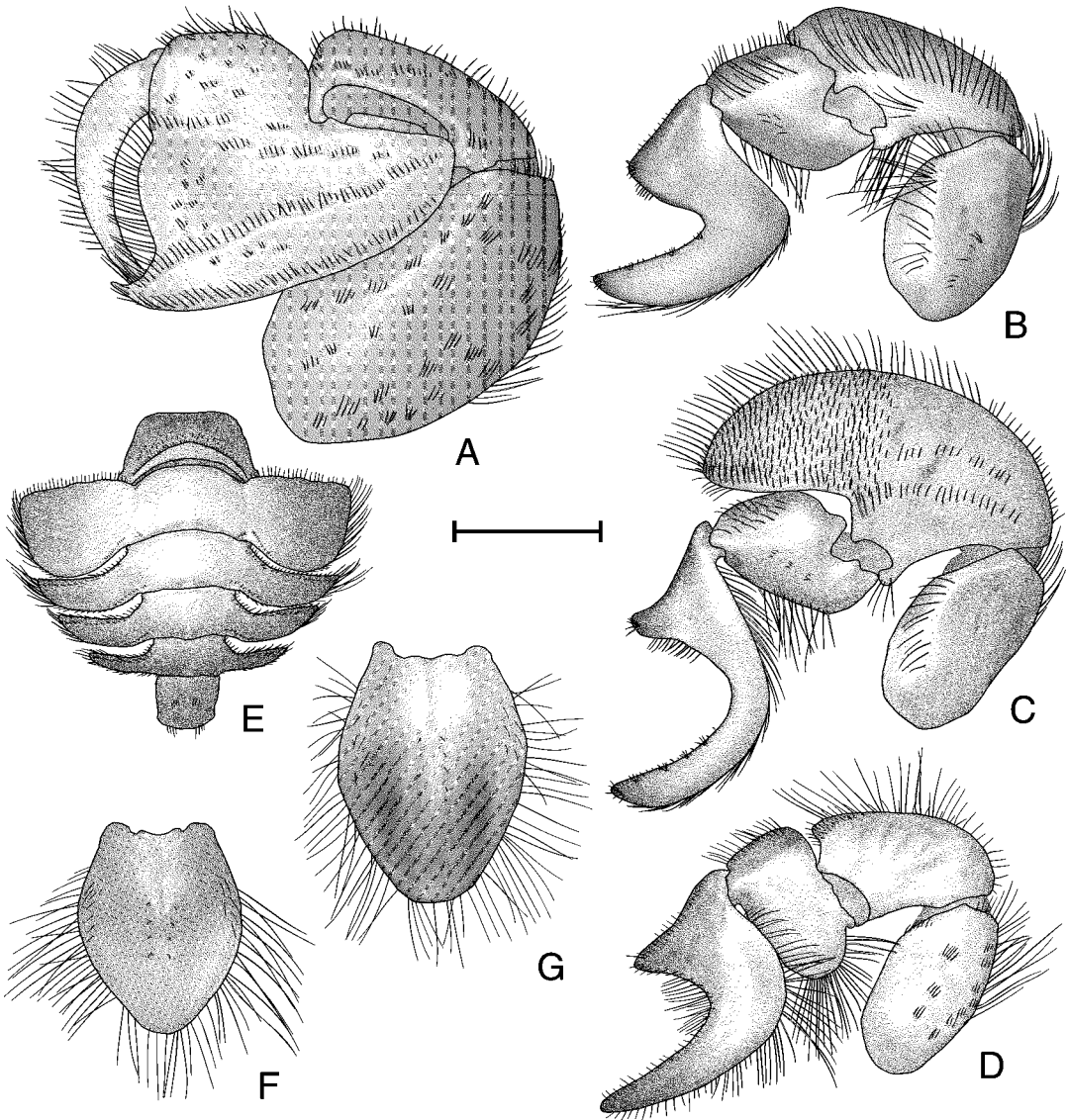


Fig. 19. *Austrolepidopa schmitti* Efford and Haig, 1968: A, F, ♂, 7.8 mm cl, AM P6369–6370, paratype; B–E, G, ♀, 7.5 mm cl, AM P15342, paratype. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I–VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 1.6 mm (F, G), 1.7 mm (A), 2.2 mm (B–D), and 3.3 mm (E).

oblique, flattened shelf, with 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, dorsal margin with long plumose setae; mesial surface smooth, submarginal and marginal rows of long plumose setae dorsally. Merus lateral surface decalcified, long plumose setae on margins and scattered on lateral surface; mesial surface with row of long

plumose setae ventral to dorsal margin and row of setal patches one-third from ventral margin. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 19C) dactylus with base to heel concave, heel produced and bluntly 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 as narrow, oblique, flattened shelf with long plumose on surface, 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; distolateral surface covered with numerous rows of short, simple setae forming setal mat, increasingly prominent distally, proximolateral surface with two parallel rows of short simple setae; mesial surface smooth, with medial row of long plumose setae. Merus smooth, ovate, dorsal and ventral margins unarmed, dorsodistal and ventral margins with long plumose setae, lateral surface decalcified; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa of male with small tubercle; female coxa unarmed. Female with large gonopore on ventral surface of coxa, lacking setae; male with similar but smaller pore.

Pereopod IV (fig. 19D) dactylus base to heel concave, heel to tip broadly concave, tip subacute, tip to base evenly convex, heel of dactylus approximately one-half length of blade; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface smooth, plumose setae proximally. Propodus expanded ventrally; ventral expansion not reaching ventral dactylar margin; dorsal and ventral margins with long plumose setae; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; lateral and mesial surfaces smooth, dorsal margin with short simple and long plumose setae, ventral margin with short plumose setae, small mat of short

simple setae on dorsodistal projection. Merus with scattered short transverse rows of setae on lateral surface, dorsal and ventrodial margins with long plumose setae, ventral surface fully calcified, smooth. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 19E) with somite I approximately twice 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, scattered short setae in region anterior to ridge. Somite II anterior margin straight but crenulate, with row of short setae at posterolateral angle; pleura expanded and directed laterally, lateral margins angled anteriorly and rounded posteriorly, anterior and lateral margins with long plumose setae, posterior margin with short setae, becoming submarginal posteromesially. Somite III similar to somite II, but shorter; pleura thinner and shorter than those of somite II, directed posteriorly in proximal half and laterally in distal half, with setae as in somite II, anterolateral angle acute, dorsal surface obliquely flattened anterolaterally with posterior marginal row of short setae. Somite IV similar to somite III, but thinner and shorter; pleura thinner and shorter than on somite III, directed and with setae as in somite III, dorsal surface obliquely flattened anterolaterally. Somite V narrower than somite IV; pleura approximately two-thirds as long as on somite IV, directed and with setae as in somite III, except with posterior row of setae terminating at posterolateral angle of somite. Somite VI subequal to somite V in width but longer, dorsal surface with two short oblique rows of setae laterad of midline posteriorly and medially; pleura absent.

Females with uniramous, paired pleopods on somites II–V, males without pleopods.

Telson of male (fig. 19F) ovate, longer than wide, smoothly rounded and tapered distally, dorsal surface with four short transverse rows of setae laterad of midline in median third, small area of submarginal setae in median third, margins with long plumose setae. Telson of female (fig. 19G) similar to that of male, distal margin more bluntly angled.

DISTRIBUTION: Known only from Queensland, Australia, in 19.7–26.7 m depth.

MAXIMUM SIZE: Males: 7.8 mm cl; females: 9.1 mm cl.

TYPE SPECIMENS: AM P15351 (holotype, lost), USNM 122072, AM 15342, BMNH 1967.9.2.1–2, RMNH 23281, LACM-AHF 221, AM P6369–6370 (22 paratypes), Efford Collection (1 paratype, current repository unknown).

TYPE LOCALITY: Noosa Head, Queensland, Australia.

REMARKS: The holotype and the 10 additional paratypes (AM P6370) cannot be located in AM and appear to be lost (Springthorpe and Lowry, 1994). The holotype, however, was recently described and illustrated by Calado (1995). Numerous additional cataloged specimens purported to be this taxon, but collected from New South Wales, Australia, are said to be in AM (Berents, personal commun.), but cannot be located. It is not unreasonable that this species ranges into New South Wales, but this remains to be verified.

This species is the sister taxon to the other two species in the genus.

*Austrolepidopa caledonia*  
Boyko and Harvey, 1999

Figures 20, 21

*Austrolepidopa caledonia* Boyko and Harvey, 1999: 391–396, 400 (list), 401 (key), figs. 8, 9\*.

MATERIAL EXAMINED: **Australia: Western Australia:** Sta. 05B10BT, northwest shelf, 19°05.0'S, 118°58.0'E, 82 m, Oct. 23, 1983, coll. CSIRO: 2 ♂, 7.2–8.2 mm cl, 1 oviger, 8.4 mm cl (QM W22312).

**New Caledonia:** Sta. DW 107, Grand Passage, 19°07.6'S, 163°30.2'E, 205 m, March 2, 1990, coll. MUSORSTOM Campagne SMIB 6: 1 ♂, 9.2 mm cl, holotype (MNHN-Hi 207), 1 ♀, 11.5 mm cl, allotype (MNHN-Hi 208); Sta. DW 109, 19°05.7'S, 163°29.7'E, 225 m, March 2, 1990, coll. MUSORSTOM Campagne SMIB 6: 1 ♀, 8 mm cl, paratype (MNHN-Hi 209); Sta. 502, 19°08'S, 163°30'W, lagoon nord, 190 m, March 4, 1985, coll. ORSTOM (B. Richer de Forges): 1 ♂, 8.7 mm cl (MNHN-Hi 255); Sta. 189, 19°7.5'S, 163°29'W, 210 m, Sept. 9, 1985,

coll. MUSORSTOM IV: 1 ♂, 8.7 mm cl (MNHN-Hi 256).

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. Rostral region truncate anteriorly, finely toothed. Ocular plate completely concealed dorsally by rostral region. Distal peduncular segments dorsoventrally flattened and triangular in shape, separated by slightly more than length of distal peduncular segments, lateral margins slightly convex, mesial margins slightly concave. Maxilliped III exopod with flagellum. 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 in indent, heel produced and rounded. Males with small pleopods. Telson of male and female similar; flattened and ovate, medially with tufts of short, thin setae in paired longitudinal rows.

DESCRIPTION: Carapace (fig. 20A) approximately 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 distal peduncular segments 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 an-



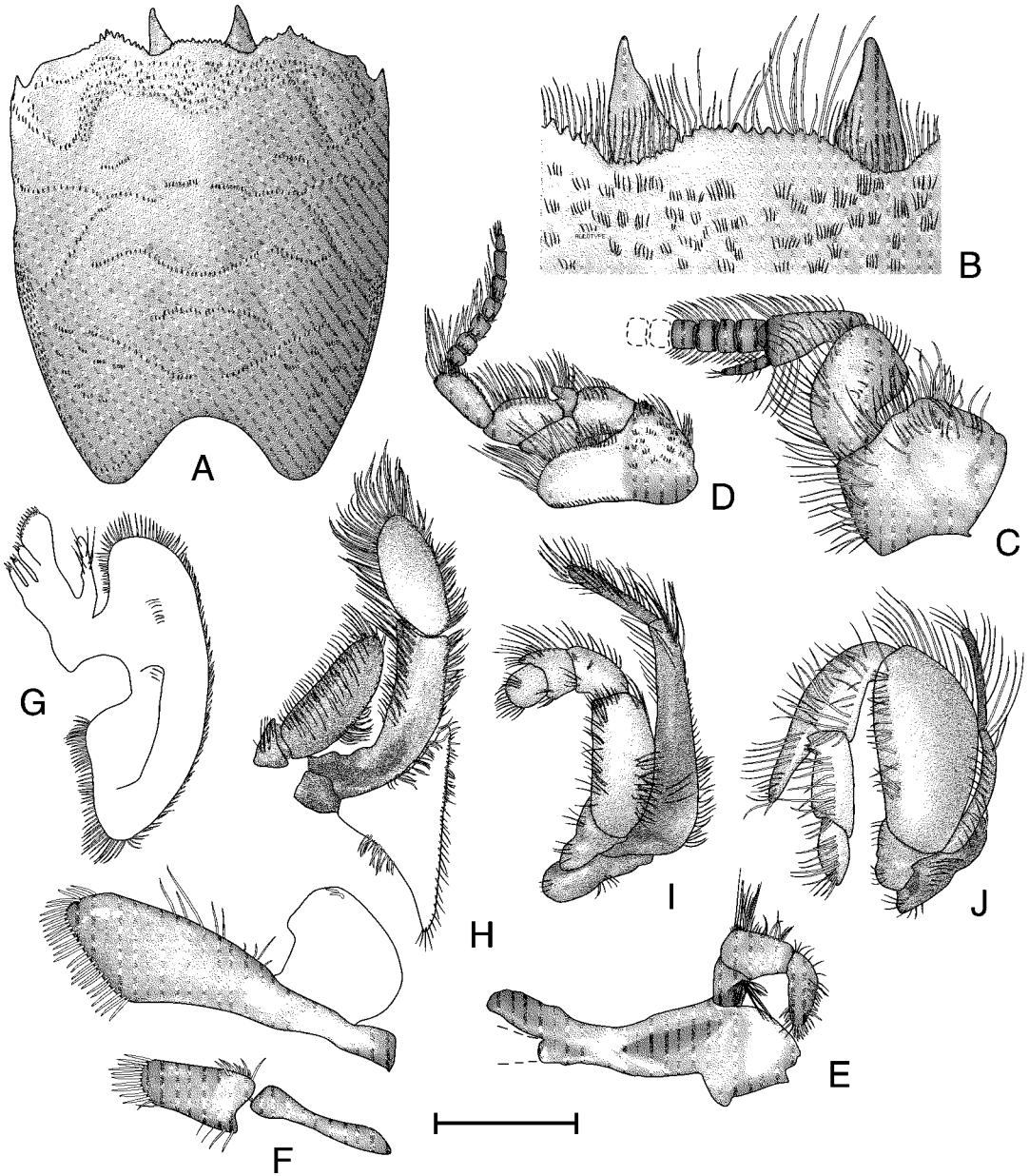


Fig. 20. *Austrolepidopa caledonia* Boyko and Harvey, 1999: A, B, ♀, 11.5 mm cl, MNHN Hi-208, allotype; C–J, ♀, 8.0 mm cl, MNHN Hi-209, paratype. A. Carapace and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Left maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 0.8 mm (F), 1.6 mm (B, C, E, H, I), 2.2 mm (D, G, J), and 4.4 mm (A).



terolateral 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 fragment 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 eight to nine 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 and median peduncular segments completely concealed by front of carapace (fig. 20B). Distal peduncular segments triangular (almost ovate in smallest specimen), broadly separated, margins without setae, ocular pigment visible in mesiodistal area.

Antennule (fig. 20C) 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 exopodal flagellum with 67 articles (only one specimen with intact flagella), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum short, usually of three articles (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. 20D) with segment V approximately two times longer than wide, long plumose setae on dorsomesial margin, and long simple setae on dorsolateral margin; flagellum with seven or eight articles, 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 approximately one-fourth 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.

Mandible (fig. 20E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 20F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under, rounded proximally; internal lobe reduced with two thick setae at distolateral margin.

Maxilla (fig. 20G) exopod evenly rounded with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe with plumose setae.

Maxilliped I (fig. 20H) epipod with plumose setae on distal margin and on distolateral surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, margins with plumose setae; distal segment spatulate, approximately two times longer than wide, broadest medially, margins with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins.

Maxilliped II (fig. 20I) dactylus evenly rounded, length equal to width, with thick simple setae distally. Propodus 1.5 times wider than long, slightly produced dorsodistally, with plumose setae on dorsal margin and long simple setae on distal margin. Carpus not strongly produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal margin. Merus approximately two times longer than wide,

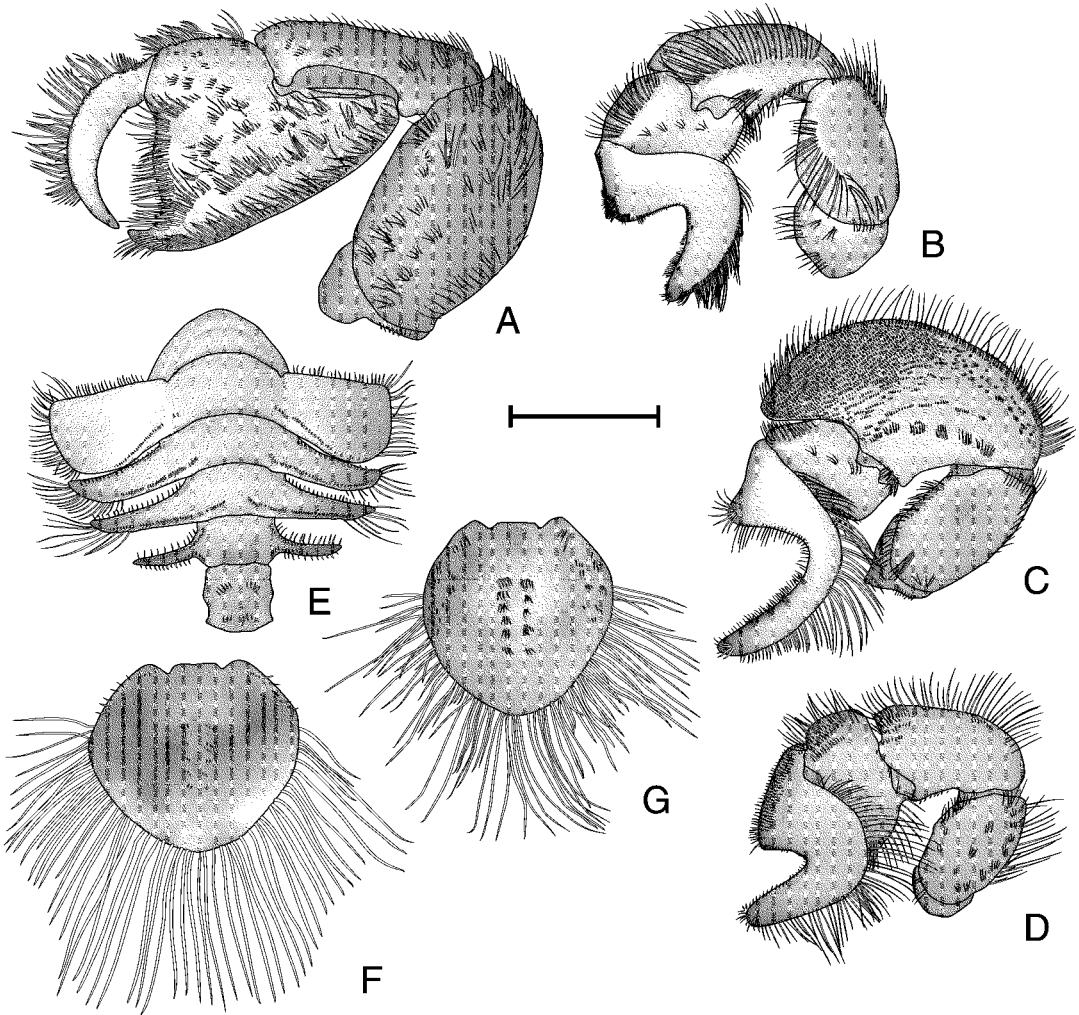


Fig. 21. *Austrolepidopa caledonia* Boyko and Harvey, 1999: A–E, G, ♀, 11.5 mm cl, MNHN Hi-208, allotype; F, ♂, 9.2 mm cl, MNHN Hi-207, holotype. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I–VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 2.2 mm (F), 3.0 mm (G), 3.3 mm (A), and 4.4 mm (B–E).

margins nearly parallel but slightly inflated, with simple setae on ventrolateral margin and plumose setae on dorsolateral margin. Basis-ischium incompletely fused, with plumose setae on margins. Exopod two-segmented, proximal segment small, distal segment styliform, tapering, approximately one-half length of merus, plumose setae on margins; flagellum with one article.

Maxilliped III (fig. 20J) 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 two-segmented, proximal segment small, distal segment styliform, tapering, approximately one-half length of merus, plumose setae on margins; flagellum with one article, almost reaching distal end of merus.

Pereopod I (fig. 21A) dactylus curved and tapering; lateral and mesial surfaces smooth, dorsal margin with long plumose and short

simple setae, ventral margin with short simple setae. Propodal 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. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 21B) dactylus 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 patch of long plumose setae between heel and base (not illustrated). Propodal 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 with 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 one-third from ventral margin. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 21C) dactylus 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 as 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. Basis-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 (fig. 21D) dactylus 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 dactylar 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 ventrodiscal margins with long plumose setae, ventrodiscal angle slightly expanded, ventral surface fully calcified,

smooth. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 21E) 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 approximately two-thirds 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 of 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.

Telson of male (fig. 21F) ovate, slightly wider than long, smoothly rounded posteriorly, dorsal surface with six short transverse rows of setae laterad of midline in median third, rugose near anterolateral angle, with short setae, margins with long plumose setae. Telson of female (fig. 21G) similar to that of male, with larger rugose areas anterolaterally.

DISTRIBUTION: Known from the vicinity of New Caledonia, in 190–225 m depth. Possibly from Western Australia (see below).

MAXIMUM SIZE: Males: 9.2 mm cl; females: 11.5 mm cl.

TYPE SPECIMENS: MNHN-Hi 207 (holotype), MNHN-Hi 208 (allotype), MNHN-Hi 209 (paratype).

TYPE LOCALITY: Grand Passage, New Caledonia, 19°07.6'S, 163°30.2'E, 205 m.

REMARKS: The record from 225 m is the greatest depth reported for any species in the Albuneidae, considerably exceeding the next deepest record, 151.5 m for a specimen of *Albunea symmysta* (Linnaeus, 1758) from the Philippines (USNM 68613). *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.).

The specimens from Western Australia, including the only known ovigerous *Austrolepidopa*, are tentatively referred to this species. They are clearly not *A. trigonops*, but they show some differences in the shape of the setal field and carapace CGs from the prior known specimens of *A. caledonia*. It is possible that these specimens represent an undescribed species in the genus, close to *A. caledonia*.

*Austrolepidopa caledonia* is most closely related to *A. trigonops*, from which it differs in having smaller anterolateral spines, shallower ocular sinuses, and a more 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 is less produced laterally. Both species possess a two-segmented exopod on maxilliped III, while *A. schmitti* has only a one-segmented exopod.

#### *Austrolepidopa trigonops*

Efford and Haig, 1968

Figures 22, 23

*Austrolepidopa trigonops* Efford and Haig, 1968: 904–907, figs. 5–7\*. – Haig, 1974: 447 (list). – Coêlho and Calado, 1987: 41. – Jones and Morgan, 1993: 150 (list). – Calado, 1995: 92–95, pl. 28, figs. a–d, pl. 29, figs. a–d\*. – Boyko and Harvey, 1999: 382, 395–396, 400 (list), 401 (key)\*.



**MATERIAL EXAMINED:** **Australia: Western Australia:** North of east end of Rottnest Island, 19.5 fms (= 35.7 m), May 7, 1960, coll. R. W. George on "Davena": 1 ♂, damaged, unmeasurable (9.8 mm cl cited by Eford and Haig, 1968), holotype (WAM 7949); near bar on south passage, Shark's Bay, 6 fms (= 11 m), May 14, 1960, R. W. George on "Davena": 1 ♀, 13.4 mm cl, paratype (WAM 7959); about 7 mi west of City Beach, Perth, 16 fms (= 29.3 m), Aug. 15, 1962, coll. R. W. George on "Bluefin": 1 ♀, 10.2 mm cl (WAM 23397); Sta. Bone-NW Shelf-36, off Kimberley, 18°38.16'S, 120°06.94'E, 93 m, July 1, 1999, coll. Y. Bone: 1 ♂, 5.1 mm cl (MOV J47315); Sta. Bone-NW Shelf-09, off Kimberley, 15°59.89'S, 121°50.109'E, 30 m, June 26, 1999, coll. Y. Bone: 1 ♀, 7.8 mm cl (MOV J47314).

**DIAGNOSIS:** Carapace as long as wide, covered with strongly setose grooves. Setal field with concave anterior margin and narrow lateral elements directed posteriorly. CG1 with contiguous posterior lateral elements; CG4 with four short median elements displaced anteriorly and posteriorly from long lateral portions of CG4; CG5 absent; CG6 merged with CG4 laterally and with CG7 medially to form two separate hybrid grooves; CG8 broken into three or four short elements; CG11 absent. Anterior margin of carapace with finely toothed lobe lateral to ocular sinus. Rostral region truncate anteriorly, finely toothed. Ocular plate completely concealed dorsally by rostral region. Distal peduncular segments dorsoventrally flattened and triangular in shape, separated by slightly more than length of distal peduncular segments, lateral margins sinuous, mesial margins slightly concave. Maxilliped III exopod with flagellum. 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 in indent, heel produced and rounded. Males with small pleopods. Telson of male and female similar; flattened and ovate, medially with tufts of short, thin setae in paired longitudinal rows.

**DESCRIPTION:** Carapace (fig. 22A) approximately as wide as long. Anterior margin dentate between ocular peduncles, with sub-

marginal ventral row of long plumose setae. Rostrum absent, rostral area truncate, overreaching base of distal peduncular segments 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, not reaching to anterior margin of carapace, narrow lateral elements directed posteriorly, anterior margin concave. CG1 sinuous, strongly crenulate, bearing short setae, connected to posterior lateral elements. Mesogastric region smooth, CG2 absent; CG3 present only as short lateral grooves; CG4 with four short median elements displaced anteriorly and posteriorly from long lateral portions of CG4. Hepatic region rugose anteriorly and anteromesially, otherwise smooth, with short rugose and setose lateral spine present on anterolateral margin. Epi-branchial 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 fragment of CG6 connecting with CG4; CG7 transverse, merging with median third of CG6. Cardiac region smooth; CG8 broken into three or four short elements; CG9 absent; CG10 present as oblique elements almost meeting in median; CG11 absent. Branchial region with short, transverse rows of setae. Posterior margin deeply and evenly convex, with submarginal groove reaching approximately halfway up posterior concavity. Branchiostegite unarmed, covered with long plumose setae, anterior region with many short rows of setae, posterior region well calcified dorsally, membranous ventrally, with numerous irregular fragments.

Ocular plate and median peduncular segments completely concealed by front of carapace (fig. 22B). Distal peduncular segments triangular, broadly separated, margins without setae, ocular pigment visible in mesio-distal area.

Antennule (fig. 22C) 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

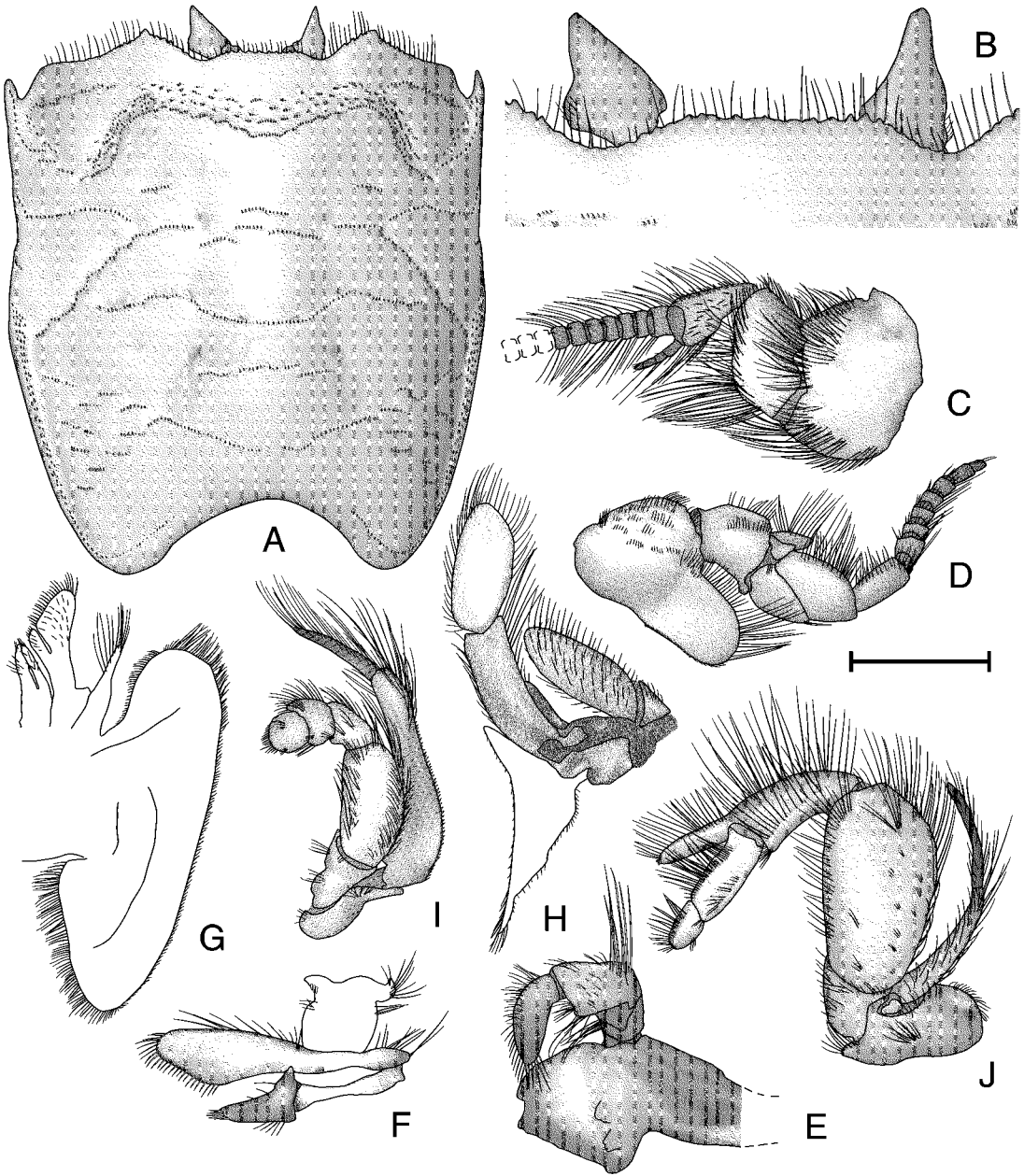


Fig. 22. *Austrolepidopa trigonops* Efford and Haig, 1968: A–J, ♀, 13.4 mm cl, WAM 7959, paratype. **A.** Carapace and ocular peduncles, dorsal view. **B.** Ocular peduncles, dorsal view. **C.** Left antennule, lateral view. **D.** Right antenna, lateral view. **E.** Right mandible, mesial view. **F.** Left maxillule, lateral view. **G.** Left maxilla, lateral view. **H.** Right maxilliped I, lateral view. **I.** Left maxilliped II, lateral view. **J.** Left maxilliped III, lateral view. Scale = 1.7 mm (B), 2.1 mm (E), 2.2 mm (F), 3.0 mm (C, H, D), 3.3 mm (D, G, J), and 4.4 mm (A).

exopodal flagellum with 46–59 articles ( $n = 2$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with three or four articles ( $n = 2$ ), 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, distodorsal third of surface rugose, lateral surface with long plumose setae on dorsolateral and ventrolateral surface, and on dorsal, ventral, and distal margins.

Antenna (fig. 22D) with segment V approximately two times longer than wide, long plumose setae on dorsomesial margin, and long simple setae on dorsolateral margin; flagellum with eight articles ( $n = 2$ ), 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 and in row on lateral surface; antennal acicle short, rounded, exceeding base of segment IV by approximately one-fourth length of segment IV, long plumose setae on dorsal and lateral margins. Segment I rounded dorsally, flattened ventrally, long plumose setae on margins, dorsolateral surface rugose with short setae, ventral margin produced into oblong flattened plate.

Mandible (fig. 22E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 22F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin setae along dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under, rounded proximally; internal lobe reduced with three thick setae at distolateral margin.

Maxilla (fig. 22G) exopod evenly rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 22H) epipod with plu-

mose setae on margins. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, margins with plumose setae; distal segment spatulate, approximately two times longer than wide, broadest medially, margins with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins.

Maxilliped II (fig. 22I) dactylus evenly rounded, length equal to width, with thick simple setae distally. Propodus 1.5 times wider than long, slightly produced dorsodistally, with plumose setae on dorsal margin and long simple setae on distal margin. Carpus not strongly produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal margin. Merus approximately two times longer than wide, margins nearly parallel but slightly inflated, with simple setae on ventrolateral margin and plumose setae on dorsolateral margin. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-third longer than merus, flagellum with one article.

Maxilliped III (fig. 22J) 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 slightly beyond distal end of propodus; lateral surface and margins with long plumose setae. Merus inflated, unarmed, with plumose setae on margins, short simple and long plumose setae scattered on lateral surface. Basis incompletely fused with ischium, without crista dentata. Exopod two-segmented, proximal segment small, distal segment styliform, tapering, approximately one-half length of merus, plumose setae on margins; flagellum with one article, almost reaching distal end of merus.

Pereopod I (fig. 23A) dactylus curved and tapering; lateral and mesial surfaces smooth, dorsal margin with long plumose and short simple setae, ventral margin with short simple setae. Propodal lateral surface with numerous short, transverse rows of setose rugae, dorsal margin unarmed but rugose, ventral margin distally produced into acute spine, cutting edge lacking teeth, lined with long plumose setae; lateral, mesial, and ven-



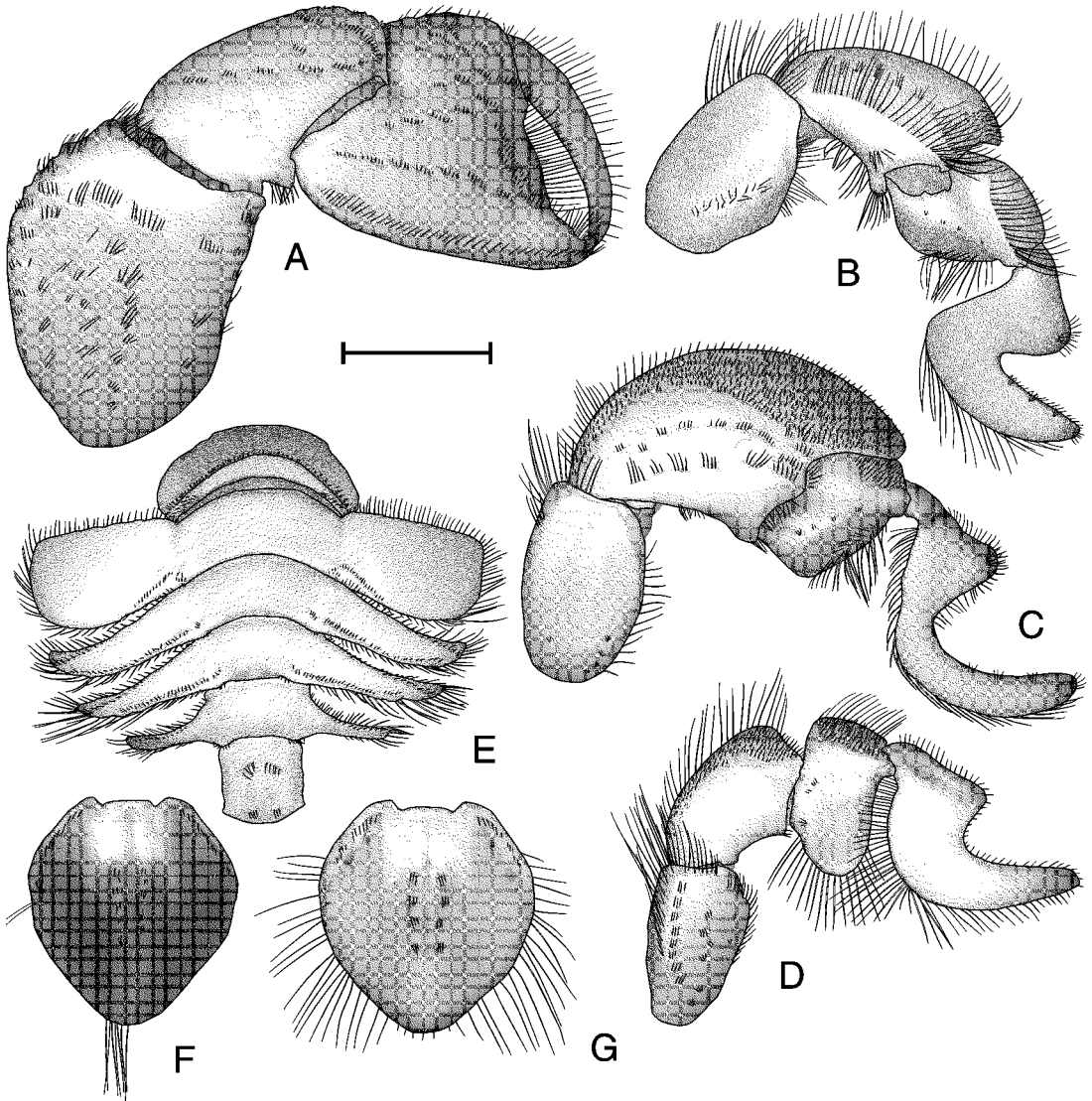


Fig. 23. *Austrolepidopa trigonops* Efford and Haig, 1968: A-E, G, ♀, 13.4 mm cl, WAM 7959, paratype; F, ♂, 9.8 mm cl, WAM 7949, holotype. A. Right pereopod I, lateral view. B. Right pereopod II, lateral view. C. Right pereopod III, lateral view. D. Right pereopod IV, lateral view. E. Abdominal somites I-VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 2.2 mm (F), 3.3 mm (A, G), and 4.4 mm (B-E).

tral margins with long setae. Carpus unarmed, dorsal margin distally rugose; 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 short plumose

setae; mesial side with few short rows of setae. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 23B) dactylus 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. Propodal dorsal surface smooth, ventral margin inflated and rounded, oblique row of long plumose setae on lateral surface, distoventral margin with long plumose setae; dorsolateral surface as 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 with subacute tip; 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 with 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 one-third from ventral margin. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 23C) dactylus with base to heel slightly concave, heel low and rounded, heel to tip broadly concave, tip rounded, tip to base smoothly convex distally and crenulate proximally; lateral surface smooth, dorsal margin with few tufts of setae; mesial surface smooth, 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 as narrow, oblique, flattened shelf with mat of short setae, 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 setal mat, increasingly prominent distally, two broken rows of long simple setae ventral to setal mat; mesial surface smooth, long plumose

setae on margins and in medial transverse row. 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. Basis-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 (fig. 23D) dactylus with base to heel slightly concave, heel to tip broadly concave, tip rounded, tip to base evenly convex, heel approximately one-fourth length of blade of dactylus; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface smooth, row of plumose setae dorsally and scattered on surface. Propodus expanded dorsally and ventrally; ventral expansion approximately equal to ventral dactylus margin, long plumose setae at ventral margin; dorsal expansion with row of long plumose setae and mat of short simple setae; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; lateral and mesial surfaces smooth, dorsal margin with short simple and long plumose setae and mat of short setae on distal quarter, ventral margin with short plumose setae. Merus with scattered short transverse rows of setae on lateral surface, dorsal and ventrodiscal margins with long plumose setae, ventrodiscal angle slightly expanded, ventral surface fully calcified, smooth. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 23E) with somite I wider than long, widest posteriorly, dorsal surface with anterior margin slightly convex, small submarginal decalcified spots anteriorly, posterior margin slightly concave, submarginal row of short setae on elevated ridge, row of setae anterior to ridge, and area of setae at posterolateral corners. Somite II anterior margin convex, with tuft of setae at posterolateral angle; pleura expanded and directed posterolaterally, anterior margin crenulate, 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 posterolaterally, with setae as in somite II, anterolateral angle subacute, 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 posterolaterally, posterior margin crenulate, dorsal surface obliquely flattened anterolaterally, margins with long plumose setae. Somite V narrower than somite IV; pleura approximately two-thirds as long as on somite IV, directed laterally, with setae as in somite IV, except with posterior row setae terminating at posterolateral angle of somite and not submarginal. Somite VI subequal to somite V in width but longer, dorsal surface with short oblique rows of setae laterad of 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.

Telson of male (fig. 23F) ovate, tapering distally, slightly longer than wide, smoothly rounded distally, dorsal surface with six short transverse rows of setae laterad of midline in median third, row of short submarginal setae along anterior third of margin, margins with long plumose setae (inferred from broken setae). Telson of female (fig. 23G) similar to that of male, with four short transverse rows of setae laterad of midline.

**DISTRIBUTION:** Known only from Western Australia and Queensland, Australia, in 11–93 m depth.

**MAXIMUM SIZE:** Males: 9.8 mm cl; females: 13.4 mm cl.

**TYPE SPECIMENS:** WAM 7949 (holotype, formerly no. 62–62), WAM 7959 (paratype, formerly no. 72–62), WAM 316–62 (paratype, lost).

**TYPE LOCALITY:** 5 mi north of east end of Rottneest Island, Western Australia, 19.5 fms (= 35.7 m).

**REMARKS:** Although Efford and Haig (1968) referred to the holotype as a female, it possesses reduced pleopods and is therefore actually a male of this species. However, it is in a pulverized and virtually unidentifiable condition. The paratype from Beagle Is-

land was lost in the mail en route to Brazil (Hewitt, personal commun.).

This species is the sister taxon to *A. caledonia*.

#### *LEUCOLEPIDOPA* EFFORD, 1969

*Leucolepidopa* Efford, 1969: 1–2. – Coêlho and Calado, 1987: 42. – Calado, 1995: 217.

**DIAGNOSIS:** Carapace as wide as long, anterior margin weakly toothed. Rostrum produced and rounded. Distal peduncular segment flattened, ovate; setae on dorsal surface. Antennular dorsal flagellum with 23+ articles, ventral flagellum absent. Antennal segment I unarmed; flagellum with three articles. Maxilliped II exopod without flagellum. Maxilliped III exopod without flagellum. Abdominal somite V pleura well calcified. Males with pleopods. Telson of male ovate, evenly but weakly calcified.

**DISTRIBUTION:** Known from Sunda Strait between Sumatra and Java, Indonesia, and from Western Australia, Australia.

**TYPE SPECIES:** *Leucolepidopa sunda* Efford, 1969, by monotypy.

**REMARKS:** This genus is monotypic and intermediate between *Austrolepidopa* and *Paraleucolepidopa*.

#### *Leucolepidopa sunda* Efford, 1969

Figures 24, 25

*Leucolepidopa sunda* Efford, 1969: 2–4, pl. 1, figs. 1–7, pl. 2, figs. 1–8\*. – Coêlho and Calado, 1987: table 1. – Calado, 1995: 217–221, pl. 71, figs. a–d, pl. 72, figs. a, b, pl. 73, figs. a–d\*. – Boyko and Harvey, 1999: 400 (list), 401 (key).

**MATERIAL EXAMINED:** **Indonesia:** Sta. 75, Sunda Strait, between Sumatra and Java, 06°10'S, 105°44'E, 40 m, July 29, 1922, coll. Danish Kei Island Expedition: 1 ♂, 7.2 mm cl, holotype (ZMUC 168).

**Australia:** Sta. Bone-NW Shelf-37, off Kimberley, 18°46.97'S, 120°14.48'E, Western Australia, 76 m, July 1, 1999, coll. Y. Bone: 1 ♂, 5.5 mm cl (MOV J47316).

**DIAGNOSIS:** As for genus.

**DESCRIPTION:** Carapace (fig. 24A) approximately as wide as long. Anterior margin smooth between ocular peduncles. Rostrum absent, rostral area convex, overreaching

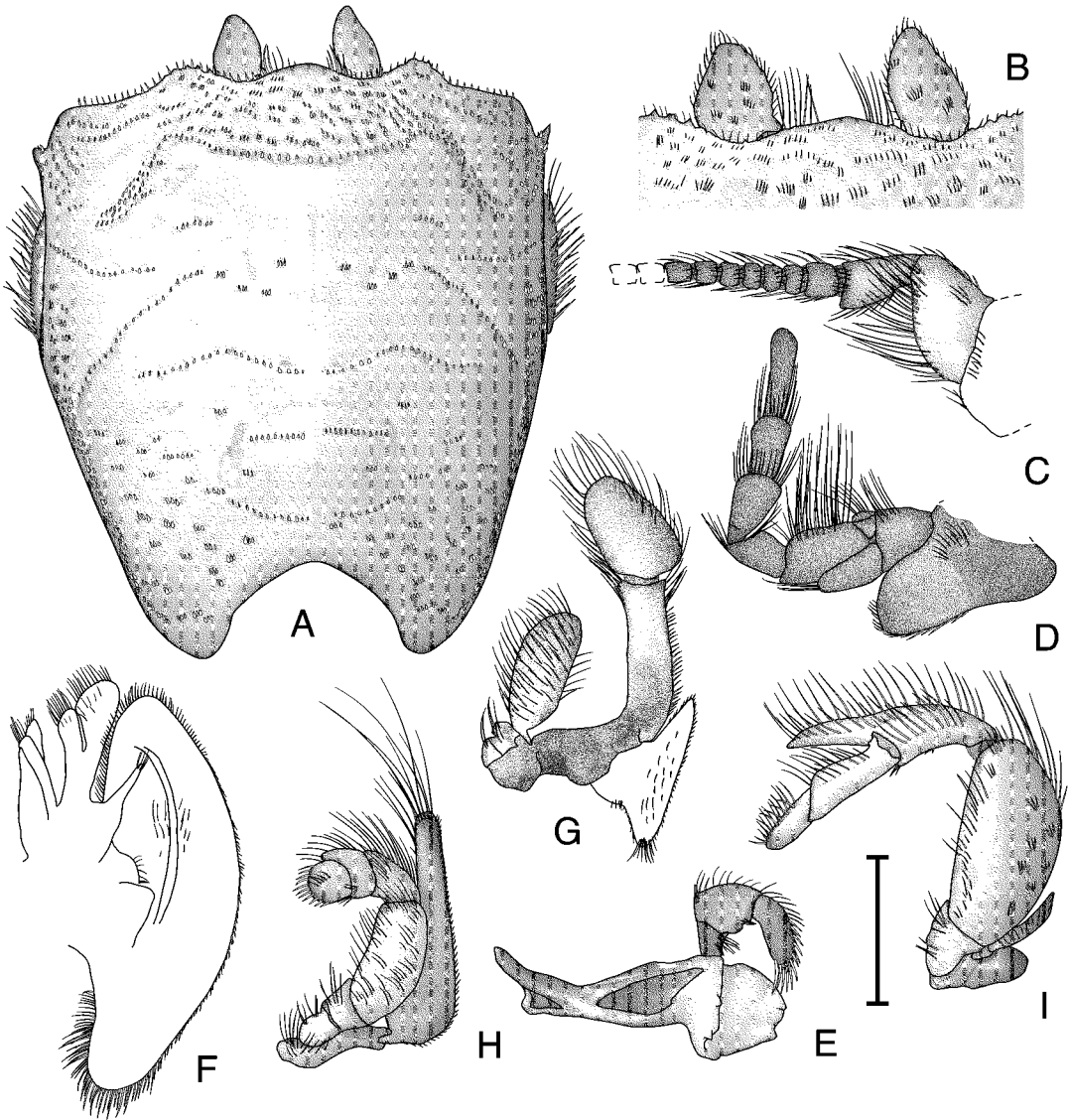


Fig. 24. *Leucolepidopa sunda* Efford, 1969: A–I, ♂, 7.2 mm cl, ZMUC 168, holotype. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxilla, lateral view. G. Left maxilliped I, lateral view. H. Left maxilliped II, lateral view. I. Left maxilliped III, lateral view. Scale = 1.4 mm (B), 1.6 mm (C–H), and 2.2 mm (A, I).

base of distal peduncular segments and exceeded by anterolateral lobes. Ocular sinus concave, with few low teeth. Anterolateral lobe broadly triangular, dentate on margin, with margins convex. Frontal region smooth, setal field broadest anteriorly, reaching to anterior margin of carapace, narrow lateral elements directed posteriorly, anterior margin

sinuous. CG1 concave, strongly crenulate, bearing short setae, connected to posterior lateral elements. Mesogastric region smooth, CG2 absent; CG3 present only as short lateral grooves; CG4 with eight short median elements: median two in line with two longer lateral elements, submedian six oblique and displaced posteriorly toward midline. Hepat-

ic 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 numerous short setae. Metagastric region smooth; CG5 absent; CG6 slightly crenulate, median concave element merging with CG7 to form hybrid groove, lateral fragment of CG6 inserted between long lateral elements and short oblique elements of CG4; CG7 oblique, merging with median third of CG6. Cardiac region smooth; CG8 broken into two long transverse elements; CG9 present as two very short lateral elements; CG10 present as two oblique elements almost meeting in median; CG11 absent. Branchial region with short, transverse rows of setae. Posterior margin deeply and evenly convex, with submarginal groove reaching posterior margin of posterior concavity. Branchiostegite unarmed, covered with long plumose setae, anterior region with many short rows of setae, posterior region well calcified dorsally, membranous ventrally, with numerous irregular fragments.

Ocular plate and median peduncular segments completely concealed by front of carapace (fig. 24B). Distal peduncular segments oblong, rounded distally, broadly separated, margins and dorsal surface with short setae.

Antennule (fig. 24C) with segment III narrow proximally, expanding distally to twice proximal width, produced distoventrally, long plumose setae on dorsal, ventral, and distal margins; dorsal exopodal flagellum with 123 articles ( $n = 1$ ), long plumose setae on dorsal, ventral and distal margins; ventral endopodal flagellum absent ( $n = 1$ ). Segment II with plumose setae on dorsal and ventral margins, and scattered on lateral surface. Segment I damaged in only specimen.

Antenna (fig. 24D) with segment V approximately two times longer than wide, long plumose setae on distal margin; flagellum with three articles ( $n = 1$ ), long thick 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 distoventral margin. Segment II short, widening distally, with long simple setae on dorsolateral margin; an-

tennal acicle short, rounded, not reaching base of segment IV, long plumose setae on dorsal and lateral margins. Segment I rounded dorsally, flattened ventrally, long plumose setae on margins, dorsolateral surface rugose and with short setae, ventral margin produced into oblong flattened plate.

Mandible (fig. 24E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule unknown.

Maxilla (fig. 24F) exopod evenly rounded, with plumose setae along distal margin. Scaphognathite rounded on posterior lobe, with plumose setae. Endopod and endites without useful characters.

Maxilliped I (fig. 24G) epipod reduced, with plumose setae on margins and surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, margins with plumose setae; distal segment spatulate, approximately 1.5 times longer than wide, broadest proximally, margins with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins.

Maxilliped II (fig. 24H) dactylus evenly rounded, length equal to width, with thick simple setae distally and in transverse medial row. Propodus two times wider than long, slightly produced dorsodistally, with plumose setae on dorsal and distoventral margins. Carpus not strongly produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal margin and scattered on distolateral surface. Merus approximately two times longer than wide, margins nearly parallel but slightly inflated, with plumose setae on margins and scattered on lateral surface. Basis-ischium incompletely fused, with plumose setae on margins. Exopod two times longer than merus, without flagellum, with long simple setae at distal tip.

Maxilliped III (fig. 24I) 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 to distal



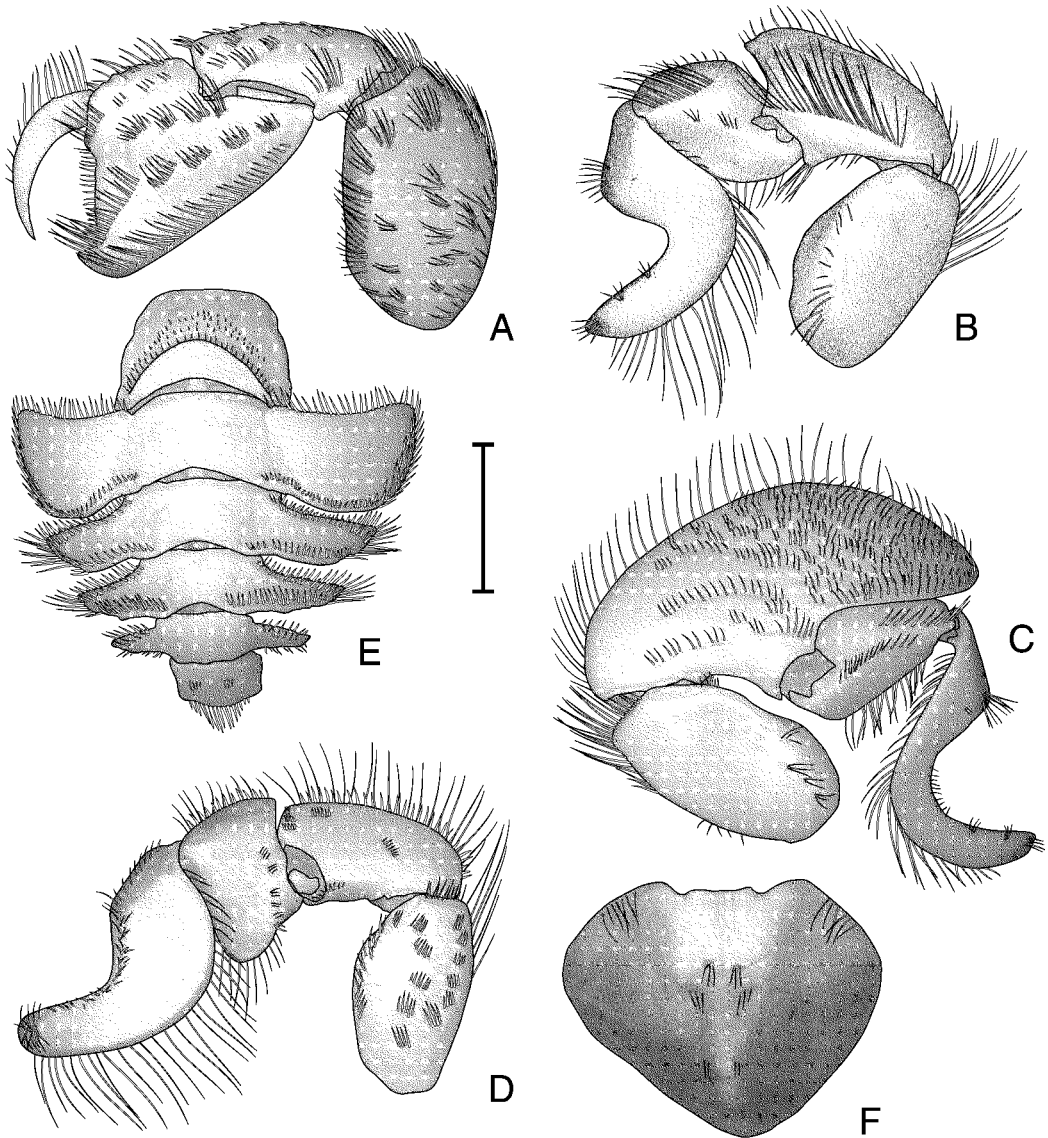


Fig. 25. *Leucolepidopa sunda* Efford, 1969: A–F, ♂, 7.2 mm cl, ZMUC 168, holotype. **A.** Left pereopod I, lateral view. **B.** Left pereopod II, lateral view. **C.** Right pereopod III, lateral view. **D.** Left pereopod IV, lateral view. **E.** Abdominal somites I–VI, dorsal view. **F.** Telson of ♂, dorsal view. Scale = 2.1 mm (F) and 2.2 mm (A–E).

end of propodus; lateral surface and margins with long plumose setae. Merus inflated, unarmed, with plumose setae on margins, short simple and long plumose setae scattered on lateral surface. Basis incompletely fused with ischium, without crista dentata. Exopod two-segmented, proximal segment small, distal segment styliform, tapering, approximately

one-half length of merus, plumose setae on margins; flagellum absent.

Pereopod I (fig. 25A) dactylus curved and tapering; lateral and mesial surfaces smooth, dorsal margin with long plumose and short simple setae, ventral margin with short simple setae. Propodus lateral surface with numerous short, transverse rows of setose ru-

gae, dorsal margin unarmed but rugose, ventral margin distally produced into acute spine, cutting edge lacking teeth, lined with short blunt and long plumose setae; lateral, mesial, and ventral margins with long setae. Carpus unarmed, dorsal margin distally rugose; 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; margins and lateral surface with scattered transverse rows of long plumose setae; mesial surface with few short rows of setae. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 25B) dactylus 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. Propodal dorsal surface smooth, ventral margin inflated and rounded, oblique row of long plumose setae on lateral surface, distoventral margin with long plumose setae; dorsolateral surface as 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 inflated and produced dorsodistally, gently rounded with subacute tip; 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 with lateral surface fully calcified, long plumose setae on dorsodistal margin, short plumose setae on ventral margin; mesial surface with row of long plumose setae below dorsal margin and row of setal patches one-third from ventral margin. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 25C) dactylus with base to heel straight, heel low and rounded, heel to tip broadly concave, tip rounded, tip to

base smoothly convex distally; lateral surface smooth, heel and dorsodistal margin with tufts of long simple setae; mesial surface smooth, 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 as narrow, oblique, flattened shelf with mat of short setae, simple setae on margins, long plumose setae on ventral margin; mesial surface with scattered long setae on and near distal margin. Carpus produced, overreaching distal margin of propodus, broadly rounded and inflated distally, dorsolateral margin unarmed; lateral surface covered with numerous rows of short, simple setae forming setal mat, increasingly prominent distally, two broken rows of long simple setae ventral to setal mat; mesial surface smooth, long plumose setae on margins and in medial transverse row. Merus smooth, ovate, dorsal and ventral margins unarmed, dorsodistal and proximoventral margins with long plumose setae, lateral surface fully calcified; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female with presumed large gonopore on ventral surface of coxa, lacking setae, male with similar but smaller pore.

Pereopod IV (fig. 25D) dactylus with base to heel convex, heel to tip broadly concave, tip rounded, tip to base evenly convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface smooth, row of plumose setae dorsally and scattered on surface. Propodus expanded dorsally and ventrally; ventral expansion not reaching ventral dactylus margin, long plumose setae at ventral margin; dorsal expansion with row of long plumose and short simple setae; lateral surface with transverse row of short plumose setae; lateral and mesial surfaces smooth; mesial surface with distal row of long plumose setae. Carpus slightly produced dorsodistally; lateral surface smooth, with few short rows of short simple setae; 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 lat-

eral surface, dorsodistal margin with long plumose setae, ventrodistal margin slightly expanded, ventral surface fully calcified, smooth. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 25E) with somite I wider than 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, numerous scattered short setae anterior to ridge. Somite II anterior margin convex; without setae; pleura expanded and directed anterolaterally, anterior margin smooth, lateral margins angled anteriorly and rounded posteriorly, anterior and lateral margins with long plumose setae, lateral and posterior margins with submarginal row of short setae. Somite III similar to somite II, but shorter with anterior and posterior margins sinuous; pleura thinner and shorter than those of somite II, directed posterolaterally, with setae as in somite II and additional submarginal row of setae anteriorly, anterolateral angle subacute, dorsal surface obliquely flattened anterolaterally; posterior margins crenulate. Somite IV similar to somite III, but thinner and shorter; with posterior row of pleural setae continuing onto lateral margins; pleura thinner and shorter than on somite III, directed laterally, anterior and posterior margins crenulate, dorsal surface obliquely flattened anterolaterally, margins with long plumose setae. Somite V narrower than somite IV; pleura approximately two-thirds as long as on somite IV, crenulate, directed laterally, with setae as in somite IV. Somite VI subequal to somite V in width but longer, dorsal surface with short oblique rows of setae laterad of midline medially, anterolateral margins with scattered plumose setae, posterior margin with row of long simple setae; pleura absent.

Females unknown, males with small pleopod buds on somites II–V.

Telson of male (fig. 25F) spade-shaped, tapering distally, slightly wider than long, smoothly rounded distally, dorsal surface with three short transverse rows of setae laterad of midline in median third, row of short submarginal setae in anterolateral corners, margins with long plumose setae (inferred

from broken setae). Telson of female unknown.

DISTRIBUTION: Known only from the type locality and Western Australia, Australia.

MAXIMUM SIZE: Males: 7.2 mm cl; females unknown.

TYPE SPECIMEN: ZMUC 168 (holotype).

TYPE LOCALITY: Sunda Strait, between Sumatra and Java, Indonesia, 06°10'S, 105°44'E, 40 m depth.

REMARKS: Both known specimens possess small pleopods, but Efford (1969) made no mention of this character.

#### PARALEUCOLEPIDOPA CALADO, 1996

*Lepidopa* Ortmann, 1896: 225–226 (part). – Schmitt, 1921: 172 (part). – Gordon, 1938: 188–190 (part). – Garcia Mendes, 1945: 119 (part). – Efford, 1971: 60–61 (part). – Calado, 1987: 119–121 (part). – Coêlho and Calado, 1987: 41 (part). – Manning, 1988: 626–627 (part). – Calado, 1995: 125–126 (part) (not *Lepidopa* Stimpson, 1858).

*Lepidops*: Stimpson, 1860: 241. – Miers, 1878: 331–332 (part) (not *Lepidopa* Stimpson, 1858). *Paraleucolepidopa* Calado, 1995: 264. – Calado, 1996: 47. – Calado, 1997b: 59–60.

DIAGNOSIS: Carapace wider than long, anterior margin weakly toothed. Rostrum produced and rounded. Distal peduncular segment flattened, ovate. Antennular dorsal flagellum with 56–67 articles, ventral flagellum with two articles. Antennal segment I unarmed; flagellum with six to eight articles. Maxilliped II exopod without flagellum. Maxilliped III exopod without flagellum. Abdominal somite V pleura well calcified. Males with pleopods. Telson of male diamond-shaped, evenly but weakly calcified.

DISTRIBUTION: Baja California, Mexico, to Panama; Dominican Republic to Brazil.

TYPE SPECIES: *Lepidopa myops* Stimpson, 1860, as the senior synonym of *L. panamaensis* Efford, 1971, the type species by monotypy.

INCLUDED SPECIES: *P. myops* (Stimpson, 1860); *P. distincta* (Gomes Côrrea, 1968).

REMARKS: Calado (1995) first introduced this generic name in her doctoral dissertation, but it must be considered unpublished from that source. It is unfortunate that she chose to subsequently publish the name in an abstract (Calado, 1996), but it is validly pub-



lished therein. A more complete redescription of the genus was given by Calado (1997b).

This genus was described with the type and sole species of *Lepidopa panamaensis* (Calado, 1996). Direct comparison of the type specimens of that taxon and numerous specimens of *L. myops* showed no important differences, and the two taxa are synonymous. *Lepidopa myops* is therefore the type of *Paraleucolepidopa* as the senior synonym of *L. panamaensis*. To complicate matters further, none of Calado's (1996; 1997b) defining characters for the genus *Paraleucolepidopa* are diagnostic for that taxon, which suggests that *Paraleucolepidopa* may be a synonym of *Lepidopa*. However, a cladistic phylogenetic analysis of the Albuneidae (Boyko and Harvey, in prep.) shows that the monophyletic clade containing *L. myops* and *L. distincta* is the sister taxon to *Lepidopa* and contains several synapomorphies (antennular dorsal flagellum with 56–67 articles, antennal segment I unarmed, maxilliped II exopod without flagellum, abdominal somite V pleura well calcified). As Calado's (1996) name is the earliest available for this clade, the name *Paraleucolepidopa* must stand but based on an entirely different suite of characters than that given by Calado (1996, 1997b).

This genus is intermediate between *Leucolepidopa* and *Lepidopa*.

#### KEY TO SPECIES

- 1 Rostrum extending forward between ocular peduncles ..... *P. distincta*  
 – Rostrum not extending between ocular peduncles ..... *P. myops*

*Paraleucolepidopa myops* (Stimpson, 1860),  
 new combination

Figures 26, 27

*Lepidops myops* Stimpson, 1860: 241–242\*. – Miers, 1878: 333, pl. 5, fig. 16\*. – Evans, 1967: 404 (list).

*Lepidopa myops*: Ortman, 1896: 226–227. – Faxon, 1895: 237 (list). – Holmes, 1900: 105 (part). – Rathbun, 1904: 14 (list) (part), 167 (list) (part). – Schmitt, 1921: 172 (part). – Gordon, 1938: 188 (part)\*. – Garcia Mendes, 1945: 119 (list). – Haig et al., 1970: 25 (part). – Efford, 1971: 63–70, figs. 1e, p, 2f, 3j, 4d, u, 5q,

6a, d, 7e\*. – Luke, 1977: 31. – Haig, 1980: 291, fig. 19.8. – Coelho and Calado, 1987: table 1. – Lemaitre and Alvarez León, 1993: 50 (list). – Hendrickx, 1992: 7 (list). – Hendrickx and Harvey, 1999: 367 (list).

*Lepidopa* spp. Knight, 1970: 141 (part).

*Lepidopa panamaensis* Efford, 1971: 72–74, figs. 1g, n, 2g, 3l, 4f, v, 5n, 6b, g, q, 7d, m\*. – Coelho and Calado, 1987: table 1 (NEW SYNONYMY).

*Lepidopa Myops*: Seridji, 1988: 1298.

*Paraleucolepidopa panamaensis*: Calado, 1995: 264–268, pl. 85, figs. a–e, pl. 86, figs. a–d. – Calado, 1996: 47. – Calado, 1997b: 60–64, figs. 1, 2. – Hendrickx and Harvey, 1999: 367 (list).  
 not *Lepidopa myops*: Holmes, 1900: 105 (part). – Benedict, 1903: 892–893, figs. 1, 4. – Rathbun, 1904: 14 (list) (part), 167 (list) (part). – Baker, 1912: 102. – Schmitt, 1921: 172 (part), pl. 31, fig. 4. – Johnson and Snook, 1927: 346, 348–349, figs. 296–297. – Gordon, 1938: 188 (part), figs. 1b, 2a, j\*. – MacGinitie, 1938: 474. – Johnson and Lewis, 1942: 82, 86, pl. 5, figs. 1–8. – Ricketts and Calvin, 1948: 188, pl. 38, fig. 4. – MacGinitie and MacGinitie, 1949: 305, fig. 149. – Schuster-Dieterichs, 1956: 51 (list). – Turner and Sexsmith, 1964: 48. – Haig et al., 1970: 25 (part). – Knight, 1970: 127–136, figs. 1–59. – Sanchez and Aguilar, 1975: 10–11. – Turner and Sexsmith, 1975: 46. – Boschi, 1981: 715, fig. 241–54. – Calado, 1995: 185–188, pl. 39, fig. 1, pl. 40, fig. j, pl. 41, fig. j, pl. 60, figs. a–c, pl. 61, figs. a–d\* (= *Lepidopa californica* Efford, 1971).

MATERIAL EXAMINED: **Mexico: Baja California Norte:** Gorda Point (Gulf side), 14 fms (= 25.6 m), April 24, 1937, coll. W. Williams: 1 oviger, 6.3 mm cl (USNM 267792); **Baja California Sur:** Cabo San Lucas, coll. J. Xantus: 1 oviger, 8.9 mm cl, lectotype of *L. myops* (MCZ 1386), 1 ♀, 9.2 mm cl, 1 oviger, 9.0 mm cl, paralectotypes of *L. myops* (BMNH 61.44), 1 ♀, 7.7 mm cl, paralectotype of *L. myops* (MNHN-Hi 83 ex USNM ex MCZ), 1 oviger, 9.0 mm cl, paralectotype of *L. myops* (ANSP 947 ex USNM); 5 mi northwest of Inocentes Ranch, near Cabo San Lucas, 15–30 fms (= 27.4–54.9 m), Jan. 29, 1939, coll. F. E. Lewis: 1 ♀, 6.8 mm cl (USNM 304313); **Nayarit:** Maria Magdalena Island, Tres Marias Islands, off Nayarit, 12 fms (= 21.9 m), Feb. 8, 1938, coll. S. A. Glassell: 1 ♀, 7.4 mm cl (USNM 304302); **Jalisco:** Banderas Bay, 25–40 fms (= 45.7–73.2 m), Feb. 13, 1938, coll. S. A. Glassell:



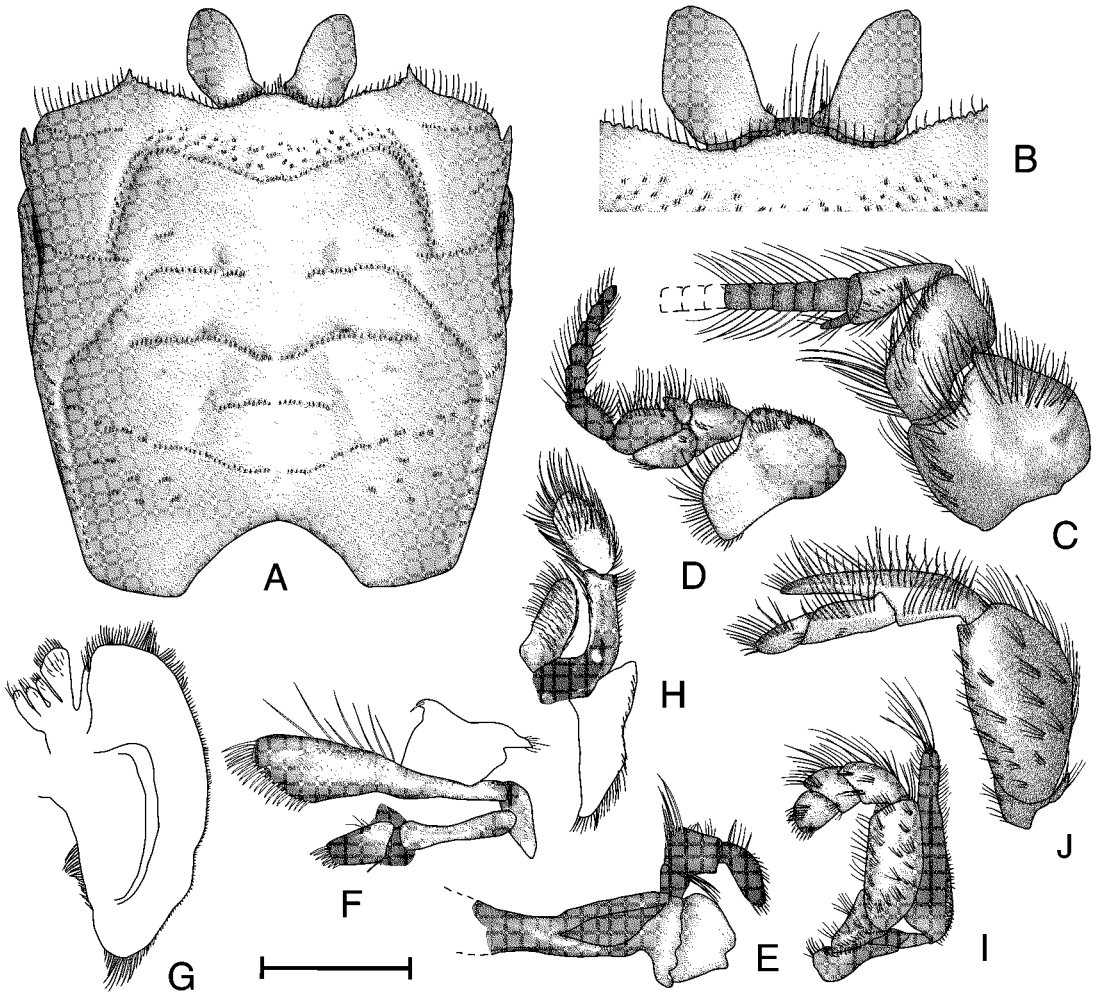


Fig. 26. *Paraleucolepidopa myops* (Stimpson, 1860), n. comb.: A, B, oviger, 8.9 mm cl, MCZ 1386, lectotype; C–J, ♀, 6.8 mm cl, USNM 304313. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Left maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 1.1 mm (F), 1.6 mm (C, E, I), 2.2 mm (B, D, G, H, J), and 3.3 mm (A).

1 ♀, 6.8 mm cl (USNM 260975); **Oaxaca:** Bay of Dulce, 20 fms (= 36.6 m), April 5, 1937, coll. W. Williams and F. E. Lewis on R/V "Stranger": 1 ♀, 8.6 mm cl (USNM 260976); Bay of Dulce, 20 fms (= 36.6 m), Sept. 5, 1937, coll. W. Williams and F. E. Lewis on R/V "Stranger": 1 unsexable and unmeasurable specimen (USNM 260977).

**Panama:** Taboganilla, Aug. 10, 1915, coll. T. Mortensen: 1 ♀, 8.5 mm cl, holotype of *L. panamaensis* (ZMUC 169); southwest point of Ray Islas Perlas, 15–25 m, Jan. 26,

1916, coll. T. Mortensen: 1 ♀, 7.8 mm cl, paratype of *L. panamaensis* (ZMUC 2636).

**DIAGNOSIS:** Rostrum not produced anteriorly as far as anterolateral spines. CG4 with short gap at median. Pereopod III carpal projection approximately as long as broad. Pereopod IV dactylus heel approximately one-third as long as blade.

**DESCRIPTION:** Carapace (fig. 26A) wider than long. Anterior margin convex on either side of ocular sinus, toothed, with basally broad, distally acute medial spine. Rostrum

a rounded, toothed projection reaching beyond median peduncular segments; unarmed. Ocular sinus smoothly concave, toothed; unarmed. Frontal region smooth; setal field a broad, sparsely setose, medially concave band paralleling CG1; extending posterolaterally almost to CG4. CG1 parallel to anterior margin of carapace, sinuous, slightly crenulate, medially concave, medial and lateral elements united. Mesogastric region smooth; CG2 absent; CG3 present as short oblique lateral elements; CG4 with two transverse long lateral elements. Hepatic region smooth with oblique lateral setose groove and short, subacute spine at median of lateral margin. Epibranchial region roughly triangular, smooth; posterolateral margin with four short rows of setae. Metagastric region smooth; CG5 absent. CG6 crenulate, with separate laterally oblique, medially straight, long lateral fragments and long sinuous median element united with CG7. CG7 straight relative to anterior margin of carapace and united with median fragment of CG6. Cardiac region smooth; CG8 present as two long medial elements. CG9 absent. CG10 present as two long oblique elements almost united in median. CG11 absent. Branchial region with few short, transverse rows of setae. Posterior margin deeply and smoothly concave medially and more or less straight laterally, with submarginal groove reaching halfway up posterior concavity, but lined with setae only to posterolateral corners of carapace. Branchiostegite without anterior submarginal spine; anterior region with anterodorsal transverse groove and granular surface; with many long plumose setae; posterior region membranous with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 26B) subquadrate, covered by carapace; median peduncular segments reduced to small rounded calcified areas anterior to ocular plate. Distal peduncular segments irregularly ovate, angled distolaterally, flattened with medially angled convex lateral and distally convex, proximally concave mesial margins, margins smooth; faint unpigmented notch in median of distal tip present; mesial margins separated along entire length; proximomesial margins with long simple setae.

Antennule (fig. 26C) segment III narrow proximally, expanding distally to two times proximal width; with plumose setae on dorsal and ventral margins and scattered on lateral surface; dorsal exopodal flagellum with 57–67 articles ( $n = 4$ ), long plumose setae on dorsal and ventral margins, short simple setae on distal margins; ventral endopodal flagellum with two articles ( $n = 5$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins, and scattered on ventral third of lateral surface. Segment I wider than long, unarmed; lateral surface dorsodistal third rugose, with long plumose setae; scattered long plumose setae on distal and ventral lateral surfaces; long plumose setae on dorsal and ventral margins.

Antenna (fig. 26D) with segment V approximately two times longer than wide, with short plumose setae on dorsal and distal margins; flagellum with six or seven (rarely eight) articles ( $n = 7$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV almost cylindrical, overreaching segment III by one-half of its length, with two rows of long plumose setae on dorsal margin. Segment III with long plumose setae on distoventral margin and short simple setae in small patch at proximodorsal angle. Segment II widening distally, with long plumose setae in subdorsal row and scattered in medial third of lateral surface; antennal acicle short, triangular, overreaching segment IV proximal margin by one-third of its length, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened and truncated ventrolaterally, with long plumose setae on margins; lateral surface unarmed; scattered setae on dorsal third of lateral surface; segment with ventromesial antennal gland pore.

Mandible (fig. 26E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 26F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and long plumose setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate

distally and curled under, with wide proximal projection; internal lobe reduced, with one thick seta at distolateral margin.

Maxilla (fig. 26G) exopod rounded with plumose setae along distal margin. Scaphognathite gently rounded on posterior lobe, with plumose setae.

Maxilliped I (fig. 26H) epipod with plumose setae on margins. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, margins with plumose setae; distal segment spatulate, longer than wide, curved mesially, broadest medially, margins and distolateral half of surface with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins.

Maxilliped II (fig. 26I) dactylus evenly rounded, length subequal to width, with thick simple setae distally and thin simple setae in short transverse row on lateral surface. Propodus slightly produced dorsodistally, two times wider than long, with plumose setae on dorsal margin and long simple setae on dorsodistal and ventrodistal margins. Carpus not strongly produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal margin and short simple setae on dorsodistal, ventrodistal, and medial lateral surface. Merus 2.5 times longer than wide, margins parallel but slightly inflated submedially, with simple setae on ventral margin and scattered on lateral surface, plumose setae on dorsolateral margin. Basis-ischium incompletely fused, with plumose setae on margins and lateral surface. Exopod one-third longer than merus, without flagellum.

Maxilliped III (fig. 26J) dactylus elongate and evenly rounded; long plumose setae on dorsal margin and lateral surface. Propodus with longitudinal median row of plumose setae on lateral surface; distoventral margins with short simple setae. Carpus strongly produced onto propodus, overreaching distal margin of propodus and extending one-half onto dactylus; lateral surface with medial transverse row of plumose setae; plumose setae on margins. Merus unarmed, broadly inflated distolaterally, with long plumose setae on dorsal margin and short simple setae scat-

tered in patches on lateral surface. Basis-ischium incompletely fused, without crista dentata. Exopod two-segmented: proximal segment small; distal segment styliform, tapering, approximately one-fifth length of merus, with plumose setae on margins; without flagellum.

Pereopod I (fig. 27A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with small rugose area proximally, smooth distally, long plumose setae along length; ventral margin with short simple setae. Propodal lateral surface with numerous short, transverse rows of setose rugae; dorsal margin with few small low ridges and spinules; ventral margin distally produced into subacute spine; cutting edge lacking teeth, lined with long plumose setae; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle rounded, with numerous setose rugae, dorsal margin smooth, with long plumose setae; lateral surface with few transverse setose ridges; mesial surface smooth with medial transverse row of long plumose setae. Merus unarmed; lateral surface with scattered transverse rows of short plumose setae, margins with long plumose setae; mesial side with few short rows of setae; proximal third of mesial surface with decalcified window. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 27B) dactylus smooth; with base to heel faintly concave, heel produced and rounded, heel to tip with broad rounded indent, tip subacute, tip to base broadly convex; lateral surface smooth, with few small setose punctae proximal to heel; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae, with patch of long plumose setae at base reaching across median of heel. Propodus with dorsal surface smooth, ventral margin inflated and rounded; distal and ventral margin with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with long plumose setae on dorsal and ventral margins; short transverse row of long plumose setae on surface; mesial surface with subdistal row of long plumose setae. Carpus produced dorsodistally, narrowing to rounded tip, not overreaching propodus; lateral surface nearly smooth, with two irregu-



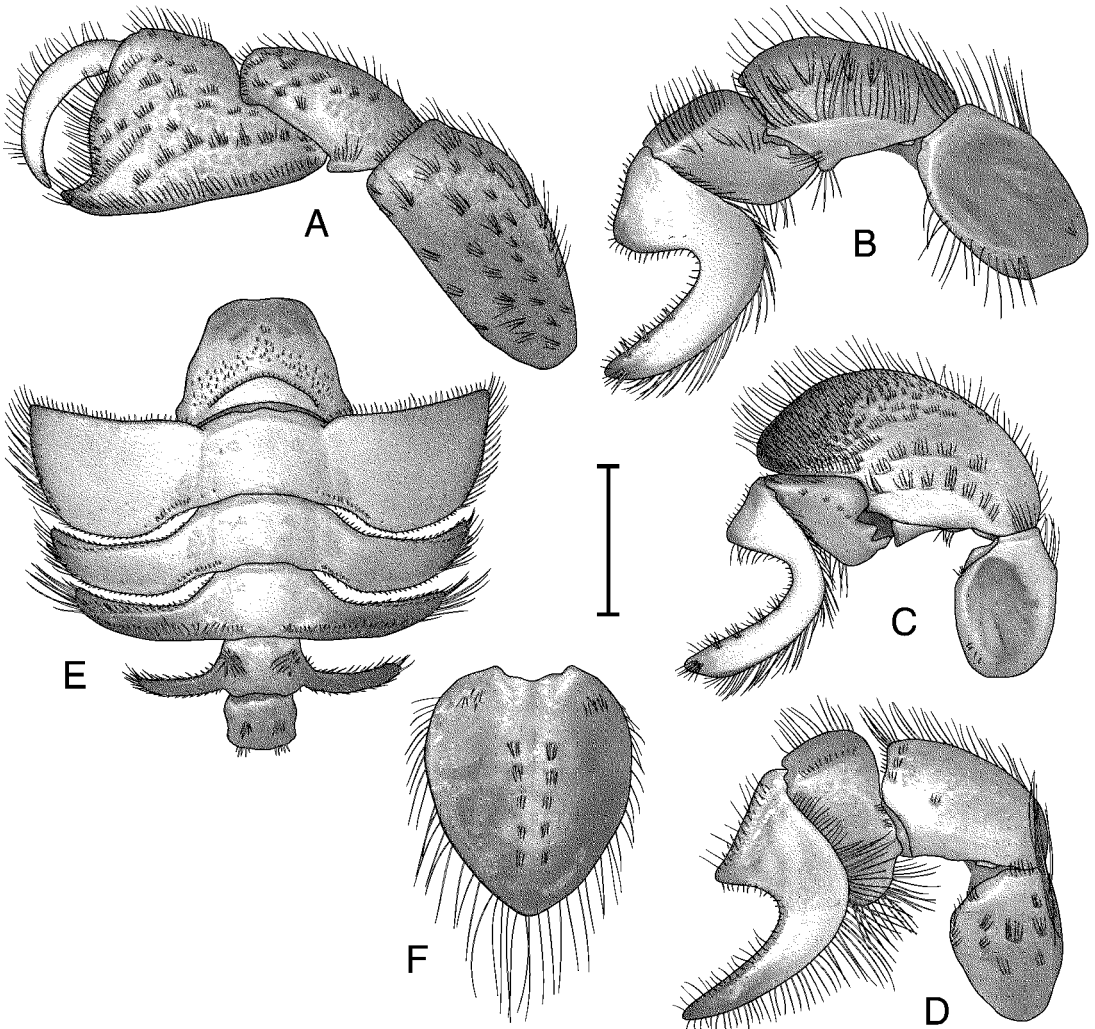


Fig. 27. *Paraleucolepidopa myops* (Stimpson, 1860), n. comb.: A, B, D-F, ♀, 6.8 mm cl, USNM 304313; C, oviger, 8.9 mm cl, MCZ 1386, lectotype. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I-VI, dorsal view. F. Telson ♀, dorsal view. Scale = 1.4 mm (F), 2.2 mm (A, B, D), and 4.4 mm (C, E).

lar, broken rows of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; dorsal margin with long plumose setae; mesial surface smooth with medial transverse row of long plumose setae. Merus with lateral surface almost entirely decalcified, with long plumose setae on dorsodistal and ventral margins; mesial surface nearly smooth with oblique median ridge, long plumose setal patches dorsal to ridge

and in row ventrally. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 27C) dactylus base to heel slightly concave, heel low, rounded, and only slightly produced, heel to tip with broad, evenly rounded indent, tip subacute, tip to base smoothly convex; lateral surface smooth, with tuft of short simple setae at end of tip, dorsodistal margin with tufts of short setae; ventral margin with long plumose se-



tae, dorsal margin with short simple and plumose setae; mesial surface smooth with plumose setae proximally at junction with propodus and in row across base of heel. Propodus not inflated dorsoventrally; lateral surface smooth, with simple setae in oblique row subdorsally, and long plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened; mesial surface with scattered long setae on and near distoventral margin. Carpus strongly produced and inflated dorsodistally, reaching distal margin of propodus, broadly rounded; dorsolateral margin unarmed; lateral surface with mat of short setae on dorsodistal third of segment and two broken transverse rows of short plumose setae medially; dorsal margin with long plumose setae; mesial surface smooth, dorsomedial third decalcified, with long plumose setae on margins and in median transverse row ventral to decalcified area. Merus smooth, lateral surface almost entirely decalcified; dorsal and ventral margins unarmed, long plumose setae dorsodistally; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female pereopod III with large mesioproximal gonopore (not opposing other gonopore); male unknown.

Pereopod IV (fig. 27D) dactylus with base to heel straight, heel acute and produced, heel to tip broadly rounded and concave, tip acute, tip to base convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short and long simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge across heel with row of short plumose setae. Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, ventral margin with long plumose setae; dorsal expansion with row of long plumose setae dorsally and short simple setae ventrally; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; lateral and mesial surfaces smooth; dorsomedial two-thirds of mesial surface decalcified; dorsal margin with few scattered, short setae at dorsodistal angle; dorsal margin with long plumose setae, ventral margin with few short, simple setae. Merus lateral surface with short transverse rows of setae, dorsodistal margin with

long plumose setae; mesial surface with large decalcified window proximoventrally. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 27E) somite I wider than long, widest posteriorly; dorsal surface with anterior margin medially slightly concave; posterior margin concave, with elevated submarginal curved row of short setae and broad field of short simple setae anterior to submarginal row; with small faint transverse decalcified windows laterad of segment median. Somite II anterior margin irregularly convex, posterior margin irregularly concave; pleura expanded and directed anterolaterally, angled anterolaterally, rounded posterolaterally, row of short simple setae at postero-mesial margin, extending onto posterolateral region of pleura; anterior and lateral margins with long plumose setae, posterior margin with short setae. Somite III similar to somite II, narrower and shorter; pleura thinner and shorter than on somite II, directed posterolaterally proximally and curving forward distally, with setae as in somite II; anterolateral angle subacute; dorsal surface slightly obliquely flattened anterolaterally, with submarginal row of short simple setae. Somite IV similar to somite III; pleura thinner and shorter than on somite III, directed anterolaterally; dorsal surface slightly obliquely flattened anterolaterally, with submarginal row of short simple setae; lateral margins with long plumose setae, short simple setae on anterior margin and in posterior submarginal row. Somite V wider than somite IV; anterolateral margins with submarginal tufts of long plumose setae; pleura indistinct from somite, shorter than in somite IV, thin, flattened, directed anterolaterally, and covered with short plumose setae. Somite VI subequal to somite V; dorsal surface with two short transverse rows of setae laterad of midline anteriorly, posterior margin with medially separated row of plumose setae; pleura absent.

Female with long uniramous pleopods on somites II–V; male unknown.

Telson of male unknown. Telson of female (fig. 27F) heart-shaped, lateral margins evenly convex and tapering to rounded distal tip; dorsal surface evenly calcified; median longitudinal groove with two parallel transverse

rows of short simple setae in medial two-thirds; margins with long simple setae.

DISTRIBUTION: Baja California Norte (Gulf side) south to Panama, in 15–73.2 m depth.

MAXIMUM SIZE: Males: unknown; females: 9.2 mm cl.

TYPE SPECIMENS: MCZ 1386 (lectotype of *L. myops*, selected by Efford, 1971), BMNH 61.44 (2 paralectotypes of *L. myops*), MNHN-Hi 83 (paralectotype of *L. myops*), ANSP 947 (paralectotype of *L. myops*), ZMUC 169 (holotype of *L. panamaensis*), ZMUC 2636 (paratype of *L. panamaensis*).

TYPE LOCALITIES: *P. myops*: Cabo San Lucas, Baja California Sur, Mexico; *P. panamaensis*: Taboganilla, Panama.

REMARKS: Type specimens of *P. myops* would be present in USNM had most of the Stimpson's Crustacea not been destroyed in the Great Chicago Fire of 1871. The paralectotype now in MNHN was sent from USNM by Stimpson in June 1858, while the BMNH specimens were also sent by Stimpson, but in January 1861 (Deiss and Manning, 1981). The Harvard specimen also came from USNM in 1861 (Deiss and Manning, 1981). It is unknown how the ANSP specimen came to be in that institution. USNM now has no types of this species in its collections.

The lack of an illustration accompanying the original description of this species (Stimpson, 1860) probably contributed to the long-standing confusion between it and *L. californica*. Stimpson (1860) did, however, clearly mention the anterior margin of the carapace as "armed with small teeth," which is not true of *L. californica* and should have served to distinguish the two taxa in spite of the brevity of Stimpson's (1860) description.

As noted by Efford (1971), Schmitt's (1921) citation of the measurements of a "type" specimen for *L. myops* was only a repetition of Stimpson's (1860) measurement, not a lectotype designation.

Direct comparison of the type specimens of *L. panamaensis* and numerous specimens of *P. myops* showed no important differences and the two taxa are synonymous. The differences cited between the two species by Efford (1971), such as number of anterior marginal teeth, broken anterolateral setal line, and number of antennal flagella, are variable

in the species. *Lepidopa myops* is therefore the type of *Paraleucolepidopa* as the senior synonym of *L. panamaensis*. Calado (1995) did not recognize the synonymy of *P. myops* and *P. panamaensis*, undoubtedly because her only specimens of *P. "myops"* (BMNH 1937.6.1.4–5) were actually *L. californica*.

There is little doubt that at least some of the larvae cited by Knight (1970) under "*Lepidopa* spp." represent this taxon. The identity of the other larval species is unclear (see appendix 1).

This species is the Pacific analogue of *P. distincta*.

*Paraleucolepidopa distincta* (Gomes Corrêa, 1968), new combination

Figures 28, 29

*Lepidopa* "que se encontra em estudo" Castro, 1967: 2.

*Lepidopa distincta* Gomes Corrêa, 1968: 77–84, figs. 1–16\*. – Efford, 1971: 70–72 (part), figs. 3k, 5c, 7f\*. – Coêlho and Ramos, 1972: 176. – Calado, 1987: 121–129, pls. 13–15. – Coêlho and Calado, 1987: table 1. – Manning, 1988: 626–627 (list). – Calado et al., 1990: 749, fig. 3c. – Calado, 1995: 159–162, pl. 39, fig. f, pl. 40, fig. f, pl. 41, fig. e, pl. 50, figs. a–e, pl. 51, figs. a–f. – Calado, 1998: 408.

?not *Lepidopa distincta*: Efford, 1971: 70–72 (part), fig. 7n\* (= *Paraleucolepidopa*, sp. nov.?).

MATERIAL EXAMINED: **Dominican Republic**: Outside Yuncu Reef, off Point Trujillo, Aug. 18, 1932, coll. J. C. Armstrong: 1 ♀, 4.9 mm cl (AMNH 10362), 1 ♀, 8.3 mm cl (USNM 122635 ex AMNH 10362), 1 ♂, 4.3 mm cl (BMNH 1968.55 ex AMNH 10362), 1 ♂, 6.3 mm cl (RMNH 23986 ex AMNH 10362).

**Brazil**: Alagoas, 09°53'20"S, 35°51'20"W, 14 m, Sept. 6, 1965, coll. P. A. Coêlho: 1 ♂, 5.6 mm cl, 2 ♀, 7.5–7.7 mm cl, syntypes (MNRJ 6473); Alagoas, 10°05'20"S, 36°02'15"W, 10–20 m, Sept. 4, 1965, coll. P. A. Coêlho: 1 ♀, 6.4 mm, syntype (MNRJ 1552).

DIAGNOSIS: Rostrum produced anteriorly as far as anterolateral spines. CG4 with wide gap at median. Pereopod III carpal projection much longer than broad. Pereopod IV dactylus heel approximately half as long as blade.

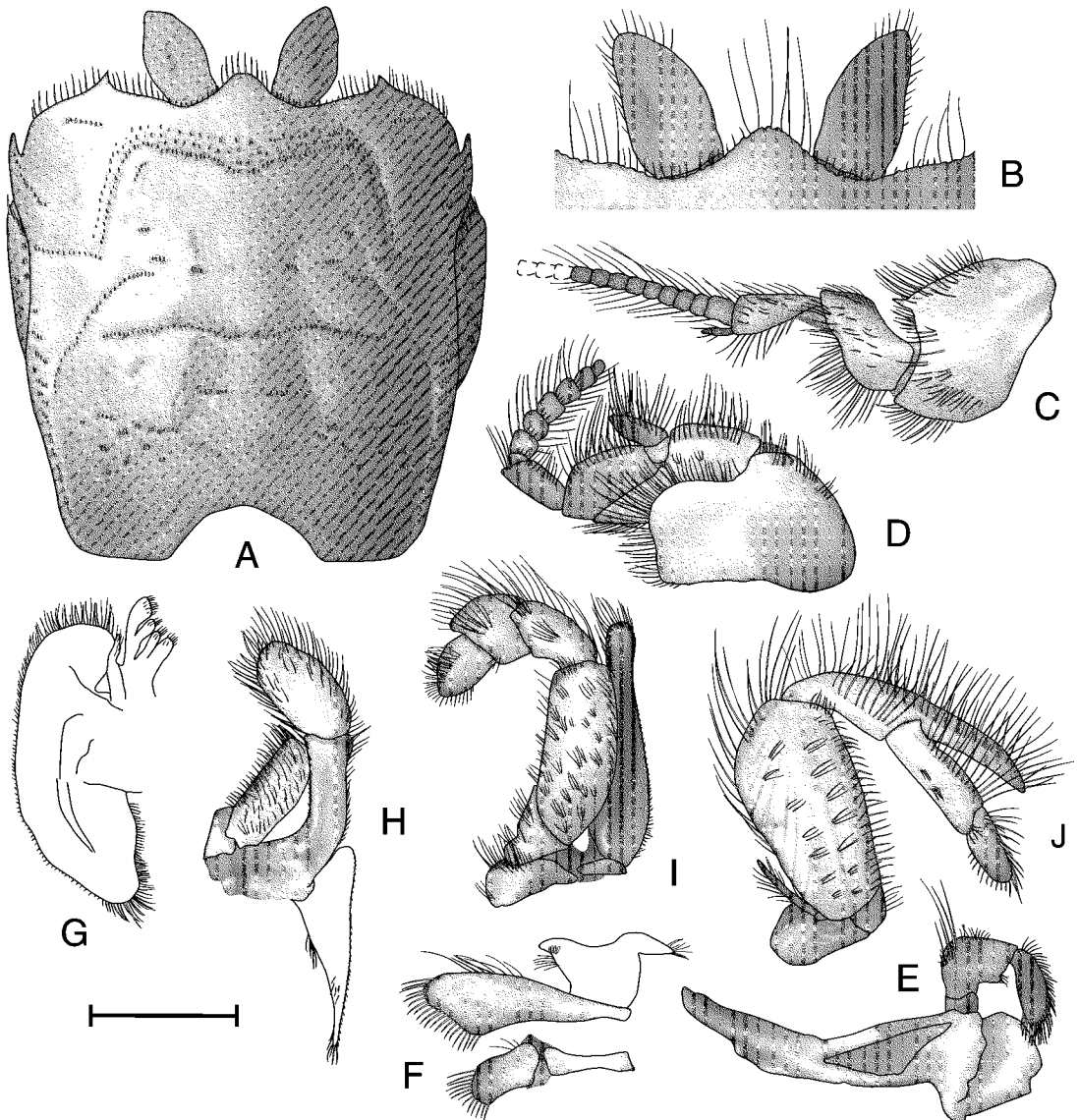


Fig. 28. *Paraleucolepidopa distincta* (Gomes Corrêa, 1968), n. comb.: A, B, J, ♀, 6.4 mm cl, MNRJ 1552, syntype; B–I, ♀, 8.3 mm cl, USNM 122635. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left mandible, lateral view. E. Left maxillule, lateral view. F. Right maxilla, lateral view. G. Left maxilliped I, lateral view. H. Left maxilliped II, lateral view. I. Right maxilliped III, lateral view. J. Right maxilliped III, lateral view. Scale = 1.4 mm (B, F), 1.6 mm (E, I), 1.7 mm (J), 2.2 mm (C, D, G, H), and 5.0 mm (A).

**DESCRIPTION:** Carapace (fig. 28A) wider than long. Anterior margin slightly convex on either side of ocular sinus, finely toothed, with basally broad, distally acute medial spine. Rostrum as rounded, finely crenulate

projection reaching to proximal margin of distal peduncular segments; unarmed. Ocular sinus smoothly concave, finely toothed; unarmed. Frontal region smooth; setal field as broad, sparsely setose, medially concave

band paralleling CG1; extending posterolaterally almost to CG4. CG1 parallel to anterior margin of carapace, sinuous, slightly crenulate, medially concave, medial and lateral elements united. Mesogastric region smooth; CG2 absent; CG3 present as short transverse lateral elements; CG4 with two transverse, long lateral elements and two to four short, posteriorly displaced medial elements. Hepatic region smooth with oblique lateral, setose groove and short, subacute spine at midpoint of lateral margin. Epibranchial region generally triangular, smooth; posterolateral margin with four short rows of setae. Metagastric region smooth; CG5 absent. CG6 crenulate, with separate laterally oblique, medially straight, long lateral fragments and long sinuous median element united with CG7. CG7 straight relative to anterior margin of carapace and united with median fragment of CG6. Cardiac region smooth; CG8 present as two long medial elements. CGs 9–11 absent. Branchial region with few short, transverse rows of setae. Posterior margin deeply and evenly concave, with submarginal groove reaching three-fourths way up posterior concavity, but lined with setae only to posterolateral corners of carapace. Branchiostegite without anterior submarginal spine; anterior region with anterodorsal transverse groove and granular surface, with many long plumose setae; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 28B) subquadrate, covered by carapace; median peduncular segments reduced to small rounded calcified areas anterior to ocular plate. Distal peduncular segments irregularly ovate, angled distolaterally, flattened with proximally convex and distally concave lateral margins and proximally concave, distally convex mesial margins, margins smooth; long longitudinal faintly pigmented streak slightly lateral to median line present; mesial margins separated along entire length; distal mesial and lateral margins with long simple setae.

Antennule (fig. 28C) segment III narrow proximally, expanding distally to three times proximal width; with plumose setae on dorsal and ventral margins and scattered on lateral surface; dorsal exopodal flagellum with

52–63 articles ( $n = 4$ ), long plumose setae on dorsal and ventral margins, short simple setae on distal margins; ventral endopodal flagellum with two articles ( $n = 5$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with long plumose setae on dorsal and ventral margins, short plumose setae scattered on medial third of lateral surface. Segment I longer than wide, armed with acute small spine on dorsodistal margin; dorsodistal one-fifth of lateral surface rugose, with long plumose setae; scattered long plumose setae on distal and ventrolateral surfaces; long plumose setae on dorsal and ventral margins.

Antenna (fig. 28D) with segment V approximately two times longer than wide, with short plumose setae on dorsal and distal margins; flagellum with seven or eight articles ( $n = 6$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV almost cylindrical, overreaching segment III by one-third of its length, with two rows of long plumose setae on dorsal margin. Segment III with long plumose setae on distoventral margin. Segment II widening distally, with long plumose setae in subdorsal row and scattered in medial third of lateral surface; antennal acicula short, triangular, overreaching segment IV proximal margin by one-third of its length, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened and truncated ventrolaterally, with long plumose setae on margins; lateral surface with small acute spine on mediadorsal margin; scattered setae on dorsal fifth of lateral surface; segment with ventromesial antennal gland pore.

Mandible (fig. 28E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 28F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and long plumose setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under, with wide proximal projection; internal lobe reduced, with four thick setae at distolateral margin.

Maxilla (fig. 28G) exopod rounded, with



plumose setae along distal margin. Scaphognathite gently rounded on posterior lobe, with plumose setae.

Maxilliped I (fig. 28H) epipod with plumose setae on margins. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, margins with plumose setae; distal segment spatulate, longer than wide, curved mesially, broadest medially, margins and distal half of surface with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins.

Maxilliped II (fig. 28I) dactylus evenly rounded, longer than wide, with thick simple setae on distal margins and thin simple setae in short transverse row on lateral surface. Propodus slightly produced dorsodistally, two times wider than long, with plumose setae on dorsal margin and long simple setae on dorsodistal and ventrodial margins. Carpus not strongly produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal margin and short simple setae on dorsodistal and mediolateral surfaces. Merus 2.5 times longer than wide, margins parallel but slightly inflated submedially, with simple setae on ventral margin and scattered in short rows on lateral surface, plumose setae on dorsolateral margin. Basis-ischium incompletely fused, with plumose setae on margins and lateral surface. Exopod one-third longer than merus, without flagellum.

Maxilliped III (fig. 28J) dactylus elongate and evenly rounded; long plumose setae on dorsal margin and in subdorsal row on lateral surface. Propodus with longitudinal median row of plumose setae on lateral surface; disventral margin with short simple setae. Carpus strongly produced onto propodus, overreaching distal margin of propodus and extending one-third onto dactylus; lateral surface with medial transverse row of long plumose setae; long plumose setae on margins. Merus unarmed, broadly inflated distolaterally, with long plumose setae on dorsal margin and short simple setae in short rows on lateral surface and ventral margin. Basis-ischium incompletely fused, without crista dentata. Exopod two-segmented; proximal

segment small; distal segment styliiform, tapering, approximately one-third length of merus, with plumose setae on margins; without flagellum.

Pereopod I (fig. 29A) dactylus curved and tapering; lateral surface smooth, with proximal submarginal setose groove, mesial surface smooth; dorsal margin with low rounded teeth on proximal three-fourths, smooth distally, long plumose setae along length; ventral margin with short simple setae. Propodal lateral surface with numerous short, transverse rows of setose rugae; dorsal margin with few small low ridges and distal spinules; ventral margin distally produced into subacute spine; cutting edge lacking teeth, lined with long plumose setae; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle rounded, with several small rounded spines and numerous setose rugae, dorsal margin smooth, with long plumose setae; lateral surface with few transverse, setose ridges; mesial surface smooth, with medial transverse row of long plumose setae. Merus unarmed; lateral surface with scattered transverse rows of short plumose setae, dorsal margin with long plumose setae, ventral margin with short plumose setae; mesial surface with few scattered setae; proximal half of mesial surface with decalcified window. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 29B) dactylus smooth; base to heel straight, heel produced and rounded with lateral submarginal row of long plumose setae, heel to tip with broad rounded indent, tip subacute, tip to base broadly convex; lateral surface smooth; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae, with patch of long plumose setae at base reaching across median of heel. Propodus with dorsal surface smooth, ventral margin inflated and rounded; distal and ventral margin with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with long plumose setae on dorsal and ventral margins; short transverse row of long plumose setae on surface; mesial surface with subdistal row of long plumose setae. Carpus produced dorsodistally, narrowing to rounded tip, not overreaching propodus; lat-

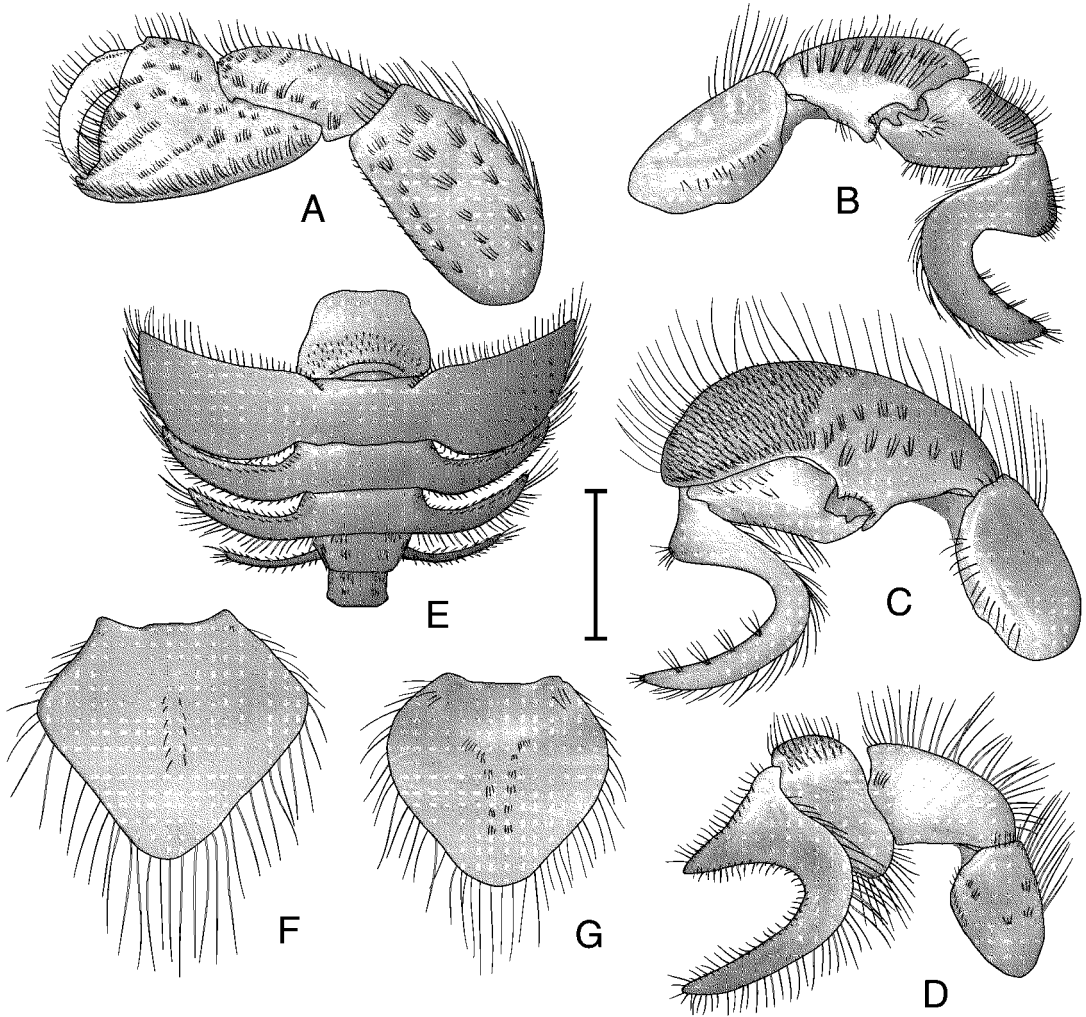


Fig. 29. *Paraleucolepidopa distincta* (Gomes Corrêa, 1968), n. comb.: A-D, G, ♀, 6.4 mm cl, MNRJ 1552, syntype; E, ♀, 8.3 mm cl, USNM 122635; F, ♂, 5.6 mm cl, MNRJ 6473, syntype. **A.** Left pereopod I, lateral view. **B.** Right pereopod II, lateral view. **C.** Left pereopod III, lateral view. **D.** Left pereopod IV, lateral view. **E.** Abdominal somites I-VI, dorsal view. **F.** Telson of ♂, dorsal view. **G.** Telson of ♀, dorsal view. Scale = 0.8 mm (F), 1.1 mm (G), 2.2 mm (A-D), and 3.3 mm (E).

eral surface nearly smooth, with two irregular, broken rows of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; dorsal margin with long plumose setae; mesial surface smooth with medial oblique and distal rows of long plumose setae. Merus with lateral surface almost entirely decalcified, with long plumose setae on dorsodistal margin and short plumose setae on ventral margin; mesial surface nearly smooth, with faint oblique median ridge,

long plumose setae in row ventrally. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 29C) dactylus base to heel slightly concave, heel low, rounded, and only slightly produced, heel to tip with broad, evenly rounded indent, tip subacute, tip to base smoothly convex; lateral surface smooth, with tuft of short simple setae at base of heel and end of tip, dorsodistal margin with tufts of short setae; ventral margin

with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth with plumose setae proximally at junction with propodus and in row across base of heel. Propodus not inflated dorsoventrally; lateral surface smooth, with simple setae in oblique row subdorsally, and long plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened; mesial surface with scattered long setae on and near distoventral margin. Carpus strongly produced and inflated dorsodistally, overreaching distal margin of propodus, broadly rounded; dorsolateral margin unarmed; lateral surface with mat of short setae on dorsodistal half of segment and two broken transverse rows of short plumose setae medially; dorsal margin with long plumose setae; mesial surface smooth, dorsomedial third decalcified, with long plumose setae on margins. Merus smooth, lateral surface almost entirely decalcified; dorsal and ventral margins unarmed, long plumose setae dorsodistally and ventrally; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female pereopod III with large mesioproximal gonopore (not opposing other gonopore); male with similar but smaller pore.

Pereopod IV (fig. 29D) dactylus with base to heel slightly concave, heel acute and produced, heel to tip broadly rounded and concave, tip acute, tip to base convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short and long simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge across heel, with row of short plumose setae. Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, ventral margin with long plumose setae; dorsal expansion with row of long plumose setae dorsally and mat of short simple setae ventrally; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; lateral and mesial surfaces smooth; dorsomedial two-thirds of mesial surface decalcified; dorsal margin with long plumose setae, ventral margin with few short simple setae. Merus lateral surface with few short transverse rows of setae, dorsodistal margin with long plumose setae; mesial surface with large decal-

cified window proximoventrally. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 29E) somite I wider than long, widest posteriorly; dorsal surface with anterior margin medially slightly concave; posterior margin concave, with elevated submarginal curved row of short setae and broad field of short simple setae anterior to submarginal row; small faint transverse decalcified windows laterad of segment median. Somite II anterior margin irregularly convex, posterior margin irregularly concave; pleura expanded and directed anterolaterally, angled anterolaterally, rounded posterolaterally; anterior and lateral margins with long plumose setae, posterior margin with short setae. Somite III similar to somite II, narrower and shorter; pleura thinner and shorter than on somite II, directed anterolaterally, with setae as in somite II; anterolateral angle subacute; dorsal surface slightly obliquely flattened anterolaterally, with submarginal row of short simple setae. Somite IV similar to somite III, with short rows of simple setae on either side of medial posterior margin; pleura thinner and shorter than on somite III, directed anterolaterally; dorsal surface slightly obliquely flattened anterolaterally, with submarginal row of short simple setae; lateral margins with long plumose setae, short simple setae on anterior margin and in posterior submarginal row. Somite V wider than somite IV; anterolateral margins with submarginal tufts of long plumose setae, two short rows of simple setae medially on either side of median line and on posterior margin; pleura distinct from somite, shorter than in somite IV, thin, flattened, directed anterolaterally and covered with short plumose setae. Somite VI narrower than somite V; dorsal surface with two short transverse rows of setae laterad of midline anteriorly; pleura absent.

Female with long uniramous pleopods on somites II–V; male with tiny pleopods.

Telson of male (fig. 29F) diamond-shaped, weakly calcified; mediolateral margins produced and rounded, distal tip rounded; anterolateral corners with few short simple setae, lateral margins with long simple setae; median longitudinal groove with short rows of few short, simple setae in medial two-thirds. Telson of female (fig. 29G) similar to

male but with rounded mediolateral margins, dorsal surface evenly and weakly calcified; median longitudinal groove with two parallel transverse rows of short simple setae in medial two-thirds, curving laterally in proximal one-fourth of groove; anterolateral angles with few short, simple setae, margins with long simple setae.

**DISTRIBUTION:** Known only from the Dominican Republic, Pernambuco and Alagoas, Brazil (Calado, 1987), in 1.4–48.0 m depth (Calado, 1987).

**MAXIMUM SIZE:** Males: 6.3 mm cl; females: 7.7 mm cl.

**TYPE SPECIMENS:** MNRJ 6473 (3 syntypes), MNRJ 1552 (1 syntype), repository of one additional syntype unknown.

**TYPE LOCALITIES:** Alagoas, 09°53'20"S, 35°51'20"W, Brazil, 14 m; Alagoas, 10°05'20"S, 36°02'15"W, Brazil, 10–20 m; Ilha do Pai, Rio de Janeiro, Brazil.

**REMARKS:** Calado (1995, 1996, 1997b) did not recognize that this taxon was congeneric with her type species of *Paraleucolepidopa*, although she examined a large number of specimens of *P. distincta* from Brazil (Calado, 1987, 1995). The drawings of Calado (1987: figs. 13, 14c, d) contain errors in the placement of the carapace grooves, which are different in the two figures of the carapace (figs. 13, 14c), and in the incomplete suture between segments III and IV of the antenna (fig. 14d).

One specimen (AMNH 10363) cited by Efford (1971; AMNH 10361) as being this species is actually quite different in numerous aspects of the CGs, and it may represent an undescribed species of *Paraleucolepidopa*. Unfortunately, this specimen is badly damaged on the front of the carapace, and a description of this possible new species must wait until more material is available.

This species is the Atlantic analogue of *P. myops*.

#### *LEPIDOPA* STIMPSON, 1858

*Albunea*: H. Milne Edwards, 1837b: 202–203 (part). – Chenu and Desmarest, 1877: 32 (part) (not *Albunea* Weber, 1795).

*Albunaea* [sic]: Dana, 1852: 404 (part) (not *Albunea* Weber, 1795).

*Lepidopa* Stimpson, 1858: 230. – Ortmann, 1896:

225–226 (part). – Holmes, 1900: 105. – Ortmann, 1901: 1153, 1275. – Benedict, 1903: 891. – Porter, 1915b: 17. – Schmitt, 1921: 172 (part). – Balss, 1927: 1011. – Gordon, 1938: 188–190 (part). – Garcia Mendes, 1945: 119 (part). – Snodgrass, 1952: 31. – Haig, 1955: 11. – Balss, 1957: 1599. – Holthuis, 1961: 27–28. – Chace and Haig, 1962: 344. – Holthuis, 1962: 125–128. – Rodrigues da Costa, 1962: 7–9. – ICZN, 1964: 28–29. – Efford, 1971: 60–61 (part). – Epelde-Aguirre and Lopez, 1975: 165. – Rodriguez, 1980: 235. – Wicksten, 1980: 209 (list). – Kaestner, 1980: 335. – Boschi, 1981: 714, 739. – Williams, 1984: 250. – Calado, 1987: 119–121 (part). – Coêlho and Calado, 1987: 41 (part). – Melville and Smith, 1987: 114. – Manning, 1988: 626–627 (part). – Seridji, 1988: 1298–1299. – Rios et al., 1990: 27. – Calado, 1995: 125–126 (part). – Boyko and Harvey, 1999: 380, 382.

*Lepidops*: Miers, 1878: 331–332 (part). – Kingsley, 1880: 410. – Ortmann, 1892: 535. – Moreira, 1901: 30. – Holthuis, 1962: 127–128. – ICZN, 1964: 28–29 (unjustified emendation).

*Ledopipa* [sic]: Calado, 1987: 85.

not *Lepidopa* Ortmann, 1896: 225–226 (part). – Schmitt, 1921: 172 (part). – Gordon, 1938: 188–190 (part). – Garcia Mendes, 1945: 119 (part). – Efford, 1971: 60–61 (part). – Calado, 1987: 119–121 (part). – Coêlho and Calado, 1987: 41 (part). – Manning, 1988: 626–627 (part). – Calado, 1995: 125–126 (part)) (= *Paraleucolepidopa* Calado, 1996).

not *Lepidops* Stimpson, 1860: 241. – Miers, 1878: 331–332 (part) (= *Paraleucolepidopa* Calado, 1996).

not *Lepidops*: Miers, 1878: 331–332 (part) (= *Thia* Leach, 1815).

not *Lepidopa*: Gordon, 1938: 187–190 (part) (= *Thia* Leach, 1815).

not “?Lepidopa”: Kamita, 1957: 94–96 (= *Blepharipoda* Randall, 1840).

**DIAGNOSIS:** Carapace unarmed or weakly spinose. Rostrum narrow, rounded. Distal peduncular segment flattened. Antennule dorsal flagellum with 78–250 articles, ventral flagellum with two or three articles. Antenna flagellum with six to nine articles. Maxilliped II with flagellum. Maxilliped III exopod without flagellum. Abdominal somite V pleura weakly calcified. Males with small pleopods.

**DISTRIBUTION:** Central California, USA, south to Chile; Virginia, USA, south to Brazil.

**TYPE SPECIES:** *Lepidopa venusta* Stimpson,



1859, by designation of ICZN Opinion 693 (ICZN, 1964).

INCLUDED SPECIES: *L. venusta* Stimpson, 1859; *L. chilensis* Lenz, 1902; *L. deamae* Benedict, 1903; *L. mearnsi* Benedict, 1903; *L. richmondi* Benedict, 1903; *L. wollebaeki* Sivertsen, 1934; *L. benedicti* Schmitt, 1935; *L. californica* Efford, 1971; *L. esposa* Efford, 1971; *L. haigae* Efford, 1971; *L. mexicana* Efford, 1971; *L. dexterae* Abele and Efford, 1972; *L. luciae*, n. sp.

REMARKS: This genus is no. 1575 on the "Official list of generic names in zoology," and is feminine (ICZN, 1964). The original type species of this genus was designated as *Hippa scutellata* Fabricius by Stimpson (1858). However, as shown by Holthuis (1962), that species is actually a third brachyuran, and Stimpson's concept of the species applied to the taxon now known as *Lepidopa richmondi* Benedict. Rather than relegate *Lepidopa* to synonymy with *Thia*, and introduce a new name for the genus previously known as *Lepidopa*, Holthuis (1962) recommended the designation of a new type species for *Lepidopa*. The ICZN concurred and selected *L. venusta* as the type species in 1964 (ICZN, 1964). This was, in retrospect, perhaps not the best choice for the type species, as it belongs to the "venusta-group" of *Lepidopa*, rather than to the "benedicti-group" to which *L. richmondi* belongs.

The names *Lepidops* Stimpson (no. 1674) and *Lepidops* Miers (no. 1675) are both placed on the "Official index of rejected and invalid generic names in zoology," as both are unjustified emendations of *Lepidopa* (ICZN, 1964).

Efford's (1971: fig. 12) "evolutionary tree" divided the genus into four major "groups" (listed here in Efford's order from most basal to most derived): the "californica-group," the "myops-group," the "benedicti-group," and the "venusta-group." The "myops-group" is now recognized as the genus *Paraleucolepidopa*, and is actually basal to *Lepidopa* sensu stricto. The "californica-group" (with only one species) is not basal, but rather is intermediate between the "venusta-" and "benedicti-" groups.

## KEY TO SPECIES

- 1 Antennal segment I spine present; branchial setae = punctae ("benedicti-group") . . . 2
- Antennal segment I spine absent; branchial setae = setose grooves . . . . . 6
- 2 Anterolateral spines absent . . . . . *L. haigae*
- Anterolateral spines present . . . . . 3
- 3 Ventrorostral spine present . . . . . 4
- Ventrorostral spine absent . . . . . 5
- 4 Posterior submarginal groove entire . . . . .
- Posterior submarginal groove broken in median . . . . . *L. richmondi*
- 5 Pereopod II dactylus indent narrow . . . . .
- Pereopod II dactylus indent broad . . . . . *L. deamae*
- 6 Ventrorostral spine present ("venusta-group") . . . . . 7
- Ventrorostral spine absent . . . . . *L. californica*
- 7 Maxilliped III exopod less than half merus length . . . . . 8
- Maxilliped III exopod more than half merus length . . . . . 10
- 8 CG10 present . . . . . *L. luciae*, n. sp.
- CG10 absent . . . . . 9
- 9 Distal margins of distal peduncular segments tapered . . . . . *L. wollebaeki*
- Distal margins of distal peduncular segments rounded . . . . . *L. mexicana*
- 10 Pereopod II dactylus heel rounded . . . . .
- Pereopod II dactylus heel tapered . . . . . *L. esposa*
- 11 Ocular peduncles subquadrate distally . . . . .
- Ocular peduncles ovate distally . . . . . *L. dexterae*
- 12 CG9 and CG10 present . . . . . *L. venusta*
- CG9 and CG10 absent . . . . . 13
- 13 Posterior submarginal groove extending up sides of medial indentation . . . . . *L. websteri*
- Posterior submarginal groove not extending up sides of medial indentation . . . . .
- Posterior submarginal groove not extending up sides of medial indentation . . . . . *L. chilensis*

### *Lepidopa luciae*, new species

Figures 30, 31

*Lepidopa venusta*: Benedict, 1903: 892, fig. 2\*. – Schmitt, 1935: 210, fig. 70\*. – Gordon, 1938: 188\*. – Efford, 1971: 87–89 (part), figs. 3p, 4l, t, 5c, k, 6h, 7b\*. – Manning, 1988: 626–627, 630–631, fig. 4\* (not *Lepidopa venusta* Stimpson, 1859).

MATERIAL EXAMINED: **Saint Lucia**: Saint Lucia, "Peru" [= West Indies], coll. Stolz-

man: 4 ♂, 5.5–8.8 mm cl, 1 ♀, 9.8 mm cl, paratypes (BMNH 1890.10.7.152–156).

**Trinidad and Tobago:** Nariva Swamp, beach side, Cocal, Nariva Co., Trinidad, July 13, 1979, coll. L. N. Sorkin: 1 ♀, 11.4 mm cl, holotype (AMNH 17533); Maracas Bay, Trinidad, Dec. 25, 1970, coll. J. M. Stohley: 1 ♂, 6.6 mm cl, 1 unsexable, unmeasurable specimen, paratypes (USNM 141353); Mayaro Beach, Trinidad, Aug. 1972, coll. V. Quesnel: 1 ♀, 12.1 mm cl, paratype (USNM 143381); Trinidad, coll. R. A. White: 1 ♂, 8.0 mm cl, paratype (BMNH 1950.12.28.6).

**Costa Rica:** Port Limon, coll. L. C. Gazzo: 1 ♀, 10.9 mm cl, paratype (ZMH K-5146).

**Colombia:** Sabanilla, "New Grenada" [= Colombia], March 16–22, 1884, coll. R/V "Albatross": 2 ♀, 7.7–11.6 mm cl, 1 oviger, 10.0 mm cl, paratypes (USNM 7573).

**DIAGNOSIS:** Carapace wider than long, with lightly setose grooves. Anterior margin with two large spines lateral to ocular sinus. CG5 absent; CG8 present as punctae; CG10 present as punctae; posterior submarginal groove reaching to posterior margin of posterior concavity. Rostrum present, rounded and armed with ventral acute spine. Distal peduncular segments dorsoventrally flattened, ovate, distal margin smooth. Cornea absent. Antennal segment I unarmed. Dactylus of pereopod II with heel produced and rounded. Dactylus of pereopod III with heel thin, projecting, acute. Dactylus of pereopod IV with produced acute heel and deep indent. Telson of male spatulate, proximal two-thirds laterally convex, distal third laterally concave with lateral expansions rounded, distal tip rounded; medioproximal third heavily calcified, lateral and distal regions decalcified.

**DESCRIPTION:** Carapace (fig. 30A) wider than long. Anterior margin convex on either side of ocular sinus, smooth. Rostrum as rounded projection reaching beyond median peduncular segments and with submarginal, terminal acute spine. Ocular sinus smoothly concave; unarmed. Frontal region smooth; setal field reduced to narrow band anterior and paralleling CG1, concave medially. CG1 parallel to anterior margin of carapace, sinuous, slightly crenulate, medially concave, medial and lateral elements united. Mesogastric region smooth; CG2 absent; CG3 absent;

CG4 with several (three to seven) anteriorly and posteriorly displaced very short elements and two long, oblique lateral elements connected to posterior margins of CG1 lateral elements. Hepatic region smooth with oblique lateral setose groove and very short, acute spine at median of lateral margin. Epibranchial region roughly triangular, smooth; posterolateral margin with two short rows of setae. Metagastric region smooth; CG5 absent. CG6 crenulate, with separate oblique long lateral fragments and short, concave, median element united with CG7. CG7 nearly straight relative to anterior margin of carapace and united with median fragment of CG6. Cardiac region smooth; CG8 present as eight minute setose punctae. CG9 absent. CG10 present as few minute setose punctae in short oblique rows. CG11 absent. Branchial region with few setose punctae but without short, transverse rows of setae. Posterior margin deeply and smoothly concave medially and more or less straight laterally, with submarginal groove reaching to posterior margin of posterior concavity. Branchiostegite without anterior submarginal spine; anterior region with anterodorsal transverse groove and granular surface; with many long plumose setae; posterior region membranous with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 30B) minute; median peduncular segments laterally elongate oblong segments, not covered by carapace anterolaterally ventral to ocular plate. Distal peduncular segments irregularly elongate-ovate, angled distolaterally, flattened, with convex lateral and mesial margins, shallow notch present laterally one-third from proximal margin, margins smooth; mesial margins separated along entire length; mesial, lateral and distal margins with long simple setae.

Antennule (fig. 30C) segment III narrow proximally, expanding distally to two times proximal width; with plumose setae on dorsal and ventral margins; dorsal exopodal flagellum with 85–123 articles ( $n = 6$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with two or three articles ( $n = 6$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae

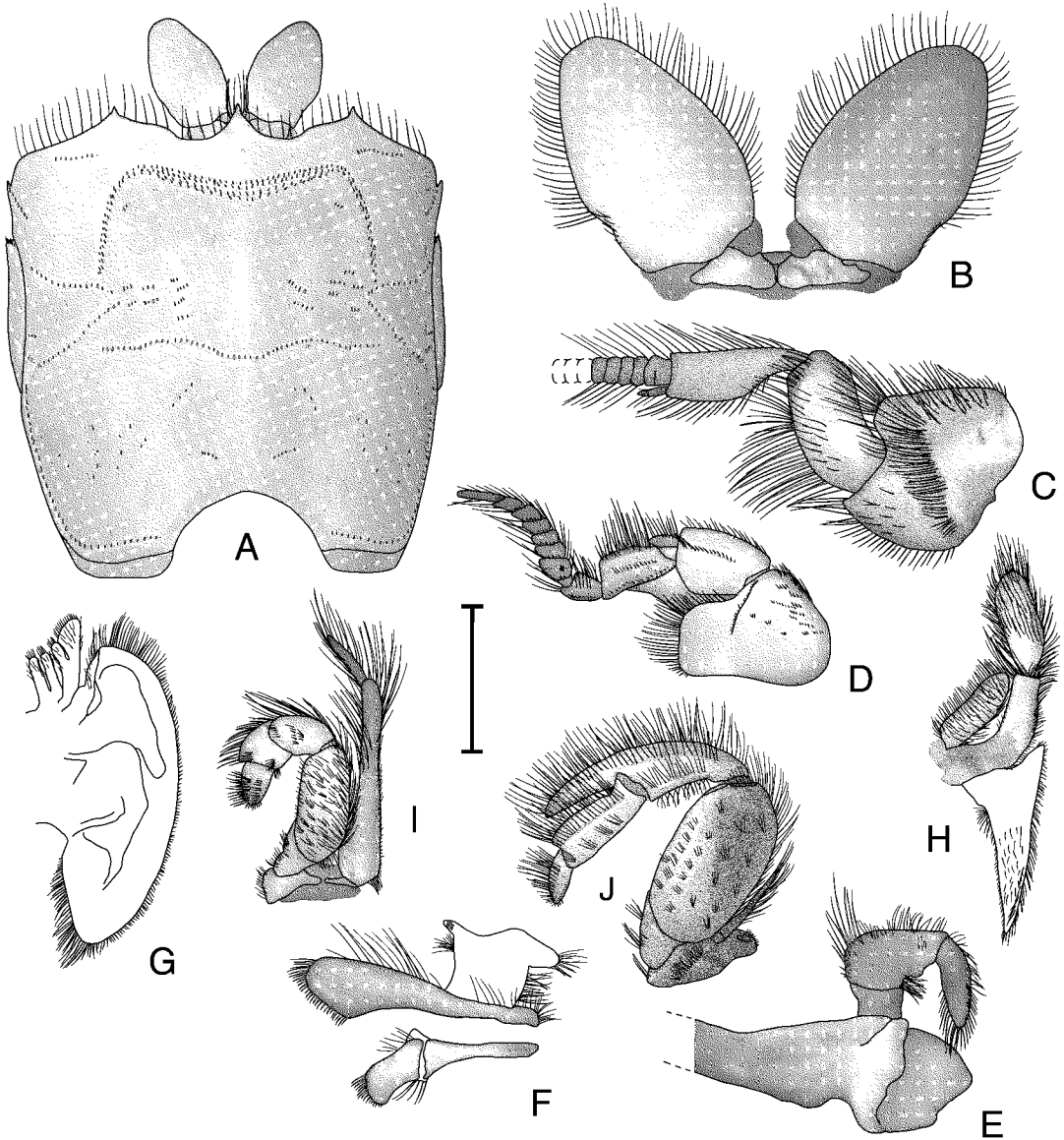


Fig. 30. *Lepidopa luciae*, n. sp.: A, ♀, 11.4 mm cl, AMNH 17533, holotype; B–J, ♀, 12.1 mm cl, USNM 143381, paratype. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Left maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 2.1 mm (E, F), 2.2 mm (B), 3.3 mm (C, I, J), and 4.4 mm (A, D, G, H).

on dorsal and ventral margins and scattered on distoventral third of lateral surface. Segment I width and length subequal, unarmed; lateral surface with submarginal dorsal row of long plumose setae and transverse band of long plumose setae across segment median;

long plumose setae on dorsal and ventral margins.

Antenna (fig. 30D) with segment V approximately 1.5 times longer than wide, with short plumose setae on dorsal margin and in submarginal ventral row, long plumose setae

on distoventral margin; flagellum with eight articles ( $n = 6$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV almost cylindrical, overreaching segment III by two-fifths its length, with long plumose setae on dorsal and distal margins, and two rows of short setae on lateral surface, one medial and one ventrally submarginal. Segment III with long plumose setae on ventral margin and short simple setae on dorsal margin. Segment II widening distally, with one row of short plumose setae on lateral surface; antennal acicle short, triangular, overreaching segment IV proximal margin by one-third of its length, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened and truncated ventrolaterally with long plumose setae on margins, short simple setae scattered on dorsal quarter of lateral surface and along transverse groove separating truncate lobe from proximal portion of segment; lateral margin unarmed; segment with ventromesial antennal gland pore.

Mandible (fig. 30E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 30F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and plumose setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under, with wide proximal projection; internal lobe reduced with four thick setae at distolateral margin.

Maxilla (fig. 30G) exopod rounded with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 30H) epipod with plumose setae on margins and on distolateral surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, with plumose setae; distal segment spatulate, longer than wide, curved mesially, broadest medially, margins and distal three-fourths of lateral surface with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins.

Maxilliped II (fig. 30I) dactylus evenly rounded, longer than wide, with thick simple setae distally and thin simple setae in short row on lateral surface. Propodus slightly produced dorsodistally, one-half wider than long, with plumose setae on dorsal margin and long simple setae on dorsodistal and ventrodistal margins. Carpus not produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal margin and scattered on lateral surface. Merus 1.5 times longer than wide, margins parallel but slightly inflated subproximally, with long simple setae on ventral margin and long plumose setae on dorsal margin and scattered on lateral surface. Basis-ischium incompletely fused, with plumose setae on margins. Exopod two times longer than merus, flagellum with one elongate article.

Maxilliped III (fig. 30J) dactylus elongate and evenly rounded; long plumose setae on margins and in medial transverse row on lateral surface. Propodus with longitudinal median row of plumose setae on lateral surface; submarginal interrupted ventral row of long simple setae; distodorsal tuft of long plumose setae; dorsal and ventral margins with short plumose setae. Carpus strongly produced onto propodus, overreaching four-fifths of propodus length; lateral surface with medial transverse row of long plumose setae; submarginal ventral row of long plumose setae; long plumose setae on margins. Merus unarmed, broadly inflated distolaterally, depressed and decalcified medially, with long plumose setae on dorsal margin and short plumose setae on medioventral margin and scattered on lateral surface. Basis-ischium incompletely fused, without crista dentata. Exopod two-segmented: proximal segment small; distal segment styliiform, tapering, approximately one-half length of merus, with plumose setae on margins; without flagellum.

Pereopod I (fig. 31A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with small rugose area proximally, smooth distally, with long plumose setae; ventral margin with short simple setae. Propodal lateral surface with numerous short, transverse rows of setose rugae; dorsal margin with few small, low ridges; ventral margin distally produced into acute spine; cutting edge lacking teeth, lined with long plu-



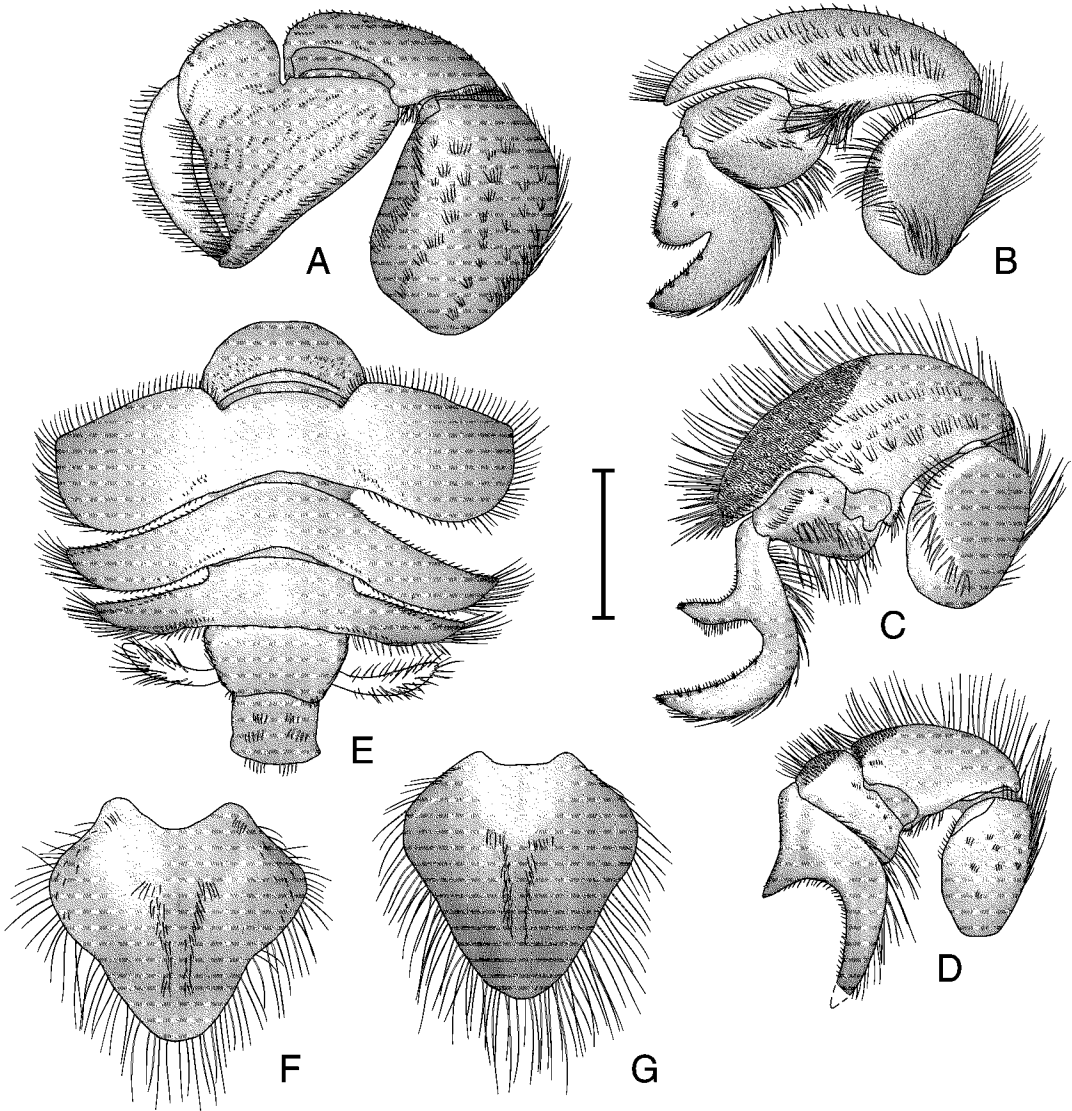


Fig. 31. *Lepidopa luciae*, n. sp.: A–E, G, ♀, 12.1 mm cl, USNM 143381, paratype; F, ♂, 8.8 mm cl, BMNH 1890.10.7.152–156, paratype. **A.** Left pereopod I, lateral view. **B.** Left pereopod II, lateral view. **C.** Left pereopod III, lateral view. **D.** Left pereopod IV, lateral view. **E.** Abdominal somites I–VI, dorsal view. **F.** Telson of ♂, dorsal view. **G.** Telson of ♀, dorsal view. Scale = 1.4 mm (F), 3.0 mm (G), and 4.4 mm (A–E).

mose setae; dorsal margin with short plumose setae, ventral margin with short simple setae; mesial surface with few short transverse rows of setose rugae. Carpus with dorsodistal angle rounded and surface rugose with short simple setae, dorsal margin smooth, with short plumose setae; lateral surface with few scattered, transverse, setose

ridges; mesial surface smooth, with transverse row of long plumose setae halfway from dorsal margin and few scattered short plumose setae on surface. Merus unarmed; lateral surface with scattered transverse rows of short plumose setae, dorsal margin with long plumose setae; mesial side with few short rows of long plumose setae; proximal

third of mesial surface with decalcified window. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 31B) dactylus smooth; with base to heel slightly concave, heel produced and rounded, with apical tuft of short simple setae, heel to tip with narrow, subacute indent, tip subacute with apical tuft of short simple setae, tip to base broadly convex; lateral surface smooth; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae, with patch of long plumose setae at base reaching across median of heel. Propodus with dorsal surface smooth, ventral margin inflated and rounded; distal and ventral margins with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with long plumose setae on ventral margin; short transverse row of long plumose setae on surface; mesial surface with oblique row of long plumose setae, distal and ventral margins with dense row of long plumose setae. Carpus strongly produced dorsodistally, reaching distal margin of propodus; lateral surface nearly smooth, with four irregular, interrupted rows of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; dorsal margin with short plumose setae, distoventral and ventral margins with long plumose setae; mesial surface smooth with medial oblique and subdistal rows of long plumose setae, few scattered short plumose setae on surface. Merus lateral surface almost entirely decalcified, with long plumose setae on dorsal and ventral margins; mesial surface nearly smooth, with oblique median ridge, patches of long plumose setae dorsal to ridge and in row ventrally, with decalcified area on proximal third of area ventral to ridge. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 31C) dactylus base to heel broadly indented, heel acute, thin, and produced, heel to tip with broad, angled indent, tip acute, tip to base smoothly convex; lateral surface smooth, with apical tufts of short simple setae on heel and tip, lateral surface proximal to indent with few setose punctae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at junction with

propodus and in row across base of heel. Propodus not inflated dorsoventrally; lateral surface smooth, with simple setae subdorsally and long plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened; mesial surface with scattered long setae on and near distoventral margin. Carpus strongly produced dorsodistally and inflated, overreaching distal margin of propodus, rounded; dorsolateral margin unarmed; lateral surface with mat of short setae on dorsodistal third of segment and three long transverse rows of setae medially and scattered on proximal lateral surface; dorsal margin with long plumose setae; mesial surface smooth, with long plumose setae on margins and in median oblique row. Merus smooth, lateral surface almost entirely decalcified; dorsal and ventral margins unarmed, with long plumose setae; mesial surface smooth with patch of long plumose setae on proximomesial margin. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female pereopod III with large mesioproximal gonopore (not opposing other gonopore); male with slightly smaller pore.

Pereopod IV (fig. 31D) dactylus with base to heel concave, heel acute, with apical tuft of short simple setae, heel to tip broadly rounded and concave, tip acute with apical tuft of short simple setae, tip to base convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge across heel with row of short plumose setae. Propodus expanded dorsally and ventrally; ventral expansion not reaching ventral margin of dactylus, margins with long plumose setae; dorsal expansion with row of long plumose setae medially and mat of short setae; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; lateral and mesial surfaces smooth; dorsomedial half of lateral and mesial surfaces decalcified, with medial patch of long plumose setae subdistally and long plumose setae on distoventral margin of mesial surface; dorsal margin with small mat of short setae at dorsodistal angle; dorsal margin with long plumose setae, ventral margin with short simple setae. Merus with small median decalcified area on lateral surface, few short

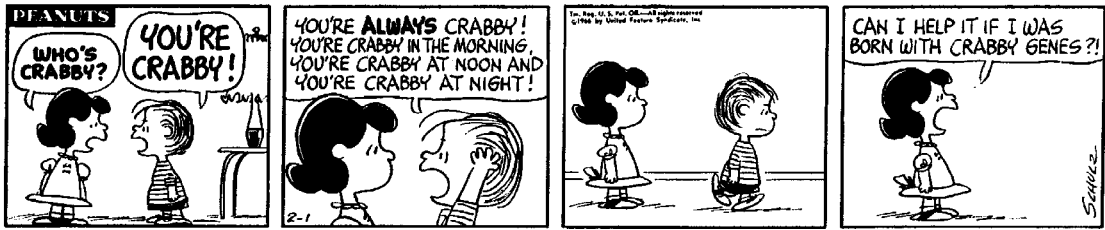


Fig. 31.1. Original 1966 “Peanuts” comic strip by Charles M. Schulz showing reason for the specific name of *Lepidopa luciae*, n. sp. (reproduced by permission).

transverse rows of setae, dorsal and distoventral margins with long plumose setae; mesial surface with small decalcified window proximoventrally. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 31E) with somite I wider than long, widest posteriorly; dorsal surface with anterior margin straight; posterior margin concave, with elevated submarginal curved row of short setae and narrow field of short simple setae anterior to submarginal row; with small faint transverse decalcified window laterad of segment median. Somite II anterior margin convex, posterior margin irregularly concave; pleura expanded and directed posterolaterally, angled anterolaterally, rounded posterolaterally, small patch of short simple setae at posteromesial margin; anterior and lateral margins with long plumose setae, posterior margin with short setae. Somite III similar to somite II, narrower and shorter; pleura thinner and shorter than on somite II, directed posterolaterally, with setae as in somite II; anterolateral angle subacute; dorsal surface obliquely flattened anterolaterally, with posterior row of short simple setae. Somite IV similar to somite III; pleura thinner and shorter than on somite III, directed laterally; dorsal surface slightly obliquely flattened anterolaterally, with ventral row of short simple setae; margins with long plumose setae. Somite V wider than somite IV, narrowing posteriorly; anterolateral margins with plumose setae, two lateral rows of setae on posterior margin; pleura distinct from somite, shorter than in somite IV, thin, flattened, directed anterolaterally, and covered with plumose setae. Somite VI narrower than somite V; dorsal surface with four short transverse rows of setae laterad of midline

anteriorly, posterior margin with long plumose setae; pleura absent.

Female with long uniramous pleopods on somites II–V; male with small pleopods.

Telson of male (fig. 31F) spatulate, proximal two-thirds laterally convex, distal third laterally concave with lateral expansions rounded, distal tip rounded; medioproximal third heavily calcified, lateral and distal regions decalcified; median longitudinal groove running along calcified region; two parallel distally converging rows of short simple setae in medial third; margins with long simple setae. Telson of female (fig. 31G) similar to male, with less produced lateral expansions and more gently concave distolateral third.

**DISTRIBUTION:** Known from Saint Lucia, West Indies, south to Colombia; depth range unknown.

**MAXIMUM SIZE:** Males: 8.8 mm cl; females: 12.1 mm cl.

**TYPE SPECIMENS:** AMNH 17533 (holotype), BMNH 1890.10.7.152–156 (5 paratypes), BMNH 1950.12.28.6 (paratype), USNM 7573 (3 paratypes), USNM 141353 (2 paratypes), USNM 143381 (paratype), ZMH K-5146 (paratype).

**TYPE LOCALITY:** Nariva Swamp, Cocal, Nariva Co., Trinidad, Trinidad and Tobago.

**ETYMOLOGY:** This species is named in honor of Charles M. Schulz (1922–2000), creator of the beloved “Peanuts” comic strip that ran nearly 50 years, from October 2, 1950 until the very date of his death. The specific name “*luciae*” is given after the “Peanuts” character Lucy VanPelt, as suggested by Jean Schulz, in recognition of Lucy’s supremely “crabby” attitude (fig. 31.1).

**REMARKS:** Schmitt’s (1935) citation and

figure of "*Lepidopa venusta*" was based on the specimens discussed by Benedict (1903), which all belong to this new species. The erroneous "Peruvian" locality cited above was discussed in more detail by Holthuis (1961), who correctly identified it as a Caribbean locality.

*Lepidopa luciae* appears superficially similar to *L. venusta*, and is the sister species to all other members of the "venusta-group." It can be separated from *L. venusta* by the rounded dactylus heel of pereopod II, the shorter dactylus heel of pereopod III, and the sinuous lateral margin of the ocular sinus. *Lepidopa venusta* has an acute dactylus heel of pereopod II, a longer dactylus heel of pereopod III, and a smoothly concave lateral margin of the ocular sinus.

*Lepidopa mexicana* Efford, 1971

Figures 32, 33

*Lepidopa mexicana* Efford, 1971: 89–90, figs. 2k, 3s, 4o, 5f, i, 6f, m, 7c\*. – Coelho and Calado, 1987: table 1. – Rios et al., 1990: 30, figs. 1d, 4. – Lemaitre and Alvarez León, 1993: 50 (list). – Hendrickx, 1992: 8 (list). – Moran and Dittel, 1993: 612 (list). – Ramos and Rios, 1995: 104, fig. 6. – Hendrickx and Harvey, 1999: 367 (list).

not *Lepidopa mexicana*: Calado, 1995: 181–182, pl. 39, fig. j, pl. 40, fig. i, pl. 41, fig. i, pl. 58, fig. a, pl. 59, figs. a–c\* (= *Lepidopa mearnsi* Benedict, 1903).

**MATERIAL EXAMINED: Mexico:** "Mexico," 1926, coll. Sec. Agricultura y Fomento: 1 oviger, 9.4 mm cl, holotype (USNM 62384); Teacapan, Sinaloa, 1926, coll. unknown: 2 ♀, 7.5–7.7 mm cl, paratypes (USNM 122634); Teacapan, Sinaloa, June 1926, coll. unknown: 1 ♂, 8.5 mm cl (USNM 62448); Zihuatenejo Bay, Guerrero, Feb. 7, 1963, coll. I. E. Efford: 1 ♀, 8.6 mm cl, paratype (LACM-AHF 638);

**Costa Rica:** Puntarenas, coll. S. Orsted: 1 ♀, 7.6 mm cl, paratype (ZMUC 2637).

**Panama (Pacific):** Sta. 235–3–7, Culebra Beach, June 3, 1977, coll. H. W. Kaufman: 1 juvenile, 2.9 mm cl (USNM 260936); Sta. 253–4–1, Culebra Beach, Feb. 7, 1978, coll. H. W. Kaufman: 1 juvenile, 2.4 mm cl (USNM 260937); Sta. 183–7, Scout Island Beach, March 10, 1974, coll. M. L. Jones and H. W. Kaufmann: 1 juvenile, 2.7 mm cl

(USNM 260938); south side, Perico Island, July 22, 1978, coll. M. L. Jones: 1 ♀, 7.5 mm cl (USNM 304312); Sta. 241–4–6, Culebra Beach, Dec. 10, 1977, coll. H. W. Kaufman: 1 oviger, 8.3 mm cl (USNM 304317).

**DIAGNOSIS:** Carapace wider than long, with lightly setose grooves. Anterior margin with two large spines lateral to ocular sinus. CG5 absent; CG8 absent; CG10 absent; posterior submarginal groove reaching to posterior margin of posterior concavity. Rostrum present, rounded and armed with ventral acute spine. Distal peduncular segments dorsoventrally flattened, ovate, distal margin smooth. Cornea absent. Antennal segment I unarmed. Dactylus of pereopod II with heel produced and rounded. Dactylus of pereopod III with heel thin, projecting, acute. Dactylus of pereopod IV with produced acute heel and deep indent. Telson of male spatulate, with broadly rounded and produced lateral lobes, proximal third laterally concave, medial third laterally convex, distal third laterally concave, distal tip rounded; medioproximal third heavily calcified, lateral and distal regions decalcified.

**DESCRIPTION:** Carapace (fig. 32A) wider than long. Anterior margin convex on either side of ocular sinus, smooth. Rostrum as rounded projection reaching beyond median peduncular segments and with a submarginal, terminal acute spine. Ocular sinus smoothly concave; unarmed. Frontal region smooth; setal field reduced to narrow band anterior to and paralleling CG1, concave medially. CG1 parallel to anterior margin of carapace, sinuous, slightly crenulate, medially concave, medial and lateral elements united. Mesogastric region smooth; CG2 absent; CG3 absent; CG4 with several (2–12) anteriorly and posteriorly displaced very short elements with wide gap in median and two long, oblique lateral elements connected to posterior margins of CG1 lateral elements. Hepatic region smooth, with oblique lateral setose groove and short, acute spine at median of lateral margin. Epibranchial region generally triangular, smooth; posterolateral margin with three or four short rows of setae. Metagastric region smooth; CG5 absent. CG6 crenulate, with separate oblique long lateral fragments and short, concave, median element united with CG7. CG7 slightly con-



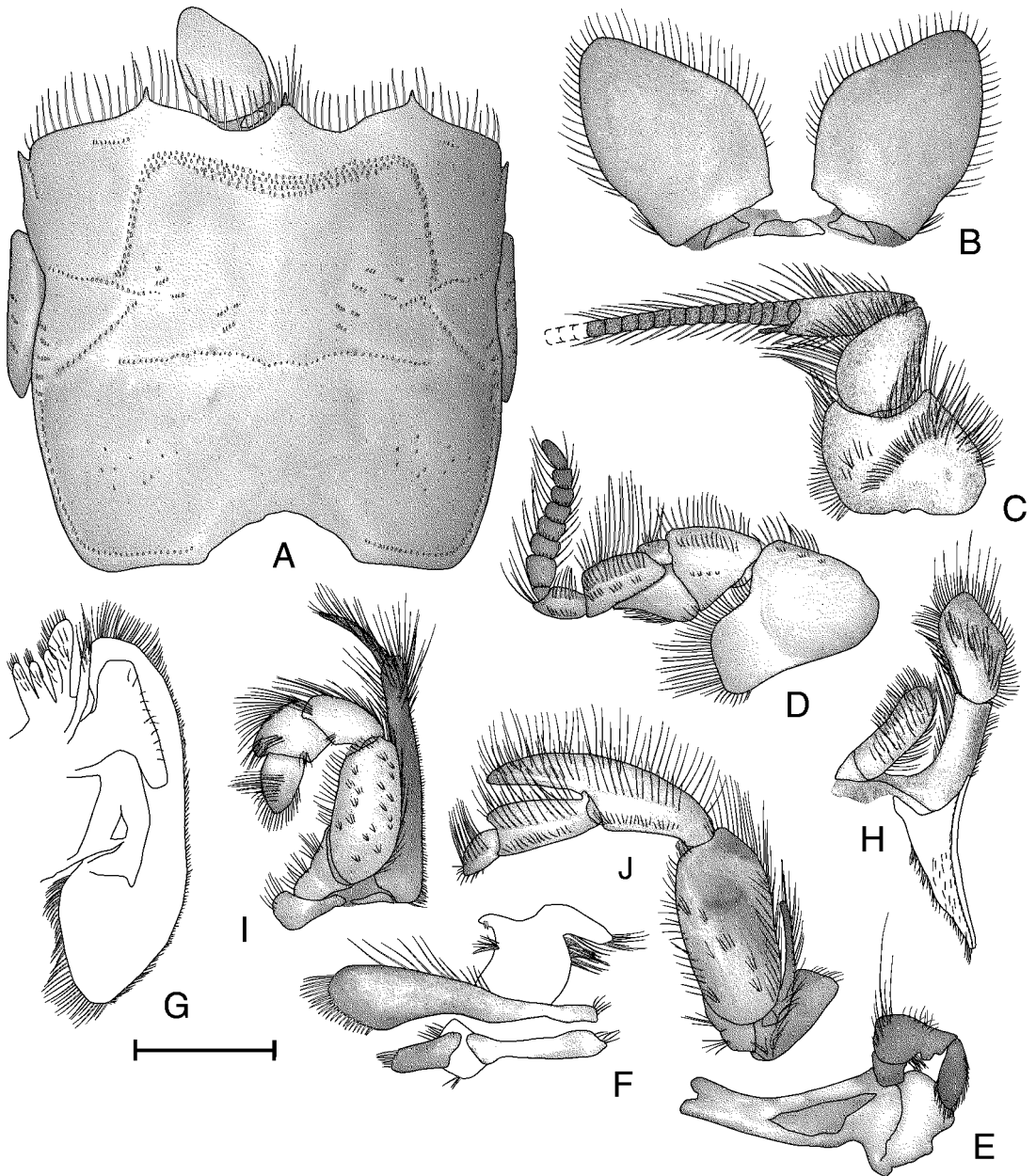


Fig. 32. *Lepidopa mexicana* Efford, 1971: A, oviger, 9.4 mm cl, USNM 62384, holotype; B–J, ♀, 7.5 mm cl, USNM 304312. A. Carapace, branchiostegite, and left ocular peduncle, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Left maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 1.1 mm (F), 1.4 mm (B), 1.6 mm (E, I), 2.2 mm (C, D, G, H, J), and 3.3 mm (A).

vex relative to anterior margin of carapace and united with median fragment of CG6. Cardiac region smooth; CG8–11 absent. Branchial region with few setose punctae but without short, transverse rows of setae. Posterior margin deeply and irregularly concave medially and more or less straight laterally, with submarginal groove reaching to posterior margin of posterior concavity. Branchiostegite without anterior submarginal spine; anterior region with anterodorsal transverse groove and granular surface; with many long plumose setae; posterior region membranous, with numerous, irregular fragments, and sparsely covered with long plumose setae.

Ocular plate (fig. 32B) laterally elongate oblong segment; median peduncular segments reduced to small subquadrate calcified areas anterolaterally ventral to ocular plate, not covered by carapace. Distal peduncular segments irregularly elongate-ovate, angled distolaterally, flattened with convex lateral and mesial margins, shallow notch present on lateral margin one-third from proximal margin, margins smooth; mesial margins separated along entire length; mesial, lateral, and distal margins with long simple setae.

Antennule (fig. 32C) segment III narrow proximally, expanding distally to two times proximal width; with plumose setae on dorsal and ventral margins; dorsal exopodal flagellum with 98–108 articles ( $n = 4$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with two or three articles ( $n = 6$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins. Segment I wider than long, unarmed; lateral surface with submarginal dorsal row of long plumose setae and transverse band of long plumose setae across segment median; long plumose setae on dorsal and ventral margins.

Antenna (fig. 32D) with segment V approximately 1.5 times longer than wide, with long plumose setae on dorsal margin and short plumose setae in submarginal ventral row, long plumose setae on distoventral margin; flagellum with eight articles ( $n = 5$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV almost cylindrical, overreaching segment III by one-third of

its length, with long plumose setae on dorsal and distal margins, and two interrupted rows of short setae on lateral surface, one medial and one ventrally submarginal. Segment III with long plumose setae on ventral margin and short simple setae on dorsal margin. Segment II widening distally, with one long row of short plumose setae on lateral surface; antennal acicle short, triangular, overreaching segment IV proximal margin by one-sixth own length, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened and truncated ventrolaterally, with long plumose setae on margins, short simple setae scattered on dorsal one-eighth of lateral surface; lateral margin unarmed; segment with ventromesial antennal gland pore.

Mandible (fig. 32E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 32F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and plumose setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under, with wide proximal projection; internal lobe reduced, with two thick setae at distolateral margin.

Maxilla (fig. 32G) exopod rounded with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe with plumose setae.

Maxilliped I (fig. 32H) epipod with plumose setae on margins and on distolateral surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, margins with plumose setae; distal segment spatulate, longer than wide, curved medially, broadest medially, margins and medial third of lateral surface with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins.

Maxilliped II (fig. 32I) dactylus evenly rounded, longer than wide, with thick simple setae distally and thin simple setae in short row on lateral surface. Propodus slightly produced dorsodistally, one-half wider than long, with plumose setae on dorsal margin

and long simple setae on dorsodistal and ventrodistal margins. Carpus not produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal margin and on dorsodistal and ventrodistal margins. Merus 2.5 times longer than wide, margins parallel but slightly inflated subproximally, with long simple setae on ventral margin and long plumose setae on dorsal margin and scattered on lateral surface. Basis-ischium incompletely fused, with plumose setae on margins. Exopod 1.5 times longer than merus, flagellum with one elongate article.

Maxilliped III (fig. 32J) dactylus elongate and evenly rounded; long plumose setae on margins and in medial transverse row on lateral surface. Propodus with longitudinal median row of plumose setae on lateral surface; submarginal interrupted ventral row of long simple setae; distodorsal tuft of long plumose setae; dorsal and ventral margins with short plumose setae. Carpus strongly produced onto propodus, overreaching nine-tenths of propodal length; lateral surface with medial transverse row of long plumose setae; submarginal ventral row of long plumose setae; long plumose setae on margins. Merus unarmed, weakly inflated distolaterally, depressed and decalcified medially, with long plumose setae on dorsal margin and short plumose setae on ventral margin and scattered on lateral surface. Basis-ischium incompletely fused, without crista dentata. Exopod two-segmented: proximal segment small; distal segment styliform, tapering, approximately three-fifths length of merus, with plumose setae on margins; without flagellum.

Pereopod I (fig. 33A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with small rugose area proximally, smooth distally, with long plumose setae; ventral margin with short simple setae. Propodal lateral surface with numerous short, transverse rows of setose rugae; dorsal margin with few small, low ridges; ventral margin distally produced into acute spine; cutting edge lacking teeth, lined with long plumose setae; dorsal margin with short plumose setae, ventral margin with short simple setae; mesial surface with few short transverse rows of setose rugae. Carpus with dor-

sodistal angle subquadrate and surface rugose, with short simple setae, dorsal margin smooth with short plumose setae; lateral surface with few scattered transverse, setose ridges; mesial surface smooth, with transverse row of long plumose setae halfway from dorsal margin and few scattered short plumose setae on surface. Merus unarmed; lateral surface with scattered transverse rows of short plumose setae, dorsal margin with long plumose setae; mesial side with few short rows of long plumose setae; proximal half of mesial surface with decalcified window. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 33B) dactylus smooth; with base to heel slightly concave, heel produced and rounded, heel to tip with wide, subacute indent, tip subacute with apical tuft of short simple setae, tip to base broadly convex; lateral surface smooth; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae, with patch of long plumose setae at base reaching across median of heel. Propodus with dorsal surface smooth, ventral margin inflated and rounded; distal and ventral margin with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with long plumose setae on ventral margin; short transverse row of long plumose setae on surface; mesial surface with oblique row of long plumose setae, distal and ventral margins with dense row of long plumose setae. Carpus strongly produced dorsodistally, extending three-fourths length of propodus; lateral surface nearly smooth, with irregular, interrupted row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; dorsal margin with short plumose setae, distoventral and ventral margins with long plumose setae; mesial surface smooth, with medial oblique and subdistal rows of long plumose setae, few scattered short plumose setae on surface. Merus lateral surface almost entirely decalcified, with long plumose setae on dorsal and ventral margins; mesial surface nearly smooth, with oblique median ridge, long plumose setae patches dorsal to ridge and in row ventrally, with decalcified area on proximal third of area ventral to ridge. Basis-ischium incompletely fused and unarmed. Coxa unarmed.



