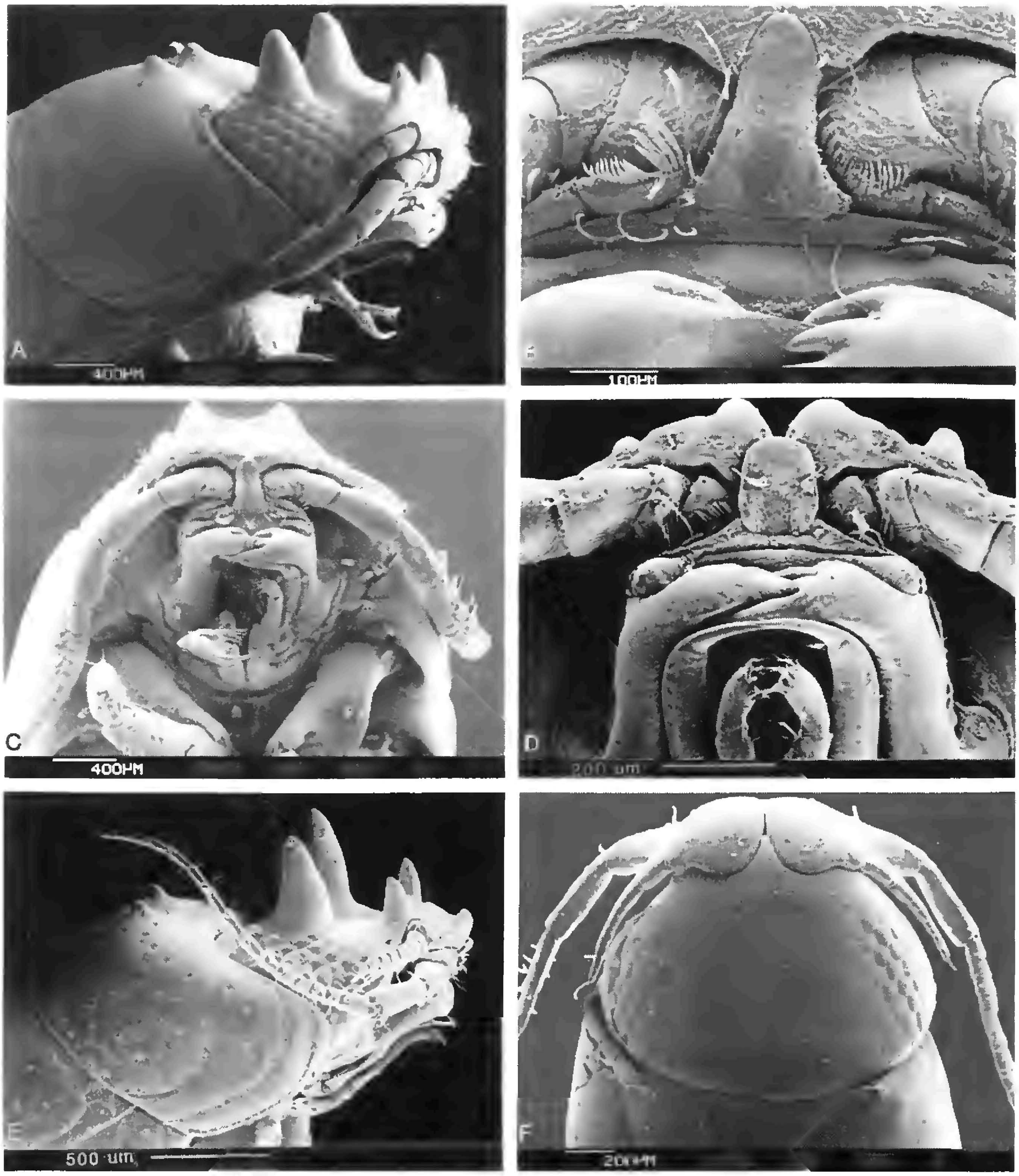


Figure 76. *Excorallana quadricornis: A*, cephalon and pereonite 1 ♂; *B*, ventral cephalon; *C*, frontal lamina enlarged. *Excorallana sexticornis: D*, cephalon and pereonite 1 ♂; *E*, cephalon ♀; *F*, ventral cephalon.

RECORDS Turks and Caicos Islands, 1 m; St. Thomas and St. Croix, U.S. Virgin Islands, 48–55 m; Cuba; Puerto Rico, on gills of rays *Aetobatus narinari* and *Dasyatis americana*, and on squirrel fish; Belize, intertidal to 15.2 m, in intertidal coral rubble, in coarse sediments in *Syringodium* and *Thalassia* sea-grass beds, on brown alga *Turbinaria*, on *Madracis* sp. sponge, on *Agaricia* sp. coral; Gulf of Mexico.

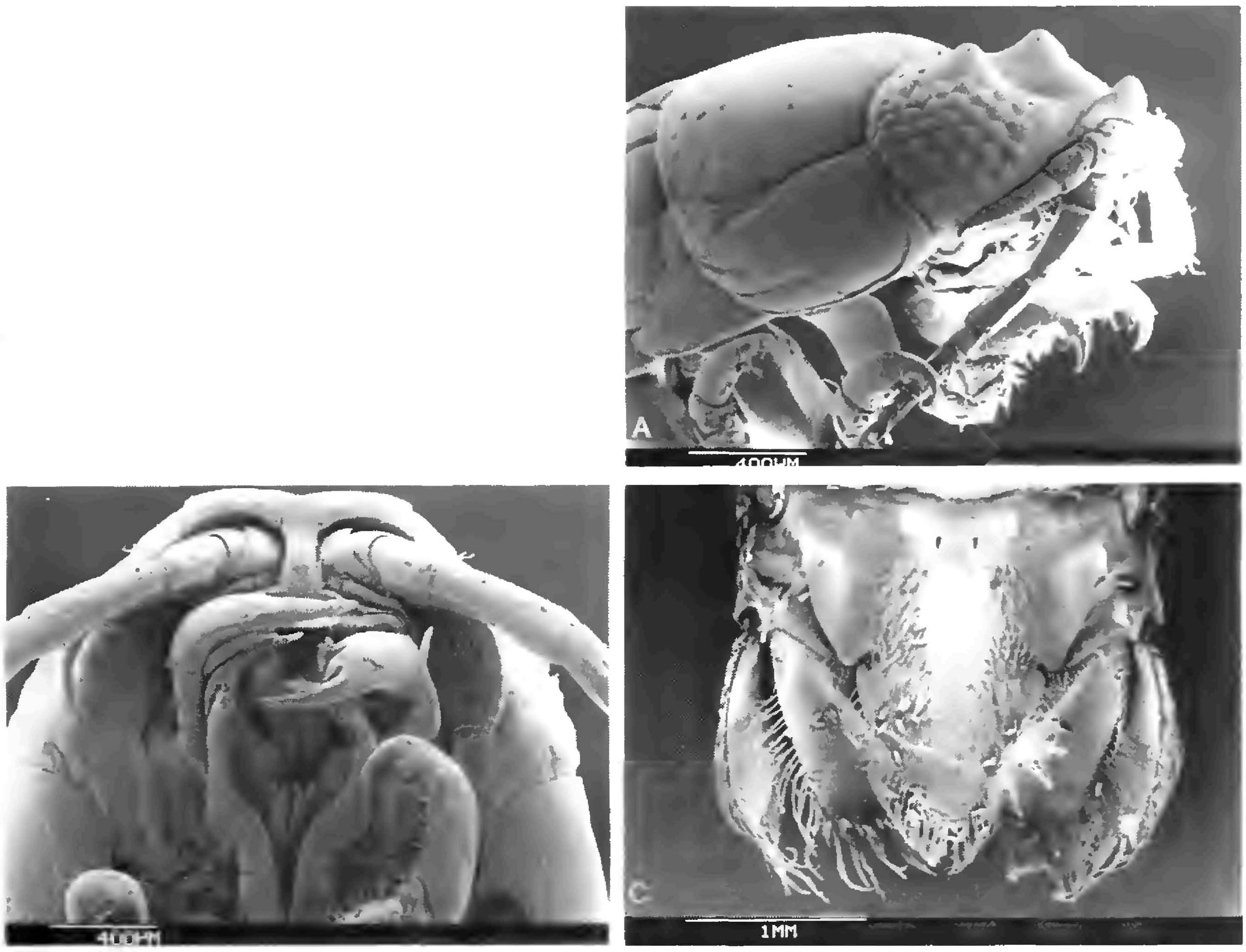


Figure 77. *Excorallana tricornis tricornis: A*, cephalon and pereonite 1 ♂; *B*, ventral cephalon; *C*, pleotelson and uropods.

REMARKS The subspecies *Excorallana tricornis occidentalis* Richardson, 1905a, from southern California, differs from the Gulf and Caribbean subspecies in lacking a gap between the margins of the pleotelsonic incision, and in having a relatively wider uropodal exopod which shows a distinctly asymmetrical apical notch.

Excorallana warmingii (Hansen, 1890)

Figure 75I,J

DIAGNOSIS ♂ 9.7 mm, ♀ 12.0 mm. Cephalon unornamented. Eyes contiguous, occupying most of dorsal surface of head. Posterior margins of pleonites very faintly tuberculate. Frontal lamina, length slightly more than twice basal width, tapering anteriorly to rounded apex. Pleotelson unornamented except for two faint submedian tubercles basally; lateral incisions lacking; apex broadly rounded, with five low but distinct marginal teeth.

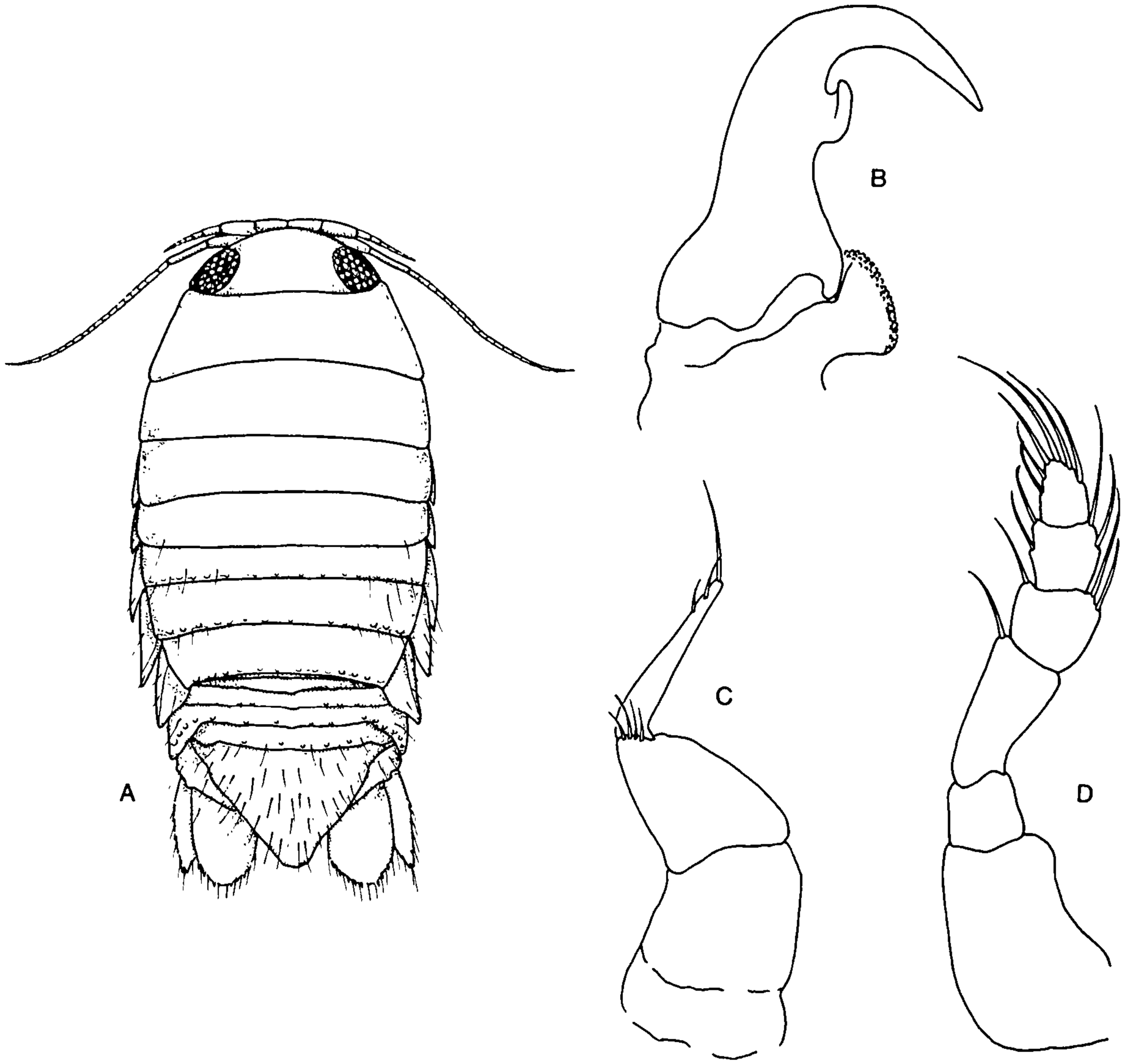


Figure 78. *Nalicora rapax: A*, ♀; *B*, maxilla 1; *C*, maxilla 2; *D*, maxilliped.

RECORDS Bahamas; between Cuba and the Yucatan Pensinsula; Puerto Rico.

Off Brazil near Rio de Janeiro.

Nalicora Moore, 1901

DIAGNOSIS Maxilla 1 exopod a single strongly falcate distal spine with knoblike mesial process, and basal caplike convex papilla-bearing structure. Maxilla 2 of four articles, distal article slender. Maxillipedal palp of five articles; endite lacking.

Nalicora rapax Moore, 1901
Figure 78

DIAGNOSIS ♂ 6.9 mm, ovigerous ♀ 10.0 mm. Eyes well developed. Frontal lamina basally slender, widening anteriorly, apex subacute. Posterior half of body bearing numerous scattered stiff setae. Pereonites 4–7 with row of low rounded tubercles near posterior margin. Posterior margins of pleonites 3–5 faintly tuberculate, more noticeable in ♂. Pleotelson wider than long; lateral margins faintly sinuous; apex rounded.

RECORDS Florida Keys, 55 m; Puerto Rico, 50–150 m; Gulf of Mexico off Florida, 37–73 m.

Family Cymothoidae Leach, 1818

DIAGNOSIS Antennules and antennae reduced, no clear distinction between peduncles and flagella. Mandibular palp of three articles. Maxilla 1 with four terminal spines. Maxilla 2 apically bilobed, armed with several spines. Maxillipedal palp of two articles, terminal article bearing hooks. All seven pairs of pereopods prehensile, ending in strongly hooked dactyli. Pleopods lacking marginal setae in adults.

REMARKS The cymothoids are exclusively ectoparasites on marine, freshwater, and brackish-water fishes. Most cymothoids occur in shallow water, mainly in tropical and subtropical areas. The position of attachment on the host (externally, in the buccal cavity, or in the gill chamber) is usually genus- or species-specific. The body of gill parasites is often asymmetrical, being slightly twisted, perhaps an effect of the position on the host. The mouthparts are highly adapted for the parasitic mode of life, while all seven pairs of pereopods are strongly prehensile. The posterior pereopods of some genera have the basal article expanded and carinate, allowing for increased musculature. The secretion of anticoagulants in the juvenile stages further aids the blood-feeding habit. The surface area of the pleopods is often increased by the development of lobes on the bases or the lamellae, providing an increased respiratory ability.

The post-mancal juvenile stages (sometimes referred to as the aegathoid stage) have large eyes, and highly setose pleopods for active swimming. The juveniles will attach themselves indiscriminantly to any convenient fish host, but eventually attach to the preferred host-species. The juvenile then develops into a functional male, losing the swimming setae of the pleopods. Both juveniles and males feed actively, drawing blood from the host fish. The

Key to genera of Cymothoidae

1. Antennule broader and usually longer than antenna; cephalon very weakly sunk into pereonite 1 2
   Antennule not broader or longer than antenna; cephalon distinctly immersed in, or not at all immersed in pereonite 1 4

2. Bases of antennules widely separated 3
   Bases of antennules contiguous ..... *Glossobius*

3. Body curved to one side; pleonite 1 extended laterally more on one side than on other ..... *Mothocya*
   Body rarely curved to one side; pleonite 1 extended equally on each side ..... *Renocila*

4. Pereonites and coxal plates 4–7 strongly expanded on one side only ..... *Agarna*
   No pereonites or coxal plates strongly expanded 5

5. Cephalon not immersed in pereonite 1; posterior margin of cephalon trisinuate 6
   Cephalon to some degree immersed in pereonite 1; posterior margin of cephalon not trisinuate 7

6. Posterolateral angles of pereonites 2–6 not produced; coxal plates short, rarely reaching posterior margin of their pereonites ..... *Anilocra*
   Posterolateral angles of pereonites 2–6 posteriorly increasingly produced; coxal plates usually reaching to posterior margin of their pereonites ..... *Nerocila*

7. Basal antennular articles expanded and contiguous ..... *Ceratothoa*
   Basal antennular articles expanded but not contiguous, or basal antennular articles neither expanded nor contiguous 8

8. Basal antennular articles expanded but not contiguous ..... *Kuna*
   Basal antennular articles neither expanded nor contiguous 9

9. Pleonal margins continuous with pereonal margins, pleon not abruptly narrowed, only weakly immersed in pereonite 7 ..... *Lironeca*
   Pleon to some degree narrower than pereon; pleon usually deeply immersed in pereonite 7 ..... *Cymothoa*

male eventually becomes a female (all cymothoids are protandrous) should a female not already be present. In some species, the female is nonfeeding. In those species which settle either in the mouth cavity or gill chamber of the host, integumental pigment is frequently lost, and the eyes become reduced.

Given the highly variable morphology of the cymothoids, in part imposed by the parasitic mode of life, and the existence of polymorphism and possible sibling species, the taxonomy of this family demands the examination of large numbers of specimens. As a further aid to identification, Table 3 is provided, giving host species, parasite, and site of attachment.

TABLE 3. CYMOTHOID PARASITES FROM THE CARIBBEAN AREA, LISTED BY FISH HOST SPECIES

Fish host	Cymothoid parasite	Site of attachment
Abudefduf saxatilis	*Anilocra abudefdufi*	beneath eye
	Kuna insularis	gill chamber
Acanthurus bahianus	*Anilocra acanthuri*	♀ at base of pectoral fin; immature on or near pectoral or pelvic fin
Acanthurus chirurgus	*Anilocra acanthuri*	♀ at base of pectoral fin; immature on or near pectoral or pelvic fin
Alutera schoepfi	*Nerocila acuminata*	on or at base of fin
Anchoa lamprotaenia	*Lironeca tenuistylis*	posterior to pectoral fin
Apogon lachneri	*Mothocya bohlkeorum*	in gill chamber
Apogon maculatus	*Renocila colini*	next to dorsal fin
Apogon townsendi	*Renocila colini*	next to dorsal fin
Arius felis	*Nerocila acuminata*	on or at base of fin
Astrapogon stellatus	*Mothocya bohlkeorum*	in gill chamber
Batrachoides surinamensis	*Nerocila acuminata*	on or at base of fin
Caranx hippos	*Cymothoa oestrum*	inside mouth
Caranx latus	*Cymothoa oestrum*	inside mouth
Caranx ruber	*Cymothoa oestrum*	inside mouth
Caranx sp.	*Cymothoa oestrum*	inside mouth
Chaetodipterus faber	*Nerocila acuminata*	on or at base of fin
Chaetodon capistratus	*Anilocra chaetodontis*	beneath eye
Chaetodon ocellatus	*Anilocra chaetodontis*	beneath eye
Chaetodon sedentarius	*Anilocra chaetodontis*	beneath eye
Chaetodon striatus	*Anilocra chaetodontis*	beneath eye

(*continued*)

TABLE 3. (*Continued*)

Fish host	Cymothoid parasite	Site of attachment
Chilomycterus schoepfi	*Nerocila acuminata*	on or at base of fin
Chromis cyaneus	*Anilocra chromis*	beneath eye
Chromis multilineatus	*Anilocra chromis*	beneath eye
Cynoscion nebulosus	*Cymothoa excisa*	inside mouth
Cynoscion sp.	*Cymothoa oestrum*	inside mouth
Epinephelus cruentatus	*Anilocra haemuli*	beneath eye
Epinephelus fulvus	*Anilocra haemuli*	beneath eye
Epinephelus guttatus	*Anilocra haemuli*	beneath eye
Epinephelus itajara	*Nerocila acuminata*	on or at base of fin
Epinephelus sp.	*Cymothoa oestrum*	on or at base of fin
Exocoetus spp.	*Glossobius impressus*	inside mouth
Gerres rhombeus	*Lironeca redmanni*	in gill chamber
Haemulon aurolineatum	*Anilocra haemuli*	beneath eye
Haemulon carbonarium	*Anilocra haemuli*	beneath eye
Haemulon chrysargyreum	*Anilocra haemuli*	beneath eye
Haemulon flavolineatum	*Anilocra haemuli*	beneath eye
Haemulon macrostomum	*Anilocra haemuli*	beneath eye
Haemulon plumieri	*Anilocra haemuli*	beneath eye
Haemulon sciurus	*Anilocra haemuli*	beneath eye
Hemirhamphus brasiliensis	*Glossobius hemirhamphi*	inside mouth
Hirundichthys speculifer	*Glossobius impressus*	inside mouth
Holacanthus tricolor	*Anilocra holacanthi*	beneath eye
Holocentrus ascensionis	*Anilocra holocentri*	♀ between eyes, ♂ and immature beneath eye
Hyporhamphus unifasciatus	*Mothocya nana*	in gill chamber
Leiostomus xanthurus	*Nerocila acuminata*	on or at base of fin
	Cymothoa excisa	inside mouth
	Lironeca redmanni	in gill chamber
Lepiosteus spatula	*Nerocila acuminata*	on at base of fin
Lutjanus analis	*Cymothoa excisa*	inside mouth
Lutjanus mahogoni	*Cymothoa excisa*	inside mouth
Lutjanus synagris	*Cymothoa excisa*	inside mouth
Megalops atlanticus	*Cymothoa oestrum*	inside mouth
Monacanthus ciliatus	*Nerocila acuminata*	on or at base of fin
Mugil cephalus	*Nerocila acuminata*	on or at base of fin
Myripristis jacobus	*Anilocra myripristi*	♀ between eyes, immature beneath eye
Ocyurus chrysurus	*Cymothoa excisa*	inside mouth
Orthopristis chrysoptera	*Cymothoa excisa*	inside mouth

Fish host	Cymothoid parasite	Site of attachment
Orthopristis ruber	*Anilocra haemuli*	beneath eye
Paranthias furcifer	*Anilocra haemuli*	beneath eye
Phaeoptyx conklini	*Mothocya bohlkeorum*	in gill chamber
Phaeoptyx pigmentaria	*Mothocya bohlkeorum*	in gill chamber
Pogonias cromis	*Nerocila acuminata*	on or at base of fin
Pomacentrus partitus	*Anilocra partiti*	beneath eye
Priacanthus arenatus	*Cymothoa oestrum*	inside nouth
Scomberomorus cavalla	*Lironeca redmanni*	in gill chamber
Scomberomorus maculatus	*Lironeca redmanni*	in gill chamber
Scomberomorus regalis	*Lironeca redmanni*	in gill chamber
Selar crumenophthalmus	*Cymothoa oestrum*	inside mouth
Serranus tigrinus	*Renocila bowmani*	next to dorsal fin
	Renocila waldneri	next to dorsal fin
Sphoeroides maculatus	*Nerocila acuminata*	on or at base of fin
Synodus foetens	*Cymothoa excisa*	inside mouth

Agarna Schioedte and Meinert, 1883

DIAGNOSIS Cephalon with posterior margin not trilobed; immersed in pereonite 1. Antennular bases contiguous. Pereonites 4–7 on one side flattened and expanded; coxal plates of pereopods 4–7 also expanded and flattened but generally hidden by lateral expansion of pereonites. Bases of posterior three pereopods with well-formed carinae. Pleonites 1 and 2 immersed in pereonite 7; pleonites 2–5 with free fingerlike lateral margins.

Agarna cumulus (Haller, 1880)
Figure 79

DIAGNOSIS ♀ 18 mm. Eyes present, indistinct. Pereon strongly "humped" dorsally. Uropod about 1/3 length of pleotelson; uropodal exopod slightly longer, and twice width of endopod. Pleotelson triangular, length 3/4 basal width, apex rounded.

RECORDS No host recorded: Key West, Florida.

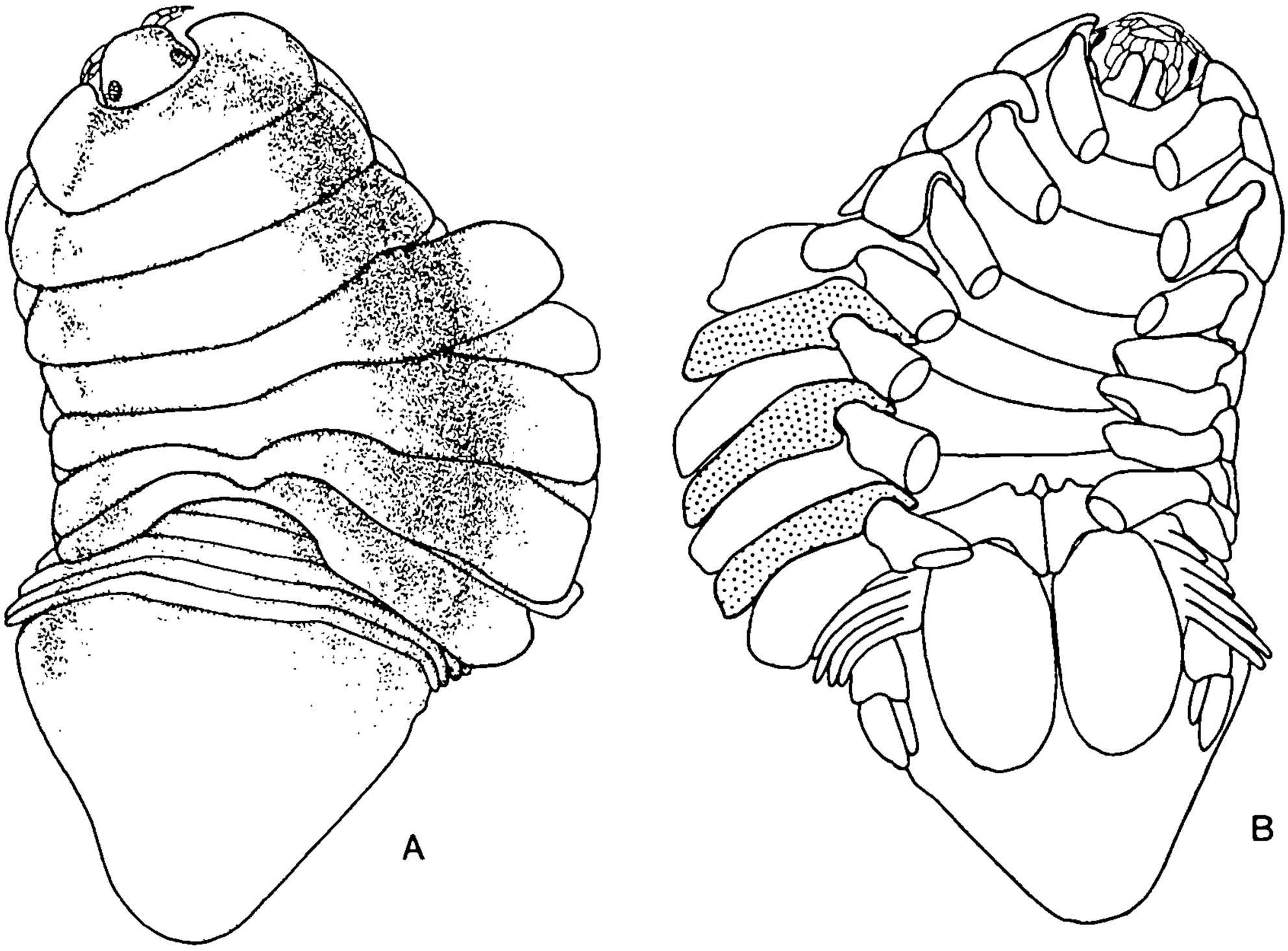


Figure 79. *Agarna cumulus: A*, ♀, dorsal view; *B*, ♀, ventral view, coxal plates stippled.

Anilocra Leach, 1818

DIAGNOSIS Cephalon usually narrowed anteriorly to triangular apex folded ventrally between bases of antennules; posterior margin trilobed; not immersed, or only weakly immersed in pereonite 1. Coxal plates small, compact, not reaching level of posterior margin of their respective pereonites. Pereopods increasing in length posteriorly, pereopod 7 often markedly longer than 6. Pleon not immersed or only slightly immersed in pereonite 7. Pleopods 3–5 often formed into deep pockets or pleats. Uropods often extending beyond pleotelsonic apex.

REMARKS Williams and Williams (1981) have provided a comprehensive treatment of this genus and nine of its species in the West Indies. Table 1 in this latter paper provides characters for separating these nine species. This table also indicates that for each species, the site of attachment of the adult to the host fish is specific, with six species attaching under the eye of the host.

Key to species of *Anilocra*

1. Pereopods 2–4 with swelling on outer margin of dactylus 2
   Pereopods 2–4 lacking swelling on outer margin of dactylus 5

2. Body axis distorted by more than 10° . . . . . *holacanthi*
   Body axis distorted by less than 5° 3

3. Dactylus of pereopod 7 longer than propodus . . . . . *partiti*
   Dactylus of pereopod 7 shorter than propodus 4

4. Posteroventral angle of pereonite 7 overlapping pleonite 1 only
   . . . . . *abudefdufi*
   Posteroventral angle of pereonite 7 overlapping pleonites 1 and 2
   . . . . . *chaetodontis*

5. Posteroventral angle of pereonite 7 produced 6
   Posteroventral angle of pereonite 7 not produced 7

6. Uropod reaching posterior margin of pleotelson . . . . . *myripristis*
   Uropod not reaching posterior margin of pleotelson . . . . . *haemuli*

7. Posteroventral angle of pereonite 7 overlapping pleonite 1 . . . . *holocentri*
   Posteroventral angle of pereonite 7 not overlapping pleonite 1 8

8. Uropod reaching posterior margin of pleotelson . . . . . *acanthuri*
   Uropod not reaching posterior margin of pleotelson . . . . . *chromis*

Anilocra abudefdufi Williams and Williams, 1981
Figure 80A–C

DIAGNOSIS Ovigerous ♀ 19.0–31.0 mm, ♂ 7.0–8.5 mm. Pereopods 2–4 with swelling on outer margin of dactylus. Posteroventral angle of pereonite 6 slightly produced, of pereonite 7 more produced, overlapping pleonite 1. Uropodal endopod variable, not reaching, to extending well beyond, apex of exopod. Color: upper lateral half to three-fourths of dorsal surface of ♀ when attached to host is dark brown; rest of dorsal surface light brown to yellow. Attaching beneath eye of host.

RECORDS Sergeant major *Abudefduf saxatilis:* Panama; Colombia.

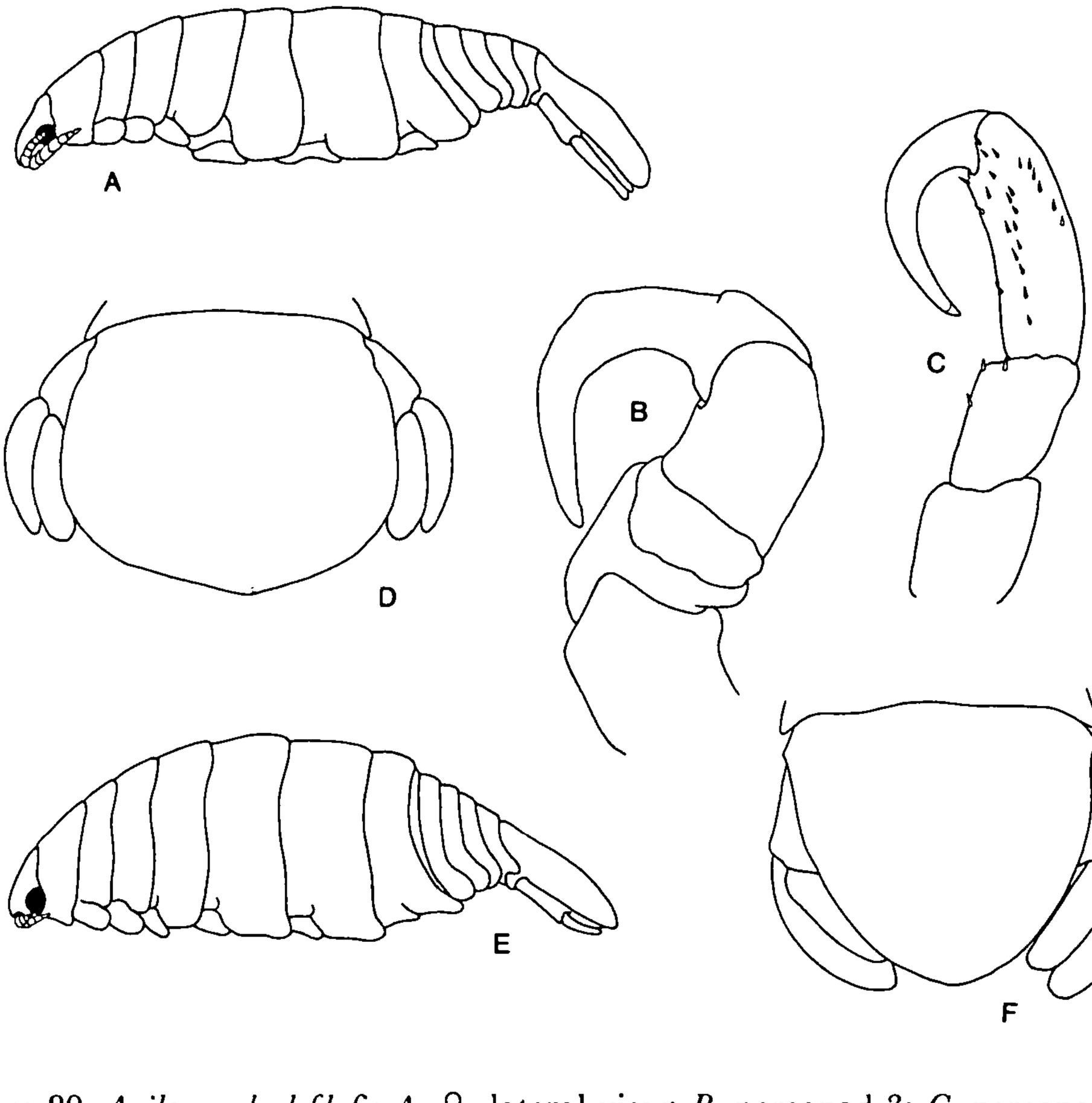


Figure 80. *Anilocra abudefdufi: A*, ♀, lateral view; *B*, pereopod 3; *C*, pereopod 7. *Anilocra acanthuri: D*, pleotelson and uropods. *Anilocra chaetodontis: E*, ♀, lateral view. *Anilocra chromis: F*, pleotelson and uropods.

Anilocra acanthuri Williams and Williams, 1981

Figure 80D

DIAGNOSIS Ovigerous ♀ 29.0–40.0 mm, ♂ 4.0–8.0 mm. Pereopods 2–4 without swelling on outer margin of dactylus. Posteroventral angles of pereonites not produced. Uropod not reaching posterior margin of pleotelson. Endopod of uropod variable, not reaching, to extending well beyond, apex of exopod. Color: dorsal surface of ♀ black to lead gray, ventral surface gray. Attaching under pectoral fin of host.

RECORDS Doctorfish *Acanthurus chirurgus:* Florida Keys; Bahamas; Puerto Rico; U.S. Virgin Islands. Ocean surgeon *Acanthurus bahianus:* Florida Keys; Bahamas; Cuba; Jamaica; Dominican Republic; Puerto Rico; U.S. Virgin Islands.

Anilocra chaetodontis Williams and Williams, 1981
Figure 80E

DIAGNOSIS Ovigerous ♀ 18–28 mm, ♂ 4–5 mm. Pereopods 2–4 with swelling on outer margin of dactylus. Posteroventral angles of pereonites 4–7 becoming progressively produced, that of pereonite 7 overlapping pleonite 2. Uropod not reaching posterior margin of pleotelson; uropodal endopod extending beyond apex of exopod. Pleotelson as wide as long to slightly wider than long. Color: dorsal surface of ♀ black to lead gray, ventral surface gray. Attaching beneath eye of host.

RECORDS Foureye butterflyfish *Chaetodon capistratus:* Bahamas; Puerto Rico; British and U.S. Virgin Islands. Banded butterflyfish *Chaetodon striatus:* Bahamas; Puerto Rico; British Virgin Islands. Spotfin butterflyfish *Chaetodon ocellatus:* Bahamas; Puerto Rico; U.S. Virgin Islands. Reef butterflyfish *Chaetodon sedentarius:* Puerto Rico.

Anilocra chromis Williams and Williams, 1981
Figure 80F

DIAGNOSIS Ovigerous ♀ 16–28 mm, ♂ 4–9 mm. Pereopods 2–4 lacking swelling on outer margin of dactylus. Posteroventral angles of pereonites not produced. Uropod extending beyond posterior margin of pleotelson; uropodal endopod not reaching beyond exopod. Color: upper lateral one-fourth to two-thirds of dorsal surface of ♀ when attached is dark gray, shading to off-white lower lateral area. Attaching beneath eye of host.

RECORDS Brown chromis *Chromis multilineatus:* Puerto Rico; British and U.S. Virgin Islands. Blue chromis *Chromis cyaneus:* Bahamas; Dominican Republic. No host recorded: Anguilla.

Anilocra haemuli Williams and Williams, 1981
Figure 81A,B

DIAGNOSIS Ovigerous ♀ 21–40 mm, ♂ 7 mm. Body axis distorted less than 5°. Pereopods 2–4 lacking swelling on outer margin of dactylus. Posteroventral angle of pereonites 6 and 7 produced, latter overlapping pleonite 1. Uropod not reaching posterior margin of pleotelson; uropodal endopod reaching beyond apex of exopod. Color: dorsal surface of ♀ yellow to light brown. Attaching beneath eye of host.

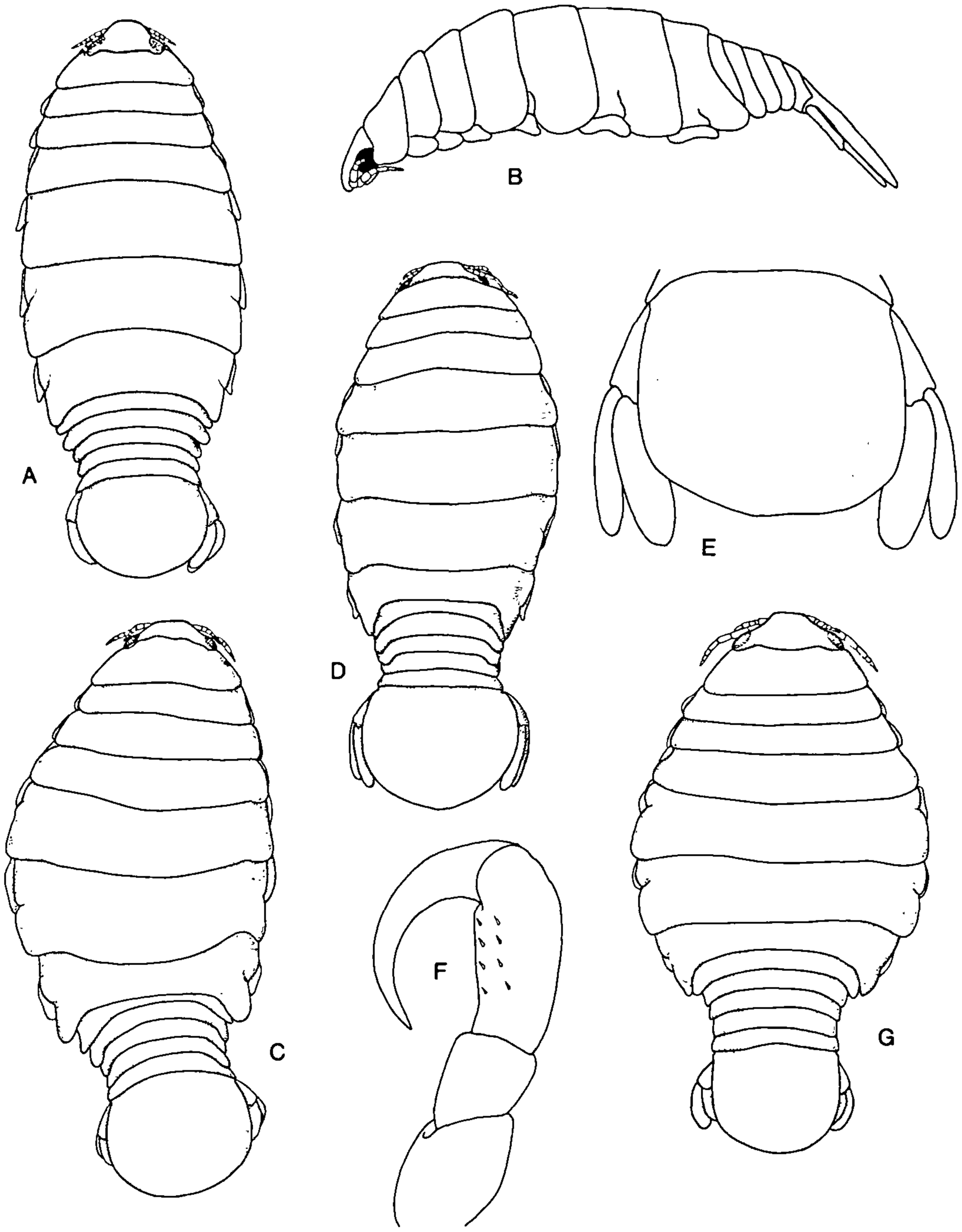


Figure 81. *Anilocra haemuli: A*, ♀, dorsal view; *B*, ♀, lateral view. *Anilocra holacanthi: C*, ♀. *Anilocra holocentri: D*, ♀. *Anilocra myripristis: E*, pleotelson and uropods. *Anilocra partiti: F*, ♀; *G*, pereopod 7.

