



Myodocopid Ostracoda of
Enewetak and Bikini Atolls

LOUIS S. KORNICKER

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ABSTRACT

Kornicker, Louis S. Mydocopid Ostracoda of Enewetak and Bikini Atolls. *Smithsonian Contributions to Zoology*, number 505, 140 pages, 71 figures, 7 tables, 1991.—Samples collected at Bikini Atoll in 1946 and at Enewetak Atoll in 1969 and 1979, mainly in benthic traps and bottom trawl samples, contained a diverse assortment of mydocopid ostracodes: 17 species (3 described previously, 12 new, and 2 left in open nomenclature) in 15 genera (2 new). Keys are supplied for genera in the Sarsiellinae and to species in 3 genera. Three species from Enewetak Atoll were previously known from either Hawaii, Fiji, or the Philippine Islands. Of the 15 genera collected at Enewetak and Bikini atolls, 7 are world-wide, 6 are known primarily from the Indo-West Pacific Region, and 2 are known only from the atolls. The juveniles as well as the adults are described for the new species *Cypridina spina* and *C. spinula*, and it is determined that each has 6 stages including the adult.

A table is presented listing the number of pectinate teeth comprising the main tooth of the 5th limb of species of Cypridinidae for which this character is known; the number of teeth on the adult 5th limb ranges from 3 to 7, and about 90% of the species have 6. For those species having 6 pectinate teeth on the adult 1 tooth is added on each succeeding instar starting with instar I, information useful for identifying the age of instars.

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Contents

	<i>Page</i>
Introduction	1
Biogeographic Comparisons	1
Distribution of Myodocopids at Enewetak Atoll	1
Abbreviations	2
Acknowledgments	2
CYPRIDINIDAE Baird, 1850	2
The Fifth Limb of the CYPRIDINIDAE	3
Number of Instars in the CYPRIDINIDAE	4
CYPRIDININAE Baird, 1850	4
CYPRIDININI Baird, 1850	5
<i>Paravargula</i> Cohen and Kornicker, 1975	5
Key to the Species of <i>Paravargula</i>	5
<i>Paravargula digitata</i> Kornicker, 1970	5
<i>Paravargula trifax</i> , new species	6
<i>Skogsbergia</i> Kornicker, 1974	11
Key to the Species of <i>Skogsbergia</i>	12
<i>Skogsbergia strophinx</i> , new species	12
<i>Cypridinodes</i> Brady, 1902	17
<i>Cypridinodes plax</i> , new species	18
<i>Codonocera</i> Brady, 1902	23
<i>Codonocera</i> species A	24
<i>Cypridina</i> Milne-Edwards, 1840	27
<i>Cypridina dentata</i> (Müller, 1906)	29
<i>Cypridina spina</i> , new species	35
<i>Cypridina spinula</i> , new species	56
PHILOMEDIDAE Müller, 1906	74
PSEUDOPHILOMEDINAE Kornicker, 1967	74
<i>Harbansus</i> Kornicker, 1978	74
<i>Harbansus vix</i> , new species	74
RUTIDERMATIDAE Brady and Norman, 1896	78
<i>Rutiderma</i> Brady and Norman, 1896	78
<i>Rutiderma vox</i> , new species	78
SARSIELLIDAE Brady and Norman, 1896	84
SARSIELLINAE Brady and Norman, 1896	84
Key to the Genera of SARSIELLINAE	85
<i>Ancohenia</i> Kornicker, 1976	85
<i>Ancohenia robusta</i> (Brady, 1890)	85
<i>Eusarsiella</i> Cohen and Kornicker, 1975	92
<i>Eusarsiella chessi</i> , new species	92
<i>Anscottiella</i> Kornicker, 1975	98
<i>Anscottiella vertex</i> , new species	98
<i>Metasarsiella</i> , new genus	104
<i>Metasarsiella vibex</i> , new species	105
CYLINDROLEBERIDIDAE Müller, 1906	109
CYLINDROLEBERIDINAE Müller, 1906	109
<i>Cylindroleberis</i> Brady, 1868	110

Key to the Species of <i>Cylindroleberis</i>	110
<i>Cylindroleberis variabilis</i> Kornicker, 1970	111
<i>Heptonema</i> Cohen and Kornicker, 1975	117
Key to the Species of <i>Heptonema</i>	118
<i>Heptonema homelix</i> , new species	118
<i>Monoasterope</i> , new genus	124
<i>Monoasterope bex</i> , new species	125
CYCLASTEROPINAE Poulsen, 1965	129
CYCLOLEBERIDINI Hartmann, 1974	129
<i>Leuroleberis</i> Kornicker, 1981	129
<i>Leuroleberis</i> species A	129
Appendix 1: Station Data with Specimens Collected	133
Appendix 2: Number of Cuspate Teeth on the Main Tooth of the Fifth Limb of Selected Species of the CYPRIDINIDAE	135
Literature Cited	138

Myodocopid Ostracoda of Enewetak and Bikini Atolls

Louis S. Kornicker

Introduction

Enewetak and Bikini atolls form part of the Marshall Islands in the northwest Pacific Ocean. The present work was stimulated by a request from Dennis M. Devaney and Beatrice L. Burch, Bernice P. Bishop Museum, Honolulu, Hawaii, to contribute a paper on myodocopid ostracodes for a planned book on the natural history of Enewetak Atoll, which has since been published (Devaney et al., editors, 1987). My contribution to that book identified and illustrated some of the myodocopid genera collected on Enewetak Atoll in 1969 and 1979 (Kornicker, 1987b); the taxa are described more completely herein. In addition, a small collection (5 specimens) from Bikini Atoll in 1946 contained a new species, which is also described herein. Although the collections studied are small (129 specimens), they have a diverse assortment of myodocopids comprising 17 species (3 described previously, 12 new, and 2 left in open nomenclature) in 15 genera (2 new). Keys are supplied for some genera and species, and the ontogenies of 2 species of *Cypridina* are elucidated. Although not collected at either Enewetak or Bikini atolls, a supplementary description is presented of *Paravargula digitata* Kornicker, 1970b, based on the holotype from the Philippine Islands.

BIOGEOGRAPHIC COMPARISONS.—The genera *Skogsbergia*, *Harbansus*, *Rutiderma*, *Eusarsiella*, *Leuroleberis*, *Cylindroleberis*, and *Heptonema* are circumglobal in distribution, but have not been reported from the Arctic Ocean and Antarctic waters.

The pelagic genus *Cypridina* is primarily Indo-Pacific.

Cypridinodes has been collected in the Indo-West Pacific region.

Paravargula has previously been collected off the tip of South Africa and from the East-Indian region (Poulsen, 1962:204; Kornicker, 1975:3).

Codonocera has been collected previously in Indo-Pacific

and Australasian waters (McKenzie, 1967:221).

Anscottiella has previously been collected off Ceylon and Thailand (Poulsen, 1965:65; Kornicker, 1975:607; Kornicker and McKenzie, 1976:348) and Australia (Hall, 1987:760).

Ancohenia has previously been collected from Hawaii (Kornicker, 1976b:7), Fiji (Kornicker, 1981a:12), and Rangiroa Atoll, South Pacific (Hartmann, 1984:122).

Two genera, *Metasarsiella* and *Monoasterope*, are known only from Enewetak Atoll, but probably occur elsewhere on Pacific islands.

At the specific level, only 3 species at Enewetak have been reported elsewhere, *Ancohenia robusta* from Fiji, *Cylindroleberis variabilis*, from the Philippine Islands, and *Cypridina dentata*, from the Malayan Archipelago.

DISTRIBUTION OF MYODOCOPIDS AT ENEWETAK ATOLL.—Most specimens from Enewetak were collected in 1979 by James R. Chess and Edmund S. Hobson during a study of diel movements of zooplankton (Hobson and Chess, 1986). Their investigation showed that many zooplankton, including myodocopid ostracodes, leave the substrate to enter the water column primarily at night (Hobson and Chess, 1986, tables 1, 3). Collections were made during day and night by placing a trap (covering about 1 square meter at its base) over substrates of sand, coral reef, and coral rubble in the vicinity of 2 stations (A and B) on the windward lagoon shelf at Enewetak Atoll (Hobson and Chess, 1986, fig. 1). (Details concerning trap construction are in Hobson and Chess (1979, fig. 1).) According to Hobson and Chess (1986:10), the coral rubble substrate actually comprised both rubble and sand, and the reef substrate comprised coral, coral rubble, and sand. Trawl samples also were collected above the stations. With the possible exception of 1 composite sample (see Appendix 1), all ostracodes received by me from that study had been collected at night.

The number of myodocopid ostracodes collected in the nocturnal traps varied from 4 to 14, and each trap captured 2 to 4 species (Table 1). The total number of species in 6 samples from the traps is 10. A nocturnal trawl drawn through the water for about 10 minutes above the traps captured 34 specimens (12

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TABLE 1.—Distribution of myodocopid ostracodes collected at night, in 1979, over substrates of sand, coral reef, and coral rubble, on a lagoon shelf at Enewetak Atoll, in six emergent traps at stations A and B, and in one midwater trawl above the stations.

Species	Sta A, Trap 6 25 May Intermittent current		Sta B, Trap 7 26 May No current		Sta B, Trap 10 30 May No current		Trawl 22 May
	Sand	Coral reef	Coral reef	Coral rubble	Coral rubble	Coral reef	
	<i>Codonocera</i> species	0	0	0	0	0	0
<i>Cypridina dentata</i>	0	0	0	0	3	0	1
<i>Cypridina spina</i>	0	4	6	0	0	11	6
<i>Cypridina spinula</i>	11	0	0	4	0	0	13
<i>Paravargula trifax</i>	0	1	0	0	0	0	0
<i>Skogsbergia strophinx</i>	0	0	0	7	1	3	1
<i>Ancohenia robusta</i>	0	0	0	1	0	0	1
<i>Anscottiella vertex</i>	0	1	1	0	0	0	1
<i>Eusarsiella chessi</i>	0	0	0	0	0	0	1
<i>Rutiderma vox</i>	1	0	0	0	0	0	5
<i>Cylindroleberis variabilis</i>	0	0	0	1	0	0	2
<i>Heptonema homelix</i>	0	1	0	0	0	0	1
<i>Leuroleberis</i> sp. A	0	0	0	0	0	0	1

species). The distributions of species from the traps over sand, reef, and coral rubble substrates are compared in Table 1, but the number of specimens is too few to draw conclusions concerning substrate preferences. The data suggest that *Cypridina spinula* prefers sand and coral-rubble substrates, whereas *C. spina* prefers a reef habitat.

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

The following abbreviations are used in illustrations:

a.m.	central adductor muscle attachments
ant.	antenna
a.p.	anterior process
B.O.	Bellonci organ
c.o.	copulatory organ
e	valve edge
endop	endopodite
epip	epipodite
esoph	esophagus
exop	exopodite
gen	genitalia
gl.o.	glandular opening of upper lip
g.o.	genital organ
i.m.	inner margin of infold
l.b.	lateral bristle on mandible
l.e.	lateral eye
l.l. or l.lip	lower lip
l.p.	lamellar prolongation of selvage or list
md.	mandible
m.e.	medial eye
m.s.	main spine of mandibular coxale endite
mx.	maxilla

s.	selvage
sens	sensory bristle of 5th joint of 1st antenna
s.v.	seminal vesicle
u.l.	upper lip
v.	valve

ACKNOWLEDGMENTS.—I thank the following individuals for their help: James R. Chess (Southwest Fisheries Center, Tiburon Laboratory) and C. Allen Child (Smithsonian Institution) for supplying the specimens from Enewetak; Anne C. Cohen (University of California, Los Angeles) for supplying information on a species and reviewing the manuscript; Carolyn Gast (Smithsonian Institution) for rendering the shaded drawings of the carapaces; Kathryn Schroeder Brown and Jack Schroeder (Jack Schroeder Associates) for assisting in preparation and inking of appendage drawings; I.G. Sohn (U.S. Geological Survey) and T.E. Bowman (Smithsonian Institution) for reviewing the manuscript; Elizabeth Harrison-Nelson (Smithsonian Institution) for general assistance; and Diane M. Tyler (Smithsonian Institution) for final editing and preparation of the manuscript for publication. Others participating in collecting at Enewetak and Bikini are acknowledged in Appendix 1.

CYPRIDINIDAE Baird, 1850

COMPOSITION.—This family includes 2 subfamilies: Cypridininae Baird, 1850, and Azygocypridininae Kornicker, 1970a. Only the former is in the collections from Enewetak.

DISTRIBUTION.—Circumglobal with depth range of intertidal to abyssal.

The Fifth Limb of the CYPRIDINIDAE

The structure of 5th limb of the Cypridinidae has been discussed by Skogsberg (1920:38, 184, 188) and Poulsen (1965:456). The limb is located just posterior to the maxilla. It is obliquely oriented resulting in the lateral side of the limb also being the anterior side, and the medial side also being the posterior side. In the present paper the sides of the limb are designated anterior and posterior, following Skogsberg (1920:188). The 1st exopodial joint bears the "main tooth," which comprises a short smooth or digitate proximal peg followed by 1 or more stout cusped teeth; if more than 1 cusped tooth is present, distal teeth are longer and stouter. The peg as well as the bases of the cusped teeth are on the posterior side of the joint where they face the mouth. Generally, the teeth

are visible for counting when the limb is viewed posterior side up when placed in a drop of glycerine on a slide, but for smaller specimens the teeth are seen best when mounted posterior side up on a slide under a cover-slip. The number of cusped teeth in cypridinids was discussed briefly by Cohen and Morin (1986:21). The number of teeth of additional species are listed in Appendix 2 herein. The list is based on the literature as well as the present study, but species are not listed if the limb was described as "typical of family," or with similar words, unless it is clear from the description that the limb had been examined in detail; the literature search started with Skogsberg (1920), because little attention was given to the main tooth before then.

The number of cusped teeth comprising the main tooth of adults of members of the Cypridinidae varies from 3 to 7 (Table 2, Appendix 2). Most of the data in Appendix 2 are from only

TABLE 2.—Number of species in genera having 3–7 pectinate teeth on the main tooth of the 5th limb of adults. (M = male, and is used if only adult male of species is known and it has less than 6 pectinate teeth, or when both sexes are known and male has fewer teeth than female; data from Appendix 2.)

Taxon	Number of species				
	3 teeth	4 teeth	5 teeth	6 teeth	7 teeth
AZYGOCYPRIDININAE					
<i>Azygocypridina</i>	0	0	2	4	0
<i>Isocypridina</i>	0	0	0	1	0
CYPRIDININAE					
CYPRIDININI					
<i>Amphisiphonostrea</i>	0	0	0	1	0
<i>Bathyvargula</i>	0	0	0	1	0
<i>Codonocera</i>	0	1	3	5	0
<i>Cypridina</i>	0	0	0	7	0
<i>Cypridinodes</i>	0	0	0	6	0
<i>Doloria</i>	0	0	0	7	0
<i>Hadacypridina</i>	0	0	0	2	0
<i>Macrocypridina</i>	0	0	0	2	0
<i>Melavargula</i>	0	0	0	2	0
<i>Metavargula</i>	0	0	3	5	0
<i>Monopia</i>	0	0	0	1	0
<i>Paracypridina</i>	0	0	0	2	0
<i>Paradoloria</i>	0	0	1M	5	0
<i>Paravargula</i>	0	1*	1*	3	0
<i>Pterocypridina</i>	1M	1	1	2	0
<i>Rheina</i>	0	0	0	1	0
<i>Rugosidoloria</i>	0	0	1	0	0
<i>Sheina</i>	0	1M	0	0	0
<i>Siphonostrea</i>	0	0	1	1	0
<i>Skogsbergia</i>	0	0	0	9	0
<i>Vargula</i>	1	0	1	21	1
GIGANTOCYPRIDINI					
<i>Gigantocypris</i>	0	0	0	3	0
Total	2	4	12	91	1

**Paravargula nanipollex* has either 4 or 5 pectinate teeth.

a few specimens of each species so that the intraspecific variability in the number of teeth of many species is unknown. The presence of 6 cusate teeth on the adult of all 7 species of *Cypridina* on the list suggests little intraspecific or interspecific variability in this character, at least for species of that genus. Eight species of *Skogsbergia* listed in Appendix 2 also have 6 cusate teeth suggesting that 6 teeth is the usual number for the genus. Most of the species in the 23 genera listed in Appendix 2 have 6 cusate teeth, and the remaining species have 3, 4, 5, or 7. Clearly, 6 cusate teeth is the more common number among the Cypridinidae. As shown in Appendix 2 and Table 2, adults of species of Azygocypridininae have 5 or 6 cusate teeth, species of Cypridinini have 3 to 7, and species of Gigantocypridini have 6. In some genera such as *Cypridina*, *Skogsbergia*, and *Gigantocypris*, the number of cusate teeth are fairly constant (6 teeth); whereas, in others such as *Codonocera* the interspecific variability is greater (4–6 teeth). Generally, the male and female have the same number of teeth, but on at least 1 species, *Pterocypridina sex*, the adult male has 3 teeth and the adult female 4. The number of cusate teeth on instar I is known for only 10 species, all having only 1 cusate tooth; the tooth, which has been described for only a few species, is more complex than teeth of later instars.

Number of Instars in the CYPRIDINIDAE

Cohen (1983:235) reared *Skogsbergia leneri* in aquaria and observed the species to have 6 stages including 1 for the adult. Other ontogenetic studies have been based on preserved specimens and as a result are probably more subjective. Based on the ontogenetic studies of Poulsen (1962:126), Hiruta (1980:145), Kornicker and Iliffe (1989a:19), Kornicker (1989:65), and the work herein, the following species also have 6 stages: *Azygocypridina imperialis*, *Macrocypridina castanea*, *Vargula hilgendorffii*, *Skogsbergia galapagensis*, *Cypridina spina*, and *C. spinula*. Poulsen (1962:126) concluded that *Macrocypridina castanea* has more than 1 adult stage, but the appendages are similar in all adult stages. Poulsen (1962:116) concluded that species of *Gigantocypris* have 6 juvenile instars and more than 1 adult instar, but according to Fenwick (1984:285) there is insufficient evidence in the data of Poulsen for concluding that post-adult molting takes place in the genus *Gigantocypris*.

What is the evidence for *Gigantocypris* having 6 juvenile instars? Poulson (1962:22, 85) had in his collection 50 specimens of *G. agassizi* Müller, 1895, and 69 specimens of *G. danae* Poulsen, 1962, but instars of stage VI were not present (although Poulsen (1962:54) states that instar VI of *G. agassizi* was not present in the material, 13 specimens are listed in his table 4, p. 34). Poulsen (1962:57) had 135 specimens of *G. muelleri* Skogsberg, 1920, including several specimens identified as juvenile instar VI. At the end of his description of the species Poulsen (1962:83) states: "The differences between the 5th and 6th stages are not great, mainly restricted to an increase

in the number of spines on the forepart of the shell and the number of short knife-formed bristles on the 2nd endopodite joint of the mandible, and to the further development of the copulatory limbs, especially of the large main spine of the outer lobe. However, the growth between the two stages is fairly large, for the males from 9 mm in the 5th to 11 mm in the 6th." Based on Poulsen's descriptions, certain similarities between the morphology of the 5th and 6th instars suggest that they should be combined as a single instar: (1) both instars have 5 cusate teeth on the 5th limb; (2) the endopodite of the male 2nd antenna of both instars have the same number of bristles (however, the long bristle of the 3rd joint is closer to midlength on instar VI, which may indicate that the instar is older); (3) the number of furcal claws is the same for both instars; and (4) the length of the male copulatory organ is 9% of shell length in both instars (Poulsen, 1962, table 10). Although the data are conflicting, I believe additional information is necessary before a conclusion can be drawn that species of *Gigantocypris* have 6 juvenile instars. Therefore, I have listed *Gigantocypris* as having 5 juvenile instars in Appendix 2. Incidentally, if as suggested here, instar VI should be combined with instar V, the case for post-adult molting in *Gigantocypris* is further weakened, because it is based on comparing variance (Kornicker, 1975:687) and coefficient of variation (Fenwick, 1984:285) of carapace length of adult and penultimate females; if instars V and VI are combined the variation in carapace length of the penultimate instar is increased.

For species having 6 cusate teeth on the main tooth of the adult 5th limb, the number of teeth are increased by 1 on each succeeding stage, starting with 1 tooth on instar I (Appendix 2). Thus, the number of teeth on a specimen of such a species may be useful in identifying the age of an instar; for example, Poulsen (1962:244) used the presence of 5 teeth on a specimen of *Pterocypridina birostrata* to identify the specimen as the last larval stage. However, caution must be used in an identification, and supporting information should be sought.

The ontogeny has not been studied in any cypridinid species having fewer than 6 cusate teeth on the main tooth of the adult 5th limb. It is probable that instar I of such species has a single tooth, because it would be necessary for masticating food, but it is not known whether these species have fewer instars than species with 6 teeth on the adult, or have the same number of instars but with teeth added more slowly. In Appendix 2 I list all species as having 5 juvenile stages, but additional studies probably will reveal some species having a different number.

CYPRIDININAE Baird, 1850

COMPOSITION.—This subfamily includes 2 tribes: Cypridinini Baird, 1850, and Gigantocypridinini Hartmann, 1974. Only the former is in the collections from Enewetak.

DISTRIBUTION.—Same as for family.

CYPRIDININI Baird, 1850

COMPOSITION.—This tribe includes 20 genera of which 5 are in the collections from Enewetak and Bikini: *Paravargula*, *Skogsbergia*, *Cypridina*, *Cypridinodes*, and *Codonocera*.

DISTRIBUTION.—Same as for family.

Paravargula Cohen and Kornicker, 1975

Paravargula Poulsen, 1962:202 [nomen nudum].

Paravargula Cohen and Kornicker, 1975:23 [designated type species].

TYPE SPECIES.—*Paravargula ensifera* Poulsen, 1962:209, by subsequent designation (Cohen and Kornicker, 1975:23).

COMPOSITION.—This genus includes 6 species including a new species described herein.

DISTRIBUTION.—*Paravargula ensifera* Poulsen, 1962, has been collected in the vicinity of the Philippines, Singapore, and the Kei Islands; *P. hirsuta* (Müller, 1906) has been collected in the East Indian region; *P. arborea* (Müller, 1908) has been collected in the vicinity of South Africa; *P. nanipollex* Kornicker, 1970b, and *P. digitata*, Kornicker, 1970b, have been collected in the Philippines; *P. trifax* was collected at Enewetak. Known depth range about 3–800 m.

REMARKS.—Because of morphological differences between the adult female of *P. trifax*, a new species from Enewetak, and the description of the juvenile male holotype of *P. digitata* from the Philippines (Kornicker, 1970b:6), the holotype of the latter was reexamined, and a supplementary description is presented below.

Key to the Species of *Paravargula*

- 1. Second claw of furca nonarticulated 2
- Second claw of furca articulated 5
- 2. Incisur shallow *P. hirsuta*
- Incisur deep 3
- 3. Bristle of 2nd exopodial joint of 2nd antenna with proximal hairs
- *P. trifax*, new species
- Bristle of 2nd exopodial joint of 2nd antenna without proximal hairs 4
- 4. Upper lip with unpaired rectangular anterior process *P. digitata*
- Upper lip with low ridge forming anterior unpaired part *P. ensifera*
- 5. Caudal process narrow *P. nanipollex*
- Caudal process elongate *P. arborea*

Paravargula digitata Kornicker, 1970

FIGURE 1

Paravargula digitata Kornicker, 1970b:6, figs. 4–6.

HOLOTYPE.—USNM 125539, 1 A-1 male on 2 slides and in alcohol.

TYPE LOCALITY.—Tawi-Tawi, Sulu Archipelago, Philippines.

DISTRIBUTION.—Balimbing Point, Tawi-Tawi, Sulu Archipelago, Philippines, depth 1 or 2 m (type locality).

SUPPLEMENTARY DESCRIPTION OF A-1 MALE HOLOTYPE (Figure 1).—Infold of carapace with several minute bristles in “pocket” of caudal process.

Second Antenna: Kornicker (1970a:9) stated that bristles of exopodial joints 2–8 have natatory hairs; it should have been joints 3–8.

Mandible: 3 claws of 3rd endopodial joint with marginal teeth.

Sixth Limb (Figure 1a): 1 terminal bristle of endites II and III short. End joint having distal margin with spinules forming

lateral row along margin except in vicinity of 4 anterior and 2 posterior bristles; medial surface hirsute; distal margin with 13 or 14 bristles (both limbs with 2 bristles with bases on lateral surface near anterior end with short marginal spines, then margin with 2 long anterior bristles with long proximal and short distal spines, followed by 1 short bristle with short marginal spines; then left limb with 3 bristles with long proximal and short distal spines, and right limb with 1 long bristle with long proximal and short distal spines, 1 bristle with short marginal spines, 2 bristles with long proximal and short distal spines; then both limbs with short space followed by 3 bristles with long proximal and short distal spines, and 2 long hirsute posterior bristles).

Seventh Limb (Figure 1b): Comb and jaw of limb illustrated.

Lateral Eye: With black pigment between ommatidia.

Upper Lip (Figure 1c): Anterior unpaired part consisting of thin projecting rectangular process, transparent except for short posterior part along posterior edge that bears internal amber-colored granules (transparent part of rectangular process with 4 truncate processes (glandular openings?); short granule-bearing part with similar truncate process). Paired posterior part with

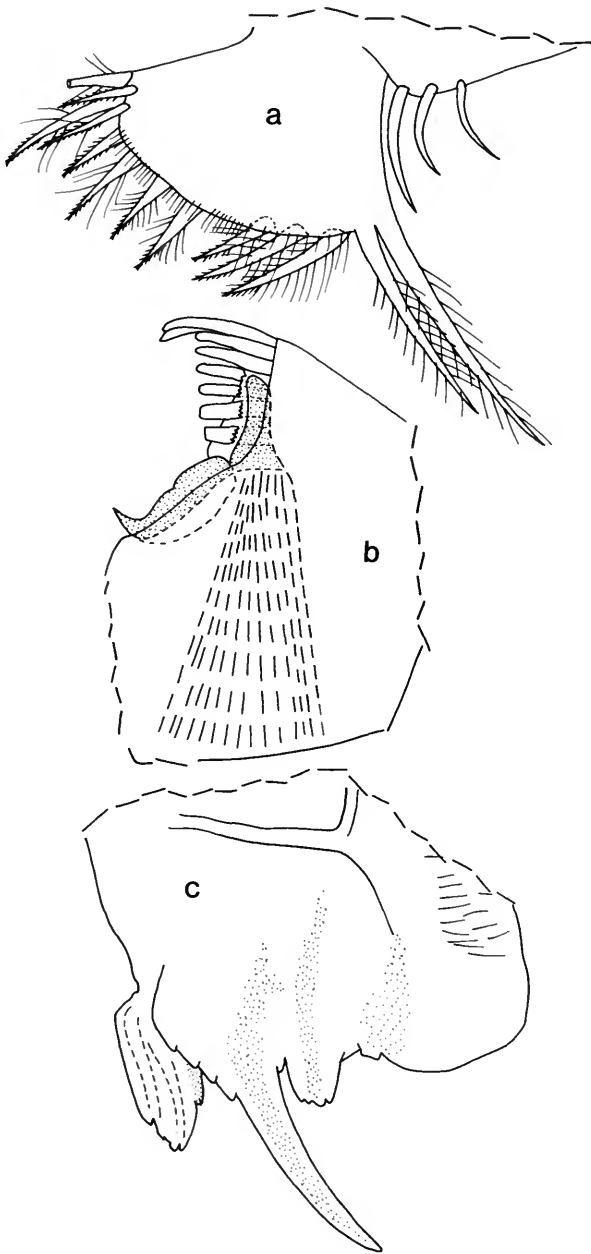


FIGURE 1.—*Paravargula digitata* Kornicker, USNM 125539, holotype, A-1 male: a, left 6th limb, lateral view (endites not shown); b, tip of 7th limb; c, upper lip, anterior to left.

long slender tusk (with 4 step-like proximal processes (glandular openings?) along anterior margin); then 2 short tusks (anterior of short tusks with about 4 glandular openings, posterior short tusk smaller and with 1 glandular opening).

Rounded surface between tusks and mouth hirsute.

Pigmentation: Carapace, body, and appendages without black pigment.

Paravargula trifax, new species

FIGURES 2-4

Paravargula sp. Kornicker, 1987b:217.

ETYMOLOGY.—From the Latin *trifax* (kind of spear).

HOLOTYPE.—USNM 158322, adult female on slide and in alcohol (unique).

TYPE LOCALITY.—Enewetak lagoon (holotype from sta A, plankton trap 6, night, coral reef substrate).

DISTRIBUTION.—Enewetak Atoll.

DESCRIPTION OF ADULT FEMALE (Figures 2-4).—Carapace with slightly convex posterodorsal curvature, deep incisur, and small but projecting caudal process; surface smooth (Figure 2a-c).

Structures on Infold: Rostrum with oblique list intersecting dorsal edge of incisur (Figure 2d). Narrow list with anterior end near valve edge ventral to incisur (Figure 2d), continuing along ventral infold, then almost joining lip slightly overhanging inner margin of infold anterior to caudal process, and then continuing along caudal process and posterior infold close to inner margin of infold, finally terminating at dorsal end of caudal process (Figure 2e); lip overhanging inner margin of infold just anterior to caudal process, then continuing along caudal process as a line between list and inner margin of infold (Figure 2e). A 2nd line present between list and edge of ridge forming anterior boundary of "pocket" of caudal process (Figure 2e).

Bristles of Infold: Rostral infold with 14 bristles forming row (including 3 bristles forming ventral end of row longer and bifurcate, others shorter and unbranched), 2 long bristles and 1 short bristle forming row just dorsal to oblique list, and 4 minute bristles near middle of infold (Figure 2d). 3 bristles on infold just posterior to inner end of incisur and pair of long bristles (longer of pair bifurcate) at inner end of incisur near valve edge. 2 small bristles on infold close to inner end of incisur. Anteroventral infold with short single bristle located inward from 4 long single bristles at valve edge anterior to list, and 7 minute divided bristles near midwidth of infold; anteroventral list and anterior part of ventral list with 42 bristles (2 anterior bristles bare and single, next 3 bristles bare and bifurcate, remaining bristles bifurcate with spines on longer branch); ventral list (extending from posterior of bifurcate spinous bristle on anteroventral list to valve midlength) with 4 widely separated slender bare bristles (these could be pore canals). Inner edge of lip overhanging inner margin of ventral infold anterior to caudal process with 2 widely separated minute bristles (only posterior of these shown in Figure 2e). 1 small bristle present in triangular area at ventral end of caudal

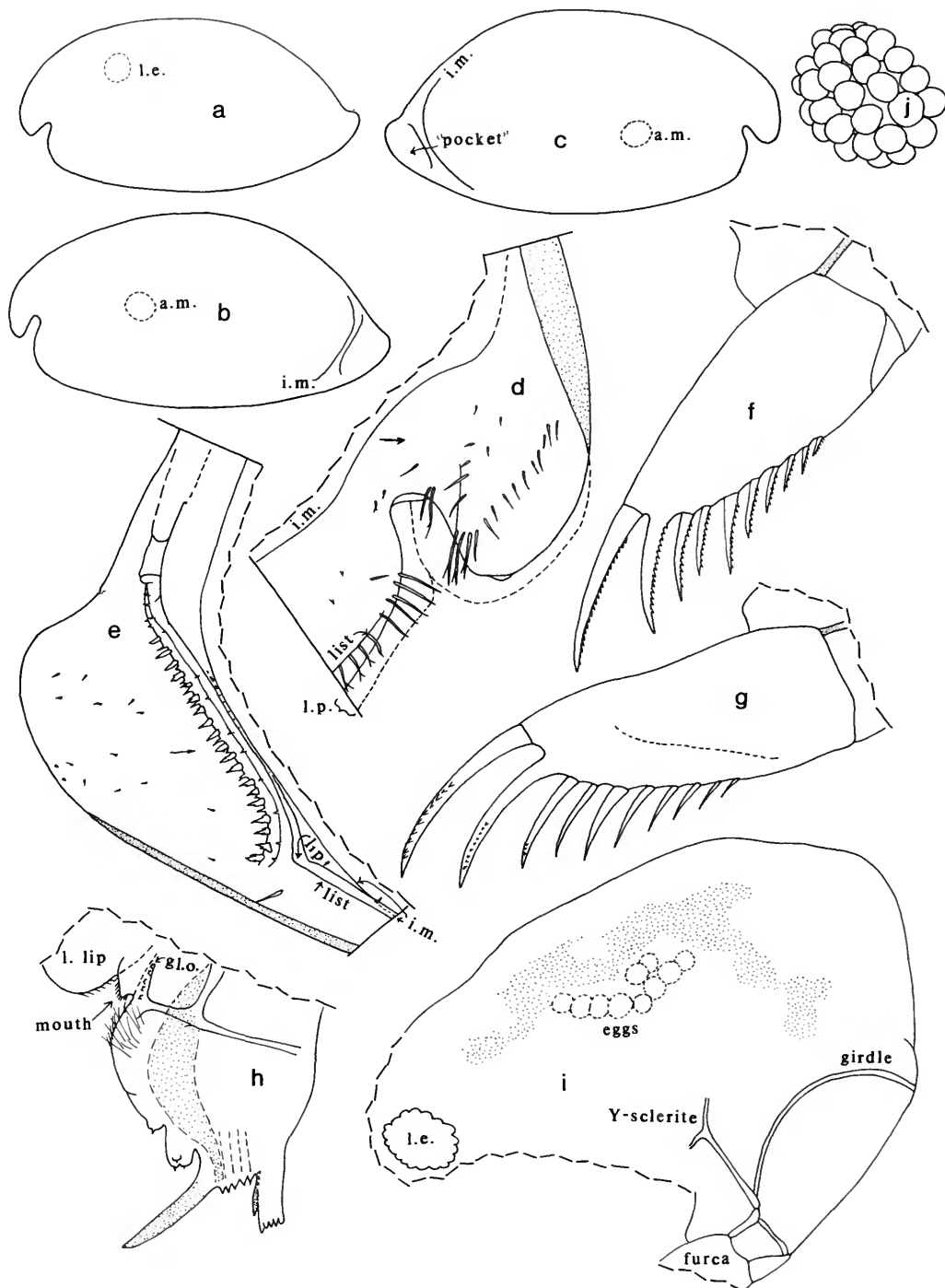


FIGURE 2.—*Paravargula trifax*, new species, USNM 158322, holotype, adult female: a, complete specimen from left side, length 2.44 mm; b, c, inner views of right and left valves, respectively, showing location of central adductor muscle attachments, inner margin of infold anterior to caudal process, and "pocket" of caudal process; d, inner view of anterior of left valve; e, inner view of caudal process of left valve; f, lateral view of left lamella of furca; g, medial view of right lamella of furca (only medial teeth of claws shown); h, upper lip, anterior to right; i, part of body showing outline of left lateral eye, proximal part of furca, Y-sclerite and girdle; j, left lateral eye.

process between outer edge of lip and inner margin of infold. 1 fairly long bristle at ventral end of caudal process at about infold midwidth (Figure 2e). Line just posterior to list on ridge anterior to pocket of caudal process with 12 minute bristles. Pocket of caudal process with about 13 minute bristles. Ridge forming anterior edge of pocket of caudal process with digitate processes forming 2 rows (Figure 2e): anterior row slightly medial to posterior row (latter on edge of ridge) and with about 17 digitate processes; posterior row with about 12 smaller digitate processes.

