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ABSTRACT

Kornicker, Louis S., and Thomas M. Iliffe. Ostracoda (Halocypridina, Cladocopina) from Anchialine Caves in Jamaica, West Indies. *Smithsonian Contributions to Zoology*, number 530, 22 pages, 11 figures, 1 table, 1992.—Three new species, *Danielopolina elizabethae*, *Spelaeoecia jamaicensis*, and *Pontopolycope mylax*, of halocyprid Ostracoda (Halocypridina, Cladocopina) are described from seven anchialine caves on the island of Jamaica, West Indies. These are the first records of troglobitic halocyprid ostracodes in Jamaica. The bristles of the 7th and 8th joints of the first antennae of *Danielopolina*, *Spelaeoecia*, and *Deeveya*, all genera of Halocypridina reported from anchialine caves, are compared. Keys are presented to species of *Spelaeoecia* and *Danieloplina*.

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Contents

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Introduction

Jamaica, the third largest island in the Caribbean after Cuba and Hispaniola, is 243 km long by 85 km wide (Figure 1). Because about 2/3 of Jamaica is underlain by limestones, and rainfall averages over 180 cm per year, numerous caves are present (Fincham, 1977). Although the age of limestones in the interior of the island dates back to the Mesozoic, the coral reef limestone along the north coast where the caves in this report are situated are in the Falmouth formation that is only about 125,000 years old (Lynton S. Land, pers. comm.).

Halocyprid ostracodes were found only in caves situated in a relatively small area along the north coast of Jamaica just east of Discovery Bay (Figure 1). Caves in which extensive collections were made but no halocyprids found include Green Grotto, a tourist show cave located east of Discovery Bay and containing at least 5 large anchialine pools; Jacksons Bay Cave, an extensive anchialine cave on the south coast; and several small inland anchialine caves at Negril on the west coast. Surface salinities in each of these latter cave pools were significantly lower than in the caves containing halocyprids (2 ppt at Green Grotto, 6.5 ppt at Jacksons Bay Cave, and 1-4 ppt at the Negril caves). Of these, only pools in the Green Grotto were deep enough to pass through a halocline. Perhaps more extensive collections there may yield halocyprids. Myodocopid ostracodes (Sarsiellinae, Cylindroleberidinae) that were not studied herein were collected in Joseph's Caves (Westmoreland Parish), which are fully marine with a salinity of 35 ppt, and consist of a series of erosional sea caves located in coastal limestone cliffs about halfway between the town of Negril and the lighthouse at the western tip of Jamaica. (Salinity was measured with a refractometer against distilled water and sea water standards; values should be correct to at least ±1 ppt.)

The biology of Jamaican caves has been discussed by Peck (1975), and Stock (1983) has reported on hypogean amphipods of the genus *Metaniphargus* collected from groundwaters in the vicinity of Discovery Bay.

The new ostracode species of *Danielopolina* Kornicker and Sohn, 1976, brings to seven the known species of the genus: one from the deep sea (South Atlantic) and six from anchialine caves (Bahamas, Canary Islands, Cuba, Galapagos Islands, Jamaica, and Yucatan, Mexico); the new species of *Spelaeoecia* Angel and Iliffe, 1987, brings to five the known species of the genus, all from anchialine caves (Bahamas, Bermuda, and Jamaica); and the new species of *Pontopolycopa* Chavtur, 1981, brings to 4 the known species of the genus, and is the first recorded from an anchialine cave.

Of interest is that *Danielopolina elizabethae*, new species, and *Spelaeoecia jamaicensis*, new species, were collected in different caves (Figure 1, Table 1). In the Bahama Islands *Danielopolina* has been collected in a cave on Eleuthera Island and *Spelaeoecia* in caves on Grand Bahama Island, Long Island, and South Andros Island (Kornicker and Iliffe, 1989a:4; Kornicker et al., 1990:2). This suggests that the 2 genera may not occur together; however, only a few specimens of *Danielopolina* were collected in the Jamaican caves, and their apparent absence in caves having *Spelaeoecia* could be the result of sampling error. Most samples collected in this study included both substrate and water column, but 2 restricted to the water column (Sta 9-033, 9-036) contained *Danielopolina* and *Spelaeoecia* indicating that both species occupy a similar ecological niche; i.e., swimming in pools of coastal but hydrologically isolated anchialine caves of relatively high

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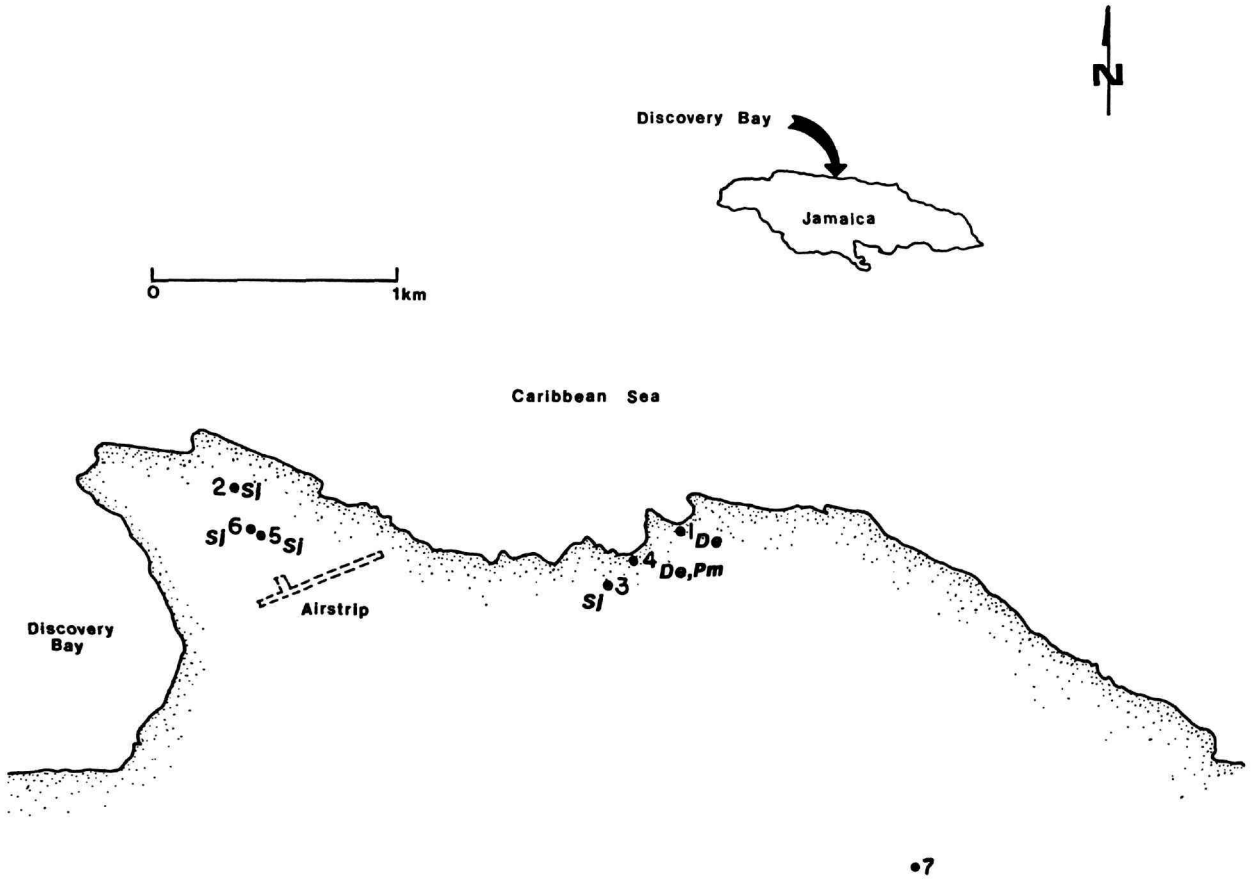


FIGURE 1.—Locations of anchialine caves containing halocyprid ostracodes near Discovery Bay, Jamaica (Green Grotto which did not yield halocyprids is also shown). Caves: 1 = East Bull Cave; 2 = Air Strip Cave #5; 3 = South Bull Cave; 4 = Dairy Bull Cave; 5 = Air Strip Cave #1; 6 = Air Strip Cave #2; 7 = Green Grotto. Species collected in caves: *De* = *Danielopolina elizabethae*; Pm = *Pontopolycope mylax*; Sj = *Spelaeoecia jamaicensis*.

TABLE 1.—Species occurrence in Jamaican caves arranged according to increasing surface salinities (ppt). Samples from Sta 90-033 and 90-036 are from water column, others are from both water column and substrate. *D. e.* = *Danielopolina elizabethae; P. m.* = *Pontopolycope mylax; S. j.* = *Spelaeoecia jamaicensis.*

Station	Cave	Depth (m)	Salinity	Species		
		(max., sampling)	surface/bottom*	D. e.	P. m.	S. j.
90-005	East Bull Cave	(2, 0–2)	14.5/14.5	X		
90-006	Dairy Bull Cave	(3–4, 0–2.5)	16.5/22.5		X	
90-033	Dairy Bull Cave	(3–4, 0–3)	16.5/22.5	X		
90-032	South Bull Cave	(3, 0–3)	18/22.5			X
90-035	Air Strip Cave #1	(5, 0–5)	25/29.5			X
90-036	Air Strip Cave #2	(5, 0–5)	25/28			X
90-010	Air Strip Cave #5	(3, 0–3)	26/29.5			X

*Bottom salinity is salinity at bottom where sample was collected.

salinity; whether they also may spend time on or in the substrate is not known with certainty. One species of *Danielopolina* has been collected in the deep sea, where it appears to be benthic. Two genera closely related to *Danielopolina* are *Thaumatoconcha* Kornicker and Sohn, 1976, and *Thaumatocypris* Müller, 1906; the former, which is cosmopolitan and has many species, is benthic at bathyal to abyssal depths, and the latter, which includes only 1 species, is pelagic at bathyal depths in the Indian Ocean and in the vicinity of Indonesia (Kornicker and Sohn, 1976:21).

DESCRIPTIONS OF CAVES.—Air Strip Caves #1, #2, and #5 are among a series of 5 fissures located on the east side of Discovery Bay along a foot path running from the terminal area of the Discovery Bay air strip to the coast. All these fissure caves extend parallel to the coastline and probably originated from tectonine movements along predominantly east-west trending faults. Fissures in the Galapagos Islands of similar nature, but situated in volcanic rocks and locally referred to as "grietas," contain troglobitic ostracodes including a species of *Danielopolina* (Kornicker and Iliffe, 1989c). The type locality for *Danielopolina orghidani* (Danielopol, 1972) is a Cuban "grieta," a karstic limestone fissure containing anchialine waters, and is similar to the Jamaican Air Strip Caves.

Air Strip Cave #1 is situated 450 m inland on the east side of the air strip trail (Figure 1). The cave consists of a 5 m deep open fissure, 15 m long and 1 m wide at water level. The pool, which extends along the length of the fissure, contains clear water up to 5 m deep. The bottom of the fissure is floored with breakdown covered by organic detritus consisting primarily of leaves and twigs. In addition to halocyprid ostracodes, copepods, tanaidaceans, podocopid ostracodes, and amphipods were collected in the pool.

Air Strip Cave #2 is situated 10 m northwest of Air Strip Cave #1 (Figure 1). A 1.5 m long by 0.5 m high opening under a ledge gives access to a downward sloping room 3 m in diameter. On the far side of this room a 4 m deep vertical fissure ends at a 4 m long by 60 cm wide and 5 m deep pool in total darkness. The pool contains clear water with a clean rocky bottom. In addition to halocyprid ostracodes the pool contained mysids, tanaidaceans, copepods, and shrimp.

Air Strip Cave #5 is located about 200 m inland on the east side of the air strip trail (Figure 1). A 3 m long by 3 m wide by 3 m deep anchialine pool extends in near total darkness along one side of a fissure partially filled with breakdown. Water in the pool was clear with a rock bottom. Copepods, mysids, tanaidaceans, and podocopid ostracodes were also collected from the pool.

Dairy Bull Cave is situated about 30 m inland from the coast and 200 m west of East Bull Cave (Figure 1). The cave is entered through a 10 m long, 2 m deep collapse sink (Figure 2). From the bottom of the sink an upward squeeze to the south leads to a 20 m diameter room with interconnected anchialine pools on three sides. By free diving through 2 underwater passages (sumps), each about 10 m in length, a series of other air rooms and pools can be reached. Small skylights, 50 cm or less in diameter, are present in each of these rooms and very old guano deposits cover the rocks in the largest chamber. A third sump continuing for at least 15 m extends from the last air room. Noticeable tidal currents were observed in several places in the cave but no sponges or other encrusting organisms were present. The water was very clear with sand or breakdown covering the floor of the pools. Maximum depths were between 3 and 4 m. In addition to halocyprid ostracodes, specimens collected include copepods, podocopid ostracodes, isopods, mites, shrimp, and gobiid fish. The fish were particularly abundant and appeared to constitute the largest animal biomass observed in the cave.