RECORDS French grunt *Haemulon flavolineatum:* Florida Keys; Puerto Rico; British and U.S. Virgin Islands. Tomtate *Haemulon aurolineatum:* Jamaica; Puerto Rico. Smallmouth grunt *Haemulon chrysargyreum:* Puerto Rico; U.S. Virgin Islands. Caesar grunt *Haemulon carbonarium:* Puerto Rico; U.S. Virgin

Islands. Spanish grunt *Haemulon macrostomum:* Puerto Rico. White grunt *Haemulon plumieri:* Florida Keys; Yucatan Peninsula. Bluestriped grunt *Haemulon sciurus:* Florida Keys. Cora cora *Orthopristis ruber:* Margarita Island, Venezuela. Coney *Epinephelus fulvus:* Bahamas; Dominican Republic; Puerto Rico; U.S. Virgin Islands; Guadeloupe. Red hind *Epinephelus guttatus:* Puerto Rico; British and U.S. Virgin Islands. Graysby *Epinephelus cruentatus:* Bahamas; Dominican Republic; U.S. Virgin Islands. Creole-fish *Paranthias furcifer:* Dominican Republic; Puerto Rico; Colombia. No host recorded: Cuba; Jamaica; Dominica; Barbados; Venezuela; Brazil.

Anilocra holacanthi Williams and Williams, 1981
Figure 81C

DIAGNOSIS Ovigerous ♀ 21–33 mm, ♂ 4–7 mm. Body axis distorted by more than 10°. Pereopods 2–4 with swelling on outer margin of dactylus. Posteroventral angles of pereonites 5–7 progressively more produced, that of pereonite 7 overlapping pleonite 1. Uropod not reaching posterior margin of pleotelson; uropodal endopod reaching beyond apex of exopod. Color: dorsal surface of ♀ black to lead gray. Attaching beneath eye of host.

RECORDS Rock beauty *Holacanthus tricolor:* Bahamas; Jamaica; Dominican Republic; Puerto Rico; British and U.S. Virgin Islands.

Anilocra holocentri Williams and Williams, 1981
Figure 81D

DIAGNOSIS Ovigerous ♀ 32–46 mm, ♂ 5–9 mm. Body axis distorted less than 5°. Pereopods 2–4 lacking swelling on outer margin of dactylus. Posteroventral angle of pereonite 7 produced, overlapping pleonite 1. Uropod not reaching posterior margin of pleotelson; uropodal endopod reaching beyond apex of exopod. Color: dorsal surface of ♀ dark brown, ventral surface light brown. ♀ attaching between eyes of host; ♂ or transitional stage beneath eye.

RECORDS Squirrelfish *Holocentrus ascensionis:* Puerto Rico; U.S. Virgin Islands.

No host recorded: Patagonia, Straits of Magellan.

Anilocra myripristis Williams and Williams, 1981
Figure 81E

DIAGNOSIS Ovigerous ♀ 29–40 mm, ♂ 6–7 mm. Body axis distorted less than 5°. Pereopods 2–4 lacking swellings on outer margin of dactylus. Posteroventral angle of pereonites 6 and 7 produced, latter overlapping pleonite 1. Uropod reaching beyond posterior margin of pleotelson; uropodal endopod reaching beyond apex of exopod. Color: dorsal surface of ♀ light reddish brown, ventral surface yellow. ♀ attaching between eyes of host; immature or transitional forms sometimes beneath eye.

RECORDS Blackbar soldierfish *Myripristis jacobus:* Bahamas; Dominican Republic; Puerto Rico.

Anilocra partiti Williams and Williams, 1981
Figure 81F,G

DIAGNOSIS Ovigerous ♀ 12–16 mm, transitional 7.6–9.0 mm. Body axis distorted less than 5°. Pereopods 2–4 with swelling on outer margin of dactylus. Pereopod 7 with dactylus longer than propodus. Posteroventral angle of pereonite 7 produced, overlapping pleonite 1. Uropod not reaching posterior margin of pleotelson; uropodal endopod not reaching apex of exopod. Color: dorsal surface black to slate gray. Attaching beneath eye of host.

RECORDS Bicolor damselfish *Pomacentrus partitus:* Jamaica.

Ceratothoa Dana, 1852

DIAGNOSIS Cephalon more or less immersed in pereonite 1, posterior margin not trisinuate. Bases of antennules expanded, contiguous. Coxal plates compact; anterior plates not extending beyond posterior margins of their respective pereonites; posterior coxal plates may or may not be produced beyond the posterior margins of the pereonites. Anterior pleonites narrowed, immersed in pereonite 7. Copulatory stylet lacking on pleopod 2 of ♂ of some species.

Ceratothoa deplanata Bovallius, 1885
Figure 82A

DIAGNOSIS ♀ 18 mm. Cephalon subtriangular, anterior margin rounded. Pereopods 4–7 with strongly carinate bases. Uropod reaching or extending

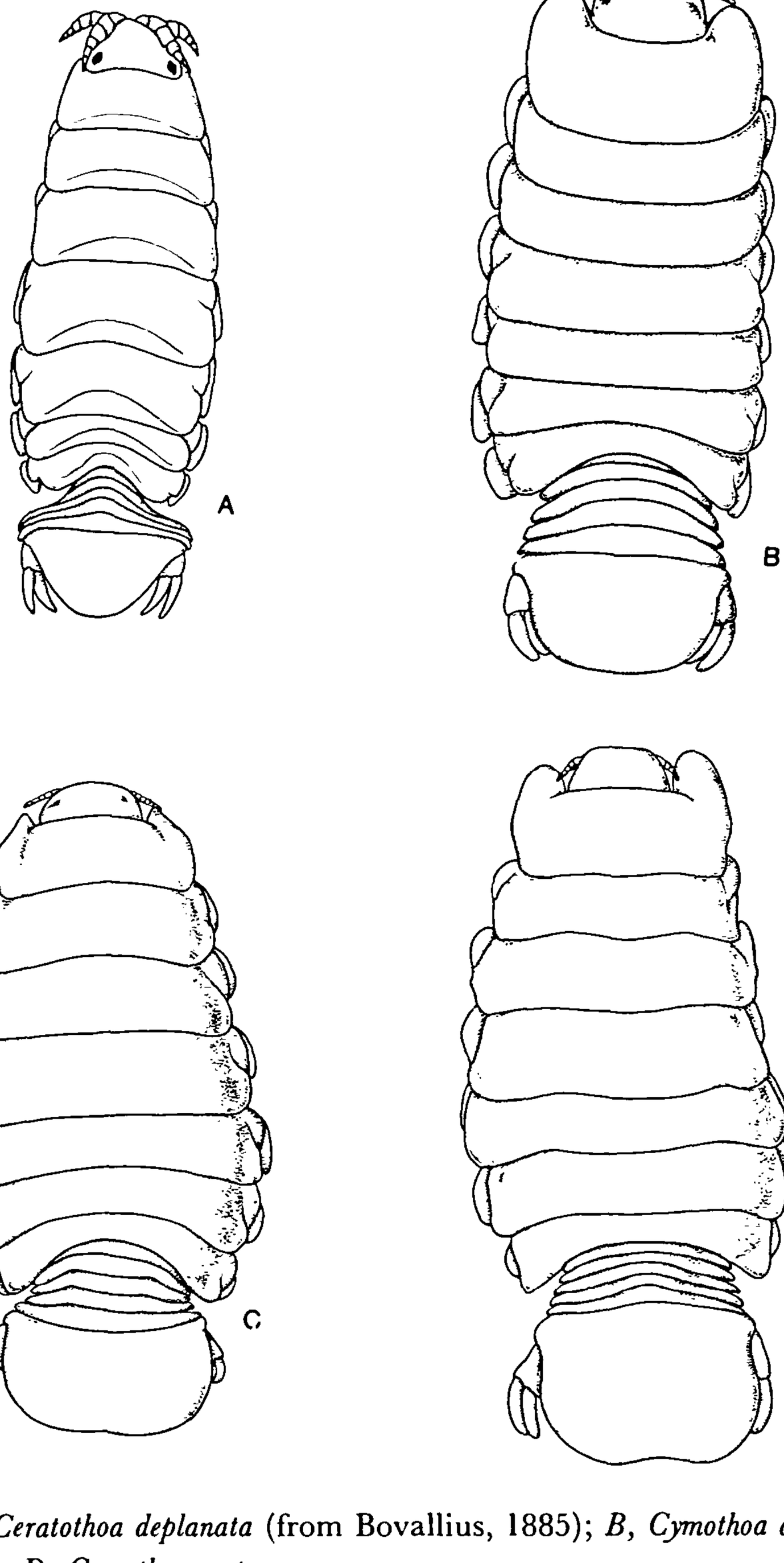


Figure 82. *A*, *Ceratothoa deplanata* (from Bovallius, 1885); *B*, *Cymothoa caraibica; C*, *Cymothoa excisa; D*, *Cymothoa oestrum*.

slightly beyond posterior margin of pleotelson; rami subequal in length and width. Pleotelson basally wider than long, posterior margin broadly rounded. Color: bright yellow.

RECORDS Haiti, host not recorded.

Cymothoa Fabricius, 1793

DIAGNOSIS Body usually not distorted. Cephalon with posterior margin not trilobed; more or less immersed in pereonite 1; latter with anterolateral corners produced to embrace cephalon. Bases of antennules not expanded, well separated. Anterior coxal plates not reaching posterior borders of their respective pereonites, posterior coxal plates nearly reaching or extending beyond posterior borders of pereonites. Pleon narrower than, and immersed in pereonite 7. Pleonites increasing in length and width posteriorly.

Key to species of *Cymothoa*

1. Anterolateral angles of pereonite 1 reaching to half length of cephalon or less; eyes or traces of eyes present 2
   Anterolateral angles of pereonite 1 broad, reaching to anterior margin of cephalon; eyes absent ..... *oestrum*

2. Anterolateral angles of pereonite 1 narrow, subacute ..... *excisa*
   Anterolateral angles of pereonite 1 broad, rounded ..... *caraibica*

Cymothoa caraibica Bovallius, 1885

Figure 82B

DIAGNOSIS ♀ 17 mm, ♂ 12–16 mm. Anterior margin of cephalon broadly rounded. Eyes large, distinct. Broadly rounded anterolateral angles of pereonite 1 reaching to about midlength of cephalon. Bases of pereopods 4–7 with strong, rounded carina. Uropodal rami subequal in length, equal to peduncle in length. Pleotelson width about twice length, posterolateral margin broadly rounded.

RECORDS Puerto Rico; Gulf of Mexico.

Cymothoa excisa Perty, 1833

Figure 82C

DIAGNOSIS Ovigerous ♀ 20–24 mm. Anterior margin of cephalon in dorsal view truncate to slightly excavate; eyes small, indistinct. Anterolateral angles of pereonite 1 narrowly rounded to subacute, reaching anteriorly to about midlength of cephalon. Pereopods 4–7 with high rounded carina on basis.

Uropods hardly reaching halfway along lateral margin of pleotelson; exopod slightly longer than endopod. Pleotelson about twice wider than long; broadly rounded and somewhat bilobed.

RECORDS Yellowtail snapper *Ocyurus chrysurus:* Yucatan Peninsula, Mexico; Carrie Bow Cay, Belize; Margarita Island, Venezuela; Panama. Mutton snapper *Lutjanus analis:* Yucatan Peninsula, Mexico; Panama. Lane snapper *Lutjanus synagris:* Panama. Mahogany snapper *Lutjanus mahogoni:* Panama. Pigfish *Orthopristis chrysoptera:* Florida, Gulf of Mexico. Spot *Leiostomus xanthurus:* Texas, Gulf of Mexico. Spotted seatrout *Cynoscion nebulosus:* Texas, Gulf of Mexico. Inshore lizardfish *Synodus foetens:* Texas, Gulf of Mexico. No host recorded: Massachusetts; South Carolina; Georgia; Florida Keys; Bahamas; Cuba; Trinidad; Brazil.

Cymothoa oestrum (Linnaeus, 1793)

Figure 82D

DIAGNOSIS Ovigerous ♀ 38 mm. Cephalon in dorsal view with anterolateral angles rounded, anterior margin slightly excavate; eyes absent. Anterolateral angles of pereonite 1 expanded, broadly rounded, reaching to level of anterior margin of cephalon. Pereonites 4–7 with high rounded carina on basis. Uropod reaching posteriorly beyond midlength of pleotelson; exopod slightly longer than endopod. Pleotelson length slightly more than half basal width.

RECORDS Bigeye scad *Selar crumenophthalmus:* Bermuda; U.S. Virgin Islands. Bigeye *Priacanthus arenatus:* Bermuda. Bar jack *Caranx ruber:* Florida Keys; Carrie Bow Cay, Belize. Horse-eye jack *Caranx latus:* Bahamas; Barbados. Crevalle jack *Caranx hippos:* Venezuela. Jack *Caranx* sp.: Jamaica; Curaçao. Hind *Epinephelus* sp.: Grenada. Parrotfish: Jamaica. Seatrout *Cynoscion* sp.: Panama. Tarpon *Megalops atlantica:* Texas, Gulf of Mexico. No host recorded: Honduras; Haiti.

Glossobius Schioedte and Meinert, 1883

DIAGNOSIS Cephalon not immersed in pereonite 1; excavate on either side in anterior half, forming broad and anteriorly rounded median area; antennae fitting into excavate areas. Bases of antennules contiguous, expanded. Antennules broader and longer than antennae. Bases of pereopods 4–7 with posterior margin expanded and flattened. Pleonites 1–3 immersed in pereonite 7.

Key to species of *Glossobius*

1. Coxal plates of pereonites 1 and 2 anteroventrally protruding *impressus*
   Coxal plates of pereonites 1 and 2 close to body, not protruding
   ..... *hemirhamphi*

Glossobius hemiramphi Williams and Williams, 1985a
Figure 83A

DIAGNOSIS Ovigerous ♀ 27 mm. Eyes small but distinct. Cephalon pointed anteriorly. Fused coxa of pereonite 1 and free coxa of pereonite 2 carinate but not protruding. Coxa of pereonite 7 semicircular in dorsal view. Pleotelson with middorsal length more than half basal width; lateral margins somewhat tapered; posterior margin variable, sinuate or excavate. Uropods reaching to or slightly beyond posterior pleotelsonic margin; rami subequal in length, exopod slightly broader than endopod.

RECORDS Ballyhoo *Hemiramphus brasiliensis:* Puerto Rico.

Glossobius impressus (Say, 1818)
Figure 83B

DIAGNOSIS Ovigerous ♀ 33 mm. Eyes small but distinct. Cephalon rounded anteriorly. Fused coxal plate of pereonite 1 and distinct coxal plate of pereonite 2 protruding strongly in oblique anteroventral direction. Uropod reaching to posterior half of pleotelson; exopod shorter and narrower than endopod. Pleotelson basal width twice length, posteriorly broadly bilobed. Attaching inside mouth of host.

RECORDS Flyingfish *Exocoetus* spp.: Rio de Janeiro, Brazil; North Atlantic, especially in the Gulf Stream.

Mirrorwing flyingfish *Hirundichthys speculifer:* North Atlantic. No host record: Senegal, West Africa.

Kuna Williams and Williams, 1986

DIAGNOSIS Cephalon somewhat immersed in pereonite 1. Anterior margin of pereonite 1 not trisinuate. Number of articles in antennules and antennae

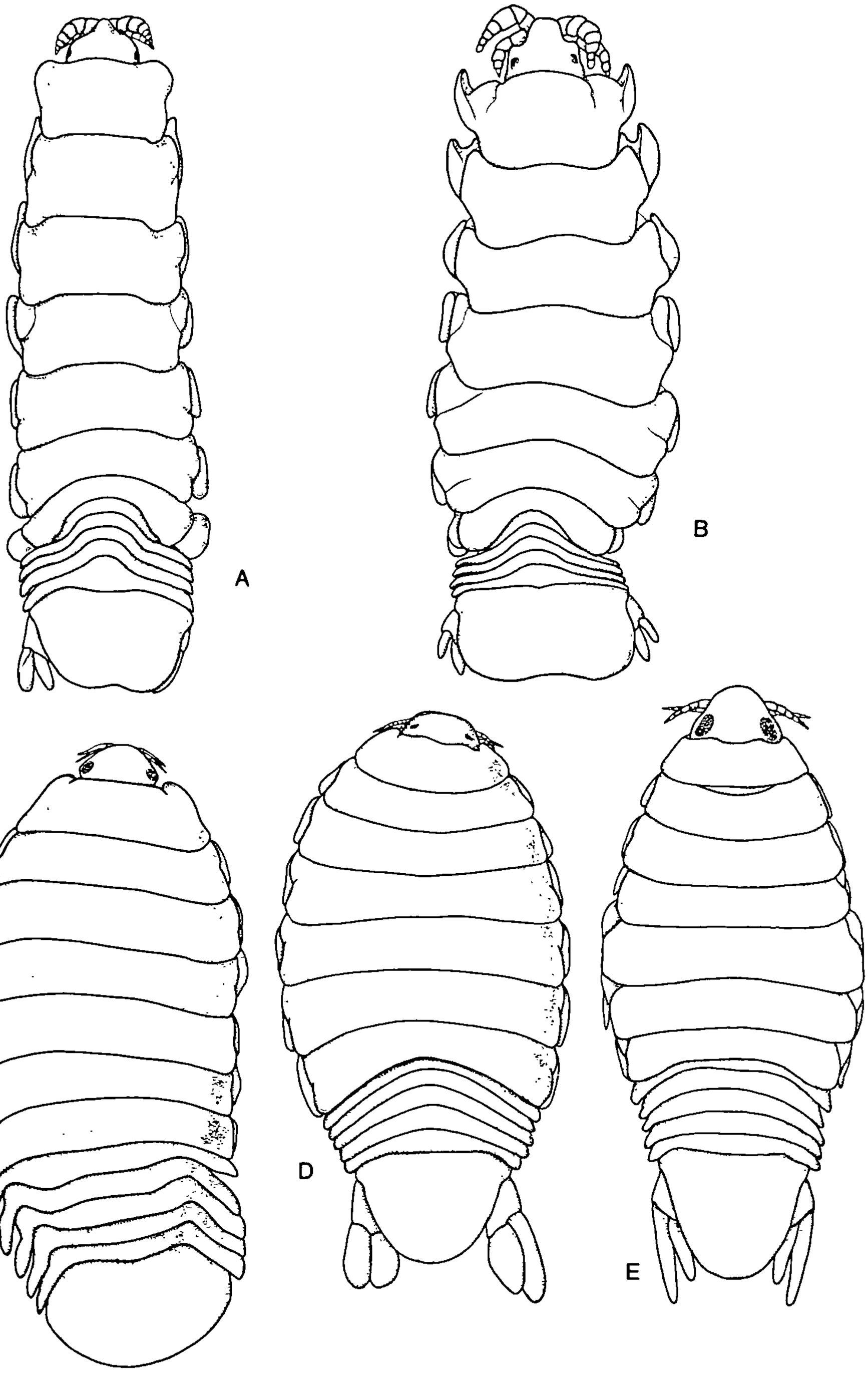


Figure 83. *A, Glossobius hemiramphi; B, Glossobius impressus; C, Kuna insularis; D, Lironeca redmani; E, Lironeca tenuistylis.*

reduced. Antennule somewhat expanded; basal article expanded but not contiguous. Copulatory stylet present on pleopods 1–3 in ♂. Pleonites dorsally strongly convex, not immersed in pereonite 7.

Kuna insularis (Williams and Williams, 1985b)
Figure 83C

DIAGNOSIS Ovigerous ♀ 11.1–17.2 mm, ♂ 4.2–8.7 mm, transitional 9.6–9.8 mm. Antennules and antennae consisting of four articles each. Uropods short, not reaching posterior margin of pleotelson. Clavate copulatory stylet present on pleopods 1–3 in ♂. Pleotelson basally broader than long, posterior margin broadly rounded.

RECORDS Sergeant major *Abudefduf saxatilis:* Carrie Bow Cay, Belize; Curaçao; Panama.

Lironeca Leach, 1818

DIAGNOSIS Cephalon weakly to deeply immersed in pereonite 1; posterior border rarely trisinuate. Bases of antennules not expanded, well separated. Posterior pereopods with carinae on bases in ♂, carinae present or absent in ♀. Pleonites subequal in width; pleonites 1 and 2 rarely narrowed and weakly to moderately immersed in pereonite 7. Pleopods highly folded, and with lamellar or digitiform accessory gills in some species.

Key to species of *Lironeca*

1. Uropodal endopod about twice longer than wide; pleon somewhat immersed in pereon ..... *redmanni*
   Uropodal endopod about three times longer than wide; pleon barely immersed in pereon ..... *tenuistylis*

Lironeca redmanni Leach, 1818
Figure 83D

DIAGNOSIS Ovigerous ♀ 19.5–25.0 mm. Cephalon barely immersed in pereonite 1. Pleon somewhat immersed in pereon, but lateral margins of pleonite 1 free. Pleotelson basally wider than long. Uropodal rami reaching well beyond posterior margin of pleotelson; exopod longer than endopod, both rami somewhat broad, endopod about twice longer than wide. Attaching to gills of host.

RECORDS New Jersey to Florida; gills of kingfish, Jamaica; Cuba; St. Christopher; Spanish mackerel *Scomberomorus maculatus* and cero *Scomberomorus regalis*, Puerto Rico; king mackerel *Scomberomorus cavalla*, Colombia; *Gerres rhombeus*, Panama; spot *Leiostomus xanthurus*, Gulf of Mexico.

Brazil.

Lironeca tenuistylis (Richardson, 1912b)

Figure 83E

DIAGNOSIS ♀ 13 mm. Cephalon barely immersed in pereonite 1. Uropodal rami reaching beyond rounded posterior margin of pleotelson; exopod longer than endopod; endopod slender, about three times longer than wide. Pleonite 1 barely immersed in pereonite 7. Pleotelson basally wider than long. Attaching to host between pectoral and anal fin.

RECORDS Longnose anchovy *Anchoa lamprotaenia:* Panama.

Mothocya Costa, 1851

DIAGNOSIS Cephalon more or less immersed in pereonite 1. Bases of antennules widely separated; antennules longer and more robust than antennae. Coxae nearly reaching or extending beyond posterior margin of respective pereonites. Pleon somewhat immersed in pereonite 7. Uropodal exopod longer than endopod.

REMARKS Bruce (1986b) revised the genus *Mothocya*. The species of *Mothocya* are almost entirely gill parasites on the fish families Hemiramphidae, Apogonidae, Belonidae, and Atherinidae.

Key to species of *Mothocya*

1. Cephalon anteriorly narrowed, slightly immersed in pereonite 1; pleotelson subrectangular ..... *bohlkeorum*
   Cephalon anteriorly broad, deeply immersed in pereonite 1; pleotelson subtriangular ..... *nana*

Mothocya bohlkeorum Williams and Williams, 1982
Figure 84B

DIAGNOSIS Ovigerous ♀ 7.6–8.5 mm, ♂ 3.7 mm. Cephalon anteriorly narrowed in dorsal view, ventrally flexed, broadly rounded; slightly immersed in pereonite 1. Pleotelson subrectangular. Uropods extending slightly beyond posterior margin of pleotelson; exopod only slightly longer than endopod. ♀ lateral lobes of pleopodal peduncles not developed. Endopods of pleopods 3–5 with small proximomedial lobe.

RECORDS Whitestar cardinalfish *Apogon lachneri:* Puerto Rico. Dusky cardinalfish *Phaeoptyx pigmentaria:* Bahamas. Freckled cardinalfish *Phaeoptyx conklini:* Florida Keys; Bahamas. Conchfish *Astrapogon stellatus:* Leeward Islands.

Mothocya nana (Schioedte and Meinert, 1884)
Figure 84A

DIAGNOSIS Ovigerous ♀ 11.0–17.0 mm, ♂ 7.9–8.3 mm. Cephalon deeply immersed in pereonite 1; rostrum anteroventrally narrowly rounded. Uropodal exopod markedly longer than endopod. Pleotelson broad, with posterior margin rounded sufficiently to give appearance of being subtriangular.

RECORDS Halfbeak *Hyporhamphus unifasciatus:* Chesapeake Bay, Maryland; Georgia; Florida; Colon, Panama. Halfbeak *Hemiramphus bermudensis:* Bermuda.

Nerocila Leach, 1818

DIAGNOSIS Body generally more depressed than in most cymothoid genera, rarely curved. Cephalon with anterior margin convex, narrowly rounded, or concave; not, or only slightly, immersed in pereonite 1. Pereonite 1 anterior margin trisinuate. Posterolateral angles of pereonites weakly to strongly produced, increasing in length posteriorly. Coxal plates prominent, usually almost reaching or extending to posterior margin of their respective pereonites. Juveniles and ♂ usually with spines on posterior pereopods; ♀ lacking these spines. Pleon not immersed in pereonite 7. Pleonites subequal in length; pleonites 1 and 2 usually produced posterolaterally. Pleopods typically with small lamellar accessory gills; pleopods 3–5 folded into deep pockets or pleats. Uropods usually extending beyond pleotelsonic apex.

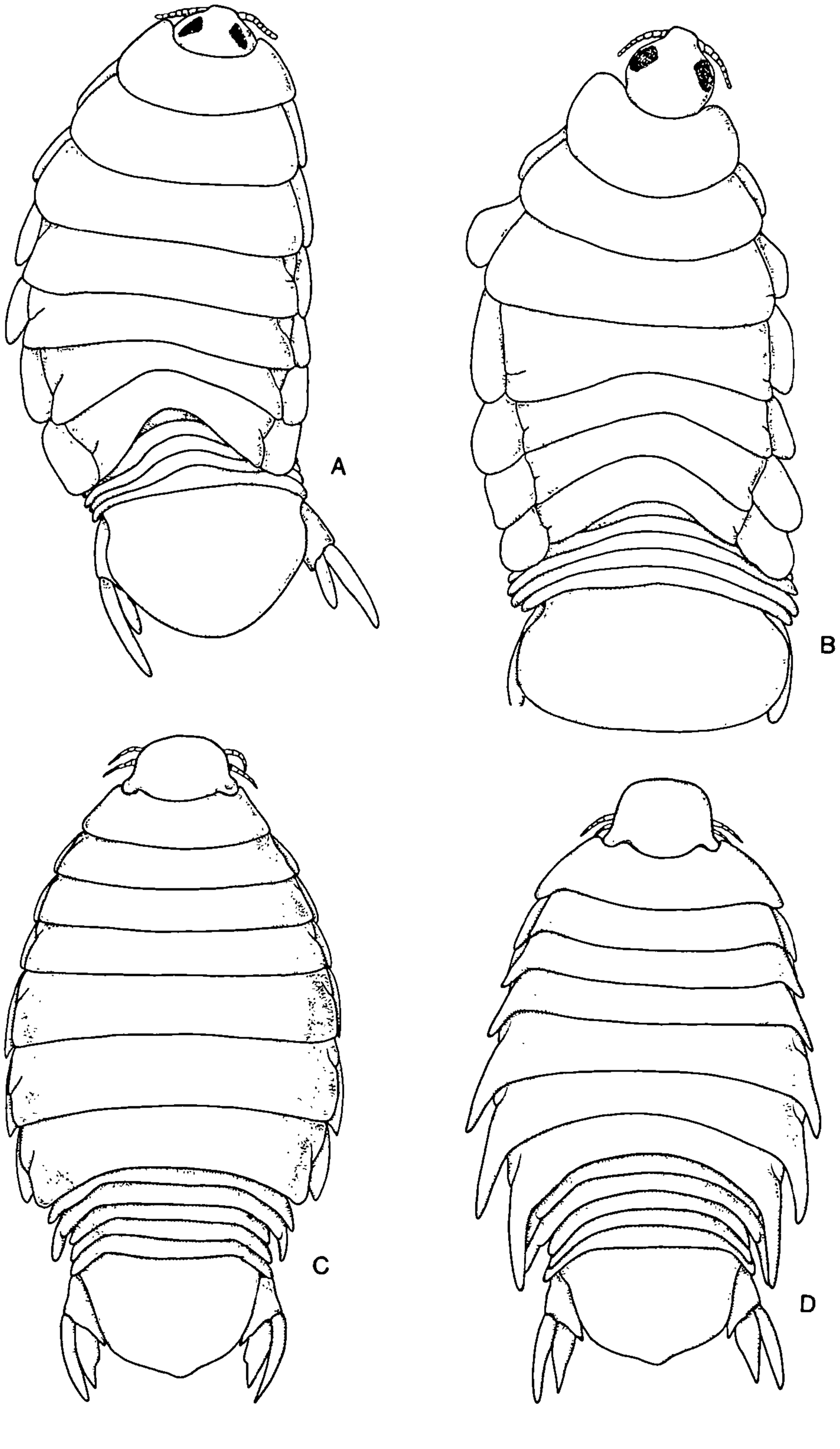


Figure 84. *A, Mothocya nana; B, Mothocya bohlkeorum; C, Nerocila acuminata* f. *acuminata; D, Nerocila acuminata* f. *aster.*

Nerocila acuminata Schioedte and Meinert, 1881

DIAGNOSIS Ovigerous ♀ 16.2–19.0 mm. Cephalon with anterior margin convex. Posterolateral angles of all, or of posterior pereonites only, produced into acute or subacute angles.

RECORDS Striped burrfish *Chilomycterus schoepfi:* Texas, Gulf of Mexico. Northern puffer *Sphoeroides maculatus:* New York. Striped mullet *Mugil cephalus:* Texas, Gulf of Mexico. Jewfish *Epinephelus itajara:* Texas, Gulf of Mexico. Hogfish: Bermuda. Alligator gar *Lepisosteus spatula:* Louisiana, Gulf of Mexico. Hardhead catfish *Arius felis:* Texas, Gulf of Mexico. Sawfish: Florida (Atlantic). Black drum *Pogonias cromis:* Texas, Gulf of Mexico. Orange filefish *Alutera schoepfi:* Texas, Gulf of Mexico. Toadfish *Batrachoides surinamensis:* Colon, Panama. Spot *Leiostomus xanthurus:* Florida, Gulf of Mexico. Spadefish *Chaetodipterus faber:* Florida, Gulf of Mexico; Virginia. Fringed filefish *Monacanthus ciliatus:* Florida, Gulf of Mexico. No host recorded: Massachusetts; Florida Keys; Florida, Gulf of Mexico. Louisiana, Gulf of Mexico. Texas, Gulf of Mexico.

REMARKS Brusca (1981) has shown that this highly variable species occurs on both sides of the Isthmus of Panama, in two relatively distinct forms. Intergrades between the two forms do occur but are uncommon. Brusca (1981:159) also lists all the host-records for this species in the eastern Pacific.

Nerocila acuminata Schioedte and Meinert, 1881, forma *acuminata*
Figure 84C

DIAGNOSIS Cephalon width equal to or greater than length; frontal margin narrowly rounded. Posterolateral angles of anterior pereonites weakly produced, rounded to subacute; of posterior pereonites more strongly produced, subacute to acute. Coxal plates 3–7, 4–7, or 5–7 with acute posterolateral angles; coxae rarely reaching beyond posterior margins of their respective pereonites.

Nerocila acuminata Schioedte and Meinert, 1881, forma *aster*
Figure 84D

DIAGNOSIS Cephalon always wider than long; anterior margin broadly rounded. Posterolateral angles of all pereonites strongly produced, acute, all reaching well beyond posterior margins of their respective pereonites. Coxal plates 2–7 strongly produced with acute posterior angles.

Renocila Miers, 1880

DIAGNOSIS Body rarely curved. Cephalon anteriorly weakly to distinctly truncate. Antennular bases well separated. Antennules and antennae somewhat flattened, antennules usually broader and longer than antennae. Pereonites 5–7 with posterolateral corners more or less strongly produced. Pleonites not laterally incised.

REMARKS Williams and Williams (1980) provide a key to nine species of *Renocila*.

Key to species of *Renocila*

1. Posteroventral angle of pereonite 7 reaching pleonite 1 ..... *colini*
   Posteroventral angle of pereonite 7 reaching beyond pleonite 1 2

2. Dorsal surface of body brown; posteroventral angle of pereonite 7 reaching pleonite 2 ..... *waldneri*
   Dorsal surface of body black; posteroventral angle of pereonite 7 reaching pleonite 3 ..... *bowmani*

Renocila bowmani Williams and Williams, 1980
Figure 85A

DIAGNOSIS ♀ 18.0 mm, ♂ 11.5 mm. Posteroventral angles of pereonites 5–7 produced, that of pereonite 7 overlapping pleonites 1–3. Pereopods 1–3 lacking swelling on dactylus. Pereopods 6–7 subequal in length. Uropodal exopod longer than endopod. Pleotelson length ¾ basal width. Color: dorsal surface of body and appendages uniform black. Attached to dorsum of body close to dorsal fin.

RECORDS Harlequin bass *Serranus tigrinus:* Dominican Republic.

Renocila colini Williams and Williams, 1980
Figure 85B,C

DIAGNOSIS Ovigerous ♀ 12.0–17.5 mm, ♂ 7.5–13.0 mm. Pereonites 5–7 with posteroventral angle produced, that of pereonite 7 overlapping pleonite 1 only. Pereopods 1–3 lacking swelling on dactyli; pereopods 6–7 subequal in length. Uropod reaching beyond pleotelson, endopod more than half length

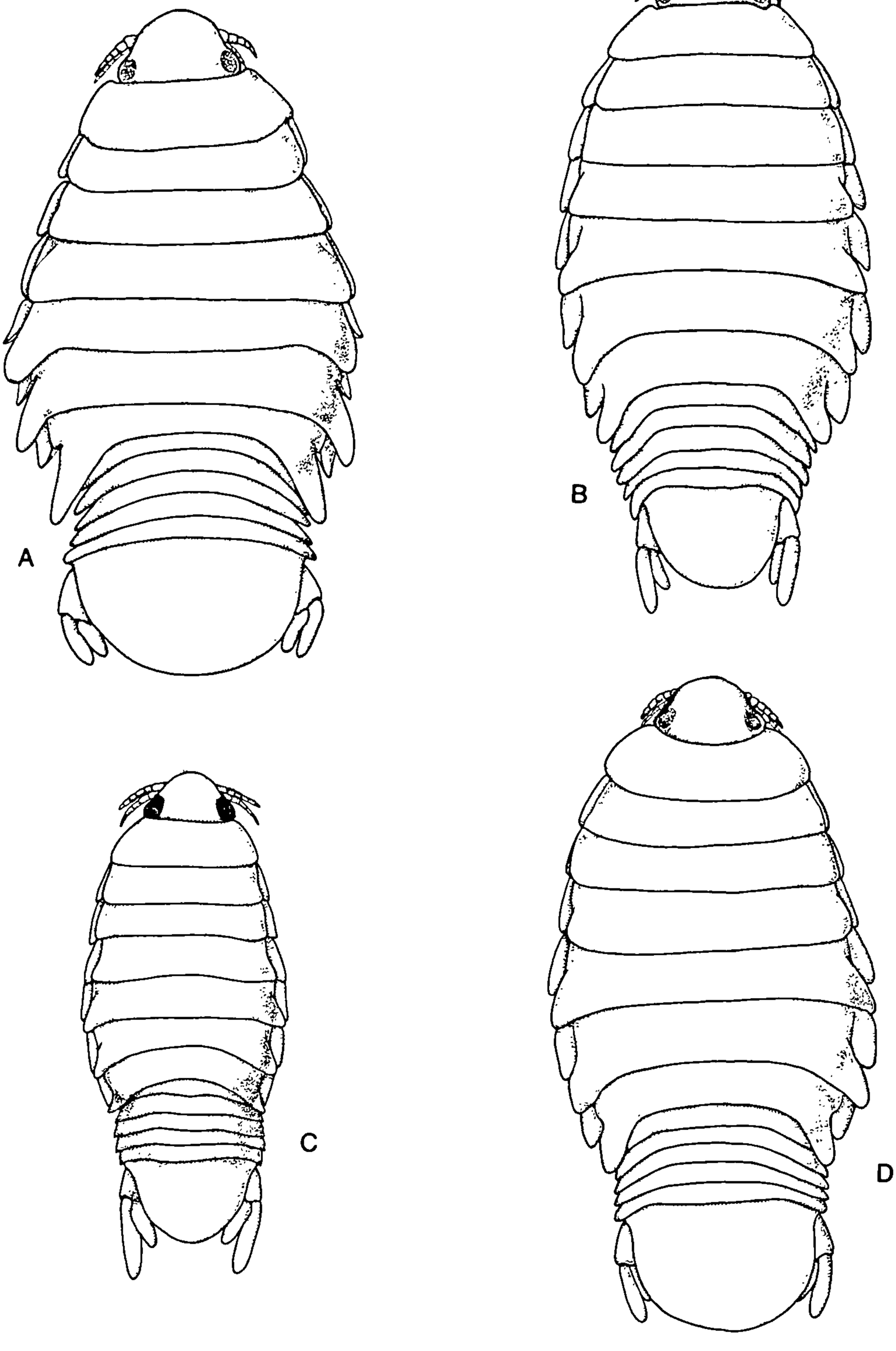


Figure 85. *A*, *Renocila bowmani*. *Renocila colini: B*, ♀; *C*, ♂. *D*, *Renocila waldneri*.

of exopod. Pleotelson 1/7 to 1/2 wider than long, with slight rounded apex. Color: dorsal surface of body and appendages uniformly yellowish brown. Attached to dorsum of body, close to dorsal fin.

RECORDS Flamefish *Apogon maculatus:* Puerto Rico. Belted cardinalfish *Apogon townsendi:* Puerto Rico.

Renocila waldneri Williams and Williams, 1980
Figure 85D

DIAGNOSIS Ovigerous ♀ 15.3–19.3 mm, ♂ 5.0–10.8 mm. Posteroventral angle of pereonite 5 moderately produced, of pereonites 6–7 more strongly produced, that of pereonite 7 overlapping pleonites 1 and 2. Pereopods 1–3 without swelling on dactyli. Pereopods 6 and 7 subequal in length. Uropodal exopod slightly longer than endopod. Pleotelson basally wider than long; posterior margin broadly and evenly rounded. Color: dorsal surface of body uniform brown; appendages yellowish brown. Attached to dorsum of body close to dorsal fin.

RECORDS Harlequin bass *Serranus tigrinus:* Dominican Republic.

Family Limnoriidae Harger, 1879

DIAGNOSIS Body ovate in cross section, often becoming more setose posteriorly. Cephalon subspherical, freely articulating with pereonite 1; eyes lateral. Antennules and antennae well separated at bases. Mandible with strong incisor; lacking molar and well-defined lacinia mobilis, but with species-distinctive lacinioid bristle or seta; palp usually of three articles. Maxillipedal palp of five articles; endite well developed. Coxae present on pereonites 2–7. Pleon consisting of five free pleonites plus pleotelson; latter subcircular, set obliquely to axis of body, usually with anterolateral crests. Uropod with strong protopod inserted ventrolaterally.

Key to genera of Limnoriidae

1. Uropodal rami very unequal 2
   Uropodal rami subequal ..... *Paralimnoria*

2. Mandibular incisors possessing rasp and file ..... *Limnoria*
   Mandibular incisors lacking rasp and file ..... *Phycolimnoria*

REMARKS This family includes a number of species that are of considerable economic importance. Given that species of *Limnoria* are wood borers, wooden structures such as wharf pilings that are immersed in sea water and even in water of reduced salinity are vulnerable to attack by these gribbles. Prolonged exposure can lead to weakening and eventual collapse of these structures (see Ray, 1959). Even creosote-treated wood is not fully protected; *Limnoria tuberculata* will bore into such wood to where the creosote has not penetrated.

The isopods rasp at the wood fibres with the rasp and file structures of the mandibles, usually following the grain of the wood. With this boring activity, saprophytic fungi and bacteria invade the wood and assist in the breakdown process. *Limnoria* lack cellulase-secreting microflora in their gut, but probably secrete a cellulase themselves (Boyle and Mitchell, 1978). It is also probable that the fungi and bacteria, the latter often densely aggregated on the setae of the isopod, form part of the animals' diet. In the natural environment, *Limnoria* perform an important role in the breakdown of dead wood, especially in mangrove areas.

Sexual dimorphism of the pleotelson does occur in some species. This aspect of the morphology, however, has hardly been investigated.

Limnoria Leach, 1814

DIAGNOSIS Antennular flagellum of four articles. Antennal flagellum of three to five articles. Incisor of right mandible equipped with filelike structure on upper surface; incisor of left mandible with rasplike structure. Rami of pleopod 5 lacking marginal setae. Uropodal exopod much shorter than endopod, bearing terminal claw. Pleotelson smooth, or variously ornamented with tubercles and ridges.

Limnoria indica Becker and Kampf, 1958

Figure 86A,B

DIAGNOSIS ♂ 3.0 mm, ovigerous ♀ 3.0 mm. Pleonite 5 with submedian pair of strong rounded ridges, converging slightly posteriorly. Pleotelson basally with two pairs of submedian tubercles and pair of lateral tubercles.

RECORDS Cozumel, Mexico; Man o'War Cay, Belize.
India; Hong Kong; Philippines; east coast of Australia.

Key to species of *Limnoria*

1. Dorsal surface of pleotelson lacking prominent tubercles, ridges, or carinae (*L. simulata* may appear to lack ornamentation; in this species the tubercles are very small) 2
   Dorsal surface of pleotelson bearing tubercles, ridges, or carinae 3

2. Pleotelson flat; pleonite 5 with broadly rounded middorsal ridge ..... *platycauda*
   Pleotelson cup shaped; pleonite 5 with strong narrowly rounded middorsal ridge ..... *insulae*

3. Pleotelson with basal tubercles but lacking ridges 4
   Pleotelson with ridges but lacking freestanding tubercles 7

4. ♂ pleotelson with single strong middorsal tubercle ..... *unicornis*
   Pleotelson with more than one basal tubercle 5

5. Pleotelson with three basal tubercles ..... *tuberculata*
   Pleotelson with more than three basal tubercles 6

6. Pleotelson with four basal tubercles in line (difficult to detect) *simulata*
   ♂ pleotelson with six basal tubercles ..... *indica*

7. Pleotelson with single middorsal longitudinal ridge ..... *multipunctata*
   Pleotelson with two rounded basal ridges 8

8. Pleonite 5 with strong Y-shaped ridge ..... *pfefferi*
   Pleonite 5 with two posteriorly converging ridges ..... *saseboensis*

Limnoria insulae Menzies, 1957

Figure 86C

DIAGNOSIS ♂ 3.0 mm, ovigerous ♀ 3.4 mm. Pleonite 5 with strong middorsal ridge. Pleotelson cup shaped, lateral crests extended anteromesially, separated basally by distinct gap; posterior margin and lateral crests not tuberculate.

RECORDS Twin Cays, Belize.
Fiji; Guam; Palmyra Island; Caroline Islands.

