



Ostracoda (Myodocopina)
from Bahamian Blue Holes

LOUIS S. KORNICKER,
THOMAS M. ILIFFE,
and
ELIZABETH HARRISON-NELSON

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*Louis S. Kornicker, Thomas M. Iliffe,
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ABSTRACT

Kornicker, Louis S., Thomas M. Iliffe, and Elizabeth Harrison-Nelson. Ostracoda (Myodocopa) from Bahamian Blue Holes. *Smithsonian Contributions to Zoology*, number 616, 99 pages, 69 figures, 8 tables, 2002.—Three troglobitic myodocopid ostracodes (two previously described and one new) in the Order Halocyprida are reported from anchialine waters in inland blue holes on Grand Bahama Island and Andros Island. The adult male and female *Deeveya bransoni* Kornicker and Palmer, 1987, is described and illustrated, a key is presented to species of *Deeveya*, and the sexual dimorphism and ontogeny of the genus is discussed.

Ten species of myodocopid ostracodes (seven previously described and three new) in the Order Myodocopida are reported from eight oceanic blue holes in the vicinity of Exuma Cays and Andros Island. The sarsiellid genus *Junctichela* Kornicker and Caraion, 1978, is reported from the Bahamas for the first time, and the new species *J. pax* is interpreted to be endemic to Crab Cay Cravasse, Exuma Cays. Descriptions of some myodocopids include brief notes on gut contents (including nematode, amphipod, worm).

No anchialine halocyprid ostracodes have been collected in oceanic blue holes, nor have they been reported from shallow open waters of the Bahamas, from which 28 species of Myodocopida have been reported. Nine species of Myodocopida, which previously had been reported either from the shallow open water of the Bahamas, or the Atlantic shelf of North America, were collected also in the oceanic blue holes. The Simpson Index of faunal resemblance between species of Myodocopida occupying the open ocean and oceanic blue holes is 67, which suggests a close relationship.

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Contents

	<i>Page</i>
Introduction	1
Terminology	1
Disposition of Specimens	1
Abbreviations	1
Acknowledgments	2
Description of Collecting Localities	2
Inland Blue Holes	2
Oceanic Blue Holes	6
Distribution	10
Superorder MYODOCOPA Sars, 1866	11
Order HALOCYPRIDA Dana, 1853	11
Suborder HALOCYPRIDINA Dana, 1853	11
Superfamily HALOCYPRIDOIDEA Dana, 1853	11
Family HALOCYPRIDIDAE Dana, 1853	11
Subfamily DEEVEYINAE Kornicker and Iliffe, 1985	11
<i>Deeveya</i> Kornicker and Iliffe, 1985	11
Key to Species of <i>Deeveya</i> in Group A	12
Key to Species of <i>Deeveya</i> in Group B	12
<i>Deeveya bransoni</i> Kornicker and Palmer, 1987	12
<i>Deeveya exleyi</i> Kornicker and Iliffe, 1998	23
<i>Spelaeoecia</i> Angel and Iliffe, 1987	23
<i>Spelaeoecia styx</i> Kornicker, 1990	23
<i>Spelaeoecia parkeri</i> , new species	26
Order MYODOCOPIDA Sars, 1866	33
Suborder MYODOCOPINA Sars, 1866	33
Superfamily CYPRIDINOIDEA Baird, 1850	33
Family CYPRIDINIDAE Baird, 1850	33
Subfamily CYPRIDININAE Baird, 1850	33
<i>Skogsbergia</i> Kornicker, 1974	33
<i>Skogsbergia leneri</i> (Kornicker, 1958)	34
Superfamily SARSIELLOIDEA Brady and Norman, 1896	35
Family PHILOMEDIDAE Müller, 1906	35
Subfamily PSEUDOPHILOMEDINAE Kornicker, 1967	35
<i>Harbansus</i> Kornicker, 1978	35
<i>Harbansus paucichelatus</i> (Kornicker, 1958)	35
Family SARSIELLIDAE Brady and Norman, 1896	46
Subfamily SARSIELLINAE Brady and Norman, 1896	46
<i>Eusarsiella</i> Cohen and Kornicker, 1975	46
<i>Eusarsiella ryanae</i> Kornicker and Iliffe, 2000	46
<i>Eusarsiella merx</i> , new species	48
<i>Eusarsiella warneri</i> , new species	59
<i>Eusarsiella</i> species x	63
<i>Eurypylus</i> Brady, 1869	64
<i>Eurypylus hapax</i> Kornicker and Iliffe, 2000	64
<i>Junctichela</i> Kornicker and Caraion, 1978	67
<i>Junctichela pax</i> , new species	67

Family RUTIDERMATIDAE Brady and Norman, 1896	82
<i>Rutiderma</i> Brady and Norman, 1896	82
<i>Rutiderma darbyi</i> Kornicker, 1983	82
Superfamily CYLINDROLEBERIDOIDEA Müller, 1906	83
Family CYLINDROLEBERIDIDAE Müller, 1906	83
Subfamily CYLINDROLEBERIDINAE Müller, 1906	83
<i>Synasterope</i> Kornicker, 1975	83
<i>Synasterope browni</i> Kornicker and Iliffe, 2000	85
Subfamily CYCLASTEROPINAE Poulsen, 1965	95
Tribe TETRALEBERIDINI Kornicker, 1981	95
<i>Amboleberis</i> Kornicker, 1981	95
<i>Amboleberis americana</i> (Müller, 1890)	95
Appendix 1: Station Data with Specimens Examined	96
Appendix 2: Number of filaments on c-, f-, and g-bristles of the first antenna of males and females of selected species of Cylindroleberidinae, and carapace length of adult males	97
Literature Cited	98

Ostracoda (Myodocopina) from Bahamian Blue Holes

Louis S. Kornicker, Thomas M. Iliffe,
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Introduction

Over the last decade and a half, investigations of anchialine caves by biologically trained cave divers have resulted in the discovery of a significant number of new stygobitic halocyprid ostracodes. These discoveries include ostracode species from caves in the Bahamas, Bermuda, Canary Islands, Jamaica, Mexico, Galapagos, and Australia. The species are typically encountered only in the deep cave interior and are considered to be troglobites. Among the notable troglobitic halocyprids are the genera *Danielopolina*, *Deeveya*, and *Spelaeoecia*. *Danielopolina* is the most widely dispersed genus, with nine species inhabiting caves in the following locations: the Bahamas (2 species); Canary Islands (2 species); Cuba (1 species); Galapagos Islands (1 species); Jamaica (1 species); Yucatan Peninsula, Mexico (1 species); and Western Australia (1 species). An additional species inhabits the deep sea in the mid-Atlantic. *Spelaeoecia* is intermediate in its distribution, with seven species inhabiting caves in the following locations: Bermuda (1 species); the Bahamas (4 species); Cuba (1 species); and the Yucatan Peninsula, Mexico (1 species). *Deeveya* has the most limited distribution of the three genera and is known only from caves in the Bahamas (6 species), and the geographically and geologically related Caicos Islands (1 species). *Deeveya* spp. are found in caves on three shallow water platforms: the Little Bahama Bank, the Great Bahama Bank, and

the Caicos Bank. These platforms are separated from one another by 5 km deep submarine canyons. This suggests that even for *Deeveya* significant dispersal abilities exist. The Bahamas, with 12 species of troglobitic halocyprid ostracodes, has the greatest diversity and could be considered to be the center of dispersal for these genera.

Within the Bahamas, the Great Bahama Bank, including Andros, Eleuthera, Exumas, and Long Island, has a total of six species: three species of *Deeveya*, two species of *Spelaeoecia*, and one species of *Danielopolina*. The Little Bahama Bank, including Grand Bahama and Abaco, has five species: three species of *Deeveya* and two species of *Spelaeoecia*. The Caicos Islands is the only other location in the Bahamas with troglobitic ostracodes, namely one species of *Deeveya*. All species have so far been found only on a single platform. Based on the limited data available, it would seem that larger platforms such as the Great Bahama and Little Bahama Banks have a more diverse fauna than smaller, more isolated islands. This paper reports on the ostracode fauna of both inland and oceanic blue holes from Grand Bahama and Andros Islands.

TERMINOLOGY.—The term “open ocean” refers to marine areas not restricted to caves or blue holes. “Inland blue holes” are circular, often deep, water-filled shafts with entrances on land that bell out beneath the surface into a wide underwater cavern. “Oceanic blue holes” are openings on the sea floor to extensive, strongly tidal, submerged cave systems. For more detailed descriptions of Blue Holes, see Kornicker and Iliffe, 2000:10. Some oceanic blue holes connect to inland cave systems (Kakuk, pers. comm., 1998).

DISPOSITION OF SPECIMENS.—All specimens have been deposited in the collections of the former United States National Museum (USNM), now the National Museum of Natural History, Smithsonian Institution, and have been assigned USNM numbers.

ABBREVIATIONS.—In the figures, Arabic numbers designate limbs 1–7, as well as individual joints of each limb (the location of the numeral indicating whether a limb or joint is

Louis S. Kornicker and Elizabeth Harrison-Nelson, Department of Systematic Biology, Division of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C., 20560. Thomas M. Iliffe, Department of Marine Biology, Texas A&M University at Galveston, P.O. Box 1675, Galveston, Texas 77553.

Review Chairman: Klaus Ruetzler, Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C., 20560.

Reviewer: Anne Cohen, Bodega Marine Laboratory, University of California, Davis, P.O. Box 247, Bodega Bay, California, 94923.

present); the number 5 also is used to designate the sensory bristle of the 5th joint of the 1st antenna. Roman numerals indicate the endites. Arrows indicate the anterior. All measurements are in millimeters unless otherwise noted.

The following abbreviations are used in the illustrations and legends.

am	central adductor muscle attachments
an	antenna
Bo	Bellonci organ
co	Copulatory organ
cx	coxale
dv	dorsal view
end	endopodite
ep	epipodite
es	esophagus
ex	exopodite
fu	furca
gl	gland
im	inner margin of infold
iv	inside view
l	left
ll	lower lip
lp	lamellar prolongation of selvage
l.v.	left valve
lv	lateral view
md	mandible
mo	mouth
mx	maxilla
nabs	not all bristles shown
precx	precoxale
prot	protopodite
r	right
r.v.	right valve
ul	upper lip
up	unpaired process

ACKNOWLEDGMENTS.—Biological collections from caves on Andros and Grand Bahama Islands were carried out during a filming trip sponsored by NDR Northern German Public TV and the Rob Palmer Blue Holes Foundation. We thank Stephanie Schwabe, Dan Malone, and Rob Parker for assistance with cave diving collections. Logistical assistance was provided by the crew of the *Ocean Explorer* and by the film crew led by Gerhard Stuetting. Penciled camera lucida taxonomic illustrations drawn by Kornicker were inked by Jack Schroeder, Schroeder Associates. Graphs and rendered shaded drawings of carapaces were prepared by Molly Ryan, Smithsonian Institution. Appendage illustrations of *Eusarsiella merx* were inked by Celia Stamerra, volunteer, Smithsonian Institution. We thank Lee-Ann Hayek for statistical calculations concerning correlation coefficients. This research was supported by grants from the Caribbean Marine Research Center (CMRC) of the National Oceanic and Atmospheric Administration (NOAA) and from the National Science Foundation (NSF #9870219). We thank Anne C. Cohen for thorough critique of the manuscript, and Jack Korytowski, Smithsonian In-

stitution Press, for final editing and preparing the manuscript for publication.

This paper is dedicated to the memory of Blue Hole cave diving pioneers Rob Palmer and Rob Parker.

Description of Collecting Localities

Bahamian ostracodes reported on in this study were collected from both inland and oceanic blue holes in the vicinity of Andros Island (Map 1), Grand Bahama Island (Map 2), and Exuma Cays (see Kornicker and Iliffe, 2000, map 4).

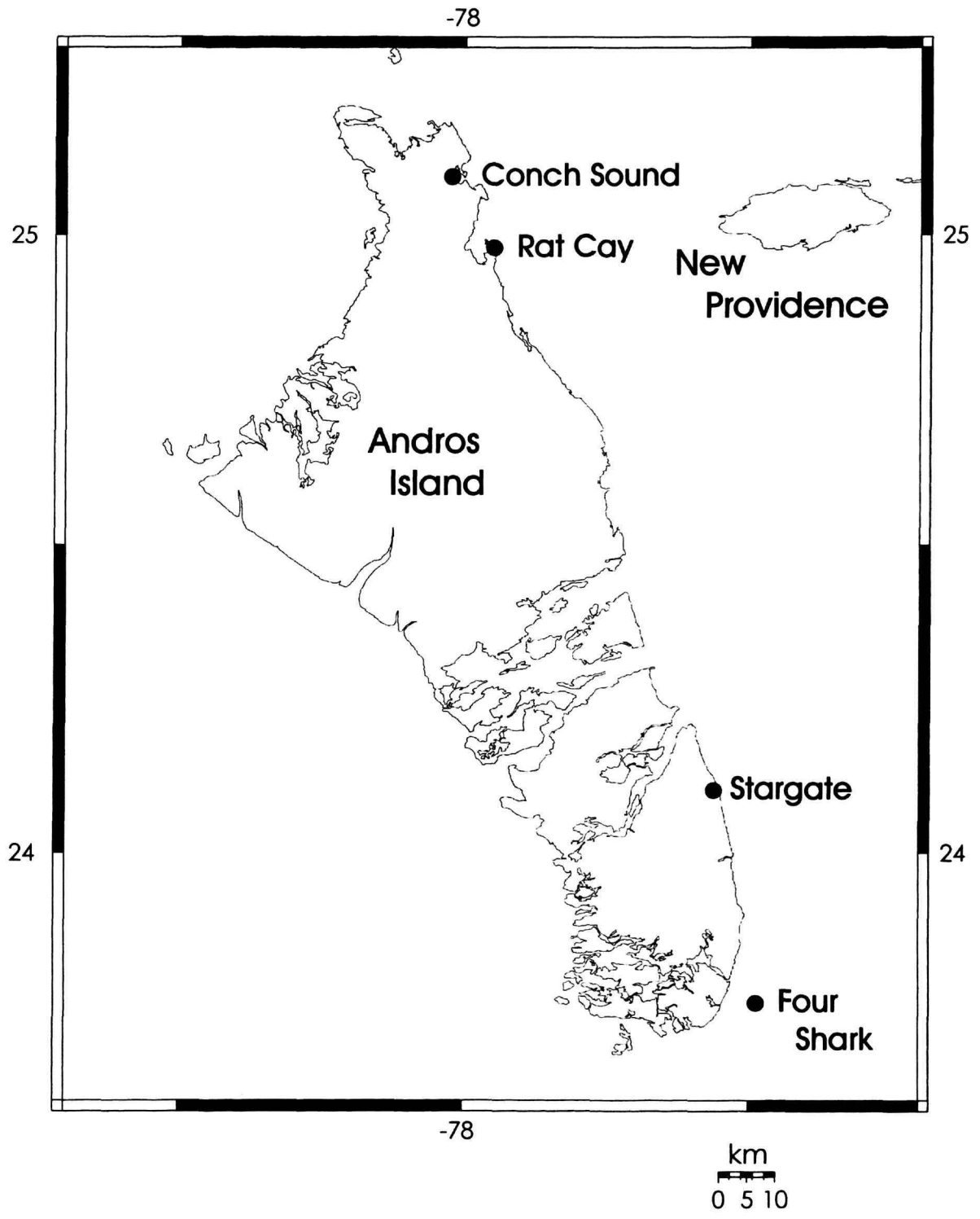
INLAND BLUE HOLES

Mermaid's Lair is located about 100 m from the south shore of Grand Bahama Island at 26°35.107'N and 78°27.766'W (Map 2). It is the seaward-most segment of the highly extensive Owl's Hole cave system. The entrance to Mermaid's Lair consists of a mangrove lined, shallow pool containing tannic stained water (Figure 1). A hole under a rock ledge on the north side of the pool opens into a large submerged cavern about 25 m long by 8 m wide and 6 m high. Water clarity improves considerably within the cavern. In the back of the breakdown-floored cavern, a wide, horizontal passage with numerous stalagmitic columns extends to the northwest at 22 m depth. This passage is generally 6 to 8 m wide and 1 to 2.5 m high. Reddish brown sediment containing wind blown dust from North Africa covers the cave floor in this area.

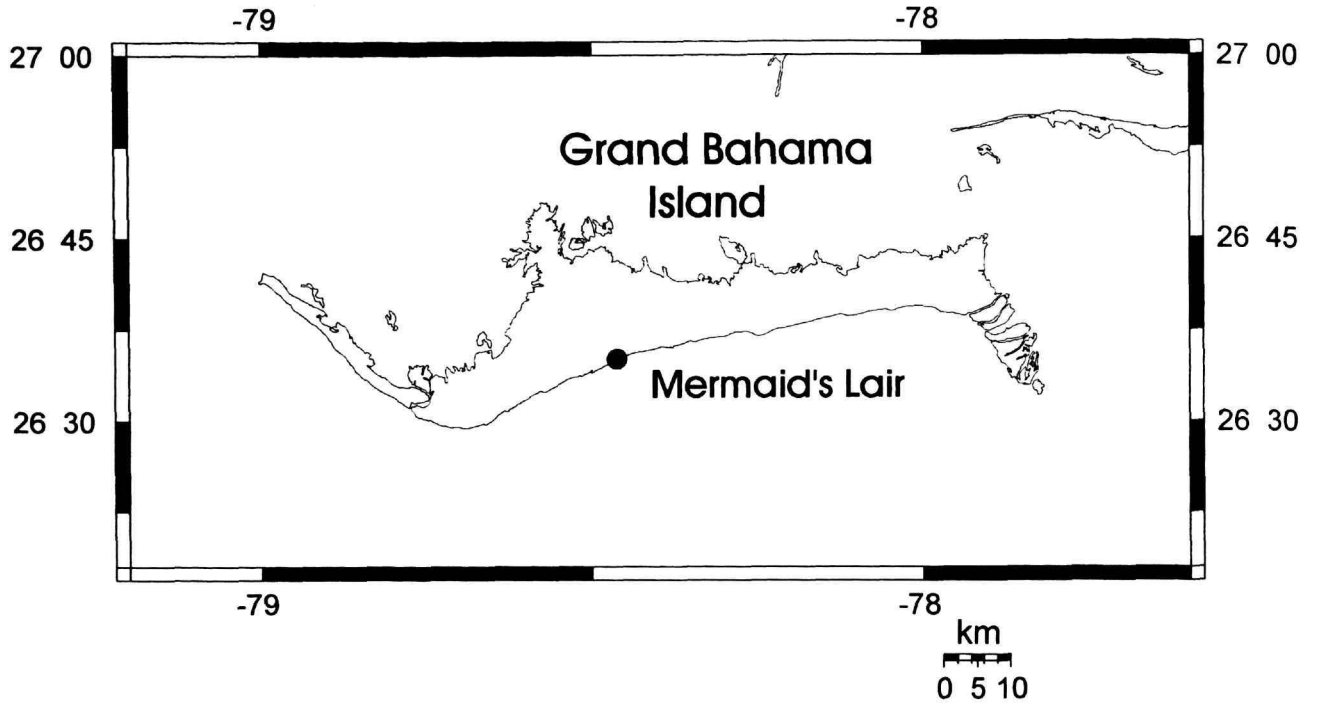
Water column profiles were obtained by a diver carrying a Hydrolab diagonally from the surface pool to the bottom in 22 m depth (Figure 2). Three distinct water masses are separated by two haloclines within the cavern zone. The first halocline, situated between 1.5 m and 6 m depth, is associated with the boundary between tannic-colored pool water and the much clearer, brackish cavern water. In this zone, salinity changes from 3.2 g/l at the surface pool to 10.4 g/l in the cavern. The second halocline occurs in 16 to 19 m depths at the bottom of the cavern where 10.4 g/l cavern water borders 35.0 g/l cave water. Temperature decreases from 26.1°C in the surface pool to about 23.7°C in the fully marine cave waters. Dissolved oxygen increases from 1.0 mg/l in the pool to 2.5 mg/l in the cavern, but then drops sharply to 0.15 mg/l in the cave waters. The pH values drop from 8.44 in the pool to 8.39 in the cavern and 8.28 in the cave waters. Distinct pH minima are associated with the two haloclines. At the upper halocline, a pH minimum of 8.31 occurs at 3 m depth, whereas at the deeper halocline, a pH minimum of 8.21 is at 17.5 m depth.

Ostracodes were collected by divers using a 93 µm mesh plankton net, suction bottle, and vials in 18–22 m depths. Thermosbaenaceans, cirrolanid isopods, and copepods were collected from the same locations.

Stargate Blue Hole (Figure 3; Map 1) is located about 500 m inland from the coast of South Andros Island on the west side



MAP 1.—Location of caves discussed herein in vicinity of Andros Island, Great Bahama Bank.



MAP 2.—Location of Mermaid's Lair, Grand Bahama Island, Little Bahama Bank.

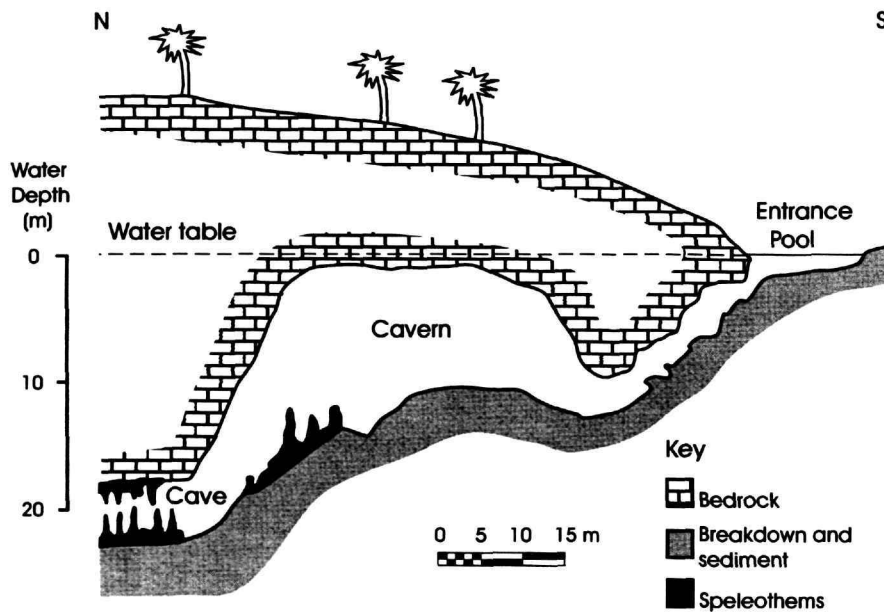


FIGURE 1.—Mermaid's Lair, Grand Bahama Island, profile view of entrance and cave section. Two haloclines are present in the cave, one at 3.5 m and another at 17.5 m depths.

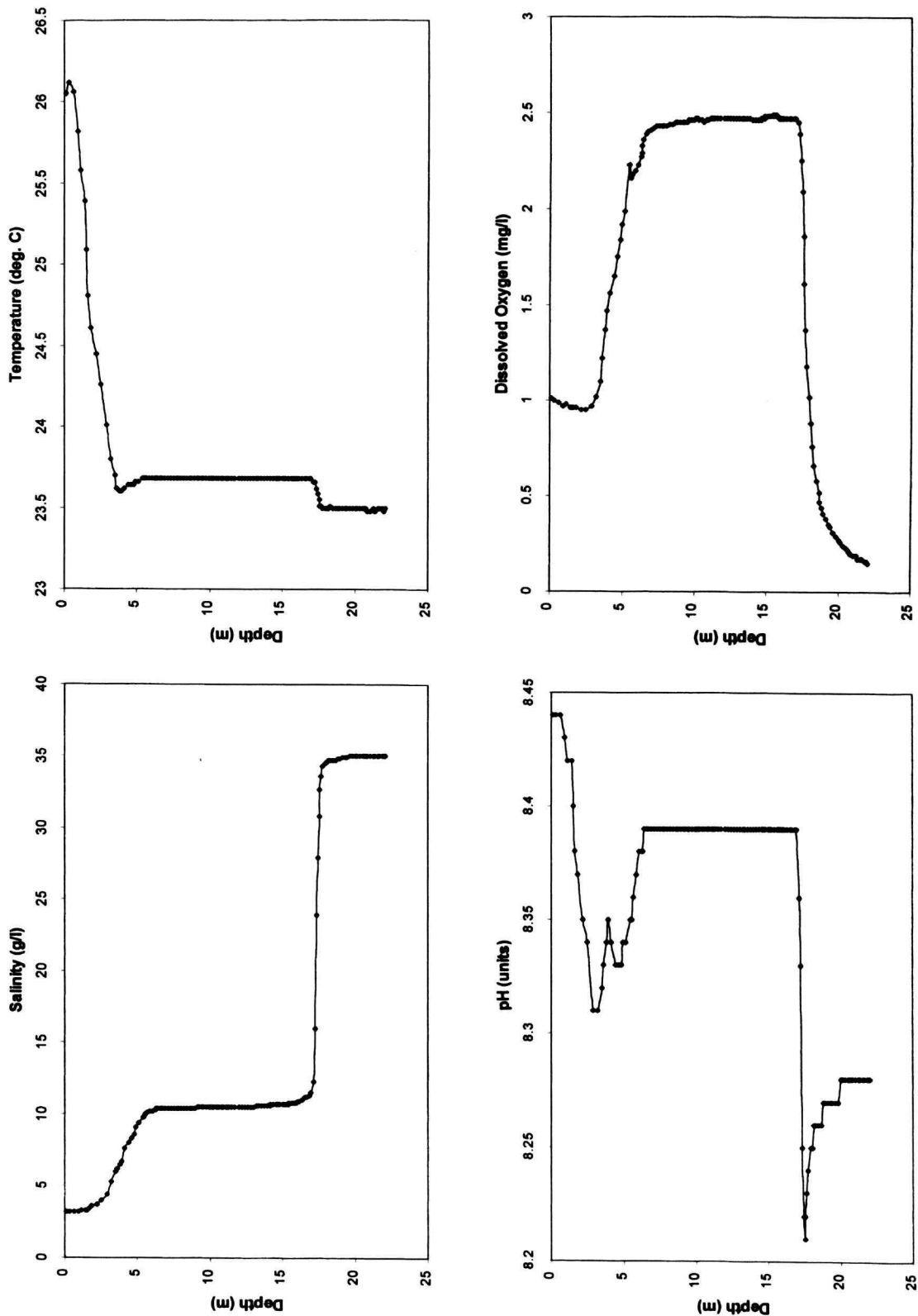


FIGURE 2.—Water column profiles of salinity, temperature, pH, and dissolved oxygen from Mermaid's Lair, Grand Bahama Island, Bahamas, on 5 Aug 1997. Measurements were made with Hydrolab Recorder Quality Multiprobe Logger, which was programmed to take data once every two seconds.

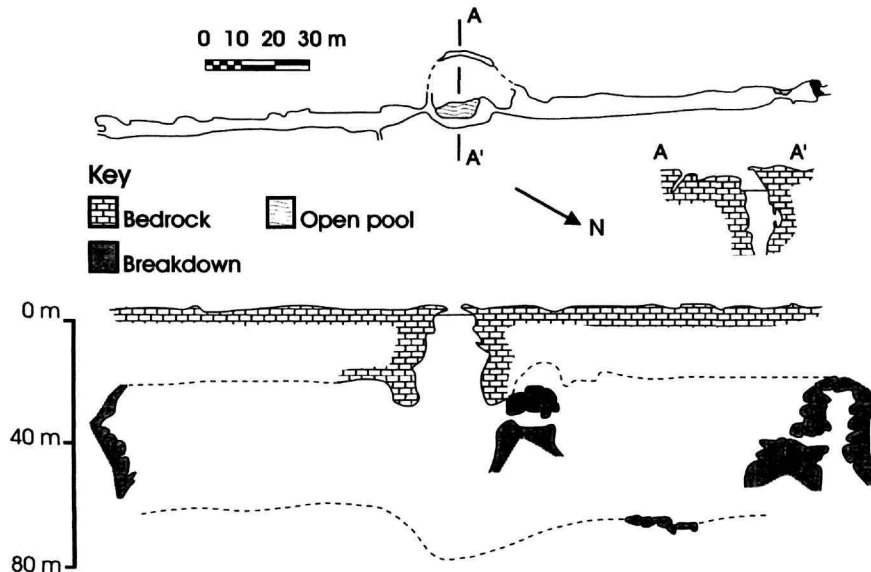


FIGURE 3.—Stargate Blue Hole, South Andros Island, Bahamas: Plan (top), profile (bottom), and cross sectional (right) views (after Palmer, 1997:90).

of The Bluff Village. It is part of a major north-south slump fracture zone paralleling the underwater escarpment that separates the Great Bahama Bank from the Tongue of the Ocean, a deep oceanic trench. This slump fracture extends for tens of kilometers and was formed as a result of glacio-eustatic sea level changes and gravitational stresses along the edge of the limestone banks (Palmer, 1968a, 1968b).

The entrance to this cave is a partially roofed-over cavern with a vertical drop of 6 m to water level. The restricted nature of the entrance limits organic input, therefore the surface water is relatively clear. Underwater, a shaft drops vertically to depths in excess of 80 m, and rift-like passages extend north and south. To the north, a 10 m wide passage with the roof at 20 m depth extends for 107 m to a breakdown choke. To the south, a similar passage runs for 100 m to another choke, possible on the right hand side at 37 m to reach an extremely loose boulder chamber that chokes again after a further 30 m.

Water column profiles were obtained by lowering a Hydro-lab Recorder Water Quality Multiprobe Logger from the surface to 80 m depth (Figure 4). Surface waters in the entrance pool were found to have a salinity of 3.4 g/l. A halocline between 22–27 m depth marked the transition to 37 g/l. The general temperature trend in the water column involved a decrease from 27.4°C at the surface to 25.0°C at 80 m. However, secondary temperature maxima occurred above and below the halocline at 10.2 m (25.82°C) and 30.2 m (26.12°C). The pH decreased from 8.7 at the surface to 8.18 at 80 m. A secondary pH minimum of 8.21 occurred at 22–24 m, whereas a secondary maximum of 8.55 was found at 30 m. Dissolved oxygen decreased from 5.67 mg/l at the surface to 0 at 80 m depth. A secondary oxygen maximum of 2.96 mg/l occurred at 31 m depth.

Two water layers, each several meters thick and characterized by reduced water clarity and abundance of copepods, are present in the cave at 16–20 m and at 43 m depths. Below the shallower layer, water clarity increases considerably. Wall rock changes in color from light brown outside to gray within the layer. Spelothems (cave formations) are present at all depths, and a thin layer of fine, brown sediment covers breakdown blocks on the floor of the cave.

Ostracodes were collected by divers, either with a plankton net tow or individually in vials, from the water column in 33–36 m depth of the North Passage and 33–39 m depth of the South Passage. Copepods, thermosbaenaceans, archeannelids, and polychaetes were collected from the same locations within the cave.

OCEANIC BLUE HOLES

Angelfish Blue Hole is located on the southwest side of Stocking Island, Exuma Cays, in the same bay containing Mystery Cave (see Kornicker and Iliffe, 2000:10, map 4). For a description of the cave, see Kornicker and Iliffe, 2000:12, map 4.

Crab Cay Crevasse is a submarine blue hole located in the central section of the bay between Great Exuma Island and Crab Cay, Exuma Cays. For a description of the crevasse, see Kornicker and Iliffe, 2000:20, map 4.

Sugar Cay Blue Hole is located about 50 m offshore from the small island of Sugar Cay, near Barratterre, Great Exuma Island, Exuma Cays. For a description of the cave, see Kornicker and Iliffe, 2000:11, map 4.

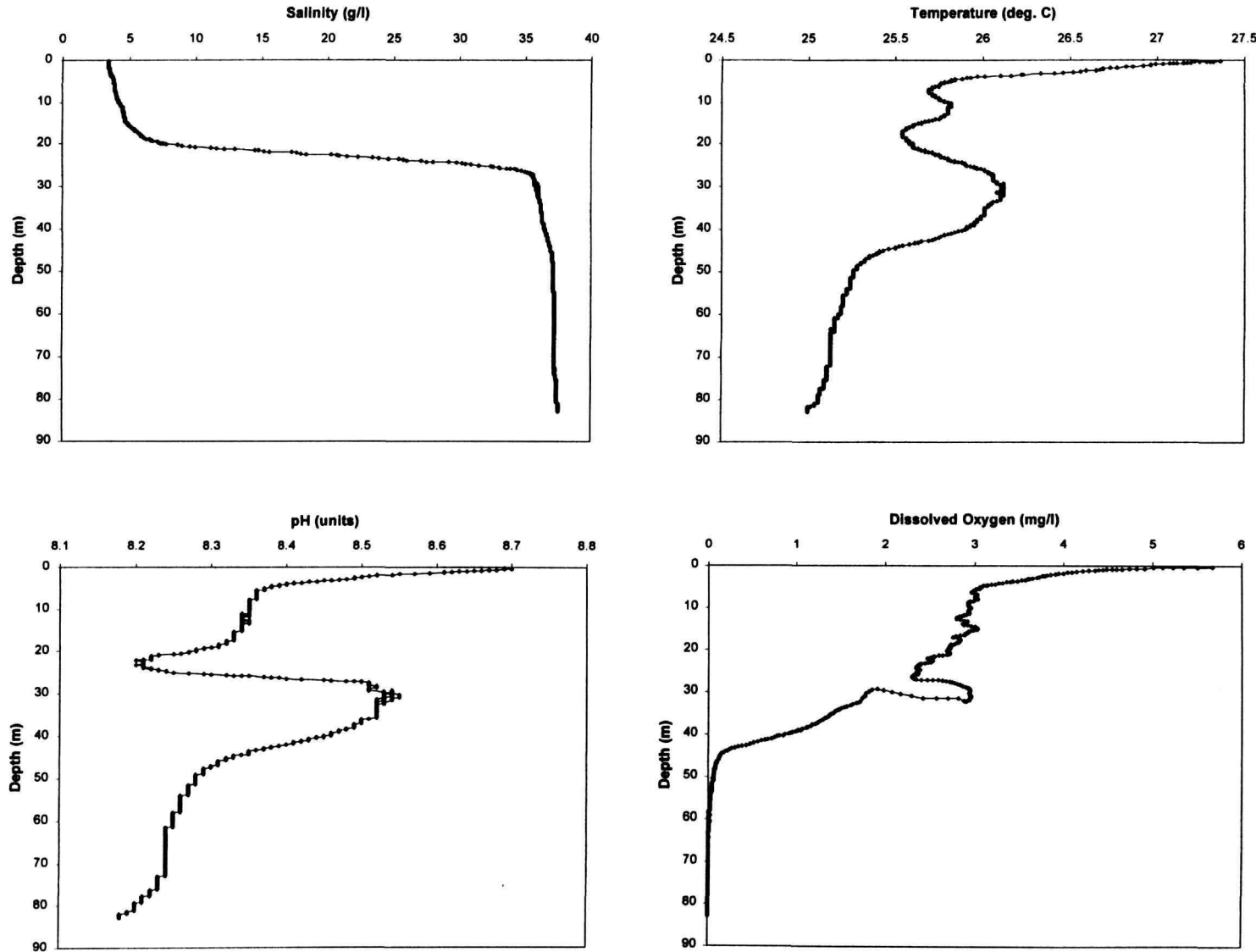


FIGURE 4.—Water column profiles of salinity, temperature, pH, and dissolved oxygen from Stargate Blue Hole, South Andros Island, Bahamas. Measurements were made on 20 Aug 1997 with Hydrolab Recorder Water Quality Multiprobe Logger, which was programmed to take data once every two seconds.

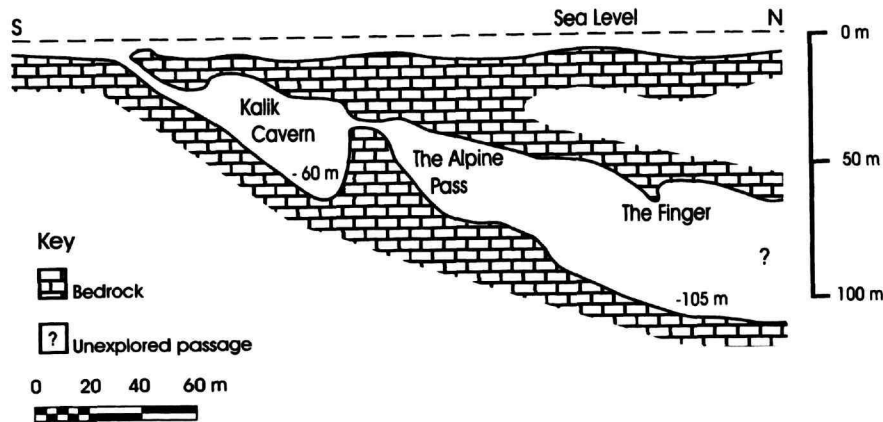


FIGURE 5.—Profile view of Four Shark Cave, Bahamas (after Palmer, 1997:162).

Mystery Cave is located on the southwest side of Stocking Island, Exuma Cays, in an almost totally enclosed bay. For a description of the cave, see Kornicker and Iliffe, 2000:10, map 4.

Master Harbour Cave is located in Master Harbour, about 4 km southeast of George Town on the northeast coast of Great Exuma Island, Exuma Cays. For a description of the cave, see Kornicker and Iliffe, 2000:10, map 4.

Conch Sound Blue Hole is located near the northeastern tip of Andros Island. For a description of the cave, see Kornicker and Iliffe, 2000:11.

Four Shark Cave (Map 1) is an offshore oceanic blue hole located along the fault line near Grassy Creek Cays, South Andros. The entrance is a coral rimmed basin about 10 m deep that opens into a 70 m long, 20 m wide chamber known as Kalik Cavern that extends to 60 m depth (Figure 5). At the far end of the cavern, a narrow crack at 40 m depth descends into a continuation of the fissure with depths from 50 to 105 m or greater. In the entrance zone, the bottom consists of sand and fine white silt. Strong tidal currents exchange reef water with that from the interior of the cave.

Due to the presence of strong tidal currents, numerous species of filter feeding invertebrates are characteristically found inside the cave's entrance. Encrusting sponges and hydroids are present on the walls at the entrance and also around the crack at rear of the cavern where current velocity increases because of the constricted nature of the passage. Primarily open-water algae, corals, echinoderms, polychaetes, mollusks, bryozoans, ascidians, and crustaceans also are found in or near blue hole entrances (Trott and Warner, 1986).

Water column profiles were obtained in the rear of the cavern using a Hydrolab Recorder (Figure 6). A diver descended with the Hydrolab from a dome in the ceiling at 9 m depth down to 40 m depth. At this point, the Hydrolab was lowered on a line to the cavern floor at 56 m.

Salinity increased gradually from 35.9 g/l at the top of the dome to 37.4 at 56 m. The general temperature trend in the water column involved a decrease from 27.6°C at 9 m to 26.0°C at

56 m. The pH decreased from 9.2 at 9 m to 8.6 at 56 m. Dissolved oxygen decreased from 2.5 mg/l at 9 m to 1.25 at 56 m depth. Thus, deeper waters in the cavern are relatively higher in salinity, although lower in temperature, pH, and dissolved oxygen.

In order to observe changes in water entering the cave over the course of a tidal cycle, a Hydrolab was suspended in the water column 15 m inside the cave and was left to record data at one minute intervals for 12 hours (8 PM to 8 AM). Open-ocean water entering the cave on a rising tide was compared with water flowing out of the cave at the end of the tidal cycle. Ocean water was relatively warmer (31.0°C vs. 26.9°C), had lower salinity (35.8 g/l vs. 36.5 g/l), lower pH (9.3 vs. 8.9), and higher dissolved oxygen (4.1 mg/l vs. 1.0 mg/l). The characteristics of the water exiting the cave at the end of the cycle most closely matched those of water from 14 to 20 m depths within the cave water column. This indicates that even in the cavern zone, cave water is not completely flushed during a typical tidal cycle. Deeper water from the bottom of the cavern and from sections of the fissure beyond the restriction must consequently have a long residence time within the cave.

Ostracodes were collected by scuba divers at 27–33 m depth in the back section of the cavern. Silt on ledges was fanned by hand and a plankton net was swept through the suspended sediment, thus sampling both the silt and the water column. Cumaceans, copepods, larval shrimp, and nebaliceans also were collected from the same locations within the cave.

Divers exploring the fissure at 70 m depth reported observing numerous apparently troglobitic crustaceans within the cave water column, but, unfortunately, specimens were not collected (Dan Malone, pers. comm., 1998). The junior author (Iliffe) thinks that Malone's observations of troglobites in the deep waters of ocean blue holes (Malone, pers. comm., 1998) may be significant in that they support hydrological data, suggesting that the deep waters are substantially different physically from sections of the cave nearer to the entrance. If this is true, then our knowledge of the fauna of oceanic blue holes is

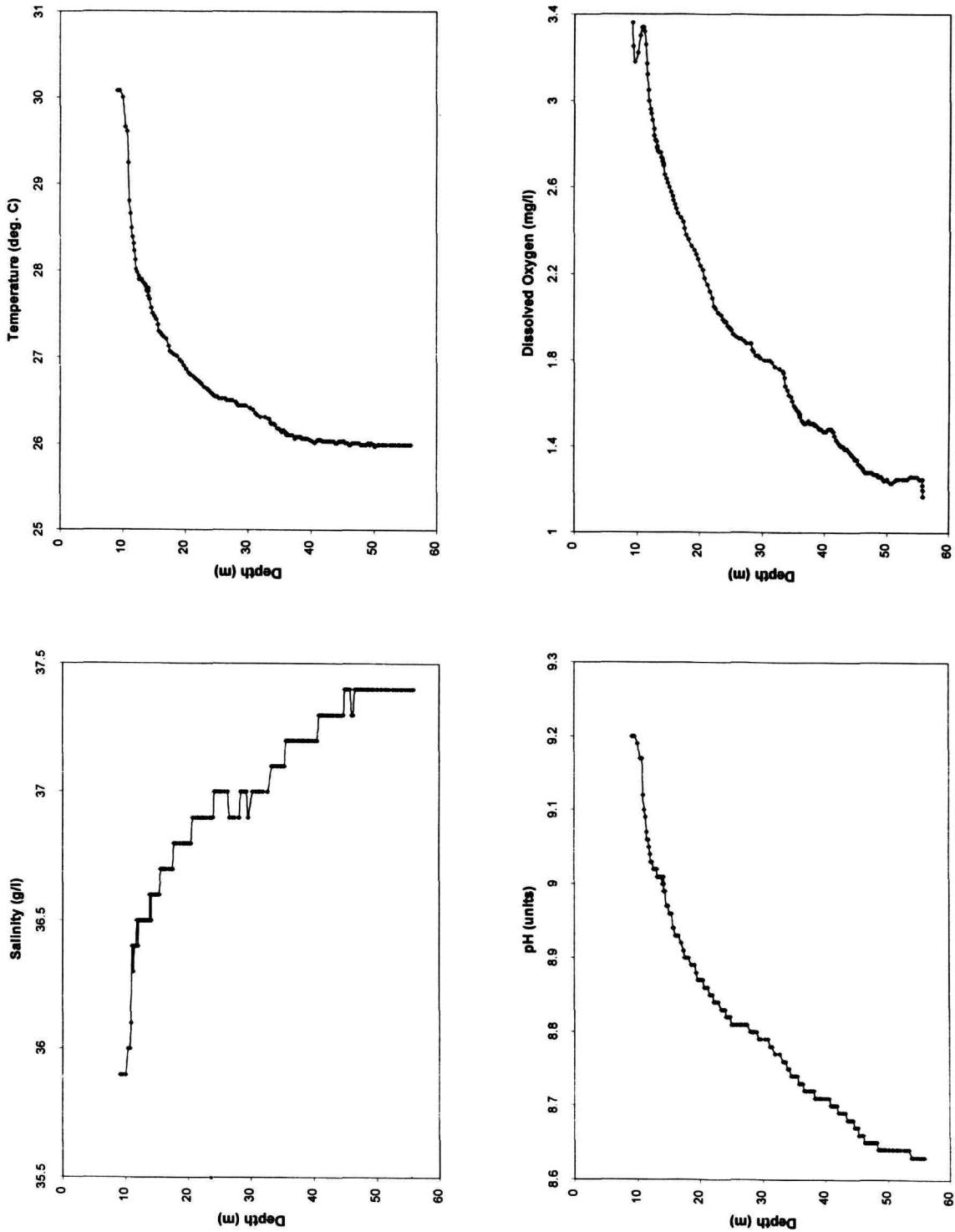


FIGURE 6.—Water column profiles of salinity, temperature, pH, and dissolved oxygen from Four Shark Cave, South Andros Island, Bahamas. Measurements were made on 14 Aug 1997 with Hydrolab Recorder Water Quality Multiprobe Logger, which was programmed to take data every two seconds.

TABLE 1.—Comparison of Myodocopa in the Bahamas. (OO=Open Ocean, OBH=Oceanic Blue Holes, IBH=Inland Blue Holes, numbers=depths (in m) at which specimens were collected, — = no specimens collected.)

Taxa	OO	OBH	IBH
Order HALOCYPRIDA			
Family HALOCYPRIDIDAE			
<i>Deeveya bransoni</i>	—	—	33–39
<i>Deeveya exleyi</i>	—	—	0–1
<i>Deeveya hirpex</i>	—	—	?
<i>Deeveya jillae</i>	—	—	0–3
<i>Deeveya medix</i>	—	—	?
<i>Deeveya spiralis</i>	—	—	7
<i>Deeveya styrax</i>	—	—	?
<i>Spelaeoecia barri</i>	—	—	0–2
<i>Spelaeoecia capax</i>	—	—	0–20
<i>Spelaeoecia sagax</i>	—	—	?
<i>Spelaeoecia styx</i>	—	—	0–39
Family THAUMATOCYPRIDIDAE			
<i>Danielopolina bahamensis</i>	—	—	0–3
<i>Danielopolina exuma</i>	—	—	6–43
Order MYODOCOPIDA			
Family CYPRIDINIDAE			
<i>Jimmorinia gamma</i>	105	—	—
<i>Jimmorinia gunnari</i>	88–105	—	—
<i>Skogsbergia lernerii</i>	shallow–105	5–35	—
<i>Vargula exuma</i>	62	—	—
Family PHILOMEDIDAE			
<i>Harbansus paucichelatus</i>	1–20	22–31	—
<i>Pseudophilomedes ferulana</i>	6	—	—
<i>Zeugophilomedes multichelata</i>	shallow	—	—
Family SARSIELLIDAE			
<i>Chelicopia arostrata</i>	1–3	—	—
<i>Eurypylus eagari</i>	67	35	—
<i>Eurypylus hapax</i>	142	—	—
<i>Eusarsiella capillariss</i>	2–20	—	—
<i>Eusarsiella costata</i>	2–67	—	—
<i>Eusarsiella gigacantha</i>	1–20	—	—
<i>Eusarsiella merx</i>	—	22	—
<i>Eusarsiella punctata</i>	1–5	—	—
<i>Eusarsiella ryanae</i>	67	27–33	—
<i>Eusarsiella truncana</i>	1–20	—	—
<i>Eusarsiella warneri</i>	—	1	—
<i>Eusarsiella species x</i>	1–20	—	—
<i>Junctichela pax</i>	—	35	—
Family RUTIDERMATIDAE			
<i>Alternochelata polychelata</i>	1–5	—	—
<i>Rutiderma darbyi</i>	—	35	1
<i>Rutiderma dinochelatum</i>	1–20	—	—
<i>Rutiderma schroederi</i>	67	—	—
Family CYLINDROLEBERIDIDAE			
<i>Actinoseta chelisparsa</i>	3–67	5	—
<i>Amboleberis americana</i>	3–10	5–22	—
<i>Asteropella monambon</i>	3–20	5	—
<i>Diasterope procax</i>	88–142	—	—
<i>Parasterope extrachelata</i>	shallow	—	—
<i>Parasterope muelleri</i>	shallow–67	—	—
<i>Synasterope browni</i>	96	27–50	—
<i>Synasterope setisparsa</i>	1–5	—	—
Total no. species	28	12	13

considerably biased by our diving limitations. Additional studies should provide clarification on this point.

Rat Cay Blue Hole is located close to Rat Cay, Andros Island, in water 1–2 m deep about 1 km offshore. For description of hole, see Warner and Moore (1984:33).

Distribution

The distribution of species in the Bahamas are listed in Table 1, and the faunal resemblances of species and genera, as indicated by the Simpson Index (Kornicker, 1975:31, 1992:4; Kornicker and Thomassin, 1998:6) as calculated from species and genera, are presented in Table 2. The Simpson Indices (S.I.) suggest that the myodocopid populations from the shallow open-ocean and the oceanic blue holes are fairly closely related (species S.I.=67; genus S.I.=90), whereas the myodocopid populations of both the shallow open-ocean and the oceanic blue holes are unrelated to that of inland blue holes (species and genus S.I.=0).

Some oceanic blue holes, such as Mystery Cave, have been found to connect to inland cave systems. Brian Kakuk (pers. comm., 1998) reported observing remipedes in the far interior of Mystery Cave, an oceanic blue hole, and Dan Malone (pers. comm., 1998) reported seeing numerous crustaceans having a troglobitic appearance in the fissure at 70 m depth in the oceanic blue hole known as Four Shark Cave. The presence of remipedes should be diagnostic of the habitat in which other troglobites, including ostracodes, would be found. Diving explorations and penetrations into oceanic blue holes reported herein were severely limited by depth and time. The areas that are most accessible to us, near the entrances, also are the areas where strong tidal currents flush out the cave waters on a diurnal cycle. Farther and deeper into the caves, troglobitic species may inhabit cave waters with much longer residence time.

Three ostracode species (*Eusarsiella merx*, *E. warneri*, and *Junctichela pax*) that were collected in the oceanic blue holes have not been reported from the open ocean and possibly could be endemic to oceanic blue holes. *Junctichela* is a genus previously known only from the eastern Atlantic and Indian Ocean. A relatively large number of specimens (18) of *J. pax* were collected in Crab Cay Crevasse at a depth of 35 m about 100 m inside the cave. All growth stages of that species are in the collection, suggesting that the species may be a permanent resident in

TABLE 2.—Simpson Indices of faunal resemblances between Bahamian species from the open ocean, oceanic blue holes, and inland blue holes based on species (top diagonal) and genera (bottom diagonal).

Localities	Open ocean	Oceanic blue holes	Inland blue holes
Open ocean	—	67	0
Oceanic blue holes	90	—	0
Inland blue holes	0	0	—

the cave, and we think that it may be endemic to the cave. However, four other ostracode species collected with *J. pax* also have been collected in the open ocean, suggesting that the water in this part of the cave is similar to that of the open ocean. The two other ostracode species collected only in the oceanic caves were few in number and are probably not endemic.

Superorder MYODOCOPA Sars, 1866

Order HALOCYPRIDA Dana, 1853

Suborder HALOCYPRIDINA Dana, 1853

Superfamily HALOCYPRIDOIDEA Dana, 1853

Family HALOCYPRIDIDAE Dana, 1853

Subfamily DEEVEYINAE Kornicker and Iliffe, 1985

***Deeveya* Kornicker and Iliffe, 1985**

TYPE SPECIES.—*Deeveya spiralis* Kornicker and Iliffe, 1985:476, figs. 1–12.

COMPOSITION AND DISTRIBUTION.—The genus includes seven species (plus one left in open nomenclature) from inland blue holes in the West Indies (Table 3).

