

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-

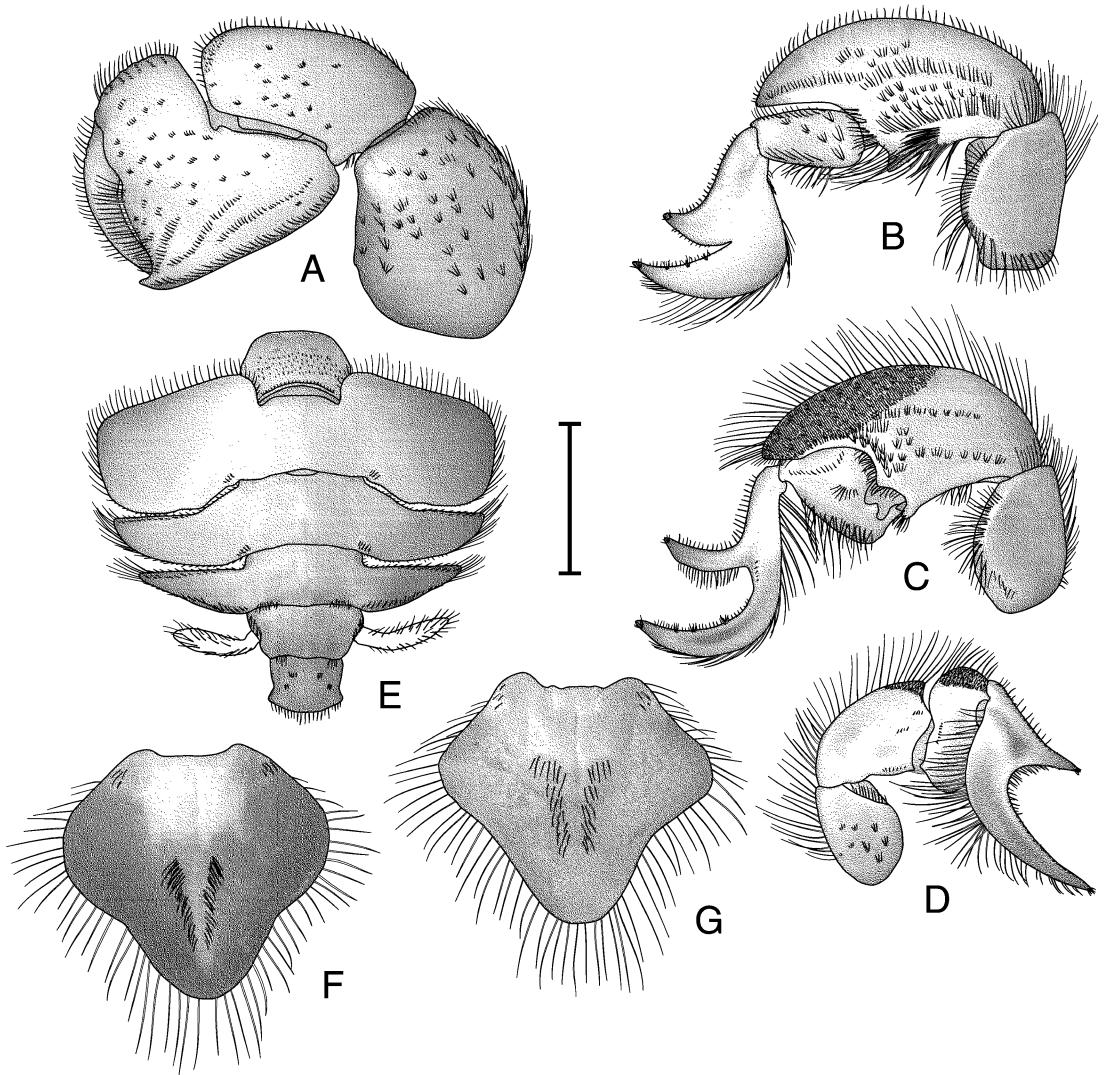


Fig. 41. *Lepidopa venusta* Stimpson, 1859: A-F, ♂, 11.1 mm cl, USNM 304309; G, ♀, 10.6 mm cl, ZMUC 8557, neotype. **A.** Left pereopod I, lateral view. **B.** Left pereopod II, lateral view. **C.** Left pereopod III, lateral view. **D.** Right pereopod IV, lateral view. **E.** Abdominal somites I-VI, 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. dexteræ* and *L. websteri*.

*Lepidopa dexteræ* Abele and Efford, 1972

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*Lepidopa dexteræ* 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

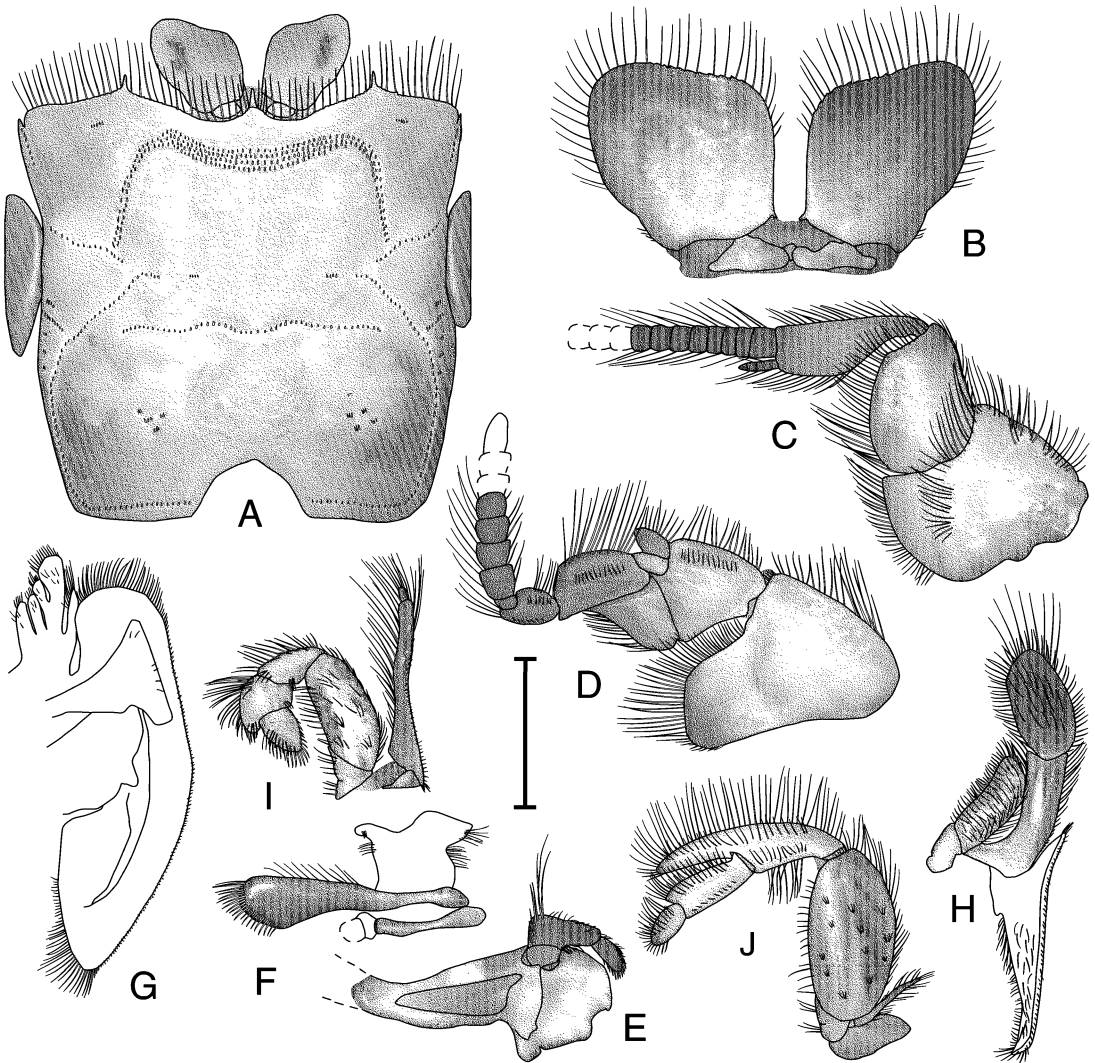


Fig. 42. *Lepidopa dexterae* Abele and Efford, 1972: A, ♀, 3.8 mm cl, USNM 135402, paratype; B–J, ♂, 3.7 mm cl, USNM 135402, paratype. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. 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-



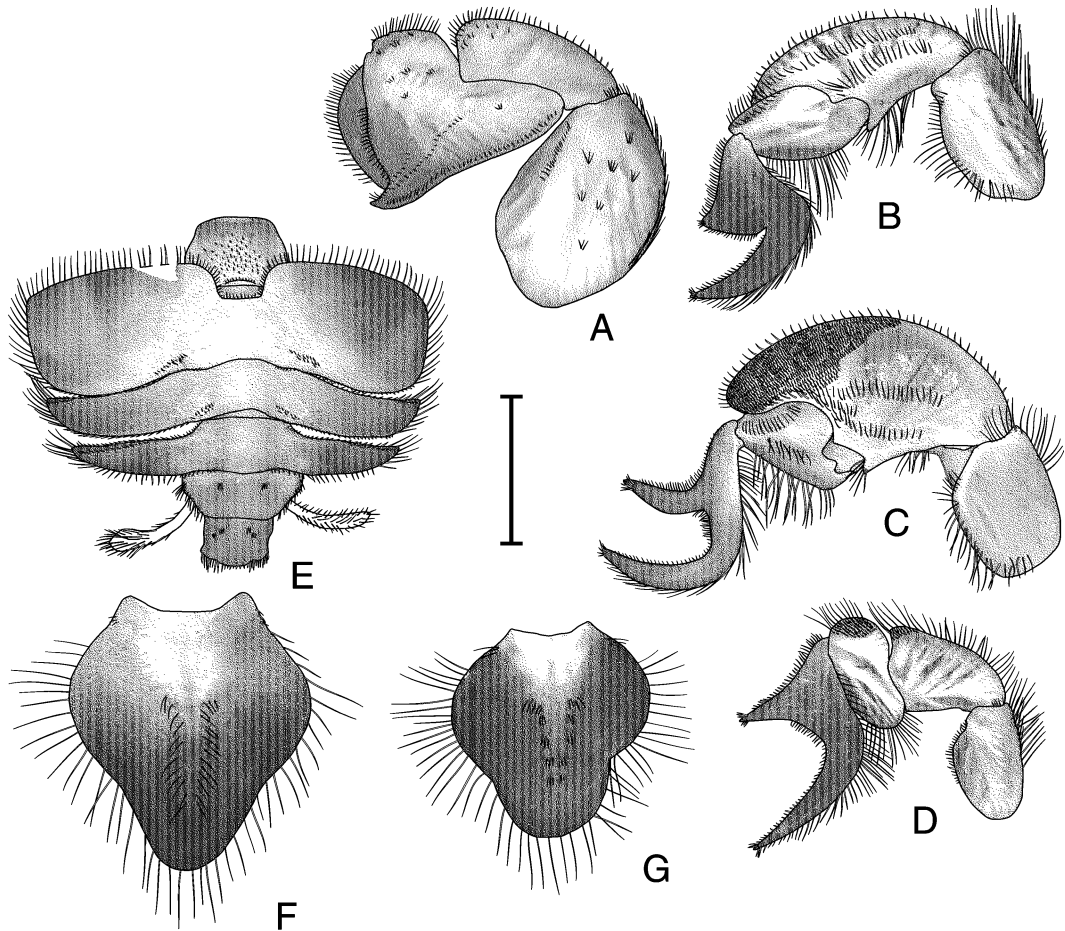


Fig. 43. *Lepidopa dexteræ* Abele and Efford, 1972: A, B, D, ♂, 3.7 mm cl, USNM 135402, paratype; C, E, F, ♂, 4.8 mm cl, USNM 135402, paratype; G, ♀, 3.8 mm cl, USNM 135402, paratype. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod 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-

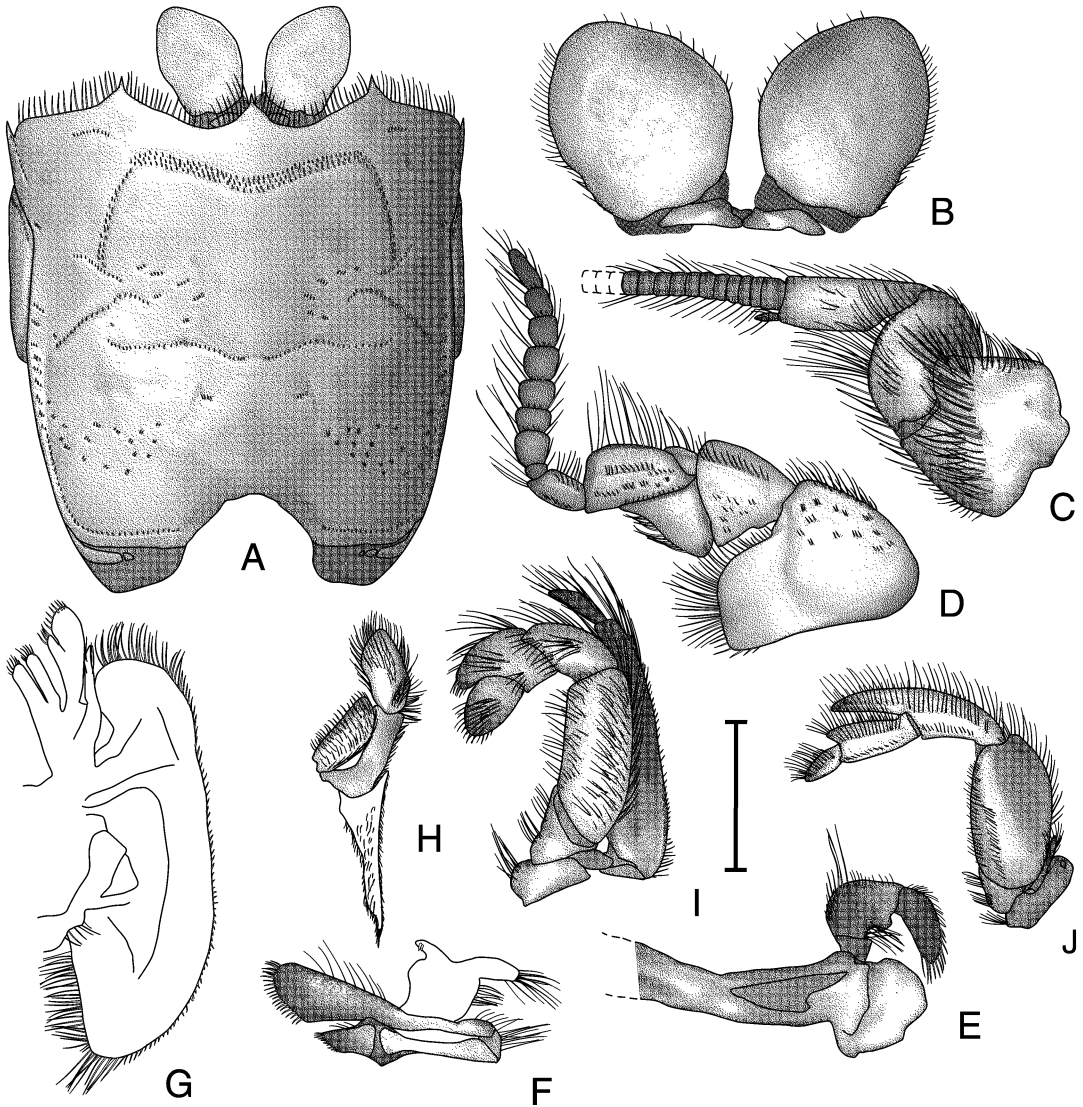


Fig. 44. *Lepidopa chilensis* Lenz, 1902: A, J, oviger, 11.6 mm cl, USNM 91742; B–I, ♂, 8.3 mm cl, USNM 91742. **A.** Carapace, branchiostegite, and ocular peduncles, dorsal view. **B.** Ocular peduncles, dorsal view. **C.** Left antennule, lateral view. **D.** Left antenna, lateral view. **E.** Left 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-