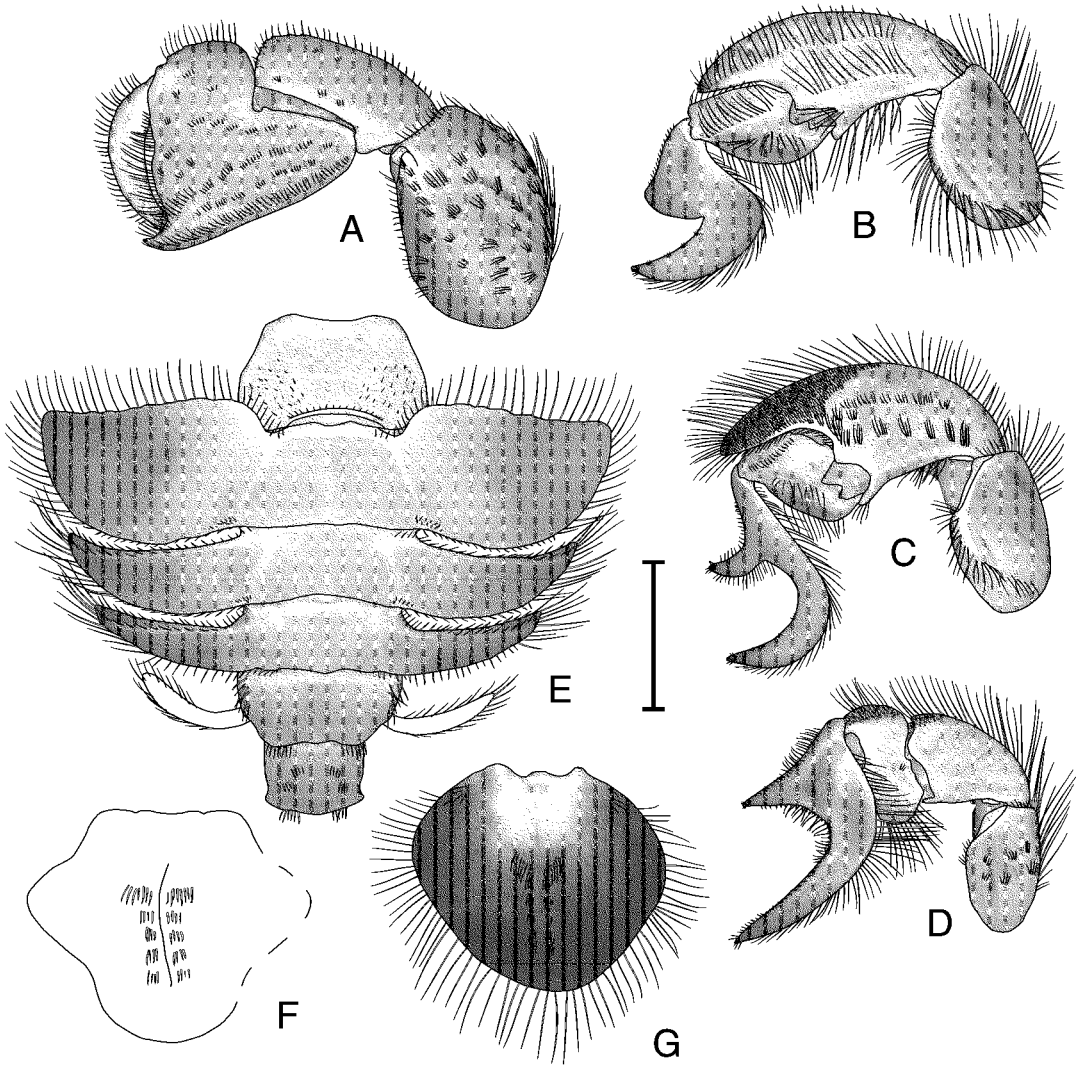


Fig. 33. *Lepidopa mexicana* Efford, 1971: A-E, G, ♀, 7.5 mm cl, USNM 304312; F, ♂, 8.5 mm cl, USNM 62448. **A.** Left pereopod I, lateral view. **B.** Left pereopod II, lateral view. **C.** Left pereopod III, lateral view. **D.** Left pereopod IV, lateral view. **E.** Abdominal somites I-VI, dorsal view. **F.** Telson of ♂, dorsal view. **G.** Telson of ♀, dorsal view. Scale = 1.6 mm (F, G), 2.2 mm (E), and 3.0 mm (A-D).

Pereopod III (fig. 33C) dactylus base to heel broadly indented, heel acute, thin, and produced, heel to tip with broad, angled indent, tip acute, tip to base smoothly convex; lateral surface smooth, with apical tufts of short simple setae on heel and tip, lateral surface proximal to indent with few setose punctae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with

plumose setae proximally at junction with propodus and in row across base of heel. Propodus not inflated dorsoventrally; lateral surface smooth, with simple setae subdorsally, and long plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened; mesial surface with scattered long setae on and near distoventral margin. Carpus strongly produced dorsodistally and inflated, overreaching distal margin of propodus,



rounded; dorsolateral margin unarmed; lateral surface with mat of short setae on dorsodistal third of segment and two long and one short transverse rows of setae medially; dorsal margin with long plumose setae; mesial surface smooth, with small median decalcified area, long plumose setae on margins and in median oblique row. Merus smooth, lateral surface almost entirely decalcified; dorsal and ventral margins unarmed, dorsodistal and ventral margins with long plumose setae; mesial surface smooth, with patch of long plumose setae on proximomesial margin. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female pereopod III with large mesioproximal gonopore (not opposing other gonopore); male with slightly smaller pore.

Pereopod IV (fig. 33D) dactylus with base to heel concave, heel acute, with apical tuft of short simple setae, heel to tip broadly rounded and concave, tip acute with apical tuft of short simple setae, tip to base convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge across heel, with row of short plumose setae. Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, margins with long plumose setae; dorsal expansion with row of long plumose setae medially and mat of short setae; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; lateral and mesial surfaces smooth; dorsomedial half of lateral and mesial surfaces decalcified, with medial patch of long plumose setae subdistally and long plumose setae on distoventral margin of mesial surface; dorsal margin with small mat of short setae at dorsodistal angle; dorsal margin with long plumose setae, ventral margin with short simple setae. Merus lateral surface small median decalcified area, with few short transverse rows of setae, dorsal and distoventral margins with long plumose setae; mesial surface with small decalcified window proximoventrally. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 33E) with somite I wider than long, widest posteriorly; dorsal surface with anterior margin concave; posterior mar-

gin concave, with elevated submarginal curved row of short setae and broad field of short simple setae anterior to submarginal row; with small faint transverse decalcified window laterad of segment median. Somite II anterior margin irregularly convex, posterior margin irregularly concave; pleura expanded and directed laterally, angled anterolaterally, rounded posterolaterally, anterior margin weakly crenulate, small patch of short simple setae at posteromesial margin; anterior and lateral margins with long plumose setae, posterior margin with short setae. Somite III similar to somite II, narrower and shorter; pleura thinner and shorter than on somite II, directed anterolaterally, with setae as in somite II; anterolateral angle subacute; dorsal surface obliquely flattened anterolaterally, with posterior row of short simple setae. Somite IV similar to somite III; pleura thinner and shorter than on somite III, directed anterolaterally; dorsal surface slightly obliquely flattened anterolaterally, with posterior row of short simple setae; margins with long plumose setae. Somite V wider than somite IV, narrowing posteriorly; anterolateral margins with plumose setae, two lateral rows of setae on posterior margin; pleura decalcified and distinct from somite, shorter than in somite IV, thin, flattened, directed anterolaterally, and covered with plumose setae. Somite VI narrower than somite V; dorsal surface with four short transverse rows of setae laterad of midline anteriorly, posterior margin with two rows of long plumose setae; pleura absent.

Female with long uniramous pleopods on somites II–V; male with small pleopods.

Telson of male (fig. 33F) spatulate, with broadly rounded and produced lateral lobes, proximal third laterally concave, medial third laterally convex, distal third laterally concave, distal tip rounded; medioproximal third heavily calcified, lateral and distal regions decalcified; median longitudinal groove running along calcified region; two parallel distally converging rows of short simple setae in medial third; margins with long simple setae. Telson of female (fig. 33G) similar to male, with less produced lateral expansions, lateral margins almost evenly convex.

DISTRIBUTION: From Sinaloa, Mexico, to

Panama and Colombia (Rios et al., 1990); depth range unknown.

MAXIMUM SIZE: Males: 8.5 mm cl; females: 9.4 mm cl.

TYPE SPECIMENS: USNM 62384 (holotype), USNM 122634 (2 paratypes), LACM-AHF 638 (paratype), ZMUC 2637 (paratype).

TYPE LOCALITY: "Mexico."

REMARKS: Calado (1995) examined only a single specimen labeled as *L. mexicana* (identified by D. Dexter), but which is a misidentified *L. mearnsi*. Calado (1995) saw no specimens of true *L. mexicana* and gave the type locality for this species incorrectly as "Teacapan, Sinoloa [sic], México."

*Lepidopa mexicana* is the sister species to *L. wollebaeki*, and differs from that species only in minor details of the arrangement of CG4 and CG5. Unfortunately, *L. wollebaeki* is only known from the holotype specimen, and intraspecific variation in that species is therefore unknown. Further Galápagos material may show that *L. wollebaeki* and *L. mexicana* are conspecific. If true, the species would have a range similar to that of *Alburnea galapagensis*, n. sp., which is known from both the Galápagos and the Gulf of California.

*Lepidopa wollebaeki* Sivertsen, 1934

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*Lepidopa wollebaeki* Sivertsen, 1934: 9, pl. 4, figs. 35–41\*. – Efford, 1971: 96–98, figs. 1h, 4n, 8\*. – Coêlho and Calado, 1987: table 1. – Calado, 1995: 213–215, pl. 39, fig. q, pl. 40, fig. p, pl. 41, fig. p, pl. 70, figs. a–f\*.

*Lepidopa wollebaecki* [sic]: Gordon, 1938: 188.

*Lepidopa wolleboecki* [sic]: Garcia Mendes, 1945: 119 (list).

*Lepidopa wollebacki* [sic]: Calado, 1987: 119 (list).

*Lepidopa wolleboeki* [sic]: Hendrickx and Harvey, 1999: 367.

MATERIAL EXAMINED: **Ecuador**: Floreana Island, Galápagos Islands, Aug. 24, 1925, coll. Galápagos Expedition: 1 ♀, 7.2 mm cl, holotype (ZMO F100).

DIAGNOSIS: Carapace wider than long, with lightly setose grooves. Anterior margin with two large spines lateral to ocular sinus. CG5 present; CG8 absent; CG10 absent; posterior submarginal groove reaching posterolateral

margin of posterior concavity. Rostrum present, rounded and armed with ventral acute spine. Distal peduncular segments dorsoventrally flattened, ovate, distal margin smooth. Cornea absent. Antennal segment I unarmed. Dactylus of pereopod II with heel produced and rounded. Dactylus of pereopod III with heel thin, projecting, acute. Dactylus of pereopod IV unknown. Telson of female appearing to be diamond-shaped and elongated, with strong narrow lateral projections.

DESCRIPTION: Carapace (fig. 34A) wider than long. Anterior margin concave on either side of ocular sinus, smooth. Rostrum as rounded projection reaching beyond median peduncular segments and with a submarginal, terminal acute spine. Ocular sinus smoothly concave; unarmed. Frontal region smooth; setal field reduced to narrow band anterior and paralleling CG1, concave medially. CG1 parallel to anterior margin of carapace, sinuous, slightly crenulate, medially concave, medial and lateral elements united. Mesogastric region smooth; CG2 absent; CG3 absent; CG4 with two long oblique lateral elements. Hepatic region smooth, with oblique lateral setose groove and very short, acute spine at median of lateral margin. Epi-branchial region generally triangular, smooth; posterolateral margin with three short rows of setae. Metagastric region smooth; CG5 present as two very short medial elements. CG6 crenulate, with separate oblique, long, lateral fragments and short sinuous median element united with CG7. CG7 straight relative to anterior margin of carapace and united with median fragment of CG6. Cardiac region smooth; CG8–11 absent. Branchial region with few punctae but without short, transverse rows of setae. Posterior margin deeply and irregularly concave medially and more or less straight laterally, with submarginal groove reaching posterolateral margin of posterior concavity. Branchiostegite without anterior submarginal spine; anterior region with anterodorsal transverse groove and granular surface; posterior region membranous, with numerous irregular fragments.

Ocular plate (fig. 34B) covered by carapace; median peduncular segments reduced to small oblong calcified areas anterolateral to ocular plate. Distal peduncular segments irregularly ovate, angled distolaterally, flat-

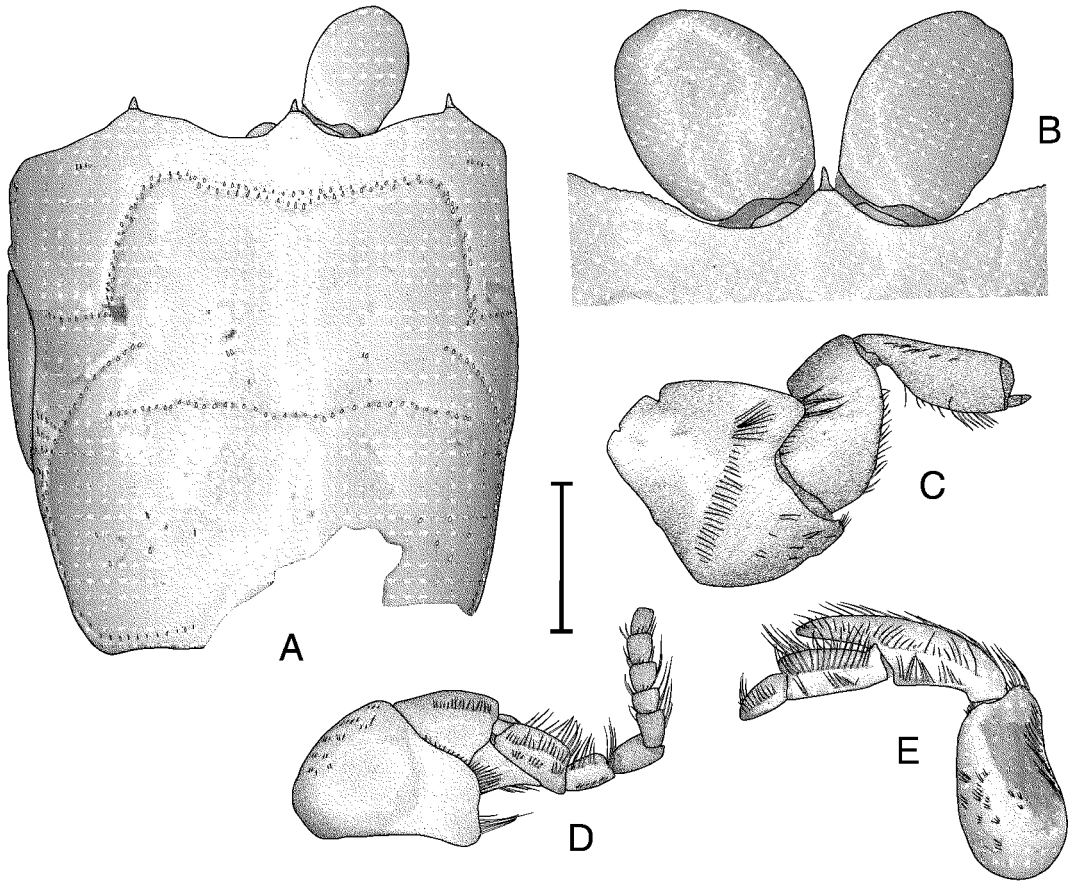


Fig. 34. *Lepidopa wollebaeki* Sivertsen, 1934: A–E, ♀, 7.2 mm cl, ZMO F100, holotype. **A.** Carapace, left branchiostegite, and right ocular peduncle, dorsal view. **B.** Ocular peduncles (reconstructed), dorsal view. **C.** Right antennule, lateral view. **D.** Right antenna, lateral view. **E.** Left maxilliped III, lateral view. Scale = 1.4 mm (B), 1.6 mm (C), 2.2 mm (D, E), and 2.3 mm (A).

tened with convex lateral and mesial margins and slightly indented distal margin, margins smooth; cornea absent; mesial margins separated along entire length.

Antennule (fig. 34C) segment III narrow proximally, expanding distally to two times proximal width; with plumose setae on ventral margin and scattered on dorsolateral surface; dorsal exopodal flagellum with unknown number of articles (76 in Sivertsen, 1934: fig. 37); ventral endopodal flagellum with two articles ( $n = 1$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins. Segment I longer than wide, unarmed; lateral surface dorsomedial third rugose; long plumose setae

on dorsal and ventral margins and in transverse row on mediolateral surface.

Antenna (fig. 34D) with segment V approximately 1.5 times longer than wide, with short plumose setae on dorsal and distal margins; flagellum with seven articles ( $n = 1$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV almost cylindrical, overreaching segment III by one-third of its length, with long plumose setae on dorsal and distal margins, and two rows of setae on dorsolateral margin. Segment III with long plumose setae on ventral margin. Segment II widening distally, with plumose setae on dorsal margin and in short transverse mediolateral row; antennal acicle short, triangular, overreaching segment IV proximal margin



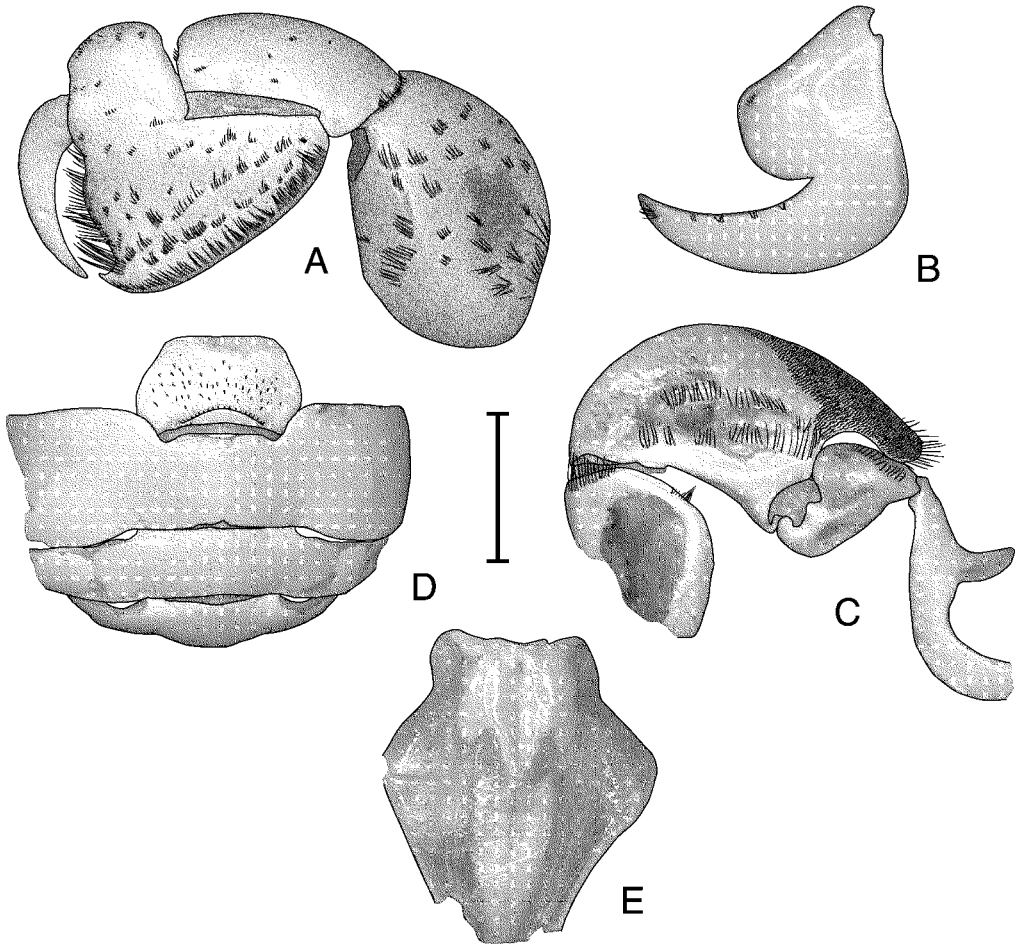


Fig. 35. *Lepidopa wollebaeki* Sivertsen, 1934: A–E, ♀, 7.2 mm cl, ZMO F100, holotype. **A.** Left pereopod I, lateral view. **B.** Left pereopod II dactylus, lateral view. **C.** Right pereopod III, lateral view. **D.** Abdominal somites I–IV, dorsal view. **F.** Telson of ♀, dorsal view. Scale = 1.1 mm (E), 1.6 mm (B), and 2.2 mm (A, C, D).

by one-fourth of its length, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened and truncated ventrolaterally, with long plumose setae on margins; lateral margin unarmed; segment with ventromesial antennal gland pore.

Mandible, maxillule, maxilla, maxilliped I, maxilliped II unknown.

Maxilliped III (fig. 34E) dactylus elongate and evenly rounded; long plumose setae on margins and in transverse row on lateral surface. Propodus with longitudinal median row of long plumose setae on lateral surface; margins with plumose setae. Carpus strongly produced onto propodus, reaching three-

fourths length of propodus; lateral surface with medial transverse row of plumose setae; plumose setae on margins. Merus unarmed, broadly inflated distolaterally, with long plumose setae on distolateral margin and short plumose setae scattered on lateral surface. Basis-ischium unknown. Exopod unknown, but presumed similar to other species in the genus with proximal segment small; distal segment styliform, tapering, without flagellum.

Pereopod I (fig. 35A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with small rugose area proximally, smooth distally; ventral margin with



short simple setae. Propodus lateral surface with numerous short, transverse rows of setose rugae; dorsal margin with few small low ridges; ventral margin distally produced into acute spine; cutting edge lacking teeth, lined with long plumose setae; dorsal margin with short plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle rounded, dorsal margin smooth with short plumose setae; lateral surface with few transverse, setose ridges; mesial surface smooth. Merus unarmed; lateral surface with scattered transverse rows of short plumose setae, margins with long plumose setae. Basis-ischium and coxa unknown.

Pereopod II (fig. 35B) dactylus smooth; with base to heel slightly concave, heel produced and subquadrate, heel to tip with broad, acute indent, tip acute, tip to base broadly convex; lateral surface smooth with tufts of short simple setae at distal ends of heel and tip; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae, with patch of long plumose setae at base reaching across median of heel. Remainder of pereopod unknown.

Pereopod III (fig. 35C) dactylus base to heel broadly indented, heel acute, thin, and produced, heel to tip with broad, subquadrate indent, tip acute (from Sivertsen, 1934), tip to base smoothly convex; lateral surface smooth, with tufts of short setae at end of heel and tip, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth. Propodus not inflated dorsoventrally; lateral surface smooth, with simple setae subdorsally, and long plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened; mesial surface with scattered long setae on and near distoventral margin. Carpus strongly produced dorsodistally and inflated, almost reaching distal margin of propodus, rounded; dorsolateral margin unarmed; lateral surface with mat of short setae on dorsodistal third of segment and long transverse row of setae medially and scattered on proximal lateral surface; dorsal margin with long plumose setae; mesial surface smooth, dorsomesial third decalcified. Merus smooth, lateral surface almost entirely decalcified;

dorsal and ventral margins unarmed, with long plumose setae; laterodistal margin with long plumose setae; mesial surface smooth. Basis-ischium and coxa unknown.

Pereopod IV unknown.

Abdomen (fig. 35D) with somite I wider than long, widest posteriorly; dorsal surface with anterior margin straight; posterior margin concave, with elevated submarginal curved row of short setae and broad field of short simple setae anterior to submarginal row; with small faint transverse decalcified window laterad of segment median. Somite II anterior margin convex, posterior margin irregularly concave; pleura expanded and directed laterally, angled anterolaterally, rounded posterolaterally, small patch of short simple setae at posteromesial margin; anterior and lateral margins with long plumose setae, posterior margin with short setae. Somite III similar to somite II, narrower and shorter; pleura thinner and shorter than on somite II, directed laterally, with setae as in somite II; anterolateral angle acute; dorsal surface slightly obliquely flattened anterolaterally. Somite IV similar to somite III; pleura thinner and shorter than on somite III, directed anterolaterally; dorsal surface slightly obliquely flattened anterolaterally; margin with long plumose setae. Somites V and VI unknown.

Female with long uniramous pleopods on somites II–V; male unknown.

Telson of male unknown. Telson of female (fig. 35E) extremely damaged but appearing to be diamond-shaped and elongated, with strong narrow lateral projections; tip unknown.

DISTRIBUTION: Known only from the unique holotype from the Galápagos Islands.

MAXIMUM SIZE: Males: unknown; females: 7.2 mm cl.

TYPE SPECIMEN: ZMO F100 (holotype).

TYPE LOCALITY: Floreana Island, Galápagos Islands, Ecuador.

REMARKS: Although it may seem surprising that this species has not been collected subsequent to the holotype, it should be noted that *Albunea galapagensis*, n. sp. was unknown from the Galápagos prior to this work. This indicates that, in spite of the recognized biogeographic importance of the Galápagos Islands, and the intensive collecting

that occurs there, many species from these islands are still poorly known.

Due to the poor condition of the dry holotype, only limited morphological details are known about this species. It is clearly a member of the “*venusta*-group” of species, and it appears to be the sister species to *L. mexicana* Efford. In fact, examination of the intact portions of the holotype shows this species to be almost identical to *L. mexicana* in many respects, such as the shape of the dactyli of pereopods II and III, and the shape of the telson. It differs from *L. mexicana* in the arrangement of CG4 and CG5. Further Galápagos material may show that this taxon and *L. mexicana* are conspecific. The range of this species would then be comparable with the only other Galápagos albuneid known, *Albunea galapagensis*, n. sp., which occurs both in the Galápagos and in the Gulf of California.

*Lepidopa esposa* Efford, 1971

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*Lepidopa esposa* Efford, 1971: 94–96, figs. 1o, 2i, 3q, 4c, 7g. – Haig, 1980: 290, fig. 19.7\*. – Coelho and Calado, 1987: 42–43, table 1. – Hendrickx, 1992: 7 (list). – Calado, 1995: 165–166, pl. 39, fig. g, pl. 41, fig. f, pl. 52, figs. a–d. – Hendrickx and Harvey, 1999: 367 (list).

**MATERIAL EXAMINED:** **Mexico:** **Sonora:** Cholla Bay, Sept. 7, 1975, coll. J. R. Hendrickson: 2 ♂, 4.5–4.9 mm cl (LACM-AHF 75–108–1); Norse Beach near Cholla Bay, Nov. 13, 1975, coll. E. Snyder: 1 ♀, 10.0 mm cl (LACM-AHF 16801); **Baja California Sur:** Bahia La Paz, gulf side, 1905, coll. Diguet: 1 ♂, 8.5 mm cl, holotype (MNHN-Hi 82).

**DIAGNOSIS:** Carapace wider than long, with lightly setose grooves. Anterior margin with two large spines lateral to ocular sinus. CG5 absent; CG8 present; CG10 absent; posterior submarginal groove reaching to lateral margin of posterior concavity. Rostrum present, rounded and armed with ventral acute spine. Distal peduncular segments dorsoventrally flattened, ovate, distal margin smooth. Cornea absent, but pigmented notch present. Antennal segment I unarmed. Dactylus of pereopod II with heel produced and rounded. Dactylus of pereopod III with heel thin, pro-

jecting, acute. Dactylus of pereopod IV with produced acute heel and deep indent. Telson of male spatulate, with length subequal to width, proximal half of lateral margins convex, distal half concave, produced into short rounded tip; weakly calcified except in proximal third.

**DESCRIPTION:** Carapace (fig. 36A) wider than long. Anterior margin concave and with one large spine on either side of ocular sinus. Rostrum as acute projection reaching beyond median peduncular segments, with submarginal and terminal acute spine. Ocular sinus smoothly concave to convex laterally; unarmed. Frontal region smooth; setal field reduced to narrow band anterior to CG1, broadest and concave in median. CG1 parallel to anterior margin of carapace, sinuous, slightly crenulate, with medial fragment and lateral elements united. Mesogastric region smooth; CG2 absent; CG3 absent; CG4 with eight very short submedial fragments scattered at mesial end of lateral long oblique elements. Hepatic region smooth, with setose groove and short, blunt spine at midpoint of lateral margin (holotype illustrated is damaged on right side). Epibranchial region generally triangular, smooth; posterolateral margin with three short rows of setae. Metagastric region smooth; CG5 absent. CG6 crenulate, with oblique long, lateral fragments and three very short elements scattered slightly posteriorly to mesial end of lateral fragments. CG7 straight relative to anterior margin of carapace and separate from CG6, short gap at median. Cardiac region smooth; CG8 with four very short elements parallel to CG7 in median of cardiac region. CG9 absent. CG10 absent. CG11 absent. Branchial region with few setose punctae. Posterior margin deeply convex medially and straight laterally, with submarginal groove reaching to lateral margin of posterior concavity. Branchiostegite without short anterior submarginal spine; anterior region with anterodorsal groove and granular surface; with many short setae; posterior region membranous with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 36B) covered by carapace; median peduncular segments reduced to small rounded calcified area anterolateral to ocular plate. Distal peduncular segments

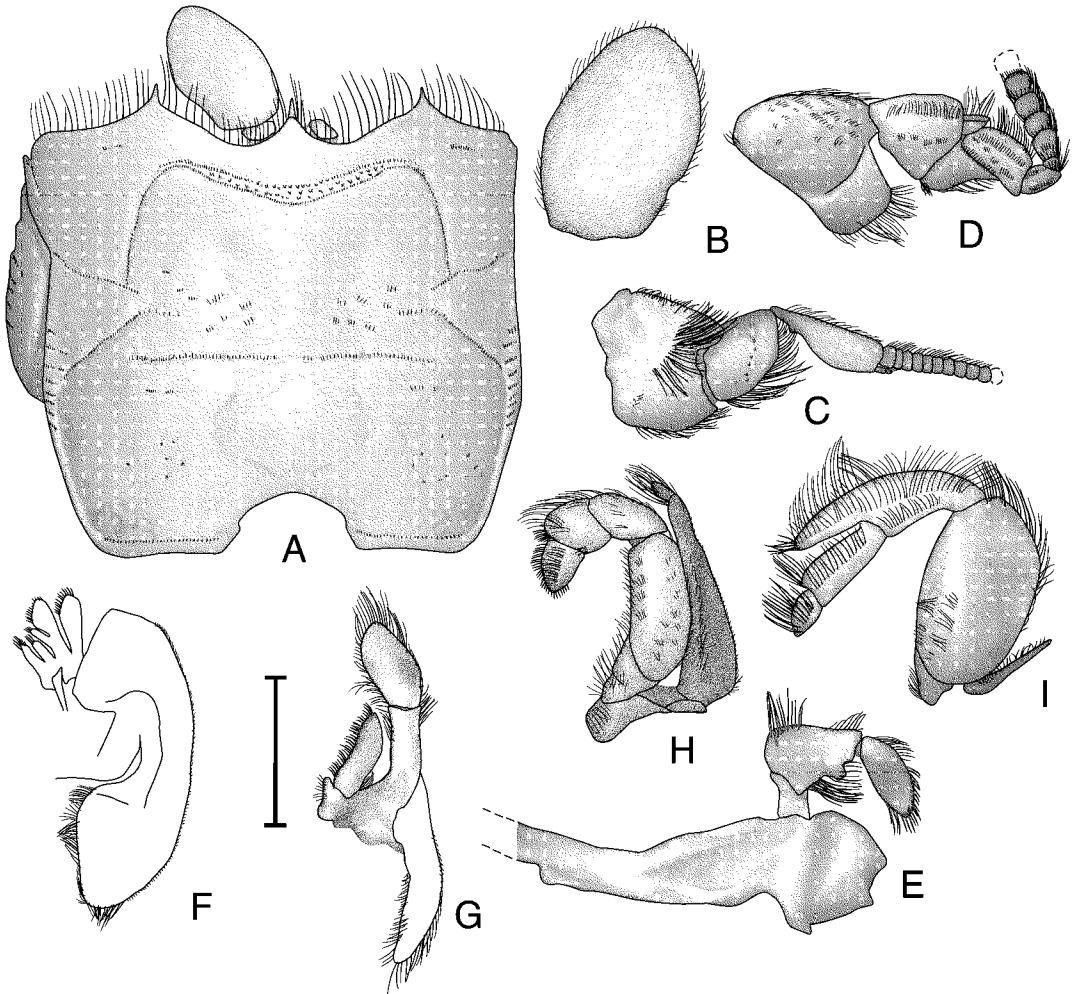


Fig. 36. *Lepidopa esposa* Efford, 1971: A–I, ♂, 8.5 mm cl, MNHN-Hi 82, holotype. **A.** Carapace, left branchiostegite, and left ocular peduncle, dorsal view. **B.** Right ocular peduncle, dorsal view. **C.** Right antennule, lateral view. **D.** Right antenna, lateral view. **E.** Left mandible, mesial view. **F.** Left maxilla, lateral view. **G.** Left maxilliped I, lateral view. **H.** Left maxilliped II, lateral view. **I.** Left maxilliped III, lateral view. Scale = 1.1 mm (H), 1.6 mm (E), 2.1 mm (B), and 3.3 mm (A, C, D, F, G, I).

elongate, smoothly rounded and flattened with convex lateral margins; notch present on lateral margin one-third from proximal margin; mesial margins separated along entire length; mesial and lateral margins with sparse row of short plumose setae.

Antennule (fig. 36C) with segment III with narrow proximally, expanding distally to twice proximal width; with plumose setae on dorsal margin; dorsal exopodal flagellum with 12+ articles (12 in only extant, broken

antennule of holotype), long plumose setae on dorsal margin; ventral endopodal flagellum short with two articles and plumose setae on dorsal margin. Segment II medially inflated in dorsal view, with plumose setae on ventral margin. Segment I wider than long, unarmed; lateral surface dorsodistal third rugose, with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 36D) with segment V approximately as long as wide, with short plu-

mose setae on dorsal and ventral margins; flagellum with seven or more articles (holotype with five on one broken antenna, seven on other), long plumose setae on dorsal, ventral, and distal margins. Segment IV almost cylindrical, overreaching segment III by one-half of its length, with long plumose setae on dorsal, ventral, and distal margins and row of setae on dorsolateral margin. Segment III with long plumose setae on ventral margin. Segment II widening distally, with plumose setae on margins; antennal acicle short, triangular, overreaching segment IV proximal margin by one-fourth of its length, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened and truncate ventrolaterally, with long plumose setae on margins; lateral surface without spine; segment with ventromesial antennal gland pore.

Mandible (fig. 36E) incisor process with one tooth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule unknown.

Maxilla (fig. 36F) exopod rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 36G) epipod with plumose setae on distal margin and on distolateral surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, margins with plumose setae; distal segment spatulate, approximately as long as wide, broadest medially, margins with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins.

Maxilliped II (fig. 36H) dactylus evenly rounded, length equal to width, with thick simple setae distally. Propodus 1.5 times wider than long, with plumose setae on dorsal margin and long simple setae on distal margin. Carpus not strongly produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal margin. Merus more than two times longer than wide, margins parallel but slightly inflated basally, with simple setae on ventrolateral margin and plumose setae on dorso-

lateral margin. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-third longer than merus, flagellum with one short article.

Maxilliped III (fig. 36I) dactylus evenly rounded, with long plumose setae on margins and lateral surface. Propodus with longitudinal median row of plumose setae on lateral surface; margins with plumose setae. Carpus strongly produced onto propodus, overreaching propodus by three-fourths of its length; lateral surface with row of plumose setae ventromedially, plumose setae on margins. Merus unarmed, broadly inflated medially, with plumose setae on margins. Basis-ischium incompletely fused, without crista dentata. Exopod two-segmented; proximal segment small; distal segment styliiform, tapering, approximately one-third length of merus, with plumose setae on margins; without flagellum.

Pereopod I (fig. 37A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose and short simple setae; ventral margin with short simple setae. Propodal lateral surface with numerous short, transverse rows of setose rugae; dorsal margin with few small, low spines; ventral margin distally produced into acute spine; cutting edge lacking teeth, lined with long plumose setae; dorsal margin with short plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle rounded, dorsal margin smooth, with short plumose setae; lateral surface with few transverse, setose ridges; mesial surface smooth, with few scattered rows of long plumose setae, margins with short 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; proximal third of mesial surface with decalcified window. Basis-ischium incompletely fused, unarmed. Coxa with small posteromesial tubercle.

Pereopod II (fig. 37B) dactylus smooth; with base to heel almost straight, heel smoothly rounded, heel to tip with narrow, acute indent, tip acute, tip to base broadly convex; lateral surface smooth, with one or two small tufts of short setae proximally, several widely spaced, submarginal tufts of



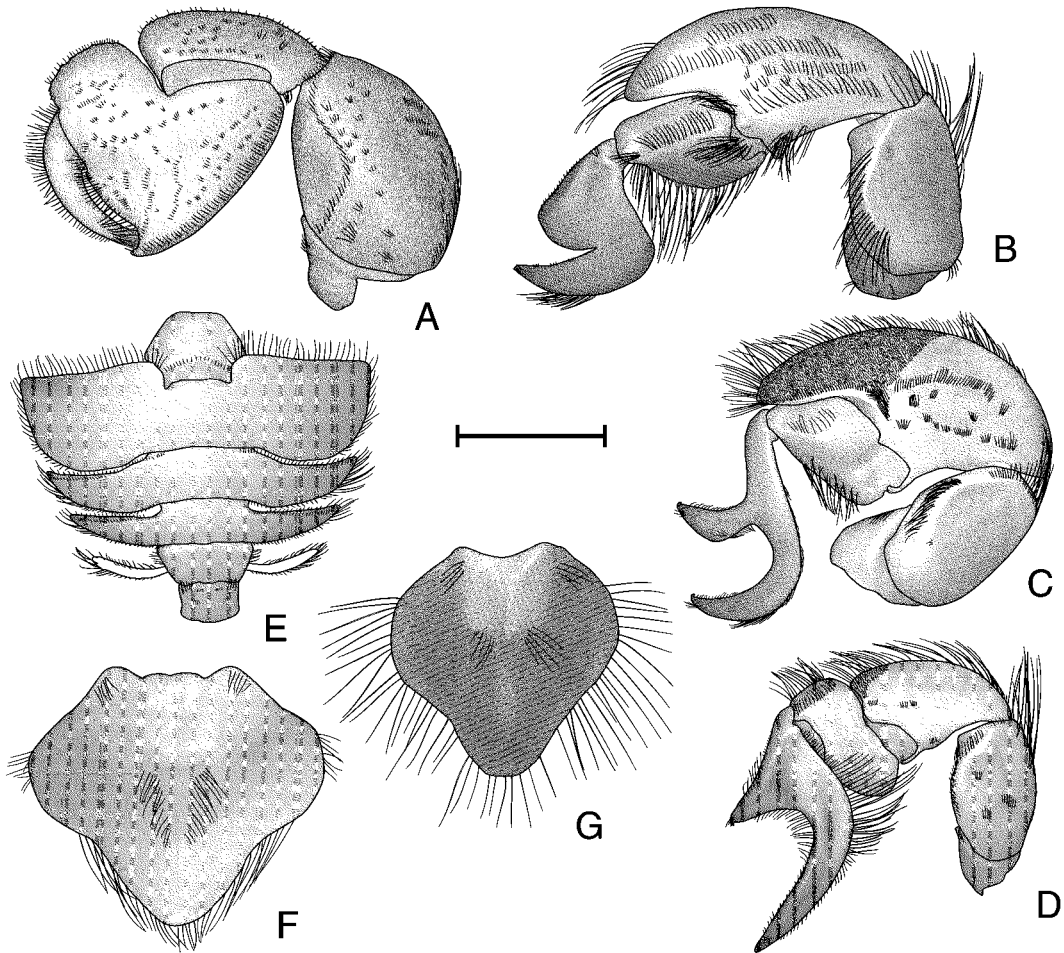


Fig. 37. *Lepidopa esposa* Efford, 1971: A–F, ♂, 8.5 mm cl, MNHN-Hi 82, holotype; G, ♀, 10.0 mm, LACM 168–01. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I–VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 1.6 mm (F), 2.2 mm (G), 3.3 mm (A–D), and 4.4 mm (E).

short setae dorsodistally; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae, with patch of long plumose setae at base. Propodus with dorsal surface smooth, ventral margin inflated and rounded; distal and ventral margins with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with long plumose setae on ventral margin; mesial surface with ventral row of setae. Carpus strongly produced dorsodistally; lateral surface nearly smooth, with irregular, interrupted row of rugae and submarginal elevated ridge ventrally, rugae and

ridge with long plumose setae; distal margins with long plumose setae; mesial surface smooth, with long plumose setae in scattered patches in line subdorsally and on margins. Merus lateral surface almost entirely decalcified, with few scattered setae on surface and margins; mesial surface nearly smooth, with oblique median ridge, long plumose setae patches dorsal to ridge and in row ventrally, with decalcified area on proximal half of area dorsal to ridge. Basis-ischium incompletely fused and unarmed. Coxa with small mesioproximal tubercle.

Pereopod III (fig. 37C) dactylus with base

to heel broadly indented, heel acute and produced, inflated medially, heel to tip with broad, evenly rounded indent, tip acute, tip to base smoothly convex; lateral surface smooth, with tufts of short setae at end of heel and tip and at inflated median of heel, dorsodistal margin with tufts of short setae; ventromesial margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth with plumose setae proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface smooth, with simple setae on dorsal margins, and long plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened; mesial surface with scattered long setae on and near distal margin. Carpus strongly produced dorsodistally and inflated, reaching distal margin of propodus, pointed but not acute; dorsolateral margin unarmed; lateral surface with mat of short setae on distal third of segment and two longer rows of setae ventrally; mesial surface smooth, with long plumose setae on margins and in median transverse row. Merus smooth, lateral surface almost entirely decalcified; dorsal and ventral margins unarmed, with long plumose setae; laterodistal margin with long plumose setae; mesial surface smooth, with small decalcified window at junction with basis-ischium. Basis-ischium incompletely fused and unarmed. Coxa with small mesioproximal tubercle. Female pereopod III unknown; male with small pore.

Pereopod IV (fig. 37D) dactylus with base to heel slightly concave, heel acute, heel to tip broadly rounded and concave, tip acute, tip to base convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge across heel with row of short setae. Propodus expanded dorsally and ventrally; ventral expansion not exceeding 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; lateral surface with distal two-thirds decalcified; dorsal margin with small mat of short setae at dorsodistal angle, short simple and

long plumose setae on margin; ventral margin with short simple setae. Merus with lateral surface with scattered short transverse rows of setae, dorsal and ventrodorsal margins with long plumose setae; mesial surface with large decalcified window proximoven- trally. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 37E) with somite I approximately as long as wide, widest posteriorly; dorsal surface with anterior margin straight; posterior margin straight, with elevated submarginal row of short setae; with small transverse decalcified windows laterad of segment median. Somite II dorsal surface with submarginal transverse ridge anteriorly; pleura expanded and directed laterally; dorsolateral margin angled, posterolateral margin 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, but reaching onto anterior margin of somite; anterolateral angle acute; dorsal surface obliquely flattened anterolaterally. Somite IV similar to somite III, but thinner and shorter; pleura thinner and shorter than on somite III, directed anterolaterally; dorsal surface obliquely flattened anterolaterally; margin with long plumose setae. Somite V wider than somite IV; lateral margins with plumose setae and two short rows of setae posterolaterally; pleura distinct from somite, shorter than in somite IV, thin, flattened and directed anteriorly. Somite VI narrower than somite V in width; dorsal surface with short transverse rows of setae laterad of midline anteriorly; pleura absent.

Female pleopods unknown; males with reduced pleopods.

Telson of male (fig. 37F) spatulate, with length subequal to width, proximal half of lateral margins convex, distal half concave, produced into short rounded tip; weakly calcified except in proximal third; median longitudinal groove short, not extending to distal end of calcified area, without setae; calcified plate not elevated medially; two oblique rows of setae just distal to calcified

region. Telson of female (fig. 37G) similar to male, with less produced lateral expansions.

**DISTRIBUTION:** Known only from Sonora and Baja California Sur, Mexico; depth range unknown.

**MAXIMUM SIZE:** Males: 8.5 mm cl; females: 10.0 mm cl.

**TYPE SPECIMEN:** MNHN-Hi 82 (holotype).

**TYPE LOCALITY:** Bahia La Paz, Baja California Sur (Gulf side), Mexico.

**REMARKS:** Calado (1995) saw no material of this species and redescribed it based on the description and illustrations of Efford (1971).

This species is a member of the “*venusta*-group” and it appears most closely related to *L. chilensis*.

*Lepidopa websteri* Benedict, 1903

Figures 38, 39

*Albunea scutellata*: Gibbes, 1850b: 187 (not *Thia scutellata* (Fabricius, 1793)).

*Lepidops venusta*: Kingsley, 1880: 410 (not *Lepidopa venusta* Stimpson, 1859).

*Lepidopa venusta*: Ortmann, 1896: 226 (part) (not *Lepidopa venusta* Stimpson, 1859).

*Lepidopa scutellata*: Ortmann, 1896: 227 (part) (not *Thia scutellata* (Fabricius, 1793)).

*Lepidopa websteri* Benedict, 1903: 892, fig. 3\*. – Hay and Shore, 1918: 415, pl. 30, fig. 12. – Gordon, 1938: 188, figs. 1c, 2c\*. – Pearse et al., 1942: 185, fig. 11\*. – Garcia Mendes, 1945: 119 (list). – Williams, 1965: 138–139, fig. 114. – Howard, 1968: 256, fig. 4. – Kurata, 1970: 184–187, pls. 55, 56. – Efford, 1971: 91–92, figs. 1b, k, 2j, 3r, 4h, m, 5g, i, 6o\*. – Van Engel and Sandifer, 1972: 158. – Young, 1978: 177. – Hill, 1979: 43–51, fig. 2. – Kaestner, 1980: 336. – Williams, 1984: 250–251, fig. 184. – Fox and Ruppert, 1985: 259 (list). – Coêlho and Calado, 1987: 42–43, table 1. – Manning, 1988: 626–627, 629–631, figs. 2, 3\*. – Ruppert and Fox, 1988: 250, 404, fig. 227. – Williams et al., 1989: 35. – Calado, 1995: 209–211, pl. 39, fig. p, pl. 40, fig. o, pl. 41, fig. o, pl. 69, figs. a, b\*.

*Lepidopa* “probably *L. websteri*”: Sandifer and Van Engel, 1972: 220–225, figs. 1–3.

*Lepidopa* cf. *L. websteri*: Sandifer, 1973: 244.

**MATERIAL EXAMINED:** **USA: North Carolina:** *Dare Co.*: On beach, Southern Shores, Outer Banks, Aug. 12, 1997, coll. C. B. Boyko: 1 carapace, 6.4 mm (CBB); *Carteret Co.*: Beaufort, coll. H. G. Webster: 1 ♀, 7.0 mm cl, holotype (USNM 42214 ex Union Col-

lege Collection); Fort Macon, Beaufort, Dec. 1871, coll. H. C. Yarrow: 1 ♀, 12.8 mm cl (YPM 21137); Macon Beach, Beaufort, July 5, 1939, coll. A. S. Pearse: 1 ♂, 7.9 mm cl (USNM 155242); Macon Beach, Beaufort, July 11, 1939, coll. A. S. Pearse: 2 ♂, 7.3–8.4 mm cl (USNM 155243); Macon Beach, Beaufort, 0.5 m, July 12, 1939, coll. A. S. Pearse: 1 ♂, 8.4 mm cl, 1 oviger, 10.9 mm cl (USNM 155244); Macon Beach, Beaufort, 0.5 m, July 14, 1939, coll. A. S. Pearse: 2 ♂, 7.8–8.2 mm cl, 1 oviger, 11.7 mm cl (USNM 155245); ocean beach, Fort Macon, above low tide line, coll. unknown: 1 ♀, 8.8 mm cl (USNM 267790); Fort Macon, Beaufort, June 1940, coll. O. Hartman: 1 ♂, 8.9 mm cl (USNM 267791); bathing beach, Bogue Bank, Beaufort, June 27, 1929, coll. A. Shaftsbury: 1 ♂, 6.2 mm cl, 1 ♀, 8.4 mm cl (USNM 62783); Bogue Banks, near Fort Macon, May 11, 1941, coll. K. D. McDougall: 1 ♂, 4.2 mm cl (USNM 81968); Beaufort, Aug. 1, 1941, coll. A. S. Pearse: 2 ♂, 8.9–9.1 mm cl, 1 unmeasurable juvenile (USNM 81969); Sta. 316, Fort Macon, Outside Beaufort, July 21, 1941, coll. A. S. Pearse: 1 first stage crab, 2.1 mm cl (USNM 81971); Bird Shoal, Beaufort, Aug. 16, 1941, coll. A. S. Pearse: 1 ♀, 8.9 mm cl (USNM 81972); Sta. 267, Bird Shoal, Beaufort, June 18, 1941, coll. A. S. Pearse: 1 ♂, 6.7 mm cl (USNM 81973); Sta. 299, Fort Macon Beach, outside Beaufort, July 10, 1941, coll. A. S. Pearse: 1 ♀, 7.2 mm cl, 1 oviger, 8.9 mm cl (USNM 81975); Sta. 303, Bird Shoal, Beaufort, July 12, 1941, coll. A. S. Pearse: 1 ♂, 7.6 mm cl, 1 unsexable specimen, 9.9 mm cl (USNM 81974), 1 ♂, 8.3 mm cl (RMNH 14630 ex USNM 81974); Sta. 331, outer beach, Cape Lookout, Aug. 9, 1941, coll. A. S. Pearse: 1 ♀, 4.8 mm cl, 8 juveniles, 2.6–4.4 mm cl (USNM 81970); Cape Lookout, Aug. 9, 1941, coll. A. S. Pearse: 1 ♂, 9.2 mm cl (USNM 82146); **South Carolina:** *Charleston Co.*: Edisto Beach at McMillan Cottage, April 14, 1979, coll. M. L. Jones: 1 ♂, 7.0 mm cl, 1 ♀, 5.8 mm cl (USNM 285389); Charleston, coll. unknown: 15 ♂, 5.4–7.8 mm cl, 7 ♀, 6.5–8.3 mm cl (MCZ 867); Sta. 2260, 32°51'N, 79°25'W”, 12 m, May 20, 1965, coll. National Marine Fisheries Service “*Asterias 65-1*”: 1 ♂, 4.7 mm cl (MCZ 19652); **Georgia:** *Liberty Co.*:



North Beach, St. Catherines Island, May 17, 1995, coll. C. B. Boyko: 2 ♂, 6.9–7.8 mm cl (AMNH 17183); Sta. M2, North Beach, St. Catherines Island, Oct. 17, 1997, coll. C. B. Boyko, J. Slapcinsky, and R. Moyle: 2 ♂, 5.1–7.8 mm cl (AMNH 17642); Sta. M2, North Beach, St. Catherines Island, Oct. 12, 1999, coll. C. B. Boyko, A. Carson, M. Spector, and J. Williams: 1 ♂, 8.9 mm cl (AMNH 18085); Sta. M5, sandbar offshore, North Beach, St. Catherines Island, May 16, 1998, coll. C. B. Boyko, J. Slapcinsky, A. and D. Harvey, and J. Williams: 1 ♂, 5.8 mm cl, 1 ♀, 7.6 mm cl (AMNH 17740); Sta. M5, sandbar offshore, North Beach, St. Catherines Island, May 20, 1998, coll. C. B. Boyko, J. Slapcinsky, A. and D. Harvey, and J. Williams: 1 ♂, 6.8 mm cl, 1 unsexable and unmeasurable molt (AMNH 17741); Sta. M5, sandbar offshore, North Beach, St. Catherines Island, May 20, 1998, coll. C. B. Boyko, J. Slapcinsky, A. and D. Harvey, and J. Williams: 1 left maxilliped III (rest eaten by unidentified shorebird) (AMNH 17739); Sta. M5, sandbar offshore, North Beach, St. Catherines Island, Oct. 29–Nov. 4, 1998, coll. C. B. Boyko, A. Harvey, M. Spector, J. and J. Slapcinsky, and J. Williams: 1 ♂, 6.8 mm cl (AMNH 17903); Sta. M5, sandbar offshore, North Beach, St. Catherines Island, Oct. 31, 1998, coll. C. B. Boyko, A. Harvey, M. Spector, J. and J. Slapcinsky, and J. Williams: 2 ♂, 7.0–7.5 mm cl (AMNH 17892); Sta. M5, sandbar offshore, North Beach, St. Catherines Island, Nov. 3, 1998, coll. C. B. Boyko, A. Harvey, M. Spector, J. and J. Slapcinsky, and J. Williams: 1 ♂, 5.5 mm cl, 1 ♀, 6.5 mm cl (AMNH 17896); Sta. M5, sandbar offshore, North Beach, St. Catherines Island, Oct. 13, 1999, coll. C. B. Boyko, A. Carson, M. Spector and J. Williams: 2 ♂, 4.9–8.2 mm cl, 3 ♀, 4.3–5.4 mm cl (AMNH 18084); Sta. M7, South Beach, St. Catherines Island, May 19, 1998, coll. C. B. Boyko, J. Slapcinsky, A. and D. Harvey, and J. Williams: 1 ♂, 5.8 mm cl (AMNH 17738); Sta. M21, between North Beach and Engineer's Point, St. Catherines Island, May 22, 1998, coll. C. B. Boyko, J. Slapcinsky, A. and D. Harvey, and J. Williams: 4 unsexable molts, 7.3–9.9 mm cl (AMNH 17742); Sta. M22, west of Engineer's Point, St. Catherines Island, Oct. 18, 1997, coll. C. B. Boyko, J.

Slapcinsky, and R. Moyle: 1 ♀, 10.5 mm cl (AMNH 17629); *McIntosh Co.*: Sapelo Island, intertidal, Feb. 24, 1963, coll. M. Gray: 2 ♂, 5.3–5.9 mm cl, 2 ♀, 6.1–7.2 mm cl (USNM 150673); off Georgia, 31°45'N, 80°28'W, 16 m, Feb. 24, 1977, coll. Texas Instruments: 1 ♂, 12.6 mm cl (USNM 174091); **Florida**: *Martin Co.*: ca. 1 mi north of St. Lucie Inlet, 27°10'54"N, 80°09'30"W, July 10, 1984, coll. R. B. Manning: 1 ♂, 8.7 mm cl (USNM 221780); ca. 1 mi north of St. Lucie Inlet, 27°10'54"N, 80°09'30"W, July 8, 1984, coll. R. B. Manning: 1 ♀, 4.2 mm cl (USNM 221781); ca. 1 mi north of St. Lucie Inlet, 27°10'54"N, 80°09'30"W, July 13, 1984, coll. R. B. Manning: 1 juvenile, 3.6 mm cl (USNM 221783); ca. 1 mi north of St. Lucie Inlet, 27°10.9'N, 80°09.5'W, July 16, 1984, coll. R. B. Manning: 1 ♂, 7.5 mm cl (HBOM 089:06395); *Pinellas Co.*: Tampa Bay, coll. unknown: 1 ♀, 4.9 mm cl (USNM 49117); **Mississippi**: *Jackson Co.*: south side, Petit Bois Island, Aug. 4, 1953, coll. S. L. Wallace: 1 ♀, 11.9 mm cl (USNM 95752); Horn Island, 1 m, May 29, 1985, coll. C. J. Field: 1 oviger, 10.6 mm cl (USNM 231290); *Harrison Co.*: Ship Island, north side near lighthouse, Aug. 21, 1951, coll. Allredge, Rosso, and Breland: 1 ♂, 6.5 mm cl (USNM 92432); **Louisiana**: *Jefferson Parish*: Grand Terre Island, Oct. 11, 1975, coll. D. Clark: 1 ♂, 6.3 mm cl (USLZ 437); Grande Terre Island, 0.5 mi east of Ft. Livingston, Oct. 11, 1975, coll. S. Williams: 1 ♂, 7.6 mm cl (USLZ 499); Grand Terre Island, Oct. 10, 1975, coll. R. Spinello: 3 ♂, 8.0–8.5 mm cl (USLZ 501); Elmer's Island, Cherniere Caminada, May 30, 1973, coll. D. L. Felder: 1 ♂, 7.8 mm cl, 1 ♀, 8.9 mm cl (USLZ 2017); **Texas**: *Nueces Co.*: Mustang Island, south end, approximately 10 mi south of Port Aransas, Oct. 31, 1975, coll. C. Dugas: 1 ♂, 6.9 mm cl (USLZ 528); Mustang Island, approximately 10 mi south of Port Aransas, Aug. 14, 1979, coll. D. L. Felder: 1 ♀, 7.3 mm cl (USLZ 2037).

**No Data**: 5 ♂, 5.0–8.3 mm cl, 6 ♀, 6.9–10.2 mm cl (MCZ 13225), 1 ♀, 10.5 mm cl (BMNH 1998.91 ex MCZ 13225).

**DIAGNOSIS**: Carapace wider than long, with lightly setose grooves. Anterior margin with two large spines lateral to ocular sinus. CG5 absent; CG8 absent; CG10 absent; posterior



submarginal groove reaching slightly beyond posterior margin of posterior concavity. Rostrum present, rounded and armed with ventral acute spine. Distal peduncular segments dorsoventrally flattened, ovate, distal margin smooth; pigmented notch present. Antennal segment I unarmed. Dactylus of pereopod II with heel produced, tapering, and subacute. Dactylus of pereopod III with heel thin, projecting, acute. Dactylus of pereopod IV with produced acute heel and deep indent. Telson of male spatulate, proximal two-thirds laterally convex, distal third laterally concave, lateral expansions rounded, distal tip rounded; medioproximal third heavily calcified, lateral and distal regions decalcified.

**DESCRIPTION:** Carapace (fig. 38A) wider than long. Anterior margin concave on either side of ocular sinus, smooth. Rostrum as subacute projection reaching beyond median peduncular segments and with a submarginal, terminal acute spine. Ocular sinus smoothly concave; unarmed. Frontal region smooth; setal field reduced to narrow band anterior and paralleling CG1, concave medially. CG1 parallel to anterior margin of carapace, sinuous, slightly crenulate, medially concave, medial and lateral elements united. Mesogastric region smooth; CG2 absent; CG3 absent; CG4 with three or four very short elements and two longer oblique lateral elements. Hepatic region smooth with oblique lateral, setose groove and short, acute spine at median of lateral margin. Epibranchial region generally triangular, smooth; posterolateral margin with four short rows of setae. Metagastric region smooth; CG5 absent. CG6 crenulate, with separate oblique, long lateral fragments and short, sinuous median element united with CG7. CG7 straight relative to anterior margin of carapace and united with median fragment of CG6. Cardiac region smooth; CG8–11 absent. Branchial region with few punctae but without short, transverse rows of setae. Posterior margin deeply and irregularly concave medially and more or less straight laterally, with submarginal groove reaching slightly beyond posterior margin of posterior concavity. Branchiostegite without anterior submarginal spine; anterior region with anterodorsal transverse groove and granular surface; with many long plumose setae; posterior region membranous with numerous, ir-

regular fragments and sparsely covered with long plumose setae.

Ocular plate covered by carapace; median peduncular segments (fig. 38A) reduced to small rounded calcified area anterolateral to ocular plate. Distal peduncular segments (fig. 38B) irregularly ovate, angled distolaterally, flattened with convex lateral and mesial margins, margins smooth; pigmented area at notch on lateral margin one-third from proximal margin present; mesial margins separated along entire length; mesial, lateral and distal margins with long simple setae.

Antennule (fig. 38C) segment III narrow proximally, expanding distally to two times proximal width; with plumose setae on ventral margin; dorsal exopodal flagellum with 150–170 articles ( $n = 6$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with two articles ( $n = 6$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins and in oblique row on mediiodistal surface. Segment I wider than long, unarmed; dorsomedial third of lateral surface rugose, with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 38D) with segment V approximately 1.5 times longer than wide, with short plumose setae on dorsal and distal margins; flagellum with eight articles ( $n = 6$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV almost cylindrical, overreaching segment III by one-third of its length, with long plumose setae on dorsal and distal margins, and row of setae on dorsolateral margin. Segment III with long plumose setae on ventral margin. Segment II widening distally, with plumose setae on dorsal margin and in short transverse medioidistal row; antennal acicle short, triangular, overreaching segment IV proximal margin by one-fourth of its length, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened and truncated ventrolaterally, with long plumose setae on margins; lateral margin unarmed; segment with ventromesial antennal gland pore.

Mandible (fig. 38E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on mar-

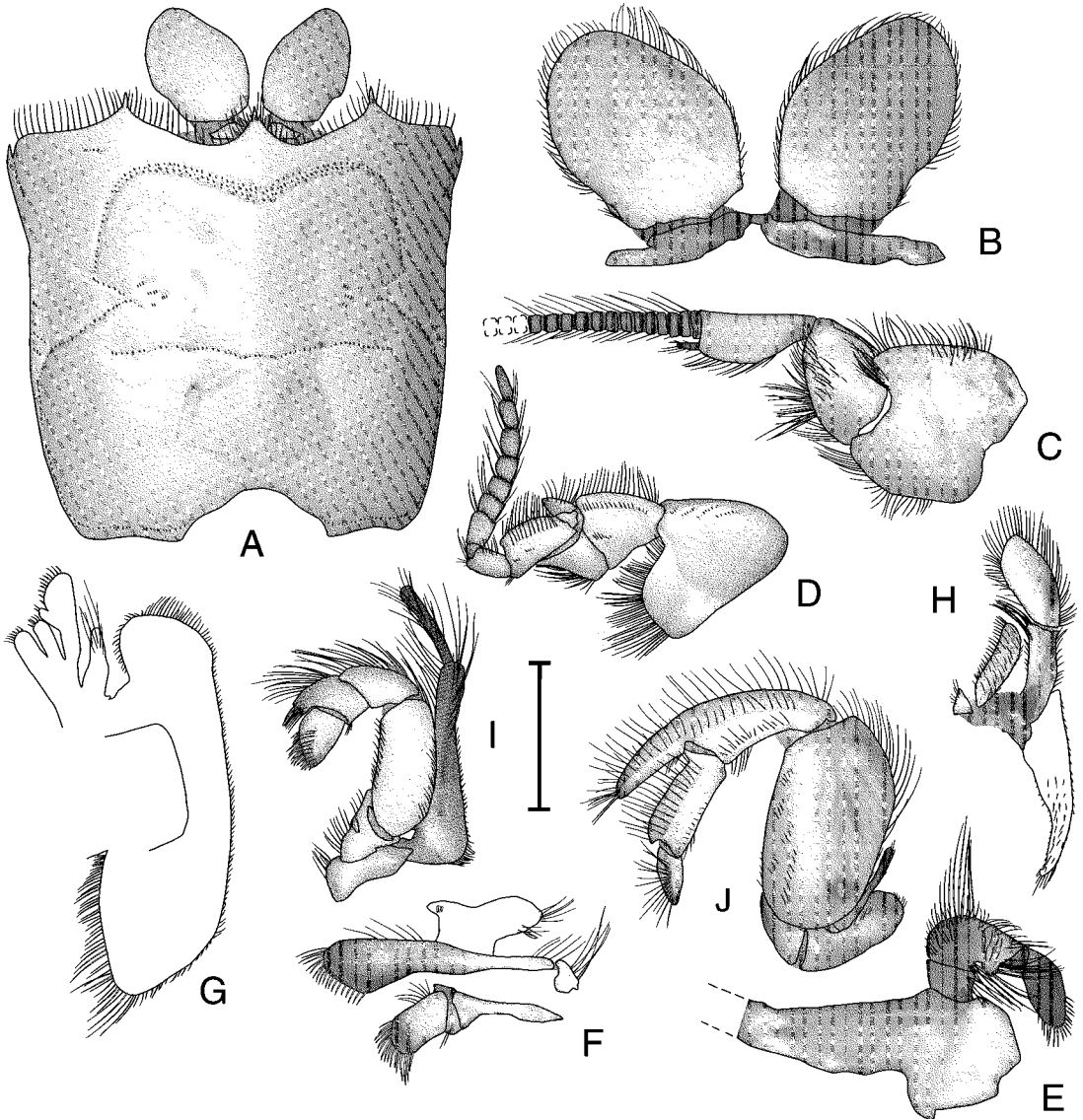


Fig. 38. *Lepidopa websteri* Benedict, 1903: A–J, ♂, 7.1 mm cl, MCZ 13225. **A.** Carapace and ocular peduncles, dorsal view. **B.** Ocular peduncles, dorsal view. **C.** Left antennule, lateral view. **D.** Left antenna, lateral view. **E.** Left mandible, mesial view. **F.** Left maxillule, lateral view. **G.** Left maxilla, lateral view. **H.** Left maxilliped I, lateral view. **I.** Left maxilliped II, lateral view. **J.** Left maxilliped III, lateral view. Scale = 1.4 mm (F), 1.6 mm (B, E), 2.2 mm (C, G, I), 3.0 mm (J), 3.3 mm (D, H), and 4.4 mm (A).

gins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 38F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and plumose setae on dorsal margin. Proximal

endite with thick simple setae on distal margin. Endopod external lobe truncate distally and curled under, with wide proximal projection; internal lobe reduced, with three thick setae at distolateral margin.

Maxilla (fig. 38G) exopod rounded with

plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe with plumose setae.

Maxilliped I (fig. 38H) epipod with plumose setae on margins and on distolateral surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, margins with plumose setae; distal segment spatulate, longer than wide, curved mesially, broadest medially, margins with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins.

Maxilliped II (fig. 38I) dactylus evenly rounded, longer than wide, with thick simple setae distally and thin simple setae in short row on lateral surface. Propodus slightly produced dorsodistally, two times wider than long, with plumose setae on dorsal margin and long simple setae on dorsodistal margin. Carpus not strongly produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal margin. Merus two times longer than wide, margins parallel but slightly inflated submedially, with simple setae on ventrolateral margin and plumose setae on dorsolateral margin. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-third longer than merus, flagellum with one elongate article.

Maxilliped III (fig. 38J) dactylus elongate and evenly rounded; long plumose setae on margins and lateral surface. Propodus with longitudinal median row of plumose setae on lateral surface; margins with plumose setae. Carpus strongly produced onto propodus, almost reaching distal margin of propodus; lateral surface with medial transverse row of plumose setae; plumose setae on margins. Merus unarmed, broadly inflated distolaterally, with plumose setae on distolateral margin. Basis-ischium incompletely fused, without crista dentata. Exopod two-segmented: proximal segment small; distal segment styliform, tapering, approximately one-third length of merus, with plumose setae on margins; without flagellum.

Pereopod I (fig. 39A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with small rugose area proxi-

mally, smooth distally; ventral margin with short simple setae. Propodal lateral surface with numerous short, transverse rows of setose rugae; dorsal margin with few small low ridges; ventral margin distally produced into acute spine; cutting edge lacking teeth, lined with long plumose setae; dorsal margin with short plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle rounded, dorsal margin smooth, with short plumose setae; lateral surface with few transverse setose ridges; mesial surface smooth, with medial transverse row of long plumose setae. Merus unarmed; lateral surface with scattered transverse rows of short plumose setae, margins with long plumose setae; mesial surface with few short rows of setae; proximal third of mesial surface with decalcified window. Basis-ischium incompletely fused, unarmed. Coxa with small posteromesial tubercle.

Pereopod II (fig. 39B) dactylus smooth; with base to heel concave, heel produced and narrowing to subacute tip, heel to tip with narrow, acute indent, tip acute, tip to base broadly convex; lateral surface smooth; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae, with patch of long plumose setae at base reaching across median of heel. Propodus with dorsal surface smooth, ventral margin inflated and rounded; distal and ventral margin with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with long plumose setae on ventral margin; short transverse row of long plumose setae on surface; mesial surface with subdistal row of long plumose setae. Carpus strongly produced dorsodistally, reaching three-fourths length of propodus; lateral surface nearly smooth, with two irregular, interrupted rows of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; dorsal margin with long plumose setae; mesial surface smooth, with medial transverse row of long plumose setae. Merus lateral surface almost entirely decalcified, with long plumose setae on margins; mesial surface nearly smooth, with oblique median ridge, long plumose setae patches dorsal to ridge and in row ventrally, with decalcified area on proximal half of area dorsal



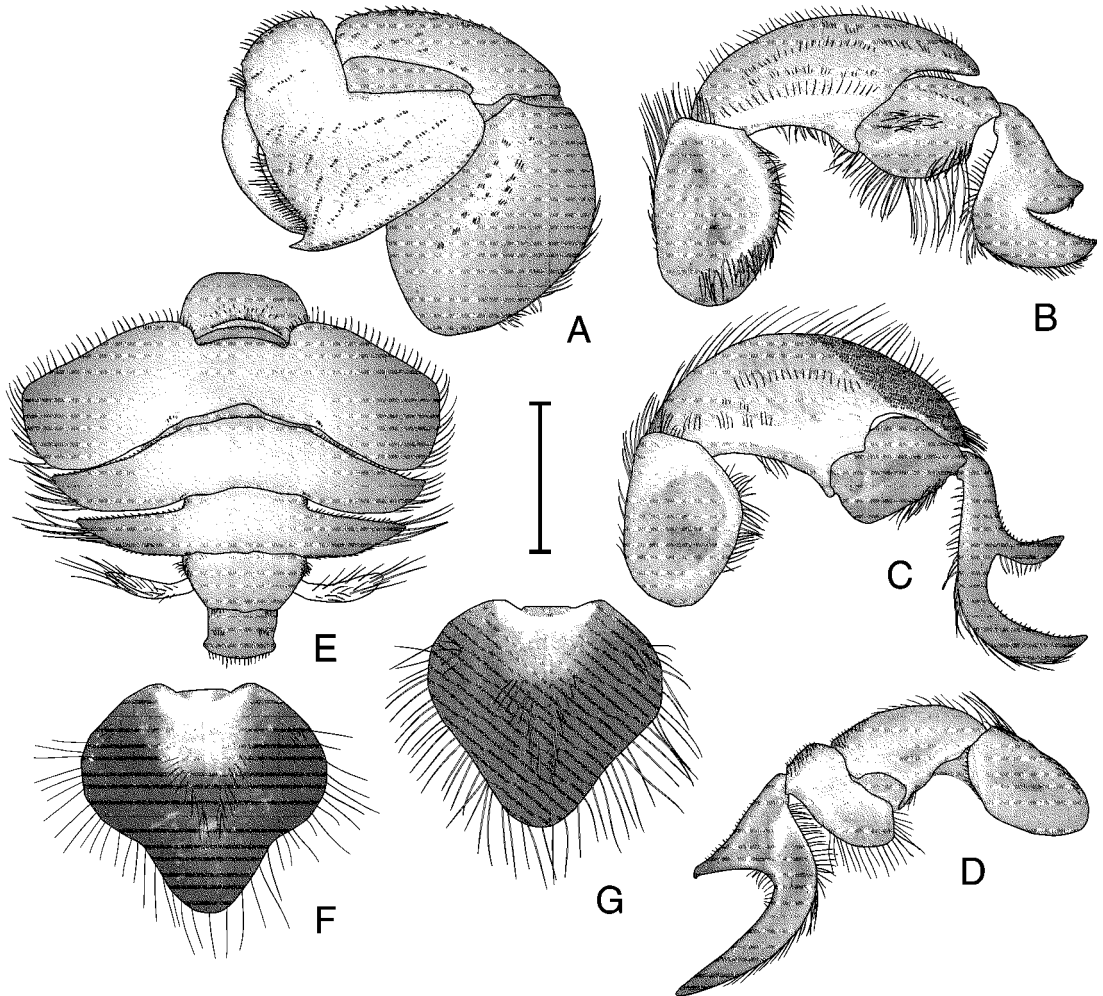


Fig. 39. *Lepidopa websteri* Benedict, 1903: A-F, ♂, 7.1 mm cl, MCZ 13225; G, ♀, 7.9 mm cl, MCZ 13225. A. Left pereopod I, lateral view. B. Right pereopod II, lateral view. C. Right pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I-VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 1.6 mm (F), 1.7 mm (G), 3.3 mm (A-D), and 4.4 mm (E).

to ridge. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 39C) dactylus base to heel broadly indented, heel acute, thin, and produced, heel to tip with broad, evenly rounded indent, tip acute, tip to base smoothly convex; lateral surface smooth, with tufts of short setae at end of heel and tip, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae

proximally at junction with propodus and in row across base of heel. Propodus not inflated dorsoventrally; lateral surface smooth, with simple setae subdorsally and long plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened; mesial surface with scattered long setae on and near distoventral margin. Carpus strongly produced dorsodistally and inflated, reaching distal margin of propodus, pointed and almost acute; dorsolateral margin unarmed; lateral surface with mat of short setae on dor-



sodistal third of segment, long transverse row of setae medially and scattered on proximal lateral surface; dorsal margin with long plumose setae; mesial surface smooth, dorsomesial third decalcified, with long plumose setae on margins and in median transverse row ventral to decalcified area. Merus smooth, lateral surface almost entirely decalcified; dorsal and ventral margins unarmed, with long plumose setae; laterodistal margin with long plumose setae; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female pereopod III with large mesioproximal gonopore (not opposing other gonopore); male with slightly smaller pore.

Pereopod IV (fig. 39D) dactylus with base to heel slightly concave, heel acute, heel to tip broadly rounded and concave, tip acute, tip to base convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge across heel, with row of short plumose setae. Propodus expanded dorsally and ventrally; ventral expansion not reaching ventral margin of dactylus, margins with long plumose setae; dorsal expansion with row of long plumose setae medially and mat of short setae; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; lateral and mesial surfaces smooth; dorsomedial two-thirds of lateral and mesial surfaces decalcified; dorsal margin with small mat of short setae at dorsodistal angle; ventral margin with short simple setae. Merus with large median decalcified area on lateral surface and few short transverse rows of setae, dorsal and ventrodistal margins with long plumose setae; mesial surface with large decalcified window proximoventrally. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 39E) with somite I wider than long, widest posteriorly; dorsal surface with anterior margin straight; posterior margin concave, with elevated submarginal curved row of short setae and narrow field of short simple setae anterior to submarginal row; with small, faint, transverse decalcified window laterad of segment median. Somite II anterior margin convex, posterior margin

irregularly concave; pleura expanded and directed posterolaterally, angled anterolaterally, rounded posterolaterally, small patch of short simple setae at posteromesial margin; anterior and lateral margins with long plumose setae, posterior margin with short setae. Somite III similar to somite II, narrower and shorter; pleura thinner and shorter than on somite II, directed posterolaterally proximally and curving forward distally, with setae as in somite II; anterolateral angle acute; dorsal surface slightly obliquely flattened anterolaterally. Somite IV similar to somite III; pleura thinner and shorter than on somite III, directed laterally; dorsal surface slightly obliquely flattened anterolaterally; margin with long plumose setae. Somite V wider than somite IV, narrowing posteriorly; anterolateral margins with plumose setae, two rows of setae on posterior margin; pleura distinct from somite, shorter than in somite IV, thin, flattened, directed anterolaterally, and covered with plumose setae. Somite VI narrower than somite V; dorsal surface with two short transverse rows of setae laterad of midline anteriorly, posterior margin with long plumose setae; pleura absent.

Female with long uniramous pleopods on somites II–V; male with small pleopods.

Telson of male (fig. 39F) spatulate, proximal two-thirds laterally convex, distal third straight, tapering, lateral expansions rounded, distal tip rounded; medioproximal third heavily calcified, lateral and distal regions decalcified; median longitudinal groove running along calcified region; two distally converging rows of short simple setae in medial third; margin with long simple setae. Telson of female (fig. 39G) similar to male, with only slightly less tapering distolateral third.

**DISTRIBUTION:** From North Carolina south to Texas, USA, in up to 12 m depth. Larvae known from as far north as Virginia.

**MAXIMUM SIZE:** Males: 12.6 mm cl; females: 12.8 mm cl.

**TYPE SPECIMEN:** USNM 42214 (holotype).

**TYPE LOCALITY:** Fort Macon, North Carolina, USA.

**REMARKS:** The holotype was originally deposited in the collections of Union University in New York (Benedict, 1903) and was later transferred to USNM.

The U-shaped burrowing pattern of this

species was discussed by Howard (1968), who correctly suggested that this species was, at least in part, a detritus feeder. Hill (1979) indicated that this species was filter-feeding during the day and deposit-feeding at night, but he gave no data to support this. Hill's (1979) supposed observations of filter-feeding at night were likely observations of water circulation.

This species is an excellent example of the relative scarcity of albuneids. As of 1918, only two specimens (one being the holotype) were known. Hay and Shore (1918) noted "a vast amount of digging close to shore has failed to produce any living specimen, nor has dredging at distances from the shore varying from 200 yards to 20 miles". This species is most common exactly at the edge of the low tide line in areas of low wave action (Boyko, personal obs.), where it is assured of minimal turbulence and maximum coverage by water during the tidal cycle, but appears never to occur in high densities in any location along this zone.

Ovigerous females are known from North Carolina in July (Williams, 1984). Larvae of this species have been recorded off Virginia, as far as 36° north (Sandifer and Van Engel, 1972), and have been found in the North Carolina and Virginia plankton during July and August (Williams, 1984). Zoal stages I–III were recorded from the plankton off Virginia by Sandifer and Van Engel (1972). Kurata (1970) reported that this species had five or six zoal stages, and he described stage I from larvae obtained from an ovigerous female and stages II, IV, and "6" from the Georgia plankton. However, as pointed out by Stuck and Truesdale (1986), it is more likely that Kurata (1970: pl. 56, fig. e) had four sequential zoal stages, and that stage IV molted into the so-called megalopa. Kurata's "megalopa" was a curious hybrid of a zoal anterior half and a megalopal posterior half. Kurata (1970) was apparently unaware of the aberrant nature of this specimen and made no comment on its unusual appearance. This illustrates the difficulty of extrapolating "normal" larval development from a single specimen (see also Gore and Van Dover, 1981).

The color of *L. websteri* is white, iridescent, with pink tinting on the anterior portion

of carapace and blue along carapace grooves and branchiostegite and distal segments of pereopod V, abdominal somites pinkish, with blue-green margins (Boyko, personal obs., modified from Williams, 1984).

This species is a member of the "venusta-group" and is closest to *L. venusta* and *L. dexterae*.

*Lepidopa venusta* Stimpson, 1859

Figures 40, 41

- Lepidopa venusta* Stimpson, 1858: 230 (nomen nudum). – Stimpson, 1859: 79. – Ortmann, 1896: 226 (part). – Garcia Mendes, 1945: 119 (list). – Holthuis, 1962: 125–128. – ICZN, 1964: 28–29. – Gomes, 1965: 97–102, figs. 1–9\*. – Castro, 1967: 2\*. – Efford, 1971: 87–89 (part)\*. – Coêlho and Ramos, 1972: 176 (list). – Rodriguez, 1980: 237–238, fig. 53. – Calado, 1987: 143–149, pl. 20\*. – Coêlho and Calado, 1987: 43, table 1. – Melville and Smith, 1987: 307. – Calado et al., 1990: 749–750, fig. 3b\*. – Rosini et al., 1994: 103–106. – Calado, 1995: 203–206, pl. 39, fig. o, pl. 40, fig. n, pl. 41, fig. n, pl. 67, figs. a–c, pl. 68, figs. a–e\*. – Calado, 1998: 408. – Nucci et al., 2001: 479.
- Lepidops venusta*: Miers, 1878: 332–333 (unjustified emendation).
- Lepidopa* sp. Gordon, 1938: 188, fig. 1a\*.  
not *Lepidops venusta*: Kingsley, 1880: 410 (= *Lepidopa websteri* Benedict, 1903).
- not *Lepidopa venusta*: Ortmann, 1896: 226 (part) (= *Lepidopa websteri* Benedict, 1903).
- not *Lepidopa venusta*: Boone, 1930: 61–63, pl. 16, figs. a–c (= *Lepidopa benedicti* Schmitt, 1935).
- not *Lepidopa venusta*: Benedict, 1903: 892, fig. 2\*. – Schmitt, 1935: 210, fig. 70\*. – Gordon, 1938: 188, fig. 2b\*. – Efford, 1971: 87–89 (part), figs. 3p, 4l, t, 5c, k, 6h, 7b\*. – Manning, 1988: 626–627, 630–631, fig. 4\* (= *Lepidopa luciae*, n. sp.).

**MATERIAL EXAMINED: U.S. Virgin Islands:** St. Thomas, coll. A. H. Riise: 1 ♀, 10.6 mm cl, neotype (ZMUC 8557).

**Panama:** La Venta, March 11, 1937, coll. S. F. Hildebrand: 1 ♂, 11.1 mm cl (USNM 304309).

**Brazil:** Ilha Do Pai, Rio de Janeiro, May 1, 1962, coll. B. Tursch: 1 ♂, 7.4 mm cl (MNRJ 1554); Praia De Baraquecaba, Rio de Janeiro, Nov. 10, 1966, coll. A. S. F. Ditadi: 1 ♀, 5.1 mm cl (MNRJ 3857); Praia de Domingos, Dominques, Ubatuba, São Paulo,

Aug. 27, 1958, coll. F. C. Müller: 1 ♂, 7.9 mm cl, 1 ♀, 8.4 mm cl (MNRJ 1553).

**DIAGNOSIS:** Carapace wider than long, with lightly setose grooves. Anterior margin with two large spines lateral to ocular sinus. CG5 absent; CG8 present as punctae; CG10 present as punctae; posterior submarginal groove reaching to posterior margin of posterior concavity. Rostrum present, rounded and armed with ventral acute spine. Distal peduncular segments dorsoventrally flattened, ovate, distal margin smooth. Cornea absent. Antennal segment I unarmed. Dactylus of pereopod II with heel produced, tapering, and subacute. Dactylus of pereopod III with heel thin, projecting, acute. Dactylus of pereopod IV with produced acute heel and deep indent. Telson of male spatulate, proximal two-thirds laterally convex, distal third laterally concave with lateral expansions rounded, distal tip rounded; medioproximal third heavily calcified, lateral and distal regions decalcified.

**DESCRIPTION:** Carapace (fig. 40A) wider than long. Anterior margin straight to slightly convex on either side of ocular sinus, smooth. Rostrum as rounded projection reaching beyond median peduncular segments and with a submarginal, terminal acute spine. Ocular sinus smoothly concave; unarmed. Frontal region smooth; setal field reduced to narrow band anterior and paralleling CG1, concave medially. CG1 parallel to anterior margin of carapace, sinuous, slightly crenulate, medially concave, medial and lateral elements united. Mesogastric region smooth; CG2 absent; CG3 absent; CG4 with numerous (ca. 12–20) anteriorly and posteriorly displaced very short elements and two short, broken, oblique lateral elements connected to posterior margins of CG1 lateral elements. Hepatic region smooth with oblique lateral setose groove and very short, thin, acute spine at median of lateral margin. Epibranchial region roughly triangular, smooth; posterolateral margin with four short rows of setae. Metagastric region smooth; CG5 absent. CG6 crenulate, with separate oblique curved long lateral fragments and short, nearly straight, median element united with CG7. CG7 nearly straight relative to anterior margin of carapace and united with median fragment of CG6. Cardiac region

smooth; CG8 present as four minute setose punctae. CG9 present as two minute setose punctae. CG10 present as few minute setose punctae in oblique rows. CG11 absent. Branchial region with few setose punctae but without short, transverse rows of setae. Posterior margin deeply and smoothly concave medially and more or less straight laterally, with submarginal groove reaching to posterior margin of posterior concavity. Branchiostegite without anterior submarginal spine; anterior region with anterodorsal transverse groove and granular surface; with many long plumose setae; posterior region membranous with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 40B) small, rounded; median peduncular segments laterally elongate, oblong, not covered by carapace, anterolaterally ventral to ocular plate. Distal peduncular segments irregularly ovate, angled distolaterally, flattened with convex lateral and mesial margins, margins smooth; mesial margins separated along entire length; mesial, lateral, and distal margins with long simple setae.

Antennule (fig. 40C) segment III narrow proximally, expanding distally to two times proximal width; with plumose setae on dorsal and ventral margins; dorsal exopodal flagellum with 139–150 articles ( $n = 3$ ) on broken flagella, 250 articles ( $n = 1$ ) on intact flagellum, long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with 2 or 3 articles ( $n = 5$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins and scattered on distoventral third of lateral surface. Segment I width and length subequal, unarmed; lateral surface with submarginal dorsal row of long plumose setae and transverse rows of long plumose setae across segment median; long plumose setae on dorsal and ventral margins.

Antenna (fig. 40D) with segment V approximately one-fifth times longer than wide, with short plumose setae on dorsal margin and in submarginal ventral row, long plumose setae on distoventral margin; flagellum with eight articles ( $n = 5$ ), long plumose setae on dorsal, ventral, and distal margins.

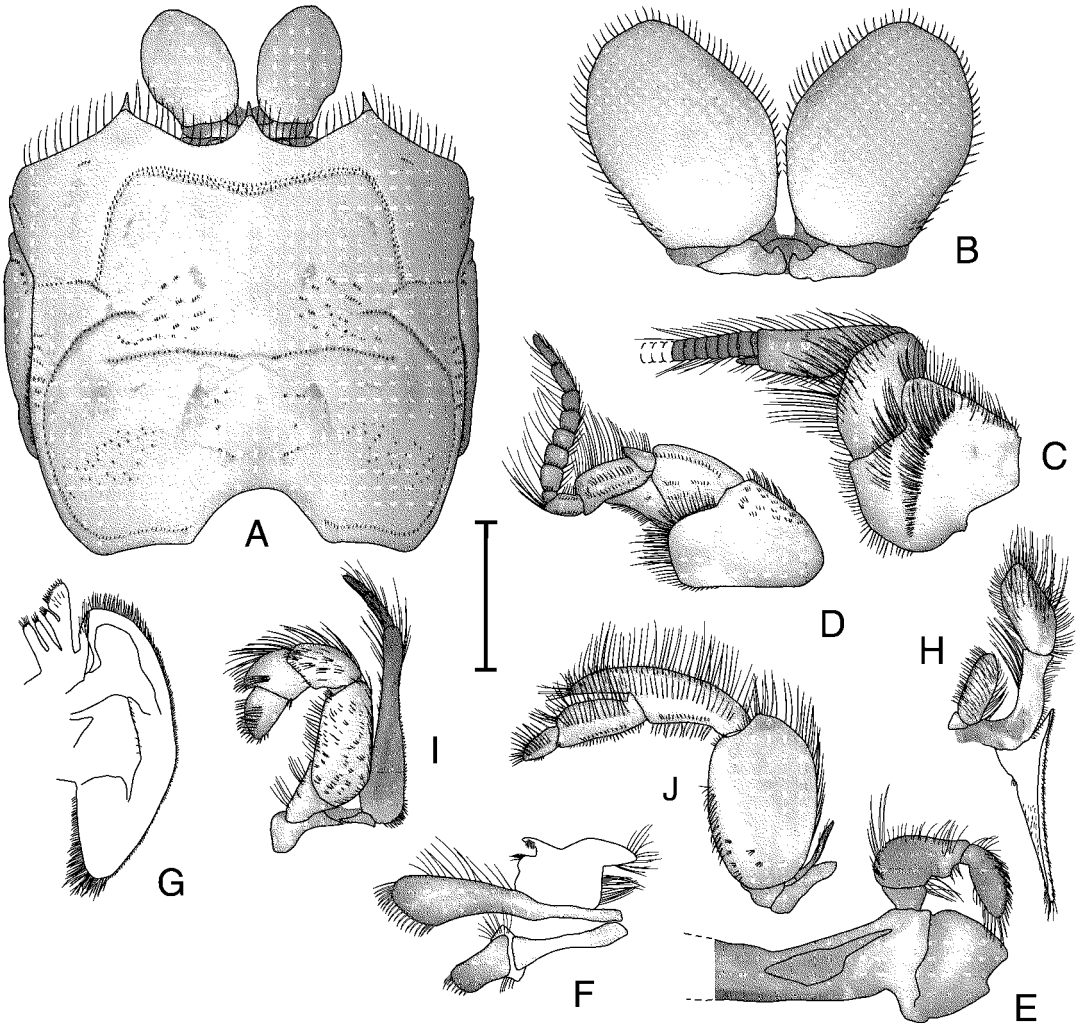


Fig. 40. *Lepidopa venusta* Stimpson, 1859: A, ♀, 10.6 mm cl, ZMUC 8557, neotype; B–J, ♂, 11.1 mm cl, USNM 304309. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Left maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 2.1 mm (E, F), 2.2 mm (B), 3.0 mm (I), 3.3 mm (C), and 4.4 mm (A, D, G, H, J).

Segment IV almost cylindrical, overreaching segment III by two-fifths of its length, with long plumose setae on dorsal and distal margins, and two rows of short setae on lateral surface. Segment III with long plumose setae on ventral margin and short simple setae on dorsal margin. Segment II widening distally, with three rows of short plumose setae on lateral surface; antennal acicle short, triangular, overreaching segment IV proximal

margin by one-third of its length, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened and truncated ventrolaterally, with long plumose setae on margins, short simple setae scattered on dorsal quarter of lateral surface; lateral margin unarmed; segment with ventromesial antennal gland pore.

Mandible (fig. 40E) incisor process with two teeth; cutting edge with one tooth. Palp



three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 40F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and plumose setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under, with wide proximal projection; internal lobe reduced, with six thick setae at distolateral margin.

Maxilla (fig. 40G) exopod rounded with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 40H) epipod with plumose setae on margins and on distolateral surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, margins with plumose setae; distal segment spatulate, longer than wide, curved mesially, broadest medially, margins and distal three-fourths of lateral surface with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins.

Maxilliped II (fig. 40I) dactylus evenly rounded, longer than wide, with thick simple setae distally and thin simple setae in short row on lateral surface. Propodus slightly produced dorsodistally, one-half wider than long, with plumose setae on dorsal margin and long simple setae on dorsodistal and ventrodistal margins. Carpus not produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal margin and scattered on lateral surface. Merus one-half longer than wide, margins parallel but slightly inflated subproximally, with long simple setae on ventral margin, long plumose setae on dorsal margin and scattered on lateral surface. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-half longer than merus, flagellum with one elongate article.

Maxilliped III (fig. 40J) dactylus elongate and evenly rounded; long plumose setae on margins and in medial transverse row on lateral surface. Propodus with longitudinal median row of plumose setae on lateral surface;

submarginal ventral row of short simple setae; distodorsal tuft of long plumose setae; dorsal and ventral margins with short plumose setae. Carpus strongly produced onto propodus, overreaching three-fourths of propodal length; lateral surface with medial transverse row of long plumose setae, submarginal ventral row of short simple setae; long plumose setae on margins. Merus unarmed, broadly inflated distolaterally, depressed and decalcified medially, with long plumose setae on dorsal margin and short plumose setae on medioventral margin. Basis-ischium incompletely fused, without crista dentata. Exopod two-segmented: proximal segment small; distal segment styliform, tapering, approximately one-half length of merus, with plumose setae on margins; without flagellum.

Pereopod I (fig. 41A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with small rugose area proximally, smooth distally, with long plumose setae; ventral margin with short simple setae. Propodal lateral surface with numerous short, transverse rows of setose rugae; dorsal margin with few small, low ridges; ventral margin distally produced into acute spine; cutting edge lacking teeth, lined with long plumose setae; dorsal margin with short plumose setae, ventral margin with short simple setae; mesial surface with few short, transverse rows of setose rugae. Carpus with dorsodistal angle rounded and surface rugose, with short simple setae, dorsal margin smooth, with short plumose setae; lateral surface with few scattered transverse, setose ridges; mesial surface smooth, with transverse row of long plumose setae halfway from dorsal margin and few scattered short plumose setae on surface. Merus unarmed; lateral surface with scattered transverse rows of short plumose setae, dorsal margin with long plumose setae; mesial surface with few short rows of setae; proximal third of mesial surface with decalcified window. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 41B) dactylus smooth; with base to heel concave, heel produced and narrowing to subacute tip, with tuft of short simple setae, heel to tip with narrow, acute indent, tip acute with tuft of short simple se-

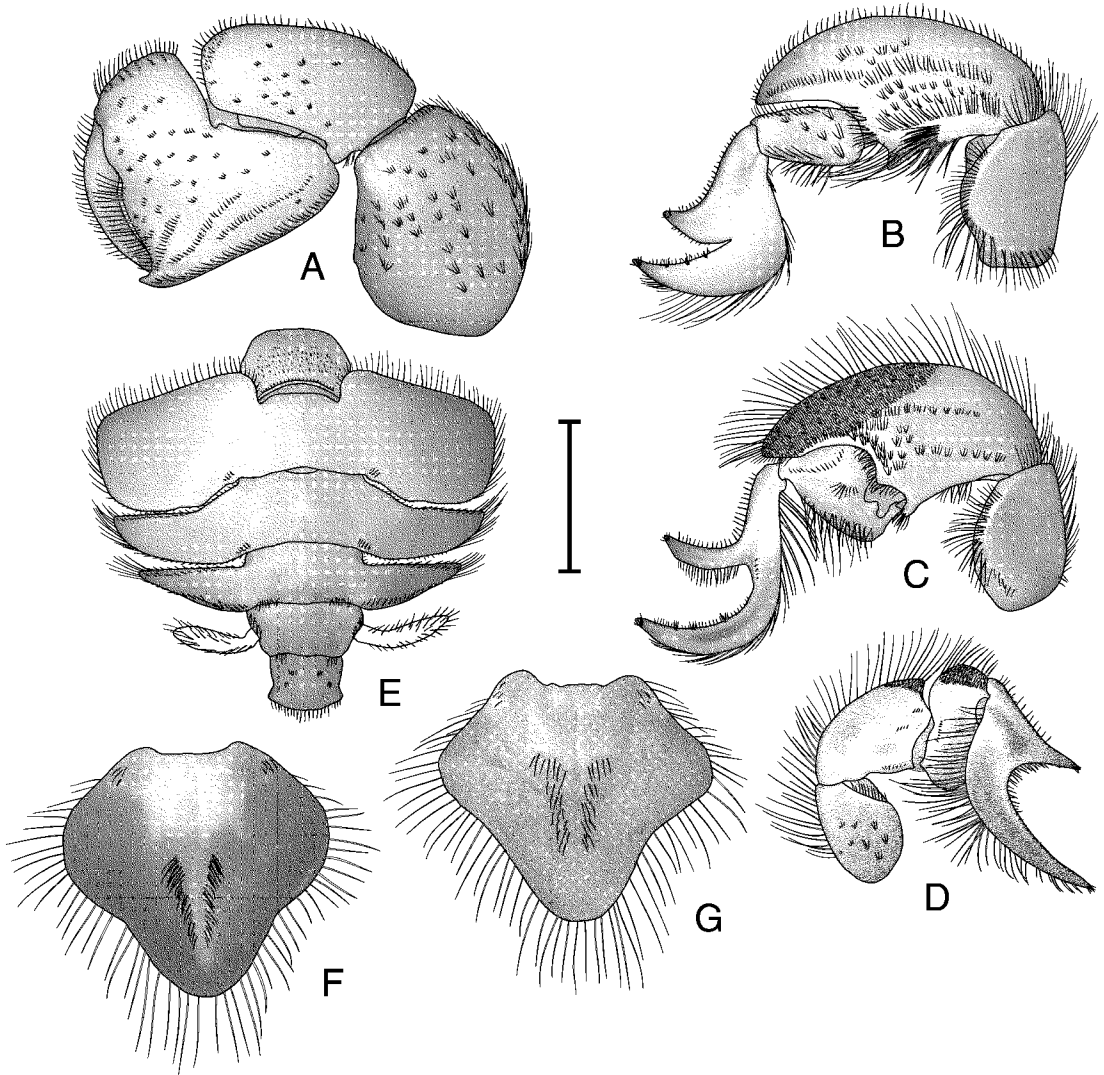


Fig. 41. *Lepidopa venusta* Stimpson, 1859: A-F, ♂, 11.1 mm cl, USNM 304309; G, ♀, 10.6 mm cl, ZMUC 8557, neotype. **A.** Left pereopod I, lateral view. **B.** Left pereopod II, lateral view. **C.** Left pereopod III, lateral view. **D.** Right pereopod IV, lateral view. **E.** Abdominal somites I-VI, dorsal view. **F.** Telson of ♂, dorsal view. **G.** Telson of ♀, dorsal view. Scale = 2.2 mm (F, G) and 4.4 mm (A-E).

tae, tip to base broadly convex; lateral surface smooth; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae, with patch of long plumose setae at base reaching across median of heel. Propodus with dorsal surface smooth, ventral margin inflated and rounded; distal and ventral margin with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with long plumose

setae on ventral margin; short transverse row of long plumose setae on surface; mesial surface with oblique row of long plumose setae, distal and ventral margins with dense row of long plumose setae. Carpus strongly produced dorsodistally, reaching distal margin of propodus; lateral surface nearly smooth, with four irregular, interrupted rows of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; dor-

sal margin with short plumose setae, distoventral and ventral margins with long plumose setae; mesial surface smooth with medial oblique and subdistal rows of long plumose setae, few scattered short plumose setae on surface. Merus lateral surface almost entirely decalcified, with long plumose setae on dorsodistal and ventral margins; mesial surface nearly smooth, with oblique median ridge, patches of long plumose setae dorsal to ridge and in row ventrally, with decalcified area on proximal half of area ventral to ridge. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 41C) dactylus base to heel broadly indented, heel acute, thin, and produced, heel to tip with broad, angled indent, tip acute, tip to base smoothly convex; lateral surface smooth, with tufts of short simple setae at end of heel and tip, lateral surface proximal to indent with few setose punctae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus and in row across base of heel. Propodus not inflated dorsoventrally; lateral surface smooth, with simple setae subdorsally and long plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened; mesial surface with scattered long setae on and near distoventral margin. Carpus strongly produced dorsodistally and inflated, overreaching distal margin of propodus, rounded; dorsolateral margin unarmed; lateral surface with mat of short setae on dorsodistal third of segment, two long transverse rows of setae medially and scattered on proximal lateral surface; dorsal margin with long plumose setae; mesial surface smooth, dorsomesial third decalcified, with long plumose setae on margins and in median oblique row ventral to decalcified area. Merus smooth, lateral surface almost entirely decalcified; dorsal and ventral margins unarmed, with long plumose setae; mesial surface smooth with patch of long plumose setae on proximomesial margin. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female pereopod III with large mesioproximal gonopore (not opposing other gonopore); male with slightly smaller pore.

Pereopod IV (fig. 41D) dactylus with base

to heel slightly concave, heel acute with distal tuft of short simple setae, heel to tip broadly rounded and concave, tip acute with distal tuft of short simple setae, tip to base convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge across heel, with row of short plumose setae. Propodus expanded dorsally and ventrally; ventral expansion not reaching ventral margin of dactylus, margins with long plumose setae; dorsal expansion with row of long plumose setae medially and mat of short setae; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; lateral and mesial surfaces smooth; dorsomesial two-thirds of lateral and mesial surfaces decalcified, with medial patch of long plumose setae subdistally and long plumose setae on distoventral margin of mesial surface; dorsal margin with small mat of short setae at dorsodistal angle; dorsal margin with long plumose setae, ventral margin with short simple setae. Merus lateral surface large median decalcified area, with few short transverse rows of setae, dorsal and distoventral margins with long plumose setae; mesial surface with large decalcified window proximoventrally. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 41E) with somite I wider than long, widest posteriorly; dorsal surface with anterior margin straight; posterior margin concave, with elevated submarginal curved row of short setae and narrow field of short simple setae anterior to submarginal row; with small faint transverse decalcified window laterad of segment median. Somite II anterior margin convex, posterior margin irregularly concave; pleura expanded and directed posterolaterally, angled anterolaterally, rounded posterolaterally, small patch of short simple setae at posteromesial margin; anterior and lateral margins with long plumose setae, posterior margin with short setae. Somite III similar to somite II, narrower and shorter; pleura thinner and shorter than on somite II, directed posterolaterally proximally and curving laterally distally, with setae as in somite II; anterolateral angle subacute; dorsal surface obliquely flattened anterolat-

erally, with posterior row of short simple setae. Somite IV similar to somite III, posterior margin with two short rows of long simple setae on either side of median; pleura thinner and shorter than on somite III, directed laterally; dorsal surface slightly obliquely flattened anterolaterally with ventral row of short simple setae; margins with long plumose setae. Somite V wider than somite IV, narrowing posteriorly; anterolateral margins with plumose setae, two lateral rows of setae on posterior margin; pleura distinct from somite, shorter than in somite IV, thin, flattened, directed anterolaterally, and covered with plumose setae. Somite VI narrower than somite V; dorsal surface with four short transverse rows of setae laterad of midline anteriorly, posterior margin with long plumose setae; pleura absent.

Female with long uniramous pleopods on somites II–V; male with small pleopods.

Telson of male (fig. 41F) spatulate, proximal two-thirds laterally convex, distal third laterally straight and tapering with lateral expansions rounded, distal tip rounded; medioproximal third heavily calcified, lateral and distal regions decalcified; median longitudinal groove running along calcified region; two parallel rows of short simple setae in medial third; margins with long simple setae. Telson of female (fig. 41G) similar to male, with more strongly angled lateral expansions and less tapering distolateral third.

**DISTRIBUTION:** Known only from the U.S. Virgin Islands, Atlantic Panama, and Brazil. The exact distribution of this species is unknown, but it may well occur throughout the southern Caribbean and Central and South Americas.

**MAXIMUM SIZE:** Males: 11.1 mm cl; females: 10.6 mm cl.

**TYPE SPECIMEN:** ZMUC 8557 (neotype).

**TYPE LOCALITY:** St. Thomas, U.S. Virgin Islands.

**REMARKS:** Although Efford (1971) designated ZMUC 8557 as neotype in order to stabilize the identity of the species, this specimen may well be an original syntype. Other Stimpson type material is known to have been sent to ZMUC (Deiss and Manning, 1981), and this specimen is from the type locality and was collected by the same person as the type material. If ZMUC 8557 is

indeed a syntype of *L. venusta*, then its existence would invalidate Efford's (1971) neotype designation, and it would become the sole extant syntype.

This species was designated as the type of the genus *Lepidopa* under the plenary powers of the ICZN (ICZN, 1964) and is no. 1958 on the "Official list of specific names in zoology" (ICZN, 1964).

This species has been confused with *L. luciae*, n. sp., although it is most similar to *L. dexteriae* and *L. websteri*.

*Lepidopa dexteriae* Abele and Efford, 1972

Figures 42, 43

*Lepidopa dexteriae* Abele and Efford, 1972: 503–506, figs. 1, 2\*. – Dexter, 1972: 455\*. – Abele, 1976: 266–267\*. – Coêlho and Calado, 1987: table 1. – Manning, 1988: 626–627 (list). – Calado, 1995: 153–156, pl. 39, fig. e, pl. 40, fig. e, pl. 42, fig. d, pl. 48, figs. a–e, pl. 49, figs. a–d\*. – Fransen et al., 1997: 79 (list).

**MATERIAL EXAMINED: Belize:** Hotel Pier, Pelican Beach, Stann Creek Town, Belize, 1 m, May 29, 1976, coll. A. Cohen: 1 ♂, 4.5 mm cl (USNM 221758); south of Stann Creek, Belize, May 17, 1977, coll. M. L. Jones: 1 ♂, 4.8 mm cl, 2 juveniles, 1.9–2.1 mm cl (USNM 304303).

**Panama (Atlantic):** Shimmey Beach, Ft. Sherman, Aug. 10, 1969, coll. D. Dexter: 2 ♂, 3.7–4.8 mm cl, 2 ♀, 3.8–4.9 mm cl, paratypes (USNM 135402); Shimmey Beach, Ft. Sherman, Aug. 15, 1969, coll. D. Dexter: 1 ♀, 3.3 mm cl, paratype (LACM-AHF 696); Shimmey Beach, Ft. Sherman, Jan. 23, 1971, coll. L. G. Abele: 2 ♂, 4.7–4.8 mm cl, paratypes (RMNH 28572).

**DIAGNOSIS:** Carapace wider than long, with lightly setose grooves. Anterior margin with two large spines lateral to ocular sinus. CG5 absent; CG8 absent; CG10 absent; posterior submarginal groove reaching to posterior margin of posterior concavity. Rostrum present, rounded and armed with ventral acute spine. Distal peduncular segments dorsoventrally flattened, irregularly ovate and distolaterally expanded, distal margin faintly toothed. Diffuse pigment present on peducle. Antennal segment I unarmed. Dactylus of pereopod II with heel produced, tapering, and subacute. Dactylus of pereopod III with heel



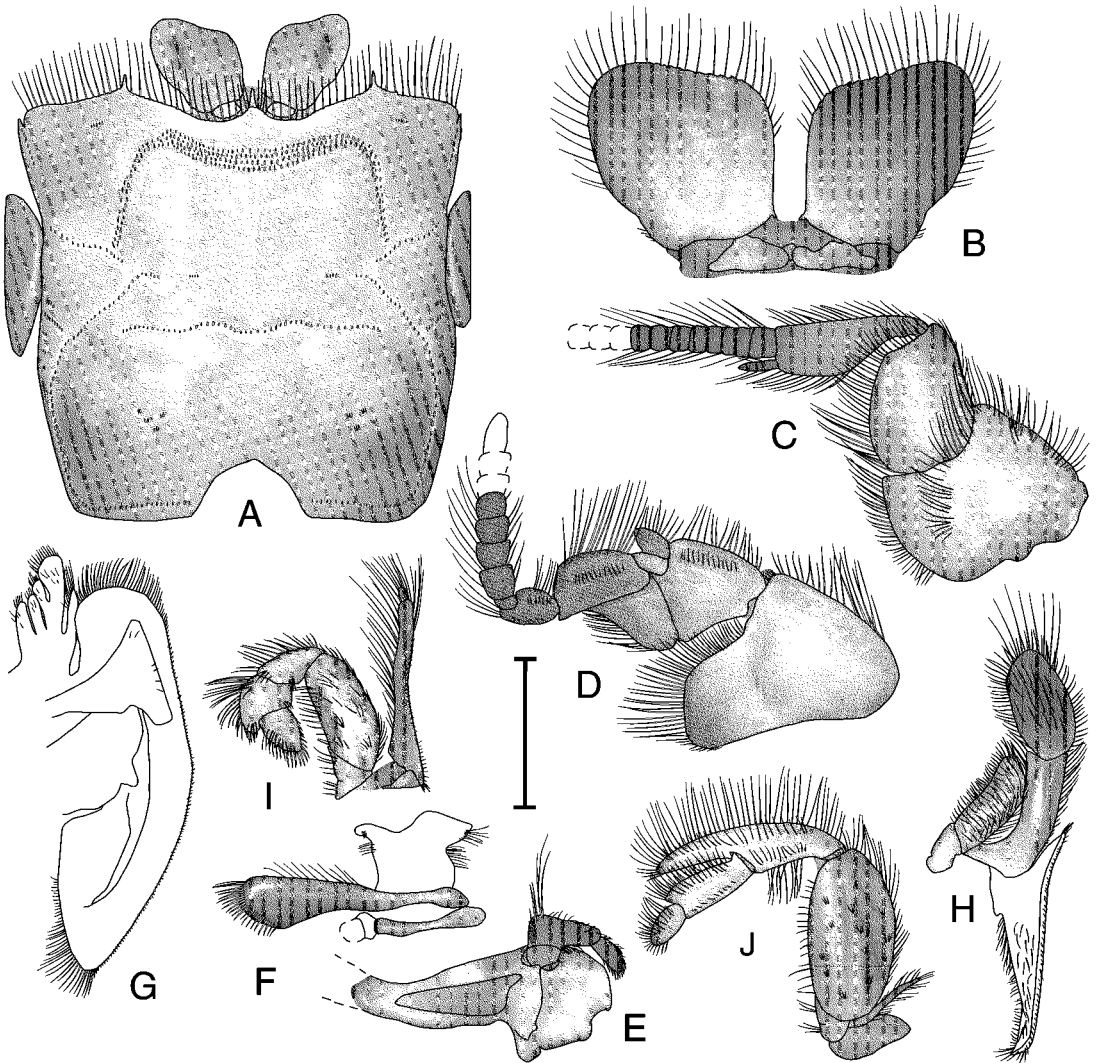


Fig. 42. *Lepidopa dexterae* Abele and Efford, 1972: A, ♀, 3.8 mm cl, USNM 135402, paratype; B–J, ♂, 3.7 mm cl, USNM 135402, paratype. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Left maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 0.7 mm (F), 0.8 mm (B, E), 1.1 mm (C, D), 1.4 mm (I), 1.6 mm (G, H, J), and 1.7 mm (A).

thin, projecting, acute. Dactylus of pereopod IV with produced acute heel and deep indent. Telson of male spatulate, proximal two-thirds laterally convex, distal third laterally concave with lateral expansions rounded, distal tip rounded; medioproximal third heavily calcified, lateral and distal regions decalcified.

**DESCRIPTION:** Carapace (fig. 42A) wider than long. Anterior margin slightly convex

on either side of ocular sinus, weakly dentate. Rostrum as rounded projection reaching to midpoint of median peduncular segments and with submarginal, terminal acute spine reaching beyond proximal margin of distal peduncular segments. Ocular sinus smoothly concave; unarmed. Frontal region smooth; setal field reduced to narrow band anterior to and paralleling CG1, concave medially. CG1

parallel to anterior margin of carapace, sinuous, slightly crenulate, medially concave, medial and lateral elements united. Mesogastric region smooth; CG2 absent; CG3 absent; CG4 with two very short medial and two long, oblique lateral elements connected to posterior margins of CG1 lateral elements. Hepatic region smooth with oblique lateral setose groove and short, stout, acute spine at median of lateral margin. Epibranchial region generally triangular, smooth; posterolateral margin with two short rows of setae. Metagastric region smooth; CG5 absent. CG6 crenulate, with separate oblique, curved, long, lateral fragments and short, concave, median element united with CG7. CG7 nearly straight relative to anterior margin of carapace, but sinuous, and united with median fragment of CG6. Cardiac region smooth; CG8–11 absent. Branchial region with few setose punctae but without short, transverse rows of setae. Posterior margin deeply and irregularly concave medially and more or less straight laterally, with submarginal groove reaching to posterior margin of posterior concavity. Branchiostegite without anterior submarginal spine; anterior region with anterodorsal transverse groove and granular surface, and many long plumose setae; posterior region membranous with numerous, irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 42B) small, rounded; median peduncular segments laterally elongate, oblong, not covered by carapace, anterolaterally ventral to ocular plate. Distal peduncular segments anterolaterally ventral to ocular plate segments subquadrate, expanded distolaterally, flattened, with convex lateral and nearly straight mesial margins, shallow notch present one-fourth from base on mesial margins, lateral margins smooth, distal margins weakly dentate; diffuse ventral field of pigment present, visible in partially decalcified specimens through dorsal surface; mesial margins separated along entire length; mesial, lateral, and distal margins with long simple setae. Distal peduncular segment of megalopa not distolaterally expanded, smooth, with broad area of pigment.

Antennule (fig. 42C) segment III narrow proximally, expanding distally to three times proximal width; with plumose setae on dor-

sal and ventral margins; dorsal exopodal flagellum with 114–136 articles ( $n = 4$ ) [110 in megalopa], long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with three articles ( $n = 5$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins. Segment I slightly longer than wide, unarmed; lateral surface with submarginal dorsal row of long plumose setae and transverse row of long plumose setae across segment median; long plumose setae on dorsal and ventral margins.

Antenna (fig. 42D) with segment V approximately two times longer than wide, with long plumose setae on dorsal margin and short plumose setae in submarginal ventral row, long plumose setae on distoventral margin; flagellum with eight articles ( $n = 4$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV almost cylindrical, overreaching segment III by two-fifths its length, with long plumose setae on dorsal and distal margins, and two rows of short setae on lateral surface. Segment III with long plumose setae on dorsal margin, short simple setae on dorsal margin. Segment II widening distally, with long plumose setae on dorsal margin, row of short plumose setae on lateral surface; antennal acicle short, triangular, not overreaching segment IV proximal margin, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened and truncated ventrolaterally with long plumose setae on margins; lateral margin unarmed; segment with ventromesial antennal gland pore.

Mandible (fig. 42E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 42F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and plumose setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under, with wide proximal projection; internal lobe reduced with three thick setae at distolateral margin.

Maxilla (fig. 42G) exopod rounded, with

plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 42H) epipod with plumose setae on margins and on distolateral surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, with plumose setae; distal segment spatulate, longer than wide, curved mesially, broadest medially, margins and lateral surface with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins.

Maxilliped II (fig. 42I) dactylus evenly rounded, longer than wide, with thick simple setae distally and thin simple setae in short row on lateral surface. Propodus slightly produced dorsodistally, as wide as long, with plumose setae on dorsal margin and long simple setae on dorsodistal and ventrodistal margins. Carpus not produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal margin and dorodistal and ventrodistal margins. Merus two times longer than wide, margins parallel but slightly inflated subproximally, with long simple setae on ventral margin, long plumose setae on dorsal margin and scattered on lateral surface. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-half longer than merus, flagellum with one short article.

Maxilliped III (fig. 42J) dactylus elongate and evenly rounded; long plumose setae on margins and in medial transverse row on lateral surface. Propodus with longitudinal median row of plumose setae on lateral surface; submarginal ventral row of short simple setae; distodorsal tuft of long plumose setae; dorsal margin with short plumose setae. Carpus strongly produced onto propodus, almost reaching distal margin of propodus; lateral surface with medial transverse row of long plumose setae; submarginal ventral row of short simple setae; long plumose setae on margins. Merus unarmed, inflated distolaterally, depressed and decalcified medially, with long plumose setae on dorsal margin and short plumose setae on ventral margin. Basis-ischium incompletely fused, without crista dentata. Exopod two-segmented: proximal

segment small; distal segment styliiform, tapering, approximately one-half length of merus, with plumose setae on margins; without flagellum.

Pereopod I (fig. 43A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with small rugose area proximally, smooth distally, with long plumose setae; ventral margin with short simple setae. Propodus lateral surface with few short, transverse rows of setose rugae; dorsal margin with few small low ridges; ventral margin distally produced into acute spine; cutting edge lacking teeth, lined with long plumose setae; dorsal margin with short plumose setae, ventral margin with short simple setae; mesial surface with few short, transverse rows of setose rugae. Carpus with dorsodistal angle rounded and surface rugose, with short simple setae, dorsal margin smooth, with short plumose setae; lateral surface with few scattered, transverse setose ridges; mesial surface smooth, with transverse row of long plumose setae halfway from dorsal margin and few scattered short plumose setae on surface. Merus unarmed; lateral surface with scattered transverse rows of short plumose setae, dorsal margin with long plumose setae; mesial side with few short rows of setae; proximal two-thirds of mesial surface with decalcified window. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 43B) dactylus smooth; with base to heel concave, heel produced and narrowing to subacute tip with apical tuft of short simple setae, heel to tip with narrow, acute indent, tip acute with apical tuft of short simple setae, tip to base broadly convex; lateral surface smooth; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae, with patch of long plumose setae at base reaching across median of heel. Propodus with dorsal surface smooth, ventral margin inflated and rounded; distal and ventral margin with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with long plumose setae on ventral margin; short transverse row of long plumose setae on surface; mesial surface with oblique row of long plumose setae, distal and ventral margins with dense row of long plumose se-



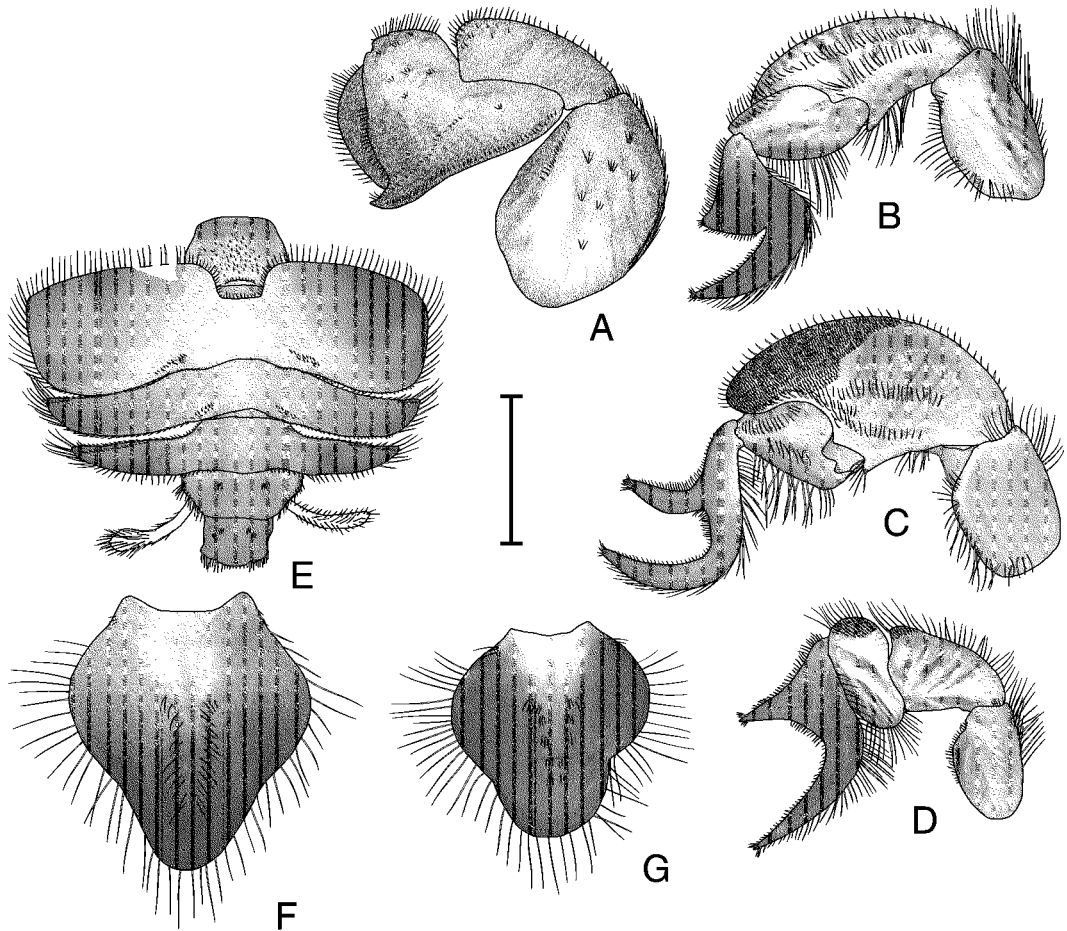


Fig. 43. *Lepidopa dexteræ* Abele and Efford, 1972: A, B, D, ♂, 3.7 mm cl, USNM 135402, paratype; C, E, F, ♂, 4.8 mm cl, USNM 135402, paratype; G, ♀, 3.8 mm cl, USNM 135402, paratype. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I-VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 1.1 mm (F, G) and 2.2 mm (A-E).

tae. Carpus strongly produced dorsodistally, reaching three-fourths of distance to distal margin of propodus; lateral surface nearly smooth, with irregular, interrupted row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; dorsal margin with short plumose setae, disventral and ventral margins with long plumose setae; mesial surface smooth, with medial oblique and subdistal rows of long plumose setae, few scattered short plumose setae on surface; lateral and mesial surfaces medially decalcified. Merus with lateral surface almost entirely decalcified, long plumose setae on dorsal and ventral margins;

mesial surface nearly smooth, with oblique median ridge, patches of long plumose setae dorsal to ridge and in row ventrally, with decalcified area on proximal half of area ventral to ridge; lateral and mesial surfaces medially decalcified. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 43C) dactylus base to heel broadly indented, heel acute, thin, and produced, heel to tip with broad, subquadrate indent, tip acute, tip to base smoothly convex; lateral surface smooth, with apical tufts of short simple setae at end of heel and tip, lateral surface proximal to indent with few setose punctae; ventral margin with long plu-



mose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus and in row across base of heel. Propodus not inflated dorsoventrally; lateral surface smooth, with simple setae subdorsally and long plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened; mesial surface with scattered long setae on and near distoventral margin. Carpus strongly produced dorsodistally and inflated, reaching distal margin of propodus, rounded; dorsolateral margin unarmed; lateral surface medially decalcified, with mat of short setae on dorsodistal third of segment and two long transverse rows of setae medially; dorsal margin with long plumose setae; mesial surface smooth, dorsomesial half decalcified, with long plumose setae on margins and in median oblique row ventral to decalcified area. Merus smooth, lateral surface almost entirely decalcified; dorsal and ventral margins unarmed, with long plumose setae; mesial surface medially decalcified, smooth, with patch of long plumose setae on proximomesial margin. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female pereopod III with large mesioproximal gonopore (not opposing other gonopore); male with slightly smaller pore.

Pereopod IV (fig. 43D) dactylus with base to heel slightly concave, heel acute with apical tuft of short simple setae, heel to tip broadly rounded and concave, tip acute with apical tuft of short simple setae, tip to base convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge across heel with row of short plumose setae. Propodus expanded dorsally and ventrally; ventral expansion not reaching ventral margin of dactylus, margins with long plumose setae; dorsal expansion with row of long plumose setae medially and mat of short setae; lateral and mesial surfaces smooth and decalcified. Carpus slightly produced dorsodistally; lateral and mesial surfaces smooth, decalcified; dorsomedial two-thirds of lateral and mesial surfaces decalcified, with medial patch of long plumose setae subdistally and long plumose setae on distoventral margin of mesial

surface; dorsolateral margin with small mat of short setae at distal angle; dorsal margin with long plumose setae, ventral margin with short simple setae. Merus with large median decalcified area on lateral surface, dorsal and distoventral margins with long plumose setae; mesial surface with large decalcified window proximoventrally. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 43E) with somite I wider than long, widest posteriorly; dorsal surface with anterior margin straight; posterior margin straight, with elevated, submarginal, curved row of short setae and broad field of short simple setae anterior to submarginal row; with small faint transverse decalcified window laterad of segment median. Somite II anterior margin straight, posterior margin irregularly concave; pleura expanded and directed posterolaterally, angled anterolaterally, rounded posterolaterally, small patch of short simple setae at posteromesial margin; anterior and lateral margins with long plumose setae, posterior margin with short setae. Somite III similar to somite II, narrower and shorter; pleura thinner and shorter than on somite II, directed posterolaterally proximally and curving laterally distally, with setae as in somite II; anterolateral angle subacute; dorsal surface obliquely flattened anterolaterally, with posterior row of short simple setae. Somite IV similar to somite III, posterior margin with two short rows of long simple setae on either side of median; pleura thinner and shorter than on somite III, directed laterally; dorsal surface slightly obliquely flattened anterolaterally, with ventral row of short simple setae; margins with long plumose setae. Somite V wider than somite IV, narrowing posteriorly; lateral margins with plumose setae, two short anteromedial rows of setae on dorsal surface; pleura distinct from somite, shorter than in somite IV, thin, flattened, directed anterolaterally, and covered with plumose setae. Somite VI narrower than somite V; dorsal surface with four short transverse rows of setae laterad of midline anteriorly, posterior margin with long plumose setae; pleura absent.

Female with long uniramous pleopods on somites II–V; male with small pleopods.

Telson of male (fig. 43F) spatulate, prox-

imal two-thirds laterally convex, distal third laterally straight and tapering with lateral expansions rounded, distal tip rounded; medioproximal third heavily calcified, lateral and distal regions decalcified; median longitudinal groove running along calcified region; two parallel rows of short simple setae in medial third; margins with long simple setae. Telson of female (fig. 43G) similar to male, with more inflated lateral expansions and broader distal tip.

DISTRIBUTION: From Belize to Panama, in up to 1 m depth.

MAXIMUM SIZE: Males: 4.8 mm cl; females: 4.9 mm cl.

TYPE SPECIMENS: USNM 135401 (holotype;? lost), USNM 135402 (4 paratypes), UPRC 89 (2 paratypes), LACM-AHF 696 (1 paratype), RMNH 28572 (2 paratypes).

TYPE LOCALITY: Shimmey Beach, Ft. Sherman, Panama Canal Zone, Panama.

REMARKS: This species has the smallest maximum size of any in the genus (4.9 mm cl), and this may account for its being known from so few specimens. The holotype was examined by Calado (1995), but cannot now be located in the USNM and may be lost.

Abele and Efford (1972) placed this species into Efford's (1971) "*benedicti*-group" due, in part, to its subtly dentate distal peduncular segment margins, long carpal dorsodistal projection on maxilliped III, antennal flagellum with eight articles, and subrostral spine. However, as Efford (1971) noted, *L. benedicti* lacks a submarginal rostral spine, and the group can hardly be characterized by that feature. In fact, many more characters (absence of dorsodistal spine on antennal segment I, thin heel on pereopod IV, telson shape) unite this species with Efford's (1971) "*venusta*-group" of species. Except for the shape of the distal peduncular segments, *Lepidopa dexterae* closely resembles both *L. venusta* and *L. websteri*. The color is typical of *Lepidopa* species: off-white with scattered iridescence (Abele and Efford, 1972).

*Lepidopa chilensis* Lenz, 1902

Figures 44, 45

*Albunaea* [sic] *scutellata*: Dana, 1852: 406 (not *Thia scutellata* (Fabricius, 1793)).

*Albunea* sp. Cunnigham, 1871: 494. – Rathbun, 1911: 595 (list). – Haig, 1955: 9 (list).

*Lepidops scutellata*: Miers, 1878: 332 (part) (not *Thia scutellata* (Fabricius, 1793)).

*Lepidopa scutellata*: Ortmann, 1896: 226–227 (part). – Gordon, 1938: 188 (part) (not *Thia scutellata* (Fabricius, 1793)).

*Lepidopa chilensis* Lenz, 1902: 749–750, pl. 23, figs. 5, 5a\*. – Rathbun, 1911: 595 (list). – Porter, 1915a: 82–83. – Porter, 1915b: 17–18. – Gordon, 1938: 187 (list). – Garcia Mendes, 1945: 119 (list). – Haig, 1955: 11. – Schuster-Dieterichs, 1956: 52 (list). – Fonseca, 1970: 37, fig. 72. – Del Solar et al., 1970: 23 (list). – Bahamonde, 1971: 6–7, fig. 1. – Efford, 1971: 93–94, figs. 3n, o, 4i, r, s, 5h, l, 7j\*. – Epelde-Aguirre and Lopez, 1975: 165, fig. 3. – Sanchez and Aguilar, 1975: 1–11, figs. 1–5. – Coêlho and Calado, 1987: 43, table 1. – Calado, 1995: 143–146, pl. 39, fig. c, pl. 40, fig. c, pl. 41, fig. b, pl. 45, figs. a–e\*. – Brazeiro, 1999: 105.

*Lepidopa? chilensis*: Holthuis, 1961: 28–31, fig. 3\*.

*Lepidopa Chilensis*: Seridji, 1988: 1298.

Albuneidae: Báez, 1997: 173 (part). – Wehrtmann and Báez, 1997: 269 (part).

MATERIAL EXAMINED: **Peru**: El Paraiso, near Huacho, Dec. 4, 1955, coll. W. K. Weyrauch: 2 ♂, 8.0–10.9 mm cl, 1 ♀, 9.9 mm cl (RMNH 14632); Ancon, 35 km north of Lima, Jan. 7, 1956, coll. W. K. Weyrauch: 1 ♂, 10.1 mm cl, 1 oviger, 10.9 mm cl (RMNH 14633), 1 ♂, 10.6 mm cl (AMNH 18087 ex RMNH 14633); Ancon, 35 km north of Lima, coll. unknown: 1 ♂, 10.6 mm cl (BMNH 1913.12.10.128); La Ventanilla, near Lima, March 1951, coll. H. W. Koepeke: 2 ♂, 10.3–11.1 mm cl, 1 ♀, 12.5 mm cl (MNB 10975); Lurin, approximately 30 km south of Lima, coll. H. W. Koepeke: 1 ♂, 8.3 mm cl, 1 oviger, 11.6 mm cl (USNM 91742); Mollendo, coll. Percy Slader Expedition: 1 ♀, 13.7 mm cl (BMNH 1938.4.4.15).

**Chile**: Iquique, coll. Plate: 1 ♂, 7.4 mm cl, holotype (MNB 10975); "Chile," coll. L. Reed: 1 ♂, 8.9 mm cl (USNM 267785); Bahia San Vicente, Concepcion, 6 m, coll. Jeldes: 1 ♂, 10.9 mm cl, 4 ♀, 8.7–11.9 mm cl (ZMH K–39034).

DIAGNOSIS: Carapace wider than long, with lightly setose grooves. Anterior margin with two large spines lateral to ocular sinus. CG5 absent; CG8 present; CG10 absent; posterior submarginal groove reaching posterior mar-

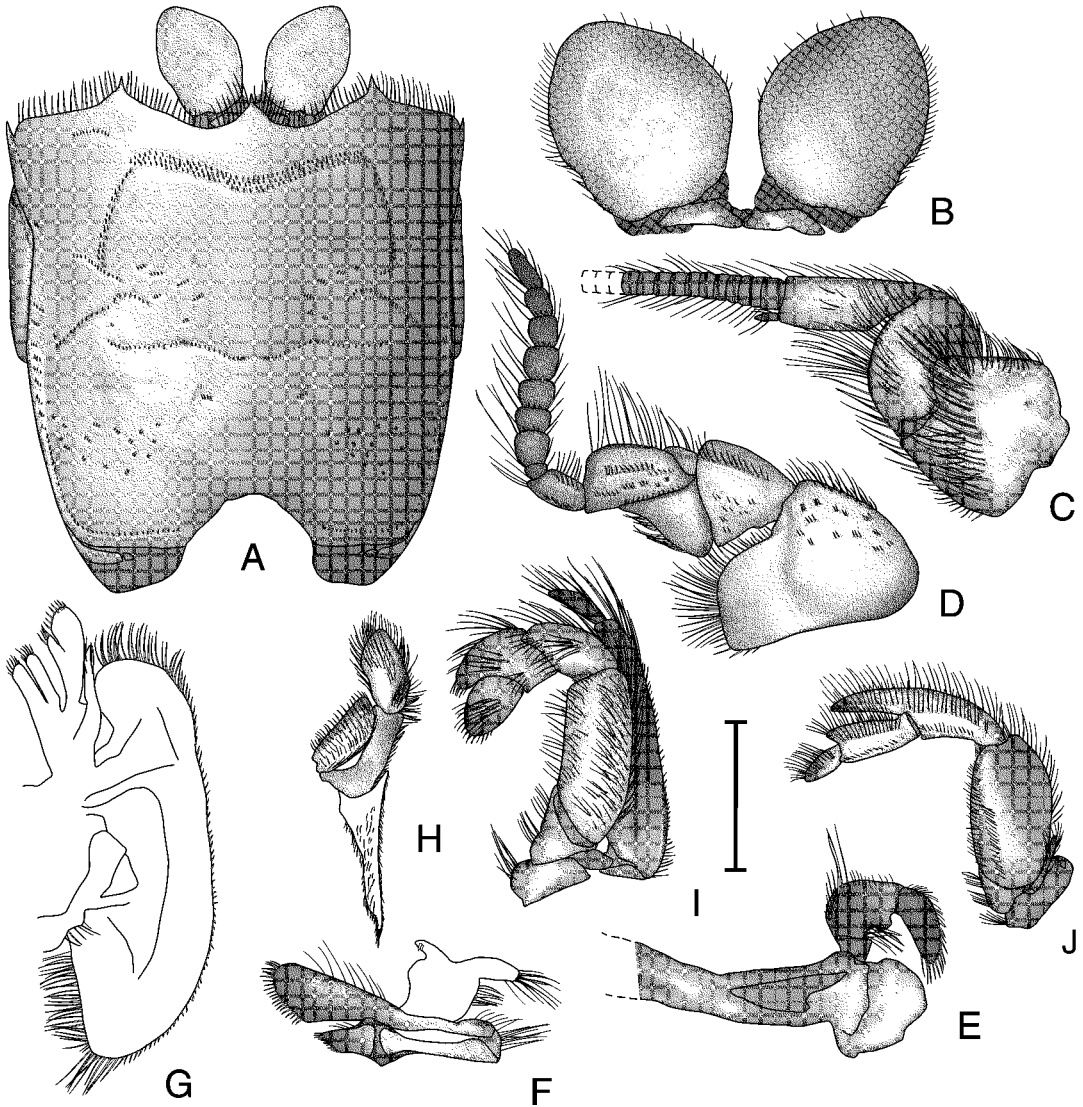


Fig. 44. *Lepidopa chilensis* Lenz, 1902: A, J, oviger, 11.6 mm cl, USNM 91742; B–I, ♂, 8.3 mm cl, USNM 91742. **A.** Carapace, branchiostegite, and ocular peduncles, dorsal view. **B.** Ocular peduncles, dorsal view. **C.** Left antennule, lateral view. **D.** Left antenna, lateral view. **E.** Left mandible, mesial view. **F.** Left maxillule, lateral view. **G.** Left maxilla, lateral view. **H.** Left maxilliped I, lateral view. **I.** Left maxilliped II, lateral view. **J.** Left maxilliped III, lateral view. Scale = 1.6 mm (B, E, F, I), 2.2 mm (C, D, G), 3.3 mm (H, J), and 4.4 mm (A).

gin of posterior concavity. Rostrum present, rounded and armed with ventral acute spine. Distal peduncular segments dorsoventrally flattened and ovate, distal margins smooth. Cornea absent. Antennal segment I unarmed. Dactylus of pereopod II with heel produced, tapering, and subacute. Dactylus of pereopod III with heel thin, projecting, acute. Dactylus

of pereopod IV with produced acute heel and deep indent. Telson of male spatulate, proximal two-thirds laterally convex, distal third laterally concave; lateral expansions rounded, distal tip rounded; medioproximal third heavily calcified, lateral and distal regions decalcified.

DESCRIPTION: Carapace (fig. 44A) wider

than long. Anterior margin concave on either side of ocular sinus, smooth. Rostrum as subacute projection reaching beyond median peduncular segments and with a submarginal, terminal acute spine. Ocular sinus smoothly concave mesially, slightly convex laterally; unarmed. Frontal region smooth; setal field reduced to narrow band anterior and paralleling CG1, concave medially. CG1 parallel to anterior margin of carapace, sinuous, slightly crenulate, medially concave, medial and lateral elements united. Mesogastric region smooth; CG2 absent; CG3 absent; CG4 with 4–20 very short elements and two longer oblique lateral elements almost united with posterior margin of CG1. Hepatic region smooth, with oblique lateral, setose groove and short, acute spine at median of lateral margin. Epibranchial region generally triangular, smooth; posterolateral margin with three short rows of setae. Metagastric region smooth; CG5 absent. CG6 crenulate, with separate oblique, long, lateral fragments, none to four tiny intermediate elements and short sinuous median element united with CG7; lateral fragment curved mesially. CG7 straight relative to anterior margin of carapace, slightly concave, united with median fragment of CG6. Cardiac region smooth; CG8 present as two very short lateral elements. CG9–11 absent. Branchial region with few setose punctae in medial region but without short, transverse rows of setae. Posterior margin deeply and irregularly concave medially and more or less straight laterally, with submarginal groove reaching posterior margin of posterior concavity; membranous area posterior to carapace margin with two or three narrow calcified plates. Branchiostegite without anterior submarginal spine; anterior region with anterodorsal transverse groove and granular surface, and many long plumose setae; posterior region membranous with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 44B) covered by carapace; median peduncular segments reduced to small, oblong, calcified area lateral to ocular plate. Distal peduncular segments irregularly ovate, angled distolaterally, flattened, with smooth convex lateral and mesial margins; notch on lateral margin one-third from

proximal margin present but without corneal pigment; mesial margins separated along entire length; mesial, lateral and distal margins with long simple setae.

Antennule (fig. 44C) segment III narrow proximally, expanding distally to two times proximal width; with plumose setae on dorsal and ventral margins; dorsal exopodal flagellum with 133–140 articles ( $n = 3$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with two or three articles ( $n = 4$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins and in oblique row on mediolateral surface. Segment I wider than long, unarmed; dorsomedial quarter of lateral surface rugose, with long plumose setae; long plumose setae on dorsal and ventral margins and on distal half of lateral surface.

Antenna (fig. 44D) with segment V approximately two times longer than wide, with short plumose setae on dorsal, ventral, and distal margins; flagellum with eight articles ( $n = 5$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV almost cylindrical, overreaching segment III by one-third of its length, with long plumose setae on dorsal and distal margins, row of setae on dorsolateral margin and interrupted irregular row of short setae ventrolaterally. Segment III with short plumose setae on dorsal margin, long plumose setae on ventral margin. Segment II widening distally, with plumose setae on dorsal margin and scattered on ventrolateral surface; antennal acicle short, triangular, overreaching segment IV proximal margin by one-fourth of its length, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened and truncated ventrolaterally, with long plumose setae on dorsal and distal margins, and scattered on dorsolateral third of surface; lateral margin unarmed; segment with ventromesial antennal gland pore.

Mandible (fig. 44E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 44F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and



plumose setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under, with wide proximal projection; internal lobe reduced with two thick setae at distolateral margin.

Maxilla (fig. 44G) exopod rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 44H) epipod with plumose setae on margins and on distolateral surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, with plumose setae; distal segment spatulate, longer than wide, curved mesially, broadest medially, long plumose setae on margins, proximolateral fourth of dorsal surface, and distal half of dorsal surface. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins.

Maxilliped II (fig. 44I) dactylus evenly rounded, longer than wide, with thick simple setae distally and thin simple setae in short row on lateral surface. Propodus produced dorsodistally, approximately as wide as long, with plumose setae on dorsal margin and long simple setae on dorsodistal and ventrodistal margins. Carpus not produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal and distal margins and in mediolateral area. Merus 2.5 times longer than wide, margins parallel but slightly inflated submedially, with simple setae on ventrolateral margin and plumose setae on dorsolateral margin and scattered on lateral surface. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-third longer than merus, flagellum with one elongate article.

Maxilliped III (fig. 44J) dactylus elongate and evenly rounded; long plumose setae on margins and lateral surface. Propodus with longitudinal median row of plumose setae on lateral surface; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus strongly produced onto propodus, almost reaching distal margin of propodus; lateral surface with medial transverse row of plumose setae; plumose setae on margins. Merus unarmed, broadly inflated me-

dially, with long plumose setae on dorsal margin, short plumose setae on ventral margin. Basis-ischium incompletely fused, without crista dentata. Exopod two-segmented: proximal segment small; distal segment styliform, tapering, approximately two-fifths length of merus, with plumose setae on margins; without flagellum.

Pereopod I (fig. 45A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with small rugose area proximally, smooth distally, lined with long plumose setae; ventral margin with short simple setae. Propodal lateral surface with numerous short, transverse rows of setose rugae; dorsal margin with few small low ridges; ventral margin distally produced into acute spine; cutting edge lacking teeth, lined with long plumose setae; dorsal margin with short plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle rounded, with numerous low, rounded spines, dorsal margin smooth, with short plumose setae; lateral surface with few transverse setose ridges, primarily near ventral margin; mesial surface smooth, with medial transverse row of long plumose setae. Merus unarmed; lateral surface with medial decalcified area and scattered transverse rows of short plumose setae, margins with long plumose setae; mesial surface with few short rows of setae; proximal two-thirds of mesial surface with decalcified window. Basis-ischium incompletely fused, unarmed. Coxa with small posteromesial tubercle.

Pereopod II (fig. 45B) dactylus smooth; with base to heel concave, heel produced and rounded, heel to tip with narrow acute indent, tip acute, tip to base broadly convex; lateral surface smooth; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae, with patch of long plumose setae at base reaching across median of heel. Propodus with dorsal surface smooth, ventral margin inflated and rounded; distal and ventral margins with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with long plumose setae on ventral margin; short transverse row of long plumose setae on surface; mesial surface with subdistal row of long plumose setae. Carpus strongly produced dorsodistally, reaching four-fifths length of propodus; lat-

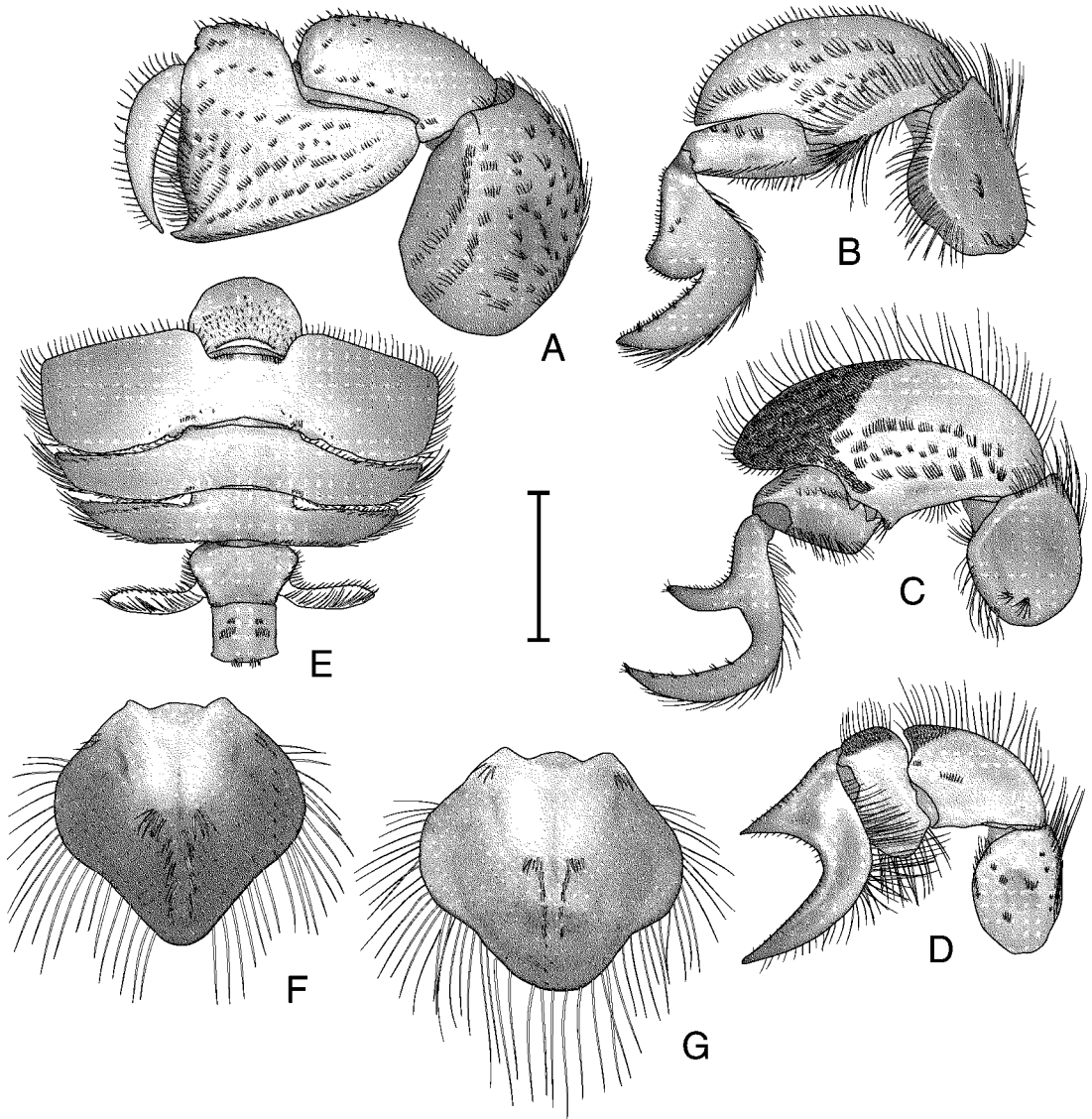


Fig. 45. *Lepidopa chilensis* Lenz, 1902: A-F, ♂, 8.3 mm cl, USNM 91742; G, oviger, 11.6 mm cl, USNM 91742. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I-VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 1.7 mm (F), 2.2 mm (G), 3.0 mm (A-D), and 3.3 mm (E).

eral surface nearly smooth, with two irregular, interrupted rows of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; dorsal margin with long plumose setae; mesial surface smooth, with subdorsal and subdistal rows of long plumose setae, few scattered setae on surface. Merus with lateral surface almost en-

tirely decalcified, long plumose setae on margins and in few small patches in decalcified area; mesial surface nearly smooth, with oblique median ridge, patches of long plumose setae dorsal to ridge and in row ventrally, with decalcified area on proximal half of area dorsal to ridge. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 45C) dactylus base to heel broadly indented, heel acute, thin, and produced, heel to tip with broad subquadrate indent, tip acute, tip to base smoothly convex; lateral surface smooth, with tufts of short setae at end of heel and tip, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus and in row across base of heel. Propodus not inflated dorsoventrally; lateral surface smooth, with simple setae subdorsally, and long plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened, with short setae on ventral margin; mesial surface with scattered long setae on and near distoventral margin. Carpus strongly produced dorsodistally and inflated, reaching distal margin of propodus, distal tip rounded; dorsolateral margin unarmed; lateral surface with mat of short setae on dorsodistal third of segment, three long, interrupted, transverse rows of setae medially and scattered on proximal lateral surface; dorsal margin with long plumose setae, ventral and ventrodistal margins with short plumose setae; mesial surface smooth, dorsomesial third decalcified, with long plumose setae on margins and in median transverse row ventral to decalcified area. Merus smooth, lateral surface almost entirely decalcified; dorsal and ventral margins unarmed, dorsodistal and ventral margins with long plumose setae; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female pereopod III with large mesioproximal gonopore (not opposing other gonopore); male with slightly smaller pore.

Pereopod IV (fig. 45D) dactylus with base to heel almost straight, heel acute, heel to tip broadly rounded and concave, tip acute, tip to base convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge across heel, with row of short plumose setae. Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, margins with long plumose setae; dorsal expansion with row of long plumose

setae medially and mat of short setae; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; lateral and mesial surfaces smooth; dorsomesial two-thirds of mesial surfaces decalcified; dorsal margin with small mat of short setae at dorsodistal angle; dorsal margin with long plumose setae; few short simple setae in median of lateral surface. Merus with large median decalcified area and few short transverse rows of setae on lateral surface, dorsal and ventrodistal margins with long plumose setae; mesial surface with large decalcified window proximovertrally. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 45E) with somite I wider than long, widest posteriorly; dorsal surface with anterior margin convex; posterior margin concave, with elevated submarginal curved row of short setae and broad field of short simple setae anterior to submarginal row; with small, faint, transverse, decalcified window laterad of segment median. Somite II anterior margin convex, posterior margin irregularly concave; pleura expanded and directed posterolaterally, angled anterolaterally, rounded posterolaterally, small patch of short simple setae at posteromesial margin; anterior and lateral margins with long plumose setae, posterior margin with short setae. Somite III similar to somite II, narrower and shorter; pleura thinner and shorter than on somite II, directed posterolaterally proximally and curving forward distally, with setae as in somite II; anterolateral angle acute; dorsal surface slightly obliquely flattened anterolaterally. Somite IV similar to somite III; pleura thinner and shorter than on somite III, directed laterally; dorsal surface slightly obliquely flattened anterolaterally; margin with long plumose setae. Somite V wider than somite IV, narrowing posteriorly; anterolateral margins with plumose setae, two rows of setae on posterior margin; pleura distinct from somite, shorter than in somite IV, thin, flattened, flexible, directed posteriorly proximally, laterally distally, covered with plumose setae. Somite VI narrower than somite V; dorsal surface with four short transverse rows of setae laterad of midline anteriorly, posterior margin with long plumose setae; pleura absent.



Female with long uniramous pleopods on somites II–V; male with small pleopods.

Telson of male (fig. 45F) spatulate, proximal two-thirds laterally convex, distal third laterally straight and tapering; lateral expansions rounded, distal tip rounded; medioproximal third heavily calcified, lateral and distal regions decalcified; median longitudinal groove running along calcified region; two distally parallel rows of short simple setae in distal half; margin with long simple setae. Telson of female (fig. 45G) similar to male, distolateral tapering less pronounced, distal tip bluntly rounded and broader than that of male.

**DISTRIBUTION:** Known from Huacho, Peru, south to Concepcion, Chile; depth range unknown.

**MAXIMUM SIZE:** Males: 11.1 mm cl; females: 13.7 mm cl.

**TYPE SPECIMEN:** MNB 10975 (holotype).

**TYPE LOCALITY:** Iquique, Chile.

**REMARKS:** Haig (1955) discussed the record of *Albunea* sp. reported by Cunningham (1871) and repeated by Rathbun (1911), and she correctly concluded that the genus *Albunea* does not occur in Chile. Although she did not assign Cunningham's (1871) record to *Lepidopa chilensis*, this is a fairly obvious identification, given that Cunningham (1871) cited a single albuneid species from Chile and that *L. chilensis* is the only albuneid known from that country. This species is known in Chile as "muy muy blanco" (Sanchez and Aguilar, 1975) and in Peru as "muy muy blanco" (Del Solar et al., 1970) or "muy-muy blanco" (Fonseca, 1970).

Sanchez and Aguilar (1975) reared five zoeal stages and one megalopal stage from ovigerous females in about 50 days from hatching at 20–23°C and an unknown salinity.

*Lepidopa chilensis* is closely related to *L. esposa* and is a member of the "venustagroup."

*Lepidopa californica* Efford, 1971

Figures 46, 47

*Lepidopa myops*: Holmes, 1900: 105 (part). – Benedict, 1903: 892–893, figs. 1, 4. – Rathbun, 1904: 14 (list) (part), 167 (list) (part). – Baker, 1912: 102. – Schmitt, 1921: 172 (part), pl. 31, fig. 4. – Johnson and Snook, 1927: 346, 348–

349, figs. 296, 297. – Gordon, 1938: 188 (part), figs. 1b, 2a, j\*. – MacGinitie, 1938: 474.&—Johnson and Lewis, 1942: 82–86, pls. 3, 4. – Ricketts and Calvin, 1948: 188, pl. 38, fig. 4. – MacGinitie and MacGinitie, 1949: 305, fig. 149. – Schuster-Dieterichs, 1956: 51 (list). – Turner and Sexsmith, 1964: 48. – Haig et al., 1970: 25 (part). – Knight, 1970: 127–136, figs. 1–59. – Sanchez and Aguilar, 1975: 10–11. – Turner and Sexsmith, 1975: 46. – Boschi, 1981: 715, fig. 241–54. – Calado, 1995: 185–188, pl. 39, fig. l, pl. 40, fig. j, pl. 41, fig. j, pl. 60, figs. a–c, pl. 61, figs. a–d\* (not *Paraleucolepidopa myops* (Stimpson, 1860)).

*Lepidopa californica* Efford, 1971: 74–76, figs. 1j, 2h, 3m, 4b, 5d, 6k, t, 7k\*. – Luke, 1977: 31. – Haig, 1980: 291, fig. 19.9. – Haig and Abbott, 1980: 582. – Wicksten, 1980: 209 (list). – Coêlho and Calado, 1987: 43, table 1. – Williams et al., 1989: 35. – Hendrickx, 1992: 7 (list). – Calado, 1995: 138–140, pl. 39, fig. b, pl. 40, fig. b, pl. 43, figs. a–c, pl. 44, figs. a–c\*. – Faulkes and Paul, 1997a: 175. – Faulkes and Paul, 1997b: 793–804. – Faulkes and Paul, 1997c: 161–168. – Faulkes and Paul, 1997d: ii. – Fransen et al., 1997: 79 (list). – Hendrickx and Harvey, 1999: 367 (list). – Dugan et al., 2000: 230–244.

*Lepidopa californica* [sic]: Coêlho and Calado, 1987: 42.

*Lepidopa Myops*: Seridji, 1988: 1298 (not *Paraleucolepidopa myops* (Stimpson, 1860)).

**MATERIAL EXAMINED: USA: California:**  
*Los Angeles Co.:* Long Beach, June 24, 1905, coll. J. E. Benedict: 1 ♂, 11.0 mm cl, holotype (USNM 42213), 3 ♂, 9.5–10.2 mm cl, 4 ♀, 10.8–15.4 mm cl, 3 ovigers, 11.7–18.1 mm cl, 1 anterior carapace (unsexable), 13.8 mm cl, paratypes (USNM 122633 ex USNM 42213), 1 ♂, 10.0 mm cl, 1 ♀, 12.3 mm cl, paratypes (BMNH 1937.6.1.4–5 ex USNM 42213); Long Beach, June 1909, coll. C. Boyd: 2 ♀, 8.6–11.8 mm cl (BMNH 1959.8.5.73–74); Long Beach, coll. H. N. Lowe: 1 ♂, 8.9 mm cl (USNM 260939 ex USNM 42102); Manhattan Beach, April 10, 1934, coll. V. Williams: 1 ♂, 9.1 mm cl, 3 ♀, 9.1–11.8 mm cl (USNM 267787); Cabriльо Beach, Los Angeles Harbor, April 17, 1976, coll. A. L. Howe: 1 ♀, 12.5 mm cl (LACM-AHF 1590–04); San Pedro, 1901, coll. J.D.A. Cockerell: 1 ♀, 15.1 mm cl (USNM 42212); *Orange Co.:* Public beach, Corona del Mar, Jan. 16, 1938, coll. G. E. and N. MacGinitie: 9 ♂, 8.0–12.5 mm cl, 1



♀, 9.4 mm cl, 3 ovigers, 10.1–11.3 mm cl (USNM 89484), 1 ♂, 8.5 mm cl, 1 ♀, 12.8 mm cl, 1 oviger, 11.1 mm cl (RMNH 14638 ex USNM 89484); off Corona del Mar, July 28, 1937, coll. G. E. MacGinitie: 1 ♂, 9.0 mm cl (USNM 267788); Newport Bay, Feb. 1, 1930, coll. G. E. MacGinitie: 2 ♂, 6.0–12.6 mm cl, 2 ♀, 7.5–9.9 mm cl (CASIZ 15215); Newport Bay, Dec. 27, 1932, coll. S. Glassell: 8 ♂, 5.0–11.0 mm cl, 1 ♀, 13.9 mm cl, 1 oviger, 10.9 mm cl (USNM 267789); Balboa Bay, July 29, 1939, coll. Markall: 1 ♀, 9.2 mm cl (CASIZ 31098); *San Diego Co.*: La Jolla, Oct.–Nov. 1925, coll. H. Boschma: 1 ♂, 10.4 mm cl, 4 ♀, 8.5–13.7 mm cl, 1 unsexable and unmeasurable specimen (RMNH 4924), 1 ♂, 9.0 mm cl, 1 ♀, 9.2 mm cl (AMNH 18088 ex RMNH 4924); Scripps Island Beach, Sept. 17, 1918, coll. W. L. Schmitt: 2 ♀, 8.6–10.4 mm cl (USNM 53932); off San Diego, 32°32'N, 117°07'W, coll. E. Mearns: 1 ♀, 17.6 mm cl (USNM 18865); San Diego, coll. unknown: 2 ♀, 4.8–10.3 mm cl, 1 juvenile, 4.3 mm cl (USNM 285391); 2.75 mi off Point Loma, San Diego, 9–13 fms (= 16.5–23.8 m), Feb. 23, 1941, coll. R/V "Velero III": 1 ♀, 5.6 mm cl (LACM-AHF 1243–41).

**DIAGNOSIS:** Carapace length and width subequal, with lightly setose grooves. Anterior margin with two large spines lateral to ocular sinus. CG5 absent; CG8 present; CG10 absent; posterior submarginal groove reaching halfway up posterior concavity. Rostrum present, rounded and unarmed. Distal peduncular segments dorsoventrally flattened and irregularly ovate, distal margin smooth; pigment spot mesial to distolateral corner present. Antennal segment I unarmed. Dactylus of pereopod II with heel produced, tapering, and subacute. Dactylus of pereopod III with heel projecting, acute. Dactylus of pereopod IV with produced acute heel and deep indent. Telson of male spatulate, proximal third laterally concave, median third laterally convex, distal third laterally concave; lateral expansions rounded, distal tip rounded; medioproximal third heavily calcified, lateral and distal regions decalcified.

**DESCRIPTION:** Carapace (fig. 46A) width and length subequal. Anterior margin convex on either side of ocular sinus, smooth, with basally broad, distally acute medial spine.

Rostrum as rounded projection reaching beyond median peduncular segments; unarmed. Ocular sinus smoothly concave; unarmed. Frontal region smooth; setal field reduced to narrow, medially concave band paralleling CG1; extending posterolaterally almost to CG4. CG1 parallel to anterior margin of carapace, sinuous, slightly crenulate, medially concave, medial and lateral elements united. Mesogastric region smooth; CG2 absent; CG3 absent; CG4 with one to five very short mesial elements and two slightly oblique lateral elements. Hepatic region smooth with oblique, lateral, setose groove and short, acute spine at median of lateral margin. Epi-branchial region generally triangular, smooth; posterolateral margin with four short rows of setae. Metagastric region smooth; CG5 absent. CG6 crenulate, with separate oblique, long, lateral fragments and short, sinuous median element united with CG7; median element with gap at middle. CG7 straight relative to anterior margin of carapace and united with median fragment of CG6. Cardiac region smooth; CG8 present as two short elements. CG9–11 absent. Branchial region with few scattered punctae but without short, transverse rows of setae. Posterior margin deeply and smoothly concave medially and more or less straight laterally, with submarginal groove reaching halfway up posterior concavity. Branchiostegite without anterior submarginal spine; anterior region with anterodorsal transverse groove and granular surface, with many long plumose setae; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 46B) subquadrate, covered by carapace; median peduncular segments reduced to small rounded calcified area anterolateral to ocular plate. Distal peduncular segments irregularly ovate, angled distolaterally, flattened with convex lateral and mesial margins, margins smooth; pigmented area just mesial to distolateral corner present; mesial margins separated along entire length; lateral margins with long simple setae.

Antennule (fig. 46C) segment III narrow proximally, expanding distally to two times proximal width; with plumose setae on dorsal and ventral margins; dorsal exopodal fla-

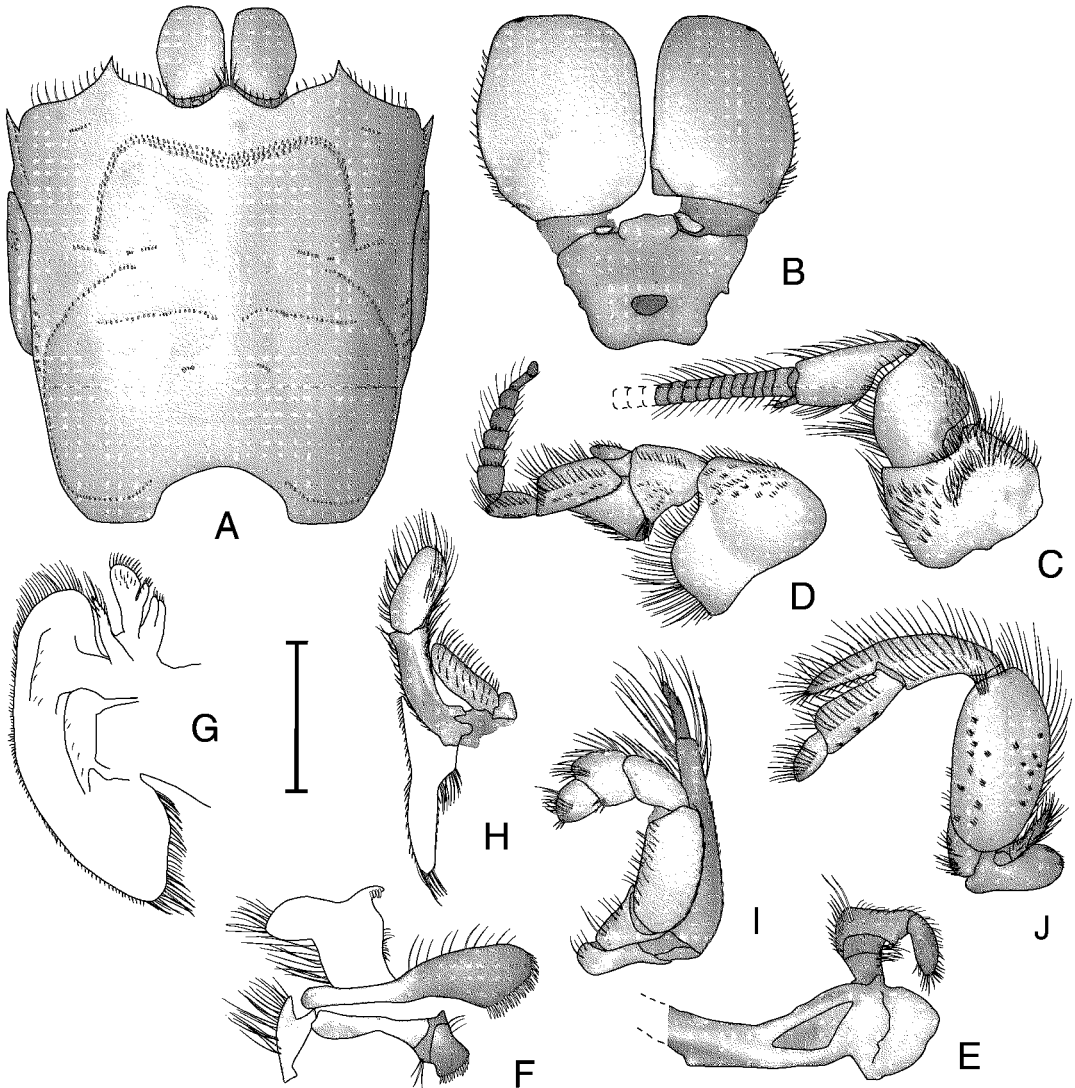


Fig. 46. *Lepidopa californica* Efford, 1971: A, ♂, 11.0 mm cl, USNM 42213, holotype; B–J, ♂, 9.5 mm cl, USNM 122633, paratype. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Right maxillule, lateral view. G. Right maxilla, lateral view. H. Right maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 1.6 mm (F), 1.7 mm (B), 2.1 mm (E), 2.2 mm (I), 3.0 mm (C, D), 3.3 mm (G, H, J), and 4.4 mm (A).

gellum with 138–168 articles ( $n = 6$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with two or three articles ( $n = 6$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins and scattered on dorsal third of lateral surface. Segment I

wider than long, unarmed; dorsodistal third of lateral surface rugose, with long plumose setae; scattered long plumose setae on distoventral lateral surface; long plumose setae on dorsal and ventral margins.