East Bull Cave is a mostly open limestone sinkhole located about 3 km east of Discovery Bay and 30 m inland from the sea on the west side of a dirt road ending at the coast (Figure 1). The sink contains a 2 m long by 1 m wide and 2 m deep anchialine pool partially extending under an overhanging ledge. The water is clear but floating debris and small pieces of wood cover the surface of one side of the pool. The bottom is floored with breakdown rubble and gravel. Also collected from this pool were copepods, isopods, amphipods, archiannelids, podocopid ostracodes, and mites.

South Bull Cave is located about 200 m inland in the area south of Dairy Bull Cave (Figure 1). The shallow sinkhole entrance to the cave is 10 m north of the road running parallel to the coast, opposite the newest and eastern-most house. A collapse chamber in the cave extends down to a 8 m long, 3 m wide anchialine pool. The coral bedrock in the cave is crumbly and contains many shallow-water fossils. A 3 m deep underwater passage connects with an isolated 4 m diameter "air bell pool" (water-filled cave except for an isolated pocket of air trapped below the ceiling). The water is very clear and only carbonate-derived sand sediments are on the bottom. In addition to the ostracode *Spelaeoecia jamaicensis*, a single specimen of a harpacticoid copepod was collected.

DISPOSITION OF SPECIMENS.—All specimens have been deposited in the National Museum of Natural History, Smithsonian Institution, and have been assigned USNM numbers.

ABBREVIATIONS.—In the figures, Arabic numerals indicate limbs 1-7, as well as individual joints of each limb (the location of the numeral indicating whether a limb or joint is indicated). Roman numerals I-III indicate the endites.

The following abbreviations are used in the illustrations and legends.

a.m.	central adductor muscle attachments
ant	antenna
B.O.	Bellonci organ
bas	basale
c.o.	copulatory organ
cox	coxale
end	endopodite
epip	epipodite
esop	esophagus

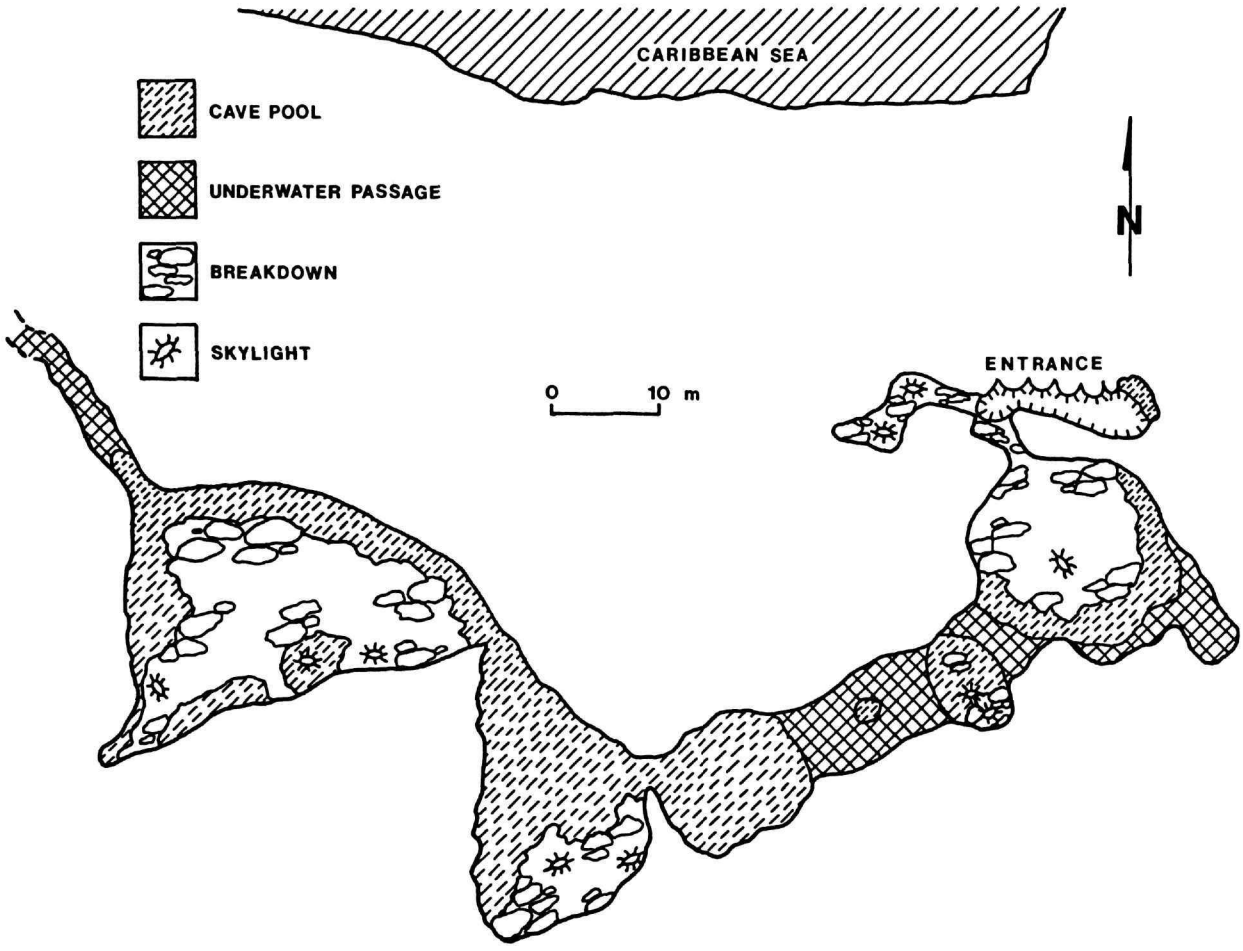


FIGURE 2.—Map of Dairy Bull Cave, Discovery Bay, Jamaica, shown in relation to coastline.

ex	exopodite
fu	furca
gl	gland
i.m.	inner margin of infold
junc	juncture
l	left
l.l.	lower lip
l.p.	lamellar prolongation of selvage
l.v.	left valve
lv	lateral view
md	mandible
mv	medial view
mx	maxilla
precox	precoxale
protop	protopodite
r	right
r.v.	right valve
ret	reticule
u.l.	upper lip

ACKNOWLEDGMENTS.—The specimens were collected by Thomas M. Iliffe and Serban Sarbu during the 1990 Jamaica Marine Cave Expedition. This research was supported by grants from the Explorers Club to Thomas Iliffe and Serban Sarbu, and from the Department of Biological Sciences, University of Cincinnati, to Serban Sarbu. Special appreciation is extended to Alan G. Fincham of the University of Southern California, Jeremy D. Woodley of the Discovery Bay Marine Laboratory, and David Lee of the Jamaica Police Department Forensic Division for providing logistical assistance and information on Jamaican caves. We thank Elizabeth Harrison-Nelson, Smithsonian Institution, for preparing the literature cited section, lettering figures, cataloging specimens, and preparing the final draft of the manuscript on a word processor. Sarbu and Iliffe surveyed Dairy Bull Cave; the map of the cave (Figure 2) was drafted by Sarbu and inked by Paul Gonzales. Penciled camera lucida taxonomic illustrations drawn by Kornicker were inked by Randy S. Moore, Texas A&M University at Galveston. The cave location map was prepared

by Iliffe from topographic maps supplied by Lynton S. Land, The University of Texas, Austin. This paper is a contribution of the Discovery Bay Marine Laboratory of the University of the West Indies.

Order HALOCYPRIDA Dana, 1853

Suborder HALOCYPRIDINA Dana, 1853

Comparison of 7th and 8th Joints of the 1st Antennae of *Spelaeoecia*, *Deeveya*, and *Danielopolina*

Spelaeoecia and *Deeveya* are known only from anchialine caves; *Danielopolina* is known both from anchialine caves and the deep sea (3459 m). The bristle terminology used here is that proposed for *Spelaeoecia* and *Deeveya* by Kornicker and Iliffe (1989a:1), which was modified slightly from that proposed for *Deeveya* by Kornicker and Palmer (1987:610) and for *Spelaeoecia* by Kornicker (1989:314). *Spelaeoecia* and *Deeveya* comprise the subfamily *Deeveyinae* in the Halocyprididae (superfamily Halocypridoidea), and have 3 bristles (a-, b-, and c-bristles) on the 7th joint and 4 bristles (d-, e-, f-, and g-bristles) on the 8th joint of the 1st antenna (Figure 3*a–e*). *Danielopolina* is in the Thaumatocyprididae (superfamily Thaumatocypridoidae), and has either 2 bristles (b- and c-bristles) (Figure 3*f,g*) or 3 bristles (a-, b-, and c-bristles) on the 7th joint (Figure 3h) and 3 bristles (d-, e-, and f-bristles) on the 8th joint (Figure 3*f–h*). Of the bristles of the 7th joint, the a-bristle is bristle-like and the b- and c-bristles filament-like. On *Deeveya* the d-bristle is lateral whereas on *Spelaeoecia* it is either medial or slightly medial relative to the e-bristle. The d-bristle is lateral on *Danielopolina* but is bristle-like, not filament-like as it is on both *Spelaeoecia* and *Deeveya*. The e-bristle is lateral and filament-like on all 3 genera and is stouter and longer than the other bristles of the 8th joint. The f-bristle is medial and filament-like on the 3 genera but is angled slightly ventrally only on *Spelaeoecia* and *Deeveya*. The g-bristle is absent on *Danielopolina*; the interpretation of the g-bristle rather than the f-bristle being absent is based on the distinctly medial position of the bristle. The g-bristle is filament-like and lateral to the f-bristle, and is either adjacent to, or slightly medial of, the e-bristle.

Superfamily HALOCYPRIDOIDEA Dana, 1853

Family HALOCYPRIDIDAE Dana, 1853

Subfamily DEEVEYINAE Kornicker and Iliffe, 1985

Spelaeoecia Angel and Iliffe, 1987

TYPE SPECIES.—*Spelaeoecia bermudensis* Angel and Iliffe, 1987.

COMPOSITION AND DISTRIBUTION.—The genus includes 5 species from anchialine caves: *S. bermudensis* Angel and Iliffe (Bermuda); *S. capax*, *S. sagax*, *S. styx* Kornicker (Bahamas); and *S. jamaicensis*, new species (Jamaica).

Revised Key to the Species of *Spelaeoecia*

1. Adult carapace longer than 2.25 mm . . . . . ***S. capax***
   Adult carapace shorter than 1.95 mm* 2
2. Posterodorsal gland of right valve on protuberance, carapace shorter than 1.10 mm . . . . . ***S. styx***
   Posterodorsal gland of right valve not on protuberance, adult carapace longer than 1.35 mm 3
3. 1st antenna with ventral bristle on 3rd joint, furcal claw 2 broken off near base . . . . . ***S. bermudensis***
   1st antenna without ventral bristle on 3rd joint, furcal claw 2 not broken off near base 4
4. 1st antenna with ventral bristle on 4th joint . . . . . ***S. jamaicensis***, new species
   1st antenna without ventral bristle on 4th joint . . . . . ***S. sagax***

*Length of adult *S. jamaicensis* estimated.

Spelaeoecia jamaicensis, new species

FIGURES 3*a*, 4–6

ETYMOLOGY.—From the island on which the species was collected.

MATERIAL.—Sta 90-010, Air Strip Cave #5, Discovery Bay (type locality): USNM 193961, 1 partly dissected A–1 or A–2 male on slide (right 1st antenna and maxilla) and in alcohol (holotype); USNM 193966, 1 undissected juvenile in alcohol. Sta 90-032, South Bull Cave, Discovery Bay: USNM 193964, 1 A–1 or A–2 female on slide and in alcohol; USNM 193965, 5 undissected juveniles in alcohol. Sta 90-035, Air Strip Cave #1, Discovery Bay: USNM 193967, 1 undissected juvenile in alcohol. Sta 90-036: Air Strip Cave #2, Discovery Bay: USNM 193968, 1 undissected juvenile in alcohol.