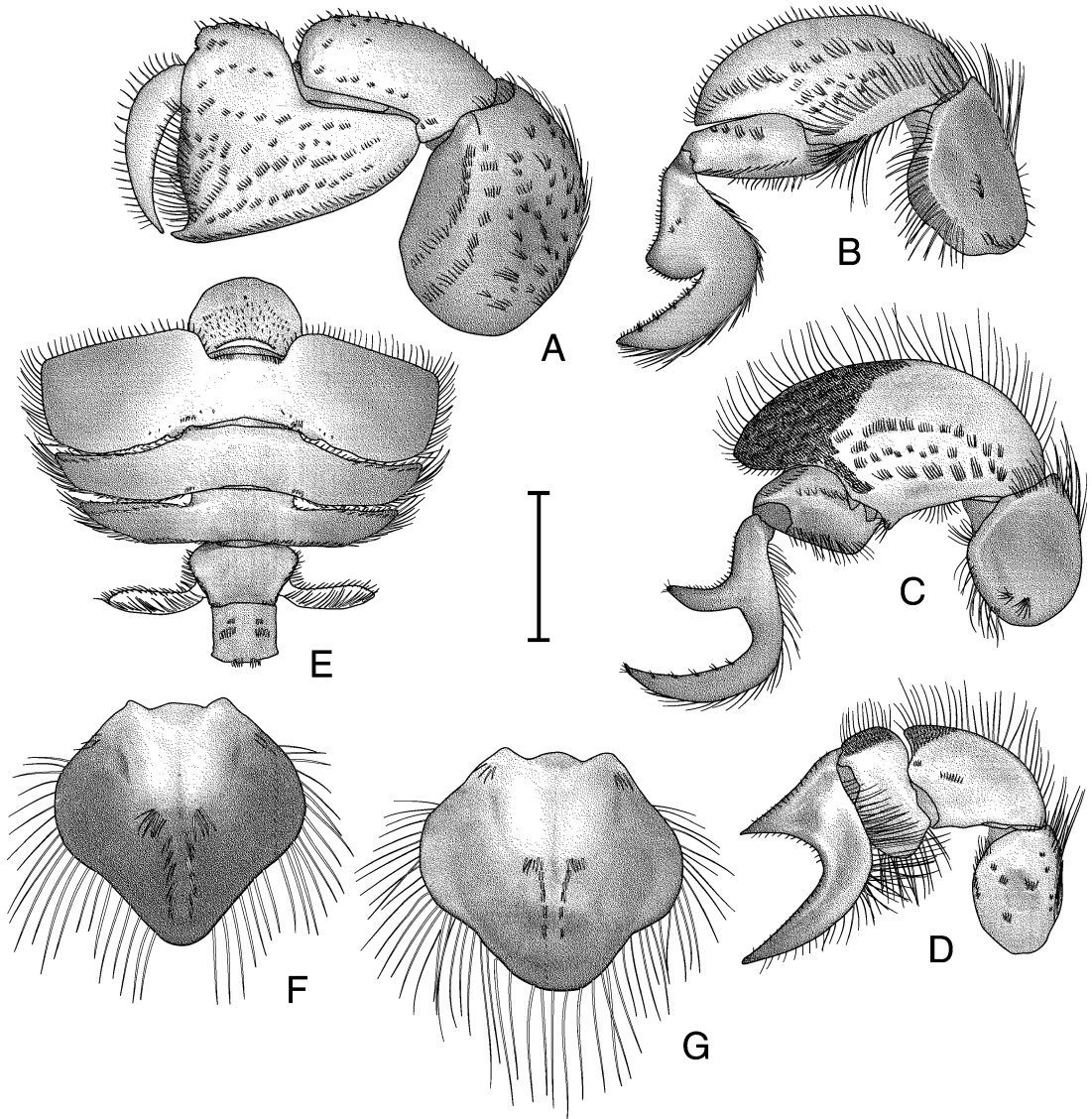


Fig. 45. *Lepidopa chilensis* Lenz, 1902: A-F, ♂, 8.3 mm cl, USNM 91742; G, oviger, 11.6 mm cl, USNM 91742. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I-VI, dorsal view. F. Telson of ♂, 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-

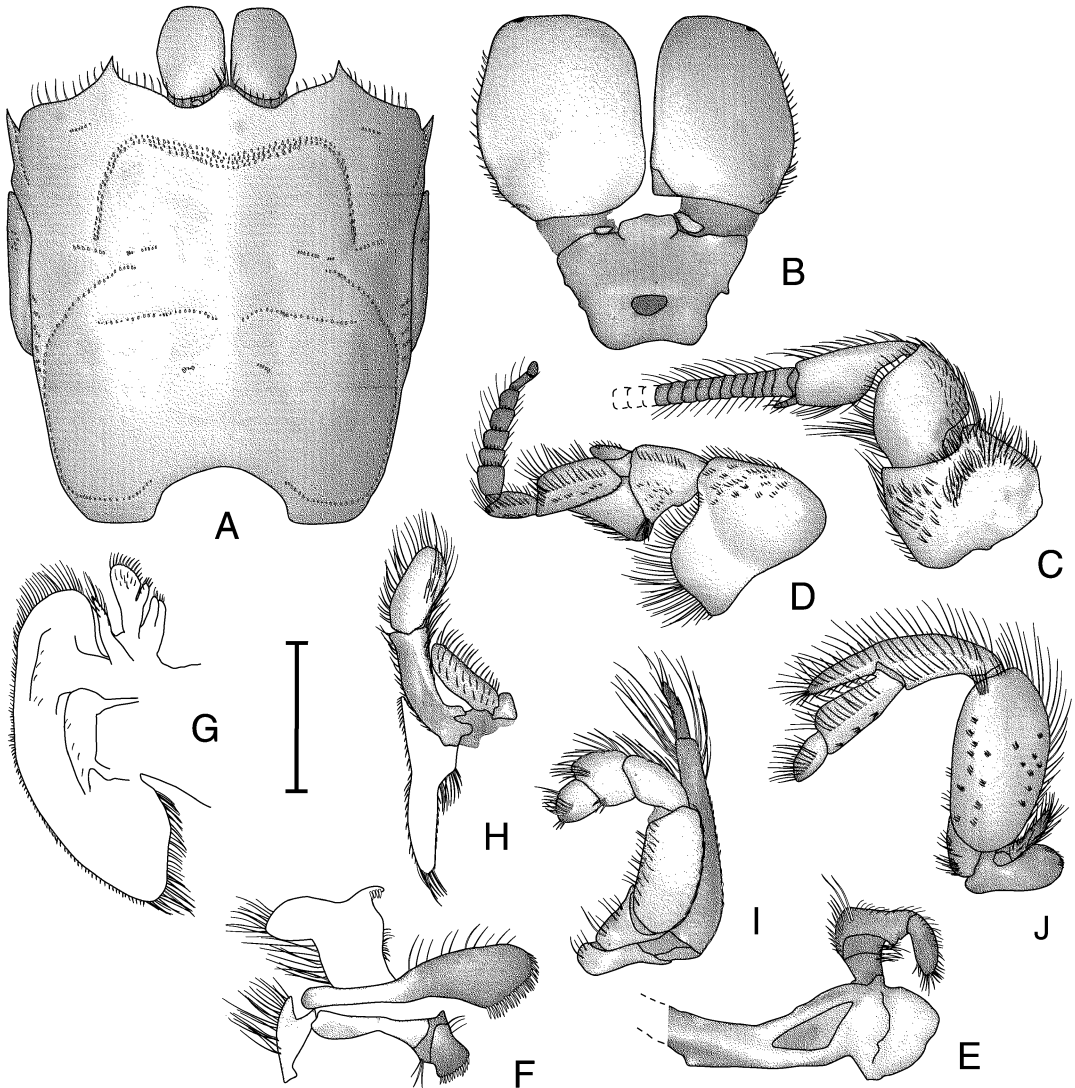


Fig. 46. *Lepidopa californica* Efford, 1971: A, ♂, 11.0 mm cl, USNM 42213, holotype; B–J, ♂, 9.5 mm cl, USNM 122633, paratype. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, 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

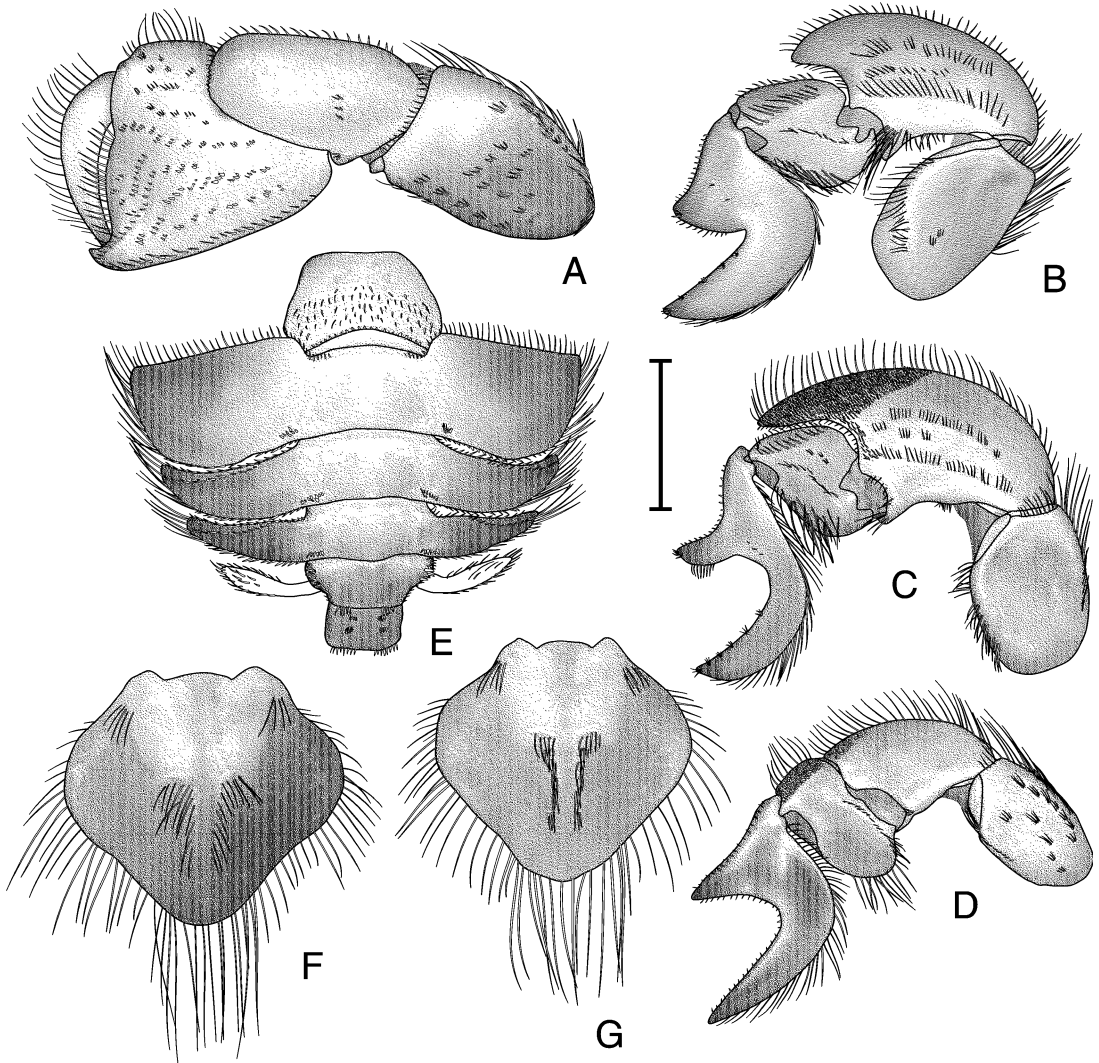


Fig. 47. *Lepidopa californica* Efford, 1971: A-F, ♂, 9.5 mm cl, USNM 122633, paratype; G, ♀, 11.4 mm cl, USNM 122633, paratype. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I-VI, dorsal 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 proximovertrally. 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;

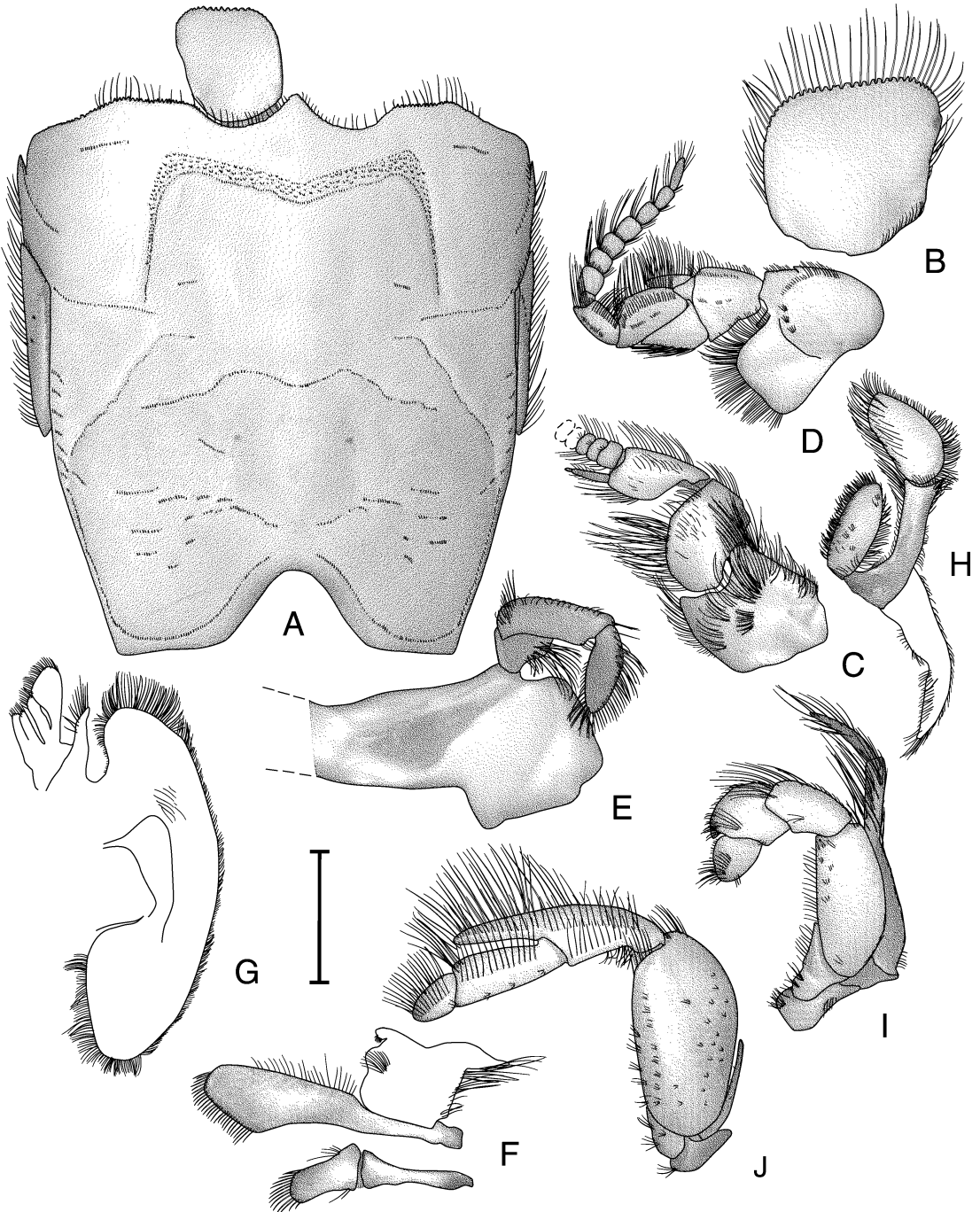


Fig. 48. *Lepidopa haigae* Efford, 1971: A–J, ♀, 11.5 mm cl, LACM 39–30.12, holotype. **A.** Carapace, branchiostegite, and left ocular peduncle, dorsal view. **B.** Right ocular peduncle, dorsal view. **C.** Left antennule, lateral view. **D.** Left antenna, lateral view. **E.** Left mandible, mesial 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