Antenna (fig. 46D) with segment V approximately 1.5 times longer than wide, with short plumose setae on dorsal and distal mar-

gins and in transverse medial row; flagellum with six to nine articles ( $n = 6$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV almost cylindrical, overreaching segment III by one-half of its length, with long plumose setae on dorsal and distal margins, row of setae on dorsolateral margin and few scattered setae on ventral half of lateral surface. Segment III with long plumose setae on ventral margin. Segment II widening distally, with plumose setae in subdorsal row and scattered on ventral half of lateral surface; antennal acicle short, triangular, overreaching segment IV proximal margin by one-third of its length, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened and truncated ventrolaterally, with long plumose setae on margins; lateral margin unarmed; scattered setae on dorsal third of lateral surface; segment with ventromesial antennal gland pore.

Mandible (fig. 46E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 46F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and plumose setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under, with wide proximal projection; internal lobe reduced, with four thick setae at distolateral margin.

Maxilla (fig. 46G) exopod rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 46H) epipod with plumose setae on margins and on distolateral surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, with plumose setae; distal segment spatulate, longer than wide, curved mesially, broadest medially, margins and mesiodistal surface with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins.

Maxilliped II (fig. 46I) dactylus evenly rounded, longer than wide, with thick simple

setae distally and thin simple setae in short transverse row on lateral surface. Propodus slightly produced dorsodistally, 1.5 times wider than long, with plumose setae on dorsal margin and long simple setae on dorsodistal and ventrodorsal margins. Carpus not strongly produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal margin. Merus two times longer than wide, margins parallel but slightly inflated submedially, with simple setae on ventrolateral margin and plumose setae on dorsolateral margin. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-third times longer than merus, flagellum with one elongate article.

Maxilliped III (fig. 46J) dactylus elongate and evenly rounded; long plumose setae on margins and lateral surface. Propodus with longitudinal median row of plumose setae on lateral surface; margins with plumose setae. Carpus strongly produced onto propodus, almost reaching distal margin of propodus; lateral surface with medial transverse row of plumose setae, plumose setae on margins. Merus unarmed, broadly inflated distolaterally, with plumose setae on dorsal margin. Basis-ischium incompletely fused, without crista dentata. Exopod two-segmented: proximal segment small; distal segment styliiform, tapering, approximately one-third length of merus, with plumose setae on margins; without flagellum.

Pereopod I (fig. 47A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with small rugose area proximally and long plumose setae, smooth distally; ventral margin with short simple setae. Propodal lateral surface with numerous short, transverse rows of setose rugae; dorsal margin with few small, low ridges; ventral margin distally produced into acute spine; cutting edge lacking teeth, lined with long plumose setae; dorsal margin with short plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle rounded, with numerous distal spinules, dorsal margin smooth, with short plumose setae; lateral surface with few transverse, setose ridges; mesial surface smooth, with medial transverse row of long plumose setae. Merus unarmed; lateral surface with scattered transverse rows of short plumose setae, margins with long



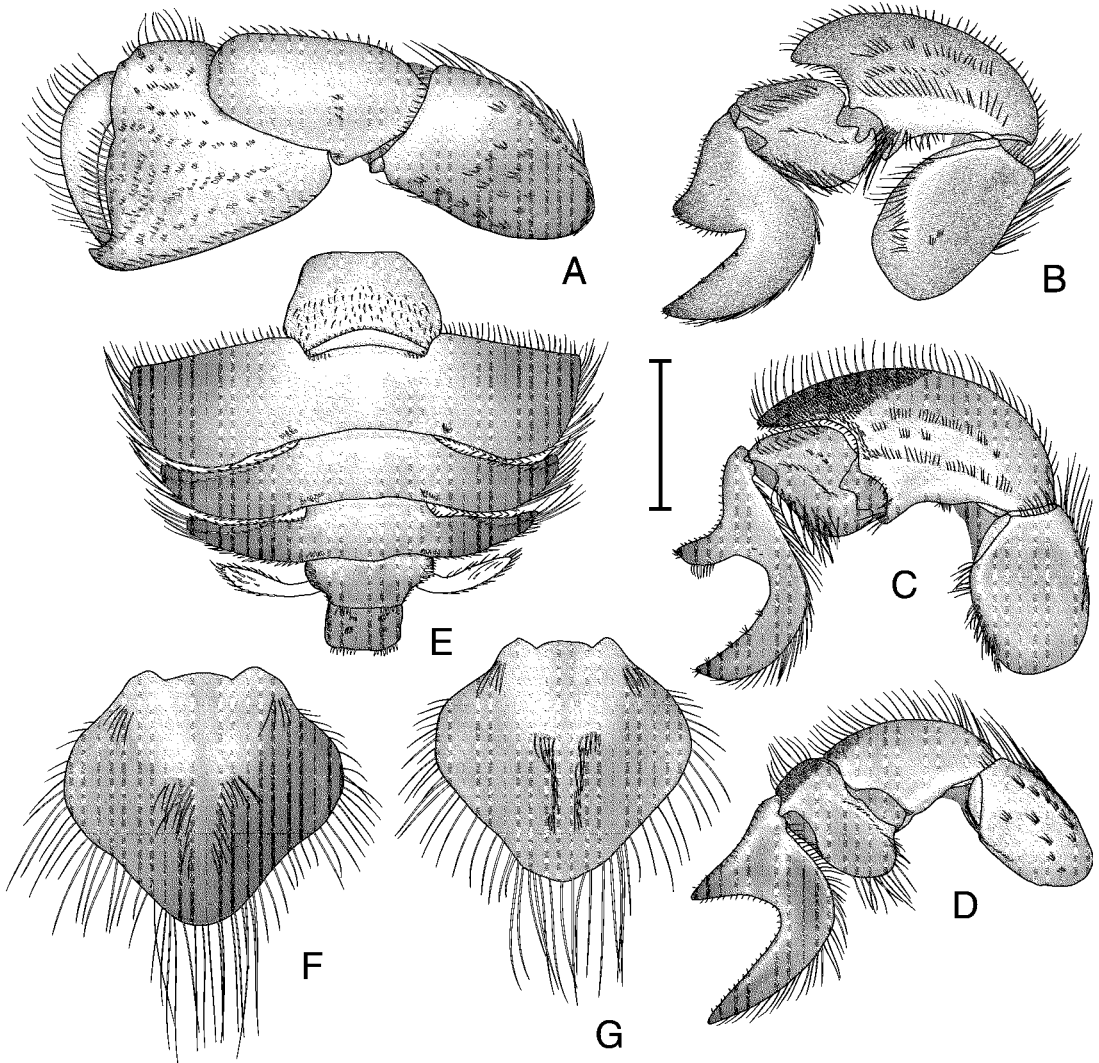


Fig. 47. *Lepidopa californica* Efford, 1971: A-F, ♂, 9.5 mm cl, USNM 122633, paratype; G, ♀, 11.4 mm cl, USNM 122633, paratype. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I-VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 1.6 mm (F), 2.2 mm (G), and 3.3 mm (A-E).

plumose setae; mesial surface with few short rows of setae; proximal third of mesial surface with decalcified window. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 47B) dactylus smooth; with base to heel concave, heel produced and narrowing to subacute tip, heel to tip with moderately narrow, acute indent, tip acute, tip to base broadly convex; lateral surface

smooth with few small, setose punctae proximal to heel; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae, with patch of long plumose setae at base reaching across median of heel. Propodus with dorsal surface smooth, ventral margin inflated and rounded; distal and ventral margin with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with long plumose



setae on ventral margin; short transverse row of long plumose setae on surface; mesial surface with subdistal row of long plumose setae. Carpus strongly produced dorsodistally and rounded at tip, one-half as long as propodus; lateral surface nearly smooth, with two irregular, interrupted rows of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; dorsal margin with long plumose setae; mesial surface smooth, with medial transverse row of long plumose setae. Merus lateral surface almost entirely decalcified with long plumose setae on dorsodistal and ventrodistal margins; mesial surface nearly smooth, with oblique median ridge, patches of long plumose setae dorsal to ridge and in row ventrally. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 47C) dactylus base to heel broadly indented, heel acute, thin, and produced, heel to tip with broad, evenly rounded indent, tip acute, tip to base smoothly convex; lateral surface smooth, with tufts of short setae at end of heel and tip, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth with plumose setae proximally at junction with propodus and in row across base of heel. Propodus not inflated dorsoventrally; lateral surface smooth, with simple setae subdorsally, and long plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened; mesial surface with scattered long setae on and near distoventral margin. Carpus strongly produced dorsodistally and inflated, reaching distal margin of propodus, pointed and almost acute; dorsolateral margin unarmed; lateral surface with mat of short setae on dorsodistal third of segment and long transverse row of setae medially and scattered on proximal lateral surface; dorsal margin with scattered long plumose setae; mesial surface smooth, dorsomedial third decalcified, with long plumose setae on margins and in median transverse row ventral to decalcified area. Merus smooth, lateral surface almost entirely decalcified; dorsal and ventral margins unarmed, with long plumose setae distally; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female

pereopod III with large mesioproximal gonopore (not opposing other gonopore); male without pore.

Pereopod IV (fig. 47D) dactylus with base to heel slightly concave, heel acute, heel to tip broadly rounded and concave, tip acute, tip to base convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge across heel, with row of short plumose setae. Propodus expanded dorsally and ventrally; ventral expansion not reaching ventral margin of dactylus, margins with long plumose setae; dorsal expansion with row of long plumose setae medially and mat of short setae; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; lateral and mesial surfaces smooth; dorsomedial two-thirds of mesial surface decalcified; dorsal margin with small mat of short setae at dorsodistal angle; dorsal margin with long plumose setae, ventral margin with few short simple setae. Merus with small median decalcified area on lateral surface, few short transverse rows of setae, dorsal and distoventral margins with long plumose setae; mesial surface with large decalcified window proximoventrally. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 47E) somite I wider than long, widest posteriorly; dorsal surface with anterior margin straight; posterior margin concave, with elevated submarginal curved row of short setae and broad field of short simple setae anterior to submarginal row; with small, faint, transverse, decalcified windows laterad of segment median. Somite II anterior margin convex, posterior margin irregularly concave; pleura expanded and directed laterally, angled anterolaterally, rounded posterolaterally, small patch of short simple setae at posteromesial margin; anterior and lateral margins with long plumose setae, posterior margin with short setae. Somite III similar to somite II, narrower and shorter; pleura thinner and shorter than on somite II, directed posterolaterally proximally and curving forward distally, with setae as in somite II; anterolateral angle subacute; dorsal surface slightly obliquely flattened anterolaterally. Somite IV similar to somite III;

pleura thinner and shorter than on somite III, directed slightly anterolaterally; dorsal surface slightly obliquely flattened anterolaterally; margins with long plumose setae. Somite V wider than somite IV, narrowing posteriorly; anterolateral margins with plumose setae, two rows of setae on posterior margin; pleura distinct from somite, shorter than in somite IV, thin, flattened, directed anterolaterally, and covered with plumose setae. Somite VI narrower than somite V; dorsal surface with four short transverse rows of setae laterad of midline anteriorly, posterior margin with medially separated row of plumose setae; pleura absent.

Female with long uniramous pleopods on somites II–V; male with small pleopods.

Telson of male (fig. 47F) spatulate, proximal third laterally concave, median third laterally convex, distal third laterally concave; lateral expansions rounded, distal tip rounded; medioproximal third heavily calcified, lateral and distal regions decalcified; median longitudinal groove running along calcified region; two parallel rows of long simple setae in medial third; margins with long simple setae. Telson of female (fig. 47G) similar to male, with less concave distolateral third.

DISTRIBUTION: Known from Los Angeles Co., California, to San Diego Co., California, USA, in up to 23.8 m depth.

MAXIMUM SIZE: Males: 12.6 mm cl; females: 18.1 mm cl.

TYPE SPECIMENS: USNM 42213 (holotype), USNM 122633 (11 paratypes), BMNH 1937.6.1.4–5 (2 paratypes).

TYPE LOCALITY: Long Beach, California, USA.

REMARKS: Fransen et al. (1997) listed RMNH 4924 and RMNH 14638 as paratypes, but this material was explicitly excluded from the type series by Efford (1971).

Efford (1971) identified specimens from the Gulf of California as this species, but I have not been able to examine these specimens to validate this record. It is possible that *L. californica* occurs in the Gulf, but it is equally possible that the Gulf specimens represents a different, perhaps undescribed, species.

The maximum percentage of ovigers in populations has been reported as occurring in March (MacGinitie and MacGinitie,

1949). The complete larval development of this species (from ovigerous females) was described by Knight (1970, as *L. myops*) with four zoeal stages and one megalopal stage reached in 73–77 days at 15–19°C and 33–34‰ salinity. Digging behavior in this species has been well studied and compared with that of the spiny sand crab *Blepharipoda occidentalis* (Faulkes and Paul, 1993, 1997b, 1997c).

This species is a unique intermediate form between the “*benedicti*-group” and “*venusta*-group” of *Lepidopa*, and it shows a mixture of characters of both groups.

*Lepidopa haigae* Efford, 1971

Figures 48, 49

*Lepidopa haigae* Efford, 1971: 85–87, figs. 1d, 2c, 3b, 4j, 5m, 6j, s, 7h\*. – Coêlho and Calado, 1987: table 1. – Calado, 1995: 168–171, pl. 39, fig. h, pl. 40, fig. g, pl. 42, fig. g, pl. 53, figs. a–e, pl. 54, figs. a–c\*. – Hendrickx and Harvey, 1999: 367 (list).

MATERIAL EXAMINED: **Mexico:** Bahia Chacahua, Oaxaca, 15°57.3'N, 97°39.8'W, 18–27 m, March 20, 1939, coll. R/V “Velero III”: 1 ♀, 11.5 mm cl, holotype (LACM 39–30.12).

DIAGNOSIS: Carapace length and width subequal, with lightly setose grooves. Anterior margin without spines lateral to ocular sinus. CG5 absent; CG8 present; CG10 present; posterior submarginal groove reaching nearly to apex of posterior concavity. Rostrum present, rounded and unarmed. Distal peduncular segments dorsoventrally flattened and subquadrate, distal margin toothed, pigmented area at distolateral notch. Antennal segment I with dorsal spine. Dactylus of pereopod II with heel produced, tapering, and subacute. Dactylus of pereopod III with heel projecting, acute. Dactylus of pereopod IV with produced acute heel and deep indent. Telson of ♀ spatulate, with medial slightly elevated and thickened calcified region.

DESCRIPTION: Carapace (fig. 48A) as wide as long. Anterior margin concave on either side of ocular sinus, toothed. Rostrum as subacute projection reaching beyond median peduncular segments, without submarginal, terminal acute spine. Ocular sinus smoothly concave; unarmed. Frontal region smooth;

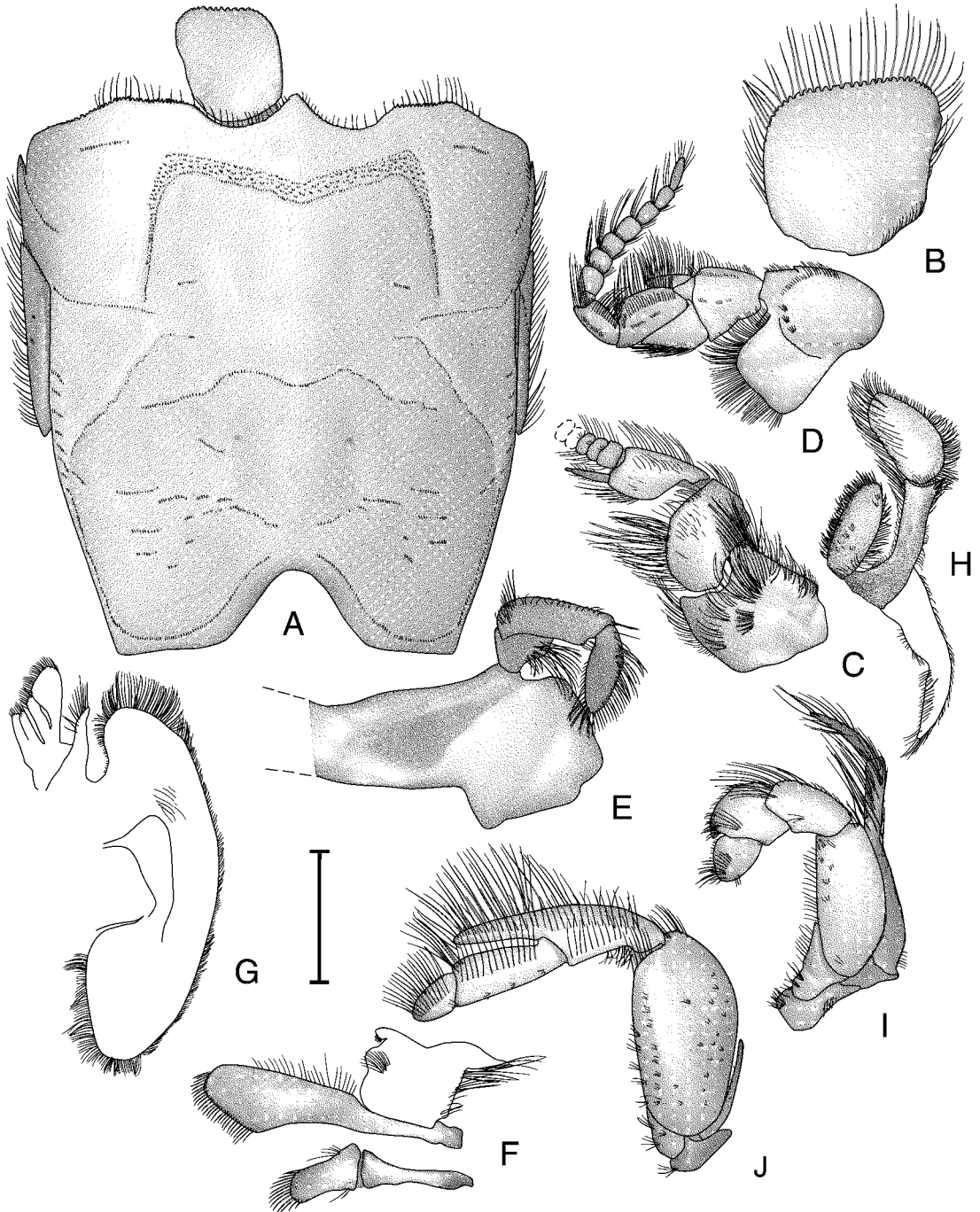


Fig. 48. *Lepidopa haigae* Efford, 1971: A–J, ♀, 11.5 mm cl, LACM 39–30.12, holotype. **A.** Carapace, branchiostegite, and left ocular peduncle, dorsal view. **B.** Right ocular peduncle, dorsal view. **C.** Left antennule, lateral view. **D.** Left antenna, lateral view. **E.** Left mandible, mesial view. **F.** Left maxillule, lateral view. **G.** Left maxilla, lateral view. **H.** Left maxilliped I, lateral view. **I.** Left maxilliped II, lateral view. **J.** Left maxilliped III, lateral view. Scale = 1.6 mm (E, F), 2.2 mm (B, I), and 3.3 mm (A, C, D, G, H, J).

setal field reduced to narrow band anterior to CG1, concave in median. CG1 parallel to anterior margin of carapace, sinuous, slightly crenulate, with medial fragment and lateral elements united. Mesogastric region smooth; CG2 absent; CG3 present as two short fragments; CG4 with two long oblique lateral elements. Hepatic region smooth with setose groove and short, blunt spine at median of lateral margin. Epibranchial region roughly triangular, smooth; posterolateral margin with six short rows of setae. Metagastric region smooth; CG5 absent. CG6 crenulate, with oblique, long, lateral fragments and short, sinuous median element united with CG7. CG7 oblique relative to anterior margin of carapace and united with median fragment of CG6. Cardiac region smooth; CG8 with one short transverse fragment on left side of region (not symmetrical in holotype). CG9 absent. CG10 with two sinuous elements separated by short gap at median. CG11 absent. Branchial region with few short, transverse rows of setae. Posterior margin deeply concave medially and straight laterally, with submarginal groove reaching nearly to apex of posterior concavity. Branchiostegite without short anterior submarginal spine; anterior region with anterodorsal transverse groove and granular surface, with many long plumose setae; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 48B) covered by carapace; median peduncular segments reduced to small rounded calcified areas anterolateral to ocular plate. Distal peduncular segments almost square, produced distolaterally, flattened, with convex lateral margins, distal margins toothed; pigmented area at notch on lateral margin two-thirds from proximal margin; mesial margins separated along entire length; mesial, lateral, and distal margins with long simple setae.

Antennule (fig. 48C) with segment III with narrow proximally, expanding distally to four times proximal width; with plumose setae on dorsal and ventral margins; dorsal exopodal flagellum with 31+ articles (in longest broken antennule of holotype), long plumose setae on dorsal, ventral and distal margins; ventral endopodal flagellum with one long proximal and one short distal segment,

plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins. Segment I wider than long, unarmed; dorsodistal third of lateral surface rugose, with long plumose setae; long plumose setae on dorsal and ventral margins and transversely across lateral surface.

Antenna (fig. 48D) with segment V approximately two times as long as wide, with short plumose setae on dorsal and distal margins; flagellum with eight articles, long plumose setae on dorsal, ventral, and distal margins. Segment IV almost cylindrical, overreaching segment III by one-fourth of its length, with long plumose setae on dorsal and distal margins, and row of setae on dorsolateral margin. Segment III with long plumose setae on ventral margin. Segment II widening distally, with plumose setae on margins; antennal acicle short, triangular, overreaching segment IV proximal margin by one-half of its length, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened and truncate ventrolaterally with long plumose setae on margins; lateral margin with small spine; segment with ventromesial antennal gland pore.

Mandible (fig. 48E) incisor process with one tooth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 48F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and plumose setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under, with narrow proximal projection; internal lobe reduced with six thick setae at distolateral margin.

Maxilla (fig. 48G) exopod rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 48H) epipod with plumose setae on distal margin and on distolateral surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, with plumose setae; distal segment spatulate, longer than wide,



curved mesially, broadest medially, margins with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins.

Maxilliped II (fig. 48I) dactylus evenly rounded, length equal to width, with thick simple setae distally and thin simple setae in short row on lateral surface. Propodus two times wider than long, with plumose setae on dorsal margin and long simple setae on distal margin. Carpus not strongly produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal margin and in short row on distolateral surface. Merus 2.5 times longer than wide, margins parallel but slightly inflated submedially, with simple setae on ventrolateral margin and plumose setae on dorsolateral margin and in short rows on ventrodistal surface. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-third times longer than merus, flagellum with one elongate article.

Maxilliped III (fig. 48J) dactylus evenly rounded; with long plumose setae on margins and lateral surface. Propodus with longitudinal median row of plumose setae on lateral surface, margins with plumose setae. Carpus strongly produced onto propodus, almost overreaching entire propodus; lateral surface with row of plumose setae ventromedially, plumose setae on margins. Merus unarmed, broadly inflated medially, with plumose setae on distolateral margins. Basis-ischium incompletely fused, without crista dentata. Exopod two-segmented: proximal segment small; distal segment styliform, tapering, approximately one-half length of merus, with plumose setae on margins; without flagellum.

Pereopod I (fig. 49A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose and short simple setae; ventral margin with short simple setae. Propodal lateral surface with numerous short, transverse rows of setose rugae; dorsal margin with few small, low ridges; ventral margin distally produced into acute spine; cutting edge lacking teeth, lined with long plumose setae; dorsal margin with short plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle rounded, dorsal margin smooth, with

short plumose setae; lateral surface with few transverse, setose ridges; mesial surface smooth, with few scattered rows of 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; proximal third of mesial surface with decalcified window. Basis-ischium incompletely fused, unarmed. Coxa with small posteromesial tubercle.

Pereopod II (fig. 49B) dactylus smooth; with base to heel concave, heel produced and smoothly rounded, heel to tip with wide, smoothly rounded indent, tip acute, tip to base broadly convex; lateral surface smooth, with one or two small tufts of short setae proximally, several widely spaced, submarginal tufts of short setae dorsodistally; mesial surface smooth, ventral margin with long plumose setae; dorsal margin with short simple setae and patch of long plumose setae at base reaching across median of heel. Propodus with dorsal surface smooth, ventral margin inflated and rounded; distal and ventral margins with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with long plumose setae on ventral margin; mesial surface with ventral row of setae. Carpus strongly produced dorsodistally; lateral surface nearly smooth, with irregular, interrupted row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; distal margins with long plumose setae; mesial surface smooth with long plumose setae in scattered patches in line subdorsally and distally. Merus lateral surface almost entirely decalcified, with few scattered setae on surface and margins; mesial surface nearly smooth, with oblique median ridge, patches of long plumose setae dorsal to ridge and in row ventrally, with decalcified area on proximal half of area dorsal to ridge. Basis-ischium incompletely fused and unarmed. Coxa with small mesioproximal tubercle.

Pereopod III (fig. 49C) dactylus with base to heel broadly indented, heel acute and produced, heel to tip with broad, evenly rounded indent, tip acute, tip to base smoothly convex; lateral surface smooth, with tufts of short setae at end of heel and tip, dorsodistal margin with tufts of short setae; ventromesial

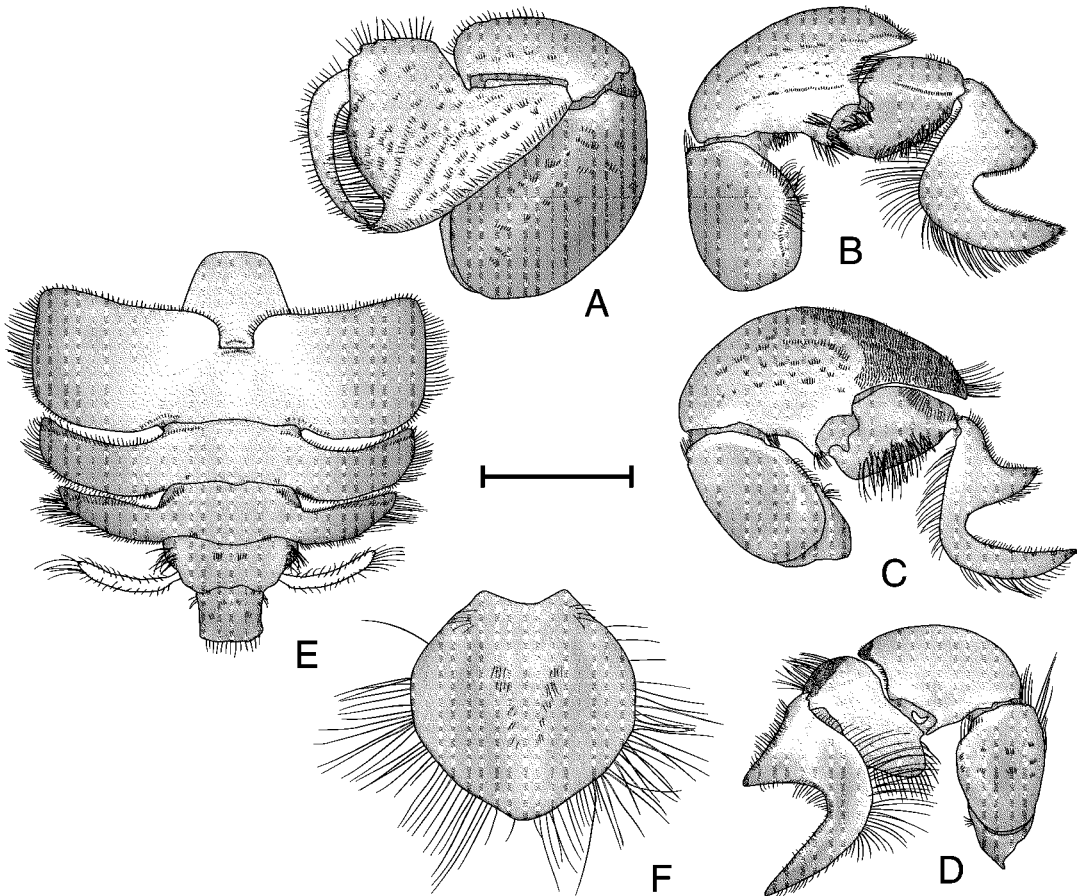


Fig. 49. *Lepidopa haigae* Efford, 1971: A-F, ♀, 11.5 mm cl, LACM 39-30.12, holotype. A. Left pereopod I, lateral view. B. Right pereopod II, lateral view. C. Right pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I-VI, dorsal view. F. Telson of ♀, dorsal view. Scale = 2.2 mm (F) and 4.4 mm (A-E).

margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus and in row across base of heel. Propodus not inflated dorsoventrally; lateral surface smooth, with simple setae subdorsally, and long plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened; mesial surface with scattered long setae on and near ventral margin. Carpus strongly produced dorsodistally and inflated, reaching distal margin of propodus, pointed and almost acute; dorsolateral margin unarmed; lateral surface, with mat of short setae on distal third of segment and long transverse row of setae medially and scattered on proximal lat-

eral surface; mesial surface smooth, with long plumose setae on margins and in median transverse row dorsal to decalcified area. Merus smooth, lateral surface almost entirely decalcified; dorsal and ventral margins unarmed, with long plumose setae; laterodistal margin with long plumose setae; mesial surface smooth, with small decalcified window at junction with incompletely fused and unarmed basis-ischium. Coxa with small mesioproximal tubercle. ♀ pereopod III with large mesioproximal gonopore; male unknown.

Pereopod IV (fig. 49D) dactylus with base to heel slightly concave, heel acute, heel to tip broadly rounded and concave, tip acute, tip to base convex; lateral surface smooth,

ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge across heel, with row of short plumose setae. Propodus expanded dorsally and ventrally; ventral expansion not exceeding ventral margin of dactylus, margin with long plumose setae; dorsal expansion with row of long plumose setae medially and mat of short setae; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; lateral and mesial surfaces smooth; lateral surface with median two-thirds decalcified; dorsal margin with small mat of short setae at dorsodistal angle; ventral margin with short simple setae. Merus with large median decalcified area on lateral surface and scattered short transverse rows of setae, dorsal and ventrodorsal margins with long plumose setae; mesial surface with large decalcified window proximoventrally. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 49E) with somite I approximately as long as wide, widest posteriorly; dorsal surface with anterior margin straight; posterior margin straight, with elevated, submarginal, curved row of short setae; with small, faint, transverse, decalcified windows laterad of segment median. Somite II dorsal surface with setose, submarginal, transverse ridge anteriorly, setose row on posterolateral margin reaching onto pleura; pleura expanded and directed anterolaterally, strongly produced anteriorly, interpleural space narrow; dorsolateral margin angled, posterolateral margin rounded, anterior and lateral margins with long plumose setae, posterior margin with short setae. Somite III similar to somite II, much narrower, shorter, and lacking anterior submarginal ridge, setae on anterolateral margins extending onto pleura; small tuft of short setae on posterolateral angle; pleura thinner and shorter than on somite II, directed anterolaterally, with setae as in somite II, but reaching onto anterior margin of somite; anterolateral angle acute; dorsal surface obliquely flattened anterolaterally. Somite IV similar to somite III; pleura thinner and shorter than on somite III, directed anterolaterally; dorsal surface obliquely flattened anterolaterally; margin with long plu-

mose setae. Somite V wider than somite IV; lateral margins with plumose setae, two anterior submarginal rows of setae and two short rows of setae posterolaterally; pleura distinct from somite, shorter than in somite IV, thin, flattened and directed anterolaterally. Somite VI narrower than somite V; dorsal surface with two or three short transverse rows of setae laterad of midline anteriorly and patch of setae on anterolateral margin, posterior margin with long plumose setae; pleura absent.

Female pleopods uniramous, three-segmented, long, reaching to female gonopore, with long simple setae; male unknown.

Uropods lacking distinctive features.

Telson of male unknown. Telson of female (fig. 49F) spatulate, with medial slightly elevated and thickened calcified region, long simple setae at proximolateral corners; median longitudinal groove long, almost reaching distal margin of calcified area, median third of groove flanked by five short rows of simple setae; margins with long simple setae.

DISTRIBUTION: Known only from the unique holotype from Bahia Chacahua, Oaxaca, Mexico, in 18–27 m depth.

MAXIMUM SIZE: Males: unknown; females: 11.5 mm cl.

TYPE SPECIMEN: LACM 39–30.12 (holotype).

TYPE LOCALITY: Bahia Chacahua, Oaxaca, Mexico, 15°57.3'N, 97°39.8'W, 18–27 m.

REMARKS: This species closely resembles *L. mearnsi* in essentially all morphological features. The only important difference between the two species is the lack of anterolateral spines on the anterior margin of the carapace and the ventral spine on the rostrum on *L. haigae*. There is a possibility that the only known specimen of *L. haigae* is damaged and that the lack of lateral spines, otherwise unknown in the genus, is not typical of these animals. If so, then *L. haigae* would be nearly identical to, and perhaps conspecific with, *L. mearnsi*. More specimens from the type locality of *L. haigae* are needed to answer this question definitively.

*Lepidopa richmondi* Benedict, 1903

Figures 50, 51

*Lepidopa scutellata*: Stimpson, 1858: 230. – Stimpson, 1859: 79. – Faxon, 1895: 237 (list).

– Ortmann, 1896: 226 (part), 227 (part). – Gordon, 1938: 188 (list, part). (not *Thia scutellata* (Fabricius, 1793)).

*Lepidops* [sic] *scutellata*: Miers, 1878: 332 (part). – Moreira, 1901: 30, 88–89 (not *Thia scutellata* (Fabricius, 1793)).

*Lepidopa richmondi* Benedict, 1903: 895, fig. 8\*. – Gordon, 1938: 188, fig. 2d. – Garcia Mendes, 1945: 119 (list). – Holthuis, 1961: 31–35, fig. 4\*. – Rodrigues da Costa, 1962: 9–10, pl. 3, figs. 4–7. – Coêlho, 1966: 244. – Efford, 1971: 83–85, figs. 1c, 2a, 3d, 4k, 6l, u, 7l\*. – Coêlho and Ramos, 1972: 176. – Dexter, 1972: 455\*. – Abele, 1976: 266–267\*. – Rodriguez, 1980: 235–237, pl. 8, fig. 52. – Calado, 1987: 130–142, pls. 16–19\*. – Coêlho and Calado, 1987: 43, table 1. – Manning, 1988: 626–627 (list). – Calado et al., 1990: 749, fig. 3a\*. – Rosini et al., 1994: 103–105. – Calado, 1995: 191–195, pl. 39, fig. m, pl. 40, fig. l, pl. 41, fig. l, pl. 62, fig. a, pl. 63, figs. a–d, pl. 64, figs. a–f\*. – Spivak, 1997: 74 (list). – Calado, 1998: 408. – Nucci et al., 2001: 479.

*Lepidopa fernandesi* Garcia Mendes, 1945: 120–122, pl. 13, figs. 1–5.

*Lepidopa websteri*: Amaral et al. in Nucci et al., 2001: 479 (not *Lepidopa websteri* Benedict, 1903).

not *Lepidopa richmondi*: Gore and Van Dover, 1981: 1018–1026, figs. 1–6. – Spivak, 1997: 81 (list) (= *Lepidopa* sp. indet.).

not *Lepidopa richmondi*: Seridji, 1988: 1298 (= *Lepidopa* sp. indet.).

**MATERIAL EXAMINED: USA: Florida:** “Florida” (data suspect, see remarks): 1 ♀, 11.8 mm cl (MCZ 865).

**Haiti:** Île à Vache, May 2, 1930, coll. Parrish Smithsonian Expedition: 1 ♂, 9.6 mm cl (USNM 65879).

**Puerto Rico:** “Puerto Rico,” coll. unknown: 1 ♀, 14.6 mm cl (USNM 104654).

**U.S. Virgin Islands:** St. Thomas, Jan. 1, 1898, coll. C. Eggert: 1 ♂, 9.3 mm cl (ZMH K-7567).

**Netherlands Antilles:** Orange Baai, St. Eustatius, Jan. 4, 1958, coll. P. A. van den Heuvel: 2 ♂, 7.4–8.1 mm cl, 1 ♀, 9.1 mm cl (RMNH 14634); Zeelandia Baai, St. Eustatius, Feb. 9, 1958, coll. P. A. van den Heuvel: 1 ♀, 9.5 mm cl (RMNH 14635); 1 ♀, 8.3 mm cl (AMNH 18083 ex RMNH 14635); Orange Baai, St. Eustatius, Feb. 7, 1958, coll. P. A. van den Heuvel: 1 ♀, 9.9 mm cl (RMNH 14636); Orange Baai, St. Eustatius,

Nov. 16, 1957, coll. P. A. van den Heuvel: 1 ♂, 5.6 mm cl (RMNH 14637);

**Trinidad and Tobago:** Maracas Bay, Trinidad, Dec. 25, 1970, coll. J. M. Stohley: 1 ♀, 7.2 mm cl (USNM 141352).

**Nicaragua:** Greytown, coll. C. W. Richmond: 1 ♀, 7.2 mm cl, holotype of *L. richmondi* (USNM 29018).

**Costa Rica:** Tortuguero, Summer 1977, coll. D. Perry: 1 ♀, 12.4 mm cl, 1 unsexable specimen, 7.8 mm cl (LACM-AHF 925–01).

**Panama (Atlantic):** Shimmey Beach, Ft. Sherman, Aug. 10, 1969, coll. D. M. Dexter: 1 ♂, 6.3 mm cl (USNM 260940); ca. 500 yd from town, Piñas Beach, July 16, 1969, coll. L. G. Abele: 2 ♀, 6.6–7.3 mm cl (USNM 304305).

**Venezuela:** Estado Sucre, Alrededores de Cumana, Playa Bordonos, June 4, 1965, coll. C. Flores: 1 ♀, 11.4 mm cl (USNM 120592).

**Brazil:** Coll. unknown: 2 ♂, 9.1–9.6 mm cl, 1 ♀, 9.8 mm cl (USNM 106079); **Rio Grande do Norte:** Natal, 1951, coll. M. Alvarenga: 1 ♀, 6.9 mm cl (MNRJ 1540); Praia do Forte, Natal, Jan. 25, 1964, coll. A. L. Castro: 1 ♂, 9.0 mm cl (MNRJ 1551); **Pernambuco:** Baía de Suape, Feb. 1964, coll. A. L. Castro: 1 ♂, 10.5 mm cl, 1 oviger, 9.0 mm cl (MNRJ 1538); **Bahia:** Praia da Ribeira, Itacaré, Feb. 10, 1993, coll. P. S. Young and M. C. Britto-Pereira: 1 ♀, 14.3 mm cl (MNRJ 2467); **Espírito Santo:** Jacaraípe, Serra, Jan. 1984, coll. D. N. Fundão: 1 ♀, 9.0 mm cl (UFES 220); Guarapari, May 29, 1968, coll. L. Behar: 2 ♂, 7.8–8.5 mm cl, 2 ♀, 6.4–8.0 mm cl (UFES 84); **Rio de Janeiro:** Recreio dos Bandeirantes, April 30, 1961, coll. H. R. da Costa: 1 ♀, 12.8 mm cl (UFES 1118); Prainha, Recreio dos Bandeirantes, Feb. 1972, coll. A.C.S. Coêlho: 1 ♀, 10.1 mm cl (MNRJ 1545); Praia de Copacabana, Nov. 10, 1954, coll. F. Pires: 2 ♀, 9.9–10.5 mm cl (MNRJ 1535); Praia de Copacabana, Jan. 9, 1980, coll. R. Novelli: 1 ♀, 11.9 mm cl (MNRJ 1541); Copacabana, Jan. 9, 1985, coll. T. C. Calado: 8 ♂, 8.2–10.2 mm cl, 9 ♀, 8.6–11.6 mm cl (MNRJ 1543); km 18, Restinga de Marambaia, June 1966, coll. B. Prazeres: 1 ♂, 9.2 mm cl (MNRJ 1536); Barro do Tijuco, May 19, 1964, coll. A. L. Castro: 1 ♀, 11.0 mm cl (MNRJ 1537); Ilha Pingo d’Água, Baía do Ribeira, Angra dos Reis, Dec. 31, 1979, coll. R. Novelli: 1



♂, 5.8 mm cl, 2 ♀, 6.7–7.3 mm cl (MNRJ 1539); Piratininga, Aug. 4, 1966, coll. unknown: 1 ♂, 8.4 mm cl, 3 ♀, 10.8–11.9 mm cl (MNRJ 1542); Praia de Ipanema, Ipanema, Feb. 17, 1985, coll. Z. Andrade: 1 ♀, 10.4 mm cl (MNRJ 1544); Ipanema, 1922, coll. H. M. Smith: 1 ♀, 12.8 mm cl (USNM 56698); Ilha Grande, Praia do Sul, Feb. 14, 1985, coll. Z. Andrade: 1 ♀, 9.0 mm cl (MNRJ 1546); Praia do Pexó, Cabo Frio, Feb. 1985, coll. T. C. Calado: 4 ♀, 9.8–11.1 mm cl (MNRJ 1547); Barro do Tijuco, Jan. 1960, coll. A. Coêlho: 1 ♂, 10.1 mm cl (MNRJ 1548); Praia de São Bráz, Baía de Mangaratiba, Jan. 24, 1951, coll. unknown: 1 ♂, 9.4 mm cl (MNRJ 1549); Praia do Leblon, Leblon, Feb. 2, 1985, coll. Z. Andrade: 1 ♀, 11.4 mm cl (MNRJ 3856); Praia do Forte, Cabo Frio, Aug. 24, 1986, coll. C. E. Ribeiro: 1 ♂, 8.6 mm cl, 1 ♀, 9.5 mm cl (MNRJ 3864b); Praia do Forte, Cabo Frio, May 22, 1994, coll. F. C. Fernandes: 1 ♀, 9.9 mm cl, 1 unsexable specimen, 10.0 mm cl (MNRJ 4310); Barra da Tijuca, May 31, 1968, coll. H. R. da Costa: 1 ♀, 9.4 mm cl (UFES 89); Jiha Marambala, April 1924, coll. S. Müllegger: 1 ♀, 11.7 mm cl (ZMH K-8153); **São Paulo**: São Vicente and Santos, Aug. 7, 1960, coll. unknown: 1 ♀, 10.9 mm cl, 1 oviger, 9.3 mm cl (MNRJ 1550); Ubatuba, Dec. 12, 1992, coll. F.L.M. Mantelatto: 2 ♀, 10.3–10.8 mm cl (AMNH 1808); Praia do Perequê, April 12, 1963, coll. A. L. Castro: 1 ♂, 6.6 mm cl (MNRJ 3854); **Santa Catarina**: Praia Grande, São Francisco do Sul, Oct. 8, 1925, coll. W. L. Schmitt: 2 ♀, 10.0–10.4 mm cl (USNM 104653); “Desterro” [= Florianópolis], coll. F. Müller: 1 ♂, 10.6 mm cl (MNHN-Hi 192).

**DIAGNOSIS:** Carapace length and width subequal, with lightly setose grooves. Anterior margin with two large spines lateral to ocular sinus. CG5 present; CG8 present; CG10 present; posterior submarginal groove uninterrupted. Rostrum present, rounded and armed with acute ventral spine. Distal peduncular segments dorsoventrally flattened and subquadrate, distal margins toothed; pigmented area at distolateral notch. Antennal segment I with dorsal spine. Dactylus of pereopod II with heel produced, tapering, and subacute. Dactylus of pereopod III with heel projecting, acute. Dactylus of pereopod IV

with produced acute heel and deep indent. Telson of male spatulate, proximal two-thirds laterally convex, distal third slightly laterally concave, lateral expansions rounded, distal tip rounded; medial third heavily calcified, lateral regions decalcified.

**DESCRIPTION:** Carapace (fig. 50A) length and width subequal. Anterior margin sinuous mesially on either side of ocular sinus, crenulate; acute strong spine at midpoint of either lateral anterior margin; margin lateral to spine sloping and slightly concave. Rostrum as rounded projection reaching beyond median peduncular segments and armed with subdorsal short acute spine. Ocular sinus smoothly concave, unarmed. Frontal region smooth; setal field reduced to narrow band anteriorly paralleling CG1, concave and broadest medially. CG1 parallel to anterior margin of carapace, concave medially, slightly crenulate, medial and posterolateral elements united. Mesogastric region smooth; CG2 absent; CG3 present as two short lateral elements; CG4 with two short elements and two long, curved lateral elements, lateral elements almost united with posterior margin of CG1 posterolateral elements. Hepatic region smooth, with short transverse element lateral to anterolateral margin of CG1, oblique lateral setose groove and short, acute spine at median of lateral margin. Epibranchial region generally triangular, smooth; posterolateral margin with four or five short rows of setae. Metagastric region smooth; CG5 present as two short elements. CG6 crenulate, with separate, oblique, long, lateral fragments and short, sinuous, posteriorly displaced median element united with CG7. CG7 transverse relative to anterior margin of carapace and united with median fragment of CG6. Cardiac region smooth; CG8 present as two short elements with gap at median. CG9 absent. CG10 present as two broken oblique elements. CG11 absent. Branchial region with few short, transverse rows of setae. Posterior margin deeply and irregularly concave medially and more or less straight laterally, with submarginal groove uninterrupted across posterior concavity. Branchiostegite unarmed; anterior region with anterodorsal transverse groove and granular surface, also many long plumose setae; posterior region membranous with numerous irregular frag-

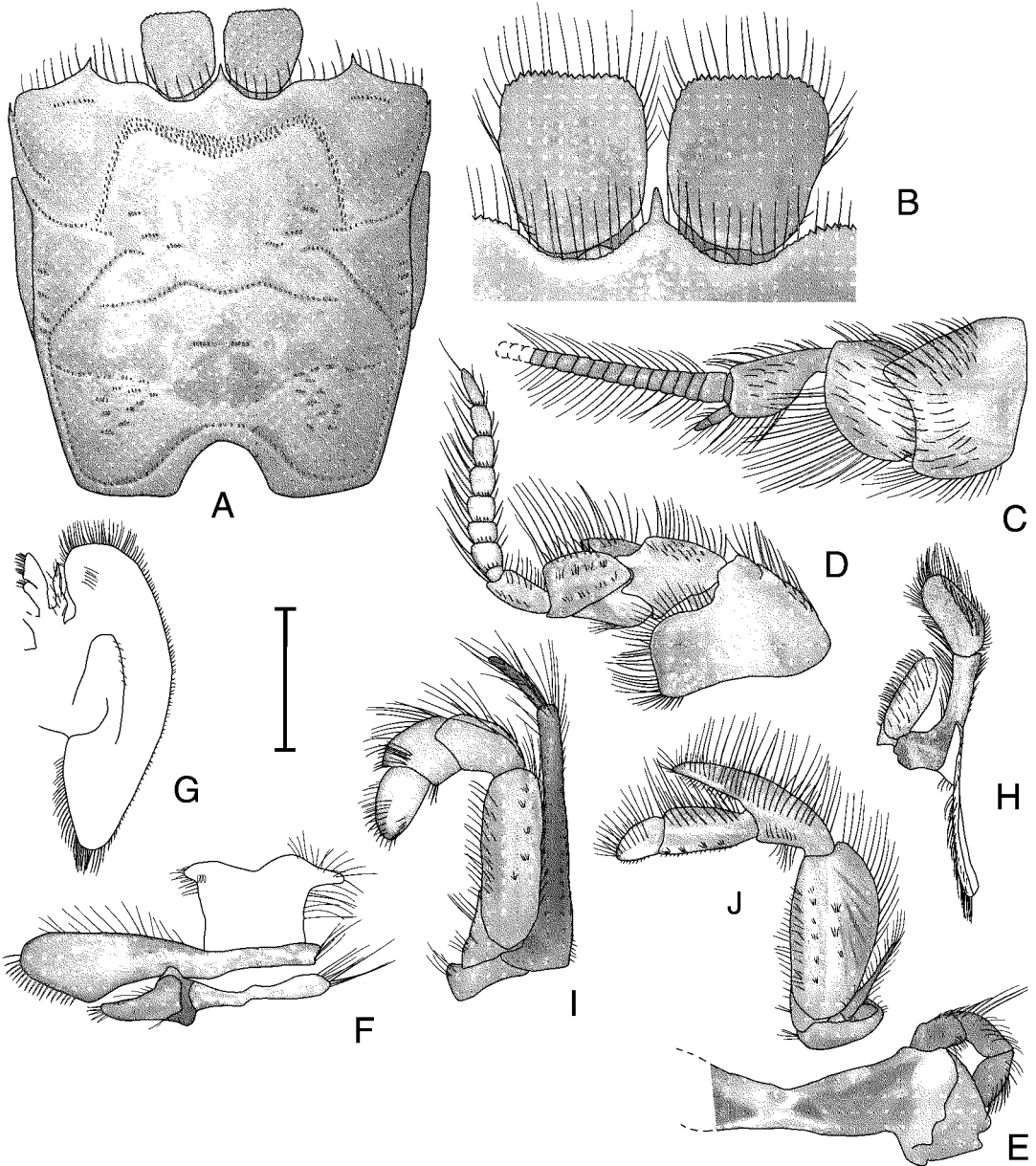


Fig. 50. *Lepidopa richmondi* Benedict, 1903: A, B, ♀, 7.2 mm cl, USNM 29018, holotype; C–J, ♀, 6.6 mm cl, USNM 304305. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Left maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 1.1 mm (F), 1.4 mm (B), 1.6 mm (E, I), 2.2 mm (C, D), 3.0 mm (G, H, J), and 4.4 mm (A).

ments and sparsely covered with long plumose setae.

Ocular plate (fig. 50B) covered by carapace; proximal ocular segments reduced to small oblong calcified areas anterolateral to ocular plate. Distal peduncular segments subquadrate, angled slightly distolaterally, flattened with sinuous-convex lateral and convex mesial margins, distolateral and distomesial angles rounded, margins smooth in proximal three-fourths, toothed in distal quarter; faint pigmented area at notch on lateral margin two-thirds from proximal margin; mesial margins separated along entire length; distal half of margins with long simple setae; small patch of setae in proximo-lateral corner.

Antennule (fig. 50C) segment III narrow proximally, expanding distally to two times proximal width; with plumose setae on dorsal and ventral margins and scattered on lateral surface; dorsal exopodal flagellum with 80–98 articles ( $n = 6$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with two or three articles ( $n = 6$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins, and scattered on mediolateral surface. Segment I wider than long, unarmed; dorsomedial third of lateral surface rugose with long plumose setae; long plumose setae on dorsal and ventral margins and scattered on distal half of lateral surface.

Antenna (fig. 50D) with segment V approximately two times longer than wide, with short plumose setae on dorsal and distal margins and in subventral row; flagellum with eight articles ( $n = 6$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV almost cylindrical, overreaching segment III by one-third of its length, with long plumose setae on dorsal and distal margins, and two interrupted rows of setae on lateral surface. Segment III with long plumose setae on ventral margin. Segment II widening distally, with plumose setae on dorsal margin and in subdorsal area; antennal acicle short, triangular, overreaching segment IV proximal margin by one-half of its length, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened and truncated ventrolaterally, with long plumose setae on

dorsal and distal margins; patch of short plumose setae subdorsally proximal to spine; dorsolateral margin with short acute spine one-third from distal margin; segment with ventromesial antennal gland pore.

Mandible (fig. 50E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 50F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and plumose setae on dorsal margin. Proximal endite with thick simple setae on distal margin and thin simple setae on dorsal margin. Endopodal external lobe truncate distally and curled under, with wide proximal projection; internal lobe reduced, with three thick setae at distolateral margin.

Maxilla (fig. 50G) exopod rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 50H) epipod with plumose setae on margins and on distolateral surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, with plumose setae; distal segment spatulate, longer than wide, curved mesially, broadest medially, margins and dorsolateral surface with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins.

Maxilliped II (fig. 50I) dactylus evenly rounded, longer than wide, with thick simple setae distally and thin simple setae in short row on lateral surface and on distoventral angle. Propodus slightly produced dorsodistally, width subequal to length, with plumose setae on dorsal margin and long simple setae on dorsodistal and ventrodorsal margins. Carpus not produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal margin. Merus 2.5 times longer than wide, margins parallel, with simple setae and plumose setae on dorsal and lateral margins and scattered in short transverse rows on surface. Basis-ischium incompletely fused, with plumose setae on mar-

gins. Exopod one-third longer than merus, flagellum with one elongate article.

Maxilliped III (fig. 50J) dactylus elongate and evenly rounded; long plumose setae on margins and lateral surface. Propodus with longitudinal median row of plumose setae on lateral surface; dorsal margin with plumose setae, ventral submarginal short rows of short setae. Carpus strongly produced onto propodus, almost reaching distal margin of propodus; lateral surface with medial transverse row of plumose setae; plumose setae on margins. Merus unarmed, broadly inflated distolaterally, with long plumose setae on lateral margin, short setae on mesial margin, and scattered in short oblique rows on surface. Basis-ischium incompletely fused, without crista dentata. Exopod two-segmented: proximal segment small; distal segment styliform, tapering, approximately three-fourths length of merus, with plumose setae on margins; without flagellum.

Pereopod I (fig. 51A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin smooth, with long plumose setae; ventral margin with short simple setae. Propodal lateral surface with numerous short, transverse rows of setose rugae; dorsal margin with few small, low ridges; ventral margin distally produced into acute spine; cutting edge lacking teeth, lined with long plumose setae; dorsal margin with long plumose setae, ventral margin with short simple setae; mesial surface smooth with few scattered short rows of short simple setae. Carpus with few small spinules and slightly rugose at dorsodistal angle, dorsal margin smooth, with short plumose setae; lateral surface with few transverse, setose ridges on distal half; mesial surface smooth, with medial transverse row of long plumose setae. Merus unarmed; lateral surface with scattered transverse rows of short plumose setae, margins with short plumose setae and long plumose setae on proximolateral margin; mesial surface with few short rows of setae; proximal half of mesial surface with decalcified window. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 51B) dactylus smooth; with base to heel slightly concave, heel broadly produced and narrowing to rounded tip, heel to indent convex, indent broad and

rounded, indent to tip almost straight, tip acute, tip to base broadly convex; lateral surface smooth, with small patch of setae in median of base to heel; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae and patch of long plumose setae at base reaching across median of heel. Propodus with dorsal surface smooth, ventral margin inflated and rounded; distoventral margin with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with long plumose setae on ventral margin, short plumose setae on dorsal margin; mesial surface with subdistal row of long plumose setae. Carpus strongly produced dorsodistally, reaching one-third length of propodus; lateral surface nearly smooth, with two irregular, interrupted rows of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; dorsal margin and distoventral angle with long plumose setae, distoventral margin with long plumose setae; mesial surface smooth, median three-fourths decalcified with ventral row of long plumose setae. Merus with lateral surface almost entirely decalcified, long plumose setae on margins; mesial surface nearly smooth, with oblique median ridge, long plumose setae patches dorsal to ridge and in row ventrally, nearly entire surface decalcified. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 51C) dactylus base to heel broadly indented, heel acute, thin, and produced, heel to tip with broad, evenly rounded indent and small indent at base of heel, tip acute, tip to base smoothly convex; lateral surface smooth, with tufts of short setae at end of heel and tip, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus and in row across base of heel. Propodus not inflated dorsoventrally; lateral surface smooth, with simple setae subdorsally, and long plumose setae on ventral margin and in oblique row on surface; dorsolateral surface narrow, oblique, flattened; mesial surface decalcified medially, with scattered long setae on and near distoventral margin. Carpus strongly produced dorsodistally and inflated, reaching distal



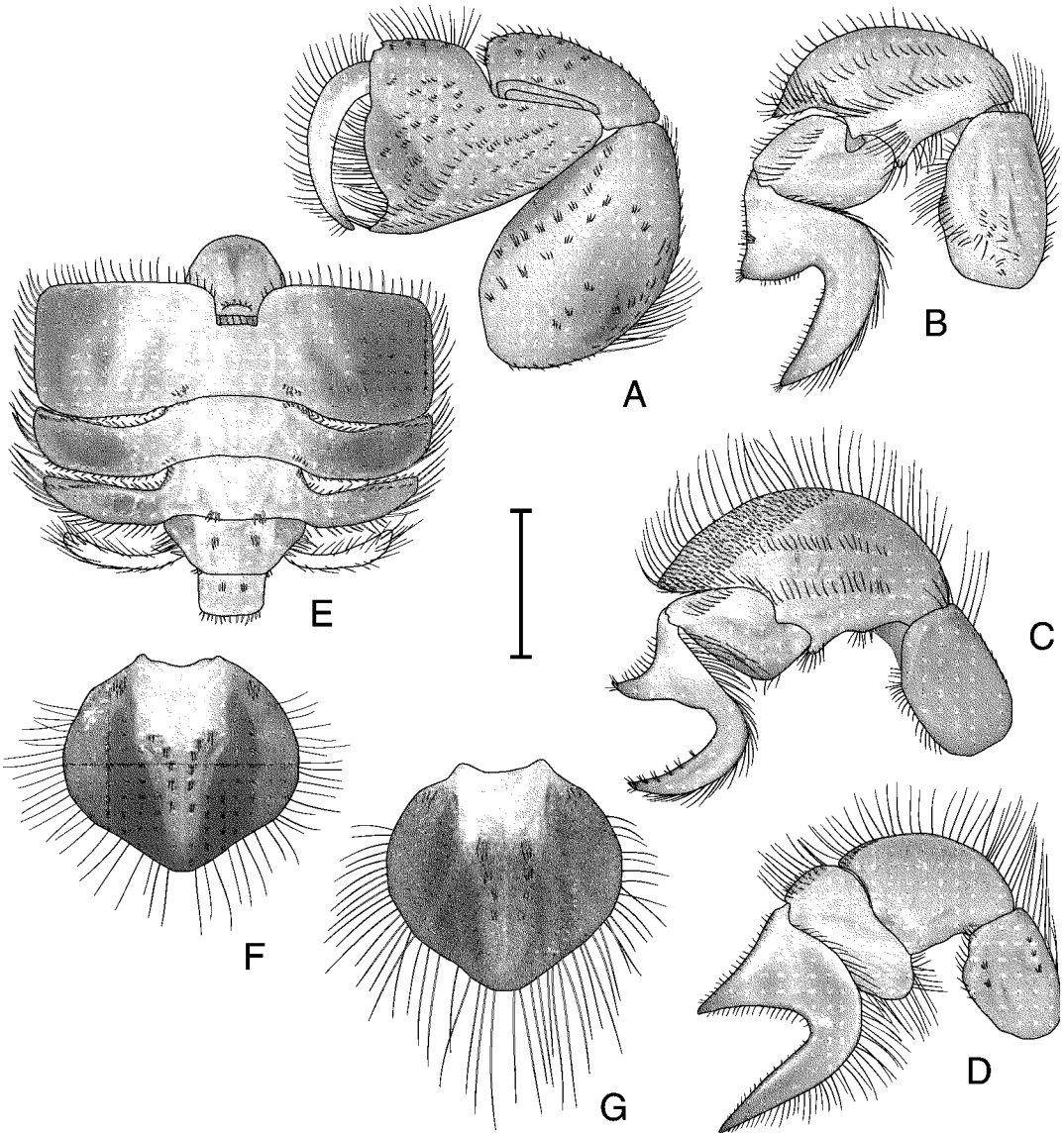


Fig. 51. *Lepidopa richmondi* Benedict, 1903: A–E, G, ♀, 6.6 mm cl, USNM 304305; F, ♂, 10.5 mm cl, MNRJ 1538. **A.** Left pereopod I, lateral view. **B.** Left pereopod II, lateral view. **C.** Left pereopod III, lateral view. **D.** Left pereopod IV, lateral view. **E.** Abdominal somites I–VI, dorsal view. **F.** Telson of ♂, dorsal view. **G.** Telson of ♀, dorsal view. Scale = 1.7 mm (G), 2.2 mm (F), 3.0 mm (A–D), and 4.4 mm (E).

margin of propodus, rounded; dorsolateral margin unarmed; lateral surface with mat of short setae on dorsodistal fourth of segment and two long, transverse, interrupted rows of setae medially, interrupted row of setae one-third dorsal to ventral margin, and patch of long plumose setae on distoventral angle;

dorsal margin with long plumose setae; mesial surface smooth, medial three-fourths decalcified, with long plumose setae on margins and in mesiodistal short transverse row in decalcified area. Merus smooth, lateral surface almost entirely decalcified; dorsal and ventral margins unarmed, mesial margin

with short plumose setae; distolateral margin with long plumose setae; mesial surface smooth with few scattered setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female pereopod III with large mesioproximal gonopore (not opposing other gonopore); male with slightly smaller pore more mesially displaced.

Pereopod IV (fig. 51D) dactylus with base to heel slightly concave, heel acute, heel to tip with broadly rounded indent, tip acute, tip to base convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge across heel, with row of short plumose setae. Propodus expanded dorsally and ventrally; ventral expansion almost reaching ventral margin of dactylus, margins with long plumose setae; dorsal expansion with row of long plumose setae medially and mat of short setae; lateral and mesial surfaces smooth, with few scattered, long plumose setae. Carpus slightly produced dorsodistally; lateral and mesial surfaces smooth; dorsomedial half of mesial surface decalcified; dorsal margin with small mat of short setae at dorsodistal angle and long plumose setae along length; ventral margin with short simple setae. Merus with small median decalcified area on lateral surface, few short transverse rows of setae, dorsal and ventrodiscal margins with long plumose setae; mesial surface with large decalcified window proximoventrally. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 51E) somite I wider than long, widest posteriorly; dorsal surface with anterior margin convex; posterior margin straight, with elevated submarginal curved row of short setae; with small, faint, transverse, decalcified window laterad of segment median. Somite II anterior margin straight, posterior margin concave; pleura expanded and directed laterally, angled anterolaterally and posterolaterally, small patch of short simple setae at posteromesial margin; anterior and lateral margins with long plumose setae, posterior margin with short setae. Somite III similar to somite II, narrower and shorter; pleura thinner and longer than on somite II, directed posterolaterally proximally

and curving forward distally, with setae as in somite II; anterolateral angle subacute; dorsal surface slightly obliquely flattened anterolaterally, with submarginal row of setae. Somite IV similar to somite III, two short rows of short simple setae on posterior margin laterad of midline; pleura thinner and shorter than on somite III, directed laterally proximally, curving forward distally; dorsal surface slightly obliquely flattened anterolaterally with submarginal row of short setae; margins with long plumose setae. Somite V wider than somite IV, narrowing posteriorly; anterolateral margins with plumose setae, two medial rows of simple setae laterad of midline; pleura distinct from somite, shorter than pleura of somite IV, thin, flattened, directed anterolaterally, and covered with plumose setae. Somite VI narrower than somite V; dorsal surface with two anterior short transverse rows of setae laterad of midline, posterior margin with continuous row of long plumose setae; pleura absent.

Female with long uniramous pleopods on somites II–V; male with small pleopods.

Telson of male (fig. 51F) spatulate, proximal two-thirds laterally convex, distal third slightly laterally concave, lateral expansions rounded, distal tip rounded; medial third heavily calcified, lateral regions decalcified; median longitudinal groove running from proximomedial margin along calcified region to just before distal margin; two distally converging rows of short simple setae in medial third; margins with long simple setae. Telson of female (fig. 51G) similar to male, slightly longer and less laterally expanded.

DISTRIBUTION: From Haiti south to Santa Catarina, Brazil, in 0–7.75 m depth (Calado, 1987).

MAXIMUM SIZE: Males: 10.5 mm cl; females: 14.6 mm cl.

TYPE SPECIMENS: USNM 29018 (holotype of *L. richmondi*). The 17 syntypes of *L. fernandesii* cannot be located in the Zoology Department of the University of São Paulo and are considered lost (G. A. de Melo, personal commun.).

TYPE LOCALITIES: Greytown, Nicaragua (*L. richmondi*); E. Paraná, Caiobá, Brazil (*L. fernandesii*).

REMARKS: The accession number ("25828") of the holotype of *L. richmondi*

was incorrectly cited by Benedict (1903) as the catalog number, which is actually USNM 29018. Even though none of the syntypes of *L. fernandesi* can be located and examined, a comparison of the holotype of *L. richmondi*, conspecific Brazilian specimens, and the illustrations of *L. fernandesi* shows all three to be identical. *Lepidopa fernandesi* was synonymized with *L. richmondi* by Holthuis (1961).

Holthuis (1962) was undoubtedly correct in his conclusion that *Lepidopa scutellata* sensu Stimpson (1858) is actually this taxon, based on the fact that Stimpson (1859) gave the locality for the species as St. Thomas, and *L. richmondi* is the only species of *Lepidopa* known to occur there. As noted by Efford (1971), there is no material to support the claim of Schmitt (in Gordon, 1938) that this species occurs off Pensacola, Florida. That record should most likely be referred to *L. benedicti*. Similarly, the notation of "Florida" from MCZ 865 is almost certainly an incorrect locality for this species, and the label may indeed have been switched with MCZ 13229, a *Lepidopa benedicti* from "Brazil" (see also Efford, 1971).

The identification of the putative larva of *L. richmondi* from off central Florida by Gore and Van Dover (1981) was convincingly refuted by Stuck and Truesdale (1986). *Lepidopa richmondi* is not otherwise known from north of Haiti. The citations of larvae by Seridji (1988) and Spivak (1997) merely repeat the record of Gore and Van Dover (1981), which is considered an indeterminate species record at this time (see appendix 1).

Efford (1971) reported a ♀ from Colombia (TU 4928) with sperm ribbon attached on the coxa of pereopod III. I was unable to examine this specimen, as the TU collections are in storage (J. Fitzpatrick, personal commun.). If true, this is the only record of this reproductive behavior in the family outside the genus *Albunea* (see also Boyko and Harvey, 1999).

Calado's (1987) illustrations of this species contain errors in the placement of the carapace grooves, which are different in the two drawings (figs. 16, 17a), and in the lack of a spine on the dorsal margin of antennal segment I (fig. 19b).

This species is a member of the "*benedic-*

*ti*-group" and is the Atlantic analogue of *L. mearnsi*.

*Lepidopa mearnsi* Benedict, 1903

Figures 52, 53

*Lepidopa mearnsi* Benedict, 1903: 895, fig. 7\*. – Gordon, 1938: 187 (list). – Garcia Mendes, 1945: 119 (list). – Westervelt, 1967: 65–66, 114, fig. 25. – Efford, 1971: 81–83, figs. 1f, 2b, 3e, 4g, 5b\*. – Haig, 1980: 289–290, fig. 19.6. – Coêlho and Calado, 1987: 42–43, table 1. – Rios et al., 1990: 29, figs. 1c, 3. – Lemaitre and Alvarez León, 1993: 49 (list). – Hendrickx, 1992: 8 (list). – Moran and Dittel, 1993: 612 (list). – Ramos and Rios, 1995: 105, fig. 7. – Hendrickx and Harvey, 1999: 367 (list).

*Lepidopa mexicana* Calado, 1995: 181–182, pl. 39, fig. j, pl. 40, fig. i, pl. 41, fig. i, pl. 58, fig. a, pl. 59, figs. a–c\* (not *Lepidopa mexicana* Efford, 1971).

not *Lepidopa mearnsi*: Calado, 1995: 174–177, pl. 39, fig. i, pl. 40, fig. h, pl. 41, fig. h, pl. 55, fig. a, pl. 56, figs. a–c, pl. 57, figs. a–d\* (= *Lepidopa deamae* Benedict, 1903).

**MATERIAL EXAMINED: Mexico:** "West coast Central America" [probably Mexico], coll. unknown: 1 ♀, 9.9 mm cl, holotype (USNM 26171); San Felipe Bay, Baja California Norte, June 20, 1936, coll. S. A. Glassell: 1 ♀, 8.7 mm cl (USNM 260972); Punta Cholla, Sonora, April 23, 1940, coll. S. A. Glassell: 1 ♀, 7.6 mm cl (USNM 304311); Punta Cholla, Sonora, May 10, 1941, coll. S. A. Glassell: 1 ♂, 7.2 mm cl (USNM 304314); Cholla Bay, Sonora, June 7, 1967, coll. Burch Cholla Bay Survey: 1 ♀, 7.2 mm cl (LACM AHF 67079); Cholla Bay, Sonora, July 29, 1969, coll. Burch Cholla Bay Survey, 1 ♂, 6.6 mm cl, 8.5 mm cl (LACM AHF 69094).

**Costa Rica:** 09°36'N, 84°37'W, Jaco, March 27, 1971, coll. D. M. Dexter: 1 ♀, 5.0 mm cl, 1 unsexable unmeasurable specimen (USNM 250213).

**DIAGNOSIS:** Carapace wider than long, with lightly setose grooves. Anterior margin with two large spines lateral to ocular sinus. CG5 present; CG8 present; CG10 present; posterior submarginal groove incomplete and reaching 90% up margin of posterior concavity. Rostrum present, rounded and armed with acute ventral spine. Distal peduncular segments dorsoventrally flattened and subquadrate, distal margins toothed; pigmented



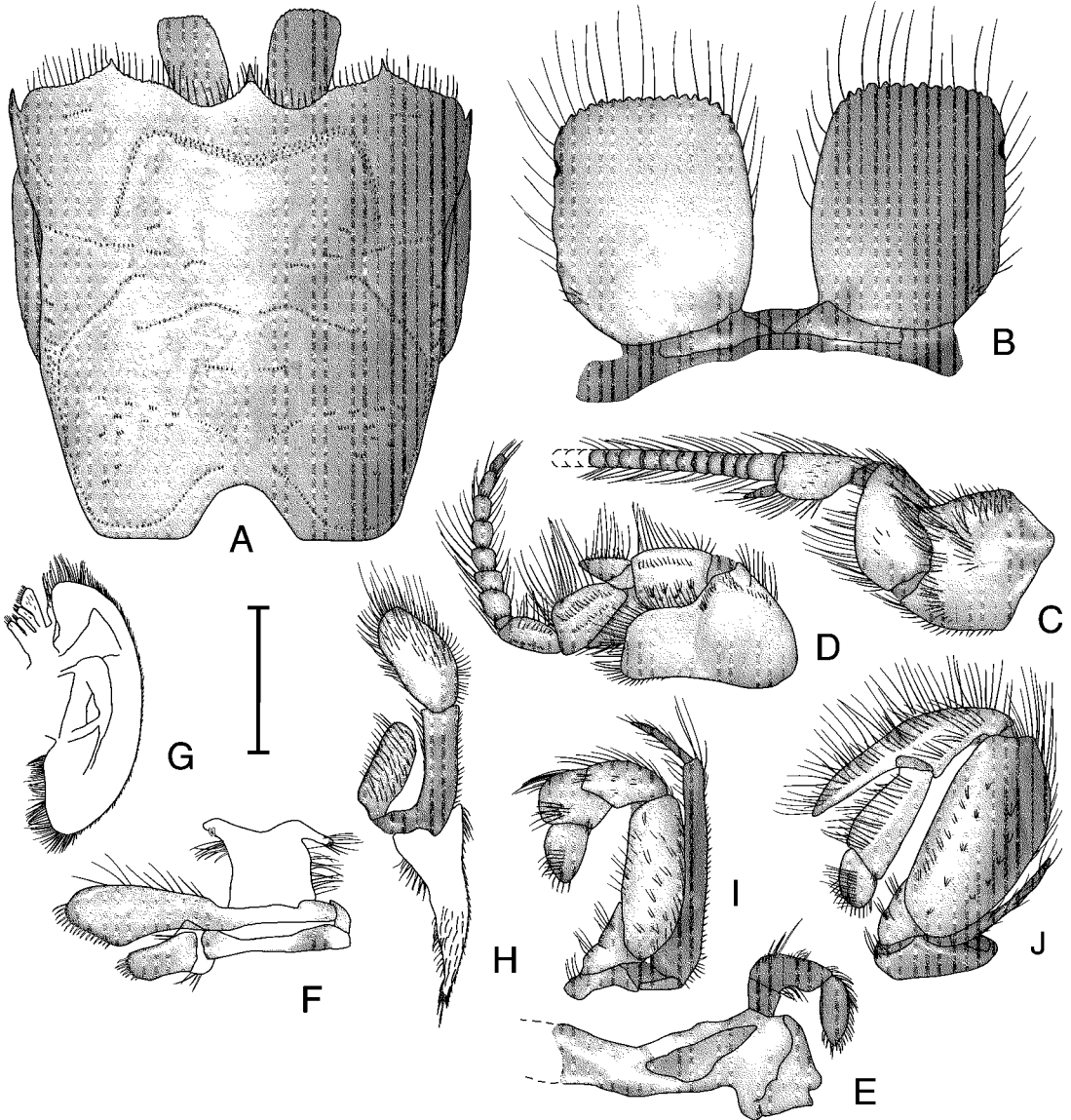


Fig. 52. *Lepidopa mearnsi* Benedict, 1903: A, ♀, 8.7 mm cl, USNM 260972; B–J, ♀, 7.6 mm cl, USNM 304311. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Left maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 1.1 mm (B, F), 1.6 mm (E, I), 2.2 mm (C, D, H, J), and 3.3 mm (A, G).

area in distolateral notch. Antennal segment I with dorsal spine. Dactylus of pereopod II with heel produced and rounded. Dactylus of pereopod III with heel projecting, acute. Dactylus of pereopod IV with produced acute heel and deep indent. Telson of male

spatulate, lateral margins strongly convex and rounded in proximal two-thirds, weakly concave in distal third, distal tip produced and rounded; medial two-thirds strongly calcified, lateral third weakly calcified.

DESCRIPTION: Carapace (fig. 52A) wider



than long, broadest anteriorly. Anterior margin sinuous mesially on either side of ocular sinus, faintly crenulate; acute strong spine at midpoint of either lateral anterior margin; margin lateral to spine sloping and slightly concave. Rostrum as rounded projection reaching beyond median peduncular segments and armed with subdorsal, short, acute spine. Ocular sinus smoothly concave, unarmed. Frontal region smooth; setal field reduced to narrow band anteriorly paralleling CG1, concave and broadest medially. CG1 parallel to anterior margin of carapace, concave medially, slightly crenulate, medial and posterolateral elements united. Mesogastric region smooth; CG2 absent; CG3 present as two short lateral elements; CG4 with two short elements and two long, slightly oblique, lateral elements, lateral elements projecting mesially beyond end of CG1 posterolateral elements. Hepatic region smooth, with short transverse element lateral to anterolateral margin of CG1, oblique, lateral, setose groove and short, acute spine at median of lateral margin. Epibranchial region generally triangular, smooth; posterolateral margin with four short rows of setae. Metagastric region smooth; CG5 present as two short curved elements. CG6 crenulate, with separate oblique long, lateral fragments and short, sinuous, posteriorly displaced median element united with CG7 and with gap at median. CG7 oblique relative to anterior margin of carapace and united with median elements of CG6. Cardiac region smooth; CG8 present as two short elements with gap at median. CG9 absent. CG10 present as two lateral oblique elements. CG11 absent. Branchial region with few short, transverse rows of setae. Posterior margin deeply and irregularly concave medially and more or less straight laterally, with submarginal groove reaching 90% up margin of posterior concavity. Branchiostegite unarmed; anterior region with anterodorsal transverse groove and granular surface, and many long plumose setae; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 52B) covered by carapace; median peduncular segments reduced to small oblong calcified area anteroventral to ocular plate. Distal peduncular segments

subquadrate, angled slightly distolaterally, flattened with faintly sinuous, straight, lateral and slightly convex mesial margins, distolateral and distomesial angles rounded, margins smooth in proximal three-fourths, toothed in distal quarter; strong pigmented area at notch on lateral margin two-thirds from proximal margin; mesial margins separated along entire length; distal three-fourths margins with long simple setae; small patch of setae in proximolateral corner.

Antennule (fig. 52C) segment III narrow proximally, expanding distally to three times proximal width; with plumose setae on dorsal and ventral margins and scattered on lateral surface; dorsal exopodal flagellum with 78–98 articles ( $n = 5$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with two or three articles ( $n = 6$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins, and sparsely scattered on mediolateral surface. Segment I wider than long, unarmed; dorsomedial third of lateral surface rugose, with long plumose setae; long plumose setae on dorsal and ventral margins and scattered on distal half of lateral surface.

Antenna (fig. 52D) segment V approximately two times longer than wide, with short plumose setae on dorsal and distal margins and in subventral row; flagellum with eight articles ( $n = 6$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV almost cylindrical, overreaching segment III by one-third of its length, with long plumose setae on dorsal and distal margins, and two interrupted rows of short setae on lateral surface. Segment III with long plumose setae on ventral margin, short simple setae on dorsal margin. Segment II widening distally, with long plumose setae on dorsal margin and in subdorsal row, few scattered areas of short setae near ventral margin; antennal acicula short, triangular, overreaching segment IV proximal margin by one-half of its length, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened and truncated ventrolaterally with long plumose setae on dorsal and distal margins; patch of short plumose setae subdorsally proximal to spine; dorsolateral margin with short acute

spine one-third from distal margin; segment with ventromesial antennal gland pore.

Mandible (fig. 52E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 52F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and plumose setae on dorsal margin. Proximal endite with thick simple setae on distal margin and thin simple setae on dorsal margin. Endopodal external lobe truncate distally and curled under, with wide proximal projection; internal lobe reduced with two thick setae at distolateral margin.

Maxilla (fig. 52G) exopod rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 52H) epipod with plumose setae on margins and on distolateral surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, with plumose setae; distal segment spatulate, longer than wide, curved mesially, broadest medially, margins and distodorsal surface with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins.

Maxilliped II (fig. 52I) dactylus evenly rounded, longer than wide, with thick simple setae distally and thin simple setae in short row on lateral surface and on distoventral angle. Propodus produced dorsomedially, width subequal to length, with plumose setae on dorsal margin and long simple setae on dorsodistal and ventrodorsal margins. Carpus not produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal margin and few short setae scattered on lateral surface. Merus 2.5 times longer than wide, margins parallel, with simple setae and plumose setae on dorsal and lateral margins and scattered in short transverse rows on surface. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-third longer than merus, flagellum with one elongate article.

Maxilliped III (fig. 52J) dactylus short and

evenly rounded; long plumose setae on margins and in distomedial row on lateral surface. Propodus with longitudinal median row of plumose setae on lateral surface; dorsal margin with plumose setae. Carpus strongly produced onto propodus, overreaching distal margin of propodus; lateral surface with medial and subventral transverse rows of long plumose setae; plumose setae on dorsal margins. Merus unarmed, broadly inflated distolaterally, with long plumose setae on lateral margin, short setae on mesial margin and scattered in short oblique rows on lateral surface. Basis-ischium incompletely fused, without crista dentata. Exopod two-segmented: proximal segment small; distal segment styliform, tapering, approximately two-thirds length of merus, with plumose setae on margins; without flagellum.

Pereopod I (fig. 53A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin smooth with long plumose setae; ventral margin with short simple setae. Propodal lateral surface with numerous short, transverse rows of setose rugae; dorsal margin with few small, low ridges; ventral margin distally produced into acute spine; cutting edge lacking teeth, lined with long plumose setae; dorsal margin with long plumose setae, ventral margin with short simple setae; mesial surface smooth, with few scattered short rows of short simple setae. Carpus with few small spinules on dorsodistal angle, slightly rugose, dorsal margin smooth, with short plumose setae; lateral surface with few transverse, setose ridges on distal two-thirds; mesial surface smooth, with medial transverse row of long plumose setae. Merus unarmed; lateral surface with scattered short, transverse rows of short plumose setae, margins with short plumose setae and long plumose setae on dorsal margin; mesial surface with few short rows of setae; proximal two-thirds of mesial surface with decalcified window. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 53B) dactylus smooth; with base to heel slightly concave, heel broadly produced, heel to indent convex, indent broad and rounded, indent to tip concave, tip subacute, tip to base broadly convex; lateral surface smooth; mesial surface smooth, ventral margin with long plumose

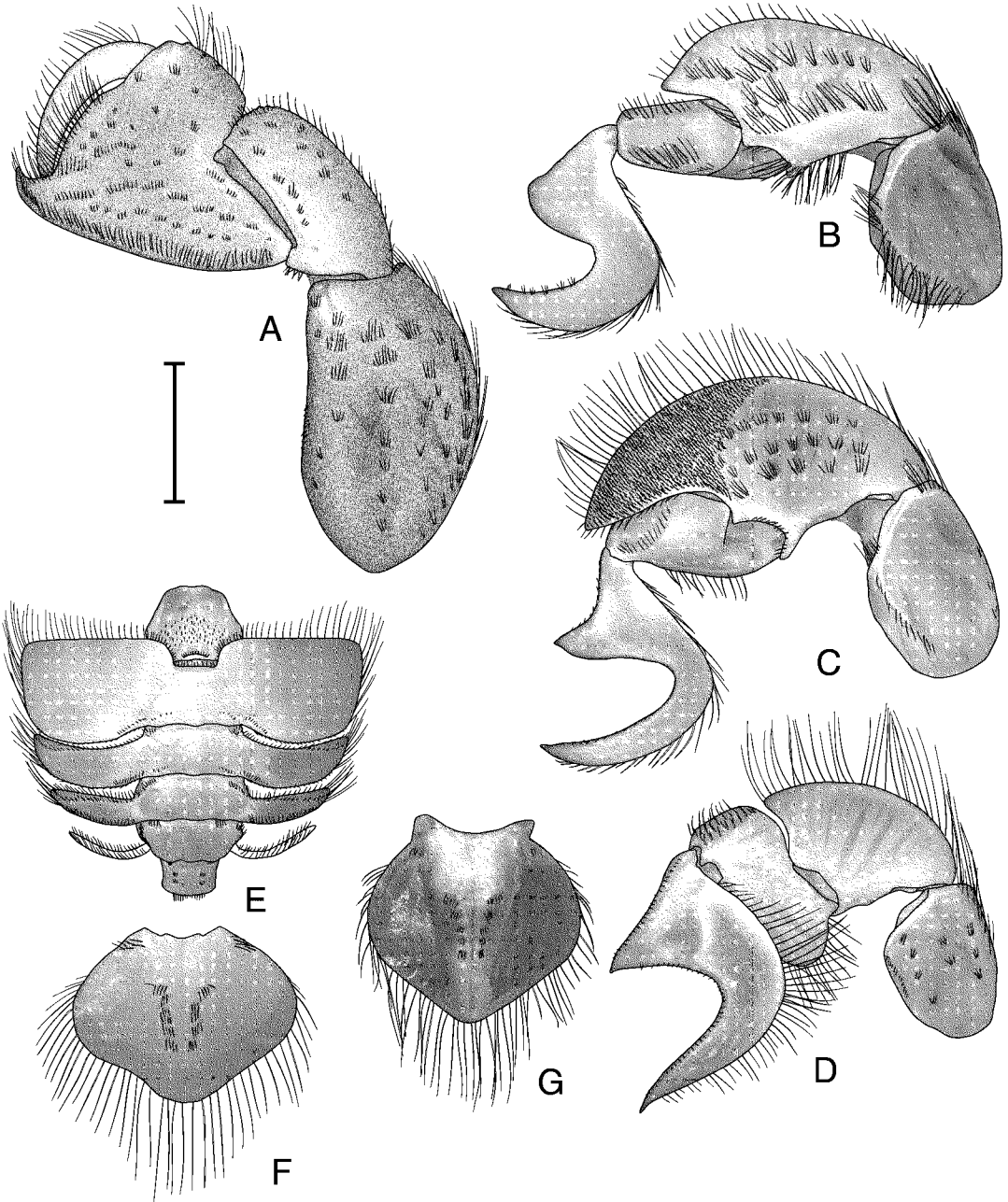


Fig. 53. *Lepidopa mearnsi* Benedict, 1903: A-E, G, ♀, 7.6 mm cl, USNM 304311; F, ♂, 7.2 mm cl, USNM 304314. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I-VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 1.6 mm (F, G), 2.2 mm (A, D), and 3.3 mm (E).

setae, dorsal margin with short simple setae, with patch of long plumose setae at base reaching across median of heel. Propodus with dorsal surface smooth, ventral margin inflated and rounded; distoventral margin with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with long plumose setae on ventral margin, short plumose setae on dorsal margin; mesial surface with subdistal row of long plumose setae. Carpus strongly produced dorsodistally, reaching one-half length of propodus; lateral surface nearly smooth, with two irregular, interrupted rows of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; dorsal margin and distoventral angle with long plumose setae, distoventral margin with long plumose setae; mesial surface smooth, median three-fourths decalcified, with ventral and subdorsal rows of long plumose setae. Merus with lateral surface almost entirely decalcified, long plumose setae on distodorsal and ventral margins; mesial surface nearly smooth, with oblique median ridge, long plumose setae patches dorsal to ridge and in row ventrally, nearly entire surface decalcified. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 53C) dactylus base to heel broadly concave, heel acute, thin, and produced, heel to tip with broad, evenly rounded indent, tip acute, tip to base smoothly convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth with plumose setae proximally at junction with propodus and in row across base of heel. Propodus not inflated dorsoventrally; lateral surface smooth, with simple setae subdorsally, and long plumose setae on ventral margin and in oblique row on surface; dorsolateral surface narrow, oblique, flattened; mesial surface decalcified medially, with scattered long setae on and near distoventral margin. Carpus strongly produced dorsodistally and inflated, overreaching distal margin of propodus, rounded; dorsolateral margin unarmed; lateral surface with mat of short simple setae on dorsodistal third of segment and three long, transverse, interrupted rows of setae medially, and patch of long plumose setae on distoventral angle;

dorsal margin with long plumose setae; mesial surface smooth, medial three-fourths decalcified, with long plumose setae on margins and in mesiodistal short transverse row in decalcified area. Merus smooth, lateral surface almost entirely decalcified; dorsal and ventral margins unarmed, ventral margin with short plumose setae; distodorsal margin with long plumose setae; mesial surface smooth, with few scattered setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female pereopod III with large mesioproximal gonopore (not opposing other gonopore); male with smaller pore.

Pereopod IV (fig. 53D) dactylus with base to heel slightly concave, heel acute, heel to tip with broadly rounded indent, tip acute, tip to base convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge across heel with row of short plumose setae. Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, margins with long plumose setae; dorsal expansion with row of long plumose setae medially and mat of short setae; lateral and mesial surfaces smooth, with few scattered long plumose setae. Carpus slightly produced dorsodistally; lateral and mesial surfaces smooth; dorsomedial half of mesial surface decalcified; dorsal margin with tiny area of short setae at dorsodistal angle and long plumose setae along length; ventral margin with few short simple setae. Merus with small median decalcified area on lateral surface, with few short transverse rows of setae, dorsal and distoventral margins with long plumose setae; mesial surface with large decalcified window proximoventrally. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Abdomen (fig. 53E) somite I wider than long, widest posteriorly; dorsal surface with anterior margin sinuous; posterior margin straight, with small elevated, submarginal curved row of short setae; with small faint, transverse, decalcified window laterad of segment median. Somite II anterior margin straight, posterior margin concave, widening distally with few short simple setae at posterolateral margin; pleura expanded and directed laterally, angled anterolaterally,



rounded posterolaterally, small row of short simple setae at posteromesial margin; anterior and lateral margins, with long plumose setae, posterior margin with short setae. Somite III similar to somite II, narrower and shorter, anterior and posterior width subequal, with row of short setae on posterolateral margin; pleura thinner and shorter than on somite II, directed posterolaterally proximally and curving forward distally, with setae as in somite II; anterolateral angle subacute; dorsal surface slightly obliquely flattened anterolaterally with submarginal row of setae. Somite IV similar to somite III, two short rows of short simple setae on posterior margin laterad of midline; pleura thinner and shorter than on somite III, directed anterolaterally; dorsal surface obliquely flattened anterolaterally with submarginal row of short setae; margins with long plumose setae. Somite V wider than somite IV, narrowing posteriorly; anterolateral margins with plumose setae; pleura distinct from somite, shorter than pleura of somite IV, thin, flattened, directed anterolaterally, and covered with plumose setae. Somite VI narrower than somite V; dorsal surface with two short transverse rows of setae laterad of midline, posterior margin with continuous row of long plumose setae; pleura absent.

Female with long uniramous pleopods on somites II–V; male with small pleopods.

Telson of male (fig. 53F) spatulate, lateral margins strongly convex and rounded in proximal two-thirds, weakly concave in distal third, distal tip produced and rounded; medial two-thirds strongly calcified, lateral third weakly calcified; medial groove extending along medial two-thirds, medial third with five short transverse rows of short simple setae on either side of groove; small area of short simple setae at proximolateral corners; lateral margins with long simple setae. Telson of female (fig. 53G) similar to male, but with less produced lateral margins and straight lateral margins in distal third.

**DISTRIBUTION:** Known only from Sonora, Mexico; Costa Rica; and Colombia (Rios et al., 1990); depth range unknown.

**MAXIMUM SIZE:** Males: 8.5 mm cl; females: 9.9 mm cl.

**TYPE SPECIMEN:** USNM 26171 (holotype).

**TYPE LOCALITY:** “West coast of Central America” (Benedict, 1903).

**REMARKS:** The holotype was described by Benedict (1903) as being in “very bad condition”. Although this is true, it has not deteriorated appreciably over time, and the diagnostic characters of this species can still be observed.

The redescription and illustration of “*L. mearnsi*” by Calado (1995) actually was of *L. deamae*, and Calado’s (1995) specimen of “*L. mexicana*” was actually a misidentified *L. mearnsi*. Both of these specimens were examined during the current study.

As noted under *Lepidopa haigae*, that species and *L. mearnsi* may be identical and, if not conspecific, they are sister species. *Lepidopa mearnsi* is the Pacific analogue of *L. richmondi*.

#### *Lepidopa deamae* Benedict, 1903

Figures 54, 55

*Lepidopa deamae* Benedict, 1903: 893, fig. 5\*. – Gordon, 1938: 187, fig. 2f. – Garcia Mendes, 1945: 119 (list). – Holthuis, 1954a: 15, pl. 1, fig. 1. – Holthuis, 1954b: 161 (list). – Bott, 1955: 51, pl. 4, fig. 5a, b. – Schuster-Dieterichs, 1956: 30, 47, 51. – Seilacher, 1961: 263–264, fig. 8. – Efford, 1971: 78–80, figs. 1i, m, 2d, 3c, g, i, 4a, 5j, o, 6c, i, r, 7i\*. – Moran, 1984: 79, fig. 6. – Coêlho and Calado, 1987: table 1. – Rios et al., 1990: 27, fig. 1a. – Lemaitre and Alvarez León, 1993: 49 (list). – Hendrickx, 1992: 8 (list). – Moran and Dittel, 1993: 612 (list). – Calado, 1995: 148–150, pl. 39, fig. d, pl. 40, fig. d, pl. 41, fig. c, pl. 46, figs. a–c, pl. 47, figs. a–b\*. – Ramos and Rios, 1995: 106, fig. 8. – Hendrickx and Harvey, 1999: 367 (list).

*Lepidopa rhomboocularis* Schuster-Dieterichs, 1956: 37, 40, 48 (nomen nudum) (NEW SYNONYMY).

*Lepidopa sorodeamae* Efford, 1971: 80–81, figs. 3f, h, 5p\*. – Coêlho and Calado, 1987: 43, table 1. – Calado, 1995: 199–200, pl. 39, fig. n, pl. 40, fig. m, pl. 41, fig. m, pl. 65, fig. a, pl. 66, figs. a–d\*. – Hendrickx and Harvey, 1999: 367 (list) (NEW SYNONYMY).

*Lepidopa daemae* [sic]: Rios et al., 1990: fig. 2.

*Lepidopa mearnsi*: Calado, 1995: 174–177, pl. 39, fig. i, pl. 40, fig. h, pl. 41, fig. h, pl. 55, fig. a, pl. 56, figs. a–c, pl. 57, figs. a–d\* (not *Lepidopa mearnsi* Benedict, 1903).

**MATERIAL EXAMINED:** **Mexico:** Santiago Bay, Colima, 19°06'N, 104°23'W, July 28,

1972, coll. D. M. Dexter: 1 ♀, 26.5 mm cl (USNM 250214); Acapulco, Guerrero, coll. Hassler Expedition: 1 ♂, 23.7 mm cl (MCZ 13257); Playa Hornos, Acapulco, Guerrero, Dec. 22, 1937, coll. E. C. Huffman: 1 ♀, 18.1 mm cl (USNM 304315); Salina Cruz, Gulf of Tehuantepec, Oaxaca, Dec. 25, 1898, coll. C. C. Deam: 1 ♀, 35.9 mm cl, holotype of *L. deamae* (USNM 26170).

**Nicaragua:** Playa Pondaya, Sept. 18, 1960, coll. unknown: 1 ♀, 30.9 mm cl (USNM 285388).

**Costa Rica:** Puntarenas, 1927, coll. J. A. Rehn: 3 ♂, 22.8–24.7 mm cl (ANSP 4736); Puntarenas, coll. A. Alfaro: 1 ♀, 21.5 mm cl (USNM 2211).

**Panama (Pacific):** La Venta, near Rio Chame, Gulf of Panama, March 11, 1937, coll. S. F. Hildebrand: 7 ♂, 20.7–24.0 mm cl, 14 ♀, 24.0–33.6 mm cl (USNM 104650), 3 ♀, 24.6–28.2 mm cl (RMNH 14629 ex USNM 104650), 1 ♀, 25.0 mm cl (AMNH 18086 ex RMNH 14629).

**Ecuador:** Solongo Island, Jan. 22, 1933, coll. W. L. Schmitt: 1 ♂, 24.4 mm cl, paratype of *L. sorodeamae* (USNM 68608).

**Peru:** Intertidal zone, Mancora, June 21, 1960, coll. W. L. Klawe, Inter-American Tropical Tuna Commission: 1 ♂, 21.5 mm cl, holotype of *L. sorodeamae* (USNM 106450).

**DIAGNOSIS:** Carapace longer than wide, with lightly setose grooves. Anterior margin with two large spines lateral to ocular sinus. CG5 present; CG8 present; CG10 present; posterior submarginal groove incomplete and reaching two-thirds beyond posterior margin of posterior concavity. Rostrum present, rounded and unarmed. Distal peduncular segments dorsoventrally flattened and subquadrate, distal margins toothed, pigment in distolateral notch. Antennal segment I with dorsal spine. Dactylus of pereopod II with heel produced, tapered and subacute. Dactylus of pereopod III with heel thin, projecting, acute. Dactylus of pereopod IV with produced acute heel and deep indent. Telson of male spatulate, lateral margins evenly convex, lateral expansions rounded, distal tip rounded, slightly truncated; medial third heavily calcified, lateral regions decalcified.

**DESCRIPTION:** Carapace (fig. 54A) longer than wide. Anterior margin sinuous mesially

on either side of ocular sinus, crenulate; acute strong spine at midpoint of either lateral anterior margin; margin lateral to spine sloping and concave. Rostrum as rounded projection reaching beyond median ocular segments and unarmed. Ocular sinus concave, rounded laterally, angled mesially, unarmed. Frontal region smooth; setal field reduced to narrow band anteriorly paralleling CG1, concave and broadest medially. CG1 parallel to anterior margin of carapace, concave medially, slightly crenulate, medial and posterolateral elements united. Mesogastric region smooth; CG2 absent; CG3 present as two short lateral elements; CG4 with two short elements and two long curved lateral elements, lateral elements united with posterior margin of CG1 posterolateral elements. Hepatic region smooth with long transverse element lateral to anterolateral margin of CG1, oblique lateral setose groove and long, acute spine at median of lateral margin. Epi-branchial region generally triangular, smooth; posterolateral margin with four or five short rows of setae. Metagastric region smooth; CG5 present as two short elements. CG6 crenulate, with separate oblique, long, lateral fragments and short, sinuous, posteriorly displaced, median element united with CG7. CG7 transverse relative to anterior margin of carapace and united with median fragment of CG6. Cardiac region smooth; CG8 present as two long elements with gap at median. CG9 absent. CG10 present as two interrupted oblique elements. CG11 absent. Branchial region with few short, transverse rows of setae. Posterior margin deeply and irregularly concave medially and more or less straight laterally, with submarginal groove reaching two-thirds up lateral margins of posterior concavity. Branchiostegite unarmed; anterior region with anterodorsal transverse groove and granular surface, and many long plumose setae; posterior region membranous with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 54B) covered by carapace; median peduncular segments reduced to small oblong calcified areas anterolateral to ocular plate. Distal peduncular segments subquadrate, produced distolaterally, flattened, with sinuous-convex lateral and con-

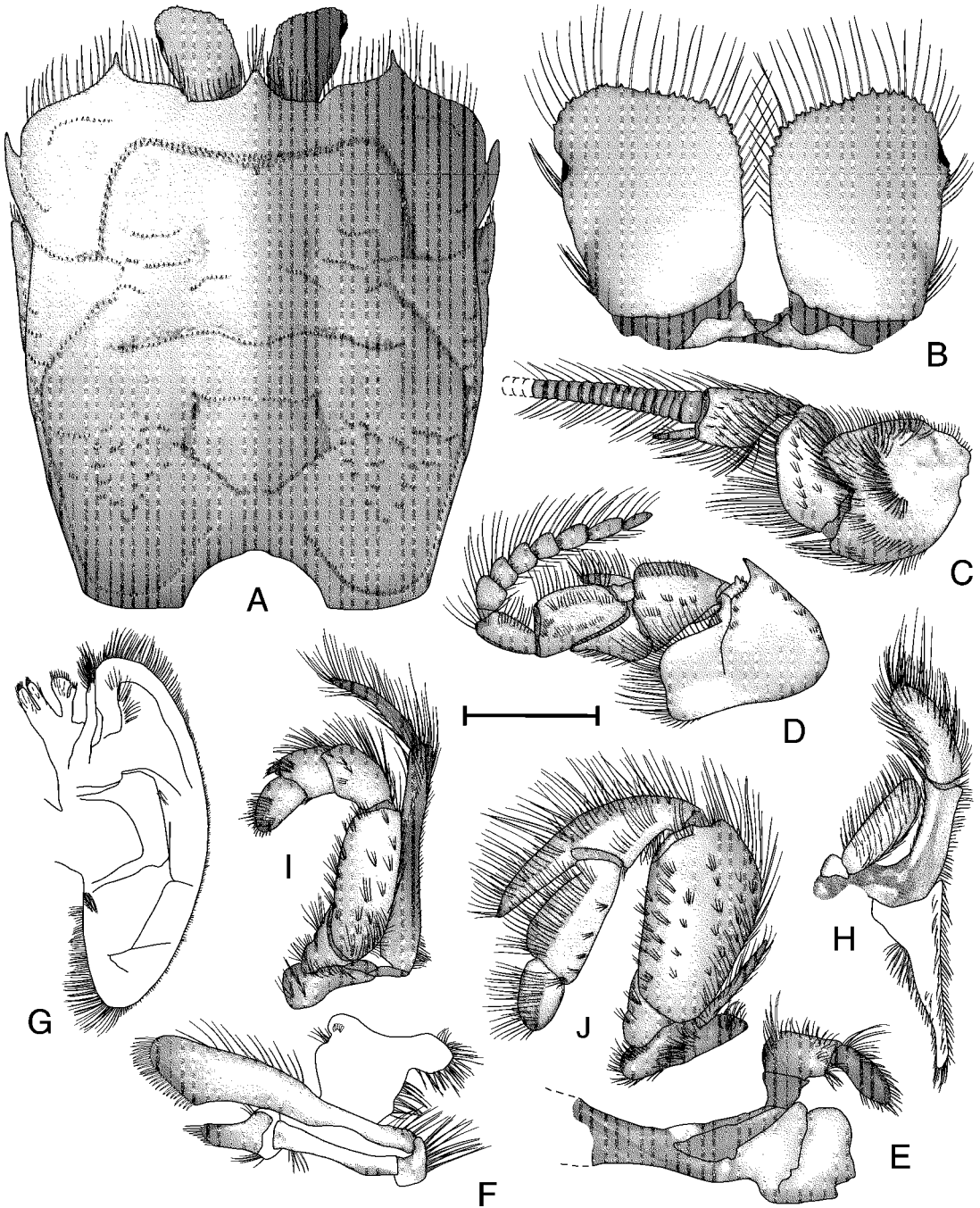


Fig. 54. *Lepidopa deamae* Benedict, 1903: A, ♀, 35.9 mm cl, USNM 26170, holotype; B–J, ♀, 18.1 mm cl, USNM 304315. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Left maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 2.2 mm (B, F), 3.3 mm (E, D), 4.4 mm (C, D, G, H, J), and 10.1 mm (A).



vex mesial margins, distolateral and distomesial angles rounded, margins smooth in proximal three-fourths, toothed in distal quarter; pigmented area at notch on lateral margin two-thirds from proximal margin; mesial margins separated along entire length; distal half of margins with long simple setae; small patch of setae in proximolateral corner.

Antennule (fig. 54C) segment III narrow proximally, expanding distally to three times proximal width; with plumose setae on dorsal and ventral margins and scattered on lateral surface; dorsal exopodal flagellum with 83–96 articles ( $n = 4$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with two or three articles ( $n = 3$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins and scattered on mediolateral surface. Segment I longer than wide, unarmed; dorsomedial third of lateral surface rugose and with long plumose setae; long plumose setae on dorsal and ventral margins and in two transverse thick rows on distal half of lateral surface.

Antenna (fig. 54D) with segment V approximately two times longer than wide, with long plumose setae on dorsal and distal margins and short simple setae in subventral row; flagellum with eight articles ( $n = 3$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV almost cylindrical, overreaching segment III by almost one-half of its length, with long plumose setae on dorsal and distal margins, and two interrupted rows of long plumose setae on lateral surface. Segment III with long plumose setae on ventral margin; short simple setae on dorsal margin. Segment II widening distally, with plumose setae on dorsal margin and in scattered rows on lateral surface; antennal acicle short, triangular, overreaching segment IV proximal margin by one-third of its length, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened and truncated ventrolaterally, with long plumose setae on distal margin; scattered patches of short plumose setae along dorsal margin; dorsolateral margin with strong acute spine one-fourth from distal margin and smaller acute spine near distodorsal margin; segment with ventromesial antennal gland pore.

Mandible (fig. 54E) incisor process with two teeth; cutting edge smooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 54F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and plumose setae on dorsal margin. Proximal endite with thick simple setae on distal margin and thin simple setae on dorsal margin. Endopodal external lobe truncate distally and curled under, with wide proximal projection; internal lobe reduced with six thick setae at distolateral margin.

Maxilla (fig. 54G) exopod rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 54H) epipod with plumose setae on margins and on distolateral surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, with plumose setae; distal segment spatulate, longer than wide, curved mesially, margins and dorsolateral surface with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins.

Maxilliped II (fig. 54I) dactylus evenly rounded, longer than wide, with thick simple setae distally and thin simple setae in short row on lateral surface and on distoventral angle. Propodus slightly produced dorsodistally, width subequal to length, with plumose setae on dorsal margin and long simple setae on dorsodistal and ventrodorsal margins. Carpus not produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal margin and scattered on distolateral surface. Merus 2.5 times longer than wide, margins parallel, with simple and plumose setae on dorsal margin and scattered in short transverse rows on lateral surface. Basis-ischium incompletely fused, with long plumose setae on margins. Exopod one-half longer than merus, flagellum with one elongate article.

Maxilliped III (fig. 54J) dactylus elongate and evenly rounded; long plumose setae on margins and in row on lateral surface. Pro-



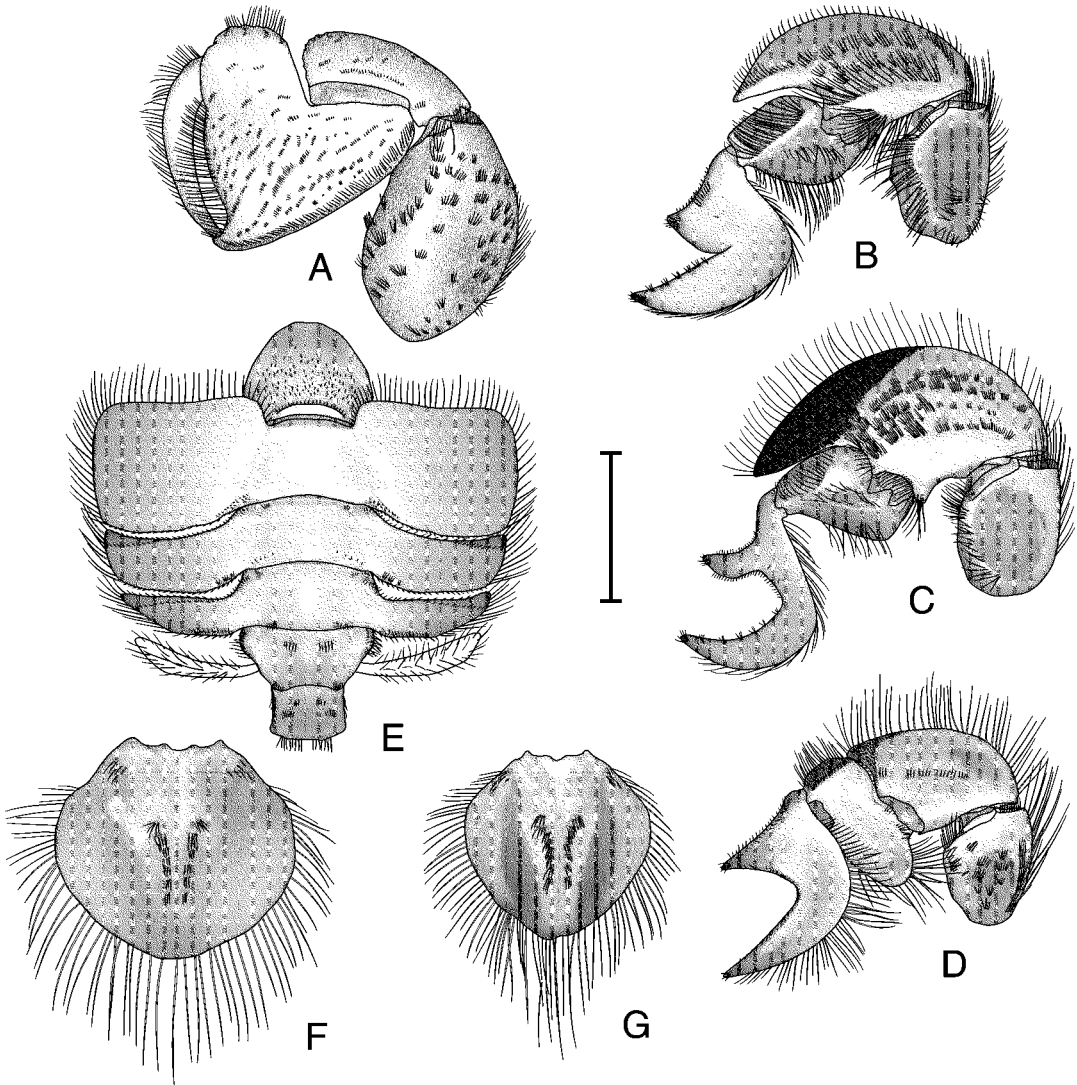


Fig. 55. *Lepidopa deamae* Benedict, 1903: A, B, D, E, G, ♀, 18.1 mm cl, USNM 304315; C, ♀, 26.5 mm cl, USNM 250214; F, ♂, 22.4 mm cl, ANSP CA4736. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I–VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 4.4 mm (F, G), 5.9 mm (E), 6.7 (A, B, D), and 8.9 mm (C).

podus with longitudinal median row of plumose setae on lateral surface; dorsal margin with long plumose setae, ventral submarginal short rows of short setae. Carpus strongly produced onto propodus, almost reaching distal margin of propodus; lateral surface with medial transverse row of long plumose setae; plumose setae on margins. Merus unarmed, broadly inflated distolaterally, with

long plumose setae on lateral margin and short setae on mesial margin and scattered in short oblique rows on surface. Basis-ischium incompletely fused, without crista dentata. Exopod two-segmented: proximal segment small; distal segment styloform, tapering, approximately one-half length of merus, with plumose setae on margins; without flagellum.

Pereopod I (fig. 55A) dactylus curved and

tapering; lateral and mesial surfaces smooth; dorsal margin smooth with long plumose setae along length and small proximal rugose area; ventral margin with short simple setae. Propodal lateral surface with numerous short, transverse rows of setose rugae; dorsal margin with few small, low ridges; ventral margin distally produced into acute spine; cutting edge lacking teeth, lined with long plumose setae; dorsal margin with long plumose setae, ventral margin with short simple setae; mesial surface smooth, with few scattered short rows of short simple setae. Carpus dorsodistal angle with few small spinules in rugose area, dorsal margin smooth, with few short plumose setae; lateral surface with few transverse setose ridges on distal three-fourths and longitudinal medial, subventral row of short simple setae; mesial surface smooth, with medial transverse row of long plumose setae and few scattered patches of short plumose setae subventrally. Merus unarmed; lateral surface with scattered transverse rows of short plumose setae, margins with short plumose setae and long plumose setae on dorsomedial margin; mesial surface with few short rows of long plumose setae; proximal half of mesial surface with decalcified window. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 55B) dactylus smooth; with base to heel concave, heel broadly produced and narrowing to rounded tip, heel to indent convex, indent narrow and slitlike, indent to tip almost straight, tip acute, tip to base broadly convex; lateral surface smooth, with small patch of short setae in median of base to heel, tufts of short simple setae on end of heel and tip; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae, with patch of long plumose setae at base reaching across median of heel. Propodus with dorsal surface smooth, ventral margin inflated and rounded; distoventral margin with long plumose setae; mediolateral surface with oblique row of long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with long plumose setae on ventral margin, short plumose setae on dorsal margin; mesial surface with subdistal row of long plumose setae. Carpus strongly produced dorsodistally, reaching two-thirds

length of propodus; lateral surface nearly smooth, with two irregular, interrupted rows of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; dorsal margin with short plumose setae, distoventral margin with long plumose setae; mesial surface smooth, fully calcified, with subdorsal and subventral rows of long plumose setae. Merus with lateral surface almost entirely decalcified, long plumose setae on margins and few scattered on distomedial area; mesial surface nearly smooth, with oblique median ridge, long plumose setae patches dorsal to ridge and in row ventrally, fully calcified. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 55C) dactylus base to heel broadly indented, heel acute, thin, and produced, heel to tip with broad, subquadrate indent, tip acute, tip to base smoothly convex; lateral surface smooth, with tufts of short setae at end of heel and tip, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus and in row across base of heel. Propodus not inflated dorsoventrally; lateral surface smooth, with long simple setae subdorsally, long plumose setae on ventral margin and in oblique row on surface; dorsolateral surface narrow, oblique, flattened; mesial surface decalcified medially, with scattered long setae on and near distoventral margin. Carpus strongly produced dorsodistally and inflated, reaching distal margin of propodus, tapered and subacute; dorsolateral margin unarmed; lateral surface with mat of short setae on dorsodistal third of segment and three long transverse interrupted rows of setae medially, interrupted row of setae one-third dorsal to ventral margin, and patch of long plumose setae on distoventral angle; dorsal margin with long plumose setae; mesial surface smooth, small medial decalcified area, with long plumose setae on margins and in mesiodistal short transverse row in decalcified area. Merus smooth, lateral surface almost entirely decalcified; dorsal and ventral margins unarmed, ventral margin with short plumose setae; distodorsal margin with long plumose setae; mesial surface smooth with few scattered se-

tae. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female pereopod III with large mesioproximal gonopore (not opposing other gonopore); male with slightly smaller pore more mesially displaced.

Pereopod IV (fig. 55D) dactylus with base to heel slightly concave, heel acute, heel to tip with broadly rounded indent, tip acute, tip to base convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge across heel with row of short plumose setae. Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, margins with long plumose setae; dorsal expansion with row of long plumose setae medially and mat of short setae; lateral and mesial surfaces smooth with few scattered long plumose setae. Carpus slightly produced dorsodistally; lateral and mesial surfaces smooth, with medial half decalcified; small decalcified region in proximodorsal area on lateral surface; dorsal margin with small mat of short setae at dorsodistal angle and long plumose setae along length; ventral margin with short simple setae. Merus with small median decalcified area on lateral surface, and few short transverse rows of setae, dorsal and ventrodorsal margins with long plumose setae; mesial surface fully calcified. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 55E) somite I wider than long, widest posteriorly; dorsal surface with anterior margin convex; posterior margin straight, with elevated submarginal curved row of short setae and broad field of short simple setae in posterior three-fourths of surface; with small faint, transverse, decalcified window laterad of segment median. Somite II anterior margin straight, posterior margin slightly concave; pleura expanded and directed laterally, angled anterolaterally and posterolaterally, small patch of short simple setae at posteromesial margin; anterior and lateral margins with long plumose setae, posterior margin with short setae. Somite III similar to somite II, narrower and shorter; pleura thinner and shorter than on somite II, directed posterolaterally proximally and curving laterally distally, with setae as in so-

mite II; anterolateral angle subacute; dorsal surface slightly obliquely flattened anterolaterally, with submarginal row of short simple setae. Somite IV similar to somite III, two short rows of short simple setae on posterior margin laterad of midline; pleura thinner and shorter than on somite III, directed laterally; dorsal surface slightly obliquely flattened anterolaterally, with submarginal row of short setae; margins with long plumose setae. Somite V wider than somite IV, narrowing posteriorly; anterolateral margins with plumose setae, two medial rows of simple setae laterad of midline; pleura distinct from somite, shorter than pleura of somite IV, thin, flattened, directed anterolaterally, and covered with plumose setae. Somite VI narrower than somite V; dorsal surface with four anterior short transverse rows of setae laterad of midline, posterior margin with medially interrupted row of long plumose setae; pleura absent.

Female with long uniramous pleopods on somites II–V; male with small pleopods.

Telson of male (fig. 55F) spatulate, lateral margins evenly convex, lateral expansions rounded, distal tip rounded, slightly truncated; medial third heavily calcified, lateral regions decalcified; median longitudinal groove running from proximal margin to end of calcified region; two distally converging rows of short simple setae in medial third; margins with long simple setae. Telson of female (fig. 55G) similar to male, slightly narrower distally, with less evenly rounded lateral expansions.

DISTRIBUTION: Known from Colima, Mexico, south to Mancora, Peru; depth range unknown.

MAXIMUM SIZE: Males: 24.7 mm cl; females: 35.9 mm cl.

TYPE SPECIMENS: USNM 26170 (holotype of *L. deamae*), USNM 106450 (holotype of *L. sorodeamae*), USNM 68608 (paratype of *L. sorodeamae*).

TYPE LOCALITIES: Salina Cruz, Gulf of Tehuantepec, Oaxaca, Mexico (*L. deamae*); Mancora, Peru (*L. sorodeamae*).

REMARKS: This is the largest species of *Lepidopa* and the largest albuneid, reaching an impressive 35.9 mm cl. Interestingly, this species co-occurs along its range with the hippid *Emerita rathbunae* Schmitt, 1935, the

largest species of that genus as well as the largest hippid taxon.

Schuster-Dieterichs (1956) introduced the nomen nudum *L. rhomboocularis*, but he did not cite this name in his list of fauna from El Salvador. Because of this, I suspect that this nomen nudum was not intended for publication, but was a manuscript placeholder for *L. deamae* that was accidentally left in the text after the true identity of the species was determined.

All the characters listed by Efford (1971) as separating *L. deamae* and *L. sorodeamae* merely represent intraspecific variation, as seen by examination of the types of both species and numerous other specimens. All characters, other than those of the distal peduncular segments, are identical in the type specimens. Efford (1971) reported that no males were known, but that was because he incorrectly identified specimens with reduced pleopods as females.

Calado (1995) redescribed and illustrated this species under the name *L. mearnsi*, based on a misidentified specimen.

*Lepidopa deamae* is the sister species to *L. benedicti*, which is the largest species of the genus in the Atlantic and which typifies the “*benedicti*-group” of *Lepidopa* species.

#### *Lepidopa benedicti* Schmitt, 1935

Figures 56, 57

*Albunea scutellata*: H. Milne Edwards, 1837b: 204, pl. 21, figs. 9–13. – Chenu and Desmarest, 1877: 32, fig. 22 (not *Thia scutellata* (Fabricius, 1793)).

*Lepidopa scutellata*: Ortmann, 1896: 226 (part). – Benedict, 1903: 894, fig. 6\*. – Schmitt, 1935: 209–210\* (not *Thia scutellata* (Fabricius, 1793)).

*Lepidopa venusta*: Boone, 1930: 61–63, pl. 16, figs. a–c\* (not *Lepidopa venusta* Stimpson, 1859).

*Lepidopa benedicti* Schmitt, 1935: 210\*. – Gordon, 1938: 187, fig. 2e, g–i\*. – Holthuis, 1961: 31–35, fig. 5\*. – Efford, 1971: 76–78, figs. 1a, 2e, 3a, 4e, p, q, 5a, 6e, n, 7a\*. – Stuck and Truesdale, 1986: 89–103, figs. 1–9\*. – Coêlho and Calado, 1987: 42, table 1. – Manning, 1988: 628–629, fig. 1\*. – Williams et al., 1989: 35. – Calado, 1995: 133–136, pl. 39, fig. a, pl. 40, fig. a, pl. 41, fig. a, pl. 42, figs. a–c\*. – Álvarez et al., 1999: 15.

*Pagurus chiliensis* [sic]: Anonymous, 1999: cover

illustration (not *Pagurus chilensis* H. Milne Edwards, 1836 = *Calcinus chilensis* (H. Milne Edwards, 1836)).

MATERIAL EXAMINED: **USA: Florida:** *Indian River Co.*: 100 m south of South Beach Park, Vero Beach, March 4, 1973, coll. C. P. Ergolin: 1 ♀, 17.1 mm cl (HBOM 089:00514); *St. Lucie Co.*: Worm Reef, Fort Pierce Inlet, Feb. 6, 1974, coll. R. H. Gore: 1 ♀, 13.2 mm cl (HBOM 089:02558); Worm Reef, Walton Rocks, July 19, 1974, coll. LES, LB, MGR: 1 ♀, 14.2 mm cl (HBOM 089:02604); Hutchinson Island, Fort Pierce, June 18, 1992, coll. R. B. Manning: 1 ♀, 15.5 mm cl (USNM 256926); Hutchinson Island, Fort Pierce, June 20, 1992, coll. R. B. Manning: 1 ♂, 13.7 mm cl (USNM 256927); *Martin Co.*: 1 mi north of St. Lucie, 27°10'54"N, 80°09'30"W, July 13, 1982, coll. R. B. Manning and Hart: 1 ♀, 5.6 mm cl (USNM 221779); 1 mi north of St. Lucie, 27°10'54"N, 80°09'30"W, July 16, 1982, coll. R. B. Manning: 1 ♂, 3.4 mm cl (USNM 221782); 1 mi north of St. Lucie, 27°10'54"N, 80°09'30"W, July 13, 1983, coll. R. B. Manning: 1 ♂, unmeasurable, 1 ♀, 5.3 mm cl, 1 ♀, unmeasurable (USNM 221784); *Palm Beach Co.*: Palm Beach, Feb. 1919, coll. T. and F. K. Barbour: 1 ♀, 25.1 mm cl (MCZ 13254); southwest corner of Singer's Island, Palm Beach, March 27, 1941, coll. A. Shepard: 1 ♀, 18.9 mm cl (USNM 267784); beach, north of Lake Worth Inlet, Dec. 7, 1908, coll. J. A. Pine on “Orion”: 1 ♂, 19.8 mm cl (USNM 68610); Delray Beach, July 1942, coll. J. Martin: 1 ♀, 21.6 mm cl (USNM 96044); *Broward Co.*: Pompano Beach, May 6, 1943, coll. E. R. Tinkham: 1 ♀, 25.3 mm cl (LACM-AHF uncataloged); *Dade Co.*: Morris Cut, off Miami, coll. J. E. Benedict: 1 ♀, 20.4 mm cl, paralectotype (USNM 29019); Miami, coll. H. A. Pilsbry: 1 ♀, 17.0 mm cl (ANSP 4760); Miami Beach, Feb. 1936, coll. J.F.W. Pearson: 1 ♀, 15.9 mm cl (MCZ 9823); *Franklin Co.*: Outer beach, Alligator Point, Aug. 26, 1952, coll. M. Wass: 1 ♀, 15.3 mm cl (USNM 95592); *Bay Co.*: West Panama City Beach, July 9, 1970, coll. L. J. Kennair: 1 ♀, 15.4 mm cl (USLZ 3128); St. Andrews State Park, Sept. 1973, coll. unknown: 1 ♂, 5.1 mm cl (USLZ 382); Laguna Beach, Aug. 17, 1963,



coll. Burney: 1 ♀, 23.3 mm cl (USLZ 28); *Santa Rosa Co.*: Outer beach, Santa Rosa Island, Pensacola, 1893, coll. J. E. Benedict: 1 ♂, 15.7 mm cl., lectotype (USNM 104656 ex USNM 29020), 2 ♀, 12.5–16.4 mm cl, paralectotypes (USNM 29020); Pensacola Beach, near Ft. Pickens, Oct. 9–10, 1980, coll. R. Heard, J. Martin, Bouchon, Scheitzelt, and D. Felder: 1 ♂, 9.6 mm cl, 1 ♀, 14.1 mm cl (USLZ 2122); Pensacola, coll. S. Stearns: 1 ♀, 15.1 mm cl (USNM 4603); Pensacola, coll. S. Kneeland: 1 ♂, 16.9 mm cl (USNM 68614); Pensacola, 1854, coll. Dr. Jeffrey: 2 ♀, 21.0–21.6 mm cl (MCZ 841); **Alabama**: *Baldwin Co.*: Beach, Gulf Shore, June 25, 1950, coll. A. F. Archer: 1 oviger, 19.8 mm cl (AMNH 14425); Gulf State Park, June 22, 1938, coll. R. O. Christianson: 1 ♀, 20.4 mm cl (USNM 81028); Gulf Shores, Oct. 17, 1989, coll. D. L. Felder: 1 ♀, 19.6 mm cl, 1 ♀, unmeasurable (USLZ uncataloged); *Mobile Co.*: Dauphin Island, Sept. 16, 1973, coll. C. R. Booth: 1 ♀, 11.2 mm cl (USLZ 371); **Mississippi**: *Jackson Co.*: Petit Bois Island, Aug. 4, 1953, coll. S. L. Wallace: 1 ♀, 22.3 mm cl (USNM 95750); Horn Island, Aug. 25, 1982, coll. F. M. Truesdale: 1 oviger, 15.9 mm cl, 3 zoea I, 6 zoea II, 5 zoea III, 6 zoea IV, 4 megalopae, 3 first stage crabs (USNM 222480); west end of Horn Island, June 30, 1968, coll. D. Farrell: 1 ♀, 6.4 mm cl (USNM 285390); *Harrison Co.*: Ship Island, Aug. 15, 1950, coll. W. H. Rose: 2 ♀, 4.2–4.9 mm cl (USNM 92433); Ship Island, July 27, 1949, coll. R. L. Caylor: 1 ♀, 12.5 mm cl (USNM 90297); **Louisiana**: *Jefferson Parish*: Grand Isle, July 5–17, 1928, coll. E. H. Behre: 4 ♂, 9.2–12.6 mm cl (USNM 63254), 1 ♂, 9.5 mm cl (RMNH 14631 ex USNM 63254); Grande Isle, May 16, 1973, coll. D. L. Felder: 2 ♀, 9.5–9.5 mm cl (USLZ 1530); eastern end of Grand Isle, Aug. 24, 1971, coll. W. W. Forman: 1 ♀, 13.4 mm cl (USLZ 3127); Chenier Camanada, near Grande Isle, July 16, 1976, coll. M. Dardeau: 1 ♂, 10.7 mm cl (USLZ 615); Grand Isle, Aug. 1969, coll. unknown: 2 ♀, 10.0–15.6 mm cl (USLZ 71); west bank of Caminada Pass, April 3, 1973, coll. D. L. Felder and C. Clifford: 1 ♂, 8.4 mm cl, 1 ♀, 5.9 mm cl (USLZ 2123); *Terrebonne Parish*: Isles Dernieres, May 25, 1972, coll. D. L. Felder: 2 ♂, 11.4–11.4 mm cl (USLZ 1531);

beach on Isle Derniere, approximately 3.6 mi from eastern tip, Freeport Sulphur Company, Lake Pelto, Sta. 3, 10 ft (= 3 m), May 25, 1972, coll. W. W. Forman and L. V. Kennair: 1 ♀, 9.2 mm cl (USLZ 1825); Freeport Sulphur Co., Lake Pelto, Sta. 2, 29°3'30"N, 90°39'40"W, 200 ft [= 60.6 m] south of Isle Dernieres, approximately 1.7 mi from eastern end (Wine Island Pass), May 25, 1972, coll. W. W. Forman: 1 ♂, 10.5 mm cl (USLZ 3129); *Cameron Parish*: beach east of Cameron Jetty near trash dump, approximately 0.8 mi south of Highway 27, June 14, 1975, coll. unknown: 1 ♀, 9.0 mm cl (USLZ 1558); **Texas**: *Galveston Co.*: Galveston Beach, Galveston, Sept. 17, 1944, coll. W. H. Ball: 1 ♀, 5.1 mm cl (USNM 260866); Galveston, July 1938, coll. C. A. Mohrle: 1 ♀, 8.1 mm cl (USNM 78066); *Nueces Co.*: Mustang Island, July 1936, coll. H. B. Parks: 2 ♀, 8.2–8.9 mm cl (USNM 72183); Surf Beach, Mustang Island, April 17, 1982, coll. D. Owens: 1 ♀, 10.5 mm cl (LACM-AHF 2429–01); Mustang Island, approximately 10 mi south of Port Aransas, Aug. 14, 1979, coll. D. L. Felder: 4 ♂, 7.7–9.7 mm cl, 1 oviger, 9.1 mm cl (USLZ 2121); Mustang Island, Port Aransas, July 20, 1977, coll. "Biol 423": 1 ♂, 7.4 mm cl (USLZ 720); beach 10 mi south of Port Aransas, Oct. 31, 1975, coll. R. Spinello: 1 ♂, 5.0 mm cl (USLZ 500); *Padre Island*: 8 mi south of Chappel's cabin, June 24, 1971, coll. D. Felder: 2 ♀, 11.0–11.4 mm cl. (USLZ 1528); 10 ft from low tide mark, 63 mi south of Bob Hall Pier, June 11, 1969, coll. T. Shirley: 1 ♀, 10.5 mm cl (USLZ 1529); coll. R. D. Comp: 1 ♀, 18.9 mm cl (USNM 50568); July 24, 1976, coll. R. Parker: 3 ♂, 7.3–8.5 mm cl (USLZ 616a), 4 ♂, 6.9–8.2 mm cl (USLZ 616b); 97°8.2'W, 27°42.5'N, Sept. 24, 1971, coll. J. Teerling: 1 ♂, 5.1 mm cl (USLZ 159); *Cameron Co.*: North jetty, South Padre Island, Oct. 27, 1979, coll. D. L. Felder, Bouchon, W. W. Forman, and Rozas: 1 ♂, 7.7 mm cl (USLZ 1813).

**Mexico**: Tecolutla, Veracruz, May 23, 1973, coll. M. A. Tidwell: 3 ♀, 9.7–17.9 mm cl (USLZ 2124).

**"Brazil"**: "Rio Parahyba, Rio De Janeiro, Brazil, 1865, coll. Thayer Expedition" (data suspect, see remarks): 1 ♂, 14.5 mm cl (MCZ 13229).

**No Data:** 1 ♀, 16.8 mm cl (MNHN-Hi 81).

**DIAGNOSIS:** Carapace length subequal to width, with lightly setose grooves. Anterior margin with two large spines lateral to ocular sinus. CG5 present; CG8 present; CG10 present; posterior submarginal groove incomplete and reaching two-thirds beyond posterior margin of posterior concavity. Rostrum present, rounded and unarmed. Distal peduncular segments dorsoventrally flattened and subquadrate, distal margins toothed; pigmented area in distolateral notch. Antennal segment I with dorsal spine. Dactylus of pereopod II with heel produced, tapered, and subacute. Dactylus of pereopod III with heel thin, projecting, acute. Dactylus of pereopod IV with produced acute heel and deep indent. Telson of male spatulate, proximal two-thirds laterally convex, distal third slightly laterally concave, lateral expansions rounded, distal tip rounded; medial third heavily calcified, lateral regions decalcified.

**DESCRIPTION:** Carapace (fig. 56A) length and width subequal. Anterior margin sinuous mesially on either side of ocular sinus, crenulate; acute strong spine at midpoint of either lateral anterior margin; margin lateral to spine sloping and slightly concave. Rostrum as rounded projection reaching beyond median peduncular segments and unarmed. Ocular sinus smoothly concave mesially, angled laterally; unarmed. Frontal region smooth; setal field reduced to narrow band anteriorly paralleling CG1, concave medially. CG1 parallel to anterior margin of carapace, concave medially, slightly crenulate, medial and posterolateral elements united. Mesogastric region smooth; CG2 absent; CG3 present as two short lateral elements; CG4 with one or two short elements and two long sinuous lateral elements, lateral elements almost united with posterior margin of CG1 posterolateral elements. Hepatic region smooth, with short transverse element lateral to anterolateral margin of CG1, oblique lateral setose groove and short, acute spine at median of lateral margin. Epibranchial region roughly triangular, smooth; posterolateral margin with six or seven short rows of setae. Metagastric region smooth; CG5 present as two short convex elements. CG6 crenulate, with separate oblique, long, lateral fragments and short sin-

uous, posteriorly displaced, median element united with CG7. CG7 oblique relative to anterior margin of carapace and united with median fragment of CG6. Cardiac region smooth; CG8 present as two short elements with gap at median. CG9 absent. CG10 present as two long oblique elements with short gap at median. CG11 absent. Branchial region with few short, transverse rows of setae. Posterior margin deeply and irregularly concave medially and more or less straight laterally, with submarginal groove reaching two-thirds beyond posterior margin of posterior concavity. Branchiostegite without anterior submarginal spine; anterior region with anterodorsal transverse groove, granular surface, and many long plumose setae; posterior region membranous with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (not shown in fig. 56B) covered by carapace; median peduncular segments (fig. 56B) reduced to small oblong calcified area anterolateral to ocular plate. Distal peduncular segments subquadrate, angled slightly distolaterally, flattened, with straight lateral and convex mesial margins, distolateral and distomesial angles rounded, margins smooth in proximal half, toothed in distal half; pigmented area at notch on lateral margin two-thirds from proximal margin; mesial margins separated along entire length; distal half of margins with long simple setae; small patch of setae in proximolateral corner.

Antennule (fig. 56C) segment III narrow proximally, expanding distally to two times proximal width; with plumose setae on dorsal and ventral margins; dorsal exopodal flagellum with 91–100 articles ( $n = 6$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with three articles ( $n = 6$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins and in scattered patches on mediolateral surface. Segment I wider than long, unarmed; dorsomedial third of lateral surface rugose, with long plumose setae; long plumose setae on dorsal and ventral margins and scattered on lateral surface.

Antenna (fig. 56D) with segment V approximately two times longer than wide, with short plumose setae on dorsal and distal mar-

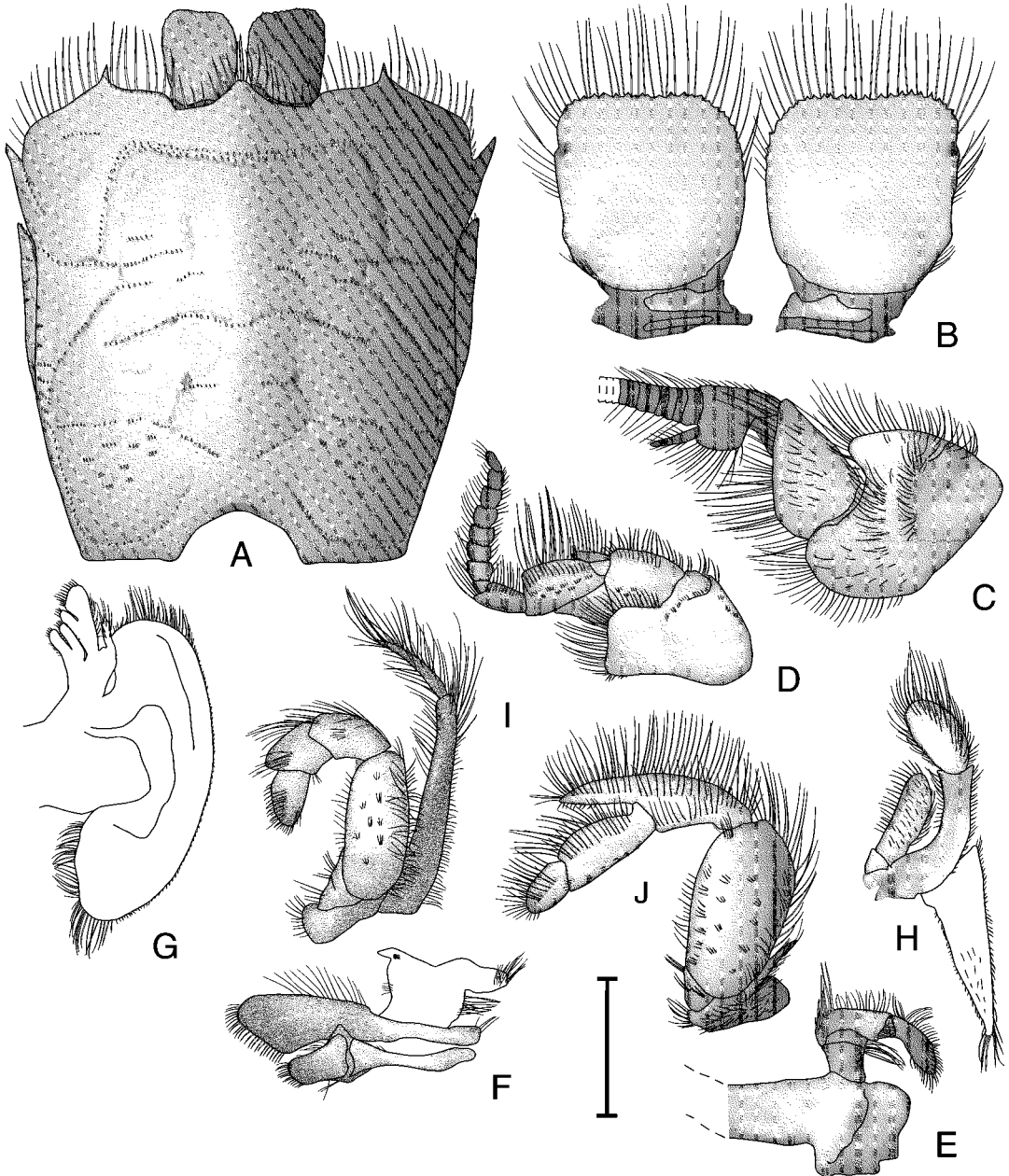


Fig. 56. *Lepidopa benedicti* Schmitt, 1935: A, oviger, 19.8 mm cl, AMNH 14425; B–J, ♀, 14.1 mm cl, USLZ 2122. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Left maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 2.1 mm (F), 2.2 mm (B), 3.0 mm (E, I), 3.3 mm (C), 4.4 mm (D, G, H, J), and 6.4 mm (A).

gins and in subventral row; flagellum with eight articles ( $n = 6$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV almost cylindrical, overreaching segment III by one-third of its length, with long plumose setae on dorsal and distal margins, and interrupted row of setae on mediolateral margin. Segment III with long plumose setae on ventral margin. Segment II widening distally, with plumose setae on dorsal margin and in short transverse mediolateral row; antennal acicle short, triangular, overreaching segment IV proximal margin by one-third of its length, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened and truncated ventrolaterally, with long plumose setae on margins; short plumose setae in sinuous row subdorsodistally; lateral margin with acute spine one-third from distal margin; segment with ventromesial antennal gland pore.

Mandible (fig. 56E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 56F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and plumose setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under, with wide proximal projection; internal lobe reduced, with four thick setae at distolateral margin.

Maxilla (fig. 56G) exopod rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 56H) epipod with plumose setae on margins and on distolateral surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments: proximal segment narrow, margins parallel, with plumose setae; distal segment spatulate, longer than wide, curved mesially, broadest medially, margins and dorsolateral surface with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins.

Maxilliped II (fig. 56I) dactylus evenly rounded, longer than wide, with thick simple

setae distally and thin simple setae in short row on lateral surface and on distoventral angle. Propodus slightly produced dorsodistally, width subequal to length, with plumose setae on dorsal margin and long simple setae on dorsodistal and ventrodorsal margins. Carpus not produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal margin and scattered on lateral surface. Merus two times longer than wide, margins parallel but slightly inflated medially, with simple setae and plumose setae on lateral margin and scattered in short transverse rows on surface. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-third longer than merus, flagellum with one elongate article.

Maxilliped III (fig. 56J) dactylus elongate and evenly rounded; long plumose setae on margins and lateral surface. Propodus with longitudinal median row of plumose setae on lateral surface; dorsal margin with plumose setae, ventral margin with submarginal short rows of short setae. Carpus strongly produced onto propodus, reaching two-thirds of distance to distal margin of propodus; lateral surface with medial transverse row of plumose setae; plumose setae on margins. Merus unarmed, broadly inflated distolaterally, with long plumose setae on lateral margin and short setae scattered in short oblique rows on surface. Basis-ischium incompletely fused, without crista dentata. Exopod two-segmented: proximal segment small; distal segment styliiform, tapering, approximately two-fifths length of merus, with plumose setae on margins; without flagellum.

Pereopod I (fig. 57A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin smooth, with long plumose setae; ventral margin with short simple setae. Propodal lateral surface with numerous short, transverse rows of setose rugae; dorsal margin with few small, low ridges; ventral margin distally produced into acute spine; cutting edge lacking teeth, lined with long plumose setae; dorsal margin with long plumose setae, ventral margin with short simple setae; mesial surface smooth, with few scattered short rows of short simple setae. Carpus with dorsodistal angle rounded but slightly rugose, dorsal margin smooth, with short plumose setae; lateral surface with few trans-



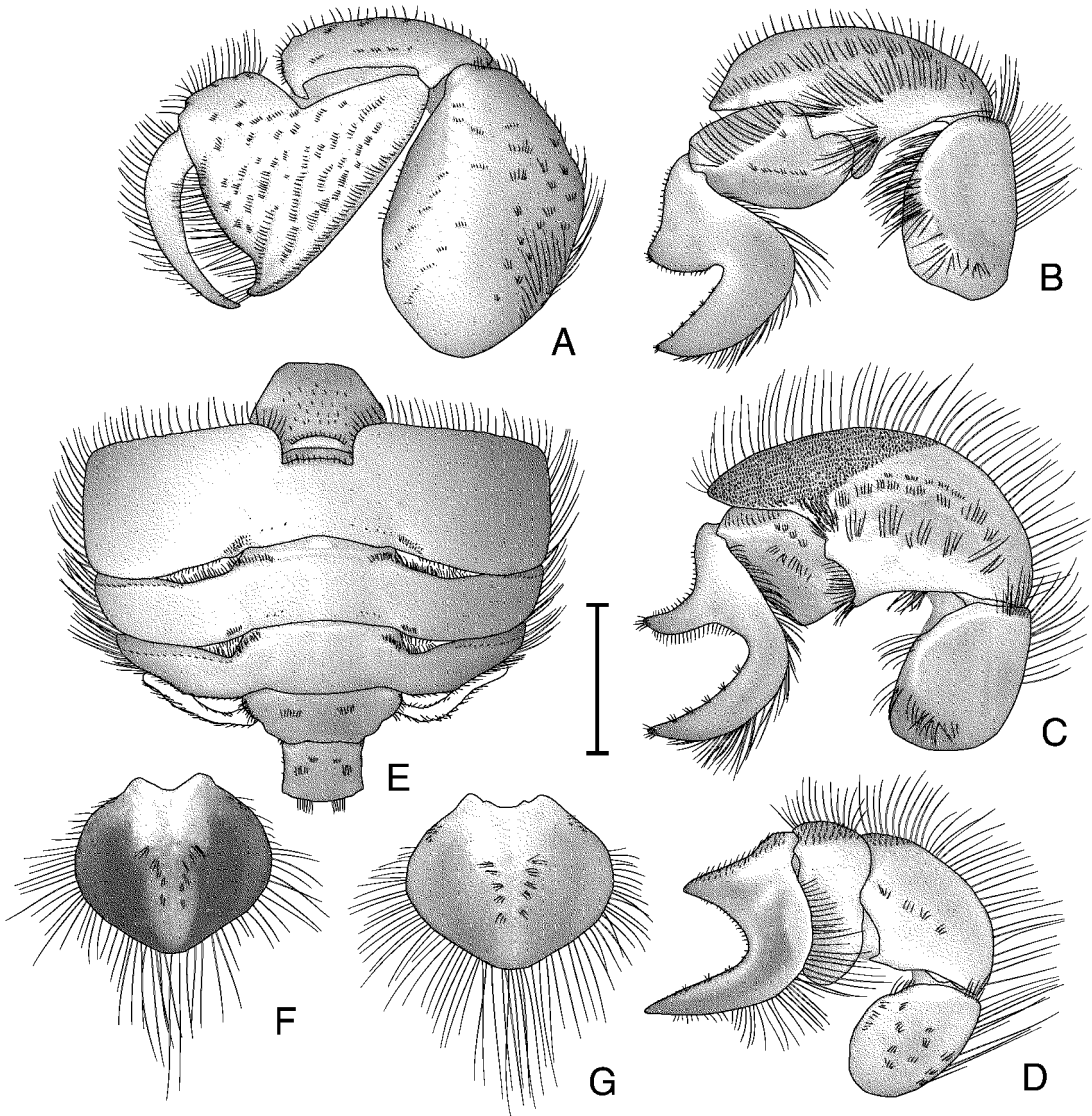


Fig. 57. *Lepidopa benedicti* Schmitt, 1935: A–E, G, ♀, 14.1 mm cl, UNLZ 2122; F, ♂, 9.6 mm cl, USLZ 2122. **A.** Left pereopod I, lateral view. **B.** Left pereopod II, lateral view. **C.** Left pereopod III, lateral view. **D.** Left pereopod IV, lateral view. **E.** Abdominal somites I–VI, dorsal view. **F.** Telson of ♂, dorsal view. **G.** Telson of ♀, dorsal view. Scale = 2.2 mm (F), 3.3 mm (G), and 4.4 mm (A–E).

verse setose ridges; mesial surface smooth, with medial transverse row of long plumose setae. Merus unarmed; lateral surface with scattered transverse rows of short plumose setae, margins with short plumose setae, long plumose setae on proximolateral margin; mesial surface with few short rows of setae; proximal half of mesial surface with decal-

cified window. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 57B) dactylus smooth; with base to heel concave, heel produced and narrowing to subacute tip, heel to tip with broad, rounded indent, tip acute, tip to base broadly convex; lateral surface smooth; mesial surface smooth, ventral margin with long

plumose setae, dorsal margin with short simple setae, with patch of long plumose setae at base reaching across median of heel. Propodus with dorsal surface smooth, ventral margin inflated and rounded; distoventral margin with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with long plumose setae on ventral margin; short transverse row of long plumose setae on surface; mesial surface with subdistal row of long plumose setae. Carpus strongly produced dorsodistally, reaching one-half length of propodus; lateral surface nearly smooth, with two irregular, interrupted rows of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; dorsal margin and distoventral angle with long plumose setae; mesial surface smooth, median half decalcified, with medial transverse row of long plumose setae. Merus lateral surface almost entirely decalcified, with long plumose setae on margins; mesial surface nearly smooth, with oblique median ridge, long plumose setae patches dorsal to ridge and in row ventrally, with decalcified area on proximal half of area dorsal to ridge. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 57C) dactylus base to heel broadly indented, heel acute, thin, and produced, heel to tip with broad, evenly rounded indent and small indent at base of heel, tip acute, tip to base smoothly convex; lateral surface smooth, with tufts of short setae at end of heel and tip, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus and in row across base of heel. Propodus not inflated dorsoventrally; lateral surface smooth, with simple setae subdorsally, and long plumose setae on ventral margin and in oblique row on surface; dorsolateral surface narrow, oblique, flattened; mesial surface decalcified medially, with scattered long setae on and near distoventral margin. Carpus strongly produced dorsodistally and inflated, reaching distal margin of propodus, rounded; dorsolateral margin unarmed; lateral surface with mat of short setae on dorsodistal third of segment and two long transverse interrupted rows of

setae medially, interrupted row of setae one-third dorsal to ventral margin, and patch of long plumose setae on distoventral angle; dorsal margin with long plumose setae; mesial surface smooth, dorsomesial third decalcified, with long plumose setae on margins and in median short transverse row in decalcified area. Merus smooth, lateral surface almost entirely decalcified; dorsal and ventral margins unarmed, with long plumose setae; laterodistal margin with long plumose setae; mesial surface smooth, with few scattered setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female pereopod III with large mesioproximal gonopore (not opposing other gonopore); male with slightly smaller pore more mesially displaced.

Pereopod IV (fig. 57D) dactylus with base to heel slightly concave, heel acute, heel to tip broadly rounded and concave, tip acute, tip to base convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge across heel with row of short plumose setae. Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, margins with long plumose setae; dorsal expansion with row of long plumose setae medially and mat of short setae; lateral and mesial surfaces smooth, with few scattered long plumose setae. Carpus slightly produced dorsodistally; lateral and mesial surfaces smooth; dorsomedial half of mesial surface decalcified; dorsal margin with small mat of short setae at dorsodistal angle and long plumose setae along length; ventral margin with short simple setae. Merus with small median decalcified area on lateral surface, few short transverse rows of setae, dorsal and ventrodorsal margins with long plumose setae; mesial surface with large decalcified window proximoventrally. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 57E) somite I wider than long, widest posteriorly; dorsal surface with anterior margin straight; posterior margin concave, with elevated submarginal curved row of short setae and field of scattered short simple setae anterior to submarginal row; with small faint transverse decalcified win-

dow laterad of segment median. Somite II anterior margin convex, posterior margin irregularly concave; pleura expanded and directed laterally, angled anterolaterally, rounded posterolaterally, small patch of short simple setae at posteromesial margin and transverse row of setose punctae mesial to setose patch; anterior and lateral margins with long plumose setae, posterior margin with short setae. Somite III similar to somite II, narrower and shorter; pleura thinner and shorter than on somite II, directed posterolaterally proximally and curving forward distally, with setae as in somite II; anterolateral angle subacute; dorsal surface slightly obliquely flattened anterolaterally with submarginal row of setae. Somite IV similar to somite III; pleura thinner and shorter than on somite III, directed laterally proximally, curving forward distally; dorsal surface slightly obliquely flattened anterolaterally with submarginal row of short setae; margins with long plumose setae. Somite V wider than somite IV, narrowing posteriorly; anterolateral margins with plumose setae, two rows of setae on posterolateral angles, two medial rows of simple setae laterad of midline; pleura distinct from somite, shorter than in somite IV, thin, flattened, directed anterolaterally, and covered with plumose setae. Somite VI narrower than somite V; dorsal surface with two anterior and two posterior short transverse rows of setae laterad of midline, posterior margin with two rows long plumose setae laterad of midline; pleura absent.

Female with long uniramous pleopods on somites II–V; male with small pleopods.

Telson of male (fig. 57F) spatulate, proximal two-thirds laterally convex, distal third slightly laterally concave, lateral expansions rounded, distal tip rounded; medial third heavily calcified, lateral regions decalcified; median longitudinal groove running from proximomedial margin along calcified region to just before distal margin; two distally converging rows of short simple setae in medial third; margin with long simple setae. Telson of female (fig. 57G) similar to male, slightly broader laterally.

**DISTRIBUTION:** Central Atlantic coast of Florida, USA, and Gulf of Mexico south to Veracruz, Mexico, in up to 3 m depth.

**MAXIMUM SIZE:** Males: 19.8 mm cl; females: 25.3 mm cl.

**TYPE SPECIMENS:** USNM 104656 (lectotype designated by Holthuis, 1961), USNM 29020 (2 paralectotypes), USNM 29019 (1 paralectotype).

**TYPE LOCALITY:** Outer beach, Santa Rosa Island, Pensacola, Santa Rosa Co., Florida, USA (restricted by selection of lectotype).

**REMARKS:** A specimen without locality data in the Paris Museum (MNHN-Hi 81) may be the specimen illustrated as *Albunea scutellata* by H. Milne Edwards (1837b) and copied by numerous later authors (e.g., Chenu and Desmarest, 1877; Anonymous, 1999). Although albuneids have been confused with raninids, corystids, and thiids, the identification of the H. Milne Edwards' (1837b) illustration by Anonymous (1999) is the only known instance of misidentification with a hermit crab.

Schmitt (1935) proposed the name *L. benedicti* for those specimens cited by Benedict (1903) as *L. scutellata*. Although both Benedict (1903) and Schmitt (1935) incorrectly attributed the authorship of *scutellata* to Desmarest (1825), Schmitt (1935) was correct in his conclusion that Desmarest's (1825) specimens were distinct from those of Benedict (1903). In fact, Desmarest (1825) had no specimens of "*Albunea scutellata*" and was merely repeating Fabricius' (1787) description of *Hippa scutellata*, which is a thiid brachyuran (see Holthuis, 1962). As pointed out by Holthuis (1961), all of the specimens discussed by Benedict (1903) must be considered syntypes of *L. benedicti* Schmitt, and the lectotype was selected by Holthuis (1961).

Although much of the Vanderbilt material is now in AMNH, the specimens cited by Boone (1930) remain on display in the Vanderbilt Marine Museum (Centerport, NY). As they could only be visually inspected though the wall of a sealed glass jar, they are not included in the material examined section. MCZ 13229 ("Brazil") is almost certainly an incorrect locality, and the label may indeed have been switched with MCZ 865, a *Lepidopa richmondi* from "Florida" (see also Eford, 1971).

The complete larval development for this species was reported by Stuck and Truesdale

(1986), with larvae reared in the laboratory from an ovigerous female. *Lepidopa benedicti* has four zoeal stages and one megalopal stage, reached 14–17 days after hatching at 25°C and 26‰ salinity (Stuck and Truesdale, 1986).

Efford (1971) reported a maximum size for males of only 4 mm, but that was because he considered only those specimens lacking pleopods to be males. Adult males in this species, as in all *Lepidopa*, have small pleopods and a well-developed gonopore on the coxae of pereopod V.

This species is in the “*benedicti*-group” of *Lepidopa* species and is the Atlantic analogue to *L. deamae*. These two species attain the largest sizes of any *Lepidopa* known.

ALBUNEINAE STIMPSON, 1858, new status

TYPE GENUS: *Albunea* Weber, 1795 as the nominotypical genus of the family Albuneidae.

INCLUDED GENERA: *Albunea* Weber, 1795; *Zygopa* Holthuis, 1961; *Stemonopa* Efford and Haig, 1968; *Paralbunea* Serène, 1977; *Squillalbunea*, n. gen.; *Italialbunea*, n. gen.

DIAGNOSIS: Carapace outer ocular spines absent. Antennule dorsal flagellum with 17–145 articles, ventral flagellum with 1–7 articles. Antenna acicle present, long; flagellum with 1–8 articles. Maxilliped II with flagellum. Maxilliped III crista dentata absent or weak; exopod slender or lamellar, without flagellum. Pereopod I dactylus with dorsal margin smooth or crenulate; propodal cutting edge smooth or with blunt teeth. Abdomen with pleura on somites II–IV. Males without pleopods.

REMARKS: As with the members of the Lepidopinae, the genera that comprise the Albuneinae have always been considered to form a natural grouping within the Albuneidae (Efford and Haig, 1968; Efford, 1969), but this group was not formally named until now.

KEY TO GENERA

- 1 Ocular peduncles reduced, fused; branchiostegite without spine . . . . . *Zygopa*
- Ocular peduncles normal, separate; branchiostegite with spine . . . . . 2

- 2 Antennal segment I dorsodistal spine present . . . . . *Albunea*
- Antennal segment I dorsodistal spine absent . . . . . 3
- 3 Median anterior margin of setal field triangular . . . . . *Italialbunea*
- Median anterior margin of setal field not triangular . . . . . 4
- 4 Telson triangular, carapace covered in setose lines . . . . . *Squillalbunea*
- Telson ovate, setal lines restricted to CGs . . . . . 5
- 5 Distal peduncular segments longer than carapace . . . . . *Stemonopa*
- Distal peduncular segments shorter than carapace . . . . . *Paralbunea*

PARALBUNEA SERÈNE, 1977

*Albunea*: Balss, 1916a: 37 (part). – Gordon, 1938: 186–187, 190–193 (part). – Serène and Umali, 1965: 89 (part). – Coêlho and Calado, 1987: 41 (part). – Sun and Wang, 1996: 31 (part) (not *Albunea* Weber, 1795).

*Paralbunea* Serène, 1977: 54. – Serène, 1979: 97–98 (part). – Coêlho and Calado, 1987: 42 (part). – Calado, 1995: 239–240 (part). – Boyko and Harvey, 1999: 380, 402 (key) (part).

*Albune* [sic]: Coêlho and Calado, 1987: 42 (part) (not *Albunea* Weber, 1795).

not *Paralbunea* Serène, 1979: 97–98 (part). – Calado, 1995: 239–240 (part). – Boyko and Harvey, 1999: 380, 402 (key) (part) (= *Squillalbunea*, n. gen.).

not *Paralbunea* Hu and Tao, 1996: 62 (junior homonym; see below).

DIAGNOSIS: Carapace wider than long, front broad, anterior margin weakly spinose or unarmed; hepatic anterolateral spine absent; branchiostegite armed. Distal peduncular segments flattened, short, without corneas. Antennular segment I unarmed; dorsal flagellum with 70–145 articles, ventral flagellum with two or three articles. Antennal segment I unarmed; flagellum with six to eight articles. Maxilliped III exopod slender. Pereopod I dactylus dorsal margin smooth; distodorsal carpal spine absent; cutting edge smooth. Males without coxal pore on pereopod III. Telson of male fully calcified. Telsons with weak sexual dimorphism.

DISTRIBUTION: Central west coast of Africa and throughout the Indo-Pacific Ocean from east Africa to Tahiti.



TYPE SPECIES: *Paralbunea* Serène: *Paralbunea manihinei* Serène, 1977, by monotypy; *Paralbunea* Hu and Tao: *Paralbunea taipeiensis* Hu and Tao, 1996, by monotypy.

INCLUDED SPECIES: *P. intermedia* (Balss, 1916); *P. paradoxa* (Gordon, 1938); *P. dayriti* (Serène and Umali, 1965); *P. manihinei* Serène, 1977.

REMARKS: The genus *Paralbunea* has been credited to Serène (1979), with the type species given as *Albunea paradoxa* Gordon, 1938. However, Serène (1977) earlier cited the “nouveau genre” *Paralbunea* and gave morphological characters to distinguish it from *Albunea*, thereby making the name available from the 1977 publication. The type species is therefore, by monotypy, the only one included in *Paralbunea* in the 1977 work: *Paralbunea manihinei* Serène. Fortunately, the concept of the genus is not altered by this change in type species, as both *paradoxa* and *manihinei* are good species of *Paralbunea*. The species *Albunea mariellae* Serène was questionably placed in this genus by Serène (1979) but it does not belong here. With the removal herein of *A. mariellae* to a new genus, all of the other taxa placed in *Paralbunea* form a monophyletic group that is the most plesiomorphic within the Albuneinae.

Hu and Tao (1996) described a new fossil genus of purported albuneid crab from the Miocene of Taiwan. They named this genus *Paralbunea*, with the type species *P. taipeiensis* Hu and Tao, 1996 as its only component. Unfortunately, *Paralbunea* Hu and Tao is preoccupied by the Recent genus *Paralbunea* Serène. Normally in such circumstances, it would be necessary to erect a replacement name for the preoccupied genus, but in this situation it is not required. This is because the type species of *Paralbunea* Hu and Tao is a composite of two, perhaps even three, different species of decapods, none of which is an albuneid (Boyko, in prep.). The genus will be synonymized elsewhere (Boyko, in prep.). Ng (1999) has pointed out that the publication of Hu and Tao (1996) “will cause substantial problems for many taxonomists” and that most of the species described by Hu and Tao (1996) “can probably be referred to current genera and species”.

#### KEY TO SPECIES

- 1 Pereopod III dactylus heel produced . . . . . 2
  - Pereopod III dactylus heel rounded . . . . . 3
  - 2 Pereopod IV dactylus heel acute . . . . .
  - Pereopod IV dactylus heel rounded . . . . .
  - 3 Maxilliped III distodorsal carpal projection extending slightly onto propodus . . . . .
  - Maxilliped III distodorsal carpal projection extending halfway onto propodus . . . . .
- ..... *P. paradoxa*  
 ..... *P. dayriti*  
 ..... *P. manihinei*  
 ..... *P. intermedia*

#### *Paralbunea intermedia* (Balss, 1916)

Figures 58, 59

*Albunea intermedia* Balss, 1916a: 37–38, figs. 14, 15\*. – Gordon, 1938: 187, figs. 3h, j, 4a\*. – Monod, 1956: 42–43, fig. 15. – Forest, 1958: 144, 147–149, 151–152, pl. 1\*. – Coêlho and Calado, 1987: table 1.

“(?)*Albunea* sp. unknown form” Lebour, 1959: 129, fig. 16 (larvae).

*Paralbunea intermedia*: Serène, 1979: 97–98. – Calado, 1995: 247–249, pl. 78, fig. 2, pl. 80, figs. a–h\*.

MATERIAL EXAMINED: **Sierra Leone**: Sierra Leone River, coll. A. R. Longhurst: 1 ♂, 3.7 mm cl (BMNH 1957.5.26.220).

**Liberia**: Cap Palmas, 7 fms (= 12.8 m), Sept. 15, 1888, coll. L. Hupfer: 1 ♀, 10.6 mm cl, holotype (ZMH K–5386).

**Gabon**: Moanda, Sept. 1947, coll. E. Darville: 1 ♂, 7.9 mm cl (MRAC 34.672).

DIAGNOSIS: Carapace wider than long, covered with lightly setose grooves. Anterior margin with five or six very small spines on either side of ocular sinus. Setal field with narrow lateral elements and straight anterior margin. CG1 with fused posterior lateral elements; CG4 fragmented into four short oblique elements and two longer lateral elements; CG6 and CG7 fused; CG8 incomplete; CG11 absent. Rostrum absent. Ocular plate ovate. Distal peduncular segments dorsoventrally flattened and subtriangular in shape, approximated along mesial margins, lateral margins broadly convex, mesial margins straight. Cornea absent. Maxilliped III carpal projection long. Dactylus of pereopod II with heel produced and rounded. Dactylus of pereopod III with heel low and rounded. Dactylus of pereopod IV sinuous from base

to tip, with deep indent. Telson of male spatulate, truncate distally, evenly calcified, with row of thin, short setae. Telson of female similar to male, rounded distally.