SEXUAL DIMORPHISM AND ONTOGENY.—Kornicker et al. (1990:37) concluded that the presence of a well-developed genital tube adjacent to 2 small bristles on the holotype of *D. bransoni* indicated that the specimen was an adult female. The study of additional specimens of the species in the present collection revealed that the genitalia also are developed in the A–1 female. Fortunately, A–1 and adult males of *D. bransoni*, whose developmental stage is easily identified on the basis of the development of the copulatory organ, also are in the present

collection. Because carapace lengths of A–1 and adult females are similar to those of equivalent male stages, it was possible to identify the stage of development of A–1 and adult females by their lengths.

Previous collections of species of *Deeveya* consist mostly of females. Adult males are known for only three (*D. styrax*, *D. medix*, *D. bransoni*) of the seven known species; a juvenile male is known from one additional species (*D. jillae*). Determination of the stage of development of females of those species lacking males must be based only on the morphology of the females.

The collections of *D. bransoni* were studied to find clues for identifying the stage of development of females of other species if males are absent. No definitive clues were found to distinguish A–1 from adult females of *D. bransoni*. The number of claws (7) on the furca is the same for both A–1 and adult stages; the A–2 instar has only 6 claws and a triangular process (incipient 7th claw) following the last claw. The presence of unextruded eggs may indicate an adult female, but this is not known with certainty. If both A–1 and adult females are in a collection, a detailed comparison of the development of the genitalia and the number of bristles on the mandible, maxilla, and 5th and 6th limbs may enable their identification (see Table 5 for *D. bransoni*). If instars earlier than the A–1 stage are in a collection, the number of furcal claws, combined with carapace lengths, may be useful in identifying the stage of later instars, providing the species has 7 claws on A–1 and adult instars, 6 claws on A–2 instars, 5 claws on A–3 instars, etc.

Because of the difficulty in separating A–1 and adult females of *D. bransoni*, prior descriptions of species of *Deeveya* were reexamined to reestimate the stage of development of specimens reported (Table 4). The age of estimated stages in the table is based in part on comparisons with the ontogeny of *D. bransoni* (Table 5). This reestimation of the stage of development resulted in changes in prior estimates of *D. bransoni*, *D. jillae*, and *D. hirpex*.

DISCRIMINATION OF SPECIES OF *Deeveya*.—The carapaces of species of *Deeveya* have walled polygons. Disks that appear bright in transmitted light are present at the intersections of the polygonal walls. The diameters of the disks relative to the breadth of the polygons are useful in discriminating species. Species may be divided roughly into two groups based on whether the diameters of the disks are smaller (Group A) or greater (Group B) than the width of the polygon walls (Kornicker et al., 1990, fig. 29). The disks may be slightly larger towards the edges of valves; comparisons between species should be made on discs near the middle of valves.

Group A (small disks)	Group B (large disks)
<i>Deeveya spiralis</i>	<i>Deeveya jillae</i>
<i>Deeveya bransoni</i>	<i>Deeveya hirpex</i>
<i>Deeveya styrax</i>	<i>Deeveya medix</i>
	<i>Deeveya exleyi</i>

TABLE 3.—Distribution of species of *Deeveya* in the West Indies.

Turks and Caicos Islands, Caicos Islands
Providencian Island (The Hole)
<i>D. spiralis</i> Kornicker and Iliffe, 1985
Bahama Islands
Little Bahama Bank
Abaco Island (Dan's Cave)
<i>D. styrax</i> Kornicker, 1990
<i>D. hirpex</i> Kornicker, 1990
Grand Bahama Island, Sweeting's Cay (Sagittarius Cave)
<i>D. styrax</i> Kornicker, 1990
<i>D. medix</i> Kornicker, 1990
Great Bahama Bank
Eleuthera Island (Hatchet Bay Cave)
<i>D. jillae</i> Kornicker and Iliffe, 1989a
South Andros Island (The Bluff: Evelyn Green's and Stargate Blue Holes)
<i>D. bransoni</i> Kornicker and Palmer, 1987
Great Guana Cay, Exuma Cays (Oven Rock Cave)
<i>D. exleyi</i> Kornicker and Iliffe, 1998
San Salvador Island (Dixon Hill Lighthouse Cave)
<i>Deeveya</i> sp. (Kornicker and Barr, 1997:2)

TABLE 4.—Inventory of reestimated growth stages of specimens of species of *Deeveya* reported in the literature and herein. (F=female, M=male, -=absent, +=present.)

Taxa	Growth stages								
	A-5	A-4	A-3	A-2F	A-2M	A-1F	A-1M	Adult F	Adult M
<i>D. bransoni</i>	-	-	-	+	-	+	+	+	+
<i>D. exleyi</i>	-	-	-	-	-	-	-	+	-
<i>D. hirpex</i>	-	-	-	-	-	+	-	-	-
<i>D. jillae</i>	-	+	-	-	+	-	-	-	-
<i>D. medix</i>	-	-	-	-	-	-	-	+	+
<i>D. spiralis</i>	-	-	-	-	-	-	-	+	-
<i>D. styrax</i>	-	-	-	-	-	-	-	+	+

The following keys to species of *Deeveya* attempt to differentiate species. When the intraspecific variability of each species becomes better known, however, it is possible that some

species will be combined. Although carapace length is used in the keys, it must be used with caution because of the difficulty in separating A-1 and adult females.

Key to Species of *Deeveya* in Group A

1. Adult carapace shorter than 2.5 mm *D. bransoni*
 Adult carapace longer than 2.5 mm 2
2. Anterior of carapace with unbranched bristles; width of distal end of 3rd joint of 1st antenna about ¼ length of dorsal margin of joint; terminal joint of 5th limb with 4 bristles *D. styrax*
 Anterior of carapace with bifurcate bristles; width of distal end of 3rd joint of 1st antenna more than ¼ length of dorsal margin of joint; terminal joint of 5th limb with 5 bristles *D. spiralis*

Key to Species of *Deeveya* in Group B

1. Adult carapace longer than 2.3 mm *D. hirpex*
 Adult carapace shorter than 2.2 mm 2
2. Estimated length of adult carapace less than 1.50 mm *D. jillae*
 Length of adult carapace more than 1.50 mm 3
3. Width of distal end of 3rd joint of 1st antenna 38% length of dorsal margin of joint; 1st endopodial joint of mandible with 4 medial bristles *D. medix*
 Width of distal end of 3rd joint of 1st antenna 26% length of dorsal margin of joint; 1st endopodial joint of mandible with 6 medial bristles *D. exleyi*

Deeveya bransoni Kornicker and Palmer, 1987

FIGURES 7-12, 13a-k

Deeveya bransoni Kornicker and Palmer, 1987:610-623, figs. 1-5.—Kornicker et al., 1990:37, figs. 22c, 23d,e, 29b, 30.

HOLOTYPE.—USNM 193301, A-1 female on slide and in alcohol.

TYPE LOCALITY.—Evelyn Green's Blue Hole, South Andros Island.

REMARKS.—Kornicker and Palmer (1987:611) described an A-1 female from Evelyn Green's Blue Hole and an A-2 female from Stargate Blue Hole. New material (adult male, adult females, A-1 males and females, and A-2 female) described herein is from Stargate Blue Hole. Kornicker et al. (1990:37)

incorrectly reinterpreted the Kornicker and Palmer material to be an adult female rather than an A-1 female (USNM 193301), and an A-1 female rather than an A-2 female (USNM 193302).

MATERIAL.—Stargate Blue Hole, South Andros Island. Sta 97-026: USNM 194538, A-2 female; USNM 194539, adult female; USNM 194540, adult female; USNM 194542, A-1 male. Sta 97-028: USNM 194535, A-1 female; USNM 194536, A-1 male; USNM 194537, adult male (many appendages lost). Sta 97-029: USNM 194541, A-1 female; USNM 194543, adult female.

DISTRIBUTION.—Known only from Evelyn Green's Blue Hole and from Stargate Blue Hole, South Andros Island, Bahamas.

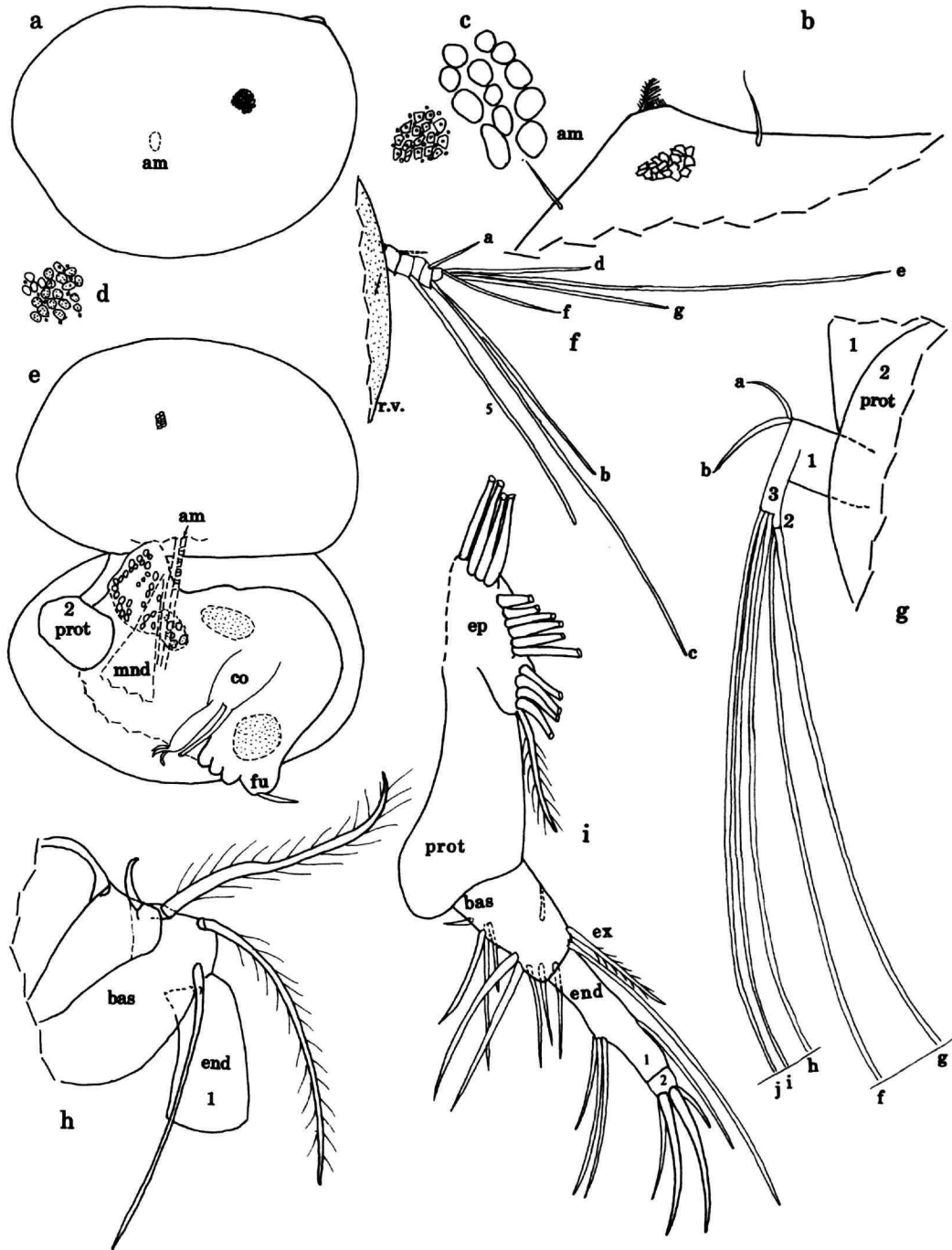


FIGURE 7.—*Deeveya bransoni* Kornicker and Palmer, 1987, USNM 194537, adult male: *a*, complete specimen from left side showing representative reticulations, length 2.04 mm; *b*, posterodorsal corner right valve, ov; *c*, adductor muscle attachments of right valve and representative reticulations, anterior toward right, ov; *d*, reticulations of right valve near central adductor attachments; *e*, opened and flattened specimen showing location of some appendages, anterior toward left, nabs; *f*, right 1st antenna protruding from carapace, anterior toward right, lv; *g*, endopodite of left 2nd antenna and part of 1st joint of left 1st antenna, anterior toward left, lv; *h*, part of right mandible, lv; *i*, left 5th limb, nabs, lv.



FIGURE 8.—*Deeveya bransoni* Kornicker and Palmer, 1987, USNM 194537, adult male: *a, b*, parts of left 6th limb viewed while attached to body, lv; *c*, part of right 6th limb, lv; *d*, right 7th limb, lv; *e*, right furcal lamella, lv; *f*, anterodorsal part of body viewed from left side, anterior to left; *g*, copulatory organ viewed from right side, anterior toward right; *h, i, j*, details from *g*.

DESCRIPTION OF ADULT MALE (Figures 7–9).—Carapace shape similar to that of A–1 female holotype and adult female (Figure 7a). Gland on posterodorsal corner of right valve.

Ornamentation: Polygons with small disk at intersections of walls and small boss within polygons (Figure 7c,d). Single bristles similar to those of A–1 female holotype (Figure 7b). Anteroventral margin with serrations.

Central Adductor Muscle Scars (Figure 7c): With about 12 indistinct ovoid scars similar to those of A–1 female holotype.

Carapace Size (length, height in mm): USNM 194537, 2.04, 1.51.

First Antenna (Figures 7f, 8f): Similar to that of A–1 female holotype, except g-bristle shorter than b-bristle, but variability of latter unknown.

Second Antenna (Figure 7e,g): Endopodite similar to that of A–1 female holotype. Prodopodite and exopodite not examined in detail, but in general similar to that of A–1 female holotype.

Mandible: In general, similar to that of A–1 female holotype (Figure 7e,h, all bristles not shown); however, limb not examined in detail. Basale with 4 proximal bristles, same number as on adult female and A–1 female described herein (A–1 female described by Kornicker and Palmer (1987:613, fig. 2a,e) had only 3, but one probably broken off).

Maxilla: Not examined.

Fifth Limb (Figure 7i): Epipodite, basale, endopodite, and exopodite bristles similar to those of A–1 female holotype, except left limb of USNM 194537 with 4 long bristles and no short bristle in dorsal group of epipodite. Bristles of proximal protopodite not examined and not shown in Figure 6i. (Note: identity of parts of limb from Boxshall (1998, fig. 13.6b), but they differ from original description of species.)

Sixth Limb (Figure 8a–c): First endopodial joint with 6 bristles on or near ventral margin (A–1 female with only 4); limb otherwise similar to that of A–1 female holotype. (Note: identity of parts of limb based on Cohen et al. (1998), and differ from original description of species.)

Seventh Limb (Figure 8d), Bellonci Organ (Figure 8f), and Posterior of Body: Similar to those of A–1 female holotype.

Furca (Figures 8e, 9e, 10a,b,d,e): Apron of USNM 194537 separated from furca by 2 lobes (tubular gut appears to terminate in middle lobe, which may be faeces); muscles in apron connect both with sclerites near posterior part of body and with furca (Figure 9e).

Lips: Not examined.

Copulatory Organ (Figures 7e, 8g–i, 9a–d): On left side of body. Posterior branch with blunt spinous tip. Anterior branch with flat sclerotized tip bearing upcurved sclerotized spine near midlength of anterior margin of tip and numerous small teeth along posterior margin and terminal end of tip (Figure 8i). Anterior margin of tip with stout proximal downcurved spine. Tapered tubular process at tip extending from internal tube running length of anterior branch (Figure 8h). Proximal part of copulatory organ located at left side of apron.

Posterior Sclerites (Figure 9e): Indistinct sclerites present on each side of posterior of body. Muscles connect sclerites with apron.

Gut Content: Unrecognizable amber-colored organic particles.

REMARKS.—Except for the 1st endopodial joint of the 6th limb having 6 rather than 4 bristles on or near the ventral margin, the examined appendages of the adult male are similar to those of the A–1 female. Male with copulatory organ.

DESCRIPTION OF ADULT FEMALE (Figures 10, 11, 12a,b).—Carapace shape and ornamentation (Figure 10a) similar to those of A–1 female holotype. Single bristles scattered on valve surface and along margins.

Glands: Glandular opening and adjacent setal bristle on tip of posterodorsal tubercle of right valve.

Central Adductor Muscle Attachments (Figure 10b): About 10 indistinct attachment scars anterior to valve midlength; 3 or 4 indistinct attachment scars anterior and ventral to larger cluster.

Carapace Size (length, height in mm): USNM 194539, 2.10, 1.58; USNM 194540, 2.00, 1.48; USNM 194543, 1.99, 1.50. Average length 2.03, average height 1.52.

First Antenna (Figures 10c,d, 11c): Dorsal bristle of 4th joint reaching 8th joint; g-bristle of 8th joint slightly shorter than b-bristle of 7th joint. Width of distal end of 3rd joint of USNM 194539 (measured perpendicular to ventral margin) 30% length of dorsal margin. Limb otherwise similar to that of A–1 female holotype.

Second Antenna (Figure 11c): Same as that of A–1 female holotype.

Mandible (Figure 10e–g): Coxale similar to that of A–1 female described by Kornicker and Palmer (1987:613, fig. 2b,c, f). Basale with 4 proximal bristles, 2 entwined lateral bristles that cross each other 5 times, 7 additional bristles, and terminal teeth similar to those of A–1 female described by Kornicker and Palmer (1987:613, fig. 2e). Endopodite: 1st joint with 8 bristles (1 dorsal terminal bristle, 1 distal ventral bristle, 5 distal medial bristles, 1 lateral bristle near midlength); 3rd joint with 7 bristles. Not all spines shown on bristles.

Maxilla (Figure 10h): Endite I with 2 proximal and about 10 terminal bristles; endite II with 2 proximal and about 11 terminal bristles; endite III with 1 proximal and about 6 terminal bristles. Coxale with stout, hirsute, terminal, dorsal bristle. Basale with 1 slender ventral bristle and 1 slender terminal bristle at midwidth. Endopodite: 1st joint with about 11 long bristles; 2nd joint with 2 stout claws and 6 slender bristles.

Fifth Limb (Figure 10i): Epipodite with 15 long bristles: 4 in dorsal group, 6 in middle group, and 5 in ventral group. Protopodite with 4 endites: endite I with 3 bristles; endite II with 1 proximal medial bristle and 4 ventral bristles; endite III with 8 ventral bristles; endite IV with 10 bristles (2 proximal medial, 2 claw-like ventral, and 6 slender ventral). Basale with 12 bristles on or near ventral margin. Exopodite represented by 2 terminal dorsal bristles on basale (1 very long). Endopodite: 1st

joint with 5 bristles (4 ventral, 1 dorsal); 2nd joint with 2 stout pectinate claw-like bristles and 2 slender ringed bristles. Not all spines shown on bristles.

Sixth Limb (Figures 11a, 12a,b): Epipodial bristles similar to those of A-1 female holotype. Precoxale and coxale with total of 8 bristles. Basale with 7 bristles (1 lateral, 6 medial or ventral). Exopodite with 4 long bristles. Endopodite 3-jointed: 1st joint with 6 ventral bristles; 2nd joint with 3 bristles (2 ventral, 1 dorsal); 3rd joint with 4 bristles (2 stout claw-like, 1 long ventral, 1 short medial). Not all spines shown on bristles.

Seventh Limb (Figure 12a,b), *Bellonci Organ* (Figure 11c), *Lips* (Figure 11e), and *Apron*: Similar to those of A-1 female holotype.

Furca (Figure 11b): Claw 4 about same length or slightly longer than claw 5; otherwise furca similar to that of A-1 female holotype.

Genitalia (Figures 11d, 12a,b): Small brown disc (with terminal triangular process) at tip of genital internal duct and adjacent to 3 small bristles (1 pair, 1 single). Sclerotized U-shaped internal structure ventral to bristles.

Posterior of Body (Figure 10a): Evenly rounded, unsegmented.

Eggs: USNM 194539 with about 15 small, unextruded eggs, each with central nucleus. USNM 194543 with many small eggs with nucleus and 1 or 2 larger eggs without nucleus (Figure 12b).

Gut Content: Unrecognizable amber-colored organic particles.

DESCRIPTION OF A-1 MALE (Figure 12c-f).—Carapace similar to that of A-1 female holotype (Figure 11c).

Carapace Size (length, height in mm): USNM 194536, 1.62, 1.14; USNM 194542, 1.64, 1.19. Average length 1.63, average height 1.17.

First Antenna, *Second Antenna*: Similar to those of A-1 female holotype.

Mandible: Basale similar to that of adult female described herein. Endopodite: 1st joint with 1 dorsal, 1 ventral, and 4 medial bristles; 2nd and 3rd joints similar to those of adult female.

Maxilla: Coxale with stout, spinous, dorsal bristle. Endopodite: 2nd joint with 2 stout claws and 5 slender bristles; anterior margin with long hairs.

Fifth Limb (Figure 12d): Epipodite similar to that of adult female (ventral bristle of ventral group slenderer and about 2/3 length of others). Endite I with 3 ventral bristles; endite II with 1 proximal and 4 ventral bristles; endite III with about 8 bristles; endite IV with about 10 bristles (2 claw-like ventral). Basale with 9 bristles. Exopodite represented by 2 bristles. Endopodite: 1st joint with 4 bristles (1 dorsal, 3 ventral); 2nd joint similar to that of adult female.

Sixth Limb: Exopodite similar to that of adult female. Endopodite: 1st joint with 4 ventral bristles; 2nd and 3rd joints similar to those of adult female.

Seventh Limb, *Furca*, *Bellonci Organ*, *Lips* (Figure 12e), and *Posterior of Body*: Similar to those of A-1 female holotype.

FIGURE 9 (right).—*Deeveya bransoni* Kornicker and Palmer, 1987, USNM 194537, adult male: a, appendages protruding from ventral edge of carapace viewed from left side, anterior toward left, nabs; b, posterior of body from left side showing location of some appendages, anterior toward left, nabs; c, copulatory organ from left side, anterior toward left, not all muscles shown; d, appendages protruding from ventral edge of carapace viewed from right side, anterior toward right, nabs; e, posteroventral part of body, anterior to right.

Apron (Figure 12g): Similar to that of adult male described herein.

Copulatory Organ (Figure 12f): Anterior branch with subterminal finger-like process proximal to flat-spined process. Narrower posterior branch with rounded tip with 6 minute spines.

Gut Content: With unidentifiable amber-colored organic particles.

SUPPLEMENTARY DESCRIPTION OF A-1 FEMALE (Figure 13a-g).—Carapace (Figure 13a,b) similar to that of A-1 female holotype.

Carapace Size (length, height in mm): USNM 194535, 1.62, 1.21; USNM 194541, 1.55, 1.16. [USNM 193301, holotype, 1.68, 1.27.] Average length 1.62, average height 1.21.

First Antenna: Width of distal end of 3rd joint of USNM 194535 (measured perpendicular to ventral margin) 36% to 37% length of dorsal margin. Limb similar to that of A-1 female holotype.

Second Antenna: Same as that of A-1 female holotype.

Mandible: Basale with 4 proximal bristles (A-1 female holotype has only 3 but one probably had broken off) (Figure 12d). Endopodite: joints 2 and 3 similar to those of A-1 female holotype. Remaining parts of limb not examined in detail.

Maxilla: Not examined in detail.

Fifth Limb: Epipodite and endopodite similar to those of A-1 female holotype. Remaining parts of limb not examined in detail.

Sixth Limb: Epipodite, exopodite, and endopodite similar to those of A-1 female holotype. Remainder of limb not examined in detail.

Seventh Limb (Figure 13f; bristles not shown), *Furca* (Figure 13e,g), *Bellonci Organ*, *Upper Lip*, *Apron* (Figure 13g), and *Posterior of Body* (Figure 13g): Similar to those of A-1 female holotype.

Genitalia (Figure 13f): Left side with 2 bristles near indistinct genital tube.

Gut Content: Unrecognizable amber-colored particulate matter.

SUPPLEMENTARY DESCRIPTION OF A-2 FEMALE (Figure 13h-k).—Carapace similar to that of adult female except dorsal margin slightly more convex (Figure 13h).

Carapace Size (length, height in mm): USNM 194538, 1.20, 0.92. [USNM 193302, paratype, 1.21, 0.94.] Average length 1.21, average height 0.93.

First Antenna: Dorsal bristle of 4th joint almost reaching 8th joint. Width of distal end of 3rd joint of USNM 194538 (measured perpendicular to ventral margin) 36% to 40% length

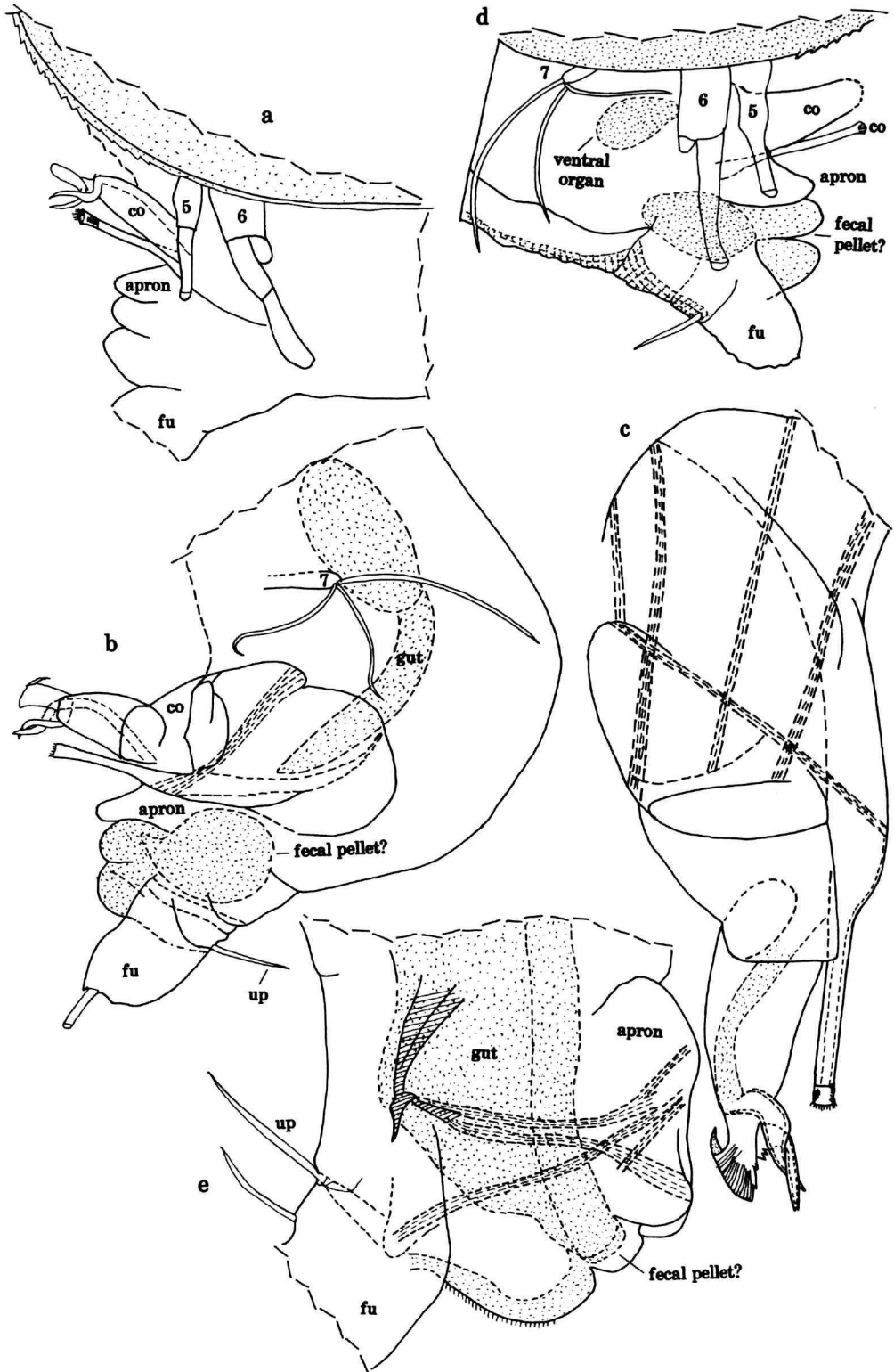




FIGURE 10.—*Deeveya bransoni* Kornicker and Palmer, 1987, USNM 194539, adult female: *a*, complete specimen from left side, length 2.10 mm; *b*, central and mandibular muscle attachments left valve, anterior to right, *iv*; *c*, 3rd joint of right 1st antenna, *mv*; *d*, 3rd joint of left 1st antenna, *lv*; *e*, basale, left mandible, anterior toward left, *lv*; *f, g*, part of right mandible, *nabs, mv*; *h*, maxilla, not all endite bristles shown; *i*, left 5th limb, *lv*.

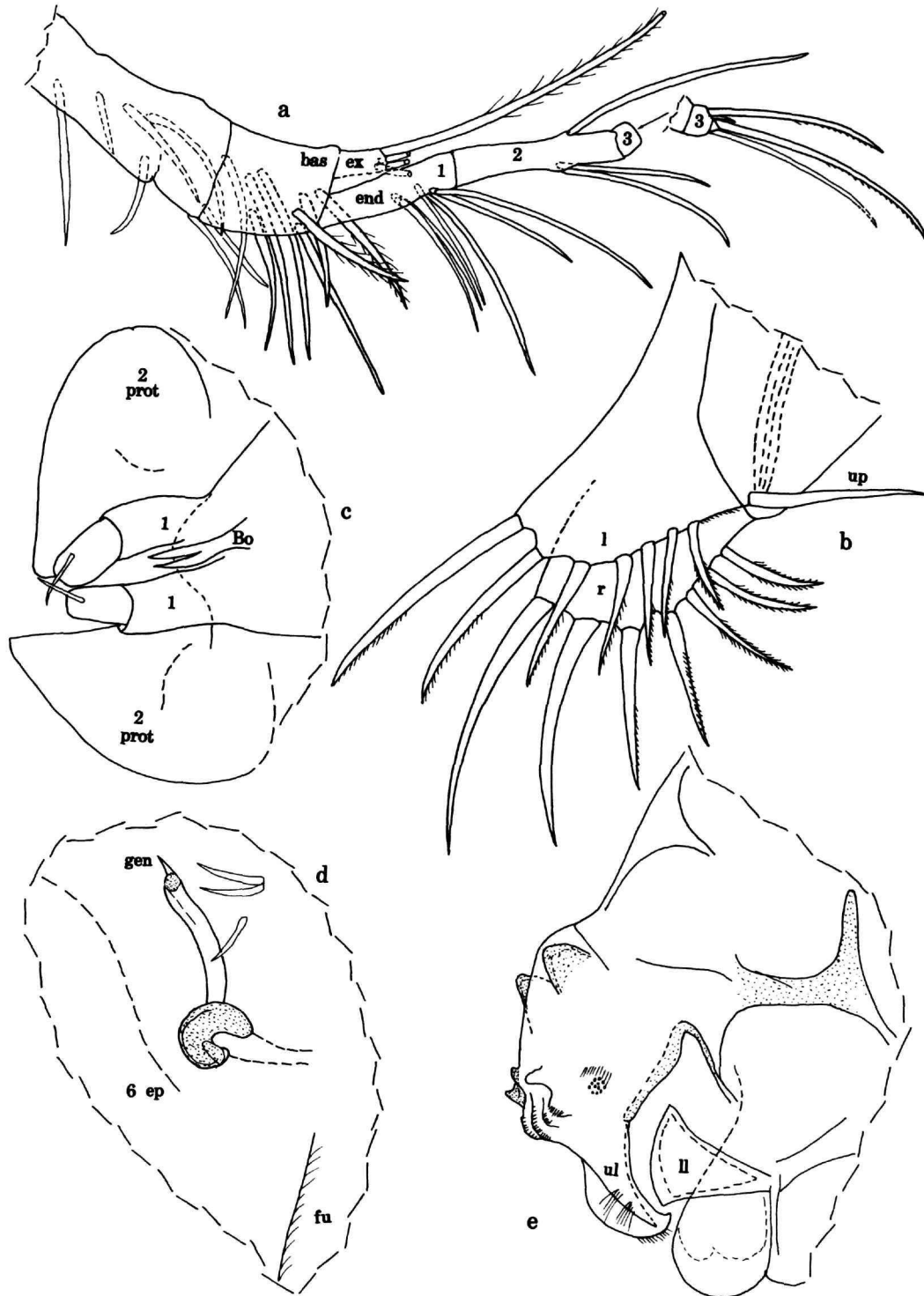


FIGURE 11.—*Deeveya bransoni* Kornicker and Palmer, 1987, USNM 194539, adult female: *a*, left 6th limb, lv; *b*, furcal lamellae from left side, anterior to left; *c*, anterior of body showing location of some appendages, anterior to left, dv; *d*, genital area from left side of body, anterior toward left; *e*, anteroventral part of body from left side, anterior toward left.

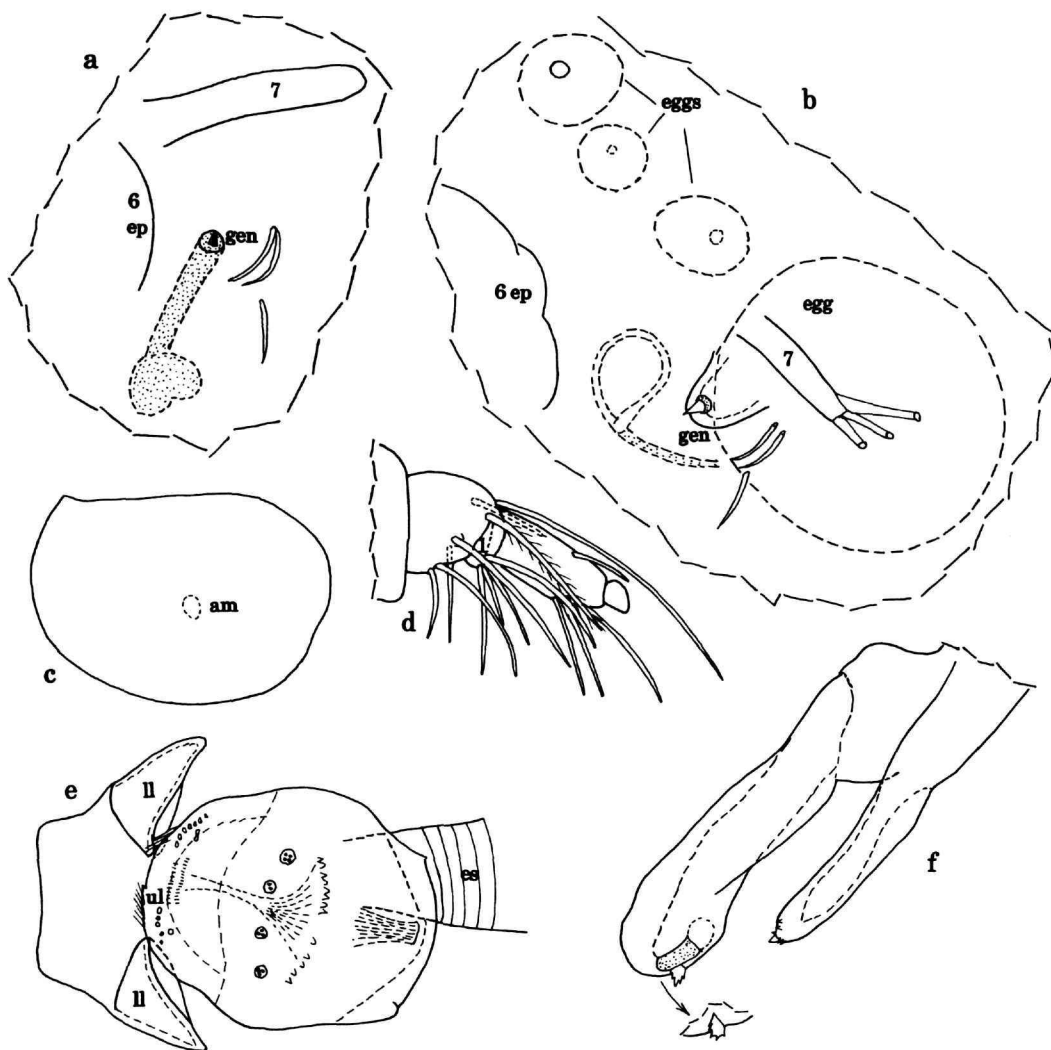
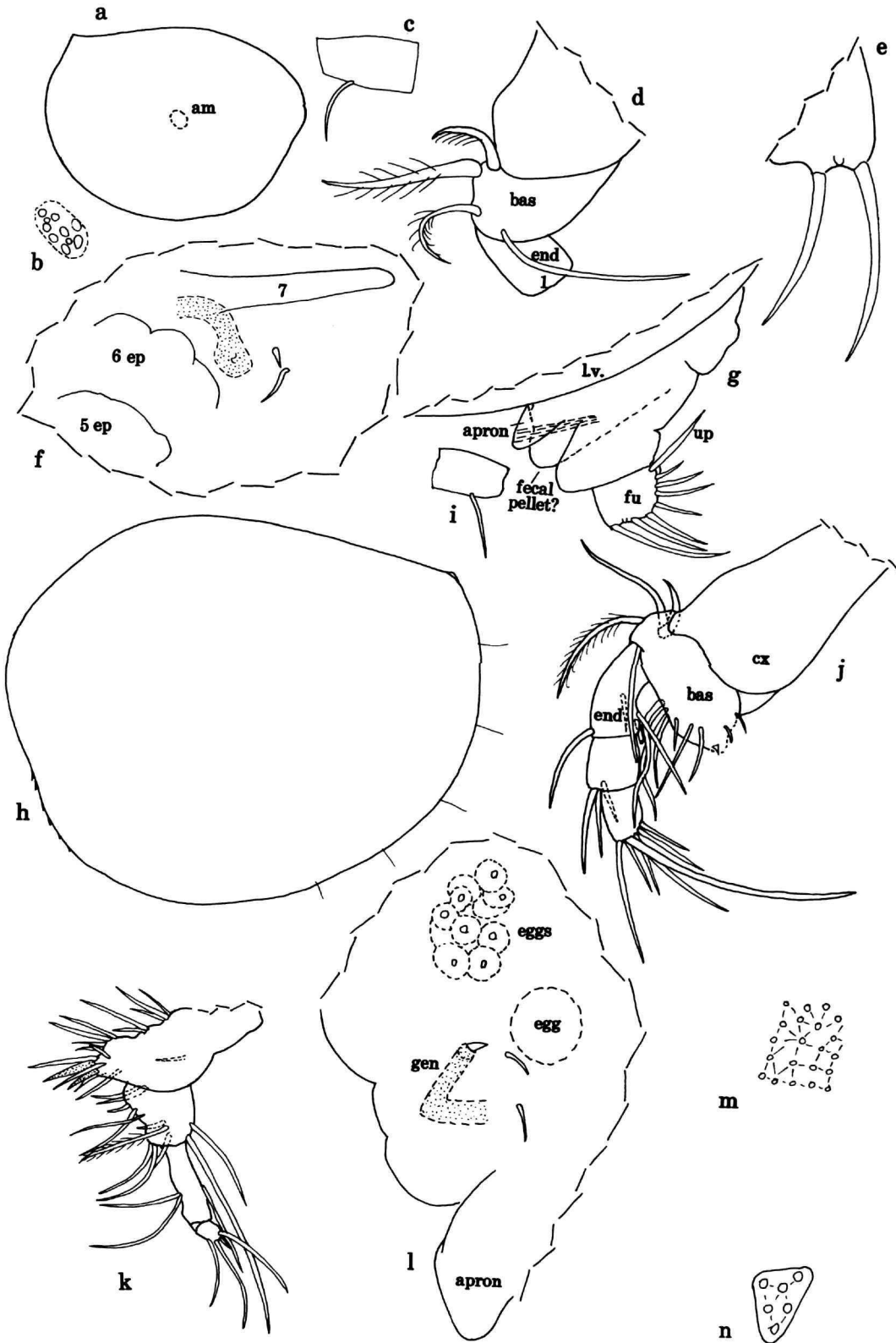


FIGURE 12.—*Deeveya bransoni* Kornicker and Palmer, 1987, USNM 194540, adult female: *a*, part of posterior of body from left side, anterior toward left, bristles of 7th limb not shown. USNM 194543, adult female: *b*, part of posterior of body from left side, anterior toward left. USNM 194536, A-1 male: *c*, complete specimen from right side, length 1.62 mm. USNM 194542, A-1 male: *d*, distal left 5th limb, nabs, lv; *e*, anterior of body and lips, anterior toward top, vv; *f*, copulatory organ from left side, anterior to left.

FIGURE 13 (right).—*Deeveya bransoni* Kornicker and Palmer, 1987, USNM 194535, A-1 female: *a*, complete specimen from right side, length 1.62 mm; *b*, detail of central adductor muscle attachments from *a*; *c*, 3rd joint left 1st antenna, anterior toward left, lv; *d*, part of left mandible, anterior toward left, lv; *e*, part of right furcal lamella, lv; *f*, part of posterior of body from left side, anterior toward left, nabs. USNM 194541, A-1 female instar: *g*, posterior of body protruding from shell viewed from left side, anterior toward left. USNM 194538, A-2 female: *h*, complete specimen from left side, length 1.20 mm; *i*, 3rd joint of right 1st antenna, lv; *j*, part of left mandible (not flattened undercover slip), nabs, lv; *k*, left 5th limb (protopodite and endite bristles approximate), lv. *Deeveya exleyi* Kornicker and Liffé, 1998, holotype, USNM 194269, adult female: *l*, part of posterior of body from left side, anterior toward left; *m*, clear pores near adductor muscle attachments of right valve, anterior toward right, ov; *n*, clear pores of valve fragment (same magnification as *m*), iv.



of dorsal margin (Figure 13*i*). Limb otherwise similar to that of adult female.

Second Antenna: Exopodite: bristle of 1st exopodial joint of right limb aberrant (twice length of joints 2–8 and subterminal on joint). Limb otherwise similar to that of A–1 female holotype, but bristles of 9th exopodial joint not clearly seen.

Mandible (Figure 13*j*): Tips of coxale and basale endites not examined. Basale with 4 proximal bristles (2 long stout plumose, 1 short stout, 1 long slender reaching tip of endopodite). Basale endite: posterior margin with 2 short distal bristles; lateral side with 6 bristles (2 long entwined crossing each other 2 or 3 times), and 1 short stout tooth just proximal to tip of endite. Endopodite: 1st joint with 1 terminal anterior bristle, 1 distal ventral bristle, and 2 distal medial bristles; 2nd joint with 4 bristles; 3rd joint with 7 bristles.

Maxilla: Coxale with stout, plumose, dorsal bristle. Basale with 2 slender bristles (1 at midwidth, 1 ventral). Endopodite: 1st joint with 3 bristles near anterior margin and 3 bristles at posterodorsal corner; 2nd joint with 2 stout claws and about 3 slender bristles.

Fifth Limb (Figure 13*k*): Epipodite: dorsal group with 4 long bristles; middle group with 6 long bristles; ventral group with 4 long bristles. Protopodite with about 20 bristles. Exopodite represented by 2 bristles. Basale with total of 8 bristles. Endopodite: 1st joint with 3 bristles (2 ventral, 1 dorsal); 2nd joint with 4 bristles (2 claw-like).

Sixth Limb: Epipodite: dorsal group with 7 bristles (dorsal bristle short); middle group with 5 long bristles (stump of 6th bristle may be present); ventral group with 5 long bristles. Endopodite: 1st joint with 2 ventral bristles; 2nd joint with 2 bristles (1 ventral, 1 dorsal); 3rd joint with 4 bristles (2 claw-like). Exopodite with 4 long bristles.

Seventh Limb: Similar to that of adult female.

Furca: Each lamella with 6 claws followed by small triangular process (incipient 7th claw). Otherwise similar to that of A–1 female holotype.

Bellonci Organ, Apron, and Posterior of Body: Similar to those of adult female.

Genitalia: None visible.

Gut Content: Unidentifiable amber-colored particulate organic matter.

ONTOGENETIC DEVELOPMENT.—The earliest instar in the collections is an A–2 instar. Genitalia are absent on the specimen, so the sex is uncertain but is assumed herein to be a female because A–2 males probably have vestigial copulatory appendages, based on the large size of the appendages on the A–1 male. The collections contain A–1 male and female instars, adult females, and one adult male. Unfortunately, most appendages of the adult male were lost before they could be studied in detail; only the 7th limb, copulatory organ, and furca are on hand, also the shell. Camera lucida drawings of the lost appendages presented herein are based on preliminary drawings made while the appendages were attached to the body.

The last two developmental stages of species of *Deeveya*

TABLE 5.—Number of bristles on some appendages of different growth stages of *Deeveya bransoni*. (F=female, M=male, na=not applicable, nd=no data, –=absent, +=present.)

Character	Growth stages				
	A–2F	A–1F	A–1M	Adult F	Adult M
Carapace average length (mm)	1.21	1.62	1.63	2.03	2.04
Mandible, endopodite					
1st joint	4	6	6	7	nd
2nd joint	4	4	4	4	nd
3rd joint	7	7	7	7	nd
Maxilla, endopodite					
1st joint	6–7	9–11	10	11	nd
2nd joint	6	7	7	8	nd
5th limb, exopodite					
1st joint	3	4	4	5	4?
2nd joint	4	4	4	4	4
6th limb, endopodite					
1st joint	2	4	4	6	6
2nd joint	2	3	3	3	3
3rd joint	4	4	4	4	4
Furcal claws	6	7	7	7	7
Genitalia	–	+	+	+	+
Female bristles	0	2	na	3	na
Number of specimens	2	3	2	3	1

bransoni may be identified by the morphology of the copulatory organ of the male. The organ of the adult male is well-developed, with a complex process at the tip of the large anterior branch (Figure 8*i*), whereas the organ of the A–1 male is less well-developed, with a less complex tip on the anterior branch (Figure 12*f*).

The sizes of the carapaces of A–1 and adult males of *D. bransoni* in the present collection differ by a factor of 1.25. By comparing the relative sizes of A–1 and adult females, which are similar to those of A–1 and adult males, respectively, the two stages of females may be identified with reasonable certainty.

Three adult females and three A–1 females of *D. bransoni* are known. The 3 adults have 3 bristles (1 paired, 1 single) in the vicinity of the genital area (Figure 11*d*), compared to 2 single bristles on the A–1 females (Figure 13*f*). The adults also have a tapered process at the tip of the genital tube (Figures 11*d*, 12*a,b*), which was not observed on the A–1 females (Figure 13*f*). These differences suggest that a detailed comparison of the morphology of the genital area may be useful in identifying the last two stages of a female. The genital areas in the present study were examined at $\times 300$ ($15\times$ ocular, $20\times$ objective) using complete specimens immersed in a drop of glycerine in a dished slide; the valves were either opened or removed. Under those conditions the genital area is visible but requires careful examination to see details, and more than one specimen should be examined. The presence of only 2 bristles and the absence of a terminal tapered process at the tip of the genital tube of the holotype of *D. bransoni* (Kornicker et al., 1990, fig. 23e), support a conclusion that the holotype is an A–1 female.

Two of the three adult females of *D. bransoni* in the present collection have unextruded eggs (Figure 12*b*). The three known A-1 females of *D. bransoni* are without eggs. The number of specimens studied is insufficient to be certain that all A-1 females are without eggs. Kornicker and Iliffe (1989:40) reported the presence of small unextruded eggs in the A-1 female (instar VI) of *Euconchoecia bifurcata pax* Kornicker and Iliffe, 1989a, so the possibility of A-1 females of *Deeveya* having eggs is real, although large eggs should be found only in the adult. Extruded eggs have not been reported within the carapace of members of *Deeveya*; presumably, like most halocypriids, eggs are not brooded within the carapace.

Although the data are few, males and females appear to be similar in size. Except for the genitalia, the morphologies of appendages also are similar. The number of bristles on some distal joints of the mandible, maxilla, and 5th and 6th limbs increases slightly in the last three stages and may be useful in identifying the stage (Table 5).

Deeveya exleyi Kornicker and Iliffe, 1998

FIGURE 13*l-n*

Deeveya exleyi Kornicker and Iliffe, 1998:53-61, figs. 37-42.

MATERIAL—Holotype, USNM 194269, adult female.

DISTRIBUTION.—Oven Rock Cave, Great Guana Cay, Exuma Cays, Great Bahama Bank.

SUPPLEMENTARY DESCRIPTION OF ADULT FEMALE GENITALIA (Figure 13*l*).—Reexamination of the holotype revealed 2 small bristles adjacent to the genitalia. (Kornicker and Iliffe, 1998:61, fig. 42a-c, had described and illustrated only 1 bristle.)

Spelaeoecia Angel and Iliffe, 1987

Spelaeoecia Angel and Iliffe, 1987:545, figs. 2-6.

TYPE SPECIES.—*Spelaeoecia bermudensis* Angel and Iliffe, 1987:545.

COMPOSITION AND DISTRIBUTION.—The genus includes nine species from anchialine caves in Bermuda, the Bahama Islands, Jamaica, Cuba, and Mexico (Kornicker and Iliffe, 2000). The Bahaman species include *S. styx*, *S. capax*, *S. sagax* Kornicker, 1990 (in Kornicker et al., 1990), *S. barri* (Kornicker and Barr, 1997), and *S. parkeri*, new species, herein. Those five species have been collected only in the Bahamas.

REMARKS CONCERNING ORNAMENTAL STRUCTURES ON OUTER SURFACE OF CARAPACE.—Surface lineations or reticulations on the outer surface of *Spelaeoecia* carapaces, which are visible when viewed in water or alcohol, disappear after being immersed in glycerine for a few weeks and are no longer visible under a light microscope. Surface ridges are part of the epicuticle of halocypriids (Bate and Sheppard, 1982, pl. 9).

Spelaeoecia styx Kornicker, 1990

FIGURES 14, 15

Spelaeoecia styx Kornicker in Kornicker et al., 1990:6, figs. 2-8.—Kornicker and Iliffe, 1998:26, figs. 17-29.

HOLOTYPE.—USNM 193441, undissected adult male in alcohol.

TYPE LOCALITY.—El Dorado Cave, South Andros Island, Great Bahama Bank.

DISTRIBUTION.—South Andros Island: El Dorado Cave, Stargate Blue Hole. Exuma Cays: Norman's Pond Cave, Oven Rock Cave.

MATERIAL.—Stargate Blue Hole, South Andros Island: Sta 97-026: USNM 194544, adult male on slide and in alcohol; USNM 194546A,B, 2 adult females in alcohol; USNM 194546C,D, 2 adult males in alcohol; USNM 194546E, 1 A-1 ?female in alcohol; USNM 194546F, 1 A-2 instar in alcohol. Sta 97-029: USNM 194545A, 1 adult male in alcohol; USNM 194545B,C, 2 adult females in alcohol.

SUPPLEMENTARY DESCRIPTION OF ADULT MALE (Figure 14).—Carapace similar to that of holotype (Figure 14*a*).

Carapace Size (length, height in mm): USNM 194544, 1.03, 0.56; USNM 194545A, 1.04, 0.58; USNM 194546C, 1.04, 0.60; USNM 194546D, 1.03, 0.58.

First Antenna (Figure 14*b,c*), **Second Antenna** (Figure 14*d,e*), **Mandible**, and **Maxilla** (Figure 14*f*): Similar to those of holotype.

Fifth Limb (Figure 14*f*): Protopodite with elongate lateral glandular process projecting outward between maxilla and 6th limb.

Sixth Limb (Figure 14*f*), **Seventh Limb**: Similar to those of holotype.

Furca (Figure 14*g*): Each lamella with 7 claws.