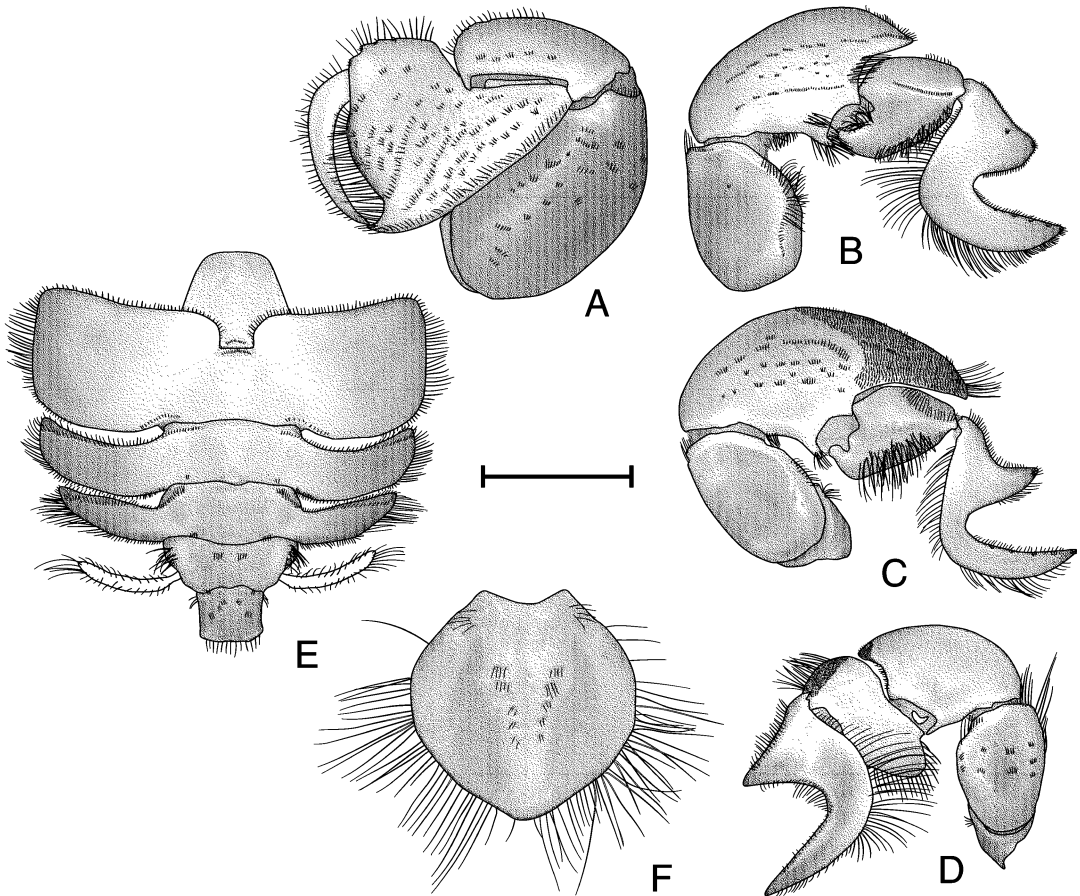


Fig. 49. *Lepidopa haigae* Efford, 1971: A-F, ♀, 11.5 mm cl, LACM 39-30.12, holotype. A. Left pereopod I, lateral view. B. Right pereopod II, lateral view. C. Right pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I-VI, dorsal view. F. Telson of ♀, dorsal view. Scale = 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 proximovertrally. 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-

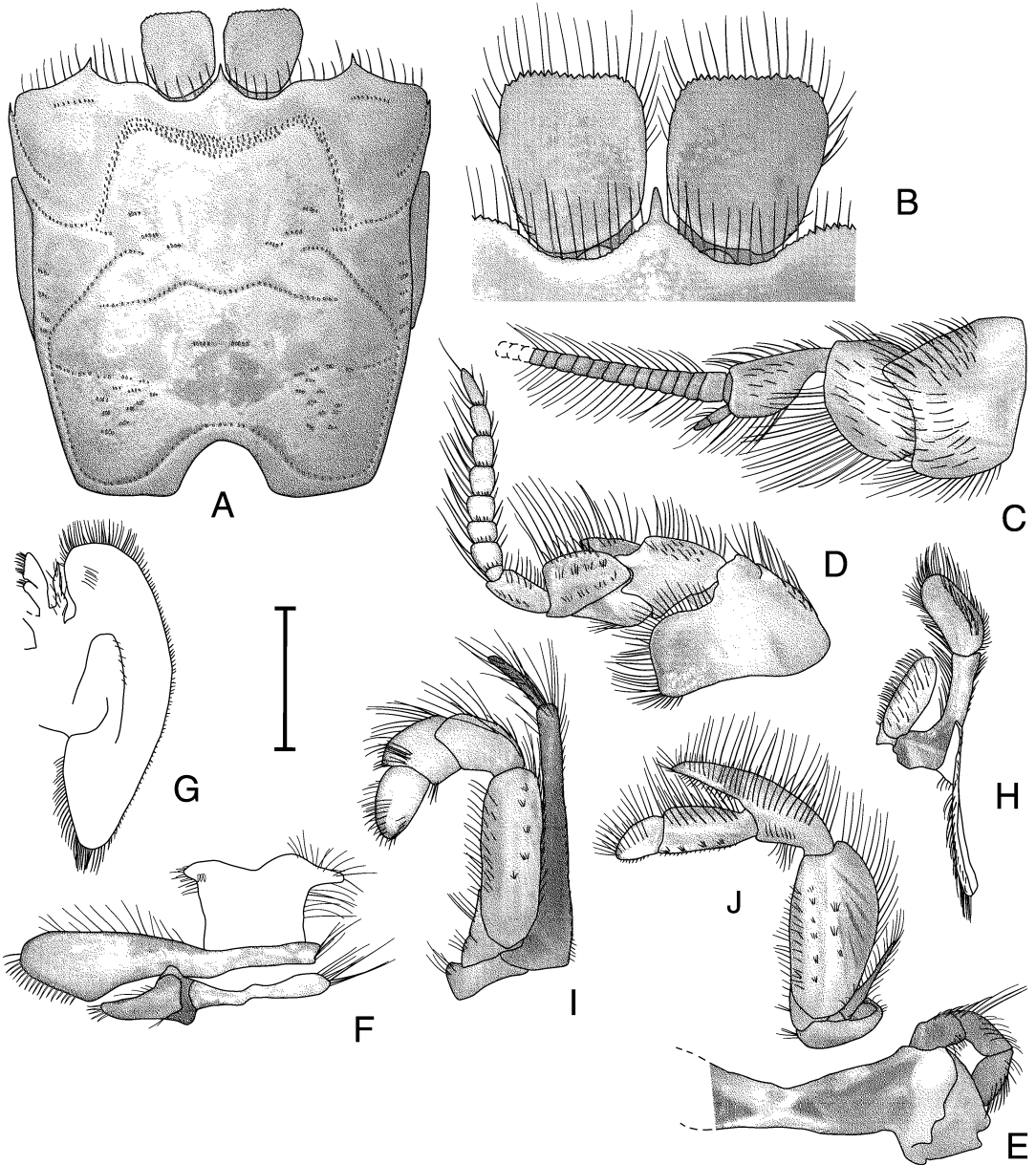


Fig. 50. *Lepidopa richmondi* Benedict, 1903: A, B, ♀, 7.2 mm cl, USNM 29018, holotype; C–J, ♀, 6.6 mm cl, USNM 304305. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, 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

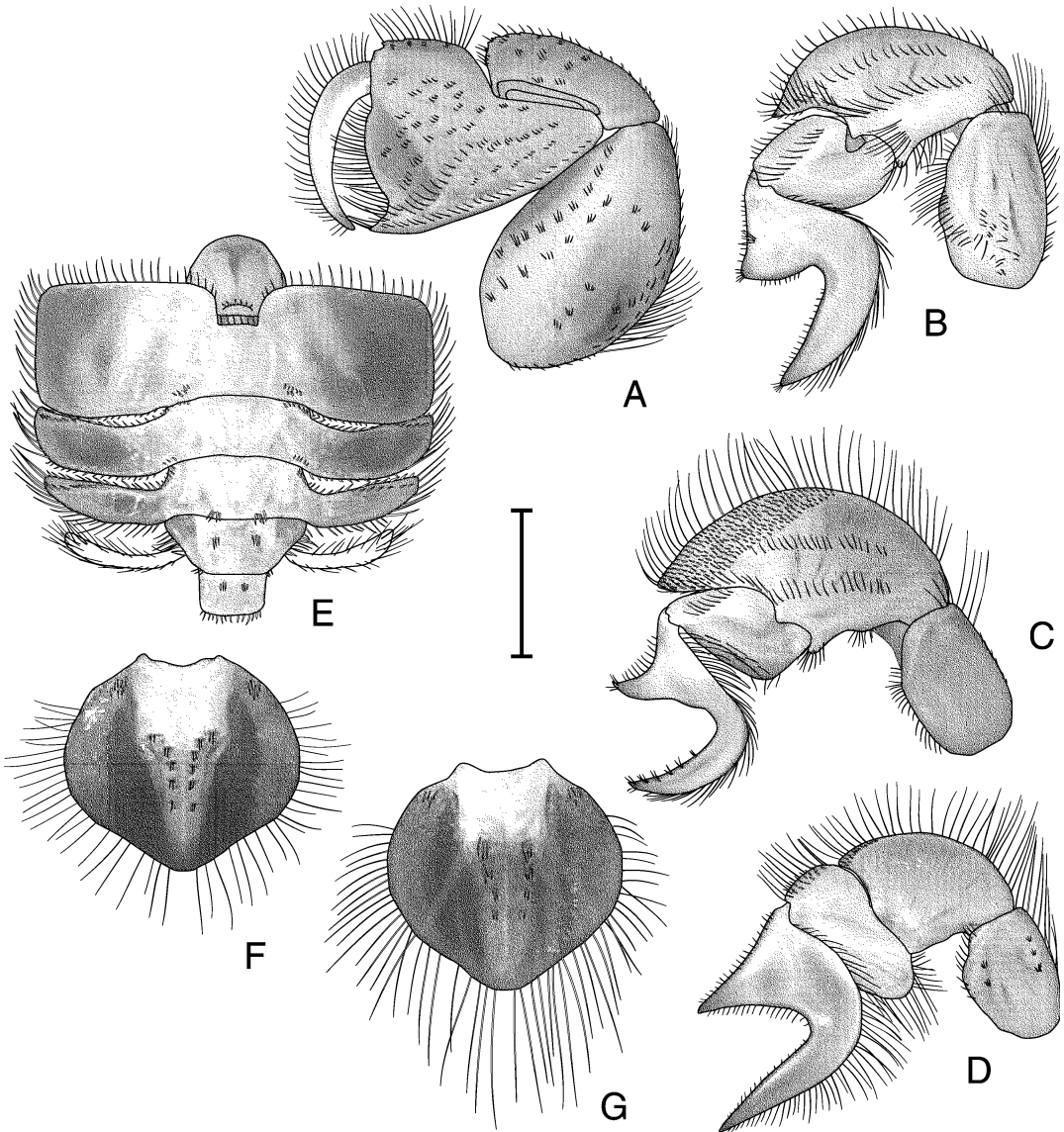


Fig. 51. *Lepidopa richmondi* Benedict, 1903: A–E, G, ♀, 6.6 mm cl, USNM 304305; F, ♂, 10.5 mm cl, MNRJ 1538. **A.** Left pereopod I, lateral view. **B.** Left pereopod II, lateral view. **C.** Left pereopod III, lateral view. **D.** Left pereopod IV, lateral view. **E.** Abdominal somites I–VI, dorsal 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

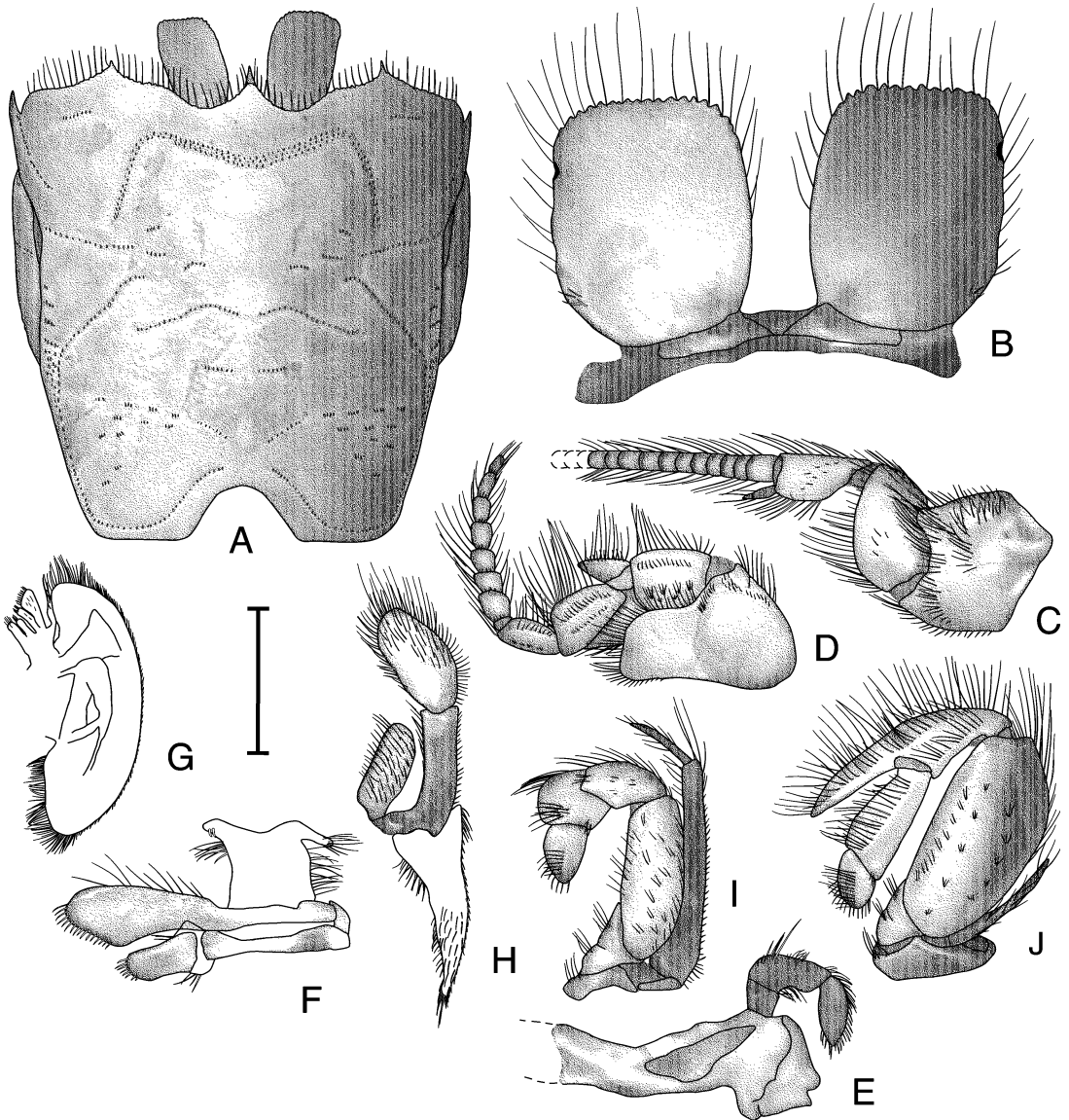


Fig. 52. *Lepidopa mearnsi* Benedict, 1903: A, ♀, 8.7 mm cl, USNM 260972; B–J, ♀, 7.6 mm cl, USNM 304311. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. F. 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 styliiform, 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

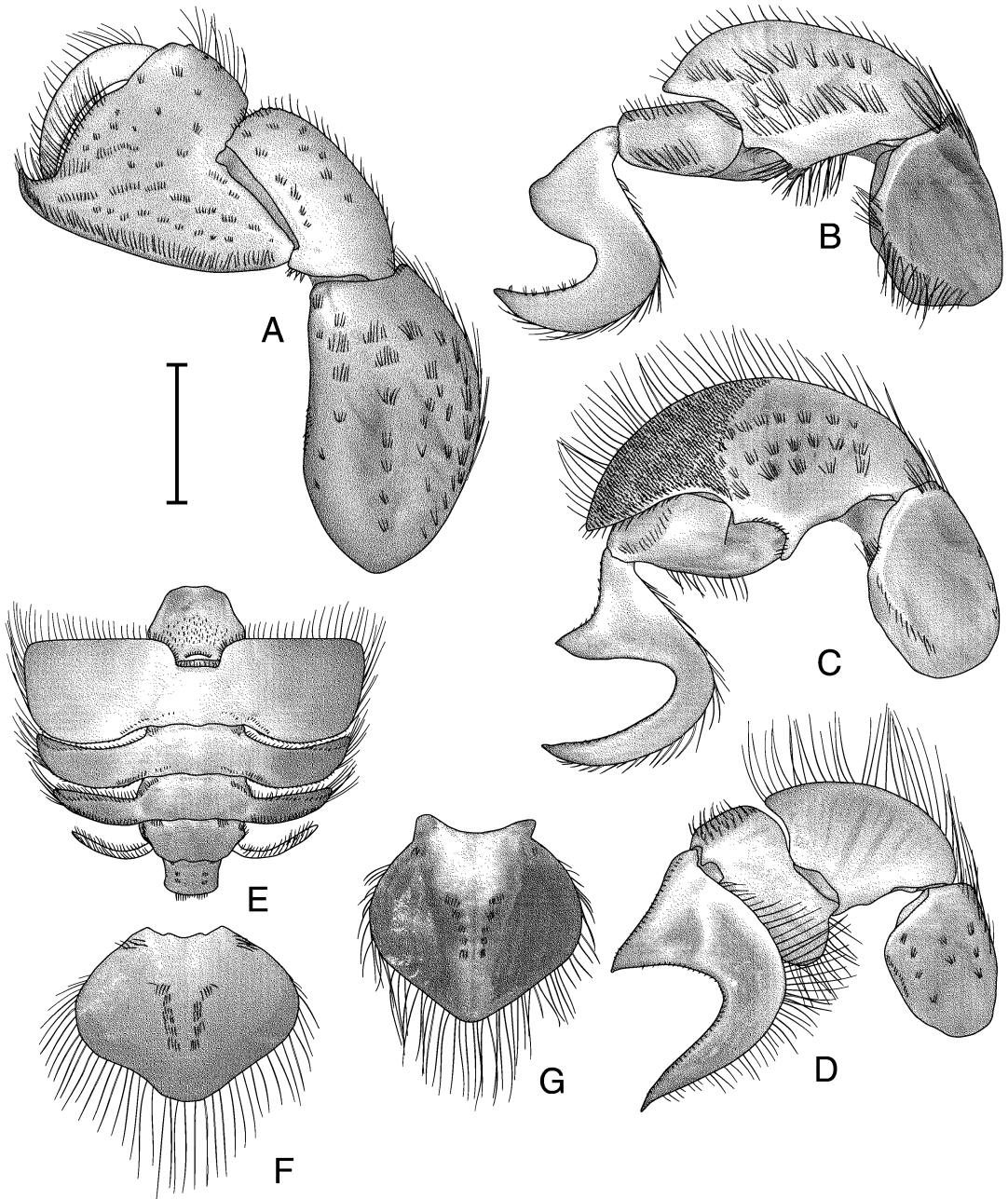


Fig. 53. *Lepidopa mearnsi* Benedict, 1903: A-E, G, ♀, 7.6 mm cl, USNM 304311; F, ♂, 7.2 mm cl, USNM 304314. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I-VI, dorsal view. F. Telson of ♂, 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-