Selvage: Lamellar prolongation present along anterior and ventral margins, terminating posteriorly near ventral end of caudal process (Figure 2d); lamellar prolongation widest as well as narrowly striated in vicinity of incisur and divides at inner end of incisur. Double prolongation present along anterior half of ventral margin: inner layer about half width of outer and with serrate margin; outer layer minutely serrate near middle of ventral margin, smooth elsewhere.

Carapace Size: USNM 158322, length 2.44 mm, height 1.31 mm.

First Antenna (Figure 3a): 1st joint bare. 2nd joint with rows of spines. 3rd joint with short spinous ventral bristle and slightly longer subterminal dorsal bristle with few indistinct spines. 4th joint with short spinous ventral bristle and longer spinous dorsal bristle. 5th joint about half length of 4th joint; stout sensory bristle with 9 long filaments followed by 3 shorter slender filaments and 1 very small subterminal filament. 6th joint with short spinous medial bristle. 7th joint: a-bristle similar to bristle of 6th joint; b-bristle 3 times length of a-bristle, with 5 filaments (with marginal spines) followed by 2 spines; c-bristle about twice length of sensory bristle of 5th joint, with 9 filaments (with marginal spines) followed by 1 shorter subterminal filament. 8th joint: d- and e-bristles slightly shorter than sensory bristle of 5th joint, bare with blunt tips; f- and g-bristles similar to c-bristle, small spine near base of some filaments.

Second Antenna: Protopodite with small spinous medial distal bristle (Figure 3b). Endopodite 1-jointed (could be interpreted as having small 2nd joint with indistinct suture separating it from 1st joint), with 4 proximal bristles and 1 long terminal filament (latter could be interpreted to be on small 2nd joint) (Figure 3b). Exopodite 9-jointed; 1st joint with few spines along concave margin (not shown); bristle of 2nd joint reaching 8th joint, with about 7 ventral and few dorsal proximal hairs followed by ventral spines and short subterminal ringed part (Figure 3c); bristles of joints 3 and 4 with ventral hairs near midlength spine-like and shorter than proximal and distal hairs; bristles of joints 5–8 with natatory hairs, no spines; 9th joint with 4 bristles (short dorsal bristle with long hairs, and 3 long bristles with natatory hairs but no spines) and lateral spine about same length as joint; joints 3–8 with basal spines increasing in length on distal joints (spine of 8th joint more than twice length of 9th joint) (Figure 3d); joints 2–8 with minute spines forming row along distal margins.

Mandible (Figure 3e): Coxale endite spinous, with 2 stout

terminal spines with small peg between them; small bristle at base of endite (not shown); hairs at boundary between coxale and basale. Basale: dorsal margin with 3 ringed bristles (1 midlength and 2 subterminal); ventral margin with 3 a-bristles, 2 c-bristles with minute unringed peg just proximal to them, and 1 long d-bristle with long proximal and short distal spines (latter spines not shown). Exopodite about $\frac{2}{3}$ length of dorsal margin of 1st endopodial joint, hirsute with 2 subterminal bristles (distal shorter). 1st endopodial joint with 4 ventral bristles; 2nd endopodial joint with distal bristles forming 3 groups with 1, 1, and 2 unringed bristles (medial slightly longer than lateral); dorsal margin with 10 ringed bristles, 1 short unringed bristle with long marginal spines (base of bristle medial to 2nd ringed bristle), and 10 short unringed bare bristles; medial surface with indistinct spines forming rows (not shown). 3rd endopodial joint with 3 subequal claws (all with few teeth) and 4 ringed bristles.

Maxilla (Figure 4a,b): Endite I with 10 or 11 bristles; endite II with 7 bristles, endite III with 5 distal bristles and 1 short proximal bristle near base of exopodite. Coxale with dorsal fringe and 1 stout dorsal bristle with long spines along proximal $\frac{2}{3}$ and short indistinct distal spines. Basale with 1 long anterior bristle and 1 shorter, ventral, medial bristle (dashed in Figure 4a). Exopodite with hairs along outer margin, 2 terminal bristles and 1 shorter subterminal bristle (subterminal and outer terminal bristle with long proximal and short distal spines, other with short spines). 1st endopodial joint spinous, with triangular cutting tooth with slightly undulate outer edge, 2 ringed alpha-bristles (medial spinous, lateral bare), and 2 ringed beta-bristles (inner medial bare, outer lateral slightly longer and pectinate). 2nd endopodial joint with 4 bare ringed a-bristles, 3 b-bristles (anterior ringed, others unringed, claw-like, pectinate), 2 ringed pectinate c-bristles, and 3 pectinate claw-like d-bristles (posterior ringed distally, others unringed).

Fifth Limb (Figure 4c): Epipodite with 48–51 hirsute bristles. Endite I with 5 bristles; endite II with 6 bristles; endite III with 6 or 7 bristles (distal medial bristle stouter at base than other endite bristles and with long proximal spines and distal teeth). Protopodite with long slender anterior tooth with subterminal marginal tooth. 1st exopodial joint with 3 bristles in anterior group (all with long spines, inner stouter and pectinate) and 1 (with long spines) closer to tooth of protopodite; main tooth with 6 cusps, proximal peg (not shown), and 1 short bristle (with long proximal spines) proximal to peg (not shown). 2nd exopodial joint with 4 pectinate a-bristles, 3 pectinate ringed b'-bristles, and 4 pectinate ringed b"-bristles; posterior ringed c-bristle and anterior d-bristle with long proximal and short distal spines (d-bristle near 3rd joint). 3rd exopodial joint: inner lobe with 1 proximal bristle with long proximal and short distal spines, and 2 terminal bristles with short marginal spines; outer lobe hirsute, with 2 terminal bristles with long proximal and short distal spines. Fused 4th and 5th exopodial joints hirsute, with 4 bristles (1 bare, 1 with long proximal and short distal spines, 2



FIGURE 3.—*Paravargula trifax*, new species, USNM 158322, holotype, adult female: *a*, medial view of right 1st antenna (c-, d-, e-, f-, and g-bristles not shown); *b*, medial view of endopodite and part of protopodite of right 2nd antenna; *c*, *d*, lateral view of joints of left 2nd antenna (only bristle of 2nd joint shown); *e*, medial view of left mandible; *f*, genitalia.

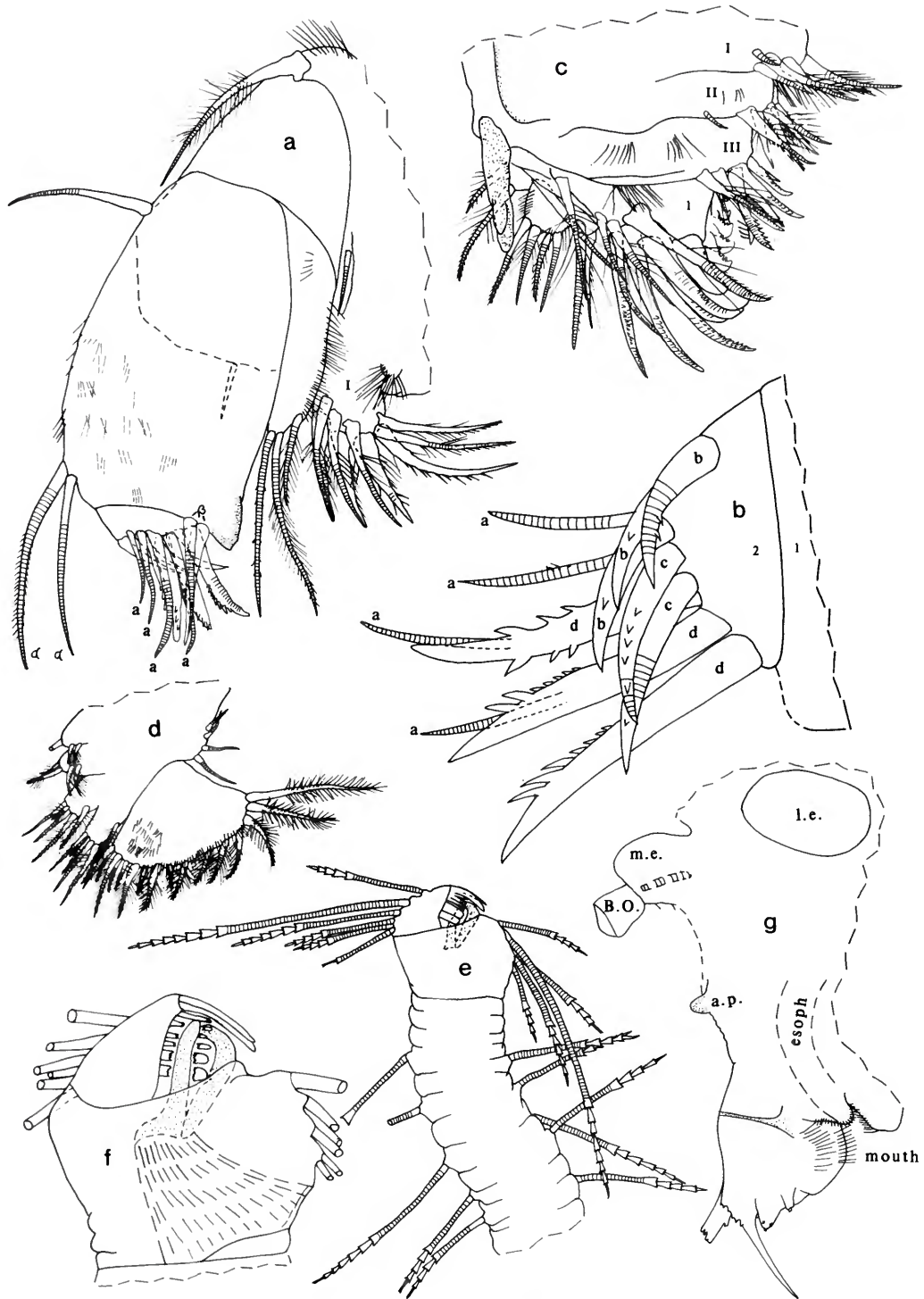


FIGURE 4.—*Paravargula trifax*, new species, USNM 158322, holotype, adult female: *a*, lateral view of left maxilla (only endite I shown); *b*, medial view of 2nd endopodal joint of right maxilla; *c*, anterior view of right 5th limb; *d*, medial view of right 6th limb; *e*, 7th limb; *f*, tip of 7th limb opposite that shown in *e*; *g*, anterior of body showing outline of left lateral eye, medial eye and Bellonci organ, anterior process, upper lip, mouth, and esophagus.

with short spines).

Sixth Limb (Figure 4d): Epipodite with 4 short bristles. Endite I with 1 long terminal bristle, and 2 short medial bristles with long spines; endite II with 1 short and 1 long spinous terminal bristle, and 2 short medial bristles with long marginal spines; endite III with 1 short and 3 long spinous terminal bristles, and 1 long medial bristle with long proximal and short distal spines; endite IV with 1 short and 5 long spinous terminal bristles, and 1 long medial bristle with long proximal and short distal spines. End joint with 16 bristles: 2 short lateral near anterior end of joint (with short spines), 14 terminal (9 with long proximal and short distal spines, 3 with only short spines, and 2 posterior hirsute bristles); lateral spines along terminal edge of joint, and long hairs forming rows on medial surface.

Seventh Limb (Figure 4e,f): 9 or 10 scattered proximal bristles (4 or 5 on each side), each with 4–6 bells; edge of terminal segment (side bearing comb) with 6 bristles, each with 1–7 bells; edge of segment (side bearing jaw) with 5 bristles, each with 4–7 bells. Comb with total of 15 teeth comprising long middle tooth with 1 long slender tooth, 4 short narrow teeth, and 2 short broad square-tipped teeth on each side (Figure 4f); a sclerotized straight bar extending between teeth (Figure 4f). Jaw consisting of curved bar with distal end meeting straight bar (Figure 4f).

Furca (Figure 2f,g): Each lamella with 10 claws; claw 2 nonarticulated; claw 4 narrower but about same length as, or slightly shorter than, claw 5; medial teeth of claw 1 stouter than lateral teeth. Right lamella slightly anterior to left lamella.

Bellonci Organ (Figure 4g): Short, broad, with triangular tip.

Eyes: Medial eye light amber colored, bare (Figures 2i, 4g). Lateral eyes well developed, larger than medial eye, with 36 brown ommatidia (in lateral view only about 30 ommatidia visible) (Figure 2j); without black pigment between ommatidia.

Lips (Figures 2h, 4g): Anterior unpaired part consisting of thin projecting rectangular process, transparent except for short part along posterior edge, which bears internal amber-colored granules (tip of transparent part of rectangular process with 4 or 5 truncate processes (glandular openings?); short granule-bearing posterior part with similar projecting truncate terminal process). Posterior paired part with 5 step-like pointed processes (glandular openings?), a long slender tusk with narrow tip, and then 2 short tusks (anterior short tusk with 3 glandular openings, posterior short tusk smaller and with 1 glandular opening). Rounded surface between tusks and mouth hirsute, with 5 small processes (glandular openings?) on posterior surface adjacent to mouth (Figure 2h). Lower lip rounded, hirsute.

Genitalia (Figure 3f): Comprising 2 ovoid processes anterior to furca.

Anterior of Body (Figure 4g): Small rounded process about midway between medial eye and upper lip.

Posterior of Body (Figure 2i): Evenly rounded, bare.

Y-Sclerite (Figure 2i): Typical for subfamily.

Pigmentation (Figure 2i): Black pigmentation widespread in dorsal and posterior parts of body, with pigment more widely distributed on left side (area of pigmentation stippled in illustration); no pigment in appendages or carapace. (Pigment layer appears to be just beneath outer layer of integument.)

Eggs (Figure 2i): Spheres within body (observed only on left side) resemble eggs but anterior location suggests otherwise.

COMPARISONS.—*Paravargula trifax* differs from *P. ensifera* and *P. digitata* in having long proximal hairs on the bristle of the 2nd exopodial joint of the 2nd antenna (*P. digitata* is known only from the A-1 male, and it is possible that the absence of proximal hairs is because of its age or sex; I have assumed that it is not). The carapace of *P. trifax* differs from *P. hirsuta* in having a deeper incisur, and from *P. nanipollex* in having a longer caudal process. The furca of *P. trifax* differs from that of *P. arborea* and *P. nanipollex* in having the 2nd claw nonarticulated. The upper lip of *P. trifax* differs from that of *P. ensifera* in having a well-developed, rectangular, unpaired, anterior process. Parts of the body of the holotype of *P. trifax* have an underlayer of black pigment, but having only 1 specimen I am unable to determine its value as a specific character. The only other species of the genus having black pigmentation is *P. arborea*. The lateral eyes of *P. digitata* differ from those of *P. trifax* in having a dense black pigmentation between the ommatidia, but this could be the result of differences in preservation; however, the presence of black pigment in the body of *P. trifax* may indicate that the absence of eye pigment is not a matter of preservation.

Skogsbergia Kornicker, 1974

Skogsbergia Poulsen, 1962:162 [nomen nudum].

Skogsbergia Kornicker, 1974:3 [designated type species].

TYPE SPECIES.—*Skogsbergia minuta* Poulsen, 1962:164, by subsequent designation (Kornicker, 1974:3).

COMPOSITION.—Ten species are referred to this genus including the new species described below (Poulsen, 1962:164; Kornicker, 1970a:10; 1974:8). A species referred to *Skogsbergia* by Poulsen (1962:164), *S. caudata* (Cleve, 1905), has an upturned caudal process unlike those of other species of *Skogsbergia*, and I think it unlikely that it is a member of the genus. The species is insufficiently known to be able to refer it to another genus with a high degree of certainty; therefore, *S. caudata* is referred herewith to the category species inquirenda. Two additional species referred to *Skogsbergia* by Poulsen (1962:164), *S. mediterranea* (Costa, 1845), and *S. sarsi* (Müller, 1912:11) are not identifiable from the original publication and are also referred to species inquirenda herewith (see discussion of *S. mediterranea* by Kornicker, 1974:8).

DISTRIBUTION.—This genus is widespread between about 60°N and 10°S in shallow to moderate depths.

Key to the Species of *Skogsbergia*

1. Furca with claws 2 and 3 nonarticulate *S. squamosa*
 Furca with no claws nonarticulate 2
 Furca with only 2nd claw nonarticulate 4
2. Carapace with long projecting caudal process *S. hesperida*
 Carapace with rounded posterior or short caudal process 3
3. 5th furcal claw stouter than 4th *S. costai*
 5th furcal claw not stouter than 4th *S. megalops*
4. Lateral eye small with 6-9 minute cells *S. galapagensis*
 Lateral eye large with 25-30 ommatidia 5
5. Carapace shorter than 1.3 mm *S. minuta*
 Carapace longer than 1.3 mm 6
6. Endopodite of 2nd antenna with 5 proximal bristles 7
 Endopodite of 2nd antenna with 4 proximal bristles 8
7. 7th limb without teeth on jaw opposite comb *S. curvata*
 7th limb with 4 small teeth (2 on each side) on jaw opposite comb *S. lernerii*
8. Tip of anterior process of male between medial eye and upper lip bifurcate
 *S. menezii*
 Tip of anterior process of male between medial eye and upper lip rounded
 *S. strophinx*, new species

Skogsbergia strophinx, new species

FIGURES 5, 6

Skogsbergia sp. Komicker, 1987b:217.ETYMOLOGY.—From the Greek *strophinx* (axle, pivot).

HOLOTYPE.—USNM 158307, adult male on slide and in alcohol.

TYPE LOCALITY.—Enewetak lagoon (holotype from sta B, plankton trap 7, night, coral rubble substrate).

PARATYPES.—Enewetak lagoon: Midwater trawl off Bokan-dretok Island: USNM 193626, 1 adult female on slide and in alcohol. Sta B, plankton trap 7, night, coral rubble substrate: USNM 193660, 6 specimens. Sta B, plankton trap 10, night, coral rubble substrate: USNM 193654, 1 adult female in alcohol. Sta B, plankton trap 10, night, coral reef substrate: USNM 193653, 3 adult females in alcohol.

DISTRIBUTION.—Enewetak Atoll.

DESCRIPTION OF ADULT MALE (Figures 5, 6a-f).—Carapace with convex ventral and dorsal margins, broad rostrum, shallow incisure, and projecting caudal process delimited from posterior margin by slight angle (Figure 5a).

Structures on Infold: Narrow list with anterior end ventral to incisure, continuing close to ventral margin of valve, and broadening to form stout bar (with minute indistinct pustules along posterior edge) near anterior edge of caudal process (Figure 5c).*Bristles of Infold*: Infold of rostrum with 7 or 8 bristles forming vertical row and 2 or 3 bristles forming horizontal row near incisure (on holotype these bristles with bases connected by

undulating line) (Figure 5b); 2 additional rostral bristles near infold midwidth; a pair of bristles (longer bifurcate) and 1 small bristle present at inner end of incisure; 1 short bristle at infold midwidth ventral to incisure (Figure 5b). Anteroventral infold and anterior third of ventral infold with 28 bristles (mostly divided and spinous); posterior half of ventral infold with 5 single bristles (these could be pore canals). Left valve only with single bristle near ventral end of broad bar of caudal process (Figure 5c). Broad bar of caudal process with transverse pore canals but no bristles; outer edge of infold of caudal process with about 11 minute pores (not shown).

Selvage: Lamellar prolongation with smooth outer edge present along anterior and ventral margins, terminating posteriorly near ventral end of caudal process; prolongation widest as well as narrowly striated in vicinity of incisure and divides at inner end of incisure (Figure 5b).*Carapace Size*: USNM 158307, length 1.37 mm, height 0.81 mm.*First Antenna* (Figure 5d): 1st and 2nd joints bare. 3rd joint with 2 small bristles (1 ventral, 1 dorsal); 4th joint elongate, with 2 small bristles (1 ventral, 1 dorsal); 5th joint short, triangular having sensory bristle with 8 or 9 long proximal filaments, 3 short distal filaments with marginal spines, and 1 very short bare filament near tip. 6th joint short, with long medial bristle (with few widely separated marginal spines) near dorsal margin (length of bristle equal to total length of joints 4-6 measured along dorsal margin). 7th joint: a-bristle about $\frac{3}{4}$ length of bristle of 6th joint, with few widely separated marginal spines; b-bristle about 3 times length of a-bristle, same length as sensory bristle of 5th joint, with proximal node



FIGURE 5.—*Skogsbergia strophinx*, new species, USNM 158307, holotype, adult male: *a*, complete specimen from left side, length 1.37 mm; *b*, inner view of anterior of right valve; *c*, inner view of caudal process of left valve; *d*, medial view of left 1st antenna (*d*-, *e*-, *f*-, and *g*-bristles not shown); *e*, medial view of endopodite and distal part of protopodite of left 2nd antenna; *f*, medial view of right mandible; *g*, lateral view of right maxilla (part of 1st endopodial joint and all of 2nd not shown); *h*, lateral view of tip of right maxilla (only alpha-bristles and a-bristles shown); *i*, medial view of posterior distal corner of 1st endopodial joint of right maxilla showing cutting tooth (stippled) and beta-bristles; *j*, medial eye and Bellonci organ.

and sucker on short stout proximal filament and 4 distal filaments (2 filaments with 3 and 2 small suckers, respectively, next 2 filaments with marginal spines), stem distal to last filament with 6 marginal spines; c-bristle almost twice length of b-bristle, with proximal node and sucker on short proximal filament (diameter of sucker 1.6–1.7 times diameter of large sucker of b-bristle) and 9 distal filaments (2 filaments with 2 small suckers, followed by 6 filaments with marginal spines, and 1 small bare filament near tip). 8th joint: d- and e-bristles bare, about $\frac{3}{4}$ length of b-bristle; f- and g-bristles stout, about same length as c-bristle, with abundant long slender proximal filaments, followed by 8 stouter pectinate filaments and 1 small smooth subterminal filament (stem proximal to subterminal filament with spine).

Second Antenna (Figure 5e): Protopodite with short, bare, medial bristle. Endopodite 1-jointed (could be interpreted to have minute 2nd joint), with 4 proximal bristles (3 short and 1 about twice as long) and 1 long terminal filament (filament could be interpreted to be on minute 2nd joint). Exopodite: 1st joint with few indistinct spines along concave margin; bristle of 2nd joint reaching to about 8th joint, with proximal hairs (13 ventral, 11 dorsal) on unringed segment, 2 slender dorsal spines and 7 stout ventral spines on following ringed segments, and short terminal segment with closely spaced rings; bristles of joints 3 and 4 with natatory hairs and long slender spines (shorter than hairs) just proximal to bristle midlength; bristles of joints 5–8 with natatory hairs, no spines; 9th joint with 4 bristles (2 long, 1 medium, 1 short dorsal) with natatory hairs, no spines; joints 3–8 with basal spines increasing in length on distal joints; basal spine of 8th joint 3.6 times length of 9th joint; 9th joint with lateral spine about same length as joint; joints 2–8 with indistinct minute spines forming row along distal margins.

Mandible (Figure 5f): Coxale endite spinous with 2 stouter terminal spines with small peg between them; with small basal bristle (not shown). Basale: dorsal margin with 1 bristle near midlength and 2 subterminal; ventral margin with 3 short medial a-bristles, 1 short lateral b-bristle, 2 small ventral c-bristles with small peg proximal to them, and 1 long d-bristle with long spines. Exopodite spinous, about $\frac{3}{4}$ length of dorsal margin of 1st endopodial joint, with 2 bristles (base of proximal bristle near midlength of exopodite, distal bristle about $\frac{1}{3}$ length proximal bristle). 1st endopodial joint with 4 ventral bristles. 2nd endopodial joint: medial surface with short spines forming rows (not shown); ventral margin with short spines, and 2 (weakly ringed) and 2 short slender pointed unringed bristles (paired bristles about same length and width); dorsal margin with 13 bristles (5 long bristles, 1 proximal, medium length bristle, 1 short ringed bristle (with long distal anterior spines) medial to 1st long bristle, 1 short ringed bristle medial to 3rd long bristle, and 5 short medial unringed bristles). 3rd endopodial joint with 3 claws (dorsal claw obscured, others with proximal ventral teeth) and 4 ringed bristles.

Maxilla (Figure 5g–i): Endite I with 11 bristles, endite II

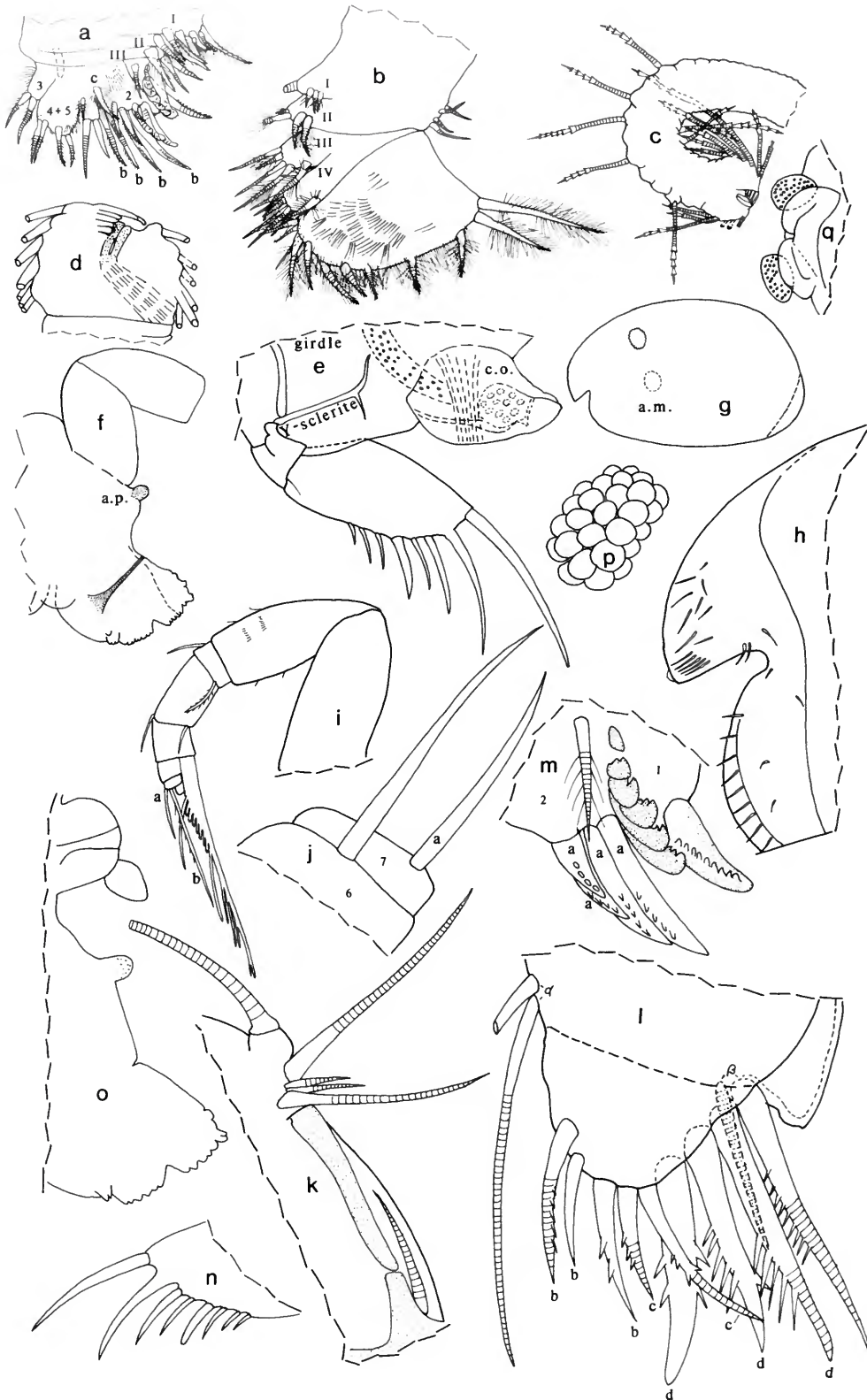
with 7 bristles, endite III with 1 proximal and 6 distal bristles (Figure 5g). Precoxale with dorsal fringe. Coxale with plumose dorsal bristle. Basale with 1 short dorsal terminal bristle and 2 ventral terminal bristles (1 short, 1 long with long spines). Exopodite hirsute, with 1 hirsute distal bristle and 2 terminal bristles (outer bristle hirsute). Endopodite: 1st joint with triangular cutting tooth, 2 slender bare ringed alpha-bristles, and 2 shorter ringed beta-bristles (inner with few marginal hairs, outer bare) (Figure 5h,i); 2nd joint with 4 bare ringed a-bristles, 3 pectinate claws plus about 5 additional obscured bristles (see description of adult female below).

Fifth Limb (Figure 6a): Epipodite with 50 plumose bristles. Endite I with 7 spinose bristles; endite II with about 6 bristles; endite III with about 7 bristles (not all endite bristles shown). Protopodite with elongate sclerotized process. Exopodite: 1st joint: main tooth with smooth peg, 6 cusped teeth, and spinous bristle proximal to peg; anterior side with 3 bristles forming row and 1 proximal bristle near protopodial process (not shown). 2nd joint with 4 stout pectinate unringed a-bristles, 2 pectinate ringed b'-bristles, 4 pectinate ringed b''-bristles, 1 spinous ringed posterior c-bristle, and 1 spinous anterior d-bristle (not shown). 3rd joint: inner lobe with short spinous proximal bristle and 2 bare terminal bristles (outer bristle unringed); outer lobe hirsute, with 2 terminal bristles with few long hairs. 4th and 5th joints hirsute, fused, each with paired bristles; indistinct small peg between pairs.

Sixth Limb (Figure 6b): Epipodite with 4 short bristles. Endite I with 3 short, spinous, proximal, medial bristles and 1 or 2 terminal bristles; endite II with 2 short, spinous, proximal, medial bristles and 2 spinous terminal bristles (1 very small); endite III with 1 long, spinous, proximal, medial bristle and 4 terminal bristles (1 short); endite IV with 1 short, spinous, proximal, medial bristle and 6 terminal bristles (1 short). End joint with 10–13 short spinous bristles followed by 2 longer plumose bristles; lateral edge with stiff spines; medial surface hirsute.

Seventh Limb: Proximal group with 7 bristles (3 or 4 on each side), each with 3–6 bells; distal group with 12 or 13 bristles (6

FIGURE 6 (opposite page).—*Skogsbergia strophinx*, new species. USNM 158307, holotype, adult male: a, posterior view of left 5th limb; b, medial view of right 6th limb; c, 7th limb; d, detail of tip of 7th limb shown in c; e, right lamella of furca and right copulatory organ; f, anterior of body showing joints 1 and 2 of right 1st antenna, anterior process, and upper lip. USNM 193626, paratype, adult female: g, complete specimen from left side showing location of central adductor muscle attachments and left lateral eye, length 1.64 mm; h, inner view of anterior of right valve; i, lateral view of left 1st antenna (c-, d-, e-, f-, and g-bristles not shown); j, medial view of joints 6 and 7 of right 1st antenna (not all bristles shown); k, medial view of endopodite and distal part of protopodite of right 2nd antenna (ventral toward top of illustration); l, medial view of endopodial joints 1 and 2 of right maxilla (a-bristles not shown); m, posterior view of 1st and 2nd exopodial joints of left 5th limb (only a-bristles of 2nd joint shown); n, lateral view of left lamella of furca; o, anterior of body showing medial eye and Bellonci organ, anterior process, and upper lip; p, right lateral eye; q, genitalia with attached spermatophores.



or 7 on comb side, 6 on jaw side), each with 1–6 bells (Figure 6c). Comb with about 11 obscured teeth (Figure 6d). Jaw difficult to resolve, either bare or with few minute teeth at distal end.