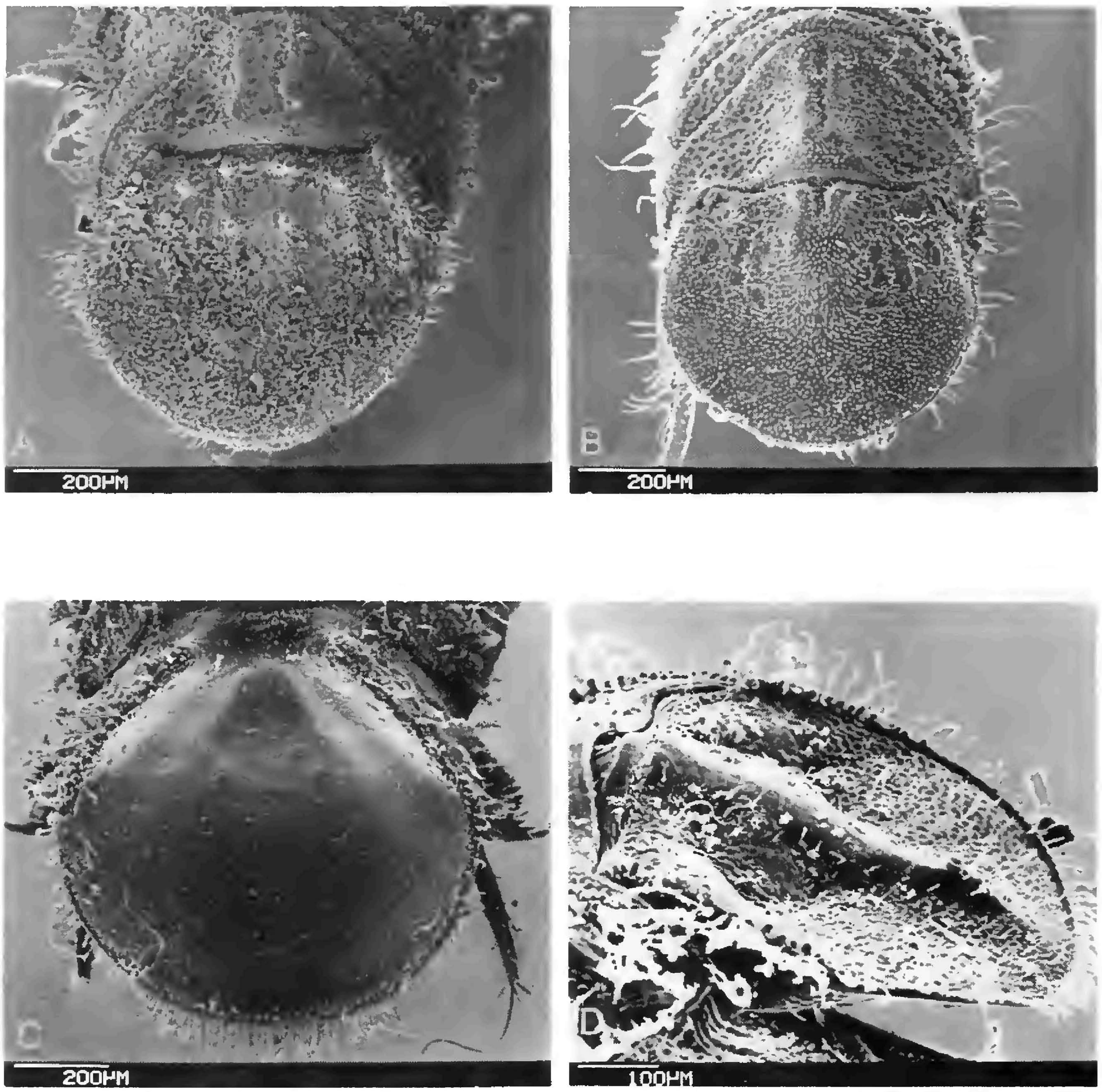


Figure 86. *Limnoria indica: A*, pleotelson, ♂; *B*, pleotelson, ♀. *Limnoria insulae: C*, pleotelson. *Limnoria multipunctata: D*, pleotelson in oblique-lateral view.

Limnoria multipunctata Menzies, 1957
Figures 86D; 87A

DIAGNOSIS ♂ 2.8 mm, ovigerous ♀ 3.0 mm. Pleonite 5 dorsally smooth. Pleotelson with middorsal longitudinal rounded ridge bearing several

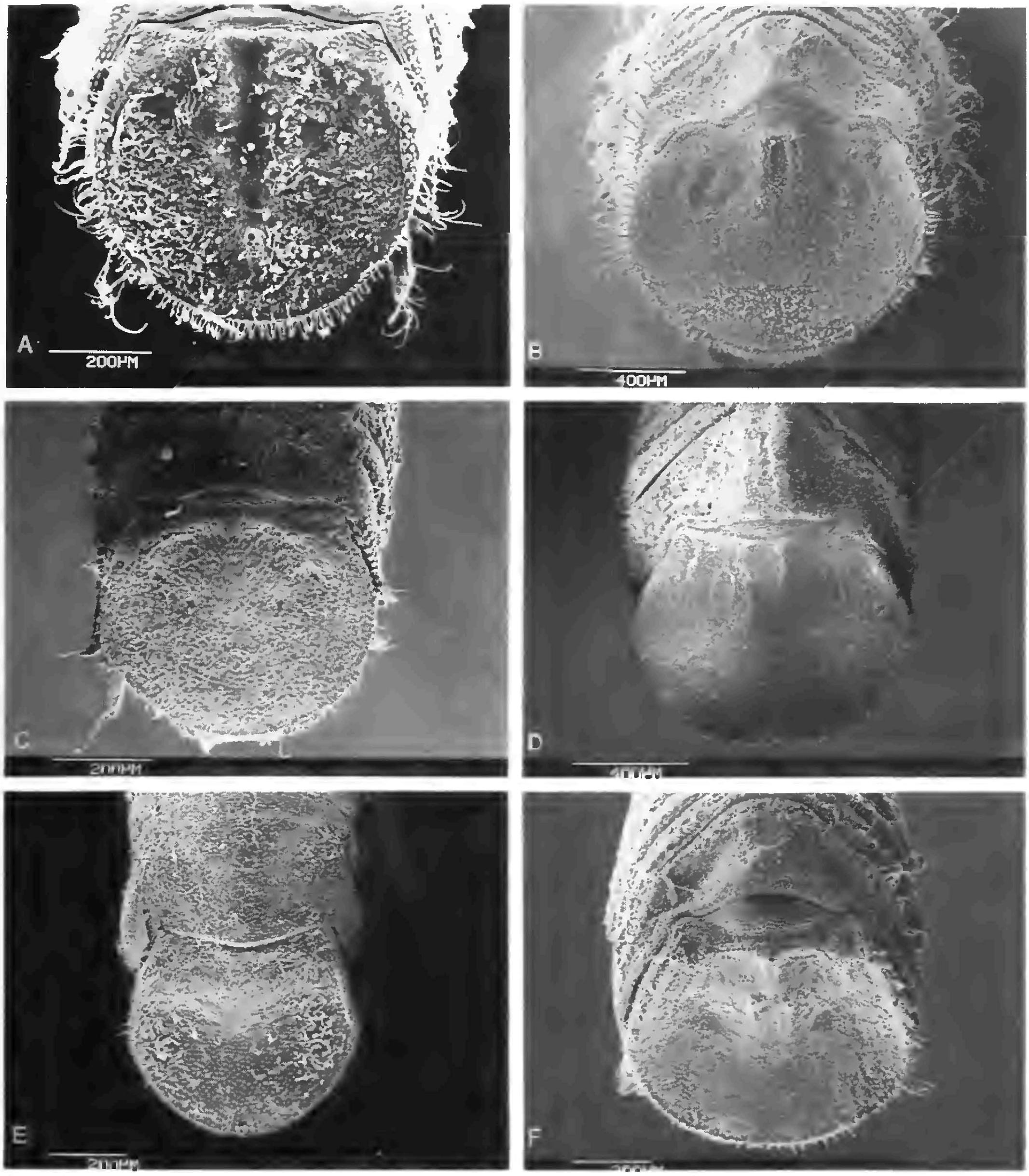


Figure 87. *Limnoria multipunctata: A,* pleotelson; *Limnoria pfefferi: B,* pleotelson; *Limnoria platycauda: C,* pleotelson; *Limnoria saseboensis: D,* pleotelson; *Limnoria simulata: E,* pleotelson; *Limnoria tuberculata: F,* pleotelson.

button-shaped tubercles in posterior half; posterior margin and lateral crests tuberculate.

RECORDS Puerto Rico; Jamaica; Twin Cays, Belize.
Japan; Kai Islands, South Pacific.

Limnoria pfefferi Stebbing, 1904
Figure 87B

DIAGNOSIS ♂ 3.8 mm, ovigerous ♀ 4.0 mm. Pleonite 5 with conspicuous middorsal Y-shaped carina. Pleotelson basally with pair of submedian rounded ridges; lateral crests lacking tubercles.

RECORDS Florida Keys; Bahamas; Puerto Rico; U.S. Virgin Islands; Twin Cays and Man o'War Cay, Belize; Yucatan Peninsula, Mexico.

Minikoi Atoll and Aldabra Atoll, Indian Ocean; Philippines; New Guinea; Panama.

Limnoria platycauda Menzies, 1957
Figure 87C

DIAGNOSIS ♂ 2.5 mm, ovigerous ♀ 2.6 mm. Pleonite 5 with broad middorsal longitudinal rounded ridge. Pleotelson lacking dorsal ornamentation; posterior margin and lateral crests bearing tubercles.

RECORDS Cuba; Puerto Rico to Curaçao; Cozumel, Mexico; Twin Cays and Man o'War Cay, Belize.

Aldabra Atoll, Indian Ocean.

Limnoria saseboensis Menzies, 1957
Figure 87D

DIAGNOSIS ♂ 3.5 mm. Pleonite 5 with submedian pair of ridges, converging slightly posteriorly. Pleotelson basally with submedian pair of anteriorly tuberculate ridges; posterior margin and lateral crests tuberculate.

RECORDS Miami, Florida.
Japan; Fiji.

Limnoria simulata Menzies, 1957
Figure 87E

DIAGNOSIS ♂ 3.8 mm, ovigerous ♀ 4.0 mm. Pleonite 5 with obscure median longitudinal groove. Pleotelson basally with submedian pair of tubercles and small lateral tubercles, latter often difficult to detect; lateral crests tuberculate.

RECORDS Florida Keys; U.S. Virgin Islands; Gulf of Mexico.

Limnoria tuberculata Sowinsky, 1884
Figure 87F

DIAGNOSIS ♂ 2.8 mm, ovigerous ♀ 3.0 mm. Pleonite 5 with two anterior tubercles, one middorsal posterior tubercle, area between tubercles depressed. Pleotelson basally with middorsal tubercle, followed by pair of submedian tubercles, all three tubercles having short obscure carina; posterior margin and lateral crests tuberculate.

RECORDS Rhode Island to Venezuela; Cuba; Man o'War Cay, Belize; Gulf of Mexico.

Uruguay; West Africa; Mediterranean; Black Sea; India; Hong Kong; Hawaii; Australia; California.

REMARKS This species has frequently been recorded under the name *Limnoria tripunctata* Menzies, 1951a.

Limnoria unicornis Menzies, 1957
Figure 88A,B

DIAGNOSIS ♂ 2.6 mm, ovigerous ♀ 2.6 mm. Mandibular palp of one article. Pleonite 5 with somewhat obscure Y-shaped ridge middorsally. Pleotelson in ♂ with strong basal slightly curved middorsal tubercle; lateral crests lacking tubercles.

RECORDS Bahamas; Man o'War Cay and Twin Cays, Belize.
Caroline Islands; Palau; Society Islands.

Paralimnoria Menzies, 1957

DIAGNOSIS Antennular flagellum of five articles. Antennal flagellum of five or six articles. Mandibular incisor with rasp and file. Pleopod 5, rami bearing marginal setae. Uropodal rami subequal in length, each with clawlike apex.

Paralimnoria andrewsi (Calman, 1910)
Figure 88C,D

DIAGNOSIS ♂ 2.6 mm, ♀ 2.6 mm. Pleonite 5 with or without triangular middorsal depressed area. Pleotelson with basal submedian pair of tubercles either obscurely or strongly carinate; lateral crest tubercles of variable strength.

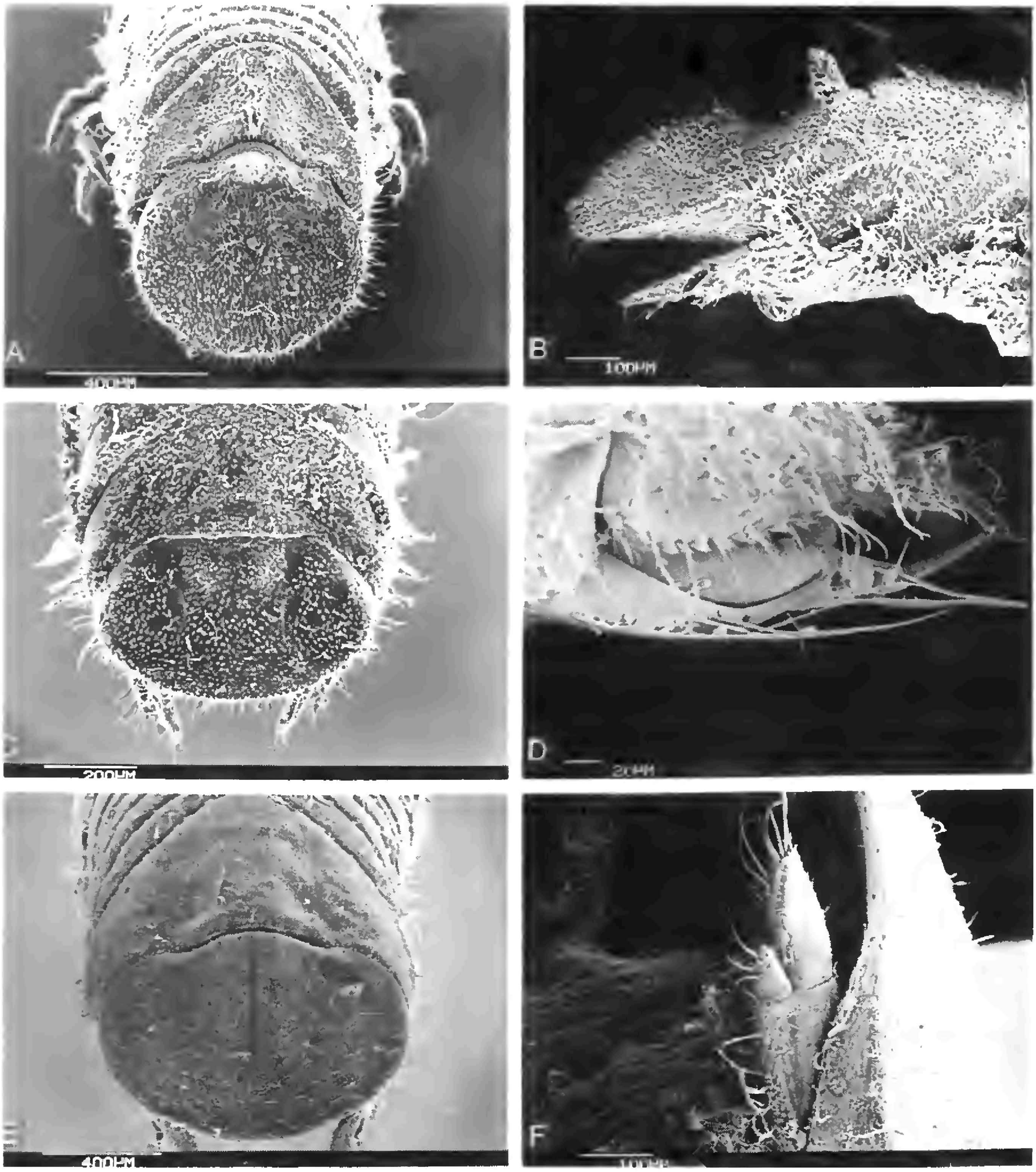


Figure 88. *Limnoria unicornis: A*, pleotelson, ♂; *B*, pleon, ♂, in lateral view. *Paralimnoria andrewsi: C*, pleonite 5 and pleotelson; *D*, uropod. *Phycolimnoria clarkae: E*, pleonite 5 and pleotelson; *F*, uropod and pleotelson in lateral view.

RECORDS Florida Keys; Puerto Rico; Twin Cays, Belize; Curaçao. Christmas Islands, Indian Ocean; Samoa; Hawaii; Japan.

REMARKS Menzies (1957) discusses three forms of this species: Forma *typica*, which lacks a central depressed area dorsally on pleonite 5 and has a pair of submedian obscurely carinate tubercles on the pleotelson; Forma A, which has a triangular depressed area dorsally on pleonite 5 and a pair of subme-

dian tubercles supported by strong carinae on the pleotelson; Forma B, having a triangular depressed area dorsally on pleonite 5 and an obscurely carinate pair of tubercles on the pleotelson. Given that at least two of these forms have been recorded occurring together, it would seem that this is merely a highly variable species.

Phycolimnoria Menzies, 1957

DIAGNOSIS Mandibular incisor lacking rasp and file. Uropodal rami unequal, exopod longer than endopod, latter usually with clawlike apex.

REMARKS Most species of *Phycolimnoria* are algal borers, frequently encountered in the holdfasts of brown algae such as *Macrocystis*, *Laminaria*, and *Sargassum*. The one species recorded from the Caribbean, *P. clarkae*, however, has only been taken from decaying wood.

Phycolimnoria clarkae Kensley and Schotte, 1987

Figure 88E,F

DIAGNOSIS ♂ 4.3 mm, ovigerous ♀ 3.3–4.4 mm. Uropodal exopod less than half length of endopod, straight, tipped with short squat claw. Pleonite 5 with broad raised middorsal region having irregular bumps. Pleotelson wider than long, with two rounded submedian ridges basally, becoming obsolete posteriorly.

RECORDS Bahamas; Twin Cays, Belize.
Aldabra Atoll, Indian Ocean.

Family Serolidae Dana, 1852

DIAGNOSIS Body dorsoventrally depressed. Eyes present or absent. Cephalon fused with pereonite 1 dorsally. Mandible bearing palp. Maxillipedal palp of one to four articles. Pereonites 2–4 with coxae demarked; pereonites 5 and 6 with coxae not demarked; pereonite 7 narrow, lacking free lateral margins. Pereopod 1 in ♂ and ♀ subchelate, pereopod 2 subchelate or ambulatory in ♂, ambulatory in ♀. Pleonites 1 and 2 free, articulated, remainder of pleonites fused with telson. Pleopods 1–3 small, natatory; pleopods 4 and 5 large, operculate. Uropods lateral, biramous.

REMARKS The serolids reach their greatest diversity (and their greatest size of up to 80 mm in length) in the southern oceans, with few species extending

into the subtropics and tropics. The deep- and abyssal-dwelling species usually lack eyes. The animals are epibenthic, living in the upper few centimeters of the bottom sediment, where they are scavengers and carnivores.

Serolis Leach, 1818

DIAGNOSIS Body markedly dorsoventrally flattened. Coxal plates produced laterally. Mandible having lacinia mobilis and single spine. Maxillipedal palp of three articles (rarely two to four). Pereopod 2 exhibiting sexual dimorphism, subchelate in ♂, ambulatory in ♀. Pleopods 1–3, peduncles elongate, rami subelliptical. Pleopod 3, exopod uniarticulate.

Serolis mgrayi Menzies and Frankenberg, 1966
Figure 89

DIAGNOSIS ♂ 4.5 mm, ovigerous ♀ 4.7 mm. Eyes present. Cephalon with two middorsal tubercles. Pereonites 2–4 each with faint rounded tubercle just mesial to coxal suture. Pereon and pleon with faint middorsal longitudinal carina bearing small blunt tubercle on posterior margin of each segment. Pleonites 1 and 2 with lateral margins not contributing to body outline, overlapped by pereonite 6. Pleotelson broadly triangular, with lateral carina in anterior half; apex truncate. Uropodal rami reaching to or slightly beyond pleotelsonic apex.

RECORDS Off North Carolina, 18–34 m; off South Carolina, 22 m; off Georgia, 18–47 m; Florida Keys, 18–88 m; Trinidad; Venezuela, 95 m; Florida, Gulf of Mexico, 11–88 m.

Family Sphaeromatidae H. Milne Edwards, 1840

DIAGNOSIS Antennular peduncle of three articles, antennal peduncle of five articles. Mandible stout, lacinia mobilis and molar usually well developed, palp of three articles. Maxillipedal palp of five articles. Mouthparts in some genera metamorphosed and somewhat reduced in ovigerous ♀. Pleon of five partially or completely fused pleonites, often indicated by lateral sutures, plus dorsally convex and sometimes inflated pleotelson. Uropods lateral, exopod free if present, endopod fused with sympod. Sexual dimorphism often marked, especially in pleotelsonal structure. Animal often capable of conglobating or folding over. Young brooded in internal pouches or anterior or posterior pockets; oostegites variable in number, if present.

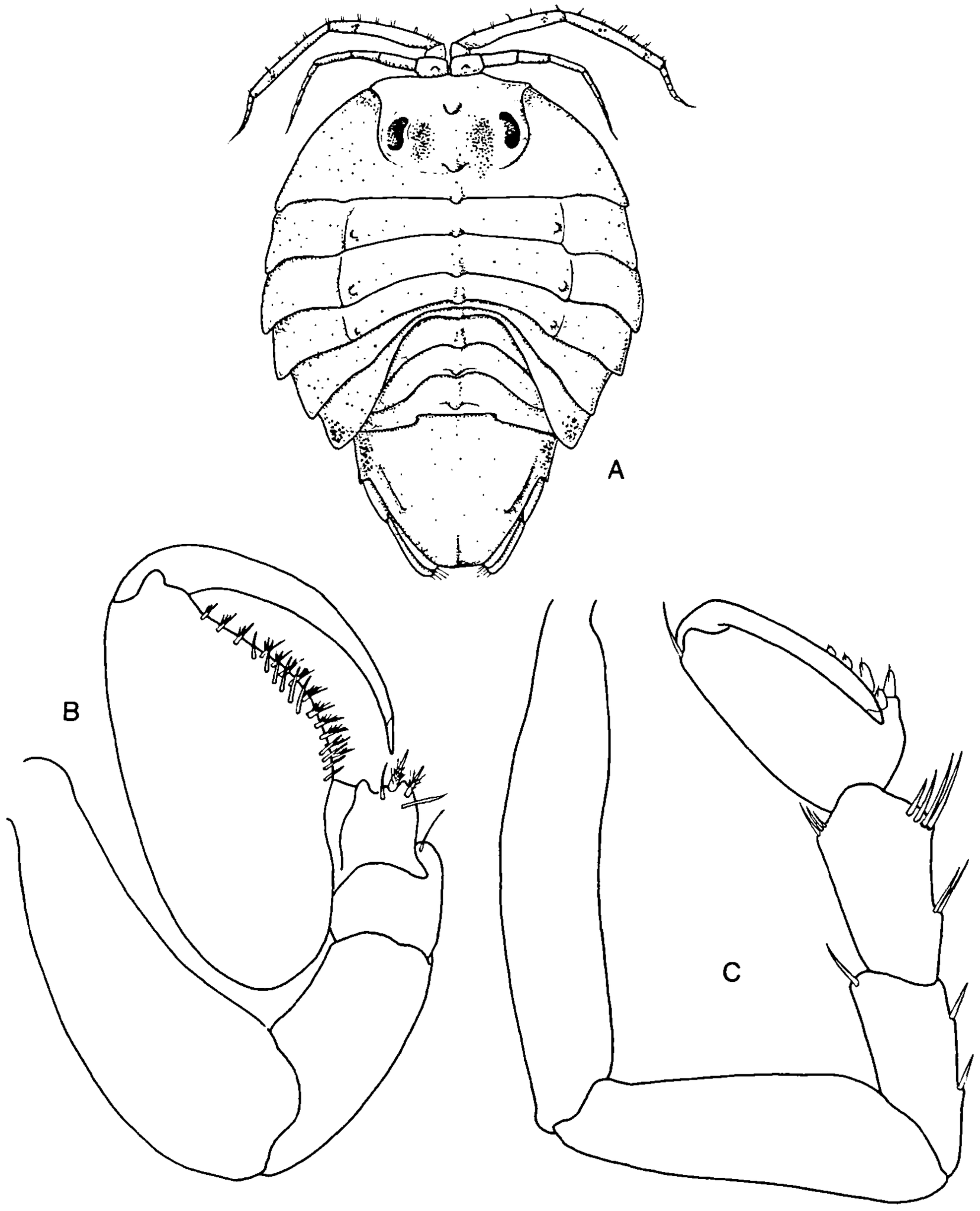


Figure 89. *Serolis mgrayi: A*, ♂; *B*, pereopod 1; *C*, pereopod 2, ♂.

REMARKS Right into the 1980s this family was routinely divided into three groups, based on the structure of the two posterior pairs of pleopods: Platybranchiatae—pleopods 4 and 5 with both rami membranous and lacking branchial pleats; Hemibranchiatae—pleopods 4 and 5 with branchial pleats on endopods only; Eubranchiatae—pleopods 4 and 5 with branchial pleats on both rami. These three "groups" were recognized formally as subfamilies by Hurley and Jansen (1977) but the names were not based on con-

tained genera and were replaced with current subfamily names by Bowman (1981) and Iverson (1982), the latter providing diagnoses for all five subfamilies. Four of these are represented in the Caribbean area; the fifth, the Tecticipitinae, contains only the single primarily Pacific genus *Tecticeps*.

While the subfamilial status now appears to be resolved, many of the genera still require unambiguous diagnoses. The work of Harrison (1984) on the structure of the female broodpouch, with its various components of oostegites, internal pouches, and anterior and posterior pockets (Figure 90), along with the metamorphosis of the female mouthparts (see Figure 96) has helped enormously to standardize the genera. Nevertheless, these features of the female remain unknown in several genera. Further, with this stabilization based on females, many problems of incorrect generic designation have been uncovered. In this work, Harrison's generic diagnoses are followed as far as possible. Where uncertainty exists, this is indicated. In some cases, we may still be unaware of existing problems: future work will without doubt result in the shifting of species to different genera, as well as in the creation of new genera.

Key to subfamilies of Sphaeromatidae

1. Pereopod 1 prehensile in both sexes; pereopod 2 prehensile only in ♂ ..... **Ancininae**
   Pereopods 1 and 2 ambulatory 2
2. Pleopods 4 and 5 lacking branchial pleats ..... Cassidininae
   Pleopods 4 and 5 with branchial pleats on endopods 3
3. Pleopods 4 and 5 with branchial pleats on both rami ... Dynameninae
   Pleopods 4 and 5 with branchial pleats on endopods only ..... Sphaeromatinae

Subfamily Ancininae Tattersall, 1905

DIAGNOSIS Body markedly dorsoventrally depressed. Cephalon fused medially with pereonite 1. Pereopod 1 prehensile in ♂ and ♀. Pereopod 2 prehensile in ♂ only. Pleopods 4 and 5 similar, lacking branchial pleats. Uropods uniramous.

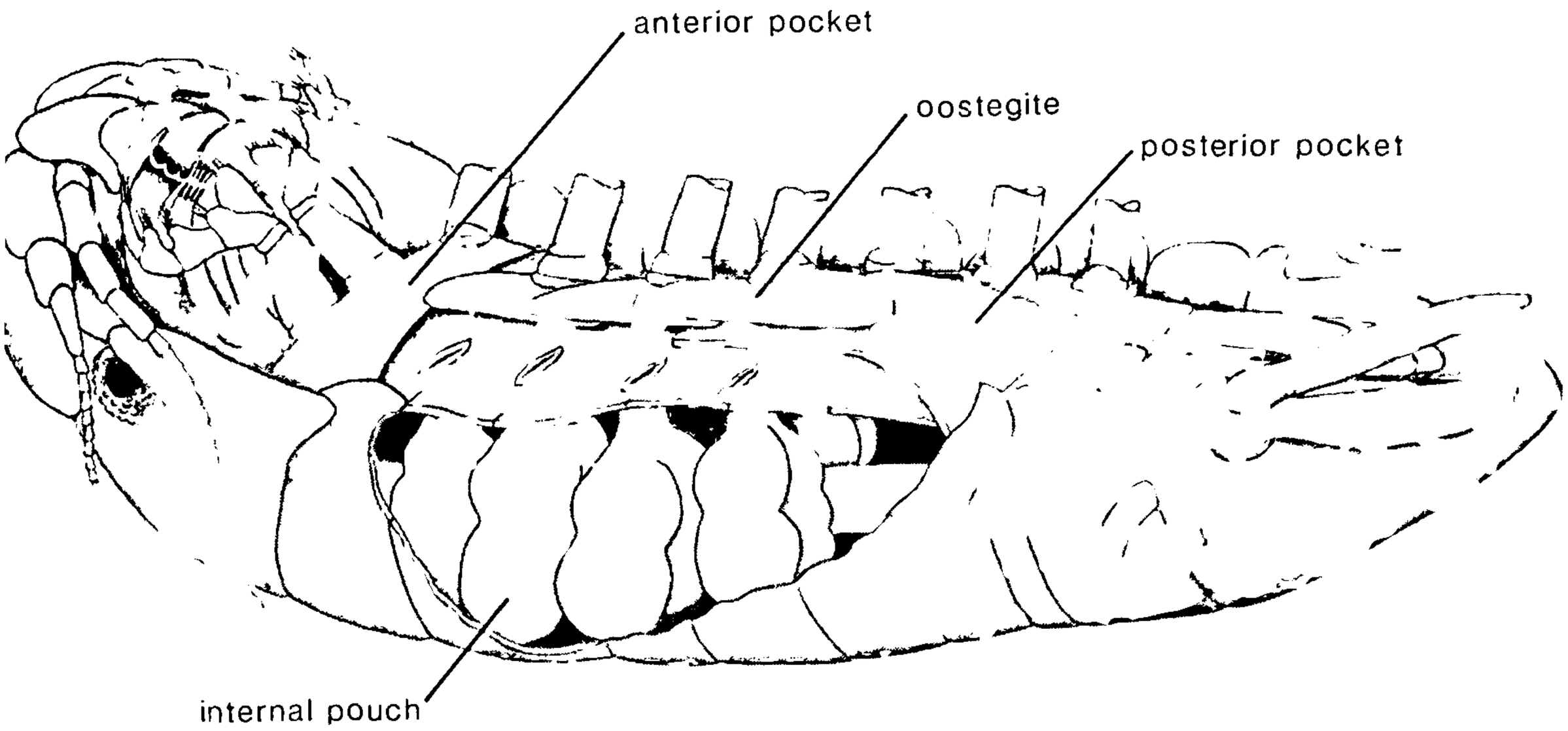


Figure 90. Diagrammatic representation of ♀ sphaeromatid, showing marsupial structures (adapted from Harrison, 1984).

Ancinus H. Milne Edwards, 1840

DIAGNOSIS Eyes dorsal. ♀ mouthparts not metamorphosed. Mandibular molar absent; palp of three articles. Maxilla 1 of single ramus, endite rudimentary. Maxilla 2 of two rami. ♀ with oostegites absent; brood held in two opposing pockets, opening as narrow ventral slit between pereopods 4. Pleon consisting of short anterior pleonite with free lateral margin, plus broadly triangular pleotelson. Pleopod 1 uniramous, endopod absent. Pleopod 2 operculiform. Pleopod 3, exopod of single article. Uropod lacking exopod, sympod not laterally expanded.

Key to species of *Ancinus*

1. Pleotelson as long as basal width, apex narrowly rounded . . . *brasiliensis*
   Pleotelson with basal width greater than length, apex subtruncate
   . . . . . *belizensis*

Ancinus belizensis Kensley and Schotte, 1987
Figure 91A–C

DIAGNOSIS ♂ 4.1 mm, ♀ 2.8 mm. Body oval, about twice longer than wide. Dorsal integument strongly pitted. Antennular flagellum of 12 articles; an-

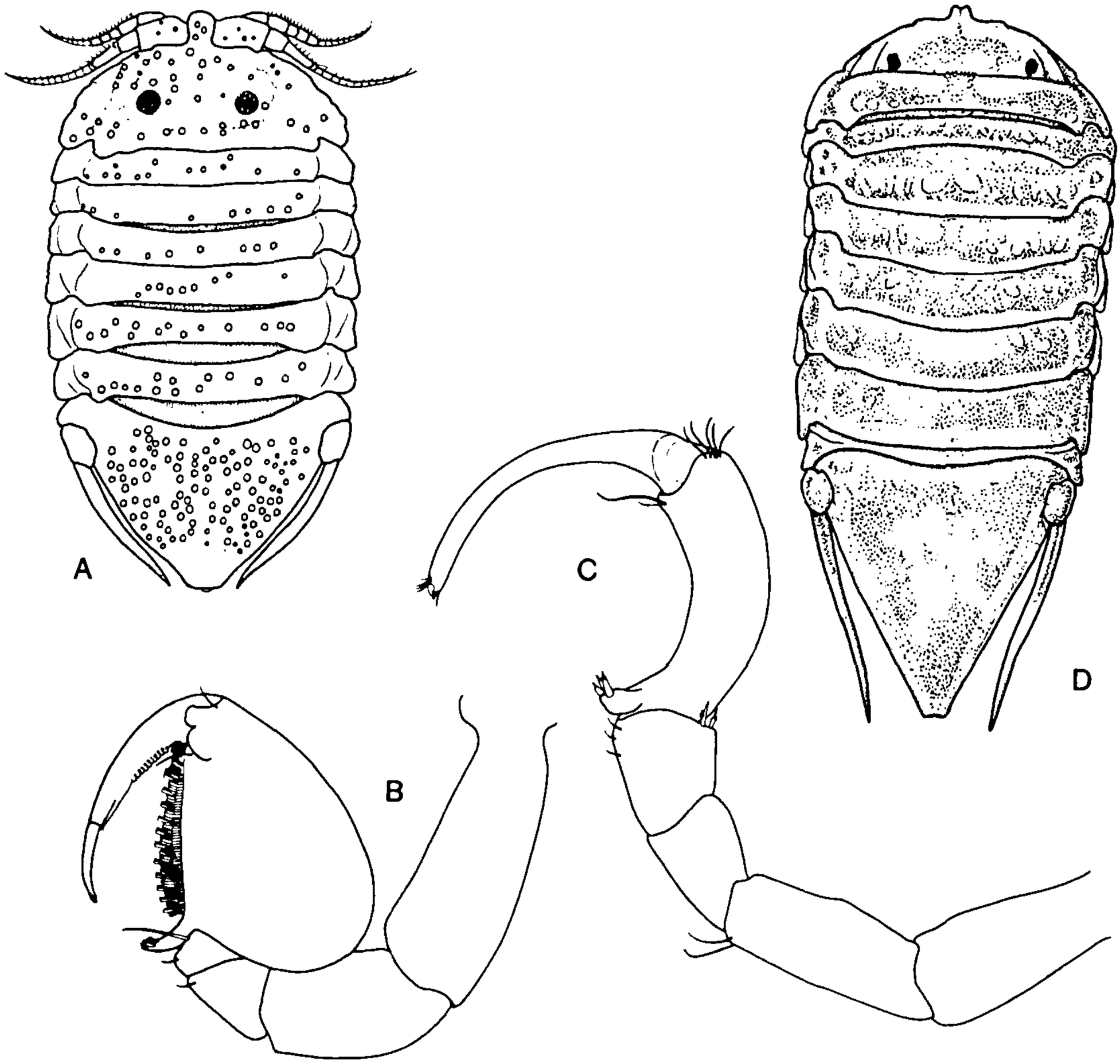


Figure 91. *Ancinus belizensis: A*, ♀; *B*, pereopod 1 ♂; *C*, pereopod 2 ♂. *Ancinus braziliensis: D*, adult (from Glynn and Glynn, 1974).

tennal flagellum of 10 articles. ♂ pereopod 2, dactylus strongly curved, reaching to proximal lobe of propodus. Pleopod 2 about 2.5 times longer than basal width.

RECORDS Carlson Point, Belize, in seagrass flats, 0.5 m.

Ancinus brasiliensis Lemos de Castro, 1959
Figure 91D

DIAGNOSIS ♂ 7.0 mm, ♀ 6.0 mm. Body about twice longer than wide. Dorsal integument smooth. Antennular flagellum of 17 articles; antennal flagellum of 10 articles. ♂ pereopod 2, dactylus strongly curved, reaching to midlength of posterior margin of carpus. Pleopod 2 almost three times longer than basal width.

RECORDS Brazilian coast from Rio de Janeiro northward, 1.5 m; Costa Rica, Panama; shallow infratidal below sandy beaches.

REMARKS Glynn and Glynn (1974) discussed color polymorphism in this species.

Subfamily Cassidininae Iverson, 1982

DIAGNOSIS Cephalon not medially fused with pereonite 1. Pereopod 1 ambulatory. Pleopods 4 and 5, both rami lacking transverse pleats, outer rami unsegmented. Pleopod 5, outer ramus with low subapical squamiferous protuberances. Pleotelsonic apex entire. Uropods with exopods reduced.

REMARKS The genus *Dies* has twice been recorded from the Caribbean: *D. arndti* Ortiz and Lalana, 1980, from Cuba, and *D. barnardi* Carvacho, 1977, from Guadeloupe. This genus is distinguished from *Cassidinidea* solely on the basis of the penial structure: biramous in *Cassidinidea,* uniramous in *Dies.* Harrison (1984) has pointed out that the separation of these two genera has not been satisfactorily resolved. The penis of neither the Cuban nor the Guadeloupan species has been illustrated, but the whole-animal illustrations of both look suspiciously like *Cassidinidea ovalis.* Examination of material of *D. barnardi* from the Paris Museum supports the view that this species was based on immature material of *C. ovalis.* Neither of the so-called species of *Dies* are dealt with in this work, both being regarded as junior synonyms of *C. ovalis.*

Key to genera of Cassidininae

1. Frontal lamina visible dorsally between antennular bases; two basal articles of antennular peduncle not expanded ..... *Cassinidinea*
   Frontal lamina not visible between antennular bases; two basal articles of antennular peduncle broadly expanded ..... *Paraleptosphaeroma*

Cassidinidea Hansen, 1905b

DIAGNOSIS Body strongly dorsoventrally depressed. Eyes dorsal, situated at posterolateral corners of cephalon. Latter somewhat sunken into pereonite 1. Frontal lamina expanded, visible dorsally between antennular bases. Antenna directed laterally. Pleon consisting of one free pleonite having short free lateral margin, plus broadly triangular pleotelson. Uropodal endopod

well developed, fused with sympod; exopod markedly reduced. Penial rami elongate, separate. ♀ mouthparts not metamorphosed. Oostegites absent. Brood housed in pouch formed by opposing pockets overhanging ventrum, opening by slit between fourth percopods.

Key to species of *Cassidinidea*

1. Posterior margin of pleotelson truncate ..... *ovalis*
   Posterior margin of pleotelson rounded ..... *mosaica*

Cassidinidea mosaica Kensley and Schotte, 1987

Figure 92A

DIAGNOSIS ♂ 1.8 mm, ovigerous ♀ 1.6 mm. Body twice longer than wide. Dorsal integument bearing close-packed flattened tubercles. Pleotelson triangular, with posterior margin narrowly rounded, dorsally convex, basally inflated.

RECORDS Carrie Bow Cay, Belize, 1.5–10 m; in silty sand and rubble between patch reefs and coral buttresses.

Cassidinidea ovalis (Say, 1818)

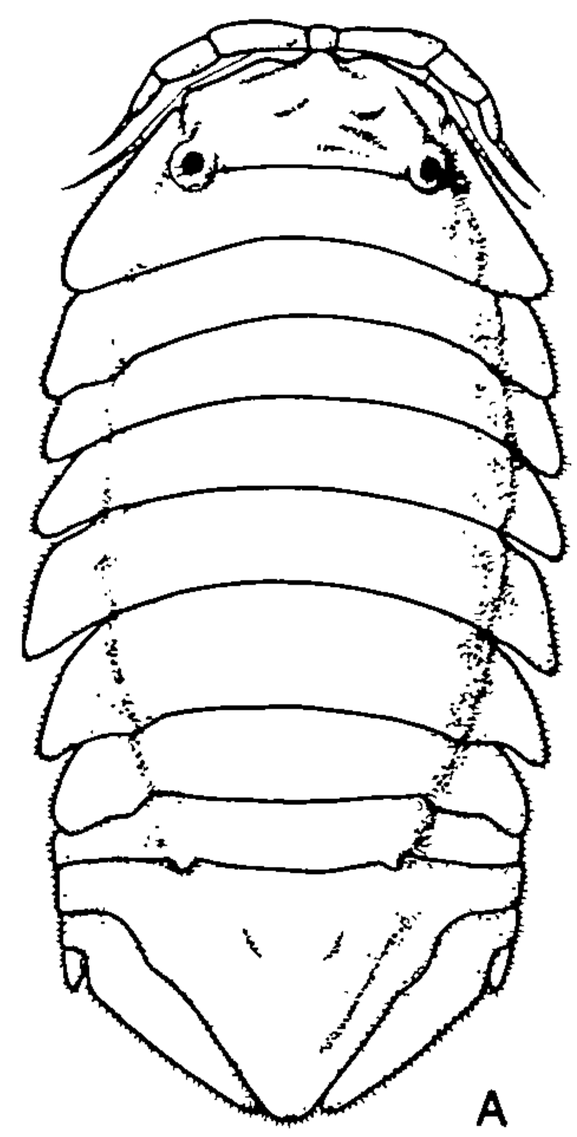
Figure 92B–E

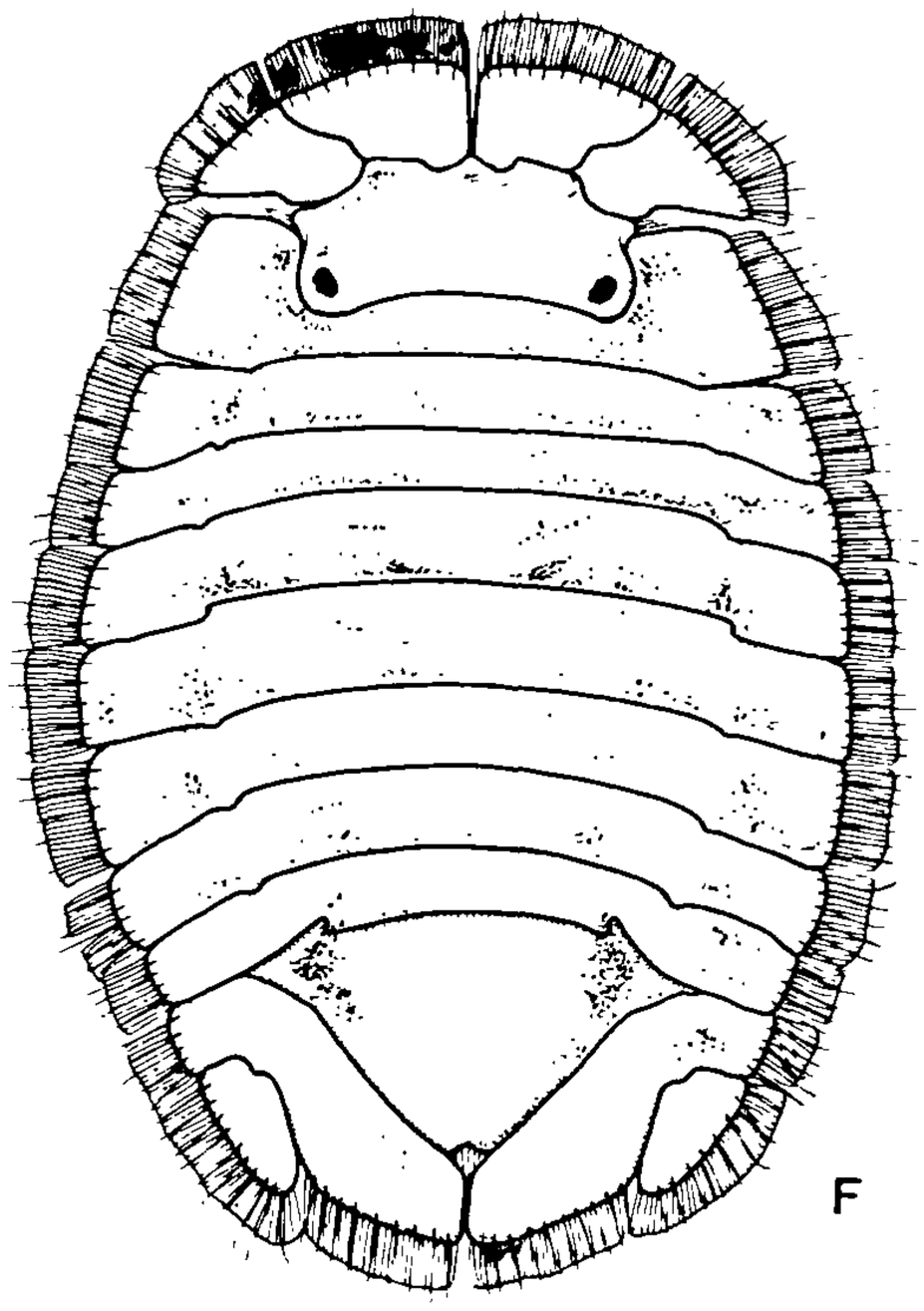
DIAGNOSIS ♂ and ♀ 3.6 mm. Body width slightly less than half length. Dorsal integument smooth. Pleotelson with raised anteromesial area, but lacking sculpture; posterior margin truncate.