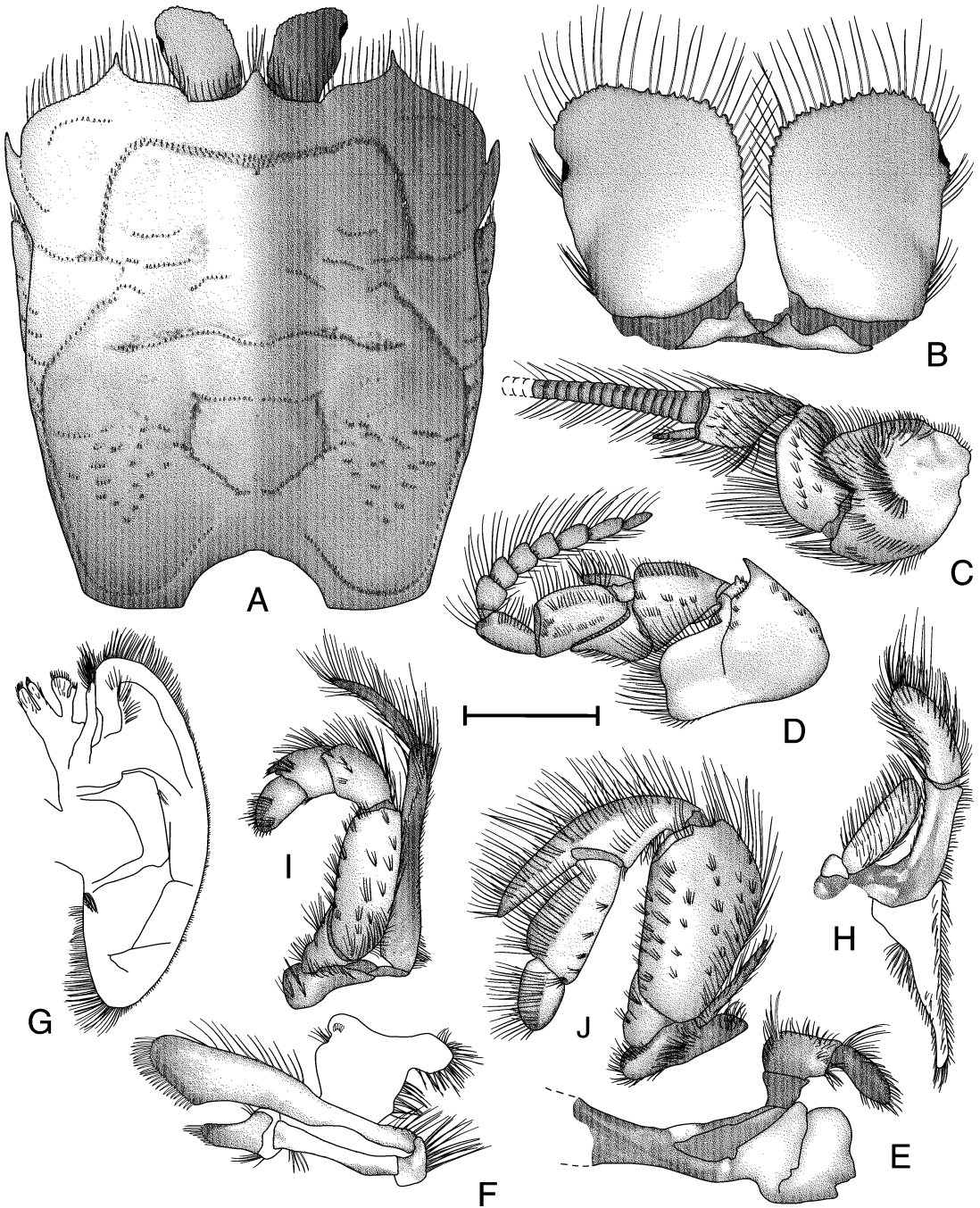


Fig. 54. *Lepidopa deamae* Benedict, 1903: A, ♀, 35.9 mm cl, USNM 26170, holotype; B–J, ♀, 18.1 mm cl, USNM 304315. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial 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-

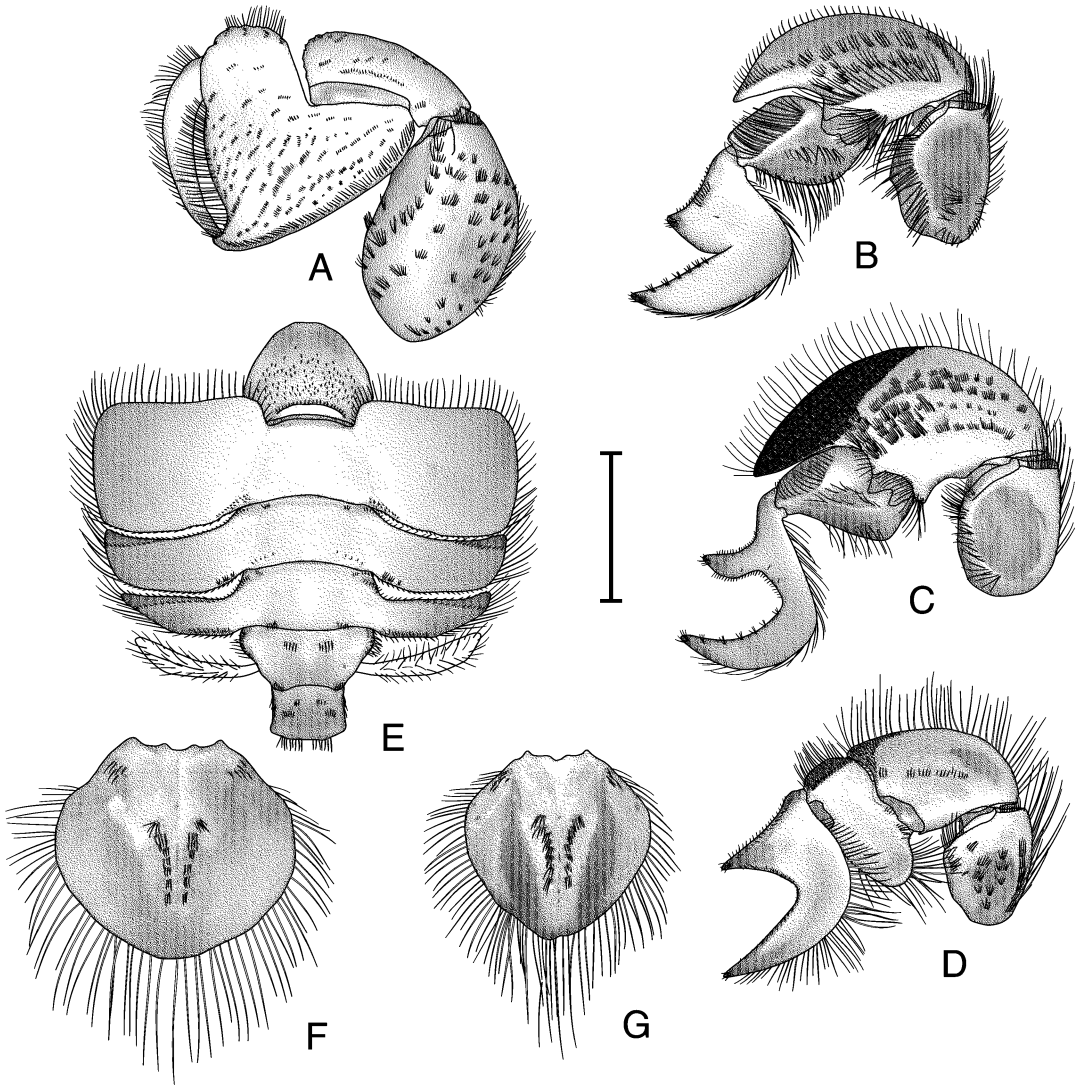


Fig. 55. *Lepidopa deamae* Benedict, 1903: A, B, D, E, G, ♀, 18.1 mm cl, USNM 304315; C, ♀, 26.5 mm cl, USNM 250214; F, ♂, 22.4 mm cl, ANSP CA4736. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal 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-

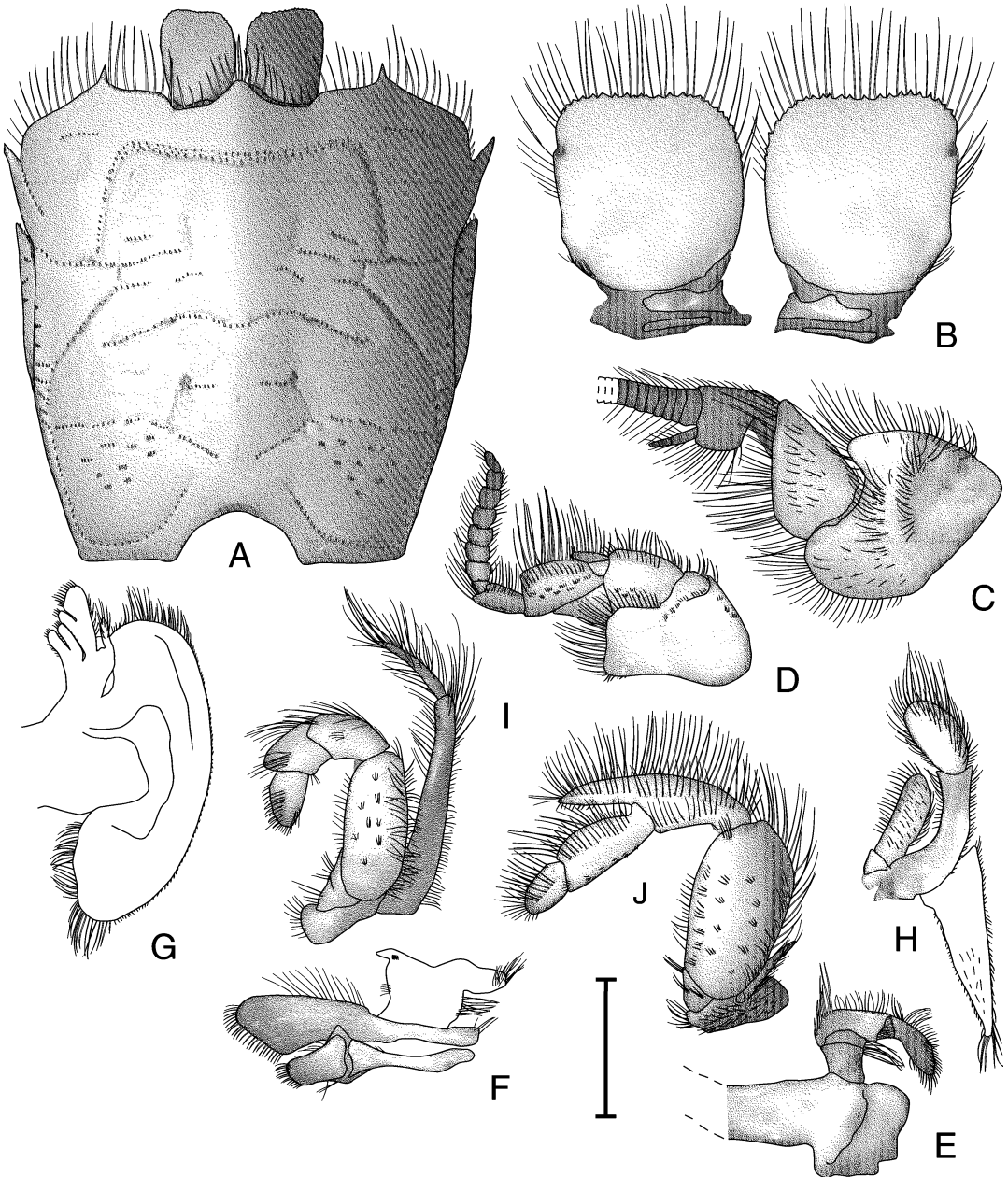


Fig. 56. *Lepidopa benedicti* Schmitt, 1935: A, oviger, 19.8 mm cl, AMNH 14425; B–J, ♀, 14.1 mm cl, USLZ 2122. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial view. 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-

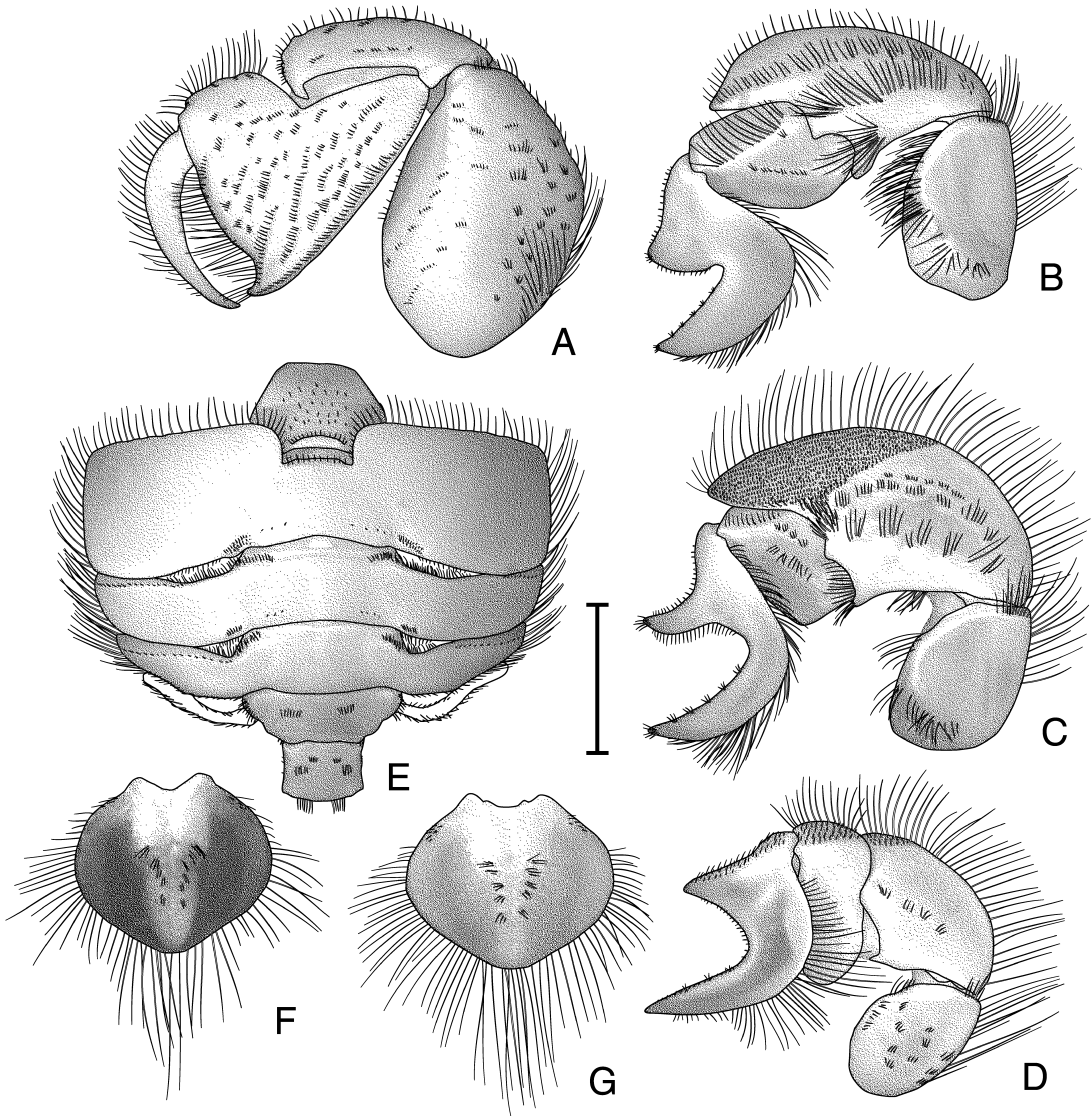


Fig. 57. *Lepidopa benedicti* Schmitt, 1935: A–E, G, ♀, 14.1 mm cl, UNLZ 2122; F, ♂, 9.6 mm cl, USLZ 2122. **A.** Left pereopod I, lateral view. **B.** Left pereopod II, lateral view. **C.** Left pereopod III, lateral view. **D.** Left pereopod IV, lateral view. **E.** Abdominal somites I–VI, dorsal 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.