Copulatory Organ (Figure 14*h,i*): Anterior branch complex, with proximal flat process with teeth along distal tip and distal toothed process; processes between flat process and distal toothed process difficult to interpret (Figure 14*i*).

SUPPLEMENTAL DESCRIPTION OF ADULT FEMALE.—**Carapace Size** (length, height in mm): Sta 97-026: USNM 194546A, 1.13, 0.57; USNM 194546B, 1.05, 0.56. Sta 97-029: USNM 194545B, 1.03, 0.56; USNM 194545C, 1.04, 0.52.

SUPPLEMENTAL DESCRIPTION OF A-1 INSTAR.—**Carapace Size** (length, height in mm): Sta 97-026, USNM 194546E (?female), 0.84, 0.50.

Furca: Each lamella with 7 claws.

SUPPLEMENTAL DESCRIPTION OF A-2 INSTAR.—**Carapace Size** (length, height in mm): Sta 97-026, 0.73, USNM 194546F, 0.41.

Furca: Each lamella with 6 claws followed by small triangular process (incipient claw).

REMARKS CONCERNING CARAPACE SURFACE.—The carapace of an adult male of *S. styx* that had been collected on Exuma Cay (Kornicker and Iliffe, 1998) and had distinct epicuticle reticulations prior to being immersed in glycerine was

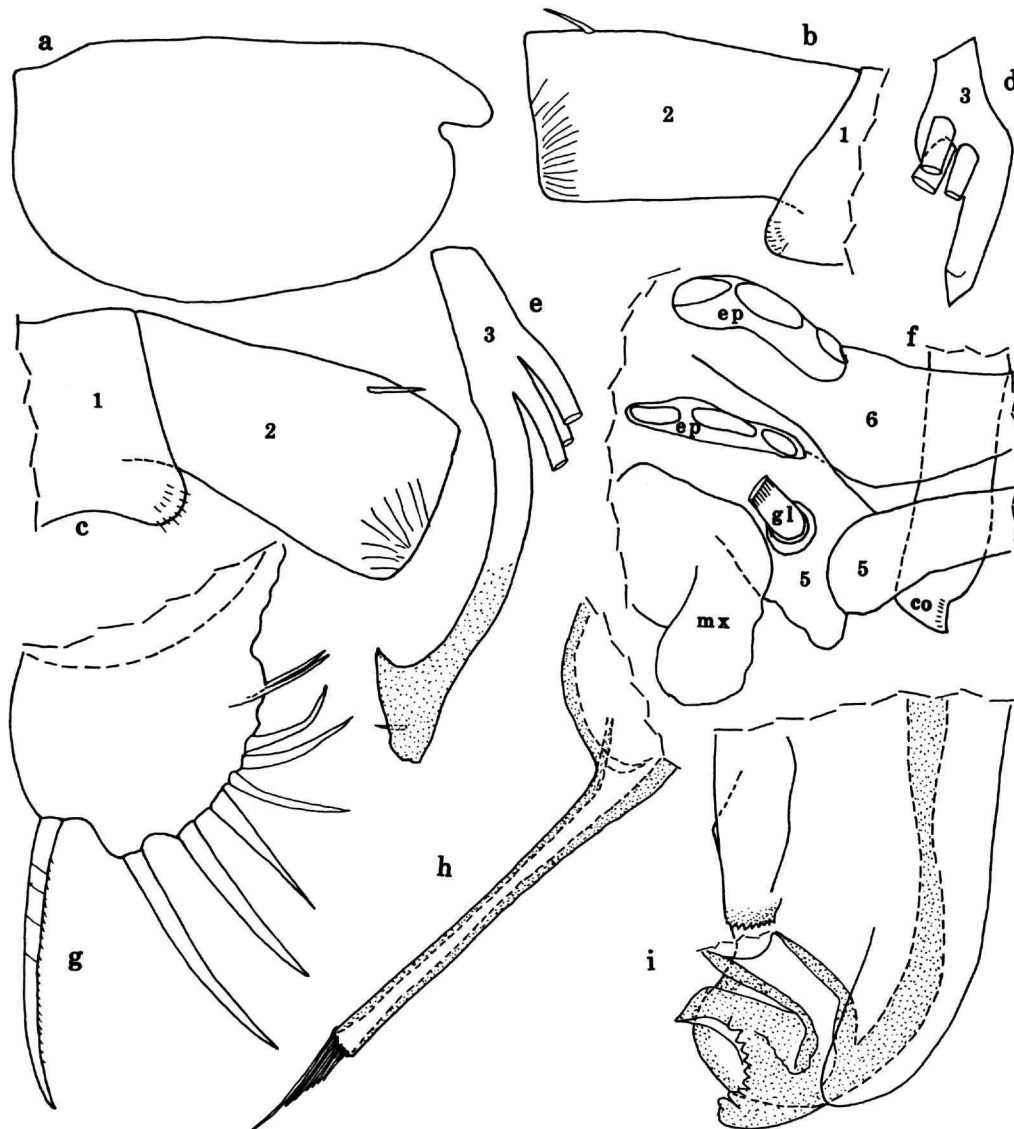


FIGURE 14.—*Spelaeoecia styx* Kornicker, 1990, USNM 194544, adult male: *a*, carapace from right side, length 1.03 mm; *b, c*, proximal part of right and left 1st antenna, respectively, mv; *d, e*, distal part of endopodite of left and right 2nd antenna, respectively, mv; *f*, left posterior appendages as seen through shell, nabs, anterior to left, lv; *g*, left furcal lamella, lv; *h, i*, distal parts of posterior and anterior branch of copulatory organ, respectively, anterior to right.

examined with a Scanning Electron Microscope; most reticulations were no longer clearly visible, but a few remained. The carapace of a specimen of *S. styx* that had been collected in Andros Island and then immersed in glycerine, which had resulted in the reticulations being no longer visible, also was examined with a Scanning Electron Microscope, and a few reticulations were found to be present. The reticulations from both localities seem sufficiently similar to indicate a close relationship be-

tween the two populations. The specimens were treated by freezing point evaporation prior to micrography.

An adult female (USNM 194298) and an A-1 male (USNM 194414) from Exuma Cays, whose reticulations had disappeared after immersion in glycerin, were placed in dyes (Chlorazol Black and Hematoxylin, respectively), but these failed to bring out surface ridges. Fresh material from Andros Island should be examined to be certain that the carapace reticulations

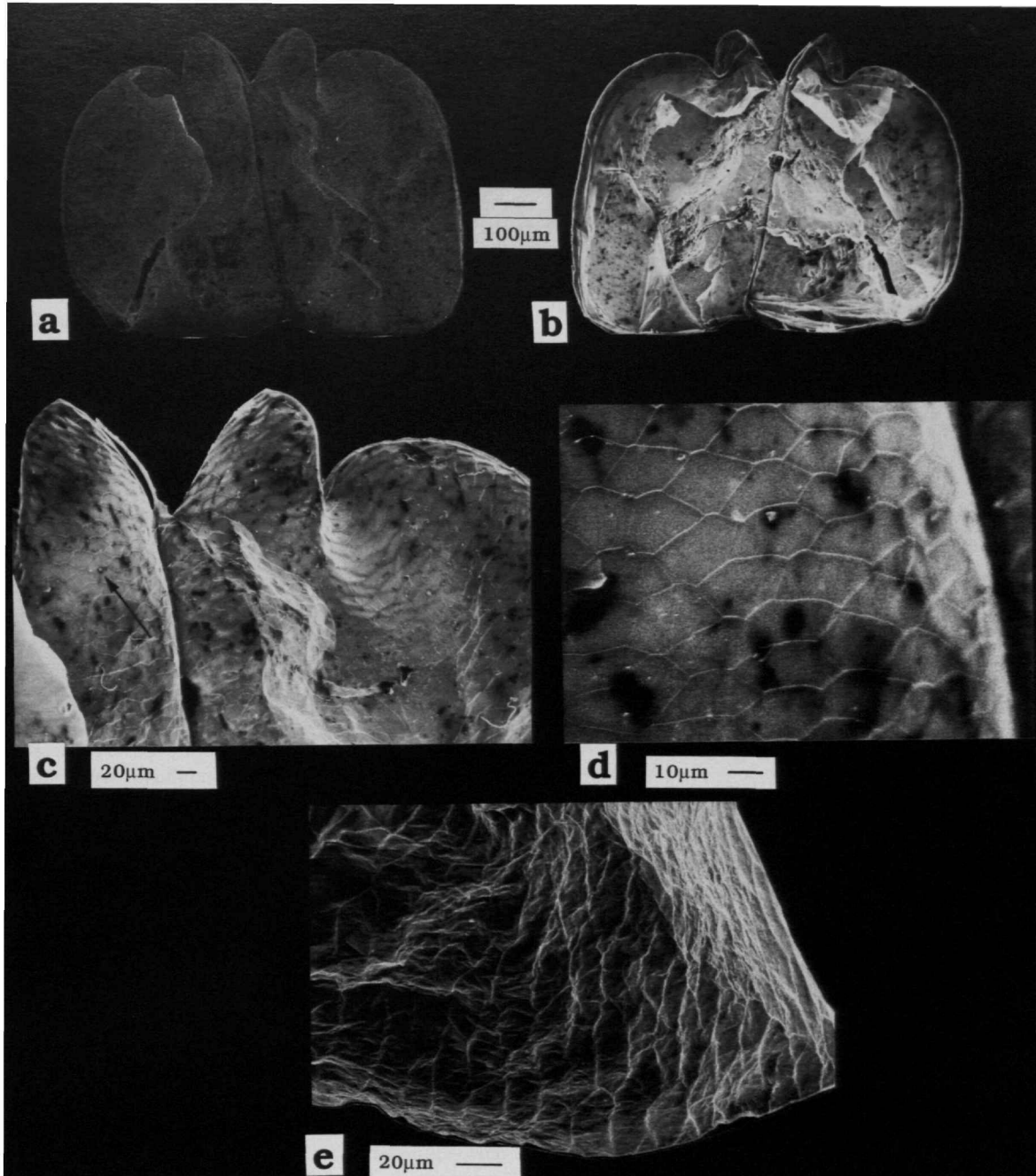


FIGURE 15.—*Spelaeoecia styx* Kornicker, 1990, SEM micrographs of carapaces whose surface reticulations were no longer visible when viewed with a light microscope after specimens were immersed in glycerin for several days or weeks (carapaces treated by freezing-point evaporation and then coated prior to micrography). *a-d*, USNM 194261, adult female from Norman's Pond Cave, Norman's Pond Cay, Exuma Cays, Bahamas (reported in Kornicker and Iliffe, 1998:26, 33), carapace length 1.02 mm: *a, b*, outside and inside views, respectively, of opened carapace; *c*, detail of anterior end, from *a*; *d*, detail of surface reticulations (location on valve indicated by arrow in *c*). *e*, USNM 194546C, adult male from Stargate Blue Hole, South Andros Island, Bahamas, carapace length 1.04 mm, distorted posterior part of left valve, ventral edge toward bottom, ov.

TABLE 6.—Comparison of carapace lengths of adult males and females of *Spelaeoecia styx* from South Andros Island and Exuma Cays. (N=number of specimens.)

Location	Adult male		Adult female	
	Length (mm)	N	Length (mm)	N
South Andros Island				
Eldorado Cave	0.98	2	0.82	1
Stargate Blue Hole	1.03–1.04	4	1.03–1.13	4
Exuma Cays				
Norman's Pond Cave	1.04–1.11	14	1.01–1.16	10
Oven Rock Cave	0.95	2	0.95–0.97	4

are similar to the carapace reticulations of the population from Exuma Cays.

COMPARISONS.—As discussed in Kornicker and Iliffe (1998:37), the 2nd joint of the 1st antennae of Andros Island specimens have a shorter dorsal bristle (Figure 14*b,c*) than the specimens from Exuma Cays, suggesting that the Andros Island and Exuma Cays populations may not be conspecific. Although the specimens are too few for statistical certainty, the carapace lengths of specimens from the four localities appear to vary (Table 6).

Spelaeoecia parkeri, new species

FIGURES 16–21

ETYMOLOGY.—The species is named in honor of Rob Parker, diving pioneer.

HOLOTYPE.—USNM 194600, female (?adult) from Sta 97-022.

TYPE LOCALITY.—Mermaid's Lair, Grand Bahama Island.

PARATYPE.—USNM 194547, juvenile instar from Sta 97-021.

DISTRIBUTION.—Mermaid's Lair, Grand Bahama Island, depth 18–22 m.

DESCRIPTION OF FEMALE (?adult) (Figures 16–20).—Carapace uncalcified, flexible, elongate; dorsal margin straight, ventral margin slightly rounded; anterior incisur dorsal to midheight (Figure 16*a*). Anterior outer part of rostrum broadly overreaching edge of valve and with rounded tip (Figure 16*e*) (rostrum of right valve of holotype twisted and appearing falsely as having pointed tip (Figure 16*a,f*)). Posterodorsal corner of each valve with obtuse angle (Figure 16*c,f,h,i*); left valve with minute process that could be glandular process (Figure 16*c*); right valve with glandular openings indicated by minutely digitate edge anterior to 2 depressions (Figure 16*c,h,i*). Posterior (Figure 16*c,f,h*) and ventral edges of valves with glandular ducts.

Ornamentation (Figure 16*b,g*): Surface of valves with striations and cross-striations that become invisible after being immersed in glycerin for a few days.

Infold (Figure 16*c,d,f,h*): Broad infold along anterior, ventral, and posterior margins; posterior list intersects valve edge near posteroventral corner; a 2nd list closer to inner margin of

infold extends from near midheight of posterior end of valve to anterior of valve ventral to inner end of incisur.

Central Adductor Muscle Attachments: Not observed.

Carapace Size (length, height in mm): USNM 194600, 1.53, 0.88.

First Antenna (Figure 17*a,b*): 1st joint with minute distal spines. 2nd joint with distal medial spines and long, bare, dorsal bristle. 3rd joint bare, about twice length of 4th joint. 4th joint with 2 well-defined bristles (1 ventral, 1 dorsal). 5th joint with long ventral filament. 7th joint with spinous a-bristle and long b- and c-bristles. 8th joint with d-, e-, f-, and g-bristles.

Second Antenna: Protopodite bare. Endopodite 3-jointed (Figure 17*d,k*): 1st joint elongate with slender a- and b-bristles; 2nd joint with small ringed c-bristle, long stout f- and g-bristles, and indistinct minute lateral bristle near base of j-bristle; 3rd joint with filamentous h-, i-, and j-bristles. Exopodite with 9 joints (Figure 17*c*): 1st joint divided into long proximal and short distal parts, with long terminal bristle with proximal ventral spines and natatory hairs; distal part of 1st joint with thinner sclerotized surface sheath than that of proximal part (Figure 17*c*); bristle of 2nd joint with ventral spines and natatory hairs; bristles of joints 3 to 8 with natatory hairs but no spines; 9th joint with 3 bristles.

Mandible (Figures 17*e-k*, 18*e*): Coxale endite with proximal and distal sets of teeth separated by gap (Figure 18*e,h*): proximal set comprising 4 broad cusps plus posterior triangular tooth; surface between cusps and just proximal to cusps with slender spines; 1 indistinct bristle on corner just anterior to anterior cusp and another just posterior to posterior cusp; 3 (possibly only 2) spinous bristles adjacent to triangular tooth; distal set of teeth comprising 2 flat teeth, each with 7 or 8 cusps; 1 stout, curved, tooth-like process proximal to flat teeth (usual bristle adjacent to process on other species not observed on limb examined, probably present but obscured). Basale (Figure 17*i,j*): distal edge (Figure 17*i*) with 5 triangular cusps and 1 smaller posterior cusp; lateral surface near distal edge with sharp tooth near midwidth; lateral surface distal to midlength with 2 minute and 4 longer bristles, none entwined (Figure 17*j*); anterior margin with long bristle distal to midlength; posterior margin hirsute, with 2 short distal bristles (proximal with pointed tip, distal tubular); proximal end of basale with 3 transparent plumose bristles; lateral surface near insertion of endopodite with long bare bristle; medial side near insertion of endopodite with small bristle. Endopodite (Figure 17*f,g,j,k*): 1st joint with 3 bare distal bristles (1 long dorsal, 1 short near ventral margin, 1 long medial); 2nd joint widening distally, with 3 terminal dorsal bristles (1 claw-like with ventral spines, 1 medial bare, 1 lateral bare) and 1 long, terminal, bare, ventral bristle; 3rd joint with 2 small medial pustules near dorsal margin (Figure 17*f,g*), 2 long, stout, claw-like, spinous bristles, 5 short bare ringed bristles forming medial row along terminal edge, and 1 longer, ringed, spinous bristle on terminal lateral edge; anterior margin and medial surface of joint hirsute.

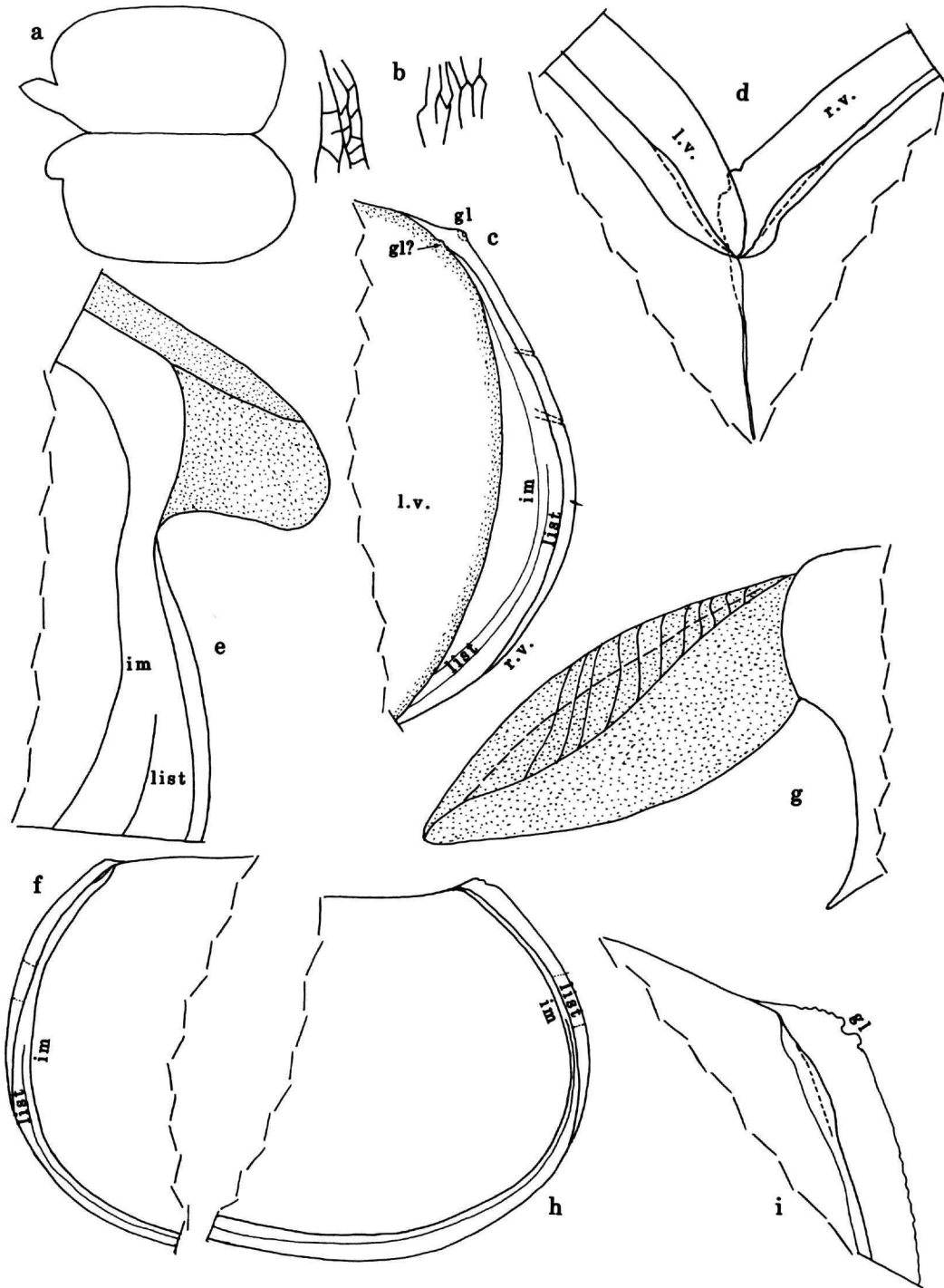


FIGURE 16.—*Spelaeoecia parkeri*, new species, holotype, USNM 194600, female (?adult): a, flattened carapace, anterior to left, ov, length 1.53 mm; b, representative lineations on valves, ov; c, posterior ends of left and right valves from left side; d, posterodorsal ends of flattened left and right valves, iv, anterior towards bottom; e, f, anterior and posterior of left valve, respectively, iv; g, h, anterior (rostrum twisted) and posterior of right valve, respectively, iv; i, posterodorsal corner of right valve, iv.

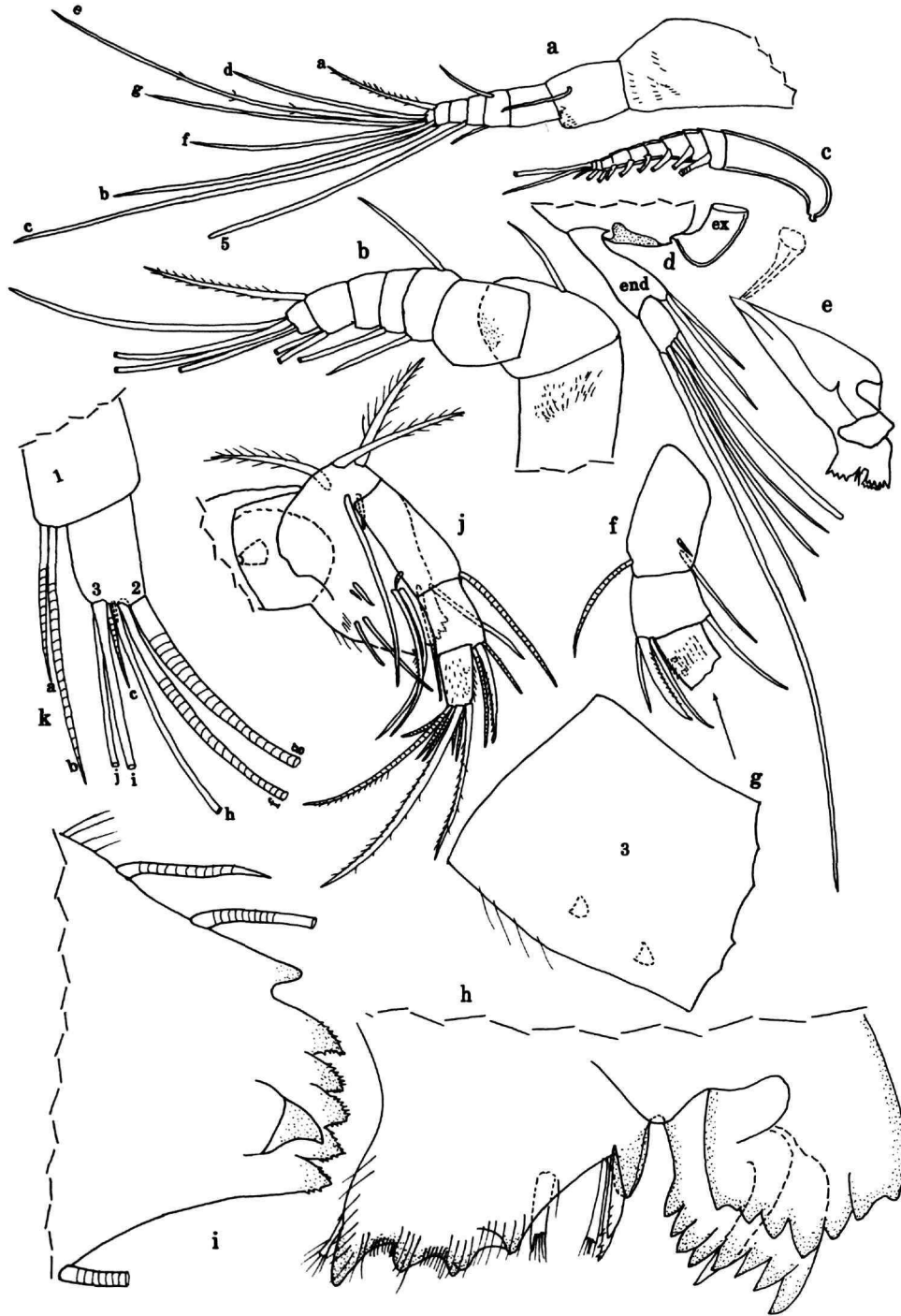


FIGURE 17.—*Spelaeoecia parkeri*, new species, holotype, USNM 194600, female (?adult): *a, b*, right 1st antenna, mv; *c*, exopodite right 2nd antenna, vv; *d*, endopodite and parts of protopodite and exopodite right 2nd antenna, vv; *e*, coxale left mandible, lv; *f*, part of endopodite left mandible, lv; *g*, detail showing pustules of 3rd endopodial joint left mandible, from *f*; *h*, distal end of coxale left mandible; *i*, distal end of basale left mandible, lv; *j*, lateral view of right mandible (drawn while appendage attached to body), nabs, lv; *k*, distal end of endopodite right 2nd antenna, mv.



FIGURE 18.—*Spelaeoecia parkeri*, new species, holotype, USNM 194600, female (?adult): a, maxilla; b-d, endites I, II, and III of maxilla shown in a, respectively; e, ventral view of anterior of body and lateral view of some appendages of right side, nabs; f, epipodite right 5th limb, anterior towards left, mv; g, left 5th limb (viewed while attached to body), nabs, mv; h, left 7th limb, mv.

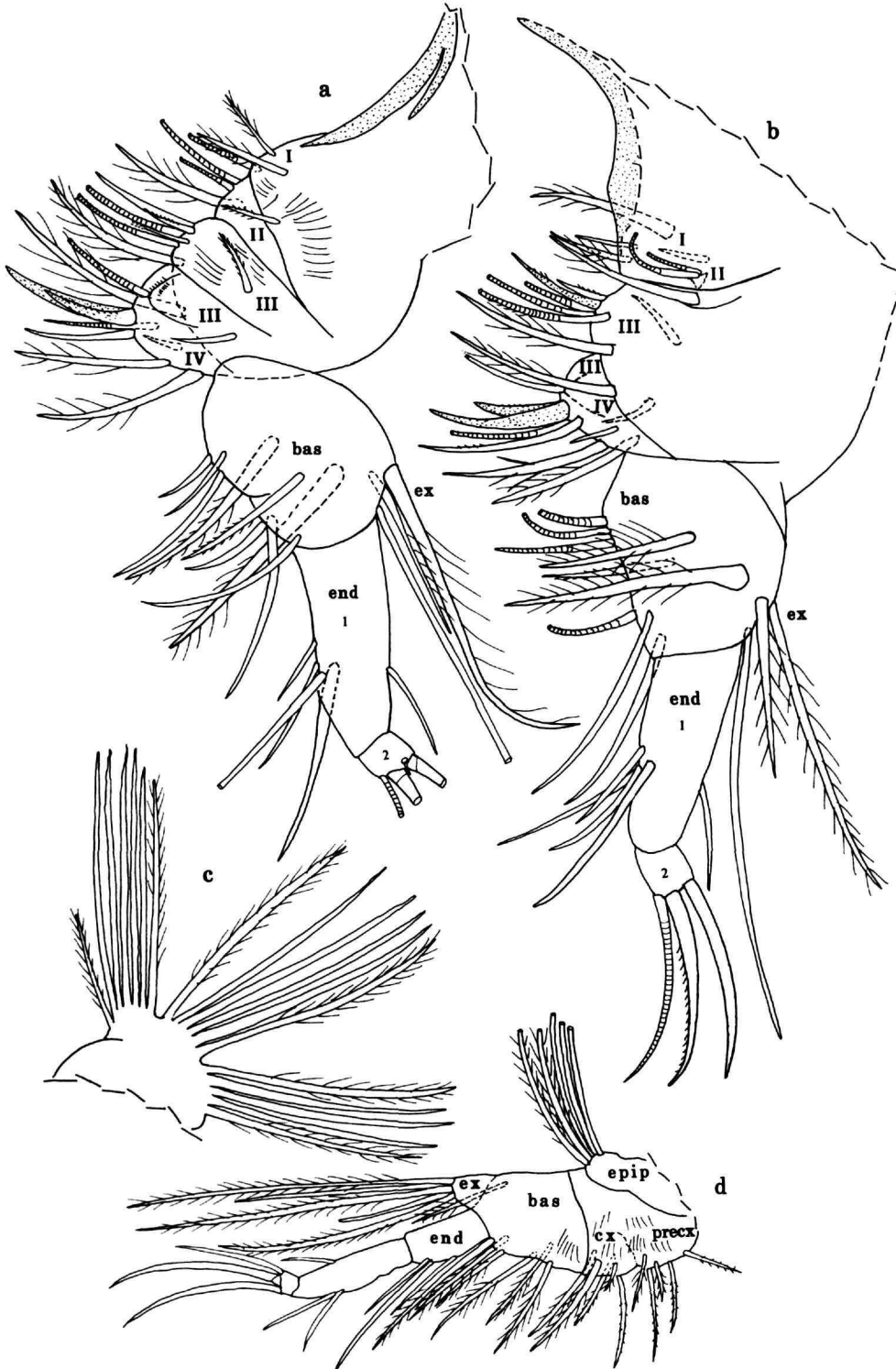


FIGURE 19.—*Spelaeoecia parkeri*, new species, holotype, USNM 194600, female (?adult): a, left 5th limb, mv; b, right 5th limb, lv; c, epipodite right 6th limb, mv; d, left 6th limb (viewed while attached to body), mv.

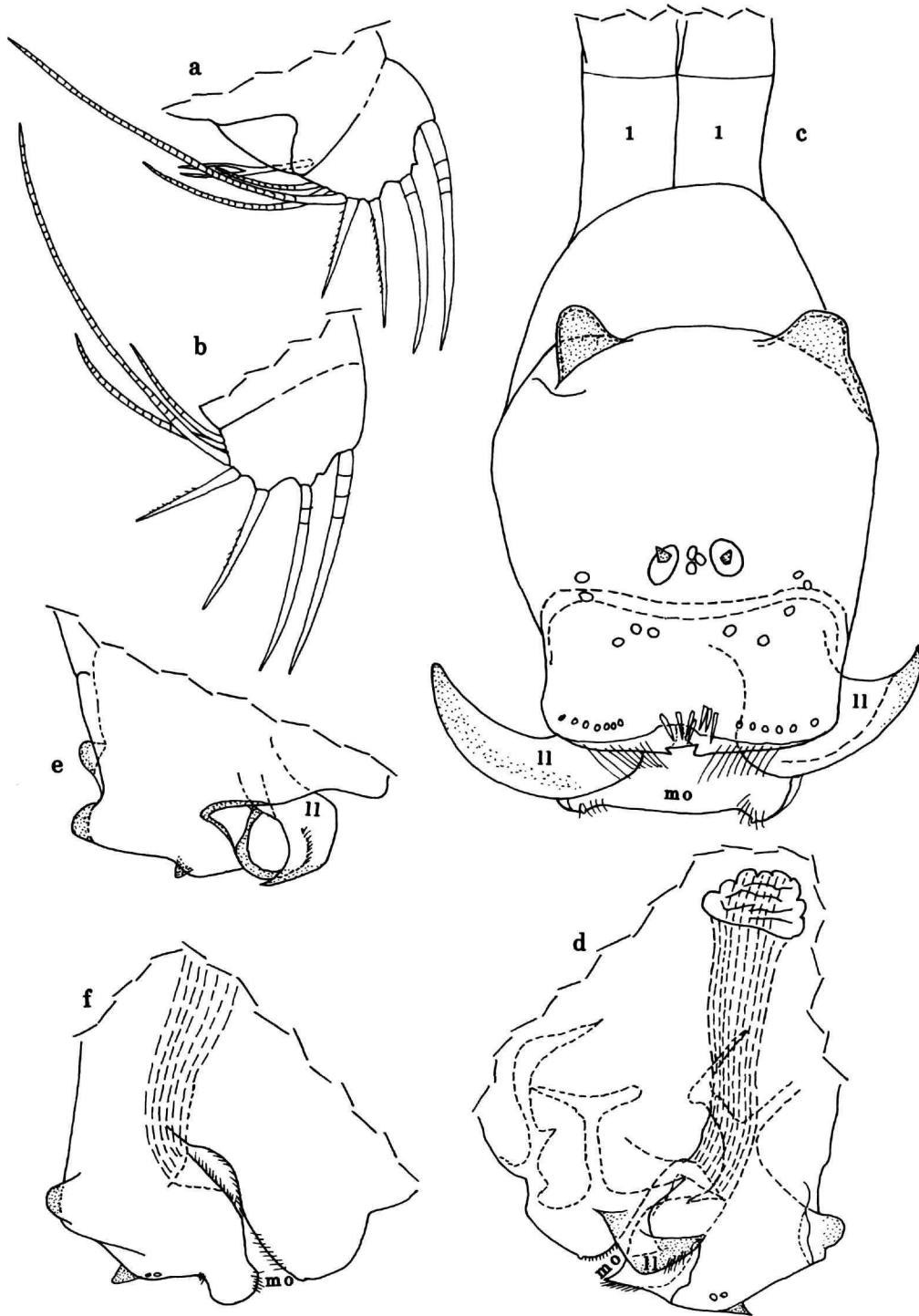


FIGURE 20.—*Spelaeoecia parkeri*, new species, holotype, USNM 194600, female (?adult): *a*, right furcal lamella, lv; *b*, left furcal lamella, mv; *c*, ventral view of anterior of body and proximal parts of 1st antenna, anterior towards top; *d*, anterior of body from right side, anterior towards right; *e*, oblique view of anteroventral part of body from left side; *f*, anteroventral part of body from left side, lower lip not shown.

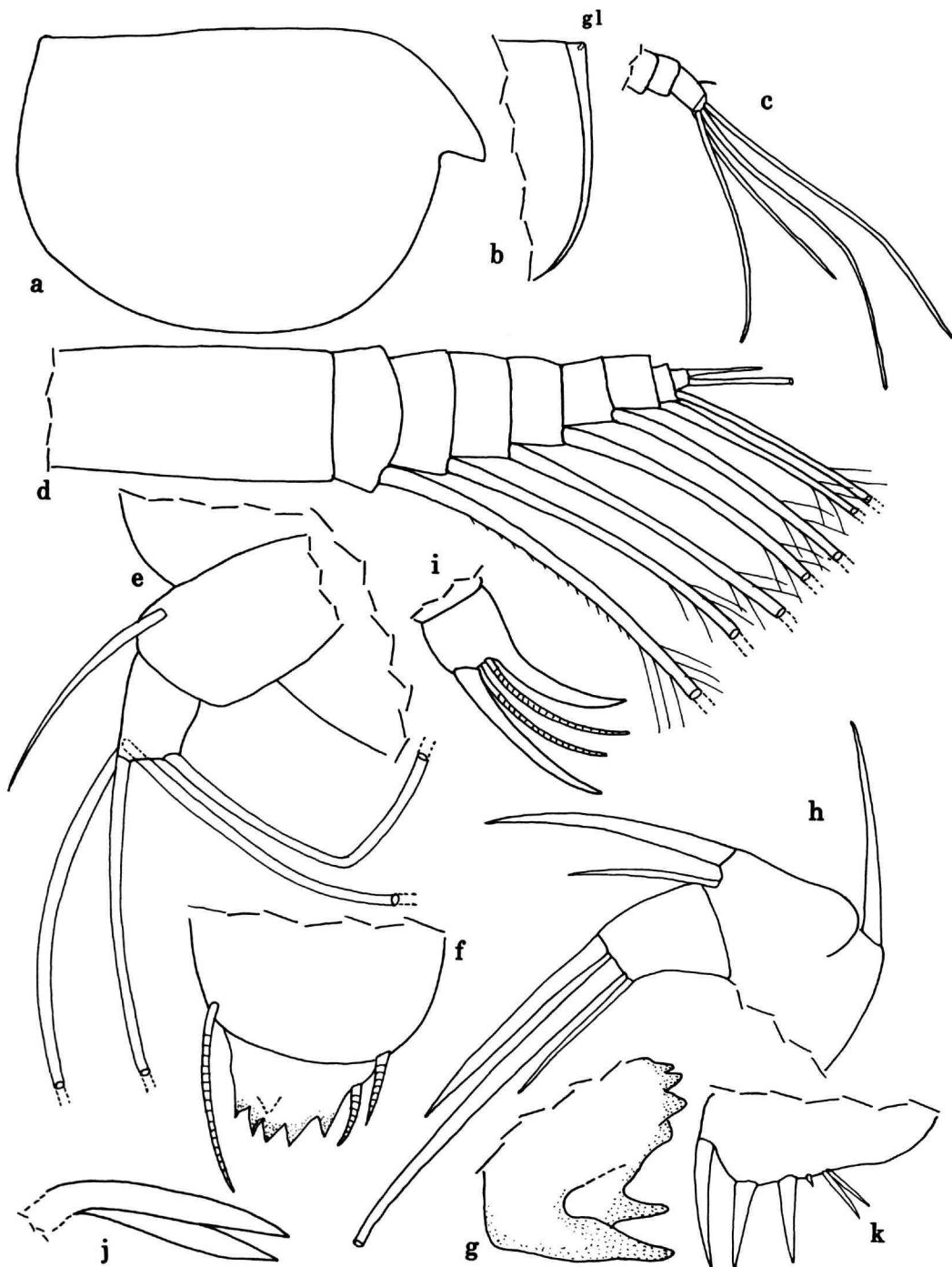


FIGURE 21.—*Spelaeoecia parkeri*, new species, paratype, USNM 194547, juvenile instar: *a*, complete carapace from right side, length 0.52 mm; *b*, posterior ends of left and right valves, anterior towards left; *c*, distal end 1st antenna, nabs; *d*, exopodite right 2nd antenna, mv; *e*, endopodite right 2nd antenna, mv; *f*, distal end of basale right mandible, mv; *g*, distal end of coxale endite right mandible (partly obscured on slide), lv; *h*, endopodite right mandible, nabs, mv; *i*, 2nd endopodial joint maxilla, mv; *j*, Bellonci organ; *k*, left lamella of furca as seen through shell.

Maxilla (Figure 18a–e): Endite I with 2 proximal and 11 terminal bristles (4 tubular); endite II with 2 proximal and about 7 terminal bristles (3 tubular); endite III with 1 long, spinous, proximal bristle and 5 terminal bristles (2 tubular). Coxale with few long hairs and stout, plumose, dorsal bristle. Basale with 1 proximal, stout, spinous, ventral bristle and 2 distal ventral bristles (1 minute). Endopodite: 1st joint with 8 to 11 bristles; 2nd joint with anterior hairs, 2 stout claw-like bristles, and 5 slender ringed bristles.

Fifth Limb (Figures 18e–g, 19a,b): Epipodite with plumose bristles forming 3 groups (ventral group with 5 bristles, middle group with 6 bristles, dorsal group with 5 bristles (4 long, 1 short dorsal)) (Figure 18f). Proximal prodopodite with 4 ventral endites: endite I with medial spines and 3 bristles closer to ventral margin; endite II with 1 medial bristle and 3 bristles closer to ventral margin (longest bristle with long spines) (Figure 19a) (endite II displaced dorsally in mounted right limb (Figure 19b)); endite III with medial spines and 9 bristles, 1 claw-like (Figure 19a,b); endite IV with 7 bristles (2 claw-like) and with distal medial lobe with slender, tubular, terminal bristle. Basale: ventral margin divided into broad proximal part and more slender distal parts; proximal part with 3 slender ventral bristles, 1 long, plumose, lateral bristle near midwidth, and 1 medial bristle with short spines near midwidth; distal part with 3 distal bristles near ventral margin and 1 long, lateral, plumose bristle near midwidth or closer to dorsal margin. Exopodite represented by 3 distal dorsal bristles (longest bare, others spinous). Endopodite: 1st joint with distal dorsal bristle and 4 distal ventral bristles. 2nd joint with 2 stout claw-like bristles, 1 slender, ringed, bare, ventral bristle, and 1 minute, spine-like, medial bristle. Bristles appearing to be tubular ringed (except on 2nd endopodial joint).

Sixth Limb (Figure 19c,d): Epipodite with plumose bristles forming 3 groups (ventral group with 5 bristles, middle group with 6 bristles, dorsal group with 7 bristles (1 short dorsal)) (Figure 19c). Proximal protopodite separated from basale by suture and divided by indistinct suture into 2 parts interpreted to be precoxale and coxale, both with long medial hairs: precoxale with 5 bristles (2 with long spines); coxale with 5 bristles (3 with long spines). Basale with long proximal medial hairs near ventral margin, and with 7 plumose bristles (6 on or near ventral margin, 1 distal lateral near dorsal margin). Exopodite well developed, with 5 long bristles (3 longest plumose, others bare). Endopodite 3-jointed: 1st joint with 3 ventral bristles; 2nd joint with 3 bristles (2 ventral, 1 dorsal); 3rd joint with 3 long, bare, terminal bristles (middle bristle stouter than others and somewhat claw-like, other bristles slender, ringed), and 1 indistinct, minute, medial, spine-like bristle (Figure 19d).

Seventh Limb (Figure 18h): Elongate, with 3 terminal bristles (1 longer than others). Only 2 bristles on right 7th limb of holotype (1 probably broken off).

Furca (Figure 20a,b): Each lamella with 4 claws (teeth observed along posterior edges of claws 3 and 4) followed by 3

ringed bristles (anterior of these very long, almost twice length of claw 1); minute glandular process between claws 1 and 2 (closer to claw 2); fairly long bifurcate bristle just posterior to furca.

Bellonci Organ: Not observed. (An elongate bifurcate organ present on juvenile described below.)

Lips (Figures 18e, 20c–f): Anterior of body dorsal to upper lip with 2 rounded processes dorsal to 2 smaller triangular processes; outer surface of upper lip with rows of small processes; distal edge of upper lip spinous. Lower lip with triangular process on each side of mouth. Cylindrical esophagus with bulbous end where it connects with anterior end of stomach (Figure 20d).

Genitalia: Absent. (Close observation did not reveal either processes or bristles. A sclerotized tube appears to exit in vicinity of apron anterior to furca, but its function is unknown.)

Gut Content: Posterior of gut with abundant slender clusters of filaments somewhat similar to sperm clusters illustrated by Kornicker et al. (1990, fig. 6).

REMARKS.—The holotype is interpreted to be a female because of the morphology of the endopodite of the 2nd antenna. The apparent lack of genitalia bristles suggests that the specimen is a late instar and not adult, but additional collections are required to document this.

DESCRIPTION OF EARLY INSTAR (Figure 21).—Carapace short, with small, indistinct, glandular process at posterodorsal corner of right valve (Figure 21a,b).

Carapace Size (length, height in mm): USNM 194547, 0.52, 0.35.

Sixth and Seventh Limbs: Apparently absent. Remaining appendages present but with fewer bristles than on holotype.

Bellonci Organ (Figure 21f): Bifurcate, with tapered tips.

REMARKS.—The partly dissected body of USNM 194547 mounted on a slide is too obscured for complete descriptions of appendages (Figure 21c–k).

COMPARISONS.—The long bristles on the furca of the holotype of *S. parkeri* are not present on previously described species of *Spelaeoecia*.

Order MYODOCOPIDA Sars, 1866

Suborder MYODOCOPINA Sars, 1866

Superfamily CYPRIDINOIDEA Baird, 1850

Family CYPRIDINIDAE Baird, 1850

Subfamily CYPRIDININAE Baird, 1850

Skogsbergia Kornicker, 1974

TYPE SPECIES.—*Skogsbergia minuta* Poulsen, 1962 (subsequent designation, Kornicker, 1974).

COMPOSITION AND DISTRIBUTION.—See Kornicker and Iliffe, 2000:30.

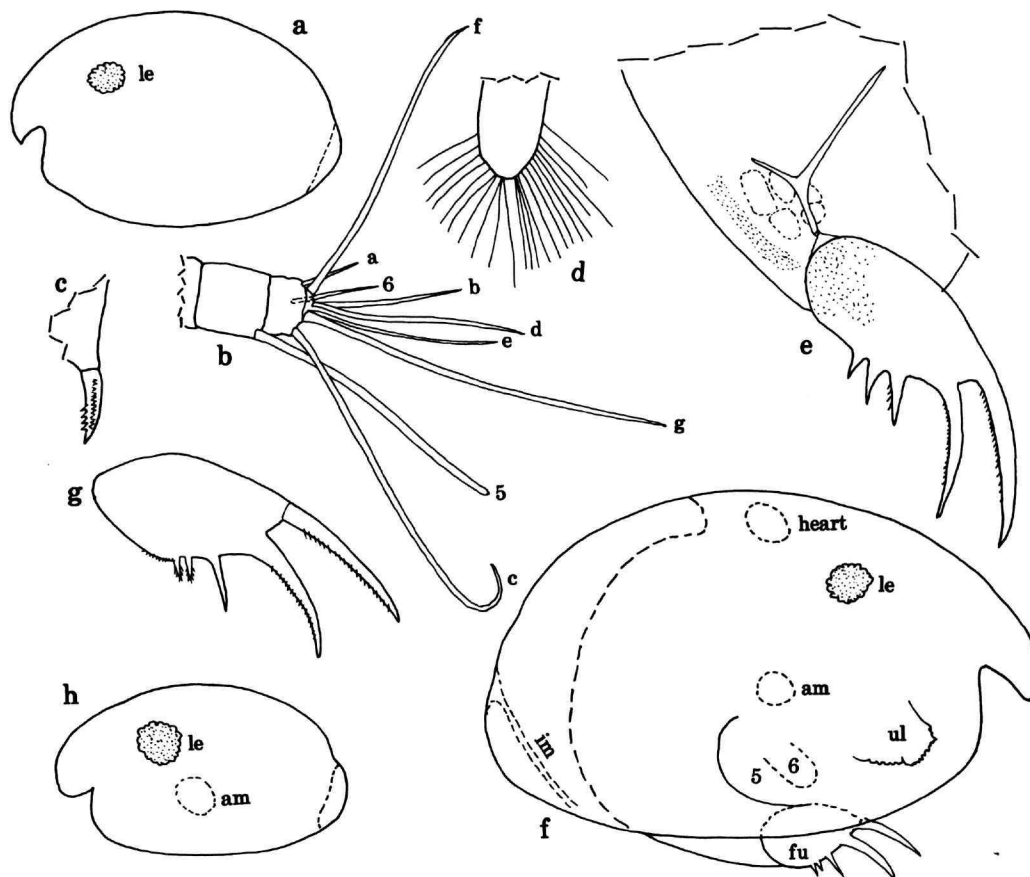


FIGURE 22.—*Skogsbergia leneri*, new species, USNM 194549, instar I: *a*, complete specimen from left side, length 0.68 mm; *b*, distal part right 1st antenna, lv; *c*, main tooth first exopodial joint left 5th limb, mv; *d*, left 6th limb, lv; *e*, posterior of body from right side showing right lamella of furca, fused girdle and Y-sclerite, and muscle ends (dashed). USNM 194576, instar I: *f*, complete specimen from right side, length 0.60 mm; *g*, right furcal lamella, lv. USNM 194575, adult male: *h*, complete specimen from left side, length 1.59 mm.

***Skogsbergia leneri* (Kornicker, 1958)**

FIGURE 22

Cypridina squamosa.—Tressler, 1949:335, fig. 21 [in part, not *Cypridina squamosa* Müller].

Asterope elliptica Philippi. —Tressler, 1949:338 [in part, only USNM 88860].

Cypridina squamosa leneri Kornicker, 1958:229, figs. 47:1a,b, 48a–d, 49a–e.

Skogsbergia leneri (Kornicker).—Kornicker, 1974:4; 1984b:14, figs. 5–7.—

Cohen, 1983:235, figs. 2–10).—Kornicker and Iliffe, 2000:30, fig. 14.

MATERIAL.—Crab Cay Crevasse, Crab Cay, Exuma Cays, Sta 95-010, depth 35 m: USNM 194581, undissected adult female in alcohol; USNM 194583, undissected juvenile in alcohol. Master Harbour Cave, Great Exuma Island, Exuma Cays, Bahamas, Sta 96-031, depth 12–15 m: USNM 194575, partly dissected adult male in alcohol; USNM 194576, undissected

instar I in alcohol. Four Sharks Blue Hole, South Andros Island, Sta 97-023, depth 27–33 m: USNM 194549, 1 instar I in alcohol.

DISTRIBUTION.—This species, described originally from Bimini, Bahamas, is widespread in Bahamas, West Indies, Belize, Gulf of Mexico, and Atlantic continental shelf off Florida, at depths of 1–130 m (Kornicker and Iliffe, 2000:30). During this study it was collected in Bahaman oceanic blue holes at Crab Cay Crevasse, Exuma Cays; Master Harbour Cave, Great Exuma Island; Four Sharks Blue Hole, South Andros Island; and outside Angelfish Cave, Stocking Island, Exuma Cays, Great Bahama Bank.

SUPPLEMENTARY DESCRIPTION OF INSTAR I (Figure 22a).—*Carapace Length* (length, height in mm) (Figure 22a): USNM 194549, 0.68, 0.43; USNM 194576, 0.60, 0.38.

First Antenna (Figure 22b): Sensory bristle of 5th joint and b- to g-bristles of 7th and 8th joints without filaments.

Fifth Limb (Figure 22c): Main tooth with 1 cusped tooth.

Sixth Limb (Figure 22d): Without bristles.

Seventh Limb: Absent.

Furca (Figure 22e-g): Each lamella with 5 claws: claw 1 articulated, remaining claws fused to lamella.

Y-Sclerite (Figure 22e): Y-sclerite fused proximally to short girdle, and without distal ventral branch.

Heart (Figure 22f): Well developed.

REMARKS.—Instar I was described previously by Cohen (1983:246). Additional morphological information about the 5th limb and Y-sclerite are supplied herein.

SUPPLEMENTARY DESCRIPTION OF ADULT MALE (Figure 22h).—*Carapace Length* (length, height in mm): USNM 194575, 1.59, 0.93.

SUPPLEMENTARY DESCRIPTION OF ADULT FEMALE.—*Carapace Length* (length, height in mm): USNM 194581 1.86, 1.28.

Superfamily Sarsielloidea Brady and Norman, 1896

Family Philomedidae Müller, 1906

Subfamily Pseudophilomedinae Kornicker, 1967

Harbansus Kornicker, 1978

TYPE SPECIES.—*Harbansus bradmyersi* Kornicker, 1978.

COMPOSITION AND DISTRIBUTION.—See Kornicker (1978: 13; 1984a:59).

Harbansus paucichelatus (Kornicker, 1958)

FIGURES 23–31

Philomedes paucichelata Kornicker, 1958:233, figs. 46: 4a,b; 54A–E, 55A–C, 87B,E,H.

Euphilomedes paucichelata.—Kornicker, 1970:36.

Harbansus paucichelatus.—Kornicker, 1978:16, figs. 5–9, pls. 1, 2; 1984a:59, figs. 32–37.—Kornicker and Iliffe, 2000:15.

HOLOTYPE.—USNM 122905, dried specimen in poor condition.