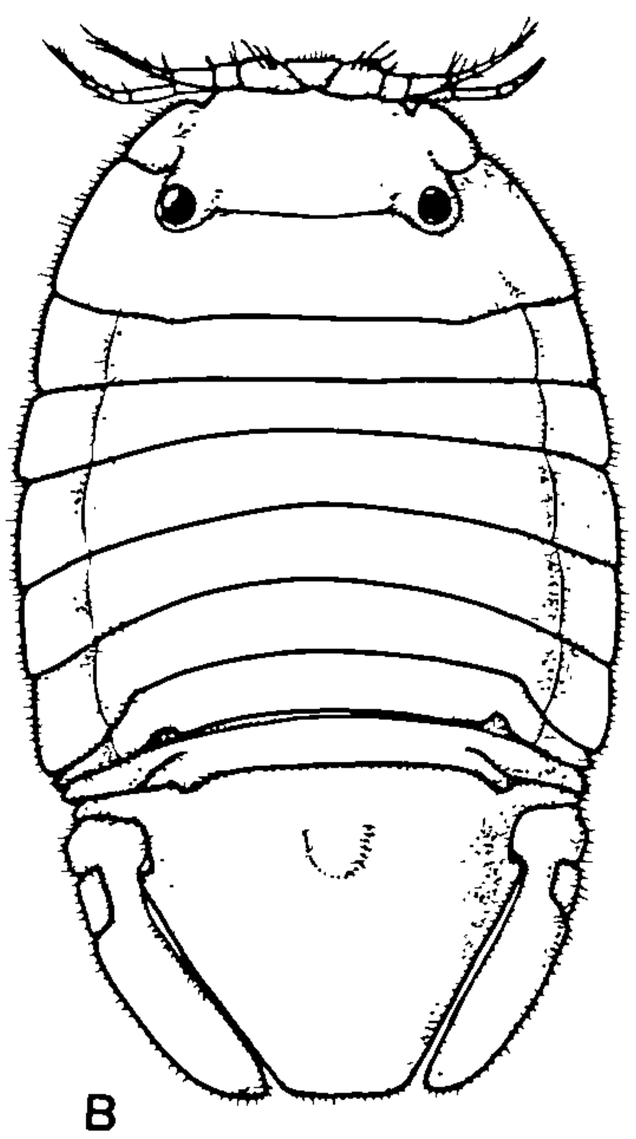
RECORDS New Jersey to Florida, in marsh mud and among dead leaves, 0–1 m; Trinidad; Belize; Panama; Dominica; Louisiana and Vera Cruz, Gulf of Mexico. Known from waters of less than 1‰ to 35‰.

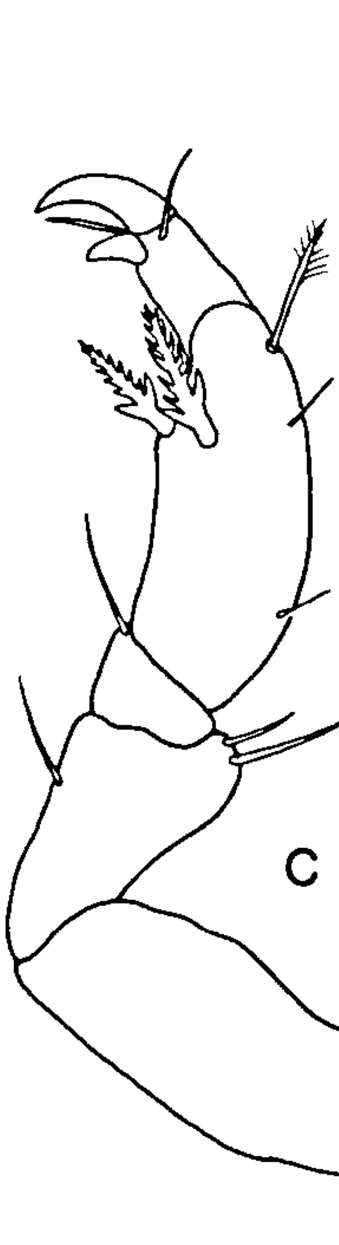
Paraleptosphaeroma Buss and Iverson, 1981

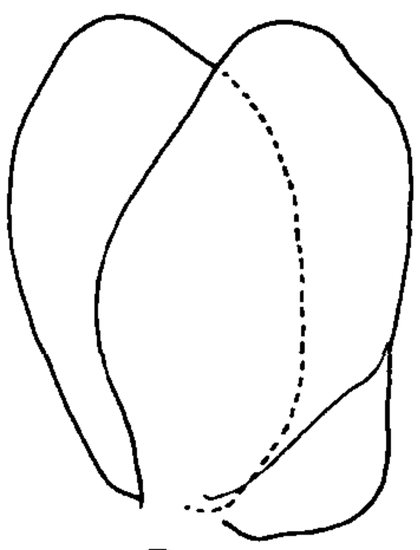
DIAGNOSIS Body oval in outline, entire circumference with transparent flange of fused setae on two expanded basal articles of antennule, on perconites, pleonite 1, and uropods. Expanded basal articles of antennules con-











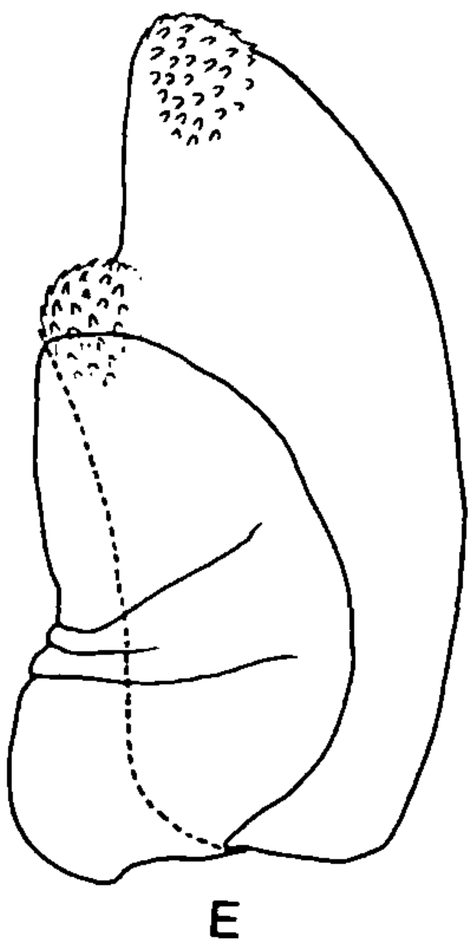


Figure 92. *Cassidinidea mosaica: A,* ♂. *Cassidinidea ovalis: B,* ♂; *C,* pereopod 1; *D,* pleopod 4; *E,* pleopod 5. *Paraleptosphaeroma glynni: F,* ♂.

tiguous in midline. Single articulated pleonite with short free lateral margin. Uropodal sympod and endopod fused; exopod articulated, much shorter than fused endopod.

Paraleptosphaeroma glynni Buss and Iverson, 1981
Figure 92F

DIAGNOSIS ♂ 2.58 mm, ovigerous ♀ 2.38 mm. Pleotelson basally broad, tapering to notched posterior margin. Fused uropodal endopod and sympod of each side almost touching posterior to pleotelsonic apex.

RECORDS Portsmouth, Dominica, intertidal rock pools.
Punta Paitilla, Pacific Panama.

REMARKS Buss and Iverson (1981) demonstrated that this species displays sequential protogynous hermaphroditism, and that the change from female to male seems to be mediated by social conditions, especially the proportion of males to females. The principal food source for this species was shown to be abascan bryozoans.

Key to genera of Dynameninae

1. Pleotelson very similar in both sexes 2
   Pleotelson showing marked sexual dimorphism 3

2. Cephalon and pleotelson smooth, lacking ridges ..... *Ischyromene*
   Pleotelson and cephalon with ridges ..... *Cerceis*

3. Uropods lamellar in both sexes 4
   Uropods lamellar in ♀, endopod reduced, exopod elongate-cylindrical in ♂ 5

4. Ovigerous ♀ lacking oostegites; ♂, pleopod 2 copulatory stylet basally broad, distally tapering, extending to or beyond ramus .. *Dynamenella*
   Ovigerous ♀ with one pair of oostegites on pereonite 4; ♂, pleopod 2 copulatory stylet narrow, extending well beyond ramus .... *Paradella*

5. ♂, strong median lobe in pleotelsonic notch reaching well beyond margin; ovigerous ♀ with three pairs of oostegites ..... *Discerceis*
   ♂, pleotelsonic notch with short median lobe, if present; ovigerous ♀ with three or four pairs of oostegites 6

6. Ovigerous ♀ with three pairs of oostegites; ♂ pleotelsonic notch lacking marginal teeth or median lobe ..... *Geocerceis*
   Ovigerous ♀ with four pairs of oostegites; ♂ pleotelsonic notch with marginal teeth and/or median lobe ..... *Paracerceis*

Subfamily Dynameninae Bowman, 1981

DIAGNOSIS Cephalon not fused with pereonite 1. Pereopods 1 and 2 ambulatory. Pleopods 4 and 5, both rami having branchial pleats. Pleopod 4, exopod unjointed, usually lacking setae, endopod with few setae at most. Pleotelsonic apex often with terminal notch or foramen, especially in ♂. Uropods biramous.

Cerceis H. Milne Edwards, 1840

DIAGNOSIS Mouthparts metamorphosed in ♀. Broodpouch of four pairs of oostegites on pereonites 1–4, overlapping in midline. Brood held in four pairs of internal pouches. Pockets absent.

"*Cerceis*" *carinata* Glynn, 1970

Figure 93A

DIAGNOSIS ♂ 3.8 mm, ♀ 3.9 mm. Dorsal integument, especially posteriorly, finely pustulose. Cephalon with three pairs of rounded dorsolateral carinae, one middorsal carina, not reaching posterior margin. Pereonite 1 with two ventrolateral carinae. Pleopod 3, exopod biarticulate. Pleotelson similar in ♂ and ♀. Pleotelson with basal middorsal inflated area flanked by two smaller lateral swellings, with carina in midline almost reaching posterior margin; posterolateral margins converging to narrow, slightly concave posterior margin. ♂: Penes elongate, basally fused. Pleopod 2, copulatory stylet basally broad, tapering distally, articulating mediodistally on endopod; exopod with three enlarged distal plumose setae.

RECORDS Venezuela, 5–7 m.

REMARKS Several differences (in the male penial structure, copulatory stylet, antennular peduncle, and pleonal sutures) between *Cerceis carinata* and the definition of the genus (Harrison and Holdich, 1982; Harrison, 1984) indicate that this species has not been placed in the correct genus. Until fresh ovigerous females and mature males are available, the generic position must remain uncertain.

Discerceis Richardson, 1905

DIAGNOSIS Mouthparts in ♀ metamorphosed. Broodpouch formed by four pairs of oostegites on pereonites 1–4, overlapping in midline. Brood held in

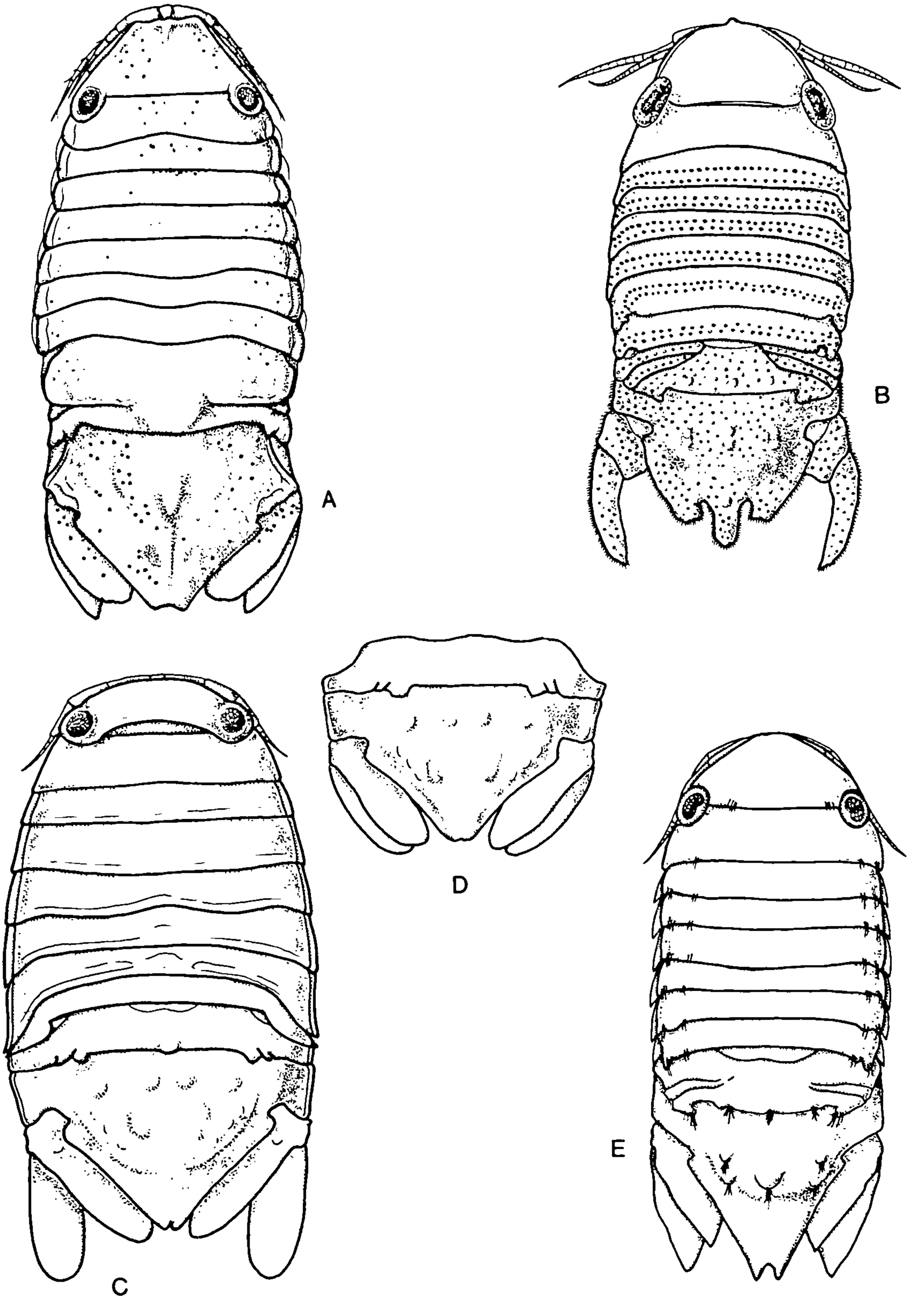


Figure 93. *"Cerceis" carinata: A,* ♂. *Discerceis linguicauda: B,* ♂. *Dynamenella acutitelson: C,* ♀; *D,* pleon ♂. *Dynamenella angulata: E,* ♀.

internal pouches (number unknown). Pockets absent. ♂ with uropodal endopod and sympod fused, very short; exopod elongate, cylindrical.

Discerceis linguicauda (Richardson, 1901)
Figure 93B

DIAGNOSIS ♂ 7.2 mm. Dorsal integument, especially of posterior half, with numerous scattered granular tubercles. Uropodal endopod and sympod fused, very short, exopod elongate, subcylindrical and slightly bowed. Anterior half of pleotelson inflated, with three elongate rounded ridges (each composed of two contiguous tubercles) ending posteriorly in subacute tubercle; posterior margin trilobed, median lobe broadly rounded, with subacute tubercle at base, lateral lobe truncate, well separated from median lobe. Head and pereonite 1 not fused. Frontal lamina visible dorsally between antennal bases. Penes short, separate. Copulatory stylet basally relatively broad, distally broadly rounded.

RECORDS Cape Catoche, Yucatan, Mexico, 48–50 m.

REMARKS This species is known only from the four male syntypes.

Dynamenella Hansen, 1905b

DIAGNOSIS Species exhibiting obvious sexual dimorphism. Both sexes lacking processes on pereon and pleon. Uropodal rami lamellar. Exopod of pleopod 3 with or without articulation. ♀: Mouthparts not metamorphosed. Broodpouch lacking oostegites, but formed by two opposing ventral pockets opening in midline between fourth pereopods. Apex of pleotelson with notch,

Key to species of *Dynamenella*

1. ♂ with pleotelsonic foramen 2
   ♂ lacking foramen but with notch, or appearing entire; ♀ pleotelson with faint notch visible ..... *acutitelson*

2. ♂ with four strong pleotelsonic ridges; ♀ with subcircular pleotelsonic foramen ..... *quadrilirata*
   ♂ lacking pleotelsonic ridges; ♀ with posterior margin of pleotelson entire ..... *perforata*

groove, or foramen. ♂: Penes basally fused, rami long, tapering. Copulatory stylet proximally broad, tapering to acute tip, reaching to or just beyond apex of endopod. Uropods broader than in ♀. Posterior pleotelson with dorsally directed foramen connected to apex by narrow slit.

REMARKS The species described by Richardson (1901) as *Dynamene angulata* from No Name Key, Florida, and referred to by some authors as a *Dynamenella,* while figured here (Figure 93E), is not included in the present key. The species is known only from immature females; correct generic placement is thus not possible.

Dynamenella acutitelson Menzies and Glynn, 1968
Figure 93C,D

DIAGNOSIS ♂ 3.5 mm, ♀ 2.3 mm. ♂: Pereonites 4–6 with transverse ridge over dorsum, ridge interrupted to form short median section. Pleotelson with two submedian and two lateral rounded tubercles basally, two submedian, poorly defined ridges in central area; posterior margin tapering in dorsal view, with slit either just visible or appearing entire. In lateral view, posterior pleotelson seen to be laterally compressed, forming narrow groove.

RECORDS Puerto Rico, intertidal rocks and algae.

REMARKS Menzies and Glynn (1968) described this species with two varieties, the holotype as *D. acutitelson* var. *typica,* and 11 paratypes as *D. acutitelson* var. *glabrothorax.* The major difference between these varieties lay in the presence of transverse ridges on pereonites 4–6 in *typica* and their absence in *glabrothorax.* The holotype, however, at 3.5 mm, would seem to be a mature male, while all the paratypes are smaller. The differences described by Menzies and Glynn (1968) may thus be due to immaturity. As further comparative material is lacking, these varieties (or whatever their true status) are not recognized here.

Menzies and Glynn (1968, fig. 30a) illustrate *D. acutitelson* var. *glabrothorax* as having scattered tiny granules over the dorsal integument. These were not seen when the type material was reexamined.

Harrison and Holdich (1982) placed this species in *Paradella,* based on the literature. However, the penes for both varieties are shown as short and separate, as in *Ischyromene.* Again, until further mature males and ovigerous females are seen, the generic placement of this species must remain in doubt.

Dynamenella perforata (Moore, 1901)
Figure 94A,B

DIAGNOSIS ♂ 3.2 mm, ♀ 2.6 mm. ♂: Pleon bearing two low rounded submedian "mounds." Pleotelson with strongly convex anterior two-thirds, with T-shaped foramen. Pleon and pleotelson with numerous scattered small tubercles. Uropodal rami broadly ovate, outer margins crenulate. ♀: Pleotelson broadly rounded in dorsal view, posterior margin entire. Inner uropodal ramus distally subacute.

RECORDS Bermuda to Puerto Rico, intertidal coral rubble and algae, and under chiton *Acanthopleura granulata;* Dominican Republic; Cuba.

Dynamenella quadrilirata Kensley, 1984
Figure 94C–H

DIAGNOSIS ♂ 2.6 mm, ♀ 2.5 mm. ♂: Two low rounded submedian tubercles on last pleonite. Anterior half of pleotelson inflated, with four rounded longitudinal ridges; posterior half tapered, somewhat dorsally flexed, with cordate foramen. Uropodal rami distally rounded, outer margins crenulate to dentate. ♀: Lacking pleonal tubercles. Pleotelson inflated, unornamented, posterior margin forming subcircular foramen.

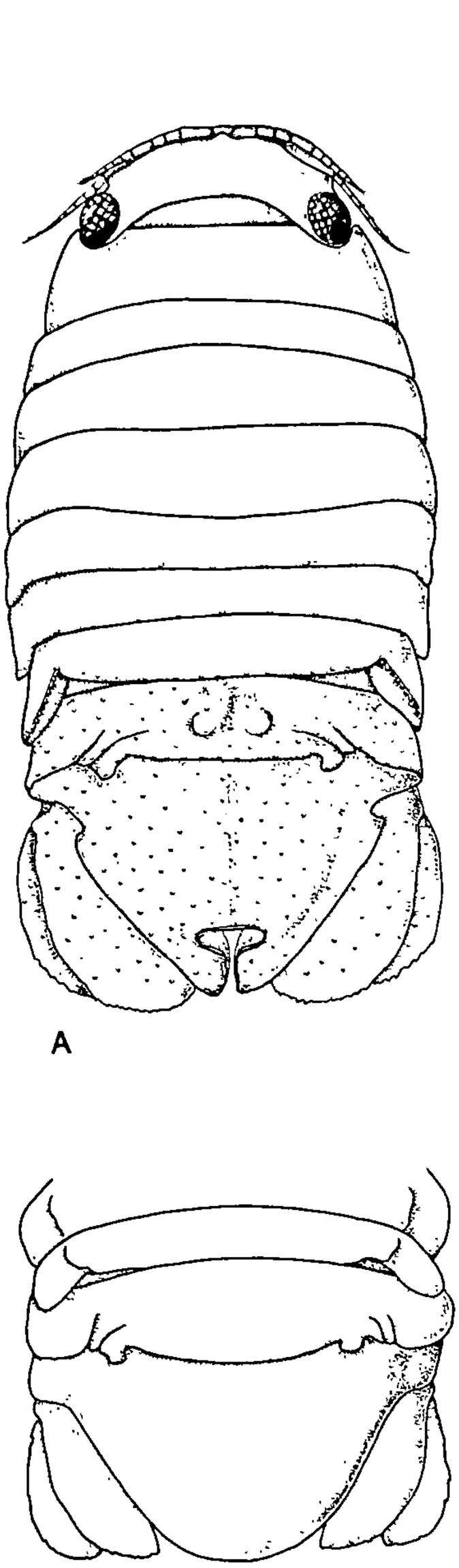
RECORDS Carrie Bow Cay, and Twin Cays, Belize; intertidal to 3 m.

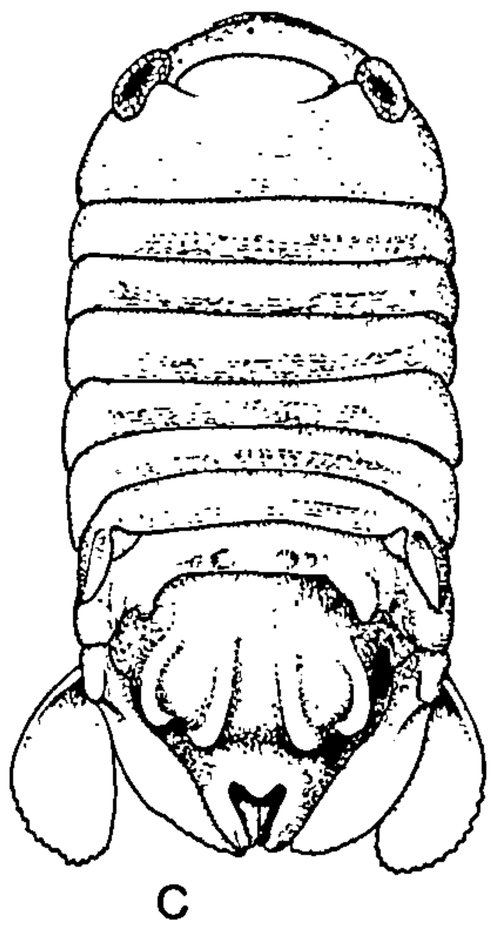
Geocerceis Menzies and Glynn, 1968

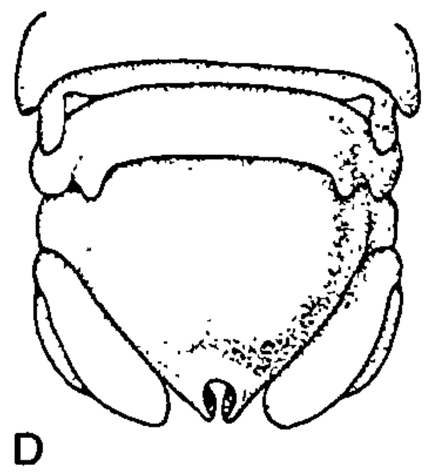
DIAGNOSIS Ovigerous ♀ with mouthparts metamorphosed. Broodpouch with three pairs of oostegites, on pereonites 2–4, just overlapping in midline. Brood held in internal pouches (number unknown). Pockets absent. Uropodal rami lamellar, shorter than pleotelson. ♂ uropodal endopod fused with sympod, very short; exopod elongate, club shaped. Pleopod 2 with copulatory stylet articulating distally on endopod.

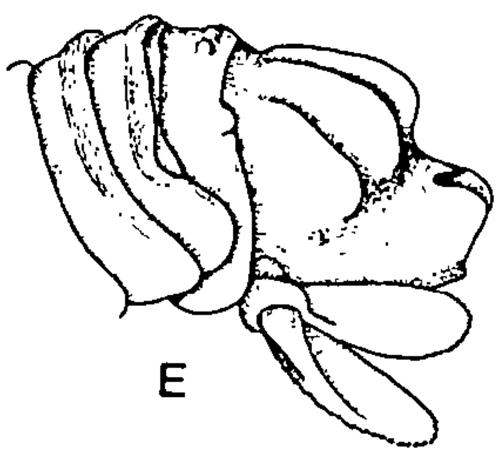
Geocerceis barbarae Menzies and Glynn, 1968
Figure 95A–C

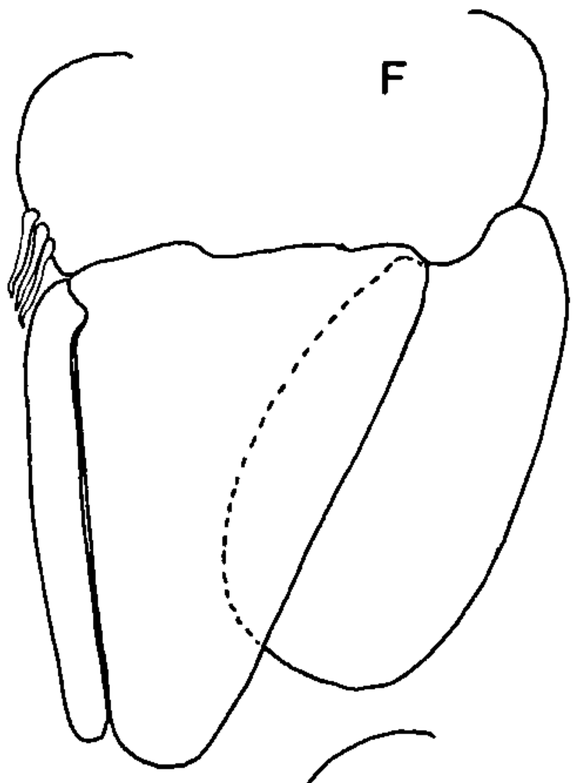
DIAGNOSIS ♂ 3.3 mm, ♀ 2.5 mm. Pleopod 3 exopod of single article. Pleon with two elongate sutures reaching lateral pleon margin. ♂: Frontal lamina expanded into ventrally directed beaklike process. Penes separate, relatively

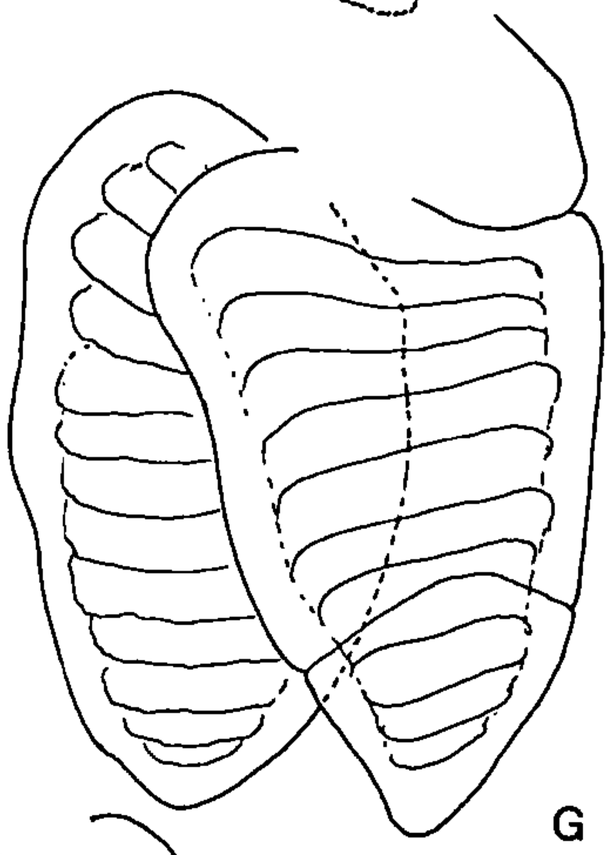












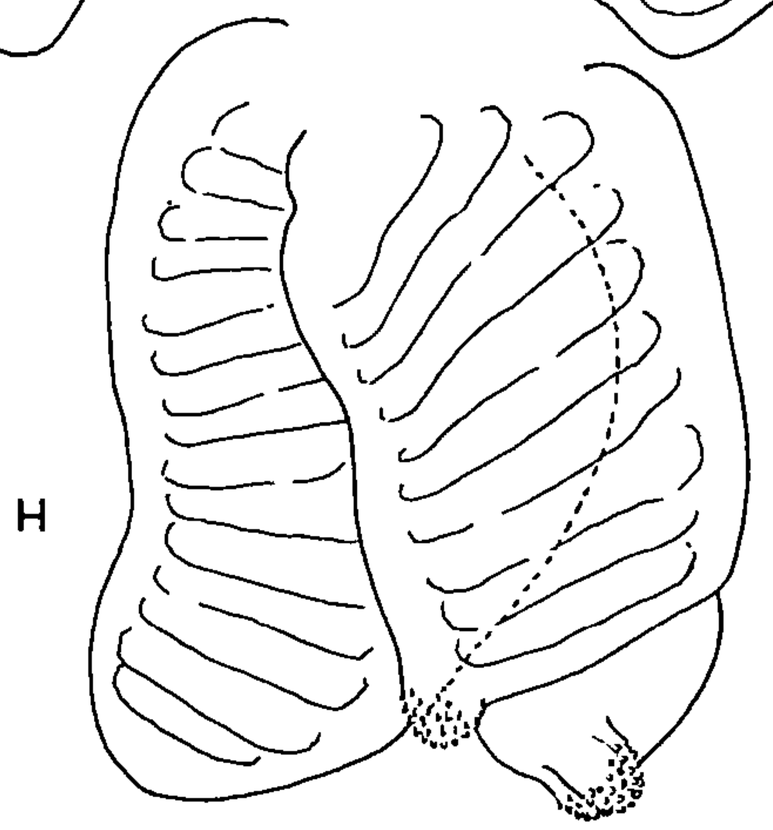


Figure 94. *Dynamenella perforata: A*, ♂; *B*, pleon ♀. *Dynamenella quadrilirata: C*, ♂; *D*, pleon ♀; *E*, pleon ♂, lateral view; *F*, pleopod 2 ♂; *G*, pleopod 4; *H*, pleopod 5.

elongate. Pleonite 5 with three dorsal tubercles near posterior margin. Pleotelson with raised anterocentral area having two lateral longitudinal rounded ridges; apex notched. ♀: Uropodal exopod and endopod subequal, lamellar. Pleotelson as in ♂. Frontal lamina not produced as in ♂.

RECORDS Puerto Rico, intertidal to 3 m, in coral rubble.

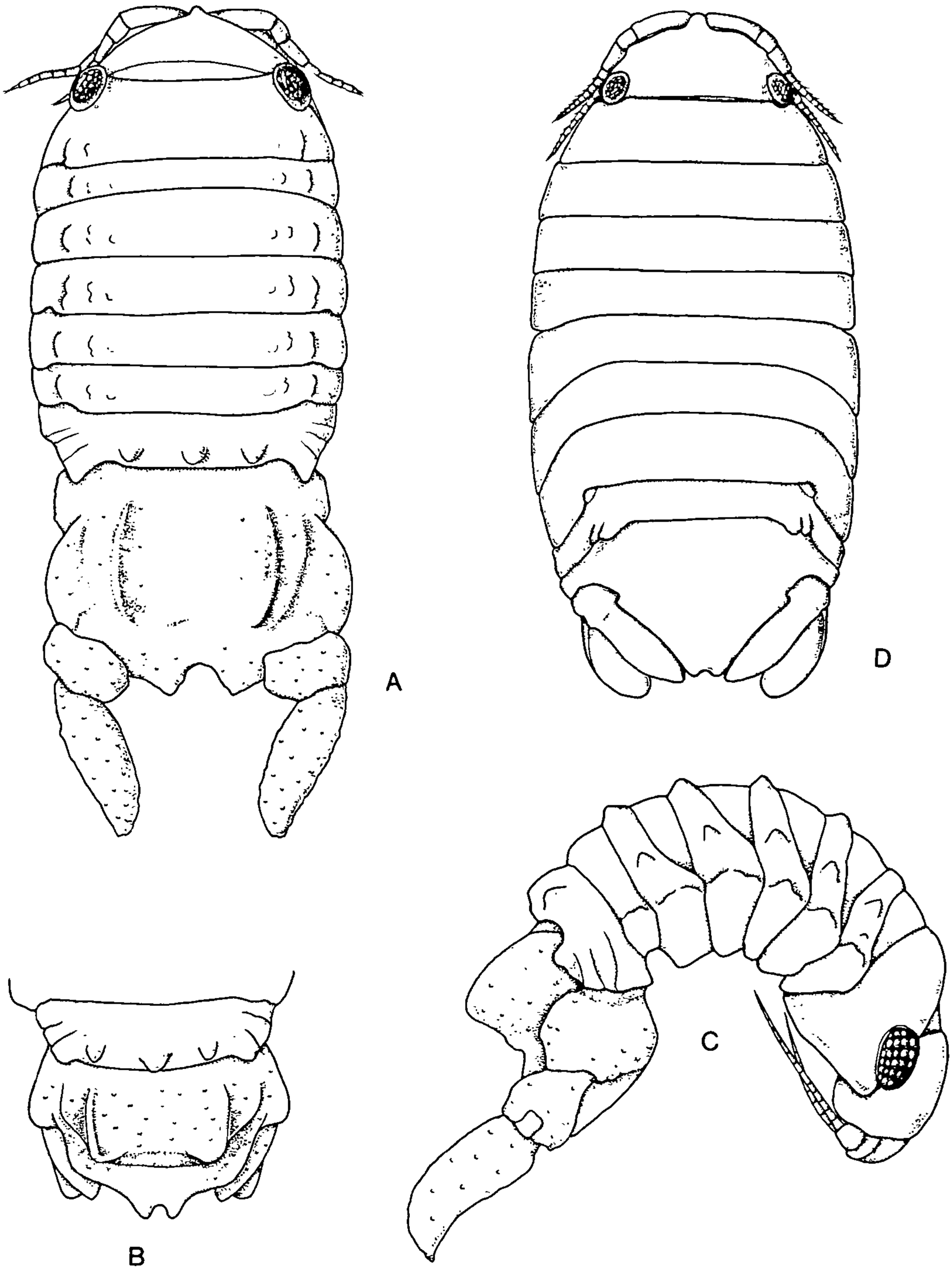


Figure 95. *Geocerceis barbarae: A*, ♂; *B*, pleon ♀; *C*, ♂, lateral view. *Ischyromene barnardi: D*, ♂.

Ischyromene Racovitza, 1908

DIAGNOSIS ♀ mouthparts not metamorphosed. Broodpouch of three pairs of oostegites on pereonites 2–4, overlapping in midline. Large posterior pocket covering posterior ventrum, opening anteriorly between fourth pereopods. Brood housed in ventral body wall. Sexual dimorphism not pro-

nounced. Uropodal rami lamellar. ♂ pleopod 2 with copulatory stylet basally narrow, reaching to or just beyond distal margin of endopod.

Ischyromene barnardi (Menzies and Glynn, 1968)

Figure 95D

DIAGNOSIS ♂ 4.5 mm, ♀ 3.7 mm. Both sexes lacking processes on pereon and pleon. Accessory unguis of pereopods often bifid. Pleopod 3, exopod of single article. Uropodal rami lamellar. ♂: Pereonite 7, posterior margin bilobed. Penes short, separate to base.

RECORDS Puerto Rico, intertidal.

Paracerceis Hansen, 1905b

DIAGNOSIS Pleopod 3 exopod with transverse suture in distal half. Pleon with two long sutures reaching to posterolateral margin. ♂: Penial rami short, separate. Pleotelson with basal area strongly vaulted; deep posterior notch sometimes having denticles on inner margins, and/or median tooth at base of notch. Uropodal endopod short, fused with sympod; exopod elongate, club shaped. ♀: Mouthparts metamorphosed. Mandible fused with cephalon. Broodpouch of four pairs of oostegites, three posterior pairs overlapping. Brood retained in internal pouches. Uropodal rami subequal, lamellar. Pleon usually less ornamented than in ♂, and with shallower median notch lacking teeth.

Key to species of *Paracerceis* (*P. nuttingi* not included)

1. ♂, pleotelsonic notch narrow, with median basal tooth; ♀, pleotelson dorsally unornamented 2
   ♂, pleotelsonic notch wide, with lateral teeth; ♀, pleotelson dorsally with tubercles 3

2. ♂, median tooth of pleotelsonic notch almost as long as notch; subacute median tubercle on anterior pleotelson; ♀, pleotelson with posterior margin faintly concave, not notched ..... *edithae*
   ♂, median tooth less than half length of notch; pleotelson with blunt rounded median tubercle; ♀, pleotelson with distinct posterior notch ..... *glynni*

3. ♂, pleotelsonic notch deep, margins usually with two teeth on each side; strong median tubercle on anterior pleotelson bluntly bifid; ♀, pleotelson with one or two rounded median tubercles and 2 smaller tubercles on each side ..... *caudata*
   ♂, pleotelsonic notch shallow, with tiny lateral denticles; median tubercle of pleotelson conical, acute; ♀, pleotelson with three large conical acute tubercles and several smaller scattered tubercles in anterior half ..... *cohenae*

Paracerceis caudata (Say, 1818)
Figure 96

DIAGNOSIS ♂ 8.1 mm, ♀ 6.4 mm. ♂: Pleotelson with blunt median bifid tubercle, with two smaller tubercles on each side. Pleotelsonic notch usually with two strong denticles on each margin, basal median tooth lacking. Uropodal exopod reaching well beyond pleotelson, slightly bowed, with 2–4 setose bumps on outer margin. ♀: Pleonite 5 with three low tubercles. Pleotelsonic apex broadly rounded in dorsal view, with two rounded median tubercles and two smaller tubercles on each side. Uropodal rami subequal, lamellar, outer distal angle of each acute.

RECORDS Bermuda; New Jersey to Florida Keys; Yucatan to Venezuela; Turks and Caicos Islands; Cuba; Puerto Rico; Bahamas; Jamaica; Haiti; St. Maartens, 0.2–127 m; St. Lucia; Gulf of Mexico. Found in the following algae: *Caulerpa, Halimeda, Turbinaria, Amphiroa, Laurencia, Dictyota;* between sponges and tunicates on red mangrove roots; in coral rubble; in spur and groove zone of reefs, lagoon, back reef, seagrass flats, and fringing mangroves.