DESCRIPTION: Carapace (fig. 58A) wider than long. Anterior margin concave on either side of ocular sinus, becoming straight and oblique laterally, five or six small spines and few protospinous tubercles on and lateral to concave region, ventral row of long plumose setae submarginally. Rostrum absent. Ocular sinus smoothly concave and unarmed. Frontal region smooth; setal field broad posteriorly, narrowing anteriorly, with narrow lateral elements and straight anterior margin. CG1 parallel to anterior margin of carapace, straight, slightly crenulate, medial and curved lateral elements unevenly united, with medially directed short element at middle of lateral elements. Mesogastric region smooth, CG2 absent; CG3 absent; CG4 fragmented into four short oblique elements and two longer lateral elements. Hepatic region smooth, with long setose groove at median of lateral margin. Epibranchial region generally triangular, smooth, posterolateral margin with two short rows of setae. Metagastric region smooth; CG5 absent; CG6 slightly crenulate, separated into strongly concave median element, united with CG7, and two long curved lateral elements; CG7 oblique and united with median element of CG6. Cardiac region smooth; CG8 present as two small elements; CG9 present as four short elements; CG10 absent; CG11 absent. Branchial region with numerous short, transverse rows of setae. Posterior margin deeply and evenly convex, with submarginal groove reaching one-fourth up margins of posterior concavity. Branchiostegite with strong laterally carinate, 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. 58B, C) as oblong triangle, with shallow median indentation. Median peduncular segments as minute ovate, faintly calcified discs anterolateral to ocular plate. Distal peduncular segments as laterally inflated triangles, with convex lateral mar-

gins, mesial margins approximated along entire length, distal margins with sparse row of long simple setae, ventral surface with proximal submarginal ridge lined with short plumose setae.

Antennule (fig. 58D) with segment III narrow proximally, expanding distally to three times proximal width; plumose setae on dorsal and ventral margins, dorsal exopodal flagellum with 70 or 71 articles in adults ( $n = 1$ ), long plumose setae on dorsal and ventral margins, ventral endopodal flagellum short, with three articles, plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, plumose setae on ventral margins. Segment I wider than long, unarmed, lateral surface with long plumose setae dorsally and on dorsal and ventral margins.

Antenna (fig. 58E) with segment V approximately two times longer than wide, long plumose setae on dorsal margin, flagellum with six to eight articles ( $n = 3$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV expanded distally, long plumose setae on dorsal and ventral 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 and lateral surface, antennal acicle long, thin, exceeding base of segment V by approximately one-half length of segment V, long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventromesially, long plumose setae on margins and dorsolateral surface; lateral surface unarmed, without dorsolateral lobe.

Mandible (fig. 58F) incisor process with one blunt tooth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 58G) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin plumose setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under, notched proximally; internal lobe reduced with three thick setae at distolateral margin.

Maxilla (fig. 58H) exopod evenly rounded, with plumose setae along distal margin. Sca-

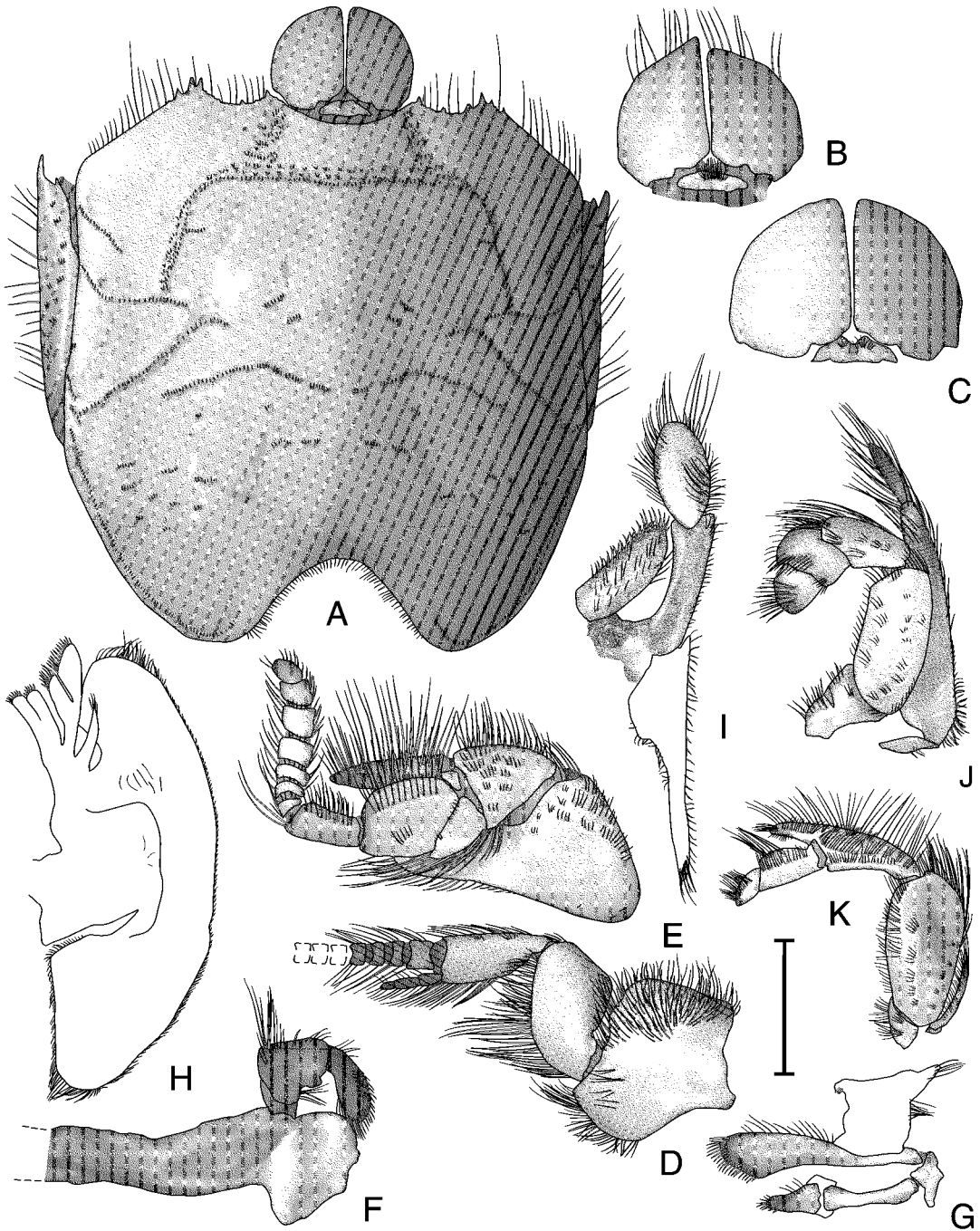


Fig. 58. *Paralbunea intermedia* (Balss, 1916a): A, C, ♀, 10.6 mm cl, ZMH K-5386, holotype; B, D–K, ♂, 7.9 mm cl, MRAC 34.672. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B, C. Ocular peduncles, dorsal view. D. Left antennule, lateral view. E. Left antenna, lateral view. F. Left mandible, mesial view. G. Left maxillule, lateral view. H. Left maxilla, lateral view. I. Left maxilliped I, lateral view. J. Left maxilliped II, lateral view. K. Left maxilliped III, lateral view. Scale = 1.6 mm (F, G), 1.7 mm (J), 2.1 mm (B, C), 2.2 mm (D, E, H, I), and 3.3 mm (A, K).



phognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 58I) epipod with short plumose setae on margins. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, with plumose setae; distal segment spatulate, nearly two times longer than wide, broadest medially, margins and proximolateral quarter with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on surface, thick simple setae on mesial margin.

Maxilliped II (fig. 58J) dactylus evenly rounded, length equal to width, with thick simple setae distally. Propodus two times wider than long, with plumose setae on dorsal margin and long simple setae on distal margin. Carpus not strongly produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal margin and scattered on surface. Merus approximately two times longer than wide, margins parallel, with simple setae on ventrolateral margin and scattered on surface, plumose setae on dorsolateral margin. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-half longer than merus, flagellum with one elongate article.

Maxilliped III (fig. 58K) dactylus rounded at tip, long plumose setae on margins and lateral surface. Propodus with longitudinal median row of plumose setae on lateral surface, dorsal margin with plumose setae. Carpus strongly produced onto propodus and reaching to three-fourths length of propodus, lateral surface with row of plumose setae medially and ventromedially; plumose setae on dorsal margin. Merus unarmed, distally inflated, plumose setae on margins and scattered on surface. Basis incompletely fused with ischium; weak crista dentata of one or two very small teeth. Exopod two-segmented, proximal segment small, distal segment styliform, tapering, approximately one-half length of merus, plumose setae on margins; flagellum absent.

Pereopod I (fig. 59A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose and short simple setae, short simple setae on ventral

margin. Propodal 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 with dorsodistal angle smoothly rounded; dorsal and distal margins with long plumose setae; lateral surface with small distal rugose area, few transverse setose ridges on dorsal third of surface and in submarginal row ventrally; mesial surface smooth with two long subdorsal and one short subventral row of long plumose setae. Merus unarmed; lateral surface with scattered transverse rows of long plumose setae, margins with scattered long plumose setae; mesial surface with proximal half decalcified, few short transverse rows of setae scattered on surface. Basis-ischium incompletely fused, unarmed. Coxa with small mesioproximal tubercle.

Pereopod II (fig. 59B) dactylus smooth; base to heel slightly convex, heel with smoothly rounded low spur, heel to tip broadly indented and wide, tip acute, tip to base broadly convex; lateral surface smooth, two small tufts of short setae on base of heel, several widely spaced submarginal tufts of short setae dorsodistally; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with row of long plumose setae from junction with propodus to median of heel. Propodal dorsal surface smooth, ventral margin proximally 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 as 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 produced one-half over propodus, gently rounded dorsally, with subacute distoventral angle; lateral surface nearly smooth, with irregular, short interrupted row of rugae medially and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae, margins with long plumose setae; mesial surface smooth, interrupted submarginal rows of long plumose se-



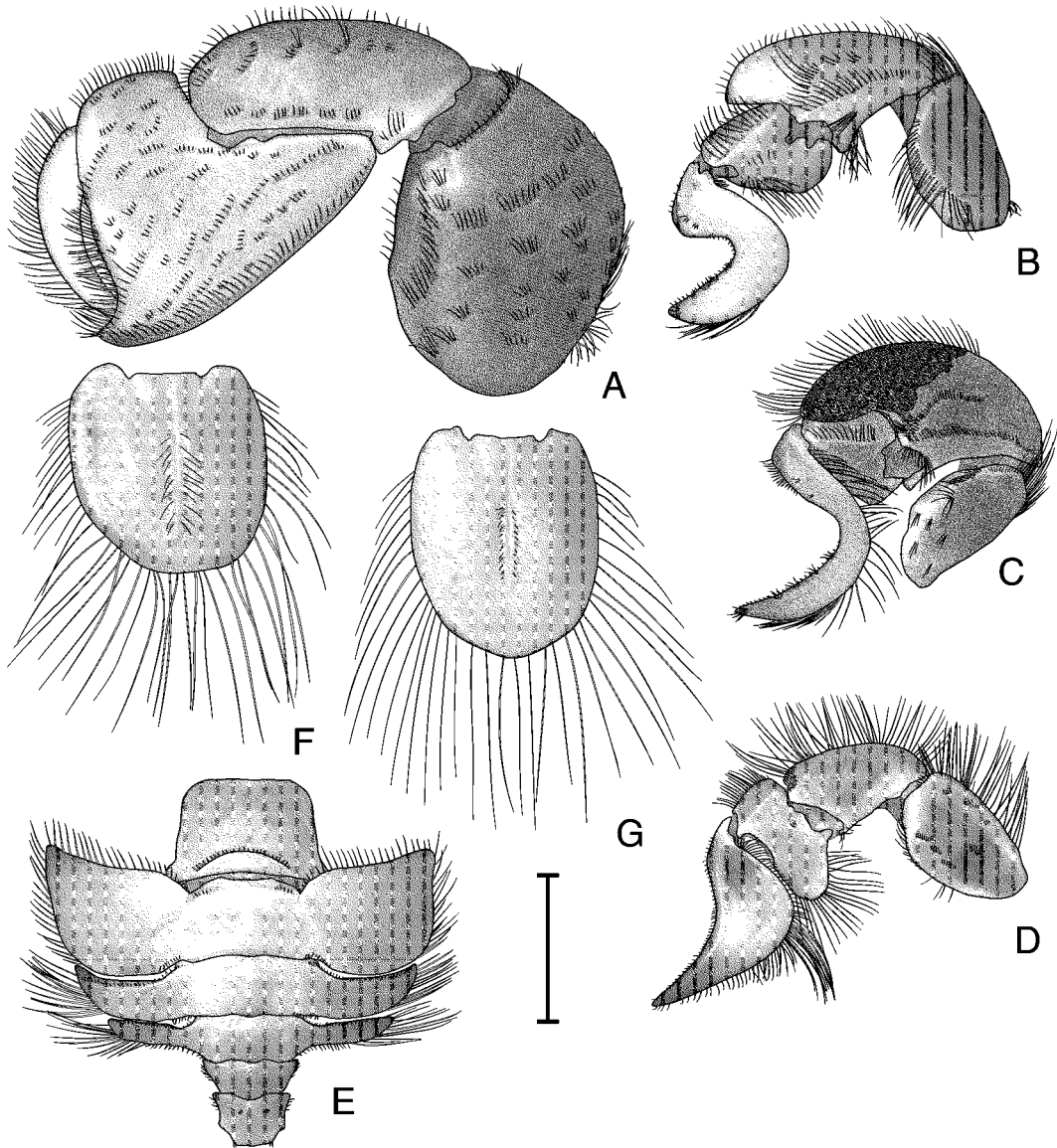


Fig. 59. *Paralbunea intermedia* (Balss, 1916a): A, C–F, ♂, 7.9 mm cl, MRAC 34.672; B, G, ♀, 10.6 mm cl, ZMH K-5386, holotype. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I–VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 1.7 mm (F), 2.2 mm (A, G), 3.3 mm (C–E), and 4.4 mm (B).

tae dorsally and distally. Merus with medial decalcified area on lateral surface, long plumose setae on lateral margins; mesial surface nearly smooth, with many short rows of long plumose setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 59C) dactylus with base

to heel almost straight, heel rounded and not produced, heel to indent nearly straight, indent broadly concave, tip acute, tip to base smoothly convex; lateral surface smooth, base of heel and dorsodistal margin with tufts of short setae, ventromesial margin with long plumose setae, dorsal margin with short sim-

ple and plumose setae; mesial surface smooth, row of plumose setae from junction with propodus to heel. 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, with long plumose setae on margins; mesial surface with few long setae scattered on surface. Carpus produced dorsodistally, inflated, reaching distal margin of propodus, broadly rounded, dorsolateral margin unarmed; lateral surface slightly rugose dorsodistally, with mat of short simple setae covering distal half of surface; proximal half of surface decalcified, with two long rows of setae medially; mesial surface smooth, submarginal row of oblique long plumose setae on disventral margin. Merus smooth, dorsal and ventral margins unarmed, with long plumose setae, distolateral margin with long plumose setae; lateral surface with decalcified area distally; mesial surface smooth with few setae. Basis-ischium incompletely fused and unarmed. Coxa with one small tubercle on anterior margin. Female with large gonopore on median mesial surface of coxa, surrounded with short plumose setae; male with smaller but distinct pore.

Pereopod IV (fig. 59D) dactylus with base to tip straight to convex, tip acute, tip to base straight distally, becoming broadly convex 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 not reaching ventral margin of dactylus, margin with long plumose setae, dorsal expansion with row of long plumose setae dorsally; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally, with small mat of setae; 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 ventrodorsal margins with long plumose setae; mesial surface proximal quarter with large decalcified window. Basis-

ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 59E) with somite I wider than long, widest posteriorly; dorsal surface with anterior margin straight, posterior margin slightly concave, with submarginal elevated and curved row of short setae, small transverse decalcified submedial windows. Somite II with submarginal transverse ridge anteriorly on dorsal surface, row of setae at posterolateral angle, extending onto pleura posteromesially; pleura expanded and directed anterolaterally, anterior margin angled, posterior margin rounded, anterior and lateral margins with long plumose setae, posterior margin with short setae. Somite III similar to somite II, but narrower, shorter, short row 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; pleura thinner and shorter than on somite III, directed slightly anterolaterally, dorsal surface obliquely flattened anterolaterally, margins with long plumose setae. Somite V subequal to somite IV, lateral margins with plumose setae; pleura absent. Somite VI subequal to somite V in width but longer, dorsal surface with two short oblique rows of setae laterad of midline anteriorly, lateral and posterior margins with long plumose setae; pleura absent.

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

Telson of male (fig. 59F) spatulate, truncate distally, evenly calcified, margins with long plumose setae; median longitudinal groove long, extending three-fourths of segment and with short setae along distal two-thirds of groove. Telson of female (fig. 59G) similar to male, longer than wide, more rounded distally, with shorter setae along distal two-thirds of median groove.

DISTRIBUTION: Known from Sierra Leone south to Gabon, in up to 12.8 m depth.

MAXIMUM SIZE: Males: 7.9 mm cl; females: 10.6 mm cl.

TYPE SPECIMEN: ZMH K-5386 (holotype).

TYPE LOCALITY: Cap Palmas, Liberia, 12.8 m.

REMARKS: The strong resemblance between the distal peduncular segments of this

species and those of the genus *Lepidopa*, combined with the suite of more typically albuneid characters, led Balss (1916a) to bestow the specific name on this taxon. Several morphological characters, such as the long carpal projection on maxilliped III, and the oblong ocular plate, suggest that this species belongs in the Lepidopinae. However, there are considerably more features, such as the lack of pleura on abdominal somite V, and the long acicle on the antenna, which unite it with the both the Albuneinae in general and *Paralbunea* in particular. It is the species with the most primitive suite of characters in the genus, the sister species to the rest of *Paralbunea* and the most primitive member of the Albuneinae.

The mysterious larva reported from off Togo by Lebour (1959) may well be a zoea of this species. It has a typically albuneidlike telson, but has extremely elongated anterior and posterior carapace spines reminiscent of the genus *Lepidopa*. Because the adult *Paralbunea* species possess a mix of typically albuneid and lepidopid characters, it is not unlikely that the larvae of this genus do so as well. If true, this is the first identification of a larval stage for any species in *Paralbunea*.

The apparent rarity of this taxon may be real, as it is for *P. paradoxa*, or it may simply reflect the limited collecting effort that has been made in western Africa.

*Paralbunea manihinei* Serène, 1977

Figures 60, 61

*Paralbunea manihinei* Serène, 1977: 47, 54, fig. 2. – Serène, 1979: 95–97, pl. 1, text-fig. 3\*. – Coelho and Calado, 1987: table 1. – Calado, 1995: 251–253, pl. 78, fig. 3, pl. 81, figs. a–c\*. – Fransen et al., 1997: 79 (list). – Boyko and Harvey, 1999: 400 (list), 402 (key).

**MATERIAL EXAMINED:** **Seychelles:** Cruise 336, Sta. 28, D–4, Grande Anse, Mahé, 10 fms (= 18.3 m), Feb. 17, 1972, coll. A. J. Bruce on R/V “♂nihine”: 1 ♂, 9.6 mm cl, holotype (BMNH 1973.19); Cruise 336, Sta. 40, D–6, Coetivy Island, 07°08'S, 56°16'E, 16 fms (= 29.3 m), Feb. 21, 1972, A. J. Bruce on R/V “♂nihine”: 1 ♀, 5.9 mm cl, paratype (RMNH 29067); Mahé, July–Aug. 1972, coll. Expédition Zoologique Mu-

sée Royal de l’Afrique Centrale, Tervuren: 1 ♂, 9.1 mm cl, paratype (MRAC 53.900).

**DIAGNOSIS:** Carapace wider than long, covered with lightly setose grooves. Anterior margin with three to five very small spines on either side of ocular sinus. Setal field with narrow lateral elements and slightly concave anterior margin. CG1 with separate posterior lateral elements; CG4 present as two short curved lateral elements united with CG1 lateral elements, CG6 and CG7 fused; CG8 incomplete; CG11 absent. Rostrum low and rounded. Ocular plate subtriangular. Distal peduncular segments dorsoventrally flattened and teardrop-shaped, separated along mesial margins, lateral margins broadly convex, mesial margins weakly convex. Cornea reduced, faint. Maxilliped III carpal projection short. Dactylus of pereopod II with heel produced and rounded. Dactylus of pereopod III with heel low and rounded. Dactylus of pereopod IV sinuous from base to tip, with shallow indent. Telson of male spade-shaped, tapering distally, evenly calcified, with row of thin, short setae. Telson of female similar to male.

**DESCRIPTION:** Carapace (fig. 60A) wider than long. Anterior margin concave on either side of ocular sinus, becoming almost straight laterally, armed with three to five small teeth on either side, ventral row of long plumose setae submarginally. Rostrum present, low and rounded, reaching posterior margin of ocular plate. Ocular sinus posterolaterally angled and unarmed. Frontal region smooth; setal field broad posteriorly, narrowing anteriorly, short lateral elements present, anterior margin slightly concave. CG1 parallel to anterior margin of carapace, sinuous, slightly crenulate, lateral elements posteriorly displaced and united with lateral elements of CG4. Mesogastric region smooth, CG2 absent; CG3 present as two short lateral elements; CG4 present as two short curved lateral elements united with CG1 lateral elements, and four very short setose grooves submedially. Hepatic region smooth, with one short setose groove medially. Epibranchial region generally triangular, smooth, lateral margin lined with short thick setae. Metagastric region smooth; CG5 present as two short elements; CG6 slightly crenulate, separated into convex lateral elements and con-



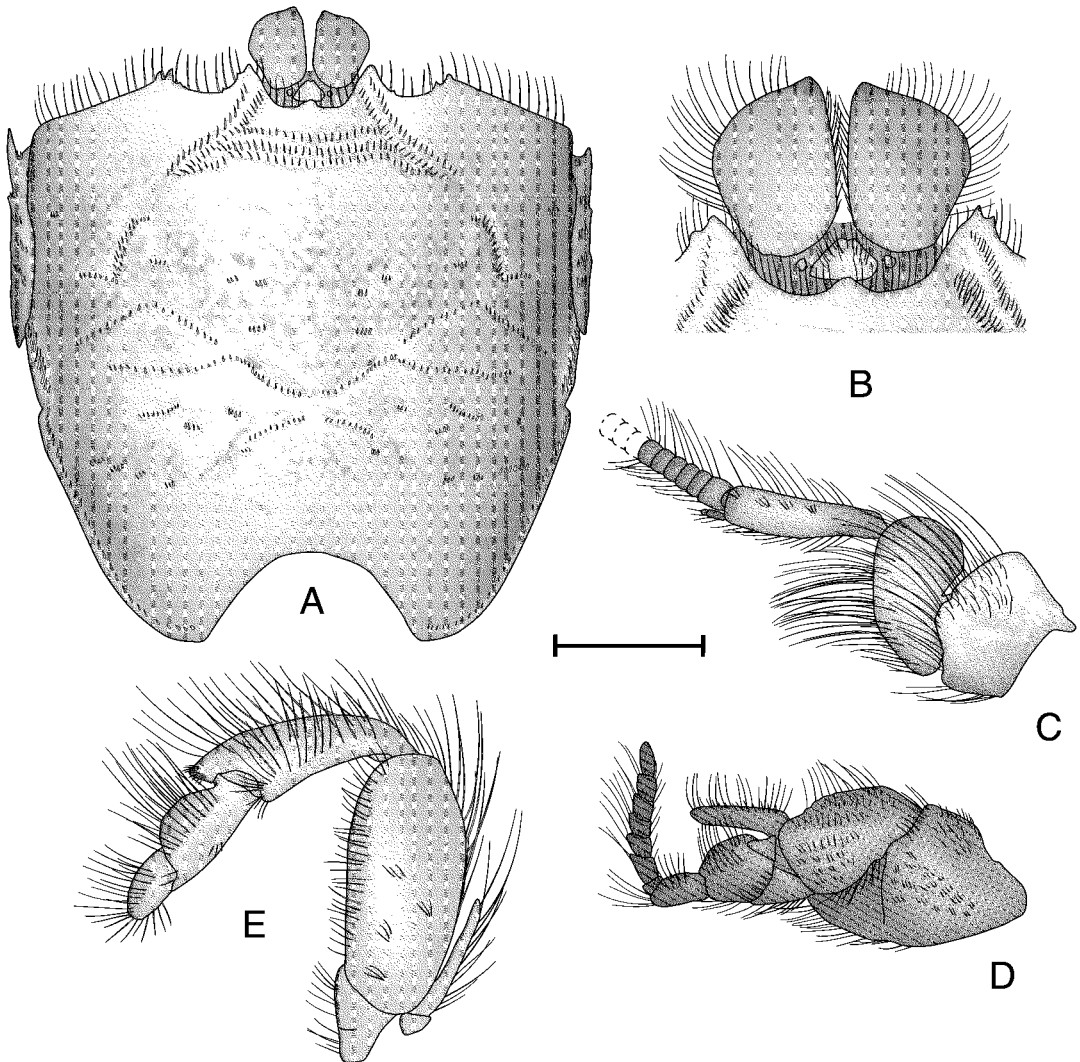


Fig. 60. *Paralbunea manihinei* Serène, 1977: A–D, ♂, 9.6 mm cl, BMNH 1973.19, holotype; E, ♂, 9.1 mm cl, MRAC 53.900, paratype. **A.** Carapace, branchiostegite, and ocular peduncles, dorsal view. **B.** Ocular peduncles, dorsal view. **C.** Left antennule, lateral view. **D.** Left antenna, lateral view. **E.** Left maxilliped III, lateral view. Scale = 1.6 mm (B), 2.2 mm (E), 3.0 mm (C, D), and 3.3 mm (A).

cave medial elements united with CG7; CG7 slightly concave and united with medial element of CG6. Cardiac region smooth with strong “pseudo-cardiac notch” laterally; CG8 present as two oblique medial elements; CG9 present as two tiny elements posterior to lateral margins of CG8; CG10 absent. CG11 absent. Branchial region with few short, transverse, setose grooves. Posterior margin deeply and evenly convex, with submarginal groove reaching to posterior margin

of posterior concavity. Branchiostegite with short anterolateral, 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. 60B) subtriangular, with shallow median indentation. Median peduncular segments reduced to minute calcified



discs lateral to ocular plate. Distal peduncular segments teardrop-shaped, with strongly convex lateral margins and slightly convex mesial margins, distolateral corners rounded, cornea present at distal tip, mesial margins separated along entire length, lateral and mesial margins with long simple setae, ventral surface medially concave, with proximal transverse submarginal ridge lined with long plumose setae.

Antennule (fig. 60C) segment III narrow proximally, expanding distally to two times proximal width; plumose setae on dorsal and ventral margins, short simple setae in few small patches on mediolateral surface, dorsal exopodal flagellum with 120–140 articles ( $n = 3$ ), long plumose setae on dorsal and ventral margins, ventral endopodal flagellum with two or three articles ( $n = 3$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, plumose setae on ventral margin and scattered on lateral surface. Segment I wider than long, unarmed, long plumose setae on rugose dorsal half of lateral surface and on dorsal and ventral margins.

Antenna (fig. 60D) with segment V approximately two times longer than wide, long plumose setae on dorsal and distoventral margins, few short setae on mediolateral surface, flagellum with seven or eight articles ( $n = 3$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV subcircular, long plumose setae on dorsal and ventral margins and on dorsolateral surface. Segment III with long plumose setae on ventral margin, short simple setae on dorsal margin. Segment II widening slightly distally, long plumose setae on margins and short plumose setae scattered on rugose lateral surface, antennal acicle long, thin, exceeding base of segment V by approximately one-fourth length of segment V, long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventromesially, long plumose setae on margins, short plumose setae on dorsolateral and mediolateral rugose surface; lateral surface unarmed, without dorsolateral lobe.

Mandible, maxillule, maxilla, maxilliped I, maxilliped II unknown.

Maxilliped III (fig. 60E) dactylus rounded at tip, long plumose setae on margins and

lateral surface. Propodus inflated dorsomedially, with longitudinal median row of long plumose setae on lateral surface, dorsal margin with long plumose setae, ventral margin with few short simple setae. Carpus weakly produced onto propodus and reaching to one-fifth length of propodus, lateral surface with scattered long plumose setae, tuft of short simple setae distodorsally and long plumose setae distoventrally; long plumose setae on dorsal margin. Merus unarmed, long plumose setae on dorsal margin, short plumose setae on ventral margin. Basis incompletely fused with ischium; crista dentata absent. Exopod two-segmented, proximal segment small, distal segment styloform, tapering, approximately one-half length of merus, plumose setae on margins; flagellum absent.

Pereopod I (fig. 61A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose and short simple setae, short simple setae on ventral margin. Propodal 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; dorsal and ventral margins with long plumose setae; patch of short plumose setae on lateral surface subdorsally. Carpus with dorsodistal angle smoothly rounded; dorsal and distal margins with short plumose setae; tuft of long plumose setae on ventral margin; mesial surface smooth, with subdorsal row of long plumose setae. Merus unarmed; dorsal margin with long plumose setae; lateral surface with dorsomedial decalcified region and scattered transverse rows of short plumose setae; mesial surface proximolateral third decalcified, with few short rows of long plumose setae scattered on surface. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 61B) dactylus smooth; base to heel slightly convex, heel with smoothly rounded low spur, heel to tip broadly indented and wide, tip subacute, tip to base broadly convex; lateral surface smooth, several widely spaced submarginal tufts of short setae dorsodistally; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with row of long plumose setae from junction with propodus

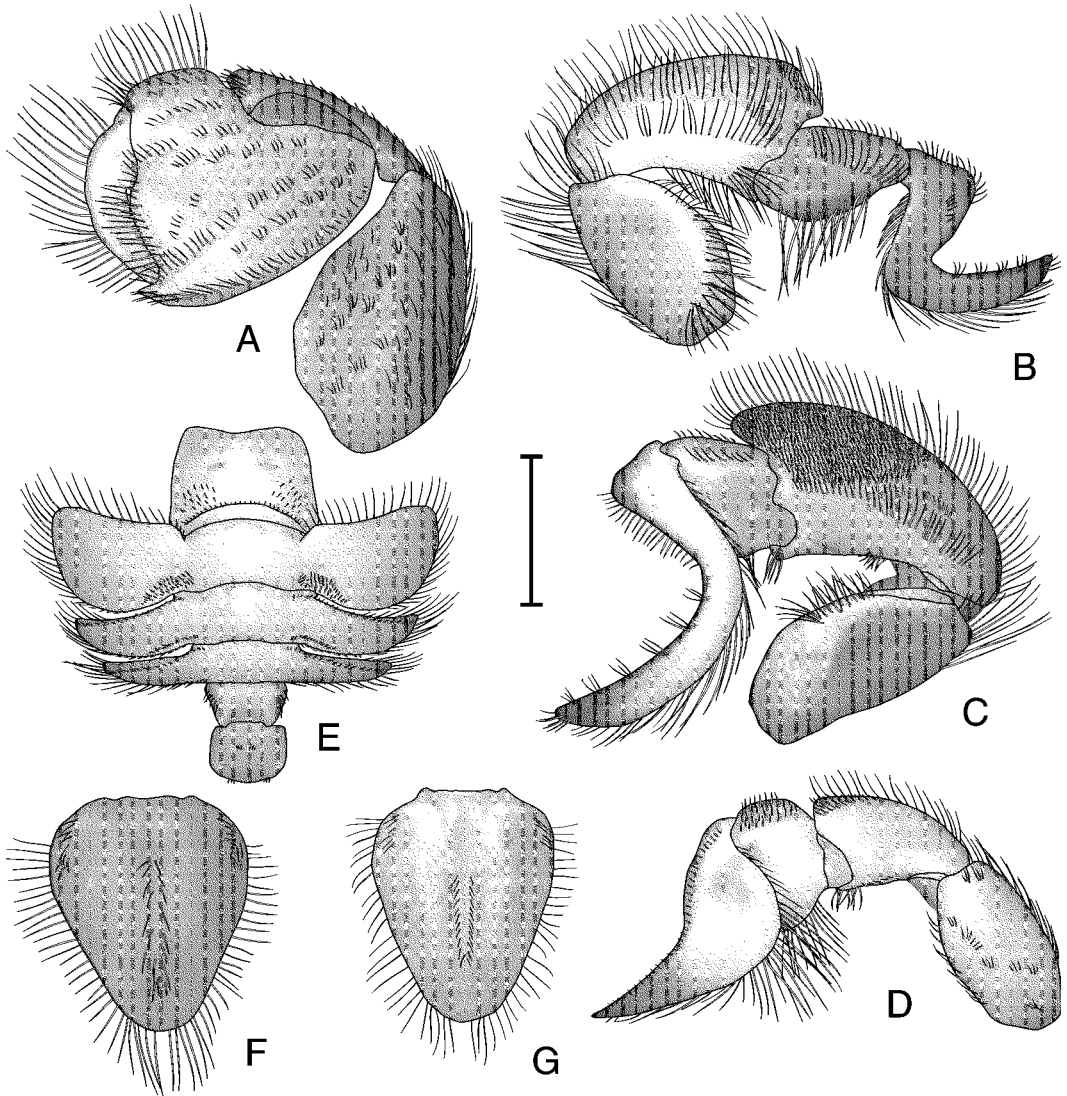


Fig. 61. *Paralbunea manihinei* Serène, 1977: A, G, ♀, 5.9 mm cl, RMNH 29067, paratype; B, D, F, ♂, 9.1 mm cl, MRAC 53.900, paratype; C, E, ♂, 9.6 mm cl, BMNH 1973.19, holotype. **A.** Left pereopod I, lateral vie. **B.** Right pereopod II, lateral view. **C.** Left pereopod III, lateral view. **D.** Left pereopod IV, lateral view. **E.** Abdominal somites I-VI, dorsal view. **F.** Telson of ♂, dorsal view. **G.** Telson of ♀, dorsal view. Scale = 1.6 mm (G), 2.2 mm (A, F), 3.3 mm (B-D), and 4.4 mm (E).

to median of heel. Propodal dorsal surface smooth, ventral margin proximally 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 as 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 produced one-third over propodus, gently rounded dorsally and angled distoventrally; lateral surface nearly smooth, with mat of short simple setae on distal tip and scattered long plumose setae on medial surface, submarginal elevated ridge ventrally, with long plumose setae, margins

with long plumose setae; mesial surface smooth, interrupted submarginal rows of long plumose setae dorsally and distally. Merus with medial decalcified area on lateral surface, long plumose setae on dorsal and ventral margins; mesial surface nearly smooth, with numerous long plumose setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 61C) dactylus base to heel slightly concave, heel low and rounded, heel to indent slightly concave, indent broadly concave, tip subacute, tip to base smoothly convex; lateral surface smooth, dorsodistal margin with tufts of short setae, ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, row of plumose setae from junction with propodus to heel. 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, with short plumose setae on margins; mesial surface with few long setae scattered on surface. Carpus produced dorsodistally, inflated, reaching one-third over length of propodus, broadly rounded, dorsolateral margin unarmed; lateral surface slightly rugose dorsodistally, with mat of short simple setae covering dorsodistal quarter of surface; with two long rows of short setae medially; mesial surface smooth, distal and oblique medial rows of long plumose setae. Merus smooth, inflated ventromedially, dorsal and ventral margins unarmed, dorsodistal and ventromedial margins with long plumose setae; lateral surface with large medially decalcified area; mesial surface smooth, with few scattered setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female with large gonopore on median mesial surface of coxa, surrounded with short plumose setae; male with small pore.

Pereopod IV (fig. 61D) dactylus with base to heel convex, heel low and gently sloping, heel to tip broadly concave, tip subacute, tip to base broadly convex; 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, se-

tose punctae ventral to decalcified window. Propodus expanded dorsally and ventrally, ventral expansion reaching ventral margin of dactylus, margins with long plumose setae, dorsal expansion with row of long plumose setae dorsally and mat of short setae ventrally; lateral and mesial surfaces smooth. Carpus not produced dorsodistally, small mat of short simple setae on dorsodistal margin; lateral and mesial surfaces smooth, with medial decalcified area, dorsal margin with short simple and long plumose setae, ventral and distal margins with long plumose setae. Merus with few scattered short transverse rows of setae on lateral surface, dorsal and ventromedial margins with long plumose setae; proximal third of mesial surface with large decalcified window. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 61E) with somite I wider than long, widest posteriorly; dorsal surface with anterior margin concave, posterior margin slightly concave, with submarginal elevated row of setae, few scattered setose punctae proximolaterally, small transverse, decalcified, submedial windows present. Somite II dorsal surface with submarginal transverse ridge anteriorly, patch of setae at posterolateral angle, extending onto pleura posteromesially; pleura expanded and directed anterolaterally, anterolateral margin rounded, posterolateral margin rounded, anterior and lateral margins with long plumose setae, posterior margin with short setae. Somite III similar to somite II, but narrower, shorter; pleura thinner and shorter than on somite II, directed posterolaterally, with setae as in somite II, anterolateral angle subacute, dorsal surface obliquely flattened anterolaterally, with submarginal row of short simple setae, submarginal ventral row of short simple setae present. Somite IV similar to somite III, but thinner and shorter; pleura thinner and shorter than on somite III, directed laterally, dorsal surface obliquely flattened anterolaterally, with submarginal row of short simple setae, margins with long plumose setae. Somite V narrower but longer than somite IV, lateral margins with plumose setae; pleura absent. Somite VI wider and longer than somite V, two short rows of short simple

setae present medially and on posterior margin; pleura absent.

Females with uniramous, paired pleopods on somites II–V, males without pleopods.

Telson of male (fig. 61F) spade-shaped, tapering distally, evenly calcified; tip rounded; groove extending along median half, lined with short simple setae; few short simple setae in proximolateral corners; margins lined with long plumose setae. Telson of female (fig. 61G) subequal to male in shape, but less tapered distally, evenly calcified; median groove shorter than in male and lined with shorter setae; few short setae in proximolateral corners; margins with long plumose setae.

**DISTRIBUTION:** Known only from the Seychelles Islands, in up to 29.3 m depth.

**MAXIMUM SIZE:** Males: 9.6 mm cl; females: 5.9 mm cl.

**TYPE SPECIMENS:** BMNH 1973.19 (holotype), RMNH 29067 (paratype), MRAC 53.900 (paratype).

**TYPE LOCALITY:** Grande Anse, Mahé, Seychelles, 18.3 m.

**REMARKS:** Discovery of this species prompted Serène (1977) to establish the genus *Paralbunea* for those species of *Albunea* sensu lato without spines on the dorsodistal margin of the carpus of pereopod I and on the lateral surface of antennal segment I. As discussed above under *Paralbunea*, although this taxon was thought to date from the work of Serène (1979), the specific name *manihinei* was actually made available from Serène's (1977) publication, as characters were given to distinguish the genus *Paralbunea* and its sole species *manihinei* from species of *Albunea*. This taxon is the sister species to *P. dayriti* and *P. paradoxa*.

Calado (1995: pl. 81, fig. a) incorrectly depicted this species as having fused anterior and posterior elements of CG1.

*Paralbunea paradoxa* (Gordon, 1938)

Figures 62, 63

*Albunea paradoxa* Gordon, 1938: 187, 193–196, pl. 29, figs. 3g, 5a–c\*. – Serène and Umali, 1965: 106–108, pl. 1, fig. 5, pl. 2, fig. 5, pl. 3, fig. 7, pl. 4, fig. 5, pl. 5, figs. 3, 3a, text-figs. 1e, 2e, 4d, 7c, 10b. – Coêlho and Calado, 1987: 43, table 1.

*Paralbunea paradoxa*: Serène, 1979: 95–98, fig.

1. – Calado, 1995: 257–260, pl. 78, fig. 5, pl. 82, fig. a, pl. 83, figs. a, b, pl. 84, figs. a–d\*. – Boyko and Harvey, 1999: 400 (list), 402 (key).

**MATERIAL EXAMINED:** **Singapore:** Coll. unknown: 1 ♀, 8.0 mm cl, holotype (BMNH 1937.6.1.7).

**DIAGNOSIS:** Carapace wider than long, covered with lightly setose grooves. Anterior margin unarmed on either side of ocular sinus. Setal field with narrow lateral elements and slightly concave anterior margin. CG1 with separate posterior lateral elements; CG4 present as two short oblique lateral elements united with CG1 lateral elements anteriorly and CG6 posteriorly, and numerous very short setose punctae scattered obliquely between lateral elements, but not in medial third; CG6 and CG7 fused; CG8 absent; CG11 absent. Rostrum low and subacute. Ocular plate subtriangular. Distal peduncular segments dorsoventrally flattened and ovate, separated along mesial margins, lateral margins broadly convex, mesial margins weakly convex. Cornea absent. Maxilliped III carpal projection short. Dactylus of pereopod II with heel produced and subacute. Dactylus of pereopod III with heel thin, produced, and acute. Dactylus of pereopod IV sinuous, with acute heel and deep indent. Telson of female ovate, evenly calcified.

**DESCRIPTION:** Carapace (fig. 62A) wider than long. Anterior margin concave on either side of ocular sinus, becoming convex laterally, unarmed, ventral row of long plumose setae submarginally. Rostrum present, not reaching posterior margin of ocular plate. Ocular sinus smoothly concave and unarmed. Frontal region smooth; setal field broad posteriorly, narrowing anteriorly, lateral elements absent, anterior margin slightly concave. CG1 parallel to anterior margin of carapace, sinuous, slightly crenulate, lateral elements posteriorly displaced and united with CG4. Mesogastric region smooth, CG2 absent; CG3 absent; CG4 present as two short oblique lateral elements united with CG1 lateral elements anteriorly and CG6 posteriorly, and numerous very short setose punctae scattered obliquely between lateral elements, but not in medial third. Hepatic region smooth. Epibranchial region generally triangular, smooth, posterolateral margin lined with



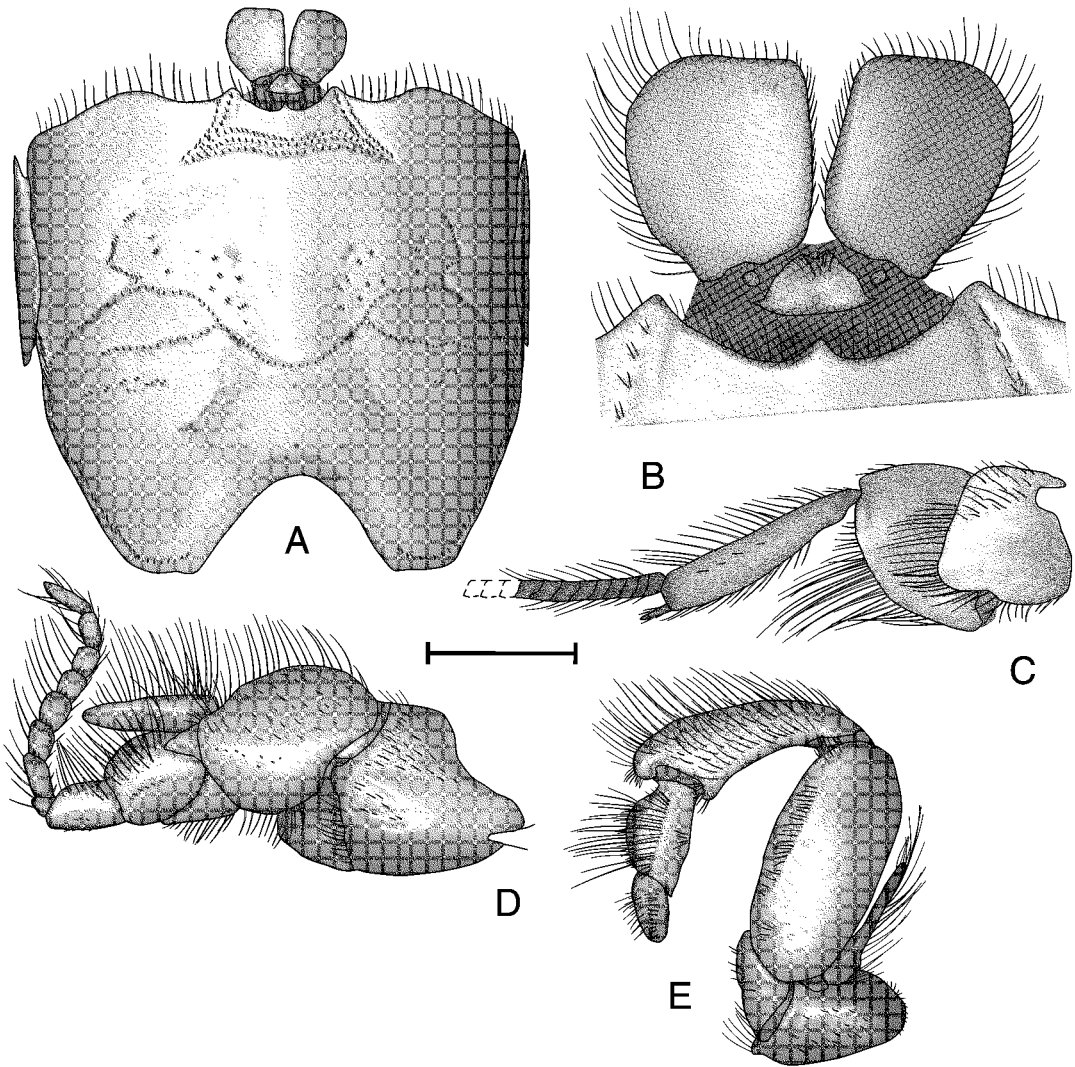


Fig. 62. *Paralbunea paradoxa* (Gordon, 1938): A–E, ♀, 8.0 mm cl, BMNH 1937.6.1.7, holotype. **A.** Carapace, branchiostegite, and ocular peduncles, dorsal view. **B.** Ocular peduncles, dorsal view. **C.** Left antennule, lateral view. **D.** Left antenna, lateral view. **E.** Left maxilliped III, lateral view. Scale = 1.1 mm (B), 2.2 mm (C–E), and 3.3 mm (A).

short thick setae. Metagastric region smooth; CG5 absent; CG6 slightly crenulate, entire, united with CG4 lateral elements anteriorly and CG7 posteriorly; CG7 slightly oblique and united with CG6. Cardiac region smooth; CG8–11 absent. Branchial region with few anterior setose punctae. Posterior margin deeply and evenly convex, with submarginal groove reaching to posterior margin of posterior concavity. Branchiostegite with short anterolateral submarginal spine, ante-

rior 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. 62B) subtriangular, with shallow median indentation. Median peduncular segments reduced to minute calcified discs anterolateral to ocular plate. Distal peduncular segments subquadrate, with convex

lateral margins and straight mesial margins, distolateral corners rounded, distomesial corners angled, cornea absent, mesial margins approximated along entire length, lateral and mesial margins with long simple setae, ventral surface medially concave, with proximal transverse submarginal ridge lined with long plumose setae.

Antennule (fig. 62C) segment III narrow proximally, expanding distally to two times proximal width; plumose setae on dorsal and ventral margins, dorsal exopodal flagellum with 136 articles ( $n = 1$ ), long plumose setae on dorsal and ventral margins, ventral endopodal flagellum with two articles ( $n = 1$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, plumose setae on ventral margin and scattered on lateral surface. Segment I wider than long, unarmed, lateral surface with long plumose setae on dorsal quarter and on dorsal and ventral margins.

Antenna (fig. 62D) with segment V approximately one-half times longer than wide, long plumose setae on dorsal margin and few short setae on mediolateral surface and ventral margin, flagellum with eight articles ( $n = 1$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV subcircular, long plumose setae on dorsal margin, few short simple setae on lateral surface. Segment III with long plumose setae on ventral margin, short simple setae on dorsal margin. Segment II short, widening slightly distally, long plumose setae on margins and short plumose setae scattered on lateral surface, antennal acicle long, thin, exceeding base of segment V by approximately one-half length of segment V, long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventromesially, long plumose setae on margins, short plumose setae on distal half of lateral surface; lateral surface unarmed, without dorsolateral lobe.

Mandible, maxillule, maxilla, maxilliped I, maxilliped II unknown.

Maxilliped III (fig. 62E) dactylus rounded at tip, long plumose setae on margins and lateral surface. Propodus inflated dorsomedially, with longitudinal median row of long plumose setae on lateral surface, dorsal margin with long plumose setae, ventral margin with few short simple setae. Carpus weakly

produced onto propodus and reaching to one-tenth length of propodus, lateral surface with scattered long plumose setae, tufts of long plumose setae distodorsally and distoventrally; long plumose setae on dorsal margin. Merus unarmed, short plumose setae on ventral margin. Basis incompletely fused with ischium; crista dentata absent. Exopod two-segmented, proximal segment small, distal segment styliform, tapering, approximately one-half length of merus, plumose setae on margins; flagellum absent.

Pereopod I (fig. 63A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose and short simple setae, short simple setae on ventral margin. Propodal 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; dorsal and ventral margins with long plumose setae; patch of short plumose setae on lateral surface subdorsally. Carpus with dorsodistal angle smoothly rounded, dorsal and distal margins with short plumose setae; oblique short setose ridge on mediolateral surface; tuft of long plumose setae on ventral margin; mesial surface smooth, with subdorsal row of long plumose setae. Merus unarmed; lateral surface with dorsomedial decalcified region and scattered transverse rows of short plumose setae; proximolateral third of mesial surface decalcified, with few short rows of long plumose setae scattered on surface. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 63B) dactylus smooth; base to heel slightly convex, heel with smoothly rounded low spur, heel to tip broadly indented and wide, tip subacute, tip to base broadly convex; lateral surface smooth, several widely spaced submarginal tufts of short setae dorsodistally; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with row of long plumose setae from junction with propodus to median of heel. Propodal dorsal surface smooth, ventral margin proximally 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 as narrow,

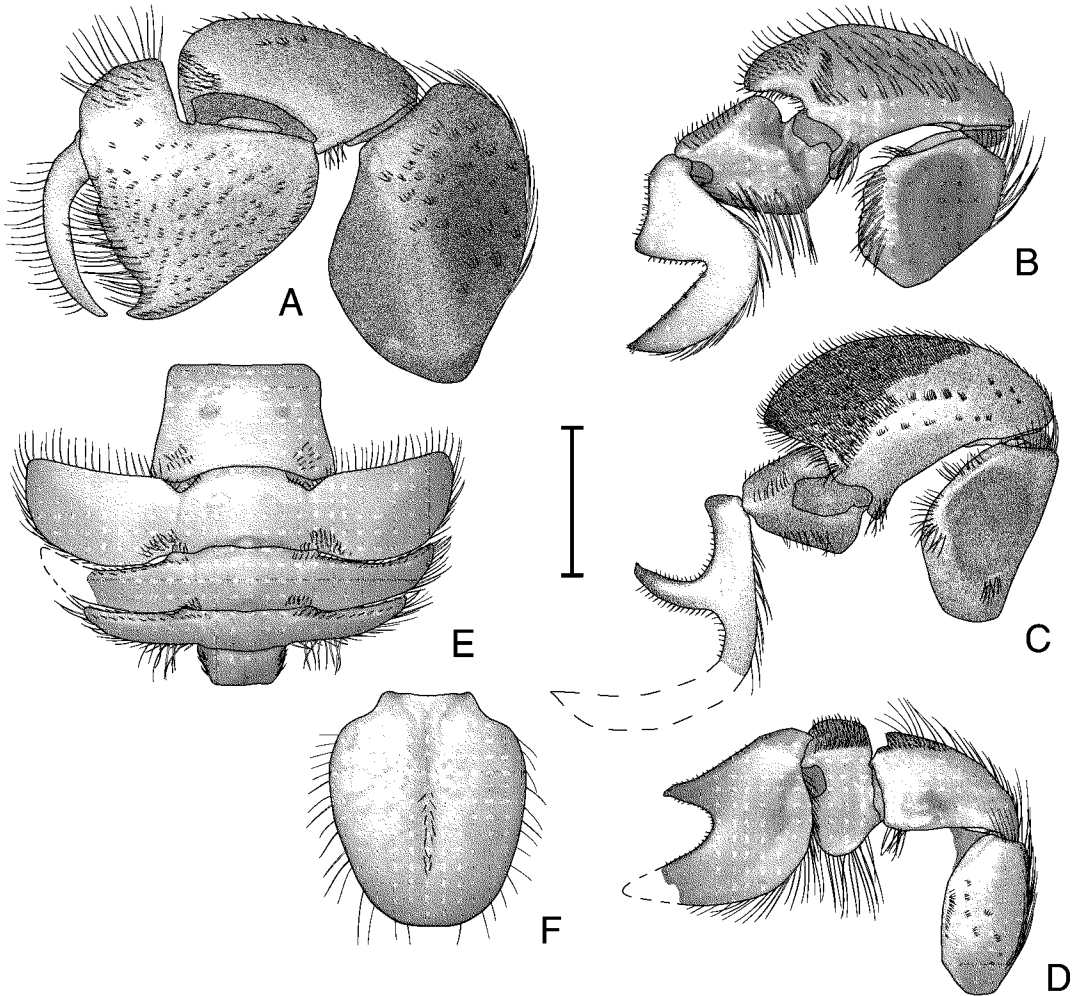


Fig. 63. *Paralbunea paradoxa* (Gordon, 1938): A–F, ♀, 8.0 mm cl, BMNH 1937.6.1.7, holotype. **A.** Left pereopod I, lateral view. **B.** Left pereopod II, lateral view. **C.** Left pereopod III, lateral view. **D.** Left pereopod IV, lateral view. **E.** Abdominal somites I–VI, dorsal view; **F.** telson of ♀, dorsal view. Scale = 2.2 mm (F) and 3.3 mm (A–E).

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 produced one-third over propodus, gently rounded dorsally with rounded distoventral angle; lateral surface nearly smooth, with mat of short simple setae on distal tip and scattered long plumose setae on medial surface, submarginal elevated ridge ventrally with long plumose setae, margins with long plumose setae; mesial surface

smooth, interrupted submarginal rows of long plumose setae dorsally, ventrally, and distally. Merus with medial decalcified area on lateral surface, long plumose setae on dorso-distal and ventromedial margins; mesial surface nearly smooth, with numerous long plumose setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 63C) dactylus base to heel broadly concave, heel acute, thin, curved, and produced, heel to indent convex, indent broadly concave, tip subacute, tip to base smoothly convex; lateral surface



smooth, dorsodistal margin with tufts of short setae, ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, row of plumose setae from junction with propodus to heel. 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, with short plumose setae on margins; mesial surface with few long setae scattered on surface. Carpus produced dorsodistally, inflated, reaching one-half across propodus, broadly rounded, dorsolateral margin unarmed; lateral surface slightly rugose dorsodistally, with mat of short simple setae covering distal half of surface; with two long rows of short setae medially; mesial surface smooth, distal and oblique medial rows of long plumose setae. Merus smooth, inflated medially, dorsal and ventral margins unarmed, dorsodistal and ventromesial margins with long plumose setae; lateral surface with large medially decalcified area and few long plumose setae scattered around window; mesial surface smooth with few scattered setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female with large gonopore on median mesial surface of coxa, surrounded with short plumose setae; male unknown.

Pereopod IV (fig. 63D) dactylus with base to heel slightly concave, heel acute and produced, heel to tip broadly concave, tip subacute, tip to base broadly convex; 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 reaching ventral margin of dactylus, margins with long plumose setae, dorsal expansion with row of long plumose setae dorsally and mat of short setae ventrally; lateral and mesial surfaces smooth. Carpus not produced dorsodistally, small mat of setae along distal half of dorsal margin; lateral and mesial surfaces smooth, with medial decalcified area, dorsal margin with short simple and long plumose setae, ventral

margin with short plumose setae. Merus lateral surface with few scattered short, transverse rows of setae, dorsal margin with long plumose setae; proximal third of mesial surface with large decalcified window. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 63E) with somite I wider than long, widest posteriorly; dorsal surface with anterior margin straight, posterior margin slightly concave, without submarginal elevated row of setae, few scattered setose punctae proximolaterally, small transverse, decalcified, submedial windows present. Somite II dorsal surface with submarginal transverse ridge anteriorly, patch of setae at posterolateral angle, extending onto pleura posteromesially; pleura expanded and directed anterolaterally, anterolateral margin rounded, posterolateral margin rounded, anterior and lateral margins with long plumose setae, posterior margin with short setae. Somite III similar to somite II, but narrower, shorter, small patch 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 subacute, dorsal surface obliquely flattened anterolaterally with submarginal row of short simple setae. Somite IV similar to somite III, but thinner and shorter; pleura thinner and shorter than on somite III, directed slightly anterolaterally, dorsal surface obliquely flattened anterolaterally with submarginal row of short simple setae, margins with long plumose setae. Somite V narrower but longer than somite IV, lateral margins with plumose setae; pleura absent. Somite VI (not illustrated) wider and longer than somite V; pleura absent.

Females with uniramous, paired pleopods on somites II–V, males unknown.

Telson of male unknown. Telson of female (fig. 63F) ovate, evenly calcified, median groove reaching from subproximal margin to subdistal margin; short simple setae in medial third of groove; margins with long simple setae.

DISTRIBUTION: Known from Singapore and the Philippines; depth range unknown.

MAXIMUM SIZE: Males: unknown; females: 8.0 mm cl.



TYPE SPECIMEN: BMNH 1937.6.1.7 (holotype).

TYPE LOCALITY: Singapore.

REMARKS: This taxon, with its apomorphic acute heels on the dactyli of pereopods III, is one of the most derived in the genus and is the sister species of *P. dayriti*. Although Serène and Umali (1965) reported numerous specimens from the Philippines, this species is apparently otherwise quite rare, as many of the other nearby localities have been historically well sampled.

*Paralbunea dayriti*  
(Serène and Umali, 1965)

Figures 64, 65

*Albunea dayriti* Serène and Umali, 1965: 103–106, pl. 1, fig. 4, pl. 2, fig. 4, pl. 3, figs. 6, 6a, pl. 4, fig. 4, pl. 5, figs. 2, 2a, text-figs. 1d, 2b, 4c, 7b, 10a, 12a\*. – Haig, 1974: 447 (list). – Yang and Sun, 1979: 203. – Coêlho and Calado, 1987: 43, table 1. – Wang, 1989: 39 (list). – Sun and Wang, 1996: 31–33, fig. 4.

*Paralbunea dayriti*: Serène, 1979: 97–98, fig. 2\*. – Calado, 1995: 243–245, pl. 78, fig. 1, pl. 79, figs. a–h. – Boyko and Harvey, 1999: 400 (list), 402 (key).

?*Albunea symnista* [sic]: Nakazawa, 1927: 1051, fig. 2025. – Nakazawa et al., 1949: 741, fig. 2144. – Nakazawa et al., 1951: 741, fig. 2144 (not *Albunea symmysta* (Linnaeus, 1758)).

?*Albunea symmysta*: Miyake, 1961: 12. – Miyake et al., 1962: 125 (part) (not *Albunea symmysta* (Linnaeus, 1758)).

?*Albunea symnista* [sic]: Miyake, 1965: fig. 1111 (not *Albunea symmysta* (Linnaeus, 1758)).

MATERIAL EXAMINED: **Japan**: Off Banda, Tateyama, Chiba Prefecture, 37 m, June 1, 1992, coll. M. Osawa: 2 ♂, 6.9–8.2 mm cl (AMNH 18099); Nagasaki, coll. unknown: 1 ♀, 4.6 mm cl (USNM 260865); Fukase, Amakusa, Kumamoto Prefecture, Kyushu Island, Oct. 1936, coll. H. Oshima: 1 ♀, 11.0 mm cl (ZLKU 3308); Misaki, Miura Peninsula, coll. unknown: 1 ♂, fragments only (ZLKU 4174); Mikawa-Isshiki, Aichi Prefecture, Honshu, Sept. 1, 1941, coll. T. Sakai: 1 ♂, 9.4 mm cl (RMNH D48604).

**Philippines**: Busuanga, Palawan, May 10–30, 1963, coll. J. E. Norton and F. E. Dayrit: 1 ♂, 7.7 mm cl, paratype (NMCR 1151a); Batangas Bay, Batangas Province,

20 fms (= 36.6 m), April 21–23, 1961, coll. F. G. Dayrit and J. E. Norton: 1 ♂, 7.4 mm cl, paratype (NMCR 938).

**Vietnam**: Sta. 289, off Nhatrang, 18 m, March 25, 1960, coll. R/V “Gallardo”: 1 anterior half, 4.5 mm cl (ZMUC 2720).

**Australia: Western Australia**: Sta. 02B02BT, northwest shelf, 19°56.8'S, 117°53.4'E, 42 m, April 22, 1983, coll. CSIRO: 1 ♂, 12.1 mm cl, 3 ♀, 6.9–8.1 mm cl (QM W22295); Sta. 02B03BT, northwest shelf, 19°55.5'S, 117°55.5'E, 42 m, April 22, 1983, coll. CSIRO: 1 ♂, 5.4 mm cl, 2 ♀, 6.7–7.1 mm cl (QM W22294); Sta. 03D02BT, northwest shelf, 19°58.5'S, 117°49.0'E, 42 m, June 26, 1983, coll. CSIRO: 1 ♂, 5.2 mm cl, 1 ♀, 11.3 mm cl (QM W22297); Sta. 03D09BT, northwest shelf, 19°58.6'S, 117°49.4'E, 43 m, June 26, 1983, coll. CSIRO: 1 ♀, 9.6 mm cl (QM W22293); Sta. 05D01BT, northwest shelf, 19°29.5'S, 118°52.2'E, 37 m, Oct. 24, 1983, coll. CSIRO: 1 ♂, 7.1 mm cl (QM W22303); Sta. 05D06BT, northwest shelf, 19°29.7'S, 118°52.1'E, 38–39 m, Oct. 25, 1983, coll. CSIRO: 1 ♂, 14.8 mm cl (QM W22298);

**Queensland**: Cape Bowling Green, 16 fms (= 29.3 m), Nov. 23, 1962, coll. W. Goode on “Dorothea”: 1 ♀, 11.2 mm cl (WAM 24511); Middle Banks, Moreton Bay, 20 ft (= 6.1 m), Dec. 1973, coll. Zoology Department, University of Queensland: 1 ♀, 3.8 mm cl (QM W8304); Middle Banks, Moreton Bay, Aug. 1975, coll. Zoology Department, University of Queensland: 1 ♀, 4.7 mm cl (QM W8311); Keppel Bay, 23°23'S, 150°52'E, Sept. 1970, coll. S. W. Gunn: 1 ♀, 10.0 mm cl (MOV J44731); **New South Wales**: Vicinity of Coffs Harbor, 30°18'S, 153°08'E, Jan. 1956, coll. W. Hargraves: 1 ♂, 13.2 mm cl (AM P12959).

**New Caledonia**: Sta. 440bis, 18°05'S, 162°55'W, Atoll de Huon, 39 m, Feb. 25, 1985, coll. ORSTOM (B. Richer de Forges): 1 ♂, 5.5 mm cl (MNHN-Hi 251); Sta. 447, 18°20'S, 163°06'E, Atoll de Surprise, 36 m, Feb. 28, 1985, coll. ORSTOM (B. Richer de Forges): 1 ♂, 6.4 mm cl (MNHN-Hi 253); Sta. DW1390, 18°27.5'S, 163°08.7'E, 38 m, May 11, 1999, coll. “Alis” Campagne SURPRISES (B. Richer de Forges): 1 ♂, 5.9 mm cl, 1 ♀, 6.0 mm cl (MNHN-Hi 254); Sta.

DW1129, 19°29.2'S, 163°48.8'E, lagoon nord, 40 m, Oct. 26, 1989, coll. ORSTOM (B. Richer de Forges): 1 ♂, 5.5 mm cl, 1 ♀, 7.1 mm cl, 1 oviger, 7.9 mm cl (MNHN-Hi 252).

**Marshall Islands:** Lagoon, Enewetak Island, Eniwetok Atoll, 150 ft (= 45.5 m), Aug. 18, 1966, coll. unknown: 1 unsexable fragment (LACM-AHF JWK-212); Enewetak Atoll, Lagoon off Ruuit, 1.2 mi offshore, 30 ft (= 9.1 m), Sept. 18, 1980, coll. D. M. Devaney and P. Colin: 1 ♀, 6.4 mm cl (BPBM S10011).

**Tahiti:** Sta. TI-III, Matavai Bay, 17°30'S, 149°30'W, 8–10 fms (= 14.6–18.3 m), Sept. 31, 1967, coll. National Geographic Society–Smithsonian-Bishop Museum Marquesas Expedition: 1 ♂, 5.6 mm cl (USNM 304316).

**DIAGNOSIS:** Carapace wider than long, covered with lightly setose grooves. Anterior margin with four to eight very small spines on either side of ocular sinus. Setal field with narrow lateral elements and slightly concave anterior margin. CG1 with separate posterior lateral elements; CG4 fragmented into four short oblique medial elements and two longer lateral elements; CG6 and CG7 fused; CG8 incomplete; CG11 absent. Rostrum present, not reaching posterior margin of ocular plate. Ocular plate broadly triangular. Distal peduncular segments dorsoventrally flattened and subtriangular in shape, tapering at tip, approximated along proximal half of mesial margins, lateral margins broadly convex, mesial margins convex. Cornea reduced, faint. Maxilliped III carpal projection short. Dactylus of pereopod II with heel produced and subacute. Dactylus of pereopod III with heel produced and rounded. Dactylus of pereopod IV sinuous from base to tip, with deep indent. Telson of male pear-shaped, tip truncate, evenly calcified, with row of thin, short setae. Telson of female similar to male.

**DESCRIPTION:** Carapace (fig. 64A) wider than long. Anterior margin concave on either side of ocular sinus, becoming convex laterally, four to eight small spines on and just lateral to concave region, ventral row of long plumose setae submarginally. Rostrum present, overreaching posterior margin of ocular plate. Ocular sinus smoothly concave and unarmed. Frontal region smooth; setal field broad posteriorly, narrowing anteriorly, with

narrow lateral elements and slightly concave anterior margin. CG1 parallel to anterior margin of carapace, sinuous, slightly crenulate, medial and curved lateral elements widely separate. Mesogastric region smooth, CG2 absent; CG3 present as two short oblique lateral elements; CG4 fragmented into four short oblique medial elements and two longer lateral elements. Hepatic region smooth, with short setose groove at median of lateral margin. Epibranchial region roughly triangular, smooth, posterolateral margin lined with short thick setae. Metagastric region smooth; CG5 present as two short oblique medial elements (rarely absent); CG6 slightly crenulate, either separated into strongly concave median element, united with CG7, and two long convex lateral elements or median and lateral elements united and separate from CG7; CG7 straight and either united with median element of CG6 or separate. Cardiac region smooth; CG8 present as four short, widely separated elements; CG9 present as two to five short oblique elements; CG10 present as two to five short oblique elements; CG11 absent. Branchial region with few anterior short rows of setae and posterior small setose punctae. Posterior margin deeply and evenly convex, with submarginal groove reaching to posterior margin of posterior concavity. Branchiostegite with strong anterolateral 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. 64B) triangular, with shallow median indentation. Median peduncular segments apparently lacking (or extremely weakly calcified). Distal peduncular segments as laterally inflated triangles, with strongly convex lateral margins and weakly convex mesial margins, cornea faintly visible at distal tip (pigment often visible as oblique band across dorsal surface in preserved specimens), mesial margins approximated along proximal half of length, lateral and distomesial margins with long simple setae, ventral surface with proximal transverse submarginal ridge lined with long plumose setae.

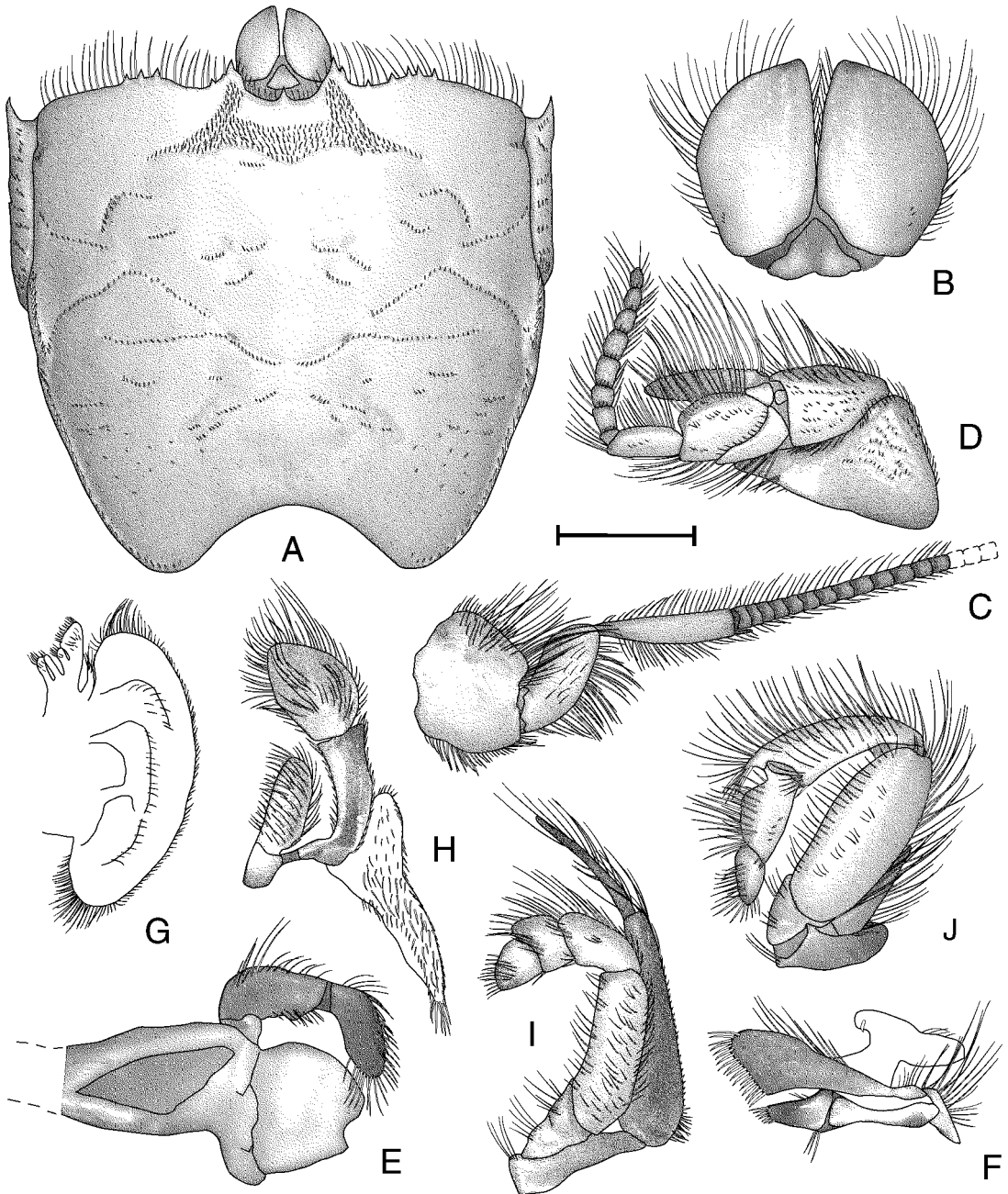


Fig. 64. *Paralbunea dayriti* (Serène and Umali, 1965): A, ♀, 10.0 mm cl, MOV J44731; B–J, ♂, 5.6 mm cl, USNM 304316. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Right antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Left maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 0.8 mm (E), 1.1 mm (F, I), 1.6 mm (B), 1.7 mm (D, H, J), 2.2 mm (C, G), and 3.3 mm (A).



Antennule (fig. 64C) segment III narrow proximally, expanding distally to two times proximal width; plumose setae on dorsal and ventral margins, dorsal exopodal flagellum with 112–145 articles ( $n = 6$ ), long plumose setae on dorsal and ventral margins, ventral endopodal flagellum with two articles ( $n = 6$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, plumose setae on ventral margin and scattered on ventral half of surface. Segment I wider than long, unarmed, lateral surface with long plumose setae on dorsal quarter and on dorsal and ventral margins.

Antenna (fig. 64D) with segment V approximately two times longer than wide, long plumose setae on dorsal margin and few short setae on mediolateral surface, flagellum with eight articles ( $n = 6$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV expanded distally, long plumose setae on dorsal and ventral margins, short simple setae on lateral surface. Segment III with long plumose setae on ventral margin, short simple setae on dorsal margin. Segment II short, widening distally, long plumose setae on margins and short plumose setae on lateral surface, antennal acicle long, thin, exceeding base of segment V by approximately one-half length of segment V, long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventromesially, long plumose setae on margins and dorsolateral surface; lateral surface unarmed, without dorsolateral lobe.

Mandible (fig. 64E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 64F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin plumose setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under, notched proximally; internal lobe reduced with one thick seta at distolateral margin.

Maxilla (fig. 64G) exopod evenly rounded, with plumose setae along distal margin. Scaphognathite rounded on posterior lobe, with plumose setae.

Maxilliped I (fig. 64H) epipod with short plumose setae on margins and covering lateral surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, with plumose setae; distal segment spatulate, approximately one-half longer than wide, broadest medially, margins and lateral surface with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on surface, thick simple setae on mesial margin.

Maxilliped II (fig. 64I) dactylus evenly rounded, length equal to width, with thick simple setae distally and thin simple setae on distolateral surface. Propodus two times wider than long, with plumose setae on dorsal margin and long simple setae on distal margin. Carpus not strongly produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal and distal margins and in small patch on lateral surface. Merus approximately three times longer than wide, margins parallel, with long plumose setae on dorsal margin and scattered on surface, simple setae on ventral margin. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-half longer than merus, flagellum with one elongate article.

Maxilliped III (fig. 64J) dactylus rounded at tip, long plumose setae on margins and lateral surface. Propodus with longitudinal median row of long plumose setae on lateral surface, dorsal margin with long plumose setae, ventral margin with few short simple setae. Carpus weakly produced onto propodus and reaching one-third length of propodus, lateral surface with rows of long plumose setae medially, ventromedially, and tuft of long plumose setae distoventrally; long plumose setae on dorsal margin. Merus unarmed, distally inflated, long plumose setae on margins and longitudinal row of short plumose setae on lateral surface. Basis incompletely fused with ischium; crista dentata absent. Exopod two-segmented, proximal segment small, distal segment styliform, tapering, approximately one-half length of merus, plumose setae on margins; flagellum absent.

Pereopod I (fig. 65A) dactylus curved and



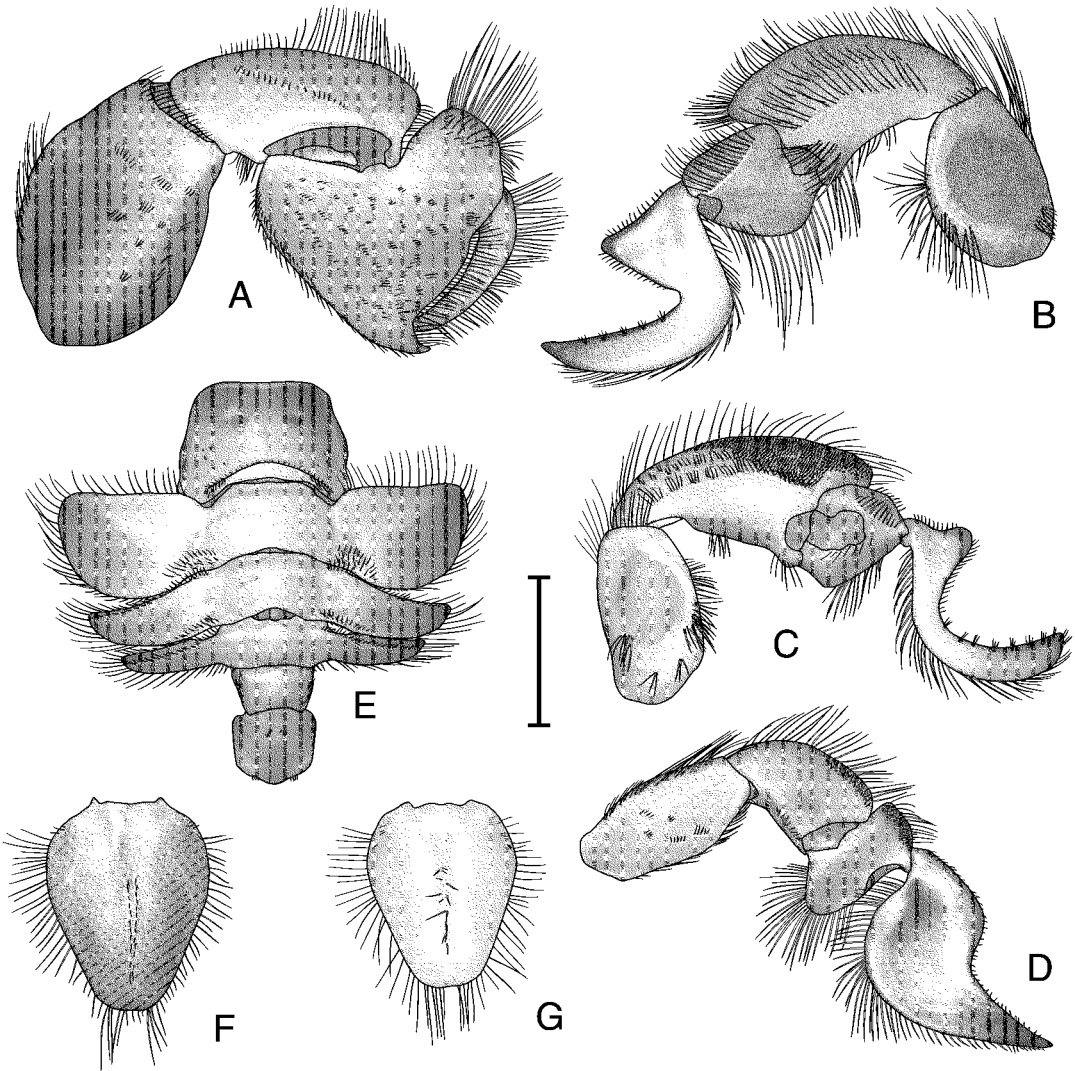


Fig. 65. *Paralbunea dayriti* (Serène and Umali, 1965): A, B, D–F, ♂, 5.6 mm cl, USNM 304316; C, ♀, 8.1 mm cl, QM W22295; G, ♀, 10.0 mm cl, MOV J44731. A. Right pereopod I, lateral view. B. Left pereopod II, lateral view. C. Right pereopod III, lateral view. D. Right pereopod IV, lateral view. E. Abdominal somites I–VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 1.6 mm (F), 2.2 mm (A–E), and 3.3 mm (G).

tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose and short simple setae, short simple setae on ventral margin. Propodus 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; dorsal and ventral margins with long plumose setae; patch of short plumose setae

on lateral surface subdorsally. Carpus with dorsodistal angle smoothly rounded; dorsal and distal margins with long plumose setae; oblique setose ridge in median of lateral surface; tuft of long plumose setae on ventral margin; mesial surface smooth. Merus unarmed; lateral surface with dorsomedial decalcified region and scattered transverse rows of short plumose setae on ventral half, dorsomedial margin with long plumose setae;

proximal third of mesial surface decalcified, with few short transverse rows of setae scattered on surface. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 65B) dactylus smooth; base to heel slightly convex, heel with smoothly rounded low spur, heel to tip broadly indented and wide, tip subacute, tip to base broadly convex; lateral surface smooth, several widely spaced submarginal tufts of short setae dorsodistally; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with row of long plumose setae from junction with propodus to median of heel. Propodal dorsal surface smooth, ventral margin proximally 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 as 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 produced one-fourth over propodus, gently rounded dorsally, with rounded distoventral angle; lateral surface nearly smooth, with irregular, short interrupted row of rugae medially and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae, margins with long plumose setae; mesial surface smooth, interrupted submarginal rows of long plumose setae dorsally, ventrally, and distally. Merus with medial decalcified area on lateral surface, long plumose setae on dorsodistal and ventromedial margins; mesial surface nearly smooth, with many short rows of long plumose setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 65C) dactylus base to heel concave, heel rounded and produced, heel to indent concave, indent broadly concave, tip subacute, tip to base smoothly convex; lateral surface smooth, dorsodistal margin with tufts of short setae, ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, row of plumose setae from junction with propodus to heel. 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, with short plumose setae on margins; mesial surface with few long setae scattered on surface. Carpus produced dorsodistally, inflated, reaching one-half across propodus, broadly rounded, dorsolateral margin unarmed; lateral surface slightly rugose dorsodistally, with mat of short simple setae covering distal half of surface; with two long rows of setae medially; mesial surface smooth, distal and oblique rows of long plumose setae. Merus smooth, dorsal and ventral margins unarmed, dorsodistal and ventromesial margins with long plumose setae; lateral surface with large medially decalcified area and few long plumose setae; mesial surface smooth, with few scattered setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female with large gonopore on median mesial surface of coxa, surrounded with short plumose setae; male with smaller but distinct pore.

Pereopod IV (fig. 65D) dactylus with base to heel straight, heel low, heel to tip convex to straight, tip acute, tip to base straight distally, becoming broadly convex 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 not reaching ventral margin of dactylus, margins with long plumose setae, dorsal expansion with row of long plumose setae dorsally and mat of short setae ventrally; lateral and mesial surfaces smooth. Carpus not produced dorsodistally, small mat of setae along distal half of dorsal margin; lateral and mesial surfaces smooth, with medial decalcified area, dorsal margin with short simple and long plumose setae, ventral margin with short plumose setae. Merus lateral surface with few scattered short transverse rows of setae, dorsal and ventral margins with long plumose setae; proximal fourth of mesial surface with large decalcified window. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 65E) with somite I wider than long, widest posteriorly; dorsal surface with anterior margin straight, posterior margin slightly concave, with submarginal elevated and curved row of short setae, few scattered setose punctae proximolaterally, small transverse decalcified submedial windows present. Somite II dorsal surface with submarginal transverse ridge anteriorly, patch of setae at posterolateral angle, extending onto pleura posteromesially; pleura expanded and directed laterally, anterolateral margin rounded, posterolateral margin rounded, anterior and lateral margins with long plumose setae, posterior margin with short setae. Somite III similar to somite II, but narrower, shorter, small patch of short thick setae on posterolateral angle; pleura thinner and shorter than on somite II, directed posterolaterally, with setae as in somite II, anterolateral angle acute, dorsal surface obliquely flattened anterolaterally, with submarginal row of short simple setae. Somite IV similar to somite III, but thinner and shorter; pleura thinner and shorter than on somite III, directed slightly posterolaterally, dorsal surface obliquely flattened anterolaterally, with submarginal row of short simple setae, margins with long plumose setae. Somite V narrower but longer than somite IV, lateral margins with plumose setae; pleura absent. Somite VI wider and longer than somite V, dorsal surface with two short oblique rows of setae laterad of midline anteriorly, posterior margins with few long plumose setae; pleura absent.

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

Telson of male (fig. 65F) pear-shaped, truncate distally, evenly calcified, margins with long plumose setae; median longitudinal groove long, extending three-fourths of surface and with short simple setae along distal two-thirds of groove; few short simple setae at proximolateral corners. Telson of female (fig. 65G) similar to male, with longer setae along distal two-thirds of median groove.

**DISTRIBUTION:** Known from southern Japan southward to Western Australia, and eastward to New Caledonia, the Marshall Islands, and Tahiti, in 6.1–45.5 m depth.

**MAXIMUM SIZE:** Males: 14.8 mm cl; females: 11.3 mm cl.

**TYPE SPECIMENS:** NMCR 938 (holotype),

NMCR 938 (7 paratypes), NMCR 500 (1 paratype), NMCR 913 (4 paratypes), NMCR 1151 (5 paratypes), NMCR 1260 (1 paratype), NMCR 1264 (3 paratypes).

**TYPE LOCALITY:** Batangas Bay, Batangas Province, Philippines.

**REMARKS:** Several records of albuneids in the literature are suspected to be this species, although they have not been confirmed by examination of specimens. The combination of ocular peduncle shape, dactyli shapes, carapace grooves, and especially the lack of strong anterior carapace margin spines suggest that the animal illustrated by Nakazawa (1927) and Nakazawa et al. (1949, 1951) was *P. dayriti*. The only known albuneid species from Amakusa, Japan, is *P. dayriti*, and the records of Miyake (1961) and Miyake et al. (1962) from this locality are suspected to be this taxon. Although the material discussed in the text by Miyake (1965) is *Albunea occultus*, n. sp., the illustration he used (fig. 1111) was copied from Nakazawa (1927) and so probably represents *P. dayriti*.

Previously known only from the Philippines, Western Australia, and China (Serène and Umali, 1965; Haig, 1974; Yang and Sun, 1979; Boyko and Harvey, 1999), this is the most widely distributed and common species of *Paralbunea*. *P. dayriti* is the sister species of *P. paradoxa*, and is one of the most derived species in the genus.

Calado (1995) saw no material of this species and redescribed it based on the text and illustrations of Serène and Umali (1965).

#### ZYGOPA HOLTHUIS, 1961

*Zygopa* Holthuis, 1961: 21. – Serène and Umali, 1965: 108–109. – Rodriguez, 1980: 238. – Coêlho and Calado, 1987: 41. – Manning, 1988: 626–627 (list). – Calado, 1995: 277.

**DIAGNOSIS:** Carapace wider than long, front narrow; anterior margin unarmed; hepatic anterolateral spine present; branchios-tegite unarmed. Rostrum absent. Ocular peduncles cylindrical, reduced, fused, corneas reduced. Antennular segment I unarmed; dorsal flagellum with 17–22 articles, ventral flagellum with one to three articles. Antennal segment I unarmed; acicle long; flagellum with one article. Maxilliped II exopod with

flagellum. Maxilliped III carpal projection short; merus unarmed; crista dentata absent; exopod lamelliform, without flagellum. Pereopod I dactylus with dorsal margin crenulate; distodorsal carpal spine absent; cutting edge bluntly toothed. Pereopods II–IV dactyli with rounded heels; dorsal margins of carpi smooth. Males without small coxal pore on pereopod III. Abdomen without pleura on somite V. Telson of male elongate, triangular, fully calcified. Telsons strongly sexually dimorphic.

**DISTRIBUTION:** Known from the Caribbean Sea, Gulf of Mexico, the Philippines, and New Caledonia.

**TYPE SPECIES:** *Zygopa michaelis* Holthuis, 1961, by monotypy.

**INCLUDED SPECIES:** *Z. michaelis* Holthuis, 1961; *Z. nortoni* Serène and Umali, 1965.

**REMARKS:** This genus is closer to *Albunea* than to *Lepidopa*, and it is clearly a member of the Albuneinae, despite the presence of the *Lepidopa*-like anterolateral carapace spine. In fact, the genus *Paralbunea* is closer to *Lepidopa* than *Zygopa* is, and that genus has always been closely allied to *Albunea* (e.g., Serène, 1979). The sister taxon to *Zygopa* is *Squillalbunea*, n. gen., which shares many characters with this genus, including a narrow anterior carapace margin with low rounded granules instead of acute spines, a rugose dorsal margin on the dactylus of pereopod I, and elongate, fully calcified male and female telsons. The two species of *Zygopa* are from opposite sides of the world, but are nevertheless extremely difficult to separate even when examined side by side. This suggests that little divergence has taken place within this genus, despite the duration and distance for which the species have been separated.

#### KEY TO SPECIES

- 1 Distal tips of ocular peduncles pointed . . . . . *Z. michaelis*  
 – Distal tips of ocular peduncles rounded . . . . . *Z. nortoni*

#### *Zygopa michaelis* Holthuis, 1961

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*Zygopa michaelis* Holthuis, 1961: 22–26, figs. 1, 2\*. – Gore and Becker, 1977: 219–220, pl. 1.\*

– Rodriguez, 1980: 238–239 (list). – Reames et al., 1982: 171–172, fig. 1.\* – Werding, 1982: 391–392. – Coelho and Calado, 1987: table 1. – Manning, 1988: 627 (list). – Williams et al., 1989: 35. – Calado et al., 1990: 750, 753, fig. 4. – Calado, 1990: 255–258, fig. 1–3. – Calado, 1995: 278–281, pl. 88, figs. a–c, pl. 89, figs. a–g\*. – Fransen et al., 1997: 79 (list). – Calado, 1998: 408.

**MATERIAL EXAMINED: USA: Florida:** Cruise 142, Sta. 7, 25°50.2'N, 80°04.9'W, off Miami Beach, 30 fms (= 54.9 m), Aug. 3, 1976, coll. D. Harpur on R/V "Bowers": 1 ♂, 10.8 mm cl, 1 ♀, 9.0 mm cl (USNM 168526), 1 ♂, 11.5 mm cl, 1 ♀, 9.9 mm cl (HBOM 089:02968); from [?base of] rocky reef, off Palm Beach, 30–40 fms (= 54.9–73.2 m), April 20, 1950, coll. Thompson and McGinty: 1 ♀, 7.2 mm cl (USNM 122644); west of Charlotte Harbor, Gulf of Mexico, 26°24'59"N, 82°58'00"W, 38 m, Oct. 23, 1977, coll. T. S. Hopkins: 1 ♀, 7.2 mm cl (USNM 184958).

**Netherlands Antilles:** Sint Michiels Baai, Curaçao, 4 m, Jan. 18, 1957, coll. L. B. Holthuis: 1 ♀, 9.2 mm cl, lectotype (RMNH 14501), 4 ♂, 6.9–10.7 mm cl, 10 ♀, 4.1–9.5 mm cl, paralectotypes (RMNH 14502), 1 ♂, 10.8 mm cl, 2 ♀, 6.7–9.7 mm cl, paralectotypes (USNM 104657), 1 ♂, 8.4 mm cl, 1 ♀, 9.8 mm cl, paralectotypes (AMNH 18082).

**Suriname:** Sta. 42, 06°46.5'N, 56°30'W, 40 m, May 6, 1966, coll. "Snellius": 1 ♀, 5.3 mm cl (RMNH 24106); Sta. 44, near Coppename and Corabijn, 06°33.6'N, 56°31.6'W, 38 m, May 6, 1966, coll. "Snellius": 1 ♂, 11 mm cl (RMNH 24105); Sta. 58, northeast of Van Monding, Van de Coratijn, 07°25.4'N, 56°54.4'W, 66–69 m, May 11, 1966, coll. "Snellius": 1 oviger, 7.8 mm cl (RMNH 24107).

**DIAGNOSIS:** Distal tips of ocular peduncles subacute; segments IV and V and flagellum of antenna slender; distal margin of male telson narrowly rounded; otherwise as for genus.

**DESCRIPTION:** Carapace (fig. 66A) wider than long; broadest medially. Anterior margin concave on either side of ocular sinus, concave lateral to outer-ocular spines and unarmed. Rostrum absent. Ocular sinus smoothly concave, unarmed. Anterolateral



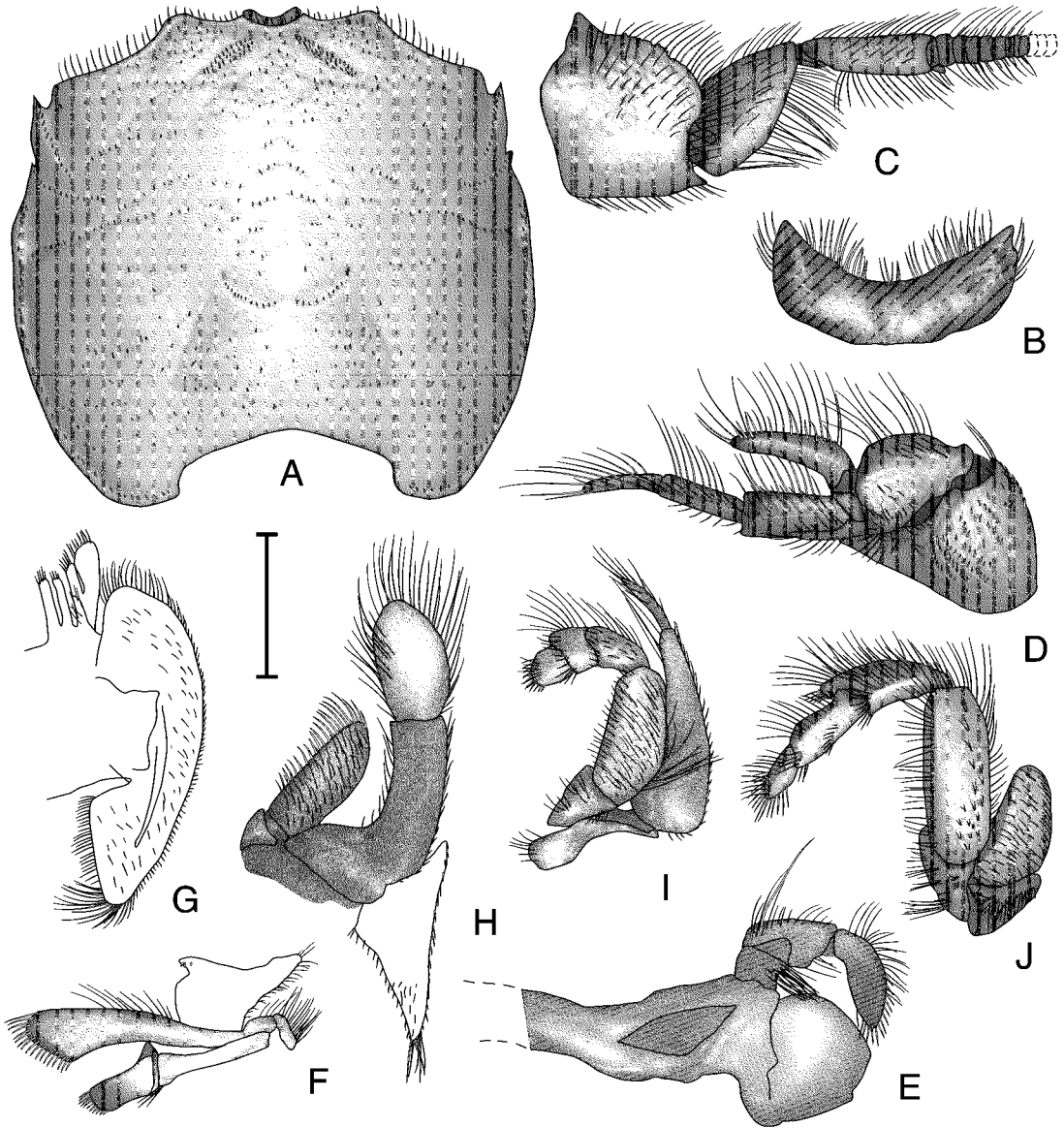


Fig. 66. *Zygopa michaelis* Holthuis, 1961: A, ♀, 9.2 mm cl, RMNH 14501, lectotype; B–J, ♂, 10.7 mm cl, RMNH 14502, paralectotype. A. Carapace and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Right antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Left maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 0.8 mm (B), 1.6 mm (E, F), 2.2 mm (C, D, H, I), 3.0 mm (G, J), and 3.3 mm (A).

lobes low, smoothly rounded. Frontal region rugose; setal field present as two narrow oblique bands behind ocular sinus; posterior lateral elements absent. CG1 parallel to anterior margin of carapace, faint laterally, indistinct medially, sinuous; lateral elements

not posteriorly displaced. Mesogastric region medially rugose; CG2 present as two minute, oblique, medial elements; CG3 present as two short, oblique, medial elements and two long, interrupted lateral elements; medial elements slightly anteriorly displaced; CG4

with two short medial elements between longer supralateral elements of CG4. Hepatic region smooth, with distolateral short spine and oblique setose groove at median of lateral margin. Epibranchial region generally triangular, smooth; bounded anteriorly by CG3 and posteriorly by CG4; tiny spine at distolateral margin. Metagastric region smooth, with scattered, very short, setose lines; CG5 absent. CG6 present as two concave medial elements; lateral elements absent. CG7 absent. Cardiac region smooth, with scattered, very short, setose lines; CG8 absent. CG9 absent. CG10 present as two short elements marking posterolateral boundary of cardiac region. CG11 absent. Post-CG11 element absent. Branchial region with numerous, very short patches of setae. Posterior margin deeply and evenly convex, with submarginal groove reaching lateral margin of posterior concavity. Branchiostegite unarmed; anterior region with scattered short, transverse lines ventral to *linea anomurica*; with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate, median and distal peduncular segments (fig. 66B) fused to form unified distolaterally projecting ocular unit; hint of seam between median and distal peduncular segments visible slightly laterad of median. Ocular unit subcylindrical medially, tapering to subacute dorsodistal tips; distal margin concave, proximal margin convex; corneal region proximal to distolateral angles notched and depressed with corneal pigment not visible; long plumose setae on ventrolateral angle, distal mesial margin, and on ventral surface.

Antennule (fig. 66C) with segment III narrow proximally, expanding distally to slightly wider proximal margin; with plumose setae on dorsal and ventral margins and scattered on lateral surface; dorsal exopodal flagellum with 17–22 articles ( $n = 6$ ), long plumose and short simple setae on dorsal and ventral margins; ventral endopodal flagellum with one or two articles ( $n = 6$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins and

scattered on lateral surface. Segment I width subequal to length, dorsal margin with medial row of short spinules; dorsal third of lateral surface rugose, with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 66D) with segment V approximately three times longer than wide, with long plumose setae on dorsal and ventral margins and in row on lateral surface; flagellum with one article ( $n = 6$ ), long plumose setae on dorsal and ventral, margins and lateral surface. Segment IV expanded distally, with long plumose setae on dorsal, ventral and distal margins, and row of setae on mediolateral surface. Segment III with long plumose setae on dorsal and ventral margins. Segment II rounded dorsally, widening distally, rugose, with plumose setae on margins and scattered on dorsal and ventral thirds of lateral surface; antennal acicle long, curved, tapering distally, and slightly exceeding distal margin of segment IV, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventrolaterally, lateral surface rugose, with long plumose setae on margins and on rugae; lateral surface unarmed; segment with ventromesial antennal gland pore.

Mandible (fig. 66E) incisor process with two teeth; cutting edge with two teeth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment and on distal margin of terminal segment.

Maxillule (fig. 66F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin simple setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under; internal lobe reduced, with three thick setae at distolateral margin.

Maxilla (fig. 66G) exopod evenly rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae. Lateral surface covered in short plumose setae.

Maxilliped I (fig. 66H) epipod with plumose setae on margins, distolateral and mesial surfaces. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment nar-

row, margins parallel, with plumose setae; distal segment spatulate, longer than wide, broadest medially, margins and mesiodorsal surface with long plumose setae. Endopod flattened and elongate, reaching two-thirds to distal end of proximal exopodal segment; plumose setae on margins and lateral surface.

Maxilliped II (fig. 66I) dactylus evenly rounded, length and width subequal, with thick simple setae distally and on distolateral surface. Propodus 1.5 times wider than long, slightly produced at dorsodistal angle, with plumose setae on dorsal and distal margins. Carpus not produced dorsodistally, approximately two times longer than wide; long simple setae on dorsal and distal margins and scattered on lateral surface. Merus approximately two times longer than wide, margins parallel but inflated medially; with long simple and plumose setae on margins and scattered on lateral surface. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-third longer than merus, flagellum with one elongate segment, approximately as long as carpus.

Maxilliped III (fig. 66J) dactylus elongate with rounded tip; long plumose setae on margins and lateral surface. Propodus dorsodistally inflated, with longitudinal median row of plumose setae on lateral surface; dorsal and distal margins with plumose setae, short transverse row of plumose setae on ventromedial margin. Carpus produced onto propodus approximately one-fourth length of propodus; lateral surface with two rows of plumose setae on surface; long plumose setae on dorsal margin and on dorsodistal and ventrodorsal angles. Merus inflated, unarmed, with plumose setae on margins and scattered on dorsal half of lateral surface. Basis-ischium incompletely fused, with crista dentata of 15–20 small subquadrate teeth. Exopod two-segmented: proximal segment small; distal segment oblong, laterally and dorsally inflated, distally rounded, approximately 70% length of merus; with plumose setae covering lateral surface; without flagellum.

Pereopod I (fig. 67A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose setae and low teeth on proximal two-thirds; ventral margin with short simple setae. Propodal lateral surface with numerous short, transverse

rows of setose rugae; dorsal margin with low, rounded teeth; ventral margin distally produced into rounded spine; cutting edge with seven to nine low rounded teeth, lined with long plumose setae; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with numerous low rugose teeth on dorsodistal angle; dorsal margin with short transverse grooves behind spine; dorsal and distal margins with long plumose setae; lateral surface with small distal, rugose area, with few transverse setose ridges on distal half of surface; mesial surface smooth, with medial transverse interrupted row of 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 scattered setae; proximal third decalcified. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 67B) dactylus smooth; base to heel convex, heel low and rounded, heel to tip with broad, rounded indent, tip subacute, tip to base broadly convex; lateral surface smooth, with two tufts of long setae in generally 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 simple setae, with patch of long plumose setae at base. Propodal dorsal surface smooth, with ventral margin inflated and rounded; oblique rows of long plumose setae on distal margin and in median of lateral surface; distal and ventral margins with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with 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 strongly produced, inflated and rounded dorsodistally, dorsal margin smooth; lateral surface smooth, produced area smooth, with dense mat of short simple setae, irregular, interrupted row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; dorsal and ventral margins with long plumose setae; mesial surface smooth, with row of long plumose setae ventrally and subdorsally. Merus



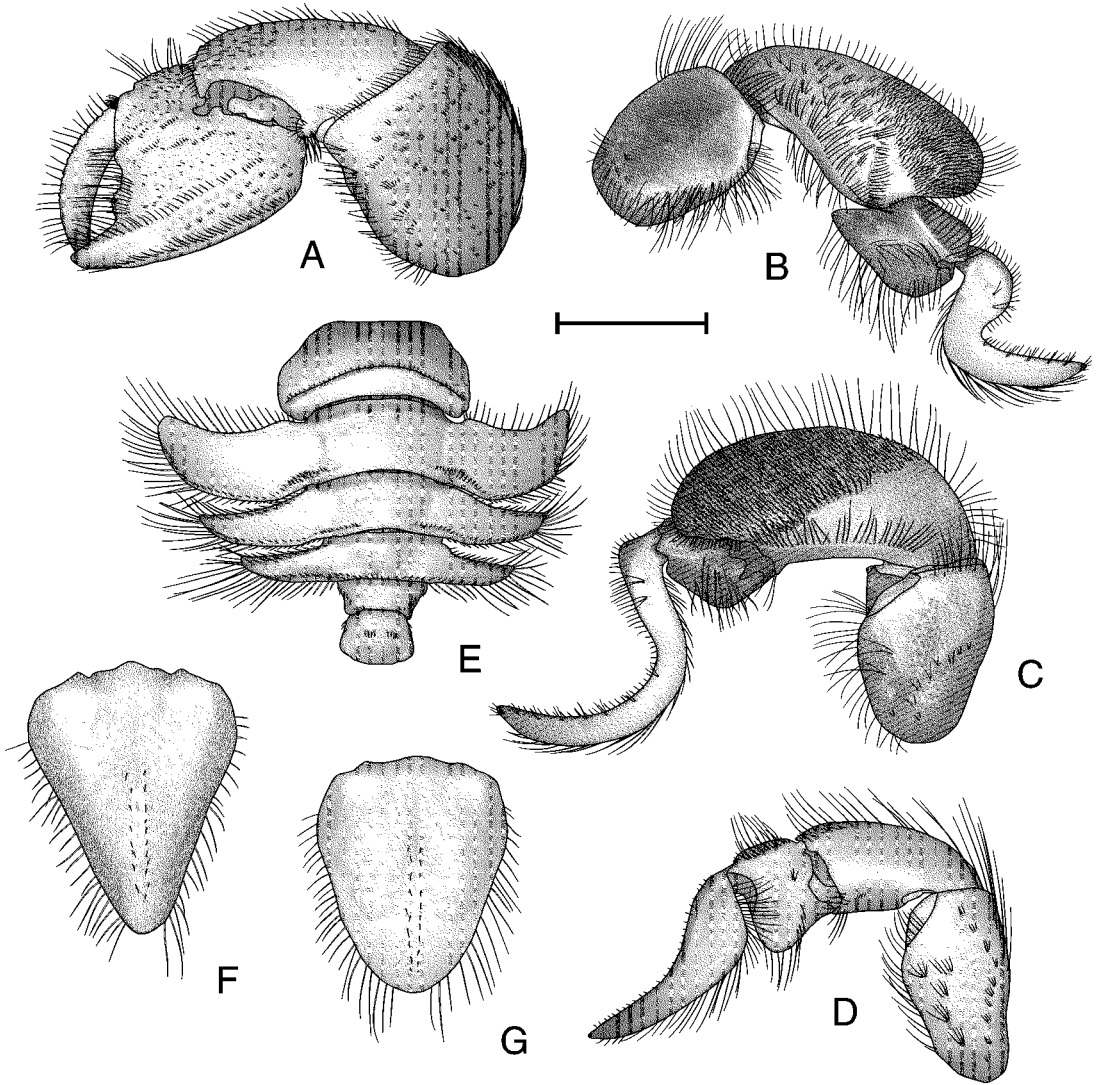


Fig. 67. *Zygopa michaelis* Holthuis, 1961: A–F, ♂, 10.7 mm cl, RMNH 14502, paralectotype; G, ♀, 9.1 mm cl, RMNH 14502, paralectotype. A. Left pereopod I, lateral view. B. Right pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I–VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 2.2 mm (F, G), 3.3 mm (C, D), and 4.4 mm (A, B, E).

with faint large median slightly decalcified window covering nearly all of lateral surface, distodorsal and ventral margins with long plumose setae; mesial surface nearly smooth, with two long interrupted rows of setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 67C) dactylus with base to heel concave, heel low and rounded, heel

to tip with broadly concave indent, tip subacute, tip to base smoothly convex; lateral surface smooth, with two small tufts of short setae in generally straight line across medioproximal surface, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface smooth, with plumose setae proximally at junction with pro-



podus. Propodus not inflated dorsoventrally; lateral surface smooth, with long plumose setae in oblique row, simple setae on dorsal margin, plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened, with setose mat; mesial surface smooth. Carpus produced dorsodistally, inflated dorsally and laterally, exceeding proximal margin of propodus by three-fourths length of propodus; tip rounded, dorsal margin unarmed; lateral surface slightly rugose dorsodistally, with dense mat of short setae and interrupted row of setae ventrally; mesial surface smooth, with long plumose setae on distal margin and in oblique row on surface. Merus smooth, fully calcified; dorsal and ventral margins unarmed, long plumose setae on dorsodistal and ventral margins and scattered in transverse medial row on lateral surface; mesial surface smooth, with few scattered setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female with large gonopore on anterior mesial margin of coxa, without setae; male without pore.

Pereopod IV (fig. 67D) dactylus with base to tip convex proximally, with shallow indistinct indent, almost straight from indent to tip, tip subacute, tip to base convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge with row of short setae; with setose punctations ventral to decalcified window. Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, ventral margin with long plumose setae; dorsal expansion with row of long plumose setae dorsally, oblique area with mat of short simple setae; lateral surface smooth, mesial surface smooth, with distoventral area of few patches of long plumose setae. Carpus slightly produced dorsodistally; ventral 90% of lateral surface, mesial surface smooth with rows of long plumose setae on distal margin, dorsodistal 10% of lateral surface with mat of short setae; dorsal margin with short simple and long plumose setae; distoventral margin with short simple setae; mesial surface fully calcified. Merus with scattered short transverse rows of setae on lateral surface, dor-

sodistal and ventral margins with long plumose setae; mesial surface fully calcified. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 67E) somite I wider than long, widest posteriorly; dorsal surface with anterior margin straight; posterior margin curved with elevated submarginal row of short setae; small transverse decalcified windows laterad of segment median. Somite II dorsal surface with irregular submarginal transverse ridge anteriorly; with small transverse decalcified windows laterad of segment median just anterior to submarginal ridge; pleura expanded and directed anterolaterally; anterolateral margins angled, anterior and lateral margins with long plumose setae, posterolateral angle rounded, posterior margin with short setae; submarginal row of short setae running from just posterior to anterolateral angle of pleura to posterior junction with somite, posteromesial angle of somite with mat of short simple setae. Somite III similar to somite II, but narrower, shorter, anterior submarginal windows present, posterior submarginal row of setae extending from junction with pleura across lateral thirds of somite; pleura thinner and shorter than on somite II, directed laterally, with setae as in somite II; anterolateral angle subacute; dorsal surface obliquely flattened anterolaterally, with submarginal row of short setae. Somite IV similar to somite III, but thinner and shorter, posterior submarginal row of setae uninterrupted across somite; pleura thinner and shorter than on somite III, directed laterally; dorsal surface obliquely flattened anterolaterally; margins with long plumose setae. Somite V subequal to somite IV in width; lateral margins with short plumose setae; pleura absent. Somite VI slightly broader than somite V, widening distally; dorsal surface with short transverse rows of setae laterad of midline; pleura absent.

Females with uniramous, paired pleopods on somites II–V; males without pleopods.

Telson of male (fig. 67F) broadly triangular, longer than wide, proximolateral margins convex, distolateral margins concave, with broadly rounded tip; entire surface thickly calcified, inflated dorsally; median longitudinal groove extending one-half length, row of short simple setae of either

side of median groove; margins with long simple setae. Telson of female (fig. 67G) flattened, ovate, margins all convex, entire surface evenly calcified with rounded tip; median groove identical to male, margins with long simple setae.

**DISTRIBUTION:** Known from both coasts of Florida, USA, to Brazil, in 4.0–73.2 m depth.

**MAXIMUM SIZE:** Males: 11.5 mm cl; females: 9.9 mm cl.

**TYPE SPECIMENS:** RMNH 14501 (lectotype by designation of Fransen et al., 1997), RMNH 14502 (14 paralectotypes), USNM 104657 (3 paralectotypes), AMNH 18082 (2 paralectotypes).

**TYPE LOCALITY:** Sint Michiels Baai (= Saint Michiels Bay), south coast of Curaçao, Netherlands Antilles, 4 m.

**REMARKS:** Fransen et al. (1997) stated that RMNH 14501 was the “holotype”; however, because Holthuis (1961) did not select a holotype, the statement of Fransen et al. (1997) constituted a lectotype designation under the then-applicable third edition of the ICZN code (ICZN, 1985).

The color of this species was reported as chalky white without iridescence (both live and preserved specimens) (Holthuis, 1961). *Zygopa michaelis* is morphologically very close to *Z. nortoni*, but they can be separated by a few constant characters, such as the distal margin of the ocular peduncles (pointed in *Z. michaelis*, rounded in *Z. nortoni*), the relative proportions of segments IV and V, as well as the single flagellar segment, of the antenna (compare figs. 66D and 68D), and the shapes of both male and female telsons (compare figs. 67F, G and 69F, G).

*Zygopa nortoni* Serène and Umali, 1965

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*Zygopa nortoni* Serène and Umali, 1965: 110–112, pl. 1, fig. 6, pl. 2, fig. 6, pl. 3, figs. 8, 8a, pl. 4, fig. 6, pl. 5, figs. 4, 4a, text-figs. 1f, 2f, 4e, f, 11, 12b\*. – Coêlho and Calado, 1987: table 1. – Calado, 1995: 284–285, pl. 90, figs. a–h. – Boyko and Harvey, 1999: 400 (list), 402 (key).

**MATERIAL EXAMINED:** **Philippines:** Cape Calavite, Mindoro Island, March 1960, coll. unknown, 1 ♀, 11.2 mm cl, paratype (NMCR 1273).

**New Caledonia:** Sta. 746, 21°18.5'S, 165°53.5'E, lagoon est, 60 m, Jan. 6, 1987, coll. ORSTOM (B. Richer de Forges): 1 ♀, 6.5 mm cl (MNHN-Hi 260).

**DIAGNOSIS:** Distal tips of ocular peduncles rounded; segments IV and V and flagellum of antenna stout; distal margin of male telson broadly rounded; otherwise as for genus.

**DESCRIPTION:** Carapace (fig. 68A) wider than long; broadest medially. Anterior margin slightly concave on either side of ocular sinus, concave lateral to outer-ocular angle, with numerous low tubercles. Rostrum absent. Ocular sinus smoothly concave, with low tubercles. Anterolateral lobes smoothly rounded and with few spinules. Frontal region rugose; setal field present as two narrow oblique bands behind ocular sinus; posterior lateral elements absent. CG1 parallel to anterior margin of carapace, faint laterally, indistinct medially, sinuous; lateral elements not posteriorly displaced. Mesogastric region medially rugose; CG2 indistinct from other setose grooves; CG3 present as two short oblique medial elements and two long, interrupted, sinuous lateral elements; medial elements slightly anteriorly displaced; CG4 with numerous short medial elements between longer supralateral elements of CG4. Hepatic region smooth, with distolateral short spine and oblique setose groove at median of lateral margin. Epibranchial region generally triangular, smooth; bounded anteriorly by CG3 and posteriorly by CG4; minute spine at distolateral margin. Metagastric region smooth, with scattered short setose lines; CG5 indistinct. CG6 present as two concave medial elements and two long, oblique lateral elements. CG7 present as two or three very short oblique elements on either side of medial elements of CG6. Cardiac region smooth, with scattered very short setose lines; CG8 absent or indistinct. CG9 absent. CG10 present as two short medial and two longer lateral elements marking posterolateral boundary of cardiac region. CG11 absent. Post-CG11 element absent. Branchial region with numerous very short patches of setae. Posterior margin deeply and evenly convex, with submarginal groove reaching lateral margin of posterior concavity. Branchiostegite unarmed; anterior region with scattered short transverse lines ventral to *lin-*

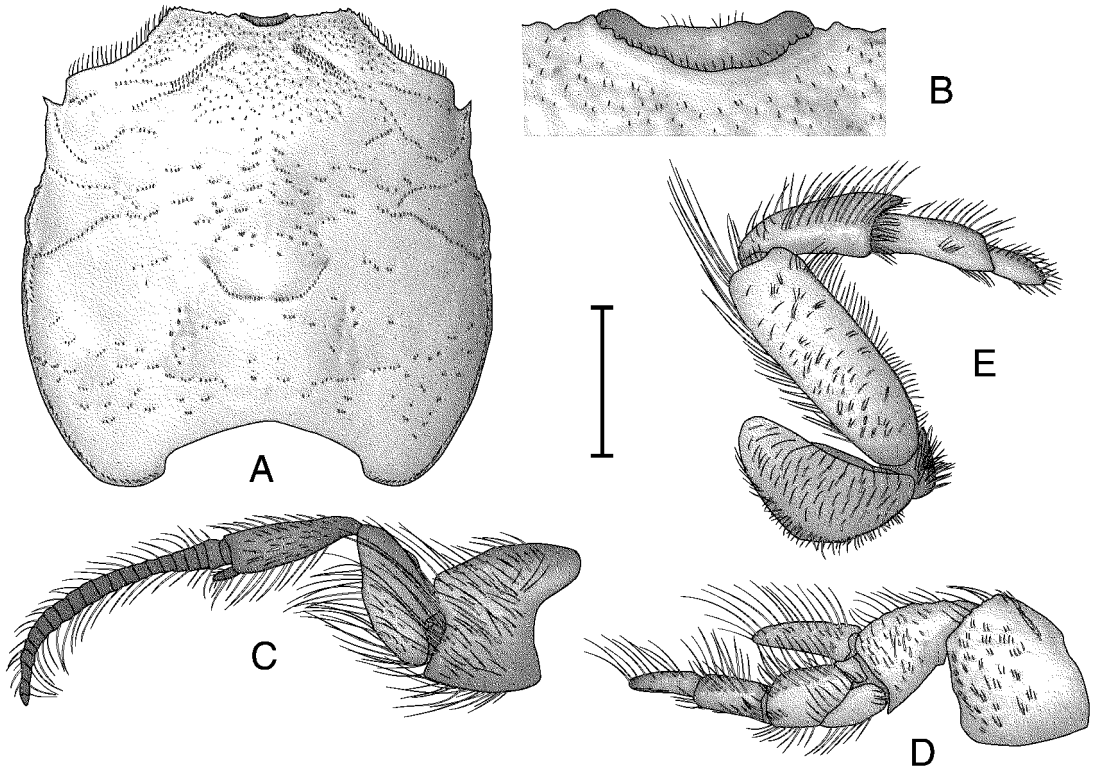


Fig. 68. *Zygopa nortoni* Serène and Umali, 1965: A–E, ♀, 11.2 mm cl, NMCR 1273, paratype. **A.** Carapace and ocular peduncles, dorsal view. **B.** Ocular peduncles, dorsal view. **C.** Left antennule, lateral view. **D.** Left antenna, lateral view. **E.** Right maxilliped III, lateral view. Scale = 1.1 mm (B), 2.2 mm (C–E), and 4.4 mm (A).

*ea anomurica*; with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate, median and distal peduncular segments (fig. 68B) fused to form unified distolaterally projecting ocular unit; hint of seam between median and distal peduncular segments visible slightly laterad of median. Ocular unit subcylindrical medially, tapering to rounded dorsodistal tips; corneal pigment not visible; long plumose setae on distal mesial margin.

Antennule (fig. 68C) with segment III narrow proximally, expanding distally to slightly wider proximal margin; with plumose setae on dorsal and ventral margins and scattered on lateral surface; dorsal exopodal flagellum with 18 articles ( $n = 1$ ), long plumose and short simple setae on dorsal and

ventral margins; ventral endopodal flagellum with three articles ( $n = 1$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins and scattered on lateral surface. Segment I wider than long, dorsal margin unarmed; lateral surface rugose, with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 68D) with segment V approximately two times longer than wide, with long plumose setae on dorsal and ventral margins and in row on lateral surface; flagellum with one article ( $n = 1$ ), long plumose setae on dorsal, ventral margins and lateral surface. Segment IV expanded distally, with long plumose setae on dorsal, ventral, and distal margins, and row of setae on distomediolateral surface. Segment III with long plumose setae on dorsal and ventral margins. Segment II rounded dorsally, wid-

ening distally, rugose, with plumose setae on margins and scattered on lateral surface; antennal acicle long, slightly curved, tapering distally, and slightly exceeding distal margin of segment IV, dorsal margin rugose, with long plumose setae on margin. Segment I rounded proximally, flattened ventrolaterally, lateral surface rugose, with long plumose setae on margins and on rugae; lateral surface unarmed; segment with ventromesial antennal gland pore.

Mandible, maxillule, maxilla, maxilliped I, maxilliped II unknown.

Maxilliped III (fig. 68E) dactylus elongate with rounded tip; long plumose setae on margins and lateral surface. Propodus dorsodistally inflated, with longitudinal median row of plumose setae on lateral surface; dorsal and distoventral margins with plumose setae, short transverse row of plumose setae on ventromedial margin. Carpus produced onto propodus approximately one-fourth length of propodus; lateral surface with two rows of plumose setae on surface; long plumose setae on dorsal margin and on dorsodistal and ventrodistal angles. Merus inflated, unarmed, with plumose setae on margins and scattered on lateral surface. Basis-ischium incompletely fused, with crista dentata of 8–10 small acute teeth. Exopod two-segmented: proximal segment small; distal segment oblong, mesially curved, laterally and dorsally inflated, distally rounded, approximately two-thirds length of merus; with plumose setae covering lateral surface; without flagellum.

Pereopod I (fig. 69A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose setae and low teeth on proximal two-thirds; ventral margin with short simple setae. Propodal lateral surface with numerous short, transverse rows of setose rugae; dorsal margin with low rounded teeth; ventral margin distally produced into rounded spine; cutting edge with 12 or 13 low rounded teeth, lined with long plumose setae; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with numerous low rugose teeth on dorsodistal angle; dorsal margin with short transverse grooves behind dorsodistal angle; dorsal and distal margins with long plumose setae; lateral surface with distal rugose area, with few transverse setose

ridges; mesial surface smooth, with medial transverse broken row of 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 scattered setae; proximal third decalcified. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 69B) dactylus smooth; base to heel convex, heel low and rounded, heel to tip with broad, rounded indent, tip subacute, tip to base broadly convex. Remainder of pereopod unknown.

Pereopod III (fig. 69C) dactylus with base to heel straight, heel low and rounded, heel to tip with broadly concave indent, tip subacute, tip to base smoothly convex; lateral surface smooth, with two small tufts of short setae in generally straight line across medioproximal surface, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface smooth, with plumose setae proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface smooth, with long plumose setae in oblique row, simple setae on dorsal margin, plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened, with setose mat; mesial surface smooth. Carpus produced dorsodistally, inflated dorsally and laterally, exceeding proximal margin of propodus by three-fourths length of propodus; tip rounded, dorsal margin unarmed; lateral surface slightly rugose dorsodistally, with dense mat of short setae on distal half of segment and interrupted row of setae ventrally; mesial surface smooth, with long plumose setae on distal margin and in oblique row on surface. Merus smooth, fully calcified; dorsal and ventral margins unarmed, long plumose setae on dorsodistal and ventral margins and in interrupted transverse medial row on lateral surface; mesial surface smooth, with few scattered setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female with large gonopore on anterior mesial margin of coxa, without setae; male unknown.

Pereopod IV (fig. 69D) dactylus with base to tip convex proximally, with shallow indistinct indent, almost straight from indent to



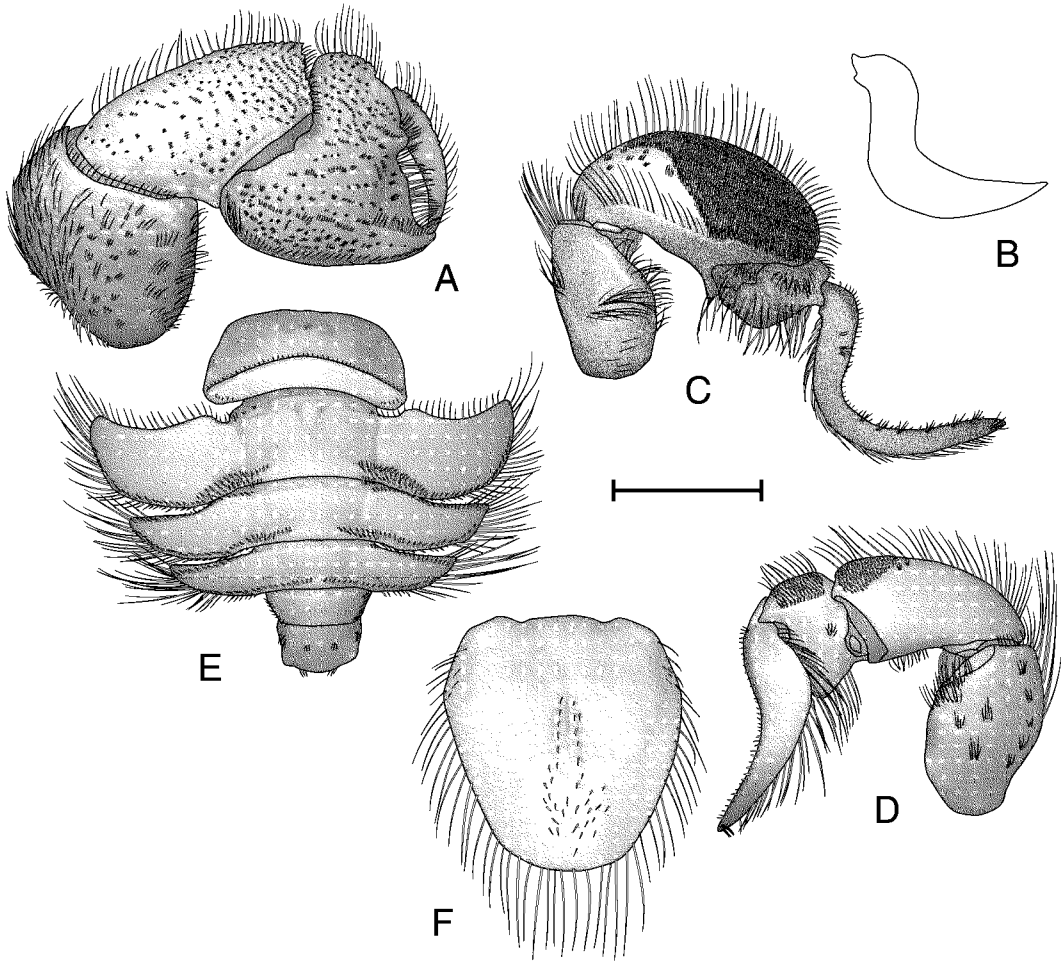


Fig. 69. *Zygopa nortoni* Serène and Umali, 1965: A, C–F, ♀, 11.2 mm cl, NMCR 1273, paratype; B, paratype (from Serène and Umali, 1965). A. Right pereopod I, lateral view. B. Right pereopod II dactylus, lateral view (from Serène and Umali, 1965). C. Right pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I–VI, dorsal view. F. Telson of ♀, dorsal view. Scale = 2.2 mm (F), 2.4 mm (B), 3.3 mm (D), and 4.4 mm (A, C, E).

tip, tip subacute, tip to base convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge with row of short setae; with setose punctations ventral to decalcified window. Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, ventral margin with long plumose setae; dorsal expansion with row of long plumose setae dorsally, oblique area with mat of short simple setae;

lateral surface smooth, mesial surface smooth with medial area of few patches of long plumose setae. Carpus slightly produced dorsodistally; ventral 90% of lateral surface and mesial surface smooth, with rows of long plumose setae on distal margins, dorsodistal 10% of lateral surface with mat of short setae; dorsal margin with short simple and long plumose setae; distoventral margin with short simple setae; mesial surface fully calcified. Merus with scattered short transverse rows of setae on lateral surface, dorsodistal and ventrodistal margins with long plumose setae;

mesial surface fully calcified. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 69E) somite I wider than long, widest posteriorly; dorsal surface with anterior margin straight; posterior margin curved, with elevated submarginal row of short setae; small transverse decalcified windows laterad of segment median; few short setae proximolateral to elevated ridge. Somite II dorsal surface with irregular submarginal transverse ridge anteriorly; with small transverse decalcified windows laterad of segment median just anterior to submarginal ridge; pleura expanded and directed anterolaterally; anterolateral margins angled, anterior and lateral margins with long plumose setae, posterolateral angle rounded, posterior margin with short setae; submarginal row of short setae running from just posterior to anterolateral angle of pleura to posterior junction with somite, posteromesial angle of somite with mat of short simple setae. Somite III similar to somite II, but narrower, shorter, anterior submarginal windows present, posterior submarginal row of setae extending from junction with pleura across lateral thirds of somite; pleura thinner and shorter than on somite II, directed laterally, with setae as in somite II; anterolateral angle subacute; dorsal surface obliquely flattened anterolaterally, with submarginal row of short setae. Somite IV similar to somite III, but thinner and shorter, posterior submarginal row of setae across entire somite; pleura thinner and shorter than on somite III, directed laterally; dorsal surface obliquely flattened anterolaterally; margins with long plumose setae. Somite V subequal to somite IV in width; lateral margins with short plumose setae; pleura absent. Somite VI slightly broader than somite V, widening distally; dorsal surface with short transverse rows of setae laterad of midline and at posterior margin; pleura absent.

Females with uniramous, paired pleopods on somites II–V; males unknown.

Telson of male unknown. Telson of female (fig. 69F) flattened, ovate, margins all convex, entire segment evenly calcified with rounded, slightly truncate tip; median groove in medial third, flanked by rows of short simple setae; numerous short simple setae scat-

tered on distomedial surface, margins with long simple setae.

DISTRIBUTION: Known from the Philippines and New Caledonia, in up to 60 m depth.

MAXIMUM SIZE: Males: unknown; females: 11.2 mm cl.

TYPE SPECIMENS: NMCR 941 (holotype), NMCR 733 (3 paratypes), NMCR 1273 (1 paratype).

TYPE LOCALITY: Batangas Bay, Luzon, Philippines.

REMARKS: Calado (1995) saw no material of this species and redescribed it based on the text and illustrations of Serène and Umali (1965). The New Caledonian specimen reported here greatly expands the known range of this species.

### *SQUILLALBUNEA*, new genus

*Paralbunea* Serène, 1979: 97–98 (part). – Calado, 1995: 239–240 (part). – Boyko and Harvey, 1999: 380, 402 (key) (part) (not *Paralbunea* Serène, 1977).

*Albunea*: Coêlho and Calado, 1987: 41 (part) (not *Albunea* Weber, 1795).

DIAGNOSIS: Carapace wider than long, front narrow; anterior margin rugose but unarmed; carapace covered in strongly setose grooves; hepatic anterolateral spine absent; branchiostegite armed. Rostrum present, short. Distal peduncular segments flattened, shorter than anterolateral lobes, weakly indented mesially with mesial reduced corneas. Antennular segment I unarmed; dorsal flagellum with 46–57 articles, ventral flagellum with 3–7 articles. Antennal segment I unarmed; flagellum with 6–8 articles. Maxilliped III carpal projection short; weak crista dentata present; exopod slender. Pereopod I dactylus with dorsal margin toothed; propodus cutting edge smooth; distodorsal carpal spine absent. Males with small coxal pore on pereopod III. Telson of male elongate, triangular, laterally concave, fully calcified. Telsons exhibiting strong sexual dimorphism.

DISTRIBUTION: Indonesia; Western Australia and Queensland, Australia; and the Marquesas Islands.

TYPE SPECIES: *Albunea mariellae* Serène, 1973, by monotypy.

ETYMOLOGY: This genus is named for the indented appearance of the distal peduncular

segments of its type species which resemble those of stomatopod crustaceans of the genus *Squilla* Fabricius, 1787. That name is combined with *Albunea*, the type genus of the family. The gender is feminine.

REMARKS: *Albunea mariellae* was questionably placed in the genus *Paralbunea* by Serène (1979), who admitted that he had no material of that species on hand to examine. Indeed, this species does not belong in *Paralbunea* and is, in fact, a transitional form between *Paralbunea* and *Zygopa*. It is the sister taxon to *Zygopa* and shares several key characters (male telson shape, dactyli shapes, rugose and numerous carapace grooves) with that genus. The genus is monotypic.

*Squillalbunea mariellae* (Serène, 1973),  
new combination

Figures 70, 71

*Albunea mariellae* Serène, 1973: 261–262, pl. 1\*.  
– Haig, 1974: 451 (list). – Coêlho and Calado,  
1987: table 1.

*Albunea* undescribed species, Haig, 1974: 447  
(list).

*Paralbunea mariellae*: Serène, 1979: 97–98, fig.  
4\*. – Calado, 1995: 255–256, pl. 78, fig. 4. –  
Boyko and Harvey, 1999: 400 (list), 402 (key).

MATERIAL EXAMINED: **Indonesia**: Sta. KR VI/H 3–10, north of Pulu Durowa, north of Nuhurawa, Kai Archipelago, 05°32'S, 132°41'E, 15–20 fms (= 27.4–36.6 m), June 11, 1970, coll. Mariel King Memorial Expedition: 1 ♂, 13.3 mm cl, paratype (WAM 10788).

**Australia: Western Australia**: Sta. 03B02BT, northwest shelf, 19°56.8'S, 117°53.5'E, 44 m, June 25, 1983, coll. CSIRO: 3 ♂, 5.9–6.9 mm cl, 2 ♀, 5.5–7.4 mm cl (QM W22288); Sta. 02B02BT, northwest shelf, 19°56.8'S, 117°53.4'E, 42 m, April 22, 1983, coll. CSIRO: 3 ♂, 7.5–21.0 mm cl, 2 ♀, 11.6–12.0 mm cl, 2 juveniles, 5.1–7.9 mm cl (QM W22289); **Queensland**: Pandora Reef, Pandora Wreck Site, under metal sheeting, 18°49'S, 146°26'E, Dec. 10, 1984, coll. Queensland Museum: 1 ♀, 22.3 mm cl (QM W15789).

**Marquises Islands**: Sta. TH-I, Haul 1, off Tahuata Island, 45 fms (= 82.3 m), Sept. 28, 1967, coll. National Geographic Society–Smithsonian–Bishop Museum Marquesas Expedition: 1 ♂, 10.8 mm cl (USNM 304310).

DIAGNOSIS: As for genus.

DESCRIPTION: Carapace (fig. 70A) wider than long. Anterior margin concave on either side of ocular sinus, becoming concave and oblique laterally, numerous small rounded tubercles on and lateral to concave region, ventral row of long plumose setae submarginally. Rostrum as small acute spine, reaching one-half across ocular plate. Ocular sinus smoothly concave and unarmed. Frontal region covered in small setose, convex, scabrous lines; setal field broad posteriorly, narrowing anteriorly, with narrow indistinct lateral elements and indistinct straight anterior margin. CG1 parallel to anterior margin of carapace, sinuous, indistinct, medial and curved lateral elements widely separated. Mesogastric region covered in setose, convex, scabrous lines, CG2 present but not recognizable in field of setose grooves; CG3 present but not distinct; CG4 long lateral elements distinct and extending to anterior curve of CG6, median elements present but indistinct. Hepatic region covered in setose, convex, scabrous lines, with long setose groove at median of lateral margin. Epibranchial region generally triangular, medial region covered in setose, convex, scabrous lines, posterolateral margin with numerous short rows of setae. Metagastric region covered in setose, convex, scabrous lines; CG5 present but indistinct; CG6 slightly crenulate, entire, united with CG7; CG7 oblique and scalloped, united with CG6. Cardiac region covered in setose, convex, scabrous lines; CG8 present but indistinct; CG9–11 present but indistinct; post-CG11 groove present but indistinct. Branchial region completely covered with numerous short, curved rows of setae. Posterior margin deeply and evenly convex, with submarginal groove reaching to lateral margin of posterior concavity. Branchiostegite with small 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. 70B) irregularly cylindrical, with shallow and broad median indentation. Median peduncular segments not vis-



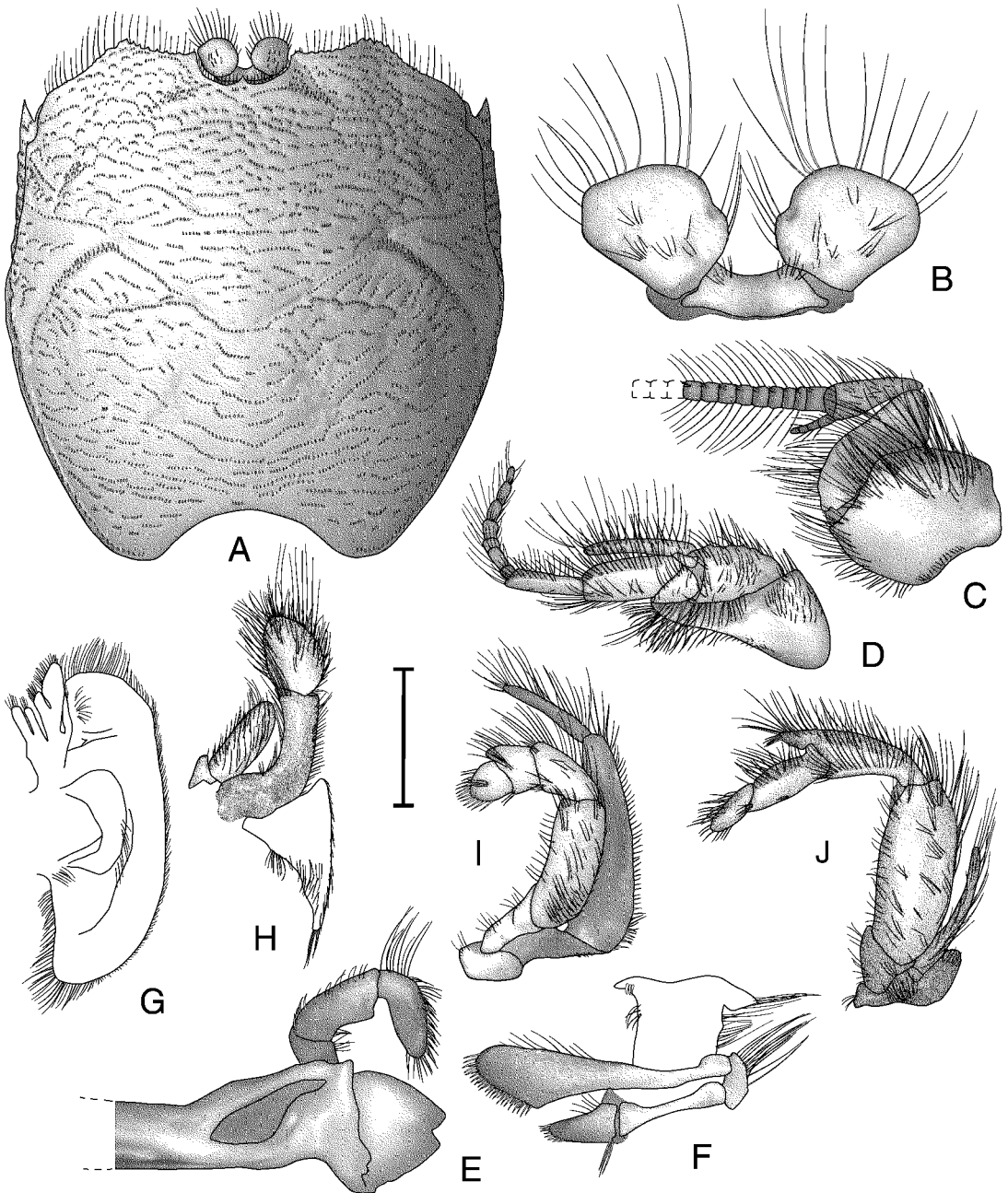


Fig. 70. *Squillalbunea mariellae* (Serène, 1973), n. comb.: A, ♀, 22.3 mm cl, QM W15789; B–J, ♂, 10.8 mm cl, USNM 304310. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Left maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 1.1 mm (B), 1.6 mm (E, F), 2.2 mm (I), 3.0 mm (C, D), 3.3 mm (G, H, J), and 7.2 mm (A).



ible, likely fused with ocular plate. Distal peduncular segments as flattened, globular, mesially indented, "mitten-shaped" ovals with convex lateral and mesial margins, cornea visible in depression at midpoint of mesial margin (junction of "thumb" and "forefinger" of imaginary "mitten"), mesial margins widely separated along entire length, distal margins with long simple setae, dorsal surfaces with scattered patches of long simple setae, ventral surfaces each with proximolateral patch of long simple setae.

Antennule (fig. 70C) with segment III narrow proximally, expanding distally to three times proximal width; plumose setae on dorsal and ventral margins and scattered on lateral surface, dorsal exopodal flagellum with 46–57 articles ( $n = 6$ ), long plumose setae on dorsal and ventral margins, ventral endopodal flagellum short, with three to seven articles ( $n = 6$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, plumose setae on ventral margins. Segment I longer than wide, unarmed, long plumose setae on dorsal and ventral margins and scattered on dorsal third of lateral surface and submarginally on distoventral surface.

Antenna (fig. 70D) with segment V approximately four times longer than wide, long plumose setae on dorsal margin, flagellum with six to eight articles ( $n = 6$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV expanded distally, long plumose setae on dorsal and ventral margins and in ventral submarginal row, and simple setae on dorsolateral margin. Segment III with long plumose setae on dorsal and ventral margins; few scattered short simple setae on lateral surface. Segment II short, width subequal along length, dorsal margin rugose, plumose setae on margins and lateral surface, antennal acicle long, thin, reaching distal margin of segment IV, long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventromesially, long plumose setae on margins and dorsolateral surface; lateral surface unarmed, without dorsolateral lobe.

Mandible (fig. 70E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on mar-

gins and short, thick, simple setae arising from bend in second segment.

Maxillule (fig. 70F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin plumose setae on dorsal margin. Proximal endite with thick simple setae on distal margin and thin plumose setae on dorsodistal and medioventral margins. Endopodal external lobe truncate distally and curled under, notched proximally; internal lobe reduced with three thick setae at distolateral margin.

Maxilla (fig. 70G) exopod evenly rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 70H) epipod with short plumose setae on margins and scattered on distolateral surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, with plumose setae; distal segment spatulate, nearly one-half longer than wide, broadest medially, margins and distal three-fourths of lateral surface with long plumose setae. Endopod flattened and elongate, reaching nearly to distal end of proximal exopodal segment, with plumose setae on surface, thick simple setae on mesial margin.

Maxilliped II (fig. 70I) dactylus evenly rounded, length equal to width, with thick simple setae on distal margin and thin simple setae on medial distolateral surface. Propodus 1.5 times wider than long, with plumose setae on dorsal margin and long simple setae on dorsodistal and ventrodial margins. Carpus not strongly produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal margin, dorsodistal and ventrodial margins, and scattered on lateral surface. Merus nearly three times longer than wide, margins parallel, with long simple setae on dorsal and ventral margins and scattered on lateral surface, plumose setae on dorsolateral margin. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-third longer than merus, flagellum with one elongate article.

Maxilliped III (fig. 70J) dactylus rounded at tip, long plumose setae on margins and distal mediolateral surface. Propodus with longitudinal median row of plumose setae on

lateral surface, dorsal and ventrodorsal margins with plumose setae. Carpus strongly produced onto propodus and reaching to one-half of length of propodus, lateral surface with longitudinal row of plumose setae medially and ventral submarginally; plumose setae on dorsal margin. Merus unarmed, slightly distally inflated, plumose setae on margins and scattered in patches on surface. Basis incompletely fused with ischium, with short plumose setae on margin; weak crista dentata of three or four very small rounded teeth. Exopod two-segmented, proximal segment small, distal segment styliform, tapering, approximately three-fourths length of merus, plumose setae on margins and surface; flagellum absent.

Pereopod I (fig. 71A) dactylus curved and tapering; lateral and mesial surfaces smooth; proximal half of dorsal margin with low tubercles, entire margin with long plumose and short simple setae, short simple setae on ventral margin. Propodal lateral surface with numerous short, transverse rows of setose rugae; dorsal margin rugose but unarmed; ventral margin distally produced into acute spine; cutting edge lacking teeth, lined with long plumose setae; dorsal, distal, and ventral margins with long setae. Carpus with dorsodistal angle rugose and scabrous, terminating in rounded tip; dorsal and distal margins with short plumose setae; lateral surface with distal rugose area, numerous transverse, setose ridges on lateral surface and in submarginal row distoventrally; mesial surface smooth, with one long subdorsal, one medial, and one short subventral row of long plumose setae. Merus unarmed; lateral surface with scattered transverse rows of long plumose setae, dorsal margin with long plumose setae; proximal fourth of mesial surface decalcified, smooth and without setae. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 71B) dactylus smooth; base to heel slightly convex, heel with smoothly rounded low spur, heel to tip broadly indented and wide, tip acute, tip to base broadly convex; lateral surface smooth, three small tufts of short setae on base of heel, several widely spaced submarginal tufts of short setae dorsodistally; mesial surface smooth, ventral margin with long plumose

setae, dorsal margin with row of long plumose setae from junction with propodus to median of heel. Propodal dorsal surface smooth, ventral margin proximally 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 as 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 produced one-third over propodus, gently rounded dorsally with rounded distoventral angle; proximal five-sixths of lateral surface nearly smooth, with irregular, short interrupted row of rugae medially and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae, distal sixth of lateral surface rugose, with mat of short thick simple setae, dorsal and distoventral margins with long plumose setae; mesial surface smooth, distal and ventral rows of long plumose setae, two dorsal submarginal interrupted rows of long plumose setae. Merus with medial decalcified area on lateral surface, long plumose setae on dorsodistal and ventral margins; mesial surface nearly smooth, with many short rows of long plumose setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 71C) dactylus with base to heel almost straight, heel rounded and not produced, heel to indent convex, indent broadly concave, tip acute, tip to base smoothly convex; lateral surface smooth, base of heel and dorsodistal margin with tufts of short setae, ventromesial margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, row of plumose setae from junction with propodus to heel, dorsal submarginal row of short simple setae on distal three-fourths of blade. 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, with mat of short simple setae; mesial surface with few long setae in oblique medial row and on distoventral angle. Carpus produced dorsodistally, inflated, reaching one-third length of

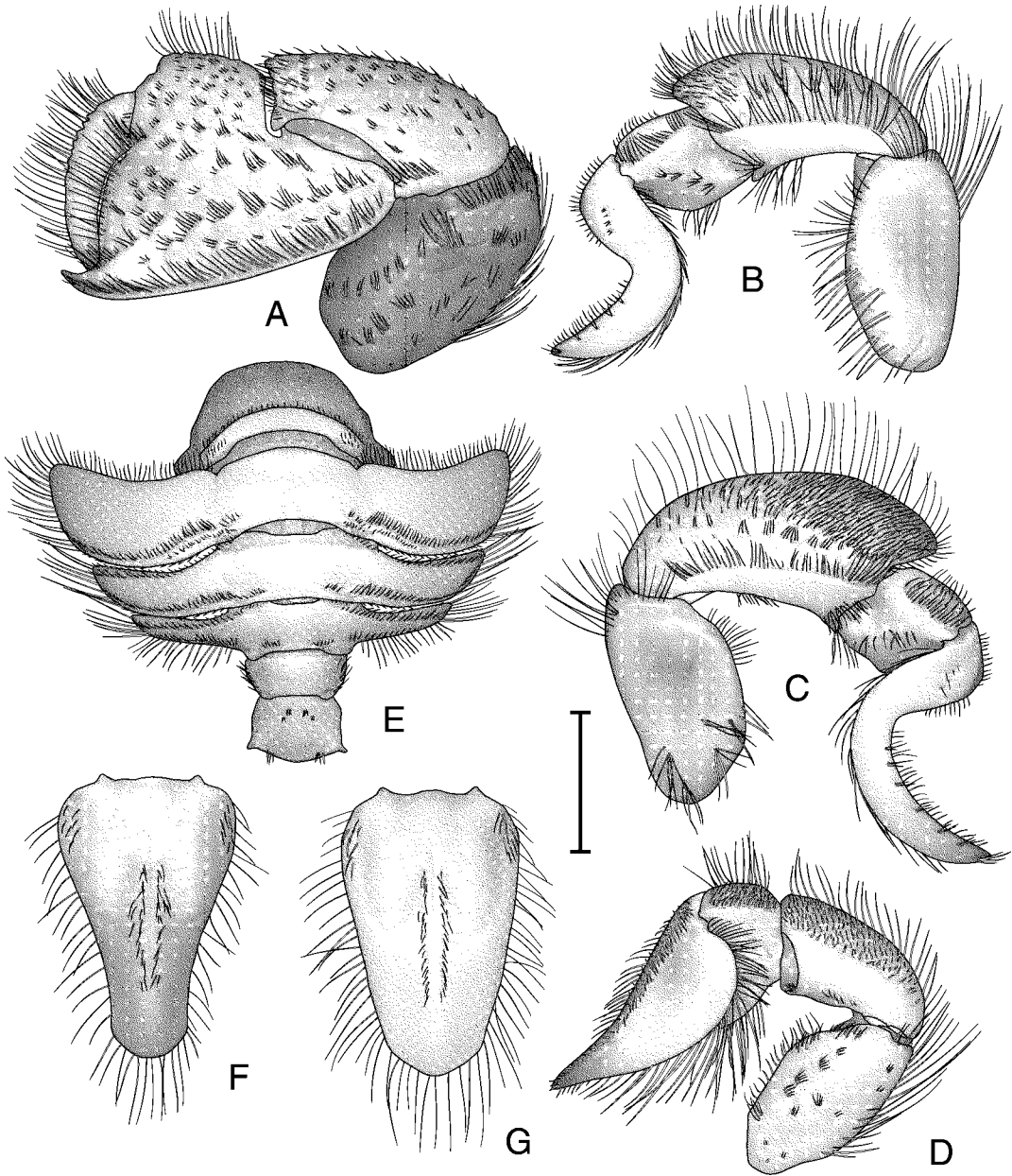


Fig. 71. *Squillalbunea mariellae* (Serène, 1973), n. comb.: A–F, ♂, 10.8 mm cl, USNM 304310; G, ♀, 22.3 mm cl, QM W15789. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Right pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I–VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 2.2 mm (F), 3.3 mm (A–E), and 4.4 mm (G).

propodus, broadly rounded, dorsolateral margin unarmed; lateral surface slightly rugose dorsodistally, with mat of short simple setae covering distal third of surface and short sim-

ple setae scattered on dorsal half of lateral surface proximal to setose mat; fully calcified, with two long rows of short setae medially; mesial surface smooth, long plumose

setae on and near distoventral margin. Merus smooth, margins unarmed, distodorsal and ventral margins with long plumose setae; lateral surface with decalcified area distally and few scattered long setae on proximal third; mesial surface smooth, with few scattered setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female with large gonopore on median mesial surface of coxa, not opposing other gonopore, without surrounding setae; male with smaller but distinct pore.

Pereopod IV (fig. 71D) dactylus with base to tip convex, tip acute, tip to base broadly convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short and long 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 exceeding ventral margin of dactylus, ventral margin with long plumose setae, dorsal expansion with row of long plumose setae dorsally and mat of short simple setae ventrally; lateral and mesial surfaces smooth, with few scattered long, plumose setae. Carpus not produced dorsodistally with mat of short simple setae on dorsal half of lateral surface; lateral and mesial surfaces smooth, mesial surface with distal and ventral row of long plumose setae and faintly medially decalcified area, dorsal margin with short simple and long plumose setae, ventral margin with few short plumose setae. Merus with scattered short transverse rows of setae on lateral surface, dorsal and ventral margins with long plumose setae; proximal fourth of mesial surface with large decalcified window. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 71E) with somite I wider than long, widest posteriorly; dorsal surface with anterior margin convex, posterior margin concave, with submarginal elevated and curved row of short setae, small transverse decalcified submedial windows present. Somite II dorsal surface with submarginal transverse ridge anteriorly, row of setae at posterolateral angle, extending onto pleura posteromesially; pleura expanded and directed anterolaterally, anterior margin angled,

posterior margin rounded, anterior and lateral margins with long plumose setae, posterior margin with short setae, posterior dorsal surface with two rows of short simple setae submarginally. Somite III similar to somite II, but narrower, shorter, small row of short thick setae on posterolateral angle; pleura thinner and shorter than on somite II, directed anterolaterally, with setae as in somite II except only one row of posterior submarginal setae present, anterolateral angle acute, dorsal surface obliquely flattened anterolaterally with short simple setae on lower margin. Somite IV similar to somite III, but thinner and shorter; pleura thinner and shorter than on somite III, directed slightly anterolaterally, dorsal surface obliquely flattened anterolaterally with setae as in somite III, margins with long plumose setae. Somite V subequal to somite IV, lateral margins with plumose setae; pleura absent. Somite VI subequal to somite V in width but longer, dorsal surface with four short transverse rows of setae laterad of midline anteriorly, lateral and posterior margins with long plumose setae; pleura absent.

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

Telson of male (fig. 71F) triangular, proximolateral margins convex, with short simple setae on surface, tapering distally with concave lateral margins, rounded at tip, evenly calcified, margins with long plumose setae; median longitudinal groove extending along medial half with short simple setae along length of groove. Telson of female (fig. 71G) triangular, proximolateral margins convex, with short simple setae on surface, only slightly tapering distally with nearly straight lateral margins, distal tip smoothly rounded, with short setae along length of median groove; lateral margins with long simple setae.

**DISTRIBUTION:** Known from Indonesia; Western Australia and Queensland, Australia; and the Marquises Islands, in up to 82.3 m depth.

**MAXIMUM SIZE:** Males: 21.0 mm cl; females: 22.3 mm cl.

**TYPE SPECIMENS:** WAM 125–71 (holotype, lost), WAM 10788 (paratype, old no. 126–71).

**TYPE LOCALITY:** North of Pulu Durowa,



north of Nuhurowa, Kai Archipelago, Indonesia, 05°32'S, 132°41'E, 15–20 fms (= 27.4–36.6 m).

REMARKS: The holotype was lost in the mail en route to Brazil (Hewitt, personal commun.), and it is fortunate that so many additional specimens have subsequently been located. This is the first report of specimens of this species since the original description. Serène (1979) tentatively placed this species in his genus *Paralbunea*, but it is quite distinct from that genus. It appears to be an important transitional form between *Zygopa* and the rest of the Albuneinae. Although most closely related to *Zygopa*, this species cannot be included in that genus and is here-in designated the type of a new genus, *Squillalbunea*.

Calado (1995) saw no material of this species and redescribed it based on the text and illustrations of Serène (1973).

The presence of this species is now confirmed in Western Australia (Haig, 1974; Boyko and Harvey, 1999) and is reported for the first time from Queensland and the Marquises Islands. The total number of species of albuneids known from the Marquises Islands is now three (see Boyko, 2000a).

#### *ITALIALBUNEA*, new genus

*Albunea*: Beschin and De Angeli, 1984: 97–102 (part). – De Angeli, 1998: 19–20 (not *Albunea* Weber, 1795).

DIAGNOSIS: Carapace anterior margin narrow with low rounded spine; median setal field triangular and projecting. Rostrum small, large spines lateral to ocular sinus absent. CGs well defined, not diffuse; CG1 entire, CG6 and CG7 fused; CG5 and CG11 absent. Posterolateral margin of epibranchial region produced into bulge. Branchial region with numerous transverse setae. Posterior submarginal groove not reaching margin of posterior concavity. Pereopod I dactylus dorsal margin smooth.

DISTRIBUTION: Known only from Middle Eocene fossil material from Italy.

TYPE SPECIES: *Albunea lutetiana* Beschin and De Angeli, 1984, by monotypy.

ETYMOLOGY: The genus name is a composite of the Latinized name of the country where the only specimens have been found

combined with the name of the type genus of the family. The gender is feminine.

REMARKS: This genus is intermediate between *Squillalbunea* and *Stemonopa*.

#### *Italialbunea lutetiana* (Beschin and De Angeli, 1984), new combination

Figure 72

*Albunea lutetiana* Beschin and De Angeli, 1984: 99–102, pl. 1, figs. 2, 2a, pl. 2, figs. 2–3a\*.— De Angeli, 1998: 19–20, figs. 1a, b, pl. 1, figs. 1–4.

MATERIAL EXAMINED: **Italy**: Middle Eocene, Valle del Chiampo, Eastern Lessini, coll. unknown: 1 carapace, 23.6 mm cl, holotype (calco-mold of MCSNV 10440).

DIAGNOSIS: As for genus.

DESCRIPTION: Carapace (fig. 72A) wider than long. Anterior margin slightly concave on either side of ocular sinus, becoming convex laterally, unarmed. Rostrum small, rounded. Ocular sinus smoothly concave and unarmed. Frontal region smooth (or with only few low rounded teeth); setal field narrow anteriorly and posteriorly; medial portion produced into triangular peak; posterior lateral elements reduced to narrow bands of setae. CG1 parallel to anterior margin of carapace, nearly straight, strongly crenulate, medial fragment and curved posterior lateral elements united. Mesogastric region smooth; CG2 present as two to four very short medial elements; CG3 broken into two short elements and two long elements between posterior lateral elements of CG1; CG4 with two short, anteriorly displaced, medial elements and two longer lateral elements between longer supralateral elements. Hepatic region smooth, with oblique setose groove at median of lateral margin. Epibranchial region generally triangular, smooth. Metagastric region smooth; CG5 absent. CG6 strongly crenulate, strongly anteriorly concave medially and sloping out to separated, anteriorly convex lateral thirds. CG7 oblique, united with medial element of CG6. Cardiac region smooth; CG8 present as several very short elements. CG9 present as two short lateral grooves with large gap at midline. CG10 present as two long lateral elements, with gap between fragments. CG11 absent. Post-CG11 element absent. Posterior submarginal

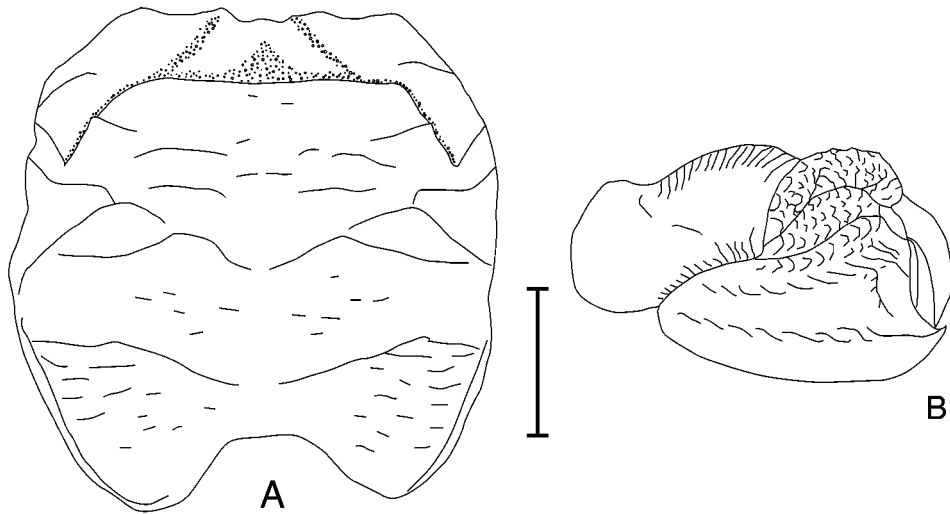


Fig. 72. *Itialbunea lutetiana* (Beschin and De Angeli, 1984), n. comb.: A, 23.6 mm cl, MCSNV 10440, holotype; B, MCSNV, paratype. **A.** Carapace, dorsal view. **B.** Right pereopod I dactylus, propodus, and carpus, lateral view. Scale = 8.5 mm.

groove not reaching margin of posterior concavity.

Pereopod I (fig. 72B) dactylus curved and tapering; lateral and mesial surfaces smooth. Propodal lateral surface with numerous short, transverse rows of strong rugae; dorsal margin unarmed; ventral margin distally produced into acute spine; cutting edge lacking teeth. Carpus with dorsodistal angle unarmed (but drawn with sharp dorsodistal spine in De Angeli [1998]), transverse ridges on distal two-thirds of dorsolateral and ventrolateral margins.

**DISTRIBUTION:** Known from the Middle Eocene from Valle del Chiampo, Eastern Lessini, as well as Cava “main” di Arzignano, Cava “Albanello” di Nogarole Vicentino, and Cava di Alonte, Italy (De Angeli, 1998: 19).

**TYPE SPECIMENS:** MCSNV 10440 (holotype), De Angeli Collection (paratype), Beschin Collection (paratype).

**TYPE LOCALITY:** Middle Eocene, Valle del Chiampo, Eastern Lessini, Italy.

**REMARKS:** This species possesses a number of unique morphological characters, in spite of its being known only from fossil carapace and pereopod I material. The narrow anterior carapace margin is reminiscent of *Zygopa* and *Squillalbunea*, and it shares an overall

carapace shape and small but present rostrum with *Squillalbunea* as well. The anterior margin of the carapace is armed with low rounded spines (not with sharp spines as on other species of *Albunea*, as drawn by Beschin and De Angeli [1984]); such spines are also found in *Squillalbunea*. It differs from *Squillalbunea* in that it has well-defined carapace grooves instead of a diffuse setal pattern, and *Itialbunea lutetiana* does not appear to have a toothed dorsal margin of the pereopod I dactylus. The pattern of carapace grooves is very similar to those seen in the genus *Stemonopa*, with which it also shares fused anterior and posterior elements of CG1. Based on the above characters, this taxon must be removed from *Albunea* sensu stricto. It cannot, however, be placed in either *Squillalbunea* or *Stemonopa*, as it has unique character combinations not found in either of those genera. Therefore, it is here placed in its own monotypic genus.

#### *STEMONOPA* EFFORD AND HAIG, 1968

*Stemonopa* Efford and Haig, 1968: 908. – Haig, 1974: 449 (list). – Coêlho and Calado, 1987: 41. – Calado, 1995: 271.

*Stemonopa* [sic] Efford, 1969: 5.

*Stemonops* [sic] Kaestner, 1980: 336.

*Stemonopa* [sic] Calado, 1987: 96.

DIAGNOSIS: Carapace as long as wide, front broad, anterior margin armed; hepatic anterolateral spine absent; branchiostegite armed. Rostrum absent. Distal peduncular segments cylindrical, longer than body, with large corneas. Antennular segment I unarmed; dorsal flagellum with 43–45 articles, ventral flagellum with four articles. Antennal segment I unarmed; flagellum with seven articles. Maxilliped III carpal projection long; weak crista dentata; exopod slender. Pereopod I dactylus with dorsal margin smooth; propodal cutting edge smooth; distodorsal carpal spine present. Males with large coxal pore on pereopod III. Telson of male elongate triangular, fully calcified. Telsons exhibiting weak sexual dimorphism.