MATERIAL.—Sugar Cay Blue Hole, Sugar Cay, Exuma Cays, Bahamas, Sta 95-091, depth 22 m: USNM 194553, partly dissected adult female in alcohol; USNM 194554, ovigerous female in alcohol; USNM 194555, adult female in alcohol. Conch Sound Blue Hole, Andros Island, Bahamas, Sta 96-040, depth 31 m: USNM 194565, dissected instar I on slide and in alcohol; USNM 194566, undissected instar I in alcohol; USNM 194567, dissected instar III male on slide and in alcohol; USNM 194568, undissected instar III male in alcohol; USNM 194569A, ovigerous female with 4 eggs in alcohol; USNM 194569B, adult female with 5 or 6 unextruded eggs in alcohol; USNM 194570, partly dissected instar IV? male in alcohol; USNM 194571, instar IV female on slide and in alcohol;

USNM 194572, instar III male in alcohol (shell torn and not measured); USNM 194573, instar III female (lost); USNM 194574, undissected instar IV female in alcohol.

DISTRIBUTION.—This species, described originally from Bimini, Bahamas, is widespread in the western Atlantic from North Carolina to Belize. Known depth range 15 cm to 135 m (Kornicker, 1884:59). Collected herein in Sugar Cay Blue Hole, Sugar Cay, Exuma Cays, and Conch Sound Blue Hole, Andros Island, Great Bahama Bank.

SUPPLEMENTARY DESCRIPTION OF ADULT FEMALE (Figure 23a–h).—Specimens with single rib near rostrum (Figure 23a,b,e,f); 2 lateral ridges indistinct and not always visible. Bristles on outer surface and along outer edge single, bare.

Central Adductor Muscle Attachments (Figure 23d): Consisting of about 9 oval scars dorsal to several elongate scars.

Carapace Size (length, height in mm): Exuma Cays: USNM 194553, 1.03, 0.56; USNM 194554, 1.06, 0.60; USNM 194555, 1.01, 0.56. Andros Island: USNM 194569A, 1.06, 0.59; USNM 194569B, 1.08, 0.61.

Second Antenna (Figure 23g): Pivot sclerite long, straight.

Number of Eggs (Figure 23a): USNM 194554 with 3 eggs in marsupium. Length of 2 eggs (mm): 0.24, 0.29. USNM 194569A, 4 eggs in marsupium. Length of 1 egg 0.28 mm.

REMARKS.—The adult females from Exuma Cays (1.01–1.06 mm) and Andros Island (1.06–1.08 mm) are longer than those reported from Bimini (0.80–0.87 mm) by Kornicker (1958:234), but a specimen as long as 1.20 mm was reported from off Florida by Kornicker (1984a:65). As previously mentioned in Kornicker (1984a:59), the considerable variability in specimens referred to this species suggests a species complex.

DESCRIPTION OF INSTAR I (sex unknown) (Figures 23i–l, 24, 25a–g).—Carapace similar in shape to that of adult female (Figure 23i).

Ornamentation (Figure 23j,k): Rostrum with 3–5 triangular nodes along anterior edge and lateral rib at midheight.

Infold: Rostral infold with 3 bristles (Figure 23k). Infold of caudal process with 1 setose bristle on posterior edge of list (Figure 23l). Anteroventral infold with several ribs parallel to outer edge of valve (Figure 23k).

Selvage: Narrow lamellar prolongation without marginal fringe observed at inner angle of incisur (Figure 23k) and along posterior edge of valve.

Central Adductor Muscle Attachments (Figure 23l): Partly obscured, but of similar type to that of adult.

Carapace Size (length, height in mm): USNM 194565, 0.56, 0.30; USNM 194566, 0.53, 0.29.

First Antenna (Figure 24a): 1st and 2nd joints bare. 3rd joint with 2 bristles (1 ventral terminal, 1 dorsal subterminal). 4th joint with terminal dorsal and ventral spines forming rows. Sensory bristle of 5th joint long, bare, except for papilla at tip. 6th joint short, fused to 5th joint, with short medial bristle. 7th joint: a-bristle about twice length of bristle of 6th joint, with indistinct short marginal spines; medial b-bristle about three-

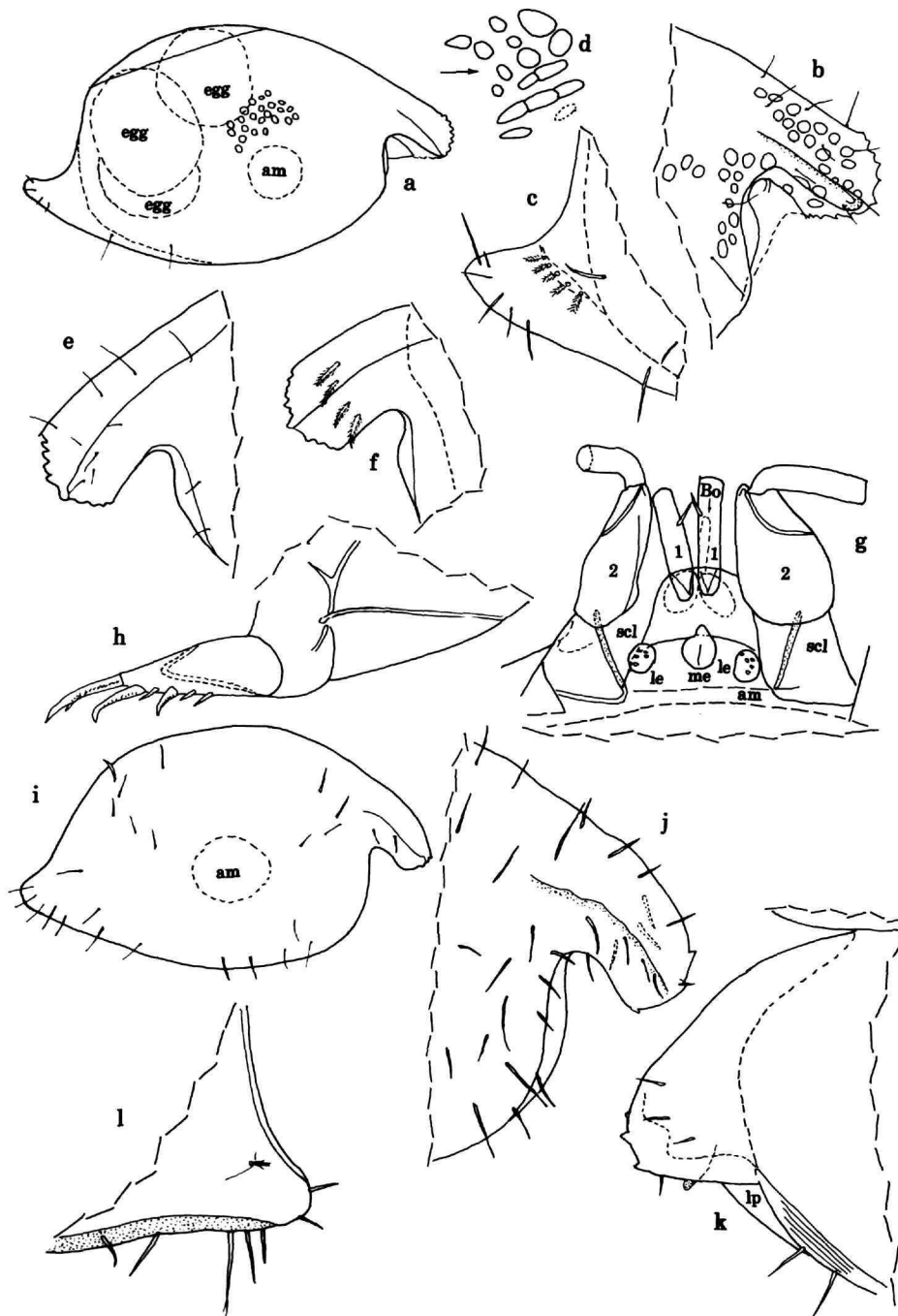


FIGURE 23.—*Harbansus paucichelatus* (Kornicker, 1958), USNM 194554, adult female: *a*, complete specimen from right side, length 1.06 mm; *b*, detail from *a*; *c*, caudal process right valve, ov; *d*, adductor muscle attachment right valve, anterior toward right, ov. USNM 194553, adult female: *e*, anterior of left valve (valve length 1.03 mm), ov; *f*, anterior of left valve showing internal bristles, ov; *g*, anterior of body (Bellonci organ broken off and out of place), nabs, dv; *h*, posterior of body including left furcal lamella from left side. USNM 194565, instar I (sex unknown): *i*, complete specimen from right side, length 0.56 mm; *j*, detail from *i*; *k*, anterior of right valve, iv; *l*, caudal process right valve, iv.



FIGURE 24.—*Harbansus paucichelatus* (Kornicker, 1958), USNM 194565, instar I (sex unknown): a, right 1st antenna, part of right 2nd antenna, outline of right lateral eye, from right side; b, endopodite right 2nd antenna, lv; c, left lateral eye, distal part of displaced Bellonci organ (dashed), and part of left 2nd antenna, nabs, lv; d, protopodite and endopodite left 2nd antenna, mv; e, right mandible, mv; f, left maxilla, mv; g, distal end endopodite right maxilla, lv; h, left maxilla and 5th limb viewed while attached to body, lv; i, dorsal part of epipodite 5th limb, anterior toward left; j-l, part of right 5th limb, nabs, av; m, n, part of left 5th limb, pv.

fifths length of c-bristle, bare; c-bristle long, bare. 8th joint: d- and e-bristles long, bare, with blunt tips; f- and g-bristles long, bare.

Second Antenna: Protodopodite bare. Endopodite 2-jointed: 1st joint short, bare, not shown; 2nd joint elongate, with anterior bristle and small terminal spine (Figure 24a-d). Exopodite 9-jointed: bristle of 2nd joint just reaching 8th joint, with few slender spines; bristles of joints 3 and 4 reaching past 9th joint, with long proximal segments, bare; bristles of joints 5-8 long, with long proximal segments, few stout proximal spines, slender distal spines, and indistinct distal natatory hairs; 9th joint with 2 bare bristles (1 medium, 1 short); joints 2-9 with rows of minute spines.

Mandible (Figure 24e): Coxale endite bifurcate, spinous. Basale: ventral margin with 2 short proximal bristles and 1 longer bristle near midlength; dorsal margin with 1 bristle near midlength and 2 subterminal. Exopodite well developed, with 2 terminal bristles. 1st endopodial joint with 2 spinous ventral bristles; 2nd endopodial joint with distal ventral spines, 1 short subterminal ventral bristle, and 4 dorsal bristles near midlength; 3rd endopodial joint with 2 stout claws and 2 slender bristles (1 ventral, 1 dorsal).

Maxilla (Figure 24f-h): Endite I with 6 bristles; endites II and III each with 4 bristles. Coxale with stout dorsal bristle and fringe of dorsal hairs. Exopodite with 3 bristles (2 long, 1 short). Basale with 3 ventral bristles. 1st endopodial joint with 1 alpha-bristle and 1 beta-bristle; 2nd endopodial joint with 5 bristles.

Fifth Limb (Figures 24h-n, 25e-g): Epipodite with 25 spinous bristles (Figure 24i (nabs)). Endite I with spinous bristle; endite II with 3 spinous bristles and 1 triangular process; endite III with 4 spinous bristles and 1 triangular process (Figure 24k). Exopodite: 1st joint with short proximal bristle on inner edge and single triangular terminal main tooth (Figure 24j,k); 2nd joint with distal margin of large tooth almost straight, forming right angle with outer edge, inner edge of tooth concave with prominent node near middle and on anterior side, and proximal bristle on inner edge; posterior side with proximal bristle near midwidth and short distal bristle (Figure 24m); 3rd joint with outer lobe with 2 bristles and without inner lobe (Figure 24n); 4th plus 5th joints fused with 2 spinous bristles (Figure 24n).

Sixth Limb (Figure 25a,b,e,f): With 3 spinous nodes and without bristles.

Seventh Limb (Figure 25c): Minute, bare, thumb-like.

Furca (Figure 25c,d): Each lamella with 3 claws: claw 1 separated from lamella by suture; claw 2 either separated from lamella by suture, or fused to lamella; claw 3 small, fused to lamella; all claws dentate. Medial spines present between and following claws and at base of claw 1.

Bellonci Organ (Figure 24c): Elongate.

Eyes: Lateral eye with 4 divided yellowish ommatidia (Figure 24a,c). Medial eye lost.

Upper Lip (Figure 25e): With minute anterior processes.

Genitalia: Absent.

Y-Sclerite: Absent.

Girdle (Figure 25c,g): Present.

DESCRIPTION OF INSTAR III MALE (Figures 25h-j, 26, 27, 28a-g).—Carapace similar in shape to that of adult female (Figure 25h-j).

Ornamentation: Lateral surface with 2 ribs (Figure 25h). Anterior margin of rostrum with about 8 processes. Surface bristles single (Figure 25i,j).

Infold: Rostral infold with 4 bristles; 2 bristles present at inner end of incisur (Figure 26a). Infold of caudal process with 4 setose bristles along posterior edge of list (Figures 25j, 26c). Anteroventral infold with parallel ridges and small bristle near incisur (Figure 26a).

Central Adductor Muscle Attachments: Not examined in detail, but of usual type and location (Figure 25h).

Carapace Size (length, height in mm): USNM 194567, 0.77, 0.41; USNM 194568, 0.76, 0.44.

First Antenna (Figure 26d,e): 1st joint bare. 2nd joint with dorsal bristle with few long spines. 3rd joint short, with medial spines and 3 bristles (1 ventral, 2 dorsal). 4th joint with 2 bristles (1 ventral, 1 dorsal). Sensory bristle of 5th joint with 2 minute proximal filaments and 2 longer distal marginal filaments. 6th joint with short medial bristle. 7th joint: a-bristle about twice length of bristle of 6th joint, with short marginal spines; medial b-bristle with fairly long filament near midlength and 2 terminal papillae; c-bristle slightly shorter than sensory bristle of 5th joint, with 2 minute proximal filaments and 3 longer distal marginal filaments. 8th joint: d- and e-bristles slightly longer than sensory bristle of 5th joint, bare with blunt tips; f-bristle long, with 2 short proximal filaments and 2 longer distal marginal filaments; g-bristle long, with short filament near midlength and 2 longer, distal, marginal filaments.

Second Antenna: Protodopodite bare; pivot sclerite slightly curved (Figure 26i); Endopodite 3-jointed (2nd and 3rd joints fused) (Figure 26f,g): 1st joint short, with 2 short bristles; 2nd joint elongate, with 2 marginal bristles; 3rd joint elongate, with minute subterminal spine and short broad terminal process. Exopodite 9-jointed (Figure 26f): 1st joint with small medial spine on distal margin; bristle of 2nd joint reaching 8th or 9th joints, with 8 stout ventral spines followed by short slender spines, but without natatory hairs; bristles of joints 1-8 with stout ventral spines and distal natatory hairs; 9th joint with small medial process and 2 spinous bristles without natatory hairs (Figure 26h); joints 2-8 with spines along distal margins.

Mandible (Figure 26j,k): Coxale endite bifurcate, spinous. Basale: medial and lateral sides with rows of spines; medial surface with 2 short proximal bristles and 1 short bristle at midlength, all near ventral margin; ventral margin with long distal bristle; lateral surface with spinous bristle near mid-length; dorsal margin with 3 bristles (1 near midlength, 2 terminal). Exopodite about one-fourth length of 1st endopodial joint, hirsute, with 2 terminal bristles. 1st endopodial joint with 3 ven-



FIGURE 25.—*Harbansus paucichelatus* (Kornicker, 1958), USNM 194565, instar I (sex unknown): *a, b*, left (lv) and right (mv) 6th limbs, respectively; *c*, posterior of body from left side including left furcal lamella; *d*, right furcal lamella, lv; *e, f*, anterior part of body (anterior toward top), nabs, vv; *g*, posterior of body from right side, nabs. USNM 194567, instar III male: *h*, complete specimen from right side, length 0.77 mm; *i, j*, anterior and posterior of complete specimen shown in *h*.

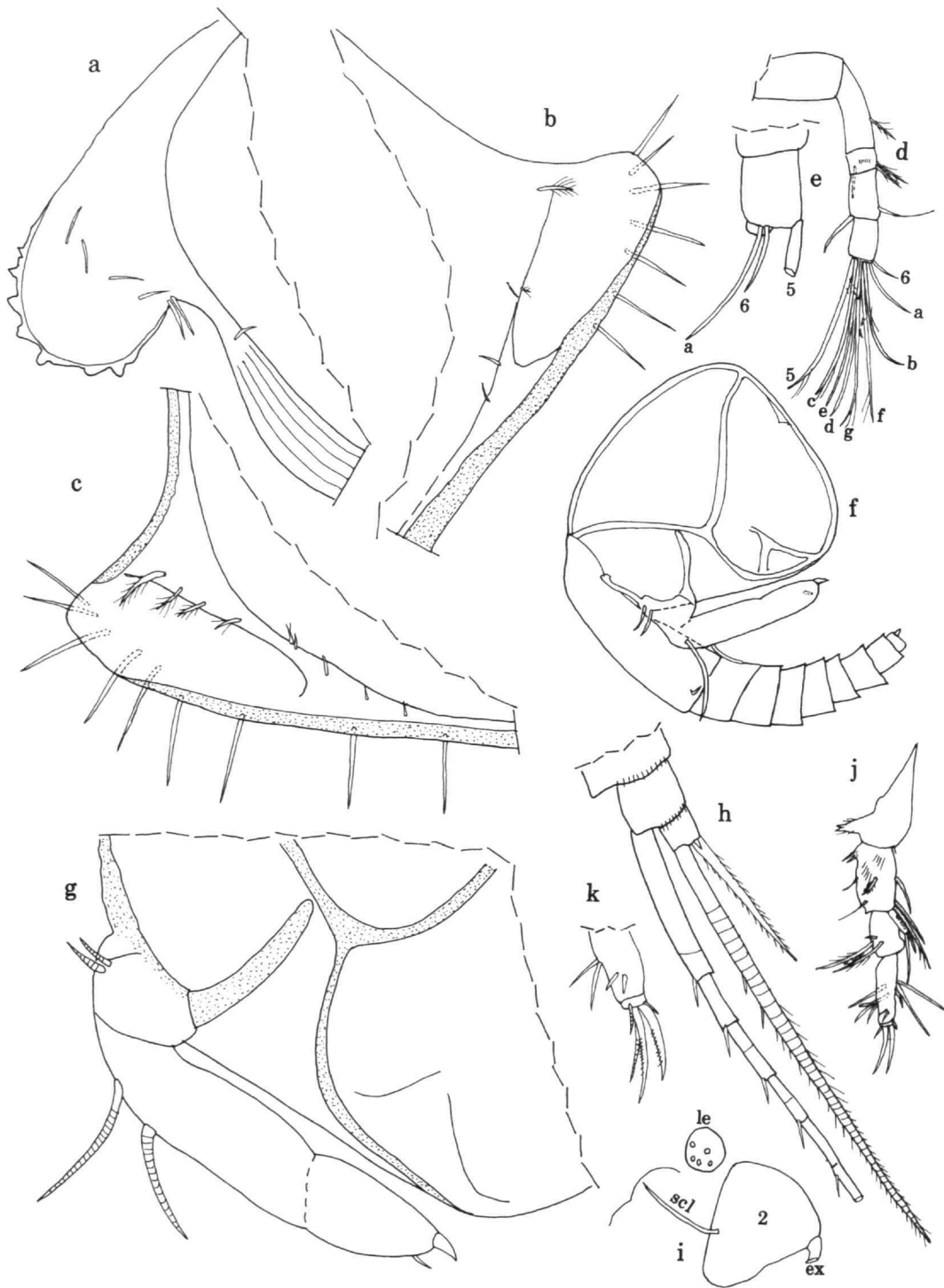


FIGURE 26.—*Harbansus paucichelatus* (Kornicker, 1958), USNM 194567, instar III male: *a, b*, anterior and posterior of right valve, respectively, lv; *c*, caudal process left valve, lv; *d*, right 1st antenna, lv; *e*, tip right 1st antenna, nabs, mv; *f*, right 2nd antenna, nabs, mv; *g*, detail from *f*; *h*, distal part of exopodite right 2nd antenna, nabs, mv; *i*, right lateral eye and part of right 2nd antenna viewed through shell, anterior toward right, lv; *j, k*, right mandible viewed while attached to body, nabs, lv.



FIGURE 27.—*Harbansus paucichelatus* (Kornicker, 1958), USNM 194567, instar III male: a, left maxilla, nabs, lv; b, endites left maxilla, lv; c, 2nd endopodial joint right maxilla, mv; d, part of right 5th limb (teeth of exopodial joint 1 not shown), av; e, part of right 5th limb, nabs, av; f, part of left 5th limb, nabs, av; g, 2nd exopodial joint left 5th limb, av; h, exopodial joints 3-5 left 5th limb viewed through shell, av.

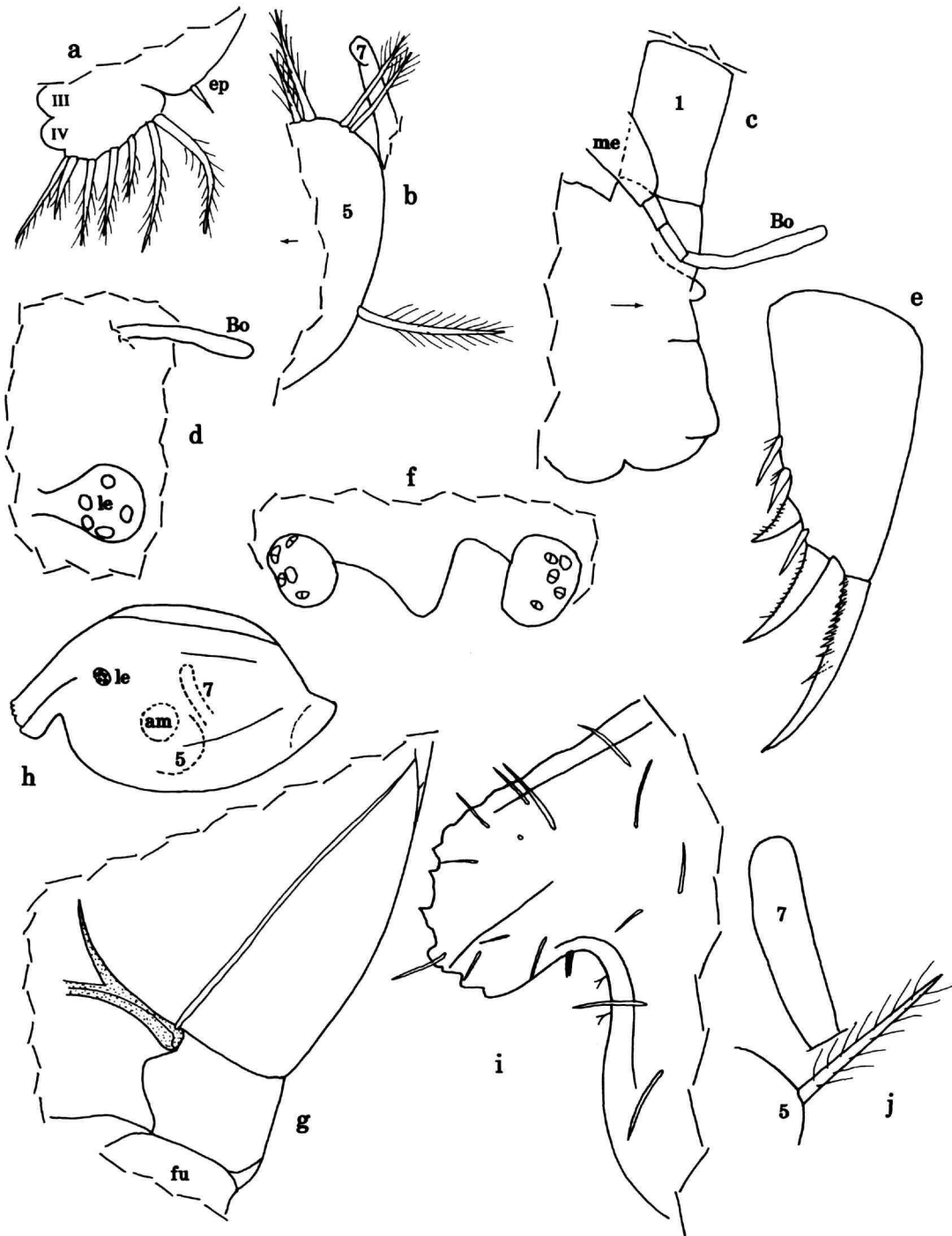


FIGURE 28.—*Harbansus paucichelatus* (Kornicker, 1958), USNM 194567, instar III male: *a*, part of left 6th limb viewed through shell, nabs, lv; *b*, part of posterior of body from left side viewed while attached to body, nabs; *c*, part of anterior of body viewed from right side while attached to body, lv; *d*, part of body, vv; *e*, right furcal lamella, lv; *f*, part of anterior of body, anterior toward bottom, dv; *g*, posterior of body from left side. USNM 194573, instar III female: *h*, complete specimen from right side, length 0.73 mm; *i*, detail from *h*; *j*, detail of appendages shown as dashed outlines in *h*.

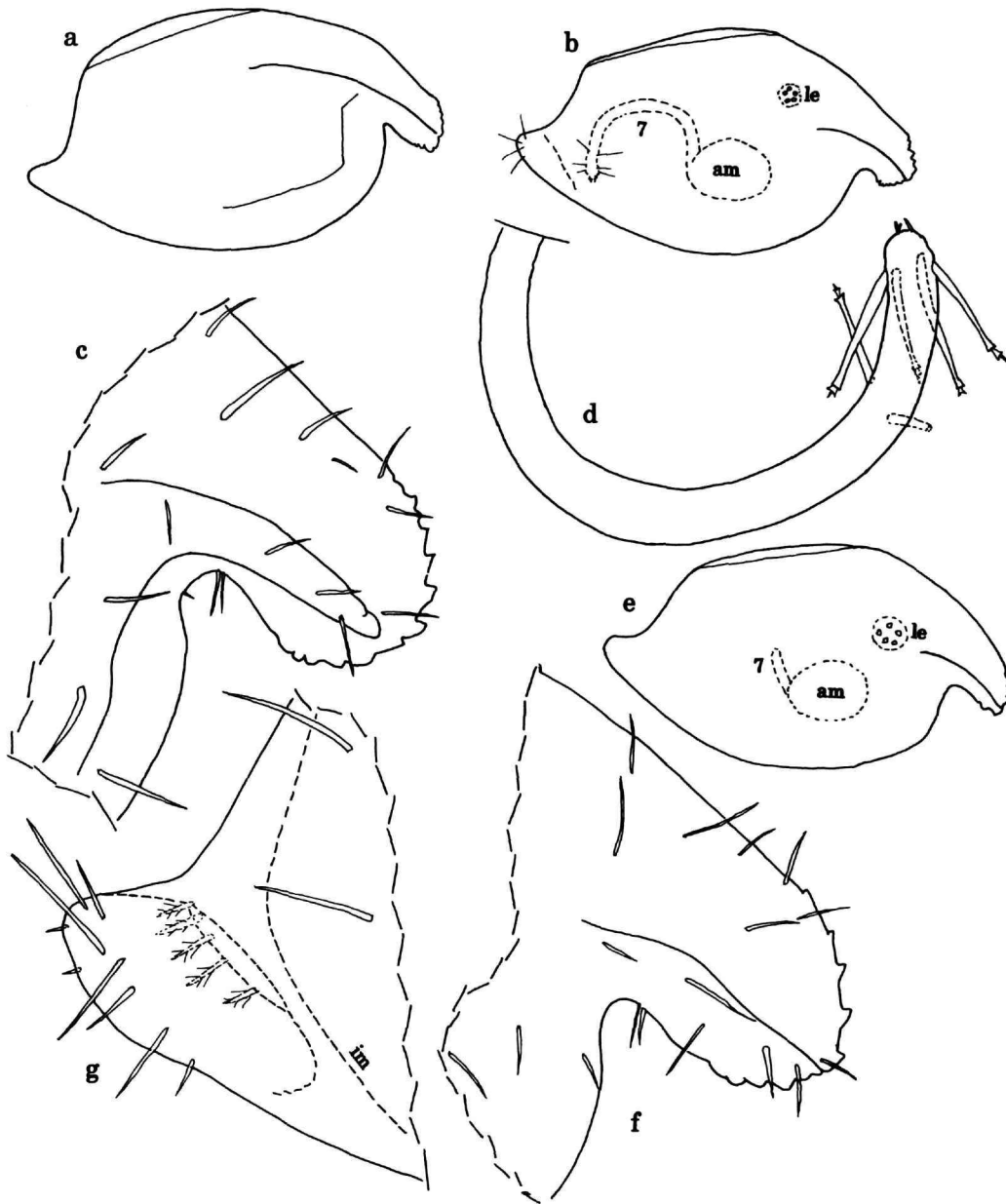


FIGURE 29.—*Harbansus paucichelatus* (Kornicker, 1958), USNM 194574, instar IV female: *a*, complete specimen from right side, length 0.90 mm. USNM 194571, instar IV female: *b*, complete specimen from right side, length 0.86 mm; *c*, detail from *b*; *d*, left 7th limb viewed through shell. USNM 194570, instar IV? male; *e*, complete specimen from right side, length 0.91 mm; *f, g*, details from *e*.

tral bristles (1 short bare, 2 long with long proximal spines). 2nd endopodial joint with 2 pairs of short distal bristles on or near ventral margin and 5 bristles near midlength on or near dorsal margin. 3rd endopodial joint with 3 claws (dorsal claw short) and 2 ventral bristles.

Maxilla (Figure 27*a-c*): Endites I and II each with 5 terminal bristles; endite III with 7 bristles (1 proximal and 6 terminal). Precoxale and coxale with fringe of dorsal hairs; coxale with long spinous dorsal bristle. Basale with 3 long distal bristles. Exopodite short, with 3 bristles (2 long, 1 short). 1st en-

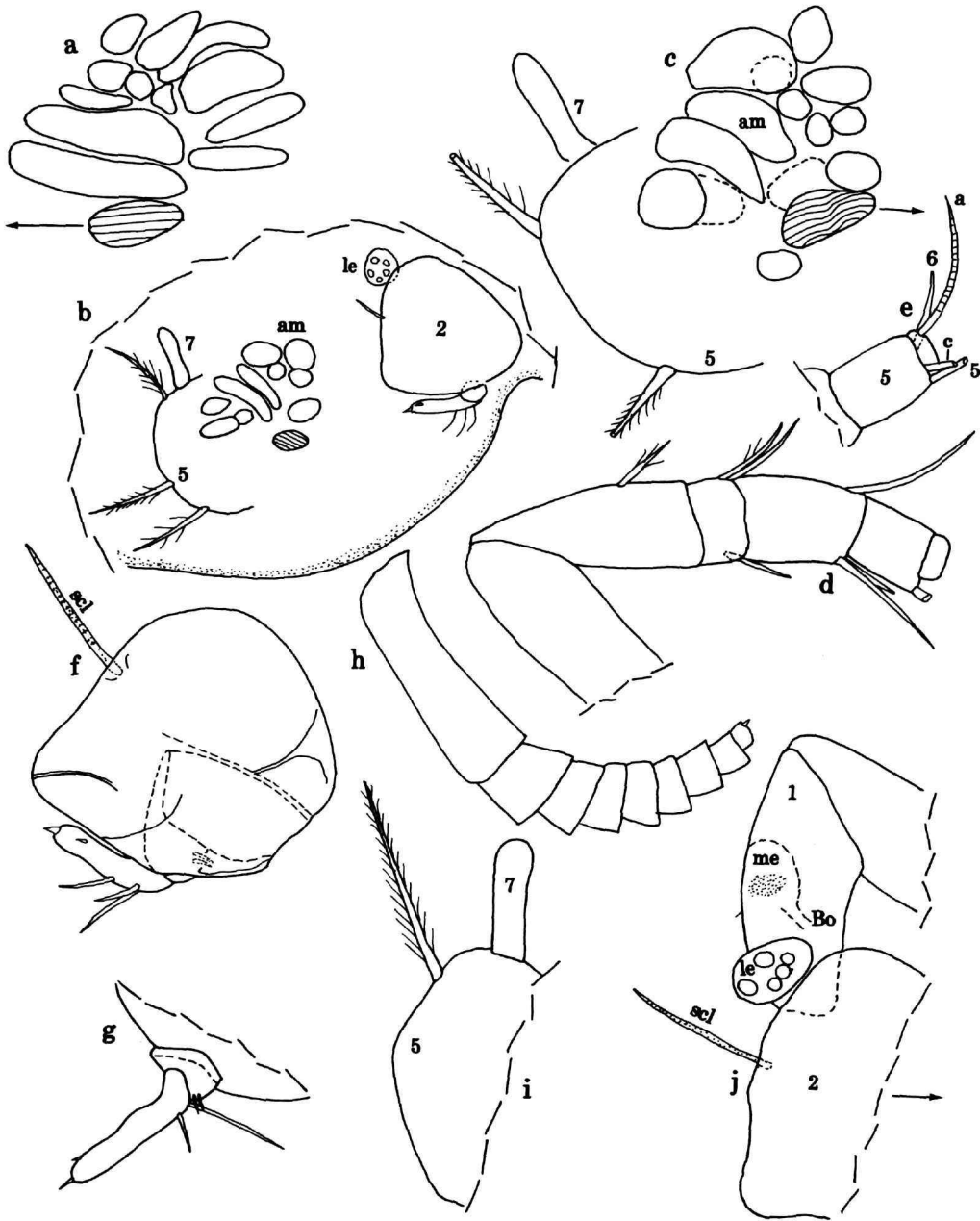


FIGURE 30.—*Harbansus paucichelatus* (Kornicker, 1958), USNM 194570, instar IV? male: *a*, central adductor muscles protruding from left side of body, anterior to left; *b*, part of right side of body viewed through shell; *c*, central adductor muscles protruding from right side of body, part of epipodite 5th limb, and outline of 7th limb; *d, e*, parts of right 1st antenna, nabs, lv; *f*, part of right 2nd antenna, lv; *g*, endopodite left 2nd antenna, mv; *h*, exopodite right 2nd antenna, nabs, lv; *i*, part of epipodial appendage right 5th limb, nabs, and right 7th limb, lv; *j*, part of anterodorsal section of body from right side, lv.

dopodial joint with 1 alpha-bristle and 2 beta-bristles. 2nd endopodial joint with 2 a-bristles and 7 terminal claws and bristles.

Fifth Limb (Figures 27*d–h*, 28*b*): Epipodite with 33 spinous bristles. Endite I with 1 bristle; endite II with 5 bristles; endite III with about 9 bristles (Figure 27*d*). 1st exopodial joint

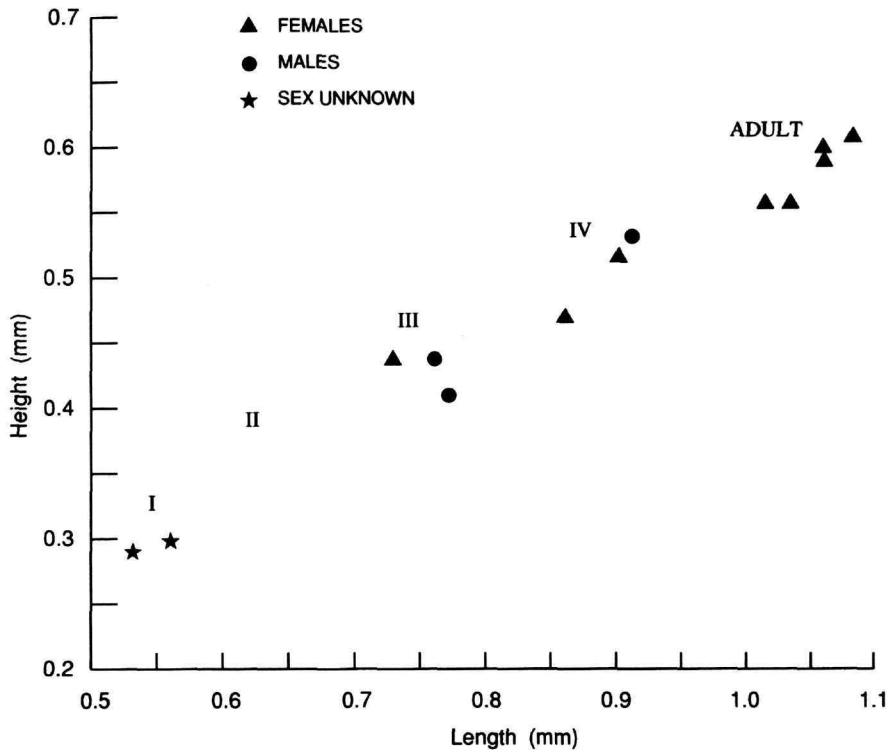


FIGURE 31.—Length-height distribution of carapaces of *Harbansus paucichelatus* (Kornicker, 1958). (Instar IV male datum point could be instar III.)

with anterior bristle near middle of distal margin (Figure 27d-f); a small bristle present near outer corner of 1st joint (Figure 27d,e); main tooth with 3 constituent teeth (proximal of these smooth, others with 2 or 3 lobes) (Figure 27f); short bristle present proximal to smooth tooth (Figure 27f). 2nd exopodial joint with large squarish tooth with node on inner edge distal to 2 bristles (Figure 27g). Inner lobe of 3rd exopodial joint with 2 bristles, outer lobe with 3. Fused 4th and 5th exopodial joints with 5 bristles (Figure 27h).

Sixth Limb: With short epipodial bristle. End joint not prolonged posteriorly and with 7 bristles (Figure 28a). Endite bristles not counted, but limb, in general, similar to that of adult female.

Seventh Limb (Figures 25h, 28b): Elongate, without bristles.

Furca (Figure 28e): Similar to that of adult female.

Bellonci Organ (Figure 28c,d): Elongate, weakly segmented in proximal part.

Eyes: Medial eye unpigmented (Figure 28c). Lateral eye well defined, with 5 ommatidia (Figures 25h, 26i, 28d,f).

Upper Lip (Figure 28c): In general, similar to that of adult female, but glands not observed.

Y-Sclerite and Girdle (Figure 28g): Similar to those of adult female.

Genitalia: Absent.

DESCRIPTION OF INSTAR III FEMALE (Figure 28h-j).—Carapace similar in shape to that of adult female (Figure 28h,i).

Carapace Size (Length, height in mm): USNM 194573, 0.73, 0.44.

Seventh Limb (Figure 28j): Elongate bare.

Remaining Appendages: Not examined in detail, but, in general, similar to those of adult female.

SUPPLEMENTARY DESCRIPTION OF INSTAR IV FEMALE (Figure 29a-d).—Carapace similar in shape to that of adult female (Figure 29a-c).

Carapace Size (length, height in mm): USNM 194571, 0.86, 0.47; USNM 194574, 0.90, 0.52.

First Antenna: 4th joint with 3 bristles (2 ventral, 1 dorsal).

Seventh Limb (Figure 29b,d): Well developed, segmented, with 4 terminal and 2 proximal bristles, each tapering distally (juvenile character). Terminus with opposing teeth and pegs.

Remaining Appendages: Not examined in detail, but, in general, similar to those of adult female.

DESCRIPTION OF INSTAR IV? MALE (Figures 29e-g, 30).—Carapace similar in shape to that of adult female (Figure 29e-g).

Carapace Size (length, height in mm): USNM 194570, 0.91, 0.53.

Central Adductor Muscle Scars: As shown in Figure 30a–c.

First Antenna (Figure 30d,e,j): Differs from that of instar III male in having 2 ventral bristles instead of 1 on the 4th joint.

Second Antenna (Figure 30b,f–h): Similar to that of instar III male, except 2nd endopodial joint of 2nd antenna of right limb with 3 instead of 2 bristles (left limb with only 2). (Note: The differences between the endopodite of the 2nd antennae of the instar III and IV females are fewer than expected, suggesting that the endopodite of the instar IV is underdeveloped.)

Seventh Limb (Figure 30b,c,i): Elongate bare, similar to that of instar III male.

Remaining Appendages (Figure 30b,c,i,j): Similar to those of instar III male, but not examined in detail.

NUMBER OF GROWTH STAGES.—The present collections contained instars I, III, IV, and adult females (Figure 31). Based on their size and appendage morphology it is tentatively concluded that the species has four juvenile growth stages. Two other species in the Pseudophilomedinae have been interpreted to have four juvenile growth stages: *Pseudophilomedes kylix* Kornicker and Iliffe, 1989b:26, and *Tetragonodon rex* Kornicker and Harrison-Nelson, 1999:3.

REMARKS.—USNM 194570 has some morphological characters suggesting that it is an instar IV male and others suggesting that it is an instar III male. Characters suggesting the former are (1) the greater size of its carapace relative to those of the two instar III males in the collection (USNM 194567, 194568), and (2) the presence of two ventral bristles rather than one on the 4th joint of the 1st antenna. Characters suggesting the latter are (1) the bare 7th limb, (2) the similarity in size and morphology of the endopodite of the 2nd antennae of USNM 194570 (Figure 30g) and USNM 194567 (Figure 26f) (instar III males), and (3) the similarity in size of both the 1st antenna and protopod and exopod of the 2nd antennae of USNM 194570 (Figure 30e,f) and USNM 194567 (Figure 26e,f). Mainly because of the carapace size, the senior author is inclined to believe that USNM 194570 is an instar IV in which some appendages are not fully developed, but the difference in carapace size could be the result of variability, or the specimen could be an instar III. In the carapace length-height graph (Figure 31), USNM 194570 is shown as an instar IV.

Family Sarsiellidae Brady and Norman, 1896

Subfamily Sarsiellinae Brady and Norman, 1896

ONTOGENY.—First instars have been described for the following species of the Sarsiellinae: *Spinacopia sandersi* Kornicker, 1969:232 (and below); *Sarsiella japonica* Hiruta, 1977:44; *Sarsiella misakiensis* Hiruta, 1978:272; *Eusarsiella ryanae* Kornicker and Iliffe, 2000; *E. merx*, new species; and *Junctichela pax*, new species.

Kornicker (1969:29) described the maxilla of instar I of *Spinacopia sandersi* as follows: “Well developed, similar in general morphology to adult female.” Hiruta (1977:58) observed that the maxilla of instar I of both *Sarsiella japonica* and *Sarsiella misakiensis* has two a-bristles and three terminal bristles on the 2nd endopodial joint and pointed out that the maxillae of those species differed from those of *S. sandersi* described by Kornicker (1969:29). The senior author reexamined herein the maxilla of instar I of *S. sandersi* (USNM 122562) and observed that, like *S. japonica* and *S. misakiensis*, it has two a-bristles and three terminal bristles on the 2nd endopodial joint. Apparently, the absence of a c-bristle and the presence of three instead of five end bristles on the 2nd endopodial joint are characteristic of the first instars of the Sarsiellinae.

Eusarsiella Cohen and Kornicker, 1975

TYPE SPECIES.—*Sarsiella capsula* Norman, 1869.

COMPOSITION AND DISTRIBUTION.—See Kornicker and Iliffe, 2000:30.

Eusarsiella ryanae Kornicker and Iliffe, 2000

FIGURE 32

Eusarsiella ryanae Kornicker and Iliffe, 2000:30–45, figs. 14–24, 25a.

HOLOTYPE.—USNM 194475, ovigerous female.

MATERIAL.—Four Shark Cave, South Andros Island, Sta 97-023: USNM 194550, 2 ovigerous females in alcohol; USNM 194551, 1 partly dissected instar IV male in alcohol; USNM 194552, 8 instar I in alcohol.

DISTRIBUTION.—Exuma Sound, depth 67 m (Kornicker and Iliffe, 2000). Collected herein in Four Shark Cave, South Andros Island, depth 27–33 m.

SUPPLEMENTARY DESCRIPTION OF ADULT FEMALE.—**Carapace Size** (length, height in mm): USNM 194550A, length with caudal process 1.00, length without caudal process 0.82, height 0.73; USNM 194550B, length with caudal process 0.95, length without caudal process 0.79, height 0.71.

Eggs: USNM 194550A with 1 extruded egg with length of 0.26 mm; USNM 194550B with 2 extruded eggs with lengths of 0.26 mm and 0.23 mm.

Attached Organisms: USNM 194550A with rotaloid Foraminifera attached to right valve near ventral margin at mid-length.

DESCRIPTION OF INSTAR IV MALE (Figure 32).—Carapace similar in shape to that of instar III male (Figure 32a).

Ornamentation (Figure 30a,b): Surface with fossae formed by rings of minute pointed spines. Two weakly developed lateral horizontal ridges formed by spines similar in position to those of adult female. Long and short bristles along valve edge similar to those of adult female. Tip of caudal process with 4 bristles (long slender bristle on either side of 2

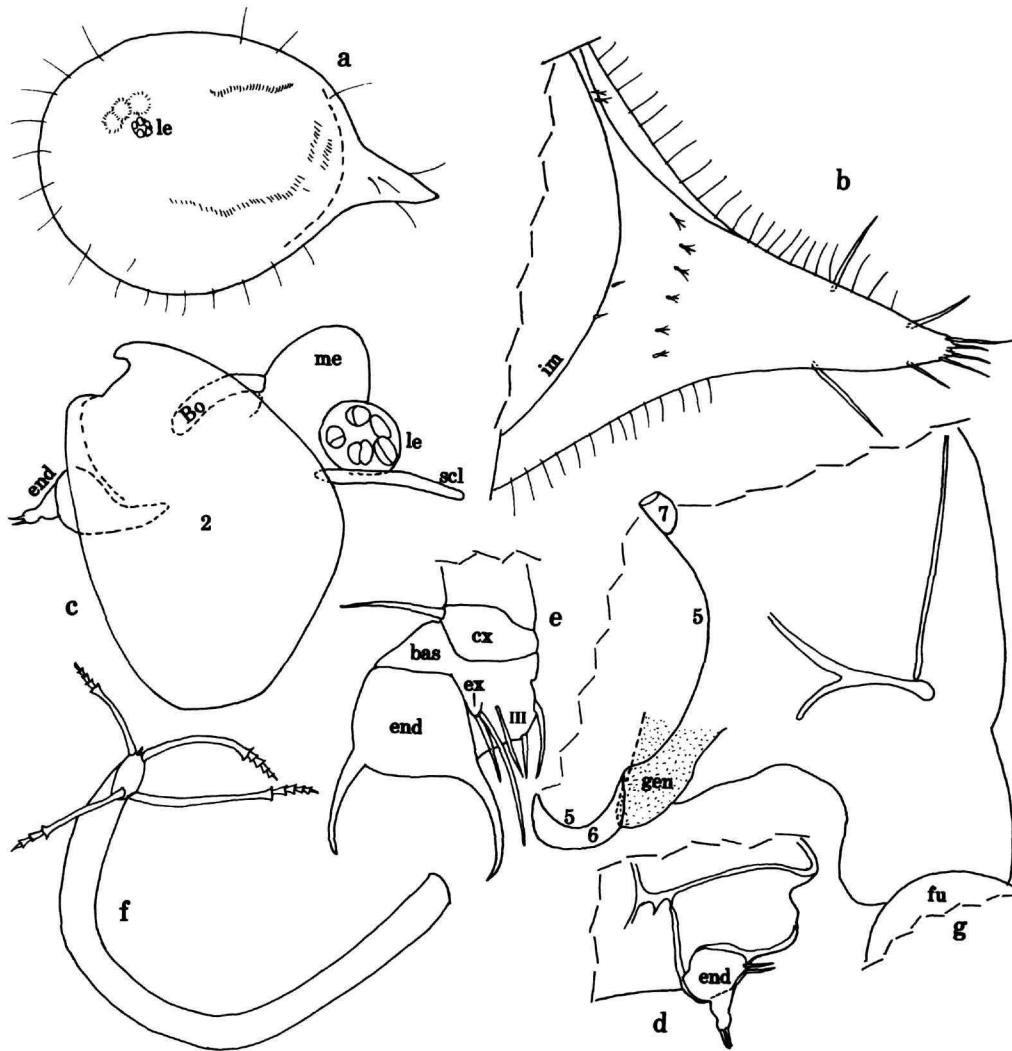


FIGURE 32.—*Eusarsiella ryanae* Kornicker and Iliffe, 2000, USNM 194551, instar IV male: a, complete specimen from left side, length 0.84 mm; b, caudal process right valve, iv; c, part of anterodorsal section of body viewed from left side; d, endopodite left 2nd antenna, mv; e, left maxilla viewed while attached to body, nabs, lv; f, left 7th limb viewed attached to body; g, posterior of body from left side.

short bristles, the latter on minute pedestals) (Figure 32b). Gel-like substance observed filling space between short bristles along valve edge.

Infold (Figure 32b): Anterior infold with small bristle near midheight. Infold of caudal process with vertical row of 6 or 7 setose bristles and few smaller undivided bristles near inner margin of infold; posterior infold with 2 setal bristles near valve midheight.

Carapace Size (length, height in mm): USNM 194551, 0.84, 0.59.

First Antenna: Similar to that of adult female, but filaments on bristles of 7th and 8th joints not counted.

Second Antenna (Figure 32c,d): Protopodite bare. Endopodite 2-jointed: 1st joint with 2 anterior ringed proximal bristles; tip of 2nd joint with 2 short terminal bristles. Exopodite similar to that of adult female.

Mandible, Maxilla (Figure 32e), **Fifth and Sixth Limbs** (Figure 32g): Not examined in detail but similar to those of adult female. Endite III of maxilla with 6 bristles.

Seventh Limb (Figure 32f): Limb long and segmented, with 4 terminal bristles, 2 on each side, each with 3 to 5 bells; bristles with slight taper distally (juvenile character). Terminal combs absent.

Furca, Bellonci Organ (Figure 32c), **Eyes** (Figure 32c), **Pos-**

terior of Body (Figure 32g), and Y-Sclerite (Figure 32g): Similar to those of adult female.

Copulatory Organ (Figure 32g): Bare lobe on each side of body posterior to 5th and 6th limbs.

Gut Content: With dark brown unidentified fragments.

ONTOGENY.—Kornicker and Iliffe (2000:37–42) described instars I to III of *E. ryanae* but had no instar IV in collection; therefore, an instar IV male in the present collection is described above.

The calculated growth factors of total carapace length between successive stages are as follows: I–II, 1.19; II–III, 1.18; III–IV (male), 1.25; IV (male)–adult female, 1.16; IV (male)–adult male, 0.96 (negative growth). The average growth factor for carapace length, including all instars and adult females, is 1.20. The morphology of the endopodite of the 2nd antenna of the instar IV male and adult male are similar. The 7th limb is bare on instar III but has 4 terminal bristles on instar IV. The bristles of the 7th limb differ from those of the adult male in being slightly tapered and in having some bristles with fewer terminal bells. The copulatory organ appears for the first time in the instar IV male as a bare lobe on each side of the body (Figure 32g).

Eusarsiella merx, new species

FIGURES 33–41

ETYMOLOGY.—From the Latin *merx* (commodities, goods, wares).

HOLOTYPE.—USNM 194556, dissected adult male on slide and in alcohol.

TYPE LOCALITY.—Sta 95-091, Sugar Cay Blue Hole, Sugar Cay, Andros Island.

PARATYPES.—Sugar Cay Blue Hole, Sta 95-091: USNM 194557, dissected instar IV female on slide and in alcohol; USNM 194559, partly dissected instar III male in alcohol; USNM 194560, partly dissected instar II (sex unknown) in alcohol; USNM 194561, dissected instar I (sex unknown) on slide.

DISTRIBUTION.—Sugar Cay Blue Hole, Sugar Cay, Andros Island, at depth of 22 m.