REMARKS Menzies and Glynn (1968:55, fig. 22f) named and figured *P. caudata* var. *brevipes* from Puerto Rico. This variant was characterized as having the margins of the pleotelsonic notch lacking denticles. Given the considerable variation in ornamentation in this species, we feel that no validity can be given to the name "brevipes."

This is the commonest sphaeromatid in the Caribbean, and it has very broad ecological requirements, being found in a wide range of habitats and depths.

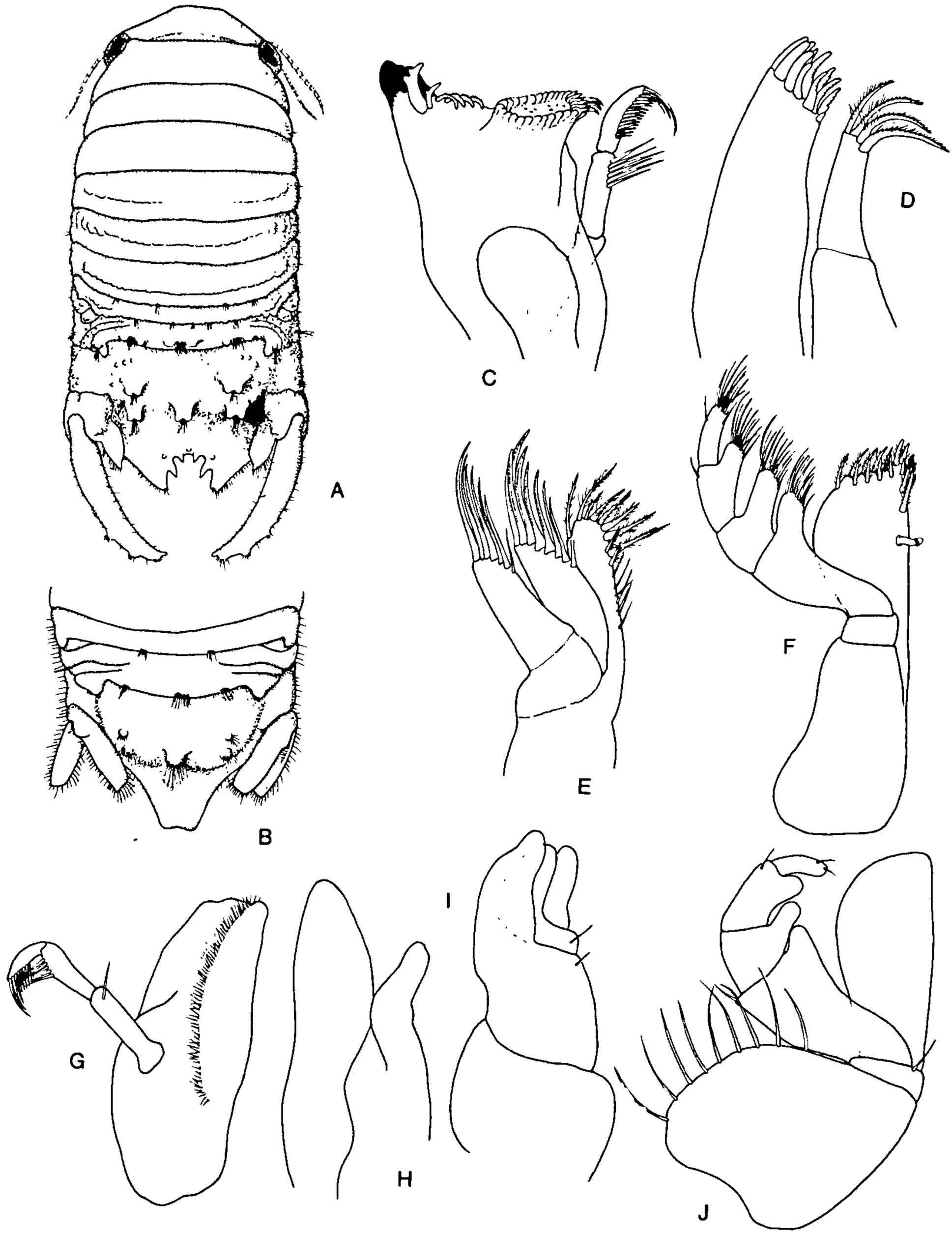


Figure 96. *Paracerceis caudata: A*, ♂; *B*, pleon ♀; *C*, mandible ♂; *D*, maxilla 1 ♂; *E*, maxilla 2 ♂; *F*, maxilliped ♂; *G*, mandible ♀; *H*, maxilla 1 ♀; *I*, maxilla 1 ♀; *J*, maxilliped ♀.

Paracerceis cohenae Kensley, 1984
Figure 97A,B

DIAGNOSIS ♂ 10.0 mm, ♀ 7.9 mm. ♂: Pereonites each with median tubercle and several smaller lateral tubercles near posterior margin of somite. Pleonite 5 with large median conical tubercle. Anterior two-thirds of

pleotelson inflated, faintly tripartite, with strong median conical tubercle; notch in posterior margin shallow, with low median tooth and tiny lateral denticles; posterolateral margins finely dentate. Uropodal exopod cylindrical, distally denticulate, six to seven times longer than basal width. ♀: Pereon and pleon much as in ♂, but pleotelsonic notch shallower and posterolateral margins not denticulate. Uropodal rami subequal, lamellar, exopod with distolateral angle acute.

RECORDS Carrie Bow Cay, Belize, 15–16 m. Only known from sponge *Callispongia plicifera* growing on outer reef slope.

Paracerceis edithae Boone, 1930

Figure 97C–E

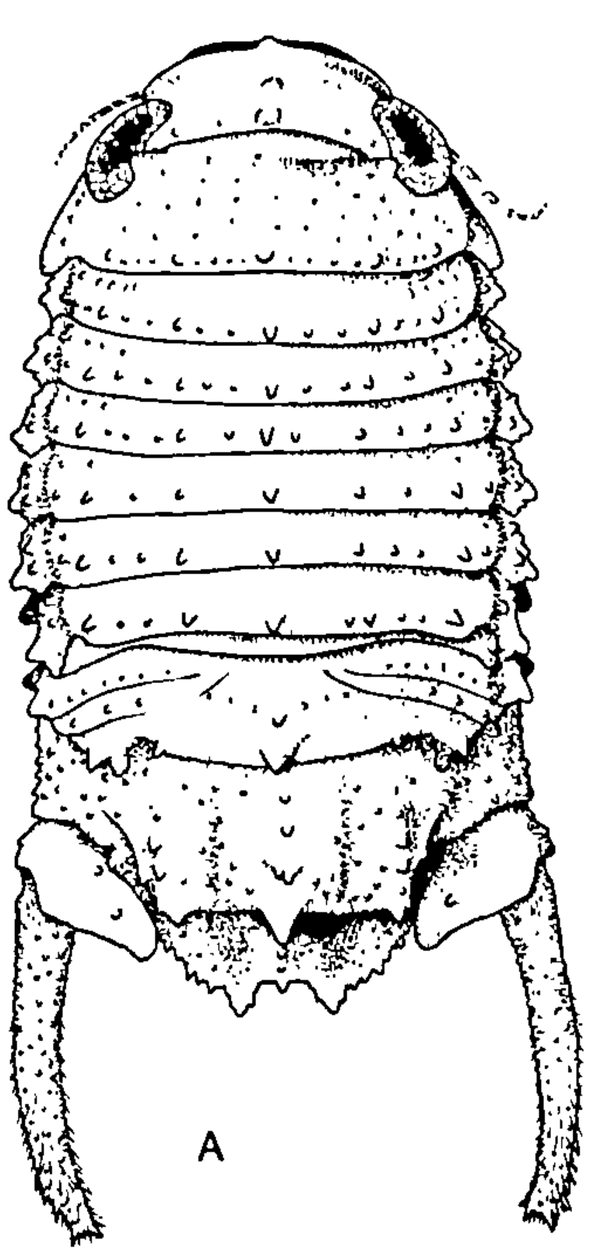
DIAGNOSIS ♂ 4.0 mm, ♀ 3.1 mm. ♂: Posterior three pereonites and pleonites each with irregular row of small tubercles near posterior margin, densely setulose tubercles becoming spinose more posteriorly. Pleotelson with strong median conical tooth in anterior half, flanked by convex spinose mound. Pleotelsonic notch deep, with elongate median basal tooth bearing strong acute tooth at its base. Lobes of posterior pleotelsonic margin broad, flattened, margins denticulate. Uropodal exopod tuberculate, tapering, apically acute. ♀: Integument much less tuberculate-spinose than in ♂. Immature ♀, posterior margin of pleotelson with faintly rounded median lobe. In mature ♀, posterior margin distinctly trilobed. Uropodal rami subequal, lamellar, distally rounded, with tiny distolateral spine on exopod.

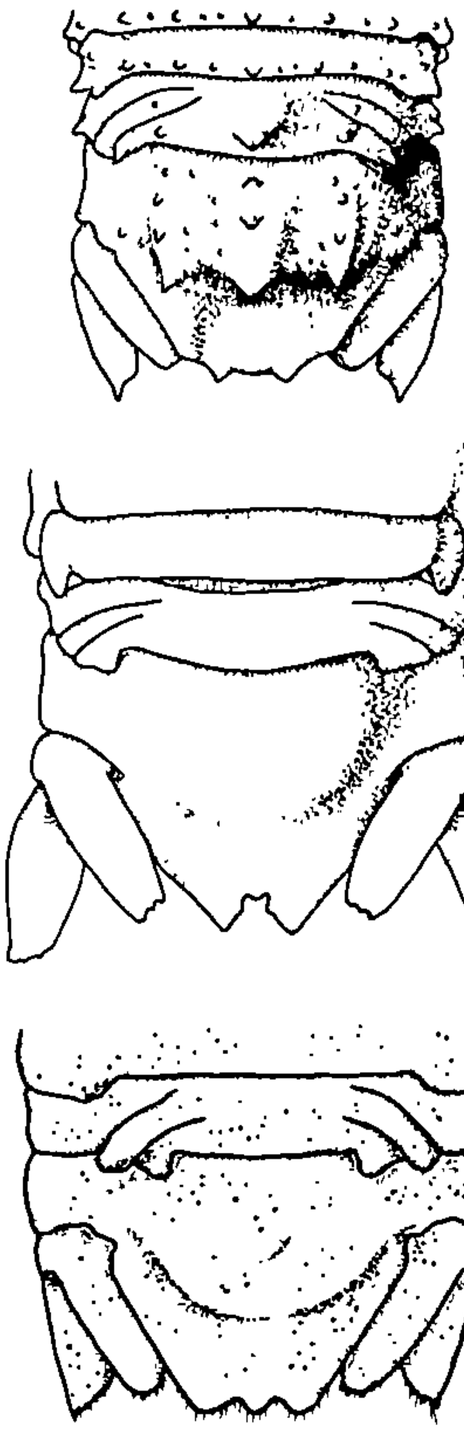
RECORDS Bahamas, 60–66 m, in vase sponge; Haiti; Puerto Rico, 20–25 m.

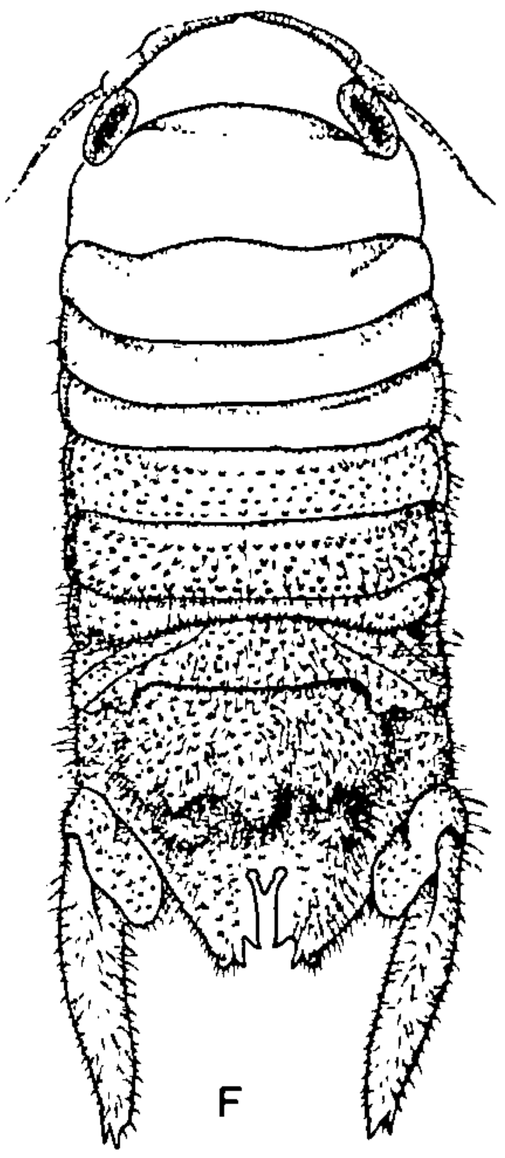
Paracerceis glynni Kensley, 1984

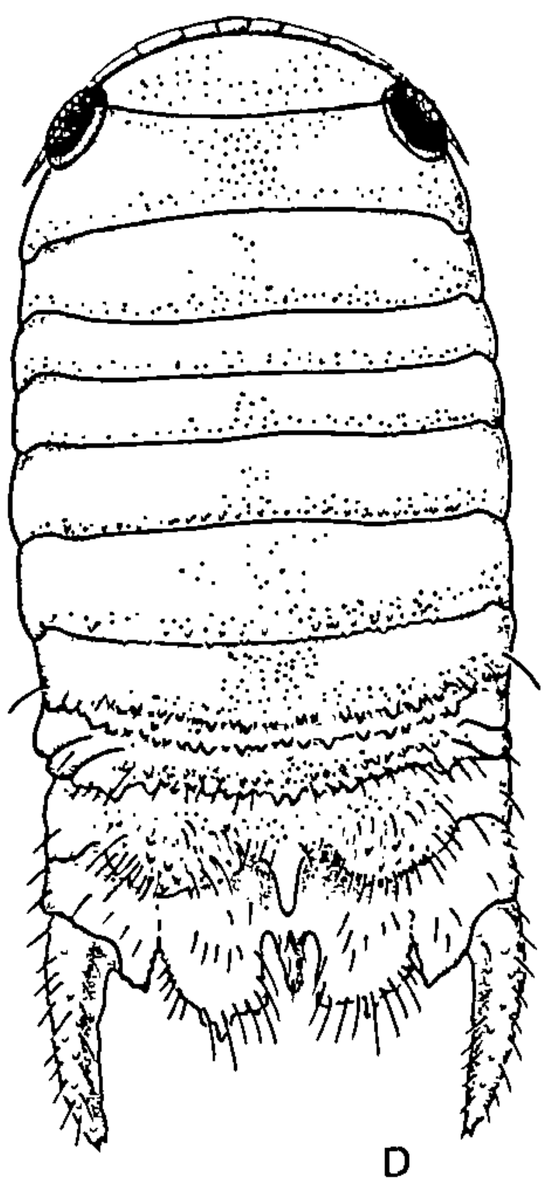
Figure 97F,G

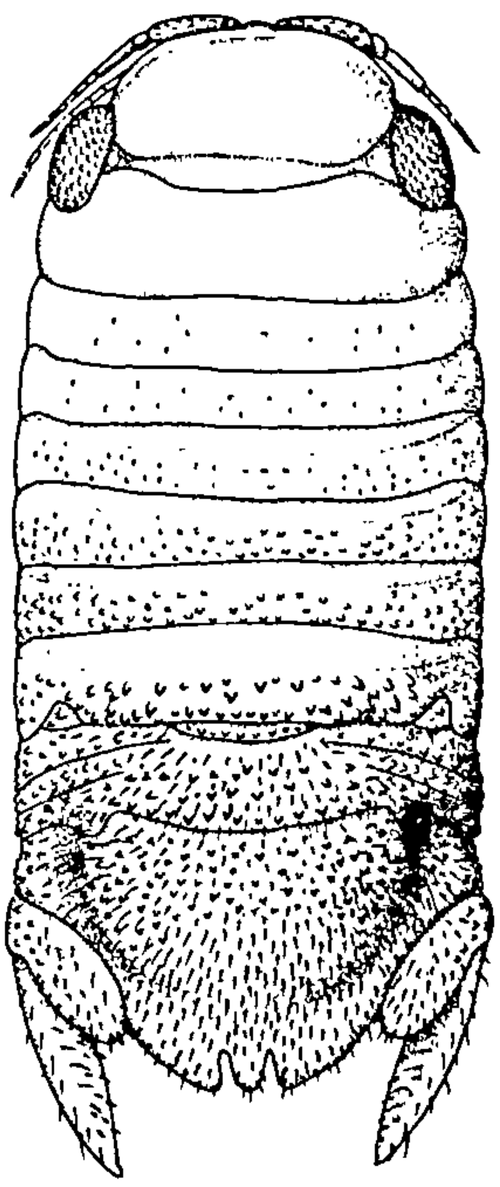
DIAGNOSIS ♂ 6.4 mm, ♀ 5.2 mm. ♂: Integument becoming strongly setose and tuberculate posteriorly from about pereonite 5. Posterior margin of inflated anterior area of pleotelson bearing strong median conical tubercle and smaller acute lateral tubercle, with low swelling beneath each lateral tubercle. Posterior notch deep, narrow, with small basal median tooth, lobes forming notch tricuspid, outer cusps recurved dorsally. Uropodal exopod fairly straight, cylindrical, apically acute. ♀: Body far less setose and tuberculate than ♂. Pleotelson with strongly inflated anterior area having very faint middorsal tubercle; notch well marked, formed by triangular lobes of











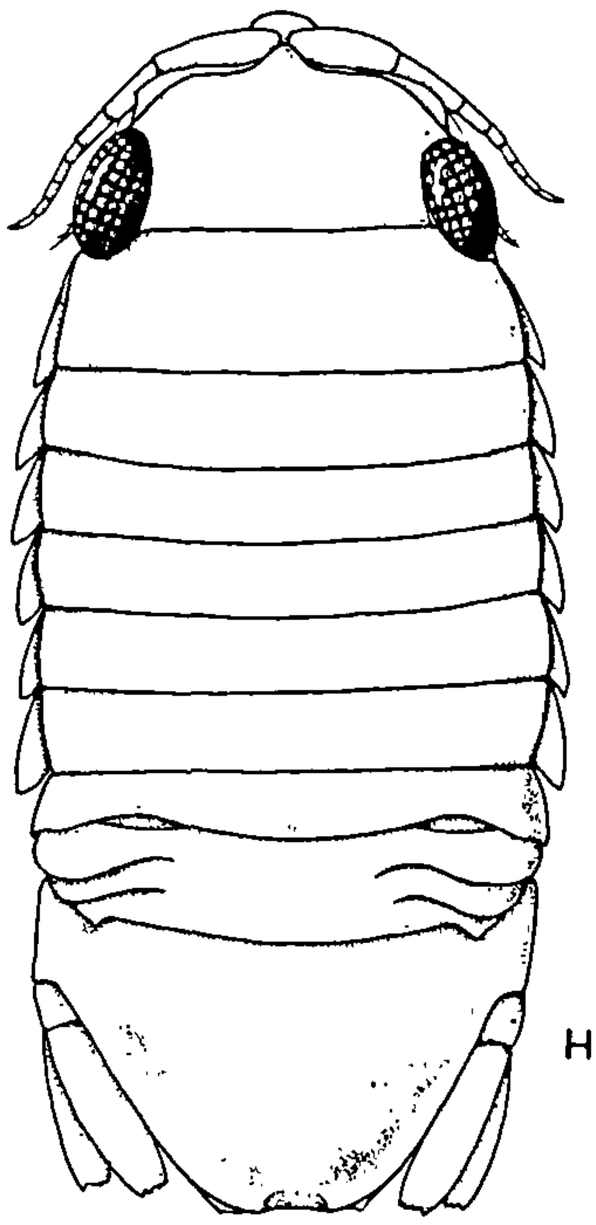


Figure 97. *Paracerceis cohenae: A*, ♂; *B*, pleotelson, ♀. *Paracerceis edithae: C*, pleotelson, ♀; *D*, mature ♂; *E*, immature ♂. *Paracerceis glynni: F*, ♂; *G*, pleotelson, ♀. *Paracerceis nuttingi: H*, ♀.

pleotelsonic margin. Uropodal rami subequal, flattened, endopod with distal margin faintly trituberculate; exopod with few distal tubercles.

RECORDS Alligator Light, Florida, 11 m; Carrie Bow Cay, Belize, 11–15.2

m, from green alga *Halimeda* sp. on forereef, and from sponge *Aphysina fistularis*.

Paracerceis nuttingi (Boone, 1921)
Figure 97H

RECORDS Barbados; Puerto Rico, 1.5 m, from *Cymodocea* seagrass, and coral rubble and sponges.

REMARKS The types of this species from Barbados consist only of females (total length 4.1 mm). Menzies and Glynn (1968) record an immature male from Puerto Rico with an incipient pleotelsonic notch. This specimen, however, still has the subequal lamellar uropodal rami. The mature male, with the characteristically reduced uropodal endopod and cylindrical exopod, is unknown. The possibility exists that this is not a true *Paracerceis*.

Paradella Harrison and Holdich, 1982

DIAGNOSIS Both sexes lacking processes on pereon and pleon. Marked sexual dimorphism. Accessory unguis of pereopods simple, not bifid. Pleopod 3

Key to species of *Paradella*

1. Pereonite 7 with projecting bilobed flange; pleon and pleotelson finely but distinctly granulate 2
   Pleon and pleotelson smooth 3

2. ♂ with pleotelsonic foramen distinctly heart shaped, with median point; four submedian tubercles of pleotelson in ♂ and ♀ somewhat elongate; ♀ pleotelson posteriorly narrowed, slit visible dorsally ..... *dianae*
   ♂ with pleotelsonic foramen wider than long, but lacking median point; four submedian tubercles of pleotelson in ♂ small, rounded, obscure in ♀; ♀ pleotelson posteriorly truncate, slit not visible dorsally ..... *plicatura*

3. Tubercles on pleotelson in ♂ and ♀ small to obscure; ♂ with pleotelsonic foramen subcircular ..... *quadripunctata*
   Tubercles on pleotelson broadly rounded mounds in ♂ and ♀; ♂ with pleotelsonic foramen wider than long ..... *tumidicauda*

exopod with articulation. Uropodal rami lamellar. ♀: Mouthparts not metamorphosed. One pair of oostegites arising from pereonite 4, short, not reaching midline. Brood held in pouch formed by two opposing pockets covering entire ventrum, opening by transverse slit between 4th pereopods. ♂: Penes long, basally fused. Copulatory stylet basally narrow, extending further beyond endopod than in *Dynamenella*. Uropods broader than in ♀.

Paradella dianae (Menzies, 1962b)
Figure 98A–C

DIAGNOSIS ♂ 3.4 mm, ovigerous ♀ 3.7 mm. ♂: Pereonite 7, posterior margin broadly bilobed. Pleonite 5 with two rounded submedian tubercles. Pleotelsonic foramen distinctly heart shaped with median point. Pleotelson with four submedian and two lateral tubercles in ♂ and ♀, plus median tubercle at base of foramen in ♂; tubercles tending to be elongate and subcarinate. Uropodal rami lamellar, margins finely crenulate, relatively broader than in ♀. ♀: Pleotelsonic slit wide, dorsally visible.

RECORDS Key West, Florida; Puerto Rico, intertidal.
Baja California, intertidal.

Paradella plicatura (Glynn, 1970)
Figure 98D,E

DIAGNOSIS ♂ 4.1 mm, ♀ 3.6 mm. Pleon and pleotelson with tiny scattered tubercles. ♂: Pereonites 5–7 with posteriorly directed flanges, that of pereonite 7 largest, bilobed. Pleotelson with four submedian and two lateral discreet rounded tubercles. Pleotelsonic foramen wider than long, with basal bulge but lacking median point. ♀: Pleotelson with wide posterior slit not visible dorsally, posterior margin appearing truncate. Pleotelsonic tubercles less marked than in ♂.

RECORDS Jamaica, under red mangroves; Margarita Island, Venezuela, shallow infratidal.

Paradella quadripunctata (Menzies and Glynn, 1968)
Figure 98F,G

DIAGNOSIS ♂ 2.5 mm, ♀ 2.5 mm. Pleonite 5 with two low rounded submedian tubercles. Pleotelson with four low submedian rounded tubercles and

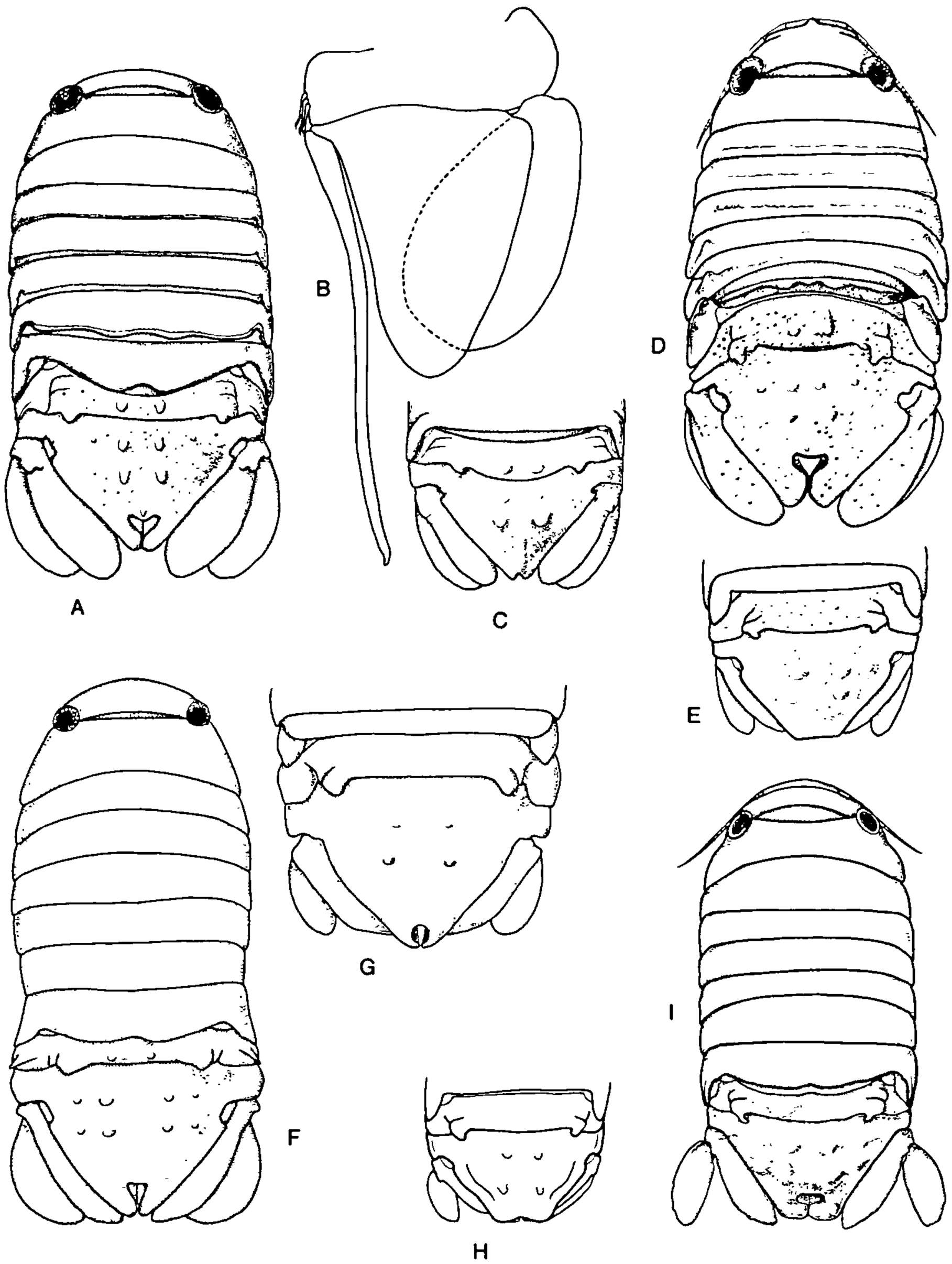


Figure 98. *Paradella dianae: A*, ♂; *B*, pleopod 2 ♂; *C*, pleon ♀. *Paradella plicatura: D*, ♂; *E*, pleon ♀. *Paradella quadripunctata: F*, ♂; *G*, pleon ♀. *Paradella tumidicauda: H*, pleon ♀ (from Glynn, 1970); *I*, ♂.

four smaller lateral tubercles. ♂: Pleotelsonic foramen subcircular, ventral margins of foramenal tube barely touching. ♀: Pleotelson posteriorly narrowly tapered, slit becoming tubelike, dorsally visible; four submedian tubercles less marked than in ♂.

RECORDS Bermuda; Florida; Dominican Republic; Puerto Rico, intertidal; U.S. Virgin Islands, intertidal to 1 m.

Paradella tumidicauda (Glynn, 1970)
Figure 98H,I

DIAGNOSIS ♂ 6.7 mm, ♀ 6.5 mm. ♂: Last pleonite with two submedian swellings. Pleotelson with four submedian broadly rounded swellinglike tubercles and two pairs of lateral tubercles. Foramen wider than long, posterior contiguous borders of foramen each bearing rounded swelling. ♀: Pleotelson with four submedian swellinglike tubercles, sometimes with two obscure lateral tubercles; posterior slit not visible dorsally, area surrounding slit swollen, horseshoe shaped.

RECORDS Margarita Island, Venezuela, from among intertidal barnacles.

Subfamily Sphaeromatinae H. Milne Edwards, 1840

DIAGNOSIS Cephalon not fused with pereonite 1. Pereopods 1 and 2 ambulatory. Pleopods 4 and 5, endopods having branchial pleats, exopods unpleated, membranous, of two articles. Uropods biramous.

Key to genera of Sphaeromatinae

1. Uropodal exopod with outer margin serrate ..... *Sphaeroma*
   Uropodal exopod with outer margin entire or faintly crenulate 2

2. ♂, pleotelsonic notch with median lobe; ♀, pleotelsonic apex barely notched with rounded median lobe; ♀, mouthparts metamorphosed 3
   Pleotelson entire to very faintly notched in ♂ and ♀; ♀, mouthparts not metamorphosed; with three pairs of oostegites ..... *Exosphaeroma*

3. Mature ♂, uropodal exopod about twice length of endopod; ♀ with three pairs of oostegites ..... *Harrieta*
   ♂, uropodal rami subequal or exopod shorter than endopod; ♀ with four pairs of oostegites ..... *Cymodoce*

Cymodoce Leach, 1814

DIAGNOSIS Pleon with two elongate straight parallel incomplete sutures on each side. Pleotelsonic apex with marked notch bearing median tooth.

Pleopod 5, exopod of two articles, distal article with apex and internal margin covered with fine teeth, anterior surface with long distally toothed boss; proximal article with two small toothed bosses at internodistal angle. ♂: Maxillipedal palp articles 2–4 bearing setigerous lobes. Penial rami elongate, separate. Pleon usually more tuberculate than in ♀. Uropodal exopod lamellar, shorter than endopod. ♀: Mouthparts metamorphosed. Broodpouch formed by four pairs of oostegites arising from pereonites 1–4, overlapping in midline. Brood housed in five pairs of internal pouches.

"*Cymodoce*" *barrerae* (Boone, 1918)
Figure 99A,B

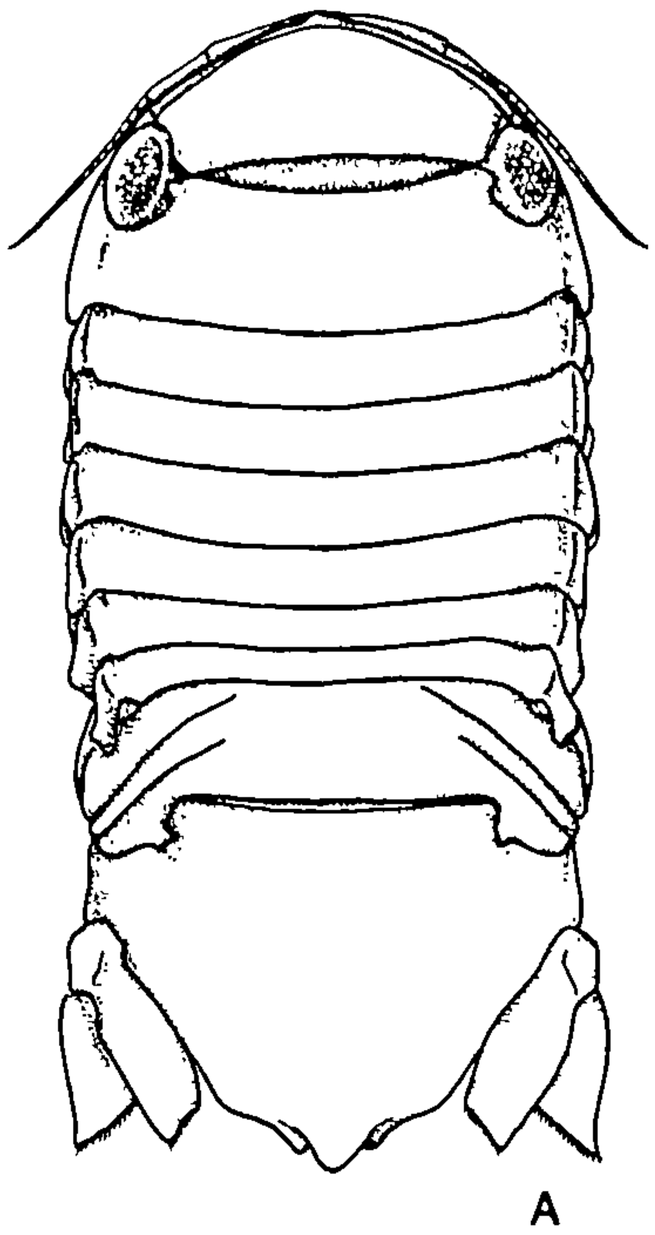
DIAGNOSIS ♀ 7.5 mm. ♀: Body dorsally strongly vaulted, unornamented. Frontal lamina distally broadly rounded, lateral shoulders rounded. Mouthparts not metamorphosed. Pleotelson anteriorly strongly inflated with barest indication of two submedian swellings; posterior margin trilobed, with median lobe strong, narrowly rounded, outer lobes much smaller and ventral to median lobe. Uropodal endopod distally obliquely truncate; exopod distally acute.

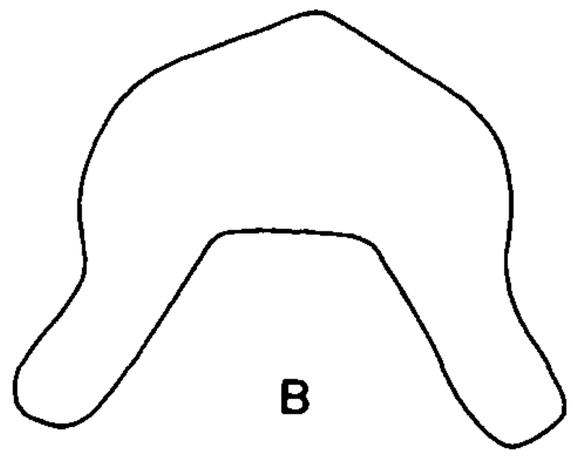
RECORDS Cabanas, Cuba.

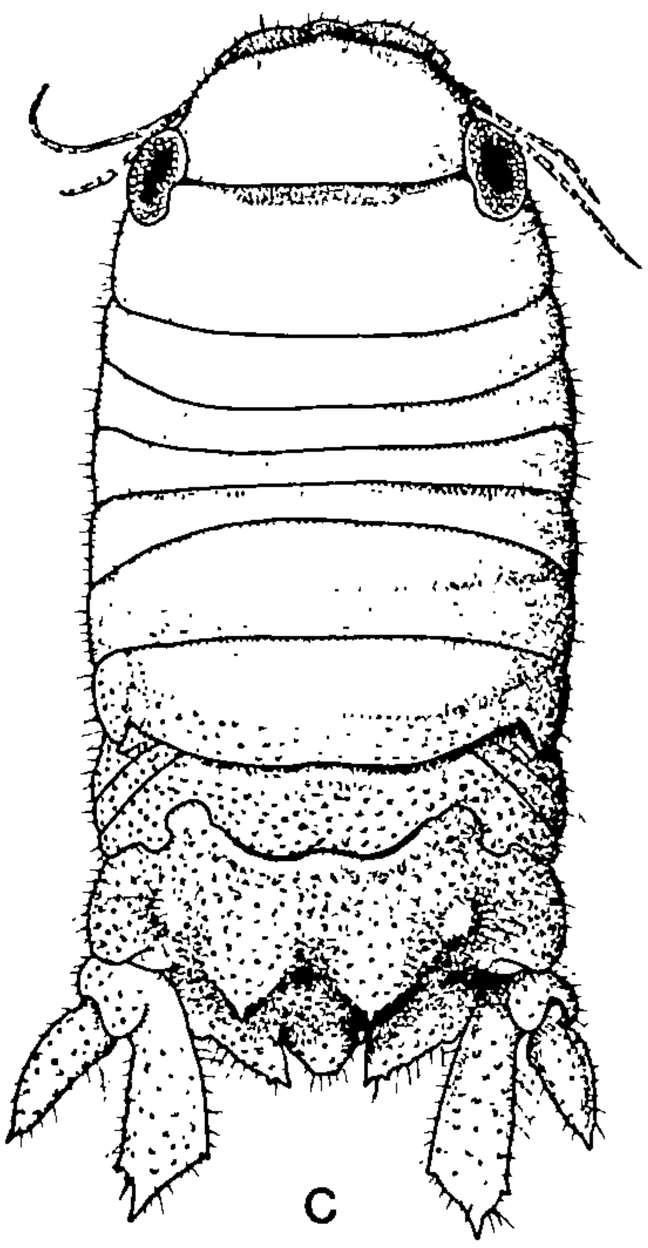
REMARKS This species is known only from the nonovigerous female holotype. Loyola e Silva (1960) placed the species in *Cymodoce*, based on a female specimen from Brazil. As the mouthparts are not metamorphosed, this does not agree with the present concept of *Cymodoce*, but with neither ovigerous females nor males available, the correct generic placement cannot be determined.

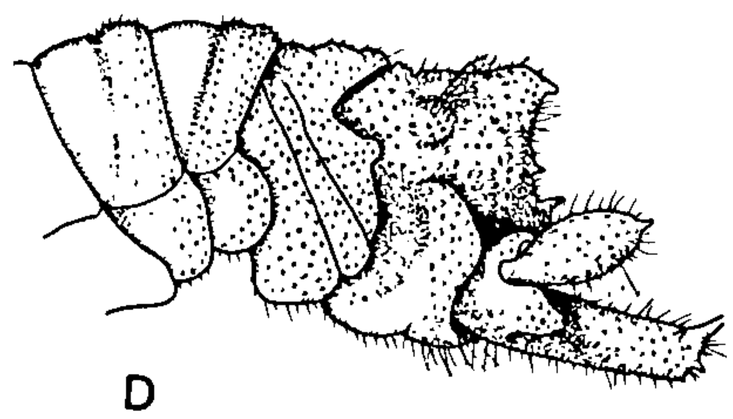
Cymodoce ruetzleri Kensley, 1984
Figure 99C–G

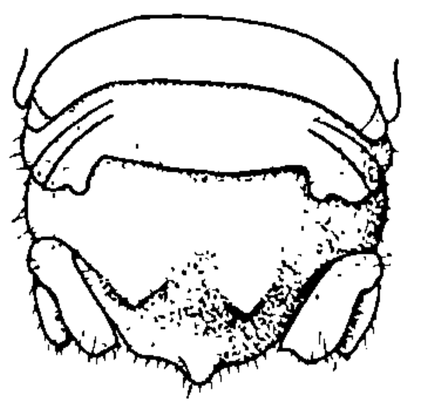
DIAGNOSIS ♂ 5.0 mm, ♀ 4.2 mm. ♂: Integument with numerous small tubercles, becoming densely setose posteriorly. Pleonite 4, posterior margin broadly bilobed. Pleotelson bearing pair of strong conical tubercles with acute tips, each tubercle flanked by low rounded tubercle; apex trilobed, outer lobes triangular, acute, sharp spine at base of incision, median lobe apically blunt. Uropodal exopod apically acute, oval in cross section, endopod and sympod fused, somewhat flattened, apex triangular with strong tooth. ♀: Pleotelson with two conical apically acute tubercles, apex barely notched, with short rounded lobe slightly offset from posterior margin. Both

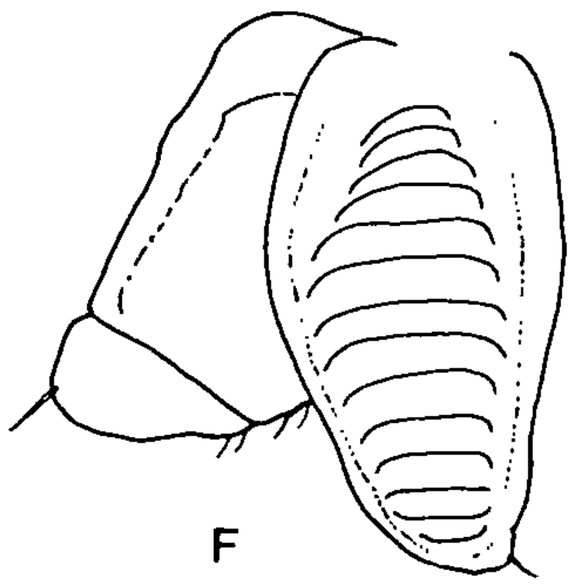












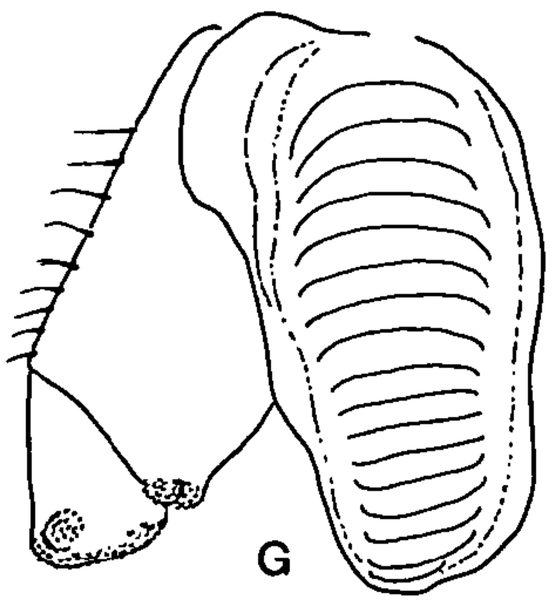


Figure 99. *"Cymodoce" barrerae: A*, ♀; *B*, frontal lamina. *Cymodoce ruetzleri: C*, ♂; *D*, pleon in lateral view, ♂; *E*, pleon ♀; *F*, pleopod 4; *G*, pleopod 5.

uropodal rami flattened; exopod with tiny apical tooth, endopod distally truncate-rounded, with small mediodistal tooth.