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-

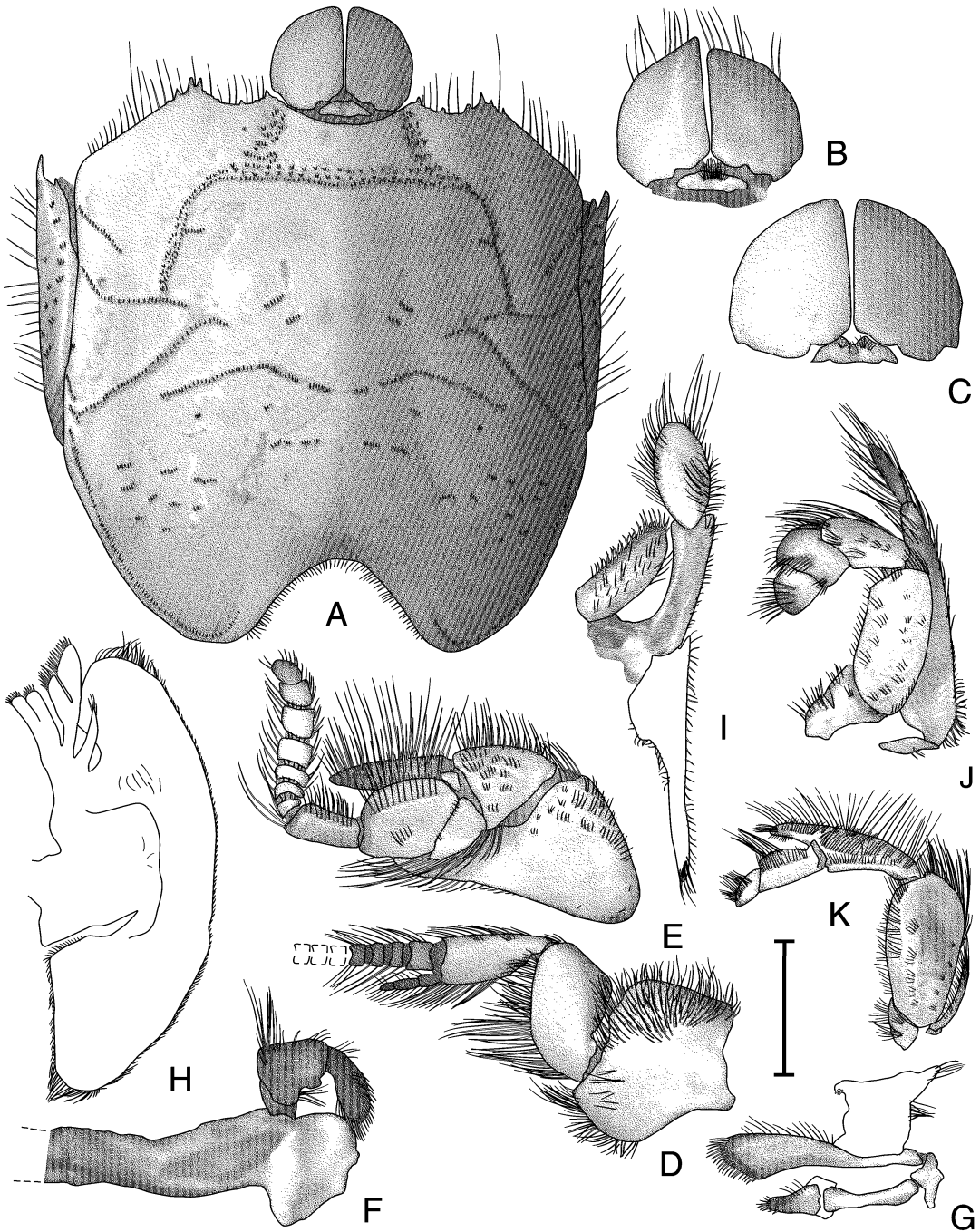


Fig. 58. *Paralbunea intermedia* (Balss, 1916a): A, C, ♀, 10.6 mm cl, ZMH K-5386, holotype; B, D–K, ♂, 7.9 mm cl, MRAC 34.672. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B, C. Ocular peduncles, dorsal view. D. Left antennule, lateral view. E. Left antenna, lateral view. F. Left 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-

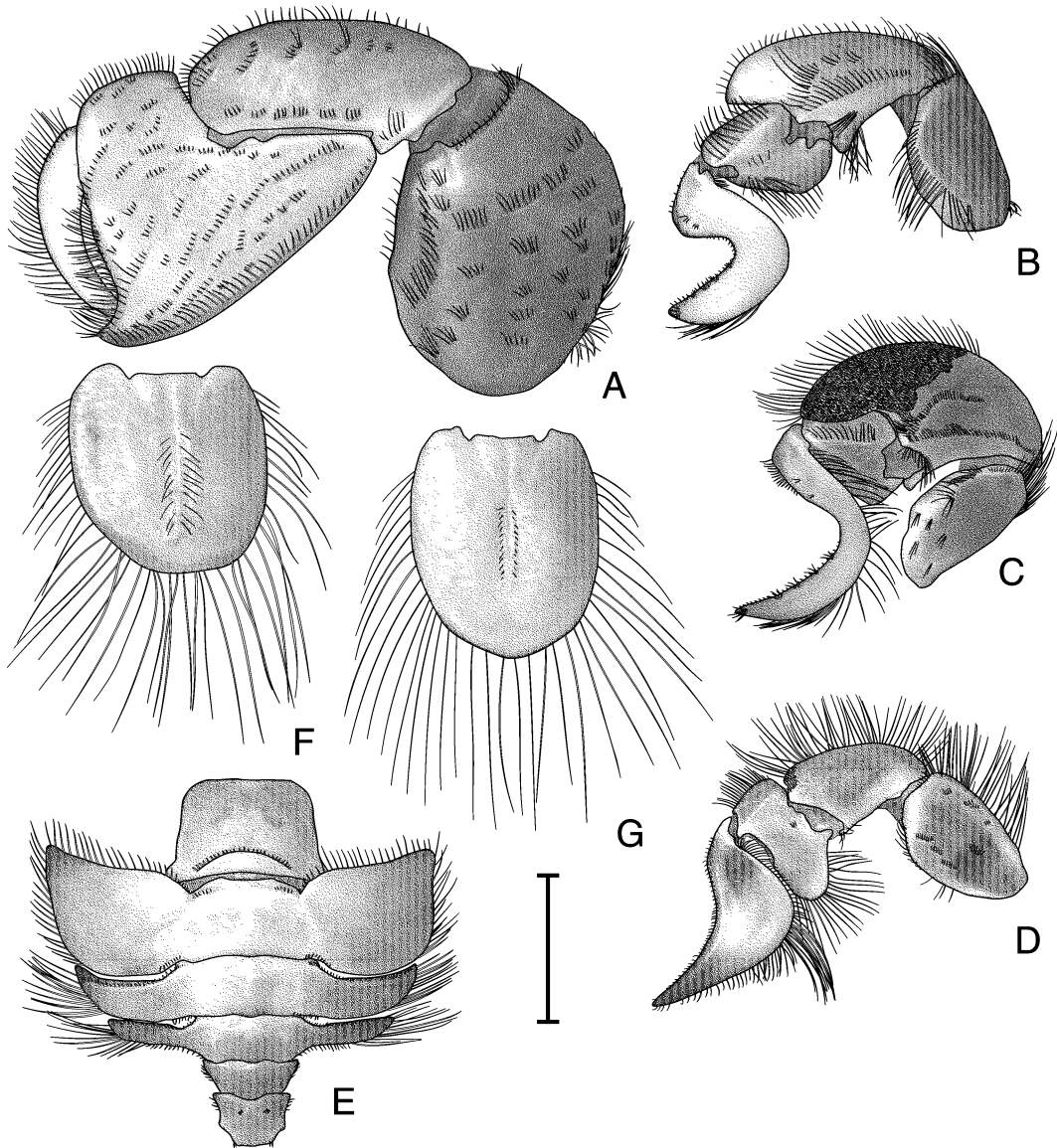


Fig. 59. *Paralbunea intermedia* (Balss, 1916a): A, C–F, ♂, 7.9 mm cl, MRAC 34.672; B, G, ♀, 10.6 mm cl, ZMH K-5386, holotype. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I–VI, dorsal 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 distoventral 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-



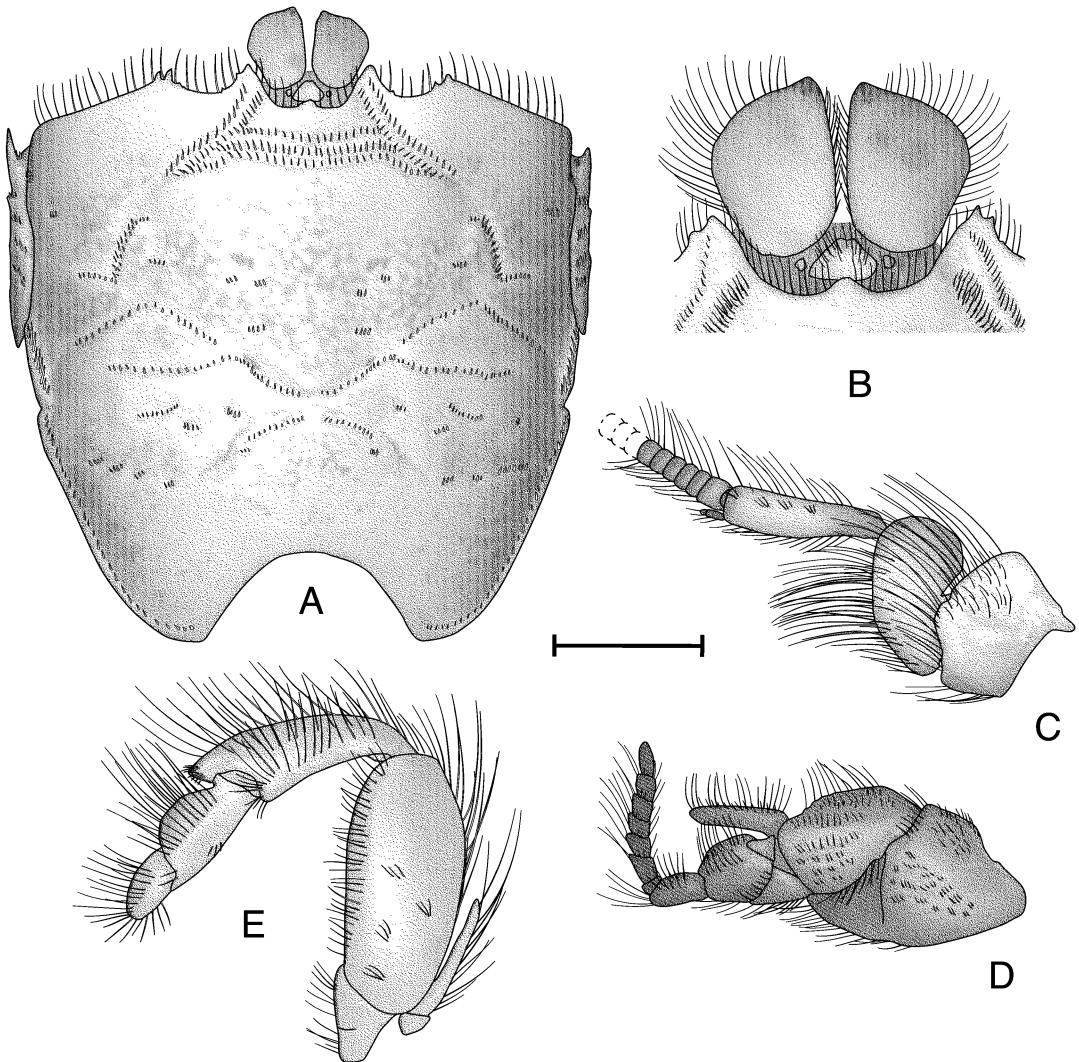


Fig. 60. *Paralbunea manihinei* Serène, 1977: A–D, ♂, 9.6 mm cl, BMNH 1973.19, holotype; E, ♂, 9.1 mm cl, MRAC 53.900, paratype. **A.** Carapace, branchiostegite, and ocular peduncles, dorsal view. **B.** Ocular peduncles, dorsal view. **C.** Left antennule, lateral view. **D.** Left antenna, lateral 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

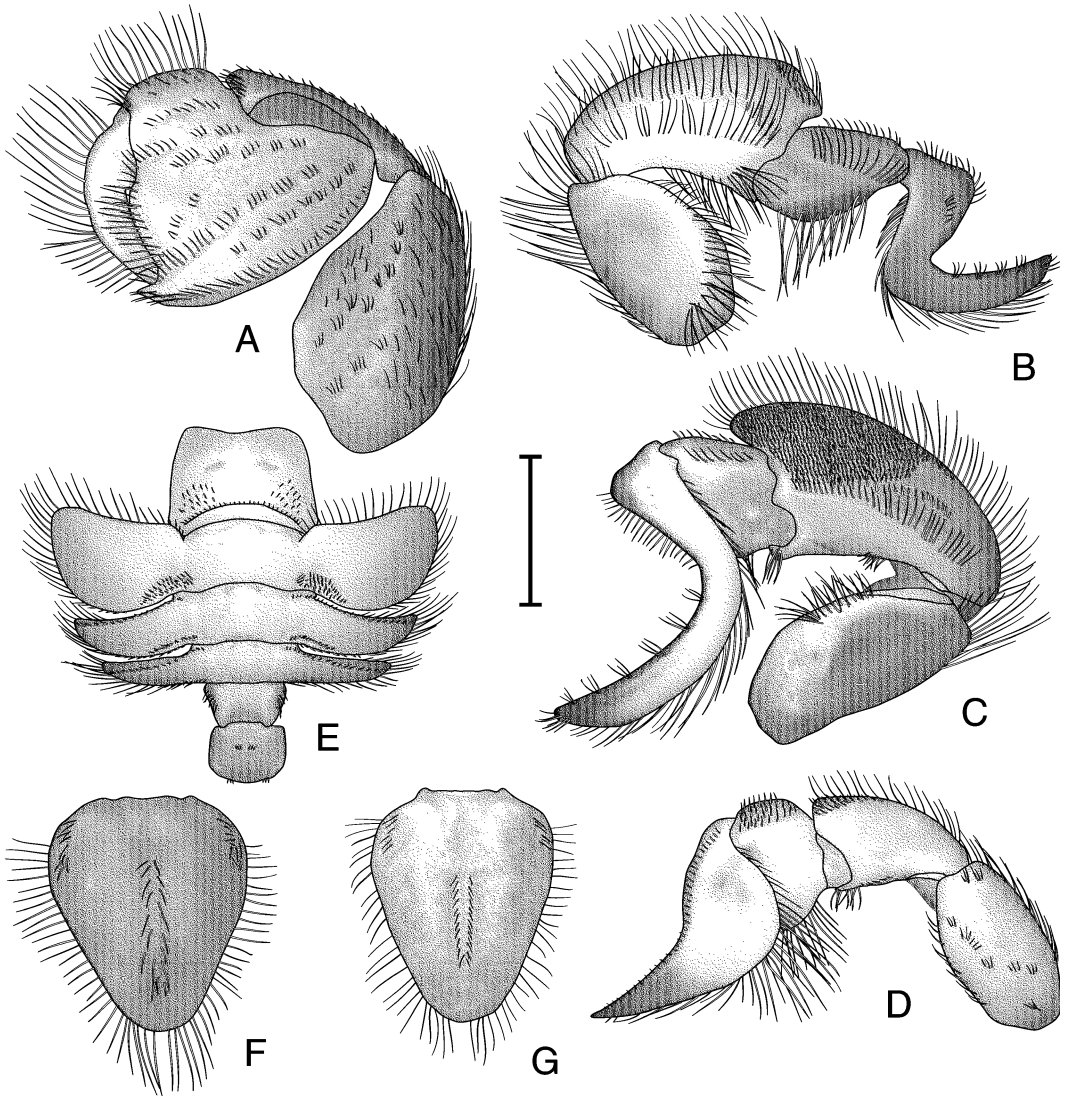


Fig. 61. *Paralbunea manihinei* Serène, 1977: A, G, ♀, 5.9 mm cl, RMNH 29067, paratype; B, D, F, ♂, 9.1 mm cl, MRAC 53.900, paratype; C, E, ♂, 9.6 mm cl, BMNH 1973.19, holotype. **A.** Left pereopod I, lateral vie. **B.** Right pereopod II, lateral view. **C.** Left pereopod III, lateral view. **D.** 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