DISTRIBUTION: Known only from Western Australia.

TYPE SPECIES: *Stemonopa insignis* Efford and Haig, 1968, by monotypy.

REMARKS: Given the limited number of times this genus has been cited in the literature, it is remarkable that three incorrect spellings have been given. Only the type species is known.

*Stemonopa* is the sister taxon to *Albunea*, and it differs primarily in the shape and length of the distal peduncular segments and characters of the antennae and antennules, as well as several carapace features such as the lack of a rostrum. This genus is intermediate between *Italiabunea* and *Albunea* sensu stricto.

*Stemonopa insignis* Efford and Haig, 1968

Figures 73, 74

*Stemonopa insignis* Efford and Haig, 1968: 908–912, figs. 8–10. – Haig, 1974: 447 (list). – Coelho and Calado, 1987: table 1. – Calado, 1995: 272–275, pl. 87, figs. a–i. – Boyko and Harvey, 1999: 400 (list), 402 (key).

MATERIAL EXAMINED: **Australia: Western Australia:** Sta. 03B02BT, northwest shelf, 19°56.8'S, 117°53.5'E, 44 m, June 25, 1983, coll. CSIRO: 1 ♂, 9.7 mm cl (QM W22309); Sta. 01B06BT, northwest shelf, 19°04.4'S, 118°47.5'E, 83 m, Feb. 16, 1983, coll. CSIRO: 1 anterior half (unsexable), 7.6 mm cl (QM W22310); Sta. Bone-NW Shelf–379, off Kimberley, 18°46.97'S, 120°14.48'E, 76

m, July 1, 1999, coll. Y. Bone: 1 ♂, 10.1 mm cl (MOV J47318).

DIAGNOSIS: As for genus.

DESCRIPTION: Carapace (fig. 73A) length and width subequal. Anterior margin slightly concave on either side of ocular sinus, becoming convex laterally with 9–12 large spines ( $n = 2$ ) along length. Rostrum absent. Ocular sinus smoothly concave and unarmed. Frontal region smooth; setal field narrow anteriorly and broad posteriorly; posterior lateral elements united with lateral, oblique, hepatic elements. CG1 parallel to anterior margin of carapace, sinuous, strongly crenulate, medial and posterior lateral elements united. Mesogastric region smooth; CG2 present as three short medial elements; CG3 broken into six short elements between posterior lateral elements of CG1; CG4 with one short, anteriorly displaced, medial element between longer supralateral elements of CG4. Hepatic region smooth, with oblique posteriorly directed setose groove at median of lateral margin, intersecting posterior elements of CG1; curved anteromedially directed setose groove intersecting anterolateral margin of medial CG1 element. Epibranchial region generally triangular, smooth; posterolateral margin without rows of setae. Metagastric region smooth; CG5 absent. CG6 strongly crenulate, strongly anteriorly concave medially and sloping out to anteriorly convex lateral thirds. CG7 oblique, not reaching lateral margins of median segment of CG6. Cardiac region smooth; CG8 present as one long medial element. CG9 present as two short lateral grooves with gap at midline. CG10 present as two long oblique elements. CG11 absent. Post-CG11 element absent. Branchial region with numerous short, transverse rows of setae in posterior half. Posterior margin deeply and evenly convex, with submarginal groove reaching posterior margin of posterior concavity. Branchiostegite with strong anterior submarginal spine; anterior region with scattered short transverse lines ventral to *linea anomurica*; with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 73C) subdivided into anterior and posterior elements; anterior ele-

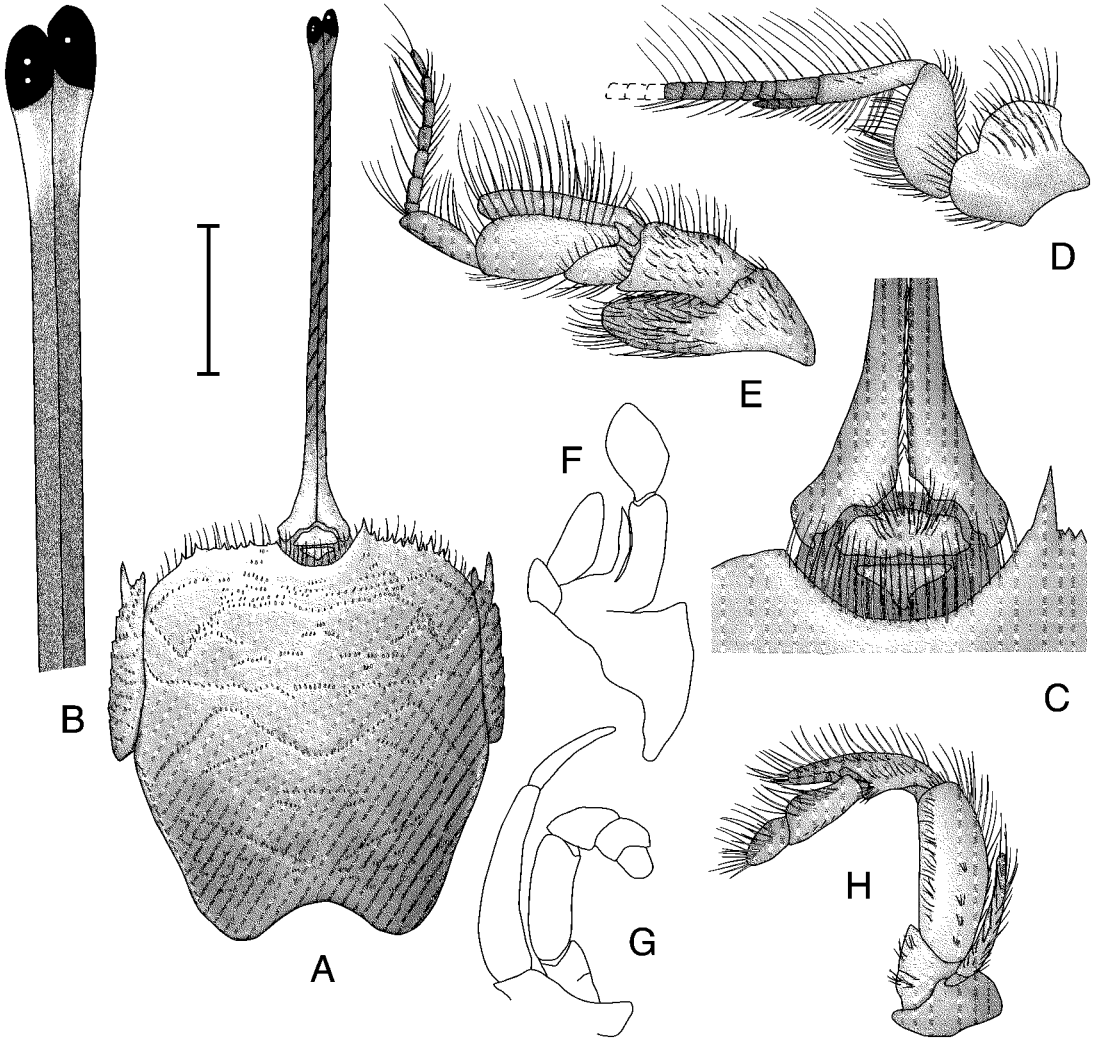


Fig. 73. *Stemonopa insignis* Efford and Haig, 1968: A–E, H, unsexable specimen, 7.6 mm cl, QM W22310; F, G, ♀, 10.4 mm cl, WAM 62–62, holotype (from Efford and Haig, 1968). **A.** Carapace, branchiostegite, and ocular peduncles, dorsal view. **B.** Ocular peduncles, proximal, dorsal view. **C.** Ocular peduncles, distal, dorsal view. **D.** Left antennule, lateral view. **E.** Left antenna, lateral view. **F.** Left maxilliped I, lateral view (from Efford and Haig, 1968). **G.** Right maxilliped II, lateral view (from Efford and Haig, 1968). **H.** Left maxilliped III, lateral view. Scale = 1.1 mm (B, C), 1.6 mm (D), 2.2 mm (E, G, H), 2.6 mm (F), and 3.3 mm (A).

ment oblong with shallow median indentation; posterior element triangular and tapering posteriorly; proximal ocular segments not visible, likely fused with ocular plate. Distal peduncular segments (fig. 73B) hyper-elongate, proximally flattened and distally cylindrical, 1.5 times length of carapace, with convex proximolateral and straight proximomesial margins, cornea covering distal

tip; mesial margins approximated along length; proximomesial margins with short plumose setae.

Antennule (fig. 73D) with segment III width subequal proximally and distally; with plumose setae on dorsal and ventral margins and sparsely scattered on lateral surface; dorsal exopodal flagellum with 43–45 articles ( $n = 2$ ), long plumose setae on dorsal and ven-



tral margins; ventral endopodal flagellum short with four articles ( $n = 2$ ) and plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins. Segment I wider than long, unarmed; dorsal half of lateral surface rugose, with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 73E) with segment V approximately two times longer than wide, with long plumose setae on dorsal and ventral margins; flagellum with seven articles ( $n = 2$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV expanded distally, with long plumose setae on dorsal and ventral margins. Segment III with long plumose setae on dorsal and ventral margins. Segment II short, widening distally, rugose, with plumose setae on margins and scattered on lateral surface; antennal acicle long, thin, and reaching distal margin of segment IV, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventrolaterally, with long plumose setae on margins and scattered on surface; lateral surface unarmed, without lobe; segment with ventromesial antennal gland pore.

Mandible, maxillule, and maxilla unknown.

Maxilliped I (fig. 73F) endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel; distal segment spatulate, longer than wide, broadest medially. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment.

Maxilliped II (fig. 73G) dactylus evenly rounded, length slightly greater than width. Propodus 1.5 times wider than long, slightly produced at dorsodistal angle. Carpus not produced dorsodistally, approximately two times longer than wide. Merus approximately 2.5 times longer than wide, margins parallel. Basis-ischium incompletely fused. Exopod one-half longer than merus, flagellum with one elongate article, longer than carpus.

Maxilliped III (fig. 73H) dactylus with rounded tip; long plumose setae on margins and lateral surface. Propodus dorsolaterally inflated, with longitudinal median row of plumose setae on lateral surface; margins

with plumose setae. Carpus produced onto propodus almost three-fourths length of propodus; lateral surface with two rows of plumose setae on surface; plumose setae on margins. Merus inflated, unarmed, with plumose setae on margins and scattered on lateral surface. Basis-ischium incompletely fused, with crista dentata of six teeth. Exopod two-segmented; proximal segment small; distal segment styloform, tapering, approximately three-fourths length of merus; with plumose setae on margins; without flagellum.

Pereopod I (fig. 74A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose and short simple setae; ventral margin with short simple setae. Propodal 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; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle produced into strong corneous-tipped spine; dorsal margin with short transverse grooves behind spine; dorsal and distal margins with long plumose setae; lateral surface with small distal rugose area, with transverse setose ridges on distal half of surface; mesial surface smooth, margins with long plumose setae. Merus unarmed; lateral surface with scattered transverse rows of short plumose setae, margins with long plumose setae; mesial surface with few scattered setae; fully calcified. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 74B) dactylus smooth; base to heel straight, heel low and rounded, heel to tip with broad indent, tip subacute, tip to base broadly convex; lateral surface smooth, with several small tufts of short setae in generally straight line across medio-proximal surface, several widely spaced submarginal tufts of short setae dorsodistally; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae, with patch of long plumose setae at base. Propodal dorsal surface smooth, with ventral margin inflated and rounded; oblique row of long plumose setae on distal margin of lateral surface; distal and ventral

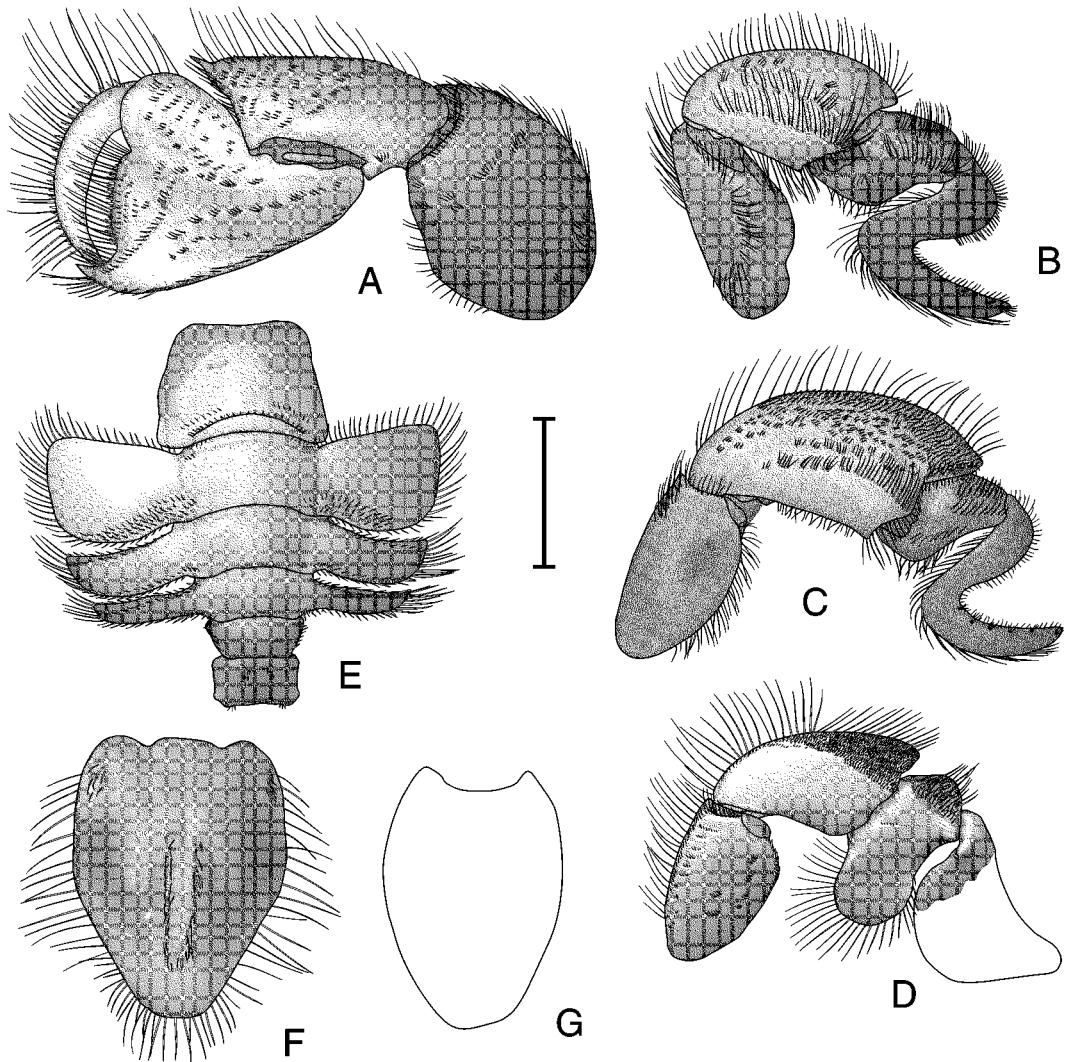


Fig. 74. *Stemonopa insignis* Efford and Haig, 1968: A, unsexable specimen, 7.6 mm cl, QM W22310; B, C, D (part), E, F, ♂, 9.7 mm cl, QM W22309; D (part), G, ♀, 10.4 mm cl, WAM 61-62, holotype (from Efford and Haig, 1968). A. Left pereopod I, lateral view. B. Right pereopod II, lateral view. C. Right pereopod III, lateral view. D. Right pereopod IV, lateral view (part of dactyl from Efford and Haig, 1968). E. Abdominal somites I-VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view (from Efford and Haig, 1968). Scale = 1.7 mm (F), 1.9 mm (G), 2.2 (A), and 3.3 mm (B-E).

margins with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with long setae on dorsal and ventral margins; mesial surface with elevated, curved setose ridge from ventral junction with dactylus almost to ventral proximal junction with carpus. Carpus strongly produced and rounded dorsodistally, dorsal mar-

gin smooth; lateral surface smooth, with irregular, interrupted row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; margins with long plumose setae; mesial surface smooth with row of long plumose setae distally and subdorsally. Merus with thin median decalcified window, with long plumose setae on

distodorsal and ventral margins; mesial surface nearly smooth, with few scattered setae. Basis-ischium incompletely fused and unarmed. Male coxae unarmed; female coxae unknown.

Pereopod III (fig. 74C) dactylus with base to heel convex, heel low and rounded, heel to tip with broadly concave indent, tip subacute, tip to base smoothly convex; lateral surface smooth, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface smooth, with long plumose setae in oblique row; dorsolateral surface narrow, oblique, flattened, with long plumose setae on dorsal and ventral margins; mesial surface smooth. Carpus produced dorsodistally approximately to median of propodus; dorsolateral margin unarmed; lateral surface slightly rugose in dorsodistal half, with mat of short setae and two broken rows of setae ventrally; mesial surface smooth. Merus smooth, with small oval decalcified window medially; dorsal and ventral margins unarmed, with long plumose setae on distodorsal and ventral margins; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Male coxae unarmed; female coxae unknown. Female presumably with large gonopore on anterior mesial margin of coxa; male with large pore.

Pereopod IV (fig. 74D) dactylus with base to tip gently convex, tip rounded, tip to base straight distally to convex proximally; lateral surface smooth (setal pattern of dactylus and mesial surface unknown). Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, margin with long plumose setae; dorsal expansion with row of long plumose setae dorsally, oblique area with mat of short simple setae; lateral and mesial surfaces smooth. Carpus produced dorsodistally; ventral two-thirds of lateral surface and mesial surface smooth, dorsodistal third of lateral surface with mat of short setae; dorsal margin with short simple and long plumose setae; ventral margin with short simple setae; mesial surface smooth. Merus lateral surface with scattered short, transverse rows of short setae, dorsal

margin with long plumose setae; proximoventral quarter of mesial surface decalcified. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 74E) with somite I longer than wide, widest posteriorly; dorsal surface with anterior margin concave; posterior margin curved, with elevated submarginal row of short setae and few scattered short setae anterior to elevated row; small transverse decalcified windows laterad of segment median. Somite II dorsal surface with submarginal transverse ridge anteriorly; with small transverse decalcified windows laterad of segment median just anterior to submarginal ridge; pleura expanded and directed anterolaterally; lateral margins angled, anterior and lateral margins with long plumose setae, posterior margin with short setae; posteromesial angle with long mat of short simple setae extending more than one-half length of pleura. Somite III similar to somite II, but narrower, shorter; pleura thinner and shorter than on somite II, directed posterolaterally proximally and curving anterolaterally distally, with setae as in somite II except with thin row of short setae near posterior margin; anterolateral angle subacute; dorsal surface obliquely flattened anterolaterally, with row of short setae on posterior margin of flattened region. Somite IV similar to somite III, but thinner and shorter; dorsal surface with few short 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 slightly broader than somite V; dorsal surface with short transverse rows of setae laterad of midline and on posterior margin; pleura absent.

Females presumably with uniramous, paired pleopods on somites II–V; males without pleopods.

Telson of male (fig. 74F) broadly triangular, longer than wide, proximal half with straight margins, distal half with concave margins, tip broadly rounded; thickly calcified medially, inflated dorsally; slightly decalcified laterally; median longitudinal groove extending one-half length, row of long simple setae of either side of median

groove beginning at median and continuing almost to distal margin of telson; proximo-lateral angles with patch of short simple setae; margins with long simple setae. Telson of female (fig. 74G) flattened, ovate, lateral and distal margins convex, tip rounded (setal pattern unknown).

**DISTRIBUTION:** Known only from Western Australia, in 44–83 m depth.

**MAXIMUM SIZE:** Males: 10.1 mm cl; females: 10.4 mm cl.

**TYPE SPECIMEN:** WAM 61–62 (♀ holotype, lost).

**TYPE LOCALITY:** 5 mi offshore, north of Maud's Landing, Point Maud, Western Australia, 31 fms (= 56.7 m).

**REMARKS:** A study of living specimens would allow a better understanding of the functional usage of the extraordinarily long distal peduncular segments in this species. In particular, it is difficult to envision how the animal is able to move through the sediment without causing damage to the peduncles.

The holotype was lost in the mail en route to Brazil (Hewitt, personal commun.). The three specimens cited above are the only other specimens known at this time. Calado (1995), due to the loss of the holotype, saw no material of this species and redescribed it based on the text and illustrations of Efford and Haig (1968).

#### ALBUNEA WEBER, 1795

*Cancer* Linnaeus, 1758: 625 (part). – Linnaeus, 1764: 441 (part). – Linnaeus, 1767: 1052–1053 (part).

*Albunea* Weber, 1795: 94 (part). – Fabricius, 1798: 372–373, 397 (part). – Lamarck, 1801: 155 (part). – Herbst, 1804: 29–31 (part). – Latreille, 1806: 44. – Duméril, 1816: 431 (part). – Lamarck, 1818: 223. – Desmarest, 1823: 283 (part). – Desmarest, 1825: 172–173 (part). – Latreille, 1831: 56. – Brewster, 1832: 234. – Griffith and Pidgeon, 1833: 178. – H. Milne Edwards, 1837a: 111. – H. Milne Edwards, 1837b: 202–203 (part). – H. Milne Edwards, 1840: 111–112. – Agassiz, 1845a: 2. – de Haan, 1849: 197–201, 202, viii. – Heller, 1863: 152–153. – Chenu and Desmarest, 1877: 32 (part). – Miers, 1878: 326. – Boas, 1880: 135–136. – Carus, 1885: 496. – Claus, 1885: 64, 69, 71–72. – Claus, 1886: 64, 69, 71–72. – Henderson, 1888: 40. – Ortmann, 1892: 535. – Stebbing, 1893: 152. – Ortmann, 1896: 222–223. – Ort-

mann, 1901: 757, 822–823, 831, 850, 862–863, 874, 876, 880, 883, 887, 896, 908, 928, 956, 1027, 1030, 1106–1107, 1109, 1112, 1153, 1197, 1273. – Stebbing, 1914: 280. – Balss, 1916a: 37 (part). – Stebbing, 1917: 26. – Balss, 1927: 1011. – Gordon, 1938: 190–193 (part). – Gurney, 1939: 100. – Ward, 1942: 63. – Garcia Mendes, 1945: 119. – Barnard, 1950: 405. – Snodgrass, 1952: 31. – Holthuis, 1954c: 33. – Holthuis, 1956: 230, 237. – Balss, 1957: 1599. – ICZN, 1958: 213, 215, 217, 225, 233, 235, 247. – Rodrigues da Costa, 1962: 6. – Serène and Umali, 1965: 89 (part). – Zariquiey Alvarez, 1968: 294. – Glaessner, 1969: R483. – Thomassin, 1969: 138. – Holthuis and Sakai, 1970: 96. – Haig, 1974: 449 (list). – Miyake, 1978: 152. – Rodriguez, 1980: 239. – Boschi, 1981: 715, 740. – Beschin and De Angeli, 1984: 97–102 (part). – Müller, 1984: 62. – Williams, 1984: 248. – Calado, 1987: 95–96. – Coêlho and Calado, 1987: 41 (part). – Melville and Smith, 1987: 43. – Manning, 1988: 626–627. – Seridji, 1988: 1298–1299. – A. J. Cain, 1990: 155. – Calado, 1995: 22–23. – Sun and Wang, 1996: 31 (part).

*albunea*: Latreille, 1803: 171–172 (part).

*albunaea* [sic]: Duméril, 1806: 182. – Froriep, 1806: 183.

Albunée: Duméril, 1806: 185 (colloquial name).

*Albunéa*: Froriep, 1806: 182.

*Symnista* Rafinesque-Schmaltz, 1815: 98. – Holthuis, 1954c: 33. – Holthuis, 1956: 230. – ICZN, 1958: 217, 225, 235. – A. J. Cain, 1990: 155.

*Albunaea* [sic]: Dana, 1852: 404 (part). – Dana, 1853: 1429. – Stimpson, 1858: 230 (list). – Stimpson, 1859: 78. – Arnold, 1901: 269.

*Albuminea* [sic]: de Saussure, 1853: 367.

*Albanea* [sic]: Hoffman, 1874: 42.

Albunearlven Claus, 1885: 64. – Claus, 1886: 64.

Albunearlarve Claus, 1886: 70.

*Aibunea* [sic]: Menon, 1937: 10.

*Albunca* [sic]: Kikuchi, 1961: 5.

*Mioranina* P. Müller, 1979: 278.

*Albune* [sic]: Coêlho and Calado, 1987: 41 (part).

*Albunae* [sic]: Seridji, 1988: 1298.

*Albumienea* [sic]: Calado, 1995: 22.

not *Albunea*: Weber, 1795: 94 (part). – Fabricius, 1798: 372–373, 397 (part). – Duméril, 1816: 431 (part) (= *Notopus* de Haan, 1841).

not *Albunea*: Weber, 1795: 94 (part). – Fabricius, 1798: 372–373, 397 (part). – Herbst, 1804: 29–31 (part) (= *Ranina* Lamarck, 1801).

not *Albunea*: Fabricius, 1798: 372–373, 397 (part). – Herbst, 1804: 29–31 (part). – Desmarest, 1823: 283 (part). – Desmarest, 1825: 172–173 (part) (= *Thia* Leach, 1815).



- not *Albunea*: Fabricius, 1798: 372–373, 397 (part). – Lamarck, 1801: 155 (part). – Herbst, 1804: 29–31 (part) (= *Corystes* Bosc, 1801–1802).
- not *albunea*: Latreille, 1803: 171–172 (part) (= *Thia* Leach, 1815).
- not *Albunea*: H. Milne Edwards, 1837b: 202–203 (part). – Chenu and Desmarest, 1877: 32 (part) (= *Lepidopa* Stimpson, 1858).
- not *Albunaea* [sic]: Dana, 1852: 404 (part) (= *Lepidopa* Stimpson, 1858).
- not *Albunea*: Balss, 1916a: 37 (part). – Gordon, 1938: 186–187 (part). – Serène and Umali, 1965: 89 (part). – Coêlho and Calado, 1987: 41 (part). – Sun and Wang, 1996: 31 (part) (= *Paralbunea* Serène, 1977).
- not *Albunea*: Beschin and De Angeli, 1984: 97–102 (part) (= *Italialbunea*, n. gen.).
- not *Albune* [sic]: Coêlho and Calado, 1987: 41 (part) (= *Paralbunea* Serène, 1977).

**DIAGNOSIS:** Carapace front broad, armed with spines; hepatic anterolateral spines absent; branchiostegite unarmed. Rostrum present, acute. Distal peduncular segments flattened, triangular, cornea present. Antennule dorsal flagellum with 48–139 articles, ventral flagellum with one to five articles. Antenna segment I armed; flagellum with five to eight articles. Maxilliped III carpal projection short; crista dentata absent or weak; exopod slender. Pereopod I dactylus with dorsal margin smooth; propodal cutting edge smooth; distodorsal carpal spine present. Telson exhibiting strong sexual dimorphism.

**DISTRIBUTION:** Worldwide in temperate, subtropical, and tropical seas.

**TYPE SPECIES:** *Albunea: Cancer symmysta* Linnaeus, 1758, by selection of Holthuis (1956); *Mioranina: Mioranina asymmetrica* P. Müller, 1979, by monotypy.

**INCLUDED SPECIES:** *A. symmysta* (Linnaeus, 1758); *A. carabus* (Linnaeus, 1758); *A. speciosa* Dana, 1852; *A. paretii* Guérin Méneville, 1853; *A. lucasia* de Saussure, 1853; *A. gibbesii* Stimpson, 1859; *A. microps* Miers, 1878; *A. thurstoni* Henderson, 1893; *A. elegans* A. Milne Edwards and Bouvier, 1898; *A. elioti* Benedict, 1904; *A. steinitzi* Holthuis, 1958; *A. asymmetrica* (P. Müller, 1979); *A. cuisiana* Beschin and De Angeli, 1984; *A. hahnae* Blow and Manning, 1996; *A. holthuisi* Boyko and Harvey, 1999; *A. danai* Boyko, 1999; *A. marquisiana* Boyko, 2000a; *A. galapagensis*, n. sp.; *A. bulla*, n. sp.; *A.*

*groeningi*, n. sp.; *A. occultus*, n. sp.; *A. catharinae*, n. sp.

**REMARKS:** As originally defined by Weber (1795), the genus *Albunea* contained three species: *Cancer symnista* [sic], *Hippa dorsipes*, and *Hippa scabra*. This is a remarkable example of grouping together species which are only distantly related, but have strong convergence of external morphology, in this case adaptation for sand-burrowing. Two of the three taxa assigned by Weber (1795) to *Albunea* have since been transferred to two different genera in the Raninidae (Brachyura) (see appendix 2). The sole remaining species of the original three, the species first listed by Weber (1795), and the type of the genus is *A. symmysta*. Calado (1995) indicated that the type species of *Albunea* was designated by Linnaeus (1758), an impossibility as the genus was not proposed until 1795 by Weber. The type species was actually selected by Holthuis (1956). This genus is no. 1299 on the “Official list of generic names in zoology,” and is feminine (ICZN, 1958). Duméril (1816) was apparently the only author who cited the origin of the name of this genus: *Albunea* is the name of a fountain who speaks with Virgil in the Aenid.

The genus *Symmysta* Rafinesque is an unnecessary replacement name, a junior objective synonym of *Albunea*, and is no. 1197 on the “List of rejected and invalid generic names in zoology” (ICZN, 1958). P. Müller (1984) recognized that his genus *Mioranina* was not a raninid, and he synonymized that genus with *Albunea*.

The highly modified distal peduncular segments of this genus, with their weakly dispersed pigmentation, have led some authors to conclude that these animals are blind (e.g., Panneerselvam and Subramoniam, 1983; Subramoniam and Panneerselvam, 1985). In fact, members of this genus have faceted corneas (personal obs.) and, as such, must possess more than just minimal light/dark-resolving vision.

The spermatophore of *A. symmysta* is a tube-shaped mass embedded in a gelatinous matrix (Subramoniam, 1993) and is often found on preserved specimens of *Albunea* either extruded from the male gonopore, or attached to the bases of pereopods III and IV

of female crabs. The origin and chemical composition of the spermatophores of *A. symmysta* are discussed in detail by Subramoniam (1993), and it is likely that these observations are applicable across the genus. Some ♀ specimens of species in this genus have an elongated patch of striate substance on the coxae of the third pereopods, superficially resembling a *Botryllus*-type tunicate. Isabella Gordon (unpubl.) 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* (see also Boyko and Harvey, 1999). I have found sperm ribbons protruding from the male gonopores in specimens of several species in the genus *Albunea*. Subramoniam and Panneerselvam (1985) subsequently alluded to the “spermatophoric ribbon attached onto the pleopodal regions” of females of *A. symmysta*, but they did not provide further details concerning their location or extent. The specific location of sperm ribbon deposition is on the third and sometimes fourth pereopod coxae of females in this species and others in the genus (Boyko and Harvey, 1999). During this study, no similar sperm packets have been found attached to the pereopods of females in any other albuneid genus, although Efford (1971) indicated an occurrence on a specimen of *Lepidopa richmondi*.

KEY TO SPECIES

(*A. asymmetrica* not included in key)

- 1 CG1 entire ..... 2
  - CG1 separated into anterior and posterior elements ..... 4
- 2 Median anterior margin of setal field produced ..... *A. cuisiana*
  - Median anterior margin of setal field not produced ..... 3
- 3 CG6 and CG7 separated ..... *A. speciosa*
  - CG6 and CG7 united ..... *A. hahnae*
- 4 Pereopod III dactylus heel rounded ..... 5
  - Pereopod III dactylus heel acute ..... 12
- 5 Ocular plate subquadrate ..... 6
  - Ocular plate triangular ..... 9
- 6 Pereopod II dactylus indent narrow .....
  - ..... *A. galapagensis*
  - Pereopod II dactylus indent broad ..... 7
- 7 Distal peduncular segments with deep medio-lateral notch ..... *A. elioti*

- Distal peduncular segments without deep medio-lateral notch ..... 8
- 8 Proximal calcified region one-fourth of total length of male telson ..... *A. microps*
  - Proximal calcified region three-fourths of total length of male telson ..... *A. bulla*
- 9 Distal margin of telson mucronate .....
  - ..... *A. gibbesii*
  - Distal margin of telson not mucronate .. 10
- 10 CG8 entire in median ..... *A. thurstoni*
  - CG8 broken in median ..... 11
- 11 Ventral margin of pereopod II dactylus heel rounded ..... *A. danaei*
  - Ventral margin of pereopod II dactylus heel subquadrate ..... *A. carabus*
- 12 CG11 absent ..... 13
  - CG11 present ..... 15
- 13 Male telson spatulate, rounded at tip .....
  - ..... *A. symmysta*
  - Male telson ovate, indented at tip ..... 14
- 14 Male telson lateral margins convex .....
  - ..... *A. steinitzi*
  - Male telson lateral margins straight .....
    - ..... *A. groeningi*
- 15 Male telson spatulate ..... *A. occultus*
  - Male telson ovate ..... 16
- 16 Male telson with indented median ridge lined with thick setae ..... 17
  - Male telson with inflated median ridge lined with thin setae ..... 20
- 17 Pereopod IV dactylus with deep indent ....
  - ..... *A. catherinae*
  - Pereopod IV dactylus with shallow indent ..... 18
- 18 Antennular segment I unarmed .....
  - ..... *A. paretii*
  - Antennular segment I with dorsal spine ...
    - ..... 19
- 19 Male telson distal margin slightly tapered ..
  - ..... *A. elegans*
  - Male telson distal margin truncated .....
    - ..... *A. lucasia*
- 20 CG11 one long element, CG10 one long element ..... *A. holthuisi*
  - CG11 two or three short elements, CG10 three or four short elements .....
    - ..... *A. marquistiana*

*Albunea speciosa* Dana, 1852

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*Albunea* [sic] *speciosa* Dana, 1852: 405–406. – Dana, 1855: pl. 25, figs. 6a–f. – Stimpson, 1858: 230 (list).

*Albunea symnista* [sic]: A. Milne Edwards, 1862: F–12\* (not *Albunea symmysta* (Linnaeus, 1758)).

*Albunea* [sic] *symmista* [sic]: Hoffman, 1874: 42 (list) (not *Albunea symmista* (Linnaeus, 1758)).  
*Albunea speciosa*: Miers, 1878: 331. – Ortmann, 1896: 225 (list). – Gordon, 1938: 187 (list). – Edmondson, 1946: 266. – Serène, 1973: 262–263, pl. 2. – Serène, 1977: 47, 52, fig. 1. – Coêlho and Calado, 1987: table 1. – Calado, 1995: 60–63, pl. 4, fig. g, pl. 5, fig. f, pl. 17, figs. a–c, pl. 18, figs. a–d. – Poupin, 1996a: 22–23\*. – Calado, 1997a: 17. – Boyko and Harvey, 1999: 400 (list), 401 (key). – Boyko, 1999: 145 (list), 147–155, figs. 3, 4\*. – Boyko, 2000a: 115–116\*.  
 “*Albunea*” *speciosa*: Borradaile, 1904: 751\*.  
*Albunea thurstoni*: Thomassin, 1969: 146–149, pl. 4, figs. 1–8, text-figs. 3d, 5 (not *Albunea thurstoni* Henderson, 1893).  
*Albunea madagascariensis* Thomassin, 1973: 265–270, pl. 1, figs. 1, 2. – Coêlho and Calado, 1987: 43, table 1. – Calado, 1995: 41–43, pl. 4, fig. d, pl. 5, fig. c, pl. 10, figs. a–f, pl. 11, figs. a–f. – Calado, 1997a: 17. – Boyko and Harvey, 1999: 400 (list), 401 (key). – Boyko, 1999: 145 (list), 154 (NEW SYNONYMY).

**MATERIAL EXAMINED: Réunion:** Île Bourbon, Nov. 1862, coll. M. Maillard: 1 ♂, 7.2 mm cl (MNHN-Hi 191).

**Seychelles:** Mahé, July–Sept. 1966, coll. Mission Zoologique MRAC-ULB: 1 oviger, 9.9 mm cl (MRAC 53.894).

**Maldives:** Hulule, Male Atoll, pre–1900, coll. J. S. Gardiner: 1 ♂, 8.4 mm cl (UMZC).

**Australia: Western Australia:** Bay on north side of Point Cloates, lee side of reef, 113°38'E, 22°41'S, 2 fms (= 3.7 m), Aug. 23, 1968, coll. Ningaloo Expedition: 1 ♂, 8.7 mm cl, 1 unsexable specimen, 9.1 mm cl (WAM 23398); southwest of Point Cloates, 113°39'30"E, 22°43'30"S, Sept. 7, 1968, coll. Ningaloo Expedition: 1 oviger, 9.7 mm cl (WAM 23399).

**Loyalty Islands:** Sta. 1413, 20°55.3'S, 167°05.0'E, Baie du Santal, Lifou, 3–10 m, Nov. 18, 2000, coll. LIFOU 2000: 1 ♀: 8.5 mm cl (MNHN-Hi 262).

**Japan:** Miyanoama Beach, Chichi-Jima Island, 3 m, May 1, 1996, coll. H. Tachikawa: 1 ♂, 6.8 mm cl (CBM-ZC)

**Society Islands:** Moorea, 1997, coll. MUSEORSTOM 9: 1 ♂, 9.2 mm cl (MNHN-Hi 250).

**Marquises Islands:** Sta. 24, Côte northwest of Baie Haahue, Île Ua Huka, 08°53.6'S, 139°37'W, 9–25 m, Oct. 1997,

coll. R. Von Cosel, J. Tröndlé, and J. Tardy: 1 ♂, 4.8 mm cl, 1 ♀, 5.2 mm cl (AMNH 17818), 1 ♂, 4.6 mm cl, 1 ♀, 5.4 mm cl (USNM 260951), 7 ♂ (3 unmeasurable), 3.9–4.8 mm cl, 3 ♀ (2 unmeasurable), 4.4 mm cl, 4 megalopae, 3.2–3.7 mm cl (MNHN-Hi 244); Sta. 24bis, Baie Haahue, Ua Huka, 08°53.6'S, 139°37.0'W, 25–34 m, Oct. 1997, coll. R. Von Cosel, J. Tröndlé, and J. Tardy: 1 ♂, 6.8 mm cl (MNHN-Hi 245); Sta. 31, 08°56.1'S, 139°32.7'W, Côte south of Baie Hiniaehi, Ua Huka, 4–7 m, Oct. 1997, coll. R. Von Cosel, J. Tröndlé, and J. Tardy: 1 ♀, 5.9 mm cl, 1 juvenile, 3.9 mm cl, 1 megalopa, 4.0 mm cl (MNHN-Hi 258); Sta. 31, 08°56.1'S, 139°32.7'W, Côte south of Baie Hiniaehi, Ua Huka, 4–7 m, Oct. 7, 1997, coll. R. Von Cosel, J. Tröndlé, and J. Tardy: 2 ♂, 4.4–6.8 mm cl (MNHN-Hi 259); Sta. 32, Côte south of Baie Hiniaehi, Ua Huka, 08°56.1'S, 139°32.7'W, 12–17 m, Oct. 1997, coll. R. Von Cosel, J. Tröndlé, and J. Tardy: 3 ♂, 4.1–7.0 mm cl, 3 ♀, 4.4–7.2 mm cl, 1 oviger, 6.8 mm cl, 5 juveniles, 3.2–4.0 mm cl (MNHN-Hi 246); Sta. 34, Baie Haavei, Pointe Tenoni, Île Teuaua, Ua Huka, 08°56.8'S, 139°35.7'W, 10–15 m, Oct. 1997, coll. R. Von Cosel, J. Tröndlé, and J. Tardy: 1 ♀, 6.7 mm cl (MNHN-Hi 247).

**USA: Hawaii:** “Kirk,” Oahu, May 27, 1938, coll. unknown: 1 ♂, 9.0 mm cl, neotype (USNM 260868), 2 ♂, 9.5–10.4 mm cl, 1 ♀, 14.0 mm cl (USNM 287087); Honolulu Harbor, Oahu, Dec. 1916, coll. E. M. Ehrhon: 2 ♂, 6.4–9.9 mm cl, 1 ♀, 7.3 mm cl (CASIZ 109240); Kailua, Oahu, March 1938, coll. unknown: 1 ♂, 10.1 mm cl (BPBM S11781); Halonu Blow Hole dive site, south shore, Oahu, 10.7 m, Aug. 3, 1997, coll. R. Holcom: 1 ♀, 6.6 mm cl, 1 unsexable, unmeasurable specimen (QM W22284); Halonu Blow Hole dive site, south shore, Oahu, 12.2–13.7 m, April 4, 1997, coll. R. Holcom: 2 ♂, 6.4–7.1 mm cl, 3 ♀, 5.7–9.5 mm cl, 6 juveniles, 3.3–4.1 mm cl (QM W22285); Oahu, April 1997, coll. R. Holcom: 2 ovigers, 7.5 mm cl (QM W22286); “Hawaii,” 1897, coll. C. M. Cook: 1 ♀, 10.0 mm cl (YPM 21133).

**No Data:** 2 ♀, 11.7–13.1 mm cl (MNHN-Hi 175).

**DIAGNOSIS:** Carapace slightly longer than wide, covered with strongly setose grooves.

Anterior margin with 13–17 spines on either side of ocular sinus. Setal field with narrow lateral elements and concave anterior margin; posterior lateral elements extending to posterior lateral elements of CG1. CG1 with separate posterior lateral elements but with anterior and posterior elements united by posterior elements of setal field; CG4 with two or three short, anteriorly displaced, medial elements; CG5 entire, nearly reaching margins of CG6; CG6 and CG7 separate; CG8 with one or two median elements separated from lateral elements; CG11 present. Rostrum reaching just beyond proximal margin of ocular plate. Ocular plate subquadrate. Distal peduncular segments dorsoventrally flattened and elongate, rounded at tip, approximate along mesial margins; lateral margins concave; mesial margins straight. Cornea at tip of distal peduncular segment. Antennule with 48–53 flagellar exopodal and two endopodal articles. Antenna with five or six flagellar articles; acute spine on dorsolateral surface of peduncle segment I. Dactyli of pereopods II and III with heels low and smoothly rounded. Coxa of pereopod III of males with small pore. Telson of male spatulate, laterally expanded, dorsoventrally flattened; produced slightly at tip. Telson of female flattened, rounded at tip.

DESCRIPTION: Carapace (fig. 75A) slightly wider than long. Anterior margin concave on either side of ocular sinus, becoming convex laterally, with 10–12 large and three or four small spines along length. Rostrum as small acute tooth, reaching just beyond proximal margin of ocular plate. Ocular sinus smoothly concave and unarmed. Frontal region smooth; setal field broad posteriorly, narrowing anteriorly, with narrow anterior lateral elements and concave anterior margin; posterior lateral elements reaching to posterior lateral elements of CG1. CG1 parallel to anterior margin of carapace, sinuous, slightly crenulate, divided into medial fragment and curved posteriorly displaced lateral elements, but with medial and lateral elements connected by posterior lateral elements of setal field. Mesogastric region smooth; CG2 short, with one or two elements; CG3 broken into two longer lateral elements and one to three short medial elements; CG4 with two or three short medial elements displaced ante-

riorly with gap at midline between short elements. Hepatic region smooth, with long setose groove at median of lateral margin. Epi-branchial region generally triangular, smooth; posterolateral margin with three short rows of setae. Metagastric region smooth; CG5 ranging from entire to four segments, nearly reaching margins of CG6. CG6 strongly crenulate, strongly anteriorly concave medially and sloping out to anteriorly convex lateral thirds. CG7 nearly straight relative to anterior margin of carapace and separate from CG6. Cardiac region smooth; CG8 with one or two median elements separated from lateral elements. CG9 present as two lateral grooves with short gap at midline. CG10 present as two curved lateral fragments, with gap between fragments approximately one-half length of single fragment. CG11 present. Branchial region with numerous short, transverse rows of setae. Posterior margin deeply and evenly convex, with submarginal groove reaching approximately half way up either side of posterior concavity. Branchiostegite with short anterior submarginal spine; anterior region with scattered, short, transverse lines ventral to *linea anomurica*; with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 75B) subquadrate, with shallow median indentation; median peduncular segments reduced to small rounded calcified areas on either side of ocular plate. Distal peduncular segments elongate, with distally concave lateral margins, tapering to rounded distal corneas; mesial margins approximated along entire length; mesial and ventral margins with sparse row of long plumose setae; tuft of plumose setae at proximal lateral ventral angle; ocular plate covered in long plumose setae.

Antennule (fig. 75C) with segment III narrow proximally, expanding distally to two times proximal width; with plumose setae on dorsal and ventral margins; dorsal exopodal flagellum with 48–53 articles, long plumose setae on dorsal and ventral margins; ventral endopodal flagellum short with two articles and plumose setae on dorsal and ventral mar-



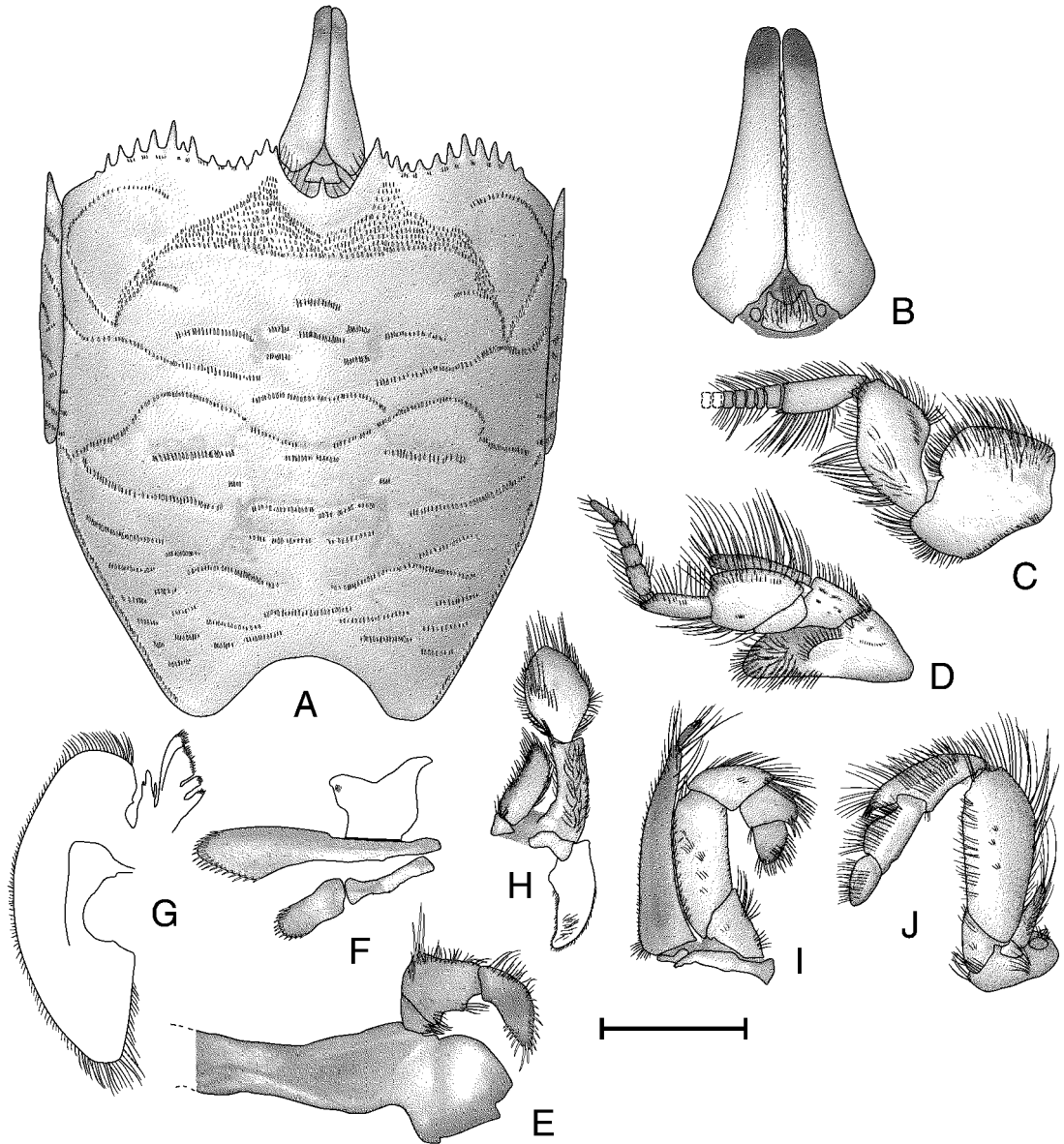


Fig. 75. *Albunea speciosa* Dana, 1852: A, ♂, 9.0 mm cl, USNM 260868, neotype; B–J, ♂, 10.4 mm cl, USNM 287087. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible; mesial view. F. Left maxillule, lateral view. G. Right maxilla, lateral view. H. Left maxilliped I, lateral view. I. Right maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 1.6 mm (B, E, F), 2.2 mm (I), and 3.3 mm (A, C, D, G, H, J).

gins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins, and scattered on ventrolateral third of surface. Segment I wider than long, unarmed; dorsal third of lateral surface ru-

gose with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 75D) with segment V approximately three times longer than wide, with long plumose setae on dorsal and ven-

tral margins; flagellum with five or six articles, long plumose setae on dorsal, ventral, and distal margins. Segment IV expanded distally, with long plumose setae on dorsal, ventral, and distal margins, and row of setae on dorsolateral margin. Segment III with long plumose setae on ventral margin. Segment II short, widening distally, with plumose setae on margins; antennal acicle long, thin, not exceeding distal margin of segment IV, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventrolaterally, with long plumose setae on margins; lateral surface with acute spine dorsally, with low semicircular dorsolateral lobe ventrodistal to spine; segment with ventromesial antennal gland pore.

Mandible (fig. 75E) incisor process with one tooth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 75F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under; internal lobe reduced with three thick setae at distolateral margin.

Maxilla (fig. 75G) exopod evenly rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 75H) epipod with plumose setae on distal margin and on distolateral surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments: proximal segment narrow, margins parallel, margins with plumose setae; distal segment spatulate, approximately as long as wide, broadest medially, margins with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins.

Maxilliped II (fig. 75I) dactylus evenly rounded, length equal to width, with thick simple setae distally. Propodus one-half wider than long, with plumose setae on dorsal margin and long simple setae on distal margin. Carpus not strongly produced dorsodistally, approximately two times longer than

wide, with long simple setae on dorsal margin. Merus approximately three times longer than wide, margins parallel, with simple setae on ventrolateral margin and plumose setae on dorsolateral margin. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-fourth longer than merus, flagellum with one article.

Maxilliped III (fig. 75J) dactylus evenly rounded; with 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, with plumose setae on margins. Basis-ischium incompletely fused, without crista dentata. Exopod two-segmented: proximal segment small; distal segment styliform, tapering, approximately one-third length of merus, with plumose setae on margins; without flagellum.

Pereopod I (fig. 76A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose and short simple setae; ventral margin with short simple setae. Propodal 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; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle produced into strong corneous-tipped spine, dorsal margin with few large and small spines posteriorly along distal third; dorsal and distal margins with long plumose setae; lateral surface with small distal rugose area, with few transverse setose ridges on distal half of surface; mesial surface smooth with few 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; proximal quarter of mesial surface with decalcified window. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 76B) with dactylus smooth; with base to heel straight, heel smoothly rounded, heel to tip with rounded,

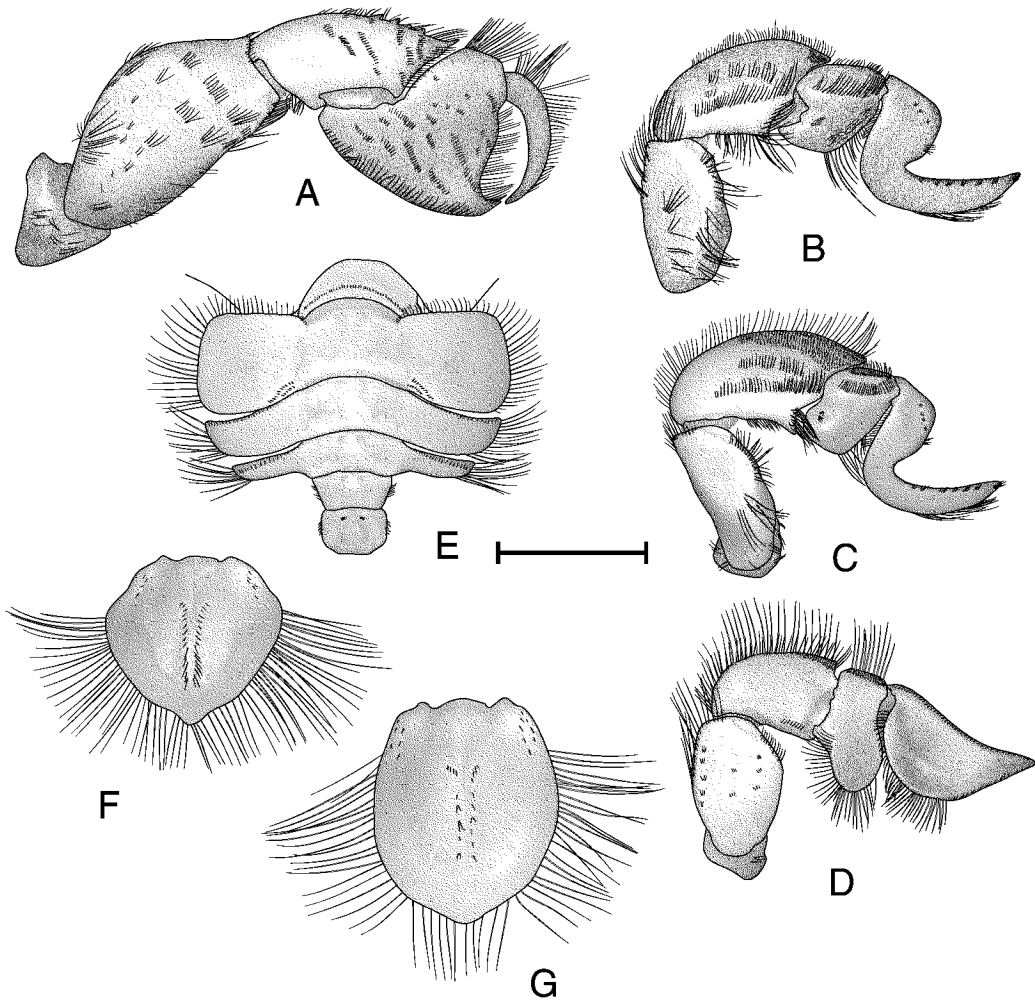


Fig. 76. *Albunea speciosa* Dana, 1852: A–E, ♂, 10.4 mm cl, USNM 287087; F, ♂, 9.0 mm cl, USNM 260868, neotype; G, ♀, 14 mm cl, USNM 287087. **A.** Right pereopod I, lateral view. **B.** Right pereopod II, lateral view. **C.** Right pereopod III, lateral view. **D.** Right pereopod IV, lateral view. **E.** Abdominal somites I–VI, dorsal view. **F.** Telson of ♂, dorsal view. **G.** Telson of ♀, dorsal view. Scale = 3.0 mm (F, G), 4.0 mm (A–D), and 4.2 mm (E).

broad indent, tip acute, tip to base broadly convex; lateral surface smooth, with several small tufts of short setae in generally 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 simple setae and patch of long plumose setae at base. Propodus with dorsal surface smooth, ventral margin inflated and rounded; oblique row of long plumose setae on distal margin of lateral sur-

face; distal and ventral margins with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with 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; decalcified region just distal to junction with carpus. Carpus slightly produced dorsodistally; lateral surface nearly smooth, with irregular, interrupted row of rugae and submarginal elevated ridge ventrally,

rugae and ridge with long plumose setae; dorsodistal projection with mat of short setae on lateral surface; margins with long plumose setae; mesial surface smooth, with long plumose setae in scattered patches on surface and on margins. Merus with few scattered setae on lateral surface and margins; mesial surface nearly smooth, with few setae and decalcified area on proximal fourth near junction with basis-ischium. Basis-ischium incompletely fused and unarmed. Coxa with one small spine on anterior margin.

Pereopod III (fig. 76C) dactylus with base to heel straight, heel broadly rounded and low, heel to tip with broad, evenly rounded indent, tip acute, tip to base smoothly convex to straight; lateral surface smooth, with several small tufts of short setae in generally straight line across medioproximal surface, dorsodistal margin with tufts of short setae; ventromesial margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface smooth, with long plumose setae distally, simple setae on dorsal margin and long plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened; mesial surface with scattered long setae on and near distal margin, with decalcified window near junction with carpus. Carpus produced dorsodistally, exceeding proximal margin of propodus by approximately one-fourth length of propodus, pointed but not acute; dorsolateral margin unarmed; lateral surface slightly rugose dorsodistally, with mat of short setae and two longer rows of setae ventrally; mesial surface smooth, with long plumose setae on margins and scattered on surface. Merus smooth; dorsal and ventral margins unarmed, with long plumose setae; laterodistal margin with long plumose setae; mesial surface smooth, with decalcified window at junction with basis-ischium. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female with large gonopore on anterior mesial surface of coxa, surrounded with short plumose setae; male with small pore.

Pereopod IV (fig. 76D) dactylus with base to tip convex to concave, tip acute, tip to base straight distally, becoming convex prox-

imally; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge with row of short setae; with 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 simple setae. Merus with scattered short transverse rows of setae on lateral surface, dorsal and ventrodistal margins with long plumose setae; mesial surface with large decalcified window proximoventrally. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 76E) with somite I approximately as long as wide, widest posteriorly; dorsal surface with anterior margin straight; posterior margin straight, with elevated submarginal row of short setae; small transverse decalcified windows laterad of segment median. Somite II dorsal surface with submarginal transverse ridge anteriorly; with small transverse decalcified windows laterad of segment median just anterior to submarginal ridge; with tuft of setae at posterolateral angle, extending onto pleuron posteromesially; posterior margin with indistinct, punctate, submarginal groove laterally; pleura expanded and directed slightly anteriorly; 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 posterolaterally; dorsal surface obliquely flattened anterolaterally; margin 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 transverse rows of setae laterad of midline anteriorly; lateral margins with long plumose setae; pleura absent.

Females with uniramous, paired pleopods on somites II–V; males without pleopods.

Telson of male (fig. 76F) spatulate, length subequal to width, produced into short rounded tip distally; weakly calcified except for large triangular anterior plate; median longitudinal groove long, extending to distal end of calcified plate, lined with long thin, simple setae; calcified plate slightly elevated medially but without ridge. Telson of female (fig. 76G) ovate, longer than wide, broadly triangular, dorsal surface smooth, with median longitudinal groove anteriorly; with row of setose punctae lateral to midline from median of longitudinal groove to distal end of groove; margins with long plumose setae.

**DISTRIBUTION:** From Madagascar eastward to the Marques Islands and Hawaii, in 3.0–34 m depth.

**MAXIMUM SIZE:** Males: 10.4 mm cl; females, 14.0 mm cl.

**TYPE SPECIMENS:** USNM 260868 (neotype of *A. speciosa*, selected by Boyko, 1999); holotype and 18 paratypes of *A. madagascariensis* in the private collection of B. Thomassin and not deposited in MNHN as stated by Thomassin (1973).

**TYPE LOCALITIES:** “Kirk,” Oahu, Hawaii, USA (*A. speciosa*); Grand Récif de Tulear, Madagascar (*A. madagascariensis*).

**REMARKS:** This species was redescribed and all known aspects of its biology discussed by Boyko (1999). Discovery of specimens of *A. speciosa* in the southern Pacific islands supports a southwest to northeast dispersal pattern for this species from its presumed western Indo-Pacific origin towards Hawaii, the type locality and easternmost part of its range (see Boyko, 1999).

Because specimens of *Albunea speciosa* were identified from several localities outside of Hawaii, Boyko (1999) suggested that the similar *A. madagascariensis* might be a junior synonym. This synonymy was actually first suggested, but also not formally proposed, by Serène (1977) in a publication that escaped the notice of later authors. Subse-

quently, Boyko (2000a) reported the discovery of additional specimens of *A. speciosa* from the Marques Islands with identical banding patterns as seen in specimens of *A. madagascariensis*. In addition, it is herein reported that A. Milne Edwards’ (1862) specimen of “*Albunea symnista*” [sic] from Réunion is actually the oldest record of *A. speciosa* from outside Hawaii (this record was repeated by Hoffman, 1874). Unfortunately, Thomassin’s (1973) type specimens have never been deposited in any museum, and all attempts to obtain them have proved unsuccessful. In spite of this, it is clear from the morphological similarities between the two taxa (discussed in detail by Boyko, 1999), the discovery of similar banding patterns on individuals from widely separated localities, and the proximity of Réunion to Madagascar, that Thomassin’s (1973) *Albunea madagascariensis* is a junior synonym of *A. speciosa*.

Little is known about the biology of this species other than the few records of ovigerous females as herein reported from April, September, and October. The Japanese male has a large sperm ribbon between the gonopores of the fifth pereopods. Several *A. speciosa* specimens (QM W22285) were collected together with the holotype of *Albunea danai*, but it is not known if the two species are typically sympatric in Hawaii. The coloration of this species is off-white with whitish setae, both in life (from color transparencies) and in preservative.

The fusion of CG1 is a character that unites this species with two fossil taxa: *A. cuisiana* Beschin and De Angeli and *A. hahnae* Blow and Manning. This character is otherwise unknown in the genus *Albunea*, but fused CG1 elements are found in other albuneid genera of both subfamilies (e.g., *Lepidopa*, *Stemonopa*). It appears that *A. speciosa*, *A. cuisiana*, and *A. hahnae* form a clade that is sister to all the other species of *Albunea*. Because two of the three taxa in this clade are fossil, and therefore known from only limited characters, and because *A. speciosa* shares so many other characters with all other *Albunea* species, it is inadvisable to erect a genus at this time based on these three species alone. *Albunea speciosa* can easily be separated from all of the other Recent species of *Albunea* by the concave

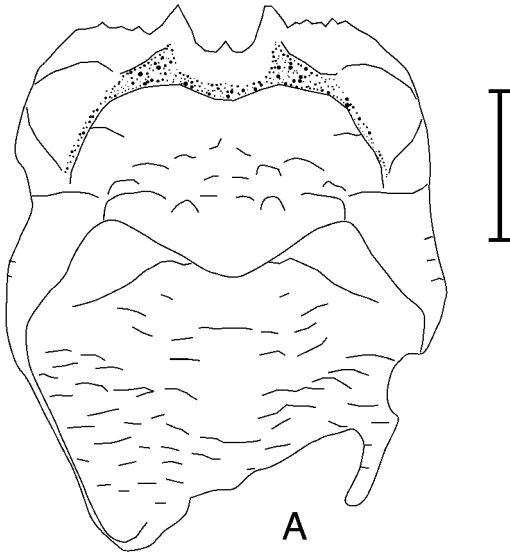


Fig. 77. *Albunea hahnae* Blow and Manning, 1996: A, 16.6 mm cl, USNM 484530, holotype. A. Carapace, dorsal view. Scale = 5.3 mm.

shape of the lateral margins of the distal peduncular segments.

*Albunea hahnae* Blow and Manning, 1996  
Figure 77

*Albunea hahnae* Blow and Manning, 1996: 4, pl. 1, fig. 2\*.

**MATERIAL EXAMINED: USA: South Carolina:** USGS 26882, Santee Limestone, M. M. Berkeley Quarry, Berkeley Co., coll. unknown: 1 carapace, 16.6 mm cl, holotype (USNM 484530).

**DIAGNOSIS:** Carapace longer than wide, covered with crenulate grooves. Anterior margin with six or seven spines on either side of ocular sinus. Setal field with thick lateral elements and concave anterior margin. CG1 with fused posterior lateral elements; CG4 with two short medial elements between longer supralateral elements of CG4; CG5 present as two triangular elements; CG6 and CG7 fused; CG8 complete; CG11 present. Rostrum present.

**DESCRIPTION:** Carapace (fig. 77A) slightly longer than wide. Anterior margin slightly concave on either side of ocular sinus, becoming convex laterally, with several spines (six or seven visible) along length. Rostrum

as small acute tooth. Ocular sinus smoothly concave and unarmed. Frontal region smooth; setal field narrow anteriorly and widening posteriorly; posterior lateral elements reduced to narrow bands of setae. CG1 parallel to anterior margin of carapace, sinuous, strongly crenulate, medial fragment and curved posterior lateral elements united. Mesogastric region smooth; CG2 absent; CG3 broken into four short elements between posterior lateral elements of CG1; CG4 with two short medial elements between longer supralateral elements of CG4. Hepatic region smooth, with oblique setose groove at median of lateral margin. Epi-branchial region generally triangular, smooth; posterolateral margin with three short rows of setae. Metogastric region smooth; CG5 present as two triangular elements anteriorly displaced and overlapping CG4. CG6 strongly crenulate, strongly anteriorly concave medially and sloping out to anteriorly convex lateral thirds. CG7 oblique, united with lateral margins of median segment of CG6. Cardiac region smooth; CG8 present as one long element. CG9 present as two short lateral grooves with gap at midline. CG10 present as two long lateral elements, with gap between fragments. CG11 present as short medial element. Post-CG11 element present.

**DISTRIBUTION:** Known only the type locality.

**TYPE SPECIMEN:** USNM 484530 (holotype).

**TYPE LOCALITY:** USGS 26882, Santee Limestone, M. M. Berkeley Quarry, Berkeley Co., South Carolina, USA.

**REMARKS:** Blow and Manning (1996) correctly noted that this taxon is most similar to *A. cuisiana*. Of the extant taxa, it is most similar to *A. speciosa*, but differs in a number of characters including length of distolateral submarginal groove and fusion of CG6 and CG7.

*Albunea cuisiana* Beschin and De Angeli,  
1984  
Figure 78

*Albunea cuisiana* Beschin and De Angeli, 1984: 97–99, pl. 1, figs. 1, 1a, pl. 2, figs. 1, 1b\*. – De Angeli, 1998: 17–18, fig. 1(2).

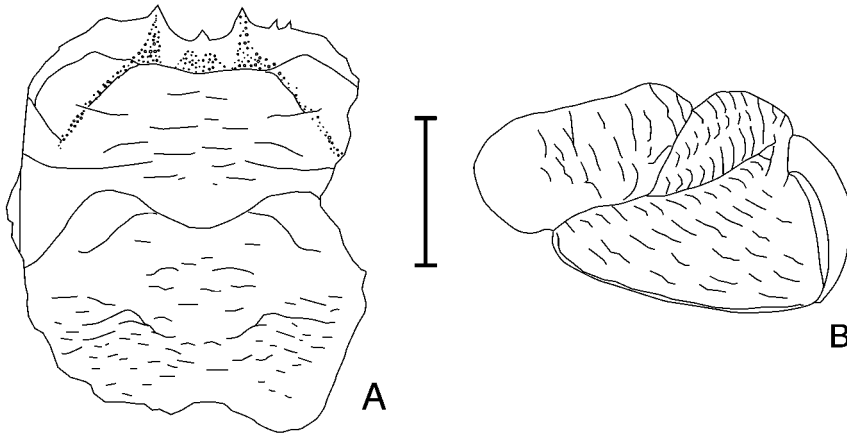


Fig. 78. *Albunea cuisiana* Beschin and De Angeli, 1984: A, 21.1 mm cl, MCSNV 10439, holotype; B, MCSNV, paratype. **A.** Carapace, dorsal view. **B.** Right pereopod I dactylus, propodus, and carpus, lateral view. Scale = 8.6 mm.

**MATERIAL EXAMINED:** **Italy:** Middle Eocene, Valle del Chiampo, Eastern Lessini, coll. unknown: 1 carapace, 21.1 mm cl, holotype (calco-mold of MCSNV 10439).

**DIAGNOSIS:** Carapace as long as wide, covered with crenulate grooves. Anterior margin with few spines on either side of ocular sinus. Setal field with thin lateral elements and produced anterior margin. CG1 with fused posterior lateral elements; CG4 with three or four short, anteriorly displaced, medial elements between longer supralateral elements; CG5 present as two medial elements; CG6 and CG7 fused; CG8 broken; CG11 present. Rostrum present. Pereopod I dactylus dorsal margin smooth; carpus dorsal margin smooth.

**DESCRIPTION:** Carapace (fig. 78A) approximately as wide as long. Anterior margin slightly concave on either side of ocular sinus, becoming convex laterally with large spines along length. Rostrum as small acute tooth. Ocular sinus smoothly concave and unarmed. Frontal region smooth; setal field narrow anteriorly and widening posteriorly; posterior lateral elements reduced to narrow bands of punctations. CG1 parallel to anterior margin of carapace, sinuous, strongly crenulate, divided into medial fragment and curved, posteriorly displaced, lateral elements. Mesogastric region smooth; CG2 present as one or two short medial elements; CG3 broken into one to three short and two

long elements between posterior lateral elements of CG1; CG4 with two or three short, anteriorly displaced, medial elements between longer supralateral elements. Hepatic region smooth, with oblique setose groove at median of lateral margin. Epibranchial region generally triangular, smooth. Metagastric region smooth; CG5 present as two medial elements. CG6 strongly crenulate, strongly anteriorly concave medially and sloping out to anteriorly convex lateral thirds. CG7 oblique, united with lateral margins of median segment of CG6. Cardiac region smooth; CG8 present as one long and two short elements; short elements displaced slightly anteriorly. CG9 present as five short elements alternating between anterior and posterior displacement. CG10 present as two long lateral elements, with two short elements between. CG11 present as two short elements. Post-CG11 element(s) present. Branchial region with numerous short, transverse rows of setae. Posterior margin deeply and evenly convex.

Pereopod I (fig. 78B) subchelate. Dactylus curved and tapering; lateral and mesial surfaces smooth. Propodal lateral surface with numerous short, transverse rows of setose rugae; dorsal margin unarmed; ventral margin distally produced into acute spine (broken); cutting edge lacking teeth. Carpus with dorsodistal angle apparently not produced into strong corneous-tipped spine; lateral surface

with transverse ridges on distal two-thirds of surface.

**DISTRIBUTION:** Known from the type locality as well as Cava "Lovara" and Cava "Boschetto" di Chiampo in Italy (De Angeli, 1998: 18).

**TYPE SPECIMENS:** MCSNV 10439 (holotype), De Angeli Collection (paratype), private collection (paratype).

**TYPE LOCALITY:** Middle Eocene, Valle del Chiampo, Eastern Lessini, Italy.

**REMARKS:** Because accurate generic placement of a species depends on a number of characters obtained from many morphological structures, it is always difficult to place fossil species, especially when they are known from fragmentary material. In the case of *Albunea cuisiana*, it is fortunate that the carapace is well preserved and that additional parts of the animal (part of pereopod I, part of abdomen) are known. I was able to directly examine a "calco-mold" of the holotype specimen carapace, but could not examine the pereopod I, abdomen, or other parts illustrated by Beschin and De Angeli (1984). Based on all available evidence this species appears to be closest to the fossil taxon *A. hahnae* Blow and Manning. It shares with that species a similar arrangement of CG6 and CG7 (fused) and numerous short grooves on the posterior hepatic region, many more than are typical of other species of *Albunea*. Both *A. cuisiana* and *A. hahnae* possess fused anterior and posterior elements of CG1, and a contiguous setal field paralleling this groove. This is marked contrast to all other species of *Albunea* (except *A. speciosa*) where CG1 is separated into distinct anterior and posterior elements.

*Albunea galapagensis*, new species

Figures 79, 80

*Albunea lucasia*: Ramos and Rios, 1995: 103, fig. 5 (not *Albunea lucasia* de Saussure, 1853).

**MATERIAL EXAMINED:** **Ecuador: Galápagos Islands:** Hard coral mud, off north Barranca, Academy Bay, Isla Santa Cruz, 5–10 fms (= 9.1–18.3 m), Feb. 21, 1964, coll. A. DeRoy, J. DeRoy and A. G. Smith: 1 ♀, 7.2 mm cl, paratype (CASIZ 109248); off the Barranca (Angemeyer's Houses), Academy Bay, Isla Santa Cruz, 9.1–18.3 m (5–10 fms),

Jan. 15, 1964, coll. A. G. Smith and J. DeRoy: 1 megalopa, 5.2 mm cl (CASIZ 109337); South Seymour Island, 10 fms (= 18.3 m), March 18, 1937, coll. W. A. Seaholm and F. E. Lewis on R/V "Stranger": 1 ♂, 14.3 mm cl, holotype (USNM 267793); South Seymour Island, 00°26'S, 90°19'W, 10 fms (= 18.3 m), March 18, 1937, coll. W. I. Seaholm on R/V "Stranger": 2 ♂, 7.3–8.3 mm cl, 1 ♀, 15.0 mm cl, allotype and paratypes (USNM 267796).

**Mexico: Baja California Sur:** Isla Espíritu Santo, Baja California Sur, 6–20 fms (= 11.0–36.6 m), March 31, 1939, coll. F. E. Lewis on R/V "Stranger": 1 ♂, 18.4 mm cl, 1 ♀, 15.0 mm cl, paratypes (USNM 267795); Sta. 37, La Vantana Bay, 24°08'15"N, 109°52'W, 13–15 fms (= 23.8–27.4 m), April 20, 1939, coll. F. E. Lewis on R/V "Stranger": 1 ♂, 15.5 mm cl, 3 ♀, 16.8–19.3 mm cl, paratypes (USNM 267797); **Guerero:** Sta. 3, Zihuatanejo, 18–26 fms (= 32.9–47.6 m), Jan. 30, 1939, coll. F. E. Lewis on R/V "Stranger": 2 ♀, unmeasurable (USNM 267794).

**DIAGNOSIS:** Carapace wider than long, covered with strongly setose grooves. Anterior margin with 8–14 spines on either side of ocular sinus. Setal field with thick lateral elements and concave anterior margin. CG1 with separate posterior lateral elements; CG4 medial elements semicontiguous with supralateral elements; CG5 present as two convex, nearly united, elements; CG6 and CG7 separate; CG8 broken; CG11 present. Rostrum present, not reaching posterior margin of ocular plate. Ocular plate subquadrate. Distal peduncular segments dorsoventrally flattened and subtriangular in shape, tapering at tip, separated along mesial margins, lateral margins convex except slightly concave at tip, mesial margins convex. Cornea at tip. Dactylus of pereopod II with heel produced and rounded. Dactylus of pereopod III with heel slightly produced and subquadrate. Dactylus of pereopod IV evenly sinuous from base to tip, with shallow indent. Telson of male subtriangular, elongated and tapering, length greater than width, distal tip narrow and subacute; thickly calcified and raised into ridge dorsomedially, median of ridge lined with long thin setae; lateral margins decalcified.



Telson of female similar to male, but with less tapered tip.

**DESCRIPTION:** Carapace (fig. 79A) wider than long. Anterior margin concave on either side of ocular sinus, becoming convex laterally, with 8–14 large spines ( $n = 6$ ) on each side along length. Rostrum as small acute tooth, not reaching proximal margin of ocular plate. Ocular sinus smoothly concave. Frontal region smooth; setal field narrow anteriorly, broad posteriorly; posterior lateral elements reduced to narrow bands of setae. CG1 parallel to anterior margin of carapace, convex, sinuous, strongly crenulate, divided into medial fragment and curved, posteriorly displaced lateral elements. Mesogastric region smooth; CG2 present as one or two short medial elements; CG3 present as one semicontiguous, long, medial element between posterior lateral elements of CG1 (rarely broken into four shorter elements); CG4 medial elements semicontiguous with supralateral elements (rarely broken into four shorter elements). Hepatic region smooth, with oblique setose groove at median of lateral margin. Epibranchial region generally triangular, smooth; posterolateral margin with three oblique rows of short setae. Metagastric region smooth; CG5 present as two convex, nearly united, elements (rarely broken into four shorter elements). CG6 strongly crenulate, strongly anteriorly concave medially and sloping out to anteriorly convex lateral thirds. CG7 almost transverse, not reaching lateral margins of median segment of CG6. Cardiac region smooth; CG8 present as two medial elements and two longer lateral elements. CG9 present as two short lateral grooves with narrow gap at midline. CG10 present as two long lateral elements. CG11 present as one or two short elements. Post-CG11 element present as one or two short lateral elements. Branchial region with numerous short and long transverse rows of setae in anterior three-fourths. Posterior margin deeply and evenly convex, with submarginal groove reaching halfway up margin of posterior concavity. Branchiostegite with long anterior, submarginal spine; anterior region with scattered short, transverse lines ventral to *linea anomurica*; with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region mem-

branous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 79B) triangular with broad median indentation; median peduncular segments present as small ovate calcified areas lateral to ocular plate. Distal peduncular segments elongate, teardrop-shaped, with broadly convex lateral and weakly convex mesial margins, cornea covering lateral portion of distal tip; lateral margins without notch; mesial margins separated at base; mesial and distolateral margins with long plumose setae; tuft of plumose setae at proximalateral ventral angles and ventrolateral oblique row of plumose setae extending from tuft to three-fourths length of peduncle.

Antennule (fig. 79C) with segment III narrow proximally, expanding distally to three times proximal width; plumose setae on dorsal and ventral margins and scattered on lateral surface; dorsal exopodal flagellum with 74–94 articles ( $n = 6$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with two or three articles ( $n = 6$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with long plumose setae on dorsal and ventral margins and scattered on lateral surface. Segment I as wide as long, unarmed; dorsal third of lateral surface rugose with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 79D) with segment V approximately 2.5 times longer than wide, with long plumose setae on dorsal margin and scattered on distal half of lateral surface; flagellum with seven articles ( $n = 6$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV expanded distally, with long plumose setae on dorsal, ventral, and distal margins, and two rows of short setae on dorsolateral and ventrolateral surface. Segment III with long plumose setae on ventral margin; short simple setae on dorsal margin and scattered on surface. Segment II short, widening distally, rugose, with long plumose setae on dorsal and distoventral margins and short simple setae scattered on lateral surface; antennal acicle long, thin, and reaching distal margin of segment IV, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventro-

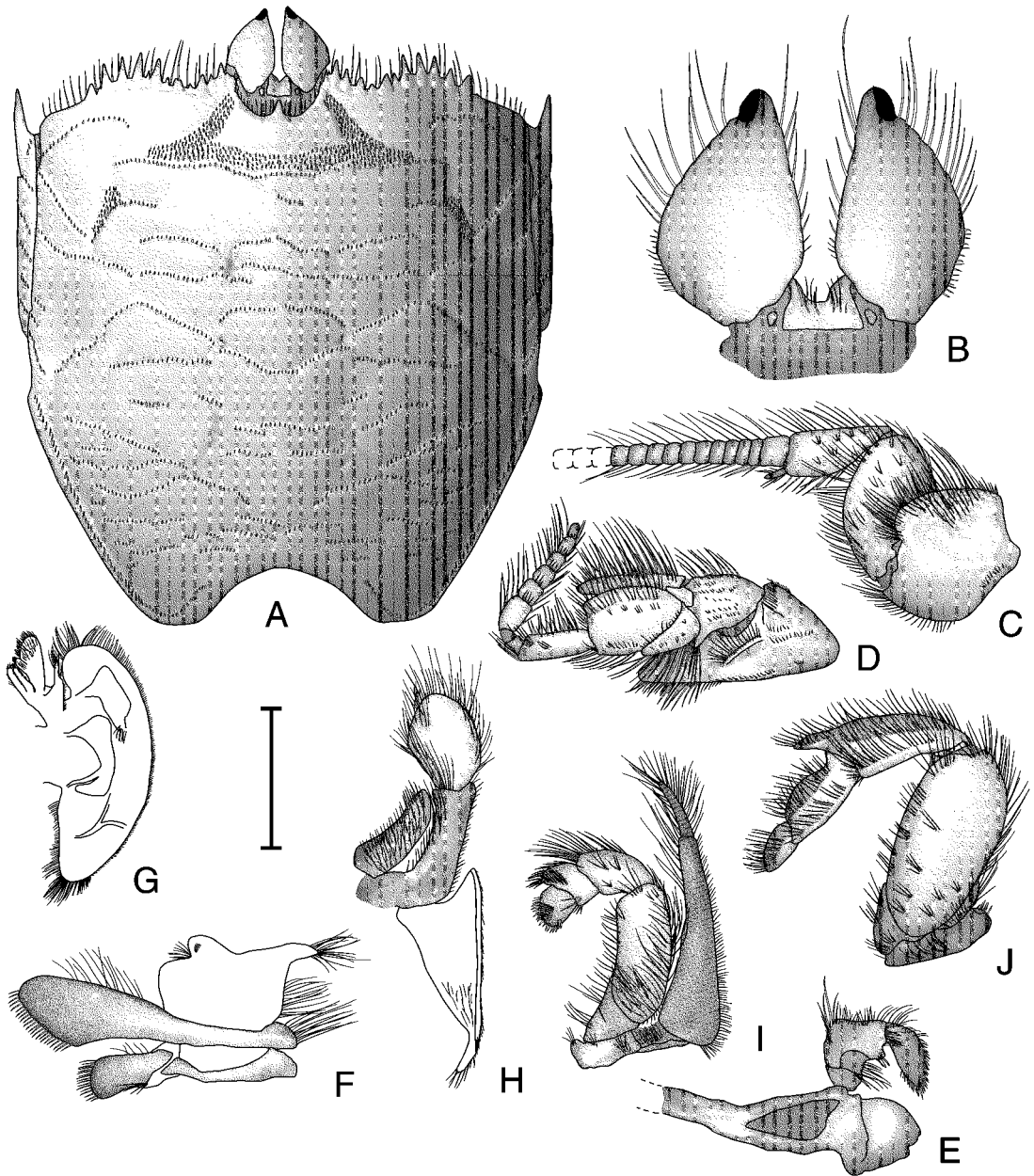


Fig. 79. *Albunea galapagensis*, n. sp.: A–J, ♀, 19.3 mm cl, USNM 267797, paratype. **A.** Carapace, branchiostegite, and ocular peduncles, dorsal view. **B.** Ocular peduncles, dorsal view. **C.** Left antennule, lateral view. **D.** Left antenna, lateral view. **E.** Left mandible, mesial view. **F.** Left maxillule, lateral view. **G.** Left maxilla, lateral view. **H.** Left maxilliped I, lateral view. **I.** Left maxilliped II, lateral view. **J.** Left maxilliped III, lateral view. Scale = 1.7 mm (B), 2.1 mm (F), 3.3 mm (E, I), 4.4 mm (C, D, H, J), 5.9 mm (A), and 6.7 mm (G).

laterally, with long plumose setae on distoventral margin, short plumose setae on distodorsal margin, and short simple setae in two short rows on surface rugae ventral to spine; lateral surface with distal, subdorsal, acute spine; low semicircular dorsolateral lobe ventrodorsal to spine, margin of lobe with long plumose setae; segment with ventromesial antennal gland pore.

Mandible (fig. 79E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment and on distal margin of terminal segment.

Maxillule (fig. 79F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin simple setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under; internal lobe reduced with three thick setae at distolateral margin.

Maxilla (fig. 79G) exopod evenly rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 79H) epipod with plumose setae on margins, distolateral surface and mesial surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel with plumose setae; distal segment spatulate, longer than wide, broadest medially, margins and mesiodorsal surface with long plumose setae. Endopod flattened and elongate, reaching two-thirds to distal end of proximal exopodal segment; plumose setae on margins and median of lateral surface.

Maxilliped II (fig. 79I) dactylus evenly rounded, length subequal to width, with thick simple setae distally and in transverse row on distolateral surface. Propodus two times wider than long, slightly produced at dorsodistal angle, with plumose setae on dorsal margin and patch of long simple setae on dorsodistal and ventrodorsal angles. Carpus not produced dorsodistally, approximately two times longer than wide; long simple setae on dorsal margin and in few patches on lateral surface. Merus approximately three times longer than wide, margins parallel;

with simple and plumose setae on margins. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-half longer than merus, flagellum with one elongate article, shorter than carpus.

Maxilliped III (fig. 79J) dactylus oblong, with rounded tip; long plumose setae on margins and in transverse row on distolateral surface. Propodus dorsodistally inflated, with longitudinal median row of plumose setae on lateral surface; margins with plumose setae. Carpus produced onto propodus approximately one-fourth length of propodus; lateral surface with two transverse rows of long plumose setae; long plumose setae on dorsal margin. Merus inflated, unarmed, with plumose setae on dorsal margin and few scattered small areas on proximoventral half of lateral surface. Basis-ischium incompletely fused, with weak crista dentata of two or three teeth. Exopod two-segmented: proximal segment small; distal segment styloform, tapering, approximately one-fourth length of merus; with plumose setae on margins; without flagellum.

Pereopod I (fig. 80A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose setae; ventral margin with short simple setae. Propodal 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; dorsal margin with long plumose setae, ventral margin with short simple setae; mesial surface with few scattered rows of short plumose setae. Carpus with dorsodistal angle produced into strong corneous-tipped spine; dorsal margin with short transverse grooves behind spine; dorsal, distal, and distoventral margins with long plumose setae; lateral surface with small distal rugose area, few transverse setose ridges on distal half of surface; mesial surface smooth, with medial and subdorsal interrupted transverse rows of setae, margins with long plumose setae. Merus unarmed; lateral surface with scattered transverse rows of long plumose setae, distal margin with long plumose setae; mesial surface with few scattered short setae; fully calcified. Basis-ischium incompletely fused, unarmed. Coxa unarmed.



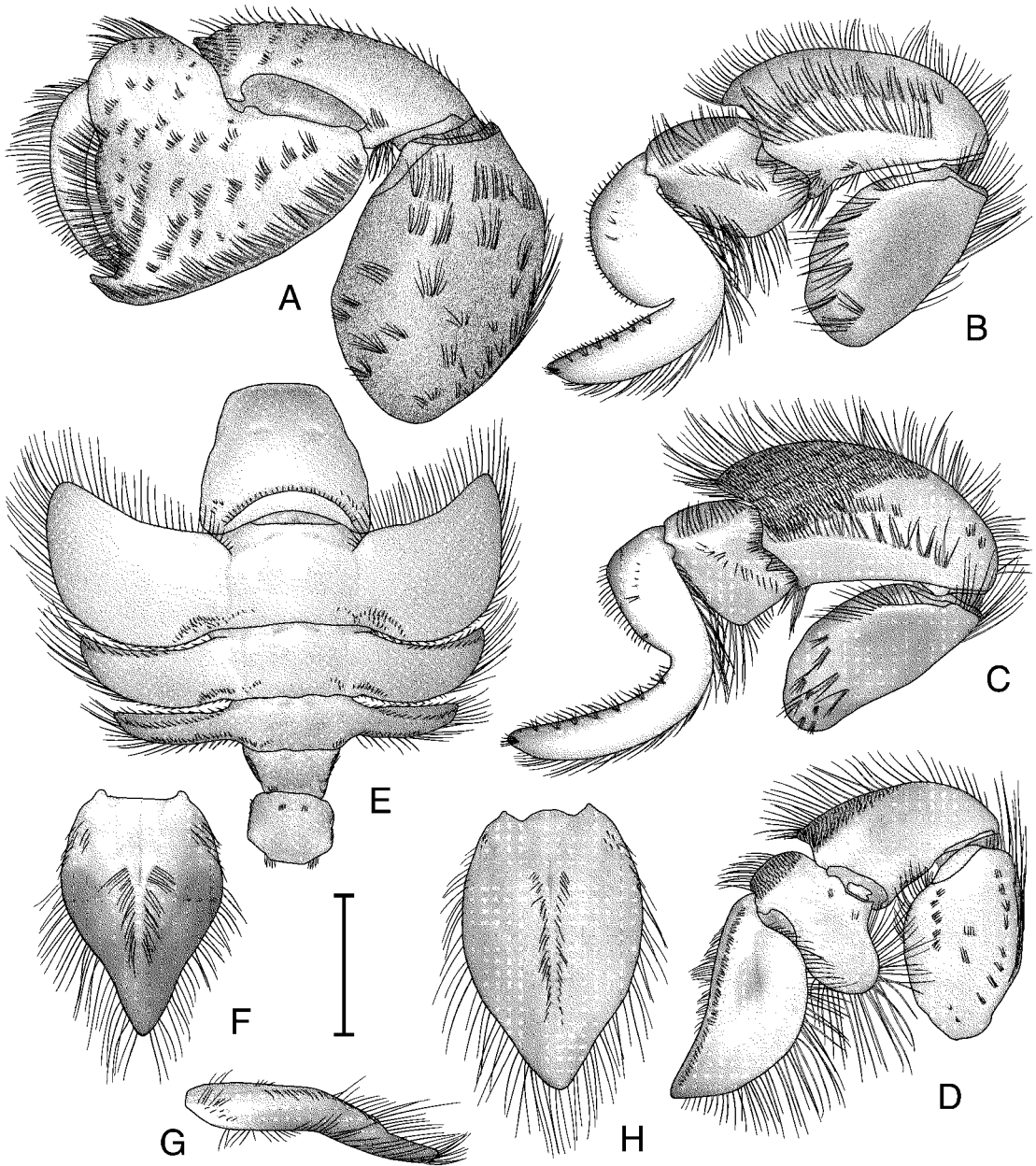


Fig. 80. *Albunea galapagensis*, n. sp.: A-E, H, ♀, 19.3 mm cl, USNM 267797, paratype; F, G, ♂, 15.5 mm cl, USNM 267797, paratype. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I-VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♂, lateral view. H. Telson of ♀, dorsal view. Scale = 3.3 mm (F-H) and 4.4 mm (A-E).



Pereopod II (fig. 80B) dactylus smooth; base to heel slightly convex, heel low and rounded, heel to tip with narrow, acute indent, tip subacute, tip to base broadly convex; lateral surface smooth, with several small tufts of short setae in generally 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 simple setae, patch of long plumose setae at base. Propodal dorsal surface smooth, with ventral margin inflated and rounded; oblique rows of long plumose setae on distal margin of lateral surface and in midline; distal and ventral margins with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with 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 strongly produced and subacute dorsodistally, dorsal margin smooth; lateral surface smooth, dorsodistal region smooth, irregular, interrupted row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; dorsal and distoventral margins with long plumose setae; mesial surface smooth, with row of long plumose setae distally and subventrally and interrupted row of long plumose setae subdorsally. Merus with large median decalcified window covering nearly all of lateral surface, long plumose setae on dorsodistal and ventral margins; mesial surface nearly smooth, with two long rows of long plumose setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 80C) dactylus with base to heel slightly convex, heel low and rounded, heel to tip with broadly concave indent, tip subacute, tip to base smoothly convex; lateral surface smooth, with several small tufts of short setae in generally straight line across medioproximal surface, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface

smooth, with long plumose setae in oblique medial row, simple setae on dorsal margin, plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened; mesial surface smooth. Carpus produced dorsodistally, exceeding proximal margin of propodus by one-fifth length of propodus; tip rounded, dorsolateral margin unarmed; lateral surface slightly rugose in dorsodistal half, with mat of short setae and two interrupted rows of long plumose setae ventrally in proximal half; mesial surface smooth, with long plumose setae on distal margin. Merus smooth, with large decalcified window covering nearly all of lateral surface medially; dorsal and ventral margins unarmed, dorsodistal and ventrodorsal margins with long plumose setae, few long plumose setae on lateral surface in proximal third; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female with large gonopore on anterior mesial margin of coxa, directly opposing other pore and surrounded with short plumose setae; male with minute pore.

Pereopod IV (fig. 80D) dactylus with base to tip slightly convex proximally, with indistinct heel and faintly concave indent, almost straight from indent to tip, tip subacute, tip to base convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge, with row of short setae; setose punctations ventral to decalcified window. Propodus expanded dorsally and ventrally; ventral expansion exceeding ventral margin of dactylus, ventral margin with long plumose setae; dorsal expansion with row of long plumose setae dorsally, oblique area with mat of short simple setae; lateral surface smooth, mesial surface smooth, with few patches of long plumose setae on distoventral area. Carpus slightly produced dorsodistally; ventral four-fifths of lateral surface and mesial surface smooth, dorsodistal one-fifth of lateral surface with mat of short setae; dorsal margin with short simple and long plumose setae; ventral margin with few short simple setae; mesial surface decalcified medially. Merus with scattered short transverse and oblique rows of setae on lateral surface, dorsal and

ventrodistal margins with long plumose setae; proximoventral third of mesial surface with large decalcified window. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 80E) somite I wider than long, widest posteriorly; dorsal surface with anterior margin straight; posterior margin curved, with elevated submarginal row of short setae; few scattered short, simple setae distolateral to submarginal row; small transverse, decalcified windows laterad of segment median. Somite II dorsal surface with irregular submarginal, transverse ridge anteriorly; with small transverse, decalcified windows laterad of segment median just anterior to submarginal ridge; pleura expanded and directed anterolaterally; anterolateral margins angled, anterior and lateral margins with long plumose setae, posterolateral angle rounded, posterior margin with short setae; postero-mesial angle with mat of short simple setae extending onto somite. Somite III similar to somite II, but narrower, shorter, anterior submarginal windows present; pleura thinner and shorter than on somite II, directed posterolaterally proximally and anterolaterally distally, with setae as in somite II; anterolateral angle subacute; dorsal surface obliquely flattened anterolaterally, with submarginal row of short setae. Somite IV similar to somite III, but thinner and shorter, anterior submarginal windows present; pleura thinner and shorter than on somite III, directed laterally; dorsal surface obliquely flattened anterolaterally; lateral and posterior margins with long plumose setae, anterior margin with short simple setae. Somite V wider than somite IV, anterior submarginal windows present; lateral margins with plumose setae; pleura absent. Somite VI slightly broader than somite V, anterior submarginal windows present; dorsal surface with two short transverse rows of setae laterad of midline and on posterior margin; pleura absent.

Females with uniramous, paired pleopods on somites II–V; males without pleopods.

Telson of male (fig. 80F, G) subtriangular, elongated, and tapering, length greater than width, distal tip narrow and subacute; thickly calcified medially, inflated dorsomedially; distal two-thirds with lateral decalcified region; median longitudinal groove extending

one-half length, row of long simple setae of either side of median groove beginning at median and continuing to distal margin of calcified area, converging distally; proximo-lateral angles with short simple setae; margins with long simple setae. Telson of female (fig. 80H) similar to male, but with less tapered distal tip and less pronounced lateral expansion, dorsal surface evenly calcified; median groove similar to male, but with shorter setae; proximolateral angle with few short simple setae, margins with long simple setae.

**DISTRIBUTION:** Known from the Galápagos Islands, Baja California Sur (Gulf side), and Guerrero, Mexico, in 9.1–47.6 m depth. Also from Colombia (Ramos and Rios, 1995).

**MAXIMUM SIZE:** Males: 18.4 mm cl; females: 19.3 mm cl.

**TYPE SPECIMENS:** USNM 267793 (holotype), CASIZ 109248 (paratype), USNM 267796 (allotype, 2 paratypes), USNM 267795 (paratype), USNM 267797 (3 paratypes).

**TYPE LOCALITY:** South Seymour Island, Galápagos Islands, Ecuador, 18.3 m.

**ETYMOLOGY:** This taxon is named after the type locality islands which served as Darwin's inspiration and have yielded so many important discoveries in the biological sciences.

**REMARKS:** The discovery of this species in both the Galápagos Islands and the Gulf of California demonstrates how much we have yet to learn about these highly diverse areas, in spite of many decades of intensive collecting. This species shares its distributional pattern with numerous other species of Galápagos anomurans that are also known from the Panamic province, such as the porcelain crabs *Petrolisthes haigae* Chace and *P. tonsorius* Haig, and possibly the sand crab, *Lepidopa wollebaeki*, if that species and *L. mexicana* are conspecific (see under *L. wollebaeki* and *L. mexicana*).

*Albunea galapagensis* belongs to the group of *Albunea* containing *A. microps* and *A. elioti*.

*Albunea microps* Miers, 1878

Figures 81, 82

*Albunea microps* White, 1847: 129\* (nomen nudum). – Miers, 1878: 328–329, pl. 5, figs. 12,

13\*. – Henderson, 1888: 40\*. – Ortmann, 1896: 224–225 (list). – Ortmann, 1901: pl. 72, fig. 4, pl. 79, fig. 3. – Borradaile, 1904: 751\*. – Gordon, 1938: 187, fig. 3c\*. – Serène and Umali, 1965: 95–97, pl. 4, figs. 1–6, text-fig. 12c. – Thomassin, 1969: 140–143 (part), text-figs. 2, 3b. – Miyake, 1978: 154–155, fig. 60b. – Coêlho and Calado, 1987: 43, table 1. – Calado, 1997a: 17, 21–22. – Markham and Boyko, 1999: 5, 7\*. – Boyko and Harvey, 1999: 383–386, 400 (list), 402 (key), figs. 1, 4\*. – Boyko, 1999: 145 (list), fig. 1\*. – Clark and Presswell, 2001: 154 (list).

*Albunea* [sp.] Gordon, 1938: 189–190, fig. 1d\*.  
*Albunea symnista* [sic]: Serène, 1977: 47. – Calado, 1995: 71–73, pl. 4, fig. i, pl. 5, fig. h, pl. 21, figs. a, b, pl. 22, figs. a–f\* (not *Albunea symnista* (Linnaeus, 1758)).  
 not *Albunea microps*: Thomassin, 1969: 140–143 (part), pl. 2, figs. 1–9. – Calado, 1995: 46–49, pl. 4, fig. e, pl. 5, fig. d, pl. 12, figs. a–f (= *Albunea elioti* Benedict, 1904).

**MATERIAL EXAMINED: Zanzibar:** Dredged in muddy sand, around Bawi and Change Islands, off Zanzibar City, 6–16 fms (= 11.0–29.3 m), Feb. 27, 1957, coll. A. J. Ostheimer III: 1 ♀, 10.9 mm cl (ANSP CA4646); Sta. 650, dredged in shell and sponge, approximately 1.5 mi east of Puopu Island, 7–9 fms (= 12.8–16.5 m), Feb. 20, 1957, coll. A. J. Ostheimer III: 1 ♀, 12.8 mm cl (ANSP CA4647).

**Oman:** Muscat, 10–15 fms (= 18.3–27.4 m), coll. unknown: 1 ♂, 7.8 mm cl (BMNH 1901.4.20.10).

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

**Maldives:** Mahlosmadulu Atoll, 20 fms (= 36.6 m), pre-1900, coll. J. S. Gardiner: 2 ♀, 4.6–4.7 mm cl (UMZC).

**Philippines: Sulu Archipelago:** “Sooloo Islands, Eastern Seas,” coll. unknown: 1 ♂, 11.3 mm cl, holotype (BMNH 1937.6.7.3); Sta. 212, 06°54′N, 122°18′E, 10 fms (= 18.3 m), Jan. 30, 1875, coll. R/V “Challenger”: 1 ♂, 9.5 mm cl (ZMUC 2715 ex BMNH), 1 unsexable, unmeasurable specimen (MNHN-Hi 11 ex BMNH); south lagoon, Sibutu, 04°31′N, 119°22′E, 12 fms (= 21.9 m), Feb. 25–26, 1964, coll. B. R. Wilson on “Pele”: 1 ♀, 12.0 mm cl (WAM 10408); south lagoon, Sibutu, 04°31′N, 119°22′E, 13 fms (= 23.8 m), Feb. 25, 1964, coll. B. R. Wilson

on “Pele”: 1 ♂, 9.1 mm cl, 1 ♀, 10.1 mm cl (WAM 10409); south lagoon, Sibutu, 04°31′N, 119°22′E, 9–13 fms (= 16.5–23.8 m), Feb. 25–26, 1964, coll. B. R. Wilson on “Pele”: 1 ♂, 8.6 mm cl (WAM 10416); west of Pearl Bank, 9–12 fms (= 16.5–21.9 m), Feb. 21, 1964, coll. B. R. Wilson on “Pele”: 1 ♂, 4.9 mm cl (WAM 10412), 1 ♂, 10.2 mm cl (ZRC 1970.11.3.1); 2.5 mi and 358° from Malanipa Island, Basilan Straits, 15 fms (= 27.4 m), Feb. 12, 1964, coll. B. R. Wilson on “Pele”: 2 ♂, 8.2–10.8 mm cl, 1 oviger, 10.0 mm cl (WAM 10417).

**India: Andaman Islands:** Port Blair, coll. unknown: 2 ♂, 6.2–6.7 mm cl (BMNH 1956.1.14.20).

**Indonesia:** Corindon II, Sta. DR293, 02°37.7′S, 117°49.4′E, Makassar, 45.0 m, Nov. 10, 1980, coll. R/V “Coriolis”: 1 oviger, 12.1 mm cl (MNHN-Hi 201).

**New Guinea:** Sta. 549, east coast of Rouw Island, Aoeri Group, West Geelrinck Bay, Feb. 23, 1956, coll. A. F. Ostheimer on “Gloria Maris”: 1 ♂, 11.2 mm cl (RMNH 23641).

**Australia: Queensland:** Michaelmas Cay, Great Barrier Reef, north of Cairns, Sept. 14, 1963, coll. W. Goode: 1 ♂, 11.6 mm cl (WAM 23385); Cape Sandwich, north of Townsville, 10 fms (= 18.3 m), Nov. 1963, coll. W. Goode: 1 unsexable specimen, 10.4 mm cl (WAM 23388); Cairns Reef near Cooktown, Oct. 1, 1963, coll. W. Goode: 1 ♂, 11.4 mm cl (WAM 23400); Rudder Reef off Mossman, 16°11′S, 145°40′E, 30 m, Oct. 21, 1973, coll. R. J. Plant: 2 ♂, 6.6–11.0 mm cl, 4 ♀, 6.2–13.0 mm cl (MOV J14553), 1 ♀, 15.7 mm cl (MOV J40128 ex MOV J14553); Rudder Reef, 30 mi northeast of Mossman, 16°11′S, 145°40′E, 3.1 m, Oct. 21, 1973, coll. R. J. Plant: 1 ♂, 11.0 mm cl (MOV J44734); Rudder Reef, 30 mi northeast of Mossman, 16°11′S, 145°40′E, 3 m, Oct. 1973, coll. R. J. Plant: 2 ♂, 5.9–6.4 mm cl (MOV J44735); Michaelmas Reef, 16°35′S, 146°00′E, Jan. 1964, coll. D. Beckworth: 1 ♀, 12.9 mm cl (MOV J44727); north edge of reef around coral patches, 1.25 mi from east end of cay, Michaelmas Reef, 15 ft (= 4.5 m), Oct. 14, 1965, coll. Australian Museum Party: 2 ♂, 10.4–10.6 mm cl, 1 ♀, 10.2 mm cl (AM P19646); Lizard Island, near Cooktown, 4 m, May 26–June 4, 1975, coll. G. Anderson: 1 ♀, 12.3 mm cl

(AM P20648); Little Trunk Reef, 18°20'S, 146°46'E, 9.1–12.2 m, Nov. 5, 1990, coll. K. Lamprell: 1 ♂ 10.0 mm cl, 2 ♀, 10.2–11.7 mm cl (QM W17460).

**New Caledonia:** Sta. DW 1390, 18°27.5'S, 163°08.7'E, 38 m, May 11, 1999, coll. "Alis" Campagne SURPRISES (B. Richer De Forges): 1 ♂, 9.7 mm cl (MNHN-Hi 261).

**DIAGNOSIS:** Carapace longer than wide, covered with strongly setose grooves. Anterior margin with 8–11 spines on either side of ocular sinus. Setal field with thick lateral elements and straight anterior margin. CG1 with separate posterior lateral elements; CG4 fragmented, median element displaced anteriorly; CG5 entire; CG6 and CG7 united; CG11 present. Rostrum present, exceeding posterior margin of ocular plate by approximately one-half length of ocular plate. Ocular plate subquadrate. Distal peduncular segments dorsoventrally flattened and oblong in shape, rounded at tip, approximated along distal two-thirds of mesial margins, lateral margins convex except at concave tip, mesial margins convex. Cornea on lateral margin at tip. Dactylus of pereopod II with heel produced and rounded. Dactylus of pereopod III with heel produced and rounded. Dactylus of pereopod IV evenly sinuous from base to tip, with shallow indent. Telson of male broadly triangular, inflated dorsally, broadly rounded at tip, strongly calcified proximally, large decalcified area on either side of thin medial calcified strip, long thin setae medially and along anterior margin of windows. Telson of female flattened, ovate, longitudinal row of short, thin setae medially.

**DESCRIPTION:** Carapace (fig. 81A) slightly wider than long. Anterior margin slightly concave on either side of ocular sinus, becoming convex laterally, with 8–11 large spines ( $n = 5$ ) along length. Rostrum as small acute tooth, extending halfway across the ocular plate. Ocular sinus smoothly concave and unarmed. Frontal region smooth; setal field broad anteriorly and posteriorly; posterior lateral elements lacking. CG1 parallel to anterior margin of carapace, faintly sinuous, strongly crenulate, divided into medial fragment and curved, posteriorly displaced, lateral elements. Mesogastric region smooth; CG2 present as one or two short me-

dial elements; CG3 broken into one to five short and one or two long elements between posterior lateral elements of CG1; CG4 with one short, anteriorly displaced, medial element and two longer lateral elements spaced approximately equally between longer supralateral elements of CG4. Hepatic region smooth with oblique setose groove at median of lateral margin. Epibranchial region generally triangular, smooth; posterolateral margin with three short rows of setae. Metagastric region smooth; CG5 entire. CG6 strongly crenulate, strongly anteriorly concave medially and sloping out to anteriorly convex lateral thirds. CG7 oblique, almost reaching lateral margins of median segment of CG6. Cardiac region smooth; CG8 present as three long elements. CG9 present as two short lateral grooves with gap at midline. CG10 present as two long lateral fragments, with gap between fragments, short line anterior to CG11 may be posteriorly displaced medial fragment of CG10. CG11 present as one or two short elements. Branchial region with numerous short, transverse rows of setae. Posterior margin deeply and evenly convex, with submarginal groove reaching less than one-third up margin of posterior concavity. Branchiostegite with short anterior submarginal spine; anterior region with scattered short, transverse lines ventral to *linea anomurica*; with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 81B, C) subquadrate, with shallow median indentation; median peduncular segments present as small ovate, calcified areas lateral to ocular plate. Distal peduncular segments irregularly oblong, with convex lateral and mesial margins, cornea located laterally on produced tip; mesial margins approximated along distal two-thirds; mesial and lateral margins with long plumose setae; tuft of plumose setae at proximolateral ventral angle and medial row of plumose setae extending from tuft to base of cornea.

Antennule (fig. 81D) with segment III narrow proximally, expanding distally to two times proximal width; with plumose setae on dorsal and ventral margins and sparsely scattered on lateral surface; dorsal exopodal fla-



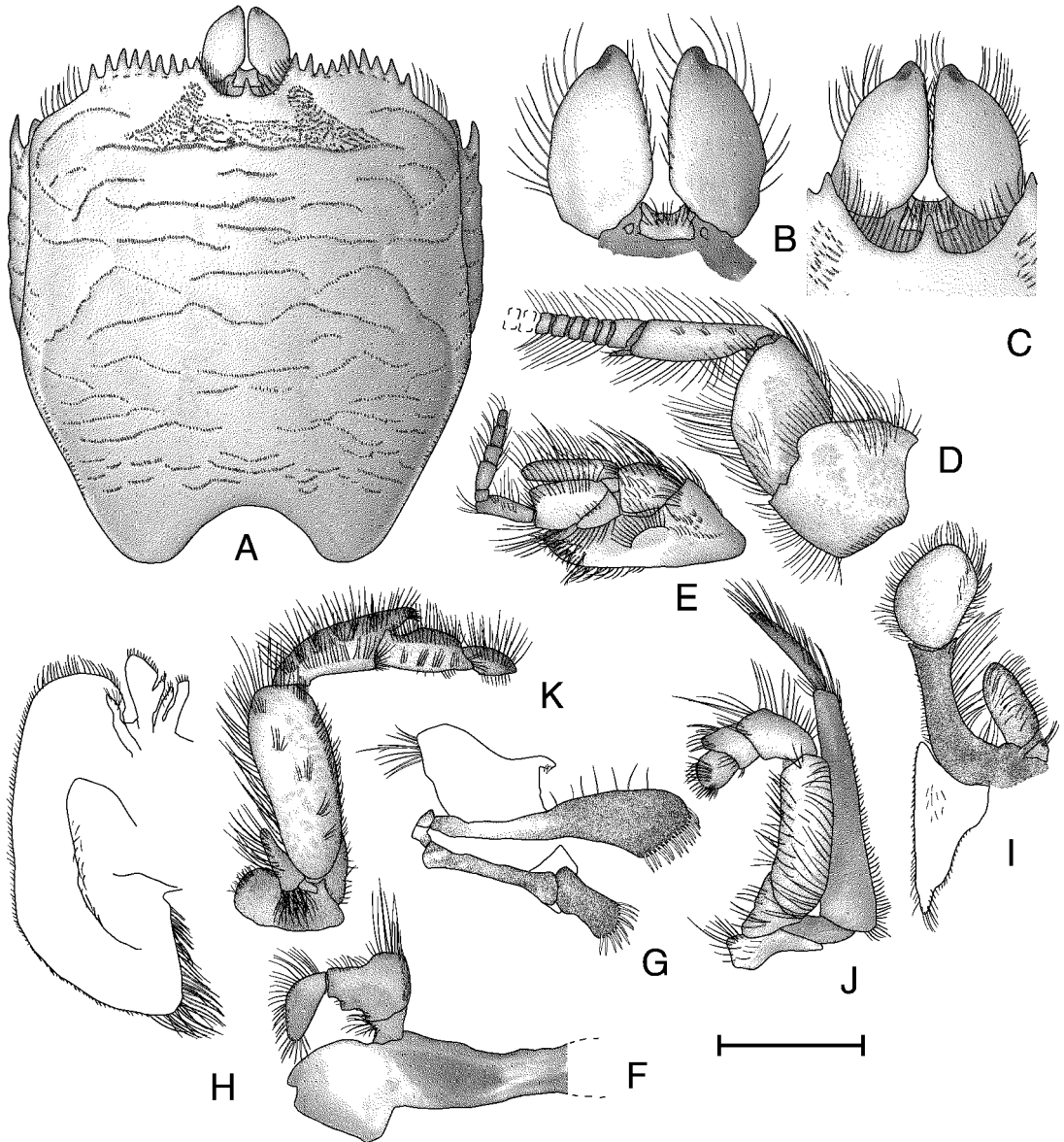


Fig. 81. *Albunea microps* Miers, 1878: A, C, oviger, 12.1 mm cl, MNHN Hi-201; B, D–K, ♂, 11.0 mm cl, MOV J44734. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Ocular peduncles, dorsal view. D. Left antennule, lateral view. E. Left antenna, lateral view. F. Right mandible, mesial view. G. Right maxillule, lateral view. H. Right maxilla, lateral view. I. Right maxilliped I, lateral view. J. Left maxilliped II, lateral view. K. Right maxilliped III, lateral view. Scale = 1.6 mm (C, G), 2.2 mm (B, F, J), 3.3 mm (D, E, H, I, K), and 4.4 mm (A).

gellum with 55–75 articles ( $n = 5$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum short, with two articles ( $n = 5$ ) and plumose setae on dorsal and ventral margins. Segment II medially in-

flated from dorsal view, with plumose setae on dorsal and ventral margins and scattered on ventrolateral third of surface. Segment I wider than long, unarmed; dorsal third of lateral surface rugose, with long plumose setae;

long plumose setae on dorsal and ventral margins.

Antenna (fig. 81E) with segment V approximately 2.5 times longer than wide, with long plumose setae on dorsal margin and scattered on lateral surface; flagellum with five or six articles ( $n=5$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV expanded distally, with long plumose setae on dorsal, ventral and distal margins, and row of setae on dorsolateral surface. Segment III with long plumose setae on dorsal and ventral margin and in short row on surface. Segment II short, widening distally, rugose, with plumose setae on margins and scattered on lateral surface; antennal acicula long, thin, and just exceeding distal margin of segment IV, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventrolaterally, with long plumose setae on margins and scattered on surface rugae behind spine; lateral surface with acute spine dorsally, low semicircular dorsolateral lobe ventrodorsal to spine; segment with ventromesial antennal gland pore.

Mandible (fig. 81F) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment and on distal margin of terminal segment.

Maxillule (fig. 81G) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin simple setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under; internal lobe reduced, with two thick setae at distolateral margin.

Maxilla (fig. 81H) exopod evenly rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 81I) epipod with plumose setae on margins, distolateral surface, and mesial surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments: proximal segment narrow, margins parallel, margins with plumose setae; distal segment spatulate, longer than wide, broadest medially, margins and mesioventral surface with long plumose setae. Endopod flattened and elongate, reaching

two-thirds of distance to distal end of proximal exopodal segment; plumose setae on margins and median of lateral surface.

Maxilliped II (fig. 81J) dactylus evenly rounded, length equal to width, with thick simple setae distally and on distolateral surface. Propodus two times wider than long, slightly produced at dorsodistal angle, with plumose setae on dorsal margin and patch of long simple setae on lateral surface and ventrolateral angle. Carpus not produced dorsodistally, approximately two times longer than wide; long simple setae on dorsal and distal margins. Merus approximately three times longer than wide, margins parallel; with simple and plumose setae on margins and scattered on surface. Basis-ischium incompletely fused with plumose setae on margins. Exopod one-third longer than merus, flagellum with one elongate article.

Maxilliped III (fig. 81K) dactylus with rounded tip; long plumose setae on margins and lateral surface. Propodus slightly inflated medially, with longitudinal median row of plumose setae on lateral surface; margins with plumose setae. Carpus produced onto propodus almost one-half length of propodus; lateral surface with two rows of plumose setae on surface; plumose setae on margins. Merus inflated, unarmed, with plumose setae on margins and scattered on lateral surface. Basis-ischium incompletely fused, with weak crista dentata of two or three teeth. Exopod two-segmented: proximal segment small; distal segment styloform, tapering, approximately one-half length of merus; with plumose setae on margins; without flagellum.

Pereopod I (fig. 82A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin proximally rugose, with long plumose and short simple setae; ventral margin with short simple setae. Propodal 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; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle produced into strong corneous-tipped spine; dorsal margin with short transverse grooves behind spine; dorsal and distal margins with long plumose setae; lateral surface with

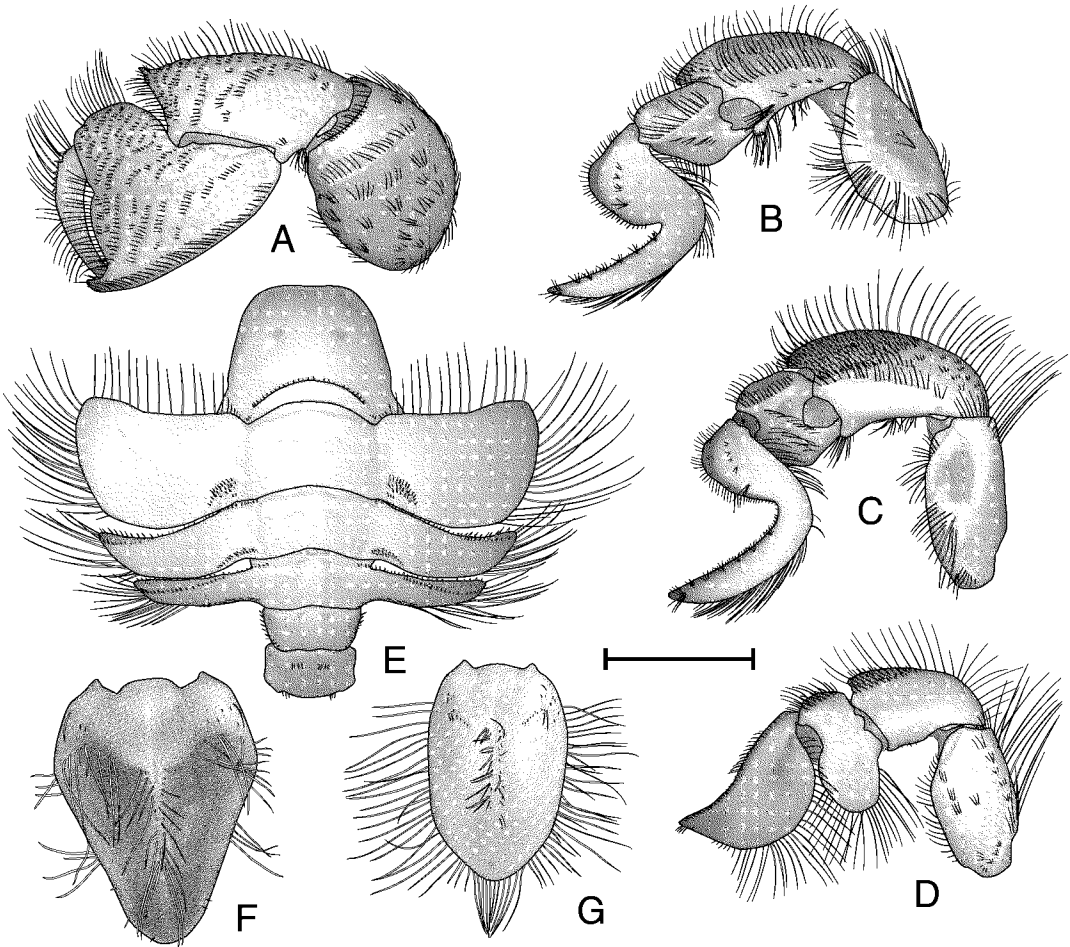


Fig. 82. *Albunea microps* Miers, 1878: A–D, ♂, 11.0 mm cl, WAM J44734; E, ♂, 10.4 mm, AM P19646; F, ♂, 11.3 mm cl, BMNH 1937.6.7.3, holotype; G, oviger, 12.1 mm cl, MNHN Hi-201. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I–VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 2.2 mm (F), 3.3 mm (E, G), and 4.4 mm (A–D).

small distal rugose area, with few transverse setose ridges on distal half of surface; mesial surface smooth, with medial transverse row of 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 scattered setae; fully calcified. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 82B) dactylus smooth; base to heel slightly concave, heel smoothly rounded, slightly produced, heel to tip with wide, acute indent, tip acute, tip to base

broadly convex; lateral surface smooth, with several small tufts of short setae in generally 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 simple setae, with patch of long plumose setae at base. Propodal dorsal surface smooth, with ventral margin inflated and rounded; oblique row of long plumose setae on distal margin of lateral surface; distal and ventral margin with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with 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 and gently rounded dorsodistally, dorsal margin unarmed; lateral surface smooth, with setose mat on produced area and irregular, interrupted row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; margins with long plumose setae; mesial surface smooth, with row of long plumose setae subdorsally. Merus with large median decalcified window covering nearly all of lateral surface, with few scattered setae on surface and margins; mesial surface nearly smooth, with two long rows of setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 82C) dactylus with base to heel straight, heel broadly rounded and low, heel to tip with broadly concave indent, tip acute, tip to base smoothly convex; lateral surface smooth, with several small tufts of short setae in generally straight line across medioproximal surface, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth with plumose setae proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface smooth, with long plumose setae in oblique row, simple setae on dorsal margin; dorsolateral surface narrow, oblique, flattened, with setose mat; mesial surface with scattered long setae on and near distal margin, and in oblique row on surface. Carpus produced dorsodistally, only slightly exceeding proximal margin of propodus; dorsolateral margin unarmed; lateral surface slightly rugose dorsodistally, with mat of short setae and row of setae ventrally; mesial surface smooth, with long plumose setae on margins. Merus smooth, with large decalcified window covering nearly half of lateral surface medially; dorsal and ventral margins unarmed, with long plumose setae; distolateral margin with long plumose setae; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa of male with small anteromesial spine; coxa of female unarmed. Female with large gonopore on anterior mesial margin of coxa, surround-

ed with short plumose setae; male without pore.

Pereopod IV (fig. 82D) dactylus with base to tip convex to concave, tip acute, tip to base convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge with row of short setae; with setose punctations ventral to decalcified window. Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, margin with long plumose setae; dorsal expansion with row of long plumose setae dorsally, oblique area with mat of short simple setae; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; ventral three-fourths of lateral surface and mesial surface smooth, dorsodistal quarter of lateral surface with mat of short setae; dorsal margin with short simple and long plumose setae; ventral margin with short simple setae; mesial surface partially decalcified medially. Merus lateral surface with scattered short transverse rows of setae, dorsal and ventrodorsal margins with long plumose setae; proximoventral third of mesial surface with large decalcified window. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 82E) with somite I wider than long, widest posteriorly; dorsal surface with anterior margin straight; posterior margin curved, with elevated submarginal row of short setae; small transverse decalcified windows laterad of segment median. Somite II dorsal surface with submarginal transverse ridge anteriorly; with small transverse decalcified windows laterad of segment median just anterior to submarginal ridge; pleura expanded and directed anterolaterally; lateral margins rounded, anterior and lateral margins with long plumose setae, posterior margin with short setae; posteromesial angle with mat of short simple setae. Somite III similar to somite II, but narrower, shorter; pleura thinner and shorter than on somite II, directed posterolaterally, 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 few short setae anterolaterally; pleura thinner and shorter



than on somite III, directed posterolaterally; 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 slightly broader than somite V; dorsal surface with short transverse rows of setae laterad of midline and posteriorly; pleura absent.

Females with uniramous, paired pleopods on somites II–V; males without pleopods.

Telson of male (fig. 82F) broadly triangular, longer than wide, with broadly rounded tip; proximal third thickly calcified, inflated dorsally; distal two-thirds with large decalcified windows laterad of thin medial calcified strip, margins of windows with long simple setae; median longitudinal groove extending one-half length; proximolateral angles with patch of short simple setae; margins with long simple setae. Telson of female (fig. 82G) flattened, ovate, and evenly calcified; median groove similar to male but flanked along distal half by long thin simple setae; proximolateral angle with patch of setae, margins with long simple setae.

**DISTRIBUTION:** From Zanzibar and Madagascar north to Oman and eastward to the Philippines and New Caledonia, in 3–45 m depth. Also reported from Japan (Miyake, 1978).

**MAXIMUM SIZE:** Males: 11.6 mm cl; females: 15.7 mm cl.

**TYPE SPECIMEN:** BMNH 1937.6.7.3 (holotype).

**TYPE LOCALITY:** “Sooloo Island” (= Sulu Archipelago, Philippines).

**REMARKS:** Although it is surprising that two of three specimens of the type series of *A. microps* reported by Henderson (1888) were transferred from BMNH to other museums, this was apparently common practice with much of the “Challenger” material (Lingwood, 1981).

Thomassin’s (1969) material of “*Albunea microps*” from Madagascar was a mixture of that species and *A. elioti*. This is clearly shown by his illustrations, as figures 2 and 3b are *A. microps*, while all of the figures on plate 2 are *A. elioti* (see also Boyko and Harvey, 1999). How many specimens of each taxon were present in Thomassin’s (1969) samples is unknown, as he did not deposit any specimens in the MNHN or any other

institution, and they cannot be examined. Thomassin’s (1969: text-fig. 12) distribution map is correct for the localities marked, but the species spans a wide geographic range between Madagascar and Samoa. The Japanese name for this species is “Togenashi-Kudahigegani” (Asakura, personal commun.).

It is obvious from the illustrations of Calado (1995) that the specimens she examined and cited as *A. “symnista”* are *A. microps*. This was confirmed by direct examination of those specimens. As discussed further under *A. symmysta*, this misidentification is probably the basis for Calado’s (1997a) subsequent description of *A. edsoni*, which is a synonym of *A. symmysta*. Calado (1995: pl. 21, fig. a) also omitted the setal field in the carapace drawing.

As with most albuneids, little is known of the biology of *A. microps*. Oviparous females are known from February and November. This species is fairly common in the Philippines, as shown by the abundant material cited above and by the 65 specimens listed by Serène and Umali (1965). MOV J40128 is the type and only known host for the bopyrid isopod *Albunione australiana* Markham and Boyko, 1999.

This species was considered the senior synonym of *A. elioti* until Boyko and Harvey (1999) clearly showed the distinctiveness of both species. The shape of both the telson of the male and the distal peduncular segments can be used to tell the two species apart. The telson of the male of *A. microps* 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, fully calcified, with short thick setae on a strong medial ridge, and lacks the oblique row of setae. The mesial margins of the distal peduncular segments are strongly convex in *A. elioti* but only slightly so in *A. microps*. In addition, the cornea of *A. elioti* is more posterolaterally displaced from the tip of the distal peduncular segment. *Albunea microps* is the sister species to *A. elioti* and typifies the “*microps*”

group" of *Albunea*, which also includes *A. elioti* and *A. galapagensis*.

*Albunea elioti* Benedict, 1904

Figures 83, 84

*Albunea elioti* Benedict, 1904: 623, fig. 2\*. – Gordon, 1938: 187 (list). – Coêlho and Calado, 1987: table 1. – Boyko and Harvey, 1999: 386, 400 (list), 402 (key)\*. – Boyko, 1999: 145 (list).

*Albunea microps*: Thomassin, 1969: 140–143 (part), pl. 2, figs. 1–9. – Calado, 1995: 46–49, pl. 4, fig. e, pl. 5, fig. d, pl. 12, figs. a–f (not *Albunea microps* Miers, 1878).

**MATERIAL EXAMINED:** **Madagascar:** Sta. 15/15, Tulear, 1976, coll. P. Galenon: 1 ♂, 10.4 mm cl (MNHN-Hi 88).

**Seychelles:** Sta. 4, 32 m, Sept. 2, 1980, coll. ORSTOM 1980–Reves 2: 1 ♀, 14.4 mm cl (MNHN-Hi 195).

**Australia: Western Australia:** Barrow Island, 3 ft (= 0.9 m), June 6, 1964, coll. W. H. Butler: 1 ♂, 12.0 mm cl (WAM 23394).

**Caroline Islands:** Sta. 137, Kapingamarangi Atoll, Polim Reef, flat region next to Tipongowakaram Pass, 01°02'00"N, 154°45'14"E, Aug. 12, 1954, coll. George Vanderbilt Foundation: 1 ♀, unmeasurable (USNM 104746).

**Fiji:** Viti [Levu] Island, coll. unknown: 1 ♀, 17.0 mm cl (ZMH K-5134 ex Museum Goddefroy 941).

**Japan:** Iko, Kuroshima Island, Yaeyama Islands, intertidal, April 28, 1998, coll. K. Nomura: 1 ♂, 16.65 mm cl (CBM-ZC 5334).

**Tonga:** South of Ohonua Harbor, Eua Island, Tongatabu Group, 21°20'15"S, 174°58'14"W, 0–5 ft (= 0–1.5 m), Nov. 2, 1993, coll. J. T. Williams et al.: 1 ♂, 16.5 mm cl (USNM 281472).

**Samoa:** "Samoa", coll. unknown: 1 ♀, 16.2 mm cl, holotype (USNM 26169).

**DIAGNOSIS:** Carapace wider than long, covered with strongly setose grooves. Anterior margin with seven to nine spines on either side of ocular sinus. Setal field with thick lateral elements and diffuse anterior margin. CG1 with separate posterior lateral elements; CG4 with one or two short medial elements and two longer lateral elements spaced approximately equally between longer supralateral elements of CG4; CG5 ranging from entire to four short elements; CG6 and CG7

almost united but separate; CG11 present. Rostrum present, exceeding posterior margin of ocular plate by approximately one-half length of ocular plate. Ocular plate subquadrate. Distal peduncular segments dorsoventrally flattened and oblong in shape, rounded at tip, separated along mesial margins, lateral margins sinuous, mesial margins convex. Cornea on lateral margin at tip. Dactylus of pereopod II with heel produced and rounded. Dactylus of pereopod III with heel produced and rounded. Dactylus of pereopod IV evenly sinuous from base to tip, with shallow indent. Telson of male elongate triangular with rounded tip; median area thickly calcified, marginal area weakly calcified, medial row of short thick simple setae. Telson of female similar to male but broader, flattened, evenly calcified, with medial row of thin setae.

**DESCRIPTION:** Carapace (fig. 83A) wider than long. Anterior margin slightly concave on either side of ocular sinus, becoming convex laterally, with seven to nine large spines (n = 5) along length. Rostrum as small acute tooth, extending halfway across ocular plate. Ocular sinus smoothly concave and unarmed. Frontal region smooth; setal field broad anteriorly and posteriorly; posterior lateral elements broad and adjoining posterior lateral elements of CG1. CG1 parallel to anterior margin of carapace, faintly sinuous, strongly crenulate, divided into medial fragment and curved posteriorly displaced lateral elements. Mesogastric region smooth; CG2 present as one or two elements; CG3 broken into one to four long and short elements approximately equally spaced between posterior lateral elements of CG1; CG4 with one or two short medial elements and two longer lateral elements spaced approximately equally between longer supralateral elements of CG4. Hepatic region smooth, with oblique setose groove at median of lateral margin. Epibranchial region generally triangular, smooth; posterolateral margin with three short rows of setae. Metagastric region smooth; CG5 ranging from entire to four short elements. CG6 strongly crenulate, strongly anteriorly concave medially and sloping out to anteriorly convex lateral thirds. CG7 oblique, almost reaching lateral margins of median segment of CG6. Cardiac region smooth; CG8 present as three long elements. CG9 present as two

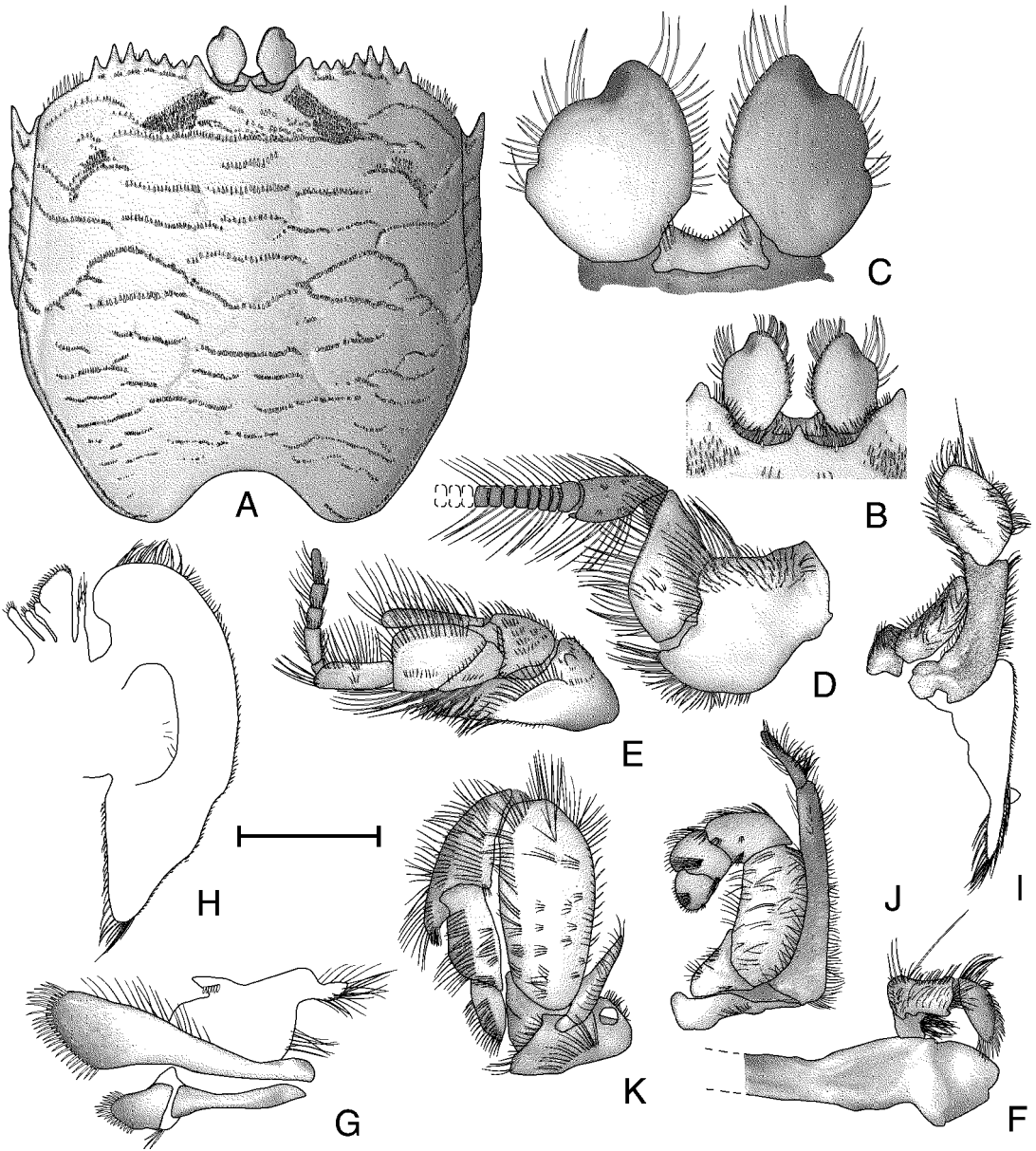


Fig. 83. *Albunea elioti* Benedict, 1904: A, B, ♀, 16.2 mm cl, USNM 26169, holotype; C–K, ♂, 16.5 mm cl, USNM 281472. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Ocular peduncles, dorsal view. D. Left antennule, lateral view. E. Left antenna, lateral view. F. Left mandible, mesial view. G. Left maxillule, lateral view. H. Left maxilla, lateral view. I. Left maxilliped I, lateral view. J. Left maxilliped II, lateral view. K. Left maxilliped III, lateral view. Scale = 1.6 mm (C), 2.2 mm (G), 3.3 mm (B, F, J), 4.4 mm (D, E, H, I, K), and 5.9 mm (A).

short lateral grooves with gap at midline. CG10 present as two long lateral fragments, with short gap between fragments. CG11 present. Branchial region with numerous short, transverse rows of setae. Posterior margin deeply and evenly convex, with submarginal groove reaching less than one-third up margin of posterior concavity. Branchios-tegite with short anterior submarginal spine; anterior region with scattered short transverse lines ventral to *linea anomurica*; with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 83B, C) subrectangular with shallow median indentation; median peduncular segments bluntly diamond-shaped and located ventral to ocular plate and distal peduncular segments; not visible in dorsal view. Distal peduncular segments irregularly oblong, with convex lateral and mesial margins, two lateral notches present with oblong cornea located in distal notch; mesial margins widely separated along all of length; mesial and lateral margins with long plumose setae; tuft of plumose setae at proximolateral ventral angle and short row of plumose setae proximoverventral to cornea notch.

Antennule (fig. 83D) with segment III narrow proximally, expanding distally to two times proximal width; with plumose setae on dorsal and ventral margins and sparsely scattered on lateral surface; dorsal exopodal flagellum with 56–64 articles ( $n = 3$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum short with one segment ( $n = 4$ ) and plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins and scattered on ventrolateral third of surface. Segment I longer than wide, unarmed; dorsal third of lateral surface rugose with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 83E) with segment V approximately 2.5 times longer than wide, with long plumose setae on dorsal margin and scattered on lateral surface; flagellum with five articles ( $n = 4$ ), long plumose setae on dorsal, ventral, and distal margins. Segment

IV expanded distally, with long plumose setae on dorsal, ventral, and distal margins, and row of setae on dorsolateral surface. Segment III with long plumose setae on dorsal and ventral margin and in short row on surface. Segment II short, widening distally, with plumose setae on margins and scattered on lateral surface; antennal acicle long, thin, and just exceeding distal margin of segment IV, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventrolaterally, with long plumose setae on margins; lateral surface with rounded spine dorsally, low semicircular dorsolateral lobe ventrodorsal to spine; segment with ventromesial antennal gland pore.

Mandible (fig. 83F) incisor process with one tooth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment and on distal margin of terminal segment.

Maxillule (fig. 83G) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin. Proximal endite with thick simple setae on distal margin and thin plumose setae on dorsal margin. Endopodal external lobe truncate distally and curled under; internal lobe reduced with six thick setae at distolateral margin.

Maxilla (fig. 83H) exopod evenly rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 83I) epipod with plumose setae on margins, distolateral surface and mesial surface (epipod shown curled in fig. 83I). Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, with plumose setae; distal segment spatulate, longer than wide, broadest medially, margins and mesioventral surface with long plumose setae. Endopod flattened and elongate, reaching nearly to distal end of proximal exopodal segment; plumose setae on margins and median of lateral surface.

Maxilliped II (fig. 83J) dactylus evenly rounded, length equal to width, with thick simple setae distally and on distolateral surface. Propodus two times wider than long, slightly produced at dorsodistal angle, with



plumose setae on dorsal margin and patch of long simple setae on lateral surface and ventrolateral angle. Carpus not produced dorso-distally, approximately two times longer than wide; long simple setae on dorsal and distal margins and in few small patches on surface. Merus approximately two times longer than wide, margins parallel; with simple and plumose setae on margins and scattered on surface. Basis-ischium incompletely fused with plumose setae on margins. Exopod one-third longer than merus, flagellum with one elongate segment.

Maxilliped III (fig. 83K) dactylus with rounded tip; long plumose setae on margins and lateral surface. Propodus slightly inflated medially, with longitudinal median row of plumose setae on lateral surface; margins with plumose setae. Carpus produced onto propodus almost one-half length of propodus; lateral surface with two rows of plumose setae on surface; plumose setae on margins. Merus inflated, unarmed, with plumose setae on margins and scattered on lateral surface. Basis-ischium incompletely fused, with weak crista dentata of one or two teeth. Exopod two-segmented: proximal segment small; distal segment styliform, tapering, approximately one-half length of merus; with plumose setae on margins; without flagellum.

Pereopod I (fig. 84A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin proximally rugose, with long plumose and short simple setae; ventral margin with short simple setae. Propodal 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; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle produced into strong corneous-tipped spine; dorsal margin with short transverse grooves behind spine; dorsal and distal margins with long plumose setae; lateral surface with small distal rugose area, few transverse setose ridges on distal half of surface; mesial surface smooth, with few median rows of 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; fully calcified. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 84B) dactylus smooth; base to heel slightly concave, heel smoothly rounded, heel to tip with wide, acute indent, tip acute, tip to base broadly convex distally and slightly concave proximally; lateral surface smooth, with several small tufts of short setae in generally 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 simple setae, with patch of long plumose setae at base. Propodal dorsal surface smooth, with ventral margin inflated and rounded; oblique row of long plumose setae on distal margin of lateral surface; distal and ventral margin with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with 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; small decalcified region just distal to junction with carpus. Carpus slightly produced and gently rounded dorsodistally, dorsal margin unarmed; lateral surface smooth, with setose mat on distodorsal quarter and irregular, interrupted row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; margins with long plumose setae; mesial surface smooth with scattered patches of long plumose setae in subdorsal and submarginal rows. Merus with large median decalcified window covering nearly all of lateral surface, with few scattered setae on surface and margins; mesial surface nearly smooth, with few setae, and small decalcified area near junction with basis-ischium. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 84C) dactylus with base to heel convex, heel broadly rounded and low, heel to tip with broadly concave indent, tip acute, tip to base smoothly convex distally to straight proximally; lateral surface smooth, with several small tufts of short setae in generally straight line across medioproximal surface, dorsodistal margin with tufts of short setae; ventral margin with long

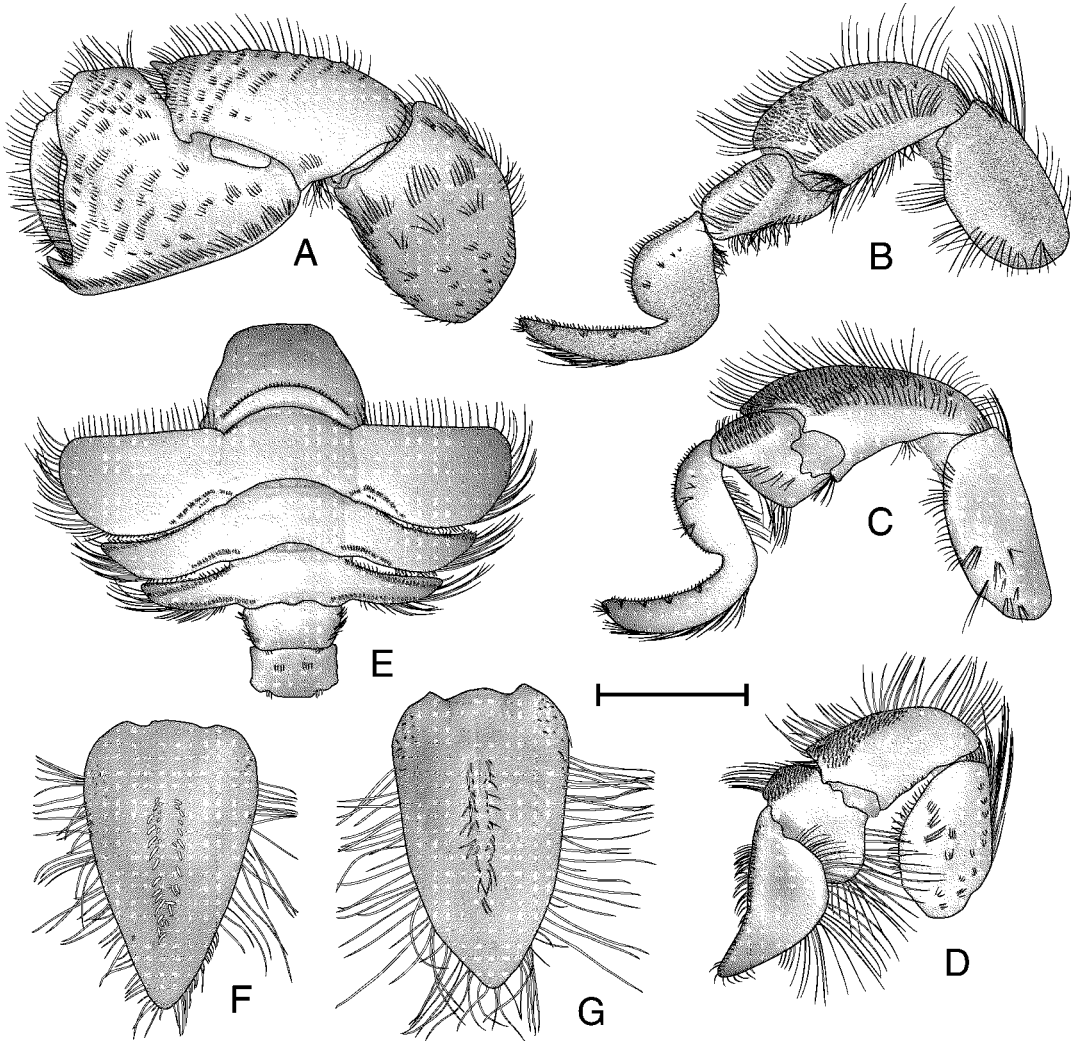


Fig. 84. *Alburnea elioti* Benedict, 1904: A-D, ♂, 12.0 mm cl, WAM 23394; E, ♂, 10.4 mm cl, MNHN Hi-88; F, ♂, 16.5 mm cl, USNM 281472; G, ♀, 16.2 mm cl, USNM 26169, holotype. **A.** Left pereopod I, lateral view. **B.** Left pereopod II, lateral view. **C.** Left pereopod III, lateral view. **D.** Left pereopod IV, lateral view. **E.** Abdominal somites I-VI, dorsal view. **F.** Telson of ♂, dorsal view. **G.** Telson of ♀, dorsal view. Scale = 3.3 mm (E-G) and 4.4 mm (A-D).

plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface smooth, with long plumose setae in oblique row, with simple setae on dorsal margins; dorsolateral surface narrow, oblique, flattened, with setose mat; mesial surface with scattered long setae on and near distal margin, with small decalcified window near junction with car-

pus. Carpus produced dorsodistally, exceeding proximal margin of propodus by approximately one-third length of propodus; dorsolateral margin unarmed; lateral surface slightly rugose dorsodistally, with mat of short setae and row of setae ventrally; mesial surface smooth, with long plumose setae on margins. Merus smooth, with large decalcified window covering nearly half of lateral surface medially; dorsal and ventral margins unarmed, with long plumose setae; latero-

distal margin with long plumose setae; mesial surface smooth, with small decalcified window at junction with basis-ischium. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female with large gonopore on anterior mesial margin of coxa, surrounded with short plumose setae; male without pore.

Pereopod IV (fig. 84D) dactylus with base to tip convex to concave, tip acute, tip to base convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge with row of short setae; with setose punctations ventral to decalcified window. Propodus expanded dorsally and ventrally; ventral expansion almost reaching ventral margin of dactylus, margin with long plumose setae; dorsal expansion with row of long plumose setae dorsally, oblique area with mat of short simple setae; lateral and mesial surfaces smooth. Carpus not produced dorsodistally; ventral three-fourths of lateral surface and mesial surface smooth, dorsodistal quarter of lateral surface with mat of short setae; dorsal margin with short simple and long plumose setae; ventral margin with short simple setae. Merus with scattered short transverse rows of setae on lateral surface, dorsal and ventrodorsal margins with long plumose setae; proximoventral third of mesial surface with large decalcified window. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 84E) with somite I wider than long, widest posteriorly; dorsal surface with anterior margin straight; posterior margin curved with elevated submarginal row of short setae; with small transverse decalcified windows laterad of segment median. Somite II dorsal surface with submarginal transverse ridge anteriorly; with small transverse decalcified windows laterad of segment median just anterior to submarginal ridge; with tuft of setae at posterolateral angle, extending onto pleura posteromesially; pleura expanded and directed slightly anterolaterally; 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; small tuft of

short thick setae on posterolateral angle; pleura thinner and shorter than on somite II, directed posterolaterally, 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 few thick setae posterolaterally; pleura thinner and shorter than on somite III, directed posterolaterally; 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; dorsal surface with short transverse rows of setae laterad of midline, anteriorly and posteriorly; pleura absent.

Females with uniramous, paired pleopods on somites II–V; males without pleopods.

Telson of male (fig. 84F) elongate triangular, two times longer than wide, with pointed rounded tip; median area thickly calcified, with dorsodistally produced tip; marginal area weakly calcified, flattened and thin; median longitudinal groove extending one-half length, flanked on distal half by dense row of short thick simple setae continuing to produced tip; proximolateral angles each with patch of short simple setae; margins with long simple setae. Telson of female (fig. 84G) similar to male but broader, flattened, and evenly calcified; median groove similar but flanked along distal half by long thin simple setae; proximolateral angle with denser patch of setae than male.

**DISTRIBUTION:** Known from Madagascar and the Seychelles eastward to Samoa, in up to 32 m depth.

**MAXIMUM SIZE:** Males: 16.65 mm cl; females: 17.0 mm cl.

**TYPE SPECIMEN:** USNM 26169 (holotype).

**TYPE LOCALITY:** Samoa.

**REMARKS:** As previously noted, Thomassin's (1969) material of "*Albunea microps*" from Madagascar was a mixture of that species and *A. elioti*. This is clearly shown by his illustrations, as figures 2 and 3b are *A. microps*, while all of the figures on plate 2 are *A. elioti* (see also Boyko and Harvey, 1999). How many specimens of each taxon were present in Thomassin's (1969) samples is unknown, as he did not deposit any specimens in MNHN or any other institution, and they are unavailable for examination.

Calado's (1995) illustration of the carapace (as *A. microps*) is too slender and does not accurately depict the subquadrate shape typical of this species.

This species was considered a synonym of *A. microps* until Boyko and Harvey (1999) gave the distinguishing characters that separate the two species (see under *A. microps* for details). *Albunea microps* is the sister species to *A. elioti*.

*Albunea bulla*, new species

Figures 85, 86

*Albunea symnista* [sic]: Gordon, 1938: 187 (part)\*  
(not *Albunea symnista* (Linnaeus, 1758)).  
?Albuneidae sp. DiSalvo et al., 1988: 458.

**MATERIAL EXAMINED:** **Taiwan:** Ma-Kung, Peng-Hui Island, Sept. 15, 1996, coll. unknown: 1 ♀, 17.4 mm cl, paratype (NTOU).

**Australia: Queensland:** Samovrez Reef, 8 m, Sept. 1974, coll. N. Coleman: 1 ♀, 19.3 mm cl, paratype (AM P20456); Cape Bowling Green, 16 fms (= 29.3 m), Nov. 23, 1962, coll. W. Goode on R/V "Dorothea": 1 ♂, 11.8 mm cl, 1 ♀, 17.9 mm cl, paratypes (WAM 23387); **New South Wales:** Off Richmond River mouth, off Ballina, 28°52'S, 153°34'E, 16 m, Oct. 6, 1962, coll. unknown: 1 ♂, 15.4 mm cl, holotype (AM P15353); Lord Howe Island, 31°33'S, 159°05'E, coll. unknown: 1 ♀, 18.9 mm cl, allotype (AM P1925).

**New Caledonia:** "New Caledonia," 1903, coll. A. Milne Edwards: 1 ♀, 19.4 mm cl (MNHN-Hi 150).

**Fiji:** Viti Island: 1 ♂, 7.5 mm cl, paratype (ZMH K-5137 ex Museum Goddefroy 2120).

**Pitcairn Island:** Sta. PIT-UI, Haul 13, 1 mi northwest of Pitcairn Island, 25°02-04'S, 130°06-07'W, 26-30 fms (= 47.6-54.9 m), Sept. 20, 1967, coll. National Geographic Society-Smithsonian-Bishop Museum Marquesas Expedition: 1 unsexable anterior half with pereopod I, 17.7 mm cl (USNM 304304).

**DIAGNOSIS:** Carapace wider than long, covered with strongly setose grooves. Anterior margin with 8-10 spines on either side of ocular sinus. Setal field with thin lateral elements and concave anterior margin. CG1 with separate posterior lateral elements; CG4

with three or four short medial elements between longer supralateral elements of CG4, CG5 two short, irregularly convex, transverse elements; CG6 and CG7 separate; CG8 present; CG11 present. Rostrum present, reaching posterior margin of ocular plate. Ocular plate subquadrate. Distal peduncular segments dorsoventrally flattened and oblong in shape, rounded at tip, approximated along mesial margins, lateral margins convex, mesial margins straight. Cornea on lateral margin at tip. Dactylus of pereopod II with heel produced and rounded. Dactylus of pereopod III with heel produced and rounded. Dactylus of pereopod IV evenly sinuous from base to tip, with shallow indent. Telson of male divided into buttonlike proximal two-thirds and mucronate, tapering, distal third; proximal two-thirds rounded, heavily calcified, dorsally inflated, row of long setae flanking distal half of telson, medial transverse row of long setae present; distal third of telson weakly calcified, sharply tapering distally with produced tip. Telson of female ovate, tapering slightly distally, tip slightly produced.

**DESCRIPTION:** Carapace (fig. 85A) wider than long. Anterior margin faintly concave on either side of ocular sinus, becoming convex laterally with 8-10 large spines (n = 5) on each side along length. Rostrum a small acute tooth, reaching proximal margin of ocular plate. Ocular sinus smoothly concave. Frontal region smooth; setal field broad anteriorly and narrow posteriorly; posterior lateral elements reduced to narrow bands of setae. CG1 parallel to anterior margin of carapace, convex, sinuous, strongly crenulate, divided into medial fragment and curved, posteriorly displaced lateral elements. Mesogastric region smooth; CG2 present as two or three short elements, anteriorly and posteriorly displaced; CG3 broken into three to six short curved elements between posterior lateral elements of CG1, medial two elements shortest; CG4 with three or four short medial elements between longer supralateral elements of CG4, medial one or two elements anteriorly displaced, lateral short elements posteriorly displaced. Hepatic region smooth, with oblique setose groove at median of lateral margin, nearly reaching posterior element of CG1. Epibranchial region



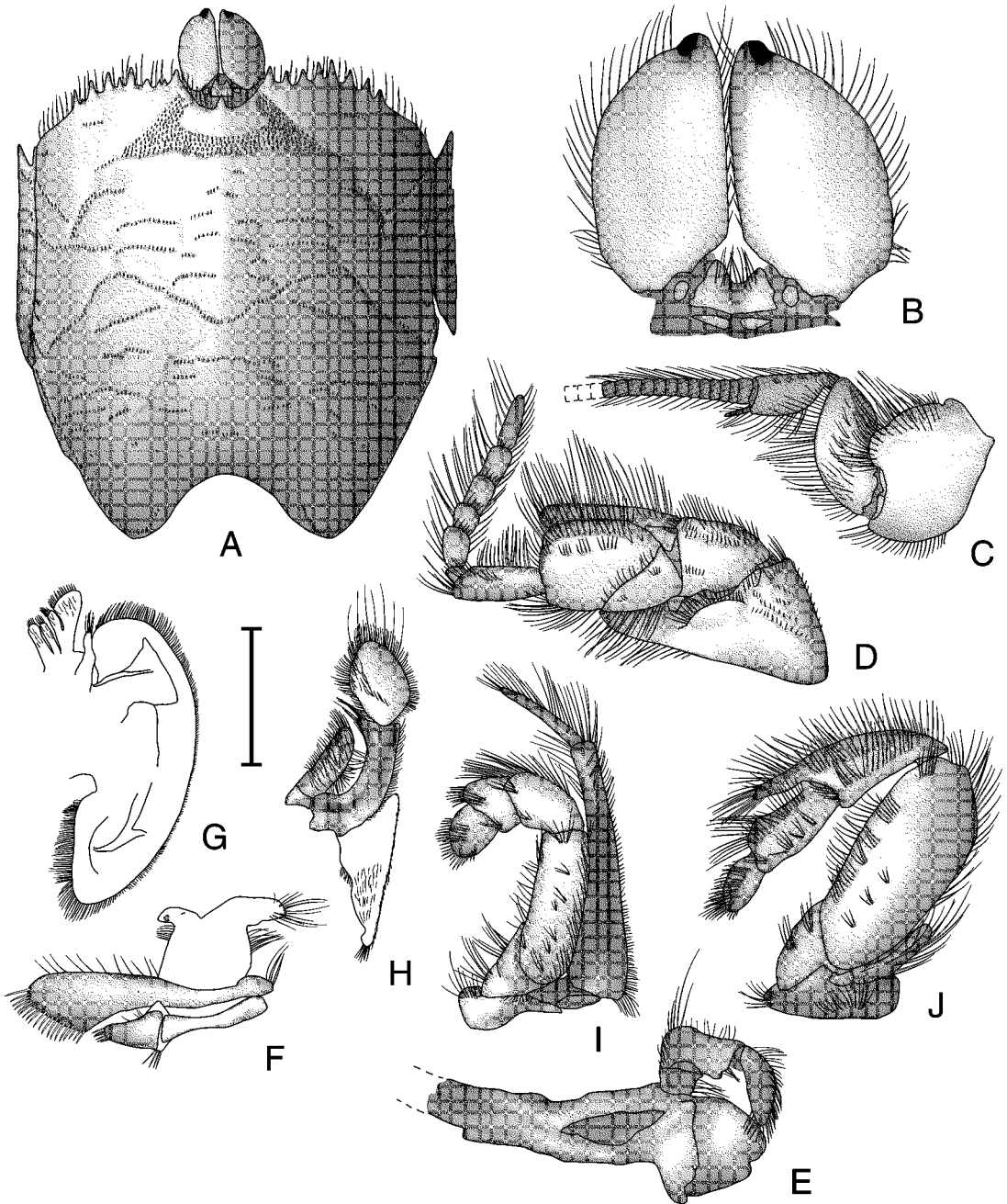


Fig. 85. *Albunea bulla*, n. sp.: A–J, ♀, 19.3 mm cl, AM P20456, paratype. **A.** Carapace, branchios-tegite, and ocular peduncles, dorsal view. **B.** Ocular peduncles, dorsal view. **C.** Left antennule, lateral view. **D.** Left antenna, lateral view. **E.** Left mandible, mesial view. **F.** Left maxillule, lateral view. **G.** Left maxilla, lateral view. **H.** Left maxilliped I, lateral view. **I.** Left maxilliped II, lateral view. **J.** Left maxilliped III, lateral view. Scale = 2.2 mm (B), 3.0 mm (F), 3.3 mm (E, I), 4.4 mm (D, J), 6.0 mm (C), 6.7 mm (G, H), and 7.1 mm (A).

generally triangular, smooth; posterolateral margin with one or two oblique rows of short setae. Metagastric region smooth; CG5 present as two short, irregularly convex, transverse elements. CG6 strongly crenulate, strongly anteriorly concave medially, and sloping out to anteriorly convex lateral thirds. CG7 oblique, not reaching lateral margins of median segment of CG6. Cardiac region smooth; CG8 present as one long medial element. CG9 present as two short lateral grooves with broad gap at midline. CG10 present as two short lateral elements. CG11 present as two or three short elements. Post-CG11 element absent. Branchial region with numerous short and long transverse rows of setae in anterior half. Posterior margin deeply and evenly convex, with submarginal groove reaching one-third up margin of posterior concavity. Branchiostegite with strong anterior submarginal spine; anterior region with scattered short, transverse lines ventral to *linea anomurica*; with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 85B) triangular with deep median indentation; median peduncular segments present as small ovate, calcified areas lateral to ocular plate. Distal peduncular segments elongate, subtriangular, with convex lateral and straight mesial margins, cornea covering lateral portion of distal tip; lateral margins with faint notch one-fourth distal from base; mesial margins approximated along length; lateral and mesial margins with long plumose setae; tuft of plumose setae at proximolateral ventral angles and ventromedial longitudinal row of plumose setae extending from tuft to three-fourths length of peduncle.

Antennule (fig. 85C) with segment III narrow proximally, expanding distally to three times proximal width; plumose setae on dorsal and ventral margins and sparsely scattered on lateral surface; dorsal exopodal flagellum with 67–77 articles ( $n = 2$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with three or four articles ( $n = 4$ ), plumose setae on dorsal and ventral margins. Segment II medially in-

flated in dorsal view, with plumose setae on dorsal and ventral margins and scattered on mediolateral surface. Segment I wider than long, unarmed; dorsal quarter of lateral surface rugose, with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 85D) with segment V approximately 2.5 times longer than wide, with long plumose setae on dorsal and distal margins and scattered on lateral surface; flagellum with six articles ( $n = 5$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV expanded distally, with long plumose setae on dorsal, ventral, and distal margins, and interrupted row of short setae on dorsolateral surface. Segment III with long plumose setae on ventral margin; short simple setae on dorsal margin and scattered on surface. Segment II short, widening distally, dorsally rugose, with plumose setae on margins and short simple setae scattered on lateral surface; antennal acicle long, thin, and reaching distal margin of segment IV, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventrolaterally, with long plumose setae on dorsal and distoventral margins, and short simple setae on surface rugae behind spine; lateral surface with acute spine dorsodistally; low semicircular dorsolateral lobe ventrodorsal to spine, margin of lobe with long plumose setae; segment with ventromesial antennal gland pore.

Mandible (fig. 85E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment and on distal margin of terminal segment.

Maxillule (fig. 85F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin simple setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under; internal lobe reduced with five thick setae at distolateral margin and one thick seta in median of lobe.

Maxilla (fig. 85G) exopod evenly rounded, with plumose setae along distal margin. Sca-phognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 85H) epipod with plu-

mose setae on margins, distolateral surface, and mesial surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments: proximal segment narrow, margins parallel, with long plumose setae; distal segment spatulate, longer than wide, broadest medially, margins and mesiodorsal surface with long plumose setae. Endopod flattened and elongate, reaching two-thirds of distance to distal end of proximal exopodal segment; plumose setae on margins and median of lateral surface.

Maxilliped II (fig. 85I) dactylus evenly rounded, length subequal to width, with thick simple setae distally and on distolateral surface. Propodus two times wider than long, slightly produced at dorsodistal angle, with plumose setae on dorsal margin and patch of long simple setae on dorsodistal and ventrodorsal angles. Carpus not produced dorso-distally, approximately two times longer than wide; long simple setae on dorsal margin and in patches on dorsodistal and ventrodorsal angles. Merus approximately three times longer than wide, margins parallel; with long simple and plumose setae on margins and scattered on lateral surface. Basis-ischium incompletely fused, with plumose setae on margins. Exopod 1.7 times longer than merus, flagellum with one elongate article, approximately as long as carpus.