Furca (Figure 6e): Each lamella with 8 claws; claw 2 nonarticulated, remaining claws articulated; claw 5 stouter and longer than claw 4; all claws with small uniform teeth along posterior margin (not shown); claw 1 with 8 distal medial teeth (most larger than teeth along posterior margin) (not shown); right lamella slightly anterior to left.

Bellonci Organ (Figure 5j): Cylindrical, short, with rounded tip.

Eyes: Lateral eye with 27–30 amber-colored ommatidia, without black pigment between ommatidia (Figure 5a). Medial eye slightly smaller than lateral eye, amber colored (Figure 5j).

Upper Lip (Figure 6f): With unpaired anterior part bearing fairly large glandular openings, and paired posterior part followed by small lateral lobe with 2 or 3 glandular openings.

Genitalia (Figure 6e): Lobate copulatory organ on each side of body.

Anterior of Body (Figure 6f): With rounded anterior process between medial eye and upper lip.

Posterior of Body: Evenly rounded, bare.

Y-Sclerite (Figure 6e): Typical for family.

DESCRIPTION OF ADULT FEMALE (Figure 6g–q).—Carapace with convex dorsal margin, slightly convex ventral margin, broadly rounded posterodorsal margin, and slightly projecting caudal process not delimited by angle from posterior margin of valve dorsal to caudal process (Figure 6g). Inferior corner of rostrum forming right angle in lateral view, and with incisur deeper than that of male carapace; tip of rostrum with minute protuberance (Figure 6h). Carapace surface smooth.

Structures on Infold: Similar to those of adult male.

Bristles of Infold: Infold of rostrum with 14 distal bristles, and 1 proximal bristle and 2 bristles near inner end of incisur (Figure 6h). 1 small bristle just ventral to inner end of incisur. Anteroventral infold and anterior third of ventral margin with 23 or 24 bristles along list and several small bristles inward from list (not all shown in Figure 6h); 2 bristles on ventral list at valve midlength; posterior half of ventral list with widely spaced minute bristles. Left valve with single bristle near ventral end of broad bar of caudal process.

Selva: Similar to that of adult male.

Carapace Size: USNM 193626, length 1.64 mm, height 1.03 mm. USNM 193653, 3 specimens: length 1.62 mm, height 1.03 mm; length 1.59 mm, height 0.99 mm; length 1.62 mm, height 1.02 mm. USNM 193654, length 1.61 mm, height 1.04 mm.

First Antenna (Figure 6i, j): 1st joint bare. 2nd joint spinous. 3rd and 4th joints each with 2 bristles (1 ventral, 1 dorsal). Sensory bristle of 5th joint with 9 stout proximal filaments followed by 3 slender filaments and bifurcate tip. 6th joint with terminal bristle with length about twice width of 6th joint (bristle missing on left limb of USNM 193626 (Figure 6i), but present on right limb (Figure 6j)). 7th joint: a-bristle about $\frac{3}{4}$

length of bristle of 6th joint; b-bristle about 3 times length of a-bristle, with about 5 marginal filaments; c-bristle longer than sensory bristle of 5th joint, with marginal filaments. 8th joint: d- and e-bristles long, bare, with blunt tips; f- and g-bristles long with marginal filaments.

Second Antenna: Protopodite with short medial bristle (Figure 6k). Endopodite 1-jointed, with 4 proximal bristles (2 long, 2 short) and 1 long terminal filament (Figure 6k). Exopodite not examined in detail but in general similar to that of adult male.

Mandible: Short bristle of exopodite reaching distal end of 1st endopodial joint. Dorsal claw of 3rd joint of endopodite bare, other 2 claws with proximal teeth. Limb otherwise similar to that of adult male.

Maxilla (Figure 6l): 2nd endopodial joint with 4 bare ringed a-bristles, 3 pectinate b-bristles (anterior ringed, others unringed), 2 pectinate ringed c-bristles, and 3 pectinate claw-like d-bristles (posterior ringed distally, others unringed). Limb otherwise similar to that of adult male.

Fifth Limb (Figure 6m): Similar to those of adult male.

Sixth Limb: Epipodite with 4 short bristles. Endite I with 3 short, spinous, proximal, medial bristles and 1 spinous terminal bristle; endite II with 2 short, spinous, proximal, medial bristles and 2 spinous terminal bristles (1 very small); endite III with 1 long, spinous, proximal, medial bristle and 4 terminal bristles (1 short); endite IV with 1 long, spinous, proximal, medial bristle and 6 terminal bristles (1 short). End joint with 12 or 13 short spinous bristles followed by 2 longer plumose bristles; lateral edge with stiff spines; medial surface hirsute.

Seventh Limb: Proximal group with 7 bristles (3 or 4 on each side), each with 4–6 bells; distal group with 6 bristles on comb side, 5 on jaw side, each bristle with 1–6 bells. Comb with about 11 teeth. Jaw obscured.

Furca (Figure 6n), *Bellonci Organ* (Figure 6o), *Upper Lip* (Figure 6o), *Anterior of Body* (Figure 6o), *Posterior of Body*, and *Y-Sclerite*: Similar to those of adult male.

Eyes: Lateral eye with 27 amber-colored ommatidia, without black pigment between ommatidia (Figure 6p). Medial eye (Figure 6o) smaller than lateral eye, amber colored but lighter shade than ommatidia of lateral eye.

Genitalia (Figure 6q): Genital lobe with attached spermatopore on each side of body anterior to furca.

Gut Content: Gut of USNM 193626 with several compound eyes of larval decapods visible through gut wall.

COMPARISONS.—*S. strophinx* is close to *S. curvata* Poulsen, 1962, and *S. menezis* Kornicker, 1970, and they could be conspecific. Some morphological differences between adult males of the 3 species are listed in Table 3, but some of the differences could be the result of intraspecific variability, which is not known. The bristle of the 6th joint and also the a-bristle of the 7th joint of the 1st antenna of the male *S. strophinx* are longer than those of *S. curvata* and *S. menezis*. The dorsal bristles of the 3rd and 4th joints of the 1st antenna of the male *S. strophinx* are much shorter than those of the male *S.*

TABLE 3.—Comparison of morphological characters of males of *Skogsbergia curvata*, *S. menezi*, and *S. strophinx* (nd = no data).

Character	<i>Skogsbergia</i>		
	<i>curvata</i> ^a	<i>menezi</i>	<i>strophinx</i>
Carapace			
length, mm	1.6–1.8	1.49	1.37
1st antenna:			
Length of bristle of 6th joint as percent of width of distal end of joint	200	135 ^b	275
Length of a-bristle as percent of width of 6th joint	117	110 ^b	180
Number of filaments on sensory bristle of 5th joint: long proximal-short distal filaments	7–3	9–4	8 or 9–4
Ratio of diameter of sucker on c-bristle to that of b-bristle	>2:1	1.3:1	1.6–1.7:1
Number of small suckers on each of 2 filaments of b-bristle	3,3	2,2	3,2
Number of filaments with small suckers on c-bristle and (number of suckers per filament)	1(3)	2(2,2)	2(2,2)
Number of filaments without suckers on c-bristle	10	6 + ^c	7
2nd Antenna, endopodite:			
Number of proximal bristles on 1st joint	5	4	4
Mandible:			
Number of pectinate claws on 3rd endopodial joint	0	3	2 or ?3
Maxilla:			
Number of cusps on cutting tooth	2	1	1
6th limb:			
Number of bristles on end joint	18	14	12–15
Number of epipodial bristles	3	2 or 3	4
7th limb:			
Number of teeth on jaw opposite comb	0	2	nd
Anterior process	nd	bifurcate	rounded

^aData on *S. curvata* is based on description and figures of Poulsen (1962:167, fig. 1).

^bData obtained from 1st antenna on slide of holotype, USNM 125497; other data for *S. menezi* based on description and figures of Kornicker (1970b:10, figs. 7, 8).

^cTip of bristle, which may bear an additional filament, broken off on limb examined.

curvata. The 1st endopodial joint of the 2nd antenna of *S. strophinx* differs from that of *S. curvata* in having 4 rather than 5 proximal bristles. The tip of the anterior process between the upper lip and medial eye of the male is bifurcate on *S. menezi* and rounded on *S. strophinx*.

Cypridinodes Brady, 1902

Cypridinodes Brady, 1902:187.

TYPE SPECIES.—*Cypridinodes favus* Brady, 1902:187, monotypy.

COMPOSITION.—Including a new species described herein, 12 species are referred to this genus: *C. bairdii* (Brady, 1866), *C. wyvillethomsoni* (Brady, 1880), *C. favus* Brady, 1902, *C. asymmetrica* (Müller, 1906), *C. acuminata* Skogsberg, 1920,

C. dorsocurvata (Graf, 1931) [new combination], *C. reticulata* Poulsen, 1962, *C. inermis*, Poulsen, 1962, *C. galathea*, Poulsen, 1962, *C. minuta* Poulsen, 1962, *C. concentrica* Kornicker, 1979, and *C. plax*, new species.

DISTRIBUTION.—Indo-West-Pacific region. The range of *Cypridinodes* extends eastward into the Pacific as far as the Samoa Islands in the South Pacific and Bikini Atoll in the North Pacific, and westward into the Indian Ocean to the vicinity of Madagascar and into the Red Sea. The northernmost extent of its range is the South China Sea (Pescadoro Islands); the southernmost extent of its range is in the Tasman Sea (latitude 43°35'S).

CORRECTION.—Kornicker (1970b:19) mistakenly listed *Cypridina elongata* instead of *Cypridina bairdii* as a synonym of *Cypridinodes bairdii*.

Cypridinodes plax, new species

FIGURES 7-9

ETYMOLOGY.—From the Greek *plax* (plate, tablet).

HOLOTYPE.—USNM 193620, adult female on slide and in alcohol.

TYPE LOCALITY.—Bikini lagoon (sta S-46-114).

PARATYPES.—Bikini lagoon: Sta S-46-46: USNM 193621, 1 adult female in alcohol (cleaned with with nitric acid and detergent); USNM 193622B, C, 2 adult females in alcohol. Sta S-46-112: USNM 193644, 1 adult female in alcohol.

DISTRIBUTION.—Bikini Atoll.

DESCRIPTION OF ADULT FEMALE (Figures 7-9).—Carapace with convex ventral and dorsal margins (Figure 7); anterior of rostrum straight or slightly convex, except slightly concave near pointed tip (Figure 7*a,b,f*). Projecting caudal process forming obtuse angle with posterior edge of valve dorsal to process; posterior edge of process slightly convex (Figure 7*a,e,h,l,m*). Incisur well developed. Each valve with oblique, short, lateral rib extending slightly past anterior edge of rostrum (Figure 7*b,f*); posterior end of rib blends into valve surface near anterior end of dorsal margin. Right valve only with lunate process ventral to incisur, with 19-23 undivided bristles forming row on inner surface just within outer edge (Figure 7*a,b,d,k*).

Ornamentation (Figure 7*c,f,g*): Surface of valves with distinct scallops (convex edge of each scallop oriented posteriorly), sparsely distributed short bristles, and small pits, some bearing a minute bilobed process (Figure 7*c,i*) (SEM micrographs of similar bilobed processes on *Cypridinodes concentrica* have been illustrated by Kornicker (1979, pl. 9)).

Infold (Figure 7): Rostral infold with 14-16 bifurcate bristles paralleling valve edge, and 2 additional bristles on edge of valve at inner end of incisur (Figure 7*f*); infold near inner end of incisur with pair of short bristles at about infold midwidth, 2 small bristles just ventral to incisur, and a small bristle near inner edge of infold. Anteroventral infold and anterior part of ventral infold with about 24-31 bifurcate bristles forming row along narrow list (USNM 193621 with 24 on right valve and 31 on left) (Figure 7*d,g,k* (not all bristles shown)); ventral infold proximal to bristles of list with 5 or 6 small indistinct bristles along inner edge of infold. Infold of lunate process of right valve with 19-23 bristles forming row near outer edge (Figure 7*d,k*). Infold of caudal process forming pocket with anterior ridge bearing 22-31 digitate processes (Figure 7*e,h*) (USNM 193620 and 193621 with 22 processes on left valves and 30 or 31 on right valves); several minute bristles in pocket posterior to ridge; several small bristles along inner margin of infold anterior to ridge; on left valve only ventral end of ridge forms low knob, and 1 small bristle present between knob and ventral edge of valve (Figure 7*h*); right valve only with small bristle on anterior edge of ridge near ventral end (Figure 7*e*). Posterior edge of caudal process with 5 or 6 minute pores or pustules and many short, straight pore canals (Figure 7*e,h*).

Selvae: Lamellar prolongation with smooth outer edge present along dorsal margin anterior to hinge and along anterior margin of rostrum. Prolongation along ventral edge of incisur broad, narrowly striate, and with minute surface pustules; prolongation along dorsal margin of incisur narrow, indistinct. Except medial to lunate process of right valve (Figure 7*d,k*), lamellar prolongation along anteroventral and ventral margins of valve with smooth outer edge; ventral prolongation broader on right valve. Posterior end of caudal process without lamellar prolongation; selvae along dorsal margin of caudal process of right valve comprising minute spines forming row; selvae along dorsal margin of caudal process of left valve indistinct, diaphanous, and without spines. Lamellar prolongation medial to lunate process of right valve slightly narrower at midlength of process, with serrate margin (about 30 serrations) slightly longer and more closely spaced along anterior 1/3 of prolongation (Figure 7*d,k*). Along ventral margin of left valve as well as along ventral margin of right valve posterior to lunate process, lamellar prolongation comprising 2 layers with narrower layer having serrate edge (serrations smaller and more closely spaced than those on prolongation medial to lunate process).

Carapace Size: USNM 193620, length 1.90 mm, height 1.35 mm. USNM 193621, length 1.82 mm, height 1.26 mm. USNM 193622B, C, 2 specimens: length 1.79 mm, height 1.24 mm; length 1.78 mm, height 1.26 mm. USNM 193644, length 1.85 mm, height 1.36 mm.

First Antenna (Figure 8*a*): 1st joint with distal lateral spines, and distal medial hairs and spines forming rows near dorsal corner. 2nd joint with lateral spines forming row near distal margin, and medial spines forming numerous rows near dorsal margin. 3rd joint with oblique distal margin, medial spines forming rows, 1 proximal spinous dorsal bristle, and 1 terminal spinous ventral bristle. 4th joint without surface spines, with 2 spinous bristles (1 ventral, 1 dorsal). 5th joint without surface spines; sensory bristle with 10 long filaments followed by 2 shorter and more slender filaments, and with bifurcate tip. 6th joint with short spinous medial bristle near dorsal margin. 7th joint: a-bristle about same length as bristle of 6th joint, with indistinct marginal spines; b-bristle about same length as combined joints 4 and 5, with 5 short proximal filaments (proximal 4 shorter and with proximal spine); c-bristle very long, with about 9 filaments, some with minute, widely spaced, triangular spines. 8th joint: d- and e-bristles slightly longer than b-bristle, bare with blunt tips; f- and g-bristles about same length as c-bristle, with about 10 filaments, some with marginal spines.

Second Antenna: Protopodite with short distal medial bristle (Figure 9*n*). Endopodite (Figure 9*n*): 1st joint with 1 long and 3 short proximal bristles and 1 long spinous bristle near midlength of joint; 2nd joint bare; 3rd joint short with long terminal filament. Exopodite (Figures 8*b*, 9*o*): 1st joint with hairs along concave margin; bristle of 2nd joint reaching just past 9th joint, with 8 stout ventral spines and 3 slender dorsal spines (Figure 8*b*); bristles of joints 3-8 with natatory hairs, no spines; 9th joint with 4 bristles (1 short, 1 medium, 2 long), all

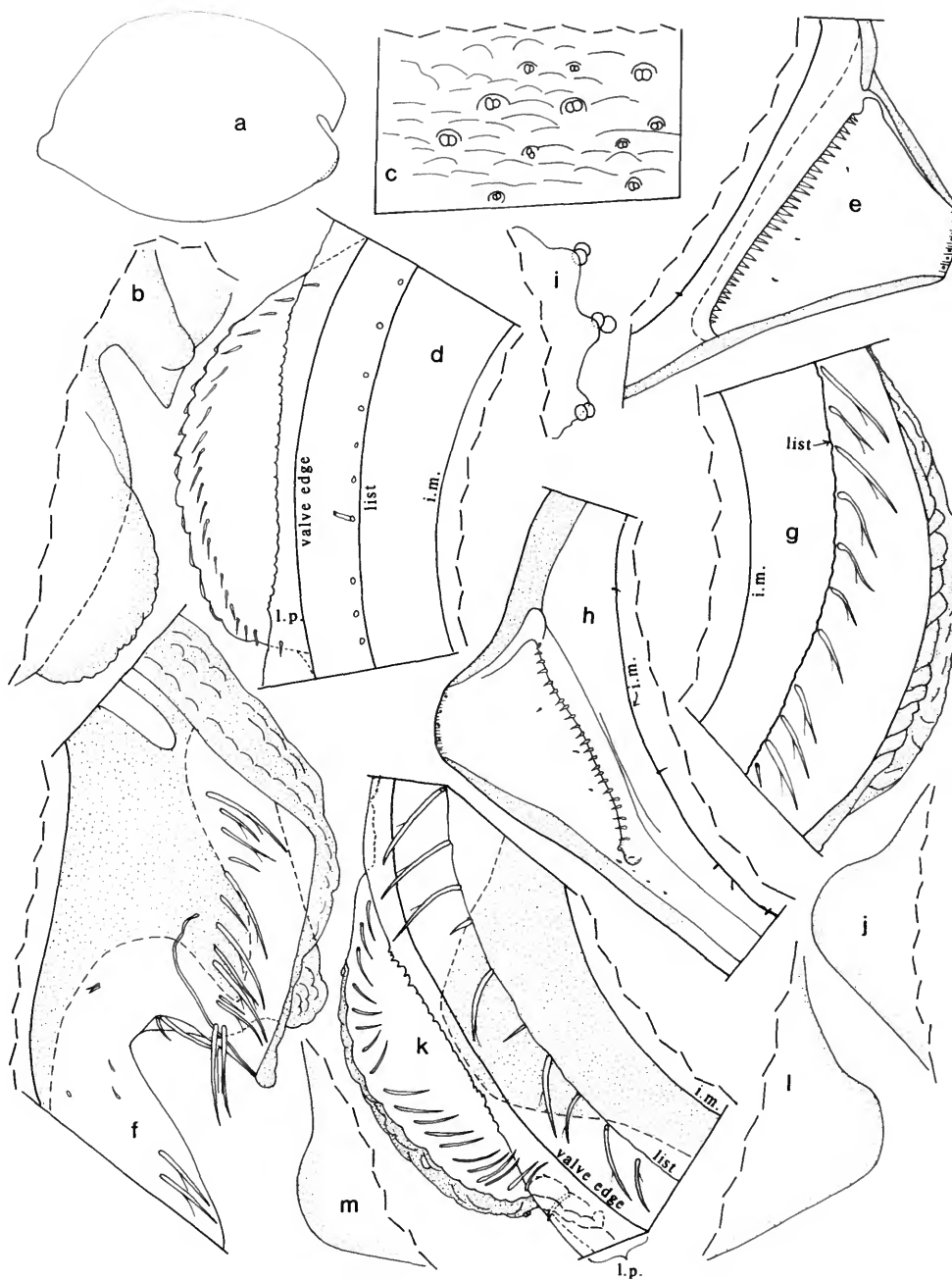


FIGURE 7.—*Cypridinodes plax*, new species. USNM 193620, holotype, adult female: *a*, complete specimen from right side, length 1.90 mm; *b*, anterior of right valve showing major processes; *c*, outside view of smaller surface features (scallops, and pits with bilobed processes), from left valve near ventral margin; *d*, inner view of lunate process and anteroventral infold of right valve (bristles that have broken off infold are represented by row of sockets); *e*, inner view of caudal process of right valve. USNM 193621, paratype, adult female: *f*, inner view of anterior of left valve; *g*, inner view of anteroventral margin of left valve; *h*, inner view of caudal process of left valve; *i*, minute bilobed processes on valve surface, from anterior just ventral to incisur; *j*, outline of caudal process of right valve; *k*, inner view of lunate process and anteroventral infold of right valve. USNM 193622B, paratype, adult female: *l*, outline of caudal process of left valve. USNM 193622C, paratype, adult female: *m*, outline of caudal process of right valve.



FIGURE 8.—*Cyprinidodes plax*, new species, USNM 193620, holotype, adult female: *a*, medial view of right 1st antenna (not all bristles of joints 7 and 8 shown); *b*, lateral view of bristle of 2nd exopodial joint of left 2nd antenna; *c*, medial view of right mandible; *d*, lateral view of 2nd and 3rd endopodial joints of left mandible; *e*, lateral view of dorsal part of proximal joints of left mandible (sclerites stippled); *f, g*, left maxilla: *f, g*, medial and lateral views, respectively (not all bristles shown); *h*, lateral view of endites; *i*, medial view of b- and c-bristles; *j*, lateral view of d-bristles; *k--n*, right maxilla: *k*, lateral view of 1st and 2nd endopodial joints (only a-bristles of 2nd endopodial joint shown); *l*, lateral view of exopodite; *m*, medial view of b- and c-bristles; *n*, lateral view of b-, c-, and d-bristles.

with natatory hairs; joints 2–8 with stout basal spines increasing in length on distal joints (spine of 8th joint about $1\frac{1}{2}$ times length of 9th joint); 9th joint with lateral spine about length of joint (Figure 9o); joints 2–8 with indistinct minute hairs forming row along distal edge.

Mandible (Figure 8c–e): Coxale endite spinous with 2 stout spines at tip with small peg between them (detail in Figure 8c); small bristle present near base; lateral side of coxale with distal dorsal lobe near basale and clusters of long hairs (Figure 8e). Basale (Figure 8c): ventral margin with 2 small a-bristles, 1 small b-bristle (bristle some distance from ventral margin), 2 c-bristles (longer with short marginal spines), and 2 d-bristles (longer with wreaths of long spines (spines not shown on illustrated limb)); dorsal margin with 1 distal and 2 terminal bristles, all with short spines; medial surface with few spines forming rows near dorsal margin. Exopodite about same length as dorsal margin of 1st endopodial joint, hirsute distally, with 2 bristles (proximal longer and with short spines and wreath of long spines at midlength; shorter bristle bare or with indistinct short spines) (Figure 8c). 1st endopodial joint with 4 ventral bristles (1 short bare medial, 2 long stout with wreaths of long spines, 1 medium slender with short spines). 2nd exopodial joint: narrows at about $\frac{2}{3}$ length (in vicinity of proximal ventral bristle); ventral margin spinous, with 2 single, pointed, weakly ringed bristles (with few spines) and paired terminal bristles (medial sclerotized, broader, longer, slightly curved, unringed; lateral ringed); dorsal margin with 7 long spinous ringed bristles and 13 short spinous unringed bristles (4 (between proximal and 3rd long bristles) with stout marginal spines, spines not shown on short bristles in Figure 8c); medial surface with spines forming rows, and ridge at midwidth extending $\frac{3}{4}$ length of joint. 3rd endopodial joint with short dorsal part bearing short bristle medial to long claw, both bare; longer ventral part bearing 2 pectinate claws (teeth only along proximal half; medial claw about $\frac{1}{3}$ longer than lateral claw), 2 long, ringed, spinous bristles, and 1 minute, unringed, bare, ventral bristle (Figure 8c,d).

Maxilla (Figure 8f–n): Endite I with 8 bristles, endite II with about 5 bristles, endite III with 1 proximal and 6 terminal bristles (Figure 8h). Precoxale with dorsal fringe of hairs (Figure 8f). Coxale with slender dorsal bristle with few short hairs (Figure 8f,g). Basale with short ventral bristle (Figure 8f,g). Exopodite elongate with 3 bristles (1 short subterminal, with marginal hairs, 2 long terminal, inner with marginal hairs) (Figure 8f,g,l). Endopodite: 1st joint with 2 ringed alpha-bristles (1 short with long proximal spines, 1 long bare except for long hairs near hooked tip, and with small tooth proximal to hooked tip), and 3 ringed beta-bristles (inner bristle short bare, 2 outer bristles long with recurved marginal teeth) (Figure 8k). 2nd joint with 4 a-bristles (3rd bristle stout pectinate, others slender, bare) (Figure 8k), 3 pectinate ringed b-bristles (Figure 8i,m,n), 3 ringed c-bristles (inner short, bare, others longer, pectinate) (Figure 8i,m,n), and 3 stout pectinate d-bristles (posterior ringed, others unringed) (Figure 8j,n) (rings of bristles not shown).

Fifth Limb (Figure 9a–e): Epipodite with 51 bristles. Endite I with 7 bristles (all with long spines, proximal bristle stouter than others), endite II with 6 bristles (1 minute bare spine-like, 2 pectinate and with long proximal spines, others with long spines), endite III with 7 bristles (1 minute bare spine-like, 1 posterior proximal bristle stout pectinate with long proximal spines, others more slender, pectinate) (Figure 9e). Anterior process of protopodite elongate with distal narrow part (Figure 9a,b). Exopodite: anterior side of 1st joint with 3 bristles forming row (2 stout with long proximal and short distal spines, 1 short slender with few spines) and 1 bristle (with long proximal and short distal hairs) closer to protopodial process (Figure 9a,b); main tooth comprising proximal smooth peg and 6 cusped teeth (Figure 9d); bristle with long proximal hairs proximal to smooth peg. 2nd joint with posterior c-bristle (Figure 9d) and anterior d-bristle (Figure 9a), both ringed with long proximal and short distal hairs, 4 pectinate ringed a-bristles, 5 pectinate ringed b'-bristles, and 4 pectinate b''-bristles (posterior bristle ringed, with uniform teeth; next ringed, with larger teeth along middle part; next 2 ringed distally, with both large and small teeth along middle part (rings not shown in Figure 9b–d)). 3rd joint: inner lobe with 1 short bare proximal ringed bristle and 2 long terminal ringed bristles with widely separated marginal spines; outer lobe hirsute, with 2 ringed bristles with short spines. 4th and 5th joints fused, hirsute, with total of 5 spinous ringed bristles (3 on 4th joint, 2 on 5th) (rings not shown in Figure 9a).

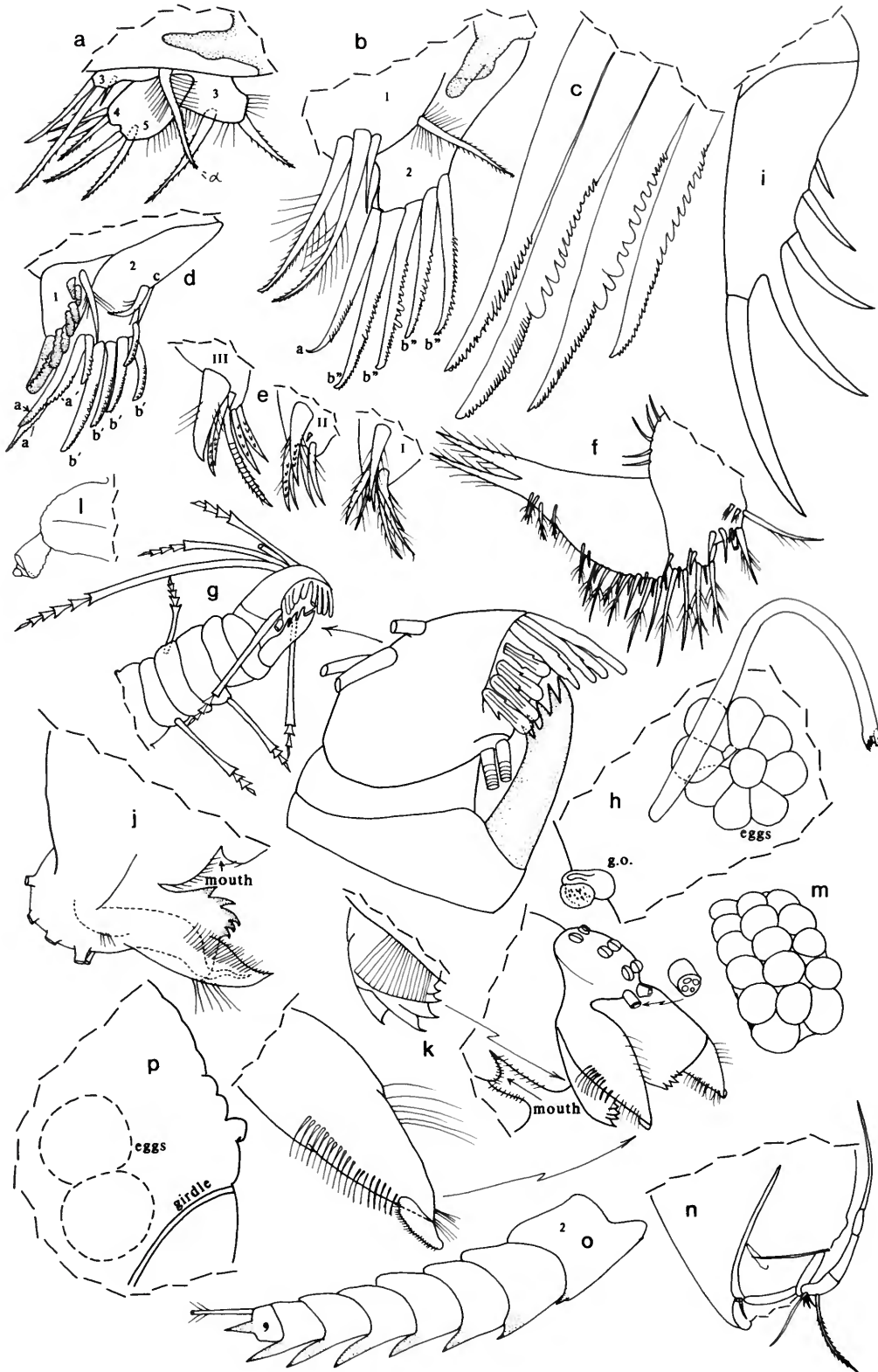
Sixth Limb (Figure 9f): Hirsute, with 5 epipodial bristles. Endite I with 3 bristles (2 short medial, 1 long terminal); endite II with 2 stout hirsute medial bristles, 2 long terminal bristles, and 2 small medial bristles near bases of terminal bristles; endites III and IV each with 1 hirsute medial bristle, and 2 long terminal bristles with minute bristle between them. End joint posteriorly extended, with 17 anteroventral bristles (10 or 11 with bases on medial side or on margin, 6 or 7 short with bases on lateral side or on margin), 4 posteroventral bristles with bases on medial side some distance from ventral margin, and 2 hirsute posterior bristles.

Seventh Limb (Figure 9g,h): Terminal segment with 4 bristles on ventral margin (with 3–5 bells) and 3 proximal to teeth (1 on one side, 2 on other, each with 3–5 bells). Proximal bristles comprise 4 or 5 on ventral side and 6 or 7 on dorsal jaw side; bristles with 3 bells. Total number of bristles on each limb 18. Stout jaw with about 10 teeth along distal edge (terminal tooth longest). Comb with 6 long teeth (terminal tooth longest) and 4 shorter square-tipped teeth on each side (Figure 9g).

Furca (Figure 9i): Each lamella with 5 claws; claw 2 nonarticulated, others articulated; claw 1 with 10 stout medial teeth in distal half; all claws with teeth forming row along posterior edge, some teeth larger than others on claws 1 and 2 but fairly uniform on other claws, distal teeth slightly longer. Right lamella slightly anterior to left.

Bellonci Organ (Figure 9l): Short with small process at tip.

Eyes: Medial eye unpigmented, bare (Figure 9l). Lateral eye unpigmented, with 16 amber-colored ommatidia (Figure 9m).



Upper Lip (Figure 9j,k): Anterior unpaired part with 4 pairs of glandular processes: 3 short dorsal pairs, each process close to adjacent process and with single terminal opening; ventral pair longer, tusk-like, with each process farther apart and longer than dorsal processes, and with 4 small openings at tip. Posterior paired part of lip with elongate pointed tusks without glandular processes; each tusk with few long anterior hairs and more abundant shorter and stouter hairs forming row along medial and lateral posterior edges (lateral hairs stouter), a short diaphanous fringed lamella on posterior edge at tip (detail in Figure 9k), and a posterior serrate process with 5 or 6 teeth; hirsute rounded process present between serrate process and mouth. [Note: in lateral view each of the 3 dorsal pairs of glandular processes of the unpaired anterior part of upper lip appears as only 1 process (Figure 9j), but both processes are visible in oblique or anterior views (Figure 9k).]

Genitalia (Figure 9h): Small ovoid process with attached spermatophore on each side of body anterior to furca.