DESCRIPTION OF A–1 OR A–2 FEMALE (Figures 3*a*, 4,

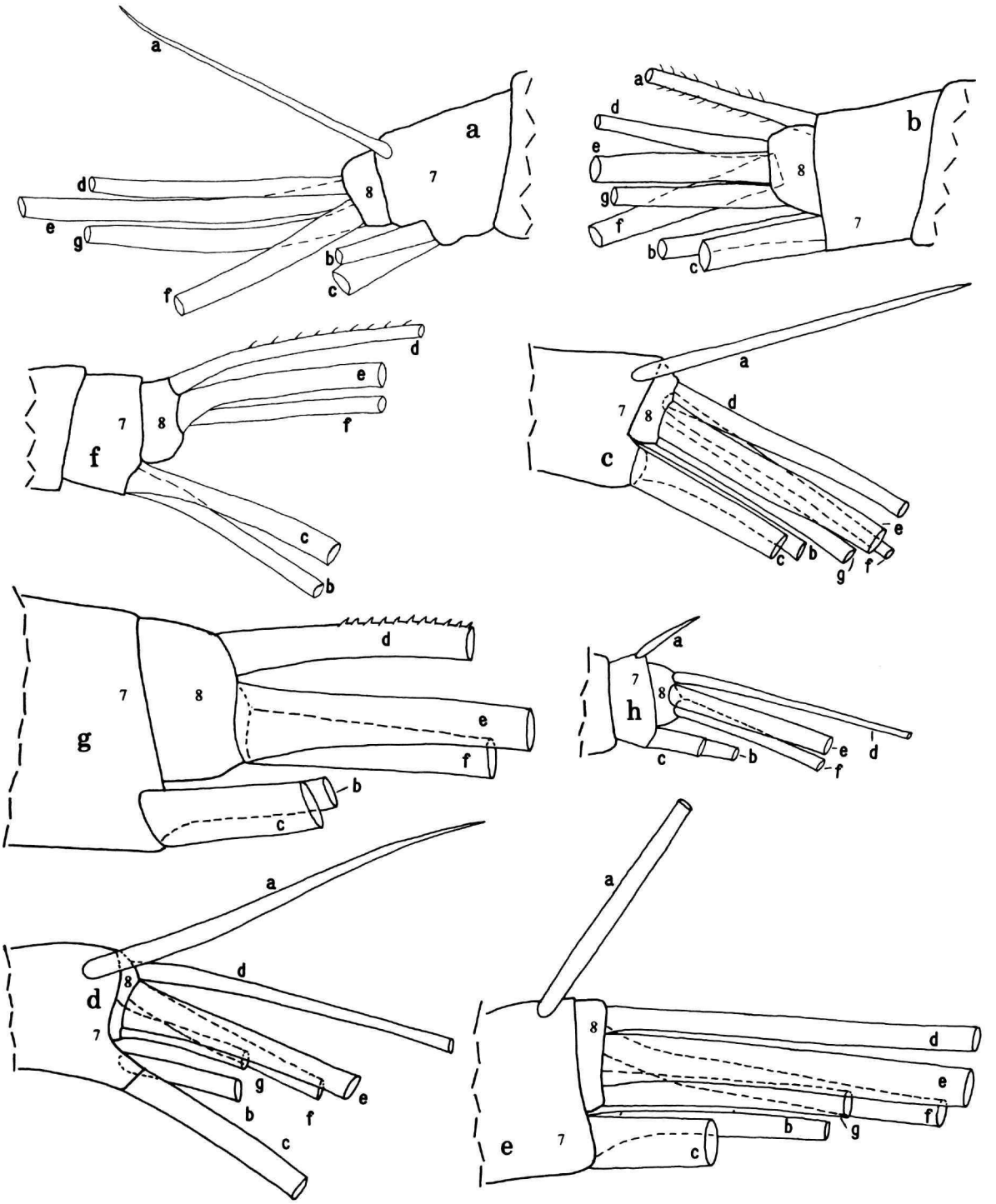


FIGURE 3.—Joints 7 and 8 of first antennae: *Spelaeoecia: a, S. jamaicensis*, new species, USNM 193964, paratype, A–1 or A–2 female, right limb, mv; *b, S. bermudensis* Angel and Iliffe, 1987, USNM 193483, adult male, left limb, lv. *Deeveya: c, D. jillae* Kornicker and Iliffe, 1989a, USNM 193298, holotype, A–1 male, right limb, lv; *d, D. spiralis* Kornicker and Iliffe, 1985, USNM 193117, holotype, adult female, right limb, lv; *e, D. bransoni* Kornicker and Palmer, 1987, USNM 193301, holotype, adult female, right limb, lv. *Danielopolina: f, D. elizabethae*, new species, USNM 193963, paratype, adult male, right limb, lv; *g, D. carolynae* Kornicker and Sohn, 1976, USNM 143789, holotype, adult female, right limb, lv; *h, D. bahamensis* Kornicker and Iliffe, 1989a, USNM 193285, holotype, adult male, right limb, lv. (For letters on bristles see text.)

5).—Carapace elongate with dorsal margin straight and ventral margin convex but fairly straight at midlength; ventral edge of rostrum at midheight and inner end slightly overlapping valve (Figure 4*a*). Anterior of rostrum viewed from inside with anterior edge broadly rounded (Figure 4*b*); anterior part of valve overreaching rostrum to form broadly rounded extension of rostrum; inner side of extended rostrum with small process (Figure 4*b*). Posterodorsal corner of right valve extends past posterodorsal corner of left valve (Figure 4*a*).

Ornamentation: Outer surface lineate (lineations oblique across rostrum, slightly curving and vertical in vicinity of midlength, and sinuate and vertical at posterior end (similar to that of A–1 or A–2 male illustrated in Figure 6*a–c*)). Posterodorsal corners of both left and right valves with minute digitations (Figure 4*c,d*). Surface with few long single bristles (1 shown in Figure 4*c*).

Infold: List forming sclerotized bar just posterior to posterior hinge juncture, then extending ventrally as narrow line intersecting posterior edge of valve at about midheight (Figure 4*c,d*); list not observed along ventral margin.

Glands (Figure 4*a,c,d*): Small gland in posterodorsal corner of right valve, and a smaller gland in same position on left valve.

Selvage: Narrow bare lamellar prolongation extends from point just ventral to incisur to posterodorsal corner; selvage terminates at ventral end of digitations of posterodorsal corner (Figure 4*d*).

Hingement: Each valve with narrow sclerotized bar along list posterior to posterior juncture of hinge (bars with closely spaced lines in Figure 4*c,d*). Edge of valve anterior to anterior juncture of hinge sclerotized (sclerotized area indicated with closely spaced lines in Figure 4*b*).

Central Adductor Muscle Attachments: Indistinct (location of attachments of A–1 or A–2 male illustrated in Figure 4*a*).

Carapace Size: USNM 193964, length 1.28 mm, height 0.64 mm.

First Antenna (Figures 3*a*, 4*e, f*): With 8 joints but 3rd and 4th joints partly fused (boundary indicated by ventral and dorsal indentations and discontinuity in sclerotization at ventral and dorsal margins). 1st joint with terminal ventral lobe with numerous short spines. 2nd joint short with well-defined dorsal bristle and distal medial spines (not shown). 3rd joint bare, longer than 4th. 4th joint with 2 bristles (1 ventral, 1 dorsal). 5th joint with long unringed ventral filament. 6th with dorsal edge shorter than ventral edge, bare. 7th joint with short ringed dorsal a-bristle (rings not shown), ventral b-bristle about 3/4 length of c-bristle, and long ventral c-bristle. 8th joint small with 4 terminal bristles (anterior medial d-bristle more than twice length of a-bristle; long lateral e-bristle about same length as c-bristle, stout with indistinct rings and widely spaced minute marginal spines (rings and spines not shown); medial f-bristle about half length of e-bristle and oriented obliquely ventrally; and g-bristle lateral to f-bristle and about same length).

Second Antenna (Figure 4*g,h*): Protopodite bare. Endopodite 3-jointed but 2nd and 3rd joints fused (Figure 4*g,h*): 1st joint with slender ringed spinous a- and b-bristles (rings not shown); 2nd joint with lateral f-bristle shorter and slenderer than medial g-bristle; g-bristle weakly ringed proximally (rings not shown); 3rd joint with filament-like h-, i-, and j-bristles, and minute medial pointed process adjacent to h-bristle (Figure 4*h*). Exopodite with 9 joints: 1st joint with short distal part with slender bristle (with ventral spines and dorsal natatory hairs) reaching well past 9th joint; bristle of 2nd joint much longer than bristle of 1st joint, with long slender ventral spines and dorsal natatory hairs; bristles of joints 3–8 with natatory hairs, no spines; 9th joint with 3 bristles (dorsal bristle short with minute spines; middle bristle about twice length of dorsal bristle, with minute spines; ventral bristle long, with dorsal spines and ventral natatory hairs); all long bristles with 2 long proximal segments followed by closely spaced rings.

Mandible (Figure 5*a–d*): Coxale endite with proximal and distal sets of teeth separated by gap (Figure 5*a–c*): proximal set comprising 4 broad cusps; surface between cusps with slender spines; 1 small indistinct spinous bristle at each end of set; 2 spinous bristles adjacent to smooth tooth in gap between proximal and distal sets; distal set of teeth comprising 2 flat teeth each with 7 or 8 cusps; 1 stout dentate process and 1 small spinous bristle proximal to flat teeth. Basale (Figure 5*a,d*): distal edge with 5 terminal triangular cusps and 1 smaller posterior cusp; lateral surface near distal edge with sharp tooth near midwidth; distal lateral side with 5 or 6 bristles (2 or 3 short, 3 long); anterior margin with 1 long distal bristle and 1 small bristle near insertion of endopodite (Figure 5*d*); posterior margin with 2 short distal bristles (distal of these tubular); proximal lateral surface near insertion of endopodite with 1 very long bristle; medial side near dorsal margin with 2 broad fragile bristles (Figure 5*a*) (these 2 bristles broke off both limbs during dissection of mandibles of USNM 193964, but are shown in Figure 5*a*). Endopodite with 3 joints (Figure 5*a*): 1st joint with 3 distal bristles (1 ventral, 1 dorsal, 1 lateral); 2nd joint broadening distally, with 4 terminal bristles (1 ventral, 3 dorsal); 3rd joint with 7 bristles (2 longest lateral, claw-like, with ventral spines, 1 slender ringed lateral, 4 slender ringed medial in row along terminal edge), and medial spines. A ganglion is attached to the posterior edge of the coxale at about midlength (Figure 5*a*).

Maxilla (Figure 5*e, f*): Endite I with 2 proximal and 11 terminal bristles (5 tubular); endite II with 2 proximal and about 11 terminal bristle (about 6 tubular); endite III with 1 proximal and 5 terminal bristles (2 tubular) (Figure 5*f*). Coxale with plumose dorsal bristle. Basale fused to 1st endopodial joint except for suture in sclerotized dorsal rim, with long plumose ventral bristle (Figure 5*e*). 1st endopodial joint with about 11 bristles. 2nd endopodial joint with 2 stout claw-like bristles and 5 slender ringed bristles (rings not shown). (Rings shown only on tubular bristles.)