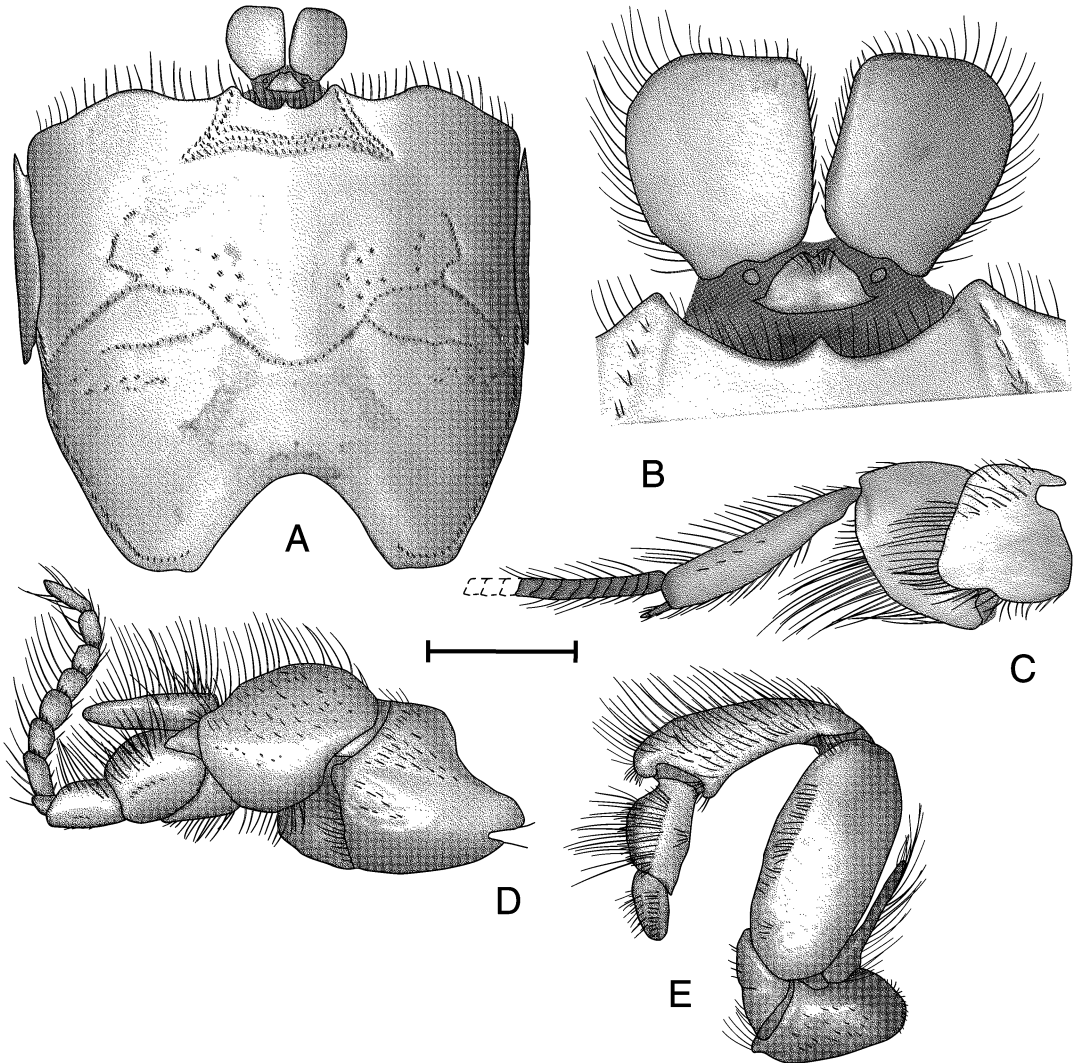


Fig. 62. *Paralbunea paradoxa* (Gordon, 1938): A–E, ♀, 8.0 mm cl, BMNH 1937.6.1.7, holotype. **A.** Carapace, branchiostegite, and ocular peduncles, dorsal view. **B.** Ocular peduncles, dorsal view. **C.** Left antennule, lateral view. **D.** Left antenna, lateral view. **E.** Left maxilliped III, lateral 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 styliiform, 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,

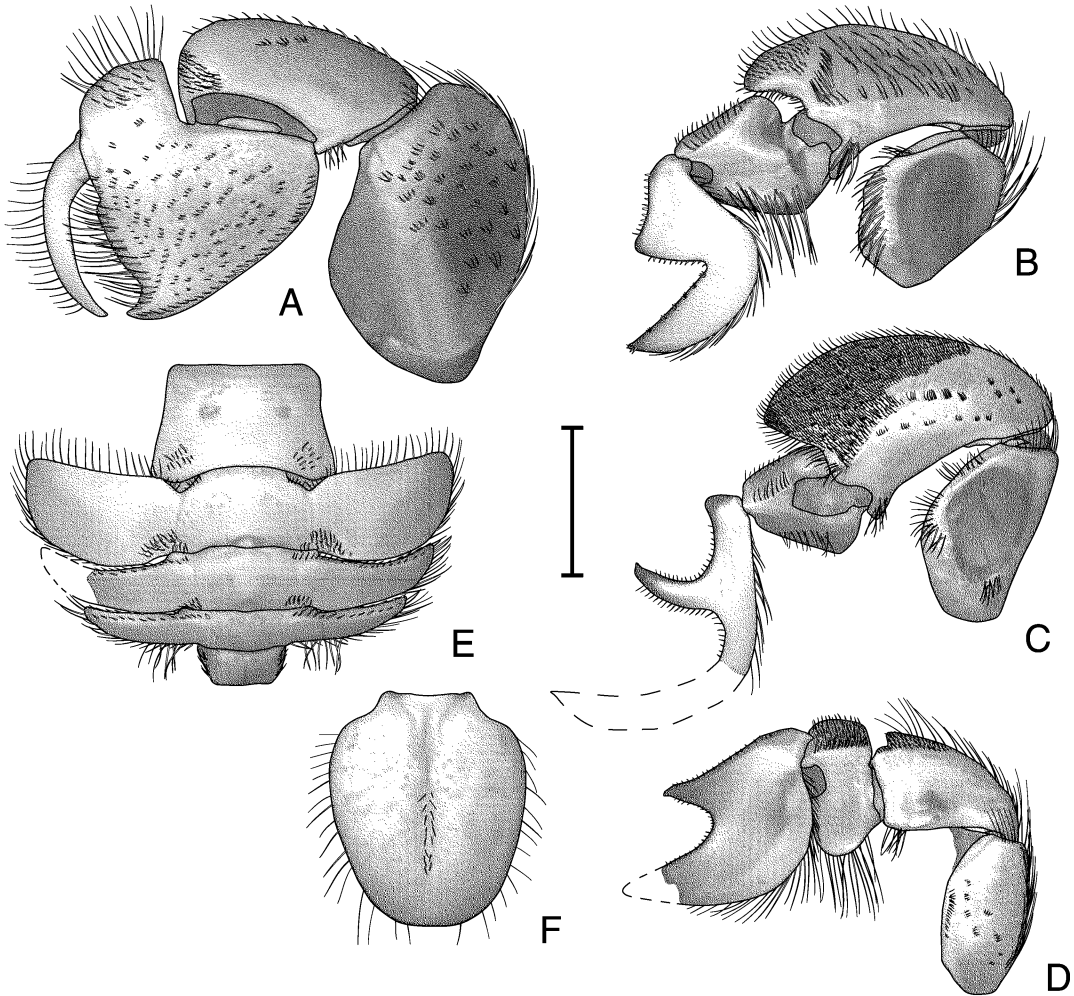


Fig. 63. *Paralbunea paradoxa* (Gordon, 1938): A–F, ♀, 8.0 mm cl, BMNH 1937.6.1.7, holotype. **A.** Left pereopod I, lateral view. **B.** Left pereopod II, lateral view. **C.** Left pereopod III, lateral view. **D.** Left pereopod IV, lateral view. **E.** Abdominal somites I–VI, dorsal view; **F.** telson 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 (ZLKY 3308); Misaki, Miura Peninsula, coll. unknown: 1 ♂, fragments only (ZLKY 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.

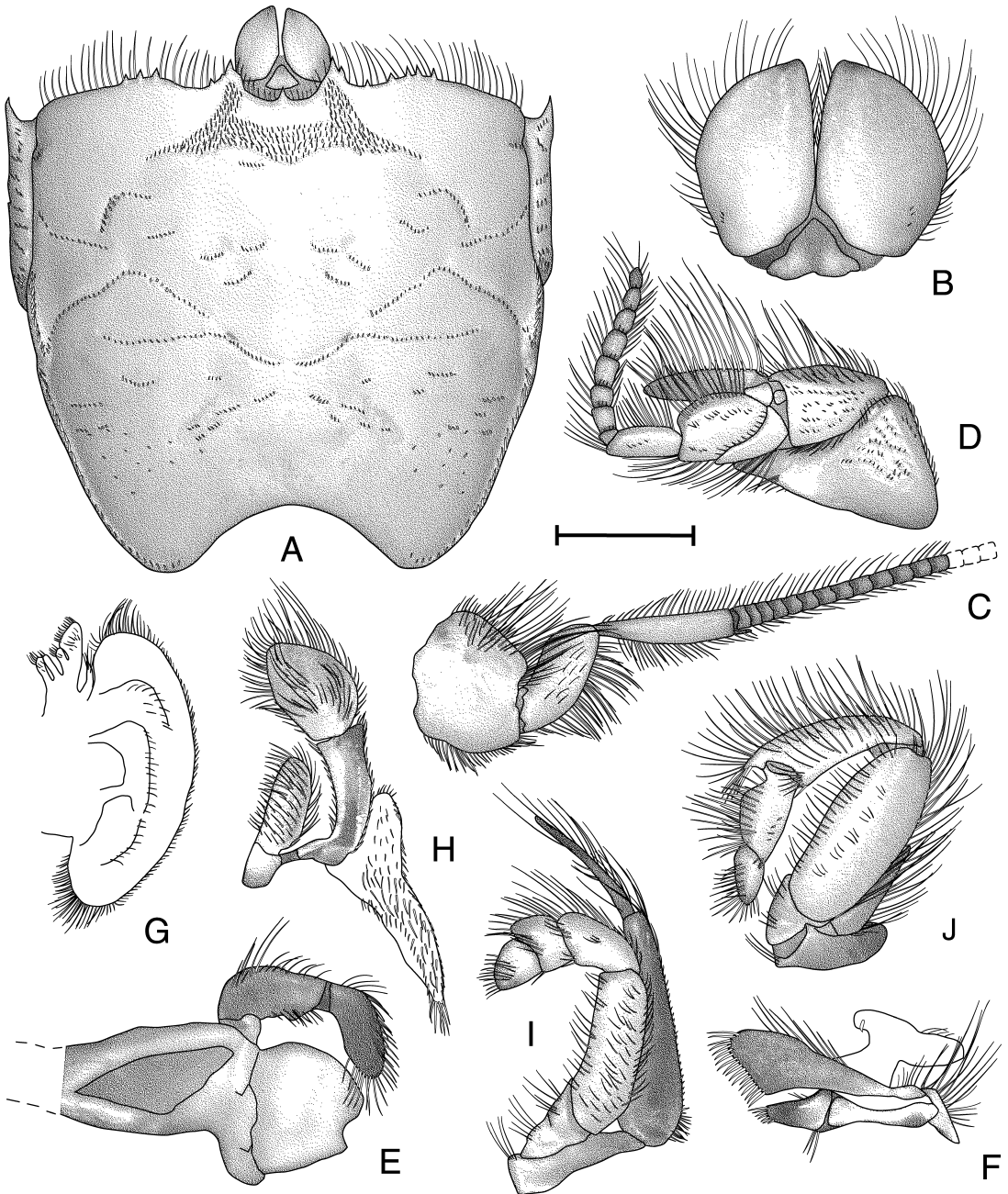


Fig. 64. *Paralbunea dayriti* (Serène and Umali, 1965): A, ♀, 10.0 mm cl, MOV J44731; B–J, ♂, 5.6 mm cl, USNM 304316. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Right antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial 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

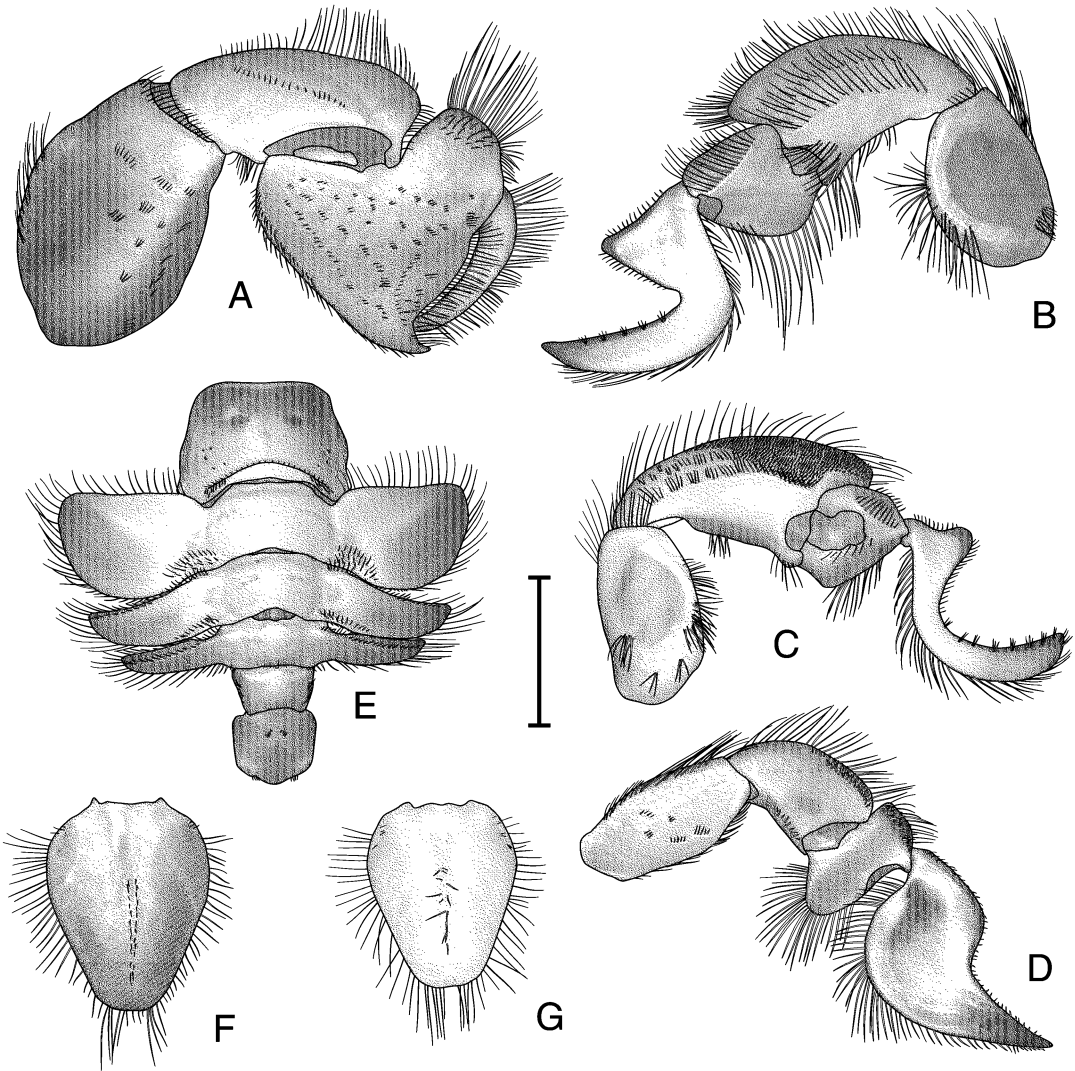


Fig. 65. *Paralbunea dayriti* (Serène and Umali, 1965): A, B, D–F, ♂, 5.6 mm cl, USNM 304316; C, ♀, 8.1 mm cl, QM W22295; G, ♀, 10.0 mm cl, MOV J44731. A. Right pereopod I, lateral view. B. Left pereopod II, lateral view. C. Right pereopod III, lateral view. D. Right pereopod IV, lateral view. E. Abdominal 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