DESCRIPTION OF ADULT MALE (Figures 33–36).—Antero-dorsal and posterodorsal margins of carapace oblique (Figures 33, 34a–c); dorsal margin linear in hinge area; ventral margin slightly scalloped; caudal process with only slight projection. Gel-like coating absent.

Ornamentation: Carapace with upper and lower ribs; upper rib with projecting process at posterior end (Figures 33, 34a). Oblique ridge setback from anteroventral margin and parallel to it (Figure 34b). Bristles sparsely distributed on lateral surface, more abundant along margins (Figures 33, 34b,c). Long bristles forming row along posterior edge of small caudal process (Figure 34c,e).

Infold (Figure 34d,e): Anterior infold with small bristle at shell midheight; posterior infold with 4 bristles within caudal

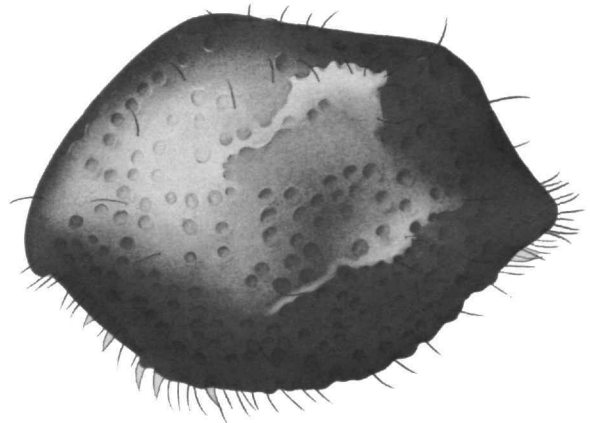


FIGURE 33.—*Eusarsiella merx*, new species, holotype, adult male, USNM 194556, length 0.85 mm.

process, and 2 setose bristles near midheight; additional bristles along inner margin of posteroventral and posterior infold.

Central Adductor Muscle Attachments (Figure 34a): Comprising about 13 oval attachments.

Carapace Size (length, height in mm): USNM 194556, 0.85, 0.64.

First Antenna (Figures 34f–k, 35a): 1st joint bare. 2nd joint with spinous dorsal bristle at midlength. 3rd joint fused with 4th; 3rd joint with long dorsal bristle and no ventral bristle; 4th joint with 3 bristles (1 dorsal, 2 ventral). 5th joint wedged ventrally between 4th and 6th joints; sensory bristle with short proximal part with abundant thin filaments (filaments not shown; tip of bristle broken off, remaining part without filaments). 6th joint long with short medial terminal bristle. 7th joint with short slender ringed a-bristle, bare b-bristle about same length as combined joints 6–8, and long c-bristle with 3 marginal filaments. 8th joint with long bare d-bristle, shorter bare e-bristle, and long f- and g-bristles with 3 or 4 marginal filaments.

Second Antenna (Figures 35a–c, 36g): Sclerite attached to posterior edge of protopodite straight (Figure 36g). Protopodite bare. Endopodite 2-jointed (Figure 35a,b): joint 1 with medial and anterior spines and 1 ringed anterior bristle; 2nd joint with 2 or 3 terminal ringed bristles. Exopodite: 1st joint with small terminal medial bristle adjacent to triangular process; bristle of 2nd joint with about 15 slender ventral spines and distal natatory hairs; bristles of joints 3–8 with natatory hairs; 9th joint with 2 bristles (1 long ventral with slender, proximal, hair-like spines and distal natatory hairs, 1 short bare (Figure 35c)); joints 2–7 with row of short terminal spines.

Mandible (Figure 35d–h): Coxale endite represented by small spine (Figure 35f). Basale: ventral margin with short bristle near midlength; medial side near ventral margin with 4 bristles (3 proximal forming cluster) (Figure 35f); dorsal mar-

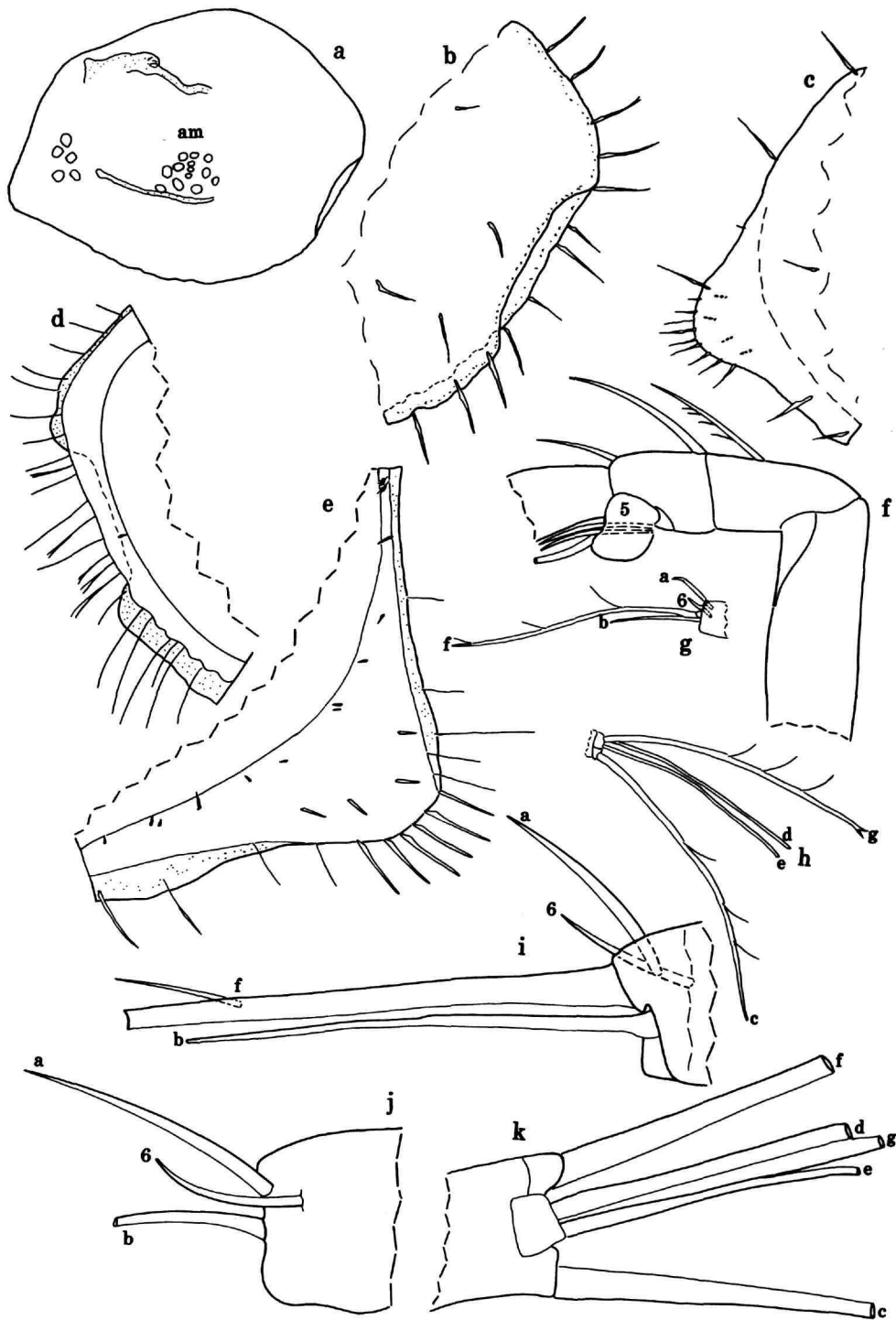


FIGURE 34.—*Eusarsiella merx*, new species, holotype, USNM 194556, adult male: *a*, complete specimen from right side, length 0.85 mm; *b, c*, details from *a* (bristles on infold of caudal process dashed in *c*); *d, e*, anterior and posterior of right valve, respectively, *iv*; *f*, part of left 1st antenna, *lv*; *g*, distal end left 1st antenna, nabs, *lv*; *h*, distal end left 1st antenna, nabs, *mv*; *i*, tip left 1st antenna, nabs, *lv*; *j*, tip right 1st antenna, nabs, *lv*; *k*, tip right 1st antenna, nabs, *lv*.



FIGURE 35.—*Eusarsiella merx*, new species, holotype, USNM 194556, adult male: *a*, parts of right 1st and 2nd antennae in place on body viewed from right side, nabs, lv; *b*, part of left 2nd antenna, mv; *c*, distal part of exopodite left 2nd antenna, lv; *d*, left mandible in place on body viewed from left side, nabs, lv; *e*, tip left mandible, mv; *f*, part of right mandible, mv; *g, h*, part of right mandible, lv.



FIGURE 36.—*Eusarsiella merx*, new species, holotype, USNM 194556, adult male: *a*, maxilla, nabs; *b*, distal end 5th limb, nabs; *c*, left 6th limb, not all hairs shown, lv; *d*, right 7th limb; *e*, left furcal lamella, lv; *f*, Bellonci organ folded over medial eye on covered slide; *g*, anterodorsal part of body viewed from right side, anterior to right; *h*, lobes of left (lv) and right (mv) copulatory organs, respectively, anterior to left, nabs; *i*, detail from *h*.

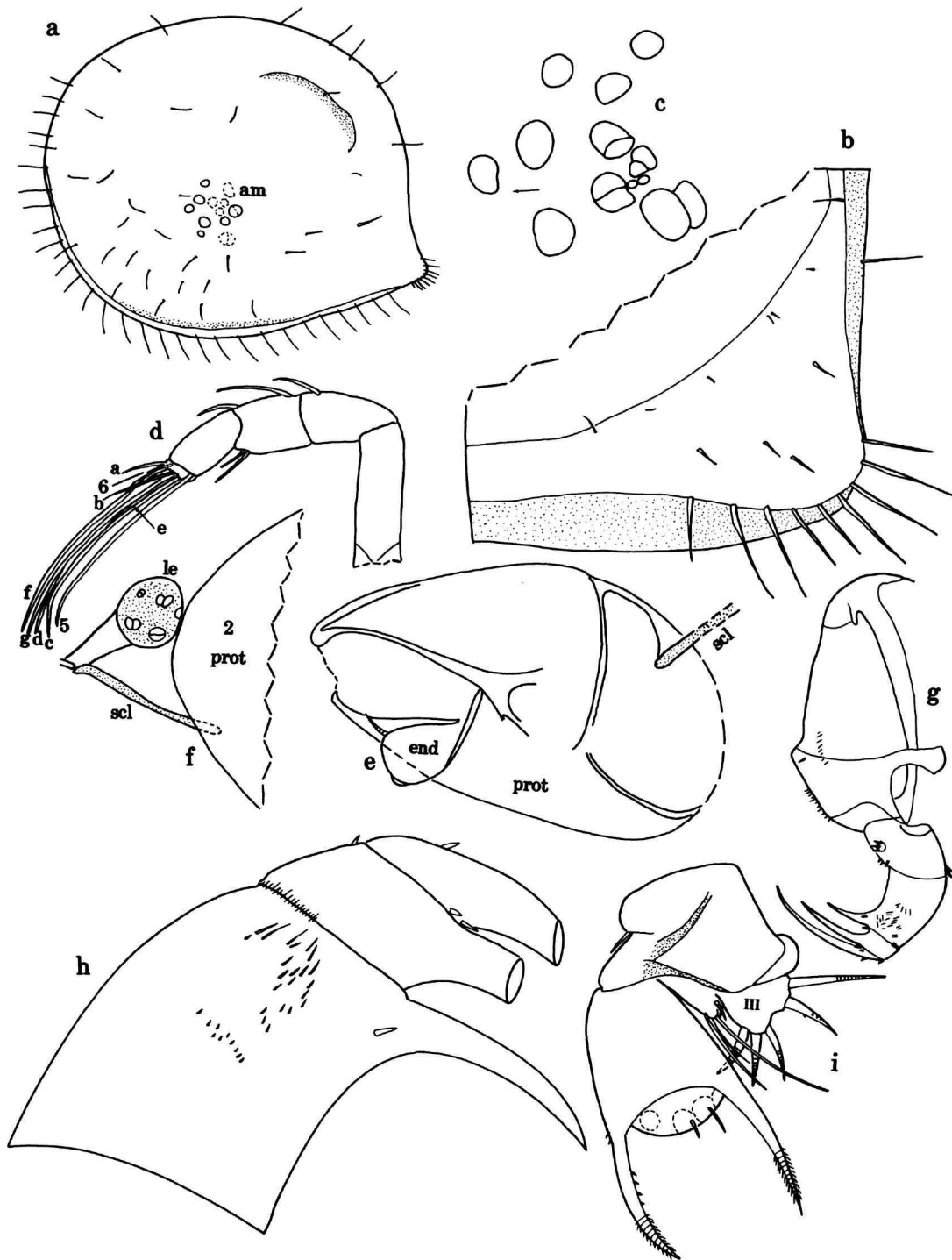


FIGURE 37.—*Eusarsiella merx*, new species, paratype, USNM 194557, instar IV female: *a*, complete specimen from left side, length 0.84 mm; *b*, caudal process right valve, iv; *c*, some central adductor muscles attachments left valve, anterior to left, ov; *d*, left 1st antenna, lv; *e*, part of right 2nd antenna, mv; *f*, right lateral eye and part of right 2nd antenna, lv; *g*, left mandible, mv; *h*, detail from *g*; *i*, left maxilla, nabs, lv.

gin with 2 subterminal bristles. 1st endopodial joint: ventral margin with 2 subterminal bristles; medial surface and dorsal margin with spines forming rows. 2nd endopodial joint: ventral margin with terminal bristle; dorsal margin with short subterminal bristle with small medial spine near base. 3rd endopodial joint (Figure 35*d,e,h*): medial side with 2 minute, indistinct, subterminal, spine-like bristles; distal margin with small ventral bristle and long, bare, terminal claw. Exopodite small indistinct hirsute (Figure 35*d,g*).

Maxilla (Figure 36*a*): Extremely reduced with weakly developed bristles.

Fifth Limb (Figure 36*b*): Single endite with 1 short bristle. Exopodite minute, joints fused, with about 9 indistinct bristles.

Sixth Limb (Figure 36*c*): Single endite with 3 bristles (2 short, 1 slightly longer hirsute). End joint hirsute with 11 or 12 bristles (6 or 7 broad hirsute bristles along anteroventral margin, 2 hirsute broad posterior bristles, and 3 medial bristles with long proximal and short distal spines).

Seventh Limb (Figure 36*d*): Small, peg-like.

Furca (Figure 36*e*): Each lamella with 5 pointed claws; claw 1 fused to lamella, claws 2–5 separated from lamella by suture; claws followed by paired spines and single spine; left lamella with indistinct spine (not shown) between claws 4 and 5; all claws with teeth along posterior margin, some larger than others; right lamella anterior to left by width of base of claw 1.

Bellonci Organ (Figure 36*f,g*): Elongate, with rounded tip.

Eyes: Lateral eye with about 12 ommatidia (2 ommatidia near ventral margin larger than others) (Figure 36*g*). Medial eye about same size as lateral eye, with brown pigment (Figure 36*f*).

Copulatory Organ (Figure 36*h,i*): Each limb with about 3 lobes; terminal lobe with foot-like sclerotized hook with 3 or 4 small bristles at inner edge of base; sclerotized medial process present at base of hook; middle lobe with 2 indistinct bristles; small proximal posterior lobe bare.

Y-Sclerite: Typical for family.

DESCRIPTION OF INSTAR IV FEMALE (Figures 37, 38).—Carapace with evenly rounded anterior and dorsal margins and oblique posterior margin (Figure 37*a*). Caudal process small and forming right-angle. Gel-like coating absent.

Ornamentation: Carapace with distinct crescentic lateral ridge near posterodorsal corner (Figure 37*a*). Surface with scattered bristles more abundant along margins (Figure 37*a*). Outer edge of caudal process with row of 8 or 9 bristles (Figure 37*b*). Several rows of minute lateral spines present just within valve edge.

Infold: Infold of caudal process with 4 small bristles (Figure 37*b*); additional smaller bristles along inner margin of infold of caudal process; 1 or 2 longer bristles along posterior infold ventral to 2 setal bristles located just ventral to valve midheight.

Central Adductor Muscle Attachments (Figure 37*c*): Consisting of 11 or 12 large ovoid attachments.

Carapace Size (length, height in mm): USNM 194557, 0.84, 0.74.

First Antenna (Figure 37*d*): 1st joint bare. 2nd joint with subterminal dorsal bristle. 3rd joint short, fused to 4th, with long dorsal bristle, but without ventral bristle. 4th joint long with 3 bristles (1 dorsal, 2 ventral). Sensory bristle of 5th joint with 2 minute filaments (1 proximal, 1 terminal). Medial bristle of 6th joint short. 7th joint: a-bristle about twice length of bristle of 6th joint; b-bristle almost twice length of a-bristle; c-bristle with minute terminal filament, about same length as sensory bristle of 5th joint. 8th joint: d-bristle bare, same length as c-bristle; e-bristle bare, slightly longer than b-bristle; f- and g-bristles about same length as c-bristle, each with minute terminal filament.

Second Antenna (Figure 37*e,f*): Protopodite bare. Endopodite 1-jointed with proximal anterior bristle and small terminal node (terminal node could be interpreted to be 2nd joint). Exopodite: 1st joint with minute, terminal, medial bristle; bristle of 2nd joint about two-thirds length of bristle of 3rd joint, with slender, proximal, ventral spines and distal natatory hairs; bristles of joints 3–8 with proximal ventral spines and distal natatory hairs; 9th joint with 2 bristles (ventral bristle long, with proximal ventral spines and distal natatory hairs; dorsal bristle short bare); joints 3–5 with row of minute spines along distal edge.

Mandible (Figure 37*g,h*): Coxale: endite consisting of minute indistinct spine; ventral margin with slender spines. Basale: medial side near ventral margin with 4 small bristles; lateral side near ventral margin with 2 small bristles; dorsal margin with 2 small subterminal bristles. No exopodite present. 1st endopodial joint: dorsal margin with minute spines forming terminal row; ventral margin with stout terminal claw with minute medial bristle near its base; medial side of joint with about 32 spines (distal spines longer). 2nd endopodial joint with stout, bare, ventral claw and small, terminal, dorsal bristle. 3rd endopodial joint with stout, bare, terminal claw, 2 minute ventral bristles, and 1 minute dorsal bristle.

Maxilla (Figure 37*i*): Coxale with short anterior bristle. Endite I with 5 bristles; endite II with 4 bristles; endite III with 5 or 6 bristles. Basale with short bristle near exopodite and short transparent flap. Exopodite with 3 bristles (1 longer than others). Endopodite: 1st joint with spinous alpha- and beta-bristles with distal rings; 2nd joint with 2 lateral a-bristles, 1 medial c-bristle, and 5 stout pectinate terminal bristles.

Fifth Limb (Figure 38*a*): Epipodial appendage with 29 bristles. Single endite with 1 short bristle. Exopodite hirsute: 1st joint with 2 bare bristles; 2nd joint with 3 bristles; joints 3–5 with 4 bristles (1 minute).

Sixth Limb (Figure 38*b,c*): Endite I with 3 short bristles. End joint with 9 or 10 bristles (with short marginal spines) followed by 2 stout hirsute bristles; posterior margin hirsute.

Seventh Limb (Figure 38*d,h*): Proximal group with 2 tapered bristles, 1 on each side, each with 2 bells; terminal group

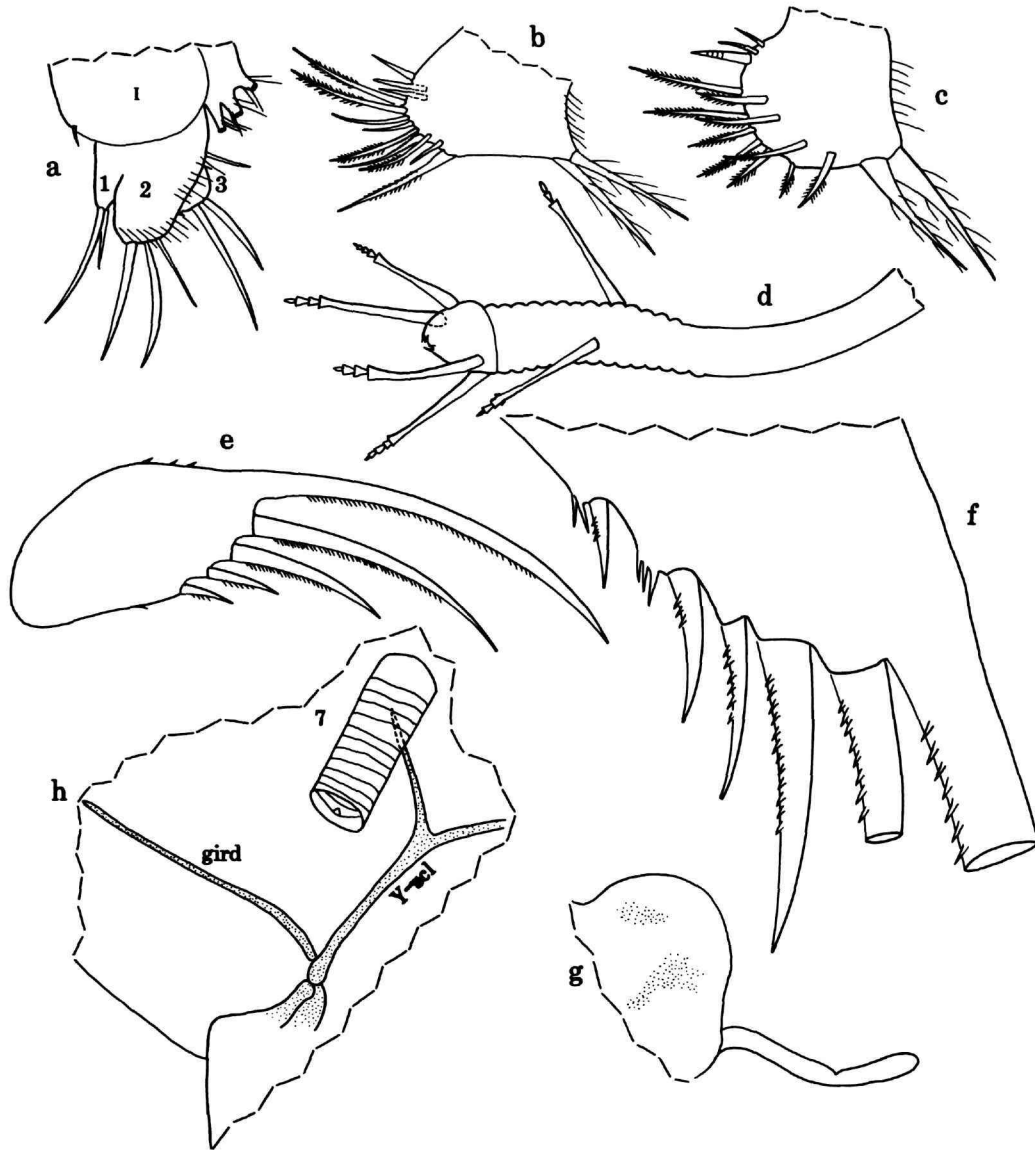


FIGURE 38.—*Eusarsiella merx*, new species, paratype, USNM 194557, instar IV female: *a*, left 5th limb, nabs, lv; *b, c*, left (lv) and right (mv) 6th limbs, respectively; *d*, right 7th limb, lv; *e*, right furcal lamella, lv; *f*, left furcal lamella, mv; *g*, medial eye and Bellonci organ from right side; *h*, part of posterior of body, anterior toward right.

with 4 tapered bristles, 2 on each side, each with 3 or 4 bells; terminus with opposing combs, each with 2 or 3 minute teeth.

Furca: Right lamella with 5 claws followed by space and small spine (Figure 38*e*); left lamella with 6 claws with spines between claws 5 and 6 and following claw 6 (Figure 38*f*); claw 1 continuous with lamella, others separated by suture; anterior margin of right lamella with 3 minute spines; right lamella anterior to left by width of base of claw 1; lamellae without hairs.

Bellonci Organ (Figure 38*g*): Elongate, with rounded tip.

Eyes: Lateral eye small, with brown pigment and 5 or 6 tidia (Figure 37*f*). Medial eye more than twice size of lateral eye, with brown pigment (Figure 38*g*).

Genitalia: Absent.

Y-Sclerite (Figure 38*h*): Typical for family.

DESCRIPTION OF INSTAR III MALE (Figure 39).—Carapace shape and ornamentation similar to that of Instar IV female (Figure 39*a*). Gel-like coating absent.

Infold: Infold of caudal process with 3 or 4 bristles; additional bristles along inner margin of infold (Figure 39*c*); 2 setal

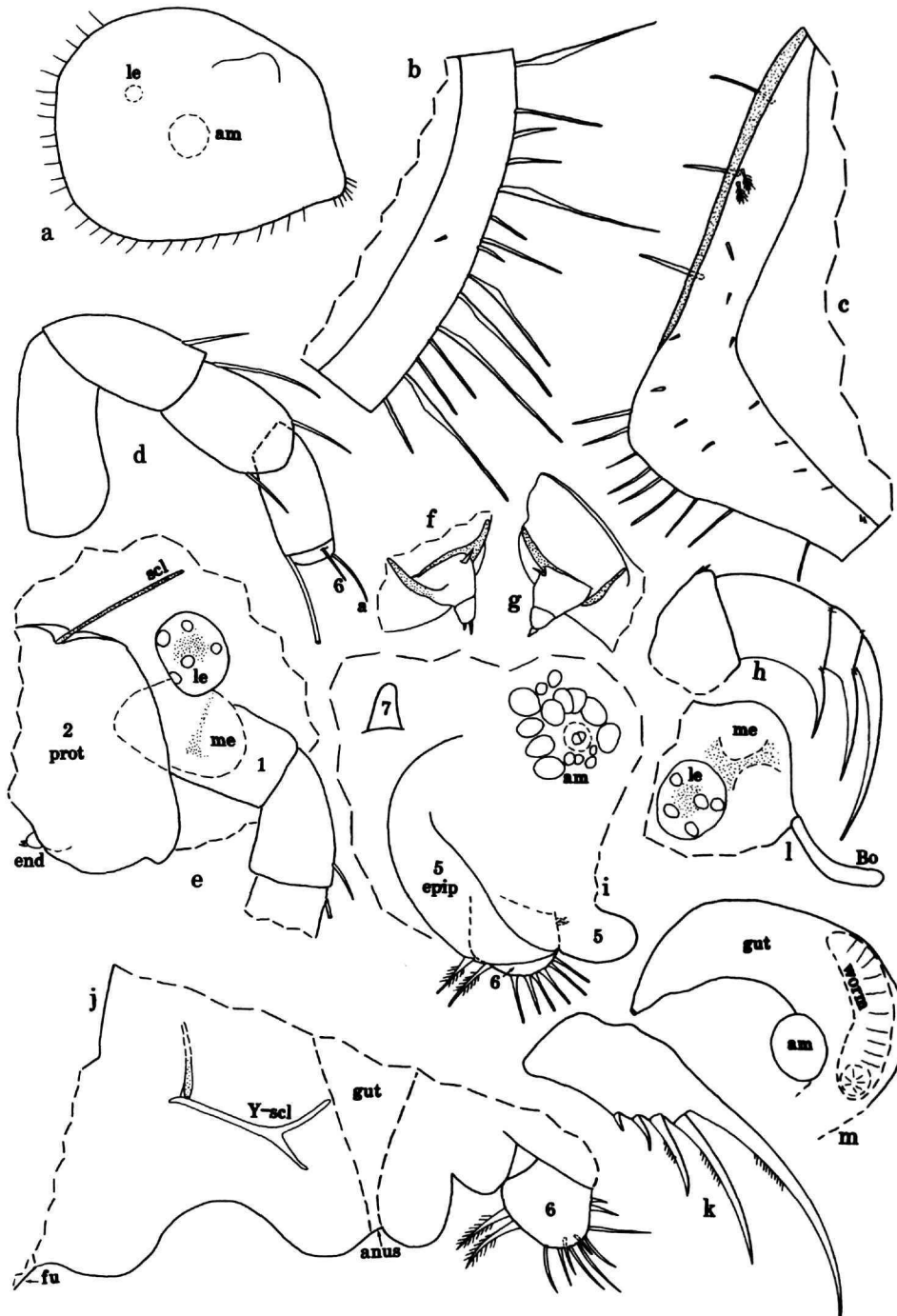


FIGURE 39.—*Eusarsiella merx*, new species, paratype, USNM 194559, instar III male: *a*, complete specimen from left side, length 0.69 mm; *b, c*, anterior and posterior of left valve, respectively, *iv*; *d*, part of left 1st antenna, nabs, mv; *e*, part of anterodorsal part of body from right side, anterior toward lower right, *lv*; *f, g*, endopodites of left and right 2nd antenna, respectively, *mv*; *h*, part of right mandible, *lv*; *i*, part of posterior of body viewed from right side (muscle attachments protruding from body), anterior toward right; *j*, posteroventral part of body from right side, nabs, anterior toward right; *k*, right furcal lamella, *lv*; *l*, right lateral eye, medial eye, and Bellonci organ, anterior toward right; *m*, worm (dashed) in gut viewed from right side, anterior toward lower right.

bristles near midheight. Anterior infold with small bristle ventral to midheight (Figure 39b).

Central Adductor Muscle Attachments (Figure 39a,i): Consisting of about 15 oval attachments.

Carapace Size (length, height in mm): USNM 194559, 0.69, 0.54.

First Antenna (Figure 39d,e): 1st joint bare. 2nd joint with subterminal dorsal bristle. 3rd joint fused to 4th, with 1 long dorsal bristle, no ventral bristle. 4th joint with 2 bristles (1 ventral, 1 dorsal). Bristles of joints 5–8 similar to those of instar IV female, but not studied in detail.

Second Antenna: Protopodite bare. Endopodite 2-jointed: 1st joint with 1 short proximal anterior bristle; 2nd joint small with 1 or 2 terminal bristles (Figure 39e–g). Exopodite similar to that of instar IV female.

Mandible (Figure 39h): Similar to that of instar IV female.

Maxilla, Fifth Limb (Figure 39i), and *Sixth Limb* (Figure 39i,j): Not studied in detail but, in general, similar to that of instar IV female.

Seventh Limb (Figure 39i): Short, bare, thumb-like.

Furca (Figure 39k): Each lamella with 5 claws; claw 1 fused to lamella, claws 1–5 separated from lamella by suture; claws with teeth along posterior edge; left lamella with small spine following claw 5; right lamella anterior to left by three-fourths width of base of claw 1.

Bellonci Organ (Figure 39l): Similar to that of instar IV female.

Eyes (Figure 39a,e,h): Medial eye with brown pigment. Lateral eye about one-half size of medial eye, with 5 ommatidia.

Y-Sclerite: Typical for family.

Genitalia: Absent.

Gut Content (Figure 39m): Large segmented organism near midlength of gut.

Remarks: USNM 194559 is interpreted to be a male because of its having a short 7th limb.

DESCRIPTION OF INSTAR II (sex unknown) (Figure 40a–h).—Carapace shape and ornamentation similar to that of instar IV female (Figure 40a).

Infold and Central Adductor Muscle Attachments (Figure 40a): Similar to those of instar III male.

Carapace Size (length, height in mm): USNM 194560, 0.59, 0.46.

First Antenna (Figure 40b): Differs from that of instar III male in lacking a ventral bristle on 4th joint. Bristles of joints 7 and 8 not examined in detail.

Second Antenna (Figure 40c): Protopodite bare. Endopodite 2-jointed: 1st joint with single proximal anterior bristle; 2nd joint short, bare. Exopodite similar to that of instar III male.

Mandible, Maxilla, and Fifth Limb: Not examined in detail but, in general, similar to those of instar III male.

Sixth Limb (Figure 40d,e): With single bristle adjacent to hirsute node.

Seventh Limb (Figure 40f): Small, bare, thumb-like.

Furca (Figure 40g): Similar to that of instar III male.

Bellonci Organ (Figure 40h) and *Eyes* (Figure 40a,h): Similar to those of instar III male.

Genitalia: Absent.

Y-Sclerite: Typical for family.

DESCRIPTION OF INSTAR I (sex unknown) (Figures 40i–q, 41).—Carapace similar in shape to that of instar II (Figure 40i). Gel-like coating absent.

Infold: Infold fairly well developed, with visible inner margin. Anterior infold with small bristle near midheight (Figure 40j). Infold of caudal process with several bristles along inner margin of infold, but none observed closer to distal end of caudal process (Figure 40k). Usual 2 posterior setal bristles not observed, possibly lost during dissection.

Central Adductor Muscle Attachments (Figure 40i): Consisting of about 13 ovoid attachments.

Carapace Size (length, height in mm): USNM 194561, 0.50, 0.39.

First Antenna (Figure 40l,m): 1st, 2nd, and 4th joints without bristles. 3rd joint with 1 long dorsal bristle. 4th joint with spines forming row in distal dorsal corner. Distal joints fused. Sensory bristle of 5th joint bare. 5th and 6th joints fused. 6th joint with short medial bristle. 7th joint: a-bristle short; b-bristle about 3 times length of a-bristle; c-bristle about same length as sensory bristle of 5th joint, bare. 8th joint: all bristles bare; d-, f-, and g-bristles long, e-bristle short, about one-third length of e-bristle.

Second Antenna (Figure 40n–q): Protopodite bare. Endopodite 1-jointed; left limb of USNM 194560 with unsclerotized pointed tip; right limb with rounded tip. Exopodite 9-jointed: 1st joint with minute terminal medial bristle; bristles of 2nd joint with ventral spines and few long distal hairs; bristles of joints 3–8 with ventral spines and distal natatory hairs; 9th joint with 2 bristles (dorsal bristle short); joints 3–7 with spines forming row along distal edges.

Mandible (Figure 41a): Coxale: endite consisting of small medial spine; ventral margin with few indistinct hairs. Basale: medial side near ventral margin with 4 small bristles; lateral side without bristles near ventral margin; dorsal margin with 2 small subterminal bristles. 1st endopodial joint: dorsal margin with few spines forming terminal row; ventral margin with stout terminal claw with minute, indistinct, medial bristle near its base; medial side with distal spines. 2nd endopodial joint with stout, bare, ventral claw and small, terminal, dorsal bristle. 3rd endopodial joint with stout, bare, terminal claw, 2 minute ventral bristles, and 1 minute dorsal bristle.

Maxilla (Figure 41b–d): Coxale with transparent dorsal fringe, but without dorsal bristle. Endite I with 5 bristles; endites II and III each with 4 bristles. Basale with short bristle near exopodite. Exopodite with 3 bristles. Endopodite: 1st joint

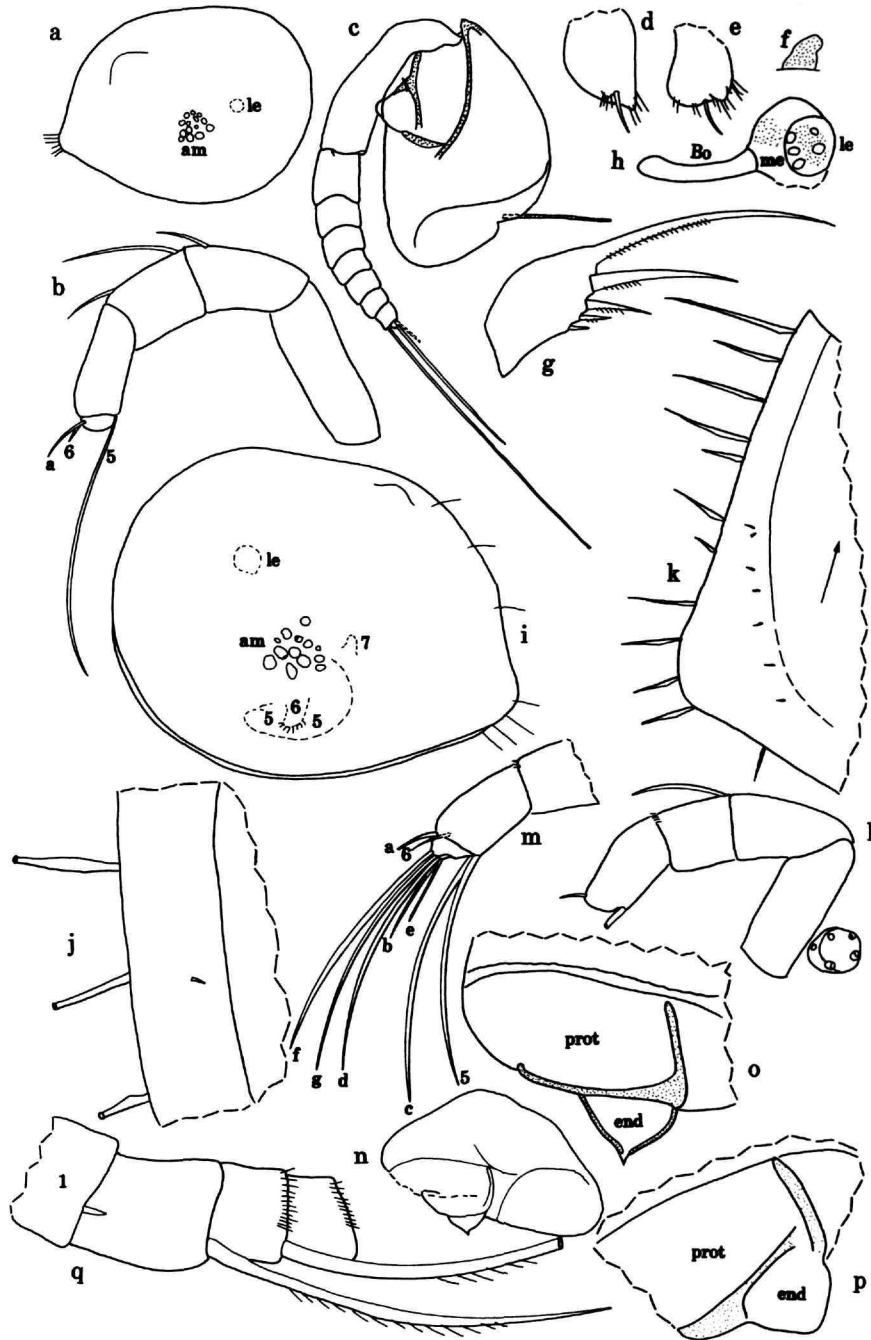


FIGURE 40.—*Eusarsiella merx*, new species, paratype, USNM 194560, instar II (sex unknown): *a*, complete specimen from right side, length 0.59 mm; *b*, part of left 1st antenna, nabs, lv; *c*, right 2nd antenna, nabs, mv; *d, e*, right (lv) and left (mv) 6th limbs, respectively; *f*, right 7th limb, lv; *g*, right lamella of furca, lv; *h*, left lateral eye, medial eye, and Bellonci organ. USNM 194561, instar I (sex unknown): *i*, complete specimen from left side, length 0.50 mm; *j, k*, anterior and posterior of right valve, respectively, mv; *l*, left lateral eye and left 1st antenna viewed through shell, nabs, lv; *m*, part of left 1st antenna, lv; *n*, part of left 2nd antenna viewed through shell, lv; *o*, detail from *n*; *p*, part right 2nd antenna, mv; *q*, part of exopodite right 2nd antenna, mv.



FIGURE 41.—*Eusarsiella merx*, new species, paratype, USNM 194561, instar I (sex unknown): *a*, left mandible, lv; *b*, left maxilla, nabs, lv; *c*, right maxilla, nabs, mv; *d*, endites right maxilla, mv; *e*, part of 5th limb, nabs; *f*, left 6th limb (lv); *g*, 6th limb; *h*, left 7th limb; *i*, left furcal lamella, lv; *j*, medial eye and Bellonci organ from left side; *k*, left lateral eye, lv; *l*, posterior of body from left side.

with spinous alpha- and beta-bristles; 2nd joint with 2 lateral a-bristles, no medial c-bristle, and 3 stout pectinate terminal bristles.

Fifth Limb (Figures 40i, 41e): Epipodite with 23 spinous bristles. Single endite with 1 short bristle. Exopodite hirsute: 1st joint with 2 bare bristles; 2nd joint with 3 bristles; joints 3–5 with 4 bristles (1 minute).

Sixth Limb (Figures 40i, 41f,g): Hirsute flap without bristles.

Seventh Limb (Figure 41h): Represented by small knob.

Furca (Figure 41i,l): Each lamella with 4 claws fused to lamella followed by stout spines (one of the spines could be interpreted to be an incipient 5th claw); all claws with teeth along posterior edges.

Bellonci Organ (Figure 41j): Elongate, with tapered tip.

Eyes: Medial eye with brown pigment (Figure 41j). Lateral eye about same size as medial eye, with 5 ommatidia and brown pigment (Figures 40i, 41k).

Y-Sclerite (Figure 41l): Anterior branches weakly developed.

Genitalia: Absent.

Posterior of Body (Figure 41l): Row of spines at postero-dorsal corner just dorsal to end of girdle.

Gut Content: Unrecognizable brownish particles in posterior part of gut.

ONTOGENY.—Development of appendages of *E. merx* during ontogeny is normal for the family (Hiruta, 1977:44; 1978:262). The presence of three stout terminal claws on the 2nd endopodial joint of the maxilla of instar I is useful in identifying the first instar of species of the Sarsiellidae; later instars have 5 stout claws. The calculated growth factors of total carapace length between successive stages are as follows: I–II, 1.18; II–III (male), 1.17; III (male)–IV (female), 1.22; IV (female)–adult (male), 1.01. The calculated average growth factor of carapace length between the few juvenile instars in the collection is 1.19. This suggests that the adult female would have a length of about 1 mm, which is longer than the adult male length of 0.85 mm.

COMPARISONS.—The 1st antenna of *E. merx* differs from that of *E. ryanae* in lacking a ventral bristle on the 3rd joint. Relatively few species of the genus lack a ventral bristle on the 3rd joint (Kornicker, 1986a, table 4). The basale of the mandible of *E. merx* is without a dorsal bristle distal to midlength that is present on *E. absens* (Kornicker, 1981c:3).

Eusarsiella warneri, new species

FIGURES 42–45

Sarsiella "carinata" (Kornicker).—Warner and Moore, 1984:32.

ETYMOLOGY.—The species is named in honor of Dr. George F. Warner, The University of Reading, who collected the adult male described herein.

HOLOTYPE.—USNM 193091, adult male on slide and in alcohol.

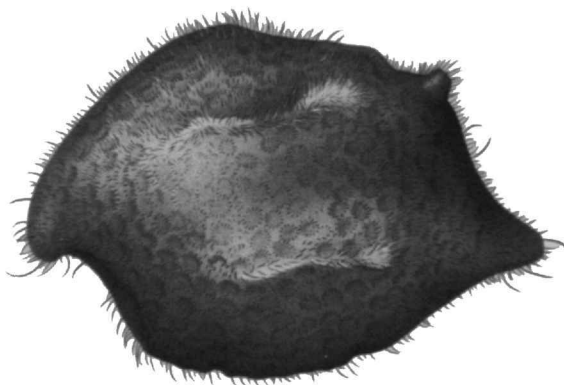


FIGURE 42.—*Eusarsiella warneri*, new species, holotype, USNM 193091, adult male, length 1.15 mm.

TYPE LOCALITY.—Rat Cay blue hole, Andros Island, Great Bahama Bank. "The bluehole ostracodes were caught in the mouth of the hole in a plankton net during the "blow" phase of the tidal current which flows strongly (up to 50 cm/sec) out of the hole with the falling tide. They are not in the "suck" phase samples taken in the inflowing current, and the inference is that they live within the caves and were dislodged from benthic habitats by the outgoing current." (Warner, in litt., 1983; also see Warner and Moore, 1984:31, 33, 34).

PARATYPES.—None.

DISTRIBUTION.—Collected only at type locality.

DESCRIPTION OF ADULT MALE (Figures 42–45).—Carapace elongate with rostrum extending well past anterior edge of valve and with projecting posteroventral caudal process (Figures 42, 43a,b). Surface with 2 lateral ribs, each followed by spinous protuberance. Anteroventral margin and part of ventral margin of right valve of USNM 193091 with distinct scalloping (Figure 43a,e); scallops poorly developed or absent on left valve.

Ornamentation: Surface with shallow round fossae and small spines between fossae (Figure 43c). Long bristles present (Figure 43b,f); long bristle at tip of caudal process with its base inside minute U-shaped depression (Figure 43g). Gel-like transparent substance visible filling space between bristles on ribs and valve edges.

Infold: Anterior infold with small bristle well below rostrum (observed only on left valve). Infold of caudal process with 4 or 5 bristles forming vertical row near inner margin of infold (Figure 43g). Posterior infold with 2 setal bristles (Figure 43g).

Selvage: Lamellar prolongation of selvage extending past tip of caudal process; narrow anterior and ventral lamellar prolongation with smooth outer edge.

Central Adductor Muscle Attachments (Figure 43a,d): Comprising about 13 ovoid attachments.

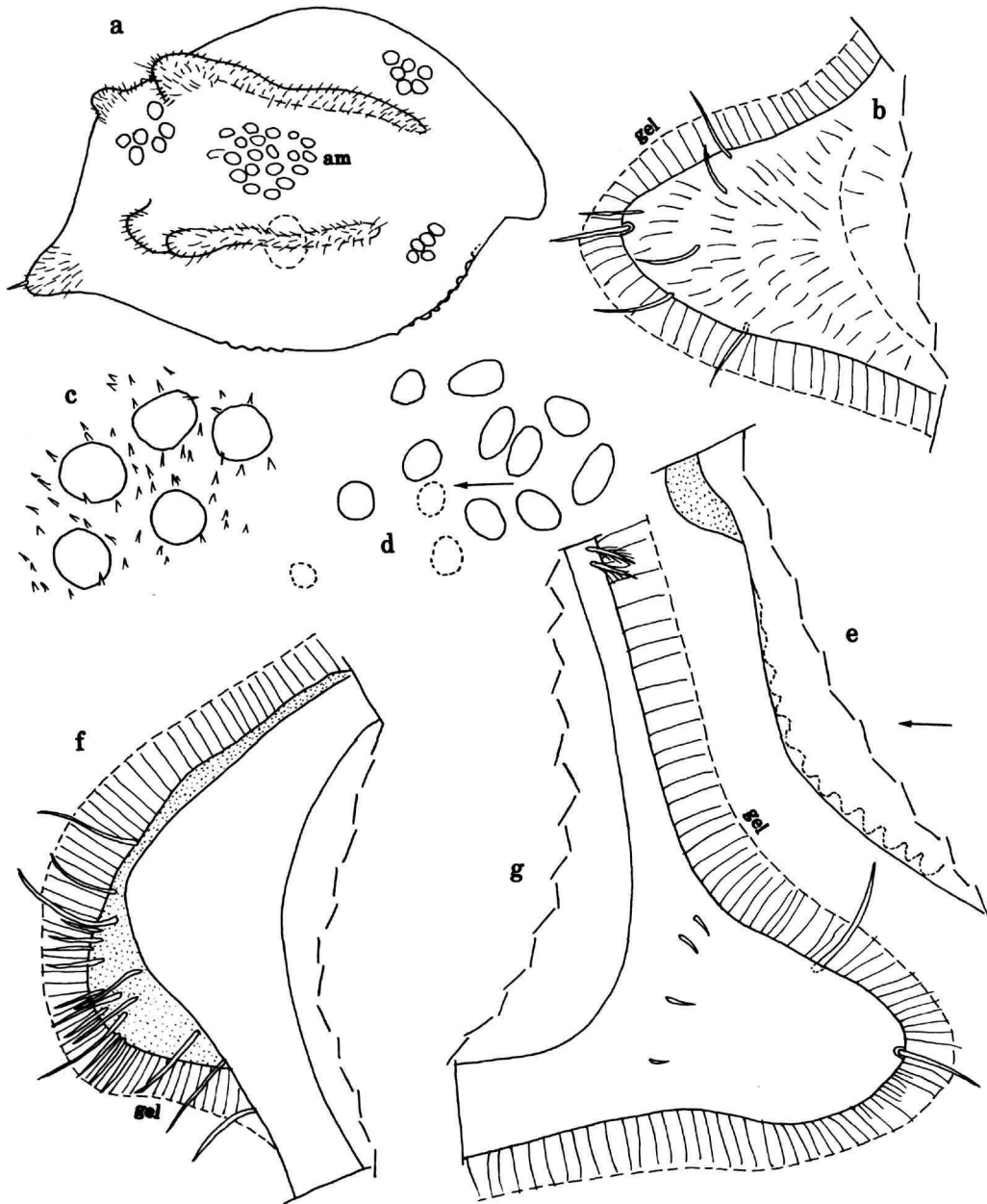


FIGURE 43.—*Eusarsiella warneri*, new species, holotype, USNM 193091, adult male: *a*, complete specimen from right side, length 1.15 mm; *b,c*, details from *a*, anterior toward right; *d*, central adductor muscle attachments left valve, anterior toward left, ov; *e*, anterovenral margin right valve, iv; *f,g*, rostrum and caudal process right valve, iv.

Carapace Size (length (with caudal process), height in mm):
USNM 193091: separated left valve, 1.19, 0.74; separated right
valve, 1.15, 0.76.

First Antenna (Figure 44*a,b*): 1st joint bare. 2nd joint with

dorsal bristle with long hairs. 3rd joint fused to 4th, with dorsal
bristle with long hairs and without ventral bristle. 4th joint with
dorsal bristle with short spines and without ventral bristles. 5th
joint wedged ventrally between 4th and 6th joints, with basal



FIGURE 44.—*Eusarsiella warneri*, new species, holotype, USNM 193091, adult male: *a*, left 1st antenna, lv; *b*, tip right 1st antenna, mv; *c, d*, endopodites left and right 2nd antenna, respectively, mv; *e*, left mandible, mv; *f*, part of right mandible, lv.



FIGURE 45.—*Eusarsiella warneri*, new species, holotype, USNM 193091, adult male: *a, b*, maxillae; *c*, 5th limb, nabs; *d*, right 6th limb, mv; *e*, 7th limb; *f*, posteroventral part of body from right side; *g*, lateral eye; *h*, complete specimen from left side showing nematode inside shell.

cup with abundant filaments and single stout bristle with 4 short filaments. 6th joint long, with short slender medial bristle on distal margin. 7th joint: a-bristle bare, about twice length of bristle of 6th joint; medial b-bristle long, bare; c-bristle long, with 4 marginal filaments. 8th joint: d- and e-bristles well developed, bare (d-bristle broken on both limbs of USNM 193091); f-bristle long, with 3 marginal filaments; g-bristle long, with 4 marginal filaments. Small medial node present near base of bristle of 6th joint (possibly on 7th joint) (Figure 44b).

Second Antenna: Protopodite bare. Endopodite 2-jointed (Figure 44c,d): joint 1 with 2 ringed anterior bristles; joint 2 very small, with 2 short bristles. Exopodite: 1st joint with minute, medial, terminal bristle; bristle of 2nd joint long, with 13–15 proximal ventral spines and natatory hairs (distal ventral and both proximal and distal dorsal); bristles of joints 3–5 with proximal ventral spines and natatory hairs similar to those on bristle of 2nd joint; bristles of joints 6–8 with natatory hairs; 9th joint with 2 bristles (1 long with natatory hairs, 1 small dorsal, either bare or with few short spines); joints 2–8 with rows of spines along distal edge.