Fifth Limb (Figure 5*g*): Epipodite with 15 long plumose bristles forming 3 groups (ventral group with 5, middle group with 6, dorsal group with 4). Protopodite with 2 ventral endites:

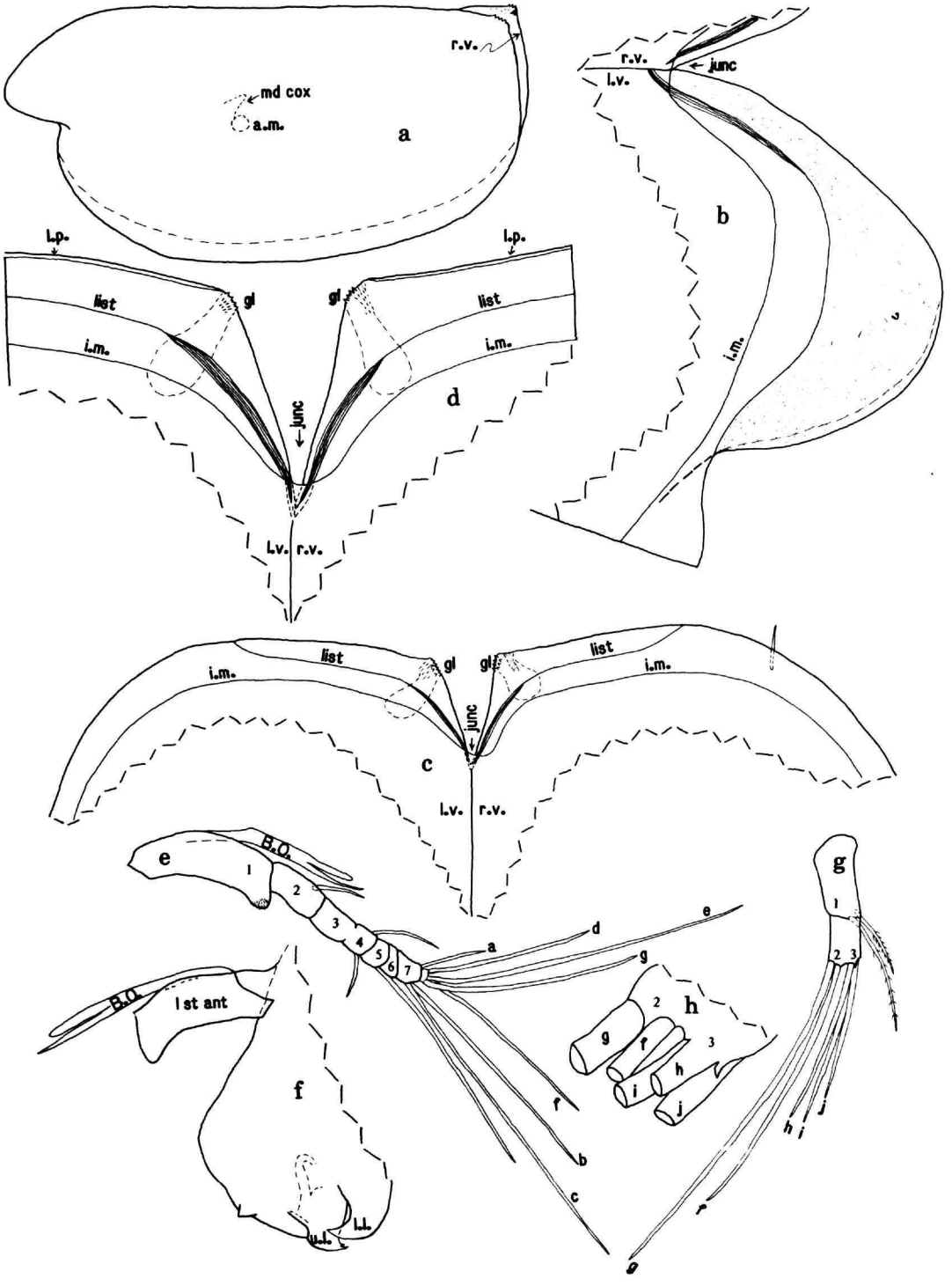


FIGURE 4.—*Spelaeoecia jamaicensis*, new species, USNM 193964, paratype, A–1 or A–2 female: *a*, complete specimen from left side (dashed line is ventral edge of right valve), length 1.28 mm; *b*, inside view of rostrum of left valve (note small process on rostrum near midwidth and midheight); *c*, inside view of posterior of carapace; *d*, detail from *c*; *e*, Bellonci organ and right 1st antenna, lv; *f*, anterior of body showing Bellonci organ, 1st joint of left 1st antenna, and upper and lower lips; *g*, endopodite of left 2nd antenna, mv; *h*, detail from *g*.

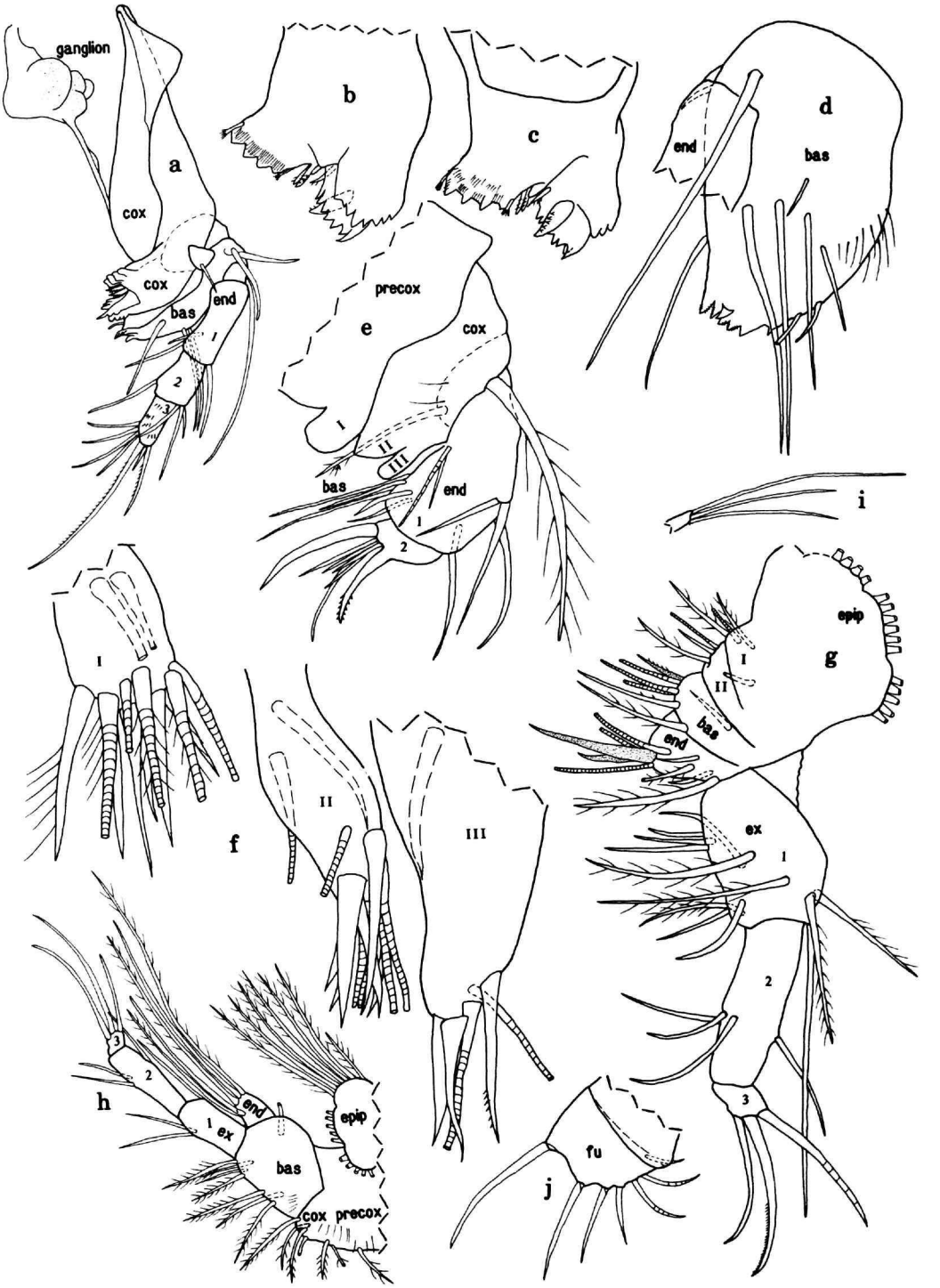


FIGURE 5.—*Spelaeoecia jamaicensis*, new species, USNM 193964, paratype, A–1 or A–2 female: *a*, left mandible, mv; *b*, distal end of coxale endite of right mandible, lv; *c*, distal end of coxale endite of left mandible, mv; *d*, basale of left mandible, lv; *e*, left maxilla, mv; *f*, endites of left maxilla, mv; *g*, right 5th limb, lv; *h*, left 6th limb, mv; *i*, left 7th limb, lv; *j*, left lamella of furca, lv.

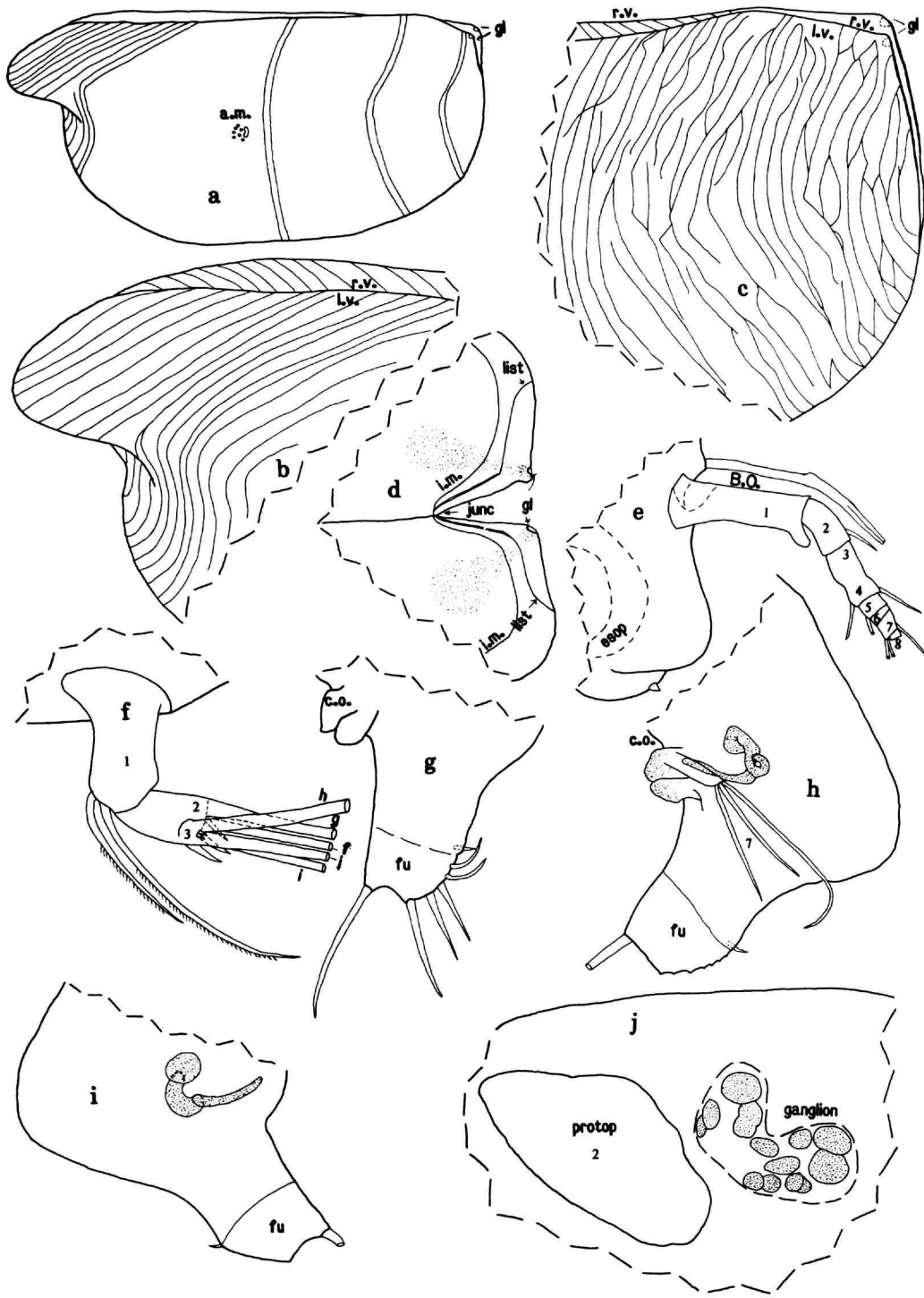


FIGURE 6.—*Spelaeoecia jamaicensis*, new species, USNM 193961, holotype, A–1 or A–2 male: *a*, complete specimen from left side (only representative lineations shown), length 1.16 mm; *b,c*, details from *a* showing surface lineations; *d*, inside view of posterior end of carapace with valves partly open; *e*, anterior of body from right side showing Bellonci organ, right 1st antenna (only proximal part of 4 bristles shown), and esophagus; *f*, endopodite of right 2nd antenna, mv; *g*, posterior of body from left side showing copulatory organ and left lamella of furca; *h*, posterior of body from left side showing 7th limb, copulatory organ and proximal organ (stippled), and left lamella of furca (only claw 1 shown); *i*, posterior of body from right side showing organ (stippled) proximal to copulatory organ (not shown) and right lamella of furca (only claw 1 shown); *j*, dorsal part of body near anterior end from left side showing protopodite of left 2nd antenna and ganglion (stippled).

endite I with 2 spinous bristles and 1 tubular bristle; endite II with 1 proximal medial bristle (could be on endite I) and 3 ventral bristles (incuding 1 tubular). Basale with 7 bristles (1 proximal medial, 1 plumose anterior lateral, and 5 ventral including 1 claw-like pectinate, and 3 tubular). Endopodite with 9 bristles (1 long plumose lateral anterior, 1 short bare medial near dorsal margin, 2 proximal lateral, and 5 on or near ventral margin (including 2 claw-like, and 3 tubular)). Exopodite: 1st joint not divided into broad proximal and narrower distal parts, with 12 bristles (3 distal dorsal (2 plumose, 1 very long slender), 2 plumose lateral near joint midheight, 1 medial just ventral to midheight, and 6 on or near ventral margin); 2nd joint with distal dorsal bristle and 3 distal bristles on or near ventral margin; 3rd joint with 2 stout claw-like bristles (dorsal with few indistinct distal rings; ventral stouter and slightly longer) and 1 slender ringed ventral bristle (rings not shown). (Rings shown only on tubular bristles; 2 claw-like bristles of endopodite stippled.)