RECORDS Carrie Bow Cay, Belize, 0.5–13 m; in algal clumps, reef crest rubble, and seagrass flats.

Exosphaeroma Stebbing, 1900

DIAGNOSIS Maxillipedal palp articles 2–4 produced medially into lobes. Pereonites 6 and 7 dorsally unarmed. Pleopod 3, exopod biarticulate. ♂: Penes short, separate. Copulatory stylet of pleopod 2 elongate, slender. Pleotelson lacking strong apical notch. ♀: Mouthparts not metamorphosed. Broodpouch of three pairs of oostegites on pereonites 2–4; oostegites short, not reaching midline. Brood held in four pairs of internal pouches.

Key to species of *Exosphaeroma*

1. Pleotelson with posterior margin entire, evenly convex 2
   Pleotelson with posterior margin faintly notched or trilobed 3

2. Frontal lamina with length less than 1.5 times greatest width ..... *diminuta*
   Frontal lamina with length almost two times greatest width ..... *productatelson*

3. Pleotelson with posterior margin faintly trilobed, and with three low rounded tubercles anteriorly ..... *yucatanum*
   Pleotelson with posterior margin faintly notched 4

4. Pleotelson posteriorly broadly notched; two rounded submedian tubercles on inflated midregion ..... *antillense*
   Pleotelson with faint narrow notch posteriorly; lacking dorsal tubercles ..... *alba*

Exosphaeroma alba Menzies and Glynn, 1968
Figure 100A–C

DIAGNOSIS ♂ 2.0 mm, ♀ 2.3 mm. Frontal lamina anteriorly broadly rounded, basally slightly wider than midlength. Pleotelson similar in ♂ and ♀; anterodorsally inflated and unornamented, posteriorly tapering to slight median notch, seen in dorsal view. Uropodal rami distally shallowly serrate, exopod 2.5 times longer than wide.

RECORDS Puerto Rico, intertidal to 0.5 m; in algae on rocks, and under *Chiton tuberculatus* and *C. marmoratus*.

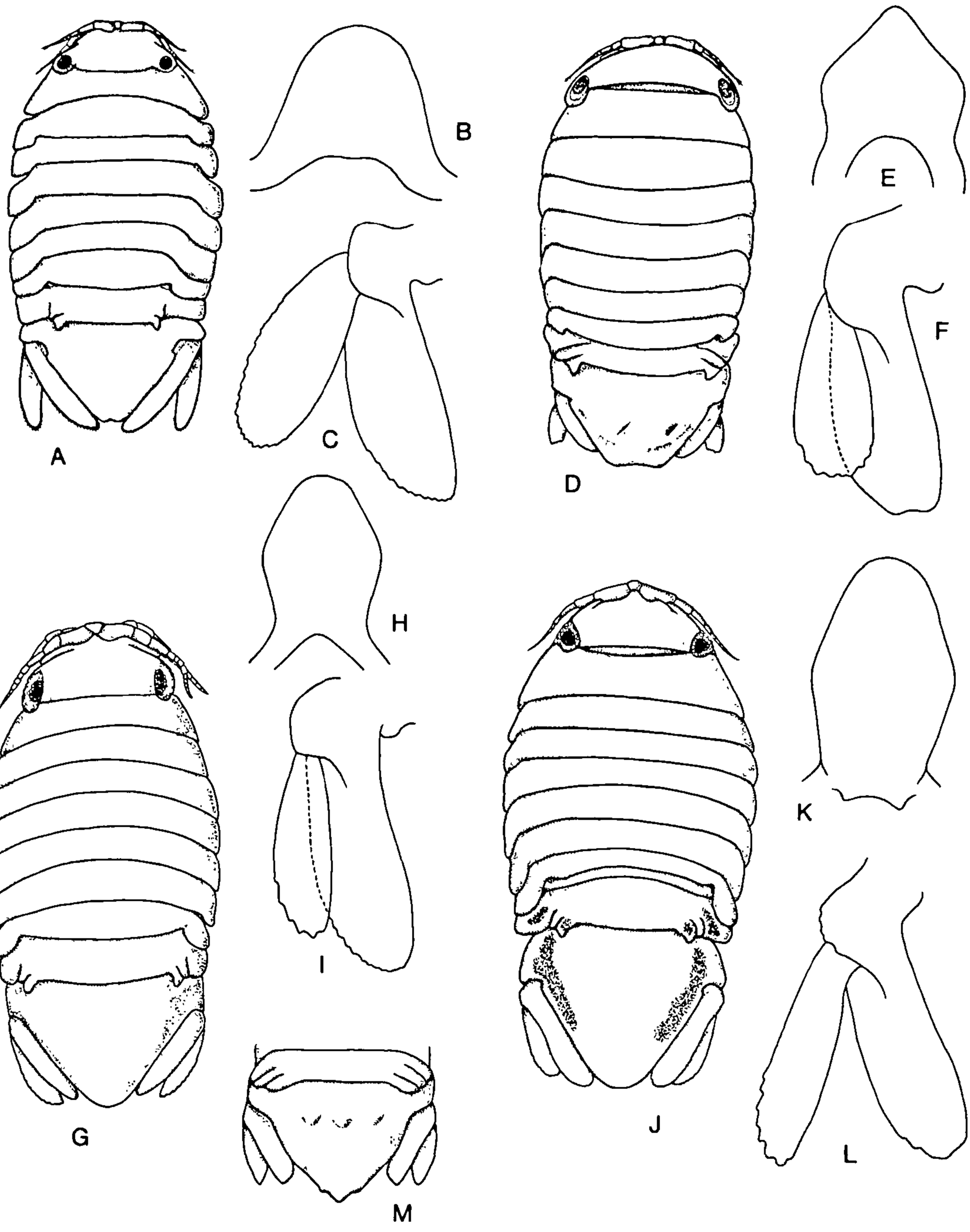


Figure 100. *Exosphaeroma alba: A; B,* frontal lamina; *C,* uropod. *Exosphaeroma antillense: D; E,* frontal lamina; *F,* uropod. *Exosphaeroma diminuta: G; H,* frontal lamina; *I,* uropod. *Exosphaeroma productatelson: J; K,* frontal lamina; *L,* uropod. *Exosphaeroma yucatanum: M,* pleon (from Richardson, 1905).

Exosphaeroma antillense Richardson, 1912d
Figure 100D,F

DIAGNOSIS ♀ 5.0 mm. Frontal lamina anteriorly tapering to subacute apex. Pleotelson with two broadly subconical submedian tubercles on inflated an-

terior area; posterior margin subtruncate to very faintly emarginate. Uropodal exopod distally crenulate, length slightly more than twice greatest width; endopod with faint distal notch.

RECORDS Montego Bay, Jamaica.

REMARKS The single ovigerous female holotype is the only known specimen of this species. The overlapping oostegites suggest that this may not be an *Exosphaeroma*.

Exosphaeroma diminuta Menzies and Frankenberg, 1966
Figure 100G–I

DIAGNOSIS ♂ 2.2 mm. Frontal lamina widest at midlength, anteriorly truncate-rounded. Pleotelson with posterior margin broadly rounded. Uropodal rami not quite reaching pleotelsonic apex; exopod margin distally crenulate.

RECORDS Chesapeake Bay to Florida; Venezuela; sand dwelling, intertidal and shallow subtidal.

Exosphaeroma productatelson Menzies and Glynn, 1968
Figure 100J–L

DIAGNOSIS ♂ 2.5 mm, ♀ 1.5 mm. Sexes essentially similar. Frontal lamina widest at midlength, where slight shoulder apparent, anteriorly broadly rounded, 1.6 times longer than wide. Pleotelson unornamented, anteriorly inflated, posterior margin entire, evenly convex. Uropodal exopod distally shallowly serrate, almost four times longer than wide; endopod wider than exopod. Broad lateral patches of pigment on pleotelson in both sexes.

RECORDS Puerto Rico, intertidal to 0.5 m, in algae on rocks; Texas, Gulf of Mexico.

Exosphaeroma yucatanum (Richardson, 1901)
Figure 100M

DIAGNOSIS Frontal lamina anteriorly tapering from widest point to subacute apex, proximally narrower than at midlength. Pleotelson posteriorly obscurely trilobed, median lobe narrowly rounded, longest; three low rounded tubercles on pleotelson in anterior region.

RECORDS Cape Catoche, Yucatan, Mexico, 48 m.

REMARKS This species was described from a single specimen which has since been lost. The true generic placement of this species is thus undetermined and full description awaits the finding of more material.

Harrieta Kensley, 1987c

DIAGNOSIS ♀ with mouthparts metamorphosed. Broodpouch of three pairs of oostegites on pereonites 2–4, overlapping in midline; brood held in five pairs of internal pouches. Uropodal rami subequal, lamellar in ♀, exopod twice length of endopod and oval in cross section in ♂. Pleopod 2 in ♂ with copulatory stylet articulating basally on endopod, curved, barely reaching apex of endopod. Penes basally fused, rami slender, elongate, tapering.

Harrieta faxoni (Richardson, 1905)
Figure 101A,B

DIAGNOSIS ♂ 6.0 mm, ♀ 6.5 mm. ♂: Frontal lamina with broad slightly convex anterior margin. Two low rounded submedian tubercles on cephalon near posterior margin. Two rounded submedian tubercles on last pleonite. Pleotelson anteriorly inflated with two submedian tubercles; posterior margin trilobed. ♀: Essentially similar to ♂, but posterior margin of pleotelson less markedly trilobed, with median lobe longer, and uropodal rami subequal in length.

RECORDS Florida to Texas, Gulf of Mexico, intertidal and subtidal in *Thalassia, Halodule,* and *Syringodium* seagrass beds, in salinities of 7‰ to 36‰.

Sphaeroma Bosc, 1802

DIAGNOSIS Maxillipedal palp with three distal articles poorly developed, lacking lobes; fringe of robust plumose setae with swollen bases on internal margin of endite; distal margin of endite with simple setae. Pereopods 1–3 with plumose setae on ischium and merus. Posterior margin of pleotelson entire, similar in ♂ and ♀. Pleopod 3, exopod uniarticulate. Uropodal exopod with outer margin serrate. Able to conglobate. ♂: Penes short, rounded, separate. Pleopod 2, copulatory stylet articulating basally on endopod, slender, reaching well beyond rami. ♀: Mouthparts not meta-

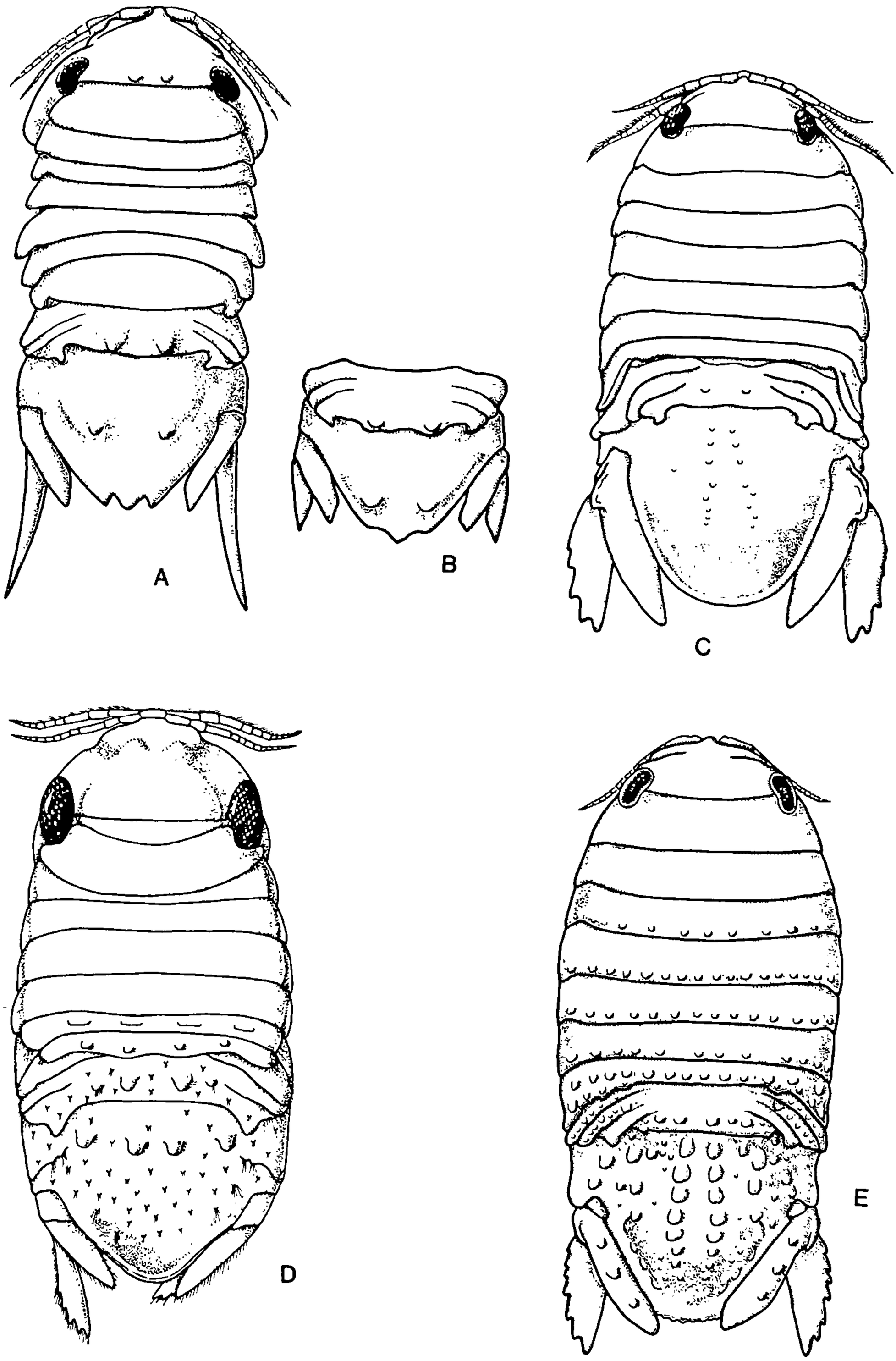


Figure 101. *Harrieta faxoni: A*, ♂; *B*, pleon ♀. *C*, *Sphaeroma quadridentata; D*, *Sphaeroma terebrans; E*, *Sphaeroma walkeri.*

morphosed. Three pairs of overlapping oostegites arising from pereonites 2–4 (but *S. terebrans* has anterior pair rudimentary).

REMARKS The genus *Sphaeroma* is one of the few sphaeromatids in which the number of oostegites varies, from the diagnostic three pairs, through two normal pairs (as in *S. terebrans)*, to having the oostegites completely absent (as in *S. annandalei)*.

Jacobs (1987) has provided a useful reevaluation of the European, Mediterranean, and northwest African species of *Sphaeroma* and related genera.

Key to species of *Sphaeroma*

1. Pleotelson posteriorly bluntly triangular, with 4 strong anterior tubercles ..... *terebrans*
   Pleotelson posteriorly broadly rounded 2

2. Pleotelson dorsally smooth or with few low tubercles ..... *quadridentata*
   Pleotelson dorsally with numerous strong tubercules ..... *walkeri*

Sphaeroma quadridentata Say, 1818
Figure 101C

DIAGNOSIS ♂ 11.0 mm, ♀ 8.0 mm. Pleotelson anteriorly inflated, sometimes with few low rounded tubercles, posteriorly flattened to concave; posterior margin entire, broadly rounded.

RECORDS New England to Florida; Gulf of Mexico, intertidal to 1 m, often in pilings and partially submerged dead tree trunks, and commonly associated with barnacles.

Sphaeroma terebrans Bate, 1866
Figure 101D

DIAGNOSIS ♂ 10.0 mm, ♀ 11.5 mm. Pereonite 7 with pair of submedian and pair of lateral tubercles. Dorsal pleon densely tuberculate. Posterior pleonite with pair of submedian acute tubercles. Pleotelson anteriorly with submedian pair and lateral pair of tubercles, posteriorly rounded-triangular.

RECORDS Virginia to Florida; Belize; Cuba; Venezuela to Brazil; Gulf of Mexico.

Nigeria, east coast of southern Africa, India, Sri Lanka, Thailand, Indonesia, Philippines, Australia.

REMARKS There is no agreement on whether this species is synonymous with *S. destructor* Richardson, 1897. This latter (if distinct) bores into wood pilings in estuarine waters, while *S. terebrans* is found in the prop roots of the red mangrove tree, *Rhizophora mangle*. In this habitat, the isopods are interpreted either as being destructive agents (e.g., Rehm and Humm, 1973) or as promoting increased root growth (Simberloff et al., 1978). It is unlikely that the bored wood itself is a source of food for the isopods; rather, as with the genus *Limnoria*, the food is probably detritus or fungi and bacteria growing on the wood fragments in the burrows or on the setae of the appendages.

Sphaeroma walkeri Stebbing, 1905

Figure 101E

DIAGNOSIS ♂ 9.5 mm, ♀ 10.0 mm. Pereonites 3–7 with transverse row of large rounded tubercles. Last pleonite with row of prominent tubercles and smaller scattered tubercles laterally. Pleotelson anteriorly inflated, posteriorly concave and cuplike, with four irregular longitudinal rows of large tubercles plus many small scattered tubercles. Posterior margin rounded, entire to irregularly crenulate. Uropodal endopod with several rounded tubercles on dorsal surface; exopod with row of smaller tubercles on ventral surface.

RECORDS Probably pan-tropical. Florida to Puerto Rico, intertidal.

Family Tridentellidae Bruce, 1984

DIAGNOSIS Eyes well developed. Pereonites 2–7 with distinct coxae. Pleon consisting of five free pleonites plus pleotelson. Mandible with acute incisor; lacinia mobilis absent; molar present; palp of three articles. Maxilla 1, outer ramus styliform with three to five strong terminal spines, and several short recurved subapical spines. Maxilla 2 uniramous, biarticulate, bearing small sometimes tridentate spines or scales distally. Maxillipedal palp of five articles; endite slender, lamellar, usually lacking coupling hooks.

Tridentella Richardson, 1905

DIAGNOSIS Body dorsally often bearing spines, tubercles, or carinae, more developed in ♂ than in ♀. Frontal lamina narrow, pentagonal. Antennular peduncle of three articles; antennal peduncle of five articles. Mandibular molar weakly sclerotized. Pereopods 1–3 weakly prehensile; pereopods 4–7 ambulatory. Copulatory stylet of pleopod 2 rodlike, arising proximally on mesial margin of endopod. Pleopod 5 endopod lacking marginal setae.

REMARKS Delaney and Brusca (1985) provide useful taxonomic and distributional comments on the family Tridentellidae.

Tridentella virginiana (Richardson, 1900b)

Figure 102

DIAGNOSIS ♂ 9.5 mm, ovigerous ♀ 9.5–11.0 mm. Cephalon and pereon dorsally smooth, pleon minutely granular. Uropodal rami with distal margins faintly dentate, apically narrowly rounded, endopod wider and slightly longer than exopod. Pleotelson basally wider than middorsal length; posterior margin broadly rounded to subtruncate.

RECORDS Nova Scotia to Florida; off Georgia, 550 m; Gulf Stream off Key West, 220 m.

Suborder Gnathiidea Leach, 1814

DIAGNOSIS Eyes usually well developed, rarely on short lateral processes, occasionally absent. Mandibles in ♂ greatly enlarged, projecting anteriorly from cephalon, not used in feeding. Mandibles lacking in ♀. Mouthparts of praniza larva styliform, with acute mandibles projecting anteriorly (see Figure 103D). Pereopod 1 modified, forming second pair of broad opercular maxillipeds covering mouthparts, referred to as pylopods. Pereopods 2–6 ambulatory. Pereonite 7 reduced, lacking pereopod. Pleonites separate, narrower than pereon. Uropods lateral, rami lamellar, forming tailfan with telson. Praniza larva with pereonites 4–6 enlarged, sometimes inflated. ♀ with pereonites 4–6 greatly inflated, forming broodpouch for internally brooded eggs (see Figure 103E).

REMARKS The gnathiideans are entirely marine, most described species being from shallow waters. The males and females are frequently found in association with sponges and do not feed. The praniza larva is an efficient swimmer and has been recorded from shallow-water plankton, but is more

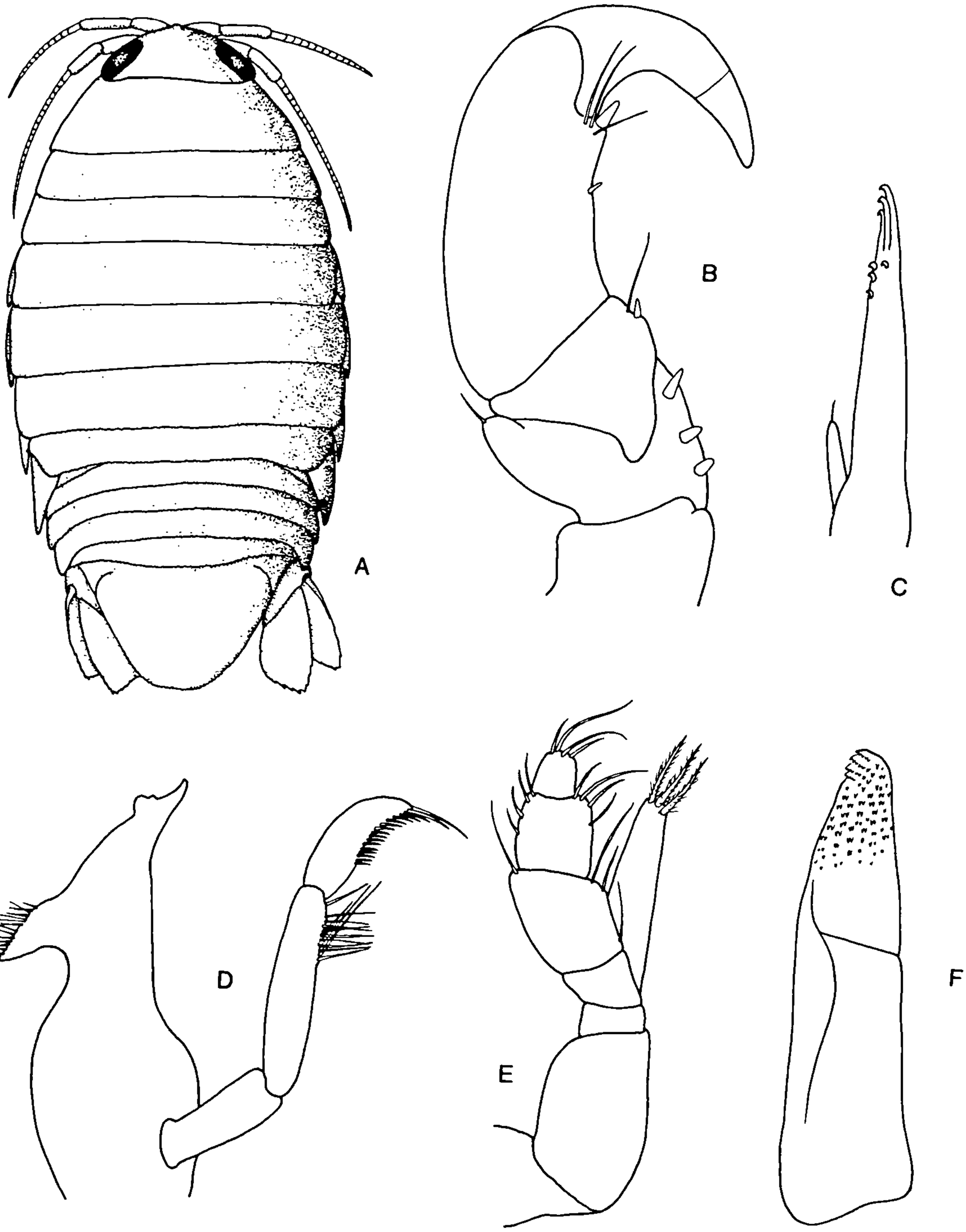


Figure 102. *Tridentella virginiana: A*, ♀; *B*, pereopod 1; *C*, maxilla 1; *D*, mandible; *E*, maxilliped; *F*, maxilla 2.

frequently encountered as a fish parasite, the favored site for sucking the host's blood being in the nares. Upton (1987a, 1987b) has shed light on the unusual life history of at least one gnathiid genus, *Paragnathia*.

The taxonomy of the Gnathiidae is based almost entirely on males, the praniza and females of most species being remarkably similar.

Family Gnathiidae Harger, 1879

DIAGNOSIS As for the suborder Gnathiidea.

Gnathia Leach, 1814

DIAGNOSIS In addition to features mentioned in diagnosis of suborder: Eyes present in most species. Pylopod with two small articles distal to broad opercular article 2, terminal article minute.

Key to species of *Gnathia* (♂ only)

1. Anterior margin of cephalon with medial process or slightly convex . . 2
   Anterior margin of cephalon concave or lacking medial process 9

2. Anterior margin of cephalon broadly triangular, projecting, with small lateral teeth . . . . . *triospathiona*
   Anterior margin of cephalon not triangular and projecting 3

3. Cephalon and two free anterior pereonites dorsally granular 4
   Cephalon and two free anterior pereonites smooth 5

4. Lobe of outer margin of mandible notched; pereonite 5 twice wider than middorsal length . . . . . *velosa*
   Lobe of outer margin of mandible rounded; pereonite 5 1.5 times wider than middorsal length 6

5. Anterior margin of cephalon with distinct medial process . . . . . *virginalis*
   Anterior margin of cephalon barely convex, lacking medial process . . . . . *rathi*

6. Inner proximal lobe of mandible distinct 7
   Inner proximal lobe of mandible indistinct . . . . . *samariensis*

7. Inner proximal lobe of mandible entire 8
   Inner proximal lobe of mandible with rounded toothlike marginal structures . . . . . *johanna*

8. Pereonites 3–5 poorly defined . . . . . *puertoricensis*
   Pereonites 3–5 clearly defined . . . . . *magdalenensis*

9. Anterior margin of cephalon concave, lacking projections . . . . . *gonzalezi*
   Anterior margin of cephalon with four projections . . . . . *beethoveni*

Gnathia beethoveni Paul and Menzies, 1971
Figure 103A

DIAGNOSIS ♂ 3.0 mm. Anterior margin of cephalon with two low tubercles flanking shallow medial notch plus slightly larger pair of lateral tubercles. Cephalon lacking dorsal tubercles. Pereonite 5 1.5 times wider than middorsal length. Uropodal endopods reaching beyond telsonic apex.

RECORDS Off Venezuela, 95 m. Colombia.

Gnathia gonzalezi Müller, 1988
Figure 103B

DIAGNOSIS ♂ 2.0 mm. Body smooth. Anterior margin of cephalon concave. Pereonites 3–5 distinct; pereonite 5 2.5 times wider than middorsal length. Cutting margin of mandible with four or five low rounded teeth.

RECORDS Colombia, 30 m.

Gnathia johanna Monod, 1926
Figure 103C

DIAGNOSIS ♂ 2.1 mm. Anterior margin of cephalon medially convex between pair of submedian tubercles. Pereonites 4 and 5 poorly separated. Proximomedial lobe of mandible having four or five rounded crenulations, with tiny seta between adjacent crenulations.

RECORDS U.S. Virgin Islands, 29–46 m; Colombia.

Gnathia magdalenensis Müller, 1988
Figure 103D

DIAGNOSIS ♂ 3.0 mm. Anterior margin of cephalon with three tubercles, median tubercle slightly shorter than submedian pair. Cephalon with few scattered low granulations dorsally. Pereonite 5 about 1.5 times wider than middorsal length. Proximomedial lobe of mandible entire.

RECORDS Carrie Bow Cay, Belize, intertidal; Colombia, 18 m.

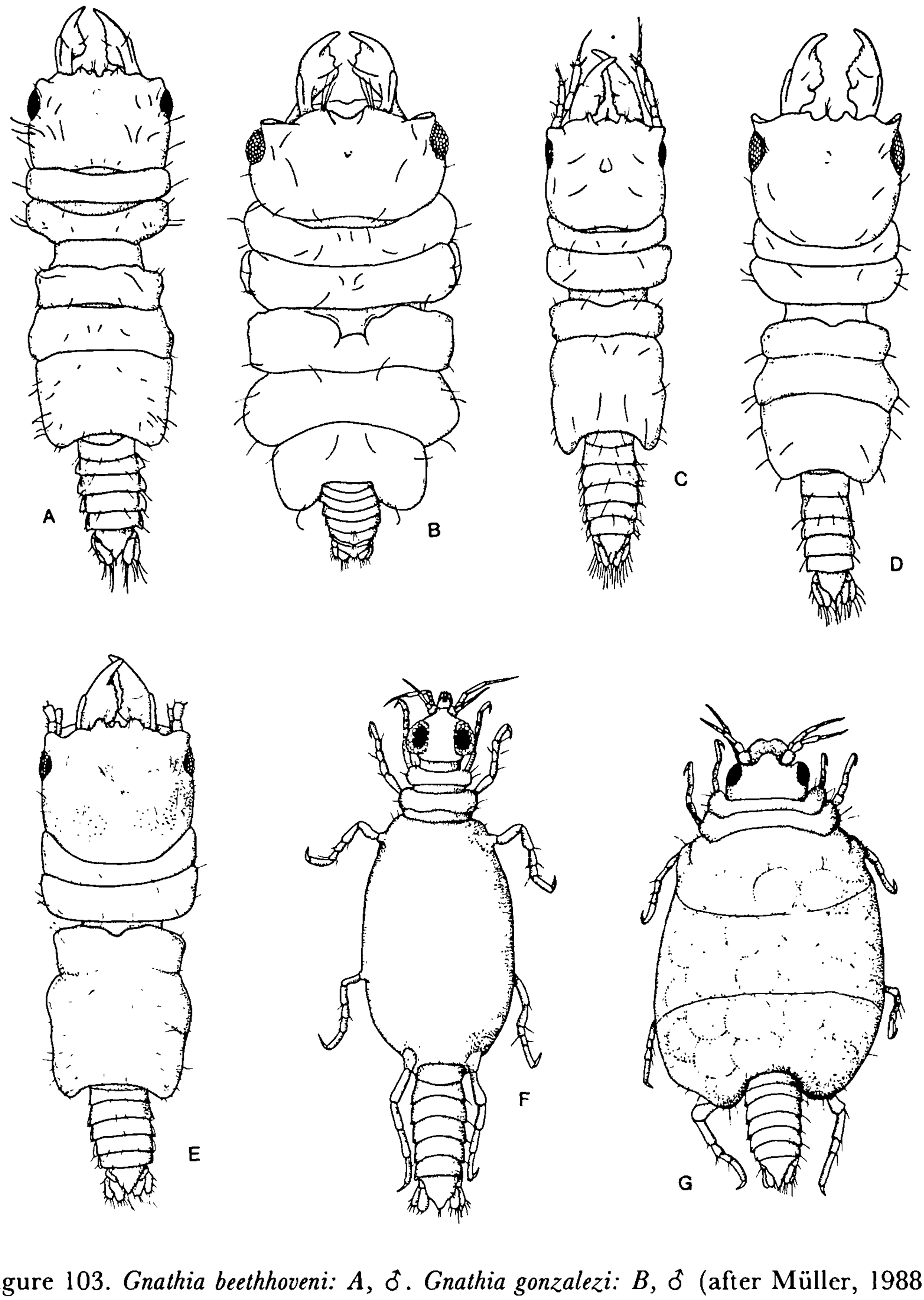


Figure 103. *Gnathia beethhoveni: A*, ♂. *Gnathia gonzalezi: B*, ♂ (after Müller, 1988). *Gnathia johanna: C*, ♂. *Gnathia magdalenensis: D*, ♂ (after Müller, 1988). *Gnathia puertoricensis: E*, ♂; *F*, praniza larva; *G*, ovigerous ♀.

Gnathia puertoricensis Menzies and Glynn, 1968
Figure 103E–G

DIAGNOSIS ♂ 3.0 mm, ovigerous ♀ 1.8 mm. Anterior margin of cephalon having three tubercles between mandibular bases, medial tubercle narrower than submedian pair. Dorsal integument finely granular, with coarser granules mediodorsal to eye. Pereonites 4 and 5 indistinctly separated. Mandible lacking proximomedial lobe.

RECORDS Carrie Bow Cay, Belize, intertidal to 2 m; Puerto Rico, intertidal; Cuba.

Gnathia rathi Kensley, 1984
Figure 104A

DIAGNOSIS ♂ 1.9 mm, ovigerous ♀ 2.2 mm. Frontal margin faintly convex to straight between single low lateral tubercle mesial to mandibular bases. Dorsal integument of cephalon and anterior two free pereonites coarsely granular. Lateral margins of telson faintly denticulate. Pereonites 4 and 5 poorly separated.

RECORDS Carrie Bow Cay, Belize, 1–36 m.

Gnathia samariensis Müller, 1988
Figure 104B

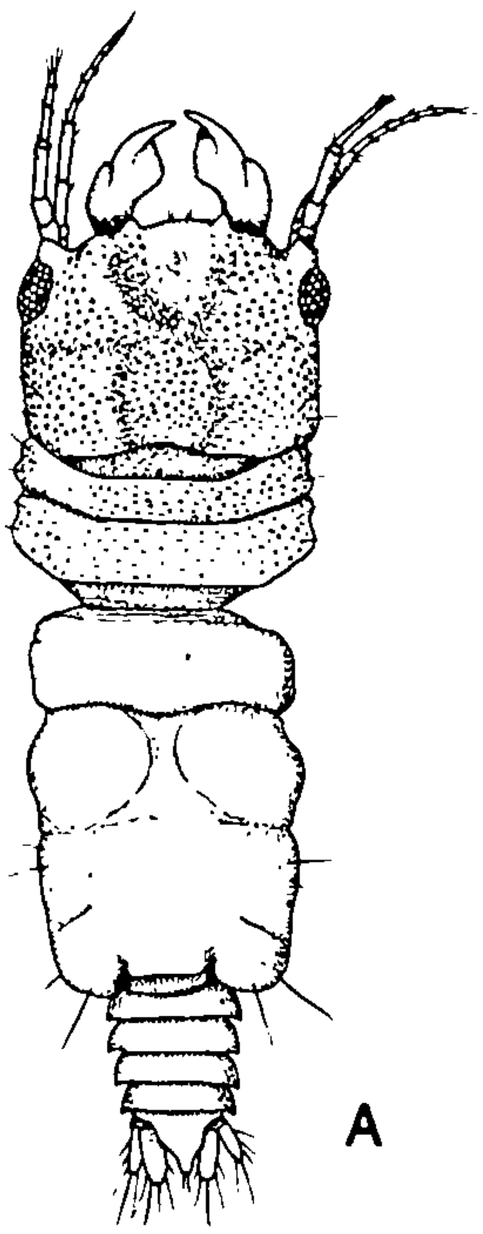
DIAGNOSIS ♂ 2.0 mm. Anterior margin of cephalon with three tubercles, median tubercle slightly shorter than submedian pair; dorsal integument smooth. Pereonites 4 and 5 well differentiated; pereonite 5 about 2.2 times wider than middorsal length. Mandible lacking proximomedial lobe.

RECORDS Colombia.

Gnathia triospathiona Boone, 1918
Figure 104C

DIAGNOSIS ♂ 8.8 mm. Anterior margin of cephalon with broad-based triangular projection bearing three low teeth; deep V-shaped depression posterior to anterior margin, with low flanking granulations.

RECORDS Off Key West, in Gulf Stream, 218 m.



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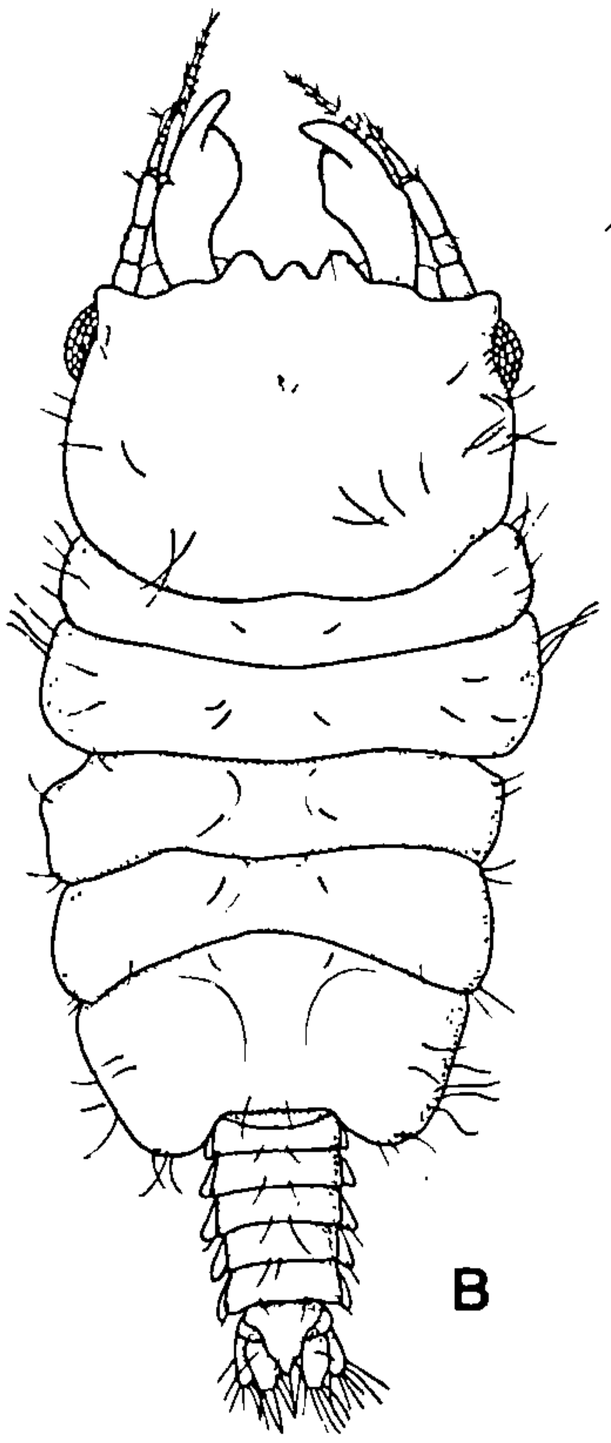

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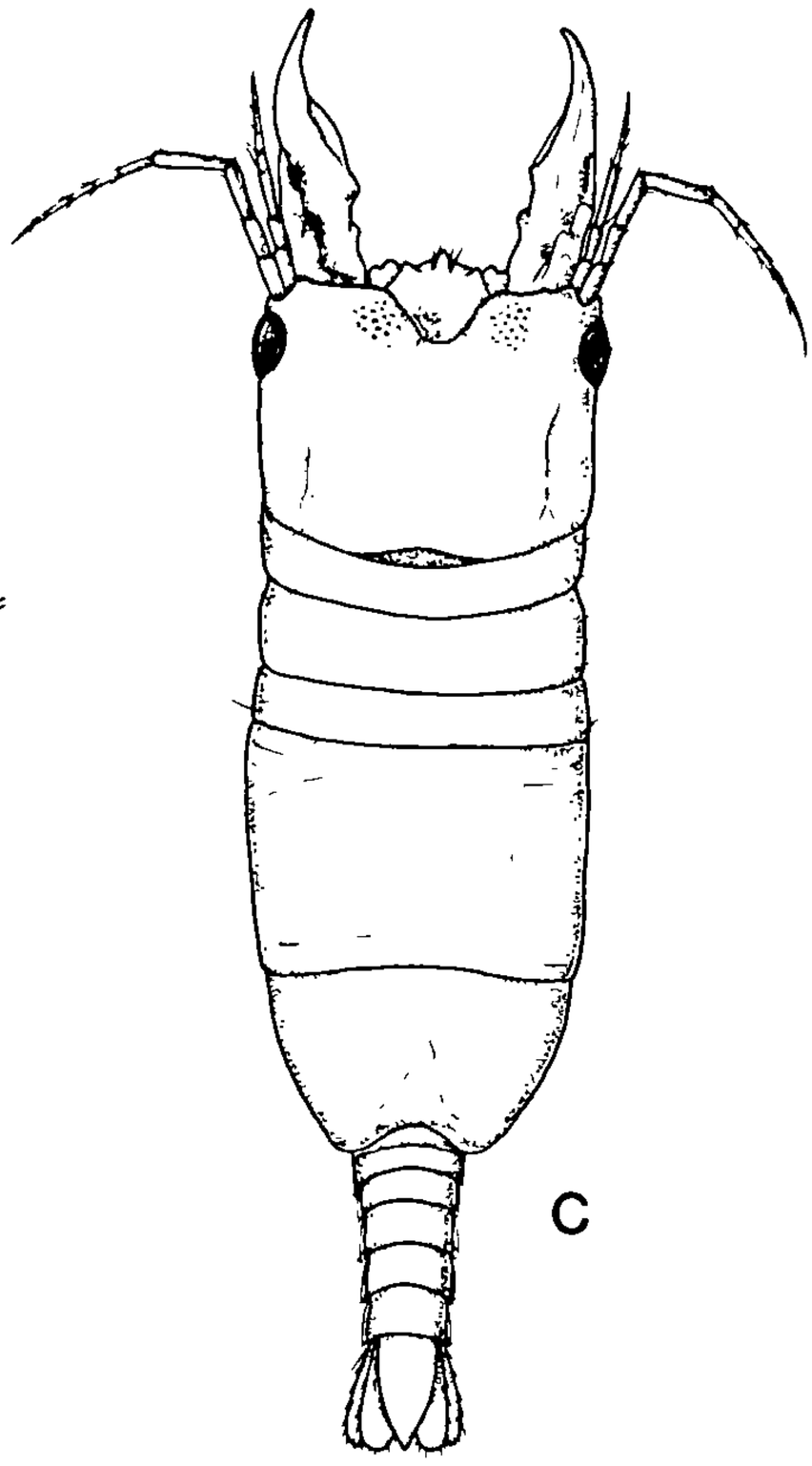

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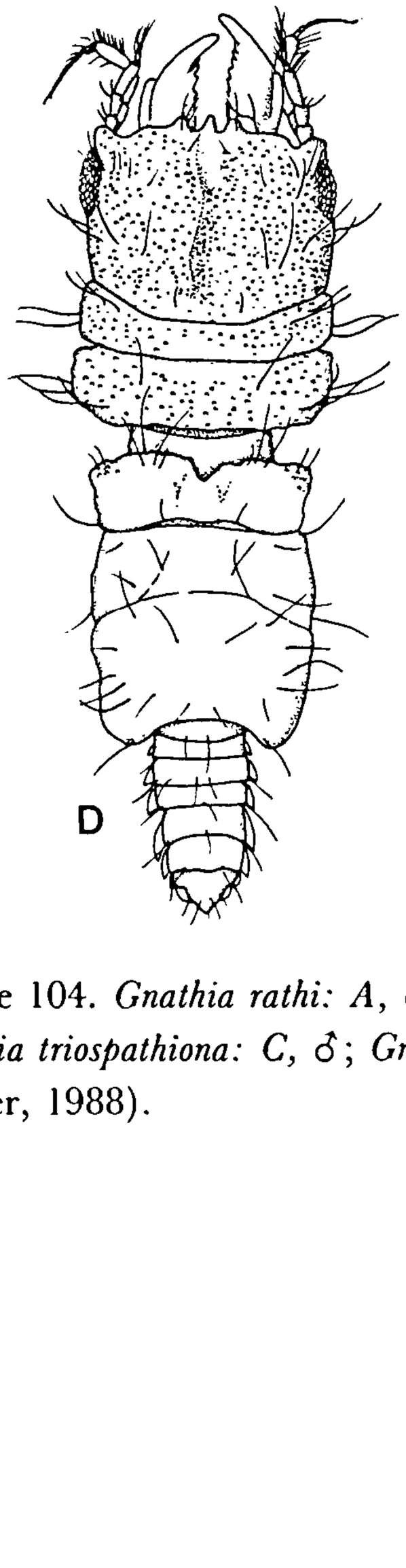

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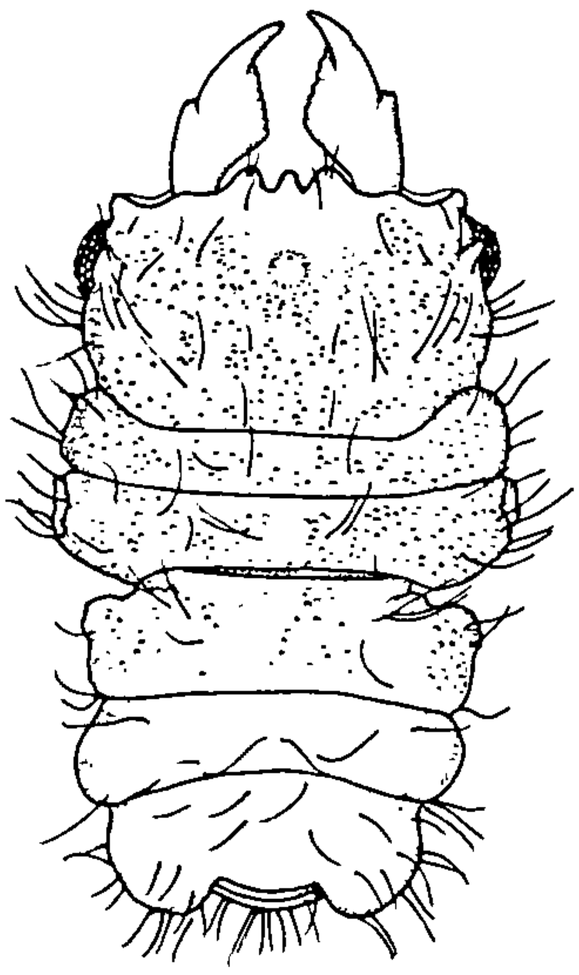

E

Figure 104. *Gnathia rathi: A*, ♂; *Gnathia samariensis: B*, ♂ (after Müller, 1988); *Gnathia triospathiona: C*, ♂; *Gnathia virginalis: D*, ♂; *Gnathia velosa: E*, ♂ (after Müller, 1988).