Mandible (Figure 44e,f): Coxale endite represented by small spine (Figure 44e). Basale: ventral margin with 2 proximal bristles; medial side near ventral margin with 4 bristles (3 proximal, 1 closer to midlength); dorsal margin with distal bristle with base on small node and 2 subterminal bristles with bases on larger node. Exopodite represented by small bristle (Figure 44f). 1st endopodial joint: ventral margin with 3 subterminal bristles; dorsal margin and medial surface with spines (Figure 44e). 2nd endopodial joint: dorsal margin with 1 short bristle near midlength; ventral margin with short subterminal bristle. 3rd endopodial joint: medial side with short terminal bristle near ventral margin; dorsal edge with small bristle; distal edge with ringed bristle lateral to the small medial bristle and 1 stout claw with proximal medial teeth.

Maxilla (Figure 45a,b): Limb reduced. Endites with total of about 12 bristles (Figure 45a). Coxale with dorsal bristle. Exopodite with 3 slender bristles (longest ringed hirsute) (Figure 45a,b). Fused endopodial joints 1 and 2 with total of about 8 bristles.

Fifth Limb (Figure 45c): Single endite with 1 small bristle. Exopodite: 1st joint with 2 long bristles; remaining joints not well defined; joint 2 with 3 long bristles; joints 3–5 with 6 bristles. Epipodite with 31 hirsute bristles.

Sixth Limb (Figure 45d): Single endite with 3 small bristles. End joint rounded, with 15–17 spinous bristles forming 2 rows followed by space, and then 2 hirsute bristles.

Seventh Limb (Figure 45e): Limbs well developed, each with 4 terminal bristles (2 on each side), each with 4 or 5 bells. Tip of limb without teeth.

Furca (Figure 45f): Each lamella with 5 claws; claw 1 fused to lamella, claws 2–5 separated from lamella by suture; claws 1–4 with teeth along posterior edge; left lamella with spines following claw 5. Right lamella anterior to left lamella by width of base of claw 1.

Bellonci Organ and Lips: Obscured on mounted specimen.

Eyes: Medial eye obscured on mounted specimen. Lateral eye with slight pigmentation and 5 amber-colored ommatidia.

Copulatory Organ (Figure 45f): Typical for genus.

Posterior of Body (Figure 45f): Evenly rounded, bare.

Y-Sclerite (Figure 45f): Typical for genus.

Ectozoa (Figure 45h): Left valve of USNM 193091 with segmented nematode inside anterodorsal corner.

COMPARISONS (Males).—The new species, *E. warneri*, differs from *E. ryanae* Kornicker and Iliffe, 2000, in the absence of ventral bristles on the 4th joint of the 1st antenna, in having a short endopodite of the 2nd antenna, and a mandible with 3 dorsal bristles on the basale and an exopodite represented by a small bristle. The carapace of *E. warneri* differs from that of *E. species x* (herein), *E. donabboti* Cohen, 1989, and *E. ryanae* Kornicker and Iliffe, 2000, in not having a row of spinous pustules between the lower rib and ventral margin of the valves, the appendages differ in not having 2 ventral bristles on the 4th joint of the 1st antenna, and in having a small bristle instead of a brush-like process representing the exopodite of the mandible.

Eusarsiella species x

Sarsiella carinata Kornicker, 1958:247, figs. 47:5a,b, 73A–G, 74A–F, 75A–D, 88J,N,R, 89E.

Eusarsiella carinata.—Poulsen, 1965:83.

Eusarsiella "carinata" (Kornicker, 1958).—Kornicker, 1986a:49, fig. 19.

Not *Sarsiella carinata* Scott, 1905:368, pl. 1: figs. 1, 2; pl. 2: figs. 40, 41.

MATERIAL.—USNM 122911 (No. 686X-2 in Kornicker, 1958:258), adult female illustrated by Kornicker (1958, fig. 47:5a,b). The specimen is dry, on a cardboard slide, and the carapace is in fragments. Other specimens illustrated by Kornicker (1958) are lost.

DISTRIBUTION.—Shallow water in vicinity of Bimini, Great Bahama Bank. Known depth range 1–20 m (Kornicker, 1986a:49).

REMARKS.—Specimens from the vicinity of Bimini, Great Bahama Bank, were misidentified as *Sarsiella carinata* Scott, 1905:368, by Kornicker (1958:247). The mistake was recognized by Kornicker (1986a:49), who referred to the Bimini specimens as *Eusarsiella "carinata"* (Kornicker, 1958). The present authors consider it expedient to refer the Bimini species herein to *Eusarsiella* sp. x.

DIAGNOSIS (adult male).—Carapace elongate, with well-developed rostrum and caudal process, 2 lateral ribs fringed with short hairs terminate in protuberances posteriorly. A row of 6 hirsute nodes present between lower rib and ventral margin of valve; ventral margin of valve with 6 spinous processes; rostrum with small process (Kornicker, 1958, fig. 88J,N). First antenna without dorsal bristle on 2nd joint and with 2 ventral bristles on 4th joint (Kornicker, 1958, fig. 74B). Endopodite of 2nd antenna with fused 1st and 2nd joints, with 2 anterior bristles on 1st joint and 2 on 2nd joint (Kornicker, 1958, fig. 74C) (presence of fused 2nd joint interpreted herein). Exopodite of mandible brush-like. Seventh limb well developed, with 2 lat-

eral and 4 terminal bristles and bare tip. Claws 1 and 2 of furca with a long tooth separating rows of smaller teeth along almost full length of claws (Kornicker, 1958, fig. 74F).

COMPARISONS (adult males).—The *Eusarsiella* sp. x differs from *S. carinata* Scott in having a row of 7 rather than 2 spinous pustules between the lower lateral rib and ventral margin of valve and in not having a dorsal bristle on the 2nd joint of the 1st antenna. The exopodite of the mandible of *Eusarsiella* sp. x differs from that of *E. warneri* in being brush-like rather than a small bristle. The endopodite of the 2nd antenna of the adult male *Eusarsiella* sp. x differs from that of *E. donabbotti* in having 4 rather than 2 bristles. The carapace of *Eusarsiella ryanae* Kornicker and Iliffe, 2000, differs from that of *Eusarsiella* sp. x in not having a row of pustules between the lower lateral rib and ventral margin of valve; the endopodite of the 2nd antenna differs in having an elongate 2nd joint.

Adult males are unknown for *Eusarsiella cornuta* Poulsen, 1965:105, *E. pillipolicus* Darby, 1965:35, and *E. paniculata* Kornicker, 1986:58; all should be compared with the adult male *E. sp. x* when they are collected.

Eurypylus Brady, 1869

TYPE SPECIES.—*Eurypylus petrosus* Brady, 1869:141, monotypy.

COMPOSITION AND DISTRIBUTION.—Widespread; known depth range shallow water to 142 m (Kornicker and Iliffe, 2000:45).

Eurypylus hapax Kornicker and Iliffe, 2000

FIGURES 46, 47

Eurypylus hapax Kornicker and Iliffe, 2000:45, figs. 27–29.

HOLOTYPE.—USNM 194494, instar IV female in alcohol.

TYPE LOCALITY.—Sta 95-002, Exuma Sound, Bahamas, depth 142 m (Kornicker and Iliffe, 2000).

MATERIAL.—Crab Cay Crevasse, Sta 95-010: USNM 194585A, instar IV female with shell opened, in alcohol; USNM 194585B, partly dissected instar IV female in alcohol; USNM 194586, dissected instar IV male on slide and in alcohol.

DISTRIBUTION.—Crab Cay, Exuma Cays, and Exuma Sound, Bahamas, depth 35 m.

SUPPLEMENTARY DESCRIPTION OF INSTAR IV FEMALE.—**Carapace Size** (length, height in mm): USNM 194585A, 0.96, 0.75; USNM 194585B, 0.93, 0.75.

Fifth Limb: Epipodite with 33 hirsute bristles.

Gut Content: Brown nonrecognizable particulate matter.

REMARKS.—The two instar IV females from Crab Cay Crevasse (length 0.93–0.96 mm) are larger than the single specimen from Exuma Sound (length 0.87 mm) described by Kornicker and Iliffe (2000:45). This is interpreted to be the result of intraspecific variability. The females from Crab Cay Cre-

vasse are interpreted to be instar IV stages because of the tapered bristles on the 7th limbs and the lack of genitalia.

DESCRIPTION OF INSTAR IV MALE (Figures 46, 47).—Carapace similar in shape and ornamentation to that of instar IV female (Figure 46a).

Carapace Size (length, height in mm): USNM 194586, 0.88, 0.69.

First Antenna (Figures 46b,c, 47k): 1st joint bare. 2nd joint with dorsal bristle. 3rd joint fused to 4th joint; 3rd joint with long dorsal bristle and no ventral bristle; 4th joint with 3 bristles (2 ventral, 1 dorsal). 5th and 6th joints fused; sensory bristle of 5th joint long, bare; medial bristle of 6th joint short. 7th joint: a-bristle about twice length of bristle of 6th joint; b-bristle about twice length of a-bristle; c-bristle about same length as sensory bristle of 5th joint, with minute proximal filament. 8th joint: lateral d- and e-bristles long, bare; f-bristle about same length as d-bristle, bare; g-bristle longer than f-bristle, bare.

Second Antenna (Figures 46d–f, 47k): Protopodite bare. Endopodite 3-jointed: 1st joint with short, proximal, anterior bristle; 2nd joint elongate, with 2 small ventral bristles near midlength; 3rd joint elongate, with 2 small terminal bristles.

Exopodite: 1st joint with small medial bristle; bristle of 2nd joint with ventral spines and few distal natatory hairs; bristles of joints 3–7 with proximal ventral spines and distal natatory hairs; bristle of joint 8 with few proximal dorsal spines and distal natatory hairs; 9th joint with 2 bristles (ventral bristle with few distal natatory hairs, dorsal bristle short bare); joints 2 and 3 (possibly others) with few spines along distal edges.

Mandible (Figures 46g,i, 47k): Coxale endite consisting of short stout spine in proximal ventral corner; ventral margin of coxale with hairs and slender spines. Basale: ventral margin with 4 small medial bristles (1 larger than others) and 2 small lateral bristles; dorsal margin with 3 small bristles (1 distal to midlength, 2 subterminal). Exopodite absent. 1st endopodial joint with medial, ventral, and distal dorsal spines, as well as lateral spines in distal lateral corner, and stout ventral terminal claw with proximal ventral and dorsal spines. 2nd endopodial joint with stout ventral claw and small dorsal bristle; 3rd endopodial joint with stout terminal claw and 2 minute bristles (1 ventral, 1 dorsal).

Maxilla (Figure 47a–c): Endite I with 2 lobes with medial spines: proximal lobe with 1 unringed terminal bristle; distal lobe with 5 bristles (2 ringed, 3 claw-like and pectinate) (Figure 47c). Endite II with 4 bristles (2 ringed, 2 claw-like pectinate) (Figure 47c). Endite III with 5 bristles (1 claw-like pectinate) (Figure 47a,c). Coxale with short dorsal bristle (Figure 47a). Precoxale or coxale with long dorsal hairs. Exopodite with 3 bristles (1 long, 2 short). 1st endopodial joint with few distal spines on anterior margin and pectinate alpha- and beta-bristles. 2nd endopodial joint with 2 a-bristles, 1 c-bristle, and 5 pectinate end bristles (middle bristle shortest, anterior bristle longest).

Fifth Limb (Figure 47d): Epipodite with 33 hirsute bristles. Single endite with short bristle. 1st endopodial joint with 2 bris-



FIGURE 46.—*Eurypylus hapax*, Kornicker and Iliffe, 2000, USNM 194586, instar IV male: a, complete specimen from right side, length 0.88 mm; b, c, right 1st antenna, lv; d, endopodite left 2nd antenna, lv; e, right lateral eye and part of right 2nd antenna, mv; f, part of right 2nd antenna, mv; g–i, left mandible, lv.



FIGURE 47 (left).—*Eurypylus hapax* Kornicker and Iliffe, 2000, USNM 194586, instar IV male: *a*, right maxilla, nabs, lv; *b*, part of right maxilla, nabs, mv; *c*, endites I–III right maxilla, mv; *d*, right 5th limb, nabs, mv; *e*, left 6th limb, lv; *f*, part of posterior of body from right side, anterior toward right; *g*, posterior of body from right side, anterior toward right; *h*, right lateral eye, medial eye, and Bellonci organ; *i*, outline of upper lip, anterior toward right; *j*, copulatory organ from left side of body, anterior to left; *k*, anterior view of body showing location of some appendages, nabs, ventral end to right.

tlies; 2nd endopodial joint with 3 bristles; joints 3–5 fused, with total of 6 bristles. Exopodial joints 2–5 hirsute.

Sixth Limb (Figure 47e): Single endite with 3 short bristles. End joint with 12 spinous bristles followed by short space and 2 stout hirsute bristles.

Seventh Limb (Figure 47f): Short, thumb-like, indistinct.

Furca (Figure 47g): Each lamella with 5 claws decreasing in length along lamella; claws 1 and 2 nonarticulated, claws 3–5 articulated. All claws with teeth along posterior margin; few teeth on claws 1 and 2 longer than others; teeth of claws 5 and 6 indistinct. Few spines present on lamellae following claws. Right lamella anterior to left by width of base of claw 1.

Bellonci Organ (Figure 47h): Elongate, broadening near rounded tip.

Eyes (Figures 46e, 47h): Medial eye bare, with line of brown pigment near midheight. Lateral eye smaller than medial eye, with 9 ommatidia (5 or 6 divided, 3 or 4 undivided (undivided ommatidia appear medial to divided ommatidia)).

Upper Lip (Figure 47i,k): Projecting anteriorly, bare.

Posterior of Body (Figure 47g): With few spines at postero-dorsal corner dorsal to posterior end of girdle.

Genitalia (Figure 47j): Consisting of 2 subequal lobes, each with several small bristles at tip.

Y-Sclerite (Figure 47g): With ventral branch typical for family.

Gut Content: Brown unrecognizable particulate matter.

REMARKS CONCERNING ADULT MALE.—The morphology of the endopodite of the 2nd antenna and of the 7th limb of the instar IV male indicates that the adult male will have a 3-jointed reflexed endopodite on the 2nd antenna and a bare 7th limb.

Junctichela Kornicker and Caraión, 1978

TYPE SPECIES.—*Junctichela margalefi* Kornicker and Caraión, 1978.

COMPOSITION AND DISTRIBUTION.—Including the new species described herein from Crab Cay Crevasse, Crab Cay, Bahamas, the genus contains a species from the continental shelf west of Mauritania, depth 25–40 m, a species from Madagascar, depth 9 m, and two species from the vicinity of Sri Lanka. The latter two are incompletely known and may not belong to the genus (Kornicker and Thomassin, 1998:97).

Junctichela pax, new species

FIGURES 48–58

ETYMOLOGY.—From the Latin *pax* (peace).

HOLOTYPE.—USNM 194587, adult female on slide and in alcohol.

TYPE LOCALITY.—Sta 95-010, Crab Cay Crevasse, Crab Cay, Bahamas, depth 35 m.

PARATYPES.—Crab Cay Cravasse, Sta 95-010: USNM 194599, 4 adult females; USNM 194589, adult male; USNM 194588, USNM 194590, 2 instar I, sex unknown; USNM 194591, USNM 194592, USNM 194593, USNM 194594, 4 instar II, sex unknown; USNM 194595, USNM 194596A–C, 4 instar III, sex unknown; USNM 194597, instar IV, carapace without body, sex unknown; USNM 194598, instar IV female.

DESCRIPTION OF ADULT FEMALE (Figures 48, 49).—Carapace oval in lateral view, with short caudal process and no rostrum (Figure 49a).

Ornamentation: Surface with distinct, fairly closely spaced ovoid nodes appearing as 2 concentric circles when shell viewed laterally (Figure 48b); in side view, nodes along edge of caudal process and elsewhere appear mushroom-like, with terminal disk on narrow stem (Figure 48d). Inner concentric circle of each node viewed perpendicularly appears to be outline of inner edge of hollow node. Areas of indistinct minute pustules present between nodes (Figure 48b). Relatively few widely separated single bristles present on valve surface and along edges. Surface with gel-like coating visible along valve edge between nodes.

Infold: Anterior infold with minute bristle (Figure 48c). Infold of caudal process with curved ridge with about 10 short bristles, as well as narrow transparent lamellar prolongation along posterior concave edge of ridge (Figure 48d). Posterior infold with 2 setal bristles just dorsal to caudal process (Figure 48d). Ventral infold with several small, widely separated bristles. Numerous pore canals visible along edge of valve when viewed from inside (Figure 48d); canals extending from line of concrescence to shell edge.

Selvae: Bare narrow lamellar prolongation present along free margin of valves.

Central Adductor Muscle Attachments: Partly obscured on USNM 194587, consisting of many ovoid attachments.

Carapace Size (length, height in mm): USNM 194587, 1.04, 0.72. USNM 194599, 4 specimens: 1.04, 0.72; 1.01, 0.72; 0.99, 0.69; 0.98, 0.70. Average: length 1.01, height 0.71. N=5.

First Antenna (Figure 48e–g): 1st joint bare. 2nd joint with few, small, dorsal spines. 3rd and 4th joints fused; 3rd joint with long, spinous, dorsal bristle and short bare ventral bristle; 4th joint elongate, with 3 bristles (2 ventral, 1 dorsal). Sensory bristle of 5th joint with minute proximal filament. 6th joint minute, fused to 5th, with short medial bristle. 7th joint: a-bristle spinous; b-bristle short, bare (Figure 48f,g); c-bristle with

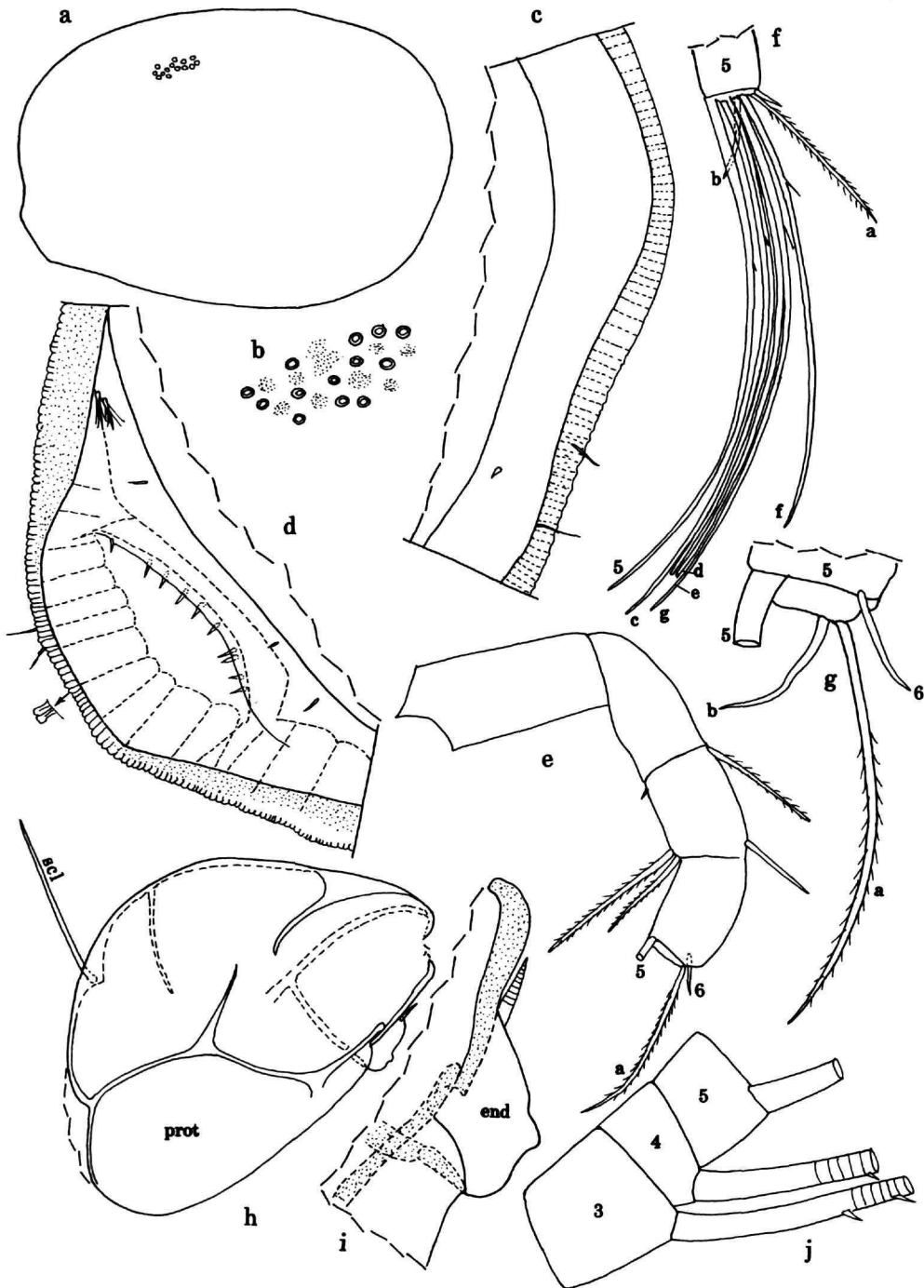


FIGURE 48.—*Juntichela pax*, new species, holotype, USNM 194587, adult female: *a*, complete specimen from right side showing representative nodes, anterior to right, length 1.04 mm; *b*, nodes (concentric circles) and pustules (dots) of anteroventral part of left valve, anterior toward left, *iv*; *c, d*, anterior and posterior of left valve, respectively, anterior toward right, *iv*; *e, f*, right 1st antenna, *lv*; *g*, tip left 1st antenna, *nabs, mv*; *h*, part of right 2nd antenna, *lv*; *i*, detail of endopodite shown in *h*; *j*, part of exopodite right 2nd antenna, *mv*.

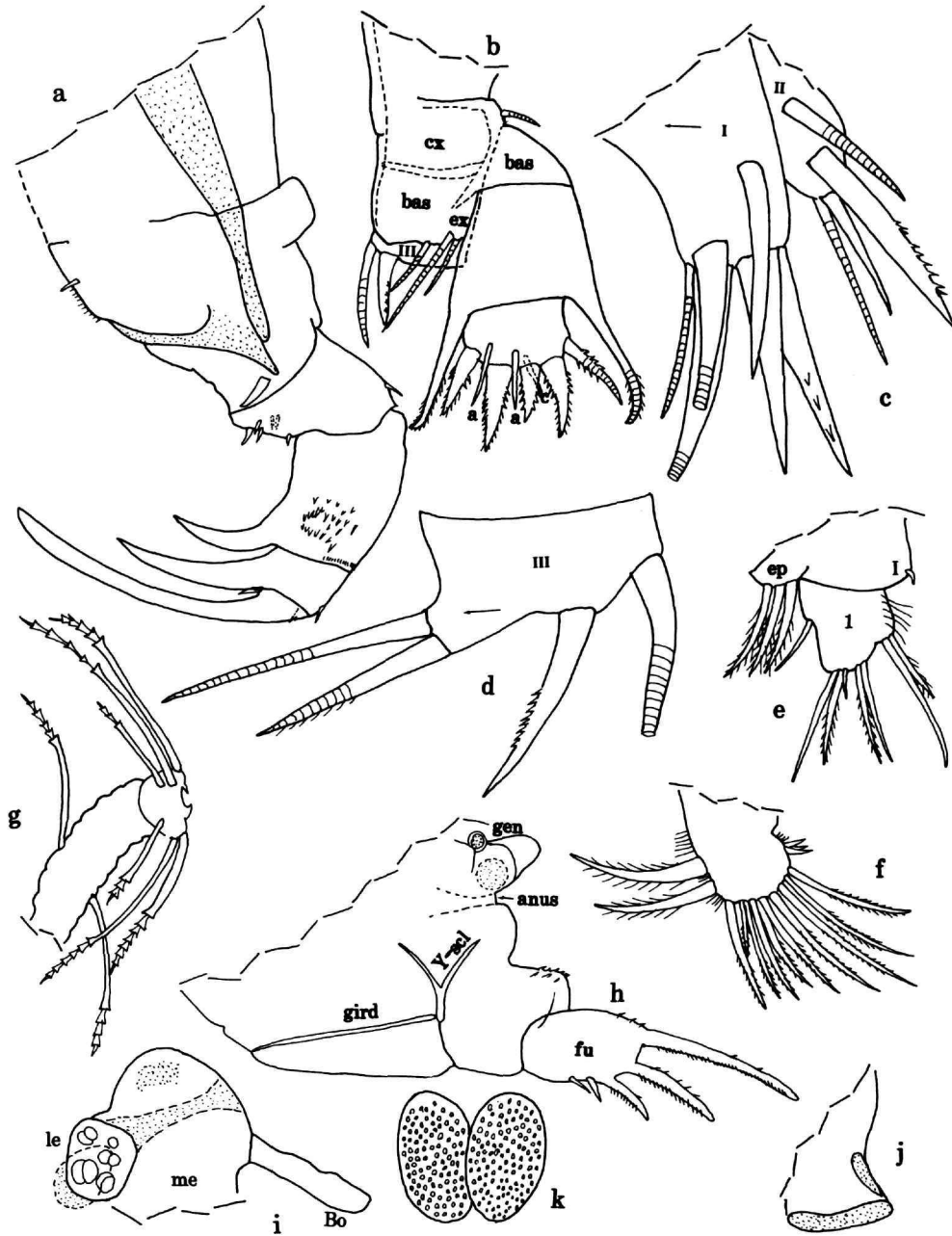


FIGURE 49.—*Juntichela pax*, new species, holotype, USNM 194587, adult female: a, left mandible, mv; b, right maxilla, nabs, lv; c, endites I and II right maxilla, lv; d, endite III left maxilla, lv; e, right 5th limb, lv; f, right 6th limb, lv; g, right 7th limb, lv; h, posteroventral part of body from right side, anterior toward right, lv; i, right lateral eye, medial eye, and Bellonci organ from right side; j, upper lip from right side, anterior toward right; k, two eggs in marsupium containing closely packed spheres.

minute proximal spine. 8th joint: d- and e-bristles filament-like, long, bare; f-bristle with fairly long proximal filament; g-bristle with small proximal filament.

Second Antenna (Figure 48h-j): Protopodite bare. Endopodite 1-jointed, with proximal anterior bristle and terminal node (node could be interpreted to be fused 2nd joint). Ex-

opodite: 1st joint with minute recurved tubular medial bristle on distal margin; bristle of 2nd joint with 14 stout, widely separated ventral proximal spines and distal natatory hairs; bristles of joints 3–8 with proximal ventral spines and distal natatory hairs; small 9th joint with fairly long bristle with natatory hairs and small bristle (dorsal) (small bristle absent on right limb of USNM 194587, ?aberration). 4th joint about one-half length of 3rd joint on right limb only of USNM 194587 (aberration) (Figure 48j). Pivot sclerite slightly curved (Figure 48h).

Mandible (Figure 49a): Coxale endite represented by small spine; ventral margin of coxale with spines with bases on lateral side. Basale: ventral margin and medial side near ventral margin with 4 small bristles (3 proximal, 1 distal); lateral side near ventral margin with 2 small bristles near midlength; dorsal margin with small subterminal bristle. Exopodite absent. Endopodite: 1st joint with distal medial spines and spines along distal dorsal corner, and distal bare ventral claw; minute ventral pustule just proximal to claw; 2nd joint with small subterminal spine-like dorsal bristle and stout ventral claw; 3rd joint with 2 small ventral bristles (medial shorter bristle indistinct) and 1 minute indistinct dorsal bristle at base of stout terminal claw.

Maxilla (Figure 49b–d): Endite I with 6 bristles (Figure 49c); endite II with 4 bristles; endite III with 4 bristles (2 anterior bristles on projection) (Figure 49d). Coxale with short dorsal bristle. Basale with slender bristle near base of exopodite. Exopodite with 2 bristles. 1st endopodial joint with stout pectinate alpha- and beta-bristles. 2nd endopodial joint with 2 a-bristles, 1 c-bristle, and 5 pectinate end bristles.

Fifth Limb (Figure 49e): Single endite with short bristle. Exopodite: 1st joint with 2 bristles; joints 2–5 fused, hirsute, with total of 6 bristles. Epipodite with 33 bristles.

Sixth Limb (Figure 49f): Single endite with 3 bristles. End joint with 10 spinous ventral bristles followed by 2 plumose bristles.

Seventh Limb (Figure 49g): Each limb with 8 bristles (2 in proximal group, 1 on each side, and 6 in terminal group, 3 on each side); each bristle with 3–6 bells and without marginal spines. Terminus with opposing combs with few small teeth.

Furca (Figure 49h): Each lamella with 5 claws; claws 1–3 nonarticulated, with teeth along posterior edge and spines along anterior edge; claws 4 and 5 articulated, bare; anterior margin of lamellae with spines; claw 1 of right lamella anterior to that of left by width of claw 1 at base.

Bellonci Organ (Figure 49i): Elongate, with uneven edges and squarish tip.

Eyes (Figure 49i): Lateral eye much smaller than medial eye, with 5 ommatidia. Medial eye bare, with light brown pigment.

Upper Lip (Figure 49j): Projecting slightly anteriorly, with sclerotized ventral edge.

Genitalia (Figure 49h): With round spermatophore attached to each side.

Brush-like Organ: Not observed with certainty.

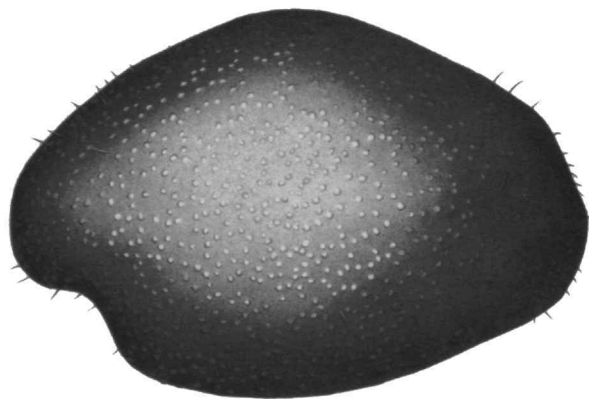


FIGURE 50.—*Junctichela pax*, new species, paratype, USNM 194589, adult male, length 0.91 mm.

Y-Sclerite (Figure 49h): Typical for subfamily.

Eggs (Figure 49k): USNM 194587 with 2 elongate eggs filled with minute globules; length and width of eggs in mm: 0.28, 0.18; 0.28, 0.17.

Gut Content: Light brown unrecognizable particulate matter.

DESCRIPTION OF ADULT MALE (Figures 50–52, 53a–h).—Carapace with rostrum, shallow incisure, and short caudal process (Figure 50).

Ornamentation (Figures 50, 51a–c): Similar to that of adult female. Surface with gel-like coating between nodes.

Infold: Anterior infold with minute bristle (Figure 51d). Infold of caudal process with indistinct straight or slightly convex ridge with 3 or 4 small bristles along posterior edge (Figure 51e,f). Posterior infold with 2 setal bristles just dorsal to caudal process. Ventral infold with several small, widely separated bristles. Numerous pore canals visible along edge of valve when viewed from inside; canals on caudal process extending from line of concrescence to valve edge (Figure 51e). Line of concrescence closer to inner margin of infold of caudal process on male than on female (Figure 51e,f).

Selvage: Lamellar prolongation of selvage without marginal spines.

Central Adductor Muscle Attachments (Figure 51c): Consisting of 9 ovoid attachments.

Carapace Size (length, height in mm): USNM 194589, 0.91, 0.61.

First Antenna (Figures 51g,h, 52a): 1st and 2nd joints bare. 3rd and 4th joints fused; 3rd joint with long dorsal bristle and short ventral bristle; 4th joint with 3 bristles (2 ventral, 1 dorsal). 5th joint wedged ventrally between 4th and 6th joints; sensory bristle of 5th joint with stout proximal flaring process bearing abundant filaments and long, stout, main bristle with 3 distal short marginal filaments. 6th joint long, with short medial bristle. 7th joint: a-bristle spinous; b-bristle short bare; c-bristle

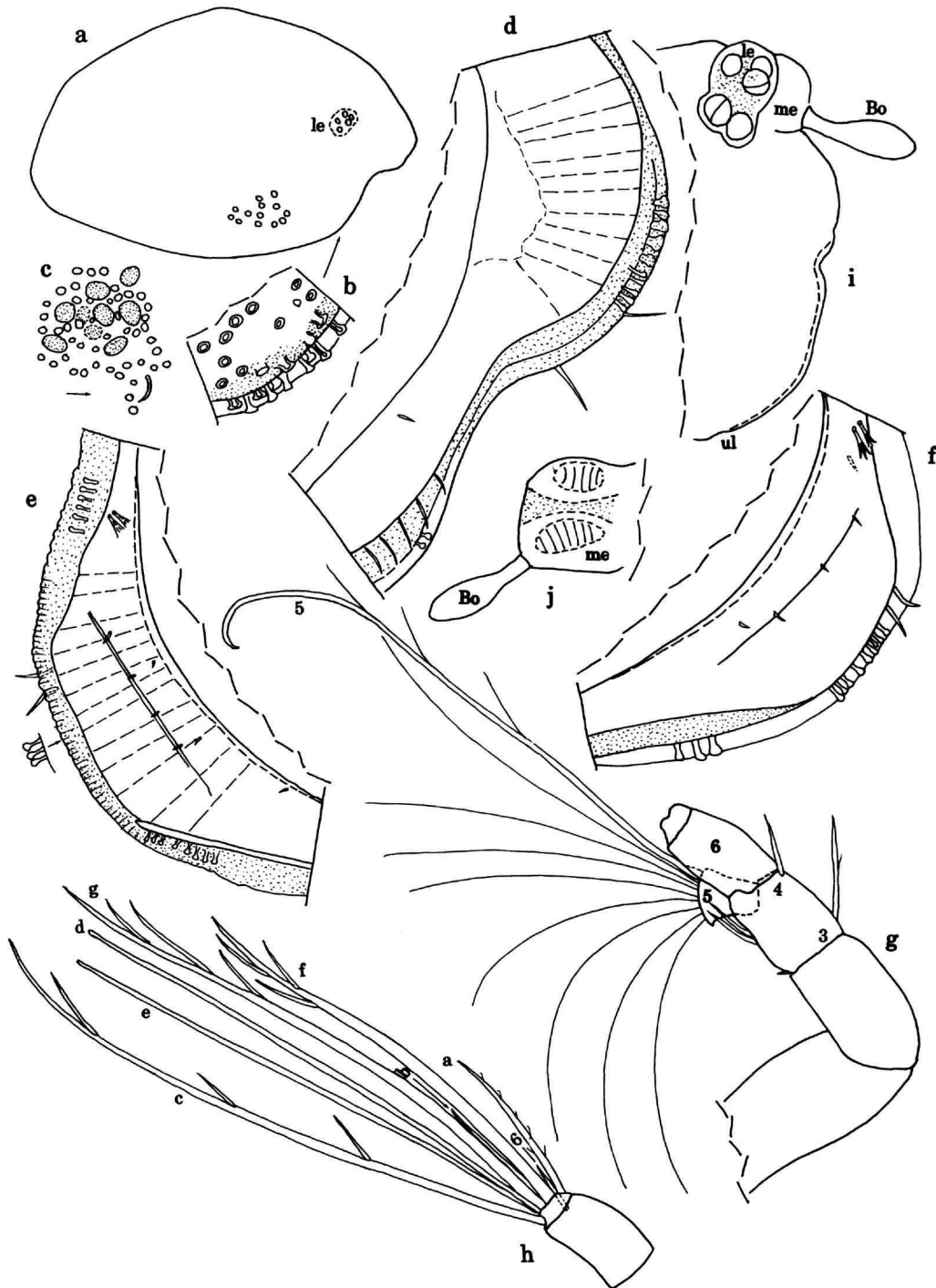


FIGURE 51.—*Juntichela pax*, new species, paratype, USNM 194589, adult male: *a*, complete specimen from right side showing right lateral eye and representative nodes, length 0.91 mm; *b*, detail of anteroventral margin from *a*; *c*, central adductor muscles (stippled) and nodes of left valve, anterior toward right, iv; *d, e*, anterior and posterior left valve, respectively, iv; *f*, posterior right valve, iv; *g, h*, left 1st antenna, iv; *i*, part of anterior of body from right side, anterior toward right; *i*, medial eye and Bellonci organ from left side.

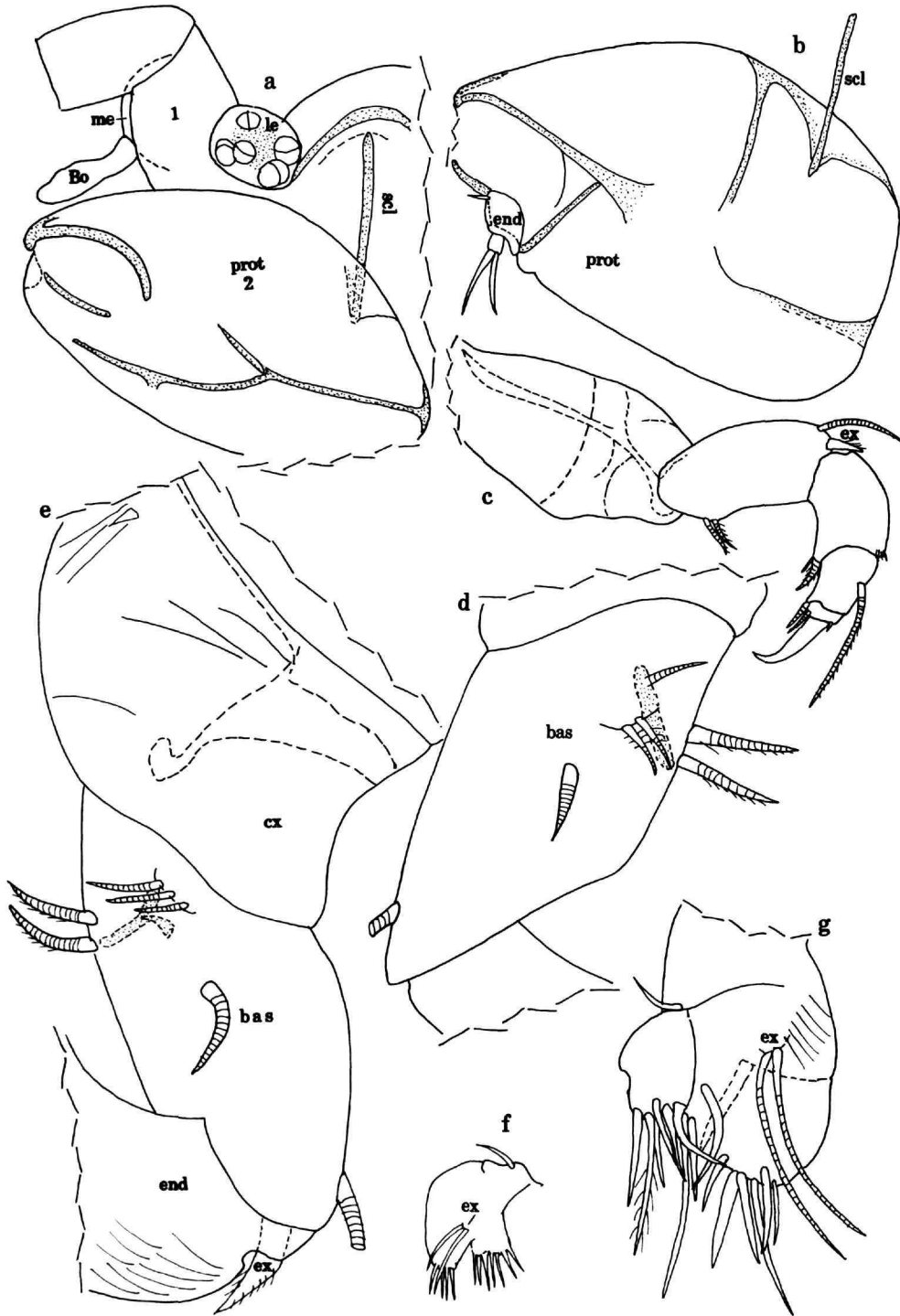


FIGURE 52.—*Juntichela pax*, new species, paratype, USNM 194589, adult male: *a*, part of anterodorsal of body from left side showing location of appendages, anterior toward left, nabs; *b*, part of right 2nd antenna, mv; *c*, right mandible, lv; *d*, basal right mandible, mv; *e*, part of left mandible, mv; *f*, left maxilla viewed attached to body, anterior toward left, nabs, lv; *g*, part of left maxilla, anterior toward left, nabs, lv.

reaching just past main bristle of 5th joint, with 3 fairly long distal filaments. 8th joint: d- and e-bristles long, bare; f-bristle long, with 3 distal filaments; g-bristle long, with 4 distal filaments.

Second Antenna (Figure 52a,b): Protopodite bare. Endopodite 2-jointed: 1st joint with short proximal anterior bristle; 2nd joint small cylindrical, with 2 terminal bristles (Figure 52b). Exopodite: 1st joint with minute recurved medial bristle; bristle of 2nd joint with 10 proximal ventral spines and distal natatory hairs; bristles of joints 3–8 with proximal ventral spines, proximal dorsal hairs, and distal natatory hairs; 9th joint with fairly long bristle with natatory hairs and small bristle (dorsal). Pivot sclerite slightly curved.

Mandible (Figure 52c–e): Coxale endite represented by small spine (Figure 52e). Ventral margin of coxale without spines. Basale: Ventral margin with 2 bristles near midlength; dorsal margin with long distal bristle; medial surface with 4 short bristles (3 proximal, 1 near midlength); sclerites (stippled) present in vicinity of proximal bristles (Figure 52d,e). Exopodite well developed, translucent, hirsute; tip of exopodite tends to bend medially. 1st endopodial joint: medial side with proximal hairs and row of spines along distal dorsal corner; ventral margin with 2 terminal bristles. 2nd endopodial joint: ventral margin with 1 short terminal bristle; dorsal margin with long bristle near midlength. 3rd endopodial joint with terminal curved claw and 2 short bristles (1 ventral, 1 dorsal).

Maxilla (Figure 52f,g): Reduced, with mostly indistinct bristles. Exopodite with 2 distinct bristles. Bristles of illustrated maxilla approximate.

Fifth Limb (Figure 53a,b): Reduced. Single endite with 1 small bristle. Exopodite fused, hirsute, with about 6 bristles.

Sixth Limb (Figure 53c): Single endite with 3 small bristles. End joint with 12 spinous and plumose bristles.

Seventh Limb (Figure 53d): Well developed. Each limb with 4 terminal bristles, 2 on each side; each bristle with 4–7 bells. Terminus without comb teeth.

Furca (Figure 53e–g): Each lamella with 5 or 6 toothed claws; claws 1–3 nonarticulated; claws 4–6 articulated; USNM 194589 with 5 claws on left lamella and 6 on right.

Bellonci Organ (Figure 51i,j): Elongate, with broad rounded tip.

Eyes (Figures 51a,i,j, 52a): Lateral eye about same size as medial eye, with 5 ommatidia and light brown pigment between ommatidia. Medial eye bare, with light brown pigment.

Upper Lip (Figure 51i): Broadly rounded.

Genitalia (Figure 53g,h): Elongate lobes with hook-like process at tip of one lobe.

Y-Sclerite (Figure 53g): Typical for subfamily.

Gut Content: Light brown unrecognizable particulate matter.

DESCRIPTION OF INSTAR I (sex unknown) (Figures 53i–l, 54, 55a–e).—Carapace similar in shape and ornamentation to that of adult female (Figures 53i, 54a,b). Gel-like substance between surface pustules.

Infold (Figure 54d,e): Indistinct. One setal bristle dorsal to caudal process (Figure 54e). Usual small bristle on anterior in-

fold not seen with certainty. Caudal infold may have 1 minute bristle (indicated by minute circle in Figure 54e).

Salvage: Similar to that of adult female.

Central Adductor Muscle Attachments (Figures 53i, 54a,c): Consisting of about 10 ovoid attachments.

Carapace Size (length, width in mm): USNM 194588, 0.48, 0.37; USNM 194590, 0.51, 0.37. Average: length 0.50, height 0.37. N=2.

First Antenna (Figure 54f,g): 1st joint bare. 2nd joint with few dorsal spines. 3rd and 4th joints fused; 3rd joint with 2 bristles (1 dorsal, 1 ventral (small)); 4th joint with terminal dorsal spines. 5th and 6th joints fused. Sensory bristle of 5th joint long, with minute proximal filament. 6th joint with small medial bristle (Figure 54g). 7th joint: a-bristle about 4 times length of bristle of 6th joint; medial b-bristle short, about same length as bristle of 6th joint; c-bristle long, bare. 8th joint: d- and e-bristles long, bare; f-bristle fairly long, bare; g-bristle long, bare.

Second Antenna (Figures 53j, 54f,h,i): Protopodite bare. Endopodite single jointed, with minute terminal node with or without minute spine or bristle at tip (Figures 53j, 54h,i). Exopodite with 9 joints: 1st joint with minute terminal medial bristle at midwidth; bristle of 2nd joint reaching past 9th joint, with about 15 ventral spines; bristles of joints 3–8 with ventral spines and distal natatory hairs; 9th joint with 2 bristles (ventral bristle fairly long and with natatory hairs, dorsal bristle minute); joints 2 or 3 to 8 with spines forming terminal row.

Mandible (Figure 54b; not all bristles shown): Coxale endite represented by stout medial spine near ventral margin. Basale: medial side with 3 short bristles near ventral margin (2 proximal, 1 distal); dorsal margin with 1 small subterminal bristle. 1st endopodial joint: ventral margin with stout terminal claw with row of short proximal spines along dorsal margin; medial side with numerous spines, including row along distal margin; dorsal margin with row of terminal spines. 2nd endopodial joint with stout ventral claw; dorsal margin of joint with small subterminal bristle. 3rd endopodial joint with stout terminal claw and 2 small bristles (1 ventral, 1 dorsal). Exopodite absent.

Maxilla (Figure 54j,k): Endites I and II with total of about 8 bristles. Endite III with 4 bristles (2 anterior bristles on projection) (Figure 54j). Coxale with short dorsal bristle. Basale with slender bristle near base of exopodite. Exopodite with 2 bristles. 1st endopodial joint with 2 stout pectinate alpha- and beta-bristles. 2nd endopodial joint with 2 a-bristles, no c-bristle, and 3 pectinate end bristles.

Fifth Limb (Figures 54k, 55a,c): Single endite with short bristle. Exopodite: 1st joint with 1 bristle; joints 2–5 fused, with total of 6 bristles. Epipodite with 27 hirsute bristles.

Sixth Limb (Figures 54b,k, 55b,c): Hirsute, without bristles.

Seventh Limb (Figures 54k, 55c,d): Short, thumb-like.

Furca (Figures 53i, 54b, 55c): Each lamella with 2 long claws and 1 short blunt spinous claw followed by 3 sets of spines (3rd claw less developed on USNM 194588). Long claws with slender teeth along posterior margin and spines along anterior margin; anterior of lamellae with spines.



FIGURE 53.—*Junctichela pax*, new species, paratype, USNM 194589, adult male: *a*, part of 5th limb, nabs; *b*, part of left 5th limb, nabs, mv; *c*, left 6th limb, bristles approximate; *d*, 7th limb; *e, f*, left and right furcal lamellae, respectively, lv; *g*, posterior of body from right side, anterior toward right, *h*, copulatory organ from left side, anterior to left. USNM 194588, instar I (sex unknown), paratype: *i*, complete specimen from left side, anterior toward left, length 0.48 mm; *j*, part of left 2nd antenna, lv; *k*, anteroventral part of body from left side, anterior toward left; *l*, nematode from inside gut of ostracod, head of nematode toward top (see *i* for location in carapace).

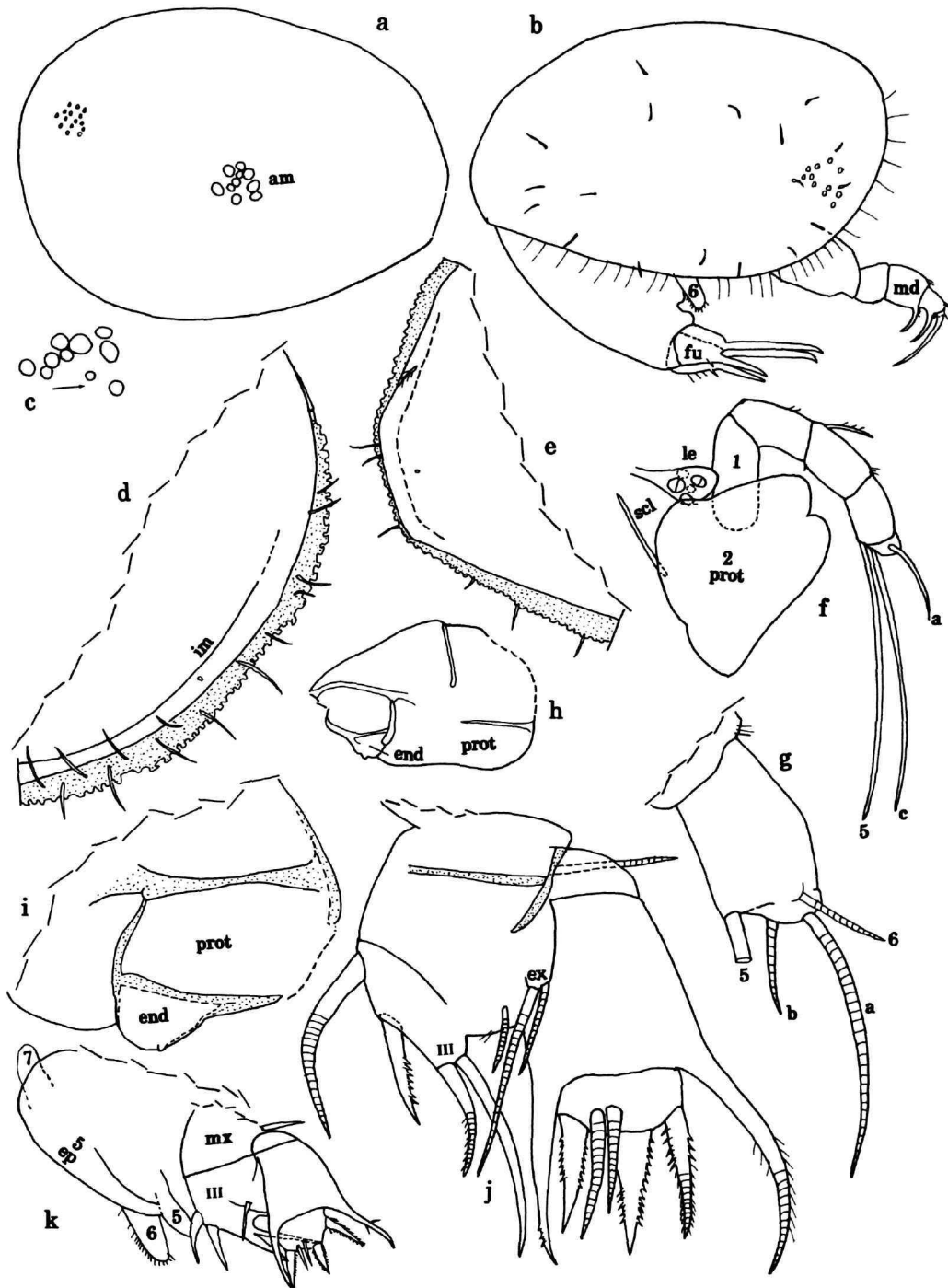


FIGURE 54.—*Juntichela pax*, new species, paratype, USNM 194590, instar I (sex unknown): *a, b*, complete specimen from left and right sides, respectively, length 0.51 mm; *c*, central adductor muscle attachments of right valve, *ov*; *d, e*, anterior and posterior of left valve, respectively, *iv*; *f*, anterodorsal part of body showing location of appendages, anterior toward right, *nabs*; *g*, tip left 1st antenna, *nabs, mv*; *h*, part of right 2nd antenna, *mv*; *i*, part of left 2nd antenna, *mv*; *j*, right maxilla, *nabs, lv*; *k*, ventral part of body from right side showing location of some appendages, anterior toward right, *nabs*.