Sixth Limb (Figure 5*h*): Epipodite with 17 plumose bristles forming 3 groups (ventral and middle group each with 5 long bristles; dorsal group with 6 long and 1 short (dorsal) bristles). Precoxale and coxale fused, with total of 7 ventral bristles. Basale with 8 bristles (1 distal medial near dorsal margin, 7 near ventral margin). Endopodite well developed, with 5 long bristles (3 plumose, 2 bare). Exopodite with 3 joints: 1st joint with 2 ventral bristles and 0 or 1 dorsal bristle; 2nd joint with 3 bristles (2 ventral, 1 dorsal); 3rd joint with 3 bristles (middle bristle claw-like).

Seventh Limb (Figure 5*i*): Elongate with 1 long and 2 shorter terminal bristles.

Furca (Figure 5*j*): Each lamella with 6 bare claws; 2 posterior claws weakly ringed distally; unpaired bristle ringed bare.

Bellonci Organ (Figure 4*e, f*): Bifurcate with tip of dorsal branch rounded, and longer ventral branch with drawn-out pointed tip.

Lips (Figure 4*f*): Tip of upper lip projecting posteriorly. Anterior face of upper lip with small spine at each side. Lower lip with triangular process at each side of mouth.

Genitalia: Indistinct structure anterior to furca of USNM 193964 could be incipient genitalia, but may not be.

Remarks: The A–1 or A–2 male described below has a fairly well-developed copulatory organ, absent on the specimen described above. The male has 6 furcal claws on each lamella, the same number that is on the specimen described above. This information formed the basis for interpreting the specimen described above to be a female at the same stage as the male. The development of the copulatory organ of the male indicates that it is not younger than an A–2 instar. It is not as well developed as that of an A–1 instar of *S. bermudensis* illustrated by Kornicker and Iliffe (1989b, fig. 29*j,q,r*).

DESCRIPTION OF A–1 OR A–2 MALE (Figure 6).—Carapace similar in shape to that of female described above (Figure 6*a–d*).

Ornamentation (Figure 6*a–c*): Similar to that of female.

Central Adductor Muscle Attachments: Indistinct (very approximate representation shown in Figure 6*a*).

Carapace Size: USNM 193961, length 1.16 mm, height 0.61 mm.

First Antenna (Figure 6*e*): Similar to that of female (bristles of joint 8 not shown).

Second Antenna: Protopodite and exopodite similar to that of female. Endopodite with 3 joints (Figure 6*f*): 1st joint with dorsal a- and b-bristles similar to those of female; 2nd joint with long f- and g-bristles and minute bristle lateral to f-bristle (minute bristle could be on 3rd joint); 3rd joint with suture separating it from 2nd joint extending part way across base on medial side; on lateral side distal edge of joint continues across 2nd joint (dashed line in Figure 6*f*); distal edge with h-, i-, and j-bristles similar to those on female plus 2 short lateral bristles.

Furca (Figure 6*g*): Similar to that of female.

Bellonci Organ (Figure 6*e*): Differs from that of female in both branches being same length; tip of upper branch appears more rounded than lower branch but not clearly resolved.

Copulatory Organ (Figure 6*h*): With 2 short lobes located slightly left of midwidth. 2 organs (1 on each side of body midwidth) extend toward copulatory organ (Figure 6*h,i*).

Ganglion (Figure 6*j*): A U-shaped ganglion with brown oval masses present in left and right sides of body just posterior to protopodite of 2nd antenna.

COMPARISONS.—The 1st antenna of *S. jamaicensis* bears a ventral bristle on the 4th joint; only *S. bermudensis* also bears a bristle in that position. The 6th limb of *S. jamaicensis* differs from that of *S. bermudensis* in having 5 rather than 4 bristles on the endopodite, and the furca differs in that the 2nd furcal claw is not broken off near its base. The carapace of *S. jamaicensis* differs from those of previously described species in having a posterodorsal gland on the left as well as the right valve (the gland of the left valve is smaller than that of the right and is indistinct on some specimens).

Superfamily THAUMATOCYPRIDOIDEA Müller, 1906

Family THAUMATOCYPRIDIDAE Müller, 1906

Danielopolina Kornicker and Sohn, 1976

TYPE SPECIES.—*Danielopolina carolynae* Kornicker and Sohn, 1976.

COMPOSITION AND DISTRIBUTION.—The genus includes 7 species: *D. carolynae* Kornicker and Sohn, 1976 (South Atlantic near the equator, 3459 m); *D. orghidani* (Danielopol, 1972) (saline grotto in Cuba); *D. wilkensi* Hartmann, 1985 (marine lava tunnel in the Canary Islands); *D. bahamensis* Kornicker and Iliffe, 1989a (anchialine cave in Eleuthera, Bahamas); *D. mexicana* Kornicker and Iliffe, 1989a (anchialine cave on the Yucatan Peninsula, Mexico); *D. styx* Kornicker and Iliffe, 1989c (anchialine pool in the Galapagos Islands); and *D. elizabethae* new species (anchialine cave in Jamaica).

CORRECTION.—Iliffe (1990:94) inadvertantly stated:

"Among the members of the Galapagos cave fauna are included the ostracod *Danielopolina* also with species in Cuba, the Bahamas, Puerto Rico, the Dominican Republic, and Bermuda...." The sentence should have been: "Among the members of the Galapagos cave fauna are included the ostracod *Danielopolina* also with species in Cuba, the Bahamas, and Yucatan; the shrimp *Typhlatya*, also from Yucatan, Cuba, the Bahamas, Puerto Rico, the Dominican Republic and Bermuda...." *Danielopolina* has not been reported from either Puerto Rico or the Dominican Republic.

Revised Key to the Species of *Danielopolina*

1. Carapace with surface spines . . . . . ***D. mexicana***
   Carapace with surface reticulations 2
2. Carapace with walls of reticulations formed of minute papillae 3
   Carapace with walls of reticulations formed by continuous or discontinuous ridges 5
3. Carapace longer than 1.5 mm . . . . . ***D. carolynae***
   Carapace shorter than 1.0 mm 4
4. Each valve with single posterodorsal process; each lamella of furca of adult with 2 articulated anterior claws and 3 short nonarticulated ventral claws . . . . . ***D. orghidani***
   Each valve without posterodorsal process; each lamella of furca of adult with 1 articulated anterior claw and more than 3 short nonarticulated ventral claws . . . . . ***D. styx***
5. Each lamella of furca of adult with 1 articulated anterior claw . . . . . ***D. elizabethae,*** new species
   Each lamella of furca of adult with 2 articulated anterior claws 6
6. Each lamella of furca of adult with 3 short nonarticulated ventral claws . . . . . ***D. bahamensis***
   Each lamella of furca of adult with 6 short nonarticulated ventral claws . . . . . ***D. wilkensi***

Danielopolina elizabethae, new species

FIGURES 3*f*, 7–9

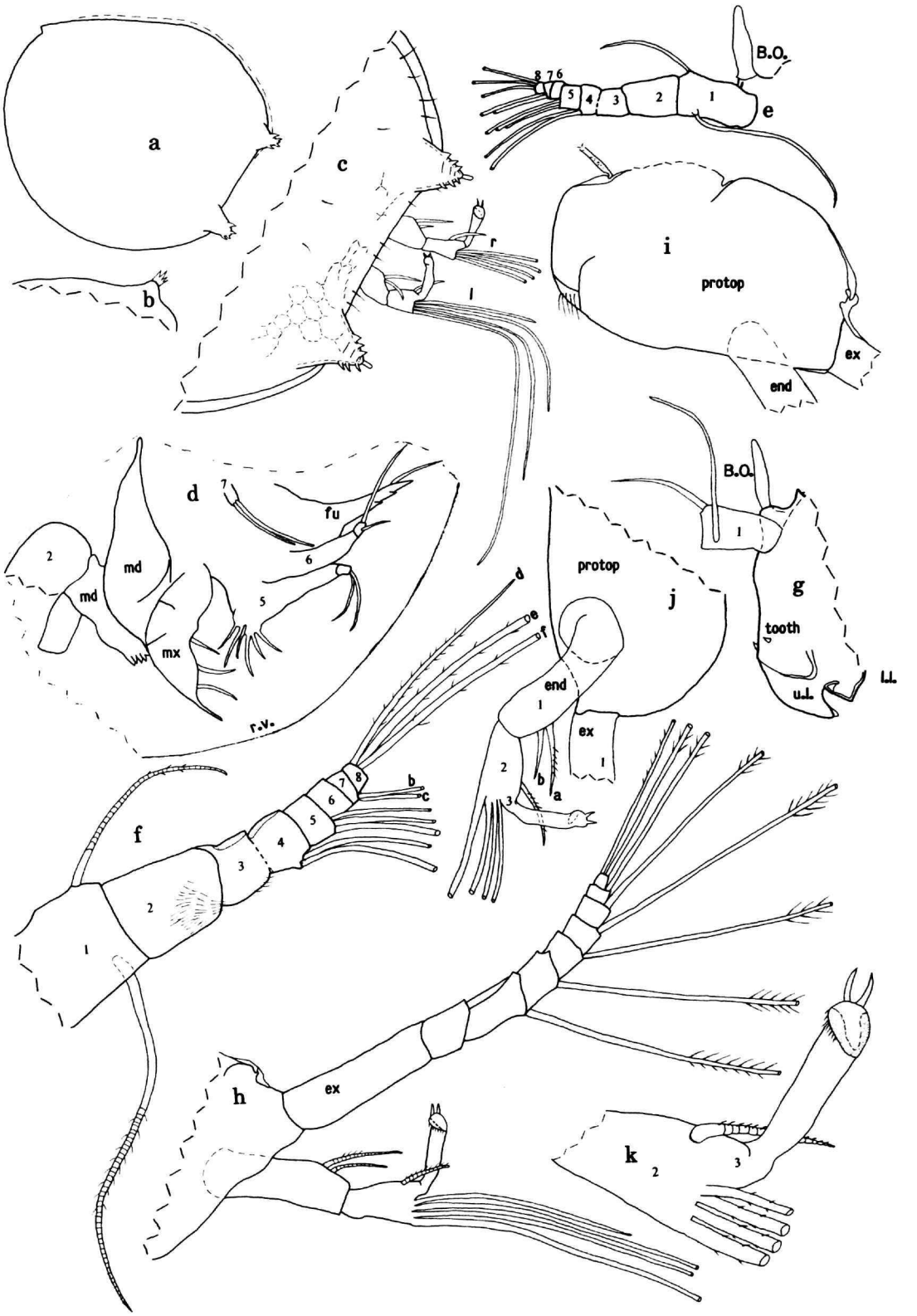
ETYMOLOGY.—Named for Elizabeth Harrison-Nelson who has assisted the senior author in the present contribution as well as in many others.

MATERIAL.—Sta 90-005, East Bull Cave, Discovery Bay: USNM 193963, 1 adult male on slide and in alcohol. Sta 90-033, Dairy Bull Cave, Discovery Bay (type locality): USNM 193962, 1 undissected late juvenile in alcohol (holotype).

DESCRIPTION OF ADULT MALE (Figures 3*f*, 7, 8).—Carapace subround in lateral view with straight dorsal margin in vicinity of hinge and also straight margin between anterior and anteroventral processes (Figure 7*a*); ventral and posterior margins as well as anterior margin dorsal to anterior process evenly rounded. Short anterior and anteroventral processes with bases just lateral to valve edge; each process bearing small cylindrical terminal process and fragile spine-bearing frill that easily breaks off at slight touch with dissecting needle leaving smaller firm triangular protuberance (Figure 7*c*); a similar posterodorsal process on each valve (Figure 7*b*). Outer surface with scattered slender undivided hairs more numerous near posterior margin (Figure 7*c*). Valve glands absent.