Posterior of Body (Figure 9p): Bare, with few small rounded humps dorsal to dorsal end of girdle.

Pigmentation: No black pigmentation observed in either appendages or carapace. Muscles within appendages, internal ducts of upper lip, ommatidia of lateral eyes, and internal structures within medial eye all amber colored.

Eggs: USNM 193620 with rosette of 9 or 10 unextruded eggs in each ovary (Figure 9h,p).

REMARKS.—Müller (1906:14) described the furca of *C. asymmetrica* as having 5 furcal claws. The specimens referred to *asymmetrica* by Poulsen (1962:297) have 7 or 8 claws, thus raising some doubt concerning whether Müller's and Poulsen's specimens are conspecific. Poulsen (1962:301) recognized this possibility and stated "it is well possible that closer investigation of a larger number of individuals will result in a division into more species." Poulsen (1962) did not mention *C. dorsocurvata*, so it is possible that he overlooked the description by Graf (1931:32), who had referred the species to *Cypridina*.

COMPARISONS.—*C. plax* is smaller than previously described species of *Cypridinodes*. Five species of *Cypridinodes* have been described previously having a lunate process ventral

to the incisur of only the right valve: *C. favus* (Brady, 1902), *C. asymmetrica* (Müller, 1906), *C. dorsocurvata* (Graf, 1931), *C. galathea* Poulsen, 1962, and *C. bairdii* (Brady, 1866). The furca of *C. plax* differs from those of *C. favus*, *C. asymmetrica*, and *C. bairdii* in having a nonarticulated 2nd claw. *C. plax* differs from *C. galathea* mainly in having 3 rather than 2 claws on the 3rd endopodial joint of the mandible, but also in having 5 rather than 6 furcal claws on each lamella, 8 rather than 10–12 stout ventral spines on the bristle of the 2nd exopodial joint of the 2nd antenna, a smooth rather than trifurcate proximal peg of the main tooth of the 5th limb, and in having 4 rather than 2 posteroventral medial bristles on the end joint of the 6th limb. The break in slope between the posterior edge of the valves and the dorsal edge of the caudal process is greater in *C. plax* than in *C. galathea*, and the posterior edge of the process viewed laterally is less convex. The carapace of the single known specimen of *S. galathea* is that of an adult male 3.2 mm in length, considerably longer than the 5 females of *C. plax* described herein, whose lengths are 1.78–1.90 mm; this large difference is unlikely to be the result of sexual dimorphism. The caudal process of the carapace of *C. dorsocurvata* is more pointed than that of *C. plax*, otherwise both species are quite similar, but more information is needed on the morphology of the mandible, maxilla, and 5th limb of *C. dorsocurvata*. The 2nd endopodial joint of the mandible of *C. plax* is unusual for the genus in having an "hourglass" shape.

Kornicker (1970b:15) described a juvenile (instar IV?) *Cypridinodes* from the Philippines, which he left in open nomenclature as *Cypridinodes* species. That specimen resembles *C. plax* in having 3 claws on the 3rd endopodial joint of the mandible and 5 claws on each lamella of the furca, of which the 2nd is not articulated. Its carapace differs from that of *C. plax* in not having the dorsal edge of the caudal process of the right valve delimited from the posterior edge of the valve by a sharp angle; the angle is present on the left valve of *Cypridinodes* species, but the caudal process is shorter than on *C. plax*. *Cypridinodes* species seems more closely related to *C. plax* than to other known species of the genus, but because of the differences in the configuration of the carapace I have retained the open nomenclature. (In reexamining the mandible of *Cypridinodes* species, USNM 125659, from the Philippines, I observed a lateral b-bristle on the basale set some distance from the ventral margin (in a location similar to that of the b-bristle of *C. plax*), which I overlooked in my previous description (1970b:15). I also reexamined the upper lip and found it to be similar to that of *C. plax*, except the 3 proximal teeth on each posterior serrate process are more rounded.)

Codonocera Brady, 1902

Codonocera Brady, 1902:188.

TYPE SPECIES.—*Codonocera cruenta* Brady, 1902:188, pl. 22, figs. 1–10, by monotypy.

COMPOSITION.—Eleven species are referred to this genus

FIGURE 9 (opposite page).—*Cypridinodes plax*, new species. USNM 193620, holotype, adult female: a–e, right 5th limb: a, anterior view showing anterior process of protopodite (stippled), d-bristle of 2nd exopodial joint, and exopodial joints 3–5; b, anterior view showing anterior process of protopodite (stippled), 4 bristles of 1st exopodial joint and 5 bristles of 2nd exopodial joint; c, detail of tips of b^r-bristles shown in b; d, posterior view showing 1st exopodial joint and some bristles of 2nd exopodial joint; e, posterior view of endites of left 5th limb; f, medial view of left 6th limb; g, 7th limb; h, posterior of body showing left 7th limb (bristles not shown), left genitalia, and unextruded eggs; i, left lamella of furca (teeth not shown); j, upper lip (anterior to left); k, oblique view of upper lip (anterior to right); l, medial eye and Bellonci organ; m, left lateral eye. USNM 193621, paratype, adult female: n, medial view of endopodite and distal part of protopodite; o, lateral view of exopodial joints 2–9 of right 2nd antenna; p, posterior of body from left side showing 2 unextruded eggs and humps dorsal to dorsal end of girdle.

(Poulsen, 1965:310; Kornicker, 1986a:119). Because the only specimens in the present collection are 1st instars it is not possible to identify the species to which they belong, and therefore, they are left in open nomenclature as *Codonocera* species A. The presence of spines on the a-bristles of the maxilla indicate that it belongs in the *cruenta* group of Poulsen (1962:311), which comprises 6 species (Kornicker, 1986, table 2). The 1st instar has not been described previously from any species of the genus.

DISTRIBUTION.—Indo-Pacific and Australasian waters (McKenzie, 1967:221).

Codonocera species A

FIGURES 10, 11

MATERIAL.—Enewetak lagoon, midwater trawl off Bokan-dretok Island, USNM 193619, 193625, 2 instar I.

DISTRIBUTION.—Enewetak Atoll.

DESCRIPTION OF INSTAR I (Figures 10, 11).—Carapace ovoid with convex dorsal and ventral margins, short incisur and projecting caudal process (Figure 10a,c). Posterodorsal margin of each valve projecting past inset straight part of hinge (Figure 10c). Anterior of carapace broadly rounded with slight indentation near tip of rostrum, but anterior of rostrum straight, not concave, with minute lateral projection at tip (Figure 10d,f). Dorsal margin of caudal process forming curved obtuse angle with posterior margin of valve dorsal to process (Figure 10e,g). Posterior edge of caudal process slightly convex (Figure 10e,g).

Ornamentation (Figure 10a,b): Surface with distinct scallops with convex edge of each scallop oriented posteriorly (only representational scallops shown in Figure 10a); edges of scallops on posterior half of carapace minutely serrate (Figure 10b). Narrow ridge along dorsal edge of incisur curving ventrally and intersecting valve margin just ventral to incisur (Figure 10a). 3 pits present on anteroventral surface ventral to incisur and close to valve edge (the 3 pits may be equivalent to grooves described on shell of *C. cruenta* by Poulsen (1962:319, fig. 145c) except the open end of each pit is on the outside of the shell some distance from the valve edge, whereas the grooves, according to Poulsen (p. 319), open "just inside the selvage." The pits on *Codonocera* species A are illustrated herein (Figure 10d) from the inside rather than the outside of the valve for easier comparison with Poulsen's illustration).

Infold (Figure 10c-g): Rostral infold with 3 or 4 long bristles dorsal to oblique list, 2 long bristles at inner end of incisur, and 1 small bristle inward from inner end (Figure 10f). Anteroventral infold with 10–12 long bristles forming row (not all bristles shown in Figure 10d,f). List along ventral margin broadening near caudal process forming triangular flap just anterior to caudal process; flap bearing few small bristles along edge (Figure 10e,g). Outer edge of caudal process with 2 minute

pores or processes connected to pore canals (Figure 10e,g). Widely separated bristles present along ventral margin and on shell surface (not shown).

Selvage: Lamellar prolongation with smooth outer edge broadest in vicinity of incisur (Figure 10f); selvage divided into dorsal and ventral segments at incisur; lamellar prolongation within incisur narrowly striate and pustulose (not shown). Lamellar prolongation absent along posterior edge of caudal process.

Central Adductor Muscle Attachments (Figure 10a): Indistinct, with about 5 elongate and 8 ovoid attachments; 3 elongate attachments form vertical anterior row.

Carapace Size: USNM 193619, length 1.00 mm, height 0.71 mm; USNM 193625, length 1.04 mm, height 0.71 mm.

Pigmentation: None present in carapace or appendages of preserved specimens.

First Antenna (Figure 11a): 1st joint bare. 2nd joint spinous. 3rd joint with 2 spinous bristles (1 ventral terminal, 1 dorsal at joint midlength). 4th joint with dorsal spines. Long 5th joint with dorsal spines; sensory bristle stout, long, without filaments. 6th joint short; medial bristle terminal on dorsal margin. 7th joint (only a-bristle shown): a-bristle short; b-bristle about 3 times length of a-bristle, bare; c-bristle long with terminal papilla but no filaments. 8th joint (bristles not shown): d- and e-bristles long, bare; f- and g-bristles long, bare (tips broken off on both limbs of illustrated specimen).

Second Antenna (Figure 11b): Protopodite with spinous distal medial bristle. Endopodite 3-jointed: 1st and 2nd joints bare; 3rd joint with long terminal filament. Exopodite 9-jointed: bristle of 2nd joint reaching 9th joint, with 11 stout ventral teeth (distal 1 or 2 teeth more slender than others); bristles of joints 3–8 with natatory hairs, no spines; 9th joint with 2 bristles with natatory hairs (dorsal bristle on small pedestal) and lateral spine (with 4 points along distal edge) about $\frac{1}{3}$ length of joint; basal spines not observed (obscured), but small if present.

Mandible (Figure 11c,d): Coxale endite well developed, spinous, with 2 stouter subequal spines at tip, basal bristle not observed. Basale with 1 spinous ringed a-bristle adjacent to stout unringed spine, no b-bristle, 2 spinous c-bristles, and no d-bristle; dorsal margin of basale with 1 bare midbristle and 2 terminal bristles (lateral bare, medial spinous); medial surface with spines forming few rows near dorsal margin. Exopodite about $\frac{3}{4}$ length of dorsal margin of 1st endopodial joint, hirsute distally, with 2 bristles, both with few indistinct spines (distal bristle shorter). 1st endopodial joint with 2 long ventral bristles, both with short spines. 2nd endopodial joint: medial surface and ventral and dorsal margins spinous (distal ventral spines stouter); ventral margin with 1 distal unringed bristle with anterior spines in addition to a posterior spine near tip; dorsal margin with 3 long ringed bristles and 3 short unringed bristles with few marginal hairs and long terminal spine. 3rd endopodial joint with 3 unringed claws and 1 ringed ventral

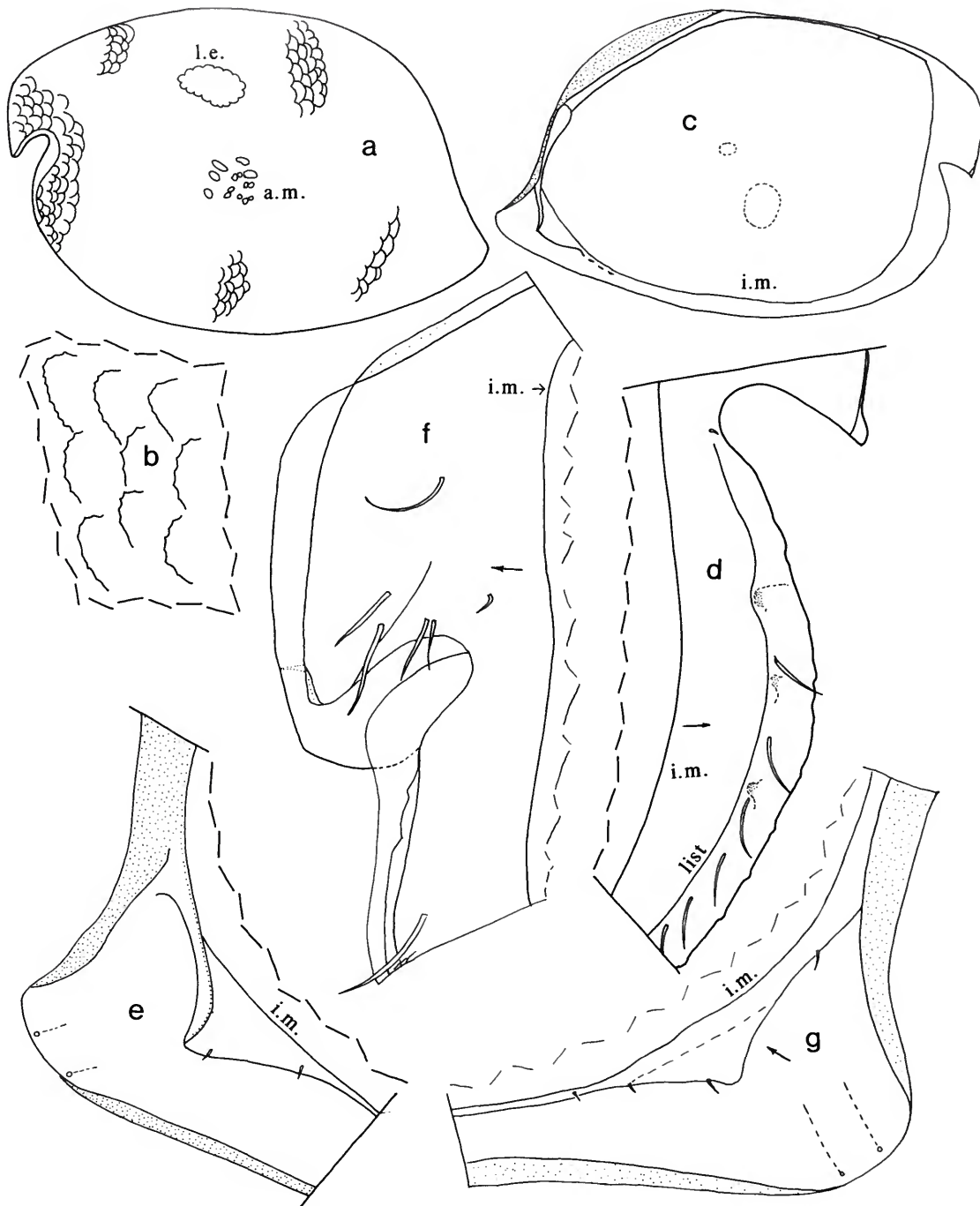


FIGURE 10.—*Codonocera* species A, USNM 193619, instar I: *a*, complete specimen from left side showing outline of left lateral eye, central adductor muscle attachments, and representative scallops on surface, length 1.00 mm; *b*, detail of scallops showing serrate edges, from right valve; *c*, inner view of left valve (area of muscle attachments shown by dashed ovals); *d*, *e*, inner views of anterior and caudal process of left valve, respectively; *f*, *g*, inner views of anterior and caudal process of right valve, respectively.



FIGURE 11.—*Codonocera* species A, USNM 193619, instar I: a, 1st antenna (only proximal part shown of sensory bristle of 5th joint; b, medial view of endopodite and proximal parts of prodopodite and exopodite of left 2nd antenna; c, lateral view of right mandible; d, medial view of 3rd endopodial joint of left mandible; e, lateral view of right maxilla; f, medial view of cutting tooth and beta-bristle of 1st endopodial joint of left maxilla; g, posterior view of left 5th limb; h, anterior view of exopodial joints 1-5 of right 5th limb; i, lateral view of right 6th limb; j, posterior of body from left side; k, anterior of body from left side; l, dorsal view of heart, anterior to right.

bristle with few proximal spines (Figure 11d); longest claw lateral and about half length of 2nd endopodial joint measured along middle of joint, with 6 proximal spines; medial claw only slightly smaller than lateral claw and with about 9 proximal spines; dorsal claw about $\frac{2}{3}$ length of lateral claw and with 6 proximal spines.

Maxilla (Figure 11e,f): Precoxale and coxale without hairs forming dorsal fringe; coxale with hirsute dorsal bristle. Endite I with 6 spinous and pectinate bristles; endite II with 5 bristles, bare or with short spines; endite III with 1 bristle at midlength and 3 terminal, bare or with short spines. Exopodite with 1 subterminal bristle (broken off on illustrated limb) and 2 terminal bristles (outer plumose, inner bare). Basale with 1 short medial bristle at joint midwidth and 1 long plumose posterior bristle near exopodite. 1st endopodial joint with 1 bare ringed alpha-bristle, 1 pectinate distally ringed beta-bristle (rings not shown), and well-developed cutting tooth (Figure 11f). 2nd endopodial joint with 2 ringed a-bristles with few spines, 1 pectinate distally ringed b- or c-bristle, and 2 pectinate unringed d-bristles (anterior bristle stouter and nonarticulated) (Figure 11e).

Fifth Limb (Figure 11g,h): Protopodite without anterior tooth. Endite I with 2 bristles (posterior bristle bare with stout pointed tooth-like tip, anterior bristle with long spines) (Figure 11g); endite II with 4 bristles (posterior bristle stout with long proximal spines and distal teeth, adjacent bristle small, bare, tooth-like, 2 anterior bristles slender ringed and with short marginal spines); endite III with 5 bristles (posterior bristle stout with long proximal spines and distal teeth, adjacent bristle small bare tooth-like, next bristle slender unringed pectinate, 2 anterior bristles slender ringed and with short marginal spines). 1st exopodial joint: main tooth comprising short bare peg with tip appearing tubular (Figure 11g), and stout unringed tooth with 7 or 8 marginal cusps; stout ringed bristle with long proximal and short distal spines proximal to peg; anterior side with long pectinate bristle proximal to main tooth (Figure 11h). 2nd exopodial joint with stout pectinate distally ringed a-bristle with 8 marginal teeth excluding tip, 1 stout distally ringed b-bristle with long proximal spines and 8 distal teeth, 1 posterior ringed c-bristle with long proximal and short distal hairs, and no d-bristle (rings not shown). 3rd exopodial joint: outer lobe hirsute with 2 short ringed bristles with minute marginal spines; inner lobe without bristles. 4th and 5th exopodial joints fused, with 2 terminal spinous ringed bristles, and small spinous subterminal process separated from bristles by indentation in margin.

Sixth Limb (Figure 11i): Small with 3 lobes at posterior end and marginal spines, no bristles.

Seventh Limb: Absent.

Furca (Figure 11j): Each lamella with 2 stout claws followed by 1 smaller claw, all articulated and with teeth along posterior edges; teeth along smallest claw spine-like and longer than those of other claws; edge of each lamella between claws

2 and 3 and following claw 3 with short spines. Anterior edge of right lamella slightly anterior to left by width of base of claw 1; claw 2 of right lamella anterior to claw 2 of left lamella by width of base of claw, but claw 3 on each lamella adjacent.

Bellonci Organ (Figure 11k): Organ at anterior ventral corner of medial eye, elongate, apex mucronate.

Eyes (Figure 11k): Medial eye unpigmented, bare. Lateral eye amber colored, with 22 ommatidia.

Upper Lip (Figure 11k): With unpaired anterior part and paired posterior part. Anterior part with numerous small glandular openings along edge; each lobe of paired posterior part comprising anterior lobe (with glandular openings along edge) and 2 small posterior tusks (anterior of these lateral, other with base in same plane as anterior lobe).

Heart (Figure 11l): Well developed, maximum length about same as that of lateral eye.

Posterior of Body (Figure 11j): Evenly rounded without hairs or spines.

Y-Sclerite (Figure 11j): Unbranched, posterior end fused to both ventral end of girdle and dorsal end of sclerite (ventral end of this sclerite joins posterior end of furca).

Gut Content: Gut filled with unidentified particles.

DISCUSSION.—The two specimens in the collection were identified as 1st instars by the absence of bristles on both the 4th joint of the 1st antenna and the 6th limb, and by the absence of the 7th limb (Hiruta, 1983, fig. 5). Other characters identifying a 1st instar are the absence of filaments on bristles of the 1st antenna (sensory bristle of 5th joint, and b-, c-, f-, and g-bristles of the 7th and 8th joints), and the morphology of the Y-sclerite (absence of distal ventral branch, and fusion of proximal end with other internal sclerites (girdle and the sclerite connected to furca)). Although adult species of the genus *Codonocera* have only 4 claws on each lamella of the furca, 3 are already present on the 1st instar. The 1st instar of *Codonocera* species A is without a tuft of hairs or spines on the posterodorsal corner of the body. A tuft has been described on 1st instars of *Skogsbergia lernerii* (Kornicker, 1958) by Cohen (1983:252, fig. 10) and in the description of *S. galapagensis* Kornicker and Iliffe, 1989:22.

Cypridina Milne-Edwards, 1840

Cypridina Milne-Edwards, 1840:409.—Poulsen, 1962:255.

Cypridina (*Pyrocypripis*) Müller, 1890:230.

Eupathistoma Brady, 1898:437.

Pyrocypripis Müller, 1906:16.—1912:16.

Cypridina (*Cypridina*) Skogsberg, 1920:313.

TYPE SPECIES.—*Cypridina Renaudii* Milne-Edwards, 1840:409, by monotypy.

COMPOSITION.—Including 2 new species, *Cypridina spina* and *C. spinula* described herein, 21 species listed below are recognized as species of *Cypridina* sensu Poulsen (1962:255).

As previously noted by Poulsen (1962:257), many species that have been referred to *Cypridina* are not described in sufficient detail to permit their recognition at the species level. I have marked with an asterisk 8 species in the following list that I regard as *Cypridina* unrecognizable as species; they are herewith referred to the category species indeterminata (a species not identifiable from the original publication). As noted in the list, the names of 3 of the species are junior primary homonyms.

C. acuminata (Müller, 1906). Remarks: Supplementary description by Poulsen (1962:258). Synonymy and localities in Hanai et al. (1980:25).

C. americana (Müller, 1890). Remarks: Supplementary description by Kornicker (1987a:173).

C. amphiacantha (Müller, 1906). Synonymy and localities in Hanai et al. (1980:26).

C. chierchiae (Müller, 1890). Remarks: See discussion of *C. natans* below. Synonymy and localities in Hanai et al. (1980:26).

C. dentata (Müller, 1906). Remarks: Supplementary description by Poulsen (1962:264). Synonymy and localities in Hanai et al. (1980:26).

*C. gibbosa** Dana, 1849. Synonymy and localities in Hanai et al. (1980:27).

C. inermis (Müller, 1906). Remarks: Supplementary description by Poulsen (1962:264). Synonymy and localities in Hanai et al. (1980:27).

*C. japonica** (Müller, 1890). Remarks: A junior primary homonym of *Cypridina japonica* Brady, 1866 (Hanai, 1974:118; Hanai et al. 1977:76).

C. multipilosa Poulsen, 1962.

C. nana Poulsen, 1962.

C. natans (Brady, 1898). Remarks: Supplementary description by Poulsen (1962:262). Brady (1898, pl. 44: fig. 26) illustrated a furca for this species having all claws articulated, but later (Brady, 1902:186) referred *C. natans* to *C. chierchiae*, a species having the 2nd claw of the furca fused to the lamella (Müller, 1912:17), and recorded additional specimens from the Bay of Bengal, which is the type locality. Skogsberg (1920:317) corrected the locality of the latter collection to the Indian Ocean near the Bay of Bengal; he restudied the specimens and was undecided as to whether they should be referred to *C. chierchiae*, but although Skogsberg lists morphological differences between the specimens and *C. chierchiae*, the furca is not mentioned, so the specimens could have the 2nd claw fused to the lamella, and therefore not be conspecific with *C. natans*. Synonymy and localities in Hanai et al. (1980:28).

*C. noctiluca** (Kajiyama, 1912b). Remarks: Kajiyama in an unpublished dissertation (1912a:18), which formed the basis for his 1912b publication, gave a more complete description of *C. noctiluca* under the manuscript name *Pyrocypris* sp. II. He described the furca as follows: "With 9 thorns on each rami, they decrease in size and length towards the foot." In the

illustration of the male furca (pl. 6: fig. 3) in my copy of the dissertation furcal claws 3–5 appear to be fused to the lamella and the sutures at the bases of claws 1 and 2 appear weak, but, unfortunately, the quality of the illustration is too poor to be certain of this.

*C. punctata** (Müller, 1890). Remarks: A junior primary homonym of *C. punctata* (Münster, 1830) Reuss, 1850, and *C. punctata* Dana, 1849. Referred to *Cypridina*? sp. in Hanai et al. (1980:29).

*C. punctata** sensu Brady, 1897, not *C. punctata* Dana, 1849. Remarks: Comprises specimens misidentified by Brady (1897:89) as "(?) *C. punctata* Dana, 1849." Müller (1906:22) considered it possible that the specimens referred by Brady (1897:89) to *C. punctata* Dana, 1849 are juvenile *C. lepidophora* [= *C. serrata*], but he later (1912:52) referred Brady's specimens (with a question) to *Cypridina* sp., which he then referred to the category "*Cypridinidarum genera dubia et species dubiae*." I refer Brady's specimens to species indeterminata.

*C. renaudii** Milne-Edwards, 1840 (type species). Remarks: Problems concerning this species were discussed by Skogsberg (1920:316). Müller (1912:52) referred the species to "*Cypridinidarum genera dubia et species dubiae*."

*C. rivilli** (Müller, 1890). Remarks: Müller (1912:18) referred *C. mollis* (Müller, 1890) to this species.

C. serrata (Müller, 1906). Remarks: A new variety *affirmans* was described in detail by Skogsberg (1920:317). Skogsberg (1920:330) referred *C. lepidophora* (Müller, 1906) to *C. serrata*. Synonymy and localities in Hanai et al. (1980:28).

*C. sharpei** (Müller, 1912).

C. sinuosa (Müller, 1906). Remarks: Supplementary description by Poulsen, 1962:262. Synonymy and localities in Hanai et al. (1980:28).

C. spina, new species, described herein.

C. spinula, new species, described herein.

DISTRIBUTION.—Indian and Pacific Oceans, between latitudes of about 35°N and 30°S, planktonic and demersal.

DISCUSSION.—As an aid in the identification of species of *Cypridina* they are listed below according to the number of nonarticulated claws on each lamella of the furca. Note that both sexes are not known for many species, and that *C. spinula* is listed in 2 categories because the female has 2 nonarticulated claws and the male only 1.

1. All furcal claws articulated.

C. acuminata (Müller, 1906) (adult male and female).

C. natans (Brady, 1898) (adult male and female).

2. One furcal claw (claw 2) nonarticulated.

C. americana Müller, 1890 (adult male, female furca unknown).

C. amphiacantha (Müller, 1906) (adult male, female furca unknown).

C. chierchiae Müller, 1890 (adult male, female furca unknown).

- C. dentata* (Müller, 1906) (adult male and female).
C. inermis (Müller, 1906) (adult male and female).
C. punctata (Müller, 1890) (sex unknown; data from Müller (1912:16, key)).
C. multipilosa Poulsen, 1962 (adult male, female unknown).
C. nana Poulsen, 1962 (adult male and female).
C. rivilli Müller, 1890 (sex unknown, data from Müller (1912:16, key)).
C. sharpei (Müller, 1912) (sex unknown).
C. sinuosa (Müller, 1906) (adult male and female).
C. spina, new species (adult male and female).
C. spinula, new species (adult male, adult female with 2 claws nonarticulated).
3. Two furcal claws nonarticulated.
C. serrata (Müller, 1906) (adult male with claws 2 and 4 nonarticulated and female with claws 2 and 3 nonarticulated).
C. spinula, new species (adult female with claws 2 and 4 nonarticulated, adult male with only claw 2 nonarticulated).
4. Three furcal claws nonarticulated.
C. punctata sensu Brady, 1897, not *C. punctata* Dana, 1849, (sex unknown).
5. Articulation of furcal claws not known.
C. gibbosa Dana, 1849.
C. japonica (Müller, 1890), not *C. japonica* Brady, 1866.
C. noctiluca (Kajiyama, 1912b).
C. renaudii Milne-Edwards, 1840.

Cypridina dentata (Müller, 1906)

FIGURES 12-14

Pyrocypris dentata Müller, 1906:20, pl. 2: figs. 17-21.—1912:17, 18.
Cypridina dentata.—Poulsen, 1962:265, fig. 123.

HOLOTYPE.—None selected; 3 syntypes (2 males, 1 female).

SYNTYPE LOCALITIES.—Malay Archipelago, Siboga Expedition: Sta 40 (1 female, 1 male), 2 Apr 1899, Paternoster Island near Kawassing, plankton, 12 m; sta 66 (1 male), 7 May 1899, bank between Bahuluwang and Tabolungan, plankton, 8-10 m.

MATERIAL.—Enewetak lagoon: Midwater trawl off Bokandretok Island: USNM 193658, 1 A-1 male in alcohol. Sta B, plankton trap 10, night, coral rubble substrate: USNM 193655A, 1 A-1 male in alcohol; USNM 193655B, 1 A-1 female in alcohol; USNM 193656, 1 A-1 male on slide and in alcohol.

DISTRIBUTION.—Malay Archipelago (Poulsen, 1962:267) and Enewetak Atoll.

DESCRIPTION OF A-1 MALE (Figures 12, 13).—Carapace elongate with convex ventral and dorsal margins (Figure 12a, c); maximum height at midlength. Rostrum with dorsal corner angular in lateral view (Figure 12a-c), more rounded in medial

view (Figure 12d), and with concave anterior margin and pointed ventral corner; caudal process elongate with rounded tip. Anteroventral edge of valve with 13 or 14 bristles along inner edge lateral to transparent lamellar prolongation of selvage (Figure 12a,c,e,g); between 1st and 2nd bristles a fairly large tooth (formed by ventral end of concave rib extending from inner end of incisur to anteroventral valve edge) followed by 4-6 smaller teeth (Figure 12e,g); about 30 narrow sutures perpendicular to valve edge in vicinity of bristles but not forming serrations along edge (Figure 12e). Outer surface of valves with 3 or 4 slender bristles along anteroventral margin near edge ventral to incisur (Figure 12e).

Infold: Rostral infold with 3 bristles forming row paralleling anterior edge of rostrum (upper bristle missing in Figure 12d), 2 bristles near inner end of incisur, and 1 small bristle proximal to their bases. Anteroventral infold (inward from bristles along edge) with 6 or 7 short bristles (Figure 12g); ventral infold with few widely separated bristles. List of anterior edge of caudal process forming narrow bar covered by broad transparent flap with long nonarticulated triangular serrations along posterior edge (USNM 193656 with 17 on right valve, 10 on left) (Figure 12f,h); flap also with small pores and bristles on outer surface; additional spines and triangular processes between flap and outer edge of caudal process (Figure 12f,h).

Selvage: Similar to that of *C. spina* described herein.

Central Adductor Muscle Attachments (Figure 12c): Comprising many closely spaced ovoid scars (not all scars illustrated).

Carapace Size: USNM 193655A, length 1.47 mm, height 0.82 mm; USNM 193656, length 1.44 mm, height 0.84 mm; USNM 193658 (shell distorted), length 1.40 mm, height 0.70 mm.

First Antenna (Figure 13a): 1st joint bare. 2nd joint with abundant medial spines forming rows. 3rd joint with 2 bare bristles (short dorsal and longer ventral (tip of ventral bristle broken off on illustrated limb)). 4th joint with 2 bare bristles (1 ventral, 1 dorsal). Sensory bristle of 5th joint with 2 short proximal filaments followed by 1 longer slender filament, 5 long stout filaments, 2 short slender filaments, and bifurcate tip. 6th joint with short bare medial bristle near dorsal margin. 7th joint: a-bristle bare, slightly longer and stouter than bristle of 6th joint; b-bristle about half length of sensory bristle of 5th joint, with 4 short proximal filaments; c-bristle about twice length of sensory bristle of 5th joint, with 8 short slender filaments, some with spines (only proximal part of bristle shown in illustrated limb); minute papilla present on joint edge just dorsal to b-bristle. 8th joint (bristles not shown): d- and e-bristles long, bare, with blunt tips (d-bristle about same length as sensory bristle, e-bristle shorter); f-bristle with tip broken off on USNM 193656, remaining part about same length as c-bristle, with 8 marginal filaments, some with spines; g-bristle about 1/3 longer than c-bristle, with 9 or 10 marginal filaments, some with spines.