Figures 66, 67

*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

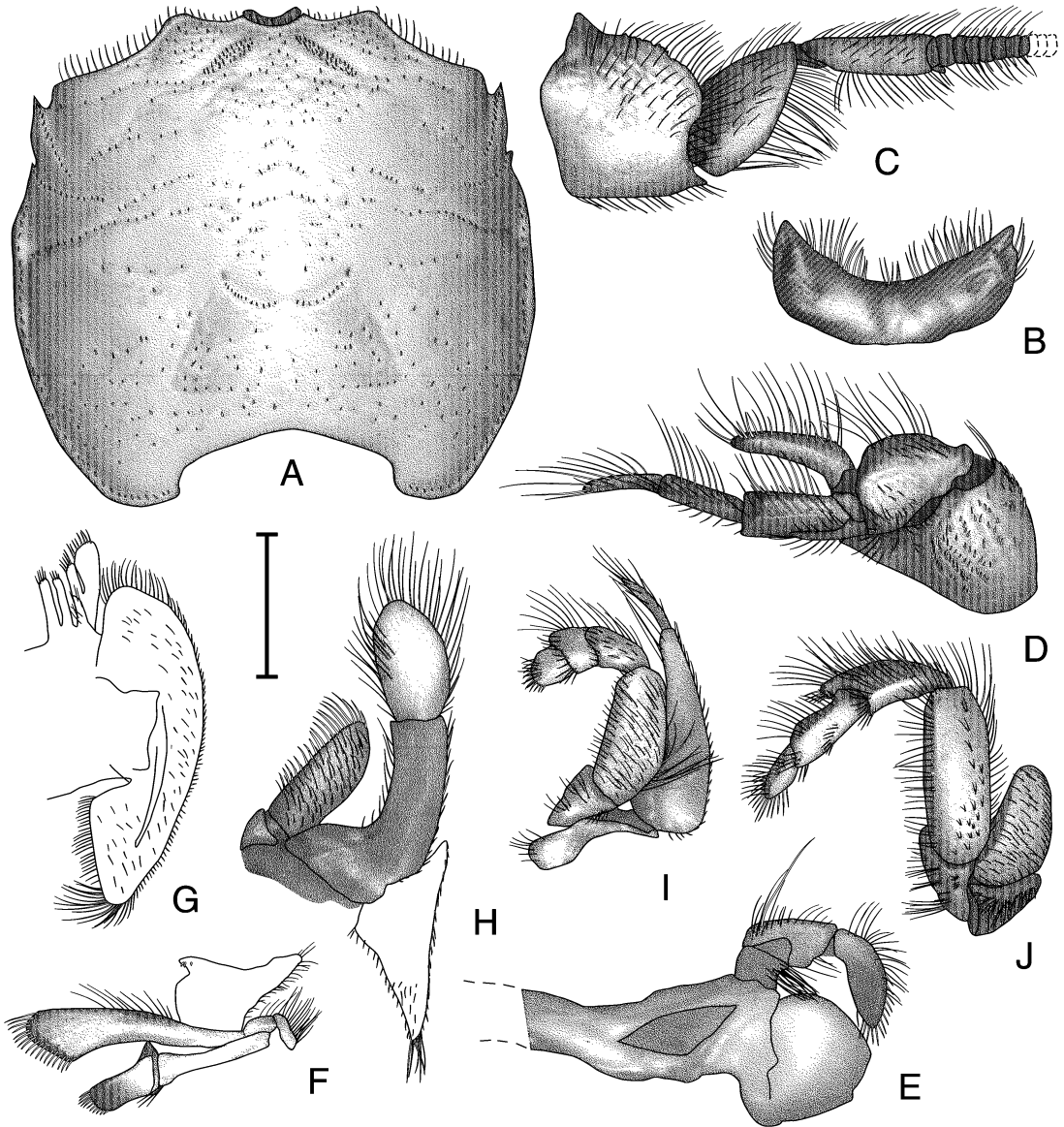


Fig. 66. *Zygopa michaelis* Holthuis, 1961: A, ♀, 9.2 mm cl, RMNH 14501, lectotype; B–J, ♂, 10.7 mm cl, RMNH 14502, paralectotype. A. Carapace and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Right antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, mesial 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 ventrodistal 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

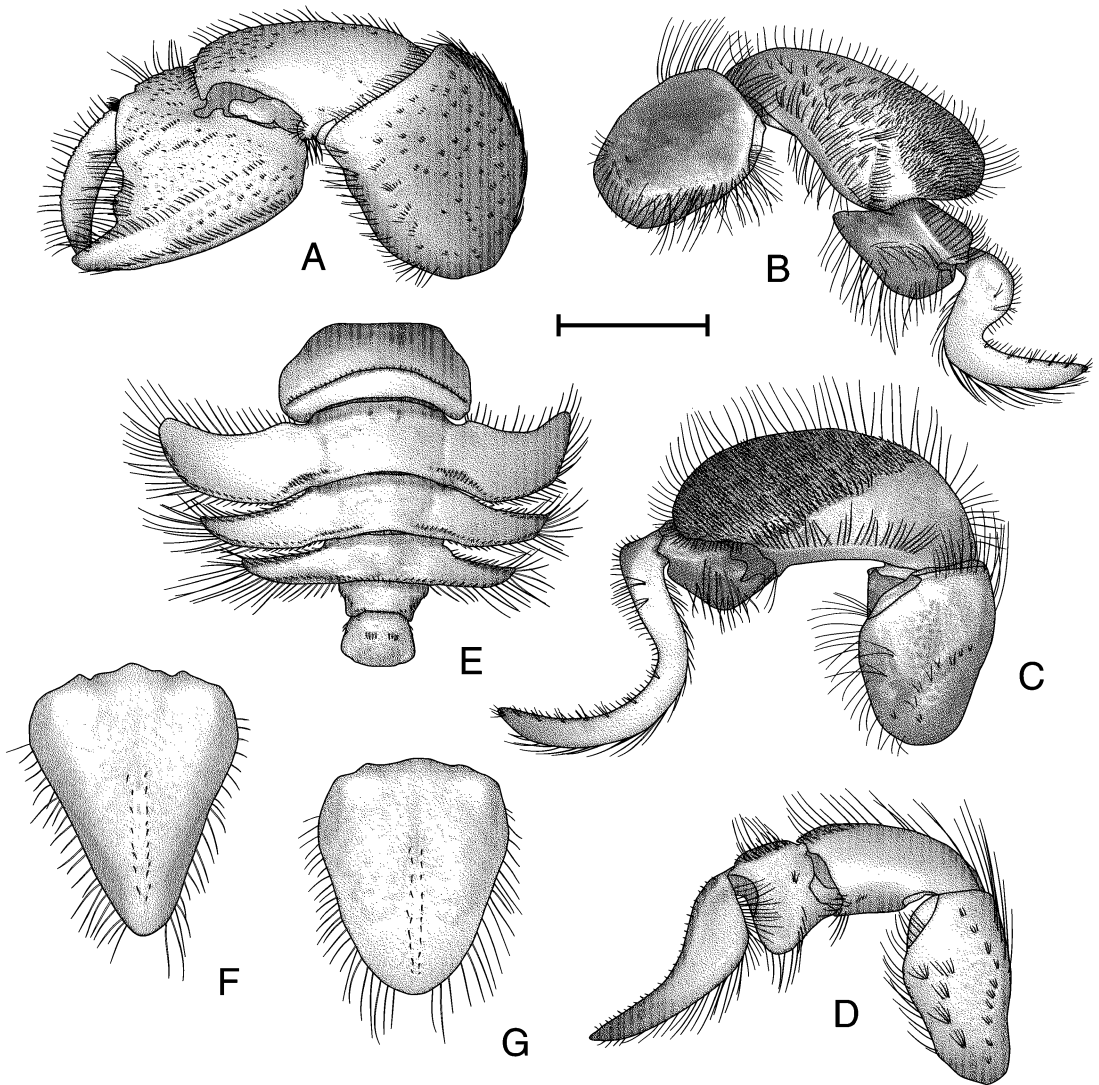


Fig. 67. *Zygopa michaelis* Holthuis, 1961: A–F, ♂, 10.7 mm cl, RMNH 14502, paralectotype; G, ♀, 9.1 mm cl, RMNH 14502, paralectotype. A. Left pereopod I, lateral view. B. Right pereopod II, lateral view. C. Left pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I–VI, 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

Figures 68, 69

*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-*

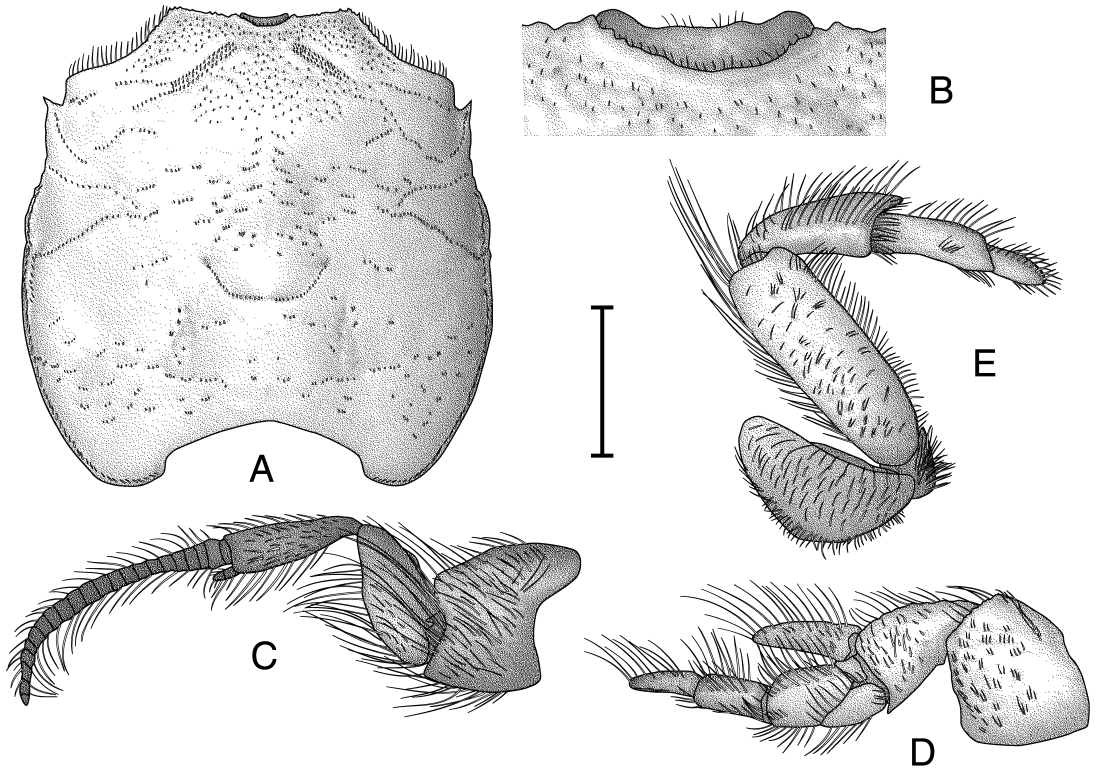


Fig. 68. *Zygopa nortoni* Serène and Umali, 1965: A–E, ♀, 11.2 mm cl, NMCR 1273, paratype. **A.** Carapace and ocular peduncles, dorsal view. **B.** Ocular peduncles, dorsal view. **C.** Left antennule, lateral view. **D.** Left antenna, lateral view. **E.** Right maxilliped III, lateral view. Scale = 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

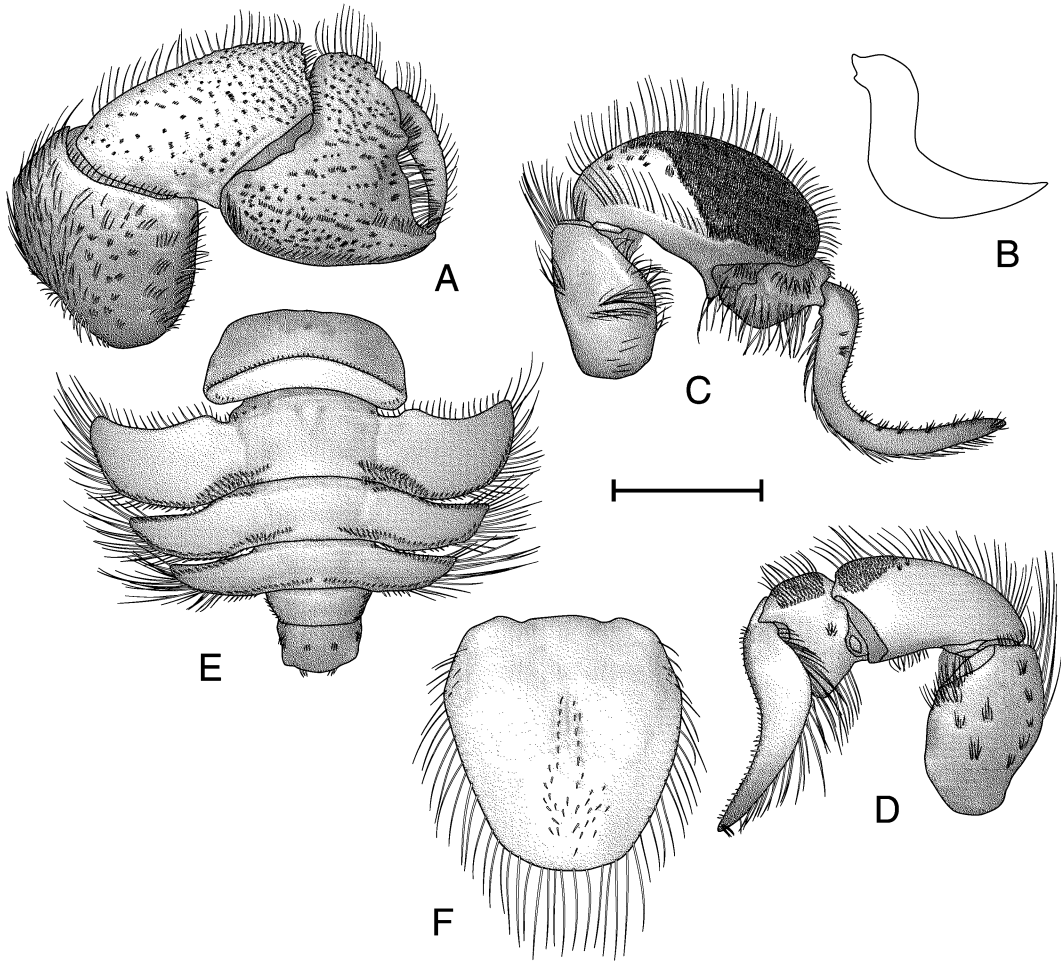


Fig. 69. *Zygopa nortoni* Serène and Umali, 1965: A, C–F, ♀, 11.2 mm cl, NMCR 1273, paratype; B, paratype (from Serène and Umali, 1965). **A.** Right pereopod I, lateral view. **B.** Right pereopod II dactylus, lateral view (from Serène and Umali, 1965). **C.** Right pereopod III, lateral view. **D.** 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).