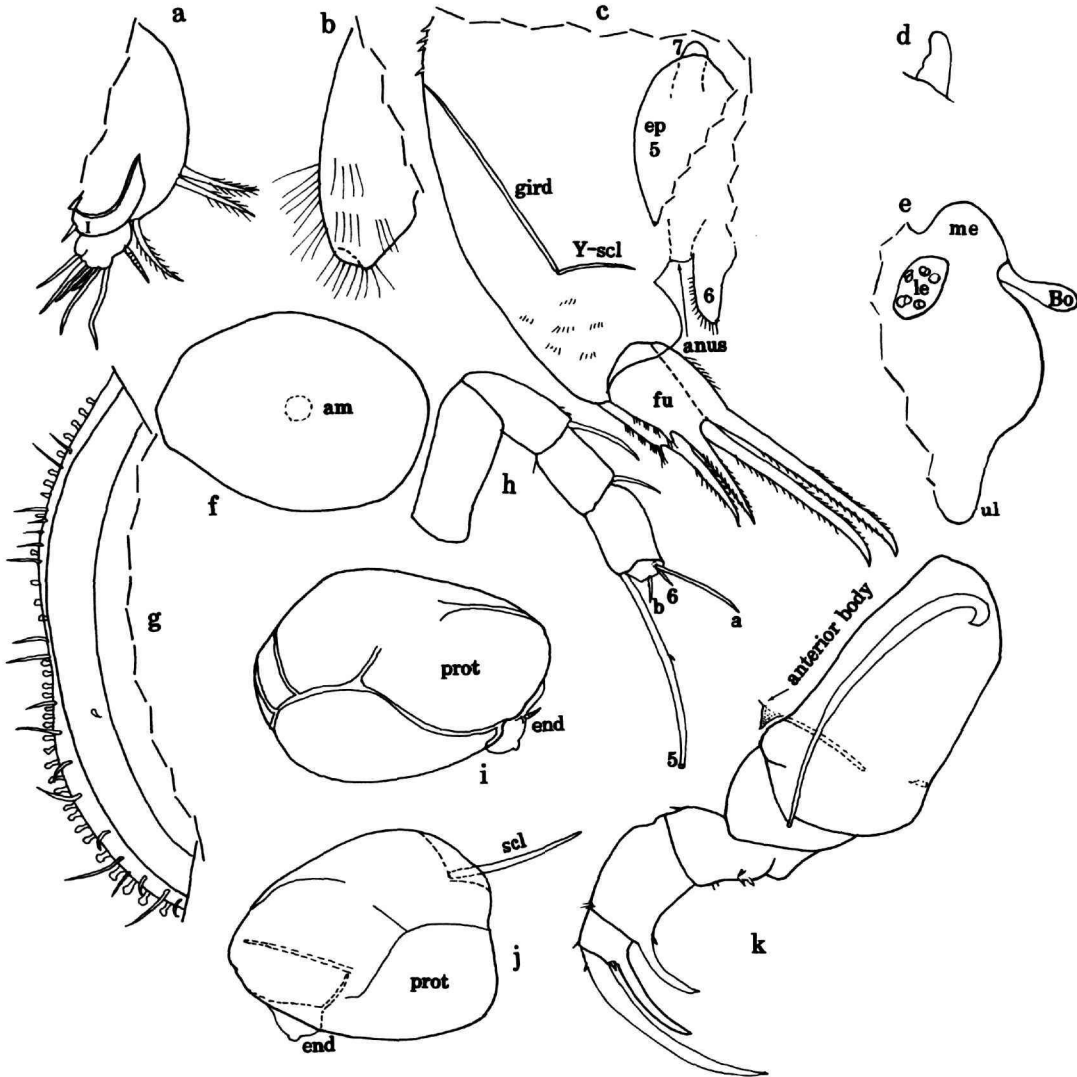


FIGURE 55.—*Juntichela pax*, new species, paratype, USNM 194590, instar I (sex unknown): a, left 5th limb, nabs, lv; b, 6th limb, anterior to right; c, posterior of body from right side showing location of appendages, anterior toward right, nabs; d, left 7th limb; e, anterior of body from right side, anterior toward right. USNM 194591, instar II (sex unknown), paratype: f, complete specimen from right side, length 0.59 mm; g, anterior of right valve, iv; h, right 1st antenna, nabs, lv; i, j, part of right and left 2nd antennae, respectively, lv; k, left mandible, lv.

Bellonci Organ (Figure 55e): Elongate, with rounded tip.

Eyes (Figures 53i, 54f, 55e): Lateral eye with 5 ommatidia. Medial eye larger than lateral eye, with light brown pigment.

Upper Lip (Figure 55): Obscured.

Genitalia: Absent.

Brush-like Organ: Not observed.

Y-Sclerite (Figure 55c): Without ventral branch. Girdle indistinct, appears not to be fused to Y-sclerite.

Gut Content: USNM 194588 with free-living nematode in gut in addition to light brown particles (Figure 53l); USNM

194590 with only unidentified light brown particles. (Presence of nematode in gut indicates that 1st instar is carnivorous. Nematode is an epsilonematid in Order Chromadorida, according to Duane Hope (pers. comm., 1998).)

DESCRIPTION OF INSTAR II (sex unknown) (Figures 55f–k, 56).—Carapace similar in shape and ornamentation to that of adult female (Figure 56f). Gel-like substance coating valves.

Infold (Figure 55g): Inner margin of infold better defined than that of instar I; anterior infold with 1 small bristle; infold

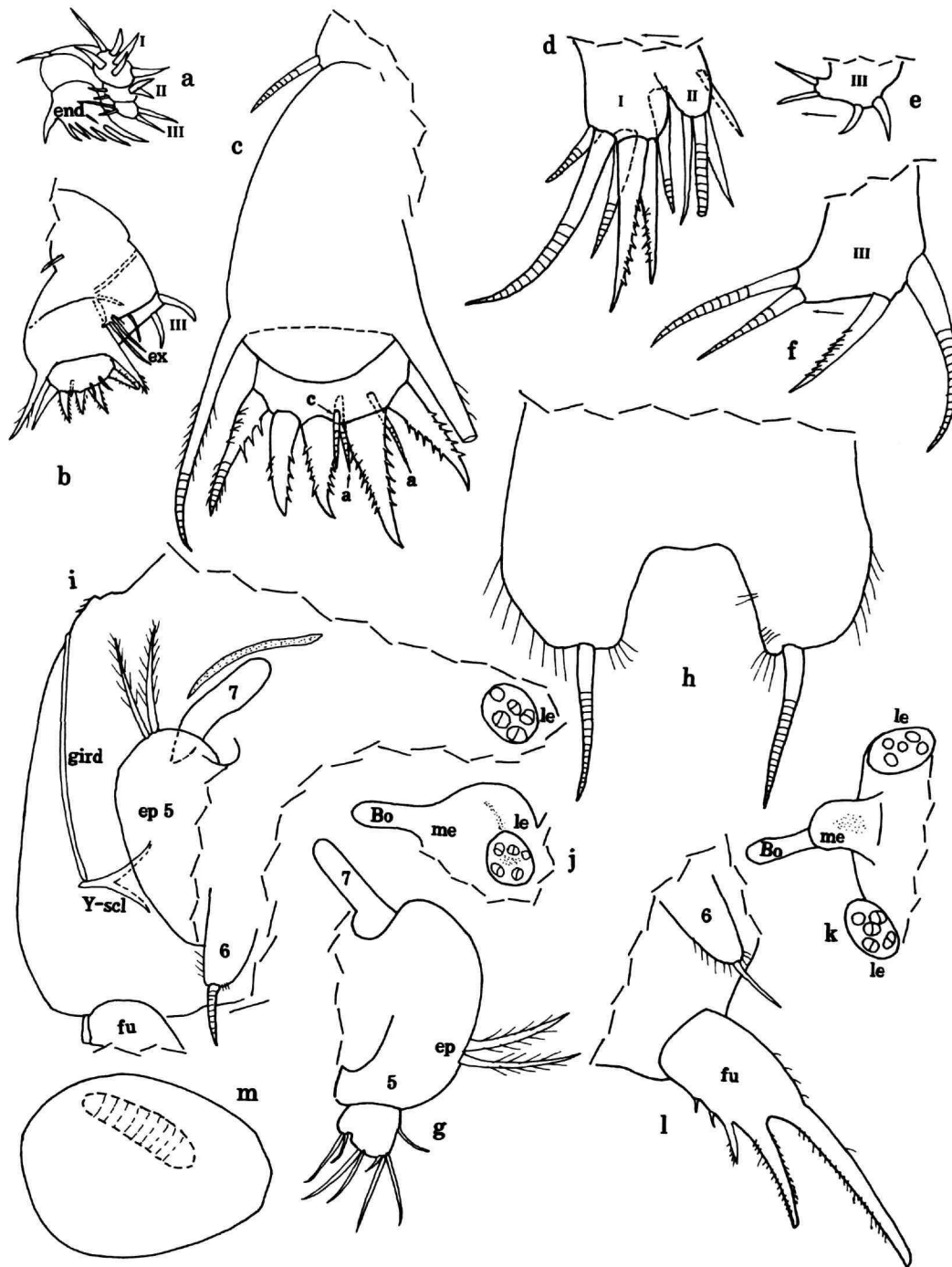


FIGURE 56.—*Juntichela pax*, new species, paratype, USNM 194591, instar II (sex unknown): *a*, right maxilla, nabs, mv; *b*, left maxilla, nabs, lv; *c*, part of right maxilla, mv; *d*, endites I and II left maxilla, lv; *e, f*, endite III of left (lv) and right (mv) maxillae, respectively; *g*, left 5th and 7th limbs viewed while attached to body, lv; *h*, 6th limb; *i*, posterior of body from right side showing location of some limbs and right lateral eye; *j*, left lateral eye, medial eye, and Bellonci organ from left side, anterior toward left; *k*, lateral eyes, medial eye, and Bellonci organ, dv; *l*, right 6th limb and right furcal lamella, lv, anterior toward right; *m*, amphipod (dashed) in gut, anterior of ostracod toward left.

of caudal process with 1 small bristle; 2 setal bristles present dorsal to caudal process.

Selvage: Similar to that of adult female.

Central Adductor Muscle Attachments: Consisting of closely spaced ovoid attachments.

Carapace Size (length, height in mm): USNM 194591, 0.59, 0.42; USNM 194592, 0.63, 0.47; USNM 194593, 0.60, 0.43; USNM 194594, 0.63, 0.44. Average: length 0.61, height 0.44. N=4.

First Antenna (Figure 55*h*; not all bristles shown): Joints 1–3 similar to those of Instar I. Joint 4 with dorsal bristle. Sensory bristle of 5th joint with 2 minute marginal filaments and 1 minute terminal filament. 6th joint with small medial bristle. 7th joint: a-bristle about 4 times length of bristle of 6th joint; medial b-bristle short, about same length as bristle of 6th joint; c-bristle long, with 2 or 3 minute marginal filaments and 1 minute terminal filament. 8th joint: d- and e-bristles long, bare; f-bristle shorter than d- and e-bristles, with minute terminal filament; g-bristle long, with 2 minute marginal filaments and minute terminal filament.

Second Antenna (Figure 55*i,j*): Protopodite bare. Endopodite single jointed, with small terminal node and proximal anterior bristle. Exopodite: 1st joint with minute terminal medial bristle; bristle of 2nd joint reaching well past 9th joint, with 13 small ventral spines; bristles of joints 3–8 with ventral spines and distal natatory hairs; 9th joint with 2 bristles (ventral bristle fairly long, with slender, proximal, ventral spines and distal natatory hairs; dorsal bristle minute); distal margins of joints bare.

Mandible (Figure 55*k*): Coxale endite with medial spine near ventral margin. Basale with 5 small bristles near ventral margin and 1 small subterminal bristle on dorsal margin. 1st endopodial joint with stout ventral claw; medial side with numerous spines, including row along distal margin; dorsal margin of joint with row of terminal spines. 2nd endopodial joint with stout ventral claw; dorsal margin of joint with small subterminal bristle. 3rd endopodial joint with stout terminal claw and 2 small bristles (1 ventral, 1 dorsal). Exopodite absent.

Maxilla (Figure 56*a–f*): Endite I with 6 bristles; endite II with 4 bristles; endite III with 4 bristles (2 anterior bristles on projection). Coxale with short dorsal bristle. Basale with slender bristle near base of exopodite. 1st endopodial joint with 2 stout pectinate alpha- and beta-bristles. 2nd endopodial joint with 2 a-bristles, 1 c-bristle, and 5 pectinate end bristles.

Fifth Limb (Figure 56*g,i*): Single endite with short bristle. Exopodite: 1st joint with 2 bristles; joints 2–5 fused, with total of 6 bristles. Epipodite with 27 bristles.

Sixth Limb (Figure 56*h,i,l*): Hirsute, with 1 bristle.

Seventh Limb (Figure 56*g,i*): Longer than limb of instar I, bare, with rounded tip.

Furca (Figure 56*i,l*): Each limb with 3 stout nonarticulated claws followed by 2 small articulated claws.

Bellonci Organ (Figure 56*j,k*): Elongate, with rounded tip.

Eyes (Figure 56*j,k*): Similar to those of instar I.

FIGURE 57 (right).—*Junctichela pax*, new species, paratype, USNM 194596B, instar III (sex unknown): *a,b*, central adductor muscle attachments of right and left valves, respectively, ov. Instar III (sex unknown), paratype, USNM 194595: *c*, complete specimen from right side, length 0.69 mm; *d*, adjacent carapace pores or fossae, iv; *e*, central adductor muscle attachments right valve, ov; *f,g*, anterior and posterior of right valve, iv; *h*, left 1st antenna, nabs, lv; *i*, part of left 2nd antenna, lv; *j*, right lateral eye and part of right 2nd antenna, lv; *k*, right mandible, mv; *l*, detail from *k*; *m*, right maxilla, nabs, lv; *n*, endites left maxilla, mv, anterior toward right, mv; *o*, right 5th limb, nabs, lv; *p*, right 7th limb and part of right 5th limb, anterior toward right, nabs, lv; *q*, right furcal lamella, lv; *r*, right lateral eye, medial eye, and Bellonci organ, anterior toward bottom.

Upper Lip: Projecting slightly.

Genitalia: Absent.

Brush-like Organ: Not observed.

Posterior of Body (Figure 56*i*): Posterodorsal margin of body with spines dorsal to posterior end of girdle.

Y-Sclerite (Figure 56*i*): With ventral branch. Girdle not fused to Y-sclerite.

Gut Content: USNM 194591, 194592, and 194594 with unidentified, light brown particles. USNM 194593 with whole amphipod and unidentified, light brown particles (Figure 56*m*).

DESCRIPTION OF INSTAR III (sex unknown) (Figures 57, 58*a–c*).—Carapace similar in shape to that of instar II (Figure 57*c*). Gel-like substance coating valves.

Ornamentation (Figure 57*d*): Similar to that of adult female. Viewed under oil immersion (×100 objective) small spines pointing inwards visible within pores (Figure 57*d*).

Infold: Anterior infold with minute bristle (Figure 57*f*). Infold of caudal process with several minute bristles, but without curved ridge present on adult female (Figure 57*g*). Posterior infold with 2 setal bristles.

Central Adductor Muscle Attachments (Figure 57*a,b,e*): Consisting of about 15 closely spaced ovoid attachments.

Carapace Size (length, height in mm): USNM 194595, 0.69, 0.49; USNM 194596A, 0.72, 0.50; USNM 194596B, 0.71, 0.51; USNM 194596C, 0.71, 0.51. Average: length 0.71, height 0.50. N=4.

First Antenna (Figure 57*h*; not all bristles shown): 1st joint bare. 2nd joint with few dorsal spines. 3rd and 4th joints fused; 3rd joint with 2 bristles (dorsal long, ventral minute); 4th joint with 2 bristles (1 dorsal, 1 ventral). Sensory bristle of 5th joint with 2 short marginal filaments. 6th joint fused to 5th, with small medial bristle. 7th joint: a-bristle about 4 times length of bristle of 6th joint; medial b-bristle short, about same length as bristle of 6th joint; c-bristle long, with 2 small marginal filaments. 8th joint: d- and e-bristles long, bare; f-bristle long, with proximal small marginal filament; g-bristle long, with 3 marginal filaments (proximal filament long).

Second Antenna (Figure 57*i,j*): Protopodite bare. Endopodite 1-jointed, with proximal anterior bristle and terminal node. Exopodite similar to that of instar III.

Mandible (Figure 57*k,l*): Coxale endite represented by small spine; ventral margin of coxale with spines with bases on lateral side. Basale: ventral margin and medial side near ventral

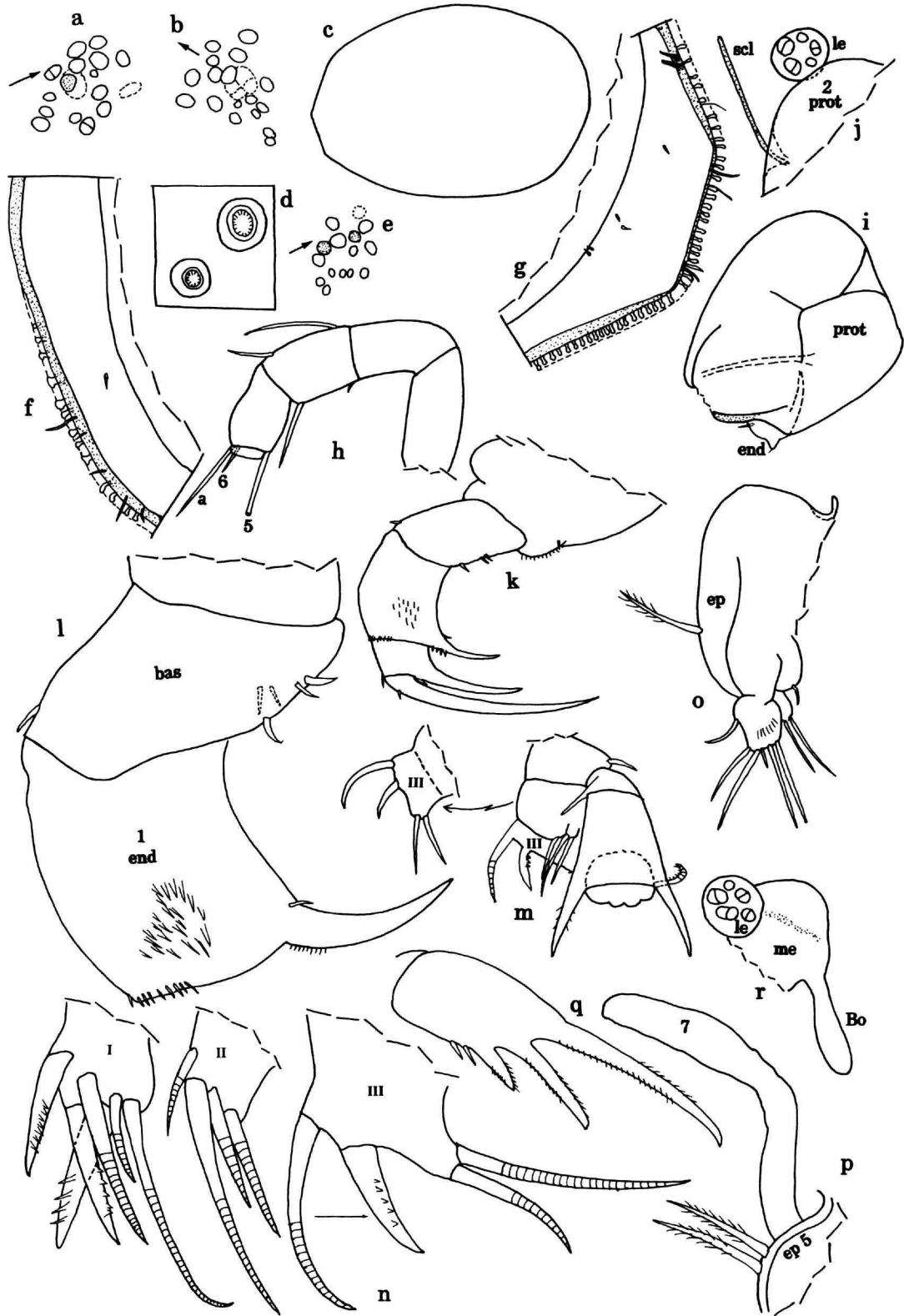




FIGURE 58 (left).—*Junctichela pax*, new species, paratype, USNM 194595, instar III (sex unknown): *a*, 6th limb; *b*, upper lip, anterior toward left; *c*, posterior of body from right side, anterior toward right. USNM 194598, instar IV female, paratype: *d*, complete specimen from left side, length 0.87 mm; *e*, posterior of left valve, iv; *f*, right lateral eye and right 1st antenna, nabs, lv; *g*, distal left 1st antenna, nabs, lv; *h*, endopodite left 2nd antenna, anterior toward right, mv; *i*, right maxilla, nabs, mv; *j*, endites I and II right maxilla, anterior toward left, mv; *k*, posterior of body from right side showing location of some appendages, anterior toward right; *l*, 6th limb; *m*, 7th limb; *n*, left furcal lamella, lv; *o*, medial eye and Bellonci organ from right side; *p*, left lateral eye, anterior toward right; *q*, upper lip from left side, anterior to left.

margin with 3 small bristles (2 proximal medial, 1 distal ventral); lateral side with 2 small bristles near midlength (Figure 57l); dorsal margin with small subterminal bristle. Exopodite absent. Endopodite: 1st joint with distal medial spines, spines along distal dorsal corner, and distal ventral claw with minute proximal spines along dorsal margin; small ventral bristle proximal to claw. 2nd joint with small subterminal dorsal bristle and stout ventral claw. 3rd joint with 2 small bristles (1 ventral, 1 dorsal).

Maxilla (Figure 57m,n): Similar to that of adult female.

Fifth Limb (Figure 57o,p): Epipodite with about 30 bristles. Endite and exopodite similar to those of adult female.

Sixth Limb (Figure 58a): Single endite with 1 or 2 bristles. End joint with 9 spinous bristles followed by 2 plumose bristles.

Seventh Limb (Figure 57p): Elongate, bare.

Furca (Figure 57g): Each lamella with 5 claws; claws 1–3 nonarticulated, with teeth along posterior edge and spines along anterior edge; claws 4 and 5 small, articulated, bare. Right lamella anterior to left by width of base of claw 1.

Bellonci Organ (Figure 57r): Elongate, with broadly rounded tip.

Eyes (Figure 57j,r): Lateral eye smaller than medial eye, with 5 ommatidia. Medial eye bare, with light brown pigment.

Upper Lip (Figure 58b): Similar to that of adult female.

Genitalia: Absent.

Brush-like Organ: Absent.

Y-Sclerite (Figure 58c): Similar to that of adult female.

Posterior of Body (Figure 58c): With few spines dorsal to posterior end of girdle.

Gut Content: USNM 194595 and USNM 194596A–C with unidentified, light brown particles.

DESCRIPTION OF INSTAR IV FEMALE (Figure 58d–q).—Carapace similar in shape and ornamentation to that of instar III (Figure 58d). Gel-like substance coating valves.

Infold (Figure 58e): Anterior infold with minute bristle. Infold of caudal process with indistinct line with about 4 short bristles (indistinct line equivalent to concave ridge on adult female); 2 or 3 minute bristles between indistinct line and posterior edge of caudal process. Posterior infold with 2 setal bristles.

Selvage: Bare narrow lamellar prolongation present along free margin of valves.

Central Adductor Muscle Attachments: Closely spaced ovoid attachments.

TABLE 7.—Average shell dimensions and calculated growth factors for female *Junctichela pax*. (*=sex not determined.)

Growth stage	Average length (mm)	Growth factor	Average height (mm)	Growth factor	Number of specimens
adult	1.01		0.71		5
IV	0.87	1.16	0.63	1.13	2
III*	0.71	1.23	0.50	1.26	3
II*	0.61	1.16	0.44	1.14	4
I*	0.50	1.22	0.37	1.19	2
Average		1.19		1.18	

Carapace Size (length, height in mm): USNM 194598, 0.87, 0.63. (USNM 194597, carapace without body, sex unknown: right valve, 0.83, 0.59; left valve, 0.84, 0.63 (dimensions not used in average length and height in Table 7).)

First Antenna (Figure 58f,g; not all bristles shown): Joints 1–4 and 6 similar to those of adult female. Sensory bristle of 5th joint with fairly long proximal filament, minute filament near midlength, and terminal spine. 7th joint: a- and b-bristles similar to those of adult female; c-bristle with fairly long proximal filament and minute filament near midlength. 8th joint: d- and e-bristles similar those of adult female; f-bristle with fairly long proximal filament, minute filament near midlength, and terminal spine; g-bristle with fairly long proximal filament, minute distal filament, and terminal spine.

Second Antenna (Figure 58h): Protopodite similar to that of adult female. Endopodite: left limb only with row of minute spines proximal to terminal node, otherwise endopodite similar to that of adult female. Exopodite: 1st joint with recurved tubular medial bristle on distal margin; bristle of 2nd joint with about 17 proximal ventral spines and distal natatory hairs; bristles of joints 3–8 with proximal ventral spines and distal natatory hairs; 9th joint with 2 bristles (ventral bristle with proximal ventral spines and distal natatory hairs, dorsal bristle small).

Mandible and Maxilla (Figure 58i,j): Similar to those of adult female.

Fifth Limb (Figure 58k): Epipodite with 31 bristles, otherwise limb similar to that of adult female.

Sixth Limb (Figure 58l): Similar to that of adult female.

Seventh Limb (Figure 58k,m): Each limb with 6 tapered bristles (2 in proximal group, 1 on each side, and 4 in terminal group, 2 on each side); each bristle with 3 or 4 bells and without marginal spines. Terminus with opposing combs with few small teeth.

Furca (Figure 58k,n): Except for spine following claw 5, furca similar to that of adult female.

Bellonci Organ (Figure 58o), *Eyes* (Figure 58f,o,p), and *Upper Lip* (Figure 58q): Similar to those of adult female.

Genitalia: Absent.

Brush-like Organ: Not observed.

Y-Sclerite (Figure 58k): Similar to that of adult female.

Gut Content: Unidentified, light brown particles.

REMARKS.—USNM 194598 is interpreted to be female because of its 7th limbs having 2 proximal bristles (these are absent on adult male).

COMPARISONS.—The new species *J. pax* differs from *Junctichela margalefi* Kornicker and Caraion, 1978, and *Junctichela lex* Kornicker and Thomassin, 1998, in the female having one instead of two proximal bristles on the endopodite of the 2nd antenna and four instead of two proximal bristles on the 7th limb. The endopodite of the 2nd antenna of the adult female of *J. margalefi* bears a long terminal bristle that is absent on *J. pax*. The endopodite of the 2nd antenna of the adult male *J. lex* has three joints compared to two on *J. pax*.

ONTOGENY.—In general, the development of *J. pax* is similar to that of known species of the Sarsiellinae. The calculated growth factors for instars and adults averaged 1.19 for carapace length and 1.18 for carapace height (Table 7).

Family RUTIDERMATIDAE Brady and Norman, 1896

TYPE SPECIES.—*Rutiderma compressa* Brady and Norman, 1896:673.

DISTRIBUTION.—Widespread between latitudes of about 34°N and 50°S and depths of 1–260 m (Kornicker, 1983:25).

***Rutiderma* Brady and Norman, 1896**

***Rutiderma darbyi* Kornicker, 1983**

FIGURE 59

Rutiderma dinochelatum.—Darby, 1965:28, 56, 57, pl. 13: figs. 1–9; pl. 14: figs. 1–7 [not *Rutidermata dinochelata* Kornicker, 1958].

Rutiderma darbyi Kornicker.—Bradford, 1980:141, fig. 2 [deliberate nomen nudum].

Rutiderma darbyi Kornicker, 1983:2–7, 11–14, 17, 25, 36–47, 62, 85, figs. 18–24; pl. 1.—Grabe, Gibson, and Watkins, 1995:698, table 2.

HOLOTYPE.—USNM 158003, ovigerous female.

TYPE LOCALITY.—Georgia continental shelf, depth 26 m.

MATERIAL.—Crab Cay Cravasse, Sta 95-010: USNM 194582, partly dissected instar IV male in alcohol.

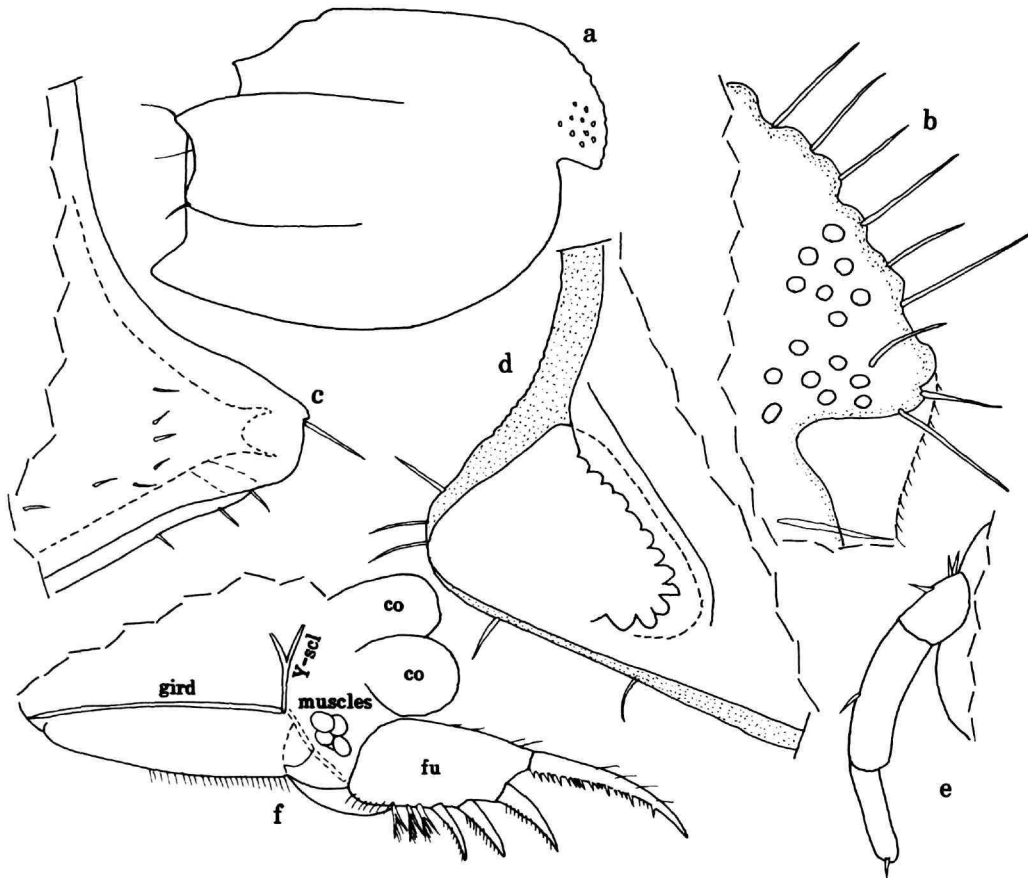


FIGURE 59.—*Rutiderma darbyi* Kornicker, 1983, USNM 194582, instar IV male: a, complete specimen from right side, length 0.94 mm; b, rostrum right valve, lv; c, caudal process right valve, iv; d, caudal process left valve, iv; e, endopodite right 2nd antenna, mv; f, posterior of body from right side.

DISTRIBUTION.—Atlantic continental shelf from North Carolina to Florida, Gulf of Mexico continental shelf off Florida, and Bahama Islands in vicinity of San Salvador Island, Andros Island (Kornicker, 1983:38), and in Crab Cay Cravasse, Exuma Islands (herein). Known depth range intertidal to 168 m (Kornicker, 1983:38).

DESCRIPTION OF INSTAR IV MALE.—Carapace similar in shape to that of adult female (Figure 59a).

Ornamentation (Figure 59a,b): Surface with small round separated fossae.

Infold: Infold of caudal process of left valve with serrations along anterior edge of pocket (Figure 59d); serrations and pocket absent on right valve (Figure 59c).

Carapace Size (length, height in mm): USNM 194582, 0.94, 0.70.

Second Antenna: Endopodite elongate, 3-jointed (Figure 59e): 1st joint with 3 short bristles; 2nd joint with 1 or 2 short bristles; 3rd joint with 1 or 2 terminal bristles.

Seventh Limb: Well developed, with 4 proximal bristles (2 on each side), each with 2 bells, and 4 terminal bristles (2 on each side), each with 4 bells; all bristles tapered (juvenile character). Tip with opposing combs with few small teeth.

Furca (Figure 59f): Each lamella with 4 stout claws followed by 2 or 3 secondary claws. USNM 194582 with 2 secondary claws on left limb and 3 on right.

Copulatory Organ (Figure 59f): Consisting of 2 lobes.

Superfamily CYLINDROLEBERIDOIDEA Müller, 1906

Family CYLINDROLEBERIDIDAE Müller, 1906

Subfamily CYLINDROLEBERIDINAE Müller, 1906

SEXUAL DIMORPHISM OF THE FIRST ANTENNAE OF THE CYLINDROLEBERIDINAE.—The c- and f-bristles of the 1st antennae on known species of the Cylindroleberidinae are generally much longer in the adult male than in the adult female and juveniles, and they have many more marginal filaments (Appendix 2). In the female the c- and f-bristles are shorter than the combined length of the joints of the limb, whereas in the male the bristles may be twice the length of the combined joints and as much as one and one-half times the length of the carapace. The c- and f-bristles of juveniles of both sexes resemble those of the adult female, but they may have fewer filaments. The adult male of many described species is unknown. The lengths of the c- and f-bristles of adult males are not presented in most descriptions of the species, but the number of sensory filaments on the bristles often are stated. According to Parker (1998:105), "halophores [filaments] may be bimodal chemosensory/mechanosensory sensilla," and are iridescent (Parker, 1995:349). The filaments are probably important in sensing females, and if iridescent, may attract females.

The bristles on the 1st antenna of the adult male *Synasterope browni* described herein differ from most members of the subfamily in being short and having few filaments (Table 8, Appendix 2). That difference prompted a brief survey of the literature concerning the morphometrics of some of the bristles of

TABLE 8.—Lengths (in mm) of shell and c- and f-bristles of male 1st antenna of selected species of Cylindroleberidinae.

Species	Shell length	Bristle length		Source
		c-	f-	
<i>Homasterope curta</i>	1.60	2.3	2.4	Skogsberg (1920:501)
<i>Parasterope nana</i>	1.24	1.8	1.8	Poulsen (1965:396)
<i>Prionotoleberis norvegica</i>	2.42	3.3	3.5	Skogsberg (1920:532)
<i>Synasterope browni</i>	0.66	0.18	0.11	Herein
<i>Synasterope oculata</i>	1.36	2.2	2.3	Skogsberg (1920:523)
<i>Synasterope oculata</i>	1.44	2.6	2.6	Poulsen (1965:413)

the 7th and 8th joints of the 1st antenna of the Cylindroleberidinae (Appendix 2).

Of the 44 adult males listed in Appendix 2, only four have relatively short c- and f-bristles with relatively few marginal filaments. The short bristles are designated "S" in Appendix 2. The c- and f-bristles on at least three of those males do not appear to be significantly different than the bristles on the adult female of the same species. The males having short c- and f-bristles have normal g-bristles, and females of those species have normal c-, f-, and g-bristles (Appendix 2).

The length and number of filaments on the c- and f-bristles on all specimens are clearly related to each other, e.g., a long c-bristle with many filaments is always accompanied by a long f-bristle with many filaments.

The number of filaments on c- and f-bristles varies directly with shell length (Figure 60). For c-bristles, the Pearson correlation coefficient is 0.615, which is significant at the level $P < 0.01$. For f-bristles, the Pearson correlation coefficient is 0.617, which is significant at the level of $P < 0.01$.

Measurements have been made of the lengths of the c- and f-bristles of the males of only six species (Table 8). The few data suggest that lengths of the c- and f-bristles vary directly with shell length.

CORRECTIONS.—Kornicker (1975:439) described the f-bristle of the 8th joint of the 1st antenna of the male *Parasterope prolixa* Kornicker, 1975, as having 8 filaments and illustrated the right 1st antenna of USNM 139140 with an f-bristle shorter than the g-bristle. The senior author reexamined the slide bearing the illustrated 1st antenna and observed the f-bristle to be folded and bearing about 14 filaments. It is about two-thirds the length of the c-bristle. Kornicker (1976:17), in the description of the f- and g-bristles of the 1st antenna of a male *Parasterope beta*, incorrectly transposed them. It should have been f-bristle with 29 filaments and g-bristle with 8 filaments. The f- and g-bristles (both broken) also were incorrectly transposed in an adult male of *Parasterope kappa* (Kornicker, 1976:22).

Synasterope Kornicker, 1975

TYPE SPECIES.—*Synasterope implumis* Poulsen, 1965, by subsequent designation (Kornicker, 1975:44).

COMPOSITION AND DISTRIBUTION.—See Kornicker and Iliffe (2000:72).

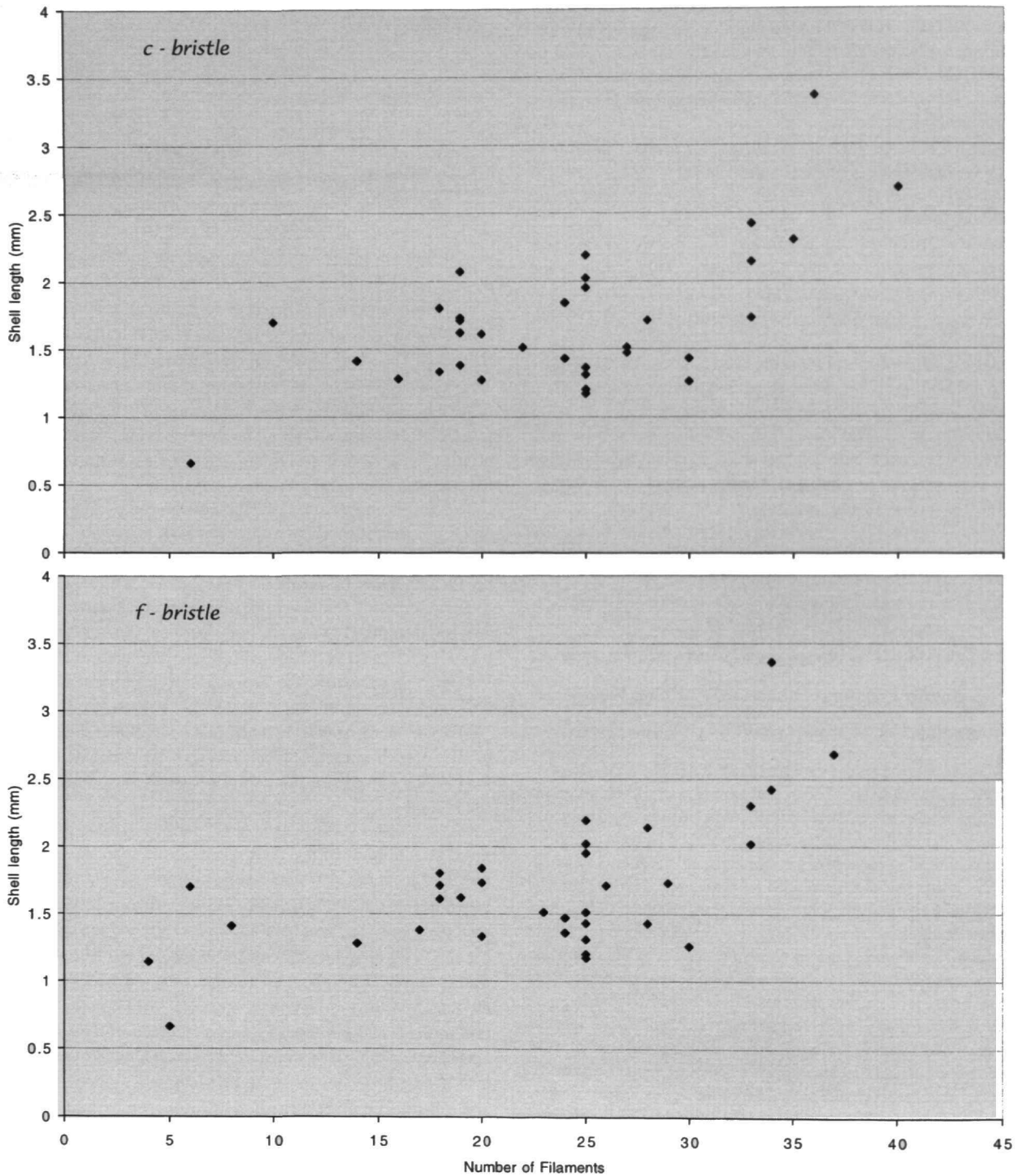


FIGURE 60.—Relationship between the number of filaments on c- and f-bristles of the first antennae and the carapace lengths of adult males of selected species of the Cyindroleberidinae (from Appendix 2). (Specimens with number of filaments on c- and f-bristles followed by plus sign in Appendix 2 not plotted on graphs.)

Synasterope browni Kornicker and Iliffe, 2000

FIGURES 61–68

Synasterope browni Kornicker and Iliffe, 2000:72–77, figs. 39–44.

HOLOTYPE.—USNM 194469, adult female on slide and in alcohol.

TYPE LOCALITY.—Exuma Sound, depth 96 m.

MATERIAL.—Four Shark Cave, Sta 97-023: USNM 194548, adult male on slide and in alcohol. Mystery Cave, Sta 96-030: USNM 194577, adult male on slide and in alcohol; USNM 194578, A-1 male on slide and in alcohol; USNM 194579, instar I in alcohol.

DISTRIBUTION.—Exuma Sound, depth 96 m; collected herein in Four Shark Cave, South Andros Island, depth 27–33 m. Mystery Cave, Stocking Island, Exuma Cays, depth 50 m.

DESCRIPTION OF ADULT MALE (Figures 61–65, 66a,b).—Carapace oval with posterodorsal margin slightly more oblique than posteroventral margin (Figures 61a, 64f); vertical row of few hairs near posterior end.

Infold: Obscure on slides, but appearing to have relatively few bristles on rostrum and along anteroventral margin (Figure 61b); flap-like posterior bristles present but number obscured (Figure 61c). No processes observed between posteroventral list and valve edge.

Carapace Size (length, height in mm): USNM 194548, 0.66, 0.42; USNM 194577, 0.69, 0.42.

First Antenna (Figures 61d,e, 65a,b): 1st joint with few lateral hairs in distal dorsal corner. 2nd joint with spinous dorsal bristle and without lateral bristle. 3rd and 4th joints fused, triangular; 3rd joint with small bristle on short ventral margin and 6 dorsal bristles (2 single bristles with long spines, 2 paired bristles (lateral with short or long spines, medial with long spines) and 2 paired bristles (lateral with short spines, medial with long spines) on long dorsal margin. 4th joint with terminal, spinous, dorsal bristle and 2 ventral lateral bristles. 5th joint fused to 6th joint and forming small ventral wedge between 4th and 6th joints; bristle of 5th joint unusually stout and with well over 100 filaments (not all shown). 6th joint long, with medial bristle with short spines. 7th joint: a-bristle claw-like, concave dorsally, with proximal dorsal teeth; b-bristle with 3 long dorsal filaments; c-bristle about same length as dorsal margin of joints 2–8, with 6 marginal filaments. 8th joint: d-bristle represented by minute peg (Figure 61e); bare e-bristle about two-thirds length of c-bristle; f-bristle bent dorsally, about two-thirds length of c-bristle, with 5 marginal filaments; g-bristle shorter than c-bristle, with 5 marginal filaments.

Second Antenna (Figure 61f,g): Protopodite with small distomedial bristle. Endopodite 3-jointed: 1st joint short bare; 2nd joint elongate with 3 short bare dorsal bristles near midlength; 3rd joint long, reflexed, with long, bare, proximal filament and pointed tip with few small teeth on inner side. Exopodite: 2nd joint only slightly longer than 3rd joint; bristle of 2nd joint reaching 7th joint, with slender ventral spines; bristles of joints

3 and 4 with slender proximal ventral spines and distal natatory hairs; bristles of joints 5–8 with natatory hairs; 9th joint minute, about one-half width of 8th joint, with 2 bristles (ventral bristle about one-half length of bristle of 8th joint and same length as combined joints 2–9; dorsal bristle shorter); joints 2–8 with few small spines at distal dorsal corner, some joints with minute spines along distal margins, stout basal spines absent.

Mandible (Figures 62, 65e): Coxale endite (Figure 62d,e): ventral branch with 3 or 4 oblique rows of spines and tip with 2 or 3 slender spines; dorsal branch with small main spine; tip obscure; usual bristle near base of ventral branch absent. Basale endite with 3 spinous end bristles, glandular peg, 2 dwarf bristles (proximal about three-quarters length of distal), and 2 trianid bristles with 2 or 3 pairs of spines proximal to terminal pair (terminal pair well developed) (Figure 62b,e). Basale: ventral margin with U-shaped boss near midlength; dorsal margin with 2 long terminal bristles. Exopodite about one-half length of dorsal margin of 1st endopodial joint, with hirsute tip and 2 short subterminal bristles (Figure 62a). 1st endopodial joint with 3 long bristles (2 with long spines near midlength and short proximal and distal spines, 1 with short spines). 2nd endopodial joint (Figure 62a,g): ventral margin with 3 terminal bristles with short marginal spines; dorsal margin with a-, b-, c-, d-, f-, and g-bristles (base of c-bristle slightly stouter than bases of b- and d-bristles), and 1 short bristle proximal to a-bristle; medial surface of joint with 3 cleaning bristles (with short spines) in oblique row near base of c-bristle. 3rd endopodial joint with fairly straight claw with few ventral and dorsal spines, and 5 bristles (not all annulations shown on bristles).

Maxilla (Figure 63a–d): Epipodite obscured. Endite I with 3 bristles (2 long, 1 short); endite II with 3 long bristles (Figure 63a). Basale: medial surface with proximal bristle near dorsal margin and 1 small distal bristle near ventral margin (seen only on left limb of USNM 194548); lateral surface with short proximal bristle near midwidth; ventral margin with long, spinous, terminal bristle. 1st endopodial joint with short alpha-bristle and long beta-bristle. 2nd endopodial joint with long terminal bristle reaching past tip of beta-bristle.

Fifth Limb (Figure 63e): Comb: lateral side with stout spinous exopodial bristle reaching past end of comb; 1 short slender bristle ventral to base of exopodial bristle; 1 pair of bristles and 1 slender bristle closer to ventral margin.

Sixth Limb (Figure 63f,g): Small medial bristle near proximal anterior corner. Anterior margin with slender bristle at upper endite and longer spinous bristle at lower endite. Skirt: anterior end with 3 ventral bristles; lateral flap with slender hirsute anterior bristle; ventral margin with 7 or 8 bristles posterior to midlength.

Seventh Limb (Figures 63h,i, 65c): Proximal group with 4 or 5 bristles (1 or 2 on one side, 3 on other side), each with 2 or 3 bells; distal group with 4 or 5 bristles (2 on one side, 2 or 3 on other side, each with 2 or 3 bells). Terminus with opposing

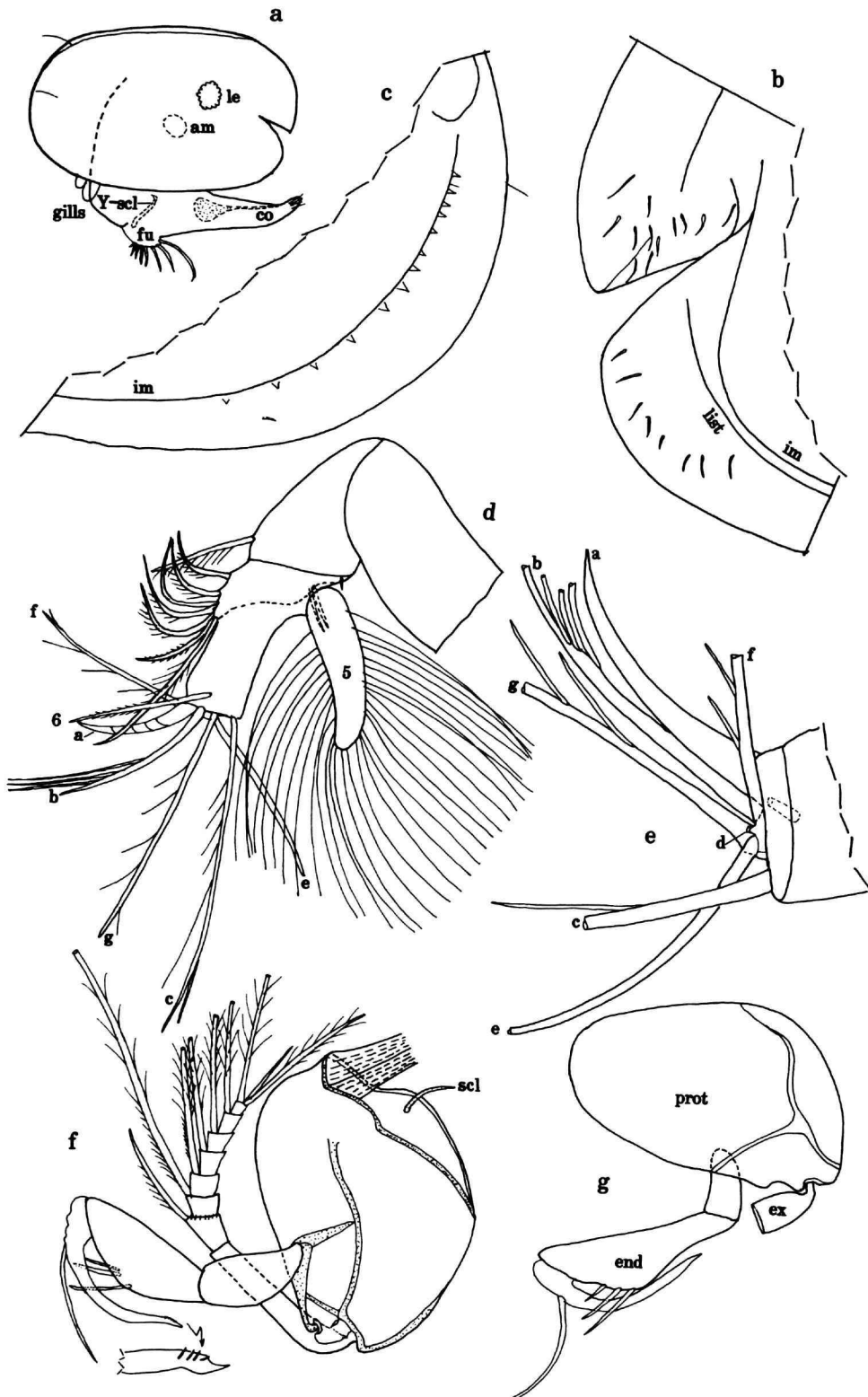


FIGURE 61 (left).—*Synasterope browni* Kornicker and Iliffe, 2000, USNM 194548, adult male: *a*, complete specimen from right side, length 0.66 mm; *b,c*, anterior and posterior of right valve, respectively, iv; *d*, right 1st antenna, nabs, mv; *e*, distal left 1st antenna, lv; *f*, distal left 2nd antenna, mv; *g*, part of right 2nd antenna, lv.

combs with small teeth.