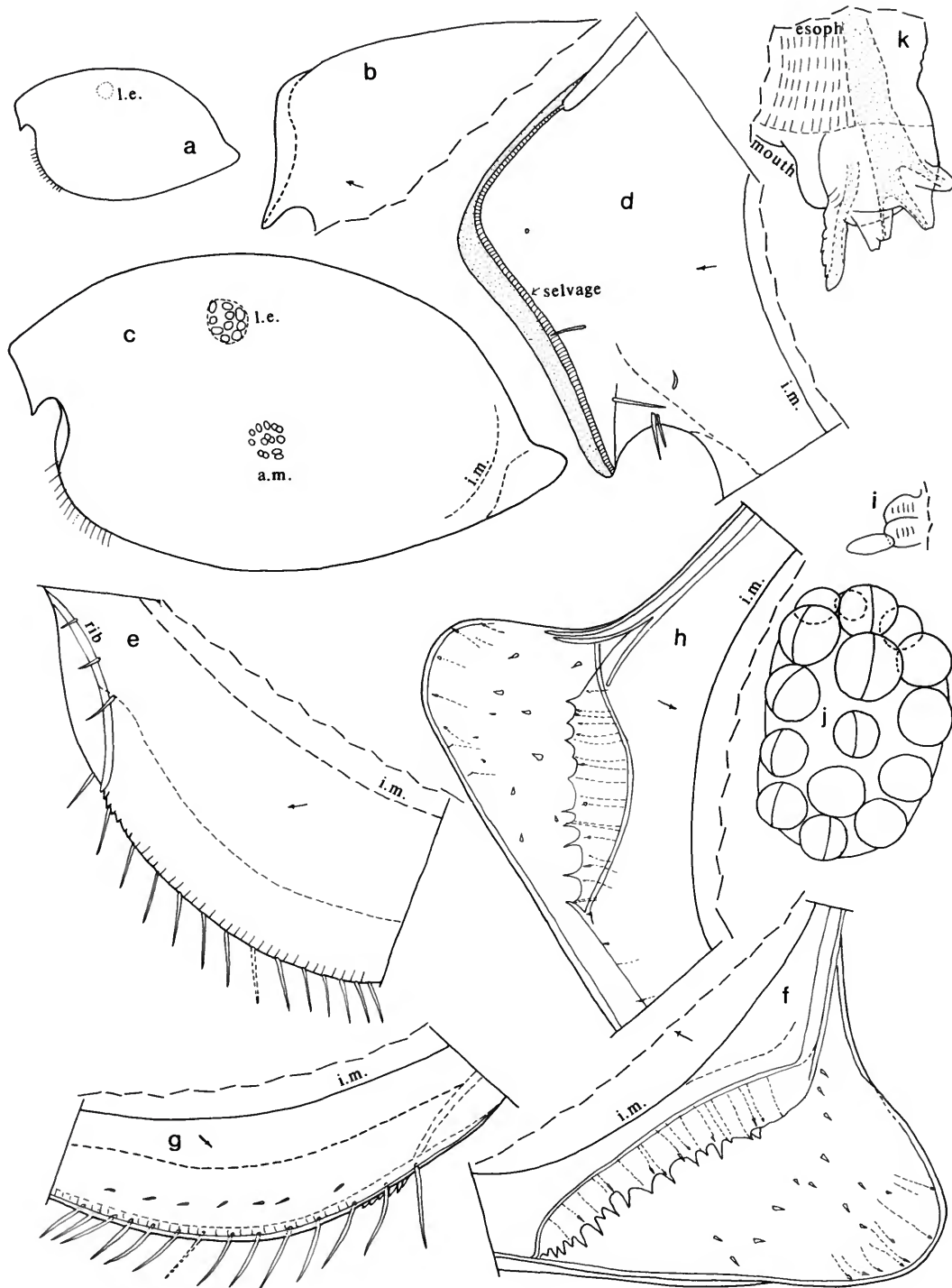


FIGURE 12.—*Cypridina dentata* (Müller), USNM 193655A, A-1 male: *a*, complete specimen from left side, length 1.47 mm; *b*, detail of rostrum in *a*, (dashed line indicates location of inner edge of selvage). USNM 193656, A-1 male: *c*, complete specimen from left side, length 1.44 mm. *d*, inner view of rostrum of right valve (missing upper bristle of infold indicated by socket); *e*, outer view of anteroventral margin of left valve; *f*, inner view of anteroventral margin and caudal process of left valve; *g, h*, inner views of anteroventral margin and caudal process of right valve; *i*, medial eye and Bellonci organ; *j*, right lateral eye; *k*, upper lip, anterior to right.

Second Antenna: Protopodite with small distal medial bristle with few minute marginal spines (Figure 13b). Endopodite 1-jointed with 4 bristles (2 small anterior bristles followed by 1 slightly longer and stouter bristle, and 1 longer bristle) and 1 distal filament about 4 times length of shortest bristle (Figure 13c). Exopodite: 1st joint with few dorsal spines along concave margin; bristle of 2nd joint reaching to about 6th joint, with 11 slender ventral spines (distal spine longer than others) (Figure 13d); bristles of joints 3–8 with natatory hairs but no spines; 9th joint with 3 bristles (2 long with natatory hairs, 1 short, dorsal, bare); joints 3–8 with slender basal spines increasing in size on distal joints; spine of joint 8 slightly longer than half length of 9th joint; 9th joint with lateral spine about $\frac{2}{3}$ length of joint; 2nd joint with few minute spines along ventral margin; joints 2–8 with indistinct spines forming row along distal margin.

Mandible (Figure 13e,f): Coxale endite well developed, spinous, with 2 stout terminal spines, 1 on each side of small triangular process; small bristle near base of endite. Basale: ventral margin with 2 small ringed a-bristles, 1 small bare b-bristle, 2 c-bristles (proximal small, distal long spinous), and 2 d-bristles (proximal small, distal long with rings of long spines); dorsal margin with 3 bristles (1 distal to midlength, bare, 2 terminal (lateral bare, medial with short spines)); medial surface with few spines near dorsal margin; lateral surface with few proximal hairs near ventral margin. Exopodite about same length as dorsal margin of 1st endopodial joint, hirsute, with terminal hirsute triangular pad and 2 subterminal bristles (distal stouter and shorter). 1st endopodial joint with 4 ventral bristles (1 minute, bare, others longer, spinous). 2nd endopodial joint: ventral margin with few proximal spines, 2 single weakly ringed distal bristles, and paired terminal bristles (medial sclerotized unringed; lateral slender, weakly ringed); dorsal margin with indistinct spines, 4 long spinous ringed bristles, 1 shorter spinous ringed bristle proximal to long bristles, 0 or 1 short bristle (with short spines) medial to proximal of long bristles, and 1 short unringed bristle (with long spines) medial to 2nd long bristle. 3rd endopodial joint with 3 equilateral unringed claws (dorsal bare, others with proximal ventral teeth) and 4 ringed bristles (2 medial near ventral margin (ventral of these small, bare, other longer, bulbous proximal to ringed spinous part and with short segment without rings near tubular tip (not shown)), 1 terminal (near ventral margin) and long with S-shaped proximal part, and 1 lateral dorsal) (Figure 13f).

Maxilla (Figure 13g): Endite I with 6 bristles; endite II with 4 or 5 bristles; endite III with 5 bristles. Coxale with plumose dorsal bristle. Basale with 2 short distal bristles (1 ventral, 1 at midwidth). Exopodite broad, hirsute, with 3 bristles (proximal and middle bristle with long marginal hairs, other bare). 1st endopodial joint with bifurcate cutting tooth, 1 ringed alpha-bristle with long marginal hairs, 2 ringed beta-bristles (medial stout pectinate, lateral slender bare, about half length of outer), and dorsal hairs forming rows. 2nd endopodial joint

with 3 slender bare ringed a-bristles, 2 small ringed b-bristles (posterior smaller and pectinate proximally, anterior hirsute), 2 ringed c-bristles, and 3 pectinate d-bristles (posterior ringed distally, others unringed).

Fifth Limb (Figure 13h,i): Epipodite with 33 hirsute bristles. Anterior tooth-like process of protopodite absent. Endite I with 5 bristles; endite II with 4 short terminal bristles, 1 minute terminal spine-like bristle, and 1 minute proximal anterior bristle; endite III with 6 bristles (not all endite bristles shown in Figure 13i). 1st exopodial joint: main tooth with proximal peg with serrate margin and 5 cusped teeth (largest tooth with 13 small cusps forming row); spinous ringed bristle proximal to peg (Figure 13h); anterior side with 2 adjacent ringed bristles (both with long proximal hairs, inner bristle twice length of outer) and 1 hirsute bristle closer to epipodite (this bristle could be on protopodite) (Figure 13i). 2nd exopodial joint with 3 pectinate unringed a-bristles, 3 pectinate b-bristles including stout b-bristle (with long proximal spines) near inner lobe of 3rd joint (small posterior bristle unringed, others ringed) (rings not shown in Figure 13h), posterior c-bristle ringed, with long proximal spines, and anterior d-bristle ringed, with long spines on proximal half (Figure 13i). 3rd exopodial joint: inner lobe with 3 bristles (1 short, ringed, proximal (with long proximal and short distal spines), 1 short, unringed, pectinate, terminal, and 1 longer ringed terminal (with short marginal spines)); outer lobe hirsute, with 2 short ringed bare bristles. 4th and 5th joints fused, hirsute, with 3 ringed bristles (1 short with few indistinct spines, 2 longer with short spines); low rounded node between long and short bristles (node not shown in Figure 13i).

Sixth Limb (Figure 13j,k): With 1 small bare epipodial bristle. Endite I with 2 small proximal medial bristles and 1 long terminal bristle (Figure 13j); endite II with 1 small proximal medial bristle, 1 small subterminal medial bristle, and 1 long terminal bristle; endite III with 1 small medial subterminal bristle and 2 long terminal bristles; endite IV with 1 short medial subterminal bristle and 1 long terminal bristle (Figure 13k). End joint with 7 bristles (4 anterior separated by space from 1 short bristle, then short space and 2 posterior hirsute bristles) (Figure 13k); medial surface of limb hirsute; lateral side with spines along ventral edge of end joint.

Seventh Limb (Figure 13l,m): Each limb with 8 bristles: 2 weakly developed proximal bristles (1 on each side, without bells), and 6 terminal (3 on each side: 2 weakly developed without bells, and 1 with rings and 2 bells). Terminus elongate with small peg at base and 4 terminal teeth.

Furca (Figure 13n-p): Each lamella with 8 claws; claw 2 nonarticulated, remaining claws articulated; claw 4 slightly narrower than claw 3; claws 2 to 8 decreasing gradually in length and width; all claws with teeth forming lateral and medial row along posterior edges (Figure 13o,p); claw 1 with several large distal teeth in medial row (Figure 13o); claws 1–3 with anterior hairs; claw 1 of right lamella anterior to claw 1 of left lamella by width of claw measured at its base.



Bellonci Organ (Figure 12i): Short, not well defined.

Eyes: Medial eye unpigmented, bare (Figure 12i). Lateral eye about twice length of medial eye, with 13 amber-colored ommatidia on surface and 3 small ommatidia beneath the surface ommatidia at dorsal end of eye; largest ommatidium placed 4th in middle row (counting from ventral end) (Figure 12j). No pigmentation between ommatidia.

Upper Lip (Figure 12k): With 2 unpaired anterior processes and 2 pairs of posterior processes. Each anterior unpaired process with glandular opening at tip; anterior of paired processes bifurcate at tip, each branch with 1 or 2 glandular openings at tip; posterior of paired processes elongate, with 4 glandular openings along posterior edge and 1 at tip.

Genitalia: Comprising 2 lobes anterior to furca (Figure 13q); an oval sac on each side of body proximal to lobes interpreted to be testes (Figure 13r).

Posterior of Body: Evenly rounded, bare.

Y-Sclerite (Figure 13n): Typical for subfamily.

Pigmentation: None in carapace or appendages.

DESCRIPTION OF A-1 FEMALE (Figure 14).—Shape of carapace similar to that of A-1 male except caudal process marginally shorter (Figure 14a). Anteroventral edge of valve with 17 or 18 bristles (more than on A-1 male) along inner edge lateral to transparent lamellar prolongation of selvage (Figure 14b,c); teeth between anterior 2 bristles not projecting past valve edge as on A-1 male; anterior 17 or 18 teeth along edge oblique, remainder vertical to edge (Figure 14b,c).

Infold: Bristles of rostrum, anteroventral and ventral margins not all counted but, in general, similar to those of A-1 male. Infold of caudal process similar to that of A-1 male (USNM 193655B with about 16 spines on right valve (Figure 14d), and 14 on left (Figure 14e)).

Carapace Size: USNM 193655B, length 1.24 mm, height 0.73 (smaller than A-1 male).

First Antenna: Joints 1–4 and 6 similar to those of A-1 male. Sensory bristle of 5th joint with 2 slender proximal filaments followed by 4 longer and stouter filaments, 2 short slender filaments, and bifurcate tip (Figure 14f). 7th joint: b-bristle bare; remaining bristles of 7th joint as well as those of 8th joint not examined in detail but, in general, similar to those of A-1 male.

Second Antenna: Protopodite and endopodite similar to

those of A-1 male (Figure 14g). Bristle of 2nd exopodial joint with 9 or 10 slender spines; exopodite otherwise similar to that of A-1 male.

Mandible, Maxilla, and Fifth Limb (Figure 14h): Similar to those of A-1 male.

Sixth Limb (Figure 14i): Endite I with 1 short proximal medial bristle and 1 long spinous terminal bristle. Limb otherwise similar to that of A-1 male.

Seventh Limb (Figure 14j): Each limb with 10 bristles: 4 weakly developed proximal bristles (2 on each side, without bells), and 6 terminal bristles (3 on each side: 2 weakly developed without bells, and 1 with rings and 1 or 2 bells). Terminus elongate with small peg at base and 5 terminal teeth.

Furca (Figure 14k): With 7 claws on left lamella and 8 on right. Limb otherwise similar to that of A-1 male.

Bellonci Organ (Figure 14m), *Upper Lip*, *Posterior of Body* (Figure 14n), *Y-Sclerite* (Figure 14n), and *Pigmentation*: Similar to those of A-1 male.

Eyes: Medial eye similar to that of A-1 male (Figure 14m). Lateral eye with 15 amber-colored ommatidia (13 on surface and 2 beneath the surface ommatidia at dorsal end of eye) otherwise similar to eye of A-1 male (Figure 14l).

Eggs: USNM 193655B with 2 rosettes of unextruded eggs inside of body, about 14 eggs in each rosette (Figure 14n).

Gut Content: Fragments of copepods in gut (identified by Thomas E. Bowman).

REMARKS.—USNM 193655A is an A-1 male with appendages having within them the developing appendages of the next instar (interpreted herein to be an adult male). The furca of the A-1 male has 8 claws, but the furca of the adult male within bears 9 claws. The oldest males in the collection are interpreted to be A-1 males because of the advanced development of the copulatory organs and testes. The oldest female in the collection is interpreted to be an A-1 instar because of the presence of unextruded eggs as well as similarities between the development of its appendages and those of the A-1 male. Based on ontogenetic studies of 2 new species of *Cypridina* described herein, A-1 instars of *C. dentata* are probably 5th instars.

COMPARISONS.—The caudal processes of carapaces of specimens in the present collection that are referred to *C. dentata* appear more elongate than those of adult males of *C. dentata* illustrated by Müller (1906, pl. 2: fig. 17) and Poulsen (1962, fig. 123a, c); also, according to Poulsen (1962:265) the bristle of the 2nd joint of the male 2nd antenna bears only 4 marginal spines, which is considerably less than the 9–11 spines reported for A-1 instars described herein. Poulsen (1962:265) gave the range of the number of anteroventral bristles on adult carapaces as 12–14, whereas the range on A-1 instars described herein is 13–18. Some of the differences may be attributable to the different ages of the specimens being compared. Despite the differences I have tentatively referred the Enewetak specimens to *C. dentata*.

FIGURE 13 (opposite page).—*Cypridina dentata* (Müller), USNM 193656, A-1 male: a, medial view of right 1st antenna (bristles of 8th joint not shown); b–d, left 2nd antenna: b, medial view of distal corner of protopodite; c, medial view of endopodite, anterior to right; d, bristle of 2nd exopodial joint; e, medial view of right mandible; f, 3rd endopodial joint of mandible shown in e; g, lateral view of exopodite and endopodite of right maxilla; h, posterior view of exopodial joints 1 and 2 and inner lobe of joint 3 of left 5th limb; i, anterior view of right 5th limb (not all bristles shown of endites and 1st and 2nd exopodial joints); j, k, lateral view of right 6th limb: j, endites I, II, and III; k, endite IV and skirt; l, m, 7th limbs; n, posterior of body; o, p, medial views of claws 1 and 2, respectively, of left lamella of furca; q, anterior or posterior view of both copulatory organs; r, left testis.

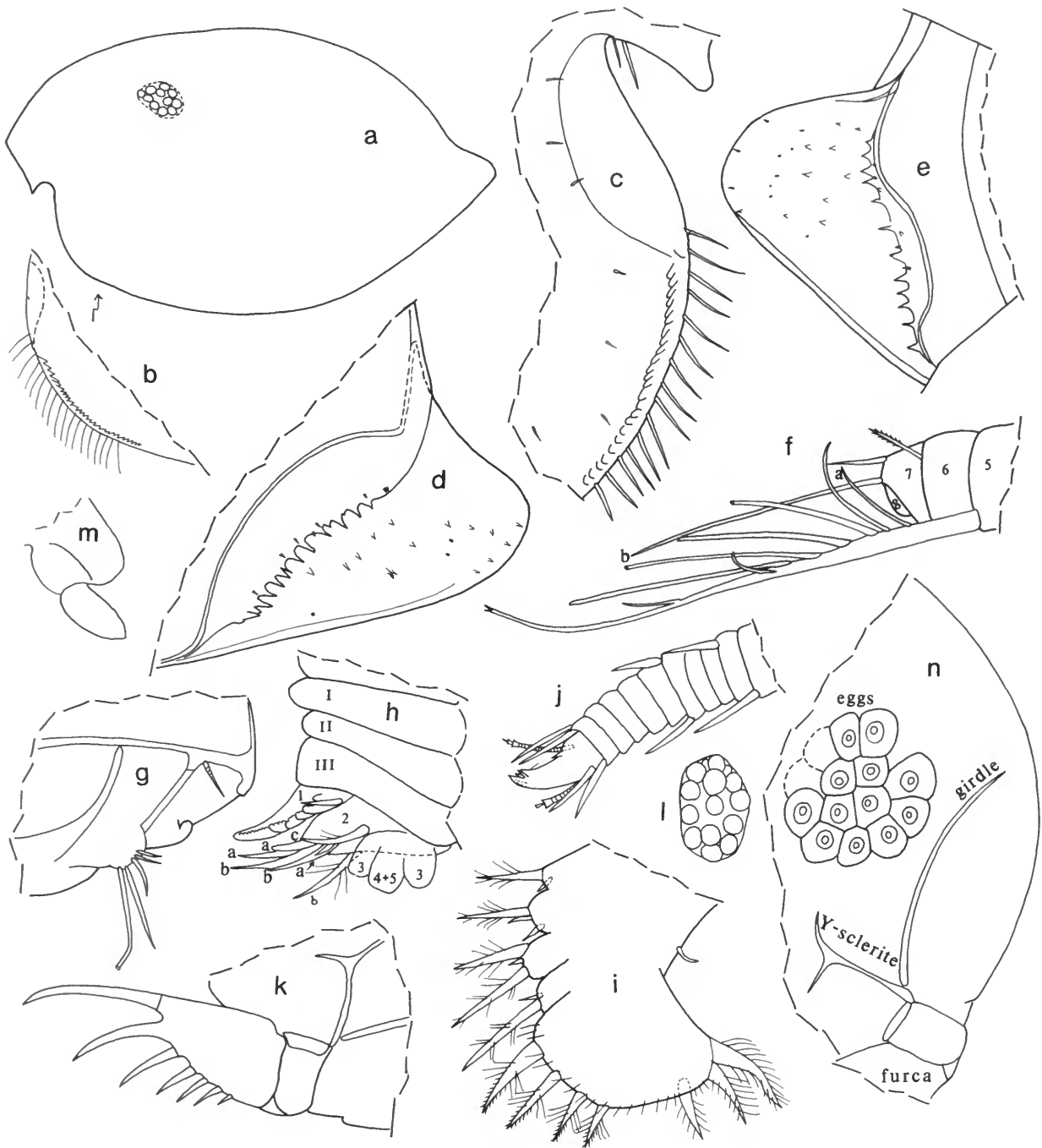


FIGURE 14.—*Cypridina dentata* (Müller), USNM 193655B, A-1 female: *a*, complete specimen from left side (anteroventral bristles and teeth not shown), length 1.24 mm; *b*, detail of anteroventral margin of left valve, from *a*; *c*, ventral end of rostrum and anteroventral margin of right valve; *d*, *e*, inner views of caudal processes of right and left valves, respectively; *f*, medial view of joints 5-8 of right 1st antenna (not all bristles of joints 7 and 8 shown); *g*, medial view of endopodite and distal part of protopodite of left 2nd antenna; *h*, posterior view of right 5th limb (only bristles of exopodial joints 1 and 2 shown); *i*, lateral view of left 6th limb; *j*, 7th limb; *k*, posterior of body with left lamella of furca; *l*, right lateral eye; *m*, medial eye and Bellonci organ; *n*, posterior of body with unextruded eggs.

Cypridina spina, new species

FIGURES 15–26

Cypridina spp. Komicker, 1987b:217 (part).

ETYMOLOGY.—From the Latin *spina* (thorn) in reference to the tooth-like internal spine just dorsal to the caudal process of the right valve.

HOLOTYPE.—USNM 193610, 1 undissected adult female in alcohol.

TYPE LOCALITY.—Enewetak lagoon (from composite sample).

PARATYPES.—Sta 039-69: USNM 158622, 1 ovigerous female on slide and in alcohol. Midwater trawl off Bokandretok Island: USNM 193640, 1 adult male on slide and in alcohol; USNM 193641A, 1 instar V male on slide and in alcohol; USNM 193641B, 2 adult females and 2 instar V females in alcohol. Sta A, plankton trap 6, night, coral reef substrate: USNM 193648, 1 ovigerous female, 2 adult females, 1 instar V female in alcohol. Sta B, plankton trap 7, night, coral reef substrate: USNM 158321, 1 ovigerous female in alcohol; USNM 193662A, 1 instar IV male on slide and in alcohol; USNM 193662B, 1 instar II male on slide and in alcohol; USNM 193662C, 1 adult female and 1 instar V female in alcohol; USNM 193662D, 1 adult male in alcohol. Sta B, plankton trap 10, night, coral reef substrate: USNM 193652A, 1 instar V male on slide and in alcohol; USNM 193652B, 5 adult females and 1 instar V male in alcohol; USNM 193652C, 1 instar IV female on slide and in alcohol; USNM 193652D, 1 instar V male on slide and in alcohol; USNM 193652E, 1 adult male in alcohol; USNM 193652F, 1 instar V female on slide and in alcohol. Composite sample: USNM 193613, 1 instar III male on slide and in alcohol; USNM 193657, 1 instar V female in alcohol.

DISTRIBUTION.—Enewetak Atoll.

DESCRIPTION OF ADULT FEMALE (Figures 15–18).—Carapace elongate with convex dorsal margin (more acuminate in dorsal half of USNM 158622 (Figure 15c) than in USNM 193610 (Figure 15a)), and slightly convex ventral margin except in posterior part in vicinity of caudal process where nearly straight margin sweeps upward (Figure 15a,c); maximum height at midlength; carapace surface smooth. Rostrum: dorsal corner sharply curved, anterior margin straight or slightly concave, inferior corner pointed in lateral view (Figure 15a,c). Caudal process elongate with broadly rounded tip (Figure 15f,j). Anteroventral edge of valve with about 20 well-developed teeth and 2 or 3 less-developed teeth anterior to others; distal ends of teeth narrowly or broadly rounded (Figure 15e,i).

Surface Bristles: Anteroventral edge of valves medial to teeth with 5–8 bristles (USNM 158622: left valve with 6 bristles (Figure 15e), right valve with 5 (Figure 15i)). Each valve with 2 minute protuberances (each with small terminal bristle) on valve edge just ventral to incisur, protuberances better developed on left valve (Figure 15d,e).

Infold (Figure 15e-k): Rostral infold with 5 bristles forming row paralleling anterior edge of rostrum (Figure 15d,h), 2 bristles near inner end of incisur and 1 small bristle proximal to their bases; rostral infold of right valve with 2 bristles along dorsal margin (Figure 15h) (possibly also on left valve but obscured); most bristles of rostral infold double; 2 or 3 small bristles near inner end of incisur. Anteroventral infold of left valve with fairly long double bristle near inner margin of infold (Figure 15e). Narrow list (with anterior end on anteroventral infold; distance of list from outer edge of infold about $\frac{1}{3}$ width of infold) extending along ventral infold and broadening to form stout sclerotized bar (bar dashed in Figure 15f,j) near anterior end of caudal process. Anteroventral infold with 4 or 5 bristles along list and 1 or 2 small bristles between list and outer edge of infold (Figure 15e,i). Ventral infold with 6 widely spaced bristles just ventral to list. Posteroventral infold with bristle (double bristle on left valve, single on right) near outer edge, and list (with minute bristles and processes) broadening anterior to caudal process (Figure 15g). Bar near anterior end of caudal process covered by transparent flap with slightly uneven posterior edge; flap bearing few minute rounded processes and minute bristles on or near posterior edge (Figure 15f,g). Broad infold of caudal process posterior to bar and flap with minute pores and pointed processes (Figure 15f,j). Small sclerotized tooth-like spine present on list of right valve dorsal to transparent flap of list of caudal process; 2 or 3 nodes each with small terminal papillae present anterior to inner margin of infold anterior to caudal process (Figure 15j,k).

Selvage: Anterior margin of rostrum with narrow ridge of selvage (to which lamellar prolongation is attached) set back from valve margin (lined in Figure 15d,h); ridge with narrow striate lamellar prolongation (not shown) extending to tip of rostrum and apparently terminating there. Prolongation along ventral margin of incisur very broad, striate except near smooth outer edge; prolongation along anteroventral margin of valve narrow, striate; prolongation broader along posteroventral margin of valve (with inner striate part with minutely digitate edge and broader nonstriate outer part with minute spines on surface and near smooth outer edge), then narrowing along ventral margin of caudal process and terminating near tip of process.

Central Adductor Muscle Attachments (Figure 15b): Comprising about 23 closely packed ovoid individual attachments.

Carapace Size: USNM 158622, length 1.50 mm, height 0.75 mm. USNM 193610, length 1.48 mm, height 0.82 mm. USNM 158321, length 1.55 mm, height 0.88 mm. USNM 193641B, 2 specimens, length 1.51 mm, height 0.87 mm; length 1.55 mm, height 0.82 mm. USNM 193648, length 1.54 mm, height 0.85 mm.

First Antenna (Figure 16a): 1st joint bare. 2nd joint with abundant short spines forming rows on medial surface (not shown) and along ventral margin, and longer hairs forming 2 distal rows on dorsal margin (rows extend onto lateral surface of joint). 3rd joint with 2 bristles (short dorsal and longer

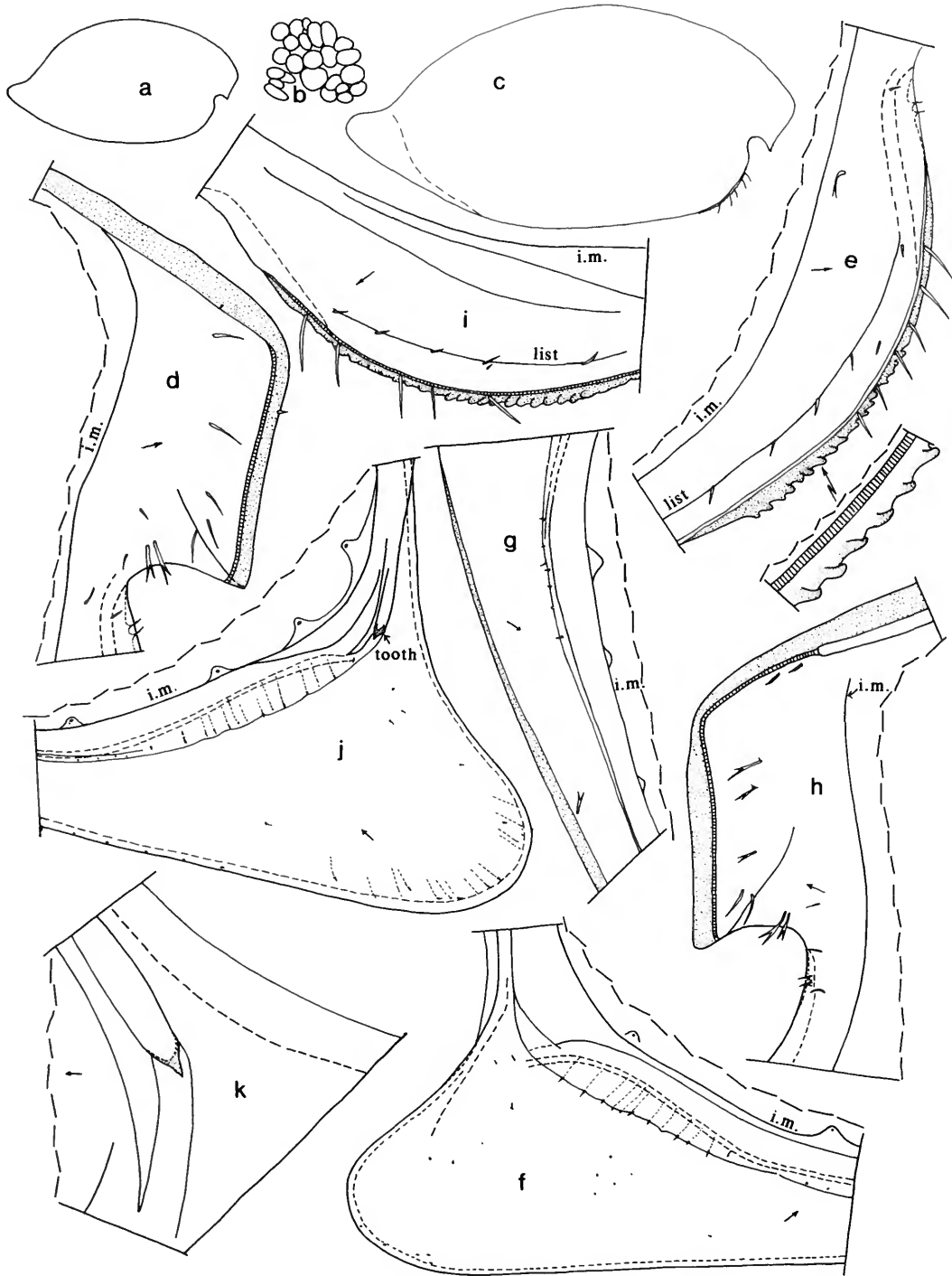


FIGURE 15.—*Cypridina spina*, new species. USNM 193610, holotype, adult female: a, complete specimen from right side (anteroventral bristles and teeth not shown), length 1.48 mm; b, central adductor muscle attachments of left valve, anterior to left. USNM 158622, paratype, adult female: c, complete specimen from right side, length 1.50 mm; d-g, inner views of left valve: d, rostrum; e, anteroventral margin; f, caudal process; g, posteroventral corner; h-k, inner view of right valve: h, rostrum; i, anteroventral margin; j, caudal process; k, detail of tooth in j.



FIGURE 16.—*Cypridina spina*, new species, USNM 158622, paratype, adult female: *a*, medial view of left 1st antenna; *b*, lateral view of endopodite and distal part of protopodite of right 2nd antenna; *c*, medial view of endopodite of left 2nd antenna, anterior to right; *d*, medial view of left mandible; *e*, medial view of 3rd endopodial joint of left mandible; *f*, proximal end of 7th limb with attached globular process; *g*, right lamella of furca; *h*, right Y-sclerite and ventral end of girdle, anterior to right.

ventral), both bare. 4th joint with 2 bare bristles (1 ventral, 1 dorsal). Sensory bristle of 5th joint with 6 long proximal filaments and 2 short, distal, slender filaments, and bifurcate tip; tip of bristle diaphanous, blunt. 6th joint with short bare medial bristle. 7th joint: a-bristle bare, about same length as bristle of 6th joint; bare b-bristle about $\frac{2}{3}$ length of sensory bristle of 5th joint; c-bristle long, about twice length of sensory bristle of 5th joint, with about 7 marginal filaments, some with spines. 8th joint: d-bristle (tip missing on illustrated limb) slightly longer than sensory bristle of 5th joint, bare with blunt tip; e-bristle similar to d-bristle but shorter; f-bristle long, about same length as c-bristle, with about 7 marginal filaments, some with small spines; g-bristle very long, about $\frac{1}{3}$ longer than f-bristle, with about 9 marginal filaments, some with spines.

Second Antenna (Figure 16b,c): Protopodite with small medial bristle with minute marginal spines. Endopodite 1-jointed with 4 or 5 bristles (2 or 3 small proximal, then 2 about twice length of smaller bristles (proximal of 2 slightly stouter)), and 1 distal filament about 5 times length of smaller bristles. Exopodite: bristle of 2nd joint short (reaching 5th joint), with about 7 slender ventral spines; bristles of joints 3–8 with natatory hairs but no spines; 9th joint with 3 bristles (2 long with natatory hairs, 1 short dorsal bare); joints 3–8 with slender basal spines increasing in size distally; spine of 8th joint about half length of 9th joint; 9th joint with lateral spine about $\frac{3}{4}$ length of joint; joints 6 and 7 with indistinct minute spines forming row along distal margin (spines possibly on additional joints but obscured).