Maxilliped III (fig. 85J) dactylus oblong with rounded tip; long plumose setae on margins and in medial row on lateral surface. Propodus dorsodistally inflated, with longitudinal median row of plumose setae on lateral surface and three or four short patches of long plumose setae submarginally ventrally; dorsal margin with long plumose setae. Carpus produced onto propodus approximately two-thirds length of propodus; lateral surface with two transverse rows of long plumose setae; long plumose setae on dorsal and distal margins. Merus inflated, unarmed, with long plumose setae on margins and few scattered small patches on lateral surface. Basis-ischium incompletely fused, with weak crista dentata of four teeth. Exopod two-segmented: proximal segment small; distal segment styliform, bluntly rounded distally, approximately one-third length of merus; with plumose setae on margins; without flagellum.

Pereopod I (fig. 86A) dactylus curved and

tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose setae; ventral margin with short simple setae. Propodal 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; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle produced into rounded projection, small dorsally directed acute spine on distodorsal mesial margin; dorsal margin with short transverse grooves behind distal projection; dorsal and distal margins with short plumose setae; lateral surface with small distal rugose area, with few transverse setose ridges on distal half of surface; mesial surface smooth with medial transverse row of setae, margins with long plumose setae. Merus unarmed; lateral surface with scattered transverse rows of long plumose setae, distal and mediadorsal margins with long plumose setae; mesial side with few scattered setae; fully calcified. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 86B) dactylus smooth; base to heel faintly convex, heel low and rounded, subquadrate, heel to tip with broad, subacute indent, tip subacute, tip to base broadly convex; lateral surface smooth, with several small tufts of short setae in generally 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 simple setae, with patch of long plumose setae at base. Propodal dorsal surface smooth, with 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 as narrow, oblique, flattened shelf, with 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 strongly produced, tapered distally, and rounded dorso-distally, dorsal margin smooth; lateral surface smooth, produced area smooth, irregular, interrupted row of rugae and submarginal



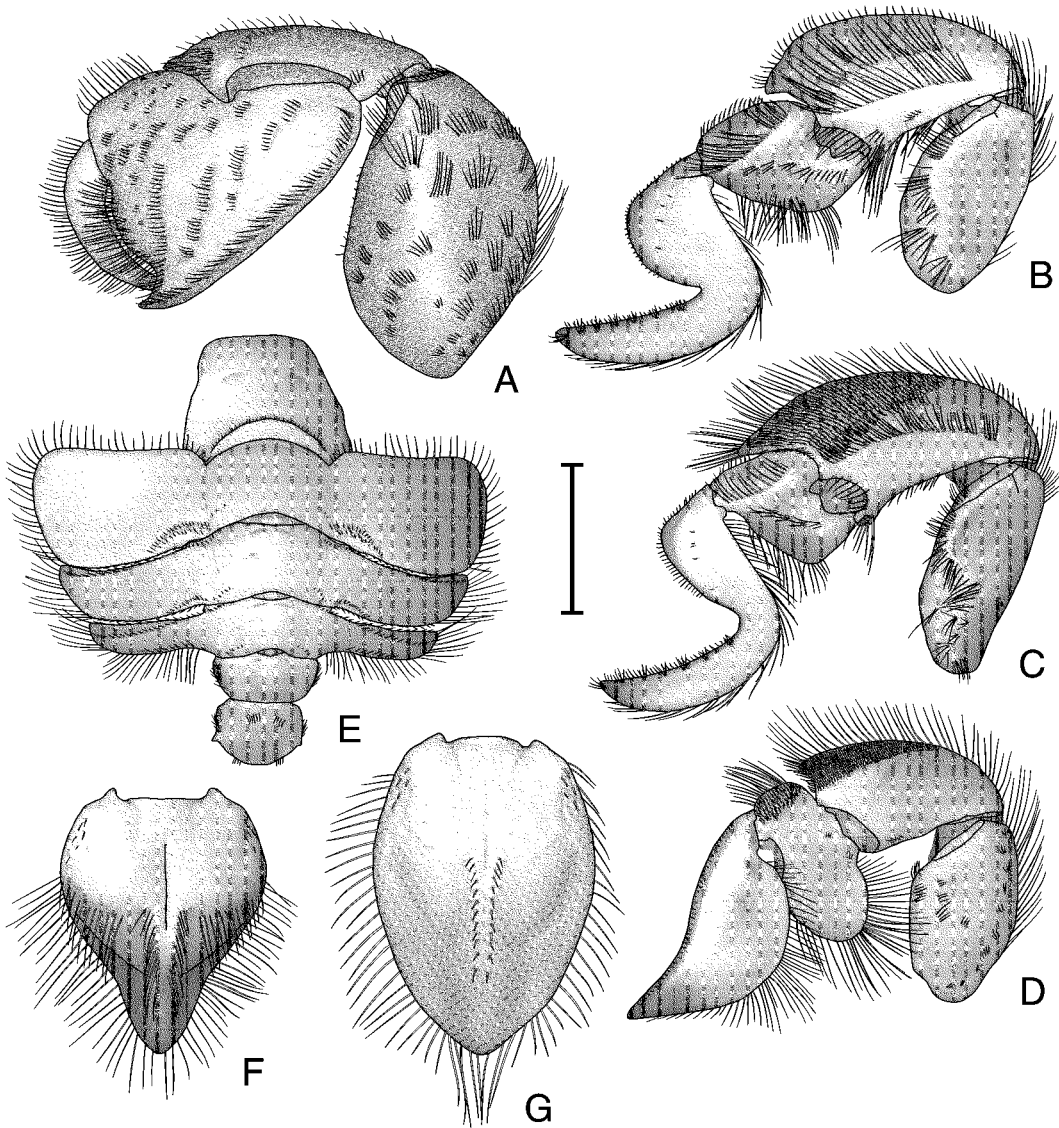


Fig. 86. *Albunea bulla*, n. sp.: A-E, G, ♀, 19.3 mm cl, AM P20456, paratype; F, ♂, 15.4 mm cl, AM P15353, holotype. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I-VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 3.0 mm (F), 3.3 mm (G), and 6.0 mm (A-E).

elevated ridge ventrally, rugae and ridge with long plumose setae; dorsal margin with short plumose setae, ventral margin with long plumose setae; mesial surface smooth, with row of long plumose setae distally, ventrally, and subdorsally. Merus with large median decalcified window covering nearly all of lateral surface, long plumose setae on dorsodistal

and ventral margins, few scattered long plumose setae on surface; mesial surface nearly smooth with two long rows of setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 86C) dactylus with base to heel straight, heel low and subquadrate, heel to tip with broadly concave indent, tip



subacute, tip to base smoothly convex; lateral surface smooth, with several small tufts of short setae in generally straight line across medioproximal surface, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface smooth, with long plumose setae in oblique row, simple setae on dorsal margin, plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened, without setose mat; mesial surface smooth. Carpus produced dorsodistally, exceeding proximal margin of propodus by one-half length of propodus; tip subacute, dorsal margin unarmed; lateral surface slightly rugose dorsodistally, with mat of short setae and two interrupted rows of setae ventrally; mesial surface smooth, with long plumose setae on distal margin and in short oblique row on distal surface. Merus smooth, narrow, and almost cylindrical, with large decalcified window covering nearly half of lateral surface medially; dorsal and ventral margins unarmed, dorsodistal and ventral margins with long plumose setae; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female with large gonopore on anterior mesial margin of coxa, surrounded with short plumose setae; male with small pore.

Pereopod IV (fig. 86D) dactylus with base to tip convex proximally, with indistinct heel and indent and almost straight from indent to tip, tip acute, tip to base concave distally to convex proximally; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge with row of short setae; with setose punctations ventral to decalcified window. Propodus expanded dorsally and ventrally; ventral expansion exceeding ventral margin of dactylus, ventral margin with long plumose setae; dorsal expansion with row of long plumose setae dorsally, oblique area with mat of short simple setae; lateral surface smooth, mesial surface smooth, with distoventral area of few patches of long plumose setae. Carpus slightly produced dorsodistally;

ventral four-fifths of lateral surface and mesial surface smooth, dorsodistal one-fifth of lateral surface with mat of short simple setae; dorsal margin with short simple and long plumose setae; ventral margin with short simple setae; mesial surface decalcified medially. Merus lateral surface with scattered short transverse rows of setae, dorsal margin with long plumose setae; proximoventral fourth of mesial surface with large decalcified window. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 86E) somite I wider than long, widest posteriorly; dorsal surface with anterior margin straight; posterior margin curved, with elevated submarginal row of short setae; small transverse decalcified windows laterad of segment median. Somite II dorsal surface with irregular, submarginal, transverse ridge anteriorly; with small, transverse, decalcified windows laterad of segment median just anterior to submarginal ridge; pleura expanded and directed laterally; anterolateral margins rounded, anterior and lateral margins with long plumose setae, posterolateral angle rounded, posterior margin with short setae; posteromesial angle with mat of short simple setae. Somite III similar to somite II, but narrower, shorter, anterior submarginal windows present; pleura thinner and shorter than on somite II, directed posterolaterally proximally and anterolaterally distally, with setae as in somite II; anterolateral angle subacute; dorsal surface obliquely flattened anterolaterally, with submarginal row of short setae. Somite IV similar to somite III, but thinner and shorter, anterior submarginal windows present; pleura thinner and shorter than on somite III, directed laterally; dorsal surface obliquely flattened anterolaterally; lateral and posterior margins with long plumose setae, anterior margin with short simple setae. Somite V wider than somite IV, anterior submarginal windows present; lateral margins with plumose setae; pleura absent. Somite VI slightly broader than somite V, anterior submarginal windows present; dorsal surface with two short transverse rows of setae laterad of midline and on posterior margin; pleura absent.

Females with uniramous, paired pleopods on somites II–V; males without pleopods.

Telson of male (fig. 86F) divided into a

subcircular (“buttonlike”) proximal two-thirds and mucronate tapering distal third; proximal two-thirds rounded, heavily calcified, dorsally inflated, with deep median groove and long plumose setae flanking distal third of groove to distal end of calcified region, proximolateral angles with few short simple setae, transverse row of long plumose setae present on either side of median groove approximately one-third proximal from distal margin of calcified region; distal third of telson weakly calcified, sharply tapering distally with produced tip; entire telson lined with long plumose setae on margins in distal two-thirds. Telson of female (fig. 86G) ovate, tapering slightly distally, tip slightly produced, dorsal surface evenly calcified; median groove present in medial two-thirds of dorsal surface, lined with short simple setae; proximolateral angle with few short simple setae, margins with long simple setae.

**DISTRIBUTION:** Known from Taiwan; Queensland, Australia; New Caledonia; and Fiji, in up to 29.3 m depth. Also provisionally from Pitcairn Island, in 47.6–54.9 m depth.

**MAXIMUM SIZE:** Males: 15.4 mm cl; females, 19.4 mm cl.

**TYPE SPECIMENS:** AM P15353 (holotype), AM P1925 (allotype), AM P20456 (paratype), NTOU (paratype), WAM 23387 (2 paratypes), ZMH K-5137 (paratype).

**TYPE LOCALITY:** Off Richmond River mouth, off Ballina, New South Wales, Australia, 28°52'S, 153°34'E, 16 m.

**ETYMOLOGY:** The specific name of this taxon is given for the distinctive buttonlike morphology of the telson of the males.

**REMARKS:** The Pitcairn specimen exists only as the carapace and anterior half of the animal with all appendages anterior to and including pereopod I. Given its poor condition, it is only provisionally referred to this species, although the characters of the extant structures are essentially identical. The single reference to an Easter Island albuneid (DiSalvo et al., 1988) may also be this taxon, as there are several crustacean species which are known from both Easter Island and Pitcairn Island (Boyko, in prep.). Despite repeated attempts to collect albuneids on Easter Island over a 3-week period in August 1999, I found no specimens.

This species belongs to the “*carabus*-group” of *Albunea* and is the sister taxon to the other two species in that group. The distinctive “buttonlike” morphology of the male telson separates it from both *A. carabus* and *A. danai*.

*Albunea carabus* (Linnaeus, 1758)

Figures 87, 88

*Cancer Carabus* Linnaeus, 1758: 632. – Linnaeus, 1767: 1052. – Houttuyn, 1769: 417. – de Villers, 1789: 156.

*Cancer carabus*: Stadius Müller, 1775: 1126–1127. – Latreille, 1831: 56.—H. Milne Edwards, 1837a: 112.—H. Milne Edwards, 1840: 112. – Bolivar, 1875: 20–21.

*Cancer (Pagurus) Carabus*: Gmelin and Linné, 1790: 2984.

*Cancer (Astacus) Carabus*: Herbst, 1796: 67–68.

*Albunea symnista* [sic]: Rafinesque-Schmaltz, 1814: 20. – Lucas, 1849a: 27–28\*. – Lucas, 1849b: pl. 3, fig. 2\*. – Heller, 1863: 153 (part). – Barrois, 1888: 18–19, 75, 82, 89, 93–94. – Bolivar, 1892: 128 (list). – Ferrer Aledo, 1914: 68. – Miranda y Rivera, 1933a: 22. – Miranda y Rivera, 1933b: 1 (list). – Holthuis, 1954c: 34. – Holthuis, 1956: 228. – ICZN, 1958: 222 (not *Albunea symmista* (Linnaeus, 1758)).

*cancer carabus*: Lamarck, 1818: 224.

*Albunea Guerinii* Lucas, 1853: 45–47, pl. 1, fig. 9. – Bolivar, 1875: 20–21. – Carus, 1885: 496. – Rodriguez Femenias, 1887: 5. – de Buen, 1887: 425. – Bolivar, 1916: 251 (list). – de Buen, 1916: 359.

*Albunea* [sic] *Guerini*: Stimpson, 1858: 230 (list).

*Albunea* sp. Larrinúa y Azcona, 1874: 46.

“*Albunea?*” Barceló y Combis, 1875: 63.

*Albunea guerinii*: Miers, 1878: 327–328. – Aharoni, 1937: 1136. – Aharoni, 1944: 41\*.

*Albunea carabus*: Ortmann, 1896: 224 (list). – Ortmann, 1901: 1276. – Monod, 1933: 473 (part). – Gordon, 1938: 186, fig. 3b. – Bouvier, 1940: 179–181, figs. 132, 133. – Holthuis, 1954c: 34. – Pigué, 1955: 14. – Holthuis, 1956: 228. – Monod, 1956: 40–42, figs 10–14. – Holthuis and Gottlieb, 1958: 77, 116\*. – ICZN, 1958: 222. – Figueira, 1960: 6. – Gauld, 1960: 66 (list). – Zariquiey Alvarez, 1961: 103–109, figs. 1–3. – Crosnier, 1967: 341\*. – Pérés, 1967: 456. – Zariquiey Alvarez, 1968: 294–296, fig. 104. – Moncharmont, 1969: 434–439, figs. 1–3. – Rubió and Holthuis, 1976: 41–46\*. – Kaestner, 1980: 336, fig. 13–26b. – Riedl, 1983: 488, pl. 179. – Beschin and De Angeli, 1984: 92, fig. 2. – Pretus, 1985–1989a: 258. – Pretus, 1985–1989b: fig. 92. – Coêlho and Calado,

1987: 42–43, table 1. – García Socias and Masuti Jaume, 1987: 79, 91 (list). – García Socias and Gracia, 1988: 55. – Seridji, 1988: 1293–1298, figs. 1–3. – Guillén Nieto, 1990: 165–167, fig. 64. – Brunet and Vicente, 1992: 168–169, figs. 1, 2. – García Raso et al., 1992: 131, 133, 258 (list). – Wirtz and Martins, 1993: 57–58. – Calado, 1995: 27–30, pl. 4, fig. a, pl. 5, fig. a, pl. 6, figs. a–f\*. – González Pérez, 1995: 165, fig. 102. – Giacobbe and Spanò, 1996: 719–725, pl. 1. – Calado, 1997a: 17, 21–22. – Spanò et al., 1999: 617–620. – d’Udekem d’Acoz, 1999: 171. – Boyko, 1999: 161.

*Albunea barbara* (Lucas ms) Ortmann, 1896: 224 (list) (nomen nudum).

*Albunea Guerinii*: A. Milne Edwards and Bouvier, 1900: 275. – Ferrer y Galdiano, 1918: 413 (list).

*Albunea symmista* [sic]: Holthuis, 1954c: 34 (not *Albunea symmista* (Linnaeus, 1758)).

?*Albunea* sp. B Lebour, 1959: 129, fig. 15.

*Albunea Carabus*: Seridji, 1988: 1293, 1298.

*Albunea* aff. *carabus*: Fransen, 1991: 48, 77.

not *Hippa caerulea* Risso, 1816: 50–51. – Risso, 1827: 36–37 (= *Gnathia* sp. cf. *phallonajopsis* Monod, 1925).

not *Hippa caerulea* [sic]: Risso, 1844: 94. – Hope, 1851: 12 (= *Gnathia* sp. cf. *phallonajopsis* Monod, 1925).

not *Albunea guerinii*: Stebbing, 1914: 281 (= *Albunea gibbesii* Stimpson, 1859).

not *Albunea carabus*: Balss, 1916a: 37\*. – Monod, 1933: 473 (part) (= *Albunea elegans* A. Milne Edwards and Bouvier, 1898).

not *Albunea guerinii*: Stebbing, 1917: 26 (= *Albunea* sp. indet.).

not *Albunea carabus*: Chace, 1966: 635 (= *Albunea gibbesii* Stimpson, 1859).

not *Albunea carabus*: Holthuis, 1977: 61–62 (= *Gnathia* sp. cf. *phallonajopsis* Monod, 1925).

**MATERIAL EXAMINED: Lebanon:** Vicinity of Beirut, coll. M. E. Ericksen: 2 ♀, 16.3–16.6 mm cl (USNM 260973).

**Israel:** Nahr-Rubin, coll. unknown: 1 ♀, 14.7 mm cl (BMNH 1920.12.16.3); Haifa Bay, June 18, 1987, coll. unknown: 1 ♀, 16.5 mm cl (ZMTAU NS 24665).

**Tunisia:** Public beach, Raouad, Jan. 30, 1973, coll. J. Moncef and R. B. Manning: 1 ♂, 14.0 mm cl (USNM 256595).

**Algeria:** Between Lebon and Hussein, 36°44'N, 03°05'E, 2–7 m, June–July 1941, coll. H. Nouvel: 1 ♂, 4.4 mm cl (RMNH 34726); Oran, July 1881, coll. M. Deshayes on “Travailleur”: 2 ♂, 12.1–13.3 mm cl, 1 ♀, 18.6 mm cl (MNHN-Hi 10); Gulf of Oran, June 6, 1900, coll. P. Pallary: 1 ♀, 20.7

mm cl (MNHN-Hi 148); Cape Matifou, 1840–1842, M. Deshayes: 1 ♀, 15.5 mm cl, syntype of *A. guerinii* (MNHN-Hi 189); Cape Matifou, 1840–1842, coll. M. Deshayes: 1 ♂, 12.4 mm cl, syntype of *A. guerinii* (MNHN-Hi 190); Cape Matifou, 1840–1842, coll. M. Deshayes: 2 ♂, 13.5–16.0 mm cl, syntypes of *A. guerinii* (MNHN-Hi 9); Rade de Bône, 15–20 m, 1908, coll. E. Chevreux: 3 ♀, 13.9–18.1 mm cl (MNHN-Hi 1).

**Spain:** Off San Andres de Llanereras, near Arenys de Mar, Barcelona, 4–5 m, Aug. 8, 1973, coll. Tau-Tau: 1 ♂, 18.0 mm cl (RMNH 36273), 1 ♂, 19.5 mm cl (AMNH 18077 ex RMNH 36273); between San Pol de Mar and San Andres de Llanereras, near Arenys de Mar, Barcelona, 3–6 m, Nov. 22, 1972, March 1973, Aug. 3, 1973, coll. Tau-Tau: 1 ♂, 20.0 mm cl (RMNH 36274), 3 ♂, 19.1–21.0 mm cl (USNM 258373 ex RMNH 36274); between San Pol de Mar and San Andres de Llanereras, near Arenys de Mar, Barcelona, 3–6 m, Aug. 27, 1974, coll. Tau-Tau: 1 ♂, 20.3 mm cl (USNM 260867); Arenys de Mar, Barcelona, 3–7 m, June 11, 1971, coll. M. Rubio: 1 ♂, 18.6 mm cl (RMNH 28713); Canet de Mar, Barcelona, 5–7 m, June 23, 1972, coll. Tau-Tau: 1 ♂, 18.4 mm cl, 1 ♀, 23.5 mm cl (RMNH 28911); Canet de Mar, Barcelona, 5 m, Nov. 1972, coll. M. Rubio: 2 ♂, 18.1–19.2 mm cl (MNHN-Hi 85).

**Portugal:** Funchal Bay, Madeira, 10–15 m, March 31, 1958, coll. A. Figuera: 1 ♀, 17.7 mm cl (ZMUC 2712); Sta. 25, 36°59'N, 25°03'W, 10–18 m, May 28, 1981, coll. CANCAP V: 1 oviger, 10.0 mm cl, 1 juvenile, 4.0 mm cl (RMNH 36282).

**Cape Verde:** Sta. 7.068, west-southwest of Ilhéu Calheta do Visto, west of Boa Vista, 16°11'N, 22°59'W, 40 m, Aug. 27, 1986, coll. CANCAP: 1 ♀, 5.1 mm cl (RMNH 38605).

**Ivory Coast:** Sta. 17, Gulf of Guinée, 27 m, June 21, 1956, coll. “Calypso”: 8 ♂, 9.4–10.4 mm cl, 6 ♀, 8.3–10.5 mm cl (MNHN-Hi 111).

**Ghana:** Trawl 1, Agassil, coll. R. Bassindale: 1 ♀, 11.4 mm cl (BMNH 1957.12.4.1).

**Togo:** Côtes du Togo, 06°07'N, 01°34'E, 26 m, Oct. 5, 1963, coll. A. Crosnier: 1 ♂, 11.8 mm cl (MNHN-Hi 5). **Dahomey:** 06°16'N, 02°26'E, 22 M, Oct. 9, 1963, coll.

A. Crosnier: 1 unsexable, unmeasurable specimen (MNHN-Hi 2); 06°14'N, 02°26'E, 30 m, Oct. 9, 1963, coll. A. Crosnier: 1 ♀, 4.9 mm cl (MNHN-Hi 3); 06°09'20"N, 01°52'E, 35 m, Oct. 4, 1963, coll. A. Crosnier: 1 ♂, 11.2 mm cl (MNHN-Hi 4); 06°14'30"N, 01°48'E, 15 m, Oct. 4, 1963, coll. A. Crosnier: 1 juvenile, 3.3 mm cl (MNHN-Hi 6).

**No Data:** 4 ♂, 13.0–16.2 mm cl (MNHN-Hi 90); 3 ♂, 14.8–15.9 mm cl (MNHN-Hi 91).

**DIAGNOSIS:** Carapace wider than long, covered with lightly setose crenulate grooves. Anterior margin with 9–14 spines on either side of ocular sinus. Setal field with narrow lateral elements and straight anterior margin. CG1 with separate posterior lateral elements; CG4 with two short and two long medial elements between longer supralateral elements of CG4; CG5 present as two curved, oblique elements; CG6 and CG7 separate; CG8 broken; CG11 present. Rostrum present, not reaching posterior margin of ocular plate. Ocular plate triangular. Distal peduncular segments dorsoventrally flattened and triangular in shape, tapering at tip, approximated along mesial margins at base, lateral margins broadly convex, mesial margins straight. Cornea at tip. Dactylus of pereopod II with heel produced, subquadrate and rounded. Dactylus of pereopod III with heel produced, subquadrate and rounded. Dactylus of pereopod IV sinuous from base to tip, with low rounded heel and shallow indent. Telson of male broadly triangular, as long as wide, with broadly rounded tip; thickly calcified in proximal third and medial strip, inflated dorsally; distolateral two-thirds decalcified, median and transverse rows of thin setae. Telson of female flattened, ovate, and evenly calcified with slightly truncate tip.

**DESCRIPTION:** Carapace (fig. 87A) wider than long. Anterior margin slightly concave on either side of ocular sinus, becoming convex laterally, with 9–14 large spines ( $n = 6$ ) along length. Rostrum as small acute tooth, not reaching proximal margin of ocular plate. Ocular sinus smoothly concave, with few small spinules. Frontal region smooth; setal field narrow anteriorly and posteriorly; posterior lateral elements reduced to narrow bands of setae. CG1 parallel to anterior mar-

gin of carapace, sinuous, strongly crenulate, divided into medial fragment and curved, posteriorly displaced lateral elements. Mesogastric region smooth; CG2 absent; CG3 broken into five to eight short elements between posterior lateral elements of CG1; CG4 with two short and two long medial elements between longer supralateral elements of CG4. Hepatic region smooth, with oblique setose groove at median of lateral margin. Epibranchial region generally triangular, smooth; posterolateral margin without rows of setae. Metagastric region smooth; CG5 present as two curved, oblique elements. CG6 strongly crenulate, strongly anteriorly concave medially, and sloping out to anteriorly convex lateral thirds. CG7 oblique, not reaching lateral margins of median segment of CG6. Cardiac region smooth; CG8 present as two short medial elements. CG9 present as two short elements with wide gap at midline. CG10 present as two long elements. CG11 present as two short elements. Post-CG11 element absent. Branchial region with numerous short, transverse rows of setae. Posterior margin deeply and evenly convex, with submarginal groove reaching halfway up margin of posterior concavity. Branchiostegite with short anterior submarginal spine; anterior region with scattered short, transverse lines ventral to *linea anomurica*; with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 87B) triangular with deep median indentation; median peduncular segments present as small ovate calcified areas lateral to ocular plate. Distal peduncular segments elongate, subtriangular, with convex lateral and straight mesial margins, cornea covering lateral three-fourths of distal tip; lateral margins with notch just proximal to cornea; mesial margins approximated along length; mesial and lateral margins with long plumose setae; tuft of plumose setae at proximolateral ventral angles and ventromedial row of plumose setae extending from tuft to base of cornea.

Antennule (fig. 87C) with segment III narrow proximally, expanding distally to twice proximal width; with plumose setae on dor-



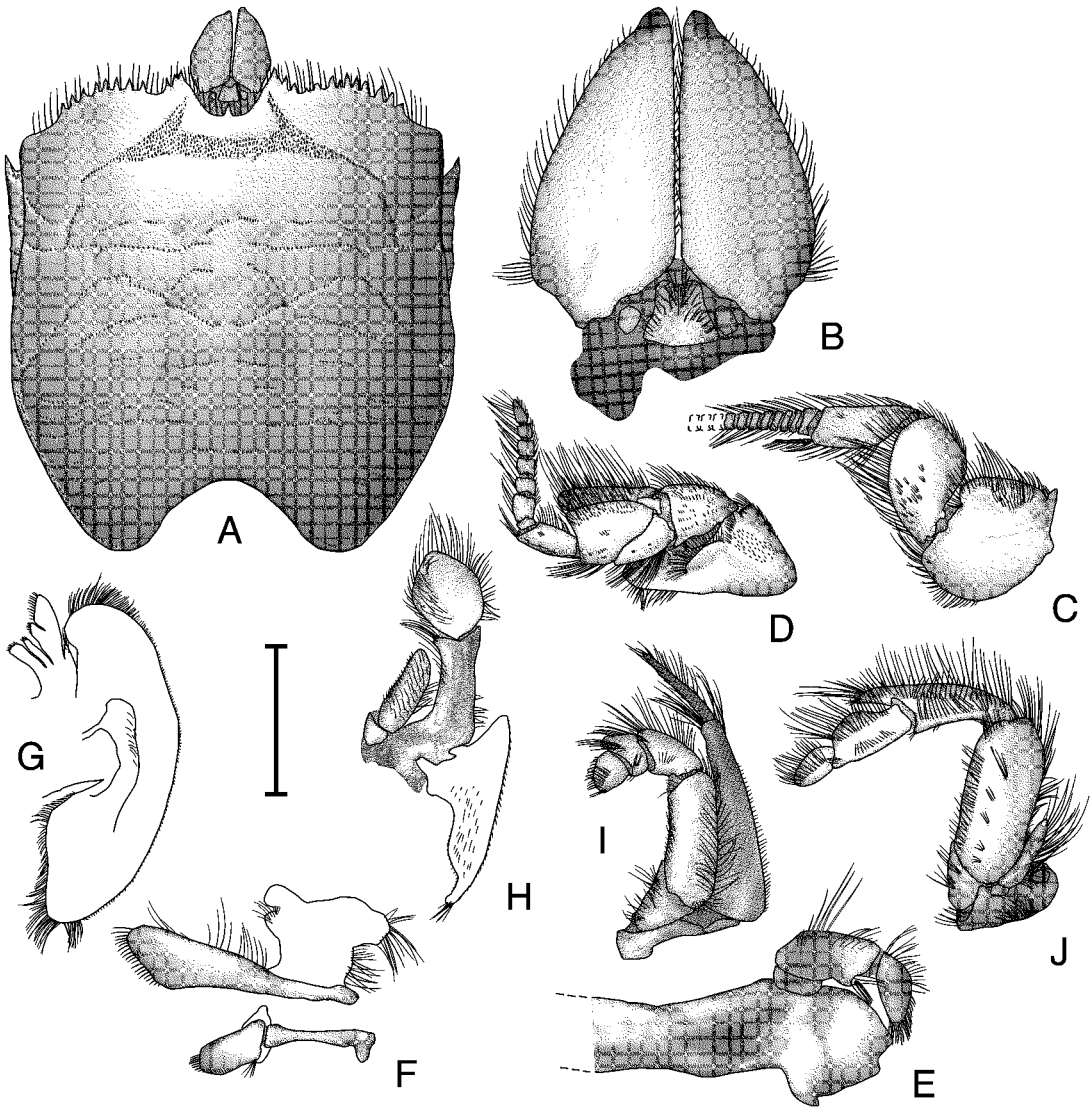


Fig. 87. *Albunea carabus* (Linnaeus, 1758): A, ♂, 21.0 mm cl, USNM 258373; B–J, ♂, 19.1 mm cl, USNM 258373. **A.** Carapace, branchiostegite, and ocular peduncles, dorsal view. **B.** Ocular peduncles, dorsal view. **C.** Left antennule, lateral view. **D.** Left antenna, lateral view. **E.** Left mandible, mesial view. **F.** Left maxillule, lateral view. **G.** Left maxilla, lateral view. **H.** Left maxilliped I, lateral view. **I.** Left maxilliped II, lateral view. **J.** Left maxilliped III, lateral view. Scale = 2.2 mm (B), 3.3 mm (E, F), 4.4 mm (I), 6.7 mm (C, D, G, H, J), and 8.5 mm (A).

sal and ventral margins and sparsely scattered on lateral surface; dorsal exopodal flagellum with 86–108 articles ( $n = 6$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with three to five articles ( $n = 6$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on

dorsal and ventral margins and scattered on ventrolateral third of surface. Segment I wider than long, unarmed; dorsal third of lateral surface rugose with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 87D) with segment V approximately two times longer than wide, with long plumose setae on dorsal and ventral

margins and scattered on lateral surface; flagellum with seven articles ( $n = 6$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV expanded distally, with long plumose setae on dorsal, ventral, and distal margins, and row of setae on dorsolateral surface. Segment III with long plumose setae on ventral margin and in short row on surface. Segment II short, widening distally, rugose, with plumose setae on margins and scattered on lateral surface; antennal acicle long, thin, and reaching to distal margin of segment IV, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventrolaterally, with long plumose setae on margins and scattered on surface rugae behind spine; lateral surface with acute spine dorsodistally (occasionally two spines), with low semicircular dorsolateral lobe ventrodorsal to spine; segment with ventromesial antennal gland pore.

Mandible (fig. 87E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment and on distal margin of terminal segment.

Maxillule (fig. 87F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin simple setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under; internal lobe reduced with three thick setae at distolateral margin.

Maxilla (fig. 87G) exopod evenly rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 87H) epipod with plumose setae on margins, distolateral surface, and mesial surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments: proximal segment narrow, margins parallel with plumose setae; distal segment spatulate, longer than wide, broadest medially, margins and mesioventral surface with long plumose setae. Endopod flattened and elongate, reaching two-thirds of distance to distal end of proximal exopodal segment; plumose setae on margins and median of lateral surface.

Maxilliped II (fig. 87I) dactylus evenly

rounded, length equal to width, with thick simple setae distally and on distolateral surface. Propodus two times wider than long, slightly produced at dorsodistal angle, with plumose setae on dorsal margin and patch of long simple setae on lateral surface and ventrolateral angle. Carpus not produced dorsodistally, approximately two times longer than wide; long simple setae on dorsal margin and in short row on lateral surface. Merus approximately three times longer than wide, margins parallel; with simple and plumose setae on margins and scattered on surface. Basis-ischium incompletely fused with plumose setae on margins. Exopod one-third longer than merus, flagellum with one elongate article, longer than carpus.

Maxilliped III (fig. 87J) dactylus with rounded tip; long plumose setae on margins and lateral surface. Propodus dorsodistally inflated, with longitudinal median row of plumose setae on lateral surface; margins with plumose setae. Carpus produced onto propodus almost one-half length of propodus; lateral surface with two rows of plumose setae; plumose setae on margins. Merus inflated, unarmed, with plumose setae on margins and scattered on lateral surface. Basis-ischium incompletely fused, without crista dentata. Exopod two-segmented: proximal segment small; distal segment styliiform, tapering, approximately one-third length of merus; with plumose setae on margins; without flagellum.

Pereopod I (fig. 88A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with few rugae proximally and long plumose and short simple setae; ventral margin with short simple setae. Propodal 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; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle produced into strong corneous-tipped spine; dorsal margin with short transverse grooves behind spine; dorsal and distal margins with short plumose setae; lateral surface with small distal rugose area, with few transverse setose ridges on distal half of surface; mesial surface smooth, with medial trans-

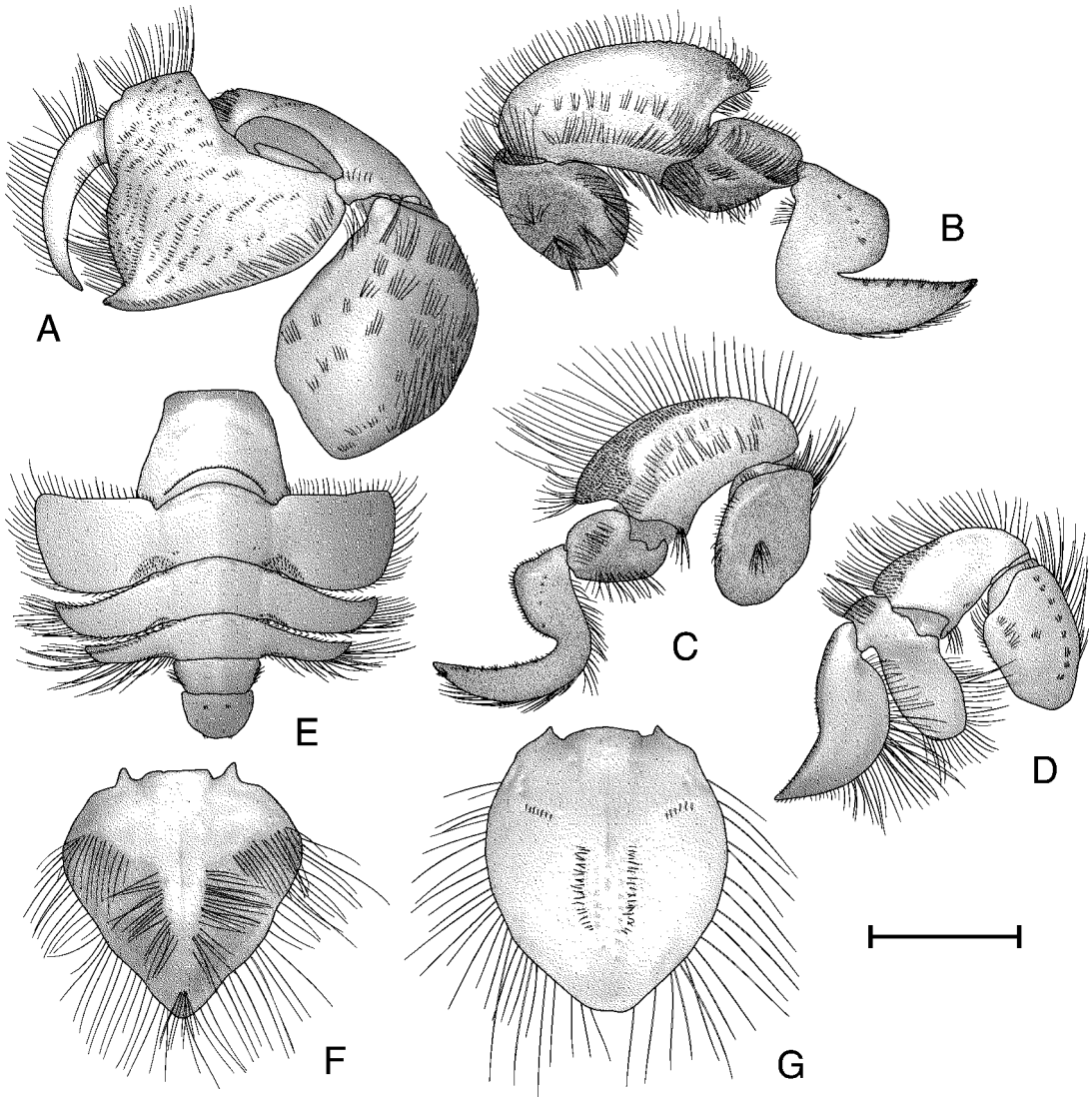


Fig. 88. *Albunea carabus* (Linnaeus, 1758): A, B, F, ♂, 19.1 mm cl, USNM 258373; C, D, ♂, 21.0 mm cl, USNM 258373; E, ♂, 19.1 mm cl, USNM 258373; G, ♀, 23.5 mm cl, RMNH 28911. **A.** Left pereopod I, lateral view. **B.** Right pereopod II, lateral view. **C.** Left pereopod III, lateral view. **D.** Left pereopod IV, lateral view. **E.** Abdominal somites I–VI, dorsal view. **F.** Telson of ♂, dorsal view. **G.** Telson of ♀, dorsal view. Scale = 3.3 mm (F, G), 6.7 mm (A, B), and 8.4 mm (C–E).

verse and subdorsal row of 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 scattered setae; fully calcified. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 88B) dactylus smooth; base to heel slightly concave, heel rounded

and not produced, heel to tip with narrow, acute indent, tip acute, tip to base broadly convex; lateral surface smooth, with 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 simple setae, with



patch of long plumose setae at base. Propodal 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 as narrow, oblique, flattened shelf, with 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 strongly produced and rounded dorsodistally, dorsal margin smooth proximally, serrate distally; lateral surface smooth, with small setose mat at tip of produced area and 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 with row of long plumose setae distally, ventrally, and subdorsally. Merus with large median decalcified window covering nearly all of lateral surface, with few scattered long plumose setae on surface and margins; mesial surface nearly smooth with two long rows of setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 88C) dactylus with base to heel slightly concave, heel rounded and not produced, heel to tip with broadly concave indent, tip acute, tip to base smoothly convex; lateral surface smooth, with several small tufts of short setae in roughly straight line across medioproximal surface, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth with plumose setae proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface smooth, with long plumose setae in oblique row, simple setae on dorsal margin; dorsolateral surface narrow, oblique, flattened; mesial surface smooth. Carpus produced dorsodistally, exceeding proximal margin of propodus by one-half length of propodus; dorsolateral margin unarmed; lateral surface slightly rugose dorsodistally, with mat of short setae and two interrupted rows of setae ventrally; mesial surface smooth, with long plumose setae on distal margin and in row on distal half of surface. Merus smooth, with

large decalcified window covering nearly half of lateral surface medially; dorsal and ventral margins unarmed, with long plumose setae; distolateral margin with long plumose setae; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female with large gonopore on anterior mesial margin of coxa, surrounded with short plumose setae; male without pore.

Pereopod IV (fig. 88D) dactylus with base to tip convex proximally, concave distally, with shallow indent, tip acute, tip to base convex; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge with row of short setae; with setose punctations ventral to decalcified window. Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, margin with long plumose setae; dorsal expansion with row of long plumose setae dorsally, oblique area smooth; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; ventral three-fourths of lateral surface and mesial surface smooth, with few scattered setae, dorsodistal quarter of lateral surface with mat of short setae; dorsal margin with short simple and long plumose setae; ventral margin with short simple setae; mesial surface decalcified medially. Merus lateral surface with scattered short transverse rows of setae, dorsal and ventrodorsal margins with long plumose setae; proximoverventral half of mesial surface with large decalcified window. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 88E) with somite I length and width subequal, widest posteriorly; dorsal surface with anterior margin straight; posterior margin curved, with elevated submarginal row of short setae; small transverse decalcified windows laterad of segment median. Somite II dorsal surface with submarginal transverse ridge anteriorly; with small transverse decalcified windows laterad of segment median just anterior to submarginal ridge; pleura expanded and directed anterolaterally; lateral margins angled, anterior and lateral margins with long plumose setae, posterior margin with short setae; posteromesial angle with mat of short simple setae. Somite III



similar to somite II, but narrower, shorter; pleura thinner and shorter than on somite II, directed posterolaterally but with distal tips swept forward, with setae as in somite II; anterolateral angle subacute; dorsal surface obliquely flattened anterolaterally. Somite IV similar to somite III, but thinner and shorter; dorsal surface with few short setae anterolaterally; pleura thinner and shorter than on somite III, directed posterolaterally with distal tips slightly swept forward; 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 slightly broader than somite V; dorsal surface and distal margin with short transverse rows of setae laterad of midline; pleura absent.

Females with uniramous, paired pleopods on somites II–V; males without pleopods. Telson of male (fig. 88F) broadly triangular, as long as wide, with broadly rounded tip; thickly calcified in proximal third and medial strip, inflated dorsally; distolateral two-thirds decalcified; median longitudinal groove extending one-half length, rows of long simple setae demarcating juncture of calcified and decalcified regions and in tuft at distal end; proximolateral angles without setae; margins with long simple setae. Telson of female (fig. 88G) flattened, ovate, and evenly calcified with slightly truncate tip; median groove similar to male, row of short simple setae on either side of median groove from midpoint of telson continuing distally to three-fourths length of telson and in short transverse submarginal lateral rows approximately one-fourth distal from proximal margin; proximolateral angle without setae, margins with long simple setae.

**DISTRIBUTION:** From Lebanon westward through the Mediterranean and from the Azores and Madeira southward to Dahomey, in up to 40 m depth.

**MAXIMUM SIZE:** Males: 21.0 mm cl; females: 23.5 mm cl.

**TYPE SPECIMENS:** The type(s) of *Cancer carabus* are lost. MNHN-Hi 189 (syntype of *A. guerinii*), MNHN-Hi 190 (syntype of *A. guerinii*), MNHN-Hi 9 (2 syntypes of *A. guerinii*). Lucas (1849a, 1853) cited 16 total specimens (= syntypes) of *A. guerinii*. Only four specimens in the MNHN are labeled as

syntypes and possess the correct data. It may be that MNHN-Hi 90 and MNHN-Hi 91 are also syntypes of *A. guerinii*, but they have no data associated with them that would confirm this.

**TYPE LOCALITIES:** *Cancer carabus*: “M. Mediterraneo” (Linnaeus, 1758). As pointed out by Rubi  and Holthuis (1976), the collector of the type(s), Erik Brander, was stationed in Algeria, and this is probably where the type(s) came from, although it cannot be considered the type locality in the absence of a primary type specimen. *Albunea guerinii*: Algeria.

**REMARKS:** At least part of the difficulty early authors had in identifying this taxon as an *Albunea* was caused by Linnaeus’ (1758) placement of the species within *Cancer*. *Cancer Carabus* (Linnaean no. 48) was separated by eight intervening taxa from *Cancer Symmysta* (Linnaean no. 39), the only other albuneid described by Linnaeus (1758). These eight intermediate taxa were an assortment of anomurans, crayfish, and shrimp which, by themselves, offered no clue as to the relationships of *carabus* and *symmysta*. By 1767, Linnaeus had moved the two taxa closer together, to no. 68 and no. 70 on his list, and separated them by a galatheid. The “rostrum dentibus 2 parallelis mobilibus depressis” described by Linnaeus (1758) for this species is actually the ocular peduncles rather than the rostrum. This was probably the key morphological feature that caused confusion as to what sort of crustacean Linnaeus was referring to (Miers, 1878). Linnaeus (1758) cited this species as “Testa magnitudine extimi pollicis” (as long as the last joint of the thumb), and this has been extrapolated to a carapace length of approximately 17 mm (Rubi  and Holthuis, 1976), although larger specimens are known. Calado (1995) erroneously cited BMNH 1920.12.16.3 as the “hol tipo.” No Linnaean material of this species exists, no neotype has ever been designated, and no neotype is needed, as this species is the only albuneid in the Mediterranean and is only distantly related to the other albuneid species in the east Atlantic. The species has been called “Leeuw-Krab” (Houttuyn, 1769), “Kahn Krabbe” (Stadius M ller, 1775), and “L w-

enkrebs" (Herbst, 1796), but no general common name has been adopted.

Lucas (1853), in describing *A. guerinii*, was the first to recognize and discuss the sexual dimorphism in telson shape within the genus. Zariquiey Alvarez's (1961: fig. 1) illustration of this species is one of the most accurate drawings published for any albuneid before 1999 (fig. 1C, herein), and his illustrations of the male and female telsons are another rare example of recognition of the sexual dimorphism present in this genus.

Brunet and Vicente (1992) incorrectly cited Monod as the first author to unequivocally assign this taxon to *Albunea*; that assignation was first indicated by Ortmann (1896). Ortmann (1896) also introduced the manuscript name "*Albunea barbara* Lucas" in synonymy with *A. carabus*. That name is both a nomen nudum and an unavailable name. The specimen cited from ANSP by Ortmann (1896) and identified as *A. barbara* Lucas is not extant (Boyko, personal obs.).

Holthuis's (1977) placement of *Hippa caerulea* Risso in synonymy with *A. carabus* is incorrect, as *Hippa caerulea* is actually a gnathiid isopod (see appendix 2).

Although there are repeated statements in the literature that this species is "muy raro" (Zariquiey Alvarez, 1968; Brunet and Vicente, 1992), it is likely more common in its preferred sand bottom habitats than current data suggest. The apparent rarity of this species in the eastern basin of the Mediterranean is likely due to limited collecting efforts rather than to unspecified "ecological factors" (see Spanò et al., 1999). The species is also probably more widely distributed in the eastern basin than current data indicate. In fact, *A. carabus* is occasionally washed ashore in large numbers, possibly due to mortality from freshwater runoff (Piguet, 1955). This is apparently the only species of albuneid in the Azores, but is only known from a few specimens from that location (Figueira, 1960).

Seridji (1988) described zoeal stages I, II, and III from plankton collected off Algeria. Seridji (1988) speculated that *A. carabus* might have the same number of zoeal stages (five) as *A. symmysta*, but as these two species are not particularly closely related and larval development in the genus is overall

poorly known, this seems a premature conclusion. The west African larvae reported by Lebour (1959) as "*Albunea* sp. B" resemble the early (stage II or III) zoeae of *A. carabus* in the shape of the posterior telson margin. The coloration of adults is: carapace dark purple with brownish areas, dorsal regions of pereopods and abdomen purple, antennular flagellae ringed with purple and yellowish brown (Rubió and Holthuis, 1976).

This species typifies the "*carabus*-group" of *Albunea*, which also includes *A. danai* and *A. bulla*. It is the sister species to *A. danai*.

*Albunea asymmetrica* (P. Müller, 1979)

Figure 89

*Mioranina asymmetrica* P. Müller, 1979: 278–279, pls. 9, 10\*.

*Albunea asymmetrica*: P. Müller, 1984: 62, pl. 28, figs. 4–6\*.

MATERIAL EXAMINED: **Hungary**: MGy–2–1, Upper Badenian, Budapest, Gyakorlót, coll. P. Müller: 1 carapace fragment, 10.5 × 13.6 mm (l × w), holotype (plaster cast of HNHM); MGy–2–2, Upper Badenian, Budapest, Gyakorlót, coll. P. Müller: 1 carapace fragment, 13.8 × 12.2 mm (l × w), paratype (plaster cast of HNHM; pl. 9, fig. 3 in P. Müller, 1979); MGy–2–2, Upper Badenian, Budapest, Gyakorlót, coll. P. Müller: 1? merus, 13.0 × 8.0 mm (l × w), paratype (plaster cast of HNHM; pl. 9, fig. 2 in P. Müller, 1979); MGy–2–2, Upper Badenian, Budapest, Gyakorlót, coll. P. Müller: 1 carapace fragment, 12.5 × 9.5 mm (l × w), paratype (plaster cast of HNHM; pl. 10, fig. 2 in P. Müller, 1979); MGy–2, Upper Badenian, Budapest, Gyakorlót, coll. P. Müller: 1 carapace fragment, 20.2 × 10.1 mm (l × w), paratype (latex cast of HNHM; pl. 10, fig. 1 in P. Müller, 1979); MGy–2, Upper Badenian, Budapest, Gyakorlót, coll. P. Müller: 6 fragments (HNHM); MR8–16, Upper Badenian, Budapest-Rákos, Layer 8, coll. P. Müller: 2 fragments, 9.5 × 9.8 mm, 7.5 × 8.0 mm (l × w) (HNHM).

DIAGNOSIS: Carapace as long as wide, covered with crenulate grooves. Anterior margin with 10 spines on either side of ocular sinus. Setal field with thin lateral elements and straight anterior margin. CG1 with separate posterior lateral elements; CG4 with two

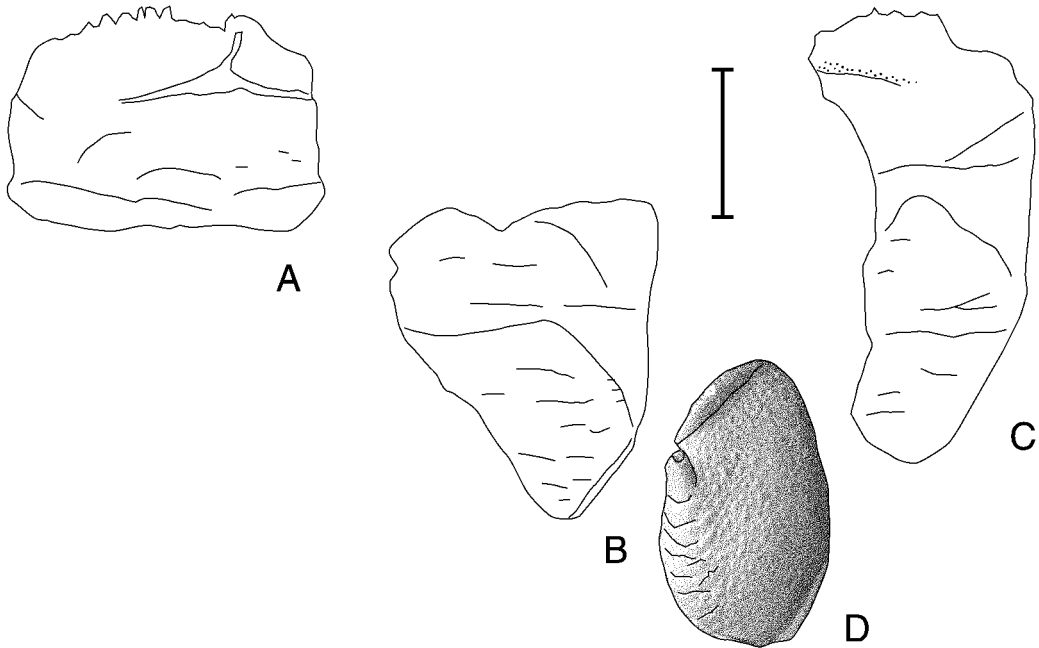


Fig. 89. *Albunea asymmetrica* (Müller, 1979): **A.** Anterolateral left quarter of carapace,  $10.5 \times 13.6$  mm ( $l \times w$ ), HNHM MGy-2-1, holotype. **B.** Posterolateral right quarter of carapace,  $13.8 \times 12.2$  mm ( $l \times w$ ), HNHM, paratype. **C.** Right half of carapace,  $20.2 \times 10.1$  mm ( $l \times w$ ), HNHM MGy-2, paratype. **D.** Anterior section of right branchiostegite,  $12.5 \times 9.5$  mm ( $l \times w$ ), HNHM. Scale = 6.7 mm (B–D) and 7.2 mm (A).

long medial elements between longer supralateral elements of CG4; CG5 unknown; CG6 and CG7 fused; CG8 unknown; CG11 unknown. Rostrum present.

**DESCRIPTION:** Carapace (fig. 89A–C) approximately as wide as long. Anterior margin slightly concave on either side of ocular sinus, becoming convex laterally with 10 large spines ( $n = 1$ ) along length. Rostrum as small acute tooth. Ocular sinus smoothly concave and unarmed. Frontal region smooth; setal field narrow anteriorly and widening posteriorly; posterior lateral elements reduced to narrow bands of setae. CG1 parallel to anterior margin of carapace, sinuous, strongly crenulate, divided into medial fragment and curved, posteriorly displaced lateral elements. Mesogastric region smooth; CG2 presence unknown; CG3 present but composition unknown; CG4 with two long medial elements between longer supralateral elements of CG4. Hepatic region smooth, with oblique setose groove at median of lateral margin. Epibranchial region generally

triangular, smooth. Metagastric region smooth; CG5 presence unknown. CG6 strongly crenulate, strongly anteriorly concave medially and sloping out to anteriorly convex lateral thirds. CG7 oblique, not reaching lateral margins of median segment of CG6. Cardiac region unknown; CG8 unknown. CG9 unknown. CG10 unknown. CG11 unknown. Branchial region with numerous short, transverse rows of setae. Branchiostegite (fig. 89D) with short anterior submarginal spine; anterior region with scattered rugae.

Pereopod I subchelate. Dactylus unknown. Propodal lateral surface with numerous short, transverse rows of setose rugae; dorsal margin unarmed.

**DISTRIBUTION:** Known only from the Upper Badenian formation, Budapest, Hungary.

**TYPE SPECIMENS:** HNHM MGy-2-1 (holotype), HNHM MGy-2-2 (8 paratypes).

**TYPE LOCALITY:** MGy-2-1, Upper Badenian, Budapest, Gyakorlótűz, Hungary.

**REMARKS:** The species was first described

as the type of the "raninid" genus *Mioranina* P. Müller, 1979, illustrating once again the convergent morphology between raninids and albuneids. None of the material of this taxon is well preserved, especially when compared to other known albuneid fossils (e.g., Beschin and De Angeli, 1984). This material is quite similar to *A. carabus* in its carapace grooves, shortness of branchiostegite spine, and proportions of length and width. The number and size of the anterior carapace margin spines of *A. asymmetrica* are not appreciably different from *A. carabus*, contrary to the statements of P. Müller (1984). The relatively recent age (15 mybp, Tertiary: Miocene) of this fossil material also suggests that it may be conspecific with an extant taxon. Additional better preserved material is needed to determine if *A. asymmetrica* and *A. carabus* are synonymous or closely related species.

*Albunea danai* Boyko, 1999

Figures 90, 91

*Albunea danai* Boyko, 1999: 145 (list), 155–161, figs. 5, 6\*.

**MATERIAL EXAMINED: USA: Hawaii:** Halonu Blow Hole dive site, south shore, Oahu, 12.2–13.7 m, April 4, 1997, coll. R. Holcom: 1 ♂, 16.7 mm cl, holotype (QM W23105); Kailua, Oahu, March 1938, coll. unknown: 1 ♀, 16.8 mm cl, allotype (BPBM S11782); off Eaa Beach, near Pearl Harbour, 15 fms (= 27.4 m), July 5, 1964, coll. B. R. Wilson on "Pele": 1 ♀, 10.8 mm cl, paratype (WAM 10422); off Waikiki, Oahu, 20 ft (= 6.1 m), May 30, 1948, coll. Allen and V. Smith: 1 ♀, 10.8 mm cl, paratype (AMNH 17716 ex BPBM S5348); off Sand Island, Oahu, 16–25 fms (= 29.3–45.7 m), July 17, 1959, coll. Pele Expedition: 1 ♂, 10.4 mm cl, paratype (AMNH 17717 ex BPBM S6776); off Honolulu, 15–22 fms (= 27.4–40.2 m), Feb.–March 1962, coll. T. Richert: 1 ♂, 16.4 mm cl, 1 ♀, 15.5 mm cl, paratypes (WAM 23390); Waikiki, Oahu, 75 ft (= 22.7 m), May 23, 1948, coll. Smith and Allen: 1 ♂, 11.6 mm cl, paratype (BPBM S5343); Kahana Bay, Oahu, 25–30 fms (= 45.7–54.9 m), July 25, 1959, coll. Pele Expedition: 1 ♂, 8.6 mm cl, paratype (BPBM S6775); Diamond Head, Oahu, 25–45 fms (= 45.7–82.3

m), Sept. 9, 1959, coll. Pele Expedition: 1 ♀, 13.0 mm cl, paratype (BPBM S6777); Kaneohe Bay, Oahu, 1924, coll. unknown: 1 ♂, 4.0 mm cl (BPBM S7806).

**DIAGNOSIS:** Carapace slightly longer than wide, covered with lightly setose grooves. Anterior margin with eight or nine spines. Setal field with narrow lateral elements and slightly concave anterior margin; posterior lateral elements not extending to posterior lateral elements of CG1. CG1 with separate posterior lateral elements; CG4 with two to four short medial elements; CG5 divided into two lateral elements, not nearly reaching margins of CG6; CG6 and CG7 separate, but almost approximate; CG8 with one or two posteriorly displaced median elements separated from lateral elements; CG11 absent. Rostrum present, not reaching proximal margin of ocular plate. Ocular plate subquadrate. Distal peduncular segments dorsoventrally flattened and elongate, pointed at tip, approximate along mesial margins; lateral margins convex; mesial margins straight proximally, convex distally. Cornea at lateral margin of tip. Antennule with 87–92 flagellar exopodal and three or four endopodal articles. Antenna with seven flagellar articles; acute spine on dorsolateral surface of peduncle segment I. Dactyli of pereopods II and III with heels low and smoothly rounded. Coxa of pereopod III of males with small pore. Telson of male triangular, dorsoventrally flattened laterally and distally, inflated medially. Telson of female flattened, rounded at tip.

**DESCRIPTION:** Carapace (fig. 90A) slightly wider than long. Anterior margin slightly concave on either side of ocular sinus, becoming convex laterally with eight or nine large spines along length. Rostrum as small acute tooth, extending only one-half of the distance between distal margin of the ocular sinus and ocular plate. Ocular sinus smoothly concave and unarmed. Frontal region smooth; setal field broad posteriorly, narrowing anteriorly, with narrow anterior lateral elements and slightly concave anterior margin; posterior lateral elements thin and not reaching to posterior lateral elements of CG1. CG1 parallel to anterior margin of carapace, faintly sinuous, strongly crenulate, divided into medial fragment and curved, posteriorly displaced lateral elements. Mesogastric re-



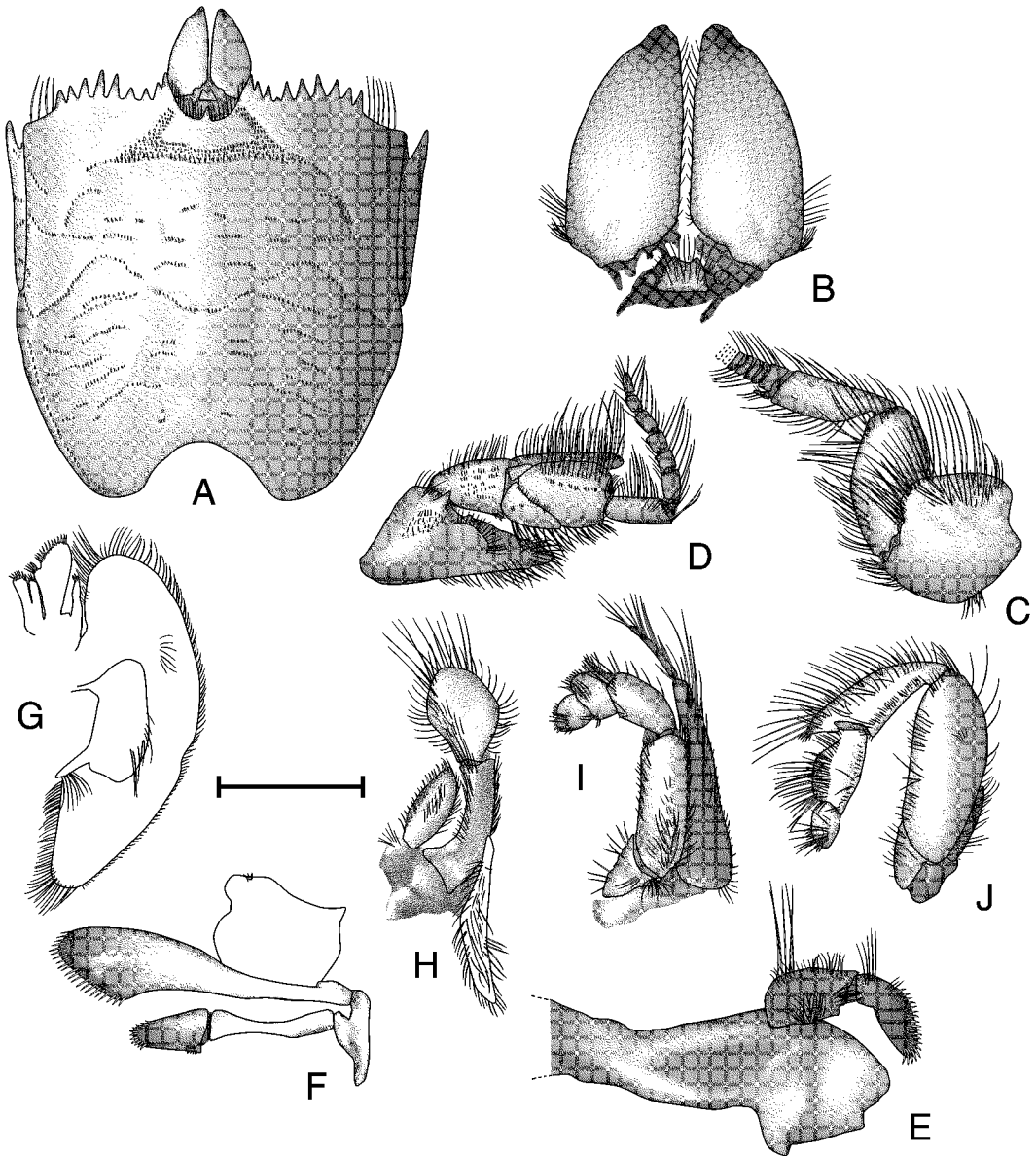


Fig. 90. *Albunea danai* Boyko, 1999: A, ♂, 16.7 mm cl, QM W23105, holotype; B–F, H–J, oviger, 10.8 mm cl, WAM 10422, paratype; G, ♂ 11.6 mm cl, BPBM S5343, paratype. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Right antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Left maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 1.2 mm (C, D, G, H, J), 1.6 mm (B, E, F), 2.2 mm (I), and 6.7 mm (A).

gion smooth; CG2 absent; CG3 broken into six short elements approximately equally spaced between posterior lateral elements of CG1; CG4 with two to four short medial el-

ements spaced approximately equally between longer lateral elements of CG4. Hepatic region smooth, with oblique setose groove at median of lateral margin. Epibran-

chial region generally triangular, smooth; posterolateral margin with two short rows of setae. Metagastric region smooth; CG5 divided into two short lateral elements. CG6 strongly crenulate, strongly anteriorly concave medially and sloping out to anteriorly convex lateral thirds. Cervical groove strongly concave at median and sloping out to irregularly convex lateral thirds; median and lateral thirds separated by short setae-free gap lateral to small depressions. CG7 oblique, almost reaching lateral margins of median segment of CG6. Cardiac region smooth; CG8 present as two very short lateromedial elements displaced posteriorly from longer lateral elements. CG9 present as two short lateral grooves with gap at midline. CG10 present as two curved lateral fragments with gap between fragments approximately equal to length of single fragment. CG11 absent. Branchial region with numerous short, transverse rows of setae. Posterior margin deeply and evenly convex, with submarginal groove reaching approximately halfway up either side of posterior concavity. Branchiostegite with short anterior submarginal; anterior region with scattered, short, transverse lines ventral to *linea anomurica*; with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 90B) subquadrate with median indentation; median peduncular segments reduced to small rounded calcified area on either side of ocular plate. Distal peduncular segments elongate, with distally convex lateral margins, tapering to rounded distal cornea located in lateral notch; mesial margins approximated almost all of length; mesial and proximolateral margins of segment with sparse row of long plumose setae; tuft of plumose setae at proximolateral ventral angle.

Antennule (fig. 90C) with segment III narrow proximally, expanding distally to two times proximal width; with plumose setae on dorsal and ventral margins and sparsely scattered on lateral surface; dorsal exopodal flagellum with 87–92 articles, long plumose setae on dorsal and ventral margins; ventral endopodal flagellum short with three or four

articles and plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins and scattered on ventrolateral third of surface. Segment I wider than long, unarmed; dorsal third of lateral surface rugose with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 90D) with segment V approximately two times longer than wide, with long plumose setae on dorsal margin and scattered on distal half of lateral surface; flagellum with seven articles, long plumose setae on dorsal, ventral, and distal margins. Segment IV expanded distally, with long plumose setae on dorsal, ventral, and distal margins and two rows of setae on dorsolateral surface. Segment III with long plumose setae on dorsal and ventral margin. Segment II short, widening distally, with plumose setae on margins and scattered on lateral surface; antennal acicle long, thin and exceeding distal margin of segment IV by one-fourth of length of segment IV, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventrolaterally with long plumose setae on margins; lateral surface with acute spine dorsally, with low semicircular dorsolateral lobe ventrodial to spine; segment with ventromesial antennal gland pore.

Mandible (fig. 90E) incisor process with one tooth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 90F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under; internal lobe reduced, with three thick setae at distolateral margin.

Maxilla (fig. 90G) exopod evenly rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 90H) epipod with plumose setae on margins, distolateral surface, and mesial surface (epipod shown curled). Endite tapered distally and subequal to first segment of exopod. Exopod with two seg-

ments; proximal segment narrow, margins parallel, with plumose setae; distal segment spatulate, approximately as long as wide, broadest medially, margins and mesioventral surface with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment; plumose setae on margins and median of lateral surface.

Maxilliped II (fig. 90I) dactylus evenly rounded, length equal to width, with thick simple setae distally and on distolateral surface. Propodus two times wider than long, slightly produced at dorsodistal angle, with plumose setae on dorsal margin and long simple setae on dorsodistal margin. Carpus not produced dorsodistally, approximately two times longer than wide; long simple setae on dorsal and distal margins. Merus approximately three times longer than wide, margins parallel; with simple setae on ventrolateral margin and plumose setae on dorsolateral margin. Basis-ischium incompletely fused with plumose setae on margins. Exopod one-third longer than merus, with flagellum one-segmented. Maxilliped III (fig. 90J) dactylus with rounded 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, with plumose setae on margins and scattered on lateral surface. Basis-ischium incompletely fused, with weak crista dentata of approximately two teeth. Exopod two-segmented: proximal segment small; distal segment styliform, tapering, approximately one-third length of merus; with plumose setae on margins; without flagellum.

Pereopod I (fig. 91A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose and short simple setae; ventral margin with short simple setae. Propodal 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; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle produced into strong corneous-tipped spine; dorsal margin

otherwise unarmed; dorsal and distal margins with long plumose setae; lateral surface with small distal rugose area, with few transverse setose ridges on distal half of surface; mesial surface smooth, with few median rows of 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; proximal quarter of mesial surface with decalcified window. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 91B) dactylus smooth; base to heel straight, heel smoothly rounded, heel to tip with wide, acute indent, tip acute, tip to base broadly convex distally and concave proximally; lateral surface smooth, with several small tufts of short setae in generally 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 simple setae, patch of long plumose setae at base. Propodal dorsal surface smooth, with ventral margin inflated and rounded; oblique row of long plumose setae on distal margin of lateral surface; distal and ventral margin with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with 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; decalcified region just distal to junction with carpus. Carpus slightly produced and gently rounded dorsodistally, dorsal margin unarmed; lateral surface smooth, with irregular, interrupted row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; margins with long plumose setae; mesial surface smooth, with long plumose setae in scattered patches on dorsal half of surface and on margins. Merus with large median decalcified window covering nearly all of lateral surface, with few scattered setae on surface and margins; mesial surface nearly smooth, with few setae, decalcified area on proximal quarter near junction with basis-ischium. Basis-ischium incompletely fused and unarmed.



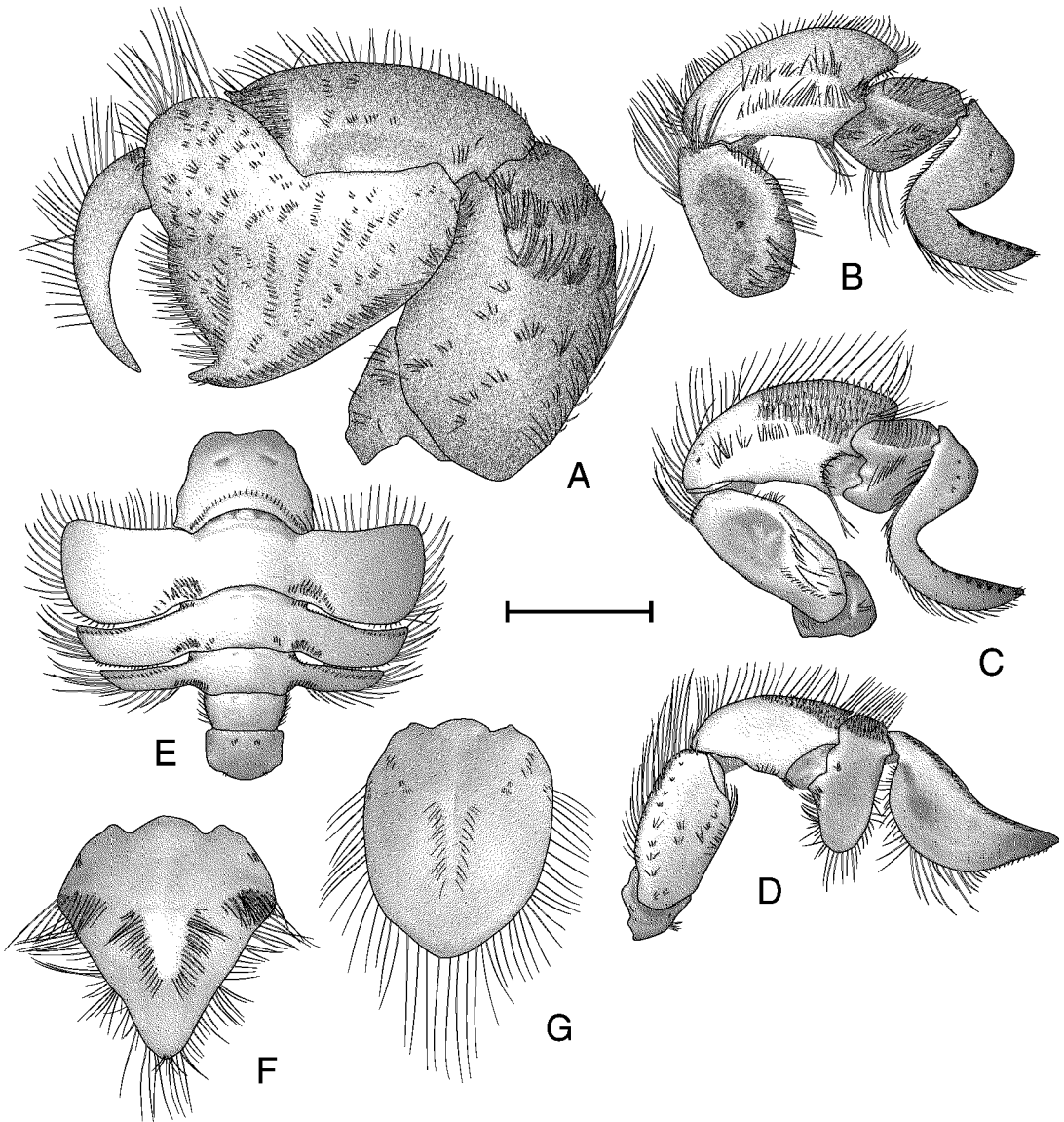


Fig. 91. *Albunea danai* Boyko, 1999: A, F, ♂, 16.7 mm cl, QM W23105, holotype; B-E, ♂, 11.6 mm cl, BPBM S5343, paratype; G, ♀, 16.8 mm cl, BPBM S11782, allotype. A. Left pereopod I, lateral view. B. Right pereopod II, lateral view. C. Right pereopod III, lateral view. D. Right pereopod IV, lateral view. E. Abdominal somites I-VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 3.0 mm (F, G) and 4.4 mm (A-E).

Coxa with one small spine on anterior margin.

Pereopod III (fig. 91C) dactylus with base to heel straight, heel broadly rounded and low, heel to tip with broadly concave indent, tip acute, tip to base smoothly convex distally to straight proximally; lateral surface

smooth, with several small tufts of short setae in generally straight line across medioproximal surface, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at



junction with propodus. Propodus not inflated dorsoventrally; lateral surface smooth, with long plumose setae distally, simple setae on dorsal margins; dorsolateral surface narrow, oblique, flattened; mesial surface with scattered long setae on and near distal margin, with decalcified window near junction with carpus. Carpus produced dorsodistally, exceeding proximal margin of propodus by approximately one-third length of propodus, rounded; dorsolateral margin unarmed; lateral surface slightly rugose dorso-distally, with mat of short setae and row of setae ventrally; mesial surface smooth, with long plumose setae on margins and scattered on surface. Merus smooth, with large decalcified window covering nearly half of lateral surface medially; dorsal and ventral margins unarmed, with long plumose setae; latero-distal margin with long plumose setae; mesial surface smooth, with decalcified window at junction with basis-ischium. Basis-ischium incompletely fused and unarmed. Coxa with tubercle on anterior margin. Female with large gonopore on anterior mesial margin of coxa, surrounded with short plumose setae; male with small pore.

Pereopod IV (fig. 91D) dactylus with base to tip convex to concave, tip acute, tip to base straight distally, becoming convex proximally; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge with row of short setae; with setose punctations 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; ventral three-fourths of lateral surface and mesial surface smooth, dorsal fourth of lateral surface with mat of short setae; dorsal margin with short simple and long plumose setae; ventral margin with short simple setae. Merus with scattered, short, transverse rows of setae on lateral surface, dorsal and ventrodorsal margins with long plumose setae; mesial surface with large decalcified window proximoventrally. Basis-

ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 91E) with somite I approximately as long as wide, widest posteriorly; dorsal surface with anterior margin straight; posterior margin straight with elevated submarginal row of short setae; with small transverse, decalcified windows laterad of segment median. Somite II dorsal surface with submarginal transverse ridge anteriorly; with small transverse decalcified windows laterad of segment median just anterior to submarginal ridge; with tuft of setae at posterolateral angle, extending onto pleura posteromesially; pleura expanded and directed slightly anteriorly; 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 posterolaterally, 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 few thick setae posterolaterally; pleura thinner and shorter than on somite III, directed posterolaterally; 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 length but wider; dorsal surface with short transverse rows of setae laterad of midline anteriorly and posteriorly; lateral margins with long plumose setae; pleura absent.

Females with uniramous, paired pleopods on somites II–V; males without pleopods.

Telson of male (fig. 91F) triangular, slightly longer than wide, with smoothly rounded tip; proximal half heavily calcified, distal half weakly calcified except for large median region; median longitudinal groove extending to distal end of calcified area, line with long, thin, simple setae; junction of proximal and distal regions demarcated by strong line of long setae laterally; calcified plate slightly elevated medially but without ridge. Telson of female (fig. 91G) ovate, longer than wide, rounded distally; dorsal surface smooth, with median longitudinal groove anteriorly; with

row of setose punctae lateral to midline from posterior end of longitudinal groove to three-fourths of length of telson; margins with long plumose setae.

**DISTRIBUTION:** Known only from Oahu, Hawaii, USA, 4.8–40.2 m depth.

**MAXIMUM SIZE:** Males: 16.7 mm cl; females: 16.8 mm cl.

**TYPE SPECIMENS:** QM W23105 (holotype), BPBM S11782 (allotype), WAM 10422 (paratype), AMNH 17716 (paratype), AMNH 17717 (paratype), WAM 23390 (2 paratypes), BPBM S5343 (paratype), BPBM S6775 (paratype), BPBM S6777 (paratype).

**TYPE LOCALITY:** Halonu Blow Hole dive site, south shore, Oahu, Hawaii, USA, 12.2–13.7 m.

**REMARKS:** The coloration of this species is brownish with reddish-brown setae in life (from color transparencies), and a uniform off-white to tan in preservative.

Based on all available data, this species appears to be a true Hawaiian endemic. However, this conclusion should be accepted cautiously, given the “endemic” label applied to *A. speciosa* prior to the findings of Boyko (1999). The holotype of *A. danai* was collected with specimens of *A. speciosa* (QM W22285) and the two species are sympatric in Hawaii in at least part of their bathymetric ranges.

This species belongs to the “*carabus*-group” and is the sister species to *A. carabus*, from the Mediterranean and western Africa, and shares with it a similar shape of the dactyli of pereopods II–IV and telson morphology. *Albunea carabus* can be easily separated from *A. danai* by its CG8 of four medial elements, more strongly crenulated CGs, more pronounced heel on the dactyli of pereopods II and III, and a less inflated merus of maxilliped III. *Albunea danai* can be distinguished from other Indo-West Pacific species, except *A. bulla*, by the triangular shape of the telson of the male, the rounded dactylus of pereopod III, and setal patterns on the carapace of both sexes. *Albunea danai* can be separated from *A. bulla*, which is the sister taxon to the clade containing *A. danai* and *A. carabus*, by the different pattern of carapace grooves and the distinctly “button-like” morphology of the telson of the males of *A. bulla*.

*Albunea marquisiana* Boyko, 2000

Figures 92, 93

*Albunea* sp. cf. *symnysta* [sic] Poupin, 1996b: 26, pl. 12, fig. c\*. – Poupin, 1998: 39\*.

*Albunea* sp. Tudge et al., 1999: 2–5, figs. 1–3\*.

*Albunea marquisiana* Boyko, 2000a: 109–115, figs. 2, 3\*.

**MATERIAL EXAMINED: Marqueses Islands:** Sta. TH X, Haul 1, Haava Straits between Île Tahuata and Île Hiva Oa, 09°52'S, 139°04'W, 40 fms (= 73 m), Oct. 1, 1967, coll. D. M. Devaney for National Geographic Society–Smithsonian–Bishop Museum Marquesas Expedition: 1 ♂, 10.2 mm cl, holotype (USNM 268577); Sta. DW 1279, Île Eiao, 07°59.4'S, 140°42.2'W, 23–70 m, Sept. 6, 1997, coll. MUSORSTOM 9 N/O “Alis” Campagne (P. Bouchet, B. Dayrat, B. Richer De Forges): 1 ♀, 9.3 mm cl, allotype (MNHN-Hi 220); Sta. CP 1304, Île Nuku Hiva, 08°54.4'S, 140°13.9'W, 50–58 m, Sept. 10, 1997, coll. MUSORSTOM 9 N/O “Alis” Campagne (P. Bouchet, B. Dayrat, B. Richer De Forges): 1 ♂, 7.5 mm cl, paratype (AMNH 17819); Sta. D 85, Île Fatu Hiva, 10°29.4'S, 138°46.5'W, 100 m, Jan. 29, 1991, coll. J. Poupin: 8 ♂, 5.2–10.0 mm cl, 2 ♀, 5.6–6.9 mm cl, 5 anterior half carapaces, 4.2–7.0 mm cl (MNHN-Hi 243), 1 ♀, 6.4 mm cl, paratype (AMNH 17820); Sta. NH-VIII, Haul 5, Baie Hatuatua, Île Nuku Hiva, 08°51'S, 140°00'W, 26 fms (= 48 m), Sept. 18, 1967, coll. National Geographic Society–Smithsonian–Bishop Museum Marquesas Expedition: 1 ♀, 5.2 mm cl, paratype (USNM 260948); Sta. UP II, Haul 4, off west coast of Île Ua Pou, 40–45 fms (= 73–82 m), Sept. 23, 1967, coll. National Geographic Society–Smithsonian–Bishop Museum Marquesas Expedition: 1 ♂, 8.5 mm cl, paratype (USNM 260949); Sta. FH I, Haul 1, west coast of Île Fatu Hiva, 10°27–30'S, 138°40'W, 41–43 fms (= 75–79 m), Sept. 25, 1967, coll. National Geographic Society–Smithsonian–Bishop Museum Marquesas Expedition: 1 anterior third (USNM 260950); Sta. EO I, Haul 1, off northern coast of Île Eiao, 08°00'S, 140°50'W, 28–29 fms (= 51–53 m), Sept. 21, 1967, coll. National Geographic Society–Smithsonian–Bishop Museum Marquesas Expedition: 1 ♂, 7.9 mm cl, paratype (USNM 260952); Sta. TH IX, Haul 1, off Hana Moe

- Noe, northwest coast of Île Tahuata, 09°54'S, 139°07'W, 37 fms (= 68 m), Oct. 1, 1967, coll. National Geographic Society-Smithsonian-Bishop Museum Marquesas Expedition: 1 ♂, 7.9 mm cl, 1 ♀, 8.4 mm cl, paratypes (USNM 268578); Sta. DW 1143, Île Ua Pou, 09°20.9'S, 140°02.7'W, 18–55 m, Aug. 22, 1997, coll. MUSORSTOM 9 N/O "Alis" Campagne (P. Bouchet, B. Dayrat, B. Richer De Forges): 1 ♂, 4.5 mm cl, paratype (MNHN-Hi 221); Sta. DW 1162, Île Nuku Hiva, 08°56.2'S, 140°06.1'W, 45–64 m, Aug. 24, 1997, coll. MUSORSTOM 9 N/O "Alis" Campagne (P. Bouchet, B. Dayrat, B. Richer De Forges): 1 anterior half, 4.7 mm cl (MNHN-Hi 222); Sta. DW 1185, Île Nuku Hiva, 08°48.9'S, 140°03.4'W, 31–33 m, Aug. 26, 1997, coll. MUSORSTOM 9 N/O "Alis" Campagne (P. Bouchet, B. Dayrat, B. Richer De Forges): 1 ♂, 7.6 mm cl, 1 anterior half, 9.5 mm cl (MNHN-Hi 222 bis); Sta. DW 1180, Île Nuku Hiva, 08°46.2'S, 140°04.6'W, 80–82 m, Aug. 26, 1997, coll. MUSORSTOM 9 N/O "Alis" Campagne (P. Bouchet, B. Dayrat, B. Richer De Forges): 1 ♂, 10.2 mm cl, paratype (MNHN-Hi 223); Sta. CP 1187, Île Nuku Hiva, 08°49.2'S, 140°03.5'W, 25–30 m, Aug. 26, 1997, coll. MUSORSTOM 9 N/O "Alis" Campagne (P. Bouchet, B. Dayrat, B. Richer De Forges): 3 ♂, 8.9–10.8 mm cl, paratypes (MNHN-Hi 224); Sta. DW 1213, Île Hiva Oa, 09°50.3'S, 139°03.2'W, 18–20 m, Aug. 29, 1997, coll. MUSORSTOM 9 N/O "Alis" Campagne (P. Bouchet, B. Dayrat, B. Richer De Forges): 1 ♀, 5.3 mm cl (MNHN-Hi 225); Sta. DW 1214, Île Hiva Oa, 09°49.8'S, 139°03.1'W, 25–40 m, Aug. 29, 1997, coll. MUSORSTOM 9 N/O "Alis" Campagne (P. Bouchet, B. Dayrat, B. Richer De Forges): 1 anterior half, 7.1 mm cl (MNHN-Hi 226); Sta. DW 1217, Île Hiva Oa, 09°44.5'S, 138°49.9'W, 85–87 m, Aug. 30, 1997, coll. MUSORSTOM 9 N/O "Alis" Campagne (P. Bouchet, B. Dayrat, B. Richer De Forges): 1 ♂, 5.1 mm cl, paratype (MNHN-Hi 227); Sta. DW 1241, Île Fatu Hiva, 10°27.8'S, 138°40.6'W, 85–130 m, Sept. 1, 1997, coll. MUSORSTOM 9 N/O "Alis" Campagne (P. Bouchet, B. Dayrat, B. Richer De Forges): 1 ♂, 6.2 mm cl, paratype (MNHN-Hi 228); Sta. DW 1242, Île Fatu Hiva, 10°28.1'S, 138°41.1'W, 119–122 m, Sept. 1, 1997, coll. MUSORSTOM 9 N/O "Alis" Campagne (P. Bouchet, B. Dayrat, B. Richer De Forges): 1 ♂, 7.2 mm cl, paratype (MNHN-Hi 229); Sta. DR 1245, Île Fatu Hiva, 10°29.2'S, 138°36.2'W, 85–130 m, Sept. 1, 1997, coll. MUSORSTOM 9 N/O "Alis" Campagne (P. Bouchet, B. Dayrat, B. Richer De Forges): 1 ♂, 10.1 mm cl, 1 ♀, 9.4 mm cl, paratypes (MNHN-Hi 230); Sta. DW 1256, Île Ua Pou, 09°25.4'S, 140°07.9'W, 70–72 m, Sept. 3, 1997, MUSORSTOM 9 N/O "Alis" Campagne (P. Bouchet, B. Dayrat, B. Richer De Forges): 6 ♂, 5.2–8.7 mm cl, 2 ♀, 6.0–7.4 mm cl, 1 posterior half of oviger (MNHN-Hi 231); Sta. DW 1260, Île Ua Pou, 09°25.4'S, 140°07.3'W, 49–100 m, Sept. 3, 1997, coll. MUSORSTOM 9 N/O "Alis" Campagne (P. Bouchet, B. Dayrat, B. Richer De Forges): 2 ♂, 8.4–8.9 mm cl, 1 ♀, 9.7 mm cl, paratypes (MNHN-Hi 232); Sta. DW 1266, Île Eiao, 07°57.3'S, 140°42.6'W, 84 m, Sept. 4, 1997, coll. MUSORSTOM 9 N/O "Alis" Campagne (P. Bouchet, B. Dayrat, B. Richer De Forges): 1 ♂, 5.6 mm cl, paratype (MNHN-Hi 233); Sta. DW 1279, Île Eiao, 07°59.4'S, 140°42.2'W, 23–70 m, Sept. 6, 1997, coll. MUSORSTOM 9 N/O "Alis" Campagne (P. Bouchet, B. Dayrat, B. Richer De Forges): 4 ♀, 3.5–8.1 mm cl, paratypes (MNHN-Hi 234); Sta. DW 1283, Île Mutu One, Hatutaa, 07°53.8'S, 140°34.5'W, 55–56 m, Sept. 7, 1997, coll. MUSORSTOM 9 N/O "Alis" Campagne (P. Bouchet, B. Dayrat, B. Richer De Forges): 1 ♂, 5.4 mm cl, paratype (MNHN-Hi 235); Sta. DW 1292, 08°54.1'S, 139°37.8'W, Île Ua Huka, 95–100 m, Sept. 8, 1997, coll. MUSORSTOM 9 N/O "Alis" Campagne (P. Bouchet, B. Dayrat, B. Richer De Forges): 1 ♂, 6.1 mm cl (MNHN-Hi 257); Sta. DW 1297, Île Ua Huka, 08°54.2'S, 139°37.4'W, 90–150 m, Sept. 8, 1997, coll. MUSORSTOM 9 N/O "Alis" Campagne (P. Bouchet, B. Dayrat, B. Richer De Forges): 1 ♂, 7.9 mm cl, paratype (MNHN-Hi 236), 1 ♀, 4.8 mm cl, paratype (MNHN-Hi 237); Sta. CP 1304, Île Nuku Hiva, 08°54.4'S, 140°13.9'W, 50–58 m, Sept. 10, 1997, coll. MUSORSTOM 9 N/O "Alis" Campagne (P. Bouchet, B. Dayrat, B. Richer De Forges): 3 ♂, 6.3–8.0 mm cl, paratypes (MNHN-Hi 238); Sta. 24, Côte NW Baie Haahue, Île Ua Huka, 08°53.6'S, 139°37'W, 9–25 m, Oct. 1997, coll. R. Von Cosel, J.

Tröndlé, and J. Tardy: 1 ♂, 4.3 mm cl, 4 ♀, 5.8–10.9 mm cl, 6 juveniles, 3.1–3.8 mm cl, 2 unsexable, unmeasurable specimens (MNHN-Hi 239); Sta. 29, Baie de Hane, Île Ua Huka, 08°55.7'S, 139°32.0'W, 7–11 m, Oct. 1997, coll. R. Von Cosel, J. Tröndlé, and J. Tardy: 2 ♀, 5.0–5.1 mm cl (MNHN-Hi 240); Sta. 34, Baie Haavei, Pointe Tenoni, Île Teuaua, Île Ua Huka, 08°56.8'S, 139°35.7'W, 10–15 m, Oct. 1997, coll. R. Von Cosel, J. Tröndlé, and J. Tardy: 1 ♂, 6.3 mm cl, paratype (MNHN-Hi 241); Sta. D 77, Île Eiao, 07°56.7'S, 139°30.8'W, 54 m, Jan. 21, 1991, coll. J. Poupin: 1 ♂, 10.0 mm cl, paratype (MNHN-Hi 242).

**DIAGNOSIS:** Carapace wider than long, covered with lightly setose grooves. Anterior margin with 8–10 spines on either side of ocular sinus. Setal field with narrow lateral elements and sinuous anterior margin. CG1 with separate posterior lateral elements; CG4 with two long lateral elements terminating above apex of CG6, occasionally with two short medial elements; CG5 broken into two short oblique elements; CG6 and CG7 separate; CG8 broken; CG11 present. Rostrum present, not reaching posterior margin of ocular plate. Ocular plate triangular. Distal peduncular segments dorsoventrally flattened and subtriangular in shape, tapering at tip, approximated along mesial margins, lateral margins convex except slightly concave at tip, mesial margins straight. Cornea at tip. Dactylus of pereopod II with heel produced and subquadrate. Dactylus of pereopod III with heel slightly produced and acute. Dactylus of pereopod IV evenly sinuous from base to tip. Telson of male spatulate, tip rounded, dorsal surface inflated medially with strong medial ridge lined with short thick setae; lateral margins decalcified. Telson of female ovate.

**DESCRIPTION:** Carapace (fig. 92A) slightly wider than long. Anterior margin concave on either side of ocular sinus, becoming convex laterally, with 8–10 large spines along length. Rostrum as small acute tooth, not reaching proximal margin of ocular plate. Ocular sinus smoothly concave and unarmed. Frontal region smooth; setal field broad posteriorly, narrowing anteriorly, with narrow anterior lateral elements and sinuous anterior margin; posterior lateral elements not reaching to

posterior lateral elements of CG1. CG1 parallel to anterior margin of carapace, sinuous, slightly crenulate, divided into medial sinuous fragment and curved, posteriorly displaced lateral elements. Mesogastric region smooth; CG2 absent; CG3 broken into four to six short elements; CG4 with two long lateral elements terminating above apex of CG6, occasionally with two short medial elements. Hepatic region smooth, with long setose groove at median of lateral margin. Epi-branchial region generally triangular, smooth. Metagastric region smooth; CG5 broken into two short oblique elements. CG6 strongly crenulate, strongly anteriorly concave medially and sloping out to anteriorly convex lateral thirds. CG7 present as two long oblique elements and separate from CG6. Cardiac region smooth; CG8 with two to four median elements and two slightly longer lateral elements. CG9 present as two short, widely separated elements. CG10 present as two straight lateral fragments, with gap between fragments greater than length of single fragment. CG11 present as two or three irregularly spaced short elements. Branchial region with numerous short, transverse rows of setae. Posterior margin deeply and evenly convex, with submarginal groove reaching approximately three-fourths up either side of posterior concavity. Branchiostegite with short anterior submarginal spine; anterior region with scattered short, transverse lines ventral to *linea anomurica*; with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 92B) subquadrate, with shallow median indentation; median peduncular segments reduced to small rounded decalcified area on either side of ocular plate. Distal peduncular segments elongate, with proximally convex and distally concave lateral margins, tapering to produced distal cornea; mesial margins approximated along entire length; mesial and ventral margins of segment with sparse row of long plumose setae; few small tufts of plumose setae on proximal quarter of segment.

Antennule (fig. 92C) with segment III subcylindrical; with plumose setae on dorsal and



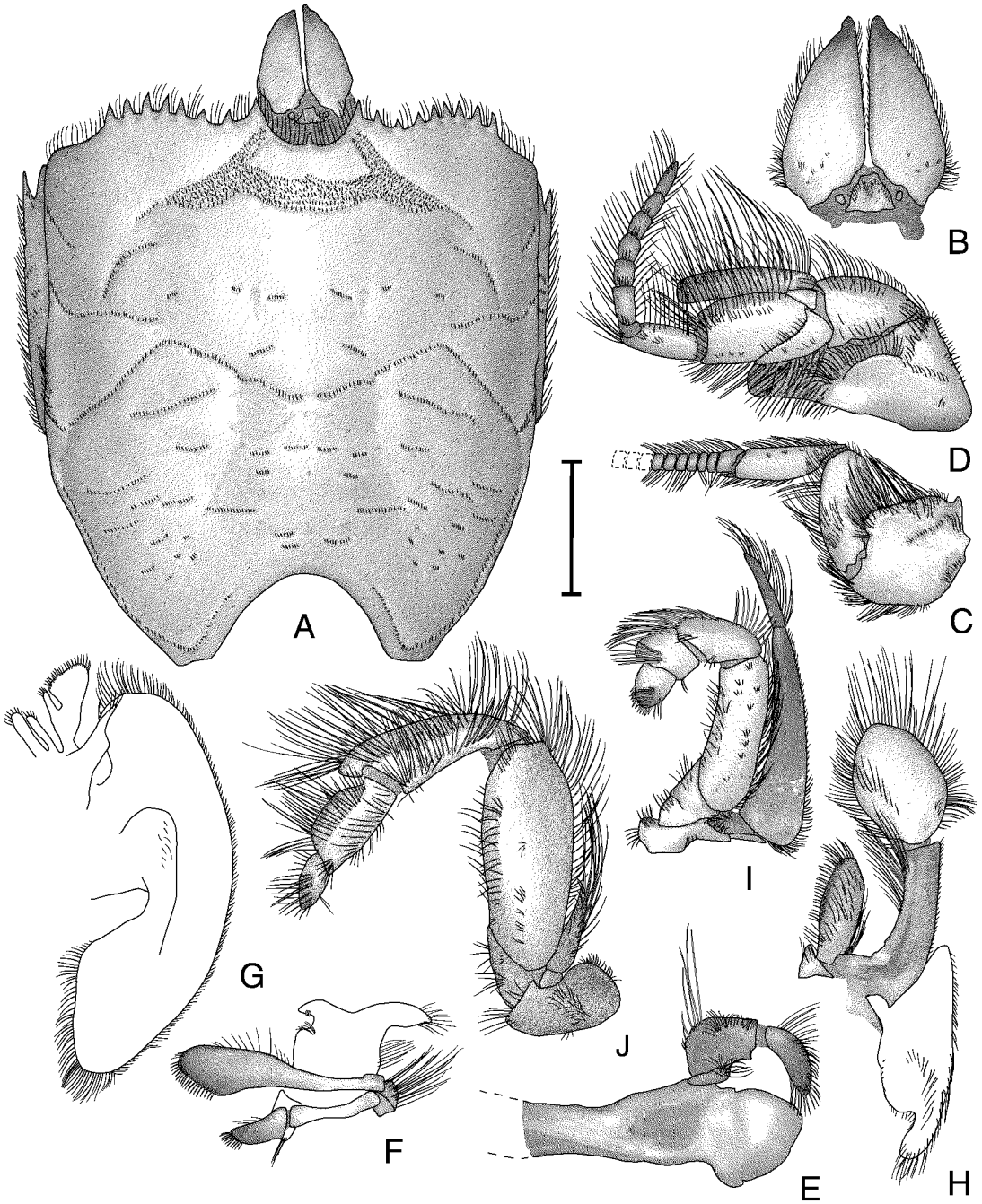


Fig. 92. *Albunea marquisiana* Boyko, 2000: A, ♂, 10.2 mm cl, USNM 268577, holotype; B–J, ♂, 7.9 mm cl, USNM 268578, paratype. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Left maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 1.6 mm (B, E, F, I), 2.2 mm (D, G, H, J), and 3.3 mm (A, C).

ventral margins; dorsal exopodal flagellum with 110–118 articles, long plumose setae on dorsal and ventral margins; ventral endopodal flagellum short with two articles and plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins and scattered on ventrolateral third of surface. Segment I wider than long, unarmed; dorsal third of lateral surface rugose with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 92D) with segment V approximately two times longer than wide, with long plumose setae on dorsal margins; flagellum with seven articles, long plumose setae on dorsal, ventral, and distal margins. Segment IV expanded distally, with long plumose setae on dorsal, ventral, and distal margins and row of setae on dorsolateral margin. Segment III with long plumose setae on dorsal and ventral margins. Segment II short, widening distally, with plumose setae on margins; antennal acicle long, thin, truncate distally, slightly exceeding distal margin of segment IV, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventrolaterally, with long plumose setae on margins; lateral surface with acute spine subdorsally, with low semicircular, dorsolateral lobe ventrodorsal to spine; segment with ventromesial antennal gland pore.

Mandible (fig. 92E) incisor process without teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 92F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin; plumose setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under; internal lobe reduced with three thick setae at distolateral margin.

Maxilla (fig. 92G) exopod evenly rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 92H) epipod with plumose setae on distal margin and on distolateral surface. Endite tapered distally and subequal to first segment of exopod. Exopod

with two segments; proximal segment narrow, margins parallel, with plumose setae; distal segment spatulate, approximately as long as wide, broadest medially, margins with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins.

Maxilliped II (fig. 92I) dactylus evenly rounded, length slightly greater than width, with thick simple setae distally. Propodus two times wider than long, with plumose setae on dorsal margin and long simple setae on distal margin. Carpus not strongly produced dorsodistally, approximately three times longer than wide, with long simple setae on dorsal margin. Merus approximately three times longer than wide, margins parallel, with simple setae on ventrolateral margin and scattered on surface, plumose setae on dorsolateral margin. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-fourth longer than merus, flagellum with one elongate article.

Maxilliped III (fig. 92J) dactylus evenly rounded; with 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, with plumose setae on margins and scattered on surface. Basis-ischium incompletely fused, with faint *crista dentata* of few small low teeth. Exopod two-segmented: proximal segment small; distal segment styliform, tapering, approximately one-third length of merus, with plumose setae on margins; without flagellum.

Pereopod I (fig. 93A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose and short simple setae; ventral margin with short simple setae. Propodal 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; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle produced into small spine, dorsal margin smooth; dorsal

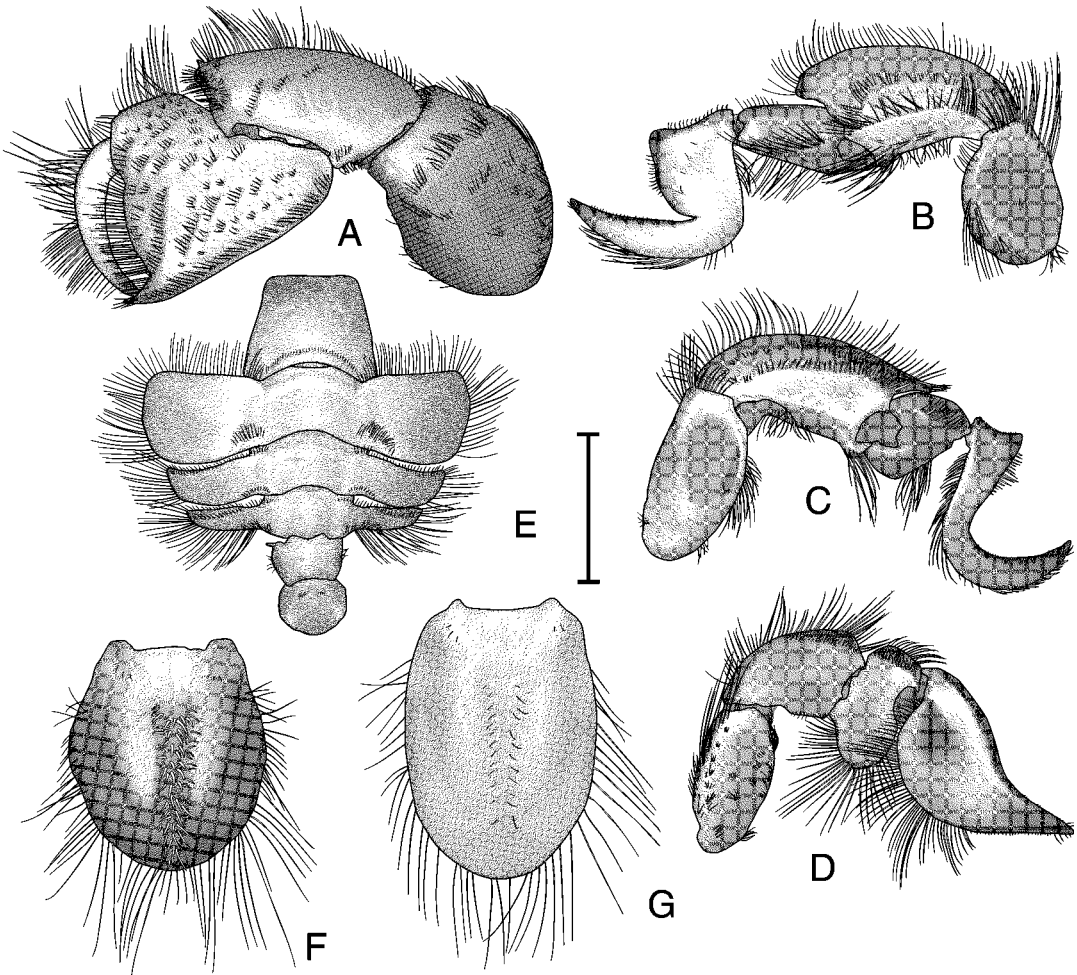


Fig. 93. *Albunea marquisiana* Boyko, 2000: A–F, ♂, 7.9 mm cl, USNM 268578, paratype; G, ♀, 5.2 mm cl, USNM 260948, paratype. **A.** Left pereopod I, lateral view. **B.** Left pereopod II, lateral view. **C.** Right pereopod III, lateral view. **D.** Right pereopod IV, lateral view. **E.** Abdominal somites I–VI, dorsal view. **F.** Telson of ♂, dorsal view. **G.** Telson of ♀, dorsal view. Scale = 1.1 mm (G), 1.6 mm (F), 3.3 mm (A–D), and 6.7 mm (E).

and distal margins with long plumose setae; lateral surface with small distal rugose area, few transverse setose ridges on distal half of surface; mesial surface smooth, with median row 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; proximal fourth of mesial surface with decalcified window. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 93B) with dactylus smooth; with base to heel slightly concave, heel smoothly rounded and slightly produced, heel to tip with acute, narrow indent, tip acute, tip to base broadly convex; lateral surface smooth, with several small tufts of short setae in generally 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 simple setae, with patch of long plumose setae at base. Propodus with



dorsal surface smooth, ventral margin inflated and rounded; oblique row of long plumose setae on distal margin of lateral surface; distal and ventral margin with long plumose setae; dorsolateral surface as narrow, oblique, flattened shelf, with 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; decalcified region just distal to junction with carpus. Carpus slightly produced dorsodistally; lateral surface nearly smooth, with irregular, interrupted row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; margins with long plumose setae; mesial surface smooth with long plumose setae in scattered patches on surface and on margins. Merus lateral surface with large decalcified area in median, few scattered setae on surface and margins and large patch of long simple setae at distolateral margin; mesial surface nearly smooth, with many median setae, with decalcified area on proximal fourth near junction with basis-ischium. Basis-ischium incompletely fused and unarmed. Coxa with one small tubercle on anterior margin.

Pereopod III (fig. 93C) dactylus with base to heel concave, heel broadly rounded and slightly produced, heel to tip with broad, evenly rounded indent, tip acute, tip to base smoothly convex to straight; lateral surface smooth, with several small tufts of short setae in generally straight line across medioproximal surface, dorsodistal margin with tufts of short setae; ventromesial margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface smooth, with long plumose setae distally, with simple setae on dorsal margins, and long plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened; mesial surface with scattered long setae on and near distal margin, with decalcified window near junction with carpus. Carpus produced dorsodistally, exceeding proximal margin of propodus by approximately one-fourth length of propodus, pointed but not acute; dorsolateral

margin unarmed; lateral surface slightly rugose dorsodistally, with mat of short setae and two longer rows of setae ventrally; mesial surface smooth, with long plumose setae on margins and in transverse row on surface. Merus smooth, with large decalcified area near median of lateral surface; dorsal and ventral margins unarmed, with long plumose setae; distolateral margin with long plumose setae; mesial surface smooth, with decalcified window at junction with basis-ischium. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female with large gonopore on anterior mesial surface of coxa, surrounded with short plumose setae; male without pore.

Pereopod IV (fig. 93D) dactylus with base to tip convex to concave, tip acute, tip to base straight distally, becoming convex proximally; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge with row of short setae; with setose punctae ventral to decalcified window. Propodus expanded dorsally and ventrally; ventral expansion not exceeding ventral margin of dactylus, margin with long plumose setae; dorsal expansion with row of long plumose setae medially and mat of short simple setae; lateral and mesial surfaces smooth, mesial surface with large decalcified area. Carpus not produced dorsodistally; lateral and mesial surfaces smooth; dorsal margin with short simple and long plumose setae; ventral margin with short simple setae and small mat of short simple setae dorsally. Merus with scattered, short, transverse rows of setae on lateral surface, dorsal and ventrodorsal margins with long plumose setae; mesial surface with large decalcified window proximoventrally. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 93E) with somite I approximately as long as wide, widest posteriorly; dorsal surface with anterior margin straight; posterior margin concave, with elevated submarginal row of short setae; with small transverse, decalcified windows laterad of segment median. Somite II dorsal surface with submarginal transverse ridge anteriorly; with small transverse, decalcified windows laterad



of segment median just anterior to submarginal ridge; with tuft of setae at posterolateral angle, extending onto pleura posteromesially; posterior margin with indistinct punctate submarginal groove laterally; pleura expanded and directed slightly anteriorly; 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 posterolaterally; dorsal surface obliquely flattened anterolaterally; margin with long plumose setae. Somite V subequal to somite IV; lateral margins with plumose setae; pleura absent. Somite VI subequal to somite V in width but longer; dorsal surface with short transverse rows of setae laterad of midline anteriorly; pleura absent.

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

Telson of male (fig. 93F) spatulate, with length greater than width, rounded distally; weakly calcified at margins of large calcified median plate; median longitudinal groove short, extending one-fourth length of telson; thick elevated ridge continuing from end of groove to distal end of telson, lined with dense row of thick simple setae. Telson of female (fig. 93G) ovate, longer than wide, dorsal surface smooth, with median longitudinal groove reaching almost to distal margin; with row of setose punctae lateral to midline along whole length of median groove except proximal fourth; margins with long plumose setae.

**DISTRIBUTION:** Known only from the Marques Islands, in 7–130 m depth.

**MAXIMUM SIZE:** Males: 10.8 mm cl; females: 10.9 mm cl.

**TYPE SPECIMENS:** USNM 268577 (holotype), MNHN-Hi 220 (allotype), AMNH 17819 (paratype), AMNH 17820 (paratype), USNM 260948 (paratype), USNM 260949 (paratype), USNM 260952 (paratype),

USNM 268578 (2 paratypes), MNHN-Hi 221 (paratype), MNHN-Hi 223 (paratype), MNHN-Hi 224 (3 paratypes), MNHN-Hi 227 (paratype), MNHN-Hi 228 (paratype), MNHN-Hi 229 (paratype), MNHN-Hi 230 (2 paratypes), MNHN-Hi 232 (3 paratypes), MNHN-Hi 233 (paratype), MNHN-Hi 234 (4 paratypes), MNHN-Hi 235 (paratype), MNHN-Hi 236 (paratype), MNHN-Hi 237 (paratype), MNHN-Hi 238 (3 paratypes), MNHN-Hi 241 (paratype), MNHN-Hi 242 (paratype).

**TYPE LOCALITY:** Haava Straits between Île Tahuata and Île Hiva Oa, Marques Islands, 09°52'S, 139°04'W, 73 m.

**REMARKS:** Juvenile specimens are virtually lacking in pigment and appear almost white. Adults are a uniform tan, with reddish-brown setae. Larger specimens show a markedly increased reddish tone on the carapace (especially the anterior region), ocular peduncles, antennae, and antennules (from preserved material and a color transparency made of a live specimen [MNHN-Hi 223]; see also Poupin, 1996b).

Little is known about the biology of this species. Oviparous females, unfortunately, are only known from the posterior portion of a single specimen. Additionally, the morphology of the spermatozoa of this species has been studied by Tudge et al. (1999), based on one of the paratypes (MNHN-Hi 236).

*Albunea marquisiana* is most similar to *A. holthuisi* and *A. groeningi*. All three species share the distinctive thick median row of setae on the telson of the male, as well as a general similarity in the shape of the pereopodal dactyli and can be collectively considered to form the “*holthuisi*-group” of species. They can easily be separated by the number of elements of CG8 (one long median element in *A. holthuisi*, three or four short elements in *A. marquisiana* and *A. groeningi*), and CG11 (absent in *A. groeningi*, one in *A. holthuisi*, two or three in *A. marquisiana*), the relative thickness of the proximal blade of pereopod III (thicker in *A. marquisiana* and *A. groeningi*), and the distal margins of both the male and female telsons (truncate in *A. holthuisi*, smoothly rounded in *A. marquisiana*, indented in *A. groeningi*).

*Albunea holthuisi* Boyko and Harvey, 1999

Figures 94, 95

?*Albunea symnista* [sic]: Ward, 1942: 52 (list), 63 (not *Albunea symmysta* (Linnaeus, 1758)).

?*Albunea steinitzi*: Thomassin, 1969: 143–146, pl. 3, figs. 1–8, text-figs. 3c, 4 (not *Albunea steinitzi* Holthuis, 1958).

*Albunea holthuisi* Boyko and Harvey, 1999: 386–391, 400 (list), 401 (key), figs. 6, 7\*.

**MATERIAL EXAMINED: Zanzibar:** Sta. 651, dredged grass and shell, 1.5 mi west-southwest of Ras Nungwa, 8 fms (= 14.6 m), Feb. 20, 1957, coll. A. J. Ostheimer III: 1 ♂, 7.7 mm cl, paratype (ANSP CA4644); Sta. 651, fine grass and shell, 1.5 mi west-southwest of Ras Nungwa, 8 fms (= 14.6 m), Feb. 20, 1957, coll. A. J. Ostheimer III: 1 ♀, 6.7 mm cl, paratype (ANSP CA4645).

**Madagascar:** Environs de Nosy Be, Côte southwest, 13°37.7'S, 47°49.6'E, 25 m, coll. unknown: 1 ♂, 8.1 mm cl, holotype (MNHN-Hi 202); Andilana, Nosy Be, Côte southwest, Sept. 1959, coll. A. Crosnier: 1 ♀, 8.1 mm, allotype (MNHN-Hi 203); voisinage de Nosy Be, Côte northwest, 13°38.3'S, 42°49.6'E, 34 m, coll. A. Crosnier: 1 ♂, 8.0 mm cl, paratype (MNHN-Hi 204); Sakatia, Envoi II, 1921, coll. G. Petit: 1 ♂, 6.7 mm cl (MNHN-Hi 19).

**Seychelles:** Sta. 5, 33 m, Sept. 4, 1980, coll. ORSTOM-Reves 2: 1 ♂, 9.2 mm cl (MNHN-Hi 249); Mahé, July–Aug. 1972, coll. Mission Zoologique MRAC-ULB: 1 ♀, 5.7 mm cl (MRAC 57.459).

**Indonesia:** Sta. 522, west side of Samberbaban Bay, Japen Island, Irian Jaya, Feb. 14, 1956, coll. C. T. Abbot on "Gloria Maris": 1 ♂, 11.3 mm cl, paratype (RMNH 23703); Corindon II, Sta. B255, Makassar, 01°56.5'S, 119°17.3'E, 13 m, Nov. 6, 1980, coll. R/V "Coriolis": 1 ♀, 7.1 mm cl, paratype (MNHN-Hi 205); Corindon II, Sta. B256, Makassar, 01°56.5'S, 119°17.2'E, 24 m, Nov. 6, 1980, coll. R/V "Coriolis": 1 ♂, 4.9 mm cl, 1 ♀, 5.4 mm cl (MNHN-Hi 206).

**Malaysia:** Juara Bay, Pulau Tioman, Pahang, May 26, 1985, coll. P.K.L. Ng: 1 ♂, 7.5 mm cl (ZRC 1989.3827).

**Australia: Queensland:** Little Trunk Reef, 18°20'S, 146°46'E, 9.1–12.2 m, Nov. 5, 1990, coll. K. Lamprell: 1 ♂, 9.6 mm cl (QM W24961).

**DIAGNOSIS:** Carapace slightly longer than wide, covered with lightly setose grooves. Anterior margin with 8–11 spines 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. Distal peduncular segments dorsoventrally flattened and oblong in shape, tapering at tip, approximated along distal two-thirds of mesial margins, lateral margins convex except slightly concave at tip, mesial margins 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.

**DESCRIPTION:** Carapace (fig. 94A) 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 as 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 six 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 generally triangular, smooth, posterolateral margin with short row

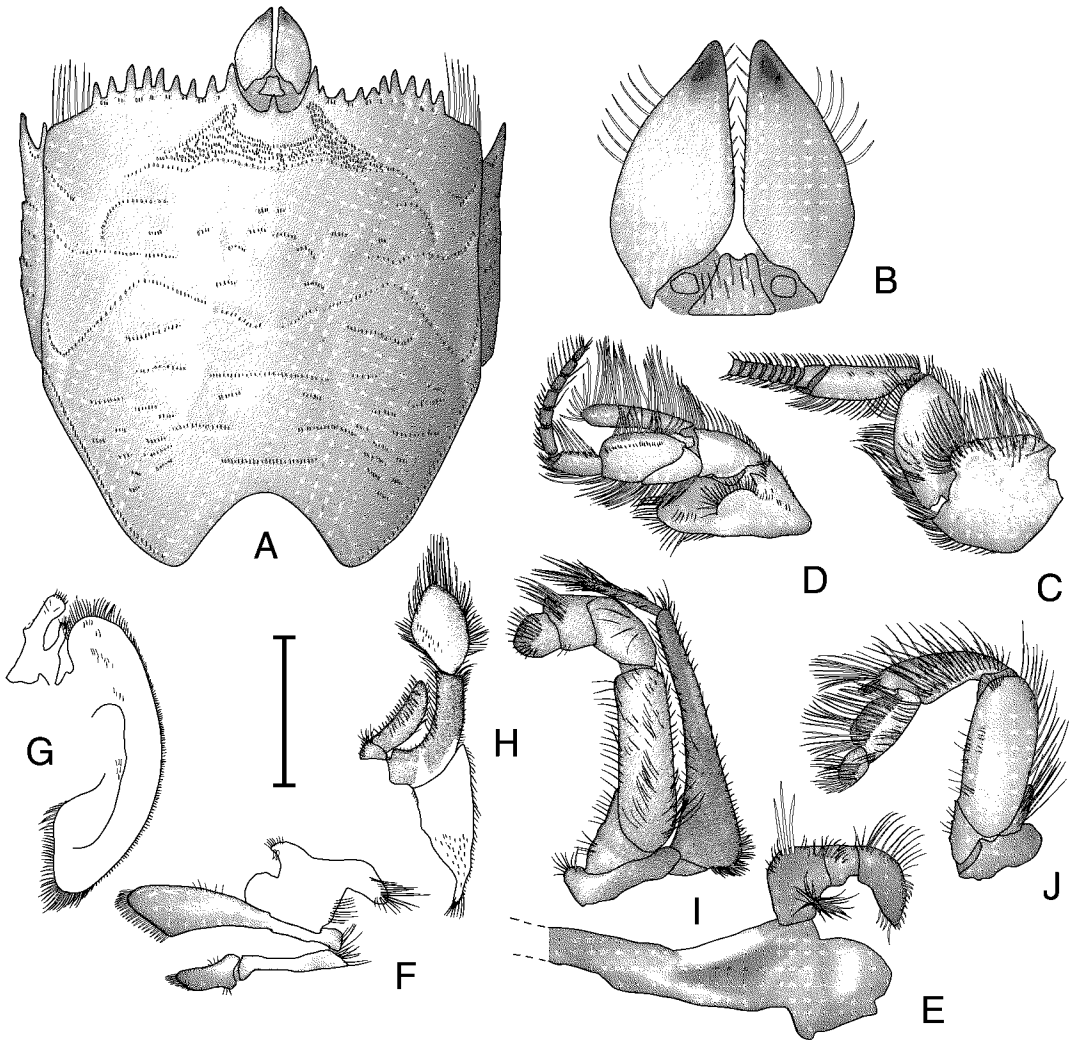


Fig. 94. *Albunea holthuisi* Boyko and Harvey, 1999: A, B, ♂, 8.1 mm cl, MNHN Hi-202, holotype; C, ♂, 7.7 mm cl, ANSP CA4644, paratype; D–J, ♂, 8.0 mm cl, MNHN Hi-204, paratype. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Left maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 1.1 mm (B), 1.6 mm (E, F, I), and 3.3 mm (A, C, D, G, H, J).

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 sin-

gle 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 ven-

trally, posterior region membranous, with numerous irregular fragments, and covered with long plumose setae.

Ocular plate (fig. 94B) triangular, with shallow median indentation; median peduncular segments present as small, ovate calcified areas lateral to ocular plate. Distal peduncular segments 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. 94C) with segment III narrow proximally, expanding distally to twice proximal width; plumose setae on dorsal and ventral margins, dorsal exopodal flagellum with 76–104 articles, long plumose setae on dorsal and ventral margins, ventral endopodal flagellum short, with two or three articles, plumose setae on dorsal and ventral margins. Segment II medially inflated in 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. 94D) with segment V approximately three times longer than wide, long plumose setae on dorsal and ventral margins, flagellum with seven articles, 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 approximately one-half 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.

Mandible (fig. 94E) incisor process with one tooth; cutting edge with one tooth. Palp three-segmented, with plumose setae on mar-

gins and long, thick, simple setae arising from bend in second segment.

Maxillule (fig. 94F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under, notched proximally; internal lobe reduced with two thick setae at distolateral margin.

Maxilla (fig. 94G) exopod evenly rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 94H) with epipod with plumose setae on distal margin and on distolateral surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, with plumose setae; distal segment spatulate, slightly longer than wide, broadest medially, margins with long plumose setae. Endopod flattened and elongate, reaching to distal end of proximal exopodal segment, with plumose setae on margins.

Maxilliped II (fig. 94I) dactylus evenly rounded, length equal to width, with thick simple setae distally. Propodus 1.5 times wider than long, with plumose setae on dorsal margin and long simple setae on distal margin. Carpus not strongly produced dorsodistally, approximately two times longer than wide, with long simple setae on dorsal margin. Merus approximately three times longer than wide, margins parallel, with simple setae on ventrolateral margin and plumose setae on dorsolateral margin. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-fourth longer than merus, flagellum with one article.

Maxilliped III (fig. 94J) 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 two or three teeth. Exopod two-segmented, proximal segment small, distal



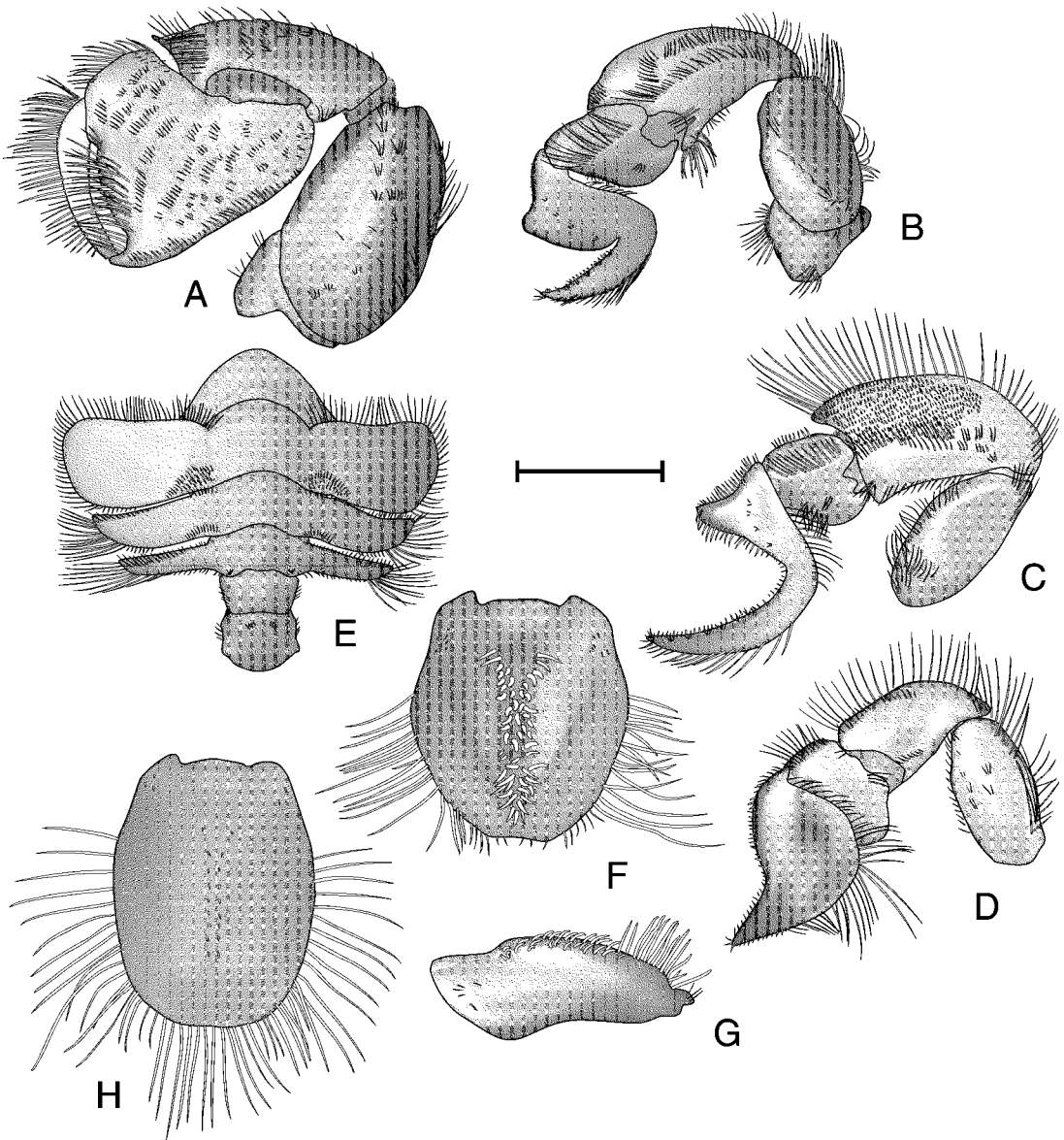


Fig. 95. *Albunea holthuisi* Boyko and Harvey, 1999: A, B, ♂, 8.0 mm cl, MNHN Hi-204, paratype; C, D, H, ♀, 8.1 mm cl, MNHN Hi-203, allotype; E-G, ♂, 8.1 mm cl, MNHN Hi-202, holotype. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I-VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♂, lateral view. H. Telson of ♀, dorsal view. Scale = 1.7 mm (F, H) and 3.3 mm (A-E, G).

segment styliform, tapering, approximately one-third length of merus, plumose setae on margins; flagellum absent.

Pereopod I (fig. 95A) dactylus curved and tapering; lateral and mesial surfaces smooth;

dorsal margin with long plumose and short simple setae, short simple setae on ventral margin. Propodal lateral surface with numerous short, transverse rows of setose rugae; dorsal margin unarmed; ventral margin dis-

tally produced into acute spine; cutting edge lacking teeth, lined with long plumose setae; lateral, mesial, and ventral margins with long setae. Carpus 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 two-thirds 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. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 95B) dactylus 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 generally 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). Propodal 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 as 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, long plumose setae on lateral margins; mesial surface nearly smooth, with few setae. Basis-ischium incompletely fused and unarmed. Coxa with one small spine on anterior margin.

Pereopod III (fig. 95C) dactylus 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 approximately one-third length of propodus, broadly rounded, dorsolateral margin unarmed; lateral surface slightly rugose dorsodistally, many short and two 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. Basis-ischium incompletely fused and unarmed. Coxa with one 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 (fig. 95D) dactylus 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 scattered short, transverse rows

of setae on lateral surface, dorsal and ventrodiscal margins with long plumose setae, slightly rugose ventrodistally, with short setae; mesial surface with large decalcified window proximoventrally. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 95E) 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 of midline anteriorly, lateral margins with long plumose setae; pleura absent.

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

Telson of male (fig. 95F, 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. 95G) covered with short thick simple setae, small tuft of setae at anterolateral margin. Telson of female (fig. 95H) ovate, longer than wide, slightly trun-

cate 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: Madagascar, Zanzibar, and the Seychelles; also from Indonesia and Queensland, Australia, in 9.1–34.0 m depth.

MAXIMUM SIZE: Males: 11.3 mm cl; females 8.1 mm cl.

TYPE SPECIMENS: MNHN-Hi 202 (holotype), MNHN-Hi 203 (allotype), MNHN-Hi 204 (paratype), MNHN-Hi 205 (paratype), ANSP CA4644 (paratype), ANSP CA4645 (paratype), RMNH 23703 (paratype).

TYPE LOCALITY: Environs de Nosy Be, Côte southwest, Madagascar, 13°37.7'S, 47°49.6'E, 25 m.

REMARKS: As with all older records of *Albunea* species lacking descriptive information or illustrations, it is difficult to be certain what species Ward (1942) was dealing with from Mauritius. I have examined no specimens from that locality, and the only species known from nearby Réunion is *A. speciosa*, which no doubt Ward (1942) would have recognized as quite different from *A. symmysta*. *Albunea holthuisi* is the best candidate for Ward's (1942) record, as it superficially resembles *A. symmysta* and is known from nearby Madagascar and the Seychelles. The other taxa known from the vicinity of Mauritius (*A. elioti* and *A. microps*) are unlikely to have been confused with *A. symmysta* by an experienced carcinologist such as Ward.

As noted by Boyko and Harvey (1999), the record of "*Albunea steinitzi*" from Madagascar given by Thomassin (1969) is not that species. This record is tentatively placed in synonymy with *A. holthuisi*, which is also known from Madagascar, even though certain morphological details shown in Thomassin's (1969) drawings do not fit perfectly with this species. Thomassin's (1969) drawing of the habitus has a produced distal margin of the (presumably male) telson, while the indent of the dactylus of pereopod II is too broad. These may, however, be due to the relatively poor quality of Thomassin's (1969) drawings (see under *A. speciosa*). Thomassin's (1969) record may represent an undescribed species, but as his material is un-

available for examination (see under *A. speciosa*), no definite conclusions can be made at this time.

Although Boyko and Harvey (1999) indicated that this species is most similar to *A. steinitzi*, that relationship was based on the species described at that time. In fact, *A. holthuisi* typifies its own group of *Albunea* species, and it is actually the sister taxon to *A. groeningi*. It is also closely related to *A. marquisiana*.

***Albunea groeningi*, new species**

Figures 96, 97

*Albunea symnista* [sic]: Gordon, 1938: 187 (part)\*. – Miyake, 1978: 152–154, figs. 59, 60a\* (not *Albunea symmysta* (Linnaeus, 1758)).

*Albunea symmysta*: Miyake et al., 1962: 125 (part; Toyama Bay material) (not *Albunea symmysta* (Linnaeus, 1758)).

*Albunea steinitzi*: Serène and Umali, 1965: 97–102, pl. 1, fig. 2, pl. 2, fig. 2, pl. 3, figs. 3–4b, pl. 4, fig. 2, text-figs. 1b, 2b, 4b, 5c, 6c, c', 7a, 9b, c\*. – Haig, 1974: 447 (list) (not *Albunea steinitzi* Holthuis, 1958).

?*Albunea symnista* [sic]: Kikuchi, 1932: 10 (? not *Albunea symmysta* (Linnaeus, 1758)).

**MATERIAL EXAMINED: Japan:** Mikawa-Ishiki, Aichi Prefecture, Honshu, Sept. 1, 1941, coll. T. Sakai: 1 ♂, 9.4 mm cl, holotype (RMNH ex 32052), 1 ♀, 12.5 mm cl, allotype (RMNH 32052); Sakai, Tottori Prefecture, March 1, 1964, coll. T. Senda: 1 ♀, 16.4 mm cl (ZLKU 12836); Fushiki, Toyama Bay, Aug. 6–26, 1950, coll. Hori and Mori: 1 ♂, 8.7 mm cl, 1 ♀, 7.0 mm cl, paratypes (ZLKU 5125–5126); Mimase, Kochi City, Tosa Bay, Shikoku Island, Dec. 24, 1959, coll. K. Sakai: 1 ♀, 17.0 mm cl, paratype (ZLKU 7438); Tosa Bay, Shikoku Island, Feb. 19, 1960, coll. S. Nakayama: 1 ♂, 11.6 mm cl, paratype (ZLKU 7511).

**Taiwan:** “Formosa,” coll. M. Maki: 1 ♀, 13.8 mm cl, paratype (USNM 59074); Kao-hsiung, 25 m, June 7, 1992, coll. unknown: 2 ♂, 9.2–9.8 mm cl, 1 ♀, 11.2 mm cl, paratypes (NTOU); “Southern Taiwan,” 30 m, Jan. 1, 1992, coll. unknown: 1 ♂, 8.8 mm cl, 1 ♀, 9.2 mm cl, paratypes (NTOU); Tung-Shiao, Miao-Li County, Aug. 30, 1999, coll. unknown: 1 ♀, 8.4 mm cl (NTOU); Tan-Shui, Taipei County, June 20, 1999, coll. unknown: 1 ♂, 4.1 mm cl (NTOU).

**Philippines:** Busuanga, Palawan, May 10–30, 1963, coll. J. E. Norton and F. E. Dayrit: 1 ♂, 6.4 mm cl, paratype (NMCR 1151b); Calapan, Mindoro, Dec. 1932–Jan. 1933, coll. P. de Mesa: 1 ♀, 7.9 mm cl, paratype (MCZ 9625).

**Singapore:** Singapore, coll. unknown: 1 ♂, 9.6 mm cl, paratype (BMNH 1937.6.1.8); Morib Beach, Selengar, March 8, 1993, coll. A. Sasekumar: 1 oviger, 10.7 mm cl, paratype (ZRC 1995.571).

**Malaysia:** Bedok, Feb. 7, 1959, coll. P. Yeoh: 1 ♂, 10.8 mm cl (ZRC 2000.1799).

**Vietnam:** Sta. 51, off Nhatrang, 15 m, Jan. 14, 1960, coll. R/V “Gallardo”: 1 ♂, 3.8 mm cl (ZMUC 2717); Sta. 215, off Nhatrang, 16 m, March 7, 1960, coll. R/V “Gallardo”: 1 ♂, 3.0 mm cl (ZMUC 2718); Sta. 54, off Nhatrang, 14 m, Jan. 14, 1960, coll. R/V “Gallardo”: 1 ♀, 3.7 mm cl (ZMUC 2719); Sta. 220, off Nhatrang, 16 m, March 7, 1960, coll. R/V “Gallardo”: 1 unsexable, unmeasurable specimen (ZMUC 2721).

**Australia: Western Australia:** “North-west Australia,” coll. unknown: 1 ♂, 6.0 mm cl, paratype (BMNH 1932.11.30.65); Rosemary Island, Dampier Archipelago, 7 fms (= 12.8 m), Aug. 22, 1963, coll. F.R.V. Lancelin: 3 ♂, 9.2–11.4 mm cl, 2 ♀, 10.6–11.3 mm cl, paratypes (WAM 23386); Bernier Island, Shark Bay, May 16, 1960, coll. R. W. George: 1 ♀, 13.4 mm cl, paratype (WAM 23391); Shark Bay, Feb. 1963, coll. L. R. Thomas: 1 ♂, 12.9 mm cl, paratype (WAM 23395); North Island, 17–25 fms (= 31.1–45.7 m), May 1965, coll. R. Seabrook: 1 ♂, 12.9 mm cl, paratype (WAM 23396); Mission Bay, Napier Broome Bay, 1–3 m, Aug. 14, 1991, coll. L. Wharsh: 2 ♂, 6.4–8.3 mm cl, 1 ♀, 8.1 mm cl, paratype (WAM 20667); **Queensland:** Ball Bay, May 24, 1964, coll. Zoology Department of the University of Queensland: 2 ♂, 10.5–12.4 mm cl, 4 ♀, 7.8–15.4 mm cl, paratypes (WAM 23389); Rockhampton, Keppel Bay, 23°10'S, 150°55'E, 9 m, Sept. 6, 1967, coll. B. J. Smith: 1 unsexable, unmeasurable specimen (MOV J47044); Lucinda, Hinchinbrook Channel, 18°29'S, 146°16'E, Oct. 1969, coll. E. Gossner: 1 ♂, 11.0 mm cl, paratype (MOV J14552); Rudder Reef, 30 mi northeast of Mossman, 16°11'S, 145°40'E, Oct. 1973, coll. R. J. Plant: 1 ♂, 8.5 mm cl, para-



type (MOV J44728); Rockhampton, Keppel Bay, 23°10'S, 150°55'E, 9 m, Sept. 6, 1967, coll. B. J. Smith: 1 ♂, 14.1 mm cl, paratype (MOV J44732); Dunk Island, 17°57'S, 146°09'E, coll. E. J. Banfield: 2 ♂, 8.9–9.2 mm cl, paratypes (AM P5340); off North Head, Port Denison, 20°01'S, 148°15'E, coll. E. H. Rainford: 1 ♂, 14.4 mm cl, paratype (AM P7029); Queen's Beach, Bowen, coll. E. N. Rainworth: 1 ♂, 9.1 mm cl, paratype (QM W143); Kinkuna National Park, 20 km south of Bundaberg, 25°00'S, 152°30'E, April 1992, coll. M. Hines: 1 unsexable specimen, 12.5 mm cl (QM W18006); Weipa, July 1961, coll. G. Webster: 1 ♂, 9.1 mm cl, 1 ♀, 9.6 mm cl, paratypes (QM W2221); Bowen, Feb. 27, 1934, coll. unknown: 1 ♂, 11.6 mm cl, paratype (QM W489); Townsville, Oct. 7, 1938, coll. G. Coates: 1 ♀, 10.5 mm cl, paratype (QM W873); **Victoria**: Mud Island, Port Phillip Bay, April 1977, coll. R. Willington: 1 ♀, 13.9 mm cl, paratype (MOV J40194).

**DIAGNOSIS:** Carapace wider than long, covered with lightly setose grooves. Anterior margin with 8–11 spines on either side of ocular sinus. Setal field with narrow lateral elements and concave anterior margin. CG1 with separate posterior lateral elements; CG4 with two to six short, oblique medial elements (rarely absent) between longer supralateral elements of CG4; CG5 present as two short transverse elements; CG6 and CG7 separate; CG8 broken; CG11 absent. Rostrum present, reaching posterior margin of ocular plate. Ocular plate triangular. Distal peduncular segments dorsoventrally flattened and subtriangular in shape, tapering at tip, approximated at base of mesial margins, lateral margins convex except slightly concave at tip, mesial margins straight. Cornea at tip. Dactylus of pereopod II with heel produced and acute. Dactylus of pereopod III with heel thin, produced and acute. Dactylus of pereopod IV with produced, subquadrate heel. Telson of male elongate, ovate, tip rounded with medial indentation, dorsal surface inflated medially, with medial row of long thickened setae; lateral margins decalcified. Telson of female similar to male, evenly calcified.

**DESCRIPTION:** Carapace (fig. 96A) wider than long. Anterior margin concave on either side of ocular sinus, becoming convex lat-

erally with 8–11 large spines ( $n = 6$ ) on each side along length. Rostrum as small acute tooth, reaching proximal margin of ocular plate. Ocular sinus smoothly concave. Frontal region smooth; setal field narrow anteriorly and posteriorly; posterior lateral elements reduced to narrow bands of setae. CG1 parallel to anterior margin of carapace, convex, sinuous, strongly crenulate, divided into medial fragment and curved, posteriorly displaced lateral elements. Mesogastric region smooth; CG2 present as none to two short elements; CG3 broken into four widely separated short elements between posterior lateral elements of CG1; CG4 with two to six short, oblique medial elements (rarely absent) between longer supralateral elements of CG4. Hepatic region smooth, with oblique setose groove at median of lateral margin. Epibranchial region generally triangular, smooth; posterolateral margin with single oblique row of short setae. Metagastric region smooth; CG5 present as two short transverse elements. CG6 strongly crenulate, strongly anteriorly concave medially and sloping out to anteriorly convex lateral thirds. CG7 almost transverse, not reaching lateral margins of median segment of CG6. Cardiac region smooth; CG8 present as two to four short medial elements and two longer lateral elements. CG9 present as two to four short lateral grooves with broad gap at midline. CG10 present as two long lateral elements. CG11 absent. Post-CG11 element absent. Branchial region with three to six short, oblique rows of setae in anterior half. Posterior margin deeply and evenly convex, with submarginal groove reaching two-thirds up margin of posterior concavity. Branchiostegite with short anterior submarginal spine; anterior region with scattered, short, transverse lines ventral to *linea anomurica*; with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 96B) triangular, with shallow median indentation; median peduncular segments present as small ovate calcified areas lateral to ocular plate. Distal peduncular segments elongate, subtriangular, with convex lateral and straight mesial mar-

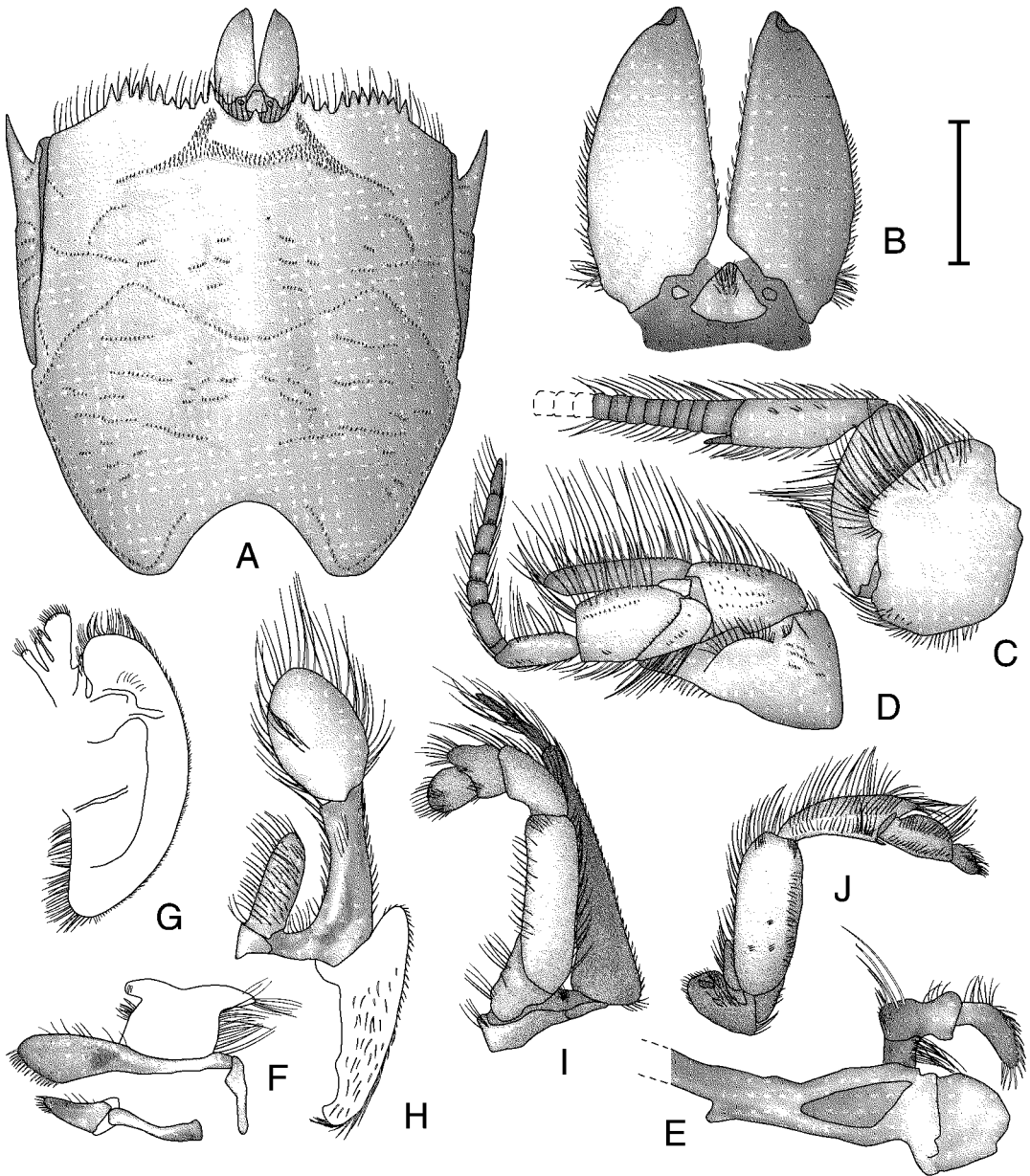


Fig. 96. *Albunea groeningi*, n. sp.: A–J, ♂, 9.2 mm cl, AM P5340, paratype. **A.** Carapace, branchiostegite, and ocular peduncles, dorsal view. **B.** Ocular peduncles, dorsal view. **C.** Left antennule, lateral view. **D.** Left antenna, lateral view. **E.** Left mandible, mesial view. **F.** Left maxillule, lateral view. **G.** Left maxilla, lateral view. **H.** Left maxilliped I, lateral view. **I.** Left maxilliped II, lateral view. **J.** Right maxilliped III, lateral view. Scale = 1.1 mm (B), 1.6 mm (E, F, I), 2.2 mm (C, D, H), and 3.3 mm (A, G, J).

gins, cornea covering lateral portion of distal tip; lateral margin with faint notch one-fourth distal from base; mesial margins approximated at base; mesial margins with long plumose setae; tuft of plumose setae at proximolateral ventral angles and ventromedial oblique row of plumose setae extending from tuft to three-fourths length of segment.

Antennule (fig. 96C) with segment III narrow proximally, expanding distally to three times proximal width; plumose setae on dorsal and ventral margins and sparsely scattered on lateral surface; dorsal exopodal flagellum with 104–127 articles ( $n = 6$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with two articles ( $n = 6$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins. Segment I wider than long, unarmed; dorsal third of lateral surface rugose with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 96D) with segment V approximately two times longer than wide, with long plumose setae on dorsal and ventral margins and scattered on lateral surface; flagellum with seven articles ( $n = 6$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV expanded distally, with long plumose setae on dorsal, ventral, and distal margins, and row of short setae on dorsolateral surface. Segment III with long plumose setae on ventral margin; short simple setae on dorsal margin and in short row on surface. Segment II short, widening distally, rugose, with plumose setae on margins and short simple setae scattered on lateral surface; antennal acicle long, thin, and exceeding distal margin of segment IV by one-third length of segment IV, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventrolaterally, with long plumose setae on dorsal and distoventral margins, and short simple setae in short row on surface rugae behind spine; lateral surface with acute spine dorsodistally; low semicircular dorsolateral lobe ventrodial to spine, margin of lobe with long plumose setae; segment with ventromesial antennal gland pore.

Mandible (fig. 96E) incisor process with three teeth; cutting edge with one tooth. Palp

three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment and on distal margin of terminal segment.

Maxillule (fig. 96F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin simple setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under; internal lobe reduced with two thick setae at distolateral margin.

Maxilla (fig. 96G) exopod evenly rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 96H) epipod with plumose setae on margins, distolateral surface, and mesial surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments: proximal segment narrow, margins parallel, with plumose setae; distal segment spatulate, longer than wide, broadest medially, margins and mesioventral surface with long plumose setae. Endopod flattened and elongate, reaching two-thirds to distal end of proximal exopodal segment; plumose setae on margins and median of lateral surface.

Maxilliped II (fig. 96I) dactylus evenly rounded, length subequal to width, with thick simple setae distally and on distolateral surface. Propodus two times wider than long, slightly produced at dorsodistal angle, with plumose setae on dorsal margin and patch of long simple setae on dorsodistal and ventrodial angles. Carpus not produced dorso-distally, approximately two times longer than wide; long simple setae on dorsal margin. Merus approximately three times longer than wide, margins parallel; with simple and plumose setae on margins. Basis-ischium incompletely fused with plumose setae on margins. Exopod one-half longer than merus, flagellum with one elongate article, approximately as long as carpus.

Maxilliped III (fig. 96J) dactylus oblong with rounded tip; long plumose setae on margins and lateral surface. Propodus dorsodistally inflated, with longitudinal median row of plumose setae on lateral surface; margins with plumose setae. Carpus produced onto propodus approximately one-third length of



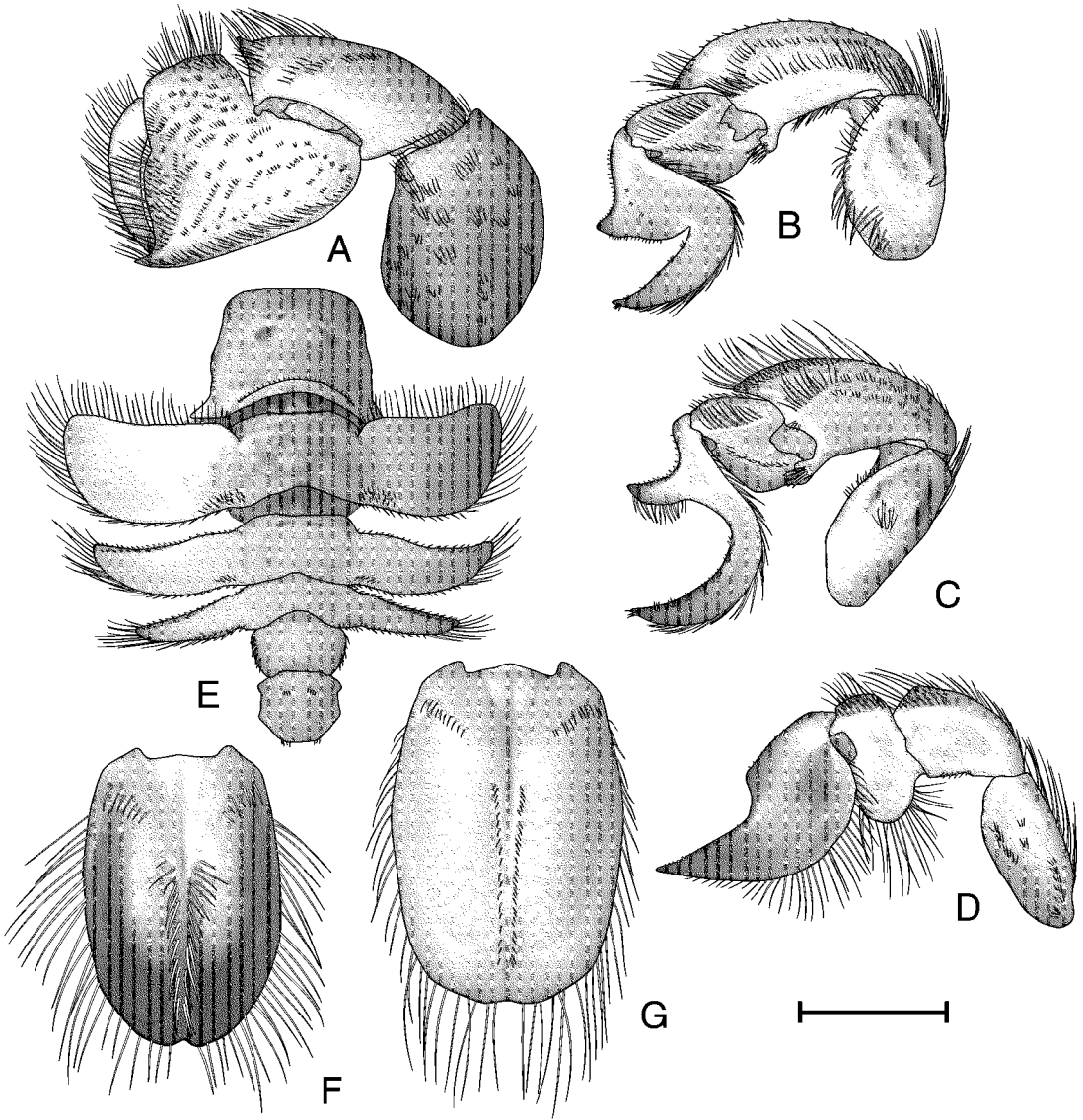


Fig. 97. *Alburnea groeningi*, n. sp.: A-F, ♂, 9.2 mm cl, AM P5340, paratype; G, ♀, 13.9 mm cl, MOV J40194, paratype. **A.** Left pereopod I, lateral view. **B.** Left pereopod II, lateral view. **C.** Left pereopod III, lateral view. **D.** Left pereopod IV, lateral view. **E.** Abdominal somites I-VI, dorsal view. **F.** Telson of ♂, dorsal view. **G.** Telson of ♀, dorsal view. Scale = 1.7 mm (F), 2.2 mm (G), and 3.3 mm (A-E).

propodus; lateral surface with two rows of plumose setae; plumose setae on margins. Merus inflated, unarmed, with plumose setae on margins and few scattered small areas on lateral surface. Basis-ischium incompletely fused, with weak crista dentata of one or two teeth. Exopod two-segmented: proximal segment small; distal segment styliform, taper-

ing, approximately one-third length of merus; with plumose setae on margins; without flagellum.

Pereopod I (fig. 97A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose setae; ventral margin with short simple setae. Propodal lateral surface with numerous short, trans-



verse rows of setose rugae; dorsal margin unarmed; ventral margin distally produced into acute spine; cutting edge lacking teeth, lined with long plumose setae; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle produced into strong corneous-tipped spine; dorsal margin with short transverse grooves behind spine; dorsal and distal margins with long plumose setae; lateral surface with small distal rugose area, few transverse setose ridges on distal half of surface; mesial surface smooth, with medial transverse row of setae, margins with long plumose setae. Merus unarmed; lateral surface with scattered transverse rows of long plumose setae, distal margin with long plumose setae; mesial surface with few scattered setae; fully calcified. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 97B) dactylus smooth; base to heel strongly and smoothly concave, heel produced, broad and subacute, heel to tip with narrow, acute indent, tip acute, tip to base broadly convex; lateral surface smooth, with several small tufts of short setae in generally 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 simple setae, with patch of long plumose setae at base. Propodal dorsal surface smooth, with 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 as narrow, oblique, flattened shelf, with 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 strongly produced and rounded dorsodistally, dorsal margin smooth; lateral surface smooth, produced area smooth, irregular, interrupted row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; dorsodistal margin with long plumose setae, proximodorsal and ventral margins with short plumose setae; mesial surface smooth, with row of long plumose setae distally and subdorsally. Merus with

large median decalcified window covering nearly all of lateral surface, long plumose setae on dorsodistal and ventral margins, few scattered long plumose setae on surface; mesial surface nearly smooth, with two long rows of setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 97C) dactylus with base to heel deeply concave, heel narrow and acutely produced, heel to tip with broadly concave indent and small concave region at midpoint of proximal margin, tip acute, tip to base smoothly convex; lateral surface smooth, with several small tufts of short setae in generally straight line across medioproximal surface, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface smooth, with long plumose setae in oblique row, simple setae on dorsal margin, plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened, with sparse setose mat; mesial surface smooth. Carpus produced dorsodistally, exceeding proximal margin of propodus by one-third length of propodus; tip subacute, dorsolateral margin unarmed; lateral surface slightly rugose dorsodistally, with mat of short setae and two interrupted rows of setae ventrally; mesial surface smooth, with long plumose setae on distal margin and in oblique row on surface. Merus smooth, with large decalcified window covering nearly half of lateral surface medially; dorsal and ventral margins unarmed, dorsodistal and ventrodorsal margins with long plumose setae; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female with large gonopore on anterior mesial margin of coxa, surrounded with short plumose setae; male without pore.

Pereopod IV (fig. 97D) dactylus with base to tip straight proximally, with subquadrate heel and broadly rounded, strongly concave indent and almost straight from indent to tip, tip acute, tip to base concave distally to convex proximally; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial sur-

face with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge with row of short setae; with setose punctations ventral to decalcified window. Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, ventral margin with long plumose setae; dorsal expansion with row of long plumose setae dorsally, oblique area with mat of short simple setae; lateral surface smooth, mesial surface smooth, with distoventral area of few patches of long plumose setae. Carpus slightly produced dorsodistally; ventral four-fifths of lateral surface and mesial surface smooth, dorsodistal one-fifth of lateral surface with mat of short setae; dorsal margin with short simple and long plumose setae; ventral margin with short simple setae; mesial surface decalcified medially. Merus with scattered short transverse rows of setae on lateral surface, dorsal margin with long plumose setae; proximoventral half of mesial surface with large decalcified window. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 97E) somite I wider than long, widest posteriorly; dorsal surface with anterior margin straight; posterior margin curved with elevated submarginal row of short setae; small transverse decalcified windows laterad of segment median. Somite II dorsal surface with irregular, submarginal, transverse ridge anteriorly; with small transverse, decalcified windows laterad of segment median just anterior to submarginal ridge; pleura expanded and directed anterolaterally; anterolateral margins angled, anterior and lateral margins with long plumose setae, posterolateral angle rounded, posterior margin with short setae; posteromesial angle with mat of short simple setae. Somite III similar to somite II, but narrower, shorter, anterior submarginal windows present; pleura thinner and shorter than on somite II, directed posterolaterally proximally and anterolaterally distally, with setae as in somite II; anterolateral angle subacute; dorsal surface obliquely flattened anterolaterally, with submarginal row of short setae. Somite IV similar to somite III, but thinner and shorter, anterior submarginal windows present; pleura thinner and shorter than on somite III, directed posterolaterally; dorsal surface

obliquely flattened anterolaterally; lateral and posterior margins with long plumose setae, anterior margin with short simple setae. Somite V wider than somite IV, anterior submarginal windows present; lateral margins with plumose setae; pleura absent. Somite VI slightly broader than somite V, anterior submarginal windows present; dorsal surface with short transverse rows of setae laterad of midline and on posterior margin; pleura absent.

Females with uniramous, paired pleopods on somites II–V; males without pleopods.

Telson of male (fig. 97F) ovate and elongated, length greater than width, distal tip rounded, with median indentation; thickly calcified medially, inflated dorsally; distal two-thirds with lateral decalcified region; median longitudinal groove extending one-half length, row of long, thick, simple setae of either side of median groove beginning at median and continuing to distal margin of calcified area; proximolateral angles with long simple setae; margins with long simple setae. Telson of female (fig. 97G) similar to male, but more truncate distally and with smaller median indentation, dorsal surface evenly calcified; median groove similar to male, but with shorter setae; proximolateral angle with few short simple setae, margins with long simple setae.

DISTRIBUTION: From southern Japan southward in a narrow band to Western Australia and Victoria, Australia, in up to 45.7 m depth.

MAXIMUM SIZE: Males: 14.4 mm cl; females: 17.0 mm cl.

TYPE SPECIMENS: RMNH ex 32052 (holotype), RMNH 32052 (allotype); AM P5340 (2 paratypes), AM P7029 (paratype), BMNH, 1932.11.30.65 (paratype), BMNH 1937.6.1.8 (paratype), MCZ 9625 (paratype), MOV J14552 (paratype), MOV J40194 (paratype), MOV J44728 (paratype), MOV J44732 (paratype), NMCR 1151b (paratype), NTOU (3 paratypes), NTOU (2 paratypes), QM W143 (paratype), QM W489 (paratype), QM W873 (paratype), QM W2221 (2 paratypes), USNM 59074 (paratype), WAM 20667 (3 paratypes), WAM 23386 (5 paratypes), WAM 23389 (6 paratypes), WAM 23391 (paratype), WAM 23395 (paratype), WAM 23396 (paratype), ZLKU 5125–5126

(2 paratypes), ZLKU 7438 (paratype), ZLKU 7511 (paratype), ZRC 1995.571 (paratype).

TYPE LOCALITY: Mikawa-Isshiki, Aichi Prefecture, Honshu, Japan.

ETYMOLOGY: This species is named after Matt Groening, cartoonist and creator of the television program “The Simpsons,” to honor his extensive promotion of crustacean issues in the popular media. “The Simpsons” has exposed people to a diversity of crustacean species, including Lisa’s hermit crab, Patty and Selma’s hermit crab cleaning techniques, and, of course, “Pinchy” the lobster. The specific name is pronounced “gray-ning-i.”

REMARKS: This species is more common in the Philippines than indicated by the above material examined. Serène and Umali (1965) cited 54 specimens from various Philippine locations (as *A. steinitzi*). It is possible that some of Serène and Umali’s (1965) material is not this species, but the identification of their material is based on their descriptions and illustrations and a single specimen cited by them that was available for examination (NMCR 1151b). Curiously, Serène and Umali (1965) stated that all of their specimens were males. However, their “female” of *A. thurstoni* (pl. 5, fig. 1a) is clearly a male, so they may have been in error regarding other specimens as well. The record of Kikuchi (1932) from Toyama Bay, Japan, is probably this species, the only *Albunea* known with certainty from that location.

One ♀ specimen from Kaoasiung, Taiwan (NTOU) is host to an undescribed species of *Albunione* Markham and Boyko (Isopoda: Bopyridae).

This species belongs to the “*holthuisi*-group” of species and is the sister-taxon to *A. holthuisi*.

*Albunea symmysta* (Linnaeus, 1758)

Figures 98, 99

*Cancer Symmysta* Linnaeus, 1758: 630. – Linnaeus, 1764: 453.

*Cancer symmysta* [sic]: Linnaeus, 1767: 1053.

*Cancer Gymmysta* [sic]: Houuttuyn, 1769: 422.

*Cancer gymmysta* [sic]: Stadius Müller, 1775: 1128.

*Hippa symmysta* [sic]: Fabricius, 1787: 329 (part). – Fabricius, 1793: 474.

*Cancer Symmysta* [sic]: de Villers, 1789: 157–158

(part). – Gmelin and Linné, 1790: 2994. – Griffith and Pidgeon, 1833: 178.

*Cancer dorsipes*: Herbst, 1791: 5–8, pl. 22, fig. 2. – Herbst, 1796: 197–198, pl. 45, figs. 1–7 (not *Notopus dorsipes* (Fabricius, 1793)).