Gnathia velosa Müller, 1988
Figure 104E

DIAGNOSIS ♂ 1.5 mm. Anterior margin of cephalon with three tubercles, median tubercles slightly shorter and narrower than submedian pair. Dorsal integument of cephalon and anterior three pereonites granular. Pereonite 5 about 2.5 times wider than middorsal length. Lateral lobe of mandible notched.

RECORDS Colombia.

Gnathia virginalis Monod, 1926
Figure 104D

DIAGNOSIS ♂ 2.2 mm. Anterior margin of cephalon with three tubercles, median tubercles slightly longer than submedian pair. Dorsal integument of cephalon and anterior three pereonites granular. Pereonite 5 about 1.7 times wider than middorsal length. Lateral lobe of mandible rounded.

RECORDS U.S. Virgin Islands, 29 m; Colombia.

Suborder Microcerberidea Lang, 1961

DIAGNOSIS Cephalon free. Mandibles with reduced palp, or lacking palp. Maxillipedal palp of five articles. Pereon of seven free segments. Pereopod 1 subchelate; pereopods 2–7 ambulatory. Pleon of two free pleonites plus pleotelson. Pleopod 1 in ♂ usually absent. Pleopod 2 modified for copulation. Pleopod 3 uniramous, opercular. Pleopod 4 biramous. Pleopod 5 reduced. Uropods usually uniramous or biramous.

Family Microcerberidae Karaman, 1933b

DIAGNOSIS Eyes absent. Body elongate, slender. Antennular peduncle of three articles; antennal peduncle of six to eight articles. Mandibular palp of single article; molar reduced to single stout fringed spine. Maxilla 2 reduced to single ramus bearing two distal fringed lobes. Pereopods 2–7 ambulatory, dactyli biunguiculate.

REMARKS The species of the Microcerberidae are all very small (less than 2 mm total length) and are most often found in interstitial habitats. They have been recorded from marine, brackish, and freshwater environments.

The microcerberideans were often classified with the Anthuridea, mainly because of the similarity in body shape. Wägele (1983) however, has convincingly demonstrated the asellotan affinities of the group.

Key to genera of Microcerberidae

1. Maxillipedal palp articles 2 and 3 enlarged; basis of pereopods lacking spinous process ..... *Yvesia*
   Maxillipedal palp articles 2 and 3 not markedly enlarged; basis of pereopods with spinous process ..... *Microcerberus*

Microcerberus Karaman, 1933b

DIAGNOSIS Maxillipedal palp articles 2 and 3 not enlarged. Articles 2 and 3 of antennal peduncle with spinous process. Basis of pereopods with spinous process. Propodus of pereopod 2 with two denticulate proximal spines.

Microcerberus syrticus Kensley, 1984

Figure 105A–E

DIAGNOSIS ♂ 1.1 mm, ♀ 1.1 mm. Tergal lobes of pereonites 2–4 rounded. Apical lobe of ♂ pleopod 2 acute.

RECORDS Carrie Bow Cay, Belize, interstitial in intertidal sand bar.

REMARKS In addition to *M. syrticus*, six species of *Microcerberus* have been recorded from the Caribbean area: *M. littoralis* Chappuis and Delamare Deboutteville, 1956, from the Bahamas; *M. minutus* Coineau and Botosaneanu, 1973, from Cuba; *M. mirabilis* Chappuis and Delamare Deboutteville, 1956, from the Bahamas; *M. nunezi* Coineau and Botosaneanu, 1973, from Cuba; *M. renaudi* Chappuis and Delamare Deboutteville, 1956, from the Bahamas; *M. simplex* Coineau and Botosaneanu, 1973, from Cuba. The reader is referred to the original descriptions for separation of the species.

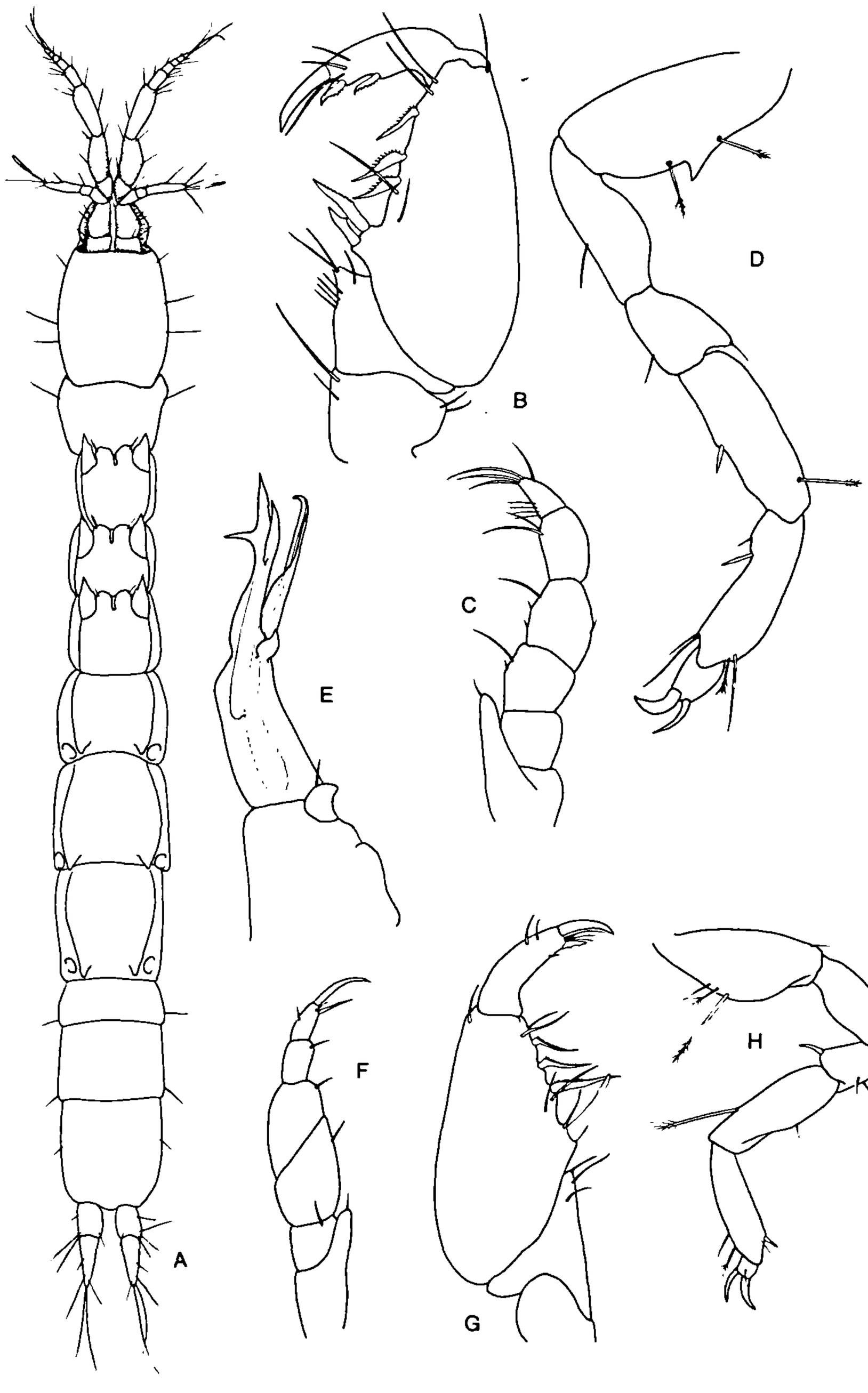

Figure 105. *Microcerberus syrticus: A*, ♂; *B*, pereopod 1; *C*, maxilliped; *D*, pereopod 2; *E*, pleopod 2 ♂. *Yvesia striata* (from Coineau and Botosaneanu, 1973): *F*, maxilliped; *G*, pereopod 1; *H*, pereopod 2.

Yvesia Coineau and Botosaneanu, 1973

Yvesia striata Coineau and Botosaneanu, 1973
Figure 105F–H

DIAGNOSIS ♀ 1.6 mm. Antennal peduncular articles 2 and 3 smooth, lacking spinous processes. Maxillipedal palp articles 2 and 3 enlarged. Bases of pereopods unarmed, lacking spinous processes. Propodus of pereopod 1 with single smooth proximal spine. Body having longitudinal ventrolateral striae.

RECORDS Oriente, Cuba, interstitial on beach.

Suborder Oniscidea Latreille, 1803

DIAGNOSIS Compound eyes usually present. Antennules usually very short. Antennae with 4- or 5-articulate peduncle; flagellum varying from few articles to multiarticulate. Mandibular palp present. Distal articles of maxillipedal palp often reduced. Coxae of pereonites 1–7 usually distinct, expanded. Pleopods respiratory, often with pseudotrachea; ♂ with pleopod 2, and sometimes pleopod 1 as well, modified for copulation. Uropods terminal or subterminal with terete rami, or ventral and opercular, with reduced rami.

REMARKS The Oniscidea includes all the isopods that have successfully invaded the terrestrial environment. While still in some degree reliant on external moisture, their morphological and behavioral adaptations have allowed them to live in almost all terrestrial habitats, from hot, dry deserts, through tropical rainforests and grasslands, to cold-temperate niches. Several forms have successfully inveigled themselves into termite or ant colonies, where with varying degrees of morphological adaptations they take advantage of the security of these habitats. A small number of species have evolved to live in more constantly wet habitats. Several species may be found in the marine intertidal, either living in and under piles of decomposing litter along the high-tide line, digging into beach sand, or sheltering in the damp cracks and crevices of rocky shores. A few may also be found in mangrove swamps.

A breakdown of families, genera, and species is not provided for this suborder, but those few species that are commonly encountered in intertidal habitats are dealt with individually. Schultz (1974, 1984) records several oniscidean isopods from the Caribbean area.

Key to genera and species of littoral Oniscidea

1. At least one uropodal ramus reaching well beyond outline of body . . . 5
   Uropodal rami very short, not reaching beyond outline of body 2

2. Uropods ventral, not visible in dorsal view . . . . . 3 *(Tylos)*
   Uropods visible in dorsal view . . . . . *Armadilloniscus ninae*

3. Ventral extensions of pleonite 5 meeting in midline . . . . . *Tylos niveus*
   Ventral extensions of pleonite 5 not meeting in midline 4

4. Ventral extensions of pleonite 5 very short, obsolete . . . . . *Tylos wegeneri*
   Ventral extensions of pleonite 5 well separated . . . . . *Tylos marcuzzii*
   Ventral extensions of pleonite 5 just falling short of meeting in midline
   . . . . . *Tylos latreillei*

5. Uropodal rami both elongate, subequal . . . . . 6 *(Ligia)*
   Uropodal rami very unequal in length 8

6. Propodus of ♂ pereopod 1 with distal rounded lobe . . . . . *Ligia exotica*
   Propodus of ♂ pereopod 1 lacking rounded lobe 7

7. Apex of ♂ pleopod 2 club shaped . . . . . *Ligia olfersii*
   Apex of ♂ pleopod 2 bifid . . . . . *Ligia baudiniana*

8. Antennal flagellum of two articles . . . . . *Rhyscotus texensis*
   Antennal flagellum of three articles . . . . . 9 *(Vandeloscia)*

9. Endopod of ♂ pleopod 1 with large scalelike subapical process
   . . . . . *Vandeloscia riedli*
   Endopod of ♂ pleopod 1 with small scalelike subapical process
   . . . . . *Vandeloscia culebrae*

Armadilloniscus Ul'yanin, 1875

Armadilloniscus ninae Schultz, 1984
Figure 106A

DIAGNOSIS ♂ 3.2 mm, ♀ 4.1 mm. Uropodal sympod expanded to form part of body outline; rami set mesial to expanded base, with exopod half length of endopod.

RECORDS Ambergris Cay, Belize; under damp objects along beach drift line.

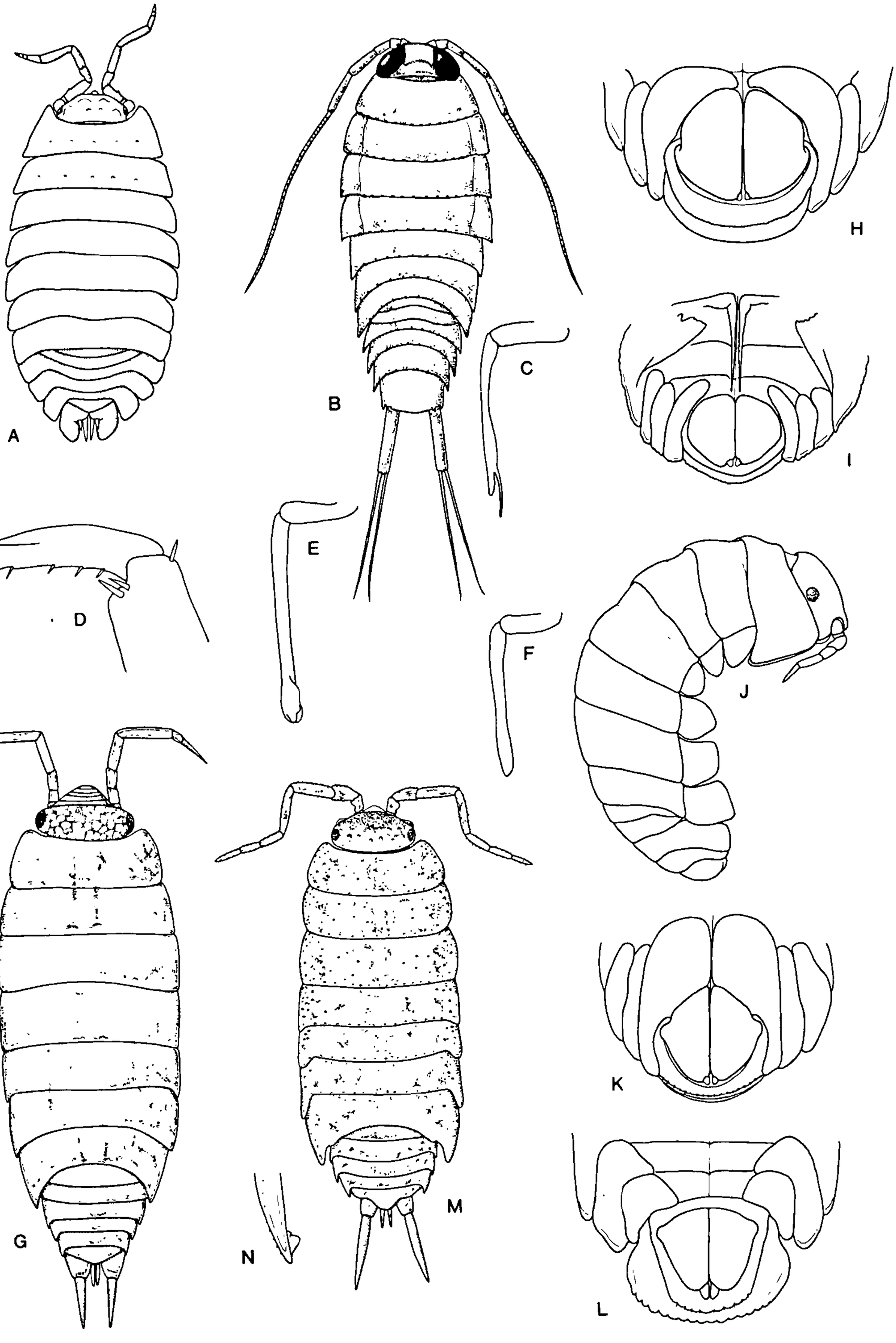

Figure 106. *A*, *Armadilloniscus ninae. Ligia baudiniana: B; C*, ♂ pleopod 2 endopod. *Ligia exotica: D*, dactylus and propodus of pereopod 1; *E*, ♂ pleopod 2 endopod. *Ligia olfersii: F*, ♂ pleopod 2 endopod. *G*, *Rhyscotus texensis. Tylos latreillei: H*, ventral pleon. *Tylos marcuzzi: I*, ventral pleon (from Schultz, 1984). *Tylos niveus: J*, lateral view; *K*, ventral pleon. *Tylos wegeneri: L*, ventral pleon. *Vandeloscia culebrae: M*, apex of pleopod 1 endopod. *N*, *Vandeloscia riedli*.

Ligia Fabricius, 1798
Ligia baudiniana H. Milne Edwards, 1840
Figure 106B,C

DIAGNOSIS ♂ and ♀ up to 22 mm. Antennal flagellum elongate, multiarticulate. Apex of ♂ pleopod 2 bifid, with lateral lobe longer and more slender than mesial lobe. Uropods inserted terminally on pleotelson; sympods elongate-cylindrical; rami slender, elongate, subequal.

RECORDS Bermuda; Bahamas; U.S. Virgin Islands; Antigua; Carrie Bow Cay, Belize; Bonaire; Aruba; Trinidad; Tobago; Gulf of Mexico.

REMARKS As is typical in the genus *Ligia*, this species may be seen on rocks and sea walls, as well as piles of drift debris at low tide. When disturbed, they run rapidly, to shelter in damp crevices and hollows.

Ligia exotica Roux, 1828
Figure 106D,E

DIAGNOSIS ♂ 28.5 mm, ovigerous ♀ 32.0 mm. Propodus of ♂ pereopod 1 with rounded lobe on inner distal surface. Apex of ♂ pleopod 2 club shaped, convoluted.

RECORDS New Jersey to Uruguay; Indo-Pacific.

Ligia olfersii Brandt, 1833
Figure 106F

DIAGNOSIS ♂ 20.0 mm, ovigerous ♀ 24.0 mm. Apex of ♂ pleopod 2 simple, club shaped.

RECORDS South Florida to Rio de Janeiro, Brazil; Texas, Gulf of Mexico.

Rhyscotus Budde-Lund, 1885
Rhyscotus texensis (Richardson, 1905)
Figure 106G

DIAGNOSIS ♂ and ♀ 6.0 mm. Antennal flagellum of two unequal articles. Uropodal endopod at least twice length of exopod, inserted distally on base, exopod inserted distally on base. Pleotelson broadly triangular.

RECORDS Carrie Bow Cay, Belize; Texas, Gulf of Mexico.

Tylos Latreille, 1826
Tylos latreillei Audouin, 1826
Figure 106H

DIAGNOSIS ♂ 12.8 mm, ♀ 13.0 mm. Ventral extensions of pleonite 5 not meeting in midline.

RECORDS Bermuda; Cuba; Puerto Rico; Honduras.
Mediterranean.

Tylos marcuzzii Soika, 1954
Figure 106I

DIAGNOSIS ♂ 6.6 mm. Antennal flagellum of four articles. Ventral extensions of pleonite 5 well separated.

RECORDS Florida Keys; Bahamas; Leeward Islands; Ambergris Cay, Belize; under debris on sand beach drift line.

Tylos niveus Budde-Lund, 1885
Figure 106J,K

DIAGNOSIS ♂ 11.0 mm., ♀ 12.0 mm. Antennal flagellum of four articles. Ventral extensions of pleonite 5 expanded, medially contiguous.

RECORDS Bahamas; Florida Keys; Cuba; Dominica; Lesser Antilles; Bonaire; Curaçao, under piles of decaying mangrove leaves at beach drift line; Carrie Bow Cay, Ambergris Cay, Belize, under deep piles of dead plant material on beach drift line; Tobago; Panama.
Rio de Janeiro, Brazil.

Tylos wegeneri Vandel, 1952
Figure 106L

DIAGNOSIS ♂ 10.5 mm, ♀ 15 mm. Antennal flagellum of three articles. Ventral extensions of pleonites short or nearly absent. Pleonite 5 lacking free lateral margins.

RECORDS Tobago; Venezuela, under decaying beach debris on drift line; Trinidad.

Vandeloscia Roman, 1977

Vandeloscia culebrae (Moore, 1901)

Figure 106M

DIAGNOSIS ♂ 5.0 mm, ♀ 6.1 mm. Tiny lateral tubercles present on pereonites. Endopod of pleopod 1 in ♂ with small scalelike subapical process on laterally folded tip.

RECORDS Florida Keys; U.S. Virgin Islands; Puerto Rico; under decaying plant material, especially *Thalassia testudinea* accumulated along beach drift line.

Vandeloscia riedli (Strouhal, 1966)

Figure 106N

DIAGNOSIS ♂ 5.9 mm, ♀ 6.0 mm. Tiny obsolete tubercles present on all pereonites. Endopod of ♂ pleopod 1 with large scalelike subapical process on laterally folded tip.

RECORDS Yucatan Peninsula, Mexico; Ambergris Cay, Belize; Barbuda; Venezuela; Brazil.

Gulf of Aqaba; Red Sea; northeastern coast of Africa; Madagascar; Bay of Bengal; St. Helena Is.

Suborder Valvifera Sars, 1882

DIAGNOSIS Pereopodal coxae, in addition to usual dorsal coxal plates, expanded ventrally to form plates. Penes situated ventrally on articulation between pereon and pleon, or on pleonite 1. Pleonites and pleotelson variously fused. Uropods forming operculum covering over pleopods.

Key to families of Valvifera

1. Body often geniculate, flexed between pereonites 4 and 5; anterior pereopods setose for feeding, posterior pereopods ambulatory ..... Arcturidae

   Body never geniculate; all pereopods ambulatory ..... Idoteidae p 255

REMARKS Of the six families in the suborder, only two have been recorded in the Caribbean area, the Idoteidae and the Arcturidae.

Family Arcturidae Sars, 1897

DIAGNOSIS Pereonite 1 either distinct, or completely or imcompletely fused with cephalon. Anterior four pairs of pereopods directed anteriorly, usually strongly setose; posterior three pairs of pereopods ambulatory, used for clinging to substrate. Body often bent between pereonites 4 and 5. Uropods usually biramous, with minute endopod concealed by larger exopod. Pleonites variously fused with pleotelson. Sexual dimorphism often marked.

REMARKS Menzies and Kruczynski (1983) described three species of arcturids from the west coast of Florida, in depths of 55–73 m: *Arcturella spinata*, *Arcturella bispinata*, and *Edwinjoycea horologium*. These species are not covered here.

Key to genera of Arcturidae

1. Pereonite 1 not fused with cephalon; at least one free pleonite ..... *Thermarcturus*
   Pereonite 1 fused with cephalon; pleonites fused with pleotelson ..... *Astacilla*

Astacilla Cordiner, 1793

DIAGNOSIS Antennae at least half length of body. Pereopod 1 with strong terminal claw on dactylus. Pereopods 2–4 lacking dactyli. Endopod of

---

Key to species of *Astacilla*

1. Body integument lacking ornamentation ..... *cymodocea*
   Body integument with spines or tubercles 2

2. Perconite 4 in ♂ and ♀ with strong middorsal tubercle; pairs of spines lacking on pereonites ..... *regina*
   Pereonite 4 lacking strong middorsal tubercle; pairs of spines on all pereonites ..... *lasallae*

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pleopod 1 ♂ with median notch and three specialized setae; pleopod 2 copulatory stylet apically trifid. Pereonite 4 considerably longer than preceeding or following pereonite.

Astacilla cymodocea Menzies and Glynn, 1968
Figure 107A,B

DIAGNOSIS ♂ 6.4 mm, ovigerous ♀ 9.0 mm. Body cylindrical, ovigerous ♀ with pereonite 4 somewhat bulged, ♂ with pereonite 4 elongate-cylindrical. Shallow groove marking fusion between cephalon and pereonite 1. Pleonites fused with pleotelson, with two incomplete shallow dorsal grooves marking lines of fusion anteriorly. Pleotelson lacking any shoulders, posteriorly tapered to narrowly rounded apex.

RECORDS Florida Keys; Puerto Rico, 1.5 m, on *Cymodocea* sp. seagrass; Carrie Bow Cay, Belize, 1–2 m, on *Syringodium filiforme* seagrass.

REMARKS In life, *A. cymodocea* is bright green, blending in with its preferred substrate of seagrasses.

Astacilla lasallae Paul and Menzies, 1971
Figure 107C

DIAGNOSIS ♀ 3.5 mm. Cephalon with large rounded area bearing pair of spines; all pereonites and two anterior fused pleonites bearing pair of short submedian spines. Pleotelson with strong anterior shoulder, posteriorly triangular, tapering sharply to narrowly rounded apex.

RECORD Off Venezuela, 95 m.

REMARKS This species is known only from the small female holotype, and until a mature male and ovigerous female are found, it cannot be confidently diagnosed.

Astacilla regina Kensley, 1984
Figure 107D–G

DIAGNOSIS ♂ 6.5 mm, ovigerous ♀ 7.1 mm. Body strongly tuberculate, many tubercles acute. Cephalon with two submedian pairs of acute tubercles; fused pereonite 1 and pereonites 2 and 3 each with single middorsal acute tubercle. Pereonite 4 with strong middorsal tubercle situated in ante-

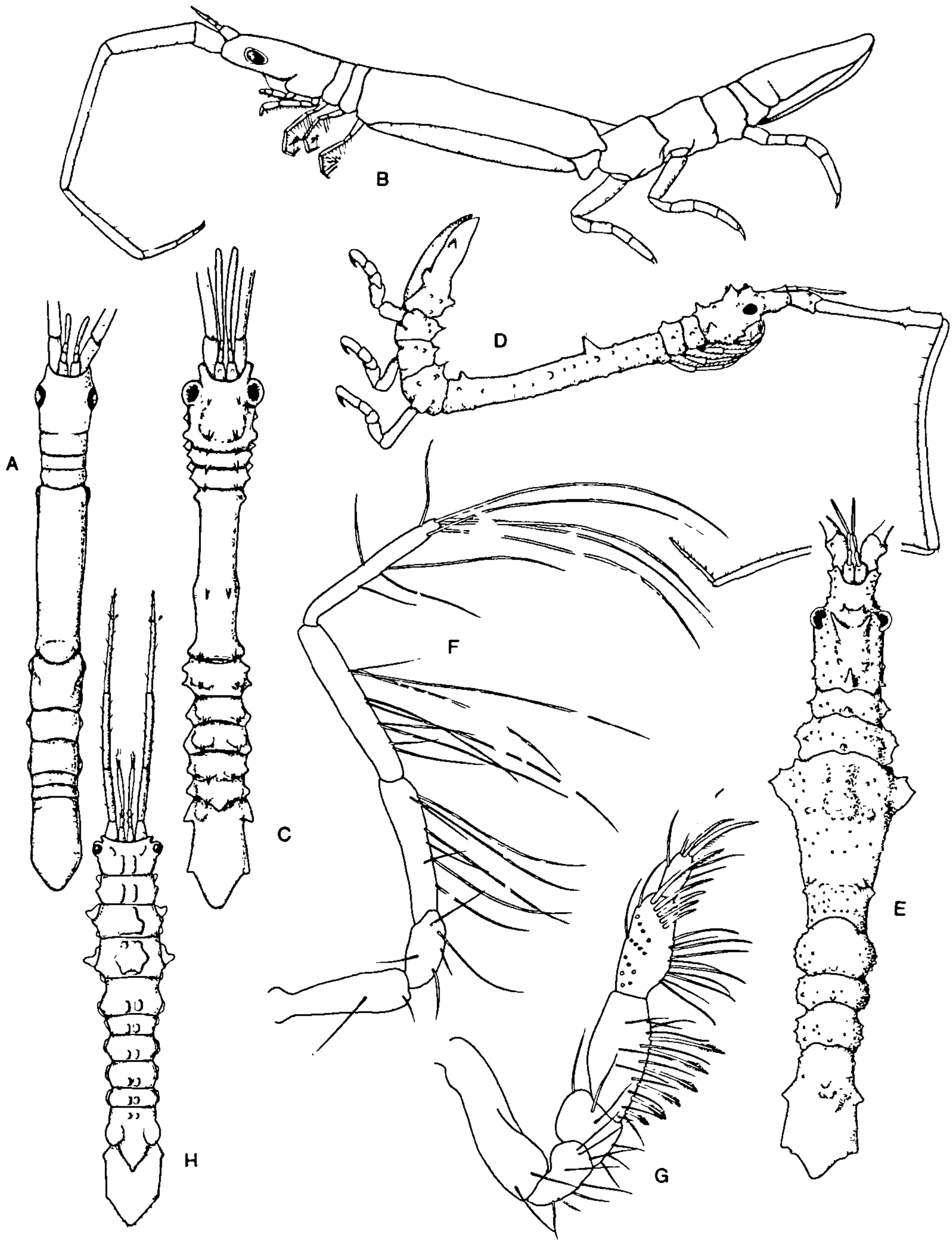

Figure 107. *Astacilla cymodocea: A*, ♂; *B*, ♀. *Astacilla lasallae: C*, ♂. *Astacilla regina: D*, ♂; *E*, ♀; *F*, pereopod 4; *G*, pereopod 1. *Thermarcturus venezuelensis: H*, ♀ (from Paul and Menzies, 1971).

rior half. Pleotelson with strong lateral shoulder in anterior half, second shoulder in posterior half, then tapering to rounded apex.

RECORDS Carrie Bow Cay, Belize, on forereef slope, 27–36 m; Barbados, 100–400 m; St. Lucia, 2–3 m, associated with crinoids.

Thermarcturus Paul and Menzies, 1971

DIAGNOSIS Pereonite 1 not fused with cephalon. Pereonite 4 subequal in length to pereonite 3, not markedly elongate. Pereopods 2–4 having dactyli but lacking elongate setae. Body cylindrical, flexed between pereonites 4 and 5. Pleon consisting of two free pleonites plus pleotelson.

Thermarcturus venezuelensis Paul and Menzies, 1971

Figure 107H

DIAGNOSIS ♀ 4.5 mm. Cephalon, all pereonites, and anterior two pleonites each with submedian pair of dorsal tubercles, those on pereonites 2 and 3 broad and expanded. Pleonite 2 with pair of bulbous lateral swellings, posterior margin triangular. Pleotelson with lateral shoulder anteriorly, posteriorly triangular.

RECORDS Off Venezuela, 95 m.

REMARKS Only the holotype (which seems to be lost) is known of this species. Considerable uncertainty exists regarding some of the features.

Family Idoteidae Fabricius, 1798
Subfamily Idoteinae Dana, 1852

DIAGNOSIS Flagellum of antenna either multiarticulate; clavate, i.e., with large basal articles and with or without one to four reduced distal articles; or

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Key to genera of Idoteinae

1. Antennal flagellum multiarticulate ..... *Idotea*
   Antennal flagellum clavate 2

2. Pereopod 4 reduced, considerably smaller than pereopods 3 or 5 3
   Pereopod 4 not reduced, of similar size to pereopods 3 and 5
   ..... *Erichsonella*

3. Pleon consisting of three complete and one incomplete pleonites plus pleotelson ..... *Cleantioides*
   Pleon consisting of two complete and two incomplete pleonites plus pleotelson ..... *Miratidotea*

---

vestigial. Maxillipedal palp consisting of five or fewer articles. Uropods uniramous or biramous, rami usually much smaller than sympod. Pleonites variously fused with pleotelson; number of fused pleonites often indicated by latcral sutures or furrows.

REMARKS Brusca (1984) has reviewed the phylogeny, evolution, and biogeography of the subfamily Idoteinae, the only one of the five subfamilies recorded from the Caribbean.

Cleantioides Kensley and Kaufman, 1978

DIAGNOSIS Antennal flagellum a single clavate article. Maxillipedal palp of four or five articles. Pereopod 4 somewhat reduced. Uropod uniramous. Pleon consisting of three complete and one incomplete pleonites plus pleotelson.

Cleantioides planicauda (Benedict, 1899)
Figure 108A

DIAGNOSIS Ovigerous ♀ 5.5 mm. Body parallel sided. Maxillipedal palp of five articles. Pleotelson posteriorly broadly rounded, with obliquely truncate subcircular dorsal area in posterior half.

RECORDS Maryland to Florida; Puerto Rico; Panama; Louisiana, Gulf of Mexico, intertidal to 44 m; often in hollow stems and roots of seagrasses, and tubes of the polychaete *Diopatra cuprea*.

Oaxaca, Pacific Mexico.

REMARKS *Cleantioides planicauda* has been recorded only once in the eastern Pacific, where it occurs with the more common *C. occidentalis* (Richardson, 1899).

Key to species of *Erichsonella*

1. Pereonites with dorsal spines 2
   Pereonites lacking dorsal spines ..... *attenuata*

2. Pereonites 1–4 with middorsal and lateral spines ..... *floridana*
   Pereonites 1–4 with middorsal spines only ..... *filiformis*

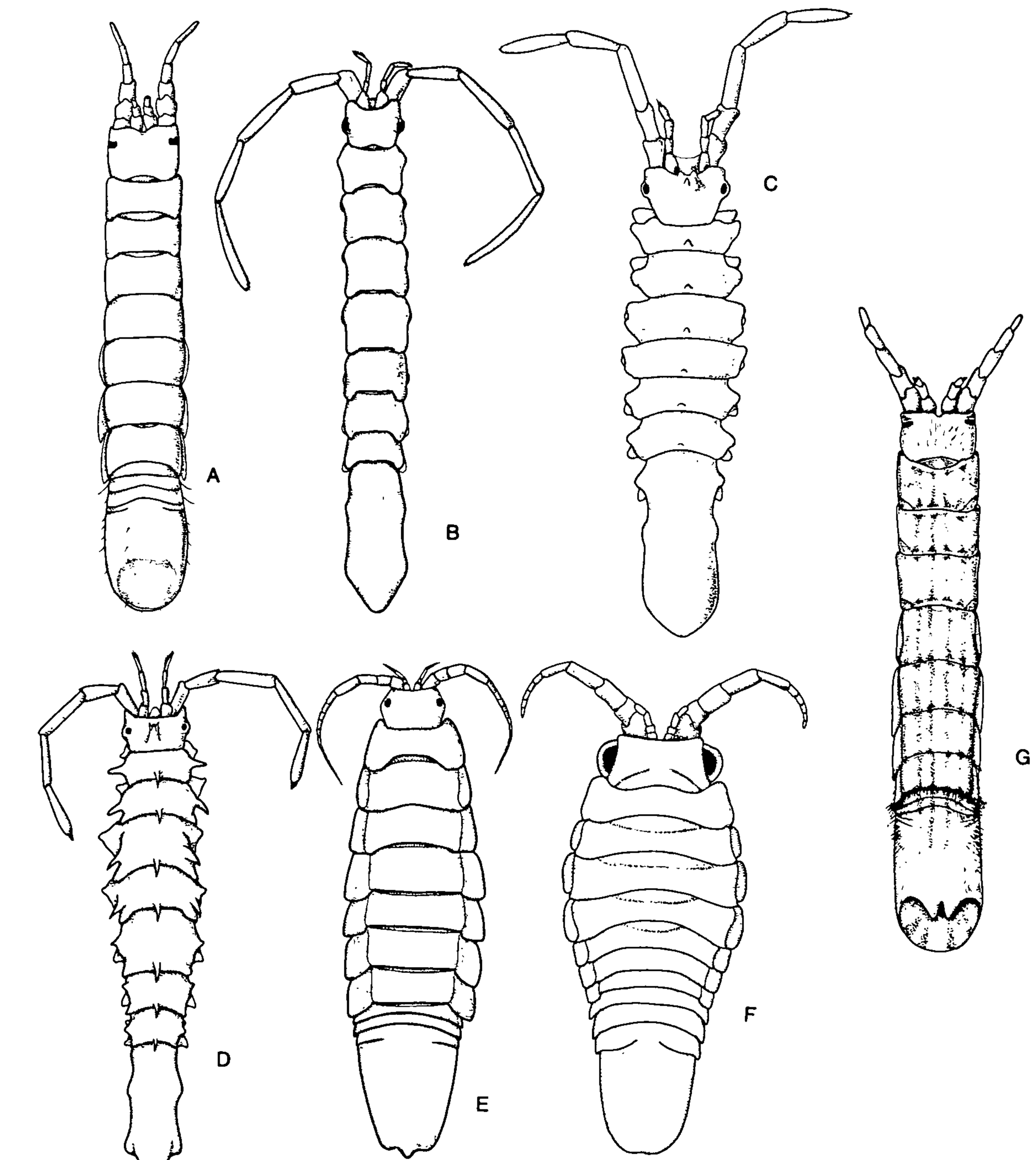


Figure 108. *A, Cleantioides planicauda; B, Erichsonella attenuata* ♂; *C, Erichsonella filiformis* ♂; *D, Erichsonella floridana* ♀; *E, Idotea balthica* ♂; *F, Idotea metallica* ♀; *G, Miratidotea bruscai* ♀.

Erichsonella Richardson, 1901

DIAGNOSIS Antennal flagellum clavate. Maxillipedal palp of four articles. Uropod uniramous. Pleonites completely fused with pleotelson.

REMARKS Pires (1984) reviewed the genus *Erichsonella* and did not recognize the subspecies *E. filiformis tropicalis* Menzies and Glynn, 1968.

Erichsonella attenuata (Harger, 1873)
Figure 108B

DIAGNOSIS ♂ 11.4 mm, ovigerous ♀ 12.0 mm. Body dorsally smooth. Cephalon lacking middorsal elevation. Antennule reaching only slightly beyond antennal peduncular article 2. Pleotelson with slight marginal bulge in anterior half, indicating ventrolateral articulation of uropod.

RECORDS Connecticut to Miami; Florida, Mississippi, Texas, Gulf of Mexico; intertidal to 2 m, usually associated with submerged seagrass and algal beds.

REMARKS While not recorded in the Florida Keys, this species does reach Miami, and continues into the Gulf of Mexico.

Erichsonella filiformis (Say, 1818)
Figure 108C

DIAGNOSIS ♂ 10.5 mm, ovigerous ♀ 8.2 mm. Body dorsally with bifid tubercle on cephalon, and low rounded middorsal tubercle on pereonites. Antennule reaching midlength of antennal peduncular article 3. Basis of pereopods 2–7 with larges tubercles. Pleotelson with distinct lateral shoulder in anterior half.

RECORDS Connecticut to Florida, shallow infratidal to 55 m; Bahamas; Turks and Caicos Islands; Puerto Rico; Quintana Roo, Yucatan Peninsula, Mexico, 60–109 m; Florida and Texas, Gulf of Mexico.
Brazil.

Erichsonella floridana Richardson, 1901
Figure 108D

DIAGNOSIS Ovigerous ♀ 10.0 mm. Antennule reaching distal end of antennal peduncular article 3. Cephalon with strong trifid tubercle. Pereonites 1–7 each with posteriorly directed spine near posterior margin; pereonites 1–4 each with lateral spine. Basis of pereopods 2–7 smooth.

RECORDS Florida Keys, intertidal to 2 m; Florida, Gulf of Mexico, intertidal mud flats.

Idotea Fabricius, 1798

DIAGNOSIS Antennal flagellum multiarticulate. Maxillipedal palp of four or five articles. Uropod uniramous. Pleon consisting of two complete and one incomplete pleonites plus pleotelson.