Mandible (Figure 16d,e): Coxale endite well developed, spinous, with 2 stout terminal spines, 1 on each side of small triangular process; small bristle at base of endite. Basale: ventral margin with 2 small spinous ringed a-bristles, 1 small bare b-bristle, 2 c-bristles (proximal small, distal long spinous), and 2 spinous d-bristles (proximal short, distal long); dorsal margin with 3 bristles (1 distal to midlength, bare, 2 terminal (lateral bare, medial with short spines)); spines forming rows on medial and lateral surfaces (not shown) and along proximal ventral margin. Exopodite reaching just past distal end of dorsal margin of 1st endopodial joint, with hirsute terminal pad and 2 distal bristles (distal of these stouter and shorter than proximal). 1st endopodial joint with 4 ventral bristles (1 minute, bare, others longer, spinous and unequal). 2nd endopodial joint: ventral margin spinous with 2 single weakly ringed bristles (with narrow tubular tips) and terminal paired bristles with narrow tubular tips (medial slightly longer, lateral may be ringed); dorsal margin with 4 long spinous ringed bristles, 2 shorter ringed bristles (1 proximal and 1 distal to long bristles), and 4 short unringed bristles medial to the proximal 2 of long bristles (distal of short unringed bristles with long spines); spines along ventral margin and on medial surface (not shown). 3rd endopodial joint with 3 equilength claws (dorsal bare, others with proximal teeth), 1 ringed lateral dorsal bristle with tubular tip, and 3 bristles near ventral edge, all with tubular tips (longest bristle lateral, ringed distally, with

proximal part S-shaped, and with a few proximal ventral spines and distal rings; longest medial bristle ringed, with slightly bulbous base and proximal ventral spines; shortest medial bristle minute and ringed) (Figure 16e).

Maxilla (Figures 17a–e, 18a): Endite I with 7 bristles (Figure 17a), endites II and III each with 5 bristles (Figure 17b). Coxale with plumose dorsal bristle (Figure 18a). Basale with 2 short bristles near ventral margin (not shown). Exopodite broad, hirsute, with 3 bristles (proximal and middle bristle with long marginal hairs, other shorter and with few short spines) (Figure 18a). Endopodite: 1st joint with dorsal hairs forming rows, undulate cutting tooth (Figures 17c–e, 18a), 1 ringed alpha-bristle with long marginal hairs, and 2 ringed beta-bristles (outer stout pectinate, inner slender with few indistinct marginal spines) (Figures 17e, 18a); 2nd joint with 3 slender bare ringed a-bristles, 2 ringed spinous b-bristles, 2 small ringed c-bristles, and 3 pectinate d-bristles (posterior bristle ringed distally, others unringed) (Figure 17e).

Fifth Limb (Figures 17f–l, 18b): Epipodite with 33 or 34 bristles with long marginal hairs. Anterior tooth-like process of protopodite absent. Endite I with 5 bristles (Figure 17i); endite II with 4 terminal bristles, 1 minute spine-like terminal bristle, and 1 minute proximal anterior bristle (Figure 17f,j); endite III with 7 bristles (Figure 17k) (all endite bristles shown on detail drawings of endites (Figure 17i–k) but not on Figure 17f). 1st exopodial joint: main tooth with proximal peg with serrate margin and 6 pectinate teeth (largest with 12 small cusps forming row) (Figure 17l); spinous bristle proximal to peg; anterior side with 2 adjacent ringed bristles (inner long, outer short, both with long proximal spines) and 1 slender bristle (with long proximal hairs) closer to epipodite (Figure 17g,h). 2nd exopodial joint with 3 pectinate a-bristles (smallest ringed; middle bristle weakly ringed; longest unringed), 3 ringed pectinate b-bristles (outer with long proximal spines), posterior c-bristle with long proximal spines, and anterior d-bristle with long spines on proximal half. 3rd exopodial joint (Figure 17m): inner lobe with 3 bristles (1 short, ringed, proximal (with long proximal and short distal spines), 1 unringed, bare, terminal (on small pedestal), 1 long ringed terminal with indistinct short marginal spines); outer lobe hirsute, with 2 ringed bare bristles. 4th and 5th exopodial joints fused, hirsute, with 3 ringed terminal bristles (1 short bare, 2 longer with short marginal spines) (Figure 17m).

Sixth Limb (Figure 18c): With 3 small bare epipodial bristles. Endites I and II each with 2 small medial bristles and 1 long terminal bristle; endite III with 2 stout terminal bristles and 1 minute bristle medial to proximal terminal bristle; endite IV fragmented on USNM 158622. End joint with 5 bristles (2 (with bases on medial surface close to edge) with long proximal and short distal spines followed by wide space, then 1 short (with base on medial surface and not as close to edge as the 2 anterior bristles) with very long hairs except near bare tip, followed by narrow space and 2 plumose bristles with bases on edge of joint); medial surface of limb including all endites

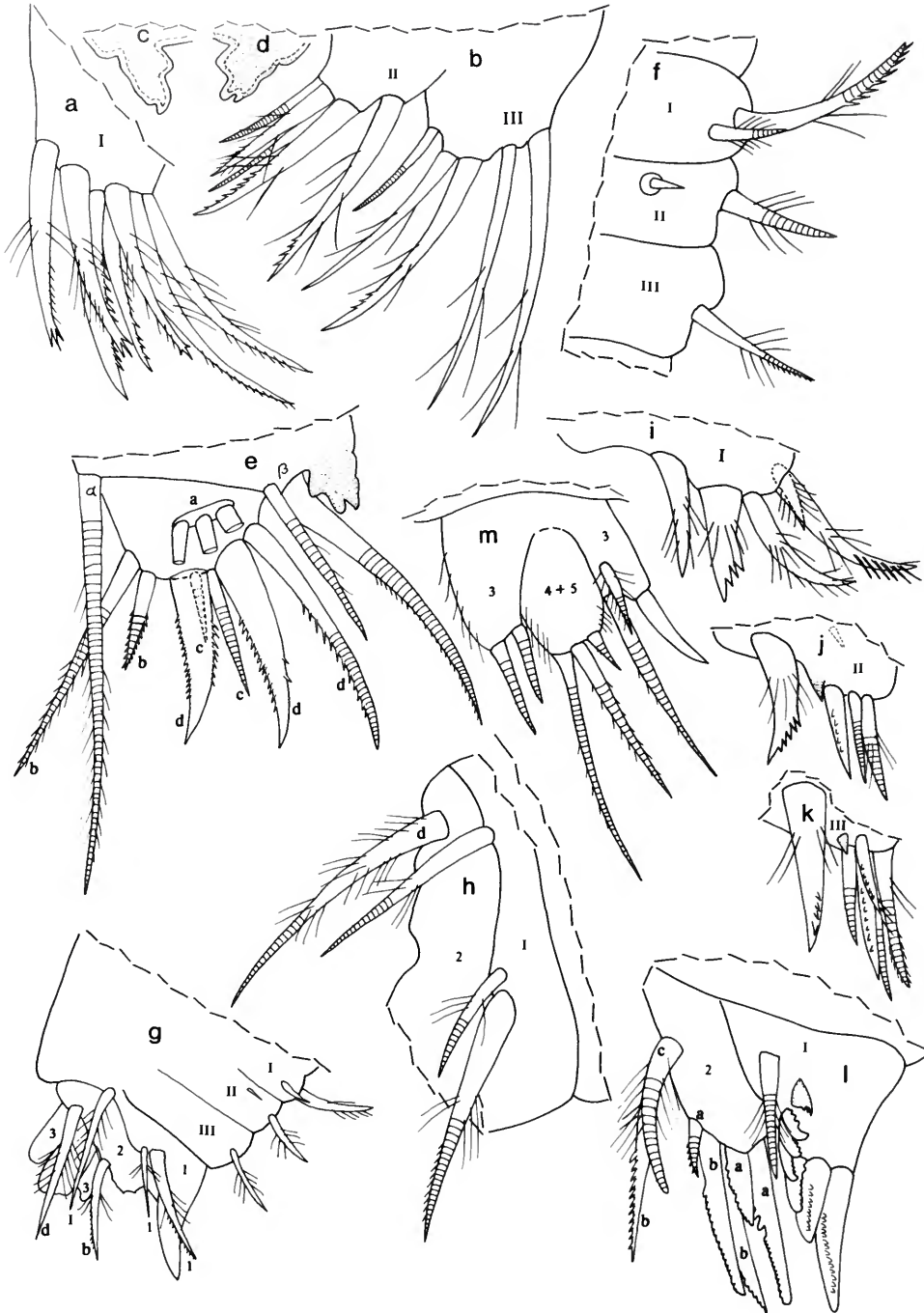


FIGURE 17.—*Cypridina spina*, new species, USNM 158622, paratype, adult female: *a-e*, maxilla: *a*, lateral view of endite I of left limb; *b*, medial view of endites II and III of left limb; *c*, *d*, lateral views of cutting tooth of 1st endopodial joints of right and left limbs, respectively; *e*, lateral view of distal end of left limb; *f-m*, 5th limb: *f*, anterior view of endites of right limb (only anterior bristles shown); *g*, anterior view of right limb (not all endite bristles or bristles of exopodial joints 2-5 shown); *h*, anterior view of right limb showing bristles of 1st exopodial joint and d-bristle of 2nd exopodial joint; *i-k*, posterior view of endites I, II, and III of left limb, respectively; *l*, posterior view of exopodial joints 1 and 2 of left limb; *m*, posterior view of exopodial joints 3-5 of left limb.

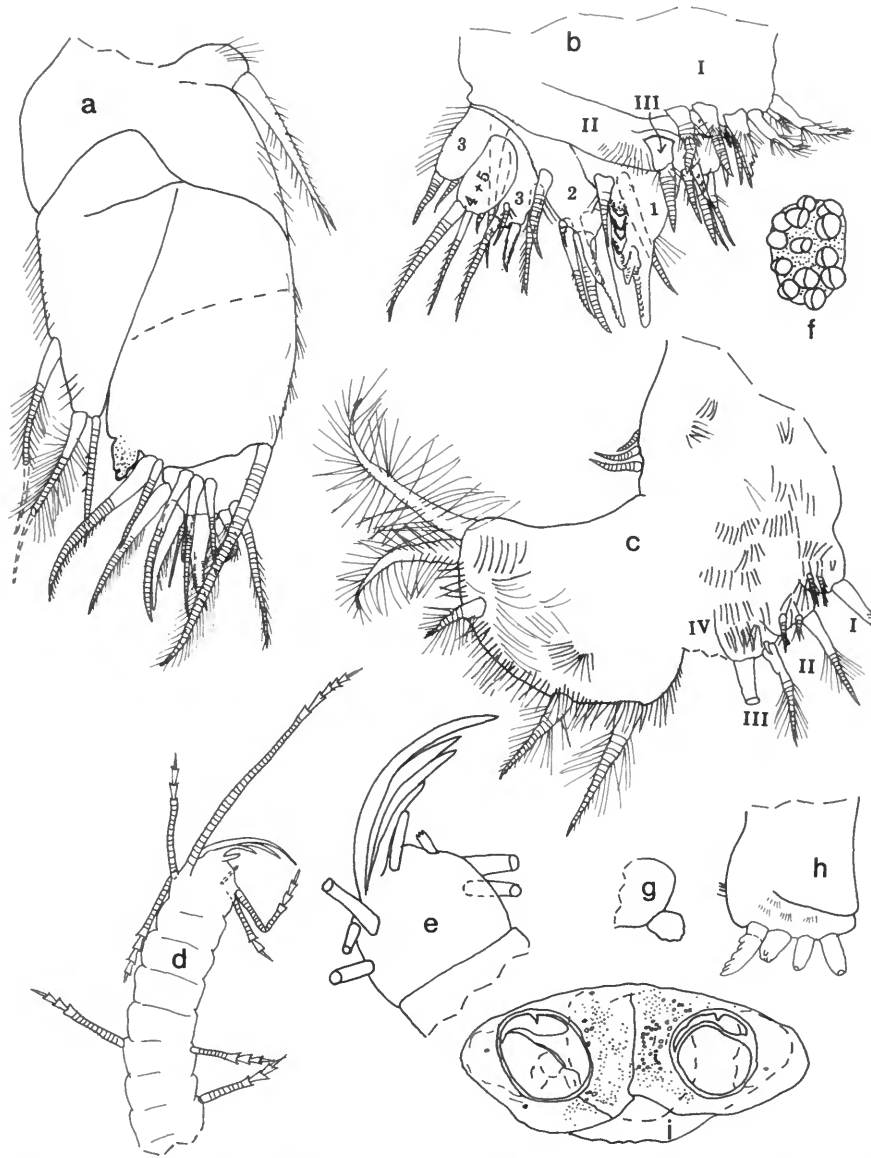


FIGURE 18.—*Cypridina spina*, new species, USNM 158622, paratype, adult female: *a*, lateral view right maxilla (endites not shown); *b*, posterior view of left 5th limb; *c*, medial view of right 6th limb (endite IV fragmented and not shown); *d*, 7th limb; *e*, detail of tip of 7th limb shown in *d*; *f*, right lateral eye; *g*, medial eye and Bellonci organ; *h*, upper lip, anterior to right; *i*, genitalia.

hirsute; lateral surface of end joint with spines forming row along anterior and ventral margins.

Seventh Limb (Figures 16*f*, 18*d,e*): Each limb with 7 or 8 bristles: 2 or 3 proximal (1 or 2 on each side, each with 3 bells) and 5 terminal (3 on comb side, 2 on peg side, each with 2–5 bells). Terminal comb with 7 teeth (longest in middle; end tooth on each side of comb short with blunt tip). Peg opposite

comb elongate, with either blunt or serrate tip. [The illustrated limb of USNM 158622 has at its proximal end, where it had been joined to the body, a small transparent globular process (containing near its center a small amount of amber-colored substance stippled in illustration) attached to the limb by a short neck (Figure 16*f*). The opposite 7th limb had been broken off some distance from the body of the ostracode and does not have

the process, nor is it on either limb of the holotype (USNM 193610). Such a process has not been previously reported on *Myodocopa*, and its relationship to the limb is unknown, but it is probably foreign.]

Furca (Figure 16g): Each lamella with 9 claws; claw 2 fused to lamella, remaining claws articulated; claw 3 more slender than claw 4 but not shorter; claws 4 to 9 decreasing gradually in width and length; all claws with slender teeth along posterior margins (not shown); claw 1 with several fairly large distal medial teeth (not shown); claw 1 of right lamella anterior to claw 1 of left lamella by width of claw at its base.

Bellonci Organ (Figure 18g): Short with obtusely triangular tip.

Eyes: Lateral eye well developed, with 15 amber-colored ommatidia (Figure 18f); no pigment between ommatidia. Medial eye smaller than lateral eye, unpigmented, bare (Figure 18g).

Upper Lip (Figure 18h): With 2 unpaired anterior processes and 2 pairs of posterior processes (anterior paired processes about half length of most posterior paired processes).

Genitalia (Figure 18i): Sclerotized oval on each side of body anterior to furca.

Posterior of Body: Evenly rounded, bare.

Y-Sclerite (Figure 16h): Typical for subfamily.

Pigmentation: None in carapace or appendages.

Eggs: USNM 158622 with 8 eggs in marsupium; USNM 158321 with 4 large embryos with well-developed eyes, each with 10 amber-colored ommatidia.

DESCRIPTION OF ADULT MALE (Figures 19, 20).—Carapace similar in shape to adult female (Figure 19a). Anteroventral edge of valve with about 20 well-developed teeth and 2 or 3 additional less-developed teeth anterior to others (Figure 19b, d).

Surface Bristles: Anteroventral edge of valves medial to teeth with 5 or 6 bristles (USNM 193640: left valve with 6 bristles (Figure 19b), right valve with 5 (Figure 19d)); each valve with 1 or 2 minute protuberances on valve edge just ventral to incisur (less developed than on female) (Figure 19e).

Infold (Figure 19c, e-h) and *Selvage* (letter s in Figure 19e): Similar to those of female.

Carapace Size: USNM 193640, length 1.60 mm, height 0.86 mm; USNM 193652E, length 1.61 mm, height 0.86 mm.

First Antenna: Joints 1–4 similar to those of adult female. Sensory bristle of 5th joint with 9 long proximal filaments and 2 short, distal, slender filaments, and bifurcate tip. 6th joint with short bare medial bristle. 7th joint (Figure 20a): a-bristle about same length as bristle of 6th joint, with few spines; length of b-bristle about same as combined lengths of joints 3–8, with short stout proximal branch (branch with diaphanous sucker, minute spine just distal to sucker, and pointed tip), followed by 2 slender filaments (each with minute proximal spine and 8 or 9 minute diaphanous suckers), and then 1 minute bare subterminal filament; c-bristle very long, about $4\frac{1}{2}$ times length of b-bristle, with short stout proximal branch with

diaphanous sucker much larger than that of b-bristle and drawn-out pointed tip, followed by 1 short bare filament, 1 slender distal filament (with minute proximal spine and 7 or 8 minute diaphanous suckers), 2 slender bare diaphanous filaments, and 4 slender diaphanous filaments with 1 proximal spine. 8th joint: d- and e-bristles about same length or slightly shorter than b-bristle, bare, diaphanous; f-bristle same length as c-bristle, with 7 or more bare diaphanous filaments; g-bristle about 3 times length of b-bristle, with 7 slender bare diaphanous filaments, followed by 3 slender diaphanous filaments each with proximal spine.

Second Antenna: Protopodite with distal medial bristle (Figure 20b). Endopodite 1-jointed, with 5 bristles (3 short slender proximal followed by 2 longer (proximal of longer bristles slightly stouter) and distal long filament with blunt tip (filament about 4 times length of short proximal bristles)) (Figure 20b). Exopodite: 1st joint with few spines along concave dorsal margin; bristle of 2nd joint short, reaching 5th joint, with 6 ventral spines (3 slender followed by 2 stout and 1 slender subterminal); bristles of joints 3–8 long, with natatory hairs but no spines; 9th joint with 3 bristles (2 long with natatory hairs, 1 short bare dorsal); joint 8 with small slender basal spine about $\frac{1}{2}$ length of 9th joint; 9th joint with small lateral spine ($\frac{1}{3}$ length of 9th joint) near dorsal bristle; spines forming row along distal margins of some joints of female exopodite absent on male.

Mandible (Figure 20c): Dorsal margin of 2nd endopodial joint with 3 or 4 long ringed bristles with short spines, 2 shorter ringed bristles (1 proximal and 1 distal to long bristles) with short marginal spines, 5–7 short unringed medial bristles (with fairly long indistinct marginal spines) adjacent to proximal 3 long bristles. Limb otherwise similar to that of adult female.

Maxilla: Endite I with 7 or 8 bristles, endite II with 5 bristles, endite III with 5 or 6 bristles. Precoxale and coxale with diaphanous dorsal fringed lamina. Coxale with plumose dorsal bristle. Basale, exopodite, and endopodite similar to those of adult female, but cutting tooth obscured.

Fifth Limb (Figure 20d,e): Epipodite with 34 bristles. Anterior tooth of protopodite absent. Endites I–III similar to those of adult female. 1st exopodial joint similar to that of adult female except largest tooth of main tooth with 13 small cusps forming row (Figure 20d). 2nd–5th exopodial joints similar to those of adult female.

Sixth Limb: Each limb with 1 small bare epipodial bristle (adult female with 3). Endites I and II each with 2 small proximal medial bristles and 1 long terminal bristle; endite III with 2 stout terminal bristles and 0 or 1 small bristle medial to terminal bristles; endite IV with 1 small medial subterminal bristle and 1 long terminal bristle. End joint with 8 bristles: 5 with long proximal and short distal spines, followed by 1 short bristle (medial base set back from edge of joint) with very long hairs except near bare tip, then narrow space and 2 plumose bristles with bases on edge of joint. Spines and hairs on lateral and medial sides of limb similar to those of adult female.

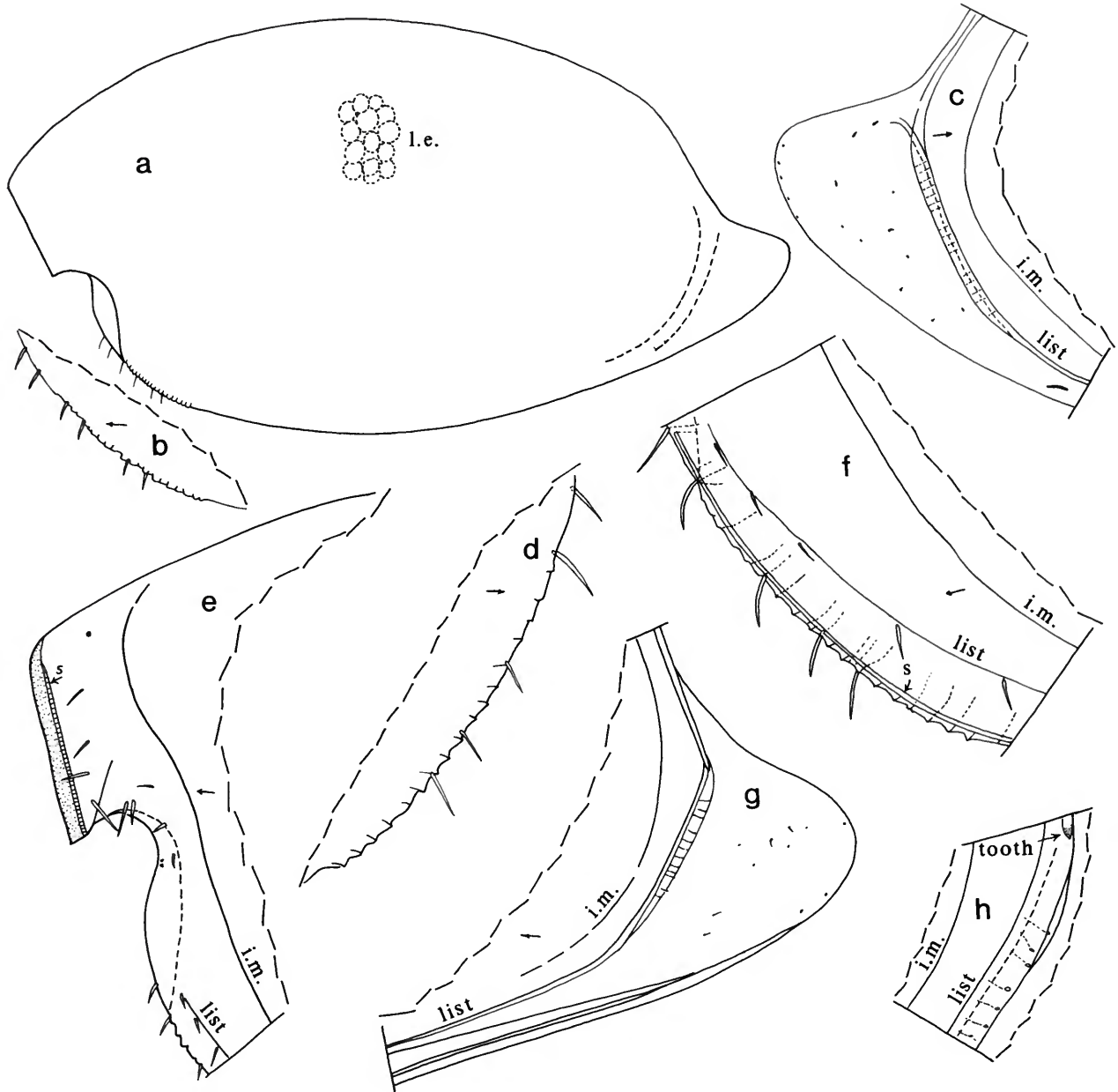


FIGURE 19.—*Cypridina spina*, new species, USNM 193640, paratype, adult male: *a*, complete specimen from left side, length 1.60 mm; *b*, detail of anteroventral margin of left valve, from *a*; *c*, inner view of caudal process of left valve; *d-h*, right valve: *d*, anteroventral margin; *e*, inner view of anterior end; *f*, inner view of anteroventral margin; *g*, inner view of caudal process; *h*, detail of upper end of list showing tooth (stippled), from *g*.

Seventh Limb (Figure 20*f*): Each limb with 3 bristles (7 or 8 on adult female), all terminal and on comb side (2 short with 4 bells (3 bells missing on 1 bristle of illustrated limb), 1 longer with 5 bells). Terminal comb with 4 teeth (tooth on each end of comb short straight and with marginal spines, 2 teeth in middle

of comb curved (1 about 2 times and other about 3 times length of straight teeth)). Peg opposite comb elongate.

Furca (Figure 20*g*): Similar to that of adult female.

Bellonci Organ (Figure 20*h*): With small process at tip.

Eyes: Lateral eye (Figure 19*a*) and medial eye (Figure 20*h*)

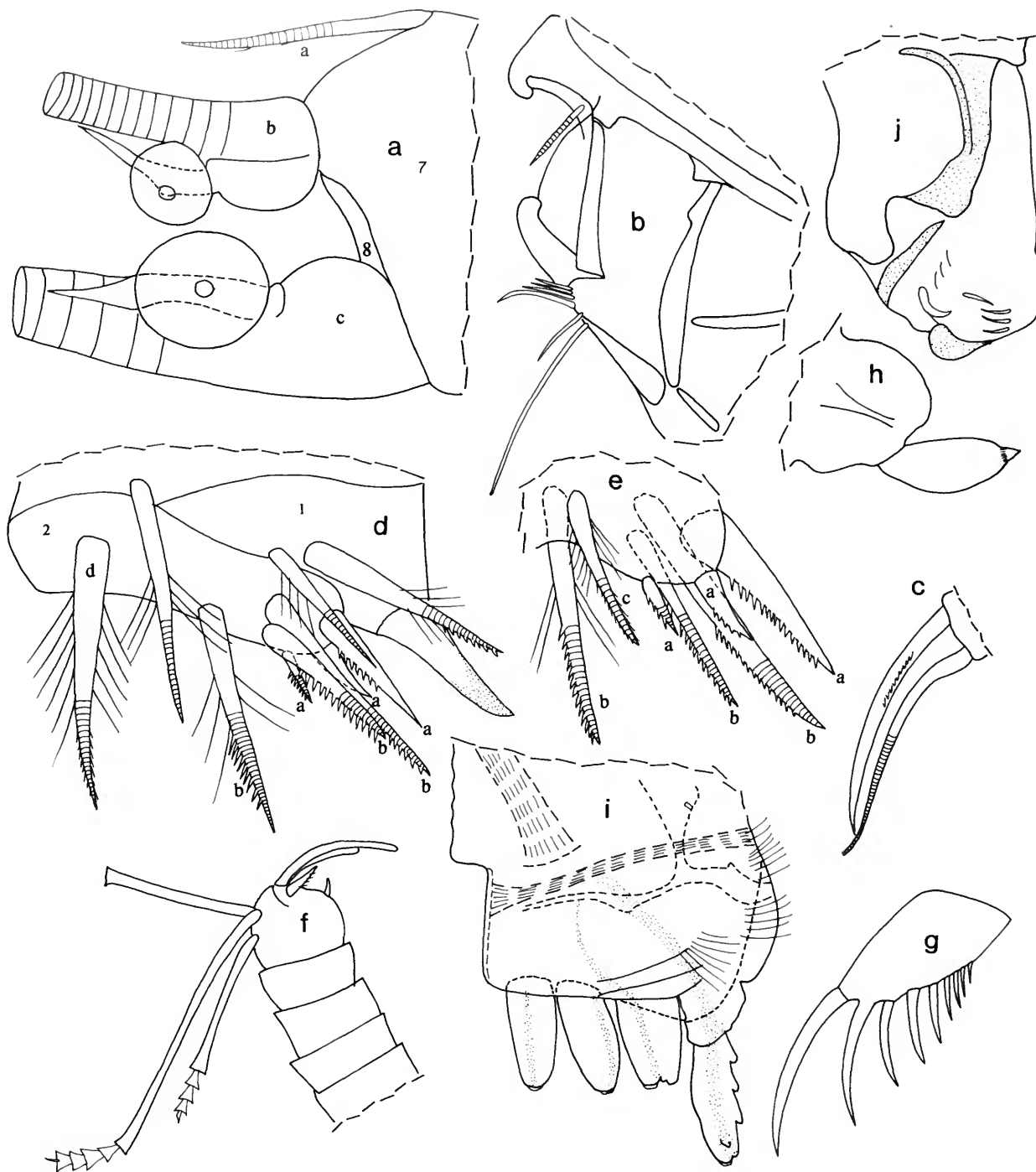


FIGURE 20.—*Cypridina spina*, new species, USNM 193640, paratype, adult male: *a*, medial view of bristles of 7th joint of right 1st antenna (only proximal parts of *b*- and *c*-bristles shown); *b*, medial view of endopodite and distal part of protopodite of right 2nd antenna; *c*, medial view of dorsal claw and lateral ventral bristle of 3rd endopodial joint of right mandible; *d*, anterior view of exopodial joints 1 and 2 of right 5th limb; *e*, posterior view of 2nd exopodial joint of left 5th limb; *f*, tip of 7th limb; *g*, left lamella of furca; *h*, medial eye and Bellonci organ; *i*, upper lip, anterior to left; *j*, lateral view of left copulatory organ, anterior to left.

similar to those of adult female.

Upper Lip (Figure 20i): Similar to that of adult female.

Genitalia (Figure 20j): Lobate copulatory organ on each side of body anterior to furca.

Posterior of Body and Y-Sclerite: Similar to those of adult female.

Pigmentation: None in carapace or appendages.

DESCRIPTION OF INSTAR II MALE (Figure 21).—Carapace similar in shape to that of adult, with 1 bristle on anteroventral margin (Figure 21a,b); anteroventral margin minutely serrate (serrations not shown on Figure).

Infold: Rostral infold with 1 or 2 bristles; 2 bristles at inner end of incisur; 2 small bristles on anteroventral infold just ventral to incisur. Infold of caudal process with transparent flap along list similar to that of adult (Figure 21c). Selvage similar to that of adult.

Carapace Size: USNM 193662B, length 0.67 mm; height 0.39 mm.

First Antenna: Joints 1–3, and 6 similar to those of adult. 4th joint with 1 short dorsal bristle and no ventral bristle (Figure 21d). Sensory bristle of 5th joint with 2 long stout proximal filaments, 2 short slender distal filaments, and bifurcate tip (Figure 21e). 7th joint (Figure 21e): a-bristle similar to bristle of 6th joint; b-bristle with short proximal filament; c-bristle long with 4 proximal filaments, each with small proximal spine (not shown). 8th joint (bristles not shown): d- and e-bristles long, bare, with blunt tips; f-bristle long with 3 filaments, each with small proximal spine; g-bristle about $\frac{1}{3}$ longer than c- and f-bristles, with 4 marginal filaments (all except proximal filament with small proximal spine).

Second Antenna: Protopodite with slender medial distal bristle (Figure 21f). Endopodite 1-jointed with 1 small bristle and long distal filament (Figure 21f). Exopodite 9-jointed: bristle of 2nd joint reaching 5th joint, with 1 slender ventral spine; bristle of 3rd joint long, with slender ventral spines along proximal $\frac{2}{3}$ followed by hairs, and with dorsal hairs; bristles of joints 4–8 with natatory hairs, no spines; 9th joint with 3 bristles (dorsal bristle minute) and minute lateral spine; joints 3–8 each with minute basal spine.

Mandible: Coxale and exopodite similar to those of adult. Basale: dorsal margin with 3 bristles (1 at midlength, 2 terminal); ventral margin with 1 ringed a-bristle, 1 small b-bristle, 2 c-bristles (proximal small), and 1 short d-bristle. 1st endopodial joint with 3 bristles (1 long, 1 short, 1 minute). 2nd endopodial joint: ventral margin with single bristle and paired terminal bristles; dorsal margin with 4 ringed bristles (proximal about $\frac{2}{3}$ length of following bristle; 2 distal bristles longer) and 2 short unringed bristles (with indistinct long spines) with bases on medial side near bases of 2 proximal ringed bristles. 3rd endopodial joint similar to that of male except with 2 instead of 3 ringed bristles near ventral edge (lacks smallest of 2 medial bristles present on adult mandible).

Maxilla: Endite I with 7 bristles; endite II with 5 bristles including 1 minute triangular tooth-like bristle; endite III with

5 bristles. Coxale with plumose dorsal bristle. Basale with 1 short ventral bristle. Exopodite similar to that of adult. 1st endopodial joint with 1 spinous alpha-bristle, 2 beta-bristles (medial long, pectinate, lateral small, peg-like) (Figure 21g); dorsal margin of joint with spines forming rows; cutting tooth small, rounded. 2nd endopodial joint with 3 a-bristles (anterior bristle small nub-like), 2 b-bristles (posterior bristle small nub-like), 1 c-bristle, and 3 pectinate d-bristles (only posterior ringed) (Figure 21g).

Fifth Limb: Epipodite with 25 hirsute bristles (bristles not shown in Figure 21k). Endite I with 3 bristles, endites II and III each with 4 bristles. 1st exopodial joint (Figure 21h,i): anterior side with 1 long stout spinous bristle adjacent to 0 or 1 small indistinct bristle; main tooth with proximal bristle, proximal digitate peg, and 2 cusped teeth (longest with about 11 marginal cusps). 2nd exopodial joint with total of 5 a- and b-bristles (posterior bristle minute tooth-like; outermost bristle with long proximal spines), posterior c-bristle, and anterior d-bristle with long proximal spines (Figure 21h). 3rd exopodial joint: inner lobe with 1 minute peg-like proximal bristle and longer ringed terminal bristle; outer lobe with 2 weakly developed ringed terminal bristles; 4th and 5th joints fused, with 2 terminal bristles.