Furca (Figures 63j, 64a,f,g, 65c,f): Each lamella with 8 claws; posterior 3 claws slender, bristle-like, but not ringed (1 oriented backward). Claws 1–7 with teeth along posterior edge; claw 8 with hairs along anterior edge.

Bellonci Organ (Figure 64h): Elongate, broad near middle, with rounded tip.

Eyes: Medial eye bare (Figure 64h). Lateral eye with black pigment and about 15 ommatidia (Figures 61a, 63k, 64f,h, 65a,d).

Lips (Figure 65d,e): Typical for genus, without spines.

Copulatory Organ: Extremely long, about one-half length of shell (Figures 61a, 64f), coalesced proximally, divided distally into 2 lobes, each with bifurcate lobate tips; lobes with indistinct bristles near tip (Figures 64d,e, 66a,b).

Posterior of Body (Figures 63j, 64a–c,g, 65c,f): Posterodorsal corner slightly lobate, bare; posterior margin bare.

Gills (Figures 64a, 65c,f): Narrow, number uncertain (2 shown).

Y-Sclerite (Figures 63j, 64a, 65c,f, 66a): Without ventral branch.

DESCRIPTION OF A–1 MALE (Figures 66c–g, 67a–f).—Carapace similar in shape to that of adult female (Figure 66c).

Infold (Figure 66d,e) and *Selvage*: Similar to that of adult female.

Carapace Size (length, height in mm): USNM 194578, 0.72, 0.39.

First Antenna (Figure 66f,g): 1st joint with lateral hairs in distal dorsal corner and distal medial hairs near midheight. 2nd joint with spinous dorsal bristle and without lateral bristle. 3rd and 4th joints fused; 3rd joint with small bristle on ventral margin and 6 dorsal bristles (2 single bristles with long spines, and 2 pairs of bristles either bare or with indistinct short spines). 4th joint with dorsal bristle with short spines and bare ventral bristle. 5th joint with weak sutures separating joint from 4th and 6th joints; sensory bristle with short proximal filament and 6 long terminal filaments. 6th joint long, with long medial bristle. 7th joint: a-bristle claw-like, with concave dorsal margin and proximal dorsal teeth; b-bristle with 3 long dorsal filaments; c-bristle with 4 filaments at midlength and 1 subterminal. 8th joint: d-bristle represented by minute papilla (not shown on illustration); bare e-bristle about one-half length of c-bristle; f-bristle bent dorsally, about two-thirds length of c-bristle, with 4 marginal filaments; g-bristle shorter than c-bristle, with 5 marginal filaments. Illustrated left limb of USNM 194578 shows filaments of sensory bristle of adult male within.

Second Antenna: Protodopite and endopodite similar to those of adult male. Endopodite 3-jointed (Figure 66h): 1st

joint bare; 2nd joint elongate with 2 short distal bristles; 3rd joint elongate with long, bare, proximal filament and pointed tip. Illustrated detail of tip of endopodite of USNM 194578 shows pointed tip with few small teeth of endopodite of adult male within.

Mandible: Coxale endite broken off. Remainder of limb similar to that of adult male.

Maxilla (Figure 67a,b): Epipodite triangular. Endite I with 3 bristles (2 long, 1 short); endite II with 3 long bristles. Basale with short proximal medial bristle near dorsal margin or at midwidth; ventral margin with short proximal bristle, none or 1 short indistinct distal bristle, and long terminal bristle; proximal lateral bristle obscured. Endopodite: 1st joint with short alpha- and long beta-bristle; 2nd joint with terminal bristle longer than beta-bristle of 1st joint.

Fifth Limb: Similar to that of adult male.

Sixth Limb: In general, similar to that of adult male.

Seventh Limb: Proximal group with 5 tapered bristles (2 on one side, 3 on other), each with 1 to 3 bells; distal group with 5 slightly tapered bristles (2 on one side, 3 on other), each with 1 or 2 bells. Terminus with opposing combs with few small teeth.

Furca (Figure 67c,d,f): Similar to that of adult male.

Bellonci Organ: Not observed.

Eyes: Medial eye not observed. Lateral eye with black pigment and obscured amber-colored ommatidia (Figure 66c).

Lips (Figure 67e): Similar to those of adult male.

Copulatory Organ (Figure 67f): Large with 2 lobes at anterior tip, without visible internal sclerites.

Posterior of Body (Figure 67d): Posterodorsal corner slightly lobate and with spines; posterior ventral to posterior end of girdle hirsute.

Gills: Narrow.

Y-Sclerite (Figure 67d): Similar to that of adult male; anterior tip with small hook-like ventral sclerite.

DESCRIPTION OF INSTAR I (sex unknown) (Figure 67g–o).—Carapace less elongate than that adult female (Figure 67g); dorsal edge of caudal process extending onto lateral surface of valve (Figure 67h).

Infold and Selvage: Not examined.

Carapace Size (length, height in mm): USNM 194579, 0.44, 0.28.

First Antenna (Figure 67i): 1st, 2nd, and 4th joints bare. 3rd joint with long, spinous, dorsal bristle and small, bare, ventral bristle. Sensory bristle of 5th joint without filaments. 6th joint with medial bristle. 7th joint: a-bristle claw-like, b- and c-bristles bare. 8th joint: d-bristle absent; e-bristle about same length as c-bristle, bare, distal part filamentous, indistinct; f- and g-bristles bare.

Second Antenna (Figure 67j,k): Protodopite with small distal medial bristle. Endopodite weakly 3-jointed, with long terminal filament. Exopodite 9-jointed: bristle of 2nd joint reaching 7th joint, with slender ventral spines; bristles of joints 3–8 with distal natatory hairs (some bristles with proximal ventral spines); 9th joint with 2 bristles (dorsal bristle short, bare, ven-

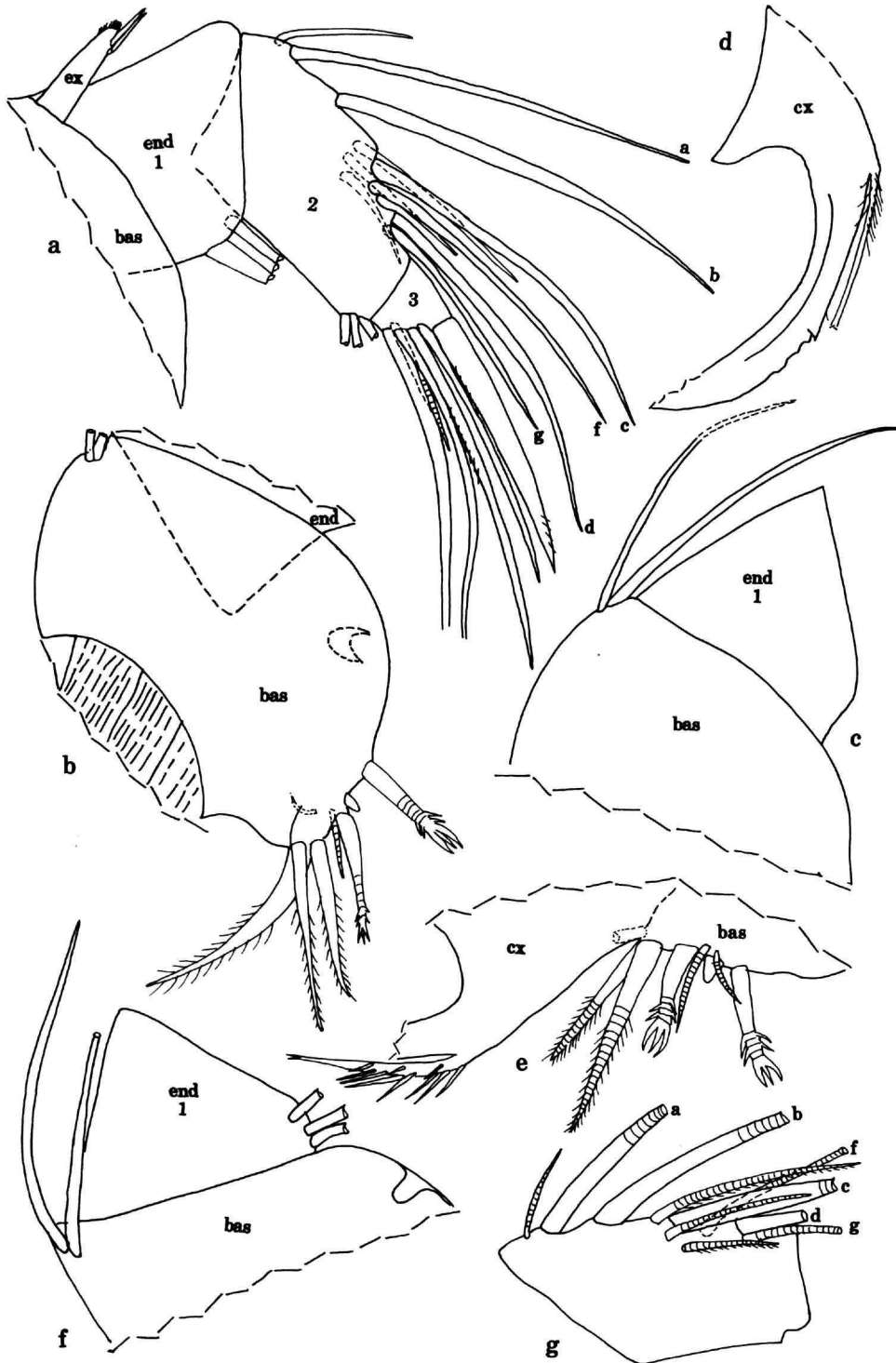


FIGURE 62.—*Synasterope browni* Komicker and Iliffe, 2000, USNM 194548, adult male, right mandible, lv: a, distal part; b, basale; c, basal and endopodite, nabs; d, coxale endite. Left mandible, mv: e, proximal coxale and ventral basale; f, distal basale and endopodite (exopodite not shown); g, dorsal bristles 1st endopodial joint.

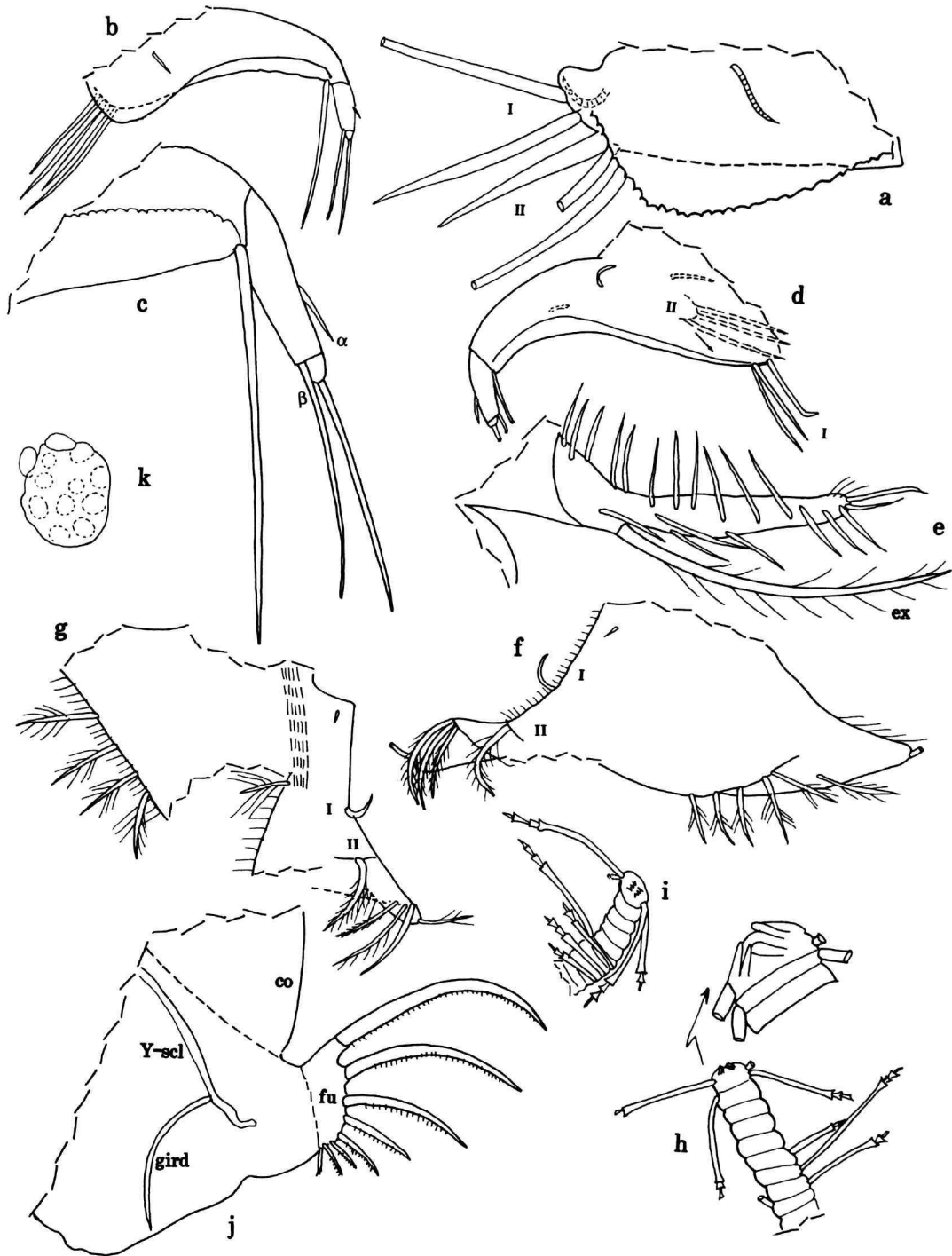


FIGURE 63.—*Synasterope browni* Kornicker and Iliffe, 2000, USNM 194548, adult male, right maxilla, lv: *a*, limb without epipodite, nabs; *b*, proximal basale; *c*, distal basale (nabs) and endopodite; *d*, left maxilla, lv; *e*, distal right 5th limb (twisted), vv; *f*, *g*, right and left 6th limbs (partly fragmented), respectively, mv; *h*, *i*, left and right 7th limbs; *j*, posterior of body from right side (gills not shown), anterior toward top; *k*, left lateral eye.

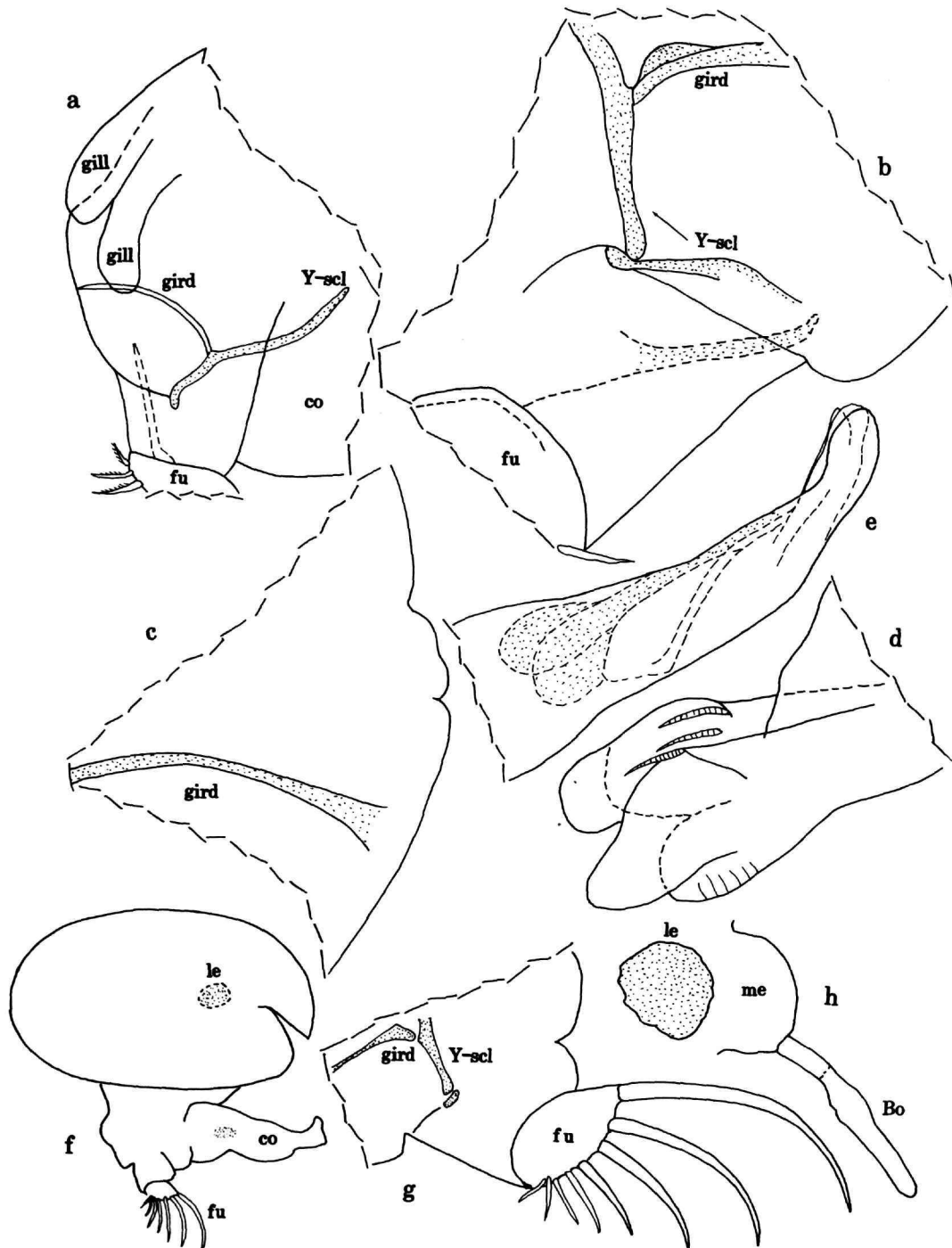


FIGURE 64.—*Synasterope browni* Kornicker and Iliffe, 2000, USNM 194548, adult male: *a*, posterior of body from right side, anterior toward right; *b, c*, parts of posterior of body from left side, anterior toward left; *d*, tip of copulatory organ, anterior toward left; *e*, copulatory organ, anterior toward right. USNM 194577, adult male: *f*, complete specimen from right side, ov, length 0.69 mm; *g*, part of posterior of body from right side, anterior toward right; *h*, right lateral eye (stippled), medial eye, and Bellonci organ, anterior toward lower right.

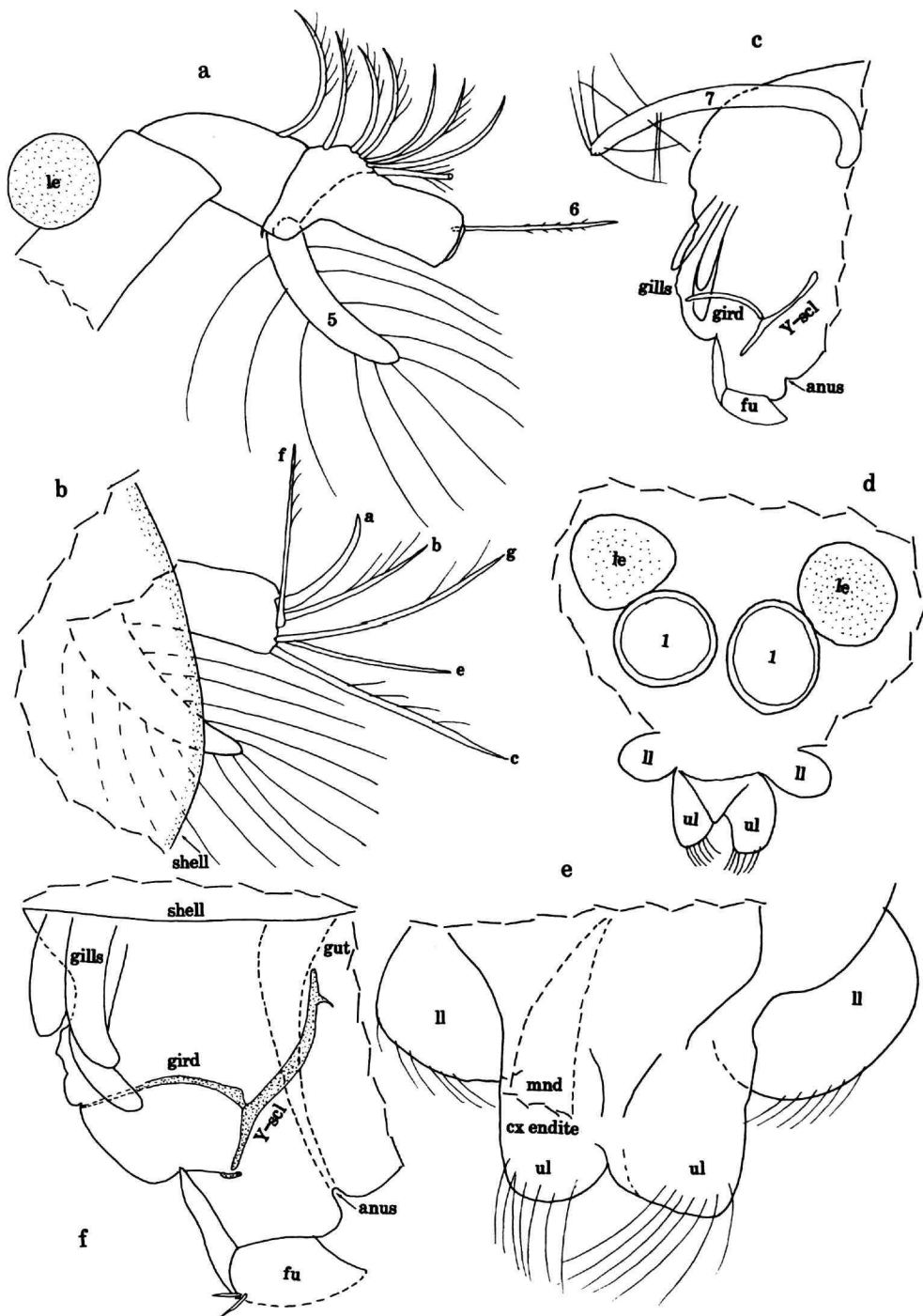


FIGURE 65.—*Synasterope browni* Kornicker and Iliffe, 2000, USNM 194577, adult male: *a*, right lateral eye and right 1st antenna, nabs, lv; *b*, right 1st antenna projecting from carapace viewed from right side, anterior toward right, nabs, lv; *c*, posterior of body from right side showing location of gills and some appendages (furcal claws not shown), anterior toward right; *d,e*, dorsal view of anterior of body showing lips, anterior to bottom; *f*, posterior of body projecting from ventral part of carapace viewed from right side, anterior toward right.

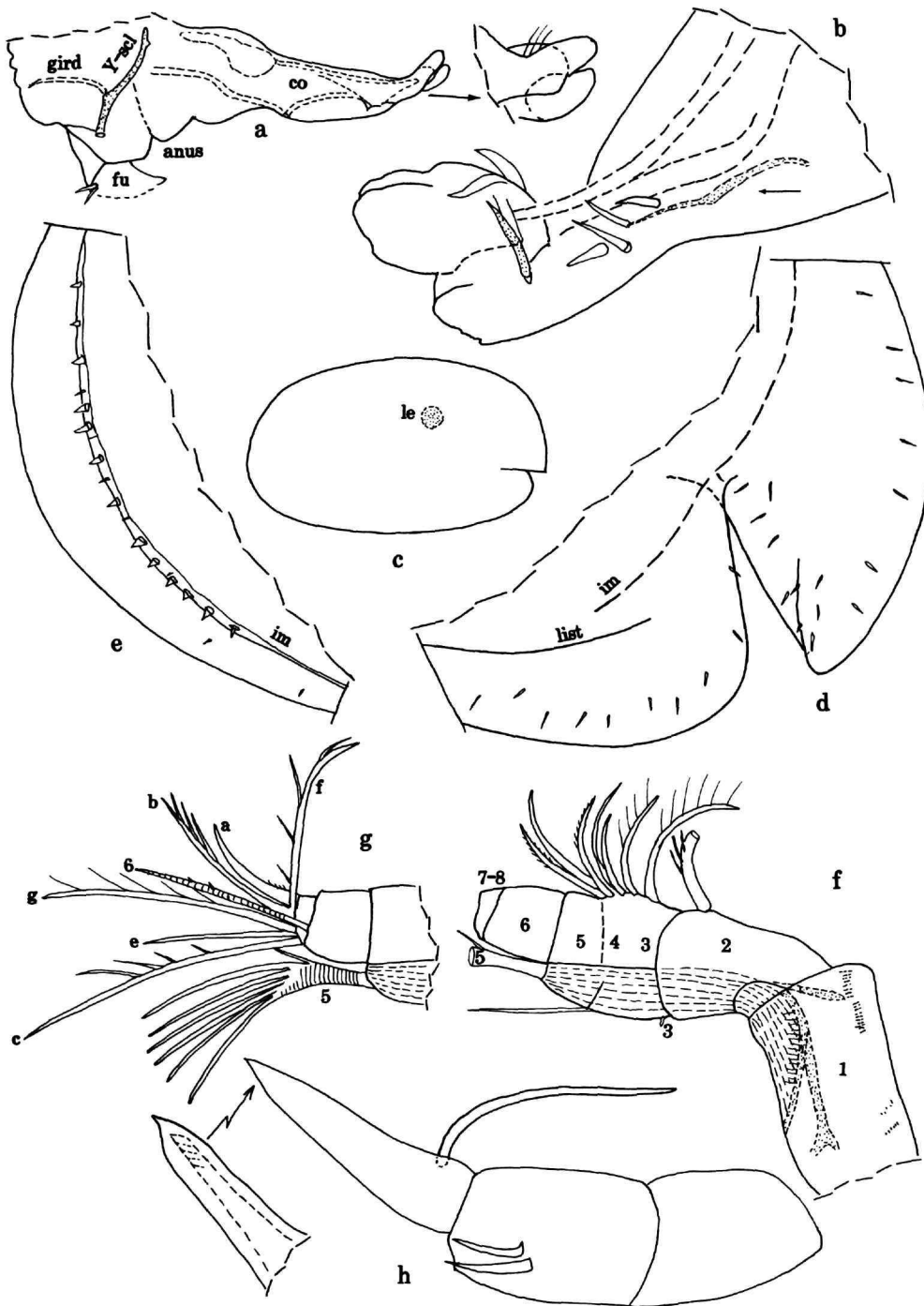


FIGURE 66.—*Synasterope browni* Kornicker and Iliffe, 2000, USNM 194577, adult male: *a*, part of posterior of body showing copulatory organ, anterior to right; *b*, tip of copulatory organ from left side, anterior toward left. USNM 194578, A-1 male (appendages of adult male visible within appendages of A-1 male): *c*, complete specimen from right side, length 0.72 mm; *d, e*, anterior and posterior of left valve, *iv*; *f, g*, parts of left 1st antenna (internal dashed lines represent filaments of bristle of 5th limb of adult male), *mv*; *h*, endopodite right 2nd antenna, *lv*.

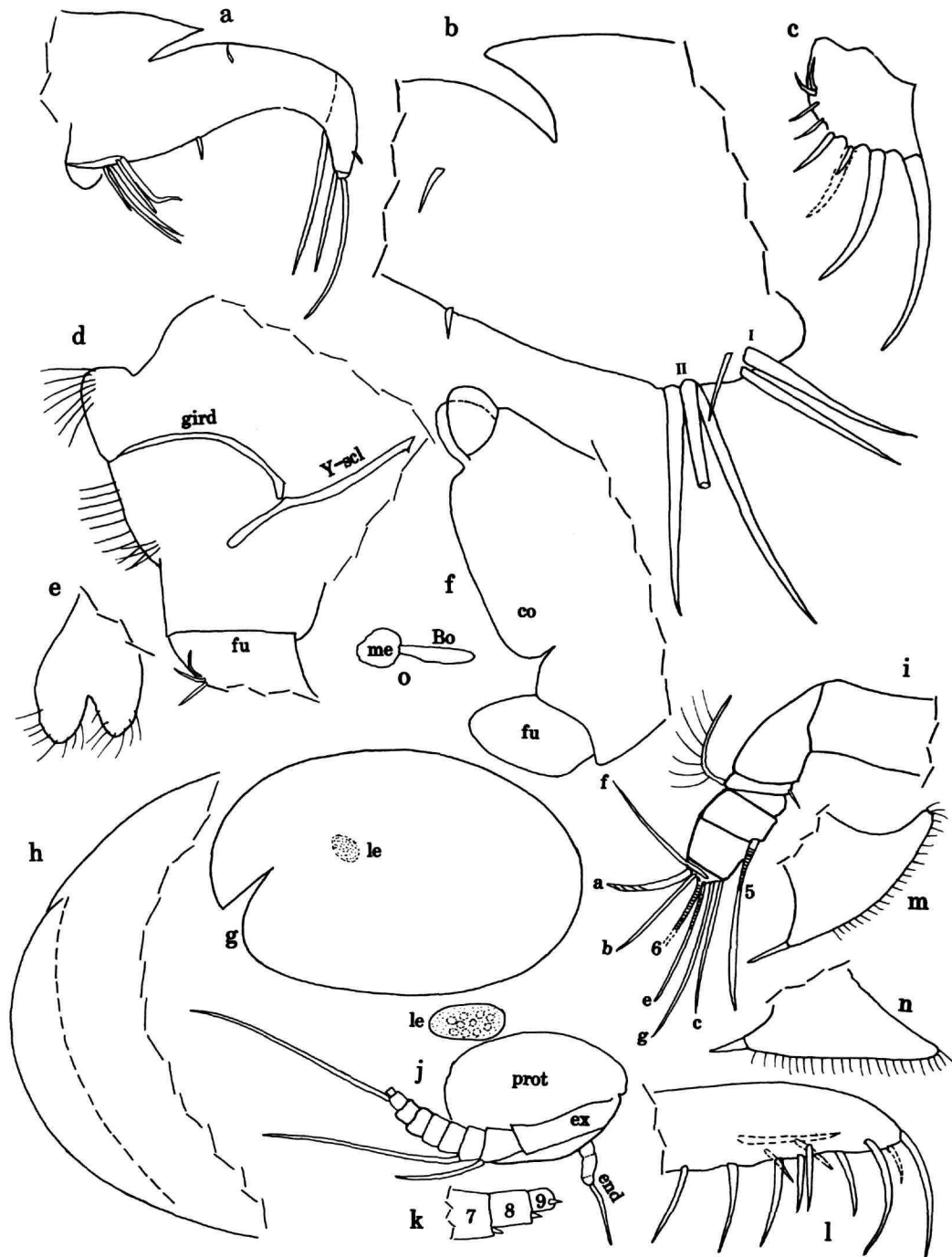


FIGURE 67.—*Synasterope browni* Kornicker and Iliffe, 2000, USNM 194578, A-1 male: a, left maxilla, nabs, mv; b, proximal part of right maxilla, mv; c, right furcal lamella, lv; d, posterior of body from right side, anterior toward right; e, upper lip, anterior toward bottom, dv; f, posteroventral part of body from left side, anterior to left. USNM 194579, instar I (sex unknown): g, complete specimen from left side, length 0.44 mm; h, posterior of right valve, ov; i, left 1st antenna, lv; j, right lateral eye and right 2nd antenna, nabs, lv; k, joints 7-9 of exopodite left 2nd antenna, nabs, lv; l, comb left 5th limb, mv; m, n, right (lv) and left (mv) 6th limbs; o, medial eye and Bellonci organ.

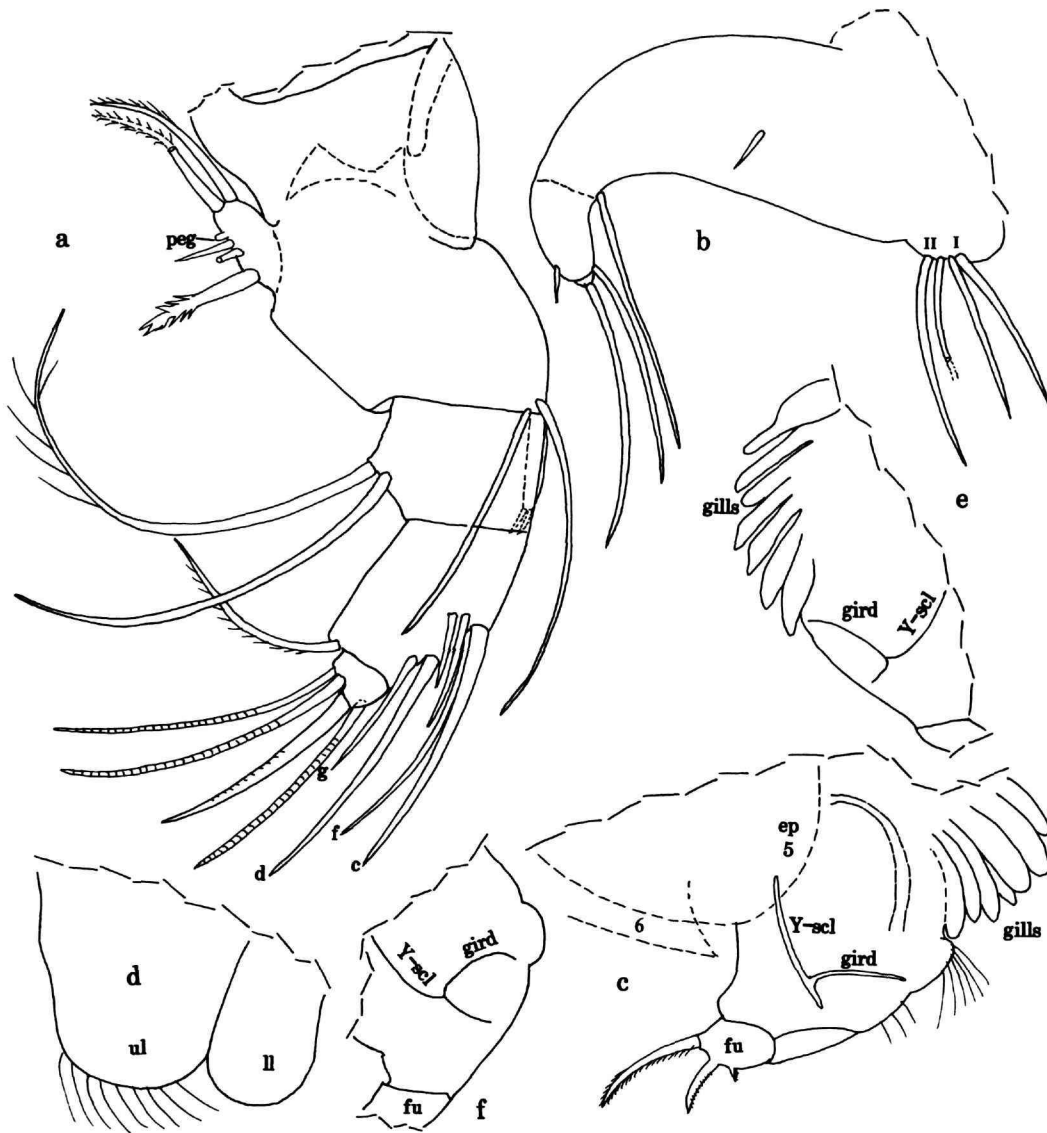


FIGURE 68.—*Synasterope browni* Kornicker and Iliffe, 2000, USNM 194579, instar I (sex unknown): *a*, left mandible, mv; *b*, right maxilla, nabs, mv; *c*, posterior of body from left side, anterior toward left, nabs; *d*, lips from left side, anterior toward left; *e*, posterior of body from right side, anterior toward right; *f*, posterior of body from left side showing absence of 7th limb, anterior toward left.

tral bristle longer and with natatory hairs); joints 3–7 with row of minute terminal spines; joints 6–8 each with indistinct, small, basal spine; 9th joint with small lateral spine (Figure 67*k*). (Basal spines not observed on exopodites of adults.)

Mandible (Figure 68*a*): Coxale endite broken off. Basale: endite with 1 trianid bristles with 3 pairs of spines proximal to terminal pair, 2 dwarf bristles, 1 glandular peg, and 2 spinous end-bristles; dorsal margin with 2 long terminal bristles. Exopodite almost as long as dorsal margin of 1st endopodial joint,

with 2 small terminal bristles. 1st endopodial joint with 2 long ventral bristles (one with long spines); 2nd endopodial joint: dorsal margin with 2 stout bristles (possibly c- and d-bristles); lateral side near dorsal margin with long lateral bristle (possibly f-bristle) between those 2 stout bristles; medial side near dorsal margin with 2 short cleaning bristles adjacent to proximal stout c?-bristle, and 1 long bristle (possibly g-bristle) just distal to distal stout d?-bristle. 3rd endopodial joint with stout claw-like bristle and 4 slender ringed bristles.

Maxilla (Figure 68b): Epipodite obscured. Endites I and II each with 2 long bristles. Basale with short medial bristle near midlength and midheight and long, ventral, terminal bristle.

1st endopodial joint with short alpha-bristle and long beta-bristle. 2nd endopodial joint with long terminal bristle extending past beta-bristle.

Fifth Limb (Figures 67l, 68c): Well developed but with few ventral bristles on comb (Figure 67l).

Sixth Limb (Figures 67m,n, 68c): With stout bristle on posterior tip of skirt, but no endite or ventral bristles.

Seventh Limb: Absent.

Furca (Figure 68c,f): Each lamella with 3 claws: claw 1 separated from lamella by suture, remaining claws fused to lamella. Claws 1 and 2 with stout teeth along posterior edge (distal teeth longer); claw 3 with hairs or slender spines along posterior edge; claw 1 with distal hairs along anterior edge. Right lamella anterior to left by width of base of claw 1.

Bellonci Organ (Figure 67o): Elongate, with rounded tip.

Eyes: Lateral eye with black pigment and small obscured ommatidia (at least 10) (Figure 67g,j). Medial eye present (Figure 67o).

Lips (Figure 68d): Similar to those of A-1 male.

Copulatory Organ: Absent.

Posterior of Body (Figure 68c,e,f): Posterodorsal corner with stout spines (not shown on Figure 68f).

Gills (Figure 68e): Seven narrow gills on each side of body. Attachment of gills typical for genus.

Y-Sclerite (Figure 68c): Fused to girdle.

REMARKS.—The lengths of the two adult males described herein from South Andros Island and Stocking Island are 0.66 mm and 0.69 mm, respectively. Both are shorter than the length (0.80 mm) of the adult female from Exuma Sound and the length (0.72 mm) of the A-1 male from Stocking Island. The two adult males and the A-1 male in the present location are from blue holes and caves, whereas the adult female is from Exuma Sound. The males and females are interpreted to be conspecific herein, but further study of males and females from the same locality is warranted.

The sensory bristle of the A-1 male bears 1 short proximal filament and 6 terminal filaments. The adult female holotype is without a short proximal filament. The presence of a short proximal filament on the sensory bristle of the A-1 male is interpreted herein to be a juvenile character state.

Subfamily CYCLASTEROPINAE Poulsen, 1965

Tribe TETRALEBERIDINI Kornicker, 1981

Amboleberis Kornicker, 1981

TYPE SPECIES.—*Asterope americana* Müller, 1890.

COMPOSITION AND DISTRIBUTION.—Three species are referred to this genus: *A. americana* (Müller, 1890), *A. antyx* Kor-

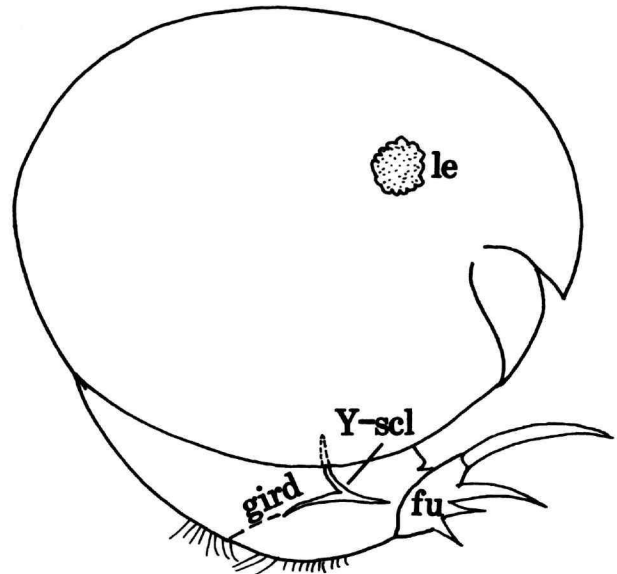


FIGURE 69.—*Amboleberis americana* (Müller, 1890), USNM 194584, instar I (sex unknown), complete specimen from right side, carapace length 0.76 mm.

nicker, 1981, and *A. cubensis* (Lalana and Kornicker, 1997). The genus is widespread in world oceans; depth ranges from surface to 53.5 m (Kornicker, 1981:167).

Amboleberis americana (Müller, 1890)

FIGURE 69

See Kornicker (1981b:168) for synonymy.

HOLOTYPE.—Present locality of specimen, if extant, unknown (Kornicker, 1981:168).

MATERIAL.—Rat Cay Blue Hole, Andros Island, 9 specimens. Crab Cay Cravasse, Exuma Cays, USNM 194584, 1 specimen.

DISTRIBUTION.—East Atlantic coast: South Carolina to Brazil. Bahamas: Rat Cay Blue Hole and Crab Cay Cravasse (herein). East Pacific: Costa Rica and Gulf of Panama. Gulf of Mexico: Florida and Texas. Depth range: surface to 53.5 m.

SUPPLEMENTARY DESCRIPTION OF INSTAR I (sex unknown).—Carapace ovoid with vertical ridge posterior to incisure (Figure 69).

Carapace Size (length, height in mm): USNM 194584, 0.76, 0.58.

Furca (Figure 69): Each lamella with 4 claws: claw 1 with suture at base, claws 2-4 without sutures.

Y-Sclerite and Girdle (Figure 69): Fused.

Appendix 1

Station Data With Specimens Examined

(in chronological order)

Inland Blue Holes

Sta 97-021, 5 Aug 1997, Mermaid's Lair, Grand Bahama Island; collected with plankton net from water column in 18–22 m depths.

Spelaeoecia parkeri: 1 specimen.

Sta 97-022, 6 Aug 1997, Mermaid's Lair, Grand Bahama Island; collected with individual vials and 93 mm mesh plankton net from halocline and below in 18–22 m depths.

Spelaeoecia parkeri: 1 specimen.

Sta 97-026, 24 Aug 1997, Stargate Blue Hole, South Andros Island; collected with plankton net, vials, and suction bottle from water column in 33–36 m depths of North Passage.

Deeveya bransoni: 4 specimens.

Spelaeoecia styx: 7 specimens.

Sta 97-028, 24 Aug 1997, Stargate Blue Hole (same collecting data as given above for Sta 97-026).

Deeveya bransoni: 3 specimens.

Sta 97-029, 26 Aug 1997, Stargate Blue Hole, South Andros Island; collected with plankton net and vials from water column in 33–39 m depths of South Passage.

Deeveya bransoni: 2 specimens.

Spelaeoecia styx: 3 specimens.

Oceanic Blue Holes

Sta 95-008, 18 May 1995, Angelfish Cave, Stocking Island, Exuma Cays, Bahamas; salinity 35 ppt; collected with suction bottle from outside the cave in 9 m water depth on a sandy ledge overlooking the cave entrance.

Cylindroleberidinae, genus and species indeterminate: 1 early instar.

Sta 95-010, 18 May 1995, Crab Cay Crevasse, Crab Cay, Exuma Cays, Bahamas; salinity 35 ppt; collected with plankton net from coarse sediment at 35 m depth about 100 m inside cave.

Skogsbergia lernerii: 2 specimens.

Eurypylus hapax: 3 specimens.

Junctichela pax: 17 specimens.

Rutiderma darbyi: 1 specimen.

Amboleberis americana: 1 specimen.

Sta 95-091, 5 Aug 1995, Sugar Cay Blue Hole, Sugar Cay, Exuma Cays, Bahamas; collected with plankton net from a silt mound on the wall of the cave passage in 31 m depth (Kornicker and Iliffe, 2000:94).

Harbansus paucichelatus: 3 specimens.

Eusarsiella merx: 5 specimens.

Eusarsiella spp. indet.: 2 instar IV (USNM 194558, 194580); 3 juveniles (USNM 194628).

Sta 96-030, 9 Sep 1996, Mystery Cave, Stocking Island, Exuma Cays, Bahamas; collected with plankton net from sandy bottom and walls in 50 m depth (Kornicker and Iliffe, 2000:94).

Synasterope browni: 3 specimens.

Sta 96-031, 9 Sep 1996, Master Harbour Cave, Great Exuma Island, Exuma Cays, Bahamas; collected with plankton net from surface of a silt mound in 12–15 m depth.

Skogsbergia lernerii: 2 specimens.

Cylindroleberidinae (genus and species indeterminate): 1 instar I.

Sta 96-040, 6 Apr 1996, Conch Sound Blue Hole, Andros Island, Bahamas; collected with plankton net from surface of silt mound in 22 m depth (Kornicker and Iliffe, 2000:94).

Harbansus paucichelatus: 11 specimens.

Eusarsiella sp. indet.: 1 instar I.

Sta 97-023, month and day unknown, 1997, Four Shark Cave, South Andros Island; collected by divers with a plankton net tow from the water column and silt on ledges at 27–33 m depth in the back section of the cavern.

Skogsbergia lernerii: 1 specimen.

Eusarsiella ryanae: 11 specimens.

Synasterope browni: 1 specimen.

Rat Cay Blue Hole, Andros Island, 1981, 1982; collected with plankton net about 1.5 m from walls of the cave in about 5 m depth while current flowed out of hole. Species marked by * are from Warner and Moore (1984, table 1) (those species were identified by Kornicker (1983, in litt.) and were returned to The Natural History Museum, London.

*Skogsbergia lernerii**: 2 specimens.

Eusarsiella warneri: 1 specimen.

*Amboleberis americana**: 9 specimens.

*Actinoseta chelisparsa**: 1 specimen.

*Asteropella monambon**: 1 specimen.

Appendix 2

(Number of filaments on c-, f-, and g-bristles of the first antennae of males and females of selected species of Cy lindroleberidinae, and carapace length of adult males. (L=carapace length of adult male in mm; nd=no data; S= bristle relatively short; -=females unknown; +=distal part of bristle missing and number of missing additional filaments unknown; number of filaments may or may not include tip of bristle.)

Species	L (mm)	Males			Females			Source
		No. filaments			No. filaments			
		c-	f-	g-	c-	f-	g-	
<i>Archasterope efficax</i>	2.60	41+	32+	7+	9	5	6	Kornicker and Poore, 1996:143
<i>Cylindroleberis bacescui</i>	2.02	35+	33	9	5	5	5	Kornicker and Caraion, 1974:29
<i>Cylindroleberis kliei</i>	1.95	25	25	6	4	5	4	Kornicker, 1976:2
<i>Cylindroleberis nodulifera</i>	1.43	24	28	6	-	-	-	Poulsen, 1965:391
<i>Diasterope bisetosa</i>	1.17	25	25	nd	-	-	-	Poulsen, 1965:356
<i>Diasterope grisea</i>	2.68	40	37	10	7	6	7	Kornicker, 1975:391
<i>Empoulsenia weddellensis</i>	3.36	36	34	6	-	-	-	Kornicker, 1975:516
<i>Heptonema latex</i>	1.31	25	25	9	5	4	5	Kornicker, 1992:172
<i>Heptonema latum</i>	2.02	25	25	10	10	6	6	Kornicker, 1986b:54
<i>Homasterope curta</i>	1.61	20	18	8	5	4	5	Skogsberg, 1920:498
<i>Homasterope maccaini</i>	1.71	19	18	9	6	5	6	Kornicker, 1975:529
<i>Homasterope trebax</i>	1.49	15+	15+	7	5	4	4+	Kornicker and Poore, 1996:120
<i>Parasterope beta</i>	1.73	33	29	8	5	5	3+	Kornicker, 1976:11
<i>Parasterope corrugata</i>	1.43	30	25	5	-	-	-	Poulsen, 1965:391
<i>Parasterope extrachelata</i>	1.73	19	20	9	nd	nd	nd	Kornicker, 1986:28
<i>Parasterope hulingsi</i>	1.62	19	19	8	7	5	6	Kornicker, 1986b:40
<i>Parasterope kappa</i>	1.02	3+	3+	nd	5	4+	5	Kornicker, 1976:18
<i>Parasterope muelleri</i>	1.20	25	25	4	5	5	5	Poulsen, 1965:370
<i>Parasterope muelleri</i>	1.47	27	24	9	6	5	6	Kornicker, 1986b:20
<i>Parasterope nana</i>	1.26	30	30	5	4	3	3	Poulsen, 1965:396
<i>Parasterope pollex</i>	1.27	20	18+	9	6	5	6	Kornicker, 1986b:32
<i>Parasterope proluxa</i>	1.28	16	14	10	6	5	6	Kornicker, 1975:439
<i>Parasterope styx</i>	2.44	33+	33+	10	6+	4+	4+	Kornicker, 1989:90
<i>Parasterope whatleyi</i>	1.41	14S	8S	9	5	3+	6	Kornicker and Poore, 1996:115
<i>Parasterope zeta</i>	1.38	19	17	9	7	5	5	Kornicker, 1986b:47
<i>Postasterope abaco</i>	1.51	27	25	9	-	-	-	Kornicker, 1986b:105
<i>Postasterope messingi</i>	1.18	15+	17+	7	6	5	7	Kornicker, 1986b:101
<i>Prionotoleberis norvegica</i>	2.42	33	34	nd	5	6	7	Skogsberg, 1920:527
<i>Prionotoleberis salomani</i>	1.84	36+	37+	9	8	5	9	Kornicker, 1986b:89
<i>Skogsbergiella macrothrix</i>	2.07	19	10?	10	7+	6	6+	Kornicker, 1975:481
<i>Skogsbergiella plocus</i>	2.30	35	33	10	7	6	7	Kornicker, 1975:489
<i>Synasterope bensoni</i>	1.14	7+S	4S	6	5	4	5	Kornicker and Caraion, 1974:23
<i>Synasterope browni</i>	0.66	6S	5S	5	4	3	4	Kornicker and Iliffe, 2000:72; herein
<i>Synasterope calix</i>	1.43	22+	21+	9	5	5	4+	Kornicker, 1992:194
<i>Synasterope cushmani</i>	1.84	24	20	8	6	4	5	Kornicker, 1974:11
<i>Synasterope dimorpha</i>	2.14	33	28	10	7	5	10	Kornicker, 1975:445
<i>Synasterope hirpex</i>	1.80	18	18	6	5	4	5	Kornicker, 1989b:105
<i>Synasterope implumis</i>	1.33	18	20	nd	4	2	2	Poulsen, 1965:421
<i>Synasterope mystax</i>	2.97	28+	25+	10	4+	3+	5	Kornicker, 1975:461
<i>Synasterope oculata</i>	1.51	22	23	6	-	-	-	Poulsen, 1965:413
<i>Synasterope oculata</i>	1.36	25	24	nd	-	-	-	Skogsberg, 1920:523
<i>Synasterope phalanx</i>	2.19	25	25	8	-	-	-	Kornicker, 1989a:102
<i>Synasterope quadrisetosa</i>	1.71	28	26	5	-	-	-	Poulsen, 1965:410
<i>Xandarasterope trux</i>	1.70	10S	6S	8	8	5	7	Kornicker and Poore, 1996:131

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