Key to species of *Idotea*

1. Posterior margin of pleotelson truncate ..... *metallica*
   Posterior margin of pleotelson with distinct median lobe ..... *balthica*

Idotea balthica (Pallas, 1772)
Figure 108E

DIAGNOSIS ♂ 24.5 mm, ovigerous ♀ 13.2–23.5 mm. Anterior margin of cephalon concave. Cephalon dorsally smooth. Pereonites evenly convex, smooth. Posterior margin of pleotelson with rounded median lobe.

RECORDS Worldwide in tropical to cold-temperate waters, often on floating seaweed, from surface to 357 m.

Idotea metallica Bosc, 1802
Figure 108F

DIAGNOSIS ♂ 30.0 mm, ovigerous ♀ 22.2 mm. Cephalon with sinuous furrow in posterior half. Pereonites 2–4 laterally with rounded convex area close to coxae. Posterior margin of pleotelson truncate.

RECORDS Worldwide in tropical to cold-temperate waters, often on floating seaweed, from surface to 200 m.

Miratidotea Kensley, 1987a

DIAGNOSIS Antennal flagellum of single clavate article. Maxillipedal palp of four articles. Uropod uniramous. Pleon consisting of two complete and two incomplete pleonites plus pleotelson.

Miratidotea bruscai Kensley, 1987a
Figure 108G

DIAGNOSIS Ovigerous ♀ 13.0 mm. Body parallel sided. Maxillipedal palp of four articles, terminal article very short. Pereopods 1–3 increasing in length posteriorly, pereopod 4 reduced, shorter than pereopod 5, and with dactylus spinelike, pereopods 5–7 increasing in length. Pleotelson consisting of two complete and two incomplete pleonites plus pleotelson; latter with broadly rounded posterior margin, and with bifid median process situated dorsal to posterior oblique-concave area.

RECORDS Carrie Bow Cay, Belize, 1.5 m, in hollow root-internodes of sea-grass *Syringodium filiforme*.

Zoogeography

FAUNAL PROVINCES

The area under discussion has been divided into several faunal regions or provinces, of which the Caribbean, West Indian, and Brazilian are the major ones (Briggs, 1974). The extent and boundaries of the provinces have been variously defined depending on the group of organisms under discussion. Inevitably, zones of overlap exist, but for the purposes of this discussion, the following rough limits have been used.

Brazilian Province: This province stretches from Cape Frio near Rio de Janeiro in Brazil to the mouth of the Orinoco River in Venezuela. The outflow of freshwater from the major rivers of this region has probably contributed to the isolation of the Brazilian coral reefs and their associated fauna from those of the Caribbean. This isolation is demonstrated by the considerable endemism of the Brazilian reef fauna and that of the Caribbean reef fauna, with very few species being common to both.

Caribbean Province: This province has two components, a northern part in peninsular Florida, that stretches from around Cape Kennedy on the east coast to Tampa or Sanibel Island on the west coast, and a southern component that runs from the mouth of the Orinoco River to around Cabo Rojo or Tampico on the gulf coast of Mexico. The northern Gulf of Mexico is excluded from this province and is characterized as being warm-temperate, rather than subtropical (Briggs, 1974:66).

West Indian Province: This includes all the islands of the West Indian chain, the Bahamas, and the isolated outrider, Bermuda. The West Indian Province closely approaches the Caribbean Province in the Yucatan Peninsula to the north, and between Grenada and Trinidad in the south. There is also some indication of the isolating effect on the Bahamas of the Florida Current through the Straits of Florida.

It has been suggested, on the basis of the molluscan fauna, that a relict of the Neogene Gatunian Province exists around northern Venezuela and Colombia (Petuch, 1982). While several isopod species have been recorded only from this area, these are all described in a single paper that covers a very small part of this region (Paul and Menzies, 1971). There is as yet too little evidence to explore the idea of this relict fauna further.

ANALYSIS OF THE ISOPOD FAUNA

In the following discussion, the West Indian and Caribbean provinces are treated as one, the isopod faunas offering little evidence to warrant a separate treatment of each.

It is a truism that for any discussion of the zoogeography of an area to have meaning, the true extent of the fauna must be known. With the area under review, collecting effort has been uneven, and the true faunal composition of many regions is still incompletely known. Obviously, any conclusions based on such incomplete data are approximate and subject to revision. Nevertheless, certain general patterns or trends emerge when the present isopod fauna is broken down into its components.

The deepwater isopod fauna of the Caribbean (i.e., from deeper than 200 m) has barely been explored, and little is to be gained from discussing the relatively few species known. A list of these deeper dwelling species is included (Table 4).

Although about 280 shallow-water species are covered by this work, certain categories of species must be excluded, for various reasons, before analysis can be attempted. Such excluded groups include the species of Oniscidea (being essentially terrestrial forms and not part of the marine regime); the cymothoid species and the species of Aegidae (being fish parasites for at least part of their life history, and whose distribution is complicated by the distribution and mobility of the hosts); the limnoriids (being wood-borers whose distribution is more a function of the distribution of floating wood); and the true cave species (which have a history more reflective of the geological history of the area than of the marine regime). The epicarideans have a distribution somewhat complicated by the distribution of their crustacean hosts and their pelagic epicaridean and cryptoniscan larvae. Nevertheless, the decapod hosts of the great majority of species covered here are Caribbean endemics, and inclusion of the epicarideans changes very little the overall patterns of distribution, as demonstrated by the two figures provided (Figure 109). After making these exclusions there remain about 166 species (218 with the epicarideans) that can be broken down into the following components (figures in brackets include epicarideans):

1. True Caribbean/Bahamian species—124 species, 74.8% [147, 67.5%]. These are the species recorded only from the Caribbean and the Bahamas. The term endemic is avoided, as too little is known of the actual distribution of many species. Of these species, 86 [87] have been recorded from a single locality.

2. Species occurring south of the discussion area, and extending into Brazil—5 species, 3.0% [9, 4.1%]. These low numbers indicate that the

TABLE 4. CARIBBEAN ISOPODS RECORDED FROM DEPTHS GREATER THAN 200 M

SUBORDER ANTHURIDEA

Family Paranthuridae

Neoanthura coeca Menzies, 1956b. South of Jamaica, 1244 m

SUBORDER ASELLOTA

Family Dendrotiidae

Dendrotion hanseni Menzies, 1956b. South of Jamaica, 1244 m

Family Desmosomatidae

Desmosoma magnispina Menzies, 1962a. Bay of Panama, 1906 m

Family Echinothambematidae

Echinothambema ophiuroides Menzies, 1956a. North of Puerto Rico Trench, 5104–5122 m

Family Eurycopidae

Acanthocope spinosissima Menzies, 1956b. South of Jamaica, 1224 m

Storthyngura pulchra caribbea (Benedict, 1901). Off Windward Islands, 1256 m

Storthyngura snanoi Menzies, 1962a. Colombia abyssal plain, 4071 m

Family Haploniscidae

Antennuloniscus dimeroceras (Barnard, 1920). North of Puerto Rico Trench, 5440–5410 m; South Atlantic off South and West Africa, 1400–3921 m; off Argentina, 5843 m

Haploniscus unicornis Menzies, 1956a. North of Puerto Rico Trench, 5104–5122 m

Hydroniscus quadrifrons Menzies, 1962a. North of Puerto Rico Trench, 5271–5684 m

Family Ischnomesidae

Haplomesus tropicalis Menzies, 1962a. Colombia abyssal plain, 4071 m; off South Africa, 2526 m; Mediterranean

Heteromesus bifurcatus Menzies, 1962a. Colombia abyssal plain, 4071 m

Ischnomesus armatus Hansen, 1916. North of Puerto Rico Trench, 5494–5477 m; Davis Straits, 2702 m

Ischnomesus caribbicus Menzies, 1962a. Off Panama, 1714 m

Ischnomesus multispinis Menzies, 1962a. Off Panama, 975 m

Family Janiridae

Abyssianira dentifrons Menzies, 1956a. North of Puerto Rico Trench, 5104–5122 m; off Argentina, 5024–5293 m; off southwest Africa, 4588 m

Ianirella caribbica Menzies, 1956b. South of Jamaica, 1244 m

Ianirella vemae Menzies, 1956a. Near Puerto Rico Trench, 5104–5122 m

Spinianirella serrata Kensley and Heard, 1985. Off Puerto Rico, 350 m

Family Macrostylidae

Macrostylis caribbicus Menzies, 1962a. Off Colombia, 2875–2941 m

Macrostylis minutus Menzies, 1962a. North of Puerto Rico Trench, 5163–5494

(*continued*)

TABLE 4. (*Continued*)

Macrostylis setifer Menzies, 1962a. North of Puerto Rico Trench, 5477–5494 m

Macrostylis vemae Menzies, 1962a. North of Puerto Rico Trench, 5410–5684 m

Family Mesosignidae

Mesosignum kohleri Menzies, 1962a. Colombia abyssal plain, 2868–4076 m

Family Nannoniscidae

Nannoniscus camayae Menzies, 1962a. Off Panama, 1714 m

SUBORDER GNATHIIDEA

Family Gnathiidae

Akidognathia poteriophora Monod, 1926. Off U. S. Virgin Islands, 914 m.

SUBORDER VALVIFERA

Family Arcturidae

Antarcturus annaoides Menzies, 1956b. South of Jamaica, 1244 m

Arcturus caribbaeus Richardson, 1901. Off Aves Island, 1360 m

Arcturus purpureus Beddard, 1886. Off Leeward Islands, 900 m

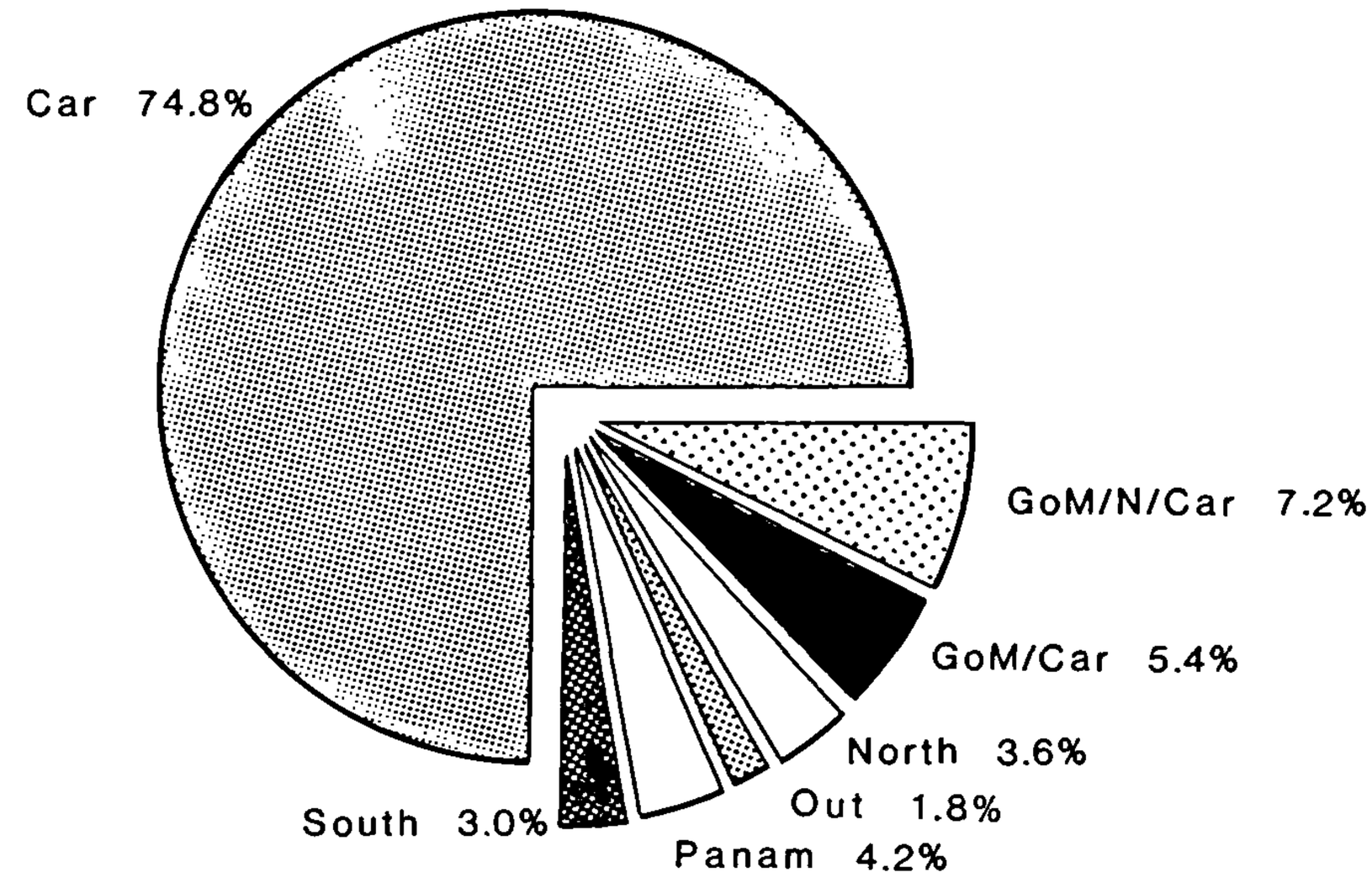
Note: Records from deep water around Bermuda are not included.

great area of mixed-salinity waters resulting from the outflow of the Orinoco, Amazon, Tocantins, and Parnaiba rivers form an effective barrier to the movement of shallow-water isopod species.

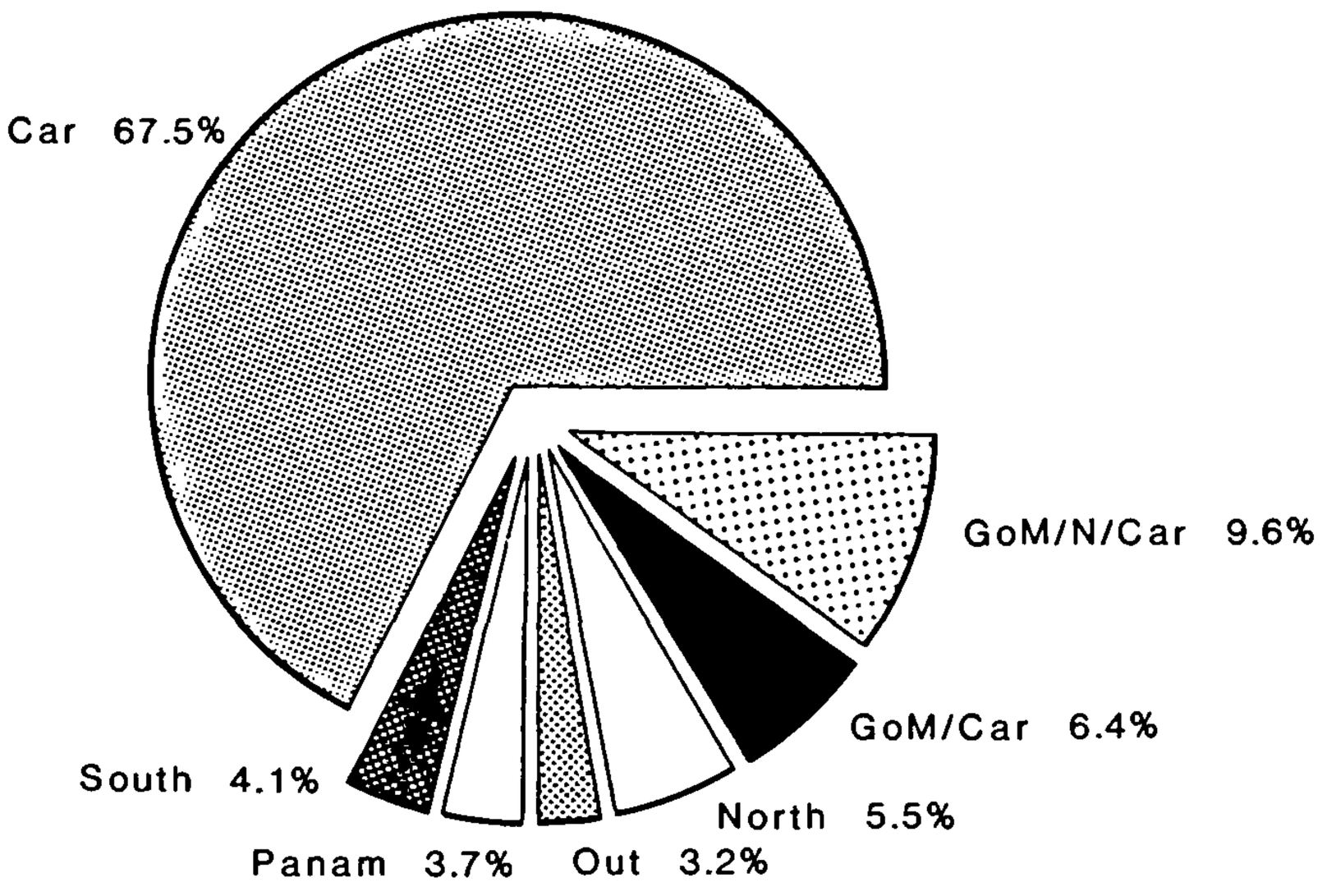
3. Species having an amphi-Panamic distribution—7 species, 4.2% [8, 3.7%] (Table 5). In spite of the history of immergence and emergence of the Isthmus of Panama, this very small amphi-Panamic component in the Caribbean isopod fauna suggests that most of this fauna has evolved since the last emergence of the late Pliocene. Given the limited mobility of most isopod species, the Panama Canal seems to have played a minimal role in contributing to this component.

4. Species occurring outside of the western Atlantic (but excluding the amphi-Panamic species)—3 species, 1.8% [7, 3.2%].

5. The role of the Gulf of Mexico isopod fauna (see Clark and Robertson, 1982) in the composition of the Caribbean/Bahamian is complex and difficult to analyze. One hundred and thirteen species of shallow-water isopods have been recorded from the Gulf of Mexico (Table 6). This number would indicate that many species remain to be recorded in this region. Of these 113 species, 61 (54%) have also been reported from the Caribbean region. It is therefore possible that there exists a true Gulf of Mexico fauna, whose evolution was perhaps spurred by the relative isolation and reduction of the Gulf



Epicaridea excluded



Epicaridea included

Figure 109. Relative proportions of the zoogeographic components of the Caribbean isopod fauna, with and without the parasitic Epicaridea. *Car*, Caribbean; *Out*, extra-western Atlantic; *GoM/Car*, Gulf of Mexico–Caribbean; *GoM/N/Car*, Gulf of Mexico-Northern-Caribbean; *North*, northern; *Panam*, amphi-Panamic; *South*, southern.

during a low-water stand (100 m below present sea level) during the Pleistocene. A significant proportion (about 27 species, 28%) of the Gulf of Mexico isopods are known from the eastern coast of the United States north

TABLE 5. SPECIES OF ISOPODS OCCURRING ON BOTH SIDES OF THE ISTHMUS OF PANAMA

**Aega deshaysiana* (H. Milne Edwards, 1840)	*Paradella dianae* (Menzies, 1962b)
Anopsilana browni (Van Name, 1936)	*Paraleptosphaeroma glynni* Buss and Iverson, 1981
Cleantioides planicauda (Benedict, 1899)	*Probopyrus pandalicola* (Packard, 1879)
Excirolana braziliensis Richardson, 1912	**Rocinela oculata* Harger, 1883
Excorallana tricornis (Hansen, 1890)	**Rocinela signata* Schioedte and Meinert, 1879
**Nerocila acuminata* Schioedte and Meinert, 1881	*Uromunna reynoldsi* Frankenberg and Menzies, 1966

* fish parasite or fish predator

of Cape Kennedy, which would indicate a significant cooler-water component. What proportion of originally Gulf species have spread into the Caribbean, and what proportion of Caribbean and temperate east coast species have entered the Gulf, cannot yet be assessed, given our incomplete knowledge of the Gulf fauna. Because of this unresolved situation, three categories of species have been separated: species ranging from north of Cape Kennedy into the Caribbean—6, 3.6% [12, 5.5%]; species occurring in the Gulf of Mexico and the Caribbean—9, 5.4% [14, 6.4%]; species occurring north of Cape Kennedy, in the Gulf, and in the Caribbean—12, 7.2% [21, 9.6%] The conclusion that the fauna of the Gulf of Mexico contains an endemic component, a Caribbean component, and a warm-temperate component was also reached by Topp and Hoff (1972), in an analysis of the pleuronectiform fishes of the Gulf.

THE BAHAMAS

The Florida Current flowing through the Straits of Florida has been suggested as a factor in reducing the movement of shallow-water fauna between peninsular Florida and the Florida Keys on the west and the Bahamas on the east (Briggs, 1974). Comparison of the number of isopod species on either side of the Straits of Florida (13 from the Bahamas, 50 from southern peninsular Florida and the Florida Keys) supports this view. Of the 13 species from the Bahamas, only four are "endemic," three of these being interstitial microcerberideans.

TABLE 6. ISOPOD SPECIES OCCURRING IN THE GULF OF MEXICO

SUBORDER ANTHURIDEA

**Accalathura crenulata* (Richardson, 1901)
**Amakusanthura magnifica* (Menzies and Frankenberg, 1966)
Cyathura polita (Stimpson, 1855)
Horoloanthura irpex Menzies and Frankenberg, 1966
Kupellonura formosa (Menzies and Frankenberg, 1966)
**Mesanthura floridensis* Menzies and Kruczynski, 1983
**Mesanthura hopkinsi* Hooker, 1985
**Mesanthura pulchra* Barnard, 1925
Paranthura floridensis Menzies and Kruczynski, 1983
Ptilanthura tricarina Menzies and Frankenberg, 1966
Skuphonura lindae Menzies and Kruczynski, 1983
**Xenanthura brevitelson* Barnard, 1925

SUBORDER ASELLOTA

Carpias floridensis Menzies and Kruczynski, 1983
Gnathostenetrioides pugio Hooker, 1985
**Joeropsis coralicola* Schultz and McCloskey, 1967
**Joeropsis rathbunae* Richardson, 1902
Mexicope kensleyi Hooker, 1985
Munnogonium wilsoni Hooker, 1985
**Pleurocope floridensis* Hooker, 1985
**Santia milleri* (Menzies and Glynn, 1968)
**Stenetrium stebbingi* Richardson, 1902
Uromunna hayesi Robertson, 1978
**Uromunna reynoldsi* Frankenberg and Menzies, 1966

SUBORDER EPICARIDEA

Allodiplophryxus floridanus Markham, 1985
**Aporobopyrina anomala* Markham, 1973
**Azygopleon schmitti* (Pearse, 1932)
**Bopyrina abbreviata* Richardson, 1904
**Bopyrione synalphei* Bourdon and Markham, 1980
**Cancricepon choprae* (Nierstrasz and Brender à Brandis, 1925)
Dactylokepon sulcipes Adkison, 1982
Eophryxus subcaudalis (Hay, 1917)
**Gigantione mortenseni* Adkison, 1984b
Gigantione uberlackerae Adkison, 1984b
**Hemiarthrus synalphei* (Pearse, 1950)
Hyperphrixus castrensis Markham, 1985
**Munidion longipedis* Markham, 1975a
Ovobopyrus alphezemiotes Markham, 1985
Parabopyrella mortenseni (Nierstrasz and Brender à Brandis, 1929)
**Parabopyrella richardsonae* (Nierstrasz and Brender à Brandis, 1929)
Parabopyriscus stellatus Markham, 1985
**Probopyria alphei* (Richardson, 1900b)
Probopyrinella heardi Adkison, 1984a

(*continued*)

TABLE 6. (*Continued*)

**Probopyrinella latreuticola* (Gissler, 1882)
Prodajus cf. *bigelowiensis* Schultz and Allen, 1982
Pseudione cognata Markham, 1985
Pseudione upogebiae Hay, 1917
**Schizobopyrina urocaridis* (Richardson, 1904)
**Stegophryxus hyptius* Thompson, 1902
**Synsynella choprae* (Pearse, 1932)
**Synsynella deformans* Hay, 1917
Synsynella integra Bourdon, 1981
**Urobopyrus processae* Richardson, 1904

SUBORDER FLABELLIFERA

**Aega deshaysiana* (H. Milne Edwards, 1840)
**Aega ecarinata* Richardson, 1898
Aega incisa Schioedte and Meinert, 1879
Alcirona krebsii Hansen, 1890
Ancinus depressus (Say, 1818)
Anilocra acuta Richardson, 1910
Anilocra laticauda H. Milne Edwards, 1840
**Bathynomus giganteus* A. Milne Edwards, 1879
**Cassidinidea ovalis* (Say, 1818)
Ceratothoa transversa (Richardson, 1900b)
Cirolana borealis Lilljeborg, 1851
**Cirolana obtruncata* Richardson, 1901
**Cirolana parva* Hansen, 1890
Conilera cylindracea (Montagu, 1804)
**Cymothoa caraibica* Bovallius, 1885
**Cymothoa excisa* Perty, 1833
**Cymothoa oestrum* (Linnaeus, 1793)
**Cerceis carinata* Glynn, 1970
**Eurydice convexa* Richardson,1900b
Eurydice littoralis (Moore, 1901)
**Eurydice piperata* Menzies and Frankenberg, 1966
**Excirolana braziliensis* Richardson, 1912a
**Excirolana mayana* (Ives, 1891)
**Excorallana antillensis* (Hansen, 1890)
Excorallana mexicana Richardson, 1905a
**Excorallana tricornis* (Hansen, 1890)
**Harrieta faxoni* (Richardson, 1905a)
**Limnoria tuberculata* Sowinsky, 1884
Lironeca ovalis (Say, 1818)
**Lironeca redmanni* Leach, 1818
Lironeca texana Pearse, 1952
Lironeca tropicalis Menzies and Kruczynski, 1983
**Nalicora rapax* Moore, 1901
**Nerocila acuminata* Schioedte and Meinert, 1881
Olencira praegustator (Latrobe, 1802)
**Paracerceis caudata* (Say, 1818)
**Paradella dianae* (Menzies, 1962b)
Paradynamene benjamensis Richardson, 1905
**Politolana polita* (Stimpson, 1853)
**Rocinela insularis* Schioedte and Meinert, 1879
**Rocinela oculata* Harger, 1883
**Rocinela signata* Schioedte and Meinert, 1879
**Serolis mgrayi* Menzies and Frankenberg, 1966
**Sphaeroma quadridentata* Say, 1818
**Sphaeroma terebrans* Bate, 1866

SUBORDER GNATHIIDEA

Gnathia floridensis Menzies and Kruczynski, 1983

SUBORDER MICROCERBERIDEA

Microcerberus mexicanus Pennak, 1958

SUBORDER VALVIFERA

Antarcturus floridanus (Richardson, 1900b)
Arcturella bispinata Menzies and Kruczynski, 1983
Arcturella spinata Menzies and Kruczynski, 1983
Astacilla lauffi Menzies and Frankenberg, 1966
Chiridotea excavata Harper, 1974
**Cleantioides planicauda* (Benedict, 1899)
Edotea lyonsi (Menzies and Kruczynski, 1983)
Edotea montosa (Stimpson, 1853)
Edwinjoycea horologium Menzies and Kruczynski, 1983
**Erichsonella attenuata* (Harger, 1873)
**Erichsonella filiformis* (Say, 1818)
**Erichsonella floridana* Benedict, 1901
Erichsonella isabelensis Menzies, 1951b
**Idotea metallica* Bosc, 1802

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* species also occurring in the Caribbean

Note: Records for the Gulf of Mexico have been assembled from published literature; in most cases, actual material has not been examined.

BERMUDA

Twenty-nine species of isopods have been recorded from Bermuda (Table 7). Of these, nine are endemics (three being cave forms). The remaining 20 species have all been recorded from the Caribbean region, indicating a strong subtropical connection, in spite of the relatively high latitude (32°15′N). Although Bermuda is of Eocene or Oligocene age, the tropical fauna was probably decimated by the low temperatures of the last Pleistocene glaciation (Briggs, 1974:76).

CAVE ISOPODS

With the expanding efforts of cave divers, more and more true stygobiont forms are being found. Concurrently, discussion of the origin of cave fauna has spurred several theories, all invoking the geological history of the Caribbean area.

Among the isopods, cave forms have been found in four suborders, the Asellota, Anthuridea, Flabellifera, and Microcerberidea. Two valuable discussions on the origin of cave crustaceans may be found in Stock (1986) and Wägele (1985).

The only true cave asellote, *Atlantasellus cavernicolus* Sket, was collected from Bermuda.

TABLE 7. ISOPOD SPECIES OCCURRING AT BERMUDA

Alcirona krebsi Hansen, 1890
**Anthomuda stenotelson* Schultz, 1979
**Apanthura harringtoniensis* Wägele, 1981
**Arubolana aruboides* (Bowman and Iliffe, 1983)
**Atlantasellus cavernicolus* Sket, 1979
Bopyrissa wolffi Markham, 1978
Cancricepon choprae (Nierstrasz and Brender à Brandis, 1925)
Carpias bermudensis Richardson, 1902
**Carpias minutus* (Richardson, 1902)
**Colanthura tenuis* Richardson, 1902
Colopisthus parvus Richardson, 1902
**Curassanthura bermudensis* Wägele, 1985
Dynamenella perforata (Moore, 1901)
Eurydice personata Kensley, 1987b
Excorallana quadricornis (Hansen, 1890)
Joeropsis rathbunae Richardson, 1902
Leidya bimini Pearse, 1951
Paracerceis caudata (Say, 1818)
Paranthura infundibulata Richardson, 1902
Pendanthura tanaiformis Menzies and Glynn, 1968
Parathelges piriformis Markham, 1972b
Parathelges tumidipes Markham, 1972b
Probopyrinella latreuticola (Gissler, 1882)
Pseudione affinis (Sars, 1882)
**Stegias clibanarii* Richardson, 1904
Stenetrium stebbingi Richardson, 1902
Stenobermuda acutirostrata Schultz, 1979
Synsynella choprae (Pearse, 1932)
Synsynella deformans Hay, 1917

* recorded only from Bermuda

The anthuridean cave representatives are found in two families: the genus *Curassanthura* Kensley in the Paranthuridae, and the genus *Cyathura* subgenus *Stygocyathura* Botosaneanu and Stock in the Anthuridae (see Figure 110).

Three species of *Curassanthura* are known, one each from Curaçao, Bermuda, and Lanzarote in the Canary Islands. *Curassanthura halma* Kensley, from Curaçao, is an interstitial form found in hypersaline waters. *Curassanthura bermudensis* Wägele was found in water of about 26‰ salinity. The Lanzarote species, *C. canariensis* Wägele, came from seawater in a lava cave. Wägele (1985) suggests that this amphi-Atlantic distribution of *Curassanthura* is the result of plate tectonics separating an ancestral hypogean progenitor that had a Tethyan distribution.

The genus *Cyathura* has representatives in the sea, in estuarine-brackish habitats, and in freshwater caves, and is found in the Atlantic, Indian, and Pacific oceans. This widespread distribution suggests a very long history for the genus. Using the morphology of the male copulatory stylet, Wägele (1985) suggests that marine ancestors, having a Tethyan distribution, entered freshwater interstitial habitats. The series of regressions of sea level during the Pleistocene probably served further to isolate these freshwater forms.

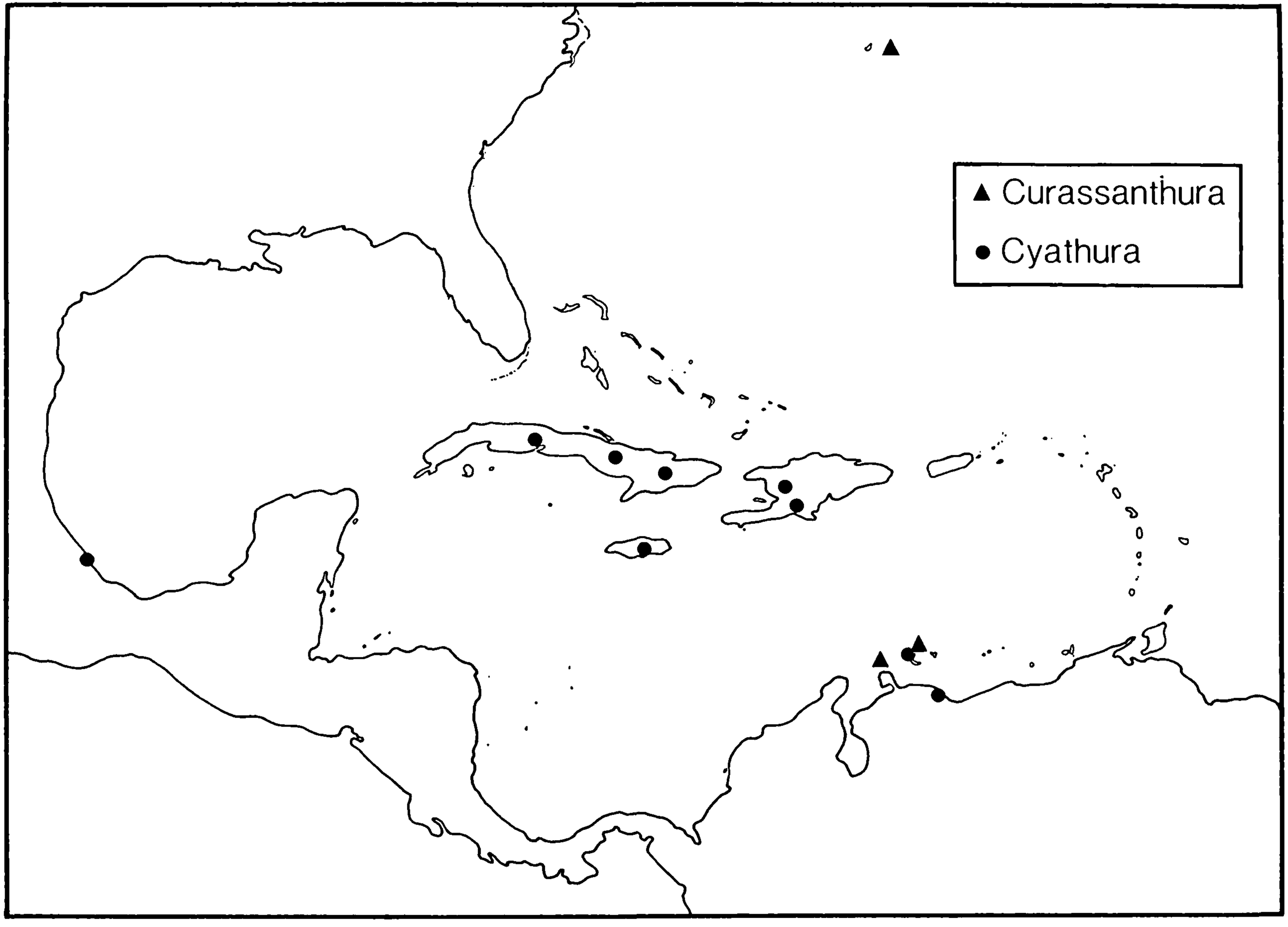

Figure 110. Map showing distribution of cave anthurideans.

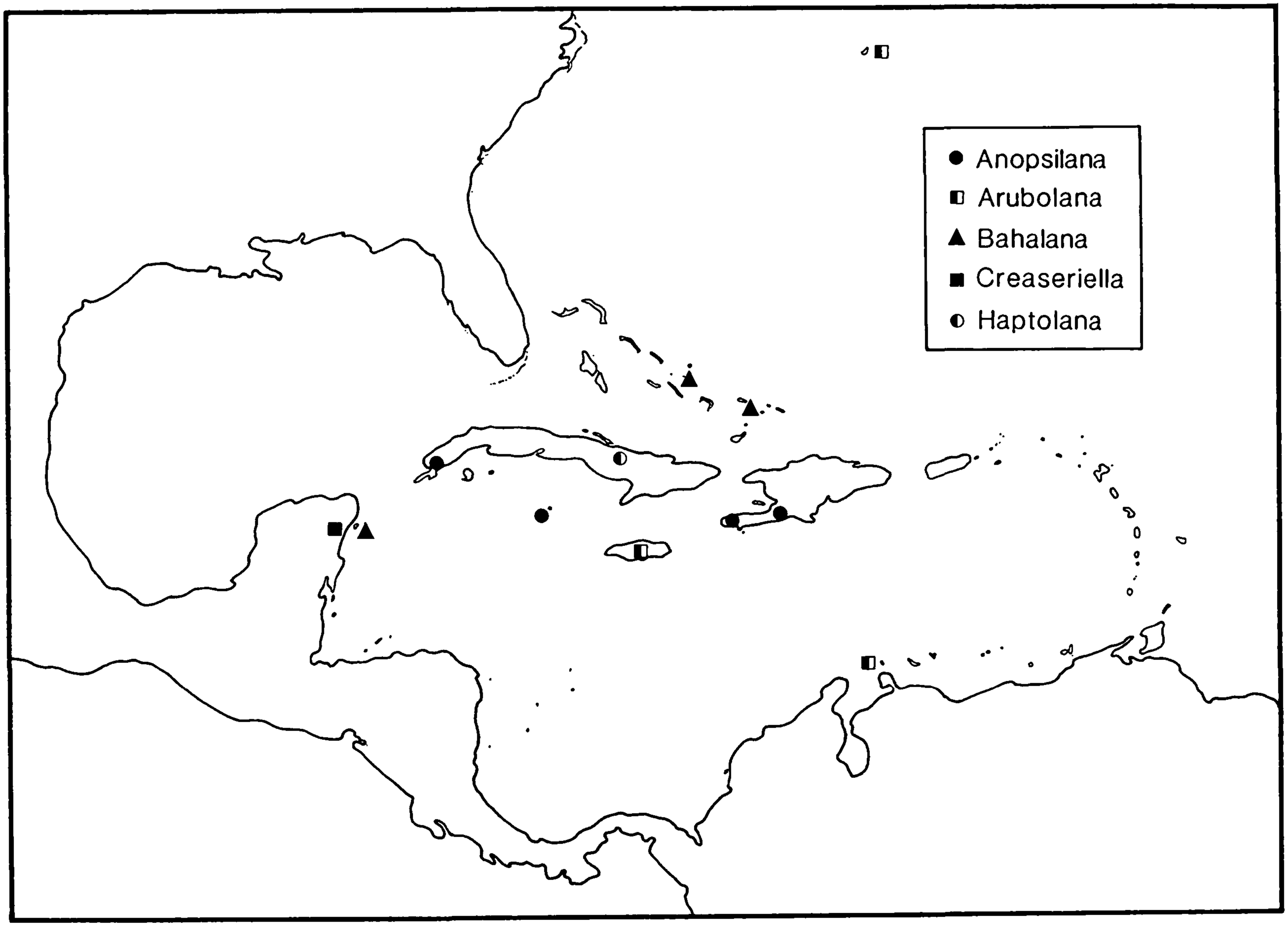

Figure 111. Map showing distribution of cave cirolanids.

The flabelliferan family Cirolanidae contains five stygobiont genera in the Caribbean: *Anopsilana, Arubolana, Bahalana, Creaseriella,* and *Haptolana* (Figure 111). Six other genera are known from the North American continent: *Antrolana, Cirolanides, Mexilana, Speocirolana, Sphaerolana,* and *Troglocirolana,* all of which, except *Antrolana* from the Appalachian Valley of Virginia, occur in Mexico and Texas (see Notenboom, 1981). A few of these forms occur in brackish water, but most are found in freshwater of caves. Cave cirolanids are also known from Palau, North and East Africa, Madagascar, Bulgaria, Greece, Jugoslavia, Israel, France, and Spain. This widespread distribution again suggests a Tethyan marine origin, with dispersal and isolation due to sea regressions.

The suborder Microcerberidea and the asellotan family Microparasellidae contain almost entirely interstitial forms, although few occur in caves. At least two genera, *Microcerberus* and *Angliera,* have very widespread distributions and are known from marine, brackish-water, and freshwater habitats, and may well have a history similar to that of *Cyathura*.

Appendix

Since the manuscript of this work was completed and sent to press, a few papers have appeared either describing new species, mentioning new records for the Caribbean and associated areas, or instituting a major new taxon. It was thought useful to include these, if only in an appendix, to make the work as current as possible. The relevant taxa are listed alphabetically, with the full citation given below.

Antheluridae Poore and Lew Ton, 1988

Poore, G. C. B., and H. M. Lew Ton. 1988. Antheluridae, a new family of Crustacea (Isopoda: Anthuridea) with new species from Australia. *Journal of Natural History* 22:489–506.

Within the geographical area covered by this work, only *Anthomuda* belongs to this new family.

Aporobopyrus collardi Adkison, 1988

Adkison, D. L. 1988. *Pseudione parviramus* and *Aporobopyrus collardi,* two new species of Bopyridae (Isopoda: Epicaridea) from the Gulf of Mexico. *Proceedings of the Biological Society of Washington* 101(3):576–584.

Booralana tricarinata Camp and Heard, 1988

Camp, D. K., and R. W. Heard. 1988. *Booralana tricarinata,* a new species of isopod from the western Atlantic Ocean (Crustacea: Isopoda: Cirolanidae). *Proceedings of the Biological Society of Washington* 101 (3):603–613.

Originally recorded from the outer shelf and upper slope off the Little Bahama Bank and the Antilles Islands in 110–610 m, this species has since been recorded off Haiti in 620 m.

Bythognathia yucatanensis Camp, 1988

Camp, D. K. 1988. *Bythognathia yucatanensis,* new genus, new species, from abyssal depths in the Caribbean Sea, with a list of gnathiid

species described since 1926 (Isopoda: Gnathiidae). *Journal of Crustacean Biology* 8(4):668–678.

Edotea samariensis Müller, 1988

Müller, H. G. 1988. Idoteidae aus N-Kolumbien mit Beschreibung von *Edotea samariensis* n. sp. (Crustacea: Isopoda: Valvifera). *Senckenbergiana biologica* 68(4/6):407–412.

Gnathia johanna Monod, 1926

Müller, H. G. 1988. Redescription of *Gnathia johanna,* 1926 (Isopoda) from St. John, Virgin Islands. *Bulletin Zoologisch Museum, Universiteit van Amsterdam* 11(15):129–133.

Phycolimnoria bacescui Ortiz and Lalana, 1988

Ortiz, M., and R. Lalana. 1988. Una nueva especie del genero *Phycolimnoria* (Isopoda, Limnoriidae) de aguas cubanas. *Revista de Investigaciones Marinas, La Habana* 9(2):37–42.

Pseudione parviramus Adkison, 1988

Adkison, D. L. 1988. *Pseudione parviramus* and *Aporobopyrus collardi,* two new species of Bopyridae (Isopoda: Epicaridea) from the Gulf of Mexico. *Proceedings of the Biological Society of Washington* 101(3):576–584.

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