Sixth Limb (Figure 21j): Hirsute, with single endite with 1 spinous terminal bristle.

Seventh Limb (Figure 21k): Short, thumb-like.

Furca (Figure 21k): Each lamella with 5 claws; claws 2–4 nonarticulated; claws 3 and 4 about same width at base; armature of claws similar to that of adult.

Bellonci Organ (Figure 21l): Elongate with pointed tip.

Eyes (Figure 21l): Lateral eye well developed with 12 amber-colored ommatidia (including 2 small ommatidia at dorsal end); area between ommatidia unpigmented. Medial eye unpigmented, bare.

Upper Lip (Figure 21m): Similar to that of adult but posterior of paired processes with fewer glandular processes.

Genitalia: None observed.

Posterior of Body (Figure 21k): Evenly rounded, bare.

Y-Sclerite (Figure 21k): Similar to that of adult.

Pigmentation: None in carapace or appendages.

DESCRIPTION OF INSTAR III MALE (Figure 22).—Shape of carapace similar to that of adult. Anteroventral margin minutely serrate and with 2 bristles (Figure 22a). Caudal process narrow as on adult (Figure 22b).

Infold: Rostral infold with 2 or 3 bristles in addition to pair at inner end of incisur (Figure 22a). List of caudal process with transparent flap as on adult (Figure 22b).

Selvage: Similar to that of adult.

Carapace Size: USNM 193613, length 0.75 mm; height 0.39 mm.

First Antenna: Joints 1–3 and 6 similar to those of adult. 4th joint with minute ventral bristle and longer dorsal bristle (Figure 22c). Sensory bristle of 5th joint with 1 short slender proximal filament followed by 3 long stout filaments, 2 short

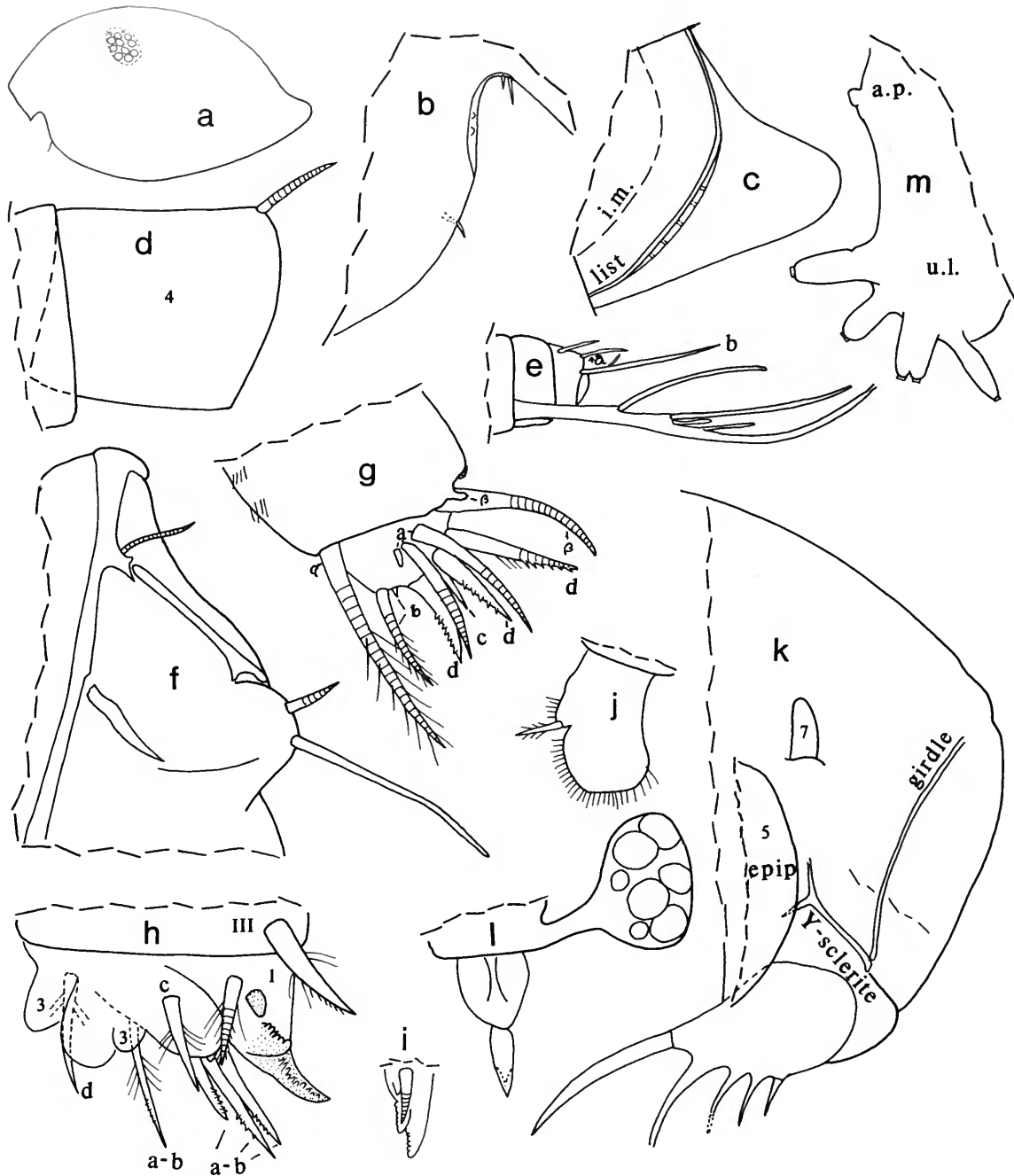


FIGURE 21.—*Cypridina spina*, new species, USNM 193662B, paratype, instar II male: *a*, complete specimen from left side, length 0.67 mm; *b*, ventral edge of rostrum and anteroventral margin of right valve; *c*, inner view of caudal process of right valve; *d*, lateral view of 4th joint of right 1st antenna; *e*, medial view of joints 5-8 of left 1st antenna (c-bristle of 7th joint and bristles of 8th joint not shown); *f*, medial view of endopodite and distal part of protopodite of left 2nd antenna; *g*, lateral view of distal end of left maxilla; *h*, posterior view of left 5th limb showing bristles of exopodial joints 1 and 2 and 1 bristle of endite III; *i*, posterior view of proximal bristle and teeth of 1st exopodial joint of right 5th limb; *j*, lateral view of left 6th limb; *k*, posterior of body from left side showing outline of base of epipodite of 5th limb, 7th limb, left lamella of furca, and sclerites; *l*, dorsal view of left lateral eye, medial eye and Bellonci organ; *m*, anterior of body showing anterior process and upper lip.

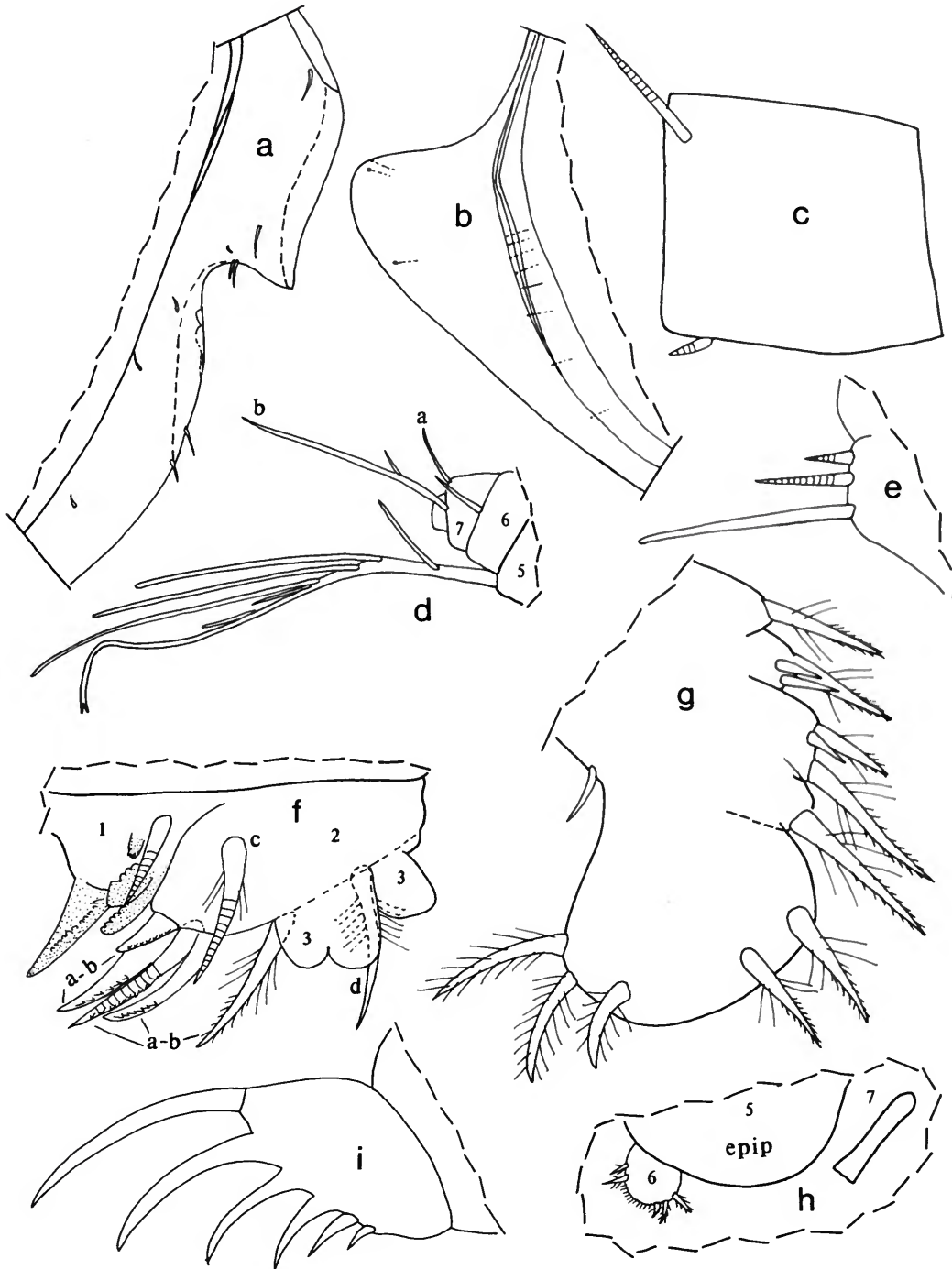


FIGURE 22.—*Cypridina spina*, new species, USNM 193613, paratype, instar III male: *a*, inner view of anterior of left valve; *b*, inner view of caudal process of left valve; *c*, medial view of 4th joint of right 1st antenna; *d*, medial view of joints 5-8 of right 1st antenna (c-bristle of 7th joint and bristles of 8th joint not shown); *e*, medial view of endopodite of right 2nd antenna, anterior toward top; *f*, posterior view of left 5th limb (endite bristles and bristles of exopodial joints 3-5 not shown); *g*, medial view of left 6th limb; *h*, posterior of body from left side showing outline of base of epipodite of 5th limb, end joint of 6th limb, and 7th limb; *i*, left lamella of furca.

slender filaments, and bifurcate tip (Figure 22d). 7th joint: a-bristle similar to bristle of 6th joint; b-bristle with single proximal filament (Figure 22d); c-bristle long with 5 marginal filaments, some with a minute proximal spine. 8th joint: d- and e-bristles long, bare; f-bristle same length as c-bristle, with about 4 marginal filaments, some with a minute proximal spine; g-bristle about $\frac{1}{3}$ longer than c- and f-bristles, with 5 marginal filaments, some with a minute proximal spine.

Second Antenna: Protopodite with slender distal medial bristle. Endopodite 1-jointed with 1 short proximal bristle followed by 1 longer bristle and 1 long distal filament (Figure 22e). Exopodite: bristle of 2nd joint just reaching 5th joint, with 1 slender ventral spine near tip; bristle of 3rd joint without ventral spines, but with some broad spine-like ventral hairs; bristles of joints 3–9 similar to those of adult; joints 4–8 each with basal spine similar to that of adult; 9th joint with lateral spine similar to that of adult.

Mandible: Coxale, exopodite, and 1st endopodial joint similar to those of adult. Except for longest d-bristle being only about $\frac{3}{4}$ length of longest c-bristle, basale similar to that of adult. 2nd endopodial joint: ventral margin with single bristle just distal to midlength and 2 paired terminal bristles; dorsal margin with 4 long bristles (proximal about $\frac{2}{3}$ length of following bristle) and 2 short bristles with bases on medial side near bases of proximal 2 of long bristles. 3rd endopodial joint similar to that of adult except for lacking smaller of medial bristles near ventral margin.

Maxilla: Coxale with hirsute dorsal bristle. Endite I with 7 bristles; endite II with 5 bristles; endite III with about 5 bristles. Basale with short ventral bristle. Exopodite similar to that of adult. 1st endopodial joint with 1 spinous alpha-bristle and 2 beta-bristles (lateral minute, ringed, medial long, pectinate); dorsal margin with spines forming rows; cutting tooth elongate with rounded tip. Except for dorsal b-bristle being minute and peg-like, bristles of 2nd endopodial joint similar to those of adult.

Fifth Limb (Figure 22f): Epipodite with 29 hirsute bristles (bristles not shown in Figure 22h). Endite I with 5 bristles; endites II and III each with 6 bristles. 1st exopodial joint: main tooth with proximal spinous bristle, small proximal digitate peg followed by 3 cusped teeth (longest with about 11 marginal cusps forming row); anterior side with 2 adjacent bristles (inner about twice length of outer) and 1 hirsute bristle closer to epipodite. 2nd endopodial joint with total of 5 a- and b-bristles (outer with long proximal and short distal hairs; 4 inner pectinate), posterior c-bristle and anterior d-bristle with long proximal spines. 3rd exopodial joint: inner lobe with 1 proximal and 2 terminal bristles (1 terminal bristle minute); outer lobe with 2 terminal bristles. 4th and 5th exopodial joints fused, with 2 terminal bristles. (Endite bristles, anterior bristles of 1st exopodial joint, and bristles of joints 3–5 not shown in Figure 22f.)

Sixth Limb (Figure 22g,h): With single epipodial bristle. Endite I with 1 or 2 bristles; endite II with 3 bristles (2 small medial and 1 long terminal); endite III with 2 long bristles and

1 small bristle between them; endite IV with 1 stout terminal bristle. End joint (Figure 22h): with 2 spinous bristles (with bases on medial surface) followed by space then 1 short spinous bristle with base on medial surface, then 2 hirsute bristles with bases along edge of joint. Medial surface of limb hirsute; end joint with stiff spines forming lateral row along convex distal edge.

Seventh Limb (Figure 22h): Elongate, bare.

Furca (Figure 22i): Each limb with 6 claws; claws 2–4 nonarticulated; claw 3 slightly narrower than claw 4 at base; armature of claws similar to that of adult.

Bellonci Organ: Fragmented.

Eyes: Lateral eye with 13 amber-colored ommatidia (includes 1 very small ommatidium); small as well as large ommatidia with suture through middle; without pigment between ommatidia. Medial eye fragmented.

Upper Lip, Posterior of Body, and Y-Sclerite: Similar to those of adult.

Genitalia: None observed.

Pigmentation: None in carapace or appendages.

Gut Content: USNM 193613 with abundant spines or spicules in gut.

Sex of USNM 193613: Because of presence of filament on b-bristle of 1st antenna, the specimen is believed to be a male.

DESCRIPTION ON INSTAR IV MALE (Figure 23).—Carapace similar in shape to that of adult (Figure 23a). Serrate anteroventral margin of each valve of USNM 193622A with 4 bristles.

Infold (Figure 23b,c): In general, similar to that of adult, but infold bristles not counted; minute dorsal tooth-like spine present on caudal process of right valve (Figure 23c).

Carapace Size: USNM 193662A, length 1.04 mm, height 0.54 mm.

First Antenna: Joints 1–4 and 6 similar to those of adult (Figure 23d). Sensory bristle of 5th joint with 1 short slender proximal filament followed by 5 long stout filaments, 2 short slender filaments, and bifurcate tip (Figure 23e). 7th joint: a-bristle slightly stouter than bristle of 6th joint; b-bristle with 2 short marginal filaments; long c-bristle with 6 marginal filaments (all except proximal filament with 1 or 2 small proximal spines) and bifurcate tip. 8th joint: d- and e-bristles long, bare, d-bristle longer; long f-bristle with 6 marginal filaments, all except proximal 2 with a small proximal spine; g-bristle longer than f- and c-bristles, tip broken off on limbs examined, 7 filaments on remaining part, all except short proximal filament with a small proximal spine.

Second Antenna: Protopodite with 1 distal medial bristle. Endopodite 1-jointed, with 1 short bristle followed by 2 slightly longer bristles and long distal filament (Figure 23f). Exopodite: bristle of 2nd joint reaching 5th joint, with 5 slender ventral spines; bristles of joints 3–9 similar to those of adult; joints 3–8 each with small basal spine; small lateral spine on 9th joint.

Mandible: Coxale, basale, exopodite, and 1st endopodial joint similar to those of adult. 2nd endopodial joint: ventral

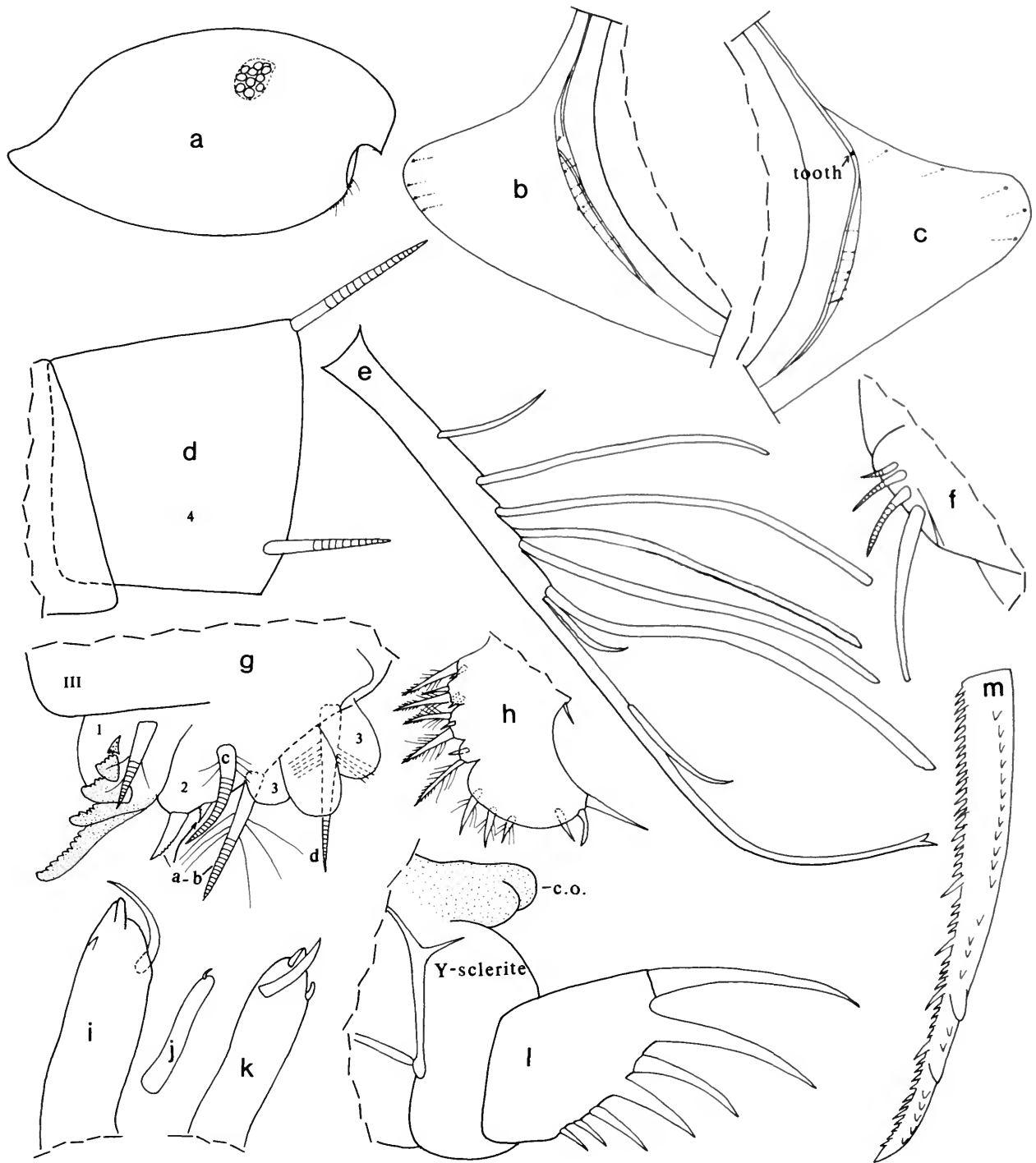


FIGURE 23.—*Cypridina spina*, new species, USNM 193662A, paratype, instar IV male: *a*, complete specimen from right side, length 1.04 mm; *b*, *c*, inner views of caudal processes of left and right valves, respectively; *d*, medial view of 4th joint of left 1st antenna; *e*, medial view of sensory bristle of 5th joint of left 1st antenna; *f*, medial view of endopodite of right 2nd antenna, anterior toward top; *g*, posterior view of right 5th limb (endite bristles, many a- and

b-bristles of 2nd exopodial joint as well as bristles of exopodial joints 3–5 not shown); *h*, lateral view of left 6th limb; *i*, tip of right 7th limb; *j*, left 7th limb (terminal teeth and peg not shown) (limb not under cover slip); *k*, tip of left 7th limb (limb under cover slip); *l*, posterior of body from right side showing copulatory organ, Y-sclerite, and right lamella of furca; *m*, posterior view of claw 1 of right lamella of furca.

bristles similar to those of adult; dorsal margin with short proximal bristle followed by 4 longer bristles and 2 short bristles with bases medial to proximal 2 of long bristles. 3rd endopodial joint similar to that of adult.

Maxilla: Endite I with 8 bristles; endites II and III each with 5 bristles. Coxale with stout hirsute dorsal bristle. Basale with 2 short bristles (1 ventral, 1 at midheight). Exopodite and endopodite similar to those of adult.

Fifth Limb (Figure 23g): Endite I with 5 bristles; endite II with 6 bristles (including 1 small proximal anterior bristle and 1 minute spine-like terminal bristle); endite III with 7 bristles including 1 minute spine-like terminal bristle. 1st exopodial joint: main tooth with proximal bristle (with long proximal spines), 1 small digitate peg and 4 cusped teeth (largest with 11 or 12 small marginal cusps forming row); anterior side with 2 adjacent bristles (inner long, outer short, both with long proximal spines) and 1 bristle (with long proximal hairs) closer to epipodite (could be on protopodite). 2nd exopodial joint with total of 6 a- and b-bristles (labeled a-b bristles in Figure 23g and only 3 of the 6 shown) (outer bristle with long proximal spines and distally pectinate, others pectinate), posterior c-bristle and anterior d-bristle with long proximal spines. 3rd exopodial joint similar to that of adult female except unringed bristle of inner lobe not on pedestal. 4th and 5th exopodial joints fused, with 2 ringed terminal bristles with short spines. (Endite bristles, anterior bristles of exopodial joint 1 and bristles of exopodial joints 3–5 not shown.)

Sixth Limb (Figure 23h): With 1 bare epipodial bristle. Endite I with 1 small medial bristle and 1 long terminal bristle; endite II with 2 small medial bristles and 1 long terminal bristle; endite III with 2 long terminal bristles and 1 small bristle between them; endite IV with 1 small medial bristle and 1 long terminal bristle. End joint with 3 anterior bristles (with long proximal and short distal spines) followed by wide space, 1 short bristle (with base on medial side set back from edge and with long hairs except at bare tip), and 2 broad hirsute bristles with bases on edge. Medial side of limb hirsute; lateral side with stiff spines along convex edge of end joint but not along posterior edge. On end joint of right limb of USNM 193662A posterior of the 3 spinous anterior bristles with base at midwidth of joint.

Seventh Limb (Figure 23i-k): Elongate without proximal bristles, with 1 bare, diaphanous, pointed, terminal bristle. Terminus with 2 weakly developed terminal teeth and a weakly developed proximal peg on side opposite base of bristle. Right limb of USNM 193662A slightly broader than left.

Furca (Figure 23l,m): Each lamella with 7 claws; claws 2 and 4 nonarticulated; claw 4 slightly broader than claw 3. Armature of claws similar to that of adult (Figure 23m).

Bellonci Organ and Medial Eye: Fragmented during dissection.

Lateral Eye (Figure 23a): Well developed with 12 large and 3 small amber-colored ommatidia; area between ommatidia unpigmented.

Upper Lip: Similar to that of adult.

Genitalia (Figure 23l): Small lobe on each side of body anterior to furca.

Posterior of Body and Y-Sclerite: Similar to those of adult.

Pigmentation: None in carapace or appendages.

DESCRIPTION OF INSTAR IV FEMALE (Figure 24).—Carapace similar to that of instar IV male but posterodorsal corner of USNM 193652c with greater slope (Figure 24a,b).

Carapace Size: USNM 193652C, length 0.96 mm, height 0.54 mm.

First Antenna: Joints 1–4 and 6 similar to those of instar IV male except for having shorter ventral bristle on 4th joint (Figure 24c). Sensory bristle of 5th joint similar to that of instar IV male. 7th joint: a-bristle slightly stouter than bristle of 6th joint; b-bristle bare; c-bristle long, with 6 filaments (most with proximal spine) and bifurcate tip. 8th joint: d- and e-bristles bare; f-bristle broken off near midlength, with 5 filaments on remaining part, some with a proximal spine; g-bristle very long, with 6 filaments.

Second Antenna: Protopodite and endopodite similar to those of instar IV male. Exopodite: bristle of 2nd joint just reaching 4th joint; otherwise similar to that of instar IV male.

Mandible: Coxale, basale, exopodite, and 1st endopodial joint similar to those of instar IV male. 2nd endopodial joint differs from that of instar IV male in having very small proximal bristle (length of bristle equal to its width) on dorsal margin. 3rd endopodial joint differs from that of instar IV male in lacking smallest medial bristle in ventral group.

Maxilla: Endite I with 7 bristles; endites II and III each with 5 bristles. Coxale, basale, exopodite, and endopodite similar to those of instar IV male.

Fifth Limb (Figure 24d,e): Endite I with bristles missing from specimen examined; endites II and III with about 5 and 7 bristles, respectively. 1st exopodial joint similar to that of instar IV male. 2nd exopodial joint of USNM 193652C with total of 5 a- and b-bristles on left limb and only 4 on right limb (right limb lacking bristle (with long proximal spines) on left limb near inner lobe of 3rd exopodial joint, probably aberrancy). Exopodial joints 3–5 similar to those of instar IV male. (Endite bristles and anterior bristles of exopodial joints 1 and 3–5 not shown.)

Sixth Limb: Endite bristles not counted but appear similar to those of instar IV male. End joint with 6 bristles similar to those of instar IV male.

Seventh Limb (Figure 24h,f): Except for terminal bristle being shorter, limb similar to that of instar IV male.

Furca (Figure 24g), *Upper Lip*, *Posterior of Body*, and *Y-Sclerite* (Figure 24h): Similar to those of instar IV male.

Bellonci Organ: Fragmented.

Eyes: Medial eye similar to that of adult. Lateral eye with same number of ommatidia as that of instar IV male (all ommatidia not shown in Figure 24a).

Genitalia: Small lobe on each side of body anterior to furca may be related to genitalia.

Eggs (Figure 24h): A cluster of about 12 small ovoids are interpreted to be eggs. (Eggs in A-2 females have not been

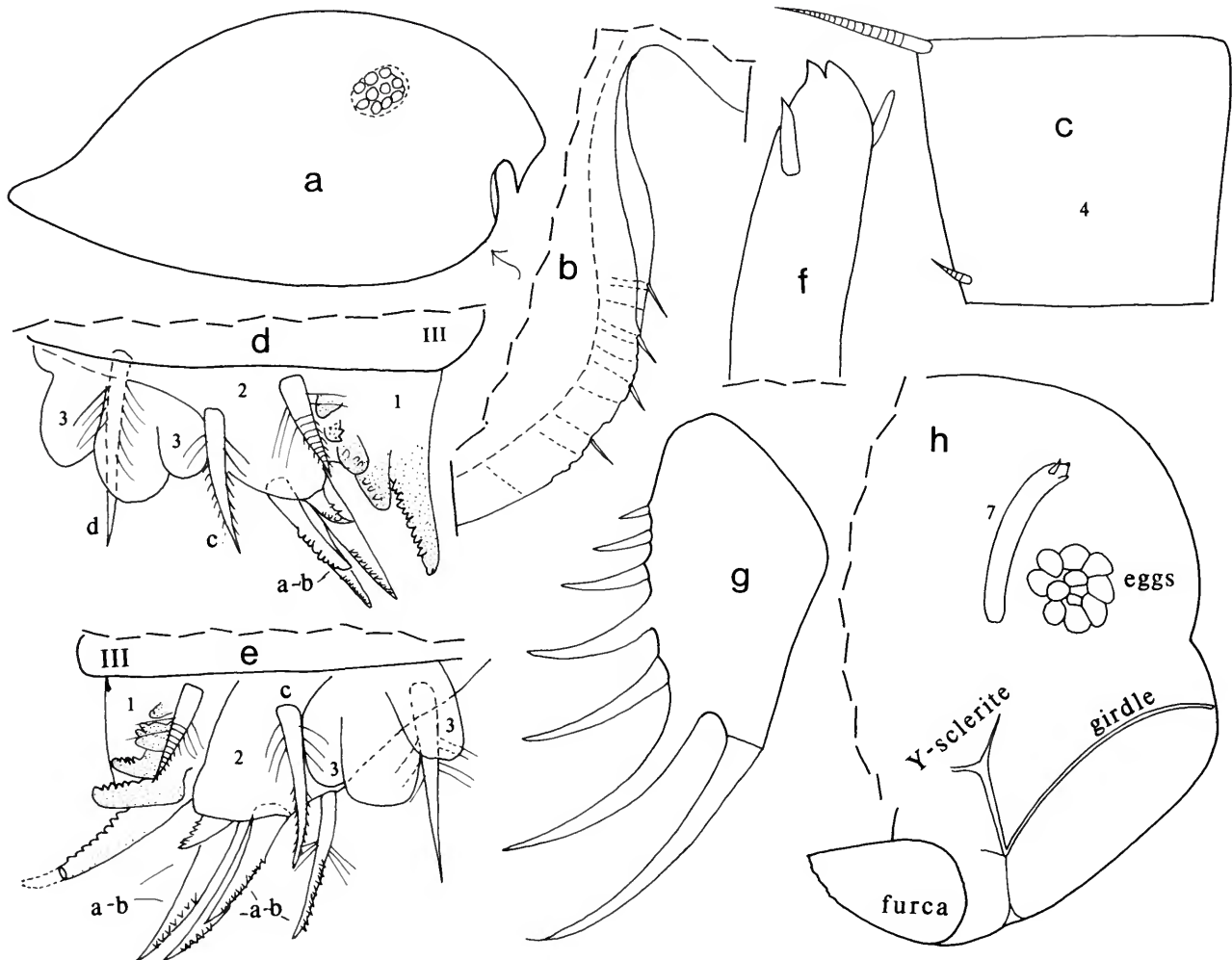


FIGURE 24.—*Cypridina spina*, new species, USNM 193652C, paratype, instar IV female: *a*, complete specimen from right side, length 0.96 mm; *b*, detail from *a*; *c*, medial view of 4th joint of right 1st antenna; *d*, *e*, posterior views of right and left 5th limbs, respectively (bristles of endites and exopodial joints 3–5 not shown); *f*, tip of 7th limb; *g*, right lamella of furca; *h*, posterior of body from left side showing internal ovoids (possibly eggs), 7th limb, base of furca, and internal sclerites.

reported previously in myodocopids.)

Gut Contents: USNM 193652C with crustacean fragments in gut.

DESCRIPTION OF INSTAR V MALE (Figure 25).—Carapace similar to that of adult male (Figure 25*a*). Serrate anteroventral margin of right valve of USNM 193641A with 5 bristles, left valve with 4.

Infold: In general, similar to that of adult female, but infold bristles not counted. Dorsal spine-like tooth present on caudal process of adult right valves indistinct on USNM 193641A.

Carapace Size: USNM 193641A, length 1.37 mm, height

0.69 mm; USNM 193652B, length 1.38 mm, height 0.73 mm; USNM 193652D, length 1.20 mm, height 0.78 mm.