Ornamentation (Figure 7*c*): Surface finely reticulate with reticulation walls formed of discontinous ridges. (When shell is in orginal alcohol preservative reticulations are distinct, but when shell is placed in a drop of glycerin for 2 or 3 days (possibly fewer) the reticulations are no longer visible when viewed in either transmitted or reflected light, phase contrast optics, Normarski interference contrast optics, or dark field optics. Some of the reticulations reappear if the shell is stained with dilute silver nitrate, which also makes surface bristles more visible, but adversely appears to completely remove frills on processes.)

FIGURE 7.—*Danielopolina elizabethae*, new species, USNM 193963, paratype, adult male: *a*, complete specimen from right side, length including anterior process 0.70 mm; *b*, outside view of posterodorsal process of left valve (anterior of valve to left); *c*, detail from *a* showing some surface reticulations plus endopodites of 2nd antenna; *d*, view of body from left side showing location of some appendages (not all parts of limbs shown; curved line along bottom represents ventral edge of right valve); *e*, Bellonci organ and left 1st antenna (only proximal part of bristles shown), lv; *f*, left 1st antenna (sclerotized dorsal edges of joints 3 and 4 stippled), mv; *g*, anterior of body from left side showing Bellonci organ, joint 1 of left 1st antenna, and upper and lower lips; *h*, left 2nd antenna (only proximal part of long bristles shown), lv; *i*, protopodite and proximal ends of exopodite and endopodite of right 2nd antenna, lv; *j*, endopodite of left 2nd antenna (only proximal part of long bristles shown), mv; *k*, joints 2 and 3 of endopodite of right 2nd antenna (only proximal part of long bristles shown), lv.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Carapace Size: USNM 193963: length excluding anterior process 0.67 mm, length including anterior process 0.70 mm, height 0.61 mm.

First Antenna (Figures 3*f*, 7*e–g*): 1st joint with 2 bristles (1 very long ventral bristle ringed distally and with few indistinct marginal hairs, and 1 fairly long dorsal bristle with weak rings and few indistinct minute marginal hairs). 2nd joint with distal medial spines. 3rd joint with few indistinct distal ventral spines; joint distinctly separated from 4th joint on dorsal margin, less so on ventral margin, and with indistinct suture on medial and lateral surfaces. 4th joint with 2 unequal long bare filament-like ventral bristles. 5th joint with 3 long filament-like ventral bristles (1 lateral with 8 distal fairly long widely-separated marginal hairs (hairs not shown); 2 medial bristles shorter, slenderer, bare). 6th joint bare. 7th joint with 2 long filament-like ventral bristles (medial b-bristle and longer lateral c-bristle) with widely separated minute marginal spines (spines not shown), and without dorsal a-bristle. 8th joint with 3 bristles (filament-like ventral medial f-bristle with widely separated minute marginal spines; longer stouter filament-like ventral lateral e-bristle with widely separated minute spines, and 1 short dorsal d-bristle with small marginal spines; all bristles weakly ringed proximally (rings not shown)).

Second Antenna (Figure 7*c,d,h–k*): Protopodite with spines forming row at posteroventral corner (Figure 7*i*). Endopodite 3-jointed (Figure 7*c,h–k*): 1st joint with 2 ringed dorsal a- and b-bristles (a-bristle with indistinct marginal hairs); 2nd joint broadening distally, with 1 short spinous ringed dorsal bristle (with base on lateral side), and row of 4 filament-like terminal bristles near ventral margin (dorsal of these bristles shortest, ventral longest; all with widely separated minute marginal spines (not shown on all illustrations)); 3rd joint small with long terminal process with knob at tip with 2 small terminal unringed bristles (stippled area in Figure 7*k* indicates sclerotization); proximal edge of knob with row of minute teeth (Figure 7*h,k*). Exopodite 8 jointed (Figure 7*h*): 1st joint divided weakly into long proximal and short distal parts; bristle of joint 2 with slender ventral spines and dorsal natatory hairs; bristles of joints 3–7 with only natatory hairs (distal hairs longer; ventral hairs on bristles of joints 5–7 stouter and longer than dorsal hairs); 8th joint with 2 bristles (ventral long with long ventral hairs and shorter slenderer dorsal hairs; dorsal shorter with small slender dorsal spines, no natatory hairs).

Mandible (Figures 7*d*, 8*a–e*): Coxale endite with proximal and distal sets of teeth separated by space; proximal set comprising 4 broad cusps plus triangular tooth close to distal set of teeth (Figure 8*b,c*); surface between cusps and medial and lateral surfaces just proximal to cusps with slender spines; 1 or 2 spinous bristles with bases just proximal and another bristle just distal to triangular tooth; distal set of teeth consisting of 2 flat teeth, each having 5 or 6 cusps (Figure 8*b–e*); 1 slender spinous bristle with base proximal to distal set of teeth (Figure 8*b*). Basale (Figure 8*a*): tooth of endite with 5 triangular cusps (anterior 4 with marginal teeth); posterior edge of endite spinous, with 2 short ringed distal bristles (distal of these tubular); anterior margin of endite with 1 long ringed bristle near midlength; lateral side of endite with spines near posterior edge and 5 ringed bristles (4 long, 1 short) near midlength and 1 short ringed distal bristle with bare spine at tip; medial side of endite with long spines near posterior edge, row of long spines near midlength, and 2 rows of shorter distal spines; medial side of basale near dorsal margin with 2 long ringed bristles (ventral of these on small mound bearing long spines). Endopodite 3-jointed (Figure 8*a*): 1st joint with medial and lateral spines and 1 ringed dorsal bristle at midlength; 2nd joint spinous, with 1 ringed terminal ventral bristle, 2 ringed medial bristles near ventral margin, and 2 ringed dorsal bristles; 3rd joint with dorsal and medial spines, 2 terminal lateral bristles (1 at midwidth about twice length of endopodite, with distal spines; 1 at ventral edge about half length of bristle at midwidth, with distal spines (longest spines at midlength)), 3 shorter ringed terminal medial bristles, and 1 ringed bristle on ventral margin. (Rings not shown on most bristles of illustrated limb.)

Maxilla (Figures 7*d*, 8*g,h*): Endite I with 10 bristles (4 tubular); endite II with 6 bristles (3 tubular); endite III with 5 bristles (2 tubular) (Figure 8*h*). Coxale with long stout plumose dorsal bristle. Basale with 2 long bristles (1 proximal ventral near base of endite III, plumose; 1 on terminal edge, tubular) (Figure 8*g*). Endopodite (Figure 8*g*): 1st joint with 3 long ringed distal anterior (dorsal) bristles, 1 long distal ringed lateral bristle, and 2 ringed posterior (ventral) bristles (shorter tubular); 2nd joint spinous, with 1 anterior stout straight nonarticulated terminal claw with minute marginal teeth, and 4 slender ringed bristles (ventral of these stouter, with marginal spines). (Only tubular bristles shown with rings in illustrations; some bristles with minute papilla at tip (papillae not shown).)

Fifth Limb (Figures 7*d*, 8*i*): Epipodite (not shown) with plumose bristles forming 3 groups: proximal dorsal group and middle group each with 4 bristles; distal ventral group with 3. Protopodite with 5 bristles (1 tubular). Basale with 6 bristles (1 short stout, 1 short slender medial proximal, 2 long plumose lateral, 2 tubular). Endopodite with 6 bristles (1 small medial tubular, 2 stout ventral claw-like, 1 long ventral tubular, 2 long plumose anterior). Exopodite 3-jointed: 1st joint with 7 bristles on or near ventral margin and 1 long terminal dorsal bristle; 2nd joint with 2 ventral bristles at midlength; 3rd joint with 3 bristles (middle bristle 59%–62% and smallest bristle 35%–37% length of longest bristle). (Only tubular bristles shown with rings in illustration.) (Terminology of joints adapted from that used by Kornicker et al. (1990, fig. 19*a*) for *Deeveya styrax*.)

Sixth Limb (Figures 7*d*, 8*j,k*): Epipodite with plumose bristles forming 3 groups (Figure 8*k*): proximal dorsal group with 4 or 5 bristles, middle group with 4, distal ventral group with 5. Precoxale with 3 plumose bristles (Figure 8*j*). Coxale with 2 plumose bristles. Basale with 2 long bristles (1 bare, 1 plumose). Small endopodite with 2 long plumose bristles. Exopodite: 1st and 2nd joints fused, with 2 bare bristles at

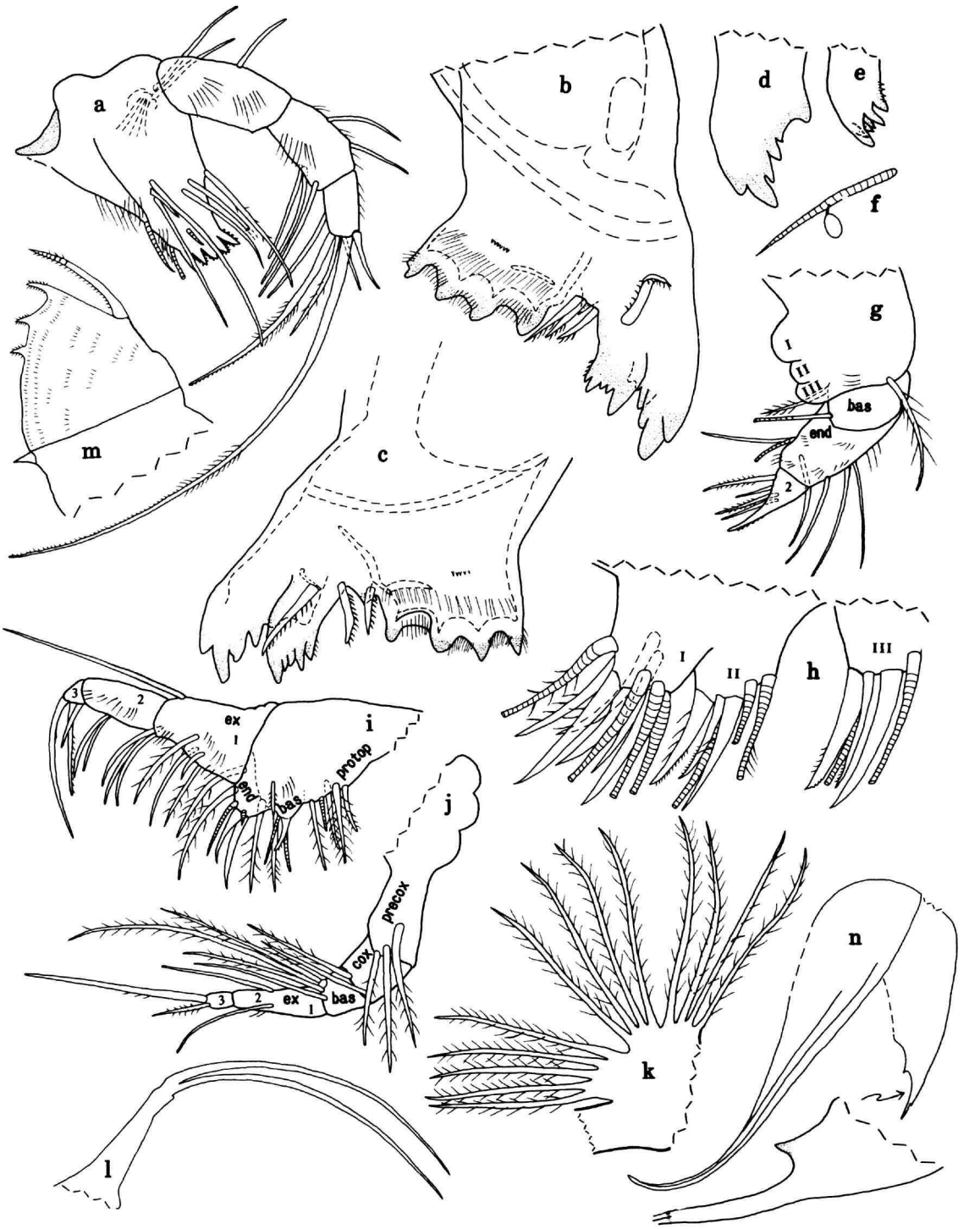

FIGURE 8.—*Danielopolina elizabethae*, new species, USNM 193963, paratype, adult male: *a*, basale and endopodite of right mandible, lv; *b,c*, distal end of coxale endite of right and left mandibles, respectively, posterior view; *d,e*, distal teeth of coxale endite of left mandible, from *c*; *f*, terminal bristle of 2nd endopodial joint of right maxilla showing attached protistan or foreign egg sac; *g*, left maxilla (endite bristles not shown), mv; *h*, endites of left maxilla, mv; *i*, right 5th limb (epipodite not shown), mv; *j*, left 6th limb (epipodial bristles not shown), mv; *k*, epipodite of right 6th limb (distal bristles towards left), mv; *l*, 7th limb; *m*, left lamella of furca, lv; *n*, copulatory limb, anterior to left.

midlength; 3rd joint with 2 bristles (shorter 34%–37% of longer bristle).