*Albunea symmysta* [sic]: Weber, 1795: 94. – Fabricius, 1798: 397. – Herbst, 1804: 31 (list). – Latreille, 1806: 44. – Lamarck, 1818: 224. – Desmarest, 1823: 283, unnumbered pl., fig. 3. – Desmarest, 1825: 173, pl. 29, fig. 3. – Guérin Méneville, 1829: 12 (list), pl. 15, fig. 1. – Latreille, 1831: 56. – Brewster, 1832: 234. – H. Milne Edwards, 1837a: 111–112, explanation for pl. 42, pl. 42, fig. 3. – H. Milne Edwards, 1837b: 203–204, pl. 42, fig. 3. – H. Milne Edwards, 1840: 111–112. – White, 1847: 57. – de Haan, 1849: viii, pl. Q. – Lucas, 1853: 45–47, pl. 1, fig. 8. – Heller, 1863: 153 (part). – Heller, 1865: 72. – Chenu and Desmarest, 1877: 32. – Miers, 1878: 326–327. – Lucas, 1881: 54–55\*. – Albert, 1883: 523–524, pl. 31, figs. 1, 6, 17. – de Man, 1887: 425. – F. Müller, 1890: 472. – Ortmann, 1892: 536. – Henderson, 1893: 338, 409\*. – Stebbing, 1893: 152 (list). – Southwell, 1910: 183. – Boschma, 1931: 351, 354\*. – Boschma, 1937: 204\*. – Menon, 1937: 10–15, figs. 46–82. – Gordon, 1938: 187 (part), figs. 1e, 3f, 4c\*. – Bouvier, 1940: 181, pl. 6, fig. 1. – Gravely, 1941: 75, 104, fig. 27–1. – Gurney, 1942: 263, fig. 110k. – Boschma, 1955: 14, 57, 65, 67\*. – Sarojini, 1962: 191, fig. 1j. – Serène and Umali, 1965: 90–95 (part), pl. 1, fig. 1, pl. 2, fig. 1, pl. 3, fig. 1, 1a, pl. 4, fig. 1, text-figs. 1a, 2a, 3, 4a, 5a, b, 6a, b, b’\*. – Thomassin, 1969: 138–140, pl. 1, text-fig. 3a. – Boonruang and Phasuk, 1975: 1–2, 8, 15, 17, fig. 4. – Anantaraman and Subramoniam, 1976: 192–199. – Naiyanetr, 1978: 333, fig. 1. – Naiyanetr, 1980: 22. – Panneerselvam and Subramoniam, 1983: 1–8, figs. 1–8. – Subramoniam, 1984: 78–94, figs. 1a, 2–14. – Coêlho and Calado, 1987: 43, table 1. – Seridji, 1988: 1298. – Subramoniam, 1993: 133, 152–155, 158, 197–198, figs. 14, 15. – Calado, 1997a: 17. – Naiyanetr, 1998: 51. – K. Sakai, 1999: 9, pl. 1, fig. d.

*albunea symmysta* [sic]: Latreille, 1803: 172, pl. 51, fig. 4.

*Albunea dorsipes*: Herbst, 1804: 31 (list) (not *Notopus dorsipes* (Fabricius, 1793)).

*Cancer lymmysta* [sic]: Froriep, 1806: 183 (list).

*Albunea Symmyste* [sic]: Duméril, 1816: 431.

*Albunaea* [sic] *symmysta* [sic]: Stimpson, 1858: 230 (list).

*Albunea (symmysta)*: Claus, 1885: 69, 108, pl. 6, fig. 52. – Claus, 1886: 69, 108, pl. 6, fig. 52.

*Albunea symmysta*: Ortmann, 1896: 224. – Ortmann, 1901: 1276, pl. 72, fig. 3, pl. 93, fig. 4, pl. 104, fig. 2. – Holthuis, 1956: 238. – ICZN,

- 1958: 234. – Subramoniam and Panneerselvam, 1985: 226–227. – Boyko and Harvey, 1999: 391, 396, 400 (list), 401 (key)\*. – Boyko, 1999: 145 (list).
- Cancer symmysta*: Holthuis, 1956: 237–238. – ICZN, 1958: 213, 215, 233–234. – Melville and Smith, 1987: 298. *Albunea Symnista* [sic]: Seridji, 1988: 1298.
- Albunea symmysta* [sic]: Chace and Kensley, 1992: 446, fig. 2n.
- Cancer symmista* [sic]: Calado, 1995: 71.
- “*Albunea* sp. n.” Calado, 1995: 76–78, pl. 4, fig. 1, pl. 5, fig. 1, pl. 23, fig. a, pl. 24, figs. a–e\*.
- Albunea symnistra* [sic]: Dexter, 1996: 12.
- Albunea symmista* [sic]: Fransen et al., 1997: 161\*. – Richmond, 1997: 214, unnumbered fig. on p. 215.
- Albunea edsoni* Calado, 1997a: 18–21, figs. 1, 2\* (NEW SYNONYMY).
- ?*Albunea oxyophthalma*: Southwell, 1910: 184 (not *Albunea oxyophthalma* Miers, 1878 = *A. paretii* Guérin Méneville, 1853).
- ?*Albunea* [sic] *symnista* [sic]: Menon, 1937: 10.
- ?*Albunea* [sp.] Menon, 1943: 331–332.
- ?*Albunea symnista* [sic]: Wang, 1989: 39. – Sun and Wang, 1996: 31 (list) (? = *Albunea* sp. indet.).
- not *Hippa symnista* [sic]: Fabricius, 1787: 329 (part) (= *Corystes cassivelaunus* (Pennant, 1777)).
- not *Cancer Symnista* [sic]: de Villers, 1789: 157–158 (part) (= *Corystes cassivelaunus* (Pennant, 1777)).
- not *Albunea symnista* [sic]: Rafinesque-Schmaltz, 1814: 20. – Lucas, 1849a: 27–28\*. – Lucas, 1849b: pl. 3, fig. 2\*. – Heller, 1863: 153 (part). – Barrois, 1888: 18–19, 75, 82, 89, 93–94. – Bolivar, 1892: 128 (list). – Ferrer Aledo, 1914: 68. – Miranda y Rivera, 1933a: 22. – Miranda y Rivera, 1933b: 1 (list) (= *Albunea carabus* (Linnaeus, 1758)).
- not *Albunea symnista* [sic]: Brullé, 1836–1844: 17. – Ozorio, 1888: 186 (= *Albunea elegans* A. Milne Edwards and Bouvier, 1898).
- not *Albunea symnista* [sic]: Gibbes, 1850a: 24\* (= *Albunea paretii* Guérin Méneville, 1853).
- not *Albunea symnista* [sic]: Gibbes, 1850b: 187 (= *Albunea catherinae*, n. sp.).
- not *Albunea symnista* [sic]: A. Milne Edwards, 1862: F–12\* (= *Albunea speciosa* Dana, 1852).
- not *Albanea* [sic] *symnista* [sic]: Hoffman, 1874: 42 (list) (= *Albunea speciosa* Dana, 1852).
- not *Albunea symnista* [sic]: Cano, 1889a: 95, 104. – Cano, 1889b: 263. (= *Albunea steinitzi* Holthuis, 1958).
- not *Albunea symmysta*: Nobili, 1906: 142–143\*. – Ramadan, 1936: 3 (list) (= *Albunea steinitzi* Holthuis, 1958).
- not *Albunea symnista* [sic]: Rathbun, 1924: 29 (= *Albunea* sp. indet.).
- not *Albunea symnista* [sic]: Nakazawa, 1927: 1051, fig. 2025. – Nakazawa et al., 1949: 741, fig. 2144. – Nakazawa et al., 1951: 741, fig. 2144 (= ? *Paralbunea dayriti* (Serène and Umali, 1965)).
- not *Albunea symnista* [sic]: Kikuchi, 1932: 10 (= *Albunea? groeningi*, n. sp.).
- not *Albunea symnista* [sic]: T. Sakai, 1935: 61 (= *Albunea* sp. indet.).
- not *Albunea symnista* [sic]: Gordon, 1938: 187 (part)\*. – Serène and Umali, 1965: 90–95 (part)\*. – Miyake, 1991: 157, pl. 53, fig. 2. – Asakura, 1995: 376, fig. 21–285 (= *Albunea occultus*, n. sp.).
- not *Albunea symnista* [sic]: Gordon, 1938: 187 (part)\*. – Miyake, 1978: 152–154, figs. 59, 60a\* (= *Albunea groeningi*, n. sp.).
- not *Albunea symnista* [sic]: Gordon, 1938: 187 (part)\* (= *Albunea bulla*, n. sp.).
- not *A. symnista* [sic]: Ward, 1942: 52 (list), 63 (= ? *Albunea holthuisi* Boyko and Harvey, 1999).
- not *Albunea symnista* [sic]: Barnard, 1950: 405–406. – Kensley, 1981: 35 (list) (= *Albunea* sp. indet.).
- not *Albunea symnista* [sic]: Kikuchi, 1959: 49 (list). – Kikuchi, 1961: 5 (list) (= *Albunea* sp. indet.).
- not *Albunca* [sic] *symnista* [sic]: Kikuchi, 1961: 5 (list) (= *Albunea* sp. indet.).
- not *Albunea symmysta*: Miyake, 1961: 12.—Miyake et al., 1962: 125 (part) (= ? *Paralbunea dayriti* (Serène and Umali, 1965)).
- not *Albunea symmysta*: Miyake et al., 1962: 125 (part, Toyama Bay material) (= *Albunea groeningi*, n. sp.).
- not *Albunea symmista* [sic]: Miyake, 1965: 651\* (= *Albunea occultus*, n. sp.).
- not *Albunea symmista* [sic]: Miyake, 1965: fig. 1111 (= ? *Paralbunea dayriti* (Serène and Umali, 1965)).
- not *Albunea symnista* [sic]: Serène, 1977: 47. – Calado, 1995: 71–73, pl. 4, fig. i, pl. 5, fig. h, pl. 21, figs. a, b, pl. 22, figs. a–f\* (= *Albunea microps* Miers, 1878).
- not *Albunea symmysta*: Kikuchi and Miyake, 1978: 31 (list) (= *Albunea* sp. indet.).
- not *Albunea symmysta*: Nurul Huda et al., 1989: 88–89 (= *Albunea? thurstoni* Henderson, 1893).

MATERIAL EXAMINED: **India**: “Indian Seas,” coll. unknown: 1 ♂, 13.6 mm cl, 2 ♀, 19.0–19.8 mm cl (BMNH 1883.25); “Ganjam,” coll. unknown: 1 ♀, 15.0 mm cl (BMNH 1889.6.17.151); Colachel, coll. un-



known: 1 ♂, 14.1 mm cl (BMNH 1903.4.6.210); Madras, coll. J. R. Henderson: 1 ♂, 16.2 mm cl, 7 ♀, 14.2–21.9 mm cl (BMNH 1892.7.15.125–132); Madras, coll. unknown: 3 ♀, 17.2–19.6 mm cl (BMNH 1903.4.6.211–212); [Madras], coll. unknown, 1 larva, 2.8 mm cl (BMNH 1949.12.2.544 ex Menon via Gurney); Madras, coll. Museum Wien: 1 ♂, 14.8 mm cl, neotype (ZMO F17538); Pondicherry, 1881, coll. M. Maindron: 1 ♀, 18.0 mm cl (MNHN-Hi 115); Pondicherry, 1881, coll. M. Maindron: 3 ♂, 12.5–13.4 mm cl (MNHN-Hi 116); Pondicherry, Jan. 1881, coll. M. Maindron: 2 ♀, 15.3–18.0 mm cl (MNHN-Hi 16); Pondicherry, Nov. 28, 1942, coll. unknown: 1 ♀, 19.5 mm cl (MNHN-Hi 15); Pondicherry, coll. M. Leschenault: 1 ♂, 17.4 mm cl, 1 ♀, 17.8 mm cl (MNHN-Hi 182); Pondicherry, coll. M. Leschenault: 1 ♀, 14.7 mm cl (MNHN-Hi 183); Pondicherry, coll. M. Leschenault: 1 ♀, 16.4 mm cl (MNHN-Hi 184); Pondicherry, coll. M. Leschenault: 1 ♂, 13.0 mm cl (MNHN-Hi 185); [Pondicherry], coll. M. Leschenault: 1 ♂, 14.1 mm cl (MNHN-Hi 186); Pondicherry, Aug. 1901, coll. M. Maindron: 25 ♂, 10.6–15.5 mm cl, 16 ♀, 11.0–20.8 mm cl (MNHN-Hi 196); Pondicherry, Bay of Bengal, 11°59'N, 79°50'E, 1901, coll. [M. Maindron]: 1 ♂, 14.6 mm cl (AM P5404); Pondicherry, 1901, coll. [M. Maindron]: 1 ♂, 15.5 mm cl (AM P5405 ex MNHN); Pondicherry, 1901, coll. [M. Maindron]: 1 ♂, 13.0 mm cl (AM P5406 ex MNHN).

**Sri Lanka (Ceylon):** “Ceylon,” coll. E. E. Green: 2 ♂, 15.3–15.9 mm cl, 1 ♀, 16.2 mm cl (BMNH 1904.11.28.4–6); “Beutkofe, SW Ceylon,” Aug. 2, 1909, coll. G. Dünker: 1 ♀, 17.7 mm cl (ZMH K–32584).

**Indonesia:** Padang, Sumatra, Oct. 14, 1828–Nov. 10, 1829, coll. S. Müller: 2 ♀, 15.0–16.0 mm cl (RMNH 23029); Benkoelen, Sumatra, Nov. 1925, coll. H. C. Kellers: 1 ♀, 19.1 mm cl (USNM 68615); “Buitenzorg,” Java, June 1906, coll. H. Jensen: 16 ♂, 10.2–14.1 mm cl, 24 ♀, 11.2–19.2 mm cl (ZMUC 2713); “Moluccas,” 1841–1843, coll. E. A. Forsten: 1 ♂, 15.5 mm cl, 1 ♀, 13.5 mm cl (RMNH 23030); “Moluccas,” coll. unknown: 8+ unsexable specimens, 12.5–15.3 mm cl (RMNH 853).

**Thailand:** Phuket Island, July 1970, coll. unknown: 1 ♀, 19.4 mm cl (CASIZ 109242).

**Philippines:** Padada Beach, Gulf of Davao, Sept. 1939, coll. G. R. Oesch: 1 oviger, 12.9 mm cl (AMNH 10393); Morong, Bataan, March 1, 1999, coll. J. D. Williams: 2 ♂, 8.9–12.6 mm cl, 1 juvenile, 5.2 mm cl (AMNH 18092); Morong, Bataan, Feb. 20, 1999, coll. J. D. Williams: 1 molt, 7.1 mm cl (AMNH 18093); Levgayen Gulf, 500 ft (= 151.5 m), May 1909, coll. “Albatross”: 1 ♀, 14.8 mm cl (USNM 68613); Calapan, Mindoro, Jan. 6, 1933, coll. P. de Mesa: 1 ♂, 12.1 mm cl (MCZ 19654); Calapan, Mindoro, coll. P. de Mesa: 1 ♂, 8.2 mm cl (MCZ 9615).

**Australia: Queensland:** 15°28'S, 145°15'E, Cooktown, June 1, 1985, coll. S. W. Gunn: 1 ♂, 9.7 mm cl (MOV J44730); Cardwell, Port Douglas, Jan. 20, 1972, coll. E. M. Grant: 1 ♀, 15.1 mm cl (QM W3848); **New South Wales:** Lord Howe Island, coll. unknown: 1 ♀, 17.8 mm cl, holotype of *A. edsoni* (BMNH 1912.11.22.106).

**Limited Data:** Sta. 1679, Mission de l'Indochine, 1912, coll. A. Kreuff: 4 ♂, 12.2–13.2 mm cl, 2 ♀, 13.6–15.5 mm cl (MNHN-Hi 86); “Asia,” pre–1866, coll. L. de Jeude: 1 ♀, 18.7 mm cl (MOV J14551); “Asia,” coll. L. de Jeude: 1 ♂, 11.9 mm cl (MOV J44726); “Yanaon, Indes Orientales,” coll. unknown: 1 ♀, 18.6 mm cl (MNHN Hi 187).

**No Data:** 1 ♂, 12.4 mm cl (MNHN-Hi 17); 1 ♀, 17.0 mm cl (MOV J14554).

**DIAGNOSIS:** Carapace wider than long, covered with lightly setose grooves. Anterior margin with 11–17 spines on either side of ocular sinus. Setal field with narrow lateral elements and concave anterior margin. CG1 with separate posterior lateral elements; CG4 with two short, anteriorly displaced medial elements between longer supralateral elements of CG4; CG5 of two triangular elements; CG6 and CG7 separate; CG8 broken; CG11 absent. Rostrum present, not reaching posterior margin of ocular plate. Ocular plate triangular. Distal peduncular segments dorsoventrally flattened and triangular, tapering at tip, approximated along mesial margins at base, lateral margins broadly convex, mesial margins straight. Cornea at tip. Dactylus of pereopod II with heel produced, tapered, and

subacute. Dactylus of pereopod III with heel tapering, projecting, acute. Dactylus of pereopod IV sinuous from base to tip, with produced subacute heel and deep indent. Telson of male broadly triangular, laterally produced, length subequal to width, with broadly rounded tip; thickly calcified medially, inflated dorsally; distal two-thirds with lateral decalcified region, median row of thin setae. Telson of female flattened, ovate, and evenly calcified with slightly produced tip.

DESCRIPTION: Carapace (fig. 98A) slightly wider than long. Anterior margin slightly concave on either side of ocular sinus, becoming convex laterally, with 11–17 large spines ( $n = 9$ ) along length. Rostrum as small acute tooth, not reaching proximal margin of ocular plate. Ocular sinus smoothly concave, with three or four small spinules. Frontal region smooth; setal field narrow anteriorly and posteriorly; posterior lateral elements reduced to narrow bands of setae. CG1 parallel to anterior margin of carapace, sinuous, strongly crenulate, divided into medial fragment and curved, posteriorly displaced lateral elements. Mesogastric region smooth; CG2 absent; CG3 broken into five or six short elements between posterior lateral elements of CG1, medial elements anteriorly displaced; CG4 with two short, anteriorly displaced medial elements between longer supralateral elements of CG4. Hepatic region smooth, with oblique setose groove at median of lateral margin. Epibranchial region generally triangular, smooth; posterolateral margin without rows of setae. Metagastric region smooth; CG5 present as two triangular elements. CG6 strongly crenulate, strongly anteriorly concave medially and sloping out to anteriorly convex lateral thirds. CG7 oblique, not reaching lateral margins of median segment of CG6. Cardiac region smooth; CG8 present as two to four short medial elements. CG9 present as two short lateral grooves with gap at midline. CG10 absent. CG11 absent. Post-CG11 element absent. Branchial region with numerous short, transverse rows of setae in anterior half. Posterior margin deeply and evenly convex, with submarginal groove reaching two-thirds up margin of posterior concavity. Branchiostegite with short anterior submarginal spine; anterior region with scattered,

short, transverse lines ventral to *linea anomurica*; with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 98B) triangular, with deep median indentation; median peduncular segments present as small ovate calcified areas lateral to ocular plate. Distal peduncular segments elongate, subtriangular, with strongly convex lateral and straight mesial margins, cornea covering lateral portion of distal tip; lateral margins with notch one-fourth distal from base; mesial margins approximated at base, with long plumose setae; tuft of plumose setae at proximolateral ventral angles and ventromedial oblique row of plumose setae extending from tuft to three-fourths length of segment.

Antennule (fig. 98C) with segment III narrow proximally, expanding distally to two times proximal width; with plumose setae on dorsal and ventral margins and sparsely scattered on lateral surface; dorsal exopodal flagellum with 121–131 articles ( $n = 6$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with three to five articles ( $n = 6$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins and scattered on ventrolateral third of surface. Segment I wider than long, unarmed; dorsal third of lateral surface rugose with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 98D) with segment V approximately two times longer than wide, with long plumose setae on dorsal and ventral margins and scattered on lateral surface; flagellum with seven articles ( $n = 6$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV expanded distally, with long plumose setae on dorsal, ventral, and distal margins and row of setae on dorsolateral surface. Segment III with long plumose setae on dorsal and ventral margin and in short row on surface. Segment II short, widening distally, rugose, with plumose setae on margins and scattered on lateral surface; antennal acicle long, thin, and exceeding distal margin of segment IV by one-sixth length of segment IV, with long plumose setae on dor-

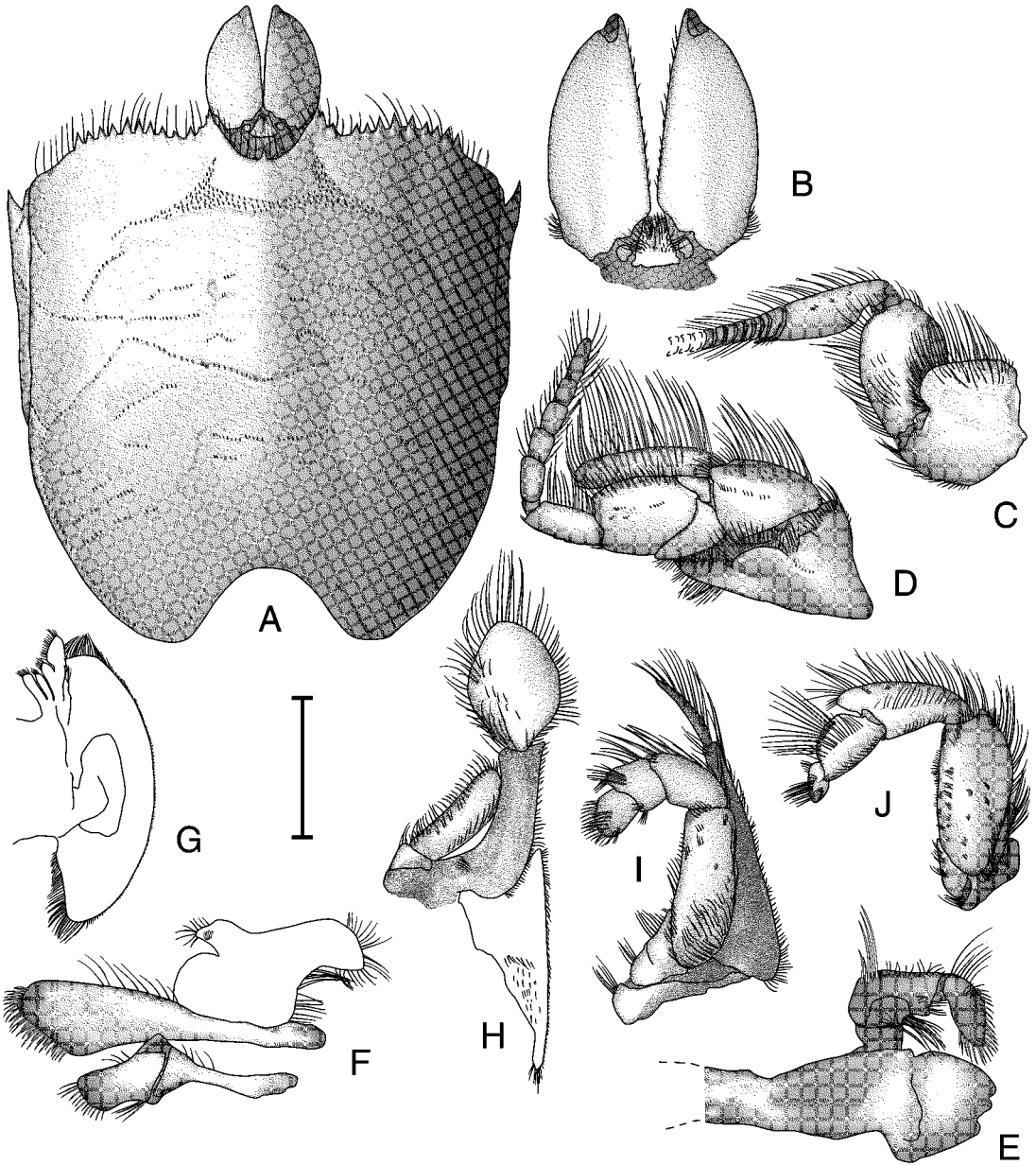


Fig. 98. *Albunea symmysta* (Linnaeus, 1758): A, ♀, 14.8 mm cl, USNM 68613; B–J, ♀, 16.9 mm cl, ZMUC 2713. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Left maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 2.2 mm (F), 3.0 mm (B, E), 3.3 mm (I), 4.4 mm (D, H), 5.0 mm (A), 5.9 mm (C), and 6.7 mm (G, J).

sal margin. Segment I rounded proximally, flattened ventrolaterally, with long plumose setae on margins and in short row on surface rugae behind spine; lateral surface with acute spine dorsodistally, with low semicircular dorsolateral lobe ventrodial to spine; segment with ventromesial antennal gland pore.

Mandible (fig. 98E) incisor process with three teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment and on distal margin of terminal segment.

Maxillule (fig. 98F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin simple setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under; internal lobe reduced with four thick setae at distolateral margin.

Maxilla (fig. 98G) exopod evenly rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 98H) epipod with plumose setae on margins, distolateral surface, and mesial surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel with plumose setae; distal segment spatulate, longer than wide, broadest medially, margins and mesioventral surface with long plumose setae. Endopod flattened and elongate, reaching two-thirds to distal end of proximal exopodal segment; plumose setae on margins and median of lateral surface.

Maxilliped II (fig. 98I) dactylus evenly rounded, length slightly greater than width, with thick simple setae distally and on distolateral surface. Propodus 1.5 times wider than long, slightly produced at dorsodistal angle, with plumose setae on dorsal margin and patch of long simple setae on dorsodistal and ventrodial angles. Carpus not produced dorsodistally, approximately two times longer than wide; long simple setae on dorsal margin. Merus approximately three times longer than wide, margins parallel; with simple and plumose setae on margins and scattered on surface. Basis-ischium incompletely fused with plumose setae on margins. Exo-

pod one-third longer than merus, flagellum with one elongate article, approximately as long as carpus.

Maxilliped III (fig. 98J) dactylus oblong with rounded tip; long plumose setae on margins and lateral surface. Propodus dorsodistally inflated, with longitudinal median row of plumose setae on lateral surface; margins with plumose setae. Carpus produced onto propodus almost one-third length of propodus; lateral surface with two rows of plumose setae on surface; plumose setae on margins. Merus inflated, unarmed, with plumose setae on margins and scattered on lateral surface. Basis-ischium incompletely fused, with weak crista dentata of three or four teeth. Exopod two-segmented: proximal segment small; distal segment styliiform, tapering, approximately two-fifths length of merus; with plumose setae on margins; without flagellum.

Pereopod I (fig. 99A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose setae; ventral margin with short simple setae. Propodal 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; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle produced into strong corneous-tipped spine; dorsal margin with short transverse grooves behind spine; dorsal and distal margins with long plumose setae; lateral surface with small distal rugose area, few transverse setose ridges on distal half of surface; mesial surface smooth, with medial transverse row of 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 scattered setae; fully calcified. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 99B) dactylus smooth; base to heel slightly concave, heel produced, broad and subacute, heel to tip with narrow, acute indent, tip acute, tip to base broadly convex; lateral surface smooth, with several small tufts of short setae in generally straight line across medioproximal surface, several widely spaced submarginal tufts of short se-



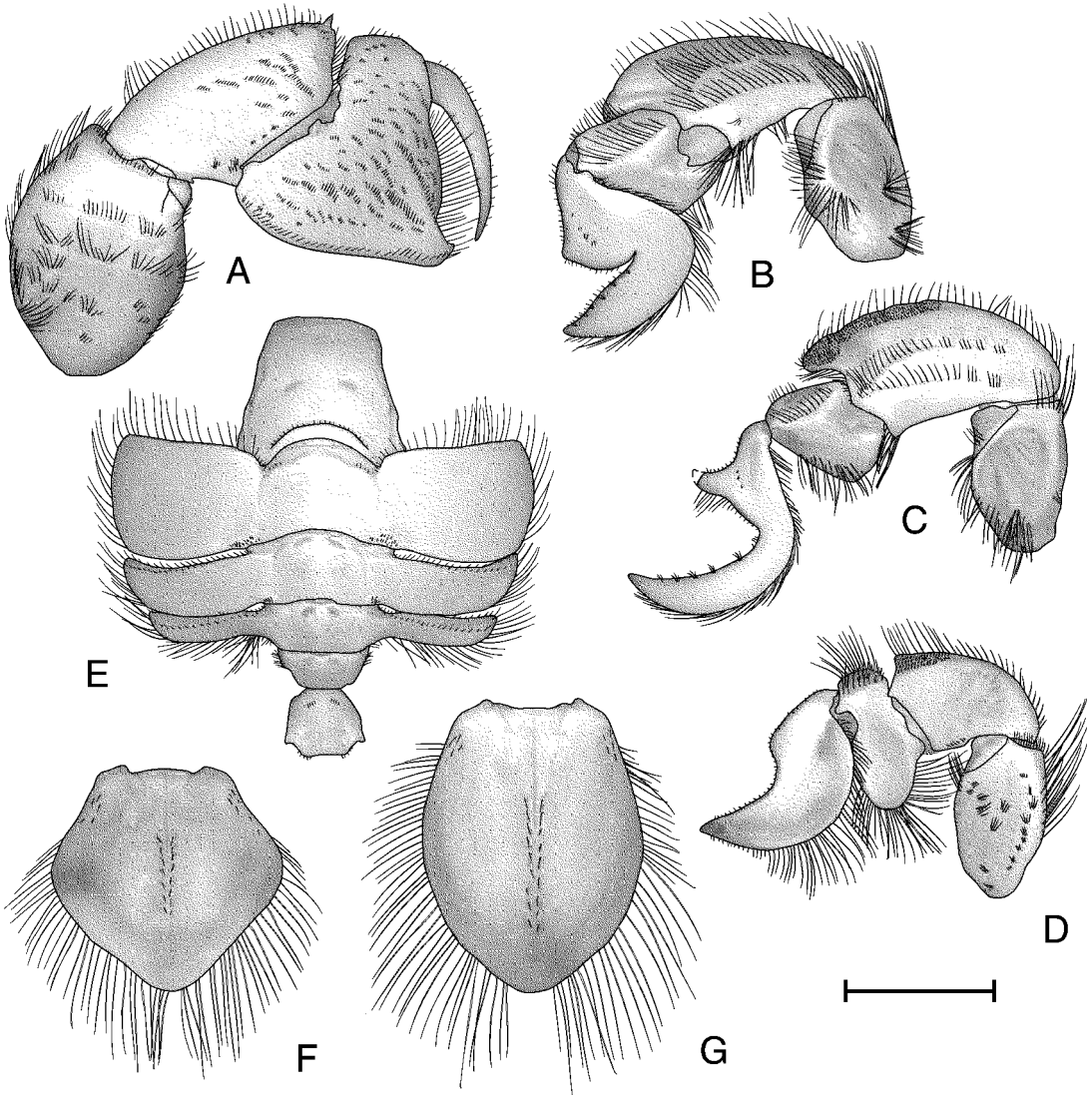


Fig. 99. *Albunea symmysta* (Linnaeus, 1758): A–E, G, ♀, 16.9 mm cl, ZMUC 2713; F, ♂, 14.1 mm cl, ZMUC 2713. **A.** Right pereopod I, lateral view. **B.** Left pereopod II, lateral view. **C.** Left pereopod III, lateral view. **D.** Left pereopod IV, lateral view. **E.** Abdominal somites I–VI, dorsal view. **F.** telson of ♂, dorsal view. **G.** Telson of ♀, dorsal view. Scale = 3.3 mm (F, G) and 5.9 mm (A–E).

tae dorsodistally; mesial surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae, patch of long plumose setae at base. Propodal dorsal surface smooth, with 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 as narrow, oblique, flattened shelf, with 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 strongly produced and rounded dorsodistally, dorsal margin smooth; lateral surface smooth, produced area smooth, irregular, interrupted row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae;

margins with short plumose setae; mesial surface smooth, with row of long plumose setae distally and subdorsally. Merus with large median decalcified window covering nearly all of lateral surface, with few scattered long plumose setae on surface and margins; mesial surface nearly smooth, with two long rows of setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 99C) dactylus with base to heel concave, heel narrow and acutely produced, heel to tip with broadly concave indent and small concave region at midpoint of proximal margin, tip acute, tip to base smoothly convex; lateral surface smooth, with several small tufts of short setae in roughly straight line across medioproximal surface, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface smooth, with long plumose setae in oblique row, simple setae on dorsal margin, plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened, with setose mat; mesial surface smooth. Carpus produced dorsodistally, exceeding proximal margin of propodus by one-third length of propodus; tip rounded, dorsolateral margin unarmed; lateral surface slightly rugose dorsodistally, with mat of short setae and two interrupted rows of setae ventrally; mesial surface smooth, with long plumose setae on distal margin and in oblique row on surface. Merus smooth, with large decalcified window covering nearly half of lateral surface medially; dorsal and ventral margins unarmed, with long plumose setae; distolateral margin with long plumose setae; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female with large gonopore on anterior mesial margin of coxa, surrounded with short plumose setae; male with tiny pore located more mesially.

Pereopod IV (fig. 99D) dactylus with base to tip convex proximally, with broadly rounded, strongly concave indent and almost straight from indent to tip, tip acute, tip to base concave distally to convex proximally; lateral surface smooth, ventral margin with

long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge with row of short setae; with setose punctations ventral to decalcified window. Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, ventral margin with long plumose setae; dorsal expansion with row of long plumose setae dorsally, oblique area with mat of short simple setae; lateral surface smooth, mesial surface smooth, with distoventral area of few patches of long plumose setae. Carpus slightly produced dorsodistally; ventral four-fifths of lateral surface and mesial surface smooth, dorsodistal fifth of lateral surface with mat of short setae; dorsal margin with short simple and long plumose setae; ventral margin with short simple setae; mesial surface decalcified medially. Merus with scattered, short, transverse rows of setae on lateral surface, dorsal and ventrodorsal margins with long plumose setae; proximoventral half of mesial surface with large decalcified window. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 99E) somite I wider than long, widest posteriorly; dorsal surface with anterior margin straight; posterior margin curved, with elevated submarginal row of short setae; small transverse decalcified windows laterad of segment median. Somite II dorsal surface with irregular submarginal transverse ridge anteriorly; with small transverse decalcified windows laterad of segment median just anterior to submarginal ridge; pleura expanded and directed anterolaterally; anterolateral margins angled, anterior and lateral margins with long plumose setae, posterolateral angle rounded, posterior margin with short setae; posteromesial angle with mat of short simple setae. Somite III similar to somite II, but narrower, shorter, anterior submarginal windows present; pleura thinner and shorter than on somite II, directed anterolaterally, with setae as in somite II; anterolateral angle subacute; dorsal surface obliquely flattened anterolaterally, with submarginal row of short setae. Somite IV similar to somite III, but thinner and shorter, anterior submarginal windows present; dorsal surface with few short setae anterolaterally;

pleura thinner and shorter than on somite III, directed anterolaterally; dorsal surface obliquely flattened anterolaterally; margins with long plumose setae. Somite V wider than somite IV, anterior submarginal windows present; lateral margins with plumose setae; pleura absent. Somite VI slightly broader than somite V, anterior submarginal windows present; dorsal surface with short transverse rows of setae laterad of midline; pleura absent.

Females with uniramous, paired pleopods on somites II–V; males without pleopods.

Telson of male (fig. 99F) broadly triangular, laterally produced, length subequal to width, with broadly rounded tip; thickly calcified medially, inflated dorsally; distal two-thirds with lateral decalcified region; median longitudinal groove extending one-half length, row of long simple setae of either side of median groove beginning at median and continuing almost to distal margin of calcified area; proximolateral angles with few long simple setae; margins with long simple setae. Telson of female (fig. 99G) flattened, ovate, and evenly calcified with slightly produced tip; median groove similar to male, setal row from midpoint of median groove to near distal margin of telson with simple setae subequal to those of male; proximolateral angle with few short setae, margins with long simple setae.

**DISTRIBUTION:** From the east coast of India throughout southeast Asia to the Philippines and Indonesia as far east as Java, in up to 151.5 m depth. Also Queensland and Lord Howe Island, Australia.

**MAXIMUM SIZE:** Males: 17.4 mm cl; females: 21.9 mm cl.

**TYPE SPECIMENS:** The type or types of *Cancer symmysta* are not extant and a neotype (♂, 14.8 mm cl) is herein designated as ZMO F17538. BMNH 1912.11.22.106 (holotype of *A. edsoni*).

**TYPE LOCALITIES:** “Asia” was the only locality information given by Linnaeus (1758) for *A. symmysta*; the neotype designated herein (ZMO F17538) was collected from Madras, India, which becomes the type locality of *A. symmysta*; Lord Howe Island, New South Wales, Australia (*A. edsoni*).

**REMARKS:** *Albunea symmysta* is no. 1565 on the “Official list of specific names in zo-

ology” (ICZN, 1958) and is the type of the genus *Albunea* by subsequent designation of Holthuis (1956). This species is called “Jakalan quai” or “buffalo cicada” in Thailand, terms also used for the genus *Hippa* (Boonruang and Phasuk, 1975).

Although Linnaeus (1758, 1767) gave the type locality as “Asia,” it should be noted that he also (1764) cited India as the “habitat” for this species, which is most likely where his specimens came from. Consequently, the neotype specimen (ZMO F17538) is selected from an Indian locality. A neotype is needed to stabilize the identity of this species, as there have been numerous instances of confusion between other albuneid taxa and *A. symmysta* (see synonymy list above). The so-called holotype of *Cancer dorsipes* “Herbst” (ZMB Herbst 2231), as cited by K. Sakai (1999), is merely Herbst’s (1804) specimen of *A. symmysta*. The species *dorsipes* was established in the genus *Hippa* by Fabricius in 1793.

The misspelling “*symnista*” was introduced by Linnaeus (1767) and unfortunately became the spelling used by most authors up to the present. It is hoped that the correct original spelling of this species will now be universally adopted.

*Albunea symmysta* is a model animal that has been used to study endocrinology, spermatophore formation, and breeding patterns (Panneerselvam and Subramoniam, 1983; Subramoniam, 1984; Subramoniam and Panneerselvam, 1985). Because of this, more is known about the biology of this species than any other albuneid, but not all published statements are accurate. As discussed for the family and genus, this species is neither blind nor a filter-feeder, as suggested by Subramoniam and Panneerselvam (1985).

This species breeds continuously along the Madras coast, with peaks in January and June, but the maximum percentage of ovigers is only 25% (Subramoniam and Panneerselvam, 1985). Sexual maturity of females was reported as 17 mm cl, and maximum size as 22 m cl (Subramoniam and Panneerselvam, 1985). However, an ovigerous ♀ of 12.9 mm cl is known from the Philippines (AMNH 10393). The larval stages were described by Menon (1937) from Indian plankton samples, and there appear to be five zoal stages.

There are 12 gills along each side in the stage IV zoea and 13 in stage V zoea vs. 10 in an adult. Menon (1943) incorrectly suggested that this showed evidence of recapitulation of ancestral characters in the larval stages.

The androgenic gland of *A. symmysta*, as described by Sarojini (1962), is distinctive and unlike that of the pagurid hermit crab he studied, but the apparent overall variability in this gland within a single species makes its utility in phylogenetic studies questionable.

*Albunea symmysta* has been well studied with regards to its parasites. One 12.3 mm cl ♀ from Java (ZMUC 2713) has an attached rhizocephalan parasite, *Sacculina anceps* Boschma, 1931. This parasite is one of only a few species of "*Sacculina*" not found on brachyurans and may not properly belong to this genus (but see Boschma, 1955). *Sacculina anceps* was described from six specimens found on specimens of *A. symmysta* (ZMUC 2713). A lectotype for *S. anceps* was selected by Boschma (1937) as "the best preserved of the two specimens of which longitudinal sections have been made". The specimen cited above is therefore a paralectotype of *S. anceps*. High levels of infection in Indian populations of *A. symmysta* by microphallid trematode metacercariae (Platyhelminthes) were reported by Anantaraman and Subramoniam (1976). The parasites were tentatively identified as *Microphallus* sp. and were found in the ovaries of female crabs, while male crabs were uninfected.

As *A. symmysta* is the only species known at present from either Sri Lanka or India, it seems likely that this is the taxon Southwell (1910: 184) collected from near Ceylon, in spite of his having also listed *A. symmysta* as a separate taxon (Southwell, 1910: 183).

It is difficult to know what species Serène and Umali (1965) were dealing with from the Philippines, but at least some of their material was true *A. symmysta*. This can be seen in their illustrations of the inflated distal peduncular segments (text-fig. 5a) and dactyli (text-fig. 3), which match well with *A. symmysta*. Some of their material is clearly not *A. symmysta*, however, as can be seen in their discussion of the variable shape of the dactylus of pereopod IV. These other specimens

are probably *A. occultus*, but need to be examined for confirmation.

Thomassin (1969) reported this species from Madagascar, but he had no specimens and relied on the personal communication of two individuals for his information. However, the species is otherwise not known to occur in Madagascar and probably does not occur west of India. Because of this and numerous other misidentifications in the literature, Thomassin's (1969: text-fig. 11) distribution map for this species is not accurate. The citation of Richmond (1997) appears to be based on the same incorrect data from Thomassin (1969) and not on actual specimens from east Africa.

The identities of the dry specimens cited by Fransen et al. (1997) were confirmed by examination of sketches kindly supplied by Dr. Fransen.

Calado (1997a) described the species *Albunea edsoni*, based on a single ♀ specimen from Australia, but this specimen is actually a large example of *A. symmysta*. The main diagnostic feature given by Calado (1997a) was "17 teeth on the right frontal edge and 16 on the left." As shown herein, the number of teeth on the frontal margin of *Albunea* species is only useful for separating species groups such as the "*microps*-group" from the "*symmysta*-group." It is not a valid means of identifying species. Although not explicitly stated by Calado (1997a), the probable reason she described this new species was because the specimen was not conspecific with the single specimen of "*A. symmysta*" she examined (Calado, 1995). I have examined that specimen (BMNH 1956.1.14.20) and, as can be seen from Calado's (1995: pl. 4, fig. i, pl. 5, fig. h, pl. 21, figs. a, b, pl. 22, figs. a-f) illustrations, it is actually a misidentified *A. microps*. Calado (1995, 1997a) apparently uncritically accepted the identification of this specimen on the label as written, and she incorrectly concluded that the Lord Howe Island specimen represented an undescribed species. This demonstrates the importance of studying large series of specimens in order to correctly understand intra-specific variation.

This species is closely related to *A. occultus* and these two species appear to be inter-



mediate in form between the “*holthuisi*-group” and the “*paretii*-group.”

*Albunea occultus*, new species

Figures 100, 101

*Albunea symnista* [sic]: Gordon, 1938: 187 (part)\*. – Serène and Umali, 1965: 90–95 (part)\*. – Miyake, 1991: 157, pl. 53, fig. 2.—Asakura, 1995: 376, fig. 21–285 (not *Albunea symnista* (Linnaeus, 1758)).

*Albunea symmista* [sic]: Miyake, 1965: 651\* (not *Albunea symnista* (Linnaeus, 1758)).

**MATERIAL EXAMINED:** **Japan:** Tosa-Shimizu, Tosa Bay, Shikoku Island, 4–7 m, May 1959, coll. K. Kurohara: 2 ♀, 8.5–15.3 mm cl, paratypes (ZLKU 7040–7041); Tosa Bay, Shikoku Island, July 6, 1959, coll. S. Nakayama: 1 ♂, 16.7 mm cl, 1 ♀, 18.1 mm cl, paratypes (ZLKU 7062–7063).

**Taiwan:** Taiwan Strait, south of Formosa Banks to the Penghu (Pescadores) Islands, 30–50 m, May 5, 1972, coll. commercial fishermen: 1 ♀, 23.0 m cl, paratype (CASIZ 109246); Kaohsiung, 15 m, May 10, 1991, coll. unknown: 1 ♀, 24.0 mm cl, paratype (NTOU); Kaohsiung, 20 m, April 3, 1988, coll. unknown: 1 ♀, 25.3 mm cl, paratype (NTOU); “Taiwan,” May 17, 1992, coll. unknown: 1 ♀, 22.3 mm cl, paratype (NTOU); “southern Taiwan,” 5 m, Jan. 24, 1992, coll. unknown: 1 ♂, 19.7 mm cl, paratype (NTOU).

**Philippines:** Mindoro, coll. P. de Mesa: 1 ♂, 10.1 mm cl, paratype (MCZ 10261); Morong, Bataan, Feb. 28, 1999, coll. J. D. Williams: 1 juvenile, 4.0 mm cl, paratype (AMNH 18094); Nasasa Bay, Zambales Province, 5–18 fms (= 9.1–32.9 m), Jan. 30 & ♀ b. 8, 1960, coll. F. G. Dayrit and J. E. Norton: 1 ♂, 6.7 mm cl, 1 ♀, 7.3 mm cl, paratypes (USNM 267779); south lagoon, Sibutu, Sulu Archipelago, 04°31'N, 119°22'E, 13 fms (= 23.8 m), Feb. 25–26, 1964, coll. B. R. Wilson on “Pele”: 1 ♂, 8.6 mm cl, paratype (WAM 10411).

**Australia: Western Australia:** Coral Bay, 1989, coll. C. Simpson: 1 ♀, 20.2 mm cl, paratype (WAM 20261); Sta. 3, northeast corner of North Pasco Island, 20°54'S, 115°19'E, Sept. 17, 1966, coll. WAM-USNM Barrow Island Expedition 1966: 1 ♂, 16.4 mm cl, paratype (WAM 23392); Sta.

05D06BT, northwest shelf, 19°29.7'S, 118°52.1'E, 38–39 m, Oct. 25, 1983, coll. CSIRO: 1 ♂, 12.9 mm cl, 3 ♀, 6.2–12.4 mm cl, paratypes (QM W22322); Sta. 05B07BT, northwest shelf, 19°30.9'S, 118°49.2'E, 38–39 m, Oct. 25, 1983, coll. CSIRO: 1 ♀, 17.7 mm cl, paratype (QM W22323); Sta. 05D02BT, northwest shelf, 19°29.4'S, 118°52.4'E, 37–38 m, Oct. 24, 1983, coll. CSIRO: 3 ♂, 6.1–14.0 mm cl, 3 ♀, 7.5–9.2 mm cl, paratypes (QM W22326); Sta. 04B09BT, northwest shelf, 19°28.4'S, 118°55.2'E, 39 m, Aug. 31, 1983, coll. CSIRO: 1 ♀, 7.7 mm cl, paratype (QM W22329); Sta. 05B12BT, northwest shelf, 19°03.6'S, 119°03.4'E, 82 m, Oct. 23, 1983, coll. CSIRO: 2 ♂, 6.3–10.3 mm cl, paratypes (QM W22338); Sta. 04B14S, northwest shelf, 19°43.9'S, 117°54.5'E, 52–53 m, Sept. 2, 1983, coll. CSIRO: 2 ♀, 5.6–6.2 mm cl, paratypes (QM W22340); “northwest Australia,” coll. unknown: 1 ♀, 10.4 mm cl, paratype (BMNH 1932.11.30.64); **Northern Territory:** Western shore, Darwin Harbour, Nov. 3, 1963, coll. unknown: 1 ♂, 18.6 mm cl, paratype (WAM 23393); Waigait, Darwin, Nov. 11, 1969, coll. O. J. Cameron: 2 ♂, 15.1–17.5 mm cl, 1 ♀, 18.1 mm cl, paratype (AM P19435); Mandora, Darwin, Nov. 22, 1972, coll. N. Coleman: 1 oviger, 23.7 mm cl, paratype (AM P19436); Mandora, Darwin, Nov. 21, 1972, coll. N. Coleman: 2 ♂, 14.0–17.5 mm cl, paratypes (AM P23809); Dudley Point, Darwin, Sept. 17, 1970, coll. O. J. and J. Cameron: 1 ♀, 21.0 mm cl, paratype (AM P19993); sand bar no. 1, Darwin, Nov. 14, 1970, coll. O. J. and J. Cameron: 1 ♂, 19.7 mm cl, holotype (AM P20486); **Queensland:** Michaelmas Cay, Great Barrier Reef, north of Cairns, Sept. 14, 1963, coll. W. Goode: 1 ♀, 11.1 mm cl, paratype (WAM 24510); Bowen, Feb. 27, 1934, coll. unknown: 1 ♂, 16.5 mm cl, paratype (QM W25188); Mornington Island, Gulf of Carpentaria, 16°29'S, 139°34'E, coll. unknown: 1 ♂, 9.1 mm cl, paratype (MOV J44733); off Cape Moreton, April 1964, coll. B. Harris: 1 ♀, 26.7 mm cl, paratype (QM W2380); **New South Wales:** Off Richmond River mouth, off Ballina, 28°52'S, 153°34'E, 16 m, Oct. 6, 1962, coll. unknown: 1 ♂, 17.3 mm cl, paratype (AM P15354); 3 mi off mouth of Clarence River, 15 fms (= 27.4 m), late 1968,

coll. J. J. Toyer: 1 ♀, 22.2 mm cl, allotype (AM P16778); within 2 km north of Clarence River bar, 8–9 fms (= 14.6–16.5 m), June 10, 1976, coll. A. E. Ford: 1 ♀, 25.0 mm cl, paratype (AM P24477).

**Limited Data:** "Océan Indien:" 1 ♀, 20.6 mm cl (MNHN-Hi 89).

**DIAGNOSIS:** Carapace wider than long, covered with lightly setose grooves. Anterior margin with 8–11 spines on either side of ocular sinus. Setal field with narrow lateral elements and concave anterior margin. CG1 with separate posterior lateral elements; CG4 with one or two short, concave, anteriorly displaced medial elements between longer supralateral elements of CG4; CG5 of two triangular elements; CG6 and CG7 separate; CG8 broken; CG11 present; posterior submarginal groove entire. Rostrum present, not reaching posterior margin of ocular plate. Ocular plate triangular. Distal peduncular segments dorsoventrally flattened and triangular, tapering at tip, approximated along mesial margins, lateral margins convex, mesial margins straight. Cornea at tip. Dactylus of pereopod II with heel produced, tapered, and subacute. Dactylus of pereopod III with heel tapering, projecting, acute. Dactylus of pereopod IV sinuous from base to tip, with low rounded heel and shallow indent. Telson of male broadly triangular, laterally produced, length subequal to width, with broadly rounded produced tip; thickly calcified medially, inflated dorsally; distal two-thirds with lateral decalcified region, median row of thin setae. Telson of female flattened, ovate, and evenly calcified with slightly produced tip.

**DESCRIPTION:** Carapace (fig. 100A) slightly wider than long. Anterior margin slightly concave on either side of ocular sinus, becoming convex laterally, with 8–11 large spines ( $n = 6$ ) along length. Rostrum as small acute tooth, not reaching proximal margin of ocular plate. Ocular sinus smoothly concave, with one or two large spines and two or three small spinules. Frontal region smooth; setal field narrow anteriorly and posteriorly; posterior lateral elements reduced to narrow bands of setae. CG1 parallel to anterior margin of carapace, sinuous, strongly crenulate, divided into medial fragment and curved, posteriorly displaced lateral ele-

ments. Mesogastric region smooth; CG2 present as one to three small medial elements; CG3 broken into two short medial and two to four longer lateral elements between posterior lateral elements of CG1, medial elements anteriorly displaced; CG4 with one or two short, concave, anteriorly displaced medial elements between longer supralateral elements of CG4. Hepatic region smooth, with oblique setose groove at median of lateral margin. Epibranchial region generally triangular, smooth; posterolateral margin without rows of setae. Metagastric region smooth; CG5 present as two triangular elements. CG6 strongly crenulate, strongly anteriorly concave medially and sloping out to anteriorly convex lateral thirds. CG7 oblique, not reaching lateral margins of median segment of CG6. Cardiac region smooth; CG8 present as one long or two short lateral elements. CG9 present as two short lateral grooves with gap at midline. CG10 present as two short lateral elements. CG11 present as one long or two short medial elements. Post-CG11 element absent. Branchial region with numerous short, transverse rows of setae laterally. Posterior margin deeply and evenly convex, with submarginal groove reaching three-fourths up margin of posterior concavity to entire. Branchiostegite with short anterior submarginal spine; anterior region with scattered, short, transverse lines ventral to *linea anomurica*; with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 100B) triangular with deep median indentation; median peduncular segments present as small ovate calcified areas lateral to ocular plate. Distal peduncular segments elongate, subtriangular, with slightly convex lateral and straight mesial margins, cornea covering lateral portion of distal tip; lateral margins with notch one-fourth distal from base; mesial margins approximated at base, with long plumose setae; tuft of plumose setae at proximolateral ventral angles and ventromedial oblique row of plumose setae extending from tuft to three-fourths length of segment.

Antennule (fig. 100C) with segment III

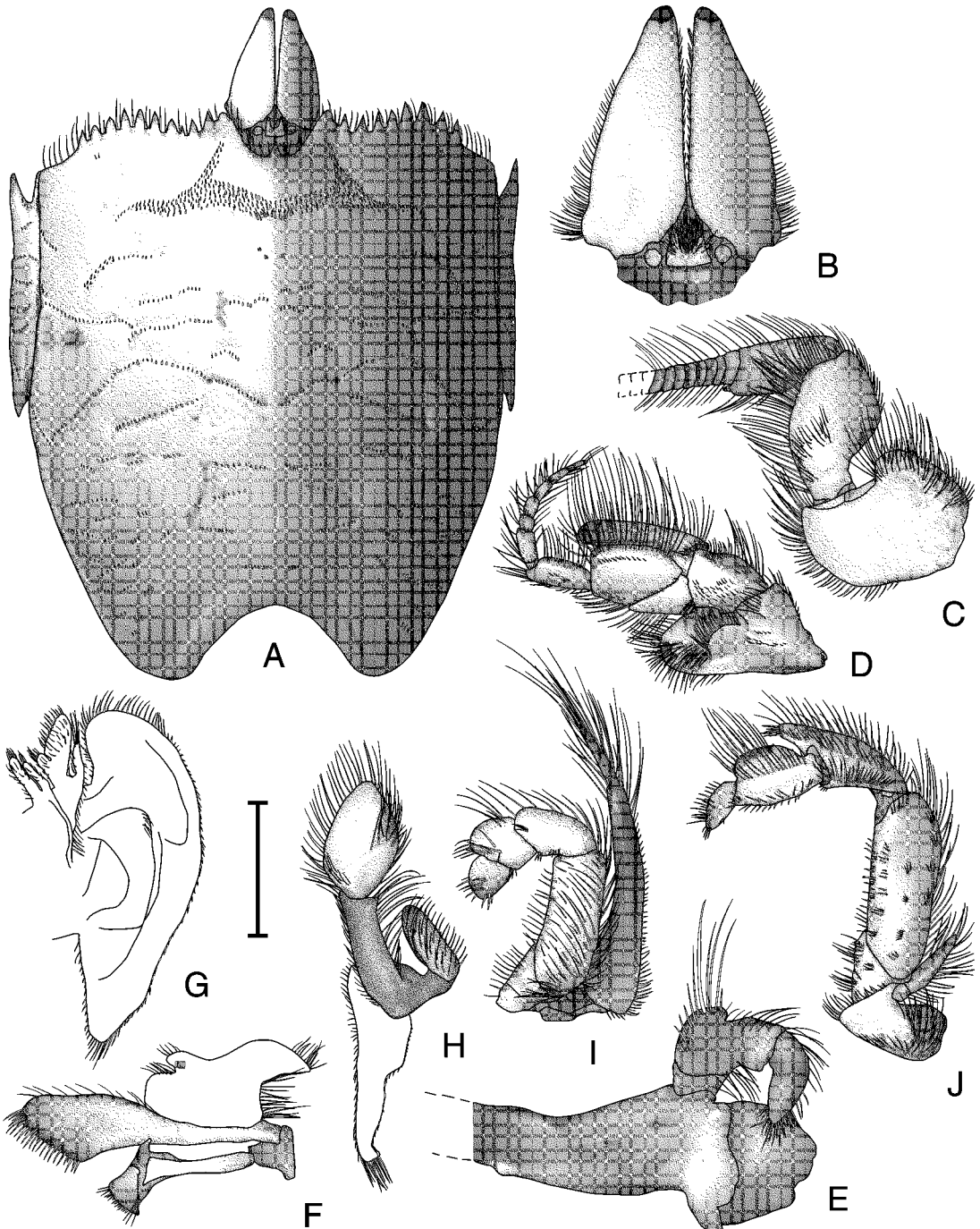


Fig. 100. *Albunea occultus*, n. sp.: A–J, ♀, 25.0 mm cl, AM P24477, paratype. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Right maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 3.3 mm (B, E, F), 4.4 mm (I), 6.7 mm (C, D, G, H, J), and 7.4 mm (A).



narrow proximally, expanding distally to 1.5 times proximal width; with plumose setae on dorsal and ventral margins; dorsal exopodal flagellum with 69–88 articles ( $n = 6$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with two or three articles ( $n = 6$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated from dorsal view, with plumose setae on dorsal and ventral margins and scattered on ventrolateral quarter of surface. Segment I longer than wide, unarmed; dorsal third of lateral surface rugose, with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 100D) with segment V approximately two times longer than wide, with long plumose setae on dorsal and ventral margins and scattered on lateral surface; flagellum with seven or eight articles ( $n = 6$ ; but QM 2380 with 10 articles on one side and eight on other), long plumose setae on dorsal, ventral, and distal margins. Segment IV expanded distally, with long plumose setae on dorsal and ventral margins, and row of short setae on dorsolateral surface. Segment III with short plumose setae on dorsal margin, long plumose setae on ventral margin. Segment II short, widening distally, rugose, with plumose setae on margins and scattered on lateral surface; antennal acicle long, thin, and exceeding distal margin of segment IV by one-seventh length of segment IV, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventrolaterally, with long plumose setae on margins, lobe, and in short row on surface rugae behind spine; lateral surface with acute spine dorsodistally, with low semicircular dorsolateral lobe ventrodial to spine; segment with ventromesial antennal gland pore.

Mandible (fig. 100E) incisor process with three teeth; cutting edge smooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment and on distal margin of terminal segment.

Maxillule (fig. 100F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin simple setae on dorsal margin. Proximal endite with thick simple setae on distal mar-

gin. Endopodal external lobe truncate distally and curled under; internal lobe reduced with six thick setae at distolateral margin.

Maxilla (fig. 100G) exopod evenly rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 100H) epipod with plumose setae on margins and mesial surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel, with plumose setae; distal segment spatulate, longer than wide, broadest medially, margins, proximolateral and mesio-medial surface with long plumose setae. Endopod flattened and elongate, reaching two-thirds to distal end of proximal exopodal segment; plumose setae on margins and median of lateral surface.

Maxilliped II (fig. 100I) dactylus evenly rounded, length slightly greater than width, with thick simple setae distally and on distolateral surface. Propodus two times wider than long, slightly produced at dorsodistal angle, with plumose setae on dorsal margin and patch of long simple setae on dorsodistal and ventrodial angles. Carpus not produced dorsodistally, approximately two times longer than wide; long simple setae on dorsal and ventrodial margins. Merus approximately three times longer than wide, margins parallel; with simple and plumose setae on margins and scattered on surface. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-third longer than merus, flagellum with one elongate article, approximately as long as carpus.

Maxilliped III (fig. 100J) dactylus oblong with rounded tip; long plumose setae on margins and lateral surface. Propodus dorsodially inflated, with longitudinal median row of plumose setae on lateral surface; margins with plumose setae. Carpus produced onto propodus almost one-third length of propodus; lateral surface with two rows of plumose setae; long plumose setae on margins. Merus inflated, unarmed, with plumose setae on margins and scattered in short patches on lateral surface. Basis-ischium incompletely fused, with weak crista dentata of three or four teeth. Exopod two-segmented: proximal segment small; distal segment styliform, ta-



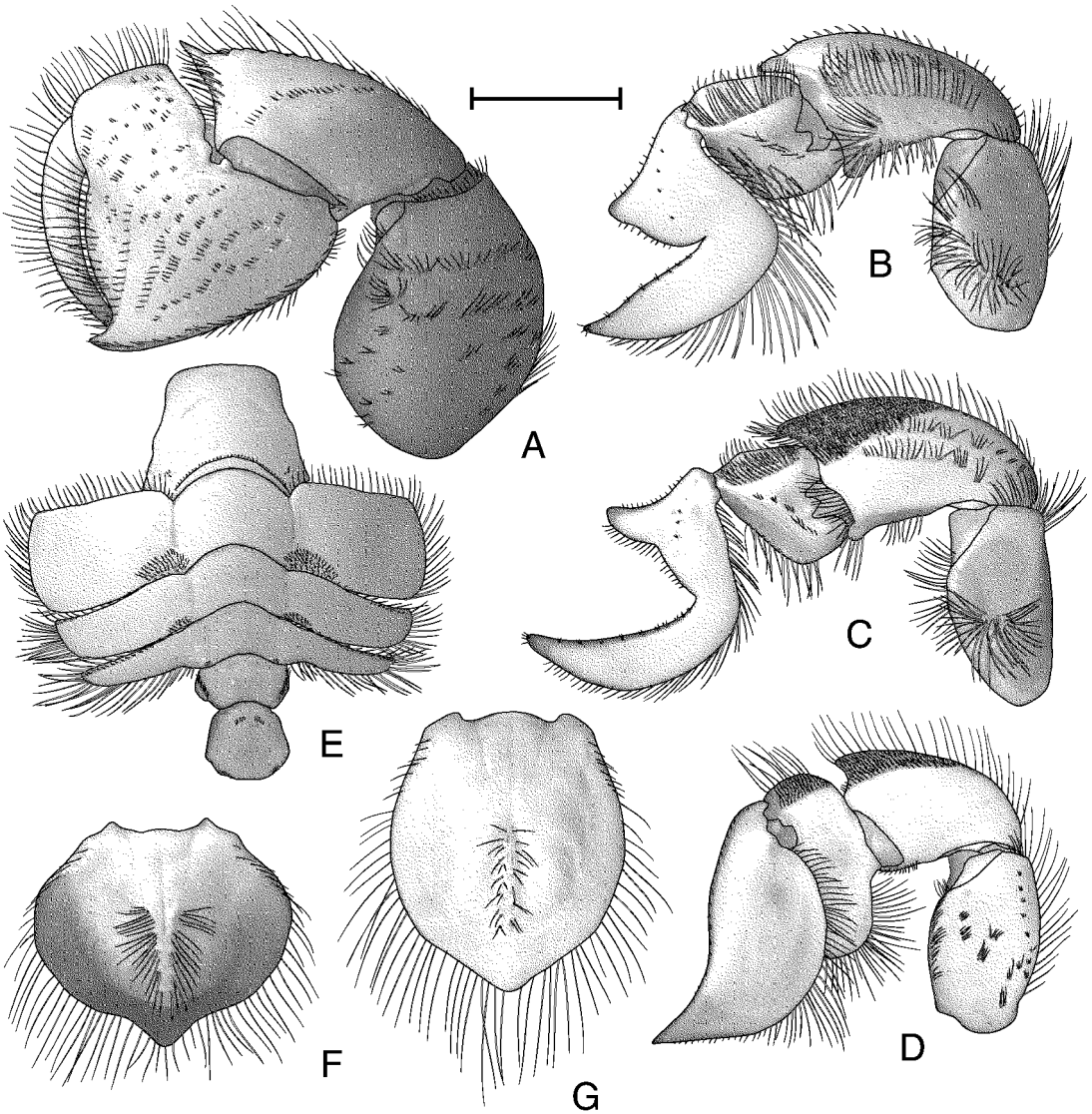


Fig. 101. *Albunea occultus*, n. sp.: A-E, ♀, 25.0 mm cl, AM P24477, paratype; F, ♂, 17.5 mm cl, AM P23809, paratype; G, ♀, 21.0 mm cl, AM P19993, paratype. **A.** Left pereopod I, lateral view. **B.** Left pereopod II, lateral view. **C.** Left pereopod III, lateral view. **D.** Left pereopod IV, lateral view. **E.** Abdominal somites I-VI, dorsal view. **F.** Telson of ♂, dorsal view. **G.** Telson of ♀, dorsal view. Scale = 3.3 mm (F, G), 6.7 mm (B-D), 7.4 mm (E), and 8.0 mm (A).

pering, approximately one-third length of merus; with plumose setae on margins; without flagellum.

Pereopod I (fig. 101A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose setae; ventral margin with short simple setae. Propodal 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; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with dorso-distal angle produced into strong corneous-tipped spine; dorsal margin with short trans-

verse grooves behind spine; dorsal and distal margins with long plumose setae; lateral surface with small distal rugose area, few transverse setose ridges on distal half of surface; mesial surface smooth, with subdorsal and medial transverse rows of long plumose setae, margins with long plumose setae. Merus unarmed; lateral surface with scattered transverse rows of long plumose setae, proximodorsal margin with long plumose setae; mesial surface with few scattered setae; fully calcified. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 101B) dactylus smooth; base to heel slightly concave, heel produced, broad and rounded at tip, heel to tip with narrow, acute indent, tip acute, tip to base broadly convex; lateral surface smooth, with several small tufts of short setae in generally 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 simple setae, with patch of long plumose setae at base. Propodal dorsal surface smooth, with 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 as narrow, oblique, flattened shelf, with 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 strongly produced and rounded dorsodistally, dorsal margin smooth; lateral surface smooth, produced area smooth, irregular, interrupted row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; dorsal margin with short plumose setae, ventral margin with long plumose setae; mesial surface dorsal margin with numerous low, rounded spines, surface smooth, with row of long plumose setae distally and in oblique interrupted row. Merus with large median decalcified window covering nearly all of lateral surface, with few scattered tufts of long plumose setae on surface and on distodorsal margin; mesial surface nearly smooth, with two long rows of setae. Basis-ischium in-

completely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 101C) dactylus with base to heel concave, heel narrow and acutely produced, heel to tip with concave area at base of heel and broadly concave indent, tip acute, tip to base smoothly convex; lateral surface smooth, with several small tufts of short setae in generally straight line across medioproximal surface, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface smooth, with long plumose setae in oblique row, simple setae on dorsal margin, plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened, with setose mat; mesial surface smooth, with few scattered setae. Carpus produced dorsodistally, exceeding proximal margin of propodus by one-third length of propodus; tip rounded, dorsolateral margin unarmed; lateral surface slightly rugose dorsodistally, with mat of short setae and two interrupted rows of setae ventrally; mesial surface smooth, with long plumose setae on distal margin and in transverse row on surface. Merus smooth, with large decalcified window covering nearly half of lateral surface medially; dorsal and ventral margins unarmed, with long plumose setae on distodorsal and mediolateral margins; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa unarmed. Female with large gonopore on anterior mesial margin of coxa, surrounded with short plumose setae; male with tiny pore located more mesially.

Pereopod IV (fig. 101D) dactylus with base to tip convex proximally, concave distally, tip acute, tip to base concave distally to convex proximally; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge with row of short setae; with setose punctations ventral to decalcified window. Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, ventral margin with long plumose

setae; dorsal expansion with row of long plumose setae dorsally, oblique area with mat of short simple setae; lateral surface smooth, mesial surface smooth, with distoventral area of few patches of long plumose setae. Carpus slightly produced and subacute dorsodistally; ventral four-fifths of lateral surface and mesial surface smooth, dorsodistal one-fifth of lateral surface with mat of short setae; dorsal margin with short simple and long plumose setae; ventral margin with short simple setae; mesial surface decalcified medially, distal margin with long plumose setae. Merus with scattered, short, transverse rows of short simple setae on lateral surface, dorsal and medioventral margins with long plumose setae; proximoventral half of mesial surface with large decalcified window. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 101E) somite I wider than long, widest posteriorly; dorsal surface with anterior margin straight; posterior margin curved with elevated submarginal row of short setae; small transverse decalcified windows laterad of segment median. Somite II dorsal surface with irregular submarginal transverse ridge anteriorly; with small transverse decalcified windows laterad of segment median just anterior to submarginal ridge; pleura expanded and directed laterally; anterolateral margins angled, anterior and lateral margins with long plumose setae, posterolateral angle rounded, posterior margin with short setae; posteromesial angle with mat of short simple setae. Somite III similar to somite II, but narrower, shorter, anterior submarginal windows present; pleura thinner and shorter than on somite II, directed posterolaterally, with setae as in somite II; anterolateral angle subacute; dorsal surface obliquely flattened anterolaterally, with submarginal row of short setae. Somite IV similar to somite III, but thinner and shorter, anterior submarginal windows present; dorsal surface with few short setae anterolaterally; pleura thinner and shorter than on somite III, directed posterolaterally; dorsal surface obliquely flattened anterolaterally; margins with long plumose setae. Somite V wider than somite IV, anterior submarginal windows present; lateral margins with plumose setae; pleura absent. Somite VI slightly

broader than somite V, anterior submarginal windows present; dorsal surface with short transverse rows of setae laterad of midline; pleura absent.

Females with uniramous, paired pleopods on somites II–V; males without pleopods.

Telson of male (fig. 101F) broadly triangular, laterally produced, length subequal to width, with broadly rounded produced tip; thickly calcified medially, inflated dorsally; distal two-thirds with lateral decalcified region; median longitudinal groove extending one-half of length, row of long simple setae of either side of median groove beginning at median and continuing almost to distal margin of calcified area; proximolateral angles with few long simple setae; margins with long simple setae. Telson of female (fig. 101G) flattened, ovate, and evenly calcified with slightly produced rounded tip; median groove similar to male, setal row from midpoint of median groove to near distal margin of telson with simple setae approximately one-half size of those of male; proximolateral angle with few short setae, margins with long simple setae.

**DISTRIBUTION:** From southern Japan southward to the eastern and western coasts of Australia, in up to 82 m depth.

**MAXIMUM SIZE:** Males: 19.7 mm cl; females: 26.7 mm cl.

**TYPE SPECIMENS:** AM P20486 (holotype), AM P16778 (allotype), AM P15354 (paratype), AM P19435 (3 paratypes), AM P19436 (paratype), AM P19993 (paratype), AM P23809 (2 paratypes), AM P24477 (paratype), AMNH 18094 (paratype), BMNH 1932.11.30.64 (paratype), CASIZ 109246 (paratype), MCZ 10261 (paratype), MOV J44733 (paratype), NTOU (paratype), NTOU (paratype), NTOU (paratype), NTOU (paratype), QM W2380 (paratype), QM W22322 (4 paratypes), QM W22323 (paratype), QM W22326 (6 paratypes), QM W22338 (2 paratypes), QM W22329 (paratype), QM W22340 (2 paratypes), QM W25188 (paratype), USNM 267779 (2 paratypes), WAM 10411 (paratype), WAM 20261 (paratype), WAM 23392 (paratype), WAM 23393 (paratype), WAM 24510 (paratype), ZLKU 7040–7041 (2 paratypes), ZLKU 7062–7063 (2 paratypes).



TYPE LOCALITY: Sand bar no. 1, Darwin, Northern Territory, Australia.

ETYMOLOGY: The specific name of this taxon is derived from the Latin word meaning "hidden," and refers to the confusion of this species with *A. symmysta* both in the literature and in museum collections.

REMARKS: The specimen illustrated by Asakura (1995) offers a rare example of a record that can be confirmed based on a photograph alone. Asakura's (1995) specimen clearly has an entire posterior submarginal groove on the carapace. Of the three species of *Albunea* known from Japan (*A. symmysta*, *A. groeningi*, *A. occultus*), only *A. occultus* possesses this diagnostic character.

It is difficult to know what species Serène and Umali (1965) were dealing with from the Philippines, but at least some of their material was probably *A. occultus*, based on their comments regarding the shape of the dactyli of pereopod IV. Their material also likely contained *A. symmysta*, but all of it needs to be examined for confirmation.

This species is most closely related to *A. symmysta*.

*Albunea elegans*

A. Milne Edwards and Bouvier, 1898

Figures 102, 103

*Albunea symnista* [sic]: Brullé, 1836–1844: 17. – Ozorio, 1888: 186 (not *Albunea symmysta* (Linnaeus, 1758)).

*Albunea elegans* A. Milne Edwards and Bouvier, 1898: 236–238.—A. Milne Edwards and Bouvier, 1900: 273–275, pl. 28, figs. 22–25. – Gordon, 1938: 187 (list). – Bouvier, 1940: 181. – Balss, 1957: 1598.

*Albunea carabus*: Balss, 1916a: 37\*. – Monod, 1933: 473 (part) (not *Albunea carabus* (Linnaeus, 1758)).

*Albunea paretii*: Monod, 1956: 37–40, figs. 2–9. – Buchanan, 1957: 56. – Sourie, 1957: 13, 31, 78. – Forest, 1958: 147 (list). – Gauld, 1960: 66 (list). – Rossignol, 1962: 124. – Fransen, 1991: 56, 77 (unjustified emendation) (not *Albunea paretii* Guérin Méneville, 1853).

*Albunea paretii*: Rossignol, 1957: 97, fig. 12. – Holthuis and Manning, 1970: 251–252\*. – Kaestner, 1980: 336 (part). – Türkay, 1982: 98, 101, 110. – d'Udekem d'Acoz, 1999: 171 (part) (not *Albunea paretii* Guérin Méneville, 1853).

?*Albunea* sp. A Lebour, 1959: 129, fig. 14.

MATERIAL EXAMINED: **Portugal: Cape**

**Verde Islands:** La Praya, 10–30 m, 1883, coll. "Talisman": 2 ♂, 12.3–13.1 mm cl, 4 ♀, 13.4–18.4 mm cl, syntypes (MNHN-Hi 7); Sta. 7.V06, 16°10'N, 22°57'W, west coast, Boa Vista, Aug. 27–28, 1986, coll. CANCAP: 3 ♀, 14.5–19.6 mm cl (RMNH 38604), 2 ♀, 17.9–19.4 mm cl (AMNH 18078 ex RMNH 38604); Plage de Mindolo, Île de São Vicente, May 15, 1950, coll. J. Cadenat: 1 ♂, 12.7 mm cl (MNHN-Hi 12); Sta. 38, 7 m, coll.? "Calypso": 1 ♀, 12.5 mm cl (MNHN-Hi 181).

**Senegal:** Virage, Cape Vert, Dakar, April 12, 1982, coll. F. C. Roest: 5 ♂, 8.6–10.8 mm cl, 2 ♀, 11.7–12.9 mm cl (RMNH 35926), 2 ♂, 9.8 mm cl, 1 ♀, 13.8 mm cl (AMNH 18079 ex RMNH 35926).

**Liberia:** Sta. 289, Net 70B, 03°04'45"N, 16°62'W, 0–132 m, Aug. 23–24, 1927, coll. R/V "Discovery": 1 zoea? V larva, 6.0 mm (BMNH 1951.2.17.2355); Sta. 295, Net TYF, 05°30'30"N, 17°45'W, 2500–2700 m (see below), Aug. 25, 1927, coll. "Discovery": 1 zoea? V larva, 7.0 mm (BMNH 1951.2.17.2356).

**Ghana:** Manford, Gold Coast, coll. C. Hupfer: 1 ♂, 19.1 mm cl (ZMH K–5136).

**Ivory Coast:** Grand Bassam, 1901, coll. V. Mayet: 2 ♀, 14.5–18.9 mm cl (MNHN-Hi 13).

**Dahomey:** Chenal de Cotonov, near Cotonou, July 19, 1963, coll. H. Hoestlandt: 3 ♀, 6.2–7.4 mm cl (RMNH 20957).

**Nigeria:** West Mole, Lagos, June 16, 1963, coll. A. R. Longhurst: 2 unsexable, unmeasurable specimens (RMNH 20959); Sta. 224, Lagos, May 9, 1965, coll. "Pillsbury": 1 ♂, 11.5 mm cl (RMNH 22664).

**Gabon:** Sta. 277, 01°44'S, 08°38'E, 0–88 m, Aug. 7, 1927, coll. R/V "Discovery": 1 zoea? V larva, 5.9 mm (BMNH 1951.2.17.2354).

**Congo:** Baie de Pointe-Noire, Jan. 1969, coll. unknown: 1 ♂, 11.9 mm cl (MNHN-Hi 14).

**Zaire:** Sta. 276, Net 100B, 05°54'S, 11°19'E, 0–110 m, Aug. 5, 1927, coll. R/V "Discovery": 2 zoea? V larvae, 6.5–6.7 mm (BMNH 1951.2.17.2353).

DIAGNOSIS: Carapace wider than long, covered with lightly setose grooves. Anterior margin with 10–12 spines on either side of ocular sinus. Setal field with narrow lateral



elements and straight anterior margin. CG1 with separate posterior lateral elements; CG4 with two to four short, anteriorly displaced medial elements between longer supralateral elements of CG4; CG5 of two oblique triangular elements; CG6 and CG7 fused; CG8 broken; CG11 present. Rostrum present, not reaching posterior margin of ocular plate. Ocular plate triangular. Distal peduncular segments dorsoventrally flattened and triangular in shape, tapering at tip, approximated along mesial margins, lateral margins convex, mesial margins straight. Cornea at tip. Dactylus of pereopod II with heel produced, tapered, and acute. Dactylus of pereopod III with heel broad, projecting, acute. Dactylus of pereopod IV sinuous from base to tip, with low rounded heel and shallow indent. Telson of male broadly triangular, tip broadly rounded, thickly calcified medially, inflated dorsally, distal two-thirds with lateral decalcified region, median row of thin setae. Telson of female flattened, ovate, and evenly calcified with slightly produced tip.

**DESCRIPTION:** Carapace (fig. 102A) slightly wider than long. Anterior margin slightly concave on either side of ocular sinus, becoming convex laterally with 10–12 large spines ( $n = 6$ ) along length. Rostrum as small acute tooth, not reaching proximal margin of ocular plate. Ocular sinus smoothly concave, surface smooth or with one small spinule. Frontal region smooth; setal field narrow anteriorly, widening posteriorly; posterior lateral elements reduced to narrow bands of setae. CG1 parallel to anterior margin of carapace, sinuous, strongly crenulate, divided into medial fragment and curved, posteriorly displaced lateral elements. Mesogastric region smooth; CG2 present as two short medial elements; CG3 broken into six to eight short elements between posterior lateral elements of CG1; CG4 with two to four short, anteriorly displaced medial elements between longer supralateral elements of CG4. Hepatic region smooth, with oblique setose groove at median of lateral margin. Epibranchial region generally triangular, smooth; posterolateral margin with two or three tiny rows of setae. Metagastric region smooth; CG5 present as two oblique, triangular elements. CG6 strongly crenulate, strongly anteriorly concave medially and

sloping out to anteriorly convex lateral thirds. CG7 oblique, reaching lateral margins of median segment of CG6. Cardiac region smooth; CG8 present as two short medial and two short lateral elements. CG9 present as two short lateral grooves with gap at midline. CG10 present as two short elements. CG11 present as one or two short medial elements. Post-CG11 element absent. Branchial region with numerous short, transverse rows of setae. Posterior margin deeply and evenly convex, with submarginal groove reaching two-thirds up margin of posterior concavity. Branchiostegite with strong anterior submarginal spine; anterior region with scattered short, transverse lines ventral to *linea anomurica*; with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 102B) triangular with shallow median indentation; median peduncular segments present as small ovate calcified areas lateral to ocular plate. Distal peduncular segments elongate, subtriangular, 0.27–0.32 length of carapace, with convex lateral and straight mesial margins, cornea covering distal tip; lateral margins with notch one-third distal from base; mesial margins approximated at base; mesial and lateral margins with long plumose setae; tuft of plumose setae at proximolateral ventral angle and ventromedial row of plumose setae extending from tuft to base of cornea.

Antennule (fig. 102C) with segment III narrow proximally, expanding distally to twice proximal width; with plumose setae on dorsal and ventral margins and sparsely scattered on lateral surface; dorsal exopodal flagellum with 100–120 articles ( $n = 6$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum short with two articles ( $n = 6$ ) and plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins and scattered on ventrolateral third of surface. Segment I wider than long, with small dorsodistal spine; dorsal third of lateral surface rugose, with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 102D) with segment V ap-

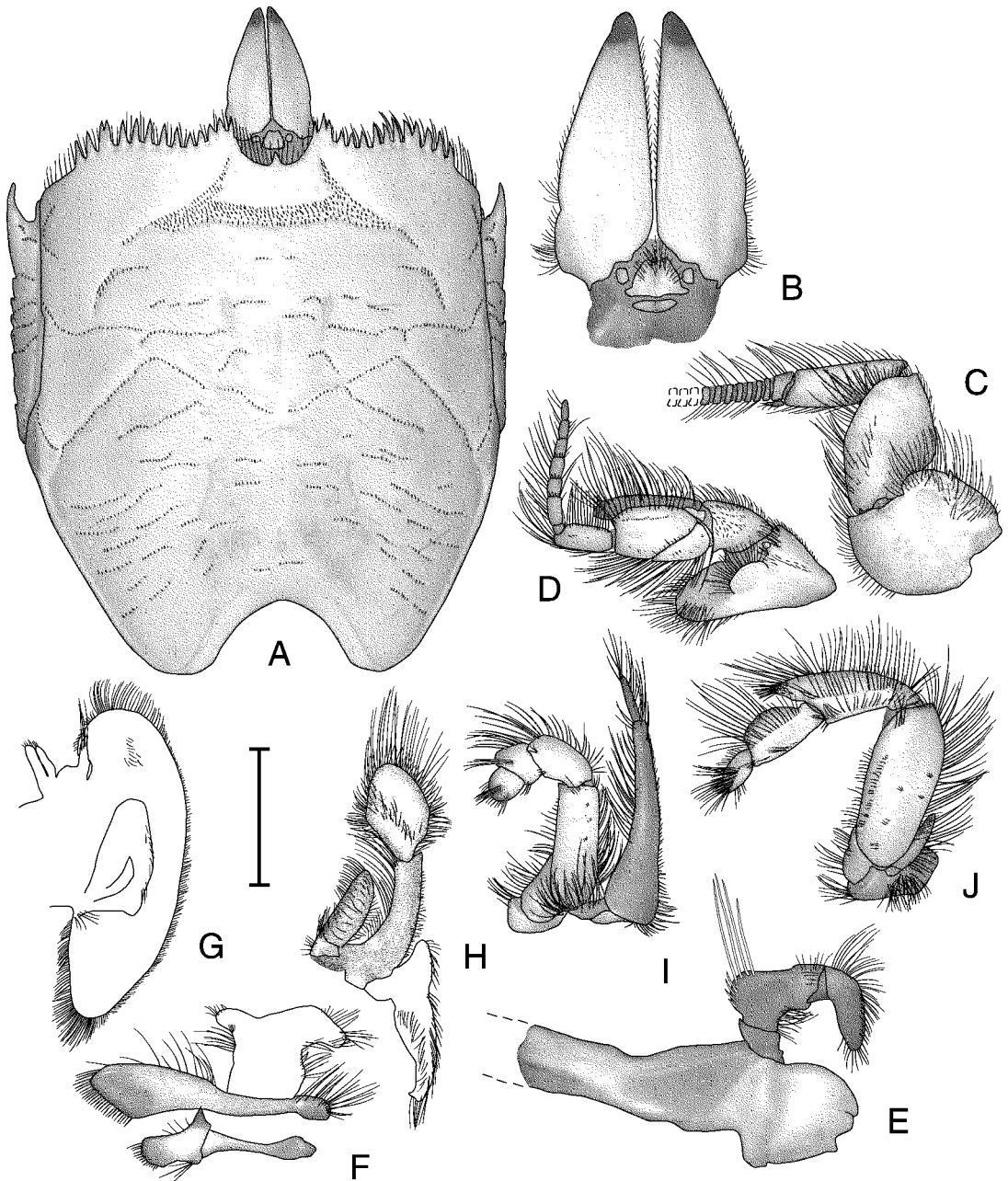


Fig. 102. *Albunea elegans* A. Milne Edwards and Bouvier, 1898: A–J, ♂, 10.4 mm cl, AMNH 18079. **A.** Carapace, branchiostegite, and ocular peduncles, dorsal view. **B.** Ocular peduncles, dorsal view. **C.** Left antennule, lateral view. **D.** Left antenna, lateral view. **E.** Left mandible, mesial view. **F.** Left maxillule, lateral view. **G.** Left maxilla, lateral view. **H.** Left maxilliped I, lateral view. **I.** Left maxilliped II, lateral view. **J.** Left maxilliped III, lateral view. Scale = 1.6 mm (B, E, F), 2.2 mm (I), and 3.3 mm (A, C, D, G, H, J).

proximately two times longer than wide, with long plumose setae on dorsal and ventral margins and scattered on lateral surface; flagellum with seven articles ( $n = 6$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV expanded distally, with long plumose setae on dorsal, ventral, and distal margins, and row of setae on dorsolateral surface. Segment III with long plumose setae on dorsal and ventral margin and in short row on surface. Segment II short, widening distally, rugose, with plumose setae on margins and scattered on lateral surface; antennal acicle long, thin, and exceeding distal margin of segment IV by one-third length of segment IV, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventrolaterally, with long plumose setae on margins and scattered in line of surface rugae behind spine; lateral surface with acute spine dorsodistally, with low semicircular dorsolateral lobe ventrodorsal to spine; segment with ventromesial antennal gland pore.

Mandible (fig. 102E) incisor process with two teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment and on distal margin of terminal segment.

Maxillule (fig. 102F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin simple setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under; internal lobe reduced with three thick setae at distolateral margin.

Maxilla (fig. 102G) exopod evenly rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 102H) epipod with plumose setae on margins, distolateral surface and mesial surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel with plumose setae; distal segment spatulate, longer than wide, broadest medially, margins and mesioventral surface with long plumose setae. Endopod flattened and elongate, reaching two-thirds to distal end of proximal exopodal segment;

plumose setae on margins and median of lateral surface.

Maxilliped II (fig. 102I) dactylus evenly rounded, length slightly greater than width, with thick simple setae distally and on distolateral surface. Propodus 1.5 times wider than long, slightly produced at dorsodistal angle, with plumose setae on dorsal margin and patch of long simple setae on lateral surface and ventrolateral angle. Carpus not produced dorsodistally, approximately two times longer than wide; long simple setae on dorsal margin. Merus approximately three times longer than wide, margins parallel; with simple and plumose setae on margins and scattered on surface. Basis-ischium incompletely fused with plumose setae on margins. Exopod one-half longer than merus, flagellum with one elongate article, approximately as long as carpus is wide.

Maxilliped III (fig. 102J) dactylus with rounded tip; long plumose setae on margins and lateral surface. Propodus dorsodistally inflated, with longitudinal median row of plumose setae on lateral surface; margins with plumose setae. Carpus produced onto propodus almost one-fourth length of propodus; lateral surface with two rows of plumose setae on surface, plumose setae on margins. Merus inflated, unarmed, with plumose setae on margins and scattered on lateral surface. Basis-ischium incompletely fused, with weak crista dentata of two teeth. Exopod two-segmented: proximal segment small; distal segment styloform, tapering, approximately one-third length of merus; with plumose setae on margins; without flagellum.

Pereopod I (fig. 103A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose and short simple setae; ventral margin with short simple setae. Propodal 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; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle produced into strong corneous-tipped spine; dorsal margin with few short, transverse grooves behind spine; dorsal and distal margins with long plumose setae; lateral surface with



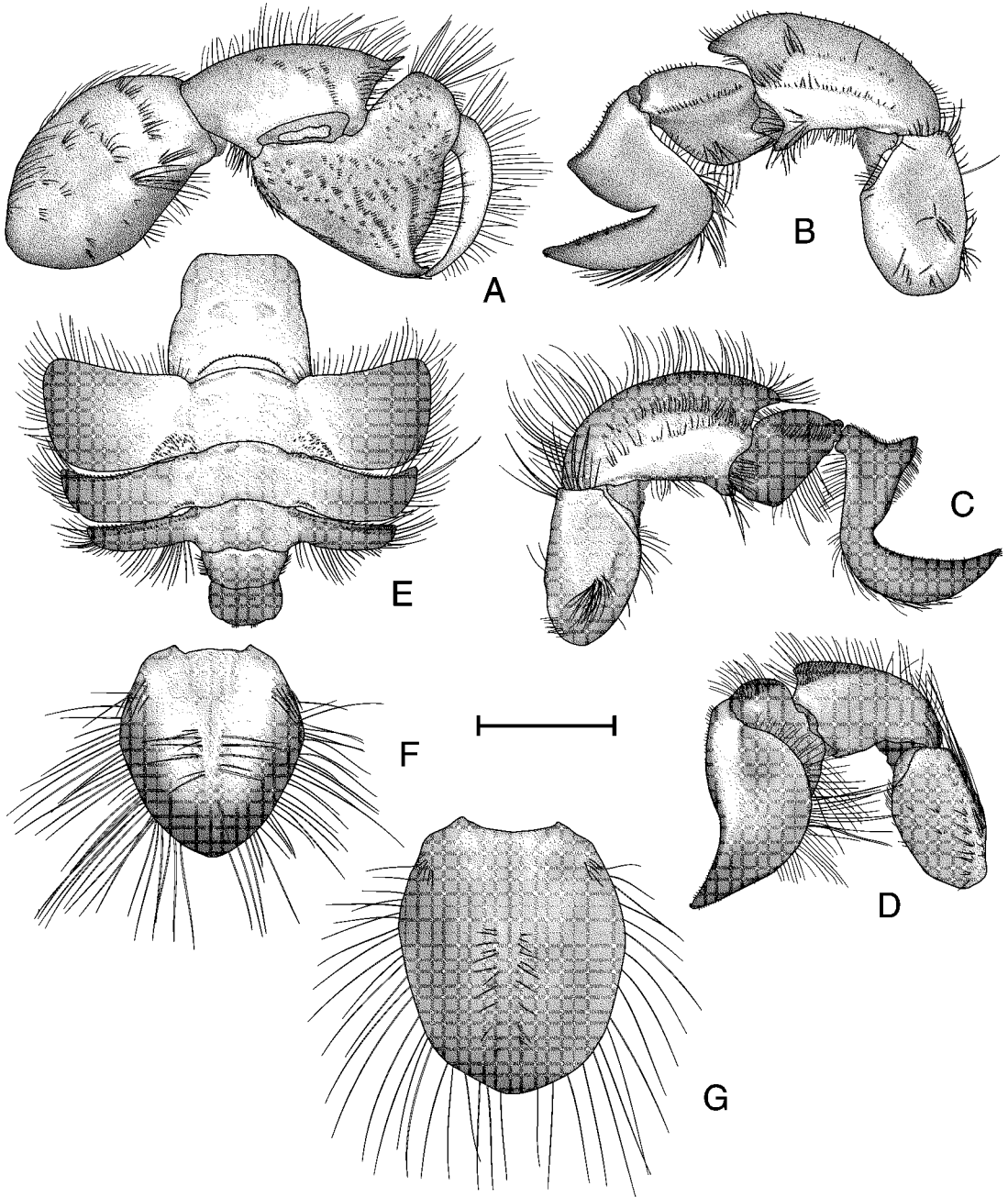


Fig. 103. *Albunea elegans* A. Milne Edwards and Bouvier, 1898: A-F, ♂, 10.4 mm cl, AMNH 18079; G, ♀, 13.8 mm cl, AMNH 18079. A. Right pereopod I, lateral view. B. Left pereopod II, lateral view. C. Right pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I-VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 2.2 mm (F, G), 3.3 mm (B, D, E), and 4.4 mm (A, C).



small distal rugose area, few transverse setose ridges on distal half of surface; mesial surface smooth, with medial transverse row of 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 scattered setae; fully calcified. Basis-ischium incompletely fused, unarmed. Coxa of male with anterior spine; coxa of female unarmed.

Pereopod II (fig. 103B) dactylus smooth; base to heel concave, heel produced and acute, heel to tip with narrow, acute indent, tip acute, tip to base broadly convex; lateral surface smooth, with several small tufts of short setae in generally 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 simple setae and patch of long plumose setae at base. Propodal dorsal surface smooth, with 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 as narrow, oblique, flattened shelf, with 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 strongly produced and rounded dorsodistally, dorsal margin smooth; lateral surface smooth, with small setose mat at tip of produced area and irregular, interrupted row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; margins with short plumose setae; mesial surface smooth with row of long plumose setae distally and subdorsally. Merus with large median decalcified window covering nearly all of lateral surface, with few scattered long plumose setae on surface and margins; mesial surface nearly smooth, with two long rows of setae. Basis-ischium incompletely fused and unarmed. Male coxa with anterior margin spine; female coxa without spine.

Pereopod III (fig. 103C) dactylus with base to heel concave, heel acutely produced, heel to tip with broadly concave indent and

sinuous proximal half of margin, tip acute, tip to base smoothly convex; lateral surface smooth, with several small tufts of short setae in generally straight line across medioproximal surface, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth with plumose setae proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface smooth, with long plumose setae in oblique row, simple setae on dorsal margin; dorsolateral surface narrow, oblique, flattened, with setose mat; mesial surface smooth. Carpus produced dorsodistally, only slightly exceeding proximal margin of propodus; dorsolateral margin unarmed; lateral surface slightly rugose dorsodistally, with thin mat of short setae and two interrupted rows of setae ventrally; mesial surface smooth, with long plumose setae on distal margin and in oblique row on surface. Merus smooth, with large decalcified window covering nearly half of lateral surface medially; dorsal and ventral margins unarmed but with long plumose setae; distolateral margin with long plumose setae; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Male coxa with spine on anterior margin; female lacking spine. Female with large gonopore on anterior mesial margin of coxa, surrounded with short plumose setae; male with small pore.

Pereopod IV (fig. 103D) dactylus with base to tip convex proximally, concave distally, indent smoothly joined with margin, tip acute, tip to base concave distally to convex proximally; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge with row of short setae; with setose punctations ventral to decalcified window. Propodus expanded dorsally and ventrally; ventral expansion not reaching ventral margin of dactylus, margin with long plumose setae; dorsal expansion with row of long plumose setae dorsally, oblique area with mat of short simple setae; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; ventral three-fourth of lateral surface and mesial

surface smooth, dorsodistal quarter of lateral surface with mat of short setae; dorsal margin with short simple and long plumose setae; ventral margin with short simple setae; mesial surface decalcified medially. Merus with scattered short transverse rows of setae on lateral surface, dorsal and ventrodorsal margins with long plumose setae; proximoventral half of mesial surface with large decalcified window. Basis-ischium incompletely fused and unarmed. Male coxa with spine on anterior margin; female coxa unarmed.

Abdomen (fig. 103E) with somite I length and width subequal, widest posteriorly; dorsal surface with anterior margin straight; posterior margin curved with elevated submarginal row of short setae; small transverse, decalcified windows laterad of segment median. Somite II dorsal surface with submarginal transverse ridge anteriorly; with small transverse, decalcified windows laterad of segment median just anterior to submarginal ridge; pleura expanded and directed anterolaterally; lateral margins rounded, anterior and lateral margins with long plumose setae, posterior margin with short setae; postero-mesial angle with mat of short simple setae. Somite III similar to somite II, but narrower, shorter; pleura thinner and shorter than on somite II; anterolateral angle subacute; dorsal surface obliquely flattened anterolaterally. Somite IV similar to somite III, but thinner and shorter; dorsal surface with few short setae anterolaterally; pleura thinner and shorter than on somite III, directed posterolaterally; 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 slightly broader than somite V; dorsal surface with short transverse rows of setae laterad of midline; pleura absent.

Females with uniramous, paired pleopods on somites II–V; males without pleopods.

Telson of male (fig. 103F) broadly triangular, slightly longer than wide, with broadly rounded tip; thickly calcified medially, inflated dorsally; distal two-thirds with lateral decalcified region; median longitudinal groove extending one-half length, row of long simple setae of either side of median groove beginning at distal end and continu-

ing almost to distal margin of telson; proximolateral angles with patch of long simple setae; margins with long simple setae. Telson of female (fig. 103G) flattened, ovate, and evenly calcified with slightly produced tip; median groove similar to male, setal row from midpoint of median groove to near distal margin of telson with simple setae approximately one-fourth length of those on male; proximolateral angle with patch of setae, margins with long simple setae.

DISTRIBUTION: Cape Verde Islands and Senegal southward to Pointe-Noire, Congo, in up to 30 m depth.

MAXIMUM SIZE: Males: 19.1 mm cl; females: 19.6 mm cl.

TYPE SPECIMENS: MNHN-Hi 7 (6 syntypes).

TYPE LOCALITY: La Praya, Cape Verde Islands, Portugal, 10–30 m depth.

REMARKS: A. Milne Edwards and Bouvier (1898) erroneously cited this species as having a maxilliped III with one pleurobranch, two arthrobranches, and lacking an epipod, and also pereopod V having two arthrobranches. These authors subsequently (1900) correctly stated that there are no arthrobranches on pereopod V, but they repeated the inaccuracies regarding maxilliped III. This error became propagated through time, as Balss (1957) repeated A. Milne Edwards and Bouvier's (1900) incorrect statements and applied them to the genus as a whole in his monumental treatise on the Decapoda.

The west African larvae reported by Labour (1959) as "*Albunea* sp. A" strongly resemble the late stage (V or VI) zoeae of *A. catherinae*, n. sp., a closely related species (Kurata, 1970). This suggests that these larvae are *A. elegans*, rather than the sympatric, but more distantly related, *A. carabus*. Several lots of larval specimens, probably stage V zoeae collected by R/V "Discovery" from east African localities, are referred to this species as they are extremely similar to the described larvae of *A. paretii*, another taxon closely related to *A. elegans*. The collection depth of 2500–2700 m for a putative larvae of this species from off Liberia (BMNH 1951.2.17.2356) is a suspect depth for any albuneid larvae, as the deepest living adults are known in no more than 225 m of water.

Although this species is similar to *A. par-*

*etii*, and for many years was confused with that western Atlantic species, it is not as closely related to *A. paretii*, as is the Pacific *A. lucasia*. *Albunea elegans* is easily distinguished from *A. catherinae*, n. sp. by the shapes of the dactyli of pereopods III and IV. It can be separated from *A. paretii* by the longer length of the branchiostegite spine, broken CG8, and the different shape of the dactylus of pereopod III.

*Albunea paretii* Guérin Méneville, 1853

Figures 104, 105

- Albunea oxyophthalmus* White, 1847: 57 (nomen nudum)\*.
- Albunea symnista* [sic]: Gibbes, 1850a: 24\* (not *Albunea symmysta* (Linnaeus, 1758)).
- Albunea Paretii* Guérin Méneville, 1853: 47–48, pl. 1, fig. 10\*. – Bolivar, 1875: 21. – Seridji, 1988: 1298.
- Albunaea* [sic] *oxyophthalma*: Stimpson, 1858: 230 (list).
- Albunaea* [sic] *Paretii*: Stimpson, 1858: 230. – Stimpson, 1859: 78 (list).
- Albunea oxyophthalma* Miers, 1878: 329–330, pl. 5, figs. 14, 15\*. – Rathbun, 1897: 42\*. – Benedict, 1901: 139. – Verrill, 1901: 61–62, pl. 8, fig. 1\*. – Verrill, 1908: 438, pl. 28, fig. 1\*. – Gordon, 1938: 187 (part)\*. – Monod, 1939: 560–561, fig. 5\*. – Bouvier, 1940: 181. – Snodgrass, 1952: fig. 11a, d.
- Albunea paretii*: Miers, 1878: 330. – Rodrigues da Costa, 1962: 6–7, pl. 1, figs. 5–7, pl. 3, figs. 1–3. – Williams, 1965: 137–138 (part)\*. – Coêlho, 1966: 244. – Fausto Filho, 1967: 12–13. – Coêlho and Ramos, 1972: 176 (part). – Gomes Corrêa and da Silva Brum, 1980: 60. – Kaestner, 1980: 336 (part). – Markham and McDermott, 1981: 1271. – Williams, 1984: 249–250 (part)\*. – Chace et al., 1986: 338–339, fig. 112. – Calado, 1987: 106–118, pls. 9–12\*. – Coêlho and Calado, 1987: 42–43, table 1. – Markham, 1988: 30. – Calado et al., 1990: 747 (part), fig. 2a, b\*. – Hernández and Bolaños, 1995: 77. – Calado, 1995: 51–55, pl. 4, fig. f, pl. 5, fig. e, pl. 13, fig. a, pl. 14, figs. a, b, pl. 15, figs. a–e, pl. 16, figs. a–c\*. – Calado, 1997a: 17. – Spivak, 1997: 74 (list). – Calado, 1998: 407. – Markham and Boyko, 1999: 4\*. – d’Udekem d’Acoz, 1999: 171 (part). – Amaral et al. in Nucci et al., 2001: 479. – Morgado et al. in Nucci et al., 2001: 479.
- Albunea paretii* [sic]: Ortmann, 1896: 225 (list). – Ortmann, 1901: 1275. – Moreira, 1901: 30, 88 (list). – Boschi, 1981: 715, 740.
- Albunea gibbesii*: Benedict, 1901: 139\* (not *Albunea gibbesii* Stimpson, 1859).
- Albunea axyophthalma* [sic]: Moreira, 1901: 88 (list).
- Albunea oxycephala* [sic]: Verrill, 1901: 18–19\* (error for *Albunea oxyophthalma* Miers, 1878).
- Albunea paretii* [sic]: Castro, 1967: 2.
- Albunea* sp. Abele, 1976: 266–267\*.
- Albunea* sp. Bowen et al., 1979: 253.
- Albunea paretii* [sic]: Rodriguez, 1980: 239 (list).
- ?*Albunea Paretii*: Boas, 1880: 140, figs. 34, 61, 91, 119, 144, 195.
- ?*Albunea* sp. Gurney, 1924: 187, fig. 73\*.
- ?*Albunea* sp. A Gurney, 1942: 263–266, fig. 110e–h.
- not *Albunea paretii*: Kingsley, 1880: 409–410. – Williams, 1965: 137–138 (part), figs. 112, 113\*. – Kurata, 1970: 182, pls. 52, 53. – Coêlho and Ramos, 1972: 176 (part). – Dörjes, 1977: 416. – Young, 1978: 177. – Kaestner, 1980: 336 (part). – Wenner and Read, 1982: 188. – Williams, 1984: 249–250 (part), figs. 182, 183\*. – Fox and Ruppert, 1985: 259 (list). – Martin and Abele, 1986: 611, figs. 1b, 2d, 3b, 4b, 5b, 6b, 8b, 9b, c, 10b, 12b, 14b, 15b, 17b. – Manning, 1988: 626–628\*. – Ruppert and Fox, 1988: 250, 404, fig. 227. – Williams et al., 1989: 35. – Calado et al., 1990: 747 (part), fig. 2a, b\* (= *Albunea catherinae*, n. sp.).
- not *Albunea oxyophthalma* [sic]: Benedict, 1904: 625, fig. 5\* (= *Albunea catherinae*, n. sp.).
- not *Albunea oxyophthalma*: Southwell, 1910: 184 (= *Albunea? symmysta* (Linnaeus, 1758)).
- not *Albunea oxyophthalma*: Gordon, 1938: 187 (part), figs. 3d, 4d\* (= *Albunea catherinae*, n. sp.).
- not *Albunea paretii*: Monod, 1956: 37–40, figs. 2–9. – Buchanan, 1957: 56. – Sourie, 1957: 13, 31, 78. – Forest, 1958: 147 (list). – Gauld, 1960: 66 (list). – Rossignol, 1962: 124. – Franzen, 1991: 56, 77 (unjustified emendation) (= *Albunea elegans* A. Milne Edwards and Bouvier, 1898).
- not *Albunea paretii*: Rossignol, 1957: 97, fig. 12. – Holthuis and Manning, 1970: 251–252\*. – Kaestner, 1980: 336 (part). – Türkay, 1982: 98, 101, 110. – d’Udekem d’Acoz, 1999: 171 (part) (= *Albunea elegans* A. Milne Edwards and Bouvier, 1898).
- not *Albunea paretii* [sic]: Kurata, 1970: 180–182 (= *Albunea catherinae*, n. sp.).

MATERIAL EXAMINED: **Bermuda**: Hungry Bay, July–Sept. 1901, coll. F. G. Gosling: 1 ♂, 16.4 mm cl, 3 ♀, 15.9–16.8 mm cl (USNM 42197), 1 ♀, 14.5 mm cl (RMNH 14647 ex USNM 42197); Castle Island, Aug. 15, 1975, coll. M. L. Jones: 1 oviger, 13.3

mm cl (USNM 264760); outside Hungry Bay, 15–20 ft (= 4.5–6.1 m), April 25, 1970, coll. J. Lightbourn: 1 ♂, 13.6 mm cl, 2 ♀, 18.8–21.0 mm cl (USNM 267776); Paget Beach, July 1901, coll. T. G. Gosling: 1 ♀, 20.0 mm cl (MCZ 19595); sandy beach between tides, Hungry Bay, Paget Parish, 1901, coll. T. G. Gosling: 1 ♀, 18.8 mm cl (YPM 21138).

**USA: Florida:** “Florida,” July 1859, coll. Capt. Woodbury: 1 ♀, 18.0 mm cl (MCZ 13243); south of Key West, 20 fms (= 36.6 m), April 12, 1940, coll. J. S. Schwengel: 1 ♂, 15.3 mm cl (ANSP 4327).

**Bahamas:** Sta. 62, Long Bay, April 20, 1937, coll. Smithsonian-Hartford Expedition: 1 ♂, 15.1 mm cl (USNM 104655); at and around tip of Pitts Town Point, northwestern tip of island, Crooked Island, June 1, 1962, coll. J. Tyler: 1 ♂, 14.7 mm cl, 1 ♀, 16.7 mm cl (USNM 260819); Andros Island, March–April 1908, coll. B. E. Dahlgren and H. Müller: 1 ♀, 10.8 mm cl (AMNH 5464).

**Cuba:** Sta. R55, Corrientes Bay, April 8, 1937, coll. Smithsonian-Roebly Expedition to Cuba: 1 ♂, 9.9 mm cl (USNM 260945); Matanzas Bay, 2 m, coll. M. Ward: 2 ♂, 9.3–9.7 mm cl, 1 oviger, 15.2 mm cl (AM P45217).

**Cayman Islands:** 1 mi north of low point, west beach, Grand Cayman, coll. unknown: 1 ♂, 5.9 mm cl, 1 ♀, 8.3 mm cl (ANSP uncataloged).

**Jamaica:** Kingston Harbor, 1893, coll. R. P. Bigelow: 3 ♀, 17.7–19.5 mm cl (USNM 17990), 1 ♀, 17.9 mm cl (BMNH 1937.6.1.3 ex USNM 17990); Rio Bueno Bay, Aug. 1972, coll. E. A. Norse: 1 intersex, 16.8 mm cl (LACM-AHF 1653–01).

**Dominican Republic:** Barahona Bay, Santo Domingo, 1932–1933, coll. J. C. Armstrong: 1 ♂, 11.0 mm cl (AMNH 10356); Porto Plata, Santo Domingo, 27–30 ft (= 8.2–9.1 m), July 1937, coll. W. J. Clench: 1 ♀, 11.9 mm cl (MCZ 9868).

**Puerto Rico:** 1 km north of Mayaguez, July 26, 1974, coll. A. Williams: 2 ♂, 15.1–15.3 mm cl, 1 ♀, 19.7 mm cl (USNM 267777); Sta. 6053, off Moon Castle, San Juan Harbor, 4–7.5 fms (= 7.3–13.7 m), Jan. 15, 1899, coll. “Fish Hawk”: 2 unmeasurable juveniles (USNM 29011); San Juan,

coll. P. A. del Valle: 1 ♀, 13.9 mm cl (USNM 84351).

**U.S. Virgin Islands:** Magens Bay, St. Thomas, Aug. 8, 1971, coll. W. E. Rainey: 1 ♀, 22.4 mm cl (USNM 154546); St. Thomas, coll. A. H. Riise: 2 ♀, 20.4–21.8 mm cl (ZMUC 2711); St. Thomas, coll. A. H. Riise: 2 ♀, 14.9–15.5 mm cl (ZMUC 2714); Drift Bay, Water Island, St. Thomas, July 13, 1915, coll. C. R. Shoemaker: 1 ♂, 14.1 mm cl (USNM 68611).

**St. Maarten:** Great Bay, June 24, 1955, coll. P. W. Hummelinck: 1 ♂, 17.2 mm cl (RMNH 23628).

**St. Eustatius:** Orange Baai, July 28, 1957, coll. P. A. Van den Heuvel: 1 ♀, 24.0 mm cl (RMNH 11239); Orange Baai, Sept. 24, 1957, coll. P. A. Van den Heuvel: 1 ♀, 24.9 mm cl (RMNH 11437); Zeelandia Baai, Sept. 17, 1957, coll. P. A. Van den Heuvel: 3 ♀, 19.8–25.5 mm cl (RMNH 11438); Zeelandia Baai, Jan. 4, 1958, coll. P. A. Van den Heuvel: 1 ♀, 21.8 mm cl (RMNH 12209); 1957, coll. P. A. Van den Heuvel: 1 ♂, 16.9 mm cl, 2 ♀, 23.2 mm cl, 1 ♀, unmeasurable (RMNH 12210).

**St. Kitts-Nevis:** Sta. 67–58, Charlestown, Nevis, 2–3 fms (= 3.7–5.5 m), April 16, 1958, coll. Smithsonian-Bredin Caribbean Expedition: 1 ♂, 9.6 mm cl (USNM 260860).

**Antigua and Barbuda:** Sta. 92–58, between Bird and Green Islands, NonSuch Bay, Antigua, 3–4 fms (= 5.5–7.3 m), April 23–24, 1958, coll. Smithsonian-Bredin Caribbean Expedition: 1 ♀, 8.9 mm cl (USNM 260944).

**Guadeloupe:** Entre Basse Terre et la Rivière des Pères, 15–20 m, Feb. 11, 1936, coll. R. Lami: 1 ♀, 5.0 mm cl (MNHN-Hi 198); Basse Terre, vers Vieux Fort, Feb. 20, 1936, coll. R. Lami: 1 ♂, 6.6 mm cl (MNHN-Hi 199).

**St. Lucia:** “St. Lucia,” June 16, 1880, coll. J. Semper: 1 ♀, 24.1 mm cl (MCZ 13261).

**Barbados:** “Barbados,” coll. C. T. Trenchman: 1 ♂, 12.6 mm cl (BMNH 1921.6.9.5).

**Trinidad and Tobago:** Sta. 4019, Gulf of Apria, near San Fernando, Trinidad, 4.5 m, May 2, 1952, coll. Shell Expedition to the



Gulf of Paria: 1 juvenile, 2.4 mm cl, 1 unsexable specimen, 7.6 mm cl (RMNH 9097).

**Netherlands Antilles:** Sint Michiels Baai, Curaçao, 4 m, Jan. 1957, coll. L. B. Holthuis: 1 ♂, 11.8 mm cl, 3 ♀, 6.1–11.7 mm cl. 1 ♀, unmeasurable (RMNH 14646), 1 ♂, 11.5 mm cl, 1 ♀, 11.5 mm cl (AMNH 18089 ex RMNH 14646).

**Honduras:** Ved Roman River, 1875, coll. P. Andersen: 1 ♂, 7.7 mm cl (ZMO F17537).

**Panama:** Sta. 258–7, Devil's Beach, July 15, 1978, coll. M. L. Jones: 1 oviger, 16.4 mm cl (USNM 260978); Shimmey Beach, Ft. Sherman, Jan. 23, 1971, coll. L. G. Abele: 2 ♂, 12.0–13.5 mm cl (USNM acc. 300691).

**Colombia:** Sta. 103, Sample 405, Humboldt Bay, May 18, 1941, coll. J. C. Armstrong ("Askoy" Expedition): 1 ♀, 18.2 mm cl (AMNH 18091); west coast of Santa Catalina Island, north of Fort Aury, Providencia Island Group, Aug. 12, 1969, coll. C. R. Gilbert, J. C. Tyler, and S. Anderson: 1 ♀, 17.5 mm cl (USNM 260942); beach in front of Santa Mar Hotel, Santa Marta, Oct. 14, 1977, coll. M. L. Jones: 1 juvenile, 3.2 mm cl (USNM 260946); 5 mi northwest of Galena Point Light, 12 fms (= 21.9 m), April 25, 1939, coll. R/V "Velero III": 1 ♂, 3.8 mm cl (LACM-AHF A48–39).

**Venezuela:** Sta. 9, Isla de Margarita, Feb. 16, 1977, coll. unknown: 1 ♂, 8.7 mm cl, 2 ♀, 7.0–8.7 mm cl, 1 megalopa, 3.3 mm cl, 4 first stage crabs, 2.6–3.3 mm cl (USNM 260941); Sta. M–10–1, 1.5 m offshore, Isla Cubagua, west of Punta Brazil, Isla de Margarita, Feb. 16, 1977, coll. M. L. Jones: 1 juvenile, 2.8 mm cl (USNM 260943); Sta. M–4–1, 1.5 m offshore, approximately 5 km west of Guayacancito, Isla de Margarita, Feb. 13, 1977, coll. M. L. Jones: 1 juvenile, 3.1 mm cl (USNM 260947).

**French Guiana:** Cayenne, coll. unknown: 1 ♂, 15.6 mm cl, syntype of *A. oxyophtalma* (BMNH 57.45).

**Brazil:** "Brazil," coll. unknown: 1 ♀, 19.9 mm cl, syntype of *A. oxyophtalma* (BMNH 64.7); "Brazil," coll. unknown: 1 ♂, 14.4 mm cl (UFES 1307); "Brazil," coll. Banco Calipso: 1 ♀, 4.5 mm cl (MNRJ 8164); **Amapá:** Pesca Norte Island, 04°03'N, 49°32.6'W, coll. S. Buitone: 1 juvenile, 3.9 mm cl (MNRJ 5408); **Pará:** Sta. 2092, off the mouth of the Amazon River, 00°23'N,

47°05'W, 21 fms (= 38.4 m), Nov. 19, 1957, coll. R/V "Oregon": 1 ♂, 18.9 mm cl (USNM 101666); 00°08'S, 46°14'W, 24 m, March 2, 1963, coll. R/V "Oregon": 2 ♂, 15.3–15.9 mm cl, 1 ♀, 16.5 mm cl (RMNH 23336); **Maranhão:** Cruise 84, Sta. 23255, 00°34'N, 46°40'W, 45.7 m, Nov. 28, 1977, coll. D. Sutherland on R/V "Oregon": 1 ♀, 19.8 mm cl (HBOM 089:05495); Sta. 4220, 00°01'N, 45°48'W, 30 fms (= 54.9 m), March 8, 1963, coll. R/V "Oregon": 1 ♂, 15.7 mm cl, 1 ♀, 19.2 mm cl (USNM 260814); Sta. 2091, 00°33'N, 47°03'W, 20 fms (= 36.6 m), Nov. 18, 1957, coll. R/V "Oregon": 1 ♂, 16.4 mm cl (USNM 260815); Cruise 58, Sta. BBC 1617 (17700), 01°21'N, 47°32'W, 31–33 fms (= 56.7–60.4 m), May 12, 1975, coll. R/V "Oregon II": 1 ♂, 12.9 mm cl (USNM 260859); Cruise 58, Sta. BBC 1628, 00°54'N, 46°42'W, 38–43 fms (= 69.5–78.6 m), May 15, 1975, coll. R/V "Oregon II": 1 ♂, 12.6 mm cl (USNM 260861); **Espírito Santo:** Praia dos Castelhamos, Anchieta, Nov. 21, 1971, coll. A. L. Castro: 1 ♀, 23.1 mm cl (MNRJ 1534); **Rio de Janeiro:** Prainha, Arraial de Cabo, Cabo Frio, Feb. 1985, coll. G. Nunan: 1 ♂, 18.4 mm cl (MNRJ 1530); Itaipu, June 6, 1959, coll. A. Coêlho, R. Arlé, and J. Becker: 1 ♀, 25.8 mm cl (MNRJ 1531); Praia dos Anjos, Arraial do Cabo, Feb. 1967, coll. J. Jurberg: 1 ♀, 22.0 mm cl (MNRJ 1532); Rio de Janeiro, coll. unknown: 1 ♂, 19.8 mm cl, 1 ♀, 9.1 mm cl (MNRJ 1533); Sta. 39, 6 mi off mouth of Rio de Janeiro River, coll. "Terra Nova": 2 larvae, 4.7–4.8 mm (BMNH 1926.5.31.354–356); Rio De Janeiro, coll. S. Krøyer: 1 ♀, 18.2 mm cl (ZMUC 2716); Angra dos Reis, July 20, 1966, coll. unknown: 1 ♂, 7.3 mm cl (MNRJ 3855); Angra dos Reis, July 15, 1966, coll. unknown: 1 ♀, 7.1 mm cl (MNRJ 3859); Angra dos Reis, July 7, 1966, coll. unknown: 1 ♂, 7.9 mm cl, 2 ♀, 4.9–8.3 mm cl (MNRJ 3861); Angra dos Reis, July 19, 1966, coll. unknown: 3 ♀, 6.1–7.7 mm cl (MNRJ 3862); Praia do Forte, Cabo Frio, Aug. 24, 1986, coll. C. E. Ribeiro: 1 ♂, 22.3 mm cl (MNRJ 3864); **São Paulo:** São Sebastião, Dec. 12, 1989, coll. unknown: 1 ♂, 9.8 mm cl (AMNH 18090); Flamengo Cove, Ubatuba, Jan. 24, 1962, coll. L. Forneris: 1 ♀, 3.9 mm cl (RMNH 20958).

**Limited Data:** "St. Croix" (locality added)

at later date): 1 ♀, 20.7 mm cl, holotype of *A. paratii* (ANSP 4101a); "Antilles" (locality may be inferred): 1 ♀, 21.9 mm cl (ANSP 4101b); "West Indies," 1 ♀, 12.1 mm cl (BMNH 1999.891).

**No Data:** 1 ♂, 16.2 mm cl (ANSP 4763); 1 ♀, 16.5 mm cl (USNM 42199); 1 ♀, 23.0 mm cl (BMNH 1998.92).

**DIAGNOSIS:** Carapace wider than long, covered with lightly setose grooves. Anterior margin with 10–13 spines on either side of ocular sinus. Setal field with narrow lateral elements and concave anterior margin. CG1 with separate posterior lateral elements; CG4 with one long (rarely two short), anteriorly displaced, medial element between longer supralateral elements of CG4; CG5 of two triangular elements; CG6 and CG7 separate; CG8 entire; CG11 present. Rostrum present, not reaching posterior margin of ocular plate. Ocular plate triangular. Distal peduncular segments dorsoventrally flattened and triangular in shape, tapering at tip, approximated along mesial margins, lateral margins slightly convex, mesial margins straight. Cornea at tip. Dactylus of pereopod II with heel produced, tapered, and subacute. Dactylus of pereopod III with heel broad, projecting, acute. Dactylus of pereopod IV sinuous from base to tip, with low rounded heel and shallow indent. Telson of male ovate, slightly longer than wide, with broadly rounded tip, thickly calcified medially, inflated dorsally, distal two-thirds with lateral decalcified region, median row of thin setae. Telson of female flattened, ovate, and evenly calcified with slightly produced tip.

**DESCRIPTION:** Carapace (fig. 104A) slightly wider than long. Anterior margin slightly concave on either side of ocular sinus, becoming convex laterally, with 10–13 large spines ( $n = 6$ ) along length. Rostrum as small acute tooth, reaching to proximal margin of ocular plate. Ocular sinus smoothly concave and unarmed except in largest specimens where lateral margins possess few additional small spines. Frontal region smooth; setal field narrow anteriorly and posteriorly; posterior lateral elements reduced to narrow bands of setae. CG1 parallel to anterior margin of carapace, sinuous, strongly crenulate, divided into medial fragment and curved, posteriorly displaced lateral elements. Me-

sogastric region smooth; CG2 present as short medial element; CG3 broken into one to three short elements and two long elements between posterior lateral elements of CG1; CG4 with one long (rarely two short), anteriorly displaced, medial element between longer supralateral elements of CG4. Hepatic region smooth, with oblique setose groove at median of lateral margin. Epibranchial region generally triangular, smooth; posterolateral margin with three short rows of setae. Metagastric region smooth; CG5 present as two triangular elements. CG6 strongly crenulate, strongly anteriorly concave medially and sloping out to anteriorly convex lateral thirds. CG7 oblique, almost reaching lateral margins of median segment of CG6. Cardiac region smooth; CG8 present as three long elements; posterior element displaced slightly posteriorly. CG9 present as two short lateral grooves with gap at midline. CG10 present as two long lateral elements, with gap between fragments. CG11 present as short medial element. Post-CG11 element present. Branchial region with numerous short, transverse rows of setae. Posterior margin deeply and evenly convex, with submarginal groove reaching two-thirds to three-fourths up margin of posterior concavity. Branchiostegite with short anterior submarginal spine; anterior region with scattered short, transverse lines ventral to *linea anomurica*; with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 104B) triangular, with shallow median indentation; median peduncular segments present as small ovate calcified areas lateral to ocular plate. Distal peduncular segments elongate, subtriangular, 0.20–0.36 length of carapace, with straight lateral and mesial margins, cornea covering distal tip; mesial margins approximated along proximal two-thirds; mesial and lateral margins with long plumose setae; tuft of plumose setae at proximolateral ventral angle and medial row of plumose setae extending from tuft to base of cornea.

Antennule (fig. 104C) with segment III narrow proximally, expanding distally to two times proximal width; with plumose setae on

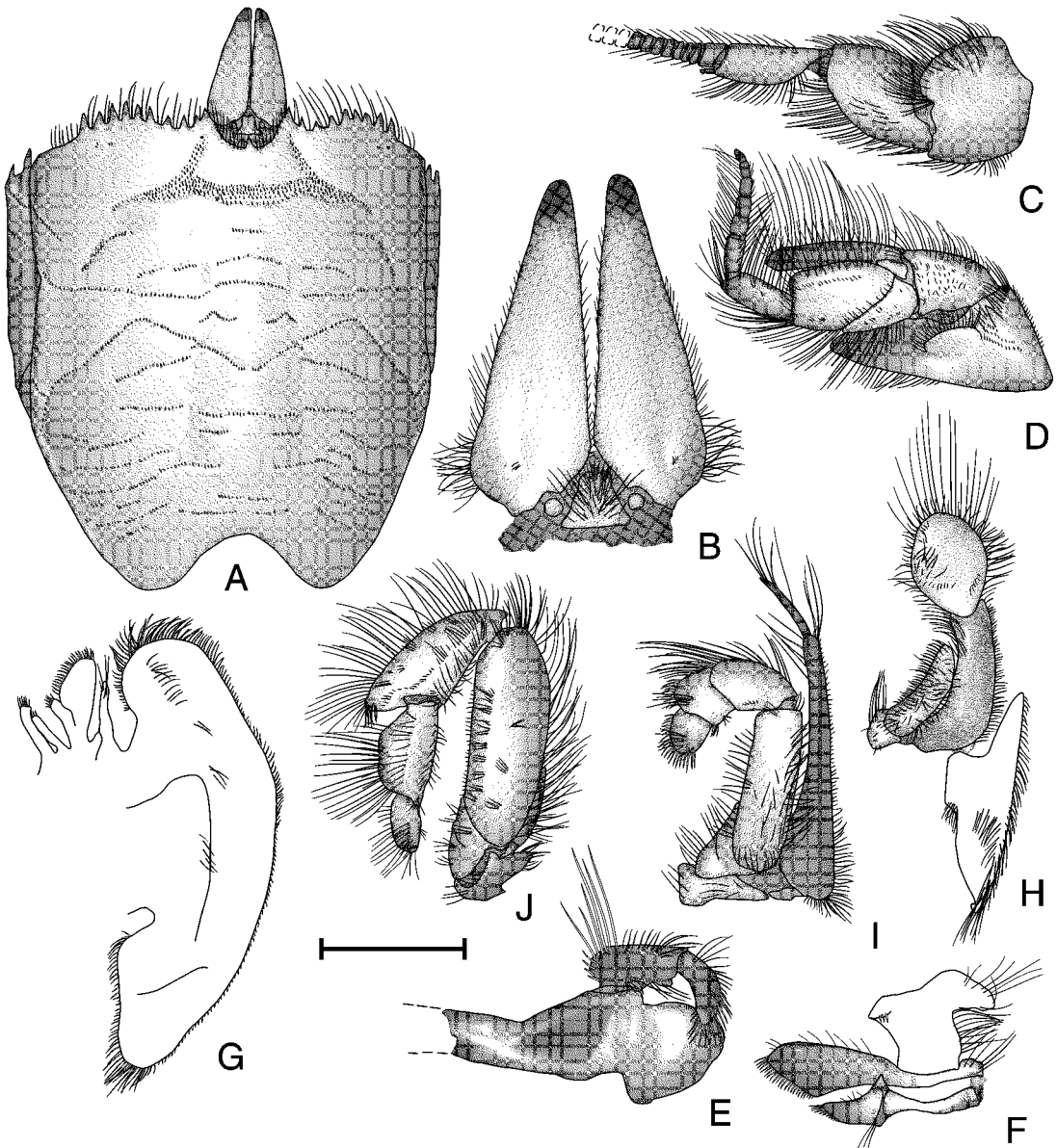


Fig. 104. *Albunea paretii* Guérin Méneville, 1853: A–D, H–J, ♀, 11.5 mm cl, AMNH 18089; E–G, ♀, 7.0 mm cl, USNM 260941. **A.** Carapace, branchiostegite, and ocular peduncles, dorsal view. **B.** Ocular peduncles, dorsal view. **C.** Left antennule, lateral view. **D.** Left antenna, lateral view. **E.** Left mandible, mesial view. **F.** Left maxillule, lateral view. **G.** Left maxilla, lateral view. **H.** Left maxilliped I, lateral view. **I.** Left maxilliped II, lateral view. **J.** Left maxilliped III, lateral view. Scale = 1.6 mm (B, E, F), 2.2 mm (G, I), 3.3 mm (D, H, J), and 4.4 mm (A, C).

dorsal and ventral margins and sparsely scattered on lateral surface; dorsal exopodal flagellum with 78–97 articles ( $n = 6$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum short with three

or four articles ( $n = 6$ ) and plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins and scattered on ventrolateral third of surface. Seg-

ment I wider than long, unarmed; dorsal third of lateral surface rugose, with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 104D) with segment V approximately three times longer than wide, with long plumose setae on dorsal margin and scattered on lateral surface; flagellum with seven articles ( $n = 6$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV expanded distally, with long plumose setae on dorsal, ventral, and distal margins, and row of setae on dorsolateral surface. Segment III with long plumose setae on dorsal and ventral margin and in short row on surface. Segment II short, widening distally, rugose, with plumose setae on margins and scattered on lateral surface; antennal acicula long, thin, and exceeding distal margin of segment IV by one-fifth length of segment IV, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventrolaterally, with long plumose setae on margins and scattered on surface rugae behind spine; lateral surface with acute spine dorsodistally, with low semicircular dorsolateral lobe ventrodistant to spine; segment with ventromesial antennal gland pore.

Mandible (fig. 104E) incisor process with two teeth; cutting edge smooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment and on distal margin of terminal segment.

Maxillule (fig. 104F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin simple setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under; internal lobe reduced with three thick setae at distolateral margin.

Maxilla (fig. 104G) exopod evenly rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 104H) epipod with plumose setae on margins, distolateral surface, and mesial surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, margins parallel with plumose setae; distal segment spatulate, longer than wide,

broadest medially, margins and mesioventral surface with long plumose setae. Endopod flattened and elongate, reaching two-thirds to distal end of proximal exopodal segment; plumose setae on margins and median of lateral surface.

Maxilliped II (fig. 104I) dactylus evenly rounded, length equal to width, with thick simple setae distally and on distolateral surface. Propodus 1.5 times wider than long, slightly produced at dorsodistal angle, with plumose setae on dorsal margin and patch of long simple setae on lateral surface and ventrolateral angle. Carpus not produced dorsodistally, approximately two times longer than wide; long simple setae on dorsal margin. Merus approximately three times longer than wide, margins parallel; with simple and plumose setae on margins and scattered on surface. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-fourth longer than merus, flagellum with one elongate article.

Maxilliped III (fig. 104J) dactylus with rounded tip; long plumose setae on margins and lateral surface. Propodus dorsally inflated, with longitudinal median row of plumose setae on lateral surface; margins with plumose setae. Carpus produced onto propodus almost one-fourth length of propodus; lateral surface with two rows of plumose setae on surface; plumose setae on margins. Merus inflated, unarmed, with plumose setae on margins and scattered on lateral surface. Basis-ischium incompletely fused, with weak crista dentata of two or three teeth. Exopod two-segmented: proximal segment small; distal segment styliform, tapering, approximately one-third length of merus; with plumose setae on margins; without flagellum.

Pereopod I (fig. 105A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose and short simple setae; ventral margin with short simple setae. Propodal 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; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle produced into strong corneous-tipped spine; dor-



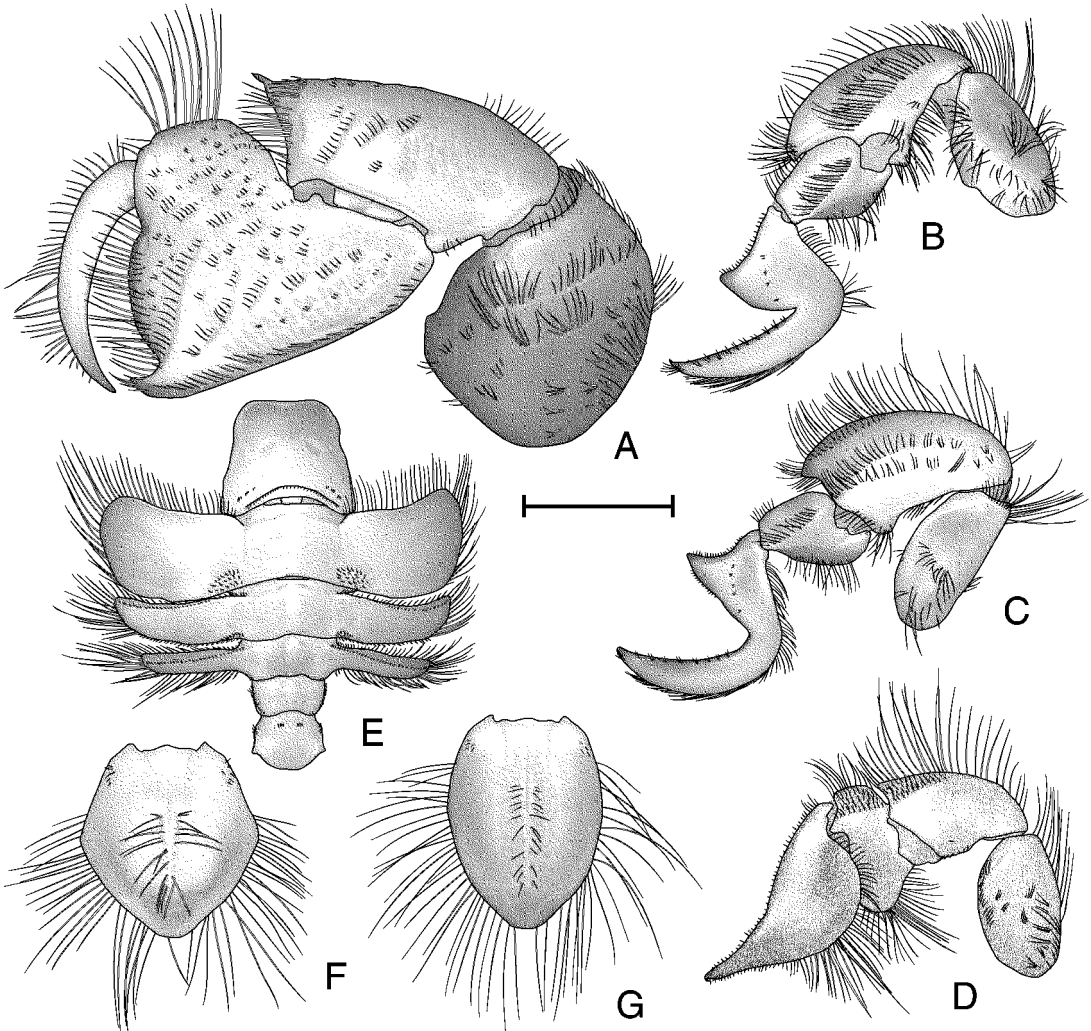


Fig. 105. *Albunea paretii* Guérin Méneville, 1853: A–E, G, ♀, 11.5 mm cl, AMNH 18089; F, ♂, 11.5 mm cl, AMNH 18089. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I–VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 3.0 mm (F, G), 3.3 mm (A), and 4.4 mm (B–E).

sal margin with short transverse grooves behind spine; dorsal and distal margins with long plumose setae; lateral surface with small distal rugose area, with few transverse setose ridges on distal half of surface; mesial surface smooth, with medial transverse row of 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 scattered setae; fully calcified.

Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 105B) dactylus smooth; base to heel concave, heel produced but subacute, heel to tip with wide, acute indent, tip acute, tip to base broadly convex; lateral surface smooth, with several small tufts of short setae in generally 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 simple setae and patch of long plumose setae at base. Propodal dorsal surface smooth, with 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 as narrow, oblique, flattened shelf, with 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 and gently rounded dorsodistally, dorsal margin with few low spines on distal two-thirds; lateral surface smooth, with setose mat at tip of produced area and irregular, interrupted row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; margins with long plumose setae; mesial surface smooth, with row of long plumose setae subdorsally. Merus with large median decalcified window covering nearly all of lateral surface, with few scattered long plumose setae on surface and margins; mesial surface nearly smooth, with two long rows of setae. Basis-ischium incompletely fused and unarmed. Coxa with small low tubercle on anterior margin.

Pereopod III (fig. 105C) dactylus with base to heel concave, heel acutely produced, heel to tip with broadly concave indent and small concave region at midpoint of proximal margin, tip acute, tip to base smoothly convex; lateral surface smooth, with several small tufts of short setae in generally straight line across medioproximal surface, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface smooth, with long plumose setae in oblique row, simple setae on dorsal margin; dorsolateral surface narrow, oblique, flattened, with setose mat; mesial surface with scattered long setae on and near distal margin and in oblique row on surface. Carpus produced dorsodistally, only slightly exceeding proximal margin of propodus; dorsolateral margin unarmed; lateral surface slightly rugose dorsodistally, with mat of short setae

and two interrupted rows of setae ventrally; mesial surface smooth, with long plumose setae on margins. Merus smooth, with large decalcified window covering nearly half of lateral surface medially; dorsal and ventral margins unarmed, with long plumose setae; distolateral margin with long plumose setae; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa with low tubercle on anterior margin. Female with large gonopore on anterior mesial margin of coxa, surrounded with short plumose setae; male with small depression in analogous position (not true pore).

Pereopod IV (fig. 105D) dactylus with base to tip convex proximally to concave distally, tip acute, tip to base concave distally to convex proximally; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge with row of short setae; with setose punctations ventral to decalcified window. Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, margin with long plumose setae; dorsal expansion with row of long plumose setae dorsally, oblique area with mat of short simple setae; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; ventral three-fourth of lateral surface and mesial surface smooth, dorsodistal quarter of lateral surface with mat of short setae; dorsal margin with short simple and long plumose setae; ventral margin with short simple setae; mesial surface faintly decalcified medially. Merus with scattered, short, transverse rows of setae on lateral surface, dorsal and ventrodorsal margins with long plumose setae; proximoventral half of mesial surface with large decalcified window. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 105E) with somite I length and width subequal, widest posteriorly; dorsal surface with anterior margin slightly concave; posterior margin curved, with elevated submarginal row of short setae; small transverse decalcified windows laterad of segment median. Somite II dorsal surface with submarginal transverse ridge anteriorly; with small transverse decalcified windows laterad

of segment median just anterior to submarginal ridge; pleura expanded and directed anterolaterally; lateral margins rounded, anterior and lateral margins with long plumose setae, posterior margin with short setae; posteromesial angle with mat of short simple setae. Somite III similar to somite II, but narrower, shorter; pleura thinner and shorter than on somite II, directed anterolaterally, with setae as in somite II; anterolateral angle subacute; dorsal surface obliquely flattened anterolaterally. Somite IV similar to somite III, but thinner and shorter; dorsal surface with few short setae anterolaterally; pleura thinner and shorter than on somite III, directed posterolaterally; 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 slightly broader than somite V; dorsal surface with short transverse rows of setae laterad of midline; pleura absent.

Females with uniramous, paired pleopods on somites II–V; males without pleopods.

Telson of male (fig. 105F) broadly triangular, slightly longer than wide, with broadly rounded tip; thickly calcified medially, inflated dorsally; distal half with lateral decalcified region; median longitudinal groove extending one-half length, row of long simple setae of either side of median groove beginning at distal end and continuing almost to distal margin of telson; proximolateral angles with patch of short simple setae; margins with long simple setae. Telson of female (fig. 105G) flattened, ovate, and evenly calcified with slightly produced tip; median groove similar to male, setal row from end of median groove to near distal margin of telson with simple setae approximately one-half length of those on male; proximolateral angle with patch of setae, margins with long simple setae.

**DISTRIBUTION:** Bermuda and the Florida Keys south throughout the Caribbean and Central America to Rio Grande do Sul, Brazil (Calado, 1987), in 0–101 m depth (Calado, 1987).

**MAXIMUM SIZE:** Males: 22.3 mm cl; females: 25.8 mm cl.

**TYPE SPECIMENS:** ANSP 4101a (holotype of *A. paretii*); BMNH 57.45 (syntype of *A.*

*oxyophthalma*); BMNH 64.7 (syntype of *A. oxyophthalma*); the repository of an additional syntype of *A. oxyophthalma* cited by both White (1847) and Miers (1878) from St. Christophers is unknown.

**TYPE LOCALITIES:** *Albunea paretii*: “Mer de Gênes” or “Mediterranea?” (incorrect localities). *Albunea oxyophthalma*: St. Christophers, Cayenne [French Guiana], and Brazil.

**REMARKS:** ANSP 4101a is clearly Guérin Méneville’s (1853) figured specimen and is the holotype by monotypy (see also Boyko, 2000b). Kingsley (1880) stated that Guérin Méneville’s type was not in the ANSP, but he was likely misled by the poor labeling of the specimen. The locality data “Antilles” was added to ANSP 4101a at a later date and may have come from Stimpson’s (1858) locality data for the species as “Antillarum?” The name *A. oxyophthalma* is a nomen nudum from both White (1847, as *A. oxyophthalmus*) and Stimpson (1858).

Much of the difficulty in recognizing the identity of this species was caused by Guérin Méneville’s (1853) uncertainty as to the type locality. Guérin Méneville (1853) was told that his specimen came from Genoa (Italy), which he thought likely, but he also was aware that the ship which brought him the specimen had been to the Americas, and he mentioned this possibility as well. The latter is the correct locality, and the specimen was likely collected in the Caribbean or South America.

It has been asserted by some authors (e.g., Monod, 1956) that the correct spelling of this specific name should be “*paretoi*,” as the species was named after the Marquis Pareto. However, Guérin Méneville (1853) gave the spelling as “*paretii*” twice, so there is no evidence of a lapsus calami or printer’s error, and *A. paretii* is therefore the incorrect original spelling and the one which must be used for the species.

Gurney’s (1942) Bermuda larvae are more likely to be *A. paretii* rather than *A. gibbesii*, as the latter species has only just been confirmed from Bermuda (herein) and is evidently much rarer there. The same can be said of Gurney’s (1924) larvae from off Rio de Janeiro, Brazil, where the common species is also *A. paretii*. The larvae of “*Albu-*

*nea* sp.” reported by Bowen et al. (1979) were also probably this species, rather than the less common *A. gibbesii*.

The specimen from Rio Bueno Bay, Jamaica (LACM-AHF 1653-01) is the type host of the bopyrid isopod *Albunione indecora* (Markham, 1988), which occurs in the branchial chamber. This host specimen is a true intersex/feminized male, with large pleopods and well-developed gonopores on the fifth pereopods. This parasite is also known from the same host species in the Bahamas (ex AMNH 5464) (Markham and Boyko, 1999).

The drawings of this species given by Calado (1987: figs. 9, 10a) are inaccurate in that the carapace grooves are highly stylized and, moreover, very different between the two illustrations. The branchiostegite was drawn in Calado's figure 9 as if it were fused to the carapace and were spinose on the margins, neither of which is true. These illustrations were repeated by Calado (1995). All of the material listed by Calado (1995) was from Brazil and, although not examined, undoubtedly belongs to this species rather than to the northern *A. catherinae*, n. sp.

Although previous authors (e.g., Monod, 1956) indicated that morphology-based separation of the trans-Atlantic *A. paretii* complex into component species was not possible, it is now evident that this is not correct. The Caribbean and South American specimens are all true *A. paretii*, while those from North America are almost all *A. catherinae*, n. sp. The African material is all *A. elegans*. It is not known how far south along the western Gulf of Mexico, if at all, *A. catherinae*, n. sp. ranges.

This species typifies the “*paretii*-group” of *Albunea*, which also includes *A. lucasia*, *A. elegans*, *A. steinitzi*, and *A. catherinae*, n. sp. All these species share a similar morphology of the male telson, and all have acute heels on the dactyli of pereopod III. *Albunea paretii* is the Atlantic analogue of *A. lucasia*. *Albunea paretii* is easily distinguished from *A. catherinae*, n. sp. by the distal ocular peduncle/carapace length ratio and by the shapes of the dactyli of pereopods III and IV (see under *A. catherinae* for specifics). It can be separated from *A. elegans* by the shortness of the branchiostegite spine,

unbroken CG8, and the different shape of the dactyli of pereopod III.

*Albunea lucasia* de Saussure, 1853

Figures 106, 107

*Albuminea* [sic] *Lucasia* de Saussure, 1853: 367, pl. 12, fig. 4\*.

*Albunea lucasii* [sic]: Stimpson, 1857: 485\*. – Miers, 1878: 330–331. – Steinbeck and Ricketts, 1941: 459.

*Albunaea* [sic] *Lucasii* [sic]: Stimpson, 1858: 230 (list).

*Albunea lucasia*: Ortmann, 1896: 225 (list). – Ortmann, 1901: 1275. – Gordon, 1938: 187 (list). – Bott, 1955: 50–51, pl. 4, fig. 4a, b. – Schuster-Dieterichs, 1956: 29, 34, 37, 40, 51. – Dexter, 1972: 455\*. – Abele, 1976: 266–267\*. – Haig, 1980: 289, fig. 19.5. – Moran, 1984: 79, fig. 6. – Coêlho and Calado, 1987: 42–43, table 1. – Lemaitre and Alvarez León, 1993: 49 (list). – Hendrickx, 1992: 9 (list). – Calado, 1995: 38–39, pl. 4, fig. c, pl. 9, fig. a. – Calado, 1997a: 17. – Hendrickx and Harvey, 1999: 366 (list).

*Albunea lucasi* [sic]: Prael et al., 1979: 55. – Prael, 1986: 97.

*Albunienea* [sic] *lucasia*: Calado, 1995: 38.

not *Albunea lucasia*: Ramos and Rios, 1995: 103, fig. 5 (= *Albunea galapagensis*, n. sp.).

**MATERIAL EXAMINED:** **Mexico:** “Mexico,” 1 ♂, 13.1 mm cl (ANSP 4102a); “Mexico,” 1926, coll. Sec. Agriculture y Fomento: 1 ♂, 19.2 mm cl (USNM 62387); “Isla Grande,” 10 fms (= 18.3 m), April 8, 1937, coll. W. Williams and F. E. Lewis on R/V “Stranger”: 1 ♂, 8.5 mm cl (USNM 260983); Sta. 963–39, “White Friars Rocks,” May 7, 1939, coll. R/V “Velero III”: 1 ♂, 10.5 mm cl, 3 ♀, 5.9–7.1 mm cl (USNM 260982); **Baja California Norte:** Punta Gorda, 14 fms (= 25.6 m), April 24, 1937, coll. W. Williams and F. E. Lewis on R/V “Stranger”: 2 ♀, 9.8–15.6 mm cl (USNM 267775); **Baja California Sur:** Cabo San Lucas, south of Santa Rosalita, March 24, 1940, coll. E. Ricketts: 1 ♀, 5.5 mm cl (USNM 267772); Bahia de la Ventana, 5–10 fms (= 9.1–18.3 m), April 21, 1937, coll. W. Williams and F. E. Lewis on R/V “Stranger”: 1 ♀, 6.7 mm cl (USNM 267773); Bahia Salinas, Isla Carmen, 20 fms (= 36.6 m), Dec. 19, 1931, coll. S. A. Glassell: 1 juvenile, 4.5 mm cl (USNM 260997); **Sonora:** Puerto Peñasco, May 3, 1935, coll. S. A. Glassell: 1 ♂, 8.1 mm cl (USNM 267768); north Tiburón Island, 20



fms (= 36.6 m), Jan. 1, 1932, coll. S. A. Glassell: 1 unsexable specimen, 5.1 mm cl (USNM 267771); Guaymas, Feb. 1951, coll. unknown: 1 ♂, 18.1 mm cl, 1 ♀, 22.4 mm cl (CASIZ 109241); Bahia Bocochoibampo, Guaymas, Nov. 1952, coll. J. P. Strohbeen: 1 ♀, 20.3 mm cl (CASIZ 109245); Bahia Soldado, Guaymas, Nov. 27, 1955, coll. L. O. Miles: 1 ♂, 13.5 mm cl, 1 ♀, 11.8 mm cl (CASIZ 109247); Punta Cholla, May 13, 1941, coll. S. A. Glassell: 1 ♀, 9.0 mm cl (USNM 260994); **Sinaloa**: Mazatlan, 1 ♀, 19.7 mm cl, holotype (ANSP 4102); **Jalisco**: Bahia Tenacatita Bay, 8–10 fms (= 14.6–18.3 m), Feb. 17, 1938, coll. S. A. Glassell: 2 ♂, 4.4–4.5 mm cl, 1 ♀, 5.7 mm cl (USNM 267770); Bahia Tenacatita, 19°18'N, 104°51'W, 7 fms (= 12.8 m), April 11, 1937, coll. F. E. Lewis on R/V "Stranger": 1 ♂, 10.8 mm cl, 4 ♀, 8.1–9.2 mm cl, 1 oviger, 12.2 mm cl (USNM 260998); Puerto Vallarta, 10 fms (= 18.3 m), April 13, 1937, coll. W. Williams and F. E. Lewis on R/V "Stranger": 1 ♀, 10.5 mm cl (USNM 304300); Puerto Vallarta, 10 fms (= 18.3 m), April 13, 1937, coll. W. Williams and F. E. Lewis on R/V "Stranger": 1 ♀, 12.9 mm cl (USNM 260992); Bahia Chamela, 8 fms (= 14.6 m), Feb. 17, 1938, coll. S. A. Glassell: 1 ♂, 6.7 mm cl (USNM 260990); **Guerrero**: Zihuatanejo, 20 fms (= 36.6 m), Feb. 24, 1938, coll. S. A. Glassell: 1 juvenile, 3.3 mm cl (USNM 267774); Zihuatanejo, 12 fms (= 21.9 m), Feb. 24, 1938, coll. S. A. Glassell: 1 ♀, 7.2 mm cl (USNM 260984); Bahia Dulce, 20 fms (= 36.6 m), April 5, 1937, coll. W. Williams and F. E. Lewis on R/V "Stranger": 2 ♂, 8.5–11.3 mm cl (USNM 260985); **Oaxaca**: Guatulco, 50 fms (= 91.5 m), March 7, 1938, coll. S. A. Glassell: 1 ♀, 9.7 mm cl (USNM 267769); Sta. 22, Puerto Guatulco, 3–30 fms (= 5.5–54.9 m), March 15, 1939, coll. F. E. Lewis on R/V "Stranger": 1 ♀, 12.6 mm cl (USNM 260995); Sta. 21, Bahia Chipequa, Gulf of Tehuantepec, 7–18 fms (= 12.8–32.9 m), March 15, 1939, coll. R/V "Stranger": 1 ♂, 9.1 mm cl, 1 ♀, 11.1 mm cl (USNM 260996).

**Guatemala**: "Guatemala," coll. Paessler: 2 ♂, 7.9–8.0 mm cl, 2 ♀, 8.0–14.0 mm cl (ZMH K-5131); San Jose, 10–12 fms (= 18.3–21.9 m), Feb. 2, 1939, coll. F. E. Lewis: 1 ♀, 8.2 mm cl (USNM 260993).

**Costa Rica**: Gulf of Nicoya, July 6, 1981, coll. unknown: 1 ♂, 5.6 mm cl (USNM 267767).

**Panama**: Chame Point, June–July 1912, coll. R. Tweedie: 1 ♂, 11.8 mm cl, 1 ♀, 14.2 mm cl (USNM 66048); Sta. 183–6, Culebra Island, March 10, 1974, coll. NMNH-STRI Panama Survey: 1 ♂, 18.9 mm cl (USNM 260986); Sta. 253–3–1, Culebra Beach, Feb. 7, 1978, coll. H. W. Kaufman: 1 juvenile, 2.3 mm cl (USNM 260991); Sta. 183–6B, Culebra Island, March 10, 1974, coll. M. L. Jones and H. W. Kaufmann: 1 juvenile, 3.1 mm cl (USNM 304299); Sta. 263–2, Whorehouse Reef, 1 m, July 20, 1978, coll. M. L. Jones: 3 ♂, 6.7–7.9 mm cl, 1 ♀, 8.8 mm cl (USNM 260999); Sta. 182–1, Pilot House Beach, 4 ft (= 1.2 m), March 9, 1974, coll. M. L. Jones and H. W. Kaufmann: 1 juvenile, 3.6 mm cl (USNM 260981); Sta. 182–5, Pilot House Beach, 60 ft (= 18.2 m), March 9, 1974, coll. M. L. Jones and H. W. Kaufmann: 1 juvenile, 4.5 mm cl (USNM 260989); Ft. Amador, Naos Island, June 1969, coll. D. Dexter: 1 ♂, unmeasurable, 1 ♀, 7.9 mm cl (USNM 260988); Pilot House Beach, Naos Island, Jan. 28, 1971, coll. T. A. Biffar: 1 ♂, 17.5 mm cl, 1 oviger, 16.1 mm (USNM 304306); Ft. Amador, Boy Scout Islands, beyond Naos Island, July 2, 1969, coll. L. G. Abele: 4 ♀, 6.2–15.5 mm cl (USNM 304307); Isla Gobernadoro, north of Panama City, 50 ft (= 15.2 m), coll. unknown: 1 ♂, 12.1 mm cl, 1 carapace, 12.1 mm cl (Feldmann Collection).

**Ecuador**: Sta. 15, La Libertad, 5–12 fms (= 9.1–21.9 m), Feb. 21, 1939, coll. F. E. Lewis on R/V "Stranger": 2 ♂, 7.2–10.3 mm cl, 2 ♀, 7.6–7.9 mm cl, 1 anterior half, 8.4 mm cl (USNM 260987).

**No Data**: 1 ♀, 21.5 mm cl (MNHN-Hi 188).

**DIAGNOSIS**: Carapace longer than wide, covered with lightly setose grooves. Anterior margin with 9–13 spines on either side of ocular sinus. Setal field with narrow lateral elements and concave anterior margin. CG1 with separate posterior lateral elements; CG4 with two to four short, anteriorly displaced, medial elements between longer supralateral elements of CG4; CG5 of two convex elements; CG6 and CG7 separate; CG8 broken; CG11 present. Rostrum present, not reaching

posterior margin of ocular plate. Ocular plate triangular. Distal peduncular segments dorsoventrally flattened and triangular in shape, tapering at tip, approximated along mesial margins, lateral margins convex, mesial margins straight. Cornea at tip. Dactylus of pereopod II with heel produced and rounded. Dactylus of pereopod III with heel broad, projecting, acute. Dactylus of pereopod IV sinuous from base to tip, with low rounded heel and shallow indent. Telson of male ovate, slightly longer than wide, with broadly rounded tip, thickly calcified medially, inflated dorsally, distal two-thirds with lateral decalcified region, median row of thin setae. Telson of female flattened, ovate, and evenly calcified with slightly produced tip.

DESCRIPTION: Carapace (fig. 106A) slightly longer than wide. Anterior margin slightly concave on either side of ocular sinus, becoming convex laterally, with 9–13 large spines ( $n = 6$ ) along length. Rostrum as small acute tooth, not reaching proximal margin of ocular plate. Ocular sinus smoothly concave and unarmed, except in largest specimens which possess one or two small spines. Frontal region smooth; setal field narrow anteriorly and posteriorly; posterior lateral elements reduced to narrow bands of setae. CG1 parallel to anterior margin of carapace, sinuous, strongly crenulate, divided into medial fragment and curved, posteriorly displaced lateral elements. Mesogastric region smooth; CG2 present as one or two short medial elements; CG3 broken into one or two long, anteriorly displaced, medial elements and two long lateral elements between posterior lateral elements of CG1; CG4 with two to four short, anteriorly displaced, medial elements between longer supralateral elements of CG4. Hepatic region smooth, with oblique setose groove at median of lateral margin. Epibranchial region generally triangular, smooth; posterolateral margin with two short rows of setae. Metagastric region smooth; CG5 present as two convex elements. CG6 strongly crenulate, strongly anteriorly concave medially and sloping out to anteriorly convex lateral thirds. CG7 oblique, not reaching lateral margins of median segment of CG6. Cardiac region smooth; CG8 present as one to three long elements, medial element anteriorly dis-

placed. CG9 present as two short lateral grooves with gap at midline. CG10 present as two long curved lateral elements, with gap between fragments. CG11 present as long medial element. Post-CG11 element absent. Branchial region with numerous short, transverse rows of setae. Posterior margin deeply and evenly convex, with submarginal groove reaching four-fifths up margin of posterior concavity. Branchiostegite with strong anterior submarginal spine; anterior region with scattered short, transverse lines ventral to *linea anomurica*; with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 106B) triangular, with shallow median indentation; median peduncular segments present as small ovate calcified areas lateral to ocular plate. Distal peduncular segments elongate, subtriangular, with slightly convex lateral and straight mesial margins, cornea covering distolateral tip; mesial margins approximated along length; mesial and lateral margins with short plumose setae; tuft of plumose setae at proximalateral ventral angle and medial row of plumose setae extending from tuft along proximal two-thirds of segment.

Antennule (fig. 106C) with segment III narrow proximally, expanding distally to twice proximal width; with plumose setae on dorsal and ventral margins; dorsal exopodal flagellum with 101–139 articles ( $n = 6$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with two to four articles ( $n = 6$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins and in transverse medial row on lateral surface. Segment I as long as wide, with short acute spine on dorsal margin; dorsal third of lateral surface rugose, with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 106D) with segment V approximately three times longer than wide, with long plumose setae on dorsal margin and scattered on lateral surface; flagellum with seven or eight articles ( $n = 6$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV expanded distally, with

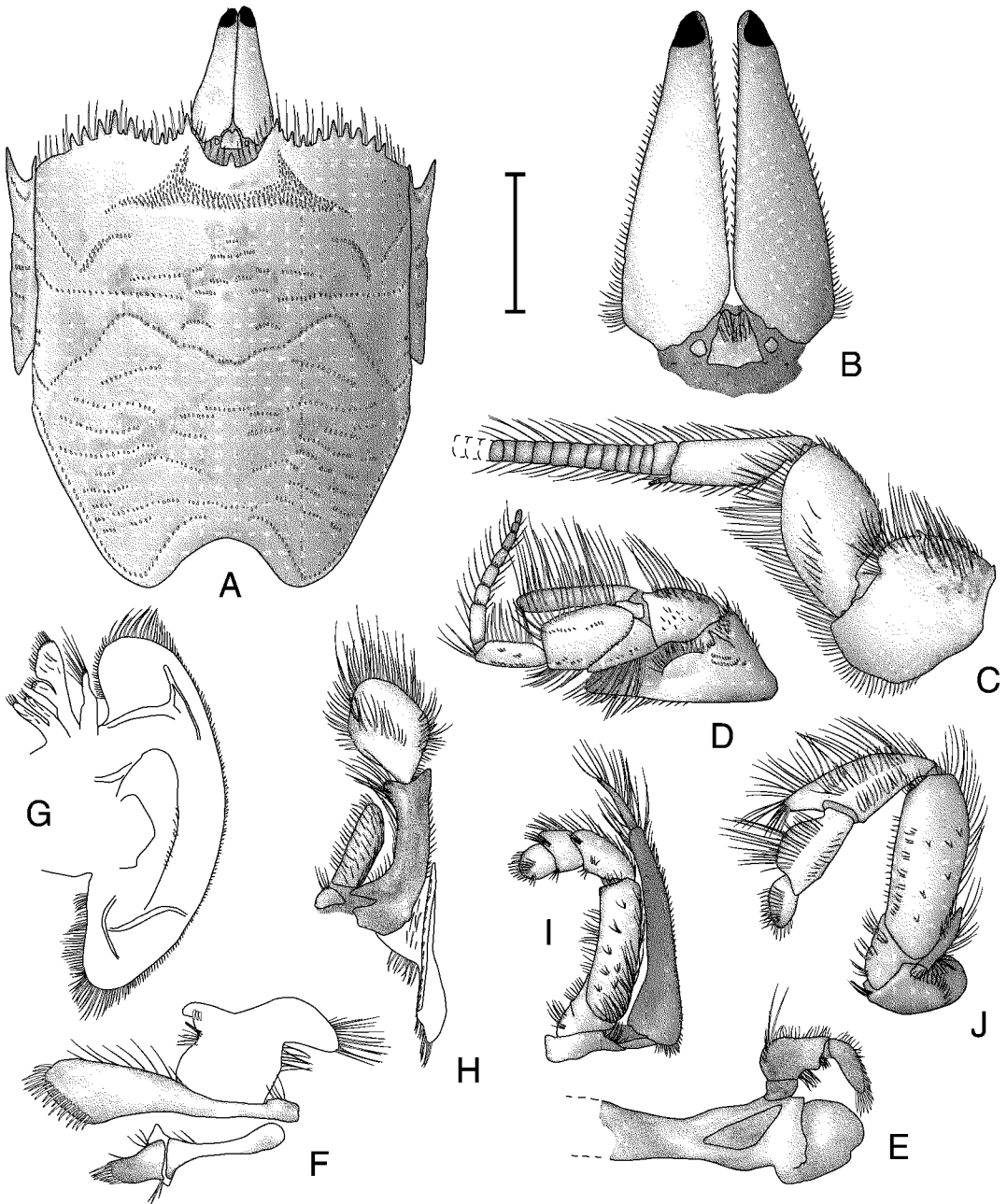


Fig. 106. *Albunea lucasia* de Saussure, 1853: A, B, D–J, ♂, 17.5 mm cl, USNM 304306; C, oviger, 16.1 mm cl, USNM 304306. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Left maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 2.2 mm (B, F), 3.3 mm (A, E, D), and 4.4 mm (C, D, G, H, J).

long plumose setae on dorsal, ventral, and distal margins, and short scattered setae on lateral surface. Segment III with long plumose setae on ventral margin, short simple setae on dorsal margin and scattered on lateral surface. Segment II short, widening distally, rugose, with plumose setae on margins and scattered on lateral surface; antennal acicle long, thin, and exceeding distal margin of segment IV by one-fourth length of segment IV, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventrolaterally, with long plumose setae on margins and scattered on surface rugae behind spine; lateral surface with acute spine dorsodistally, with low semicircular dorsolateral lobe ventrodistant to spine; segment with ventromesial antennal gland pore.

Mandible (fig. 106E) incisor process with two teeth; cutting edge smooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment and on distal margin of terminal segment.

Maxillule (fig. 106F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin simple setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under; internal lobe reduced with three thick setae at distolateral margin.

Maxilla (fig. 106G) exopod evenly rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 106H) epipod with plumose setae on margins, distolateral surface, and mesial surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, parallel margins with plumose setae; distal segment spatulate, longer than wide, broadest medially, margins and mesioventral surface with long plumose setae. Endopod flattened and elongate, reaching two-thirds to distal end of proximal exopodal segment; plumose setae on margins and median of lateral surface.

Maxilliped II (fig. 106I) dactylus evenly rounded, length equal to width, with thick simple setae distally and on distolateral surface. Propodus 1.5 times wider than long,

slightly produced at dorsodistal angle, with plumose setae on dorsal margin and patch of long simple setae on lateral surface and ventrolateral angle. Carpus not produced dorsodistally, approximately two times longer than wide; long simple setae on dorsal margin. Merus approximately three times longer than wide, margins parallel; with simple and plumose setae on margins and scattered on surface. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-half longer than merus, flagellum with one elongate article.

Maxilliped III (fig. 106J) dactylus with rounded tip; long plumose setae on margins and lateral surface. Propodus dorsally inflated, with longitudinal median row of plumose setae on lateral surface; margins with plumose setae. Carpus produced onto propodus almost one-third length of propodus; lateral surface with two rows of plumose setae on surface; plumose setae on margins. Merus inflated, unarmed, with plumose setae on margins and scattered on lateral surface. Basis-ischium incompletely fused, with weak crista dentata of three or four teeth. Exopod two-segmented: proximal segment small; distal segment styliiform, tapering, approximately two-fifths length of merus; with plumose setae on margins; without flagellum.