First Antenna: Joints 1–4 similar to those of adult male. Sensory bristle of 5th joint with 1 slender proximal filament followed by 7 stouter filaments (distal 4 stouter than others), 2 short slender distal filaments, and bifurcate tip. 6th joint with short medial bristle. 7th joint: *a*-bristle similar to bristle of 6th joint; *b*-bristle about same length as combined lengths of joints 5–8, with 4 small proximal filaments; *c*-bristle about twice length of sensory bristle of 5th joint, with 8 marginal filaments, most with a small proximal spine. 8th joint: *d*- and *e*-bristles long, bare; *f*-bristle about same length as *c*-bristle, with 7

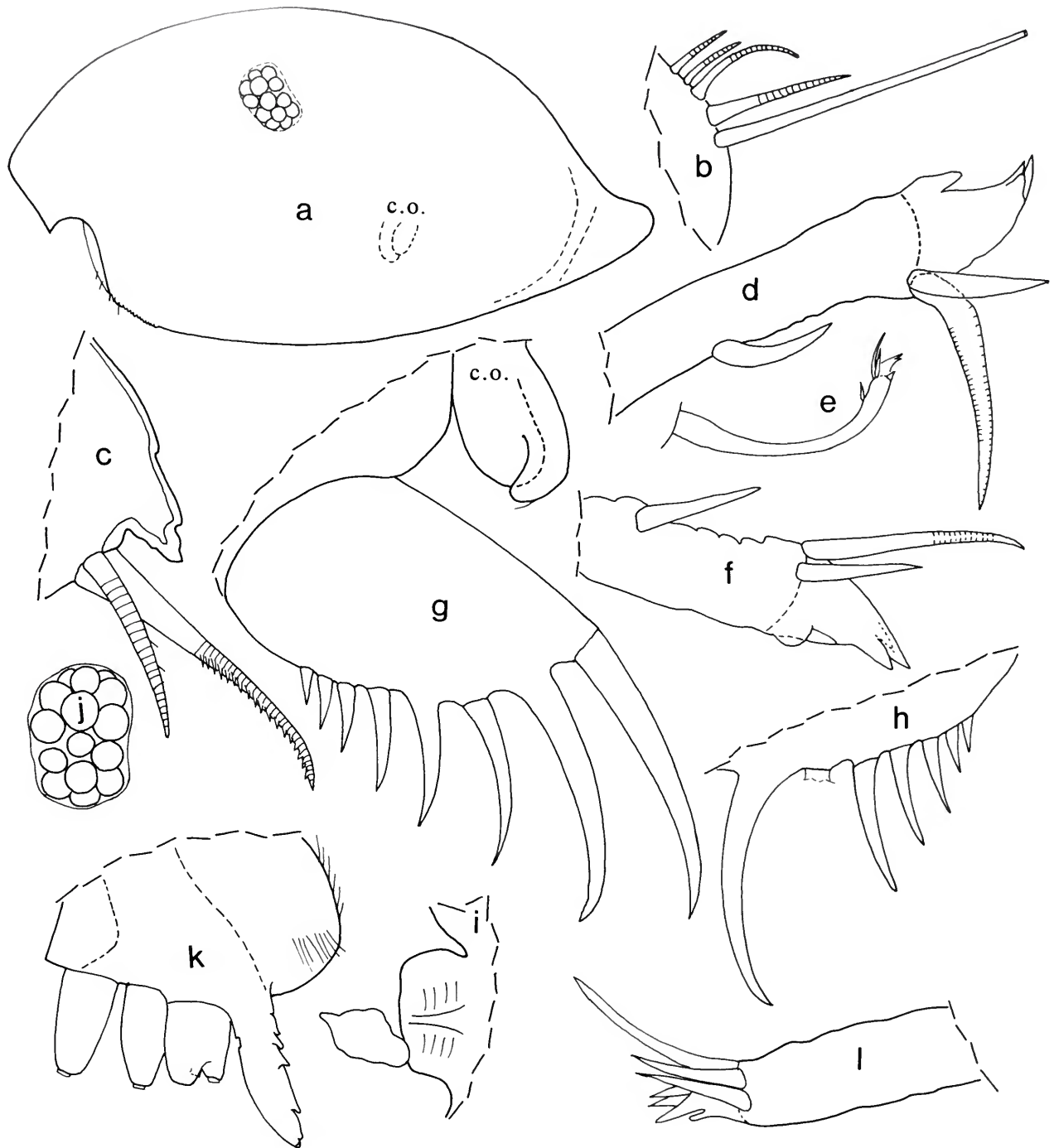


FIGURE 25.—*Cypridina spina*, new species. USNM 193641A, paratype, instar V male: *a*, complete specimen from left side showing internal copulatory organs, length 1.37 mm; *b*, lateral view of endopodite of right 2nd antenna, anterior toward top; *c*, lateral view of cutting tooth and beta-bristles of 1st endopodial joint of right maxilla; *d*, tip of 7th limb; *e*, opposite 7th limb; *f*, tip of 7th limb shown in *e*; *g*, right copulatory organ and lamella of furca; *h*, claws 2-8 of left lamella of furca (claw 3 broken off); *i*, medial eye and Bellonci organ; *j*, right lateral eye; *k*, upper lip, anterior to left. USNM 193652D, paratype, instar V male: *l*, tip of 7th limb.

filaments, most with a small proximal spine; g-bristle about $\frac{1}{3}$ longer than f-bristle, with 9 filaments, most with a small proximal spine.

Second Antenna: Protopodite similar to that of adult male. Endopodite with 2 short proximal bristles followed by 2 longer bristles and distal long filament with blunt tip (Figure 25b). Exopodite: joint 1 with few indistinct spines along concave margin; bristle of 2nd joint just reaching 5th joint, with 4 ventral spines; bristles of joints 3–8 with natatory hairs, no spines; joints 3–8 with slender basal spine increasing in length on distal joints; spine of 8th joint about $\frac{2}{3}$ length of 9th joint; 9th joint with lateral spine about half length of joint. Limb otherwise similar to that of adult male.

Mandible: Coxale, basale, exopodite, and 1st and 3rd endopodial joints similar to those of adult male. Dorsal margin of 2nd endopodial joint with 1 short proximal bristle followed by 4 long bristles (all with short marginal spines) and 2 small spinous bristles with bases medial to proximal 2 of long bristles.

Maxilla: Endites, coxale, exopodite, and endopodite (Figure 25c) similar to those of adult female.

Fifth Limb: Epipodite with 31 bristles. Endite I with 5 bristles, endite II with 6 bristles, endite III with 7 bristles. Main tooth of 1st exopodial joint with spinous bristle, proximal peg, and 5 cusped teeth. Otherwise, exopodite similar to that of adult male.

Sixth Limb: Each limb with 1 bare epipodial bristle. Endites I to IV similar to those of adult male. End Joint with 7 bristles: 4 bristles (with long proximal and short distal spines) followed by 1 short bristle (with base on medial side and set back from edge of joint) with long hairs except near bare tip, then narrow space and 2 plumose bristles with bases on edge of joint.

Seventh Limb: USNM 193641A (Figure 25d-f): each limb stouter in proximal $\frac{1}{3}$, with 3 bare diaphanous pointed bristles (1 proximal and 2 terminal), all on comb side; longest terminal bristle with indistinct rings. Terminal comb with 3 bare straight teeth (middle longer); elongate peg opposite and proximal to comb. USNM 193652A (Figure 25l) differs from limb of USNM 193641A in not having proximal bristle and in having 3 instead of 2 terminal bristles.

Furca: Each lamella with 8 claws; claw 2 nonarticulated; claw 4 either articulated or nonarticulated (claw 4 of right lamella of USNM 193641A nonarticulated (Figure 25g), but that of left lamella articulated (Figure 25h)); base of claw 3 about same width, or very slightly narrower, than base of claw 4. Armature of claws similar to that of adult female.

Bellonci Organ (Figure 25i): Similar to that of adult male.

Eyes: Lateral eye well developed, with 15 amber-colored ommatidia (Figure 25j) (not all ommatidia shown in Figure 25a); amber color between ommatidia. Medial eye amber colored, bare (Figure 25i).

Upper Lip (Figure 25k): Similar to that of adult.

Genitalia (Figure 25g): Well-developed lobe on each side of body anterior to furca.

Posterior of Body and Y-Sclerite: Similar to those of adult female.

Pigmentation: None in carapace or appendages.

Gut Content: USNM 193641A with copepod fragments in gut.

DESCRIPTION OF INSTAR V FEMALE (Figure 26).—Carapace similar in shape to that of adult (Figure 26a); anteroventral margin serrate and with 5 bristles.

Infold: Infold of caudal process with transparent flap extending from bar of list similar to that of adult; remaining parts of infold not examined in detail.

Carapace Size: USNM 193652F, length 1.11 mm, height 0.66 mm. USNM 193641B, 2 specimens, length 1.17 mm, height 0.69 mm; length 1.17 mm, height 0.64 mm.

First Antenna: Joints 1–4 and 6 similar to those of adult. Sensory bristle of 5th joint with 1 short proximal filament followed by 5 long stout filaments, 2 short slender filaments, and bifurcate tip (Figure 26b). 7th joint: a-bristle slightly longer than bristle of 6th joint; b-bristle bare; c-bristle long and with filaments. 8th joint: d- and e-bristles long, bare; f-bristle similar to c-bristle; g-bristle about $\frac{1}{3}$ longer than c- and f- bristles and with filaments.

Second Antenna (Figure 26c), *Mandible*, and *Maxilla:* Similar to those of instar V male.

Fifth Limb: Endites I and II fragmented; endite III with 7 bristles. Exopodite similar to that of instar V male (Figure 26d).

Sixth Limb (Figure 26e): With 2 epipodial bristles. Endites I and II each with 2 small proximal medial bristles and 1 long terminal bristle; endite III with 3 terminal bristles (2 long, 1 short, latter either between long bristles or to one side); endite IV with 2 bristles (1 short medial and 1 long terminal). End joint of left limb of USNM 193652F with 3 spinous bristles followed by space, then 2 short bristles (anterior peg-like) with bases medial and set back from edge of joint, then 2 long hirsute bristles with bases on edge; on right limb of USNM 193652F small peg-like bristle set close to anterior bristles and followed by space and then 3 posterior bristles.

Seventh Limb (Figure 26f,g): Each limb with 7 pointed diaphanous bristles: 2 proximal (1 on each side) and 5 terminal (2 on peg side, 3 on comb side). Terminus with comb of 3 pointed teeth and proximal elongate peg.

Furca: Each lamella with 8 claws; claw 2 nonarticulated; claw 4 either nonarticulated (Figure 26i) or articulated (Figure 26h); claw 4 slightly stouter at base than claw 3. Armature of claws similar to that of adult.

Bellonci Organ (Figure 26j), *Upper Lip*, *Posterior of Body*, and *Y-Sclerite:* Similar to those of adult.

Eyes: Medial eye similar to that of adult (Figure 26j). Lateral eye with 15 amber-colored ommatidia (including 2 small dorsal ommatidia medial to larger ommatidia) (Figure 26a); no pigmentation between ommatidia.

Genitalia: Not evident.

Pigmentation: None on carapace or appendages.

Eggs: USNM 193652F with about 11 small unextruded eggs

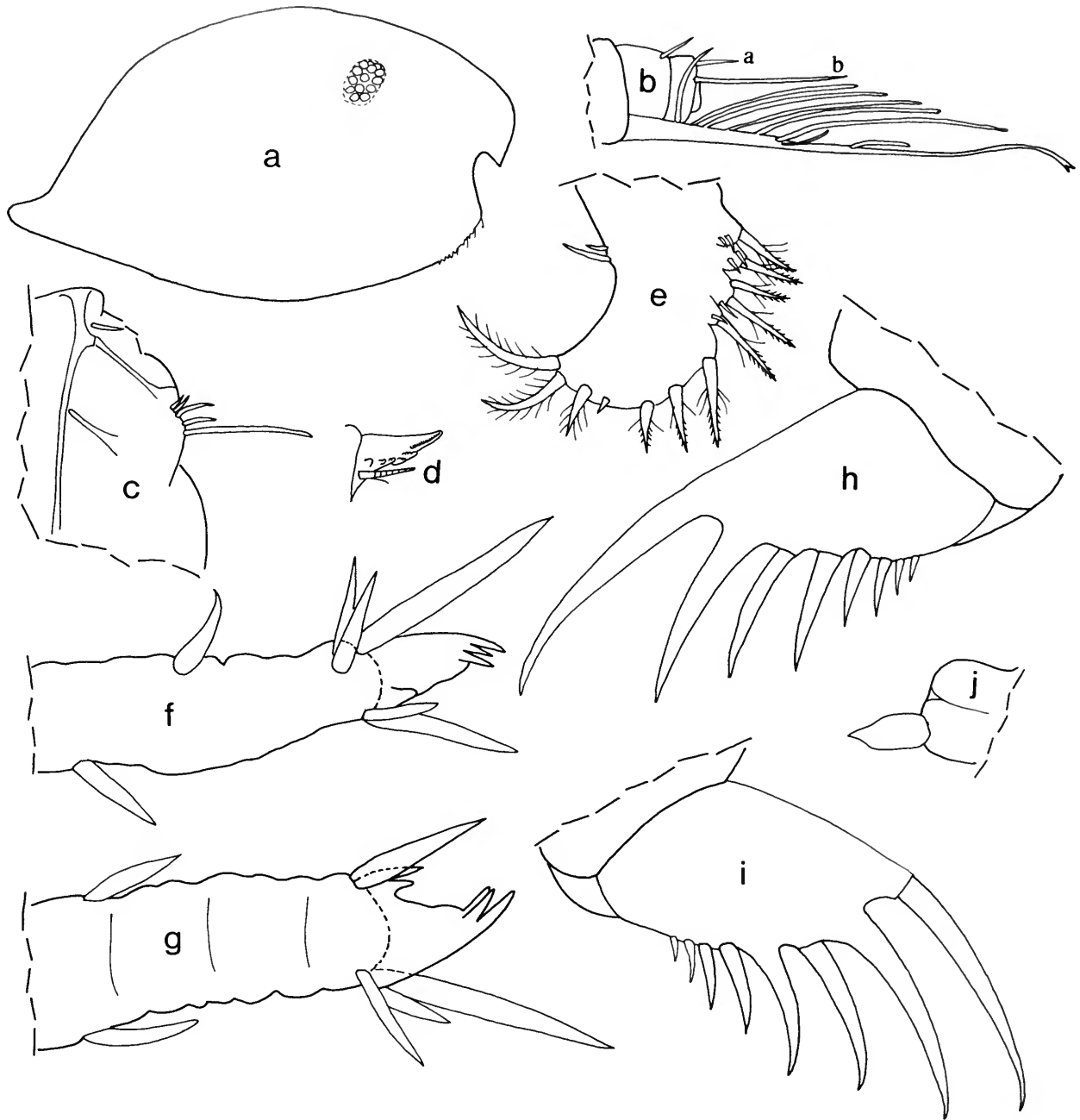


FIGURE 26.—*Cypridina spina*, new species, USNM 193652F, paratype, instar V female: *a*, complete specimen from right side, length 1.11 mm; *b*, medial view of tip of left 1st antenna (c-bristle of 7th joint and no bristles of 8th joint shown); *c*, medial view of endopodite and distal part of protopodite of left 2nd antenna; *d*, posterior view of main tooth and proximal bristle of 1st exopodial joint of left 5th limb; *e*, medial view of left 6th limb; *f*, *g*, 7th limbs; *h*, *i*, left and right lamellae of furca, respectively (teeth not shown); *j*, medial eye and Bellonci organ.

on each side of body.

COMPARISONS.—In lateral view the carapace of *C. spina* resembles that of *C. inermis* in having a narrow caudal process. In the female *C. inermis* described by Poulsen (1962:264), the list of the caudal process of the right valve is narrow with a dense row of minute teeth, and does not have the flap present on the list of the caudal process of *C. spina*. The female *C. inermis* described by Poulsen also has 6 terminal bristles on the 7th limb, not 5 as on *C. spina*, but this could be the result of intraspecific variability. The female described by Müller (1906, pl. 2: fig. 8) bears 4 bristles on the endopodite of the 2nd antenna, not 5 or 6 as on *C. spina*. *C. spina* differs from *C. acuminata* and *C. natans* in having the 2nd furcal claw nonarticulated, from *C. serrata* in having the 3rd furcal claw of the female articulated, from *C. dentata* and *C. americana* in having the 4th furcal claw stouter than the 3rd, from *C. multipilosa* and *C. sinuosa* in not having inward pointing spines on the bulge ventral to the incisur, from *C. amphiacantha* in having minute teeth along the anteroventral margin of each valve, from *C. nana* in being much larger and in having a longer caudal process, and from *C. hesperida* in not having a notch on each valve just dorsal to the caudal process. Because many species previously referred to *Cypridina* are incompletely described, they could not be compared with *C. spina*.

The right valve of *C. spina* has a small tooth-like spine near the dorsal end of the caudal process, but because of its small size, it is quite possible that the spine has been overlooked on some previously described species. Its possible importance as a specific character for discriminating species must await study of other species.

In his diagnosis of the genus *Cypridina*, which is based on a limited number of species (8), Poulsen (1962:255) states the following concerning the b- and c-bristles of the male 1st antenna: "the proximal sucker of the b- and c-bristles is rather

small, on the b-bristle follow 2 long slender filaments with 2–4 small suckers distally; on the c-bristle filament no. 2 is short and bare, no. 3 is long and slender with 2–4 small suckers." On the male *C. spina* the 2 slender filaments of the b-bristle bear 8 or 9 small suckers, and the slender filament of the c-bristle bears 7 or 8 small suckers. The number of small suckers on filaments of the b- and c-bristles of males of 11 species of *Cypridina* is given in Table 4.

ONTOGENY AND SEXUAL DIMORPHISM (Table 5).—*C. spina* has 5 juvenile instars but only the last 4 are in the present collection. In his diagnosis of the genus *Cypridina* Poulsen (1962:255) stated that the b-bristle of the female 1st antenna is without filaments. In the present study the presence or absence of filaments on the b-bristle was used to identify the sex of juveniles. The method probably would not hold for 1st instars, which probably lack filaments on the b-bristle of both sexes. The shape of the carapace of juveniles and adults of both sexes are similar. The number of bristles along the anteroventral margin of the carapace increases gradually from 1 on instar II to 5–8 on the adult.

First Antenna (Table 5): Except for the ventral margin of the 4th joint, the number of bristles on joints of the 1st antenna are constant for instar II and later stages. A ventral bristle is absent on the 4th joint of instar II and is present on later stages. The number of filaments on the sensory bristle of the 5th joint increases from 4 on instar II to 8 on the adult female and 11 on the adult male. The number of filaments on the c-bristle of the 7th joint, and the f- and g-bristles of the 8th joint also increases on each succeeding stage. The b- and c-bristles of the adult male bear suckers.

Second Antenna (Table 5): The protopodite bears 1 distal medial bristle on all instars. The exopodite of all instars bears a single bristle on joints 2–8, and 3 bristles on the 9th joint; all except the bristle of the 2nd joint and the short dorsal bristle of

TABLE 4.—Number of small suckers on filaments of the b- and c-bristles of the first antenna of males of 11 species of *Cypridina*.

Species	b-bristle	c-bristle	Source
<i>C. spina</i> Komicker, n. sp.	8 or 9	7 or 8	herein
<i>C. spinula</i> Komicker, n. sp.	5 or 6	4	herein
<i>C. serrata affirmans</i> Skogsberg, 1920	5	3	Skogsberg (1920:320)
<i>C. acuminata</i> (Müller, 1906)	4	4	Poulsen (1962:258)
<i>C. natans</i> (Müller, 1906)	4	4	Poulsen (1962:262)
<i>C. sinuosa</i> (Müller, 1906)	4	4	Poulsen (1962:262)
<i>C. inermis</i> (Müller, 1906)	4	4	Poulsen (1962:264)
<i>C. dentata</i> (Müller, 1906)	2 or 3	3	Poulsen (1962:265)
<i>C. multipilosa</i> Poulsen, 1962	3	2	Poulsen (1962:266)
<i>C. nana</i> Poulsen, 1962	3	3	Poulsen (1962:269)
<i>C. americana</i> (Müller, 1890)	5 or 6	5	Komicker (1987a:176)

TABLE 5.—Distribution of selected characters on instars of *Cypridina spina* (F = female, M = male; d = dorsal, v = ventral; nd = no data).

Character	Instar							
	II	III	IV		V		Adult	
	M	M	M	F	M	F	M	F
Carapace:								
average length (mm)	0.67	0.75	1.04	0.96	1.3	1.2	1.6	1.5
Anteroventral bristles	1	2	4	4	4-5	5	5-6	5-8
First Antenna								
1st joint: bristles	0	0	0	0	0	0	0	0
2nd joint: bristles	0	0	0	0	0	0	0	0
3rd joint: bristles (v/d)	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
4th joint: bristles (v/d)	0/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
5th joint: filaments of sensory bristle	4	6	8	8	10	8	11	8
6th joint: bristles	1	1	1	1	1	1	1	1
7th joint: bristles	3	3	3	3	3	3	3*	3
8th joint: bristles	4	4	4	4	4	4	4	4
Second Antenna								
Endopodite: bristles and filament	2	3	4	4	5	5	6	5-6
Exopodite, 9th joint: bristles	3	3	3	3	3	3	3	3
Mandible								
Basale:								
a-bristles	1	2	2	2	2	2	2	2
b-bristles	1	1	1	1	1	1	1	1
c-bristles	2	2	2	2	2	2	2	2
d-bristles	1	2	2	2	2	2	2	2
Dorsal margin bristles	3	3	3	3	3	3	3	3
Exopodite: bristles	2	2	2	2	2	2	2	2
1st endopodial joint: bristles	3	4	4	4	4	4	4	4
2nd endopodial joint: bristles (v/d)	3/6	3/6	4/7	4/7	4/7	4/7	4/12	4/10
3rd endopodial joint: bristles + claws	6	6	7	6	7	7	7	7
Maxilla								
Endites I + II + III: bristles	17	17	18	17	17	17	18	17
Coxale: bristles	1	1	1	1	1	1	1	1
Basale: bristles	1	1	2	2	2	2	2	2
Exopodite: bristles	3	3	3	3	3	3	3	3
1st endopodial joint								
alpha-bristles	1	1	1	1	1	1	1	1
beta-bristles	2	2	2	2	2	2	2	2
2nd endopodial joint								
a-bristles	3	3	3	3	3	3	3	3
b-bristles	2	1	2	2	2	2	2	2
c-bristles	1	2	2	2	2	2	2	2
d-bristles	3	3	3	3	3	3	3	3
Fifth Limb								
Endites I + II + III: bristles	11	17	18	nd	18	nd	18	18
1st exopodial joint; Main tooth								
Proximal bristle	1	1	1	1	1	1	1	1
Proximal peg	1	1	1	1	1	1	1	1
Pectinate teeth	2	3	4	4	5	5	6	6
1st exopodial joint; Anterior bristles	1-2	3	3	3	3	3	3	3
2nd exopodial joint								
a- + b-bristles	5	5	6	5	6	6	6	6
c- + d-bristles	2	2	2	2	2	2	2	2
3rd exopodial joint								
Inner lobe/outer lobe: bristles	2/2	3/2	3/2	3/2	3/2	3/2	3/2	3/2
4th + 5th exopodial joints: bristles	2	2	2	2	3	3	3	3
Sixth Limb								
Epipodite: bristles	0	1	1	1	1	2	1	3

TABLE 5.—Continued.

Character	Instar									
	II		III		IV		V		Adult	
	M	M	M	F	M	F	M	F	M	F
Endites I + II + III + IV: bristles	1	8-9	10	10	11	11	11	nd		
End joint: bristles	0	5	6	6	7	7	8	5		
Seventh Limb: bristles	0	0	1	1	3	7	3	7-8		
Furca										
Claws (total)	5	6	7	7	8	8	9	9		
Claws (nonarticulated)	3	3	2	2	1-2	1-2	1	1		
Lateral eyes: ommatidia	12	13	15	15	15	15	15	15		

*b- and c-bristles bearing suckers.

the 9th joint bear natatory hairs. Basal spines are present on some exopodial joints and the endopodite is single-jointed on all instars. The endopodite bears 1 bristle and 1 filament (the filament is listed as a bristle in Table 5) on instar II and adds an additional bristle on each succeeding stage (the adult generally has 5 bristles and 1 filament, but the 5th bristle is lacking on some limbs).

Mandible (Table 5): The coxale is similar on all stages. Except for having only 1 a-bristle and 1 d-bristle on instar II, the basale is similar on all stages. (Of interest is that the d-bristle missing on instar II is the long bristle.) The exopodite is similar on all stages. The 1st endopodial joint bears 3 ventral bristles on instar II and 4 on later instars. The 2nd endopodial joint is without one of the single ventral bristles on instars II and III. The number of dorsal bristles on the 2nd joint increases from 6 on instar II to 10-12 on the adult. The 3rd endopodial joint bears 3 claws on all stages, but on instars II and III and female instar IV the joint is lacking 1 of the 4 bristles on later stages.

Maxilla (Table 5): The total number of bristles on endites I-III remains fairly constant on all stages. One of the 2 basale bristles is absent on instars II and III. Except for lacking a c-bristle on instar II, the endopodite has the same number of bristles on all stages. The exopodite is similar on all stages.

Fifth Limb (Table 5): The number of endite bristles are about the same for instars III to the adult; instar II has fewer endite bristles but only 1 limb was available and some bristles of endite I could have been missing. The main tooth of the 1st exopodial joint of instar II has 2 cusped teeth, and 1 tooth is added on each succeeding stage; the adult has 6 cusped teeth. The 1st exopodial joint has 1 or 2 anterior bristles on instar II and 3 bristles on later stages. The inner lobe of the 3rd exopodial joint of instar II bears only 2 of the 3 bristles present on later stages. The fused 4th and 5th exopodial joints bear 2 bristles on instars II-IV and 3 on later instars and adults.

Sixth Limb (Table 5): This limb on instar II bears only 1 bristle, which is on an endite. Later stages bear many bristles. The adult female has 3 epipodial bristles, whereas, the adult

male has only 1.

Seventh limb (Table 5): The 7th limb of instar II is short, thumb-like, and bare. On instar III it is more elongate but remains bare. The male and female limbs of instar IV bear 1 diaphanous terminal bristle without bells, and 2 weakly developed terminal teeth. On instar V the male limb bears 3 diaphanous bristles, and the female 7, all without bells; limbs of both sexes have 3 terminal teeth. The adult male limb bears 3 bristles with bells, and 4 terminal teeth, and the adult female limb bears 7 or 8 bristles with bells, and 7 terminal teeth.

Furca (Table 5): Each lamella of the furca of instar II bears 5 claws and 1 claw is added on each succeeding stage; the adult has 9 claws. Each lamella of instars II and III have claws 2, 3, and 4 nonarticulated. On instar IV only claws 2 and 4 are nonarticulated. On instar V claw 2 is nonarticulated and claw 4 may or may not be nonarticulated (on some specimens the claw is articulated on one lamella and nonarticulated on the other). On the adult only claw 2 is nonarticulated.

Bellonci Organ, Upper Lip, and Y-Sclerite: Similar on all stages.

Lateral Eye (Table 5): Well developed and with 12 ommatidia on instar II, 13 on instar III, and 15 ommatidia on succeeding instars and adults. Relative size of male and female eyes not studied.

Genitalia: The male copulatory organ is well defined on instar V and the adult, and is represented by a small lobe on instar IV. The female genitalia well defined only in the adult.

Posterior of Body: Evenly rounded and bare on all instars and adults.

Cypridina spinula, new species

FIGURES 27-35

Cypridina spp. Kormicker, 1987b:217 (part).

ETYMOLOGY.—From the Latin *spinula* (small thorn) in reference to the many spines on the list of the caudal process.

HOLOTYPE.—USNM 193611, 1 adult female in alcohol.

TYPE LOCALITY.—Enewetak lagoon (holotype from composite sample).

PARATYPES.—Enewetak lagoon: Midwater trawl off Bokandretok Island: USNM 193642, 1 adult male on slide and in alcohol; USNM 193643, 2 ovigerous females and 1 adult female with large unextruded eggs, plus 9 specimens, mostly juveniles, all specimens in alcohol. Sta A, plankton trap 6, night, sand substrate: USNM 158323, 1 ovigerous female on slide and in alcohol; USNM 193651A, 1 adult male and 1 adult female in alcohol; USNM 193651B, 1 instar II male on slide and in alcohol; USNM 193651C, 1 instar V female on slide and in alcohol; USNM 193651D, 1 instar IV female on 2 slides and in alcohol; USNM 193651E, 1 instar III male on slide and in alcohol; USNM 193651F, 1 embryo (lost); USNM 193651G, 1 embryo in alcohol; USNM 193651H, 1 instar II male on slide and in alcohol; USNM 193651J, 1 instar II female in alcohol; USNM 193651K, 1 instar II male in alcohol. Sta B, plankton trap 7, night, coral rubble substrate: USNM 193659, 1 adult male, 1 adult female, and 2 juveniles in alcohol. Composite sample, USNM 193612A, 1 instar II male on slide and in alcohol; USNM 193612B, 1 instar II female on slide and in alcohol; USNM 193614, 1 instar V female in alcohol.

DISTRIBUTION.—Enewetak Atoll.

DESCRIPTION OF ADULT FEMALE (Figures 27–29).—Carapace elongate with convex dorsal and ventral margins (Figure 27a). Rostrum: dorsal corner sharply curved in lateral view (Figure 27a), more rounded in medial view (Figure 27c), with 6 slightly overlapping crenulations along edge (Figure 27c); anterior margin concave, inferior corner pointed. Caudal process relatively narrow, height at anterior end equal to about half of valve height, with tip broadly rounded (Figure 27b,e). Carapace surface with indistinct scalloping not visible on all specimens.

Surface Bristles: Anteroventral margin without bristles along inner edge, but with 3 small bristles with bases on lateral surface of valve just proximal to valve edge and extending ventrally past valve edge (Figure 27d shows bristles as seen through shell); about 10 additional small thread-like lateral bristles form row along ventral margin just within valve edge; additional slender bristles form row proximal to the row closer to valve edge (Figure 27d). Left valve with 3 bristles forming row just dorsal to caudal process (Figure 27b). Dorsal corner of rostrum with 3 or 4 small bristles (Figure 27c); outer surface of rostrum with about 6 short thread-like bristles. Outer surface of caudal process with several small thread-like bristles.

Infold: Rostral infold with 8 or 9 double bristles forming row paralleling anterior margin (on right valve 1 additional bristle near dorsal margin), 3 single bristles along oblique list, 2 bristles near inner end of incisur, and 1 small bristle proximal to their bases (Figure 27c); 2 additional small bristles near inner end of incisur. Narrow list with anterior end on anteroventral infold (Figure 27d) (distance of list from outer edge of infold about $\frac{1}{4}$ width of infold) extending along ventral infold and broadening to form stout sclerotized bar along anterior end of

caudal process. Double bristle present just anterior to anterior end of list (only socket of this bristle present on right valve) (Figure 27d). Anteroventral infold with 4 or 5 bristles along list (Figure 27d); 2 or 3 additional bristles along ventral list anterior to midlength of valves. Posteroventral infold with bristle just anterior to caudal process, and list with 2 or 3 minute bristles and processes (Figure 27b); bar forming list along anterior end of caudal process covered by broad stiff flap with 34 stout spines along posterior edge on right valve (Figure 27e), and 38 much smaller spines on left valve (Figure 27b); about 8 small pores, some bearing minute points, present on stiff flap just proximal to posterior spines; right valve with about 15 stout bristles below stiff flap (bristles without rigidity of posterior spines of flap); no bristles below flap of left valve; caudal “pocket” posterior to stiff flap with about 47 small-to-large bristles on right valve and about 65 small bristles on left valve. 5 small pores present along outer edge of infold of caudal process (Figure 27e). Small sclerotized tooth present on each valve, just dorsal to bar of caudal process (Figure 27b,e).

Selvage: Anterior margin of rostrum with narrow proximal ridge of selvage (to which lamellar prolongation is attached) set back a considerable distance from valve margin and more concave than margin (Figure 27c); the ridge with narrow striate lamellar prolongation with smooth outer edge (Figure 27f); similar lamellar prolongation along dorsal margin of rostrum; selvage appearing to terminate at ventral tip of rostrum but actually continuing as narrow indistinct prolongation along dorsal margin of incisur. Lamellar prolongation along ventral margin of incisur very broad and with widely spaced striations and minute surface pustules on part near inner end of incisur (Figure 27f); lamellar prolongation along anteroventral margin of valve narrow, weakly striate, and with smooth outer edge; prolongation along ventral margin of valve narrow, weakly striate except near outer edge, and with minute spines along outer edge (Figure 27g); lamellar prolongation along posteroventral margin of valve without spines along outer edge but with inner segment about $\frac{2}{3}$ width of selvage; inner segment striate and with serrate edge (Figure 27h); lamellar prolongation terminating on posteroventral margin of valve near posterior end of caudal process. Selvage absent along posterior end of caudal process and posterior margin of valve dorsal to caudal process.

Central Adductor Muscle Attachments: Comprising about 23 closely packed ovoid attachments in area indicated in Figure 27a.

Carapace Size: USNM 158323, length 1.48 mm, height 0.81 mm. USNM 193611, length 1.53 mm, height 0.83 mm. USNM 193643, 3 specimens: length 1.48 mm, height 0.82 mm; length 1.51 mm, height 0.89 mm; length 1.47 mm, height 0.81 mm.

First Antenna (Figure 28a): 1st joint bare. 2nd joint with abundant short spines forming rows on medial surface and along ventral and dorsal margins. 3rd joint with 2 bristles (shorter dorsal bristle bare, longer ventral bristle spinous). 4th joint with 2 bristles (dorsal bristle bare, ventral bristle longer,