Seventh Limb (Figures 7*d*, 8*l*): Elongate with 2 long bare terminal bristles.

Furca (Figures 7*d*, 8*m*): Each lamella with 1 long anterior articulated claw (with spines along concave margin, few distal spines on convex margin, and weakly ringed distally) and 3 short ventral nonarticulated claws with spines along anterior and posterior edges; each lamella with medial and lateral spines (not all shown). Stout unpaired process on posterior of body just proximal to lamellae.

Bellonci Organ (Figure 7*g*,*e*): Diaphanous, elongate, with rounded tip. (Because of being diaphanous this organ easily could be overlooked; organ is now attached to mounted right 1st antenna of USNM 193963.)

Lips (Figure 7*g*): Each side of tip of upper lip with a small process oriented posteriorly; anterior face of lip with minute spine on each side pointing anteriorly. Lower lip a triangular process at each side of mouth.

Copulatory Organ (Figure 8*n*): Anterior part with long recurved process tapering to narrow tip; posterior styliform process with small tooth on anterior edge proximal to tip; tip diaphanous and morphology not resolved because of debris on mounted organ of USNM 193963.

Epizoa: USNM 193963 with stemmed oval protistan, or egg sac, attached to bristle of maxilla (Figure 8*f*) and between claws of furcal lamella (the stem longer on ovals attached to furca).

Gut Content: Brown unidentified particles.

DESCRIPTION OF JUVENILE (sex undetermined) (Figure 9).—Carapace similar to that of adult male but smaller (Figure 9*a*).

Carapace Size: USNM 193962, length excluding anterior process 0.46 mm, length including anterior process 0.50 mm, height 0.39 mm.

Furca (Figure 9*b*): Each lamella with 1 long anterior claw and 2 short nonarticulated claws followed by minute triangular node (incipient claw). Stout unpaired process on posterior of body just proximal to lamellae.

COMPARISONS.—Only *D. elizabethae* and *D. styx* have 1 nonarticulated anterior claw on each lamella of the furca; other known species have 2. The carapace of *D. elizabethae* differs from that of *D. styx* in having surface reticulations formed of discontinuous ridges rather than rows of pustules, and in having a posterodorsal process on each valve absent on *D. styx*. Each lamella of the furca of the adult *D. elizabethae* has 3 nonarticulated ventral claws compared to more than 3 on *D. styx*. The 1st antenna of *D. styx* bears a dorsal bristle (a-bristle) on the 7th joint absent on *D. elizabethae*. The adult male is known for only *D. bahamensis* and *D. elizabethae:* the 3rd joint of the endopodite (clasper) of the 2nd antenna of *D. elizabethae* bears 2 small terminal bristles absent on *D. bahamensis*. *Danielopolina elizabethae* bears a Bellonci organ similar to that of *D. mexicana*; the furca of the latter species has 2 articulated anterior claws and more than 3 nonarticulated ventral claws on each lamella.

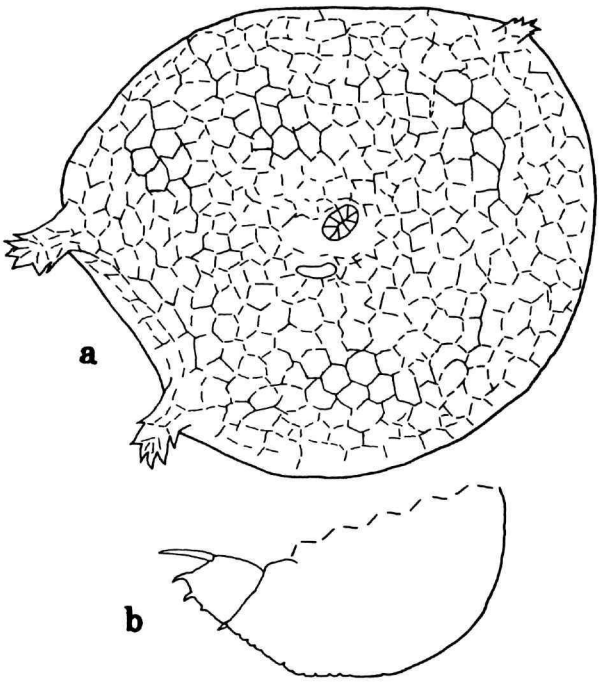

FIGURE 9.—*Danielopolina elizabethae*, new species, USNM 193962, holotype, late juvenile (sex undetermined): *a*, complete specimen from left side, length including anterior process 0.50 mm; *b*, posterior of body showing left lamella of furca.

Suborder CLADOCOPINA Sars, 1866

Superfamily POLYCOPOIDEA Sars, 1866

Family POLYCOPIDAE Sars, 1866

Subfamily POLYCOPINAE Sars, 1866

COMPOSITION AND DISTRIBUTION.—The Polycopinae include 14 living cosmopolitan marine genera of which 2 (*Micropolycope* Chavtur, 1979, and *Polycopissa* Chavtur, 1979) have representatives in Bermudan caves (Kornicker and Iliffe, 1989b). *Pontopolycope* Chavtur, 1981, previously known only from open seas, is recorded in a Jamaican cave herein.

Pontopolycope Chavtur, 1981

TYPE SPECIES.—*Polycope rostrata* Müller, 1894.

COMPOSITION AND DISTRIBUTION.—Chavtur (1981:58) referred 3 species to this genus: *P. rostrata* (Müller, 1894) (Bay of Naples); *P. dentata* (Müller, 1894) (Bay of Naples); and *P. moenia* (Joy and Clark, 1977) (Canadian Basin, Artic Ocean).

A new species from Jamaica described here is the first report of the genus from an anchialine cave.

Pontopolycope mylax, new species

FIGURES 10, 11

ETYMOLOGY.—From the Latin *mylax* (millstone).

MATERIAL.—Sta 90-006, Dairy Bull Cave, Discovery Bay (type locality): USNM 193971, USNM 193972, 2 adult females, each with appendages on slide and shell remnants in alcohol; USNM 193973, 1 adult male with appendages on slide and shell in alcohol; USNM 193974, 1 undissected adult female in alcohol (holotype); USNM 193975, 46 undissected adults and juveniles in alcohol.

TERMINOLOGY OF APPENDAGES.—To conform to terminology of the 1st antenna proposed by Kornicker and Iliffe (1989b:50) the 1st antenna of *P. mylax* is interpreted to have 8 joints, but joints 1-5 are either fused or partly fused, and joints 7 and 8 are fused.

DESCRIPTION OF ADULT MALE (Figures 10, 11).—Carapace oval in lateral view with anterior concavity just ventral to rostrum (Figure 10*a,b*). Triangular rostrum lateral to shell edge. Outer surface reticulate (only 1 reticulation shown in Figure 10*a*) similar to that of female (Figure 11*a*). Surface within reticule with pebbly texture (Figure 10*a*). Straight posterodorsal hinge indented (Figure 10*b*). Selvage with broad serrated lamellar prolongation along outer edge except at hinge (not shown). (After being in glycerine for a week the surface reticulations as well as the rostrum are less visible.)

Central Adductor Muscle Attachments (Figure 10*a*): Comprising 3 individual scars at contact surface of muscles with shell, but just medial to contact surface (towards midline of body) each muscle subdivides into additional bundles (not shown).

Carapace Size: USNM 193973, length including rostrum 0.24 mm, length excluding rostrum 0.22 mm, height 0.20 mm.

First Antenna (Figure 10*c*): Joints 1-5 with dorsal spines. Joints 1 and 2 mostly fused but partly separated by sinuous margins of 2 lobes; joint 2 with terminal dorsal bristle; indistinct weak suture partly separating 2nd and 3rd joints. Joints 3 and 4 without bristles. Joint 5 with indistinct short ventral bristle. Joint 6 broadening distally, with 3 ventral bristles (2 well-defined, 1 shorter indistinct) and 1 short dorsal bristle. 7th and 8th joints fused with total of 4 bristles (ventral $^2/_3$ length and dorsal $^1/_4$ length of 2 long bristles).

Second Antenna: Protopodite bare (Figure 10*d*). Exopodite with 9 joints: joints 1-8 each with long bristle with natatory hairs; joint 9 with 2 bristles (ventral short). Endopodite 3-jointed (Figure 10*e*): 1st joint with short cylindrical terminal lateral process (stippled); 2nd joint short with small indistinct dorsal bristle, small rounded sclerotized dorsal process, and 5 long terminal bristles; 3rd joint short with 4 long bristles.

Mandible (Figure 10*f*): Coxale endite elongate with serated tip. Basale with 3 or 4 long spinous bristles on or near ventral margin. Exopodite broadening distally, with 1 or 2 indistinct terminal processes difficult to clearly resolve. Endopodite 2-jointed: 1st joint with 3 spinous ventral bristles and 2 spinous distal dorsal bristles; 2nd joint with 2 spinous terminal bristles (dorsal stouter, somewhat claw-like).

Maxilla (Figure 10*g*): Precoxale and coxale well defined. Endite of precoxale with about 7 or 8 spinous bristles. Coxale with 2 endites with total of about 6 bristles. Basale: ventral margin with 2 spinous distal bristles; dorsal margin with proximal hump with internal muscles (not shown) extending into exopodite. Exopodite undivided, with 8 long terminal bristles. Endopodite 3-jointed: 1st joint with 1 spinous ventral bristle at midlength; 2nd joint with 4 or 5 spinous bristles (2 or 3 ventral, 2 dorsal); 3rd joint with 4 terminal bristles. (Spines not shown on all bristles.)

Fifth Limb (Figure 10*h*): Epipodite with about 10 plumose bristles. Coxale with 2 dorsal bristles. Basale, exopodite, and endopodite fused, with total of about 8 bristles. (Spines not shown on all bristles.)

Furca (Figure 10*i,j*): Each lamella with 7 articulated claws with slender spines along posterior edge. Small nonarticulated process between adjacent claws except for claws 6 and 7. Single nonarticulated pointed process anterior to claw 1 of each lamella. Unpaired pointed process on body proximal to posterior claw. Anterior margin of left lamella with cluster of stout proximal spines (Figure 10*j*).

Bellonci Organ (Figure 10*d,k*): 2 plumose slender bristles.

Upper Lip (Figure 10*k*): Helmet shaped.

Copulatory Organ (Figure 10*i,l,m*): About same size as furcal lamella (Figure 10*i*). With hirsute lobe adjacent to divided sclerotized toothed lobe (1 part with 3 teeth, other with 7 (detail in Figure 10*m*)).

Posterior of Body: With few segments dorsal to furca (Figure 10*i*).

DESCRIPTION OF ADULT FEMALE (Figure 11).—Carapace similar to that of adult male (Figure 11*a,b,f*). (Pebbly surface within reticules not shown in Figure 11*a*; reticules not shown in Figure 11*f*.)

Carapace Size: USNM 193972, length including rostrum 0.26 mm, length excluding rostrum 0.23 mm, height 0.21 mm; USNM 193971, length including rostrum 0.26 mm, length excluding rostrum 0.24 mm, height 0.21 mm.

First Antenna (Figure 11*c,g*): Joints 1-5 similar to those of adult male. Joint 6 without bristles. Joints 7 and 8 fused, with total of 5 bristles (2 long, 1 medium (anterior) and 2 short).

Second Antenna: Protopodite and exopodite similar to those of adult male (Figure 11*c*). Endopodite (Figure 11*h*): 1st joint bare; 2nd joint with 6 bristles (1 short dorsal, 5 long terminal and ventral); 3rd joint with 4 long bristles.