Pereopod I (fig. 107A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose and short simple setae; ventral margin with short simple setae. Propodal 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; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle produced into strong corneous-tipped spine; dorsal margin with short transverse grooves behind spine; dorsal and distal margins with long plumose setae; lateral surface with small distal rugose area, with few transverse, setose ridges on distal half of surface; mesial surface smooth, with medial transverse row of setae, margins with long plumose setae. Merus unarmed; lateral surface with scattered transverse rows of long plumose setae, margins with long plumose setae; mesial sur-



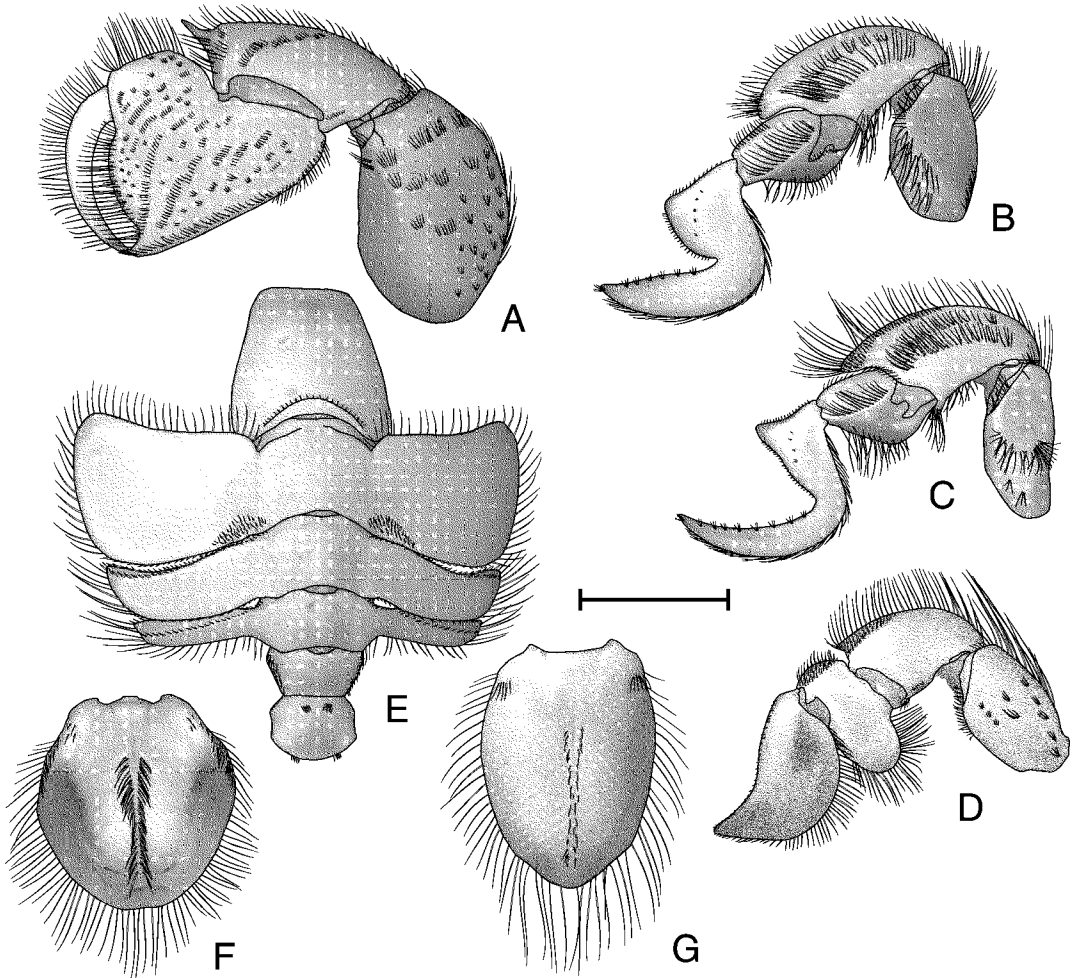


Fig. 107. *Albunea lucasia* de Saussure, 1853: A–F, ♂, 17.5 mm cl, USNM 304306; G, oviger, 16.1 mm cl, USNM 304306. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I–VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 3.0 mm (G), 4.4 mm (E, F), and 5.9 mm (A–D).

face with few scattered setae; fully calcified. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 107B) dactylus smooth; base to heel slightly concave, heel produced but rounded, heel to tip with wide, subacute indent, tip acute, tip to base broadly convex; lateral surface smooth, with several small tufts of short setae in generally straight line across medioproximal surface, several widely spaced submarginal tufts of short setae dorsodistally; mesial surface smooth, ventral margin with long plumose setae, dorsal mar-

gin with short simple setae and patch of long plumose setae at base. Propodal dorsal surface smooth, with 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 as narrow, oblique, flattened shelf, with 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 and gently

rounded dorsodistally, dorsal margin with few low spines on distal two-thirds; lateral surface smooth, with setose mat at tip of produced area and irregular, interrupted row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; margins with long plumose setae; mesial surface smooth, with row of long plumose setae subdorsally. Merus with large median decalcified window covering nearly all of lateral surface, with few scattered long plumose setae on surface and margins; mesial surface nearly smooth, with two long rows of setae. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Pereopod III (fig. 107C) dactylus with base to heel concave, heel produced and narrowing, rounded at apex, heel to tip with broadly concave indent and small concave region at midpoint of proximal margin, tip acute, tip to base smoothly convex; lateral surface smooth, with several small tufts of short setae in generally straight line across medioproximal surface, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface smooth, with long plumose setae in oblique row, simple setae on dorsal margin; dorsolateral surface narrow, oblique, flattened, with long simple setae on ventral margin; mesial surface with scattered long setae on and near distal margin and in oblique row on surface. Carpus produced dorsodistally, exceeding proximal margin of propodus by one-half length of propodus; dorsolateral margin unarmed; lateral surface slightly rugose dorsodistally, with mat of short setae and two interrupted rows of setae ventrally; mesial surface smooth, with long plumose setae on margins. Merus narrow, smooth, with large decalcified window covering nearly half of lateral surface medially; dorsal and ventral margins unarmed, with long plumose setae; distolateral margin with long plumose setae; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa with low tubercle on anterior margin in male; in female unarmed. Female with large gonopore

on anterior mesial margin of coxa; male without pore.

Pereopod IV (fig. 107D) dactylus with base to tip convex proximally to concave distally, tip acute, tip to base concave distally to convex proximally; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge with row of short setae; with setose punctations ventral to decalcified window. Propodus expanded dorsally and ventrally; ventral expansion exceeding ventral margin of dactylus, margin with long plumose setae; dorsal expansion with row of long plumose setae dorsally, oblique area with mat of short simple setae; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; ventral four-fifths of lateral surface and mesial surface smooth, dorsodistal fifth of lateral surface with mat of short setae; dorsal margin with short simple and long plumose setae; ventral margin with short simple setae; mesial surface decalcified medially. Merus with scattered short, transverse rows of setae on lateral surface, dorsal and ventrodial margins with long plumose setae; proximoventral half of mesial surface with large decalcified window. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 107E) with somite I longer than wide, widest posteriorly; dorsal surface with anterior margin straight; posterior margin curved, with elevated submarginal row of short setae; small transverse, decalcified windows laterad of segment median. Somite II dorsal surface with submarginal transverse ridge anteriorly; with small transverse, decalcified windows laterad of segment median just anterior to submarginal ridge; pleura expanded and directed anterolaterally; lateral margins rounded, anterior and lateral margins with long plumose setae, posterior margin with short setae; posteromesial angle with mat of short simple setae. Somite III similar to somite II, but narrower, shorter; pleura thinner and shorter than on somite II, directed posterolaterally proximally and anterolaterally distally, with setae as in somite II; anterolateral angle subacute; dorsal surface obliquely flattened anterolaterally. Somite IV similar to somite III, but thinner and

shorter; pleura thinner and shorter than on somite III, directed posterolaterally; 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 broader than somite V; dorsal surface with two short transverse rows of setae laterad of midline and on posterior margin; pleura absent.

Females with uniramous, paired pleopods on somites II–V; males without pleopods.

Telson of male (fig. 107F) ovate, slightly longer than wide, with broadly rounded tip and distally flattened apex; thickly calcified medially, inflated dorsally; distal half of dorsal surface with lateral decalcified region; median longitudinal groove extending one-half length, row of long simple setae on either side of median groove beginning at distal end and continuing almost to distal margin of calcified region; proximolateral angles with patch of short simple setae; margins with long simple setae. Telson of female (fig. 107G) flattened, ovate, and evenly calcified with slightly produced tip; median groove similar to male, setal row from end of median groove to near distal margin of telson, with simple setae approximately one-fourth length of those on male; proximolateral angle with patch of setae, margins with long simple setae.

**DISTRIBUTION:** Baja California Norte (Gulf side), Mexico, south to Ecuador, in up to 91.5 m depth.

**MAXIMUM SIZE:** Males: 19.2 mm cl; females: 22.4 mm cl.

**TYPE SPECIMEN:** ANSP 4102 (holotype).

**TYPE LOCALITY:** Mazatlan [Sinaloa], Mexico.

**REMARKS:** As shown by Boyko (2000b), ANSP 4102 is de Saussure's (1853) figured specimen and the holotype by monotypy. The holotype was also examined and cited by Stimpson (1857). de Saussure (1853) clearly named this species after his fellow carcinologist Pierre Hippolyte Lucas, but gave the spelling as "*Lucasia*" in two places, rather than the correct form of *lucasi*. As there is no evidence of printer's error or lapsus calami, *Albunea lucasia* is the incorrect original spelling that must be used for this taxon.

Calado (1995) saw no material of this species, but she redescribed it by repeating the brief text of de Saussure (1853), as well as his carapace drawing; she also incorrectly gave the type locality as "Cabo de San Lucas," probably due to a misinterpretation of the etymology of the specific name.

Haig (1980) stated that this species occurs southward to Peru, but he did not cite what material this was based on. I have seen no material or specific records in the literature from any locality south of Ecuador.

This species is the Pacific analogue of *A. paretii*.

### *Albunea catherinae*, new species

Figures 108–110

*Albunea symnista* [sic]: Gibbes, 1850b: 187 (not *Albunea symmysta* (Linnaeus, 1758)).

*Albunea paretii*: Kingsley, 1880: 409–410. – Williams, 1965: 137–138 (part), figs. 112, 113\*. – Kurata, 1970: 182, pls. 52, 53. – Coêlho and Ramos, 1972: 176 (part). – Dörger, 1977: 416. – Young, 1978: 177. – Kaestner, 1980: 336 (part). – Wenner and Read, 1982: 188. – Williams, 1984: 249–250 (part), figs. 182, 183\*. – Fox and Ruppert, 1985: 259 (list). – Martin and Abele, 1986: 611, figs. 1b, 2d, 3b, 4b, 5b, 6b, 8b, 9b, c, 10b, 12b, 14b, 15b, 17b. – Manning, 1988: 626–628\*. – Ruppert and Fox, 1988: 250, 404, fig. 227. – Williams et al., 1989: 35. – Calado et al., 1990: 747 (part) (not *Albunea paretii* Guérin Méneville, 1853).

*Albunea* [sic] *gibbesii*: Arnold, 1901: 269, pl. 61, fig. 2 (not *Albunea gibbesii* Stimpson, 1859).

*Albunea oxyophthalma* [sic]: Benedict, 1904: 625, fig. 5\* (not *Albunea oxyophthalma* Miers, 1878 = *Albunea paretii* Guérin Méneville, 1853).

*Albunea gibbesii*: Hay and Shore, 1918: 414, pl. 30, fig. 11. – Pearse et al., 1942: 185\* (not *Albunea gibbesii* Stimpson, 1859).

*Albunea oxyophthalma*: Gordon, 1938: 187 (part), figs. 3d, 4d\* (not *Albunea oxyophthalma* Miers, 1878 = *Albunea paretii* Guérin Méneville, 1853).

*Albunea paretii* [sic]: Kurata, 1970: 180–182 (not *Albunea paretii* Guérin Méneville, 1853).

**MATERIAL EXAMINED:** **USA: Virginia:** Accomack Co.: 37°31'12"N, 75°18'36"W, 26 m, March 22, 1976, coll. Virginia Institute of Marine Science: 1 ♂, 4.4 mm cl (USNM 179377); **North Carolina:** Dare Co.: Off Cape Hatteras, 35°20'35"N, 75°18'05"W, 16 fms (= 29.3 m), Oct. 19, 1884, coll. "Albatross": 1 ♂, 9.0 mm cl, paratype (YPM



21134); *Carteret Co.*: Sta. 2913, 34°29'N, 76°09'W, 20 fms (= 36.6 m), March 12, 1961, coll. R/V "Silver Bay": 1 ♂, 15.3 mm cl, paratype (USNM 260813); Morehead City, April 7, 1891, coll. "Fish Hawk": 1 ♂, 10.8 mm cl, paratype (USNM 29008); Sheepshead Shoal, Beaufort, July 4, 1941, coll. A. S. Pearse: 1 ♂, 16.1 mm cl, 2 ♀, 13.3–15.3 mm cl, paratypes (USNM 81025), 1 ♀, 17.5 mm cl, paratype (RMNH 14649 ex USNM 81025); Bird Shoal, Beaufort, June 11, 1941, coll. A. S. Pearse: 1 ♂, 17.0 mm cl, 2 ♀, 16.6–18.0 mm cl, paratypes (USNM 81026), 1 ♂, 15.3 mm cl, paratype (RMNH 14648 ex USNM 81026); Bird Shoal, Beaufort, Aug. 4, 1942, coll. A. S. Pearse: 1 ♀, 16.8 mm cl, paratype (USNM 81027); Ft. Macon, Beaufort, coll. E. Coues: 1 ♀, 10.7 mm cl, paratype (YPM 21135); Ft. Macon, Beaufort, Dec. 1871, coll. H. C. Yarrow: 1 ♀, 14.9 mm cl, paratype (YPM 21136); sandflat west of dining hall, Duke Marine Laboratory, Beaufort, May 12, 1972, coll. Duke Marine Laboratory: 1 ♂, 14.3 mm cl, 1 ♀, 14.3 mm cl, paratypes (ZMUC 2710); GOSNOLD 45, Vessel 03 Cruise 02, Sta. 1448, 34°30'N, 77°02'W, 15 m, May 18, 1964, coll. NMFS: 1 ♀, 8.4 mm cl, paratype (MCZ 19598); *Brunswick Co.*: 33°35'N, 78°05'W, 18 m, Feb. 11, 1977, coll. Texas Instruments 1C: 1 ♀, 11.0 mm cl, paratype (USNM 174227); 33°50'N, 78°24'W, 11 m, Feb. 9, 1977, coll. Texas Instruments 1A: 1 juvenile, 3.9 mm cl (USNM 174453); GOSNOLD 45, Vessel 03, Cruise 02, Sta. 1462, 33°30'N, 78°15'W, 20 m, May 19, 1964, coll. NMFS: 1 ♀, 15.4 mm cl, paratype (MCZ 19596); **South Carolina**: *Charleston Co.*: ASTERIAS 65–1, Sta. 2259, 32°57'N, 79°22'W, 9 m, May 20, 1965, coll. NMFS: 1 ♀, 7.7 mm cl, paratype (MCZ 19600); *Beaufort Co.*: ASTERIAS 65–1, Sta. 2295, 32°05'N, 80°38'W, 8 m, May 28, 1965, coll. NMFS: 1 oviger, 14.1 mm cl, paratype (MCZ 19601); **Georgia**: *Chatham Co.*: 31°41'06"N, 80°20'42"W, 28 m, July 29, 1981, coll. M. Dojiri; 1 first stage crab. 2.7 mm cl (USNM 225928); *Liberty Co.*: Sta. M2, North Beach, St. Catherines Island, May 17, 1995, coll. C. B. Boyko (AMNH St. Catherines Island Expedition): 1 ♂, 15.0 mm cl, holotype (AMNH 17194); Sta. M5, on exposed sand, sandbar offshore, North Beach, St. Catheri-

nes Island, May 16, 1998, coll. C. B. Boyko, J. Slapcinsky, A. and D. Harvey, and J. Williams (AMNH St. Catherines Island Expedition): 1 ♀, 18.1 mm cl, allotype (AMNH 17796); Sta. M5, sandbar offshore, North Beach, St. Catherines Island, Nov. 4, 1998, coll. C. B. Boyko (AMNH St. Catherines Island Expedition): 2 ♂, 10.8–15.5 mm cl, paratypes (AMNH 17887); *McIntosh Co.*: Off sea buoy, Sapelo Island, 44 ft (= 13.3 m), June 6, 1963, coll. M. Gray: 1 ♂, 15.5 mm cl, paratype (USNM 150671); east-southeast of sea buoy, Sapelo Island, 35 ft (= 10.6 m), Sept. 2, 1963, coll. M. Gray: 1 ♀, 12.0 mm cl, paratype (USNM 150672); **Florida**: West coast of Florida, pre-Nov. 1901, coll. J. W. Velie: 3 ♂, 8.6–16.2 mm cl (USNM 25186), 1 ♂, 12.9 mm cl (BMNH 1976.436 ex USNM 25186); "Florida," coll. unknown: 1 oviger, 20.0 mm cl (AMNH 159); *Nassau Co.*: Off Fernandina, 35 fms (= 64 m), April 1951, coll. R. Humes: 1 ♀, 19.9 mm cl, paratype (RMNH 24842); GOSNOLD 45, Vessel 03, Cruise 02, Sta. 1499, 30°40'N, 81°14'W, 16 m, May 22, 1964, coll. NMFS: 1 ♂, 9.3 mm cl, paratype (MCZ 19597); *Duval Co.*: 30°23'N, 81°15'W, 15 m, coll. Nov. 26, 1977, coll. Texas Instruments 6B: 1 ♀, 14.7 mm cl, paratype (USNM 174098); *St. Johns Co.*: GOSNOLD Cruise 2, Sta. 1509, 29°50'N, 81°14'W, 14 m, May 22, 1964, coll. NMFS: 1 ♂, 7.2 mm cl, 1 ♀, 7.4 mm cl, paratypes (MCZ 19599); *Volusia Co.*: Daytona, coll. N. S. Chamberlain: 1 ♂, 13.5 mm cl, paratype (USNM 65837 ex Boston Soc. Nat. Hist.); Ponce de Leon Inlet, July 13, 1937, coll. J. R. Preer: 1 ♀, 19.2 mm cl, paratype (USNM 79063); *Brevard Co.*: Indian River, northwest side of Sebastian Bridge, June 17, 1978, coll. E. Hillman: 1 ♂, 14.9 mm cl, paratype (HBOM 089:06083); Sebastian Inlet, April 13, 1972, coll. R. H. Gore: 1 ♂, 10.4 mm cl, paratype (HBOM 089:00250); Sta. 262/782, 27°49.8'N, 80°07.2'W, 29 m, Aug. 13, 1975, coll. R/V "Gosnold": 1 ♂, 8.7 mm cl, paratype (HBOM 089:02424); Sta. 346, 28°31.3'N, 80°12.7'W, 40 m, July 1, 1973, coll. R/V "Hernan Cortez": 1 ♀, 11.0 mm cl, paratype (HBOM 089:03167); *St. Lucie Co.*: North side, Dynamite Point, Ft. Pierce Inlet, March 18, 1972, coll. R.G.G.: 1 ♂, 9.3 mm cl, paratype (HBOM 089:00052); west



of Coon Island, Indian River, March 6, 1985, coll. Lee and Petry: 1 ♂, 10.9 mm cl, paratype (USNM 221757); inlet on rocks by Dynamite Point, Ft. Pierce, June 14, 1972, coll. R. Gore: 1 ♂, 11.0 mm cl, paratype (ANSP uncataloged); Hutchinson Island, Fort Pierce, June 18, 1992, coll. R. B. Manning: carapace fragments (USNM 256928); Sta. 229/406, 27°22.3'N, 80°14.5'W, 8 m, April 16, 1974, coll. R/V "Gosnold": 1 ♀, 10.2 mm cl, paratype (HBOM 089:00893); *Martin Co.*: 27°08'N, 80°06'30"W, 11 m, March 5, 1974, coll. R/V "Gosnold": 2 ♂, 8.7–11.9 mm cl, 2 ♀, 9.6–9.8 mm cl, 1 unsexable specimen, 8.8 mm cl (USNM 170055); Jupiter Island, June 25, 1973, coll. MER, KE, DSK: 12 ♂, 8.1–15.3 mm cl, 4 ♀, 8.3–15.5 mm cl, paratypes (HBOM 089:00521); Sta. 297, 27°08'N, 80°06.6'W, 15 m, March 5, 1974, coll. R/V "Gosnold": 1 unsexable specimen, 7.8 mm cl (HBOM 089:02419); Sta. 407, 27°15.5'N, 80°11.6'W, 9.5 m, April 16, 1974, coll. R. H. Gore on R/V "Gosnold": 1 ♂, 5.0 mm cl (HBOM 089:02421); Sta. 809, 27°30.1'N, 80°01.6'W, 12.6 m, Jan. 27, 1977, coll. R/V "Gosnold": 1 ♂, 8.4 mm cl, paratype (HBOM 089:03168); Sta. 222/266A, 27°09.2'N, 80°01.2'W, 29 m, Feb. 26, 1974, coll. R/V "Gosnold": 1 ♀, 10.9 mm cl, paratype (HBOM 089:00973); Sta. 237/500, 26°56.6'N, 80°03'W, 9 m, June 10, 1974, coll. R/V "Gosnold": 1 ♂, 12.2 mm cl, paratype (HBOM 089:02418); Sta. 223/292, 27°10.8'N, 80°06.8'W, 13 m, March 4, 1974, coll. R/V "Gosnold": 2 ♀, 7.7–8.8 mm cl, 1 unsexable specimen, 10.0 mm cl (HBOM 089:02420); Sta. 223/300, 27°03.8'N, 80°02.2'W, 19 m, March 5, 1974, coll. R/V "Gosnold": 1 ♂, 10.0 mm cl, 1 unsexable anterior half carapace (HBOM 089:02422); *Palm Beach Co.*: Off Palm Beach, 15 fms (= 27.4 m), Feb. 1950, coll. McGinty: 1 ♀, 6.1 mm cl (USNM 260816); *Collier Co.*: Marco, May 1884, coll. H. Hemphill: 1 ♂, 11.6 mm cl, 1 ♀, 16.0 mm cl (USNM 6988); Marco Beach, Sept. 12, 1960, coll. L. B. Holthuis on "Donna": 1 ♀, 11.4 mm cl, paratype (RMNH 15897); *Lee Co.*: Captiva Key, 1859, coll. G. Wurdemann: 1 ♀, 14.9 mm cl, paratype (MCZ 846); *Sarasota Co.*: Sarasota Bay, coll. unknown: 1 ♂, 7.9 mm cl, paratype (USNM 42198 ex Union College Collection); *Hillsborough Co.*: Egmont Key, 1868?, coll. W. T. Coons: 1 ♀, 11.3 mm cl, paratype (YPM 993); *Franklin Co.*: Alligator Point, Jan. 10, 1966, coll. J. Rudloe: 1 ♀, 15.4 mm cl, paratype (USNM 119330); Alligator Point, Nov. 25, 1968, coll. J. Rudloe: 1 ♀, 16.7 mm cl, paratype (USNM 125573); Alligator Point, Nov. 8, 1969, coll. J. Rudloe: 1 ♂, 11.2 mm cl (USNM 260817); *Okaloosa Co.*: 3 mi south of Destin, Oct. 24, 1979, coll. J. Martin on R/V "Oregon II": 1 ♂, 15.6 mm cl (USLZ 969); *Escambia Co.*: Pensacola, coll. J. E. Benedict: 1 ♂, 11.9 mm cl, paratype (USNM 29007); **Alabama**: *Mobile Co.*: 30°08'33"N, 88°06'27"W, 14 m, Jan. 20, 1980, coll. Interstate Electronics Corporation: 1 unsexable unmeasurable specimen (USNM 260821); 30°09'18"N, 88°06'36"W, 13 m, Jan. 19, 1980, coll. Interstate Electronics Corporation: 1 ♂, 5.9 mm cl (USNM 260822); 30°09'32.5"N, 88°04'32.4"W, 8 m, Jan. 19, 1980, coll. Interstate Electronics Corporation: fragments (USNM 260823); **Louisiana**: *Lafourche Parish*: 29°02'52"N, 90°09'46"W, 500 m north of platform, Bay Marchand Lease Area, 14 m, Aug. 30, 1978, coll. SWRI For BLM: 1 juvenile, 1.9 mm cl (USNM 186673); Sta. 14927, 28°41'N, 90°27'W, south of Timbalier Island, June 7, 1974, coll. T. C. Shirley on R/V "Oregon II": 1 ♂, 10.2 mm cl (USLZ 2024); *Terrebonne Parish*: Sta. OEI14, 28°47'54"N, 90°28'30"W, 19.8 m, July 13, 1973, coll. Gulf Coast Research Laboratory: 1 megalopa, 3.2 mm cl (USNM 260974); 28°51'34"N, 91°07'52"W, 500 m north of platform, Ship Shoal Lease Area, 5 m, Sept. 21, 1978, coll. SWRI for BLM: 1 juvenile, 2.7 mm cl (USNM 186674); *Vermilion Parish*: Trinity Shoal, 29°13'N, 92°11'W, June 28, 1968, coll. unknown: 1 juvenile, 3.1 mm cl (USLZ 40); *Cameron Parish*: 29°30'N, 93°27'W, south of Cameron, Aug. 5, 1981, coll. D. L. Felder et al.: 1 unsexable specimen, 13.3 mm cl (USLZ 2023); **Texas**: *Jefferson Co.*: Heald Banks, Sabine, Oct. 18, 1953, coll. W. G. Hewatt: 1 ♂, 5.1 mm cl, 1 ♀, 5.3 mm cl, paratypes (USNM 97661); Heald Banks, Sabine, Oct. 18, 1953, coll. W. G. Hewatt: 1 ♂, 6.4 mm cl, paratype (USNM 97662); Heald Banks, Sabine, Oct. 1953, coll. W. G. Hewatt: 1 ♀, 6.8 mm cl, paratype (USNM 97663); *Galveston Co.*: Sta. 10, off Galveston Beach, 2 fms (= 3.7 m), Sept. 24, 1968,

coll. D. Harper: 1 ♀, 3.9 mm cl (A&M 2-1573(A)); Sta. 6, off Galveston Beach, 6 fms (= 11.0 m), Oct. 23, 1968, coll. D. Harper: 1 megalopa, 2.4 mm cl (A&M 2-1573(B)); Sta. 3, off Galveston Beach, 4 fms (= 7.3 m), Aug. 4, 1968, coll. D. Harper: 1 megalopa, 2.6 mm cl (A&M 2-1573(C)); Sta. 7, off Galveston Beach, 5 fms (= 9.1 m), Aug. 21, 1968, coll. D. Harper: 1 megalopa, 2.2 mm cl (A&M 2-1573(D)); Sta. 2, off Galveston Beach, 3 fms (= 5.5 m), Sept. 24, 1968, coll. D. Harper: 1 megalopa, 2.8 mm cl (A&M 2-1573(E)); Sta. 6, off Galveston Beach, 6 fms (= 11.0 m), Sept. 24, 1968, coll. D. Harper: 1 megalopa, 3.0 mm cl (A&M 2-1573(F)); Sta. 3, off Galveston Beach, 4 fms (= 7.3 m), Aug. 4, 1968, coll. D. Harper: 1 megalopa, 2.4 mm cl (A&M 2-1573(G)); Sta. 7, off Galveston Beach, 5 fms (= 9.1 m), Oct. 23, 1968, coll. D. Harper: 3 megalopae, 2.1–2.7 mm cl (A&M 2-1573(H)); Sta. 3, off Galveston Beach, 4 fms (= 7.3 m), Oct. 17, 1968, coll. D. Harper: 1 megalopa, 3.2 mm cl (A&M 2-1573(I)); Sta. 4, off Galveston Beach, 5 fms (= 9.1 m), Aug. 4, 1968, coll. D. Harper: 2 megalopae, 2.1–2.5 mm cl (A&M 2-1573(J)); Sta. 9, off Galveston Beach, 3 fms (= 5.5 m), Oct. 23, 1968, coll. D. Harper: 1 ♂, 3.4 mm cl, 2 first stage crabs, 2.4–2.5 mm cl (A&M 2-1573(K)); Sta. 7, off Galveston Beach, 5 fms (= 9.1 m), Sept. 24, 1968, coll. D. Harper: 1 megalopa, 2.2 mm cl (A&M 2-1573(L)); Sta. 65A3–8, 3 mi off Galveston Harbor, 10 m, March 12, 1965, coll. W. E. Pequegnat on "Alaminos": 1 ♀, 6.0 mm cl (A&M 2-6794); Galveston, June–July, 1932, coll. Liberty Fish and Oyster Co.: 1 ♀, 13.8 mm cl, paratype (YPM 21132); *Brazoria Co.*: San Bernard River, east of San Bernard Refuge, Sept. 10, 1969, coll. Nesbitt: 1 ♀, 12.6 mm cl (A&M uncataloged); *Matagorda Co.*: Alligator Head, Matagorda Bay, coll. J. D. Mitchell: 1 ♀, 17.2 mm cl, 1 ♀, unmeasurable (USNM 22814); *Calhoun Co.*: Near Pass Cavallo, coll. J. D. Mitchell: 1 ♂, 14.1 mm cl (USNM 18902); *Aranas Co.*: Aransas Pass, Corpus Christi Bay, Nov. 20, 1936, coll. K.H.M.: 1 ♀, 17.5 mm cl (USNM 260818); *Nueces Co.*: Corpus Christi, Dec. 5, 1934, coll. Texas College of Arts and Industries: 1 ♂, 14.0 mm cl, paratype (USNM 77385); *Kenedy Co.*: Sta. 19, 26°49.9'N,

97°19.8'W, 5 fms (= 9.1 m), Oct. 11, 1988, coll. Ferrell: 2 ♂, 6.2–8.4 mm cl (A&M uncataloged); Sta. 33, 26°39.1'N, 97°15'W, 14 m, Oct. 12, 1988, coll. Ferrell: 1 ♂, 7.8 mm cl (A&M uncataloged).

**Limited Data:** "Florida or West Indies," coll. unknown: 1 ♂, 11.3 mm cl (AMNH 249).

**Questionable Data:** "West Indies," coll. unknown: 1 ♂, 16.0 mm cl (YPM 2701).

**No Data:** [?Florida], 4 ♀, 15.5–18.3 mm cl (USNM 260820).

**DIAGNOSIS:** Carapace wider than long, covered with lightly setose grooves. Anterior margin with 8–10 spines on either side of ocular sinus. Setal field with narrow lateral elements and concave anterior margin. CG1 with separate posterior lateral elements; CG4 with one long, anteriorly displaced, and two short, posteriorly displaced, medial elements between longer supralateral elements of CG4; CG5 present as two triangular elements with two shorter straight elements located posteromedially; CG6 and CG7 separate; CG8 broken; CG11 present. Rostrum present, not reaching posterior margin of ocular plate. Ocular plate triangular. Distal peduncular segments dorsoventrally flattened and triangular in shape, tapering at tip, approximated along proximal half of mesial margins, lateral margins convex except slightly concave at tip, mesial margins sinuous. Cornea at tip. Dactylus of pereopod II with heel produced, tapered and acute. Dactylus of pereopod III with heel thin, projecting, acute. Dactylus of pereopod IV sinuous from base to tip, with subacute heel and deep indent. Telson of male broadly triangular, tip tapered and broadly rounded, thickly calcified medially, inflated dorsally, distal two-thirds with lateral decalcified region, median row of thin setae. Telson of female flattened, ovate, and evenly calcified with slightly produced tip.

**DESCRIPTION:** Carapace (fig. 108A) slightly wider than long. Anterior margin slightly concave on either side of ocular sinus, becoming convex laterally, with 8–10 large spines ( $n = 6$ ) along length. Rostrum as small acute tooth, not reaching proximal margin of ocular plate. Ocular sinus smoothly concave, with three or four small spinules. Frontal region smooth; setal field narrow anteriorly and posteriorly; posterior lateral el-

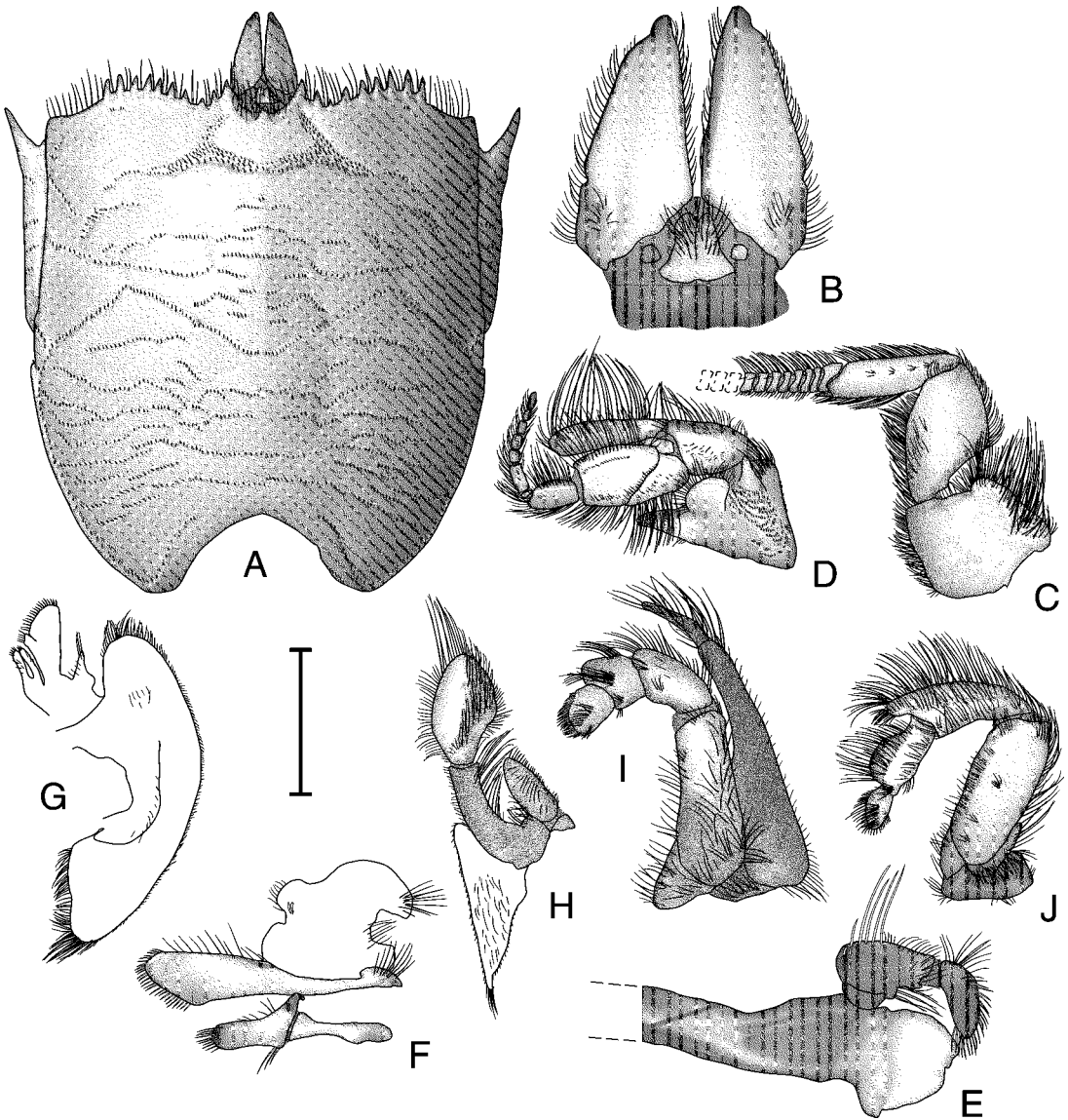


Fig. 108. *Albunea catherinae*, n. sp.: A, ♂, 15.0 mm cl, AMNH 17194, holotype; B–J, oviger, 20.0 mm cl, AMNH 159. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Right maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 2.2 mm (B), 3.0 mm (F), 3.3 mm (E, I), 5.5 mm (A), 6.0 mm (D, G), and 6.7 mm (C, H, J).

elements reduced to narrow bands of setae. CG1 parallel to anterior margin of carapace, sinuous, strongly crenulate, divided into medial fragment and curved, posteriorly displaced lateral elements. Mesogastric region smooth; CG2 present as one or two short me-

dial elements; CG3 broken into 6–11 short elements between posterior lateral elements of CG1; CG4 with one long, anteriorly displaced, and two short, posteriorly displaced, medial elements between longer supralateral elements of CG4. Hepatic region smooth



with oblique setose groove at median of lateral margin. Epibranchial region generally triangular, smooth; posterolateral margin without rows of setae. Metagastric region smooth; CG5 present as two triangular elements with two shorter straight elements located posteromedially. CG6 strongly crenulate, strongly anteriorly concave medially and sloping out to anteriorly convex lateral thirds. CG7 oblique, not reaching lateral margins of median segment of CG6. Cardiac region smooth; CG8 present as one to four short medial and two long lateral elements; median element displaced slightly anteriorly. CG9 present as two short lateral grooves with gap at midline. CG10 present as one or two long elements. CG11 present as long medial element. Post-CG11 element absent. Branchial region with numerous short, transverse rows of setae. Posterior margin deeply and evenly convex, with submarginal groove reaching two-thirds up margin of posterior concavity. Branchiostegite with strong anterior submarginal spine; anterior region with scattered short, transverse lines ventral to *linea anomurica*; with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 108B) triangular with deep median indentation; median peduncular segments present as small ovate, calcified areas lateral to ocular plate. Distal peduncular segments elongate, subtriangular, 0.15–0.23 length of carapace, with convex lateral and straight margins, cornea covering distal tip; lateral margins with notch one-third distal from base; mesial margins approximated at base; mesial and lateral margins with long plumose setae; tuft of plumose setae at proximalateral dorsal and ventral angles, ventromedial row of plumose setae extending from tuft to base of cornea.

Antennule (fig. 108C) with segment III narrow proximally, expanding distally to twice proximal width; with plumose setae on dorsal and ventral margins and sparsely scattered on lateral surface; dorsal exopodal flagellum with 94–132 articles ( $n = 6$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum short with two or three articles ( $n = 6$ ) and plumose setae

on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins and scattered on ventrolateral third of surface. Segment I wider than long, unarmed; lateral surface dorsal third rugose with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 108D) with segment V approximately two times longer than wide, with long plumose setae on dorsal and ventral margins and scattered on lateral surface; flagellum with seven articles ( $n = 6$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV expanded distally, with long plumose setae on dorsal, ventral, and distal margins, and row of setae on dorsolateral surface. Segment III with long plumose setae on dorsal and ventral margin and in short row on surface. Segment II short, widening distally, rugose, with plumose setae on margins and scattered on lateral surface; antennal acicle long, thin, and exceeding distal margin of segment IV by one-fourth length of segment IV, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventrolaterally, with long plumose setae on margins and scattered on surface rugae behind spine; lateral surface with acute spine dorsodistally, with low semicircular dorsolateral lobe ventrodorsal to spine; segment with ventromesial antennal gland pore.

Mandible (fig. 108E) incisor process with two teeth; cutting edge smooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment and on distal margin of terminal segment.

Maxillule (fig. 108F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin simple setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under; internal lobe reduced with two thick setae at distolateral margin.

Maxilla (fig. 108G) exopod evenly rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 108H) epipod with plumose setae on margins, distolateral surface,



and mesial surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, parallel margins with plumose setae; distal segment spatulate, longer than wide, broadest medially, margins and mesioventral surface with long plumose setae. Endopod flattened and elongate, reaching two-thirds to distal end of proximal exopodal segment; plumose setae on margins and median of lateral surface.

Maxilliped II (fig. 108I) dactylus evenly rounded, length slightly greater than width, with thick simple setae distally and on distolateral surface. Propodus 1.5 times wider than long, slightly produced at dorsodistal angle, with plumose setae on dorsal margin, patch of long simple setae on lateral surface and ventrolateral angle. Carpus not produced dorsodistally, approximately two times longer than wide, long simple setae on dorsal margin. Merus approximately three times longer than wide, margins parallel; with simple and plumose setae on margins and scattered on surface. Basis-ischium incompletely fused with plumose setae on margins. Exopod one-third longer than merus, flagellum with one elongate article, approximately as long as carpus.

Maxilliped III (fig. 108J) dactylus with rounded tip; long plumose setae on margins and lateral surface. Propodus dorsolaterally inflated, with longitudinal median row of plumose setae on lateral surface; margins with plumose setae. Carpus produced onto propodus almost one-fourth length of propodus; lateral surface with two rows of plumose setae on surface, plumose setae on margins. Merus inflated, unarmed, with plumose setae on margins and scattered on lateral surface. Basis-ischium incompletely fused, with weak crista dentata of three or four teeth. Exopod two-segmented: proximal segment small; distal segment styliform, tapering, approximately one-third length of merus; with plumose setae on margins; without flagellum.

Pereopod I (fig. 109A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose and short simple setae; ventral margin with short simple setae. Propodal lateral surface with numerous short, transverse rows of se-

tose rugae; dorsal margin unarmed; ventral margin distally produced into acute spine; cutting edge lacking teeth, lined with long plumose setae; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle produced into strong corneous-tipped spine; dorsal margin with short transverse grooves behind spine; dorsal and distal margins with long plumose setae; lateral surface with small distal rugose area and few transverse setose ridges on distal half of surface; mesial surface smooth, with medial transverse row of 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 scattered setae; fully calcified. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 109B) dactylus smooth; base to heel concave, heel produced and acute, heel to tip with narrow, acute indent, tip acute, tip to base broadly convex; lateral surface smooth, with several small tufts of short setae in generally 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 simple setae, with patch of long plumose setae at base. Propodal dorsal surface smooth, with 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 as narrow, oblique, flattened shelf, with 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 strongly produced and rounded dorsodistally, dorsal margin smooth; lateral surface smooth, with small setose mat at tip of produced area and irregular, interrupted row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; margins with short plumose setae; mesial surface smooth, with row of long plumose setae distally and subdorsally. Merus with large median decalcified window covering nearly all of lateral

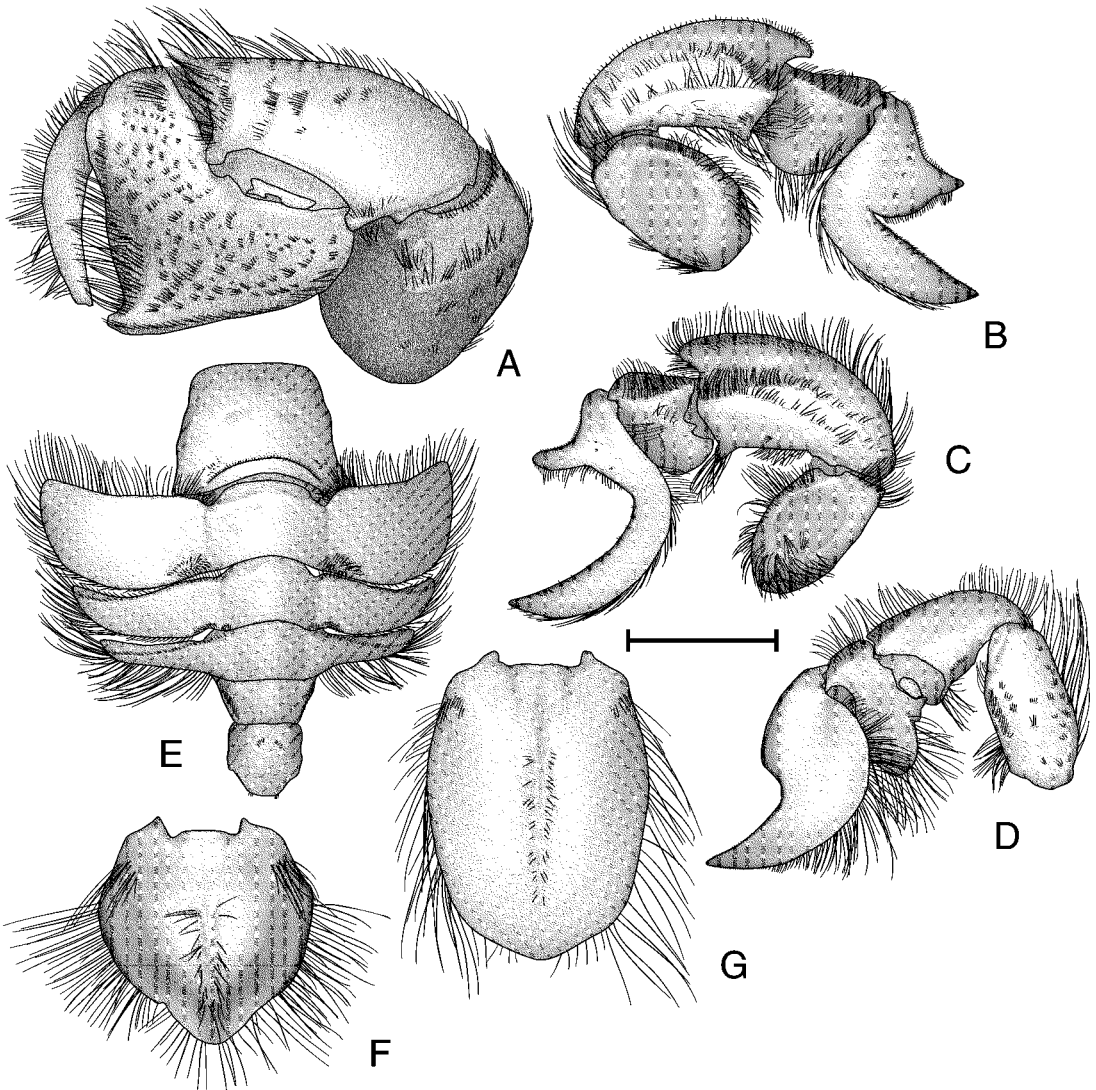


Fig. 109. *Albunea catherinae*, n. sp.: A-E, G, oviger, 20.0 mm cl, AMNH 159; F, ♂, 15.0 mm cl, AMNH 17194, holotype. A. Left pereopod I, lateral view. B. Right pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I-VI, dorsal view. F. Telson of ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 3.3 mm (F, G), 6.0 mm (A), and 6.7 mm (B-E).

surface, with few scattered long plumose setae on surface and margins; mesial surface nearly smooth, with two long rows of setae. Basis-ischium incompletely fused and unarmed. Both males and females coxa with spine on anterior margin.

Pereopod III (fig. 109C) dactylus with base to heel concave, heel acutely produced, heel to tip with broadly concave indent and

small concave region at midpoint of proximal margin, tip acute, tip to base smoothly convex; lateral surface smooth, with several small tufts of short setae in generally straight line across medioproximal surface, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae

proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface smooth, with long plumose setae in oblique row, simple setae on dorsal margin; dorsolateral surface narrow, oblique, flattened, with setose mat; mesial surface smooth. Carpus produced dorsodistally, only slightly exceeding proximal margin of propodus; dorsolateral margin unarmed; lateral surface slightly rugose dorsodistally, with mat of short setae and two interrupted rows of setae ventrally; mesial surface smooth, with long plumose setae on distal margin and in oblique row on surface. Merus smooth, with large decalcified window covering nearly half of lateral surface medially; dorsal and ventral margins unarmed, with long plumose setae; distolateral margin with long plumose setae; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Male coxa with spine on anterior margin; female coxa lacking spine. Female with large gonopore on anterior mesial margin of coxa, surrounded with short plumose setae; male without pore.

Pereopod IV (fig. 109D) dactylus with base to tip convex proximally, with strongly concave indent and almost straight from indent to tip, tip acute, tip to base concave distally to convex proximally; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge with row of short setae; with setose punctations ventral to decalcified window. Propodus expanded dorsally and ventrally; ventral expansion not reaching ventral margin of dactylus, margin with long plumose setae; dorsal expansion with row of long plumose setae dorsally, oblique area with mat of short simple setae; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; ventral three-fourth of lateral surface and mesial surface smooth, dorsodistal quarter of lateral surface with mat of short setae; dorsal margin with short simple and long plumose setae; ventral margin with short simple setae; mesial surface decalcified medially. Merus with scattered, short, transverse rows of setae on lateral surface, dorsal and ventrodorsal margins with long plumose setae; proximoventral half of mesial surface

with large decalcified window. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 109E) with somite I length and width subequal, widest posteriorly; dorsal surface with anterior margin straight; posterior margin curved, with elevated submarginal row of short setae; small transverse decalcified windows laterad of segment median. Somite II dorsal surface with submarginal transverse ridge anteriorly; with small transverse decalcified windows laterad of segment median just anterior to submarginal ridge; pleura expanded and directed anterolaterally; lateral margins angled, anterior and lateral margins with long plumose setae, posterior margin with short setae; posteromesial angle with mat of short simple setae. Somite III similar to somite II, but narrower, shorter; pleura thinner and shorter than on somite II, directed anterolaterally, with setae as in somite II; anterolateral angle subacute; dorsal surface obliquely flattened anterolaterally. Somite IV similar to somite III, but thinner and shorter; dorsal surface with few short setae anterolaterally; pleura thinner and shorter than on somite III, directed anterolaterally; 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 slightly broader than somite V; dorsal surface with short transverse rows of setae laterad of midline; pleura absent.

Females with uniramous, paired pleopods on somites II–V; males without pleopods.

Telson of male (fig. 109F) broadly triangular, slightly longer than wide, with broadly rounded tip; thickly calcified medially, inflated dorsally; distal two-thirds with lateral decalcified region; median longitudinal groove extending one-half length, row of long simple setae of either side of median groove beginning at distal end and continuing almost to distal margin of telson; proximolateral angles with patch of long simple setae; margins with long simple setae. Telson of female (fig. 109G) flattened, ovate, and evenly calcified with slightly produced tip; median groove similar to male, setal row from midpoint of median groove to near distal margin of telson with simple setae approximately one-fourth length of those on

male; proximolateral angle with patch of setae, margins with long simple setae.

**DISTRIBUTION:** From Virginia south to Palm Beach Co., Florida, then from Collier Co., Florida, through the Gulf of Mexico to southern Texas, in up to 64 m depth. Apparently absent from the Florida Keys.

**MAXIMUM SIZE:** Males: 17.6 mm cl; females: 19.9 mm cl.

**TYPE SPECIMENS:** AMNH 17194 (holotype), AMNH 17796 (allotype), AMNH 17887 (2 paratypes), ANSP uncat. (paratype), HBOM 089:00052 (paratype), HBOM 089:00250 (paratype), HBOM 089:00521 (16 paratypes), HBOM 089:00893 (paratype), HBOM 089:00973 (paratype), HBOM 089:02418 (paratype), HBOM 089:02424 (paratype), HBOM 089:03167 (paratype), HBOM 089:03168 (paratype), HBOM 089:06083 (paratype), MCZ 846 (paratype), MCZ 19596 (paratype), MCZ 19597 (paratype), MCZ 19598 (paratype), MCZ 19599 (2 paratypes), MCZ 19600 (paratype), MCZ 19601 (paratype), RMNH 14648 (paratype), RMNH 14649 (paratype), RMNH 15897 (paratype), RMNH 24842 (paratype), USNM 29007 (paratype), USNM 29008 (paratype), USNM 42198 (paratype), USNM 65837 (paratype), USNM 77385 (paratype), USNM 79063 (paratype), USNM 81025 (3 paratypes), USNM 81026 (3 paratypes), USNM 81027 (paratype), USNM 97661 (2 paratypes), USNM 97662 (paratype), USNM 97663 (paratype), USNM 119330 (paratype), USNM 125573 (paratype), USNM 150671 (paratype), USNM 150672 (paratype), USNM 174098 (paratype), USNM 174227 (paratype), USNM 221757 (paratype), USNM 260813 (paratype), YPM 993 (paratype), YPM 21132 (paratype), YPM 21134 (paratype), YPM 21135 (paratype), YPM 21136 (paratype), ZMUC 2710 (2 paratypes).

**TYPE LOCALITY:** North Beach, St. Catherines Island, Liberty Co., Georgia, USA.

**ETYMOLOGY:** The specific name of this taxon is given for two reasons. First, it is named after the Georgia barrier island, St. Catherines, which serves as the type locality for the species. This island was visited by the great American naturalist Thomas Say in the early 1800s, and it has been the site of seven years of personal field research on the biodiversity

of the local invertebrate fauna. Second, it is named after my niece, Catherine Elizabeth Boyko, whose detailed discussions of events and objects continue unabated until she is satisfied that they have been fully explained; an excellent quality should she someday choose the biological sciences as a profession.

**REMARKS:** Kurata (1970; as *A. paretii*) described the zoeal stage I hatched from an ovigerous female. He also indicated that this species has a total of six zoeal stages, and described stages II–VI based on larvae from the Georgia plankton. Ovigerous females are known from North Carolina in May and June (Williams, 1984). Williams' (1984) remark that that *A. gibbesii* "is occasionally found on exposed sandy shoals, especially at times of extreme low tides" likely refers to *A. catherinae*, n. sp., as *A. gibbesii* is rarely found in shallow water.

This species was confused with *A. paretii* for many years, and is indeed a member of the "*paretii*-group" of species. However, *A. catherinae*, n. sp. actually is more closely related to *A. steinitzi* from the western Indian Ocean than to the Central and South American *A. paretii*.

*Albunea catherinae*, n. sp. is easily distinguished from *A. paretii* by its smaller distal peduncular segment/carapace length ratio, and by the shapes of the dactyli of pereopods III and IV. A plot of distal peduncular segment length against carapace length for 68 specimens of *A. paretii* (5.0–27.4 mm cl) and 50 specimens of *A. catherinae* (6.8–22.1 mm cl) reveals that the two species have greatly differing distal peduncular segment/carapace length ratios, especially above 10 mm cl (fig. 110). Below that size, it is necessary to consider other factors, such as the shape of the dactyli of pereopods III and IV, in order to separate the species. *Albunea catherinae*, n. sp. can also be separated from *A. elegans* by the shapes of the dactyli of pereopods III and IV.

*Albunea steinitzi* Holthuis, 1958

Figures 111, 112

*Albunea symnista* [sic]: Cano, 1889a: 95, 104. – Cano, 1889b: 263 (not *Albunea symmysta* (Linnaeus, 1758)).

*Albunea symmysta*: Nobili, 1906: 142–143\*. –



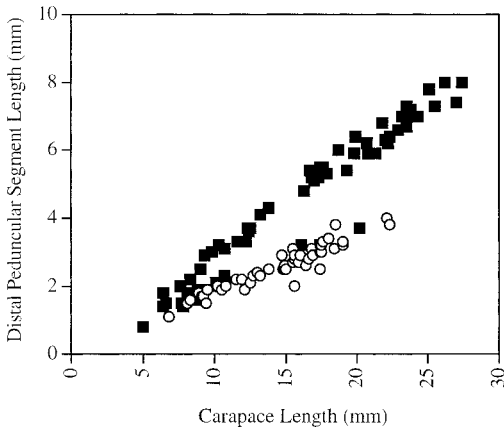


Fig. 110. Graph of length of distal peduncular segments plotted against carapace length for *Albunea paretii* and *Albunea catherinae*, n. sp. Data points are for 68 specimens of *A. paretii* (5.0–27.4 mm cl) and 50 specimens of *A. catherinae*, n. sp. (6.8–22.1 mm cl). ○, *Albunea catherinae*, n. sp. ■, *Albunea paretii*.

Ramadan, 1936: 3 (list) (not *Albunea symmysta* (Linnaeus, 1758)).

*Albunea steinitzi* Holthuis, 1958: 42–44, fig. 1\*.  
– Lewinsohn, 1969: 175–177, 179, 185, 193\*.  
– Tirmizi, 1978: 94, figs. 1–8. – Coêlho and Calado, 1987: 43, table 1. – Hogarth, 1988: 1103. – Fransen et al., 1997: 79 (list). – Calado, 1995: 66–68, pl. 4, fig. h, pl. 5, fig. g, pl. 19, figs. a–d, pl. 20, figs. a–d\*. – Calado, 1997a: 17, 22. – Boyko and Harvey, 1999: 391, 400 (list), 401 (key)\*. – Boyko, 1999: 145 (list).

not *Albunea steinitzi*: Serène and Umali, 1965: 97–102, pl. 1, fig. 2, pl. 2, fig. 2, pl. 3, figs. 3–5a, pl. 4, fig. 2, text-figs. 1b, c, 2b, c, 4a, b, 5c, 6c, c', 7a, 9b, c\*. – Haig, 1974: 447 (list) (= *Albunea groeningi*, n. sp.).

not *Albunea steinitzi*: Thomassin, 1969: 143–146, pl. 3, figs. 1–8, text-figs. 3c, 4 (? = *Albunea holthuisi* Boyko and Harvey, 1999).

**MATERIAL EXAMINED: Pakistan:** Open sand beach, northwest of Karachi, April 3, 1986, coll. unknown: 1 ♂, 9.9 mm cl (USNM 304308).

**Oman:** 16 mi west of Muscat, 1973, coll. F. Luiner: 1 ♂, 7.1 mm cl, 1 ♀, 15.4 mm cl (BMNH 1999.892–893).

**Israel:** Gulf of Aqabah, Eylath, Sept. 1952, coll. L. Fishelson and C. Lewinsohn: 1 ♀, 6.8 mm cl, holotype (RMNH 11847).

**Djibouti:** “dans le Sables a *Balanoglossus* pres la jetre de la factorie Mesnier,” Obock,

1904, coll. C. Gravier: 3 ♂, 6.8–10.8 mm cl (MNHN-Hi 18).

**Eritrea:** Abiad Bay, Entedebir Island, Dahlak Archipelago, March 25, 1962, coll. C. Lewinsohn: 1 ♂, 10.8 mm cl (ZMTAU E62/3614).

**Tanzania:** Dar es Salaam, coll. R. G. Hartnoll: 1 ♂, 7.9 mm cl (BMNH 1973.628).

**DIAGNOSIS:** Carapace wider than long, covered with lightly setose grooves. Anterior margin with 11–13 spines on either side of ocular sinus. Setal field with narrow lateral elements and concave anterior margin. CG1 with separate posterior lateral elements; CG4 with no medial elements between longer supralateral elements of CG4; CG5 of two triangular elements; CG6 and CG7 separate; CG8 broken; CG11 absent. Rostrum present, not reaching posterior margin of ocular plate. Ocular plate triangular. Distal peduncular segments dorsoventrally flattened and triangular in shape, tapering at tip, approximated along mesial margins, lateral margins convex, mesial margins straight. Cornea at tip. Dactylus of pereopod II with heel produced, tapered, and acute. Dactylus of pereopod III with heel thin, projecting, acute. Dactylus of pereopod IV sinuous from base to tip, with slightly produced, rounded heel and shallow indent. Telson of male broadly triangular, tip broadly rounded and medially indented, thickly calcified medially, inflated dorsally, distal two-thirds with lateral decalcified region, median row of thin setae. Telson of female flattened, ovate, and evenly calcified with slightly indented tip.

**DESCRIPTION:** Carapace (fig. 111A) slightly wider than long. Anterior margin slightly concave on either side of ocular sinus, becoming convex laterally, with 11–13 large spines ( $n = 4$ ) along length. Rostrum as small acute tooth, not reaching proximal margin of ocular plate. Ocular sinus smoothly concave, with one to four small spinules. Frontal region smooth; setal field narrow anteriorly and posteriorly; posterior lateral elements reduced to narrow bands of setae. CG1 parallel to anterior margin of carapace, sinuous, strongly crenulate, divided into medial fragment and curved, posteriorly displaced lateral elements. Mesogastric region smooth; CG2 present as two short medial elements; CG3 broken into six short elements

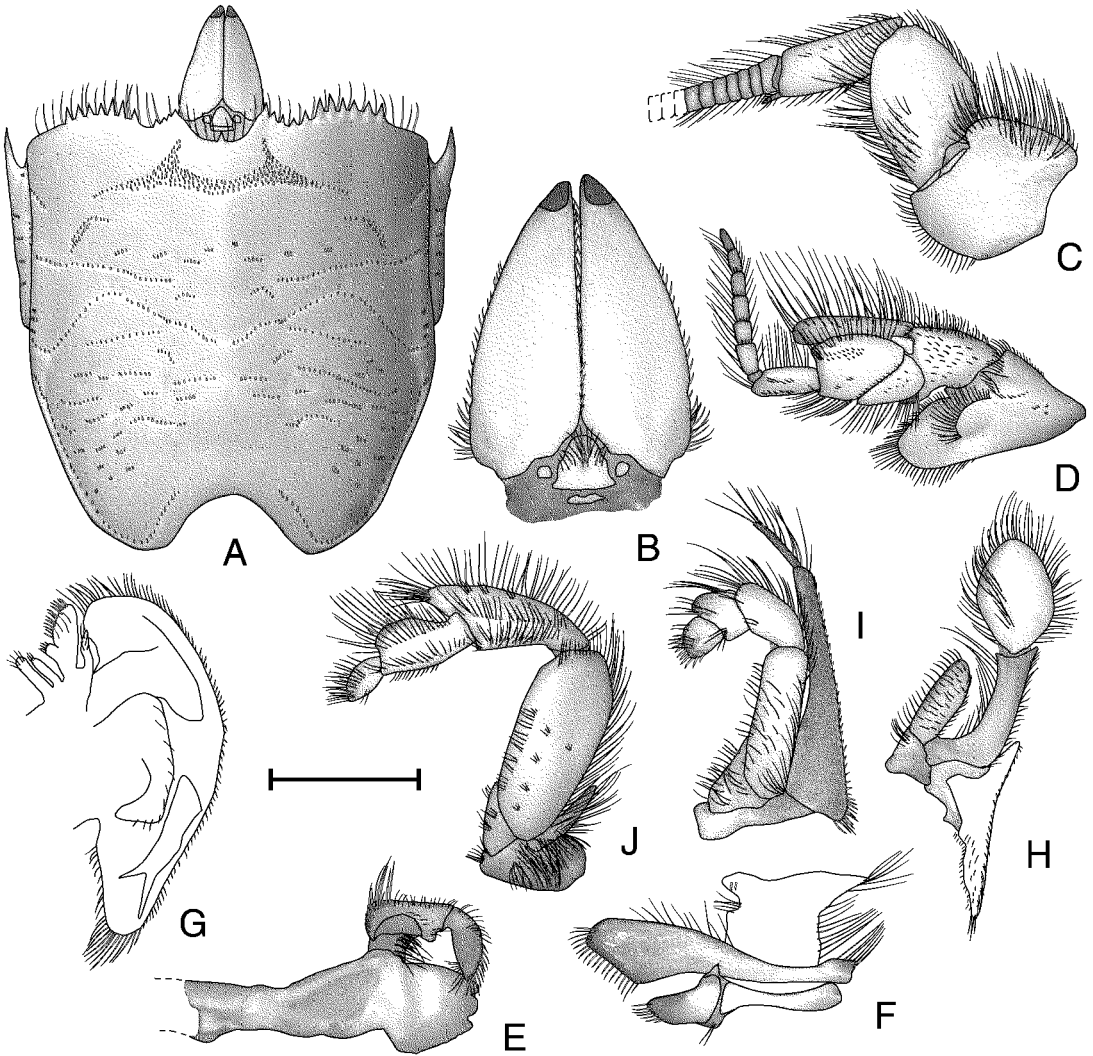


Fig. 111. *Albunea steintizi* Holthuis, 1958: A, ♂, 10.8 mm cl, ZMTAU E62/3614; B–J, ♂, 9.9 mm cl, USNM 304308. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. Left maxillule, lateral view. G. Left maxilla, lateral view. H. Left maxilliped I, lateral view. I. Left maxilliped II, lateral view. J. Left maxilliped III, lateral view. Scale = 1.6 mm (B, F), 2.2 mm (E, I), 3.3 mm (C, D, G, H, J), and 4.5 mm (A).

between posterior lateral elements of CG1; CG4 with no medial elements between longer supralateral elements. Hepatic region smooth, with oblique setose groove at median of lateral margin. Epibranchial region generally triangular, smooth; posterolateral margin three or four short rows of setae. Metagastric region smooth; CG5 present as two triangular elements. CG6 strongly crenulate,

strongly anteriorly concave medially and sloping out to anteriorly convex lateral thirds. CG7 oblique, not reaching lateral margins of median segment of CG6. Cardiac region smooth; CG8 present as two to four short medial and two long lateral elements; medial elements displaced slightly posteriorly. CG9 present as two short lateral grooves with gap at midline. CG10 present

as two short lateral elements. CG11 present absent. Post-CG11 element absent. Branchial region with numerous short, transverse rows of setae in anterior half. Posterior margin deeply and evenly convex, with submarginal groove reaching two-thirds up margin of posterior concavity. Branchiostegite with strong anterior submarginal spine; anterior region with scattered short, transverse lines ventral to *linea anomurica*; with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 111B) triangular with shallow median indentation; median peduncular segments present as small ovate calcified areas lateral to ocular plate. Distal peduncular segments elongate, subtriangular, with convex lateral and straight mesial margins, cornea covering distolateral tip; lateral margins with notch one-fourth distal from base; mesial margins approximated along entire length; mesial and lateral margins with short plumose setae; tuft of plumose setae at proximolateral dorsal and ventral angles, ventromedial row of plumose setae extending from tuft to base of cornea.

Antennule (fig. 111C) with segment III narrow proximally, expanding distally to two times proximal width; with plumose setae on dorsal and ventral margins and sparsely scattered on lateral surface; dorsal exopodal flagellum with 94–112 articles ( $n = 4$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum short with two or three articles ( $n = 4$ ) and plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins and scattered on ventrolateral third of surface. Segment I wider than long, small spine on dorsomedial margin; dorsal third of lateral surface rugose, with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 111D) with segment V approximately two times longer than wide, with long plumose setae on dorsal and ventral margins and scattered on lateral surface; flagellum with seven articles ( $n = 4$ ), long plumose setae on dorsal, ventral, and distal mar-

gins. Segment IV expanded distally, with long plumose setae on dorsal, ventral, and distal margins and row of setae on dorsolateral surface. Segment III with short plumose setae on dorsal margin and in short row on surface, long plumose setae on ventral margin. Segment II short, widening distally, rugose, with plumose setae on margins and scattered on lateral surface; antennal acicle long, thin, and exceeding distal margin of segment IV by one-fourth length of segment IV, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventrolaterally, with long plumose setae on margins and scattered on surface rugae behind spine; lateral surface with acute spine dorsodistally, with low semicircular dorsolateral lobe ventrodorsal to spine; segment with ventromesial antennal gland pore.

Mandible (fig. 111E) incisor process with three teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment and on distal margin of terminal segment.

Maxillule (fig. 111F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin simple setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under; internal lobe reduced with two thick setae at distolateral margin.

Maxilla (fig. 111G) exopod evenly rounded, with plumose setae along distal margin. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 111H) epipod with plumose setae on margins, distolateral surface, and mesial surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, parallel margins with plumose setae; distal segment spatulate, longer than wide, broadest medially, margins and mesioventral surface with long plumose setae. Endopod flattened and elongate, reaching two-thirds to distal end of proximal exopodal segment; plumose setae on margins and median of lateral surface.

Maxilliped II (fig. 111I) dactylus evenly rounded, length slightly greater than width, with thick simple setae distally and on dis-

tolateral surface. Propodus 1.5 times wider than long, slightly produced at dorsodistal angle, with plumose setae on dorsal margin and patch of long simple setae on lateral surface and ventrolateral angle. Carpus not produced dorsodistally, approximately two times longer than wide, long simple setae on dorsal and distal margins. Merus approximately three times longer than wide, margins parallel; with simple and plumose setae on margins and scattered on surface. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-third longer than merus, flagellum with one elongate article, approximately as long as carpus.

Maxilliped III (fig. 111J) dactylus with rounded tip; long plumose setae on margins and lateral surface. Propodus dorsolaterally inflated, with longitudinal median row of plumose setae on lateral surface; margins with plumose setae. Carpus produced onto propodus almost one-fourth length of propodus; lateral surface with two rows and few small patches of plumose setae on surface; plumose setae on margins and in thick patch at dorsodistal tip. Merus inflated, unarmed, with plumose setae on margins and scattered on mediolateral surface. Basis-ischium incompletely fused, with weak crista dentata of one or two teeth. Exopod two-segmented; proximal segment small; distal segment styliform, tapering, approximately one-third length of merus; with plumose setae on margins; without flagellum.

Pereopod I (fig. 112A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose and short simple setae; ventral margin with short simple setae. Propodal 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; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle produced into strong corneous-tipped spine; dorsal margin with short transverse grooves behind spine; dorsal and distal margins with long plumose setae; lateral surface with small distal rugose area, few transverse setose ridges on distal half of surface; mesial surface smooth, with medial transverse row

of 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 scattered setae; fully calcified. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 112B) dactylus smooth; base to heel concave, heel produced and subacute, heel to tip with narrow, acute indent, tip subacute, tip to base broadly convex; lateral surface smooth, with several small tufts of short setae in generally 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 simple setae and patch of long plumose setae at base. Propodal dorsal surface smooth, with 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 as narrow, oblique, flattened shelf, with 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 strongly produced and rounded dorsodistally, dorsal margin smooth; lateral surface smooth, with minute setose mat at tip of produced area and irregular, interrupted row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; margins with long plumose setae; mesial surface smooth, with row of long plumose setae distally and subdorsally. Merus with large median decalcified window covering nearly all of lateral surface, with long plumose setae on distodorsal and ventral margins; mesial surface nearly smooth, with two long rows of setae. Basis-ischium incompletely fused and unarmed. Both males and females coxa with spine on anterior margin.

Pereopod III (fig. 112C) with dactylus with base to heel concave, heel acutely produced, heel to tip with broadly concave indent and small concave region at midpoint of proximal margin, tip acute, tip to base smoothly convex; lateral surface smooth, with several small tufts of short setae in gen-



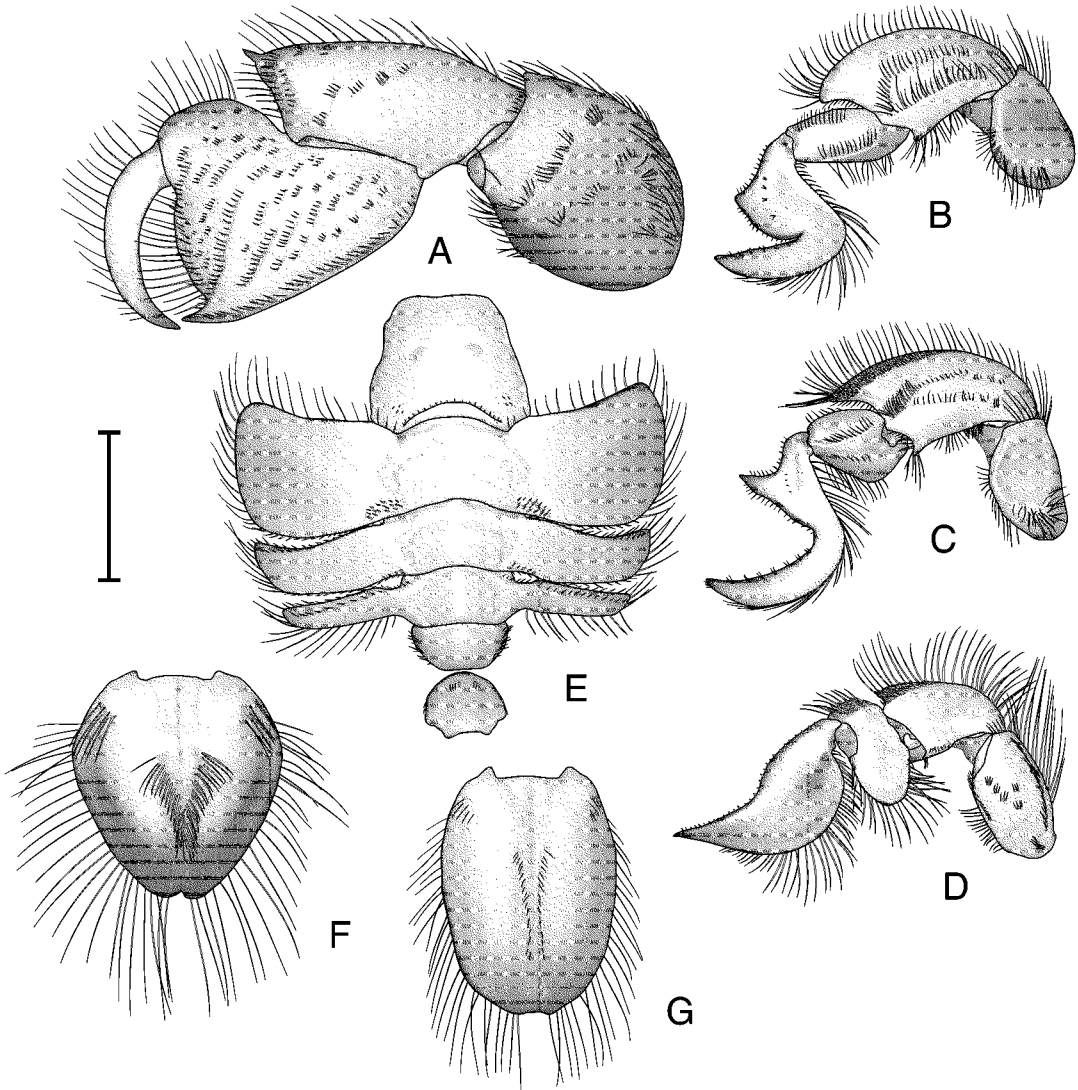


Fig. 112. *Albunea steintzi* Holthuis, 1958: A–F, ♂, 9.9 mm cl, USNM 304308; G, ♀, 15.4 mm cl, BMNH 1999.892–893. **A.** Left pereopod I, lateral view. **B.** Left pereopod II, lateral view. **C.** Left pereopod III, lateral view. **D.** Left pereopod IV, lateral view. **E.** Abdominal somites I–VI, dorsal view. **F.** Telson of ♂, dorsal view. **G.** Telson of ♀, dorsal view. Scale = 2.2 mm (F), 3.3 mm (A, E, G), and 4.4 mm (B–D).

erally straight line across medioproximal surface, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface smooth, with long plumose setae in oblique row on surface on ventral mar-

gin, simple setae on dorsal margin; dorsolateral surface narrow, oblique, flattened; mesial surface smooth. Carpus produced dorsodistally and pointed but not acute, exceeding proximal margin of propodus by one-half length of propodus; dorsolateral margin unarmed; lateral surface slightly rugose dorsodistally, with mat of short setae and two interrupted rows of setae ventrally;

mesial surface smooth, with long plumose setae on distal margin and in oblique medial row on distal half of surface. Merus smooth, with large decalcified window covering nearly half of lateral surface medially; distodorsal and ventral margins unarmed, with long plumose setae; few long setae on proximal lateral surface; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Male coxa with spine on anterior margin; female coxa lacking spine. Female with large gonopore on anterior mesial margin of coxa, surrounded with short plumose setae; male with smaller pore.

Pereopod IV (fig. 112D) dactylus with base to tip convex proximally, with shallow concave indent and almost straight from indent to tip, tip acute, tip to base concave distally to convex proximally; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge with row of short setae; with setose punctations ventral to decalcified window. Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, margin with long plumose setae; dorsal expansion with row of long plumose setae dorsally, oblique area with mat of short simple setae; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; ventral three-fourth of lateral surface and mesial surface smooth, dorsodistal quarter of lateral surface with mat of short setae; dorsal margin with short simple and long plumose setae; ventral margin with short simple setae; mesial surface decalcified medially. Merus lateral surface with scattered short transverse rows of setae, dorsal and proximoventral margins with long plumose setae; proximoventral half of mesial surface with large decalcified window. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 112E) with somite I wider than long, widest posteriorly; dorsal surface with anterior margin straight; posterior margin curved, with elevated submarginal row of short setae; small transverse, decalcified windows laterad of segment median. Somite II dorsal surface with submarginal transverse ridge anteriorly; with small transverse, de-

calcified windows laterad of segment median just anterior to submarginal ridge; pleura expanded and directed anterolaterally; anterolateral margins angled, posterolateral margins rounded, anterior and lateral margins with long plumose setae, posterior margin with short setae; posteromesial angle with mat of short simple setae. Somite III similar to somite II, but narrower, shorter; pleura thinner and shorter than on somite II, directed anterolaterally, with setae as in somite II; anterolateral angle subacute; dorsal surface obliquely flattened anterolaterally with submarginal row of short setae. Somite IV similar to somite III, but thinner and shorter; dorsal surface with few short setae anterolaterally; pleura thinner and shorter than on somite III, directed posterolaterally; dorsal surface obliquely flattened anterolaterally with submarginal row of short setae; margins with long plumose setae. Somite V wider than somite IV; lateral margins with short plumose setae; pleura absent. Somite VI slightly broader than somite V; dorsal surface with short transverse rows of setae laterad of midline; pleura absent.

Females with uniramous, paired pleopods on somites II–V; males without pleopods.

Telson of male (fig. 112F) broadly triangular, longer than wide, with broadly rounded, medially indented tip; thickly calcified medially, inflated dorsally; distal two-thirds with lateral decalcified region; median longitudinal groove extending one-half length, row of long simple setae of either side of median groove beginning at distal end and continuing almost to distal margin of calcified region; proximolateral angles with patch of long simple setae; margins with long simple setae. Telson of female (fig. 112G) flattened, ovate, and evenly calcified with subquadrate and medially indented tip; median groove similar to male, setal row from midpoint of median groove to one-fourth proximal to tip; simple setae approximately one-fourth length of those on male; proximolateral angle with patch of short simple setae, margins with long simple setae.

**DISTRIBUTION:** From Pakistan into the Red Sea and southward to Tanzania; depth range unknown.

**MAXIMUM SIZE:** Males: 10.8 mm cl; females: 15.4 mm cl.

TYPE SPECIMENS: RMNH 11847 (holotype); the repository of the paratype is unknown.

TYPE LOCALITY: Eylath, Israel.

REMARKS: Thomassin's (1969: text-fig. 13) distribution map for this species is highly inaccurate, as he had no material of *A. steinitzi* from Madagascar, and the species apparently does not occur east of India. Tirmizi (1978) reported eggs still attached to a "molt" of this species, but ovigers are otherwise unknown.

This species is a member of the "*paretii*-group" of species and is closely related to *A. catherinae*, n. sp.

*Albunea gibbesii* Stimpson, 1859

Figures 113, 114

*Albunaea* [sic] *Gibbesi* Stimpson, 1858: 230 (nomen nudum).

*Albunaea* [sic] *Gibbesii* Stimpson, 1859: 78, pl. 1, fig. 6.

*Albunea gibbesii*: Miers, 1878: 329.—Benedict, 1904: 624–625, figs. 3, 4\*. — Schmitt, 1935: 208–209, fig. 69\*. — Gordon, 1938: 187, figs. 3e, 4b\*. — Williams, 1965: 136–137, fig. 112\*. — J. E. Randall, 1967: 723, 751. — Coêlho and Ramos, 1972: 176. — Young, 1978: 177. — Kaestner, 1980: 336. — Rodriguez, 1980: 239 (list). — Wenner and Read, 1982: 187. — Williams, 1984: 248–249, fig. 182\*. — Calado, 1987: 96–105, pls. 6–8. — Coêlho and Calado, 1987: 42–43, table 1. — Manning, 1988: 626–627 (list). — Ruppert and Fox, 1988: 251, 404 (list). — Williams et al., 1989: 35. — Calado et al., 1990: 747, fig. 2c, d. — Calado, 1995: 32–35, pl. 4, fig. b, pl. 5, fig. b, pl. 7, figs. a–h, pl. 8, figs. a, b. — Calado, 1997a: 17. — Calado, 1998: 407.

*Albunea gibbesi* [sic]: Ortmann, 1896: 225 (list). — Ortmann, 1901: 1275. — Boschi, 1981: 715.

*Albunea guerinii*: Stebbing, 1914: 281 (not *Albunea guerinii* Lucas, 1853 = *A. carabus* (Linnaeus, 1758)).

*Albunea carabus*: Chace, 1966: 635 (not *Albunea carabus* (Linnaeus, 1758)).

*Albunea* sp. T. D. Cain, 1972: 80.

*Albunea gibbesii* [sic]: Boschi, 1981: 740.

?*Albunea gibbesii*: Kurata, 1970: 183–184, pl. 54. not *Albunea gibbesii*: Benedict, 1901: 139\* (= *Albunea paretii* Guérin Méneville, 1853).

not *Albunaea* [sic] *gibbesii*: Arnold, 1901: 269, pl. 61, fig. 2. (= *Albunea catherinae*, n. sp.).

not *Albunea gibbesii*: Hay and Shore, 1918: 414, pl. 30, fig. 11. — Pearse et al., 1942: 185\* (= *Albunea catherinae*, n. sp.).

MATERIAL EXAMINED: **Bermuda**: Paget Beach, July 1901, coll. T. G. Gosling: 1 ♀, 22.2 mm cl (MCZ 19594).

**USA: North Carolina**: GOSNOLD 45, Vessel 03, Cruise 02, Sta. 1439, 34°58'N, 76°00'W, 18 m, May 18, 1964, coll. NMFS: 1 ♂, 5.9 mm cl (MCZ 19649); Sta. 2208, 34°35'N, 76°11'W, 18 fms (= 32.9 m), July 24, 1960, coll. R/V "Silver Bay": 1 ♂, 21.8 mm cl, 1 ♀, 22.0 mm cl (USNM 260808); Sta. 2615, off Cape Fear, 33°45'N, 77°25'W, Oct. 10, 1885, coll. "Albatross": 1 ♂, 9.7 mm cl (USNM 11265); 33°20'N, 77°40'W, 25 m, Feb. 11, 1977, coll. Texas Instruments: 1 unmeasurable ♂ (USNM 174234); 33°17'N, 77°31'W, 25 m, July 27, 1967, coll. I. E. Gray on R/V "Eastward": 3 ♂, 7.3–10.5 mm cl, 1 ♀, 19.1 mm cl, 1 unsexable specimen, 7.1 mm cl, 1 unsexable, unmeasurable specimen (USNM 267375); Sta. 5, S71–22, 34°05.4'N, 77°01.5'W to 34°06'N, 77°01.5'W, April 15, 1971, coll. C. L. Smith and CCNY Class: 1 ♀, 7.2 mm cl (AMNH 18080); **South Carolina**: 31°27'N, 79°46'W, 64 m, Nov. 22, 1977, coll. Texas Instruments: 1 ♂, 10.1 mm cl (USNM 174193); 31°34'N, 80°03'W, 38 m, Feb. 23, 1977, coll. Texas Instruments 4C: 1 ♀, 17.7 mm cl (USNM 174225); 32°01'N, 79°31'W, 46 m, Aug. 25, 1977, coll. Texas Instruments: carapace fragments (USNM 174235); 31°40'N, 80°16'W", 26 m, Aug. 27, 1977, coll. Texas Instruments 4D: 2 ♂, 15.4–17.7 mm cl (USNM 174238); 32°40'N, 78°47'W, 37 m, May 13, 1977, coll. Texas Instruments 2E: 1 ♂, 7.1 mm cl (USNM 174239); 32°49'30"N, 78°39'18"W, 34 m, Nov. 3, 1981, coll. South Carolina Marine Research: 1 ♂, 18.9 mm cl (USNM 221016); Sta. 1695, 33°57'N, 77°01'W, 19 fms (= 34.8 m), Feb. 29, 1960, coll. "Silver Bay": 1 ♂, 17.0 mm cl (USNM 267778); Blackfish Banks, off Charleston, March 1880, coll. R. E. Earll: 1 ♂, 20.4 mm cl (USNM 4115); GOSNOLD 45, Vessel 03, Cruise 02, Sta. 1480, 32°30'N, 79°46'W, 18 m, May 21, 1964, coll. NMFS: 1 ♂, 23.4 mm cl (MCZ 19646); ex *Dasyatis centroura* (Mitchill), Sta. 3655, 32°43'N, 78°34'W, Dec. 14, 1961, coll. "Silver Bay": 1 ♂, 15.7 mm cl, 3 ♀, 13.2–21.3 mm cl (RMNH 26626); **Georgia**: GOSNOLD 45, Vessel 03, Cruise 02, Sta. 1758, 32°00'N, 79°45'W, 30 m, June 16, 1964, coll. NMFS: 1 ♀, 12.8 mm

cl (MCZ 19651); off sea buoy, Sapelo Island, 115 ft (= 34.8 m), May 6, 1963, coll. M. Gray: 1 ♀, 8.8 mm cl (USNM 150669); off sea buoy, Sapelo Island, 31°03'N, 80°28'30"W, 110 ft (= 33.3 m), June 12, 1963, coll. M. Gray: 1 ♂, 20.9 mm cl (USNM 150670); 31°05'N, 80°35'W, 25 m, Nov. 24, 1977, coll. Texas Instruments 5D: 1 ♂, 19.3 mm cl (USNM 174222); 31°05'N, 80°35'W, 25 m, Aug. 30, 1977, coll. Texas Instruments 5D: 1 ♀, 18.4 mm cl (USNM 174229); 31°01'N, 80°17'W, 40 m, April 24, 1977, coll. Texas Instruments: 1 ♂, 17.3 mm cl (USNM 174233); 31°05'N, 80°35'W, 25 m, Aug. 30, 1977, coll. Texas Instruments 5D: 1 ♂, 17.0 mm cl (USNM 174243); 31°01'N, 80°17'W, 40 m, Aug. 30, 1977, coll. Texas Instruments: 1 ♂, 15.8 mm cl (USNM 174244); GOSNOLD 45, Vessel 03, Cruise 02, Sta. 1754, 31°39'N, 79°45'W, 45 m, June 16, 1964, coll. NMFS: 1 oviger, 21.4 mm cl (MCZ 19647); **Florida:** "Florida," July 1899, coll. Smiths: 1 ♂, 22.4 mm cl (MNHN-Hi 8 ex USNM); "Florida," June 1859, G. Würdemann: 5 ♂, 15.8–22.6 mm cl (MCZ 869); "Florida?," 1 unsexable specimen, 23.7 mm cl (USNM 5227); *St. Johns Co.:* 30°23'N, 80°36'W, 35 m, Sept. 1, 1977, coll. Texas Instruments 6D: 1 ♂, 20.2 mm cl (USNM 174336); GOSNOLD 45, Vessel 03, Cruise 02, Sta. 1713, 30°11'N, 80°15'W, 73 m, June 13, 1964, coll. NMFS: 1 ♀, 6.8 mm cl (MCZ 19648); *Flagler Co.:* Sta. 201–1, 29°53.5'N, 80°38'W, 42 mi southeast of St. Augustine, 19 fms (= 34.8 m), March 27, 1940, coll. R/V "Pelican": 1 ♂, 17.6 mm cl (USNM 260807); *Volusia Co.:* 29°28'N, 80°57'W, 20 m, Nov. 27, 1977, coll. Texas Instruments 7B: 1 ♂, 21.7 mm cl (USNM 174244); GOSNOLD 45, Vessel 03, Cruise 02, Sta. 1691, 29°20'N, 80°29'W, 33 m, June 12, 1964, coll. NMFS: 1 ♂, 15.3 mm cl (MCZ 19650); Sta. 7409, 29°02'N, 80°26'W, 17 fms (= 31.1 m), Dec. 5, 1967, coll. R/V "Oregon": 2 ♂, 18.4–24.8 mm cl (USNM 260812); *Brevard Co.:* Sta. 19756, 28°11'N, 80°13'W, 35 m, March 26, 1976, coll. R/V "Oregon II": 1 ♀, 10.6 mm cl (HBOM 089: 02890); Sta. 3358, 28°23'N, 80°16'W, 15 fms (= 27.4 m), Sept. 20, 1960, coll. R/V "Silver Bay": 1 ♂, 21.2 mm cl (USNM 260805); *St. Lucie Co.:* Capron Shoal, off Hutchinson Island, 6.1–12.2 m, May 24, 1988, coll. J. E.

Miller and P. M. Mikkelsen: 1 ♂, 17.9 mm cl (HBOM 089:06469); Sta. 5099, 27°39.5'N, 80°08'W, 15 fms (= 27.4 m), Sept. 28, 1963, coll. R/V "Silver Bay": 1 ♂, 24.1 mm cl (USNM 260809); Sta. JV–1/038, 27°28'36"N, 80°28'36"W, 70 ft (= 21.2 m), Aug. 1, 1973, coll. R/V "Joie de Vivre": 1 anterior half of carapace (HBOM 089: 00906); *Broward Co.:* Second reef off Sea Ranch Lakes Villas, July 6, 1970, coll. R. H. Gore: 2 ♂, 11.6–17.8 mm cl (HBOM 089: 01930); *Monroe Co.:* 25°45'56"N, 82°09'21"W, 20 m, Nov. 8, 1980, coll. Continental Shelf Associates: 1 ♂, 18.4 mm cl (USNM 242663); 25°17'22"N, 82°09'00"W, 22.5 m, April 27, 1981, coll. Continental Shelf Associates: 1 ♀, 17.9 mm cl (USNM 242662); 25°45'56"N, 82°09'21"W, 19.6 m, April 28, 1981, coll. Continental Shelf Associates: 1 ♀, 20.4 mm cl (USNM 242661); back reef area with coarse sand bottom, 3 mi offshore of Rock Harbor between Rodriguez Key and Pickles Reef, Key Largo, 25°02'N, 80°26'W, 2 m, June 13, 1981, coll. H. Reichardt: 1 ♂, 17.9 mm cl (HBOM 089: 05105); Key West, May 1940, coll. J. R. Miller: 1 ♀, 19.6 mm cl (MCZ 11934); Key West, 1885, coll. H. Hemphill: 5 ♂, 7.6–10.9 mm cl, 5 ♀, 7.3–10.6 mm cl (USNM 14046); Key West, 1885, coll. H. Hemphill: 3 ♂, 9.0–10.5 mm cl, 3 ♀, 8.2–20.8 mm cl (USNM 14066), 1 ♀, 9.9 mm cl (BMNH 1937.6.1.2 ex USNM 14066); Key West, coll. unknown: 1 ♀, 9.9 mm cl (RMNH 14645); Key West, coll. unknown: 1 ♂, 10.5 mm cl (BMNH 1937.6.1.1 ex USNM 15786); ex fish no. 69, Dry Tortugas, June 5, 1925, coll. W. L. Schmitt: 2 ♀, 8.0–9.3 mm cl (USNM 65838); ex fish no. 70, Dry Tortugas, June 5, 1925, coll. W. L. Schmitt: 1 ♂, 8.5 mm cl, 1 ♀, 9.9 mm cl (USNM 65839); off Port Everglades, 8.5 fms (= 15.5 m), April 23, 1940, coll. J. S. Schwengel: 1 ♂, 15.1 mm cl, 1 ♀, 13.2 mm cl (ANSP 4438); *Okaloosa Co.:* Off Fort Walton, 14–15 fms (= 25.6–27.4 m), June 3–4, 1947, coll. F. Lyman: 1 ♂, 7.7 mm cl, 2 ♀, 7.7–11.3 mm cl, 1 oviger, 16.8 mm cl (USNM 260810); off Camp Walton, Jan. 27, 1939, coll. L. A. Burry: 1 ♀, 24.1 mm cl (USNM 260811); 25 mi south of Fort Walton, 19–22 fms (= 34.8–40.2 m), July 31, 1948, coll. L. A. Burry: 4 ♂, 6.0–10.6 mm cl, 1 ♀, 13.1 mm cl (AMNH 10247); 25 mi



east-southeast of Destin, 13–14 fms (= 23.8–25.6 m), July 30, 1948, coll. L. A. Burry: 1 ♂, 13.3 mm cl (AMNH 10248); 5 mi east of Destin, 40–70 ft (= 12.1–21.2 m), Summer 1972 or 1973, coll. M. Jervey: 1 ♀, 7.9 mm cl (USLZ 3590); *Escambia Co.*: Sta. 7814, off light, Pensacola, 12 fms (= 21.9 m), Jan. 18, 1913, coll. “Fish Hawk”: 3 ♂, 6.7–18.9 mm cl, 2 ♀, 6.3–12.5 mm cl (USNM 65848); Pensacola, July 1893, coll. J. E. Benedict: 1 ♂, 19.9 mm cl (USNM 17924); Pensacola, coll. S. Stearns: 1 ♂, 20.1 mm cl (USNM 4614); **Texas**: Heald Banks (Sabine), Jefferson Co., coll. Magnolia Field Research Lab: 1 ♂, 17.2 mm cl (USNM 97680).

**Mexico: Veracruz**: Boca del Rio, Aug. 9, 1949, coll. B. W. Halstead: 1 ♂, 19.4 mm cl (LACM-AHF uncataloged); **Campeche**: Sta. C-425, 19°47.5'N, 91°47.5'W, 24 fms (= 43.9 m), Aug. 19, 1951, coll. R/V “Combat”: 1 ♂, 20.6 mm cl (USNM 260806).

**Dominican Republic**: Barahona Bay, Santo Domingo, 1932–1933, coll. J. C. Armstrong: 1 juvenile, 4.3 mm cl (AMNH 10364).

**Puerto Rico**: Salinas Cove from Don Luis Cayo, June 27, 1915, coll. R. C. Osburn: 1 oviger, 9.0 mm cl (AMNH 2160).

**Brazil**: Cruise 58, Sta. BBC 1619 (17704), 01°24'N, 47°13'W”, 35–36 fms (= 64.0–65.8 m), May 13, 1975, coll. R/V “Oregon II”: 1 ♀, 11.4 mm cl (USNM 260862); São Sebastião, São Paulo, coll. H. Luederwaldt: 2 ♂, 15.6–19.1 mm cl, 1 ♀, 15.0 mm cl (USNM 104658), 1 ♂, 18.2 mm cl, 1 ♀, 20.5 mm cl (RMNH 15260 ex USNM 104658), 2 ♀, 17.4–17.9 mm cl (BMNH 1976.423 ex USNM 104658).

**Ascension Island** (St. Helena): “deep water,” James Bay, 1973, coll. A. Flagg: 1 ♀, 10.1 mm cl (USNM 151035).

**DIAGNOSIS**: Carapace wider than long, covered with strongly setose grooves. Anterior margin with 8–11 spines on either side of ocular sinus. Setal field with narrow lateral elements and straight anterior margin. CG1 with separate posterior lateral elements; CG4 with one or two short, anteriorly displaced medial elements between longer supralateral elements; CG5 present as two oblique triangular elements; CG6 and CG7 separate; CG8 complete; CG11 present. Rostrum present, overreaching posterior margin of ocular

plate. Ocular plate triangular. Distal peduncular segments dorsoventrally flattened and triangular, tapering at tip, approximated along mesial margins, lateral margins convex, mesial margins straight. Cornea at tip. Dactylus of pereopod II with heel slightly produced, low and rounded. Dactylus of pereopod III with heel slightly projecting, rounded. Dactylus of pereopod IV sinuous from base to tip, with slight indent. Telson of male elongate, ovate, with strongly produced mucronate tip, dorsal surface with ovate, elevated, medial area and row of long thin setae. Telson of female flattened and ovate, tapered at tip, with longitudinal row of short, thin setae medially.

**DESCRIPTION**: Carapace (fig. 113A) wider than long. Anterior margin slightly concave on either side of ocular sinus, becoming convex laterally with seven to nine large and one or two small spines ( $n = 4$ ) along length. Rostrum as small acute tooth, reaching and overlapping proximal margin of ocular plate. Ocular sinus smoothly concave with few low lateral tubercles in large specimens. Frontal region smooth; setal field narrow anteriorly and posteriorly; posterior lateral elements reduced to narrow bands of setae. CG1 parallel to anterior margin of carapace, sinuous, strongly crenulate, divided into medial fragment and curved, posteriorly displaced lateral elements. Mesogastric region smooth; CG2 present as two short medial elements; CG3 broken into five or six short elements between posterior lateral elements of CG1; CG4 with one or two short, anteriorly displaced medial elements between longer supralateral elements. Hepatic region smooth, with oblique setose groove at median of lateral margin. Epibranchial region generally triangular, smooth; posterolateral margin without rows of setae. Metagastric region smooth; CG5 present as two oblique triangular elements. CG6 strongly crenulate, strongly anteriorly concave medially and sloping out to anteriorly convex lateral thirds. CG7 oblique, not reaching lateral margins of median segment of CG6. Cardiac region smooth; CG8 present as one long medial element. CG9 present as two short lateral grooves with gap at midline. CG10 present as two curved lateral elements. CG11 present as two or three short elements. Post-CG11

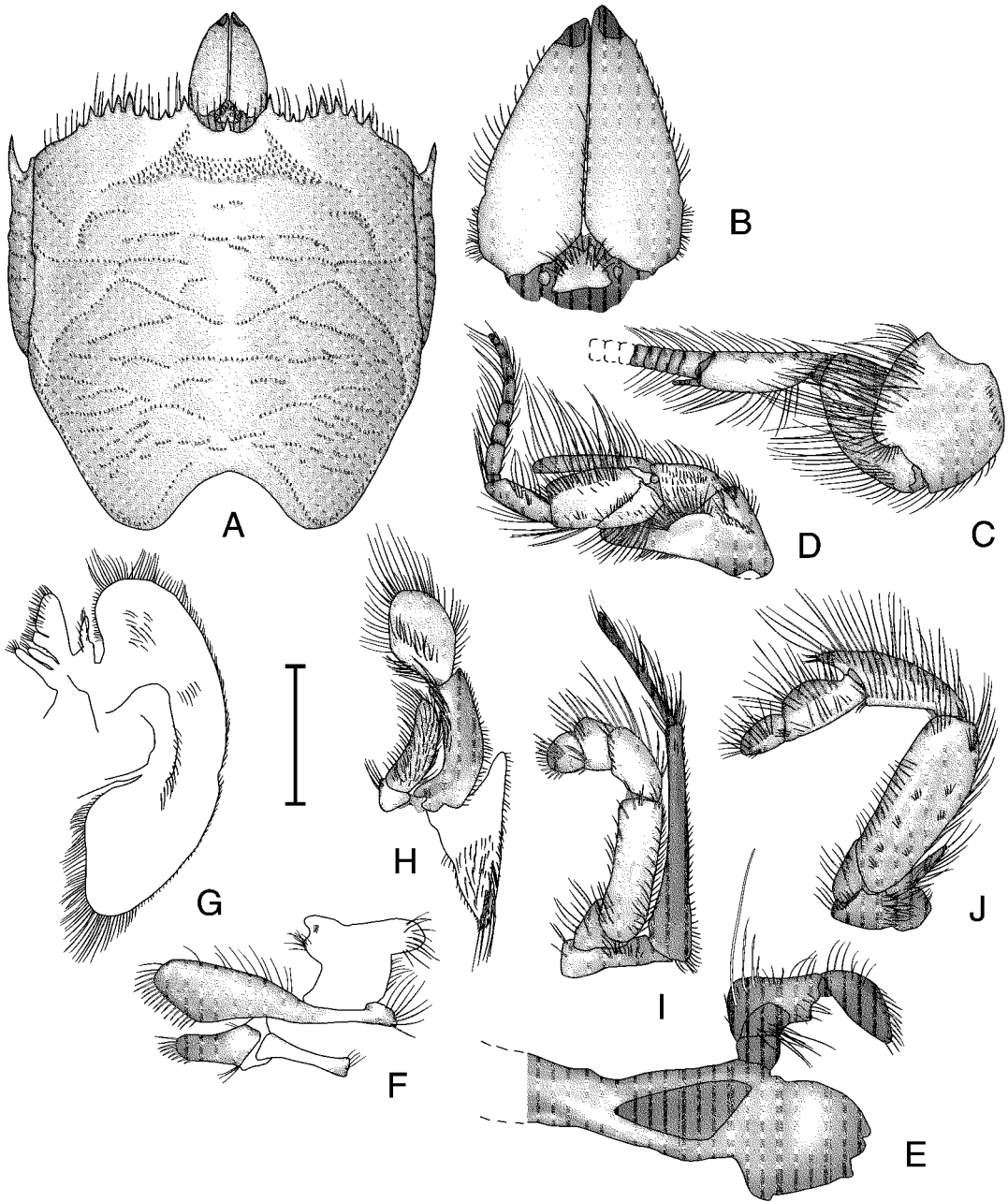


Fig. 113. *Albunea gibbesii* Stimpson, 1859: A–J, ♂, 10.6 mm cl, AMNH 10247. **A.** Carapace, branchiostegite, and ocular peduncles, dorsal view. **B.** Ocular peduncles, dorsal view. **C.** Left antennule, lateral view. **D.** Left antenna, lateral view. **E.** Left mandible, mesial view. **F.** Left maxillule, lateral view. **G.** Left maxilla, lateral view. **H.** Left maxilliped I, lateral view. **I.** Left maxilliped II, lateral view. **J.** Left maxilliped III, lateral view. Scale = 1.6 mm (B, E, F), 2.2 mm (I), and 3.3 mm (A, C, D, G, H, J).

element absent. Branchial region with numerous short, transverse rows of setae in anterior two-thirds. Posterior margin deeply and evenly convex, with submarginal groove reaching three-fourths up margin of posterior concavity. Branchiostegite with short anterior submarginal spine; anterior region with scattered short, transverse lines ventral to *linea anomurica*; with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 113B) triangular with acute median indentation; median peduncular segments present as small ovate, calcified areas lateral to ocular plate. Distal peduncular segments elongate, subtriangular, with convex lateral and straight mesial margins, cornea covering lateral portion of distal tip; lateral margins with notch one-third distal from base; mesial margins approximated along length; lateral and mesial margins with long plumose setae; tuft of plumose setae at proximalateral ventral angles and ventromedial oblique row of plumose setae extending from tuft to three-fourths length of segment.

Antennule (fig. 113C) with segment III narrow proximally, expanding distally to two times proximal width; with plumose setae on dorsal and ventral margins and sparsely scattered on lateral surface; dorsal exopodal flagellum with 73–81 articles ( $n = 4$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with two or three articles ( $n = 4$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins and scattered on ventrolateral third of surface. Segment I wider than long, unarmed; dorsal third of lateral surface rugose, with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 113D) with segment V approximately three times longer than wide, with long plumose setae on dorsal and ventral margins and scattered on lateral surface; flagellum with six to eight articles ( $n = 4$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV expanded distally, with long plumose setae on dorsal, ventral, and distal margins, and scattered setae

on dorsolateral surface. Segment III with long plumose setae on dorsal and ventral margin and in short row on surface. Segment II short, widening distally, rugose, with plumose setae on margins and scattered on lateral surface; antennal acicle long, thin, and exceeding distal margin of segment IV by one-sixth length of segment IV, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventrolaterally, with long plumose setae on margins and in short row on surface rugae behind spine; lateral surface with acute spine dorsodistally, with low semicircular dorsolateral lobe ventrodorsal to spine; segment with ventromesial antennal gland pore.

Mandible (fig. 113E) incisor process with three teeth; cutting edge with one tooth. Palp three-segmented, with plumose setae on margins and long, thick, simple setae arising from bend in second segment and on distal margin of terminal segment.

Maxillule (fig. 113F) distal endite proximally narrow, widening to inflated distal end, with thick simple setae on distal margin and thin simple setae on dorsal margin. Proximal endite with thick simple setae on distal margin. Endopodal external lobe truncate distally and curled under; internal lobe reduced with two thick setae at distolateral margin.

Maxilla (fig. 113G) exopod evenly rounded, with plumose setae along distal margin and scattered on surface. Scaphognathite bluntly angled on posterior lobe, with plumose setae.

Maxilliped I (fig. 113H) epipod with plumose setae on margins, distolateral surface, and mesial surface. Endite tapered distally and subequal to first segment of exopod. Exopod with two segments; proximal segment narrow, parallel margins with plumose setae; distal segment spatulate, longer than wide, broadest medially, margins and mesioventral surface with long plumose setae. Endopod flattened and elongate, reaching two-thirds to distal end of proximal exopodal segment; plumose setae on margins and median of lateral surface.

Maxilliped II (fig. 113I) dactylus evenly rounded, length subequal to width, with thick simple setae distally and on distolateral surface. Propodus 1.5 times wider than long, slightly produced at dorsodistal angle, with

plumose setae on dorsal margin and patch of long simple setae on dorsodistal and ventrodistal angles. Carpus not produced dorsodistally, approximately two times longer than wide; long simple setae on dorsal and distal margins. Merus approximately three times longer than wide, margins parallel; with simple and plumose setae on margins and scattered on surface. Basis-ischium incompletely fused, with plumose setae on margins. Exopod one-third longer than merus, flagellum with one elongate article, longer than carpus.

Maxilliped III (fig. 113J) dactylus oblong with rounded tip; long plumose setae on margins and lateral surface. Propodus dorsodistally inflated, with longitudinal median row of plumose setae on lateral surface; margins with plumose setae. Carpus produced onto propodus almost one-third length of propodus; lateral surface with two rows of plumose setae; plumose setae on margins. Merus inflated, unarmed, with plumose setae on margins and scattered in short rows on lateral surface. Basis-ischium incompletely fused, with weak crista dentata of two or three teeth. Exopod two-segmented: proximal segment small; distal segment styliform, tapering, approximately one-third length of merus; with plumose setae on margins; without flagellum.

Pereopod I (fig. 114A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose setae; ventral margin with short simple setae. Propodal 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; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle produced into strong corneous-tipped spine; dorsal margin with short transverse grooves behind spine; dorsal and distal margins with long plumose setae; lateral surface with small distal rugose area, with few transverse setose ridges on distal half of surface; mesial surface smooth, with medial transverse row of setae, margins with long plumose setae. Merus unarmed; lateral surface with scattered transverse rows of long plumose setae, dorsodistal margin with long plumose setae; mesial surface with few scat-

tered setae; fully calcified. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 114B) dactylus smooth; base to heel slightly concave, heel produced, broad and rounded, heel to tip with narrow, acute indent, tip acute, tip to base broadly convex; lateral surface smooth, with several small tufts of short setae in generally 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 simple setae, with patch of long plumose setae at base. Propodal dorsal surface smooth, with 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 as narrow, oblique, flattened shelf, with 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 produced and rounded dorsodistally, dorsomedial margin with low teeth; produced area smooth, lateral surface smooth, with irregular interrupted row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; margins with long plumose setae; mesial surface smooth, with row of long plumose setae distally and subdorsally. Merus with large median decalcified window covering nearly all of lateral surface, with long plumose setae on margins; mesial surface nearly smooth, with two long rows of setae. Basis-ischium incompletely fused and unarmed. Coxa with one small acute anterior spine.

Pereopod III (fig. 114C) dactylus with base to heel slightly concave, heel low and rounded, heel to tip with broadly concave indent, tip acute, tip to base smoothly convex; lateral surface smooth, with several small tufts of short setae in generally straight line across medioproximal surface, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth with plumose setae proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface



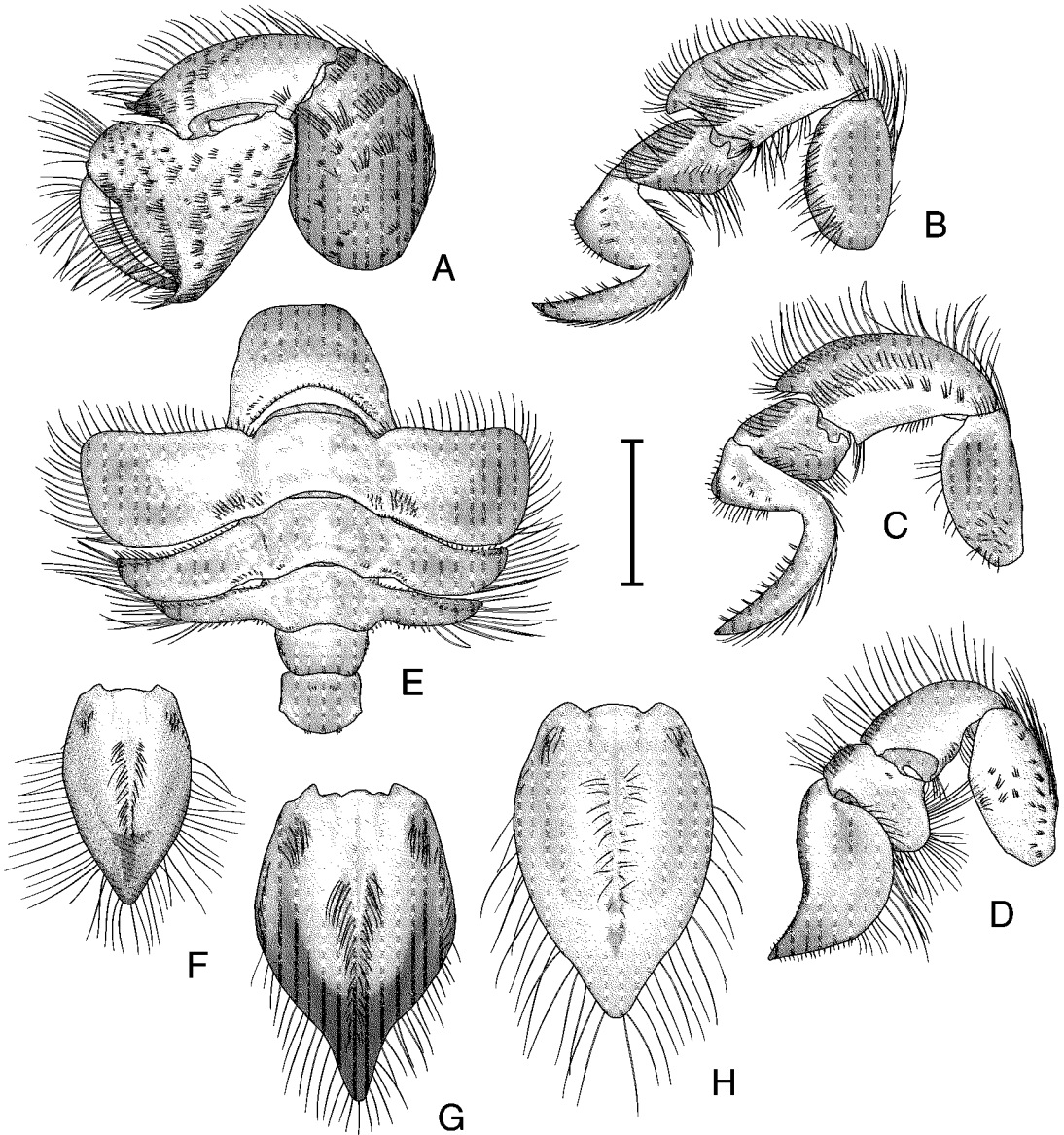


Fig. 114. *Albunea gibbesii* Stimpson, 1859: A–F, ♂, 10.6 mm cl, AMNH 10247; G, ♂, 15.1 mm cl, ANSP 4438; H, ♀, 12.8 mm cl, MCZ 19651. **A.** Left pereopod I, lateral view. **B.** Left pereopod II, lateral view. **C.** Left pereopod III, lateral view. **D.** Left pereopod IV, lateral view. **E.** Abdominal somites I–VI, dorsal view. **F.** Telson of immature ♂, dorsal view. **G.** Telson of mature ♂, dorsal view. **H.** Telson of ♀. Scale = 2.2 mm (H), 3.0 mm (F, G), 3.3 mm (C, E), and 4.4 mm (A, B, D).

smooth, with oblique row of long plumose setae, simple setae on dorsal margin, plumose setae on ventral margin; dorsolateral surface narrow, oblique, flattened, with long plumose setae on ventral margin; mesial surface smooth. Carpus produced dorsodistally,

exceeding proximal margin of propodus by one-third length of propodus; tip rounded, dorsolateral margin unarmed; lateral surface slightly rugose dorsodistally, with mat of short setae and two interrupted rows of setae ventrally; mesial surface smooth, with long

plumose setae on distal margin and in oblique row on surface. Merus smooth, with large decalcified window covering nearly half of lateral surface medially; dorsal and ventral margins unarmed, with long plumose setae dorsodistally and ventrally; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa with one small, acute, anterior spine. Female with large gonopore on medial mesial margin of coxa, surrounded with short plumose setae and opposing other coxa; male with minute pore.

Pereopod IV (fig. 114D) dactylus with base to tip convex proximally, with broadly rounded, strongly concave indent and almost straight from indent to tip, tip acute, tip to base concave distally to convex proximally; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge with row of short setae; with setose punctations ventral to decalcified window. Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, ventral margin with long plumose setae; dorsal expansion with row of long plumose setae dorsally, oblique area with mat of short simple setae; lateral surface smooth, mesial surface smooth, with distoventral area of few patches of long plumose setae. Carpus not produced dorsodistally; ventral five-sixths of lateral surface and mesial surface smooth, dorsodistal sixth of lateral surface with mat of short setae; dorsal margin with short simple and long plumose setae; ventral margin with short simple setae; mesial surface decalcified medially. Merus with scattered, short, transverse rows of setae on lateral surface, dorsal and ventrodistal margins with long plumose setae; proximoventral half of mesial surface with large decalcified window. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 114E) somite I width subequal to length, widest posteriorly; dorsal surface with anterior margin straight; posterior margin curved, with elevated submarginal row of short setae; small transverse decalcified windows laterad of segment median. Somite II dorsal surface with irregular submarginal transverse ridge anteriorly; with

small transverse decalcified windows laterad of segment median just anterior to submarginal ridge; pleura expanded and directed anterolaterally; anterolateral margins angled, anterior and lateral margins with long plumose setae, posterolateral angle rounded, posterior margin with short setae; postero-mesial angle with mat of short simple setae. Somite III similar to somite II, but narrower, shorter; pleura thinner and shorter than on somite II, directed posterolaterally, with setae as in somite II; anterolateral angle subacute; dorsal surface obliquely flattened anterolaterally, with submarginal row of short setae. Somite IV similar to somite III, but thinner and shorter; 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 slightly broader than somite V; dorsal surface with short transverse rows of setae laterad of midline and at posterior margin; pleura absent.

Females with uniramous, paired pleopods on somites II-V; males without pleopods.

Telson of immature male (fig. 114F) similar to female (see below) with even less concave distal margins and no produced tip. Telson of mature male (fig. 114G) elongate, oval, laterally produced, longer than wide, distal margin deeply concave on either side of strongly produced, decalcified, rounded tip; thickly calcified medially, inflated dorsally; distal two-thirds with lateral decalcified region; median longitudinal groove extending one-half length, dense row of long simple setae of either side of median groove beginning at median and continuing almost to distal margin of produced tip; proximolateral angles each with patch of long simple setae; margins with long simple setae becoming submarginal at point proximal to greatest width. Telson of female (fig. 114H) flattened, ovate, and evenly calcified, with slightly produced tip; median groove similar to male, setal row from midpoint of median groove to near distal margin of inflated region with sparse simple setae shorter than those of male; proximolateral angle with few short setae, margins with long simple setae.

DISTRIBUTION: From Bermuda and Cape Lookout, North Carolina, south through the

Gulf of Mexico and Caribbean to São Paulo, Brazil; also Ascension Island; in 2.0–90.0 m depth (T. D. Cain, 1972).

MAXIMUM SIZE: Males: 24.8 mm cl; females: 24.1 mm cl.

TYPE SPECIMENS: Stimpson's (1859) type specimens were destroyed in the Great Chicago Fire. As this is a very distinctive species, no neotype is required.

TYPE LOCALITY: St. Augustine, Florida, USA.

REMARKS: Stimpson (1859) named this species after L. R. Gibbes and considered Gibbes' (1850b) record of *A. symnista* [sic] to be *A. gibbesii*. Ironically, Gibbes' (1850b) specimen (ANSP 4101a) is actually one of *A. paretii*. Williams (1984) also incorrectly included Gibbes' (1850b) record in the synonymy of *A. gibbesii*. Stimpson (1858) correctly formed the species name as "*Gibbesi*," but as he gave no description, that name is a nomen nudum. Stimpson's (1859) later spelling of this taxon as "*gibbesii*" is the incorrect original spelling and must be used for this species, as he listed it twice by that spelling and there is therefore no evidence of a lapsus calami or printer's error. Stimpson (1859) only illustrated the male telson of this species, but that was a distinctive enough structure to allow unambiguous identifications of this species by most subsequent authors.

The color of this species is light brown to orange-tan, with lighter carapace grooves, antennules with alternating light and dark flagellar articles (modified from Williams, 1984). Little is known about the biology of this species, outside of ovigerous females known from North Carolina in June (Williams, 1984). It remains to be seen if the single zoea IV described from the plankton off Georgia by Kurata (1970) is actually this species or *A. catherinae*, n. sp. The larval development of *A. gibbesii* is otherwise unknown. Williams' (1984) remark that this species "is occasionally found on exposed sandy shoals, especially at times of extreme low tides" more likely refers to *A. catherinae*, n. sp., as *A. gibbesii* is rarely found in shallow water. Given the depth (70–90 m), it is likely that the *Albunea* sp. cited by T. D. Cain (1972) is this species rather than the typically shallower water *A. catherinae*, n.

sp. *Albunea gibbesii* is a known prey item of the reef fish *Haemulon album* (Cuvier and Valenciennes) and *Trachinotus falcatus* (Linnaeus) in the West Indies (J. E. Randall, 1967).

This is the first record of this species in Bermuda, where it co-occurs with *A. paretii*. The specimen from Ascension Island (St. Helena) cited by Stebbing (1914) is conspecific with USNM 151035, as is evident from Stebbing's description of the telson as "drawn out subacutely" and the dactylus of pereopod III being "without the narrow linear lobe" (= acute heel). Although it may appear surprising that the specimens from Ascension Island are conspecific with ones from the western Atlantic, this island contains many taxa also known from the West Indian Province of the Western Atlantic Region (Briggs, 1974).

The drawings of this species given by Calado (1987) contain several errors in the pereopod II, female telson, antennal flagellae, and the carapace groove pattern (Calado, 1987: figs. 6, 7a) bears no resemblance to the actual pattern (fig. 113A, herein). These illustrations were repeated by Calado (1995).

This distinctive species appears to be the sister taxon to *A. thurstoni*, but as only two apparently immature male *A. thurstoni* are known, no definitive statement can be made about their relationships.

#### *Albunea thurstoni* Henderson, 1893

Figures 115, 116

*Albunea Thurstoni* Henderson, 1893: 338, 409–410, pl. 38, figs. 13–15\*. – Nobili, 1906: 143. – Balss, 1916b: 2.

*Albunea thurstoni*: Ortmann, 1896: 224 (list). – Southwell, 1910: 183\*. – Ramadan, 1936: 3 (list). – Gordon, 1938: 187, fig. 3a, i, k\*. – Holthuis, 1958: 43–44, fig. 2\*. – Serène and Umali, 1965: 99–102, pl. 1, fig. 3, pl. 2, fig. 3, pl. 3, fig. 2, pl. 4, fig. 3, pl. 5, figs. 1, 1a, text-figs. 8, 9a. – Lewinsohn, 1969: 177, 179, 193. – Coêlho and Calado, 1987: 43, table 1. – Calado, 1995: 81–83, pl. 4, fig. j, pl. 5, fig. i, pl. 25, figs. a–e\*. – Calado, 1997a: 17. – Boyko and Harvey, 1999: 400 (list), 401 (key). – Boyko, 1999: 145 (list).

?*Albunea symmysta*: Nurul Huda et al., 1989: 88–89 (not *Albunea symmysta* (Linnaeus, 1758)). not *Albunea thurstoni*: Thomassin, 1969, 146–

149, pl. 4, figs. 1–8, text-figs. 3d, 5 (= *Albunea speciosa* Dana, 1852).

**MATERIAL EXAMINED:** **Yemen:** May–June 1977, coll. unknown: 1 ♀, 7.9 mm cl (USLZ 2264).

**Oman:** Muscat, 10–15 fms (= 18.3–27.4 m), coll. unknown: 2 ♀, 5.4–8.1 mm cl (BMNH 1901.4.20.11–12).

**India:** Cheval, Madras, coll. unknown: 1 ♂, 5.0 mm cl, 1 ♀, 6.8 mm cl, syntypes (BMNH 1894.11.3.4–5).

**Australia:** Sta. Bone-NW Shelf–39, 19°07.19'S, 120°30.22'E, off Kimberley, Western Australia, 50 m, July 1, 1999, coll. Y. Bone: 1 immature? ♂, 6.0 mm cl (MOV J47317).

**Loyalty Islands:** Sta. 1413, 20°55.3'S, 167°05.0'E, Baie du Santal, Lifou, 3–10 m, Nov. 18, 2000, coll. LIFOU 2000: 1 immature ♂: 6.5 mm cl (MNHN-Hi 263).

**DIAGNOSIS:** Carapace as long as wide, covered with strongly setose grooves. Anterior margin with 8–10 spines on either side of ocular sinus. Setal field with narrow lateral elements and concave anterior margin. CG1 with separate posterior lateral elements; CG4 with one or two long, anteriorly displaced, medial elements between longer supralateral elements; CG5 present as two convex, triangular elements; CG6 and CG7 separate; CG8 complete; CG11 present. Rostrum present, overreaching posterior margin of ocular plate. Ocular plate triangular. Distal peduncular segments dorsoventrally flattened and oblong in shape, tapering at tip, approximated along mesial margins, lateral margin convex, mesial margin straight. Cornea at tip. Dactylus of pereopod II with heel slightly produced, low, and rounded. Dactylus of pereopod III with heel slightly projecting, rounded. Dactylus of pereopod IV sinuous from base to tip, with slight indent. Telson of female flattened and ovate, longitudinal row of short, thin setae medially.

**DESCRIPTION:** Carapace (fig. 115A) approximately as long as wide. Anterior margin slightly concave on either side of ocular sinus, becoming convex laterally, with 8–10 large and small spines ( $n = 4$ ) along length. Rostrum as small acute tooth, overreaching reaching proximal margin of ocular plate. Ocular sinus smoothly concave and unarmed.

Frontal region smooth; setal field narrow anteriorly and posteriorly; posterior lateral elements reduced to narrow bands of setae. CG1 parallel to anterior margin of carapace, sinuous, strongly crenulate, divided into medial fragment and curved, posteriorly displaced lateral elements. Mesogastric region smooth; CG2 present as two short medial elements; CG3 broken into two or three short medial elements between posterior lateral elements of CG1; CG4 with one or two long, anteriorly displaced, medial elements between longer supralateral elements. Hepatic region smooth, with oblique setose groove at median of lateral margin. Epibranchial region generally triangular, smooth; posterolateral margin with two short rows of setae. Metagastric region smooth; CG5 present as two convex, triangular elements. CG6 strongly crenulate, strongly anteriorly concave medially, and sloping out to anteriorly convex lateral thirds. CG7 oblique, not reaching lateral margins of median segment of CG6. Cardiac region smooth; CG8 present as one long element. CG9 present as two short lateral grooves with gap at midline. CG10 present as two long curved lateral elements, with gap between fragments. CG11 present as long medial element. Post-CG11 element absent. Branchial region with numerous short, transverse rows of setae. Posterior margin deeply and evenly convex, with submarginal groove reaching five-sixths up margin of posterior concavity. Branchiostegite with short anterior submarginal spine; anterior region with scattered short, transverse lines ventral to *linea anomurica*; with many short rows of setae and sparsely covered with long plumose setae ventrally; posterior region membranous, with numerous irregular fragments and sparsely covered with long plumose setae.

Ocular plate (fig. 115B) triangular with shallow median indentation; median peduncular segments present as small ovate calcified areas lateral to ocular plate. Distal peduncular segments elongate, subtriangular, with slightly lateral and straight mesial margins, cornea covering distolateral tip; mesial margins approximated along length; mesial and lateral margins with short plumose setae; tuft of plumose setae at proximolateral ven-



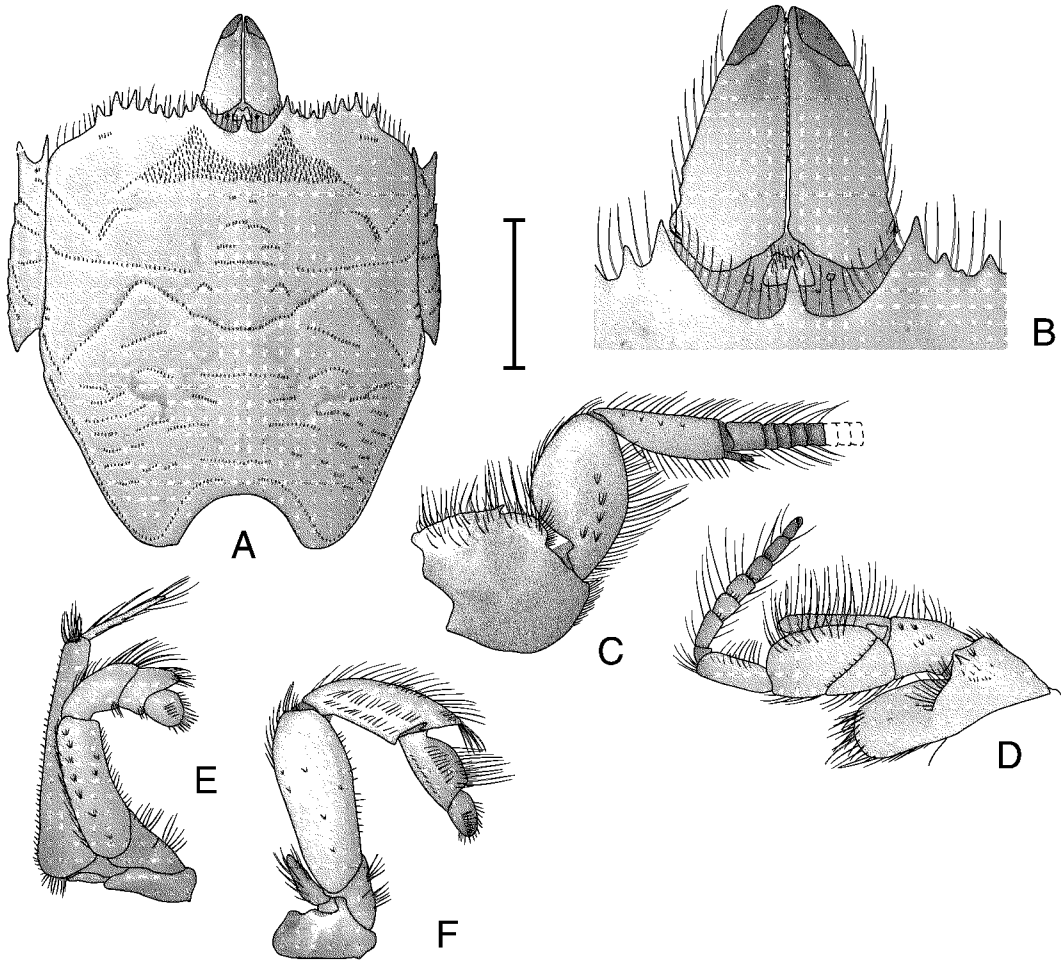


Fig. 115. *Albunea thurstoni* Henderson, 1893: A–F, ♀, 6.8 mm cl, BMNH 1894.11.3.4–5, syntype. **A.** Carapace, branchiostegite, and ocular peduncles, dorsal view. **B.** Ocular peduncles, dorsal view. **C.** Right antennule, lateral view. **D.** Left antenna, lateral view. **E.** Right maxilliped II, lateral view. **F.** Right maxilliped III, lateral view. Scale = 0.8 mm (B), 1.4 mm (C, E), 1.6 mm (D), and 2.2 mm (A, F).

tral angle and medial row of plumose setae extending from tuft to base of cornea.

Antennule (fig. 115C) with segment III narrow proximally, expanding distally to three times proximal width; with plumose setae on dorsal and ventral margins; dorsal exopodal flagellum with 66 articles ( $n = 1$ ), long plumose setae on dorsal and ventral margins; ventral endopodal flagellum with two articles ( $n = 4$ ), plumose setae on dorsal and ventral margins. Segment II medially inflated in dorsal view, with plumose setae on dorsal and ventral margins and in sparse transverse medial row on lateral surface.

Segment I as long as wide, with short acute spine on dorsal margin; dorsal third of lateral surface rugose, with long plumose setae; long plumose setae on dorsal and ventral margins.

Antenna (fig. 115D) with segment V approximately three times longer than wide, with long plumose setae on dorsal margin and distoventral angle; flagellum with seven articles ( $n = 4$ ), long plumose setae on dorsal, ventral, and distal margins. Segment IV expanded distally, with long plumose setae on dorsal and ventral margins. Segment III with long plumose setae on ventral margin,

short simple setae on dorsal margin. Segment II short, widening distally, rugose, with plumose setae on margins and scattered on lateral surface; antennal acicle long, thin, and reaching distal margin of segment IV, with long plumose setae on dorsal margin. Segment I rounded proximally, flattened ventrolaterally, with long plumose setae on margins and scattered on surface rugae behind spine; lateral surface with acute spine dorsodistally, with low semicircular dorsolateral lobe ventrodorsal to spine; segment with ventromesial antennal gland pore.

Mandible, maxillule, maxilla, maxilliped I unknown.

Maxilliped II (fig. 115E) dactylus evenly rounded, length equal to width, with thick simple setae distally and on distolateral surface. Propodus two times wider than long, produced at dorsodistal angle, with plumose setae on dorsal margin and patch of long simple setae on dorsolateral and ventrolateral angles. Carpus not produced dorsodistally, approximately two times longer than wide; long simple setae on dorsal margin and on distoventral angle. Merus approximately three times longer than wide, margins parallel; with simple and plumose setae on margins and scattered on surface. Basis-ischium incompletely fused with plumose setae on margins. Exopod one-half longer than merus, flagellum with one elongate article.

Maxilliped III (fig. 115F) dactylus with rounded tip; long plumose setae on margins and lateral surface. Propodus dorsodistally inflated, with longitudinal median row of plumose setae on lateral surface; margins with plumose setae. Carpus produced onto propodus almost one-third length of propodus; lateral surface with two rows of plumose setae; long plumose setae on margins. Merus cylindrical, unarmed, with plumose setae on distodorsal margin and sparsely scattered on lateral surface. Basis-ischium incompletely fused, with weak crista dentata of three or four teeth. Exopod two-segmented: proximal segment small; distal segment styliform, tapering, approximately one-third length of merus; with plumose setae on margins; without flagellum.

Pereopod I (fig. 116A) dactylus curved and tapering; lateral and mesial surfaces smooth; dorsal margin with long plumose

and short simple setae; ventral margin with short simple setae. Propodus 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; dorsal margin with long plumose setae, ventral margin with short simple setae. Carpus with dorsodistal angle produced into strong corneous-tipped spine; dorsal margin with short transverse grooves behind spine; dorsal and distal margins with long plumose setae; lateral surface with small distal rugose area, few transverse setose ridges on distal half of surface; mesial surface smooth, with medial transverse row of 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 scattered setae; fully calcified. Basis-ischium incompletely fused, unarmed. Coxa unarmed.

Pereopod II (fig. 116B) dactylus smooth; base to heel slightly concave, heel subquadrate and rounded, heel to tip with wide, subacute indent, tip acute, tip to base broadly convex; lateral surface smooth, with several small tufts of short setae in generally 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 simple setae and patch of long plumose setae at base. Propodal dorsal surface smooth, with 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 as narrow, oblique, flattened shelf, with 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 and gently rounded dorsodistally, dorsal margin unarmed; lateral surface smooth, with setose mat at tip of produced area and irregular, interrupted row of rugae and submarginal elevated ridge ventrally, rugae and ridge with long plumose setae; margins with short plumose setae; mesial surface smooth,

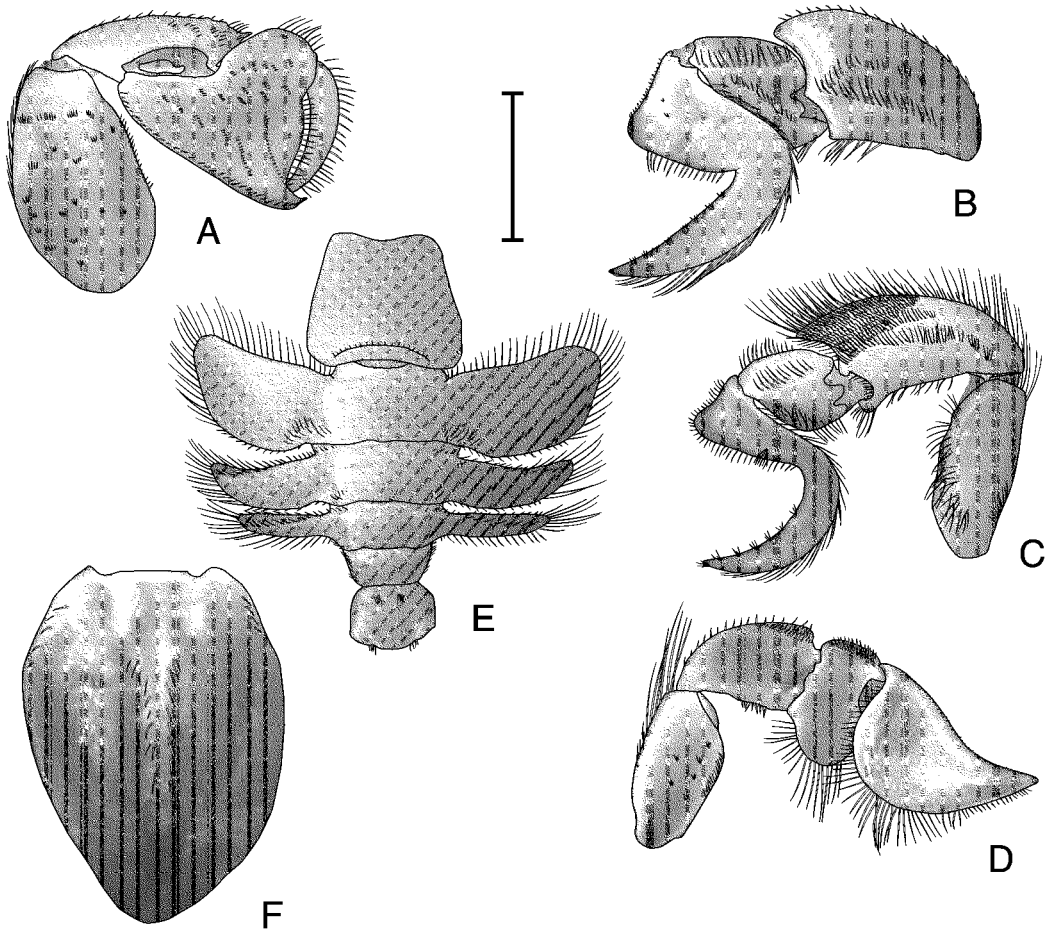


Fig. 116. *Albunea thurstoni* Henderson, 1893: A, B, D, F, ♀, 6.8 mm cl, BMNH 1894.11.3.4–5, syntype; C, E, ♀, 5.4 mm cl, BMNH 1901.4.20.11–12. A. Right pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Right pereopod IV, lateral view. E. Abdominal somites I–VI, dorsal view. F. Telson of immature ♂, dorsal view. G. Telson of ♀, dorsal view. Scale = 0.8 mm (F), 1.8 mm (E), 2.2 mm (A, B, D), and 2.5 mm (C).

with row of long plumose setae subdorsally. Merus with large median decalcified window covering nearly all of lateral surface, with few scattered long plumose setae on surface and margins; mesial surface nearly smooth, with two long rows of setae. Basis-ischium incompletely fused and unarmed. Coxa of male and female with small acute spine on anterior margin.

Pereopod III (fig. 116C) with dactylus with base to heel concave, heel produced and rounded, heel to tip with broadly concave indent and small concave region at midpoint of proximal margin, tip acute, tip to base smoothly convex; lateral surface smooth,

with tuft of short setae on medioproximal surface, dorsodistal margin with tufts of short setae; ventral margin with long plumose setae, dorsal margin with short simple and plumose setae; mesial surface smooth, with plumose setae proximally at junction with propodus. Propodus not inflated dorsoventrally; lateral surface smooth, with long plumose setae in oblique row, simple setae on dorsal margin; dorsolateral surface narrow, oblique, flattened, with long simple setae on ventral margin; mesial surface with scattered long setae on and near distal margin and in oblique row on surface. Carpus produced dorsodistally, exceeding proximal margin of



propodus by one-fourth length of propodus; dorsolateral margin unarmed; lateral surface slightly rugose dorsodistally, with mat of short setae and two interrupted rows of setae ventrally; mesial surface smooth, with long plumose setae on margins. Merus narrow, smooth, with large decalcified window covering nearly half of lateral surface medially; dorsal and ventral margins unarmed; distodorsal and ventral margins with long plumose setae; mesial surface smooth. Basis-ischium incompletely fused and unarmed. Coxa of male and female with small acute spine on anterior margin. Female with large gonopore on anterior mesial margin of coxa; mature male unknown, but pore lacking on immature male

Pereopod IV (fig. 116D) dactylus with base to tip convex proximally to concave distally, tip acute, tip to base concave distally to convex proximally; lateral surface smooth, ventral margin with long plumose setae, dorsal margin with short simple setae; mesial surface with dorsal decalcified region, demarcated ventrally by longitudinal elevated ridge with row of short setae; with setose punctations ventral to decalcified window. Propodus expanded dorsally and ventrally; ventral expansion reaching ventral margin of dactylus, margin with long plumose setae; dorsal expansion with row of long plumose setae dorsally, oblique area with mat of short simple setae; lateral and mesial surfaces smooth. Carpus slightly produced dorsodistally; ventral four-fifths of lateral surface and mesial surface smooth, dorsodistal fifth of lateral surface with mat of short setae; dorsal margin with short simple and long plumose setae; ventral margin with short simple setae; mesial surface decalcified medially. Merus with scattered, short, transverse rows of setae on lateral surface in ventral half, dorsal margin with long plumose setae, ventral margin with short plumose setae; proximoventral half of mesial surface with large decalcified window. Basis-ischium incompletely fused and unarmed. Coxa unarmed.

Abdomen (fig. 116E) with somite I wider than long, widest posteriorly; dorsal surface with anterior margin concave; posterior margin curved, with elevated submarginal row of short setae; small transverse, decalcified windows laterad of segment median. Somite

II dorsal surface with submarginal transverse ridge anteriorly; with small transverse, decalcified windows laterad of segment median just anterior to submarginal ridge; pleura expanded and directed anterolaterally; lateral margins rounded, anterior and lateral margins with long plumose setae, posterior margin with short setae; posteromesial angle with mat of short simple setae. Somite III similar to somite II, but narrower, shorter; pleura thinner and shorter than on somite II, directed posterolaterally proximally and anterolaterally distally, with setae as in somite II; anterolateral angle subacute; dorsal surface obliquely flattened anterolaterally. Somite IV similar to somite III, but thinner and shorter; 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 broader than somite V; dorsal surface with two short transverse rows of setae laterad of midline and on posterior margin; pleura absent.

Females with uniramous, paired pleopods on somites II–V; immature male with reduced pleopods; mature male unknown.

Telson of immature male (fig. 116F) elongate, not laterally produced, longer than wide, distal margin nearly straight towards rounded tip; thickly calcified in proximolateral two-thirds, inflated dorsolaterally; median longitudinal groove extending one-half length, sparse row of long simple setae of either side of median groove in median third of surface; proximolateral angles each with elongate patch of short simple setae; margins with long simple setae. Telson of female (fig. 116G) flattened, ovate, and evenly calcified, with slightly produced tip; median longitudinal groove extending one-half length, row of short simple setae from proximal end of median groove to near distal margin of telson; proximolateral angle with patch of setae, margins with long simple setae.

DISTRIBUTION: Known with certainty only from Yemen, Oman, India, Western Australia, and Loyalty Islands, in up to 50 m depth. This species probably also occurs in the Red Sea (Nobili, 1906).

MAXIMUM SIZE: Males: 6.5 mm cl; females: 8.1 mm cl.



TYPE SPECIMENS: BMNH 1894.11.3.4–5 (2 syntypes); the current repository of the additional three syntypes is unknown.

TYPE LOCALITY: Cheval Par, Madras, India.

REMARKS: This is a small species of *Albunea*, but the current maximum size for males is clearly an underestimate, as no mature males have been examined. The “female” *A. thurstoni* illustrated by Serène and Umali (1965: pl. 5, fig. 1a) is clearly a mature male, but those authors did not provide measurements of their specimens. The only two males examined lacked gonopores on either the third or fifth pereopods, but possessed reduced pleopods and a different telson morphology than female specimens.

Without direct examination of the specimens cited by Nurul Huda et al. (1989), it is not possible to ascertain its true identity. However, Nurul Huda et al. (1989) described that specimen as having an indistinct spur on the heel of the dactyl of pereopod III, and having a narrower and straighter “ischium” (probably refers to the merus) of maxilliped III than seen on *A. symmysta*. The only species known from the eastern Indian coast which could be easily confused with *A. symmysta*, and which has both those characters, is *A. thurstoni*.

There have been several misconceptions as to the range of this species. Thomassin’s (1969: text-fig. 14) distribution map of this species is inaccurate, as it contains his Madagascar material, which he later described as *A. madagascariensis* (= *A. speciosa*). Also, contrary to the unsupported statement of Calado (1995), this species does not occur in Hawaii, although it does have a broad range in the Indo-Pacific.

Judging by the number of specimens collected, *A. thurstoni* is one of the rarest albuneid species. It is probably not closely related to *A. microps*, as suggested by Henderson (1893), although these two species have a certain similarity in the crenulated appearance of the carapace grooves, but it may be the sister species to *A. gibbesii*. More information is needed about the morphology of *A. thurstoni*, especially the mature male telson, before any conclusions can be drawn.

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## APPENDIX 1: INDETERMINATE LITERATURE RECORDS

As with all systematic revisionary work, there are some records which are impossible to assign to species with confidence unless the specimens are examined. Unfortunately, there are always specimens that have become lost over time or else are not available for examination. These most vexing records are given below with suggestions as to their identities, but all are considered specimens *inquirenda* at present.

*Albunea guerinii*: Stebbing, 1917: 26 (not *Albunea guerinii* Lucas, 1853 = *A. carabus* (Linnaeus, 1758)).

*Albunea symnista* [sic]: Barnard, 1950: 405–406. – Kensley, 1981: 35 (list) (not *A. symmysta* (Linnaeus, 1758)).

REMARKS: Although it is certain that this specimen from Durban is not *A. carabus*, there is no way to accurately ascertain its identity, especially as I have seen no South African, or even Mozambique, material. It may be *A. holthuisi*, which is known from as close as Madagascar. Barnard (1950) saw no new material and only repeated Stebbing's (1917) record while correctly suggesting that it was not likely to be identical with the Mediterranean species *A. guerinii* (a synonym of *A. carabus*). There are two lots of albuneid zoea stage? V larvae in the BMNH from off South Africa (BMNH 1951.2.17.2352, BMNH 1951.2.17.2357) which are probably the larvae of the species cited by Barnard (1950).

Albunealarve Claus, 1876: 59.

“*Albunea*?” Claus, 1876: pl. 9, figs. 1–10.

REMARKS: The most likely identity for these larvae from Zanzibar is either *Albunea holthuisi* or *A. microps*, both of which are known from that area. The larvae of neither species is known.

*Albunea* [sp.] Cano, 1893: 16, 23, pl. 2, figs. 87, 92.

REMARKS: This specimen from China may be the megalopal stage of either *Albunea groeningi*, n. sp. or *A. occultus*, n. sp. Due to the sketchy quality of the drawings, it is unlikely that its true identity will ever be known.

*Albunea* sp. Gurney, 1942: 266, fig. 111.

REMARKS: As with all South African records, the identity of these specimens (larvae) is unknown. They may be *A. holthuisi*, which is the species whose known range has the closest geographic proximity to South Africa.

*Albunea* sp. B Gurney, 1942: 263–266, fig. 110a–d.

*Albunea* sp. Boschi, 1981: 240, fig. 241–57.

REMARKS: These larvae are definitely of the ge-

nus *Lepidopa*, rather than *Albunea*, but as no specimens from the former genus have been reported from Bermuda, it is unclear what taxon they might represent. Comparisons with the larvae described by Stuck and Truesdale (1986) show that Gurney's (1942) larvae are probably not *L. benedicti*. The best candidates are therefore *L. richmondi* and *L. venusta*. Boschi's (1981) figure is a direct copy of Gurney's (1942).

*Albunea symmysta*: Kikuchi and Miyake, 1978: 31 (list) (not *Albunea symmysta* (Linnaeus, 1758)).

REMARKS: This record might refer to *Albunea groeningi*, n. sp. or *A. occultus*, n. sp. It may even represent *Paralbunea dayriti*, which is also known from Amakusa, Japan.

*Albunea symnista* [sic]: Rathbun, 1924: 29 (not *Albunea symmysta* (Linnaeus, 1758)).

REMARKS: These specimens from Cape Jaubert, Australia, are likely either *Albunea groeningi*, n. sp. or *A. occultus*, n. sp., both of which are found in nearby localities. No specimens of true *A. symmysta* are known from Western Australia.

*Albunea symnista* [sic]: T. Sakai, 1935: 61 (not *Albunea symmysta* (Linnaeus, 1758)).

REMARKS: These specimens from Shimoda are likely either *Albunea groeningi*, n. sp. or *A. occultus*, n. sp., both of which are found in nearby localities in Japan.

*Albunea symnista* [sic]: Kikuchi, 1959: 1949 (list). – Kikuchi, 1961: 5 (list) (not *Albunea symmysta* (Linnaeus, 1758)).

*Albunea* [sic] *symnista* [sic]: Kikuchi, 1961: 5 (list) (not *Albunea symmysta* (Linnaeus, 1758)).

REMARKS: These records from Sado Island are likely either *Albunea groeningi*, n. sp. or *A. occultus*, n. sp., both of which are found in nearby localities in Japan.

*Albunea symnista* [sic]: Wang, 1989: 39. – Sun and Wang, 1996: 31 (list) (not *Albunea symmysta* (Linnaeus, 1758)).

REMARKS: These specimens from Zhejiang Province, China, could be *A. symmysta*, although they are more likely either *A. groeningi*, n. sp. or *A. occultus*, n. sp., both of which are found on nearby Taiwan where *A. symmysta* is apparently absent.

*Blepharipoda occidentalis*: Schuster-Dieterichs, 1956: 51 (list, part) (not *Blepharipoda occidentalis* J. W. Randall, 1840).

REMARKS: Whatever taxon Schuster-Dieterichs (1956) identified as *B. occidentalis* from El Salvador, it is very unlikely to be conspecific with

that species. No specimens of *B. occidentalis* are known south of central Baja California, Mexico, and the species, genus and family are otherwise exclusively antitropical in distribution. The El Salvador material may have been a raninid brachyuran, many species of which are large, spinose, and superficially similar in morphology to *Blepharipoda*. Knight (1968a, 1968b) found no *Blepharipoda* larvae in numerous plankton samples from off El Salvador.

*Lepidopa richmondi*: Gore and Van Dover, 1981: 1018–1026, figs. 1–6. – Spivak, 1997: 81 (list) (not *Lepidopa richmondi* Benedict, 1903).

*Lepidopa Richmondi*: Seridji, 1988: 1298 (not *Lepidopa richmondi* Benedict, 1903).

REMARKS: Although these larval and megalopal stages were said not to be *L. richmondi* by Stuck and Truesdale (1986), it is unclear what *Lepidopa* species they represent. Until they can be matched up with larvae reared from a known parent, all that can be said is that they are probably conspecific with either *L. benedicti* or *L. websteri*. The larva of Gore and Van Dover (1981) actually differs from the *L. benedicti* of Stuck and Truesdale (1986) only in minor features. It is here suggested that the single larva of Gore and Van Dover (1981) may have been aberrant in its development and that certain morphological features may be atypical (cf. larvae of Kurata, 1970). There were three zoeal stages and one megalopal stage, obtained in 18+ days at 24°C and 35‰ salinity (Gore and Van Dover, 1981). This is in contrast to the more typical four zoeal stages found in oth-

er *Lepidopa* species (Knight, 1970; Sanchez and Aguilar, 1975; Stuck and Truesdale, 1986). Care must be exercised when extrapolating larval data from a single specimen to an entire species, as both variation and typical development are unknown when only a single specimen is studied.

*Lepidopa scutellata*: Schmitt, 1924: 96 (not *Thia scutellata* (Fabricius, 1793)).

REMARKS: Although it is very possible that Schmitt (1924) did have a *Lepidopa* larva, its identity cannot be determined. Given the Barbados locality, it was probably either *L. richmondi* or *L. luciae*, n. sp., both of which have been collected in nearby Trinidad. This specimen was not mentioned by previous researchers discussing *Lepidopa* larvae (e.g., Gore and Van Dover, 1981; Stuck and Truesdale, 1986).

*Lepidopa* sp. B Knight, 1970: 136–138, figs. 60–64.

*Lepidopa* spp. Knight, 1970: 141 (part).

REMARKS: Some part of the larvae referred to by Knight (1970) under this blanket heading of *Lepidopa* spp. are undoubtedly *L. myops*. However, because *L. californica* and *L. myops* are still the only species of this genus known from the Pacific side of Baja California, the identity of these other larvae is unclear. *Lepidopa* sp. B may only represent additional variability in the larvae of *L. californica*, but more study and more specimens from the west coast of Baja California are required to answer this question with any certainty.

## APPENDIX 2: EXCLUDED TAXA

The following taxa were at one time placed within the Albuneidae. Most were subsequently recognized as “true crabs,” having only convergently evolved characters in common with albuneids, and were removed to other families within the Brachyura. During this study, one species (*Hippa caerulea*) has been found to be a gnathiid isopod. Only those references which included these taxa among the Albuneidae are included, along with a few important works which show correct systematic placement.

ISOPODA LATREILLE, 1817

GNATHIIDAE LEACH, 1814

GNATHIA LEACH, 1813

*Gnathia* sp. cf. *phallonajopsis* Monod, 1925

cf. *Gnathia phallonajopsis* Monod, 1925: 5–6.

*Hippa caerulea* Risso, 1816: 50–51. – Desmarest, 1825: 424. – Risso, 1827: 36–37.

*Hippa caerulea* [sic]: Risso, 1844: 94.

*Hippa caerulea* [sic]: Hope, 1851: 12.

cf. *Gnathia phallonajopsis*: Monod, 1926: 463–470, figs. 195–199 (synonymy).

*Albunea carabus*: Holthuis, 1977: 61–62 (not *Albunea carabus* (Linnaeus, 1758)).

*Gnathia* sp. cf. *phallonajopsis*: Boyko, 2001: 115–122.

REMARKS: As was shown in detail elsewhere (Boyko, 2001), the taxon known as *Hippa caerulea* is not a hippoid decapod at all, but rather is an unidentifiable gnathiid isopod close to *Gnathia phallonajopsis*. The description by Risso (1816) was based on subadult females or possibly praniza larvae.

ANOMURA MACLEAY, 1838  
PAGURIDAE LATREILLE, 1802  
PAGURUS FABRICIUS, 1775

*Pagurus* Fabricius, 1775: 410 (part).  
?*Blepharipoda*: Rathbun, 1926: 126 (not *Blepharipoda* Randall, 1840).

“*Pagurus*” *brucei* (Rathbun, 1926)

*Blepharipoda brucei* Rathbun, 1926: 126–127, pl. 28, figs. 10, 11.

*Pagurus brucei*: Schweitzer and Boyko, 2000: 631.

REMARKS: This species was established based only on a few pereopod fragments. Subsequent examination of the types showed that they could not belong to any *Blepharipoda*, but rather appeared to represent a species of pagurid hermit crab (Schweitzer and Boyko, 2000). Due to the fragmentary nature of the types and only known specimens, the current generic placement is uncertain and they are tentatively referred to the paraphyletic genus *Pagurus* until better preserved material becomes available.

BRACHYURA LATREILLE, 1802  
RANINIDAE de HAAN, 1839  
RANINA LAMARCK, 1801

*Albunea* Weber, 1795: 94 (part). – Fabricius, 1798: 372–373, 397 (part). – Herbst, 1804: 29–31 (part) (not *Albunea* Weber, 1795). *Ranina* Lamarck, 1801: 156.

*Ranina ranina* (Linnaeus, 1758)  
Figure 1D

*Cancer raninus* Linnaeus, 1758: 625.  
*Hippa scabra* Fabricius, 1787: 330. – Fabricius, 1793: 476. – Zimsen, 1964: 648.  
*Albunea scabra*: Weber, 1795: 94. – Fabricius, 1798: 398. – Herbst, 1804: 31 (list). – Haig, 1955: 9.  
*Cancer scaber* [sic]: Herbst, 1796: 11.  
not *Albunea scabra*: Molina, 1810: 187 (= *Blepharipoda spinosa* (H. Milne Edwards and Lucas, 1841)).

REMARKS: The type or types of *Hippa scabra* are lost (Zimsen, 1964). Weber (1795) included this species, under its junior synonym name of *H. scabra*, in his new genus *Albunea*.

NOTOPUS de HAAN, 1841

*Hippa* Fabricius, 1793: 475 (part) (not *Hippa* Fabricius, 1793).

*Albunea* Weber, 1795: 94 (part). – Fabricius, 1798: 372–373, 397 (part). – Duméril, 1816: 431 (part) (not *Albunea* Weber, 1795).  
*Notopus* de Haan, 1841: 137.

*Notopus dorsipes* (Fabricius, 1787)  
Figure 1E

*Hippa dorsipes* Fabricius, 1787: 329.  
*Albunea dorsipes*: Weber, 1795: 94. – Fabricius, 1798: 397–398.  
*Albunea Dorsipede* [sic]: Duméril, 1816: 431.  
*Notopus dorsipes*: T. Sakai, 1965: 1, pl. 1, fig. 1. not *Cancer dorsipes*: Herbst, 1791: 5–8, pl. 2, fig. 2. – Herbst, 1796: 197–198, pl. 45, figs. 1–7 (= *Albunea symmysta* (Linnaeus, 1758)).  
not *Albunea dorsipes*: Herbst, 1804: 31 (list) (= *Albunea symmysta* (Linnaeus, 1758)).

REMARKS: This species was an original member of the genus *Albunea*, as defined by Weber (1795).

CORYSTIDAE SAMOUELLE, 1819  
CORYSTES BOSC, 1801–1802

*Albunea*: Fabricius, 1798: 372–373, 397 (part). – Lamarck, 1801: 155 (part). – Herbst, 1804: 29–31 (part) (not *Albunea* Weber, 1795).  
*Corystes* Bosc, 1801–1802: 65.

*Corystes cassivelaunus* (Pennant, 1777)  
Figure 1B

*Cancer cassivelaunus* Pennant, 1777: 6, pl. 7, fig. 13.  
*Cancer personatus* Herbst, 1785: 193, pl. 12, fig. 71.  
*Hippa symnista* [sic]: Fabricius, 1787: 329 (part) (not *Albunea symmysta* (Linnaeus, 1758)).  
*Albunea Symnista* [sic]: de Villers, 1789: 157–158 (part) (not *Albunea symmysta* (Linnaeus, 1758)).  
*Hippa dentata* Fabricius, 1793: 475.  
*Euryala denata*: Weber, 1795: 94.  
*Albunea dentata*: Fabricius, 1798: 398. – Lamarck, 1801: 155. – Herbst, 1804: 31 (list).  
*Albunea personata*: Lamarck, 1801: 155.  
*Corystes dentata*: Roux, 1829: 70–72, pl. 12.  
*Corystes cassivelaunus*: White, 1850: 21.—Christiansen, 1969: 34–37, fig. 12.

REMARKS: The type or types for *Hippa dentata* are lost (Zimsen, 1964). The types of *Cancer personatus* are in the ZMB (K. Sakai, 1999).

Although moderately convergent with albuneids, and also adapted to a sand-burrowing lifestyle, corystids have long been recognized as brachyurans, primarily because cause their fifth

pereopods are not reduced. This species exhibits so strong a sexual dimorphism that males and females were identified as separate species (*personata* and *dentata*) for many years.

#### THIIDAE DANA, 1852

##### *Thia* LEACH, 1815

*Hippa*: Fabricius, 1793: 474 (part) (not *Hippa* Fabricius, 1787).

*Albunea*: Fabricius, 1798: 372–373, 397 (part). – Herbst, 1804: 29–31 (part). – Desmarest, 1823: 283 (part). – Desmarest, 1825: 172–173 (not *Albunea* Weber, 1795).

*albunea*: Latreille, 1803: 171–172 (part) (not *Albunea* Weber, 1795).

*Thia* Leach, 1815: 312.

*Lepidops*: Miers, 1878: 331–332 (part) (not *Lepidopa* Stimpson, 1858).

*Lepidopa*: Gordon, 1938: 187–190 (part) (not *Lepidopa* Stimpson, 1858).

REMARKS: This genus is no. 1577 on the “Official list of generic names in zoology” (ICZN, 1964).

##### *Thia scutellata* (Fabricius, 1793)

###### Figure 1A

*Hippa scutellata* Fabricius, 1793: 474–475. – Weber, 1795: vii. – Holthuis, 1962: 125–128, pl. 4. – Zimsen, 1964: 649.

*Albunea scutellata*: Fabricius, 1798: 397. – Herbst, 1804: 31 (list). – Desmarest, 1823: 284. – Desmarest, 1825: 173–174.

*albunea scutellata*: Latreille, 1803: 172. – Lamarck, 1818: 224.

*Lepidopa scutellata*: Ortmann, 1896: 226 (part). – Gordon, 1938: 188 (part).

*Lepidopa scutellata*: Holthuis, 1962: 125–128.

*Thia scutellata*: Holthuis, 1962: 125–128. – Christiansen, 1969: 40–41, fig. 14.

*Thia scutella* [sic]: Salva and Feldmann, 2001: 24, fig. 12a–c.

not *Albunea scutellata*: H. Milne Edwards, 1837b: 204, pl. 21, figs. 9–13. – Chenu and Desmarest, 1877: 32, fig. 22 (= *Lepidopa benedicti* Schmitt, 1935).

not *Albunea scutellata*: Gibbes, 1850b: 187 (= *Lepidopa websteri* Benedict, 1903).

not *Albunaea* [sic] *scutellata*: Dana, 1852: 406 (= *Lepidopa chilensis* Lenz, 1902).

not *Lepidopa scutellata*: Stimpson, 1858: 230.—Stimpson, 1859: 79. – Faxon, 1895: 237 (list). – Ortmann, 1896: 226 (part), 227 (part). – Gordon, 1938: 188 (list, part) (= *Lepidopa richmondi* Benedict, 1903).

not *Lepidops* [sic] *scutellata*: Miers, 1878: 332 (part) (= *Lepidopa chilensis* Lenz, 1902).

not *Lepidops* [sic] *scutellata*: Miers, 1878: 332 (part). – Moreira, 1901: 30, 88–89 (= *Lepidopa richmondi* Benedict, 1903).

not *Lepidopa scutellata*: Ortmann, 1896: 226 (part). – Benedict, 1903: 894, fig. 6\*. – Schmitt, 1935: 209–210\* (= *Lepidopa benedicti* Schmitt, 1935).

not *Lepidopa scutellata*: Ortmann, 1896: 227 (part) (= *Lepidopa websteri* Benedict, 1903).

not *Lepidopa scutellata*: Ortmann, 1896: 227 (part). – Gordon, 1938: 188 (part) (= *Lepidopa chilensis* Lenz, 1902).

not *Lepidopa scutellata*: Schmitt, 1924: 96 (= *Lepidopa* sp. indet.).

REMARKS: This species was the last albuneid to be recognized as a brachyuran and removed from the Albuneidae (Holthuis, 1962). The longstanding confusion about the identity of this species dates back to Weber (1795), who placed it under the heading “Cancroidea dubia.” This species later was designated the type of the genus *Lepidopa* by Stimpson (1858), who incorrectly applied the name to a species of that genus. The type species of *Lepidopa* was subsequently designated as *L. venusta* by the plenary powers of the ICZN (ICZN, 1964). The type(s) of *Hippa scutellata* are lost (Holthuis, 1962; Zimsen, 1964) and a neotype (RMNH D351) was designated by Holthuis (1962). The familiar placement of the species has been recently verified by Salva and Feldmann (2001). This specific name is no. 1956 on the “Official list of specific names in zoology” (ICZN, 1964).

This species is also adapted to a sand-dwelling mode of life and has been collected in the same samples as *Albunea carabus* in shallow (3–7 m) water off Spain (Rubió and Holthuis, 1976).