**Marqueses 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-

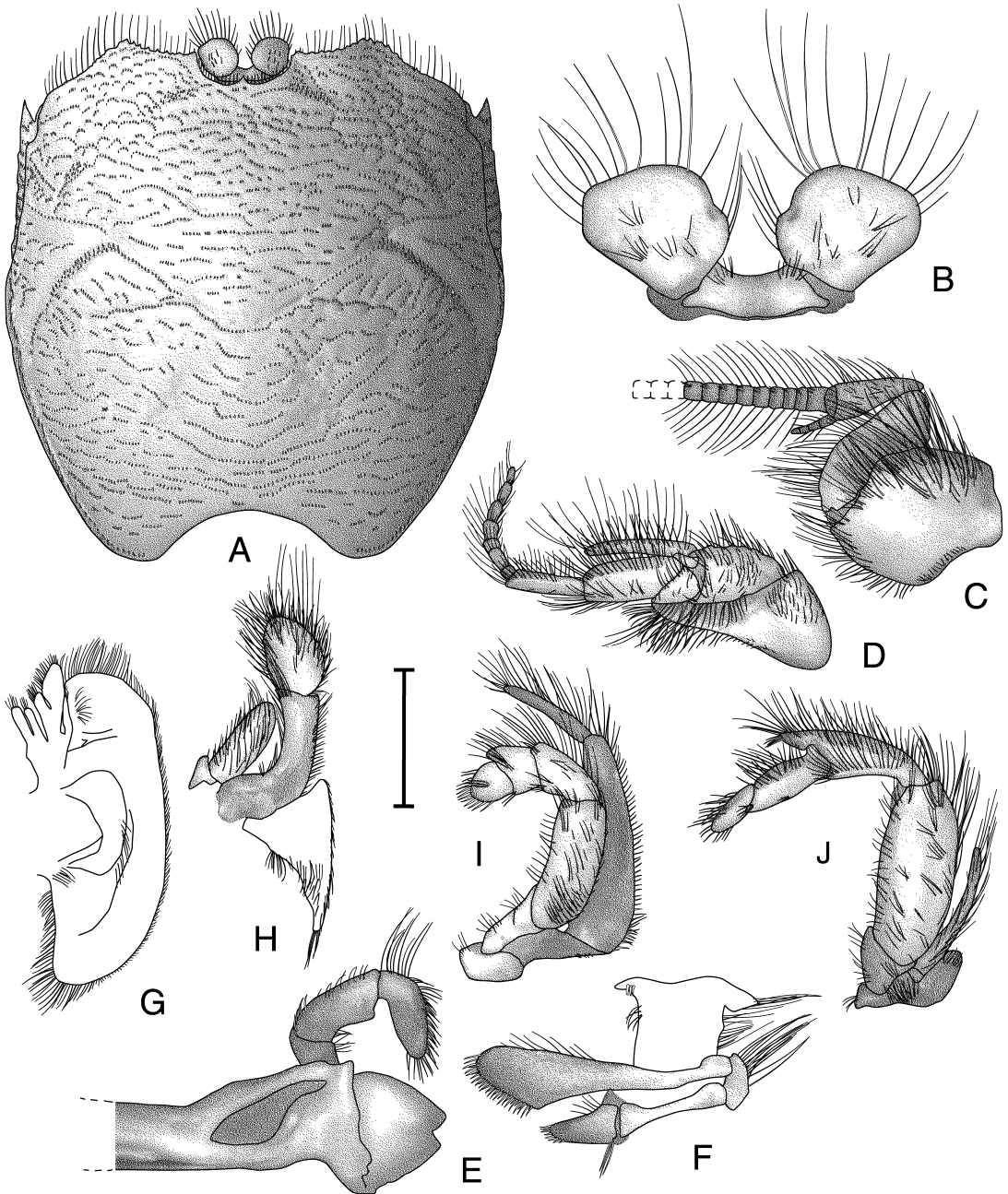


Fig. 70. *Squillalbunea mariellae* (Serène, 1973), n. comb.: A, ♀, 22.3 mm cl, QM W15789; B–J, ♂, 10.8 mm cl, USNM 304310. A. Carapace, branchiostegite, and ocular peduncles, dorsal view. B. Ocular peduncles, dorsal view. C. Left antennule, lateral view. D. Left antenna, lateral view. E. Left mandible, 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 ventrodistal 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

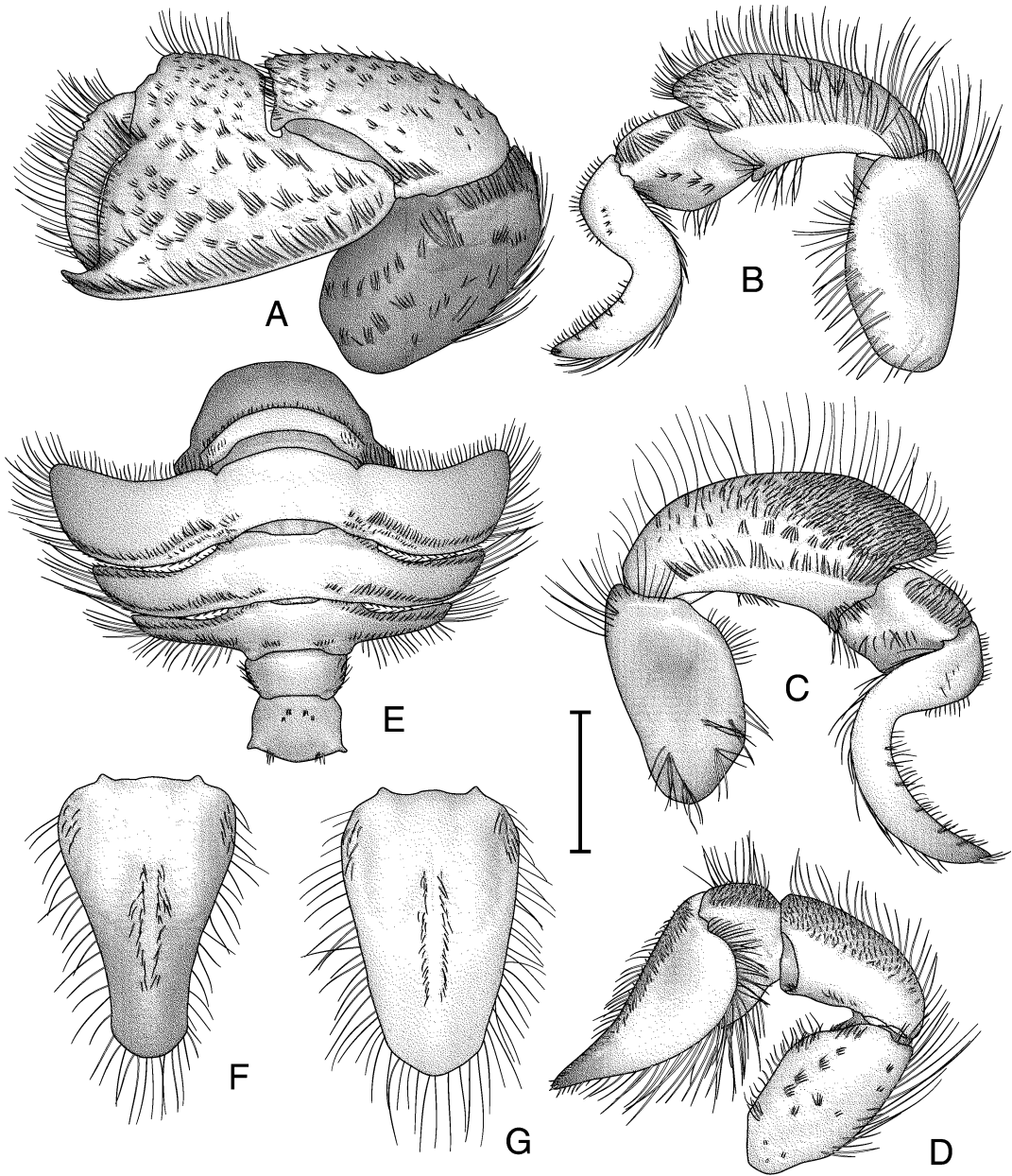


Fig. 71. *Squillalbunea mariellae* (Serène, 1973), n. comb.: A–F, ♂, 10.8 mm cl, USNM 304310; G, ♀, 22.3 mm cl, QM W15789. A. Left pereopod I, lateral view. B. Left pereopod II, lateral view. C. Right pereopod III, lateral view. D. Left pereopod IV, lateral view. E. Abdominal somites I–VI, dorsal view. 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 Marques Islands. The total number of species of albuneids known from the Marques 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

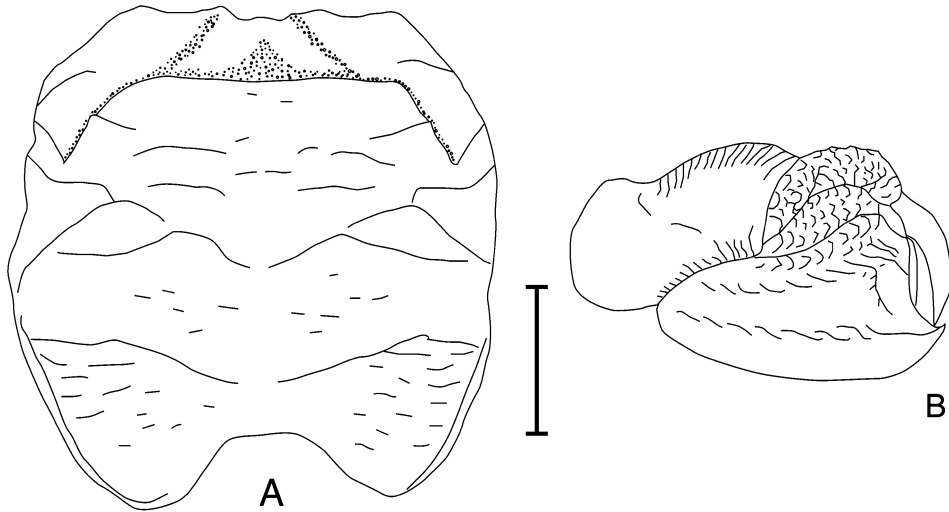


Fig. 72. *Itialbunea lutetiana* (Beschin and De Angeli, 1984), n. comb.: A, 23.6 mm cl, MCSNV 10440, holotype; B, MCSNV, paratype. **A.** Carapace, dorsal view. **B.** Right pereopod I dactylus, propodus, and carpus, lateral view. Scale = 8.5 mm.

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.

*Stemenopa* [sic] Efford, 1969: 5.

*Stemenops* [sic] Kaestner, 1980: 336.

*Stomonopa* [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-

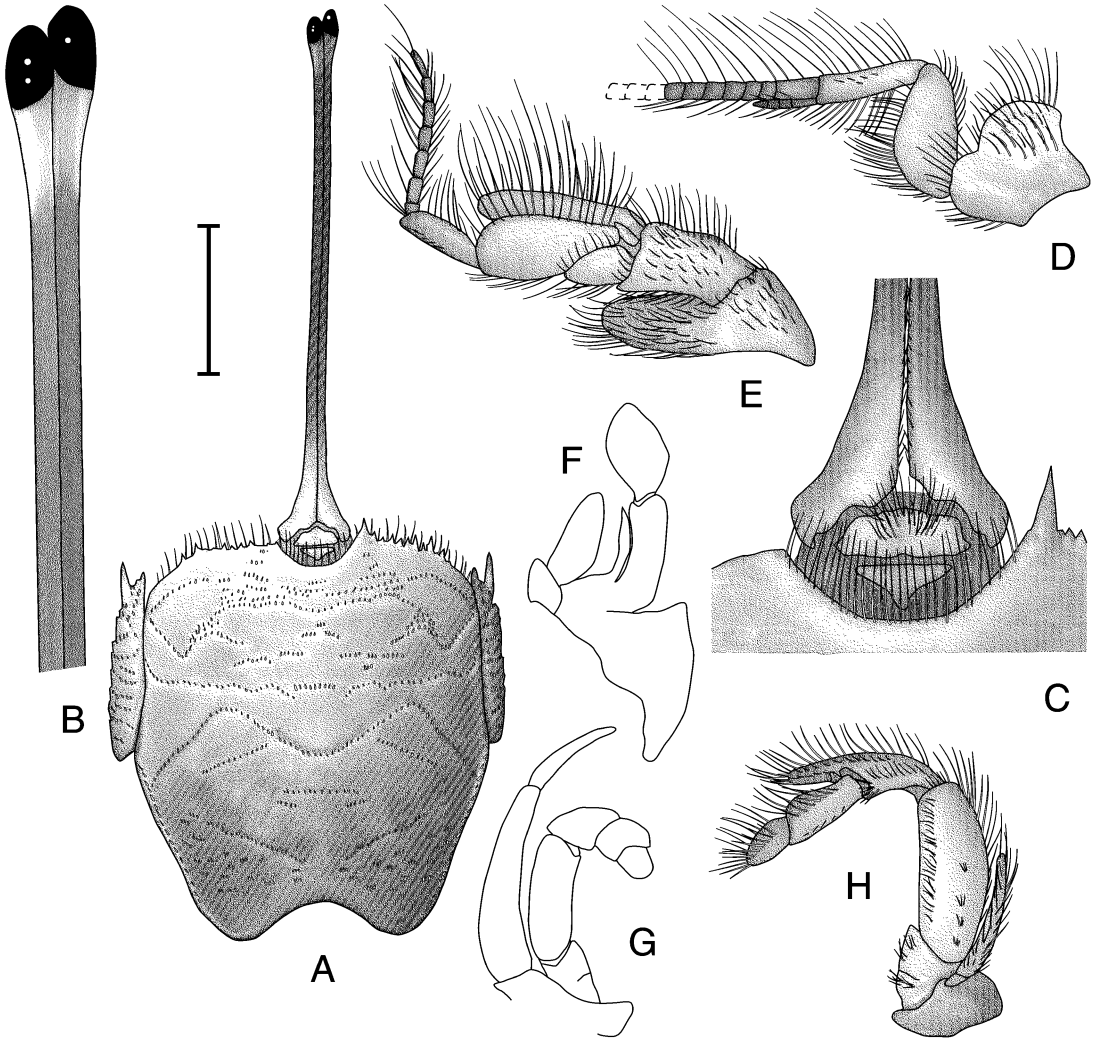


Fig. 73. *Stemonopa insignis* Efford and Haig, 1968: A–E, H, unsexable specimen, 7.6 mm cl, QM W22310; F, G, ♀, 10.4 mm cl, WAM 62–62, holotype (from Efford and Haig, 1968). **A.** Carapace, branchiostegite, and ocular peduncles, dorsal view. **B.** Ocular peduncles, proximal, dorsal view. **C.** Ocular 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 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

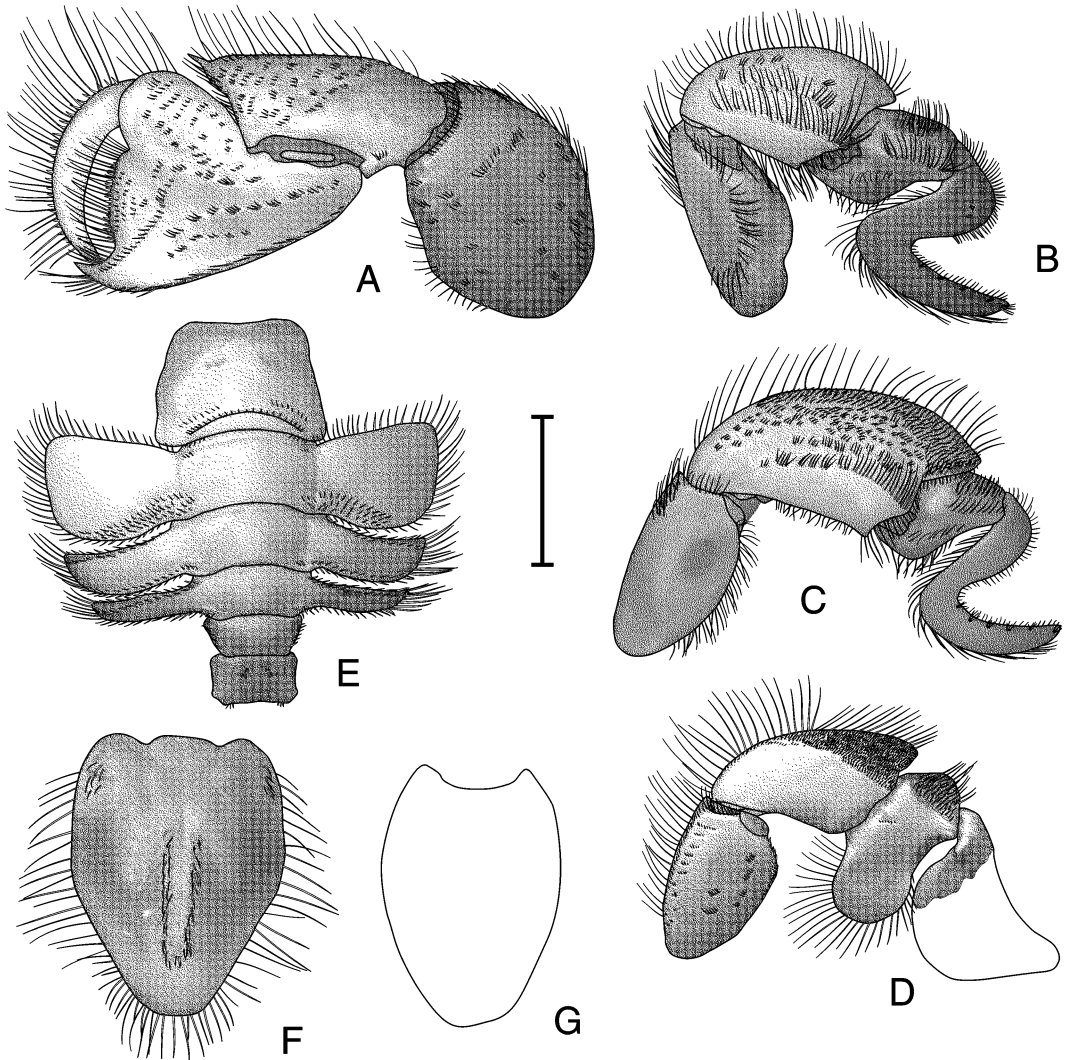


Fig. 74. *Stemonopa insignis* Efford and Haig, 1968: A, unsexable specimen, 7.6 mm cl, QM W22310; B, C, D (part), E, F, ♂, 9.7 mm cl, QM W22309; D (part), G, ♀, 10.4 mm cl, WAM 61-62, holotype (from Efford and Haig, 1968). A. Left pereopod I, lateral view. B. Right pereopod II, lateral view. C. Right 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.

Albunearlve 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

Figures 75, 76

*Albunaea* [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-