Mandible (Figure 11*c,d,e,i*): Basale with 4 ventral bristles and exopodite with only 1 cylindrical terminal process (Figure

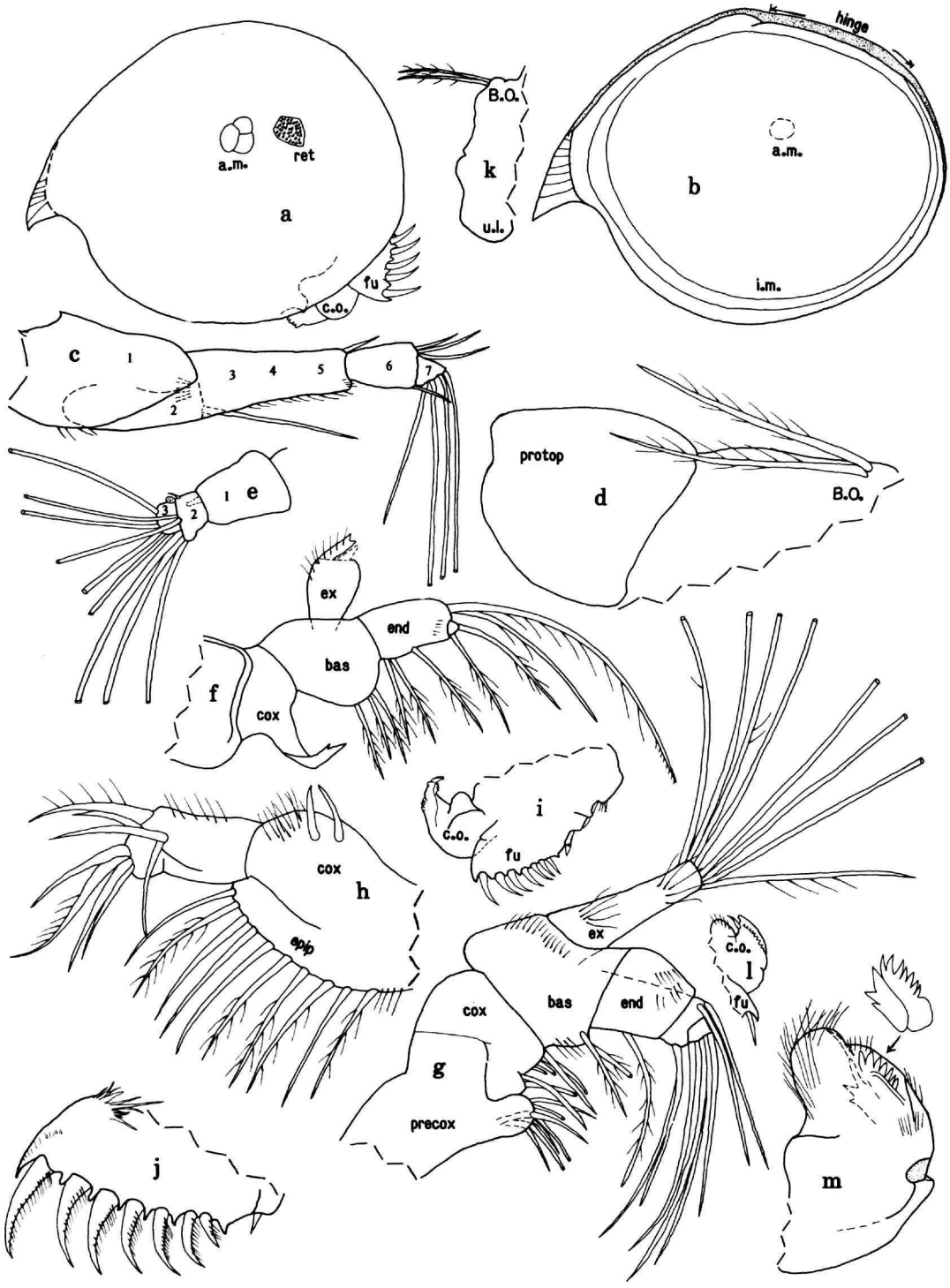

FIGURE 10.—*Pontopolycope mylax*, new species, USNM 193973, paratype, adult male: *a*, complete specimen from left side, carapace length including rostrum 0.24 mm; *b*, inside view of right valve; *c*, left 1st antenna (only proximal part of long bristles shown; limb mounted with ventral margin at top), lv; *d*, Bellonci organ and protopodite of left 2nd antenna, lv; *e*, endopodite of right 2nd antenna (only proximal part of long bristles shown), mv; *f*, left mandible, mv; *g*, left maxilla (only proximal part of long bristles shown), mv; *h*, 5th limb; *i*, posterior of body from left side showing copulatory organ and left lamella of furca (see *j* for cluster of spines on anterior margin of lamella); *j*, left lamella of furca, lv; *k*, anterior of body from left side showing Bellonci organ and outline of upper lip; *l*, copulatory organ from right side and right lamella of furca (only claw 1 shown); *m*, detail of copulatory organ from right side, from *l*.

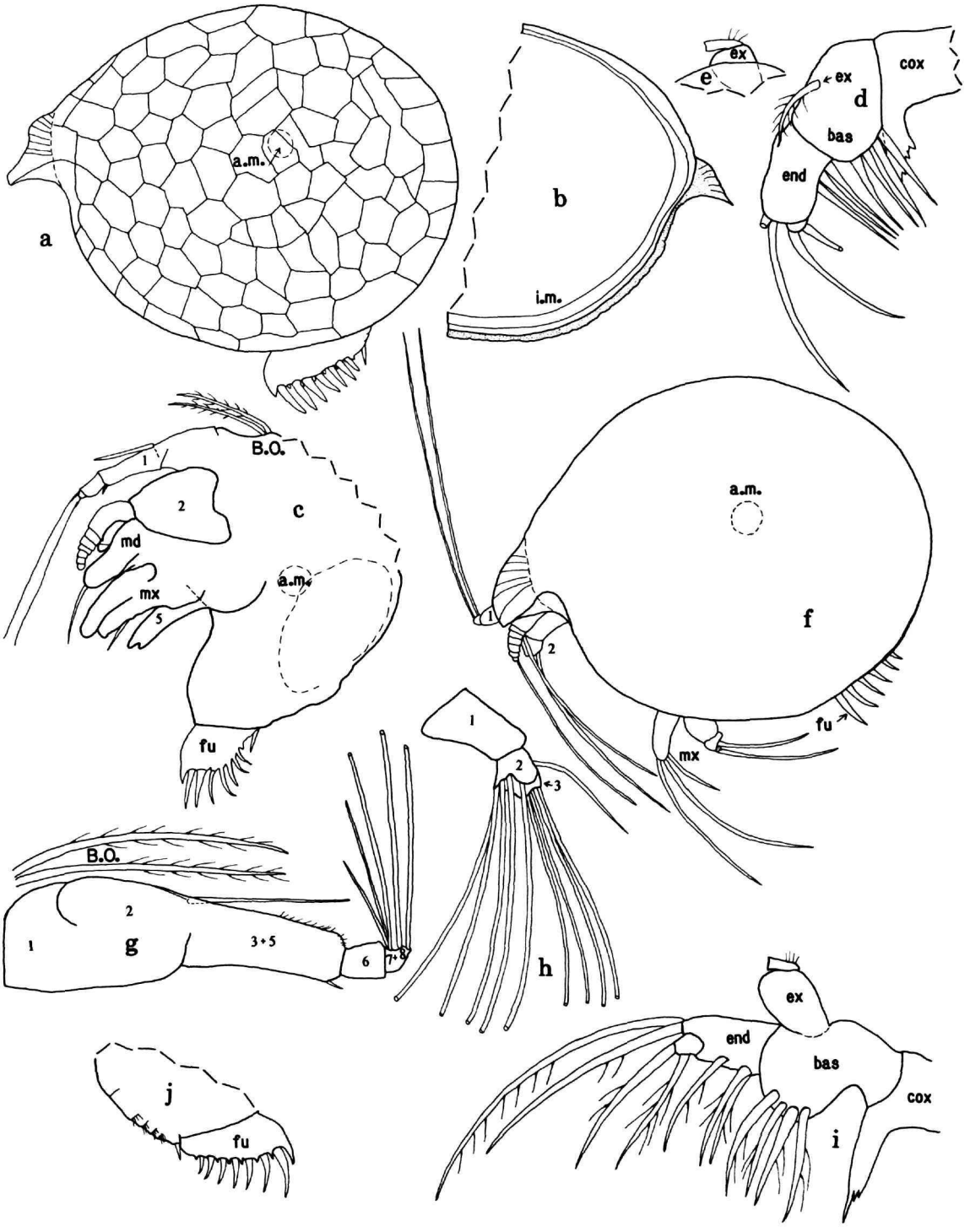

FIGURE 11.—*Pontopolycope mylax*, new species, USNM 193971, paratype, adult female: *a*, complete specimen from left side, carapace length including rostrum 0.26 mm; *b*, inside of anterior of left valve (part outside of selvage stippled); *c*, body from left side showing location of appendages (not all parts of limbs shown); *d*, left mandible, lv; *e*, exopodite of right mandible, mv. USNM 193972, paratype, adult female: *f*, complete specimen from left side (surface reticulations not shown; not all bristles shown on projecting limbs), carapace length including rostrum 0.26 mm; *g*, bristles of Bellonci organ and right 1st antenna, lv; *h*, endopodite of left 2nd antenna (only proximal part shown of long bristles), mv; *i*, left mandible (not all spines shown on bristles), lv; *j*, posterior of body from right side showing right lamella of furca.

11*e,i*), otherwise similar to that of adult male. Left limb of USNM 193971 aberrant in having spinous bristle in place of exopodite (Figure 11*d*).

Maxilla (Figure 11*c*): Similar to that of adult male.

Fifth Limb (Figure 11*c*): Obscured but in general similar to that of adult male.

Furca (Figure 11*c,j*): Similar to that of adult male, except anterior margin of left lamella bare, not with cluster of stout proximal spines present on male.

Eggs: USNM 193971 with unextruded mass of minute amber-colored globules in posterior part of body that may be related to egg formation (dashed oval in Figure 11*c*).

COMPARISONS.—*Pontopolycope moenia* is known only from its shell, which is more elongate than that of *P. mylax*. The shell of *P. dentata* is punctate, not reticulate like that of *P. mylax*, and the rostrum is narrower (tooth-like). The shell of *P. rostrata* has lateral and marginal spines not present on *P. mylax*.

Appendix

Station Data with Specimens Examined

(in chronological order)

Sta 90-005, 11 Jun 1990, East Bull Cave, Discovery Bay, St. Ann Parish; salinity 14.5 ppt (surface and bottom); collected with a 93 μm mesh plankton net from the water column and gravel bottom in 0–2 m depths.

Danielopolina elizabethae: 1 adult male, USNM 193963.

Sta 90-006, 11 Jun 1990, Dairy Bull Cave, Discovery Bay, St. Ann Parish; salinity 16.5 (surface)–22.5 (bottom) ppt, collected with a 93 μm mesh plankton net from the water column and gravel and sand bottom of the pool extending around the perimeter of the first room in 0–2.5 m depths.

Pontopolycope mylax: 3 adult females, USNM 193971, 193972, 193974; 1 adult male, USNM 193973; 46 adults and juveniles, USNM 193975.

Sta 90-010, 13 Jun 1990, Air Strip Cave #5, Discovery Bay, St. Ann Parish; salinity 26 (surface)–29.5 (bottom) ppt, collected with a 93 μm mesh plankton net from the water column and rocky bottom in 0–3 m depths.

Spelaeoecia jamaicensis: 1 A–1 or A–2 male, USNM 193961; 1 juvenile (sex unknown), USNM 193966.

Sta 90-032, 30 Jun 1990, South Bull Cave, Discovery Bay, St. Ann Parish; salinity 18 (surface)–22.5 (bottom) ppt, collected with a 280 μm mesh plankton net from the water column and sandy bottom sediments in 0–3 m depths.

Spelaeoecia jamaicensis: 1 A–1 or A–2 female, USNM 193964; 5 juveniles (sex unknown), USNM 193965.

Sta 90-033, 30 Jun 1990, Dairy Bull Cave, Discovery Bay, St. Ann Parish; salinity 16.5 (surface)–22.5 (bottom) ppt, 2 specimens (1 lost) collected with a 280 μm mesh plankton net from the water column at 0–3 m depths.

Danielopolina elizabethae: 1 late juvenile, USNM 193962.

Sta 90-035, 30 Jun 1990, Air Strip Cave #1, Discovery Bay, St. Ann Parish; salinity 25 (surface)–29.5 (bottom) ppt, collected with a 280 μm mesh plankton net from the water column and organic detritus on the bottom in 0–5 m depths.

Spelaeoecia jamaicensis: 1 juvenile (sex unknown), USNM 193967.

Sta 90-036, 30 Jun 1990, Air Strip Cave #2, Discovery Bay, St. Ann Parish; salinity 25 (surface)–28 (bottom) ppt, collected with a 280 μm mesh plankton net from the water column in 0–5 m depths.

Spelaeoecia jamaicensis: 1 juvenile (sex unknown), USNM 193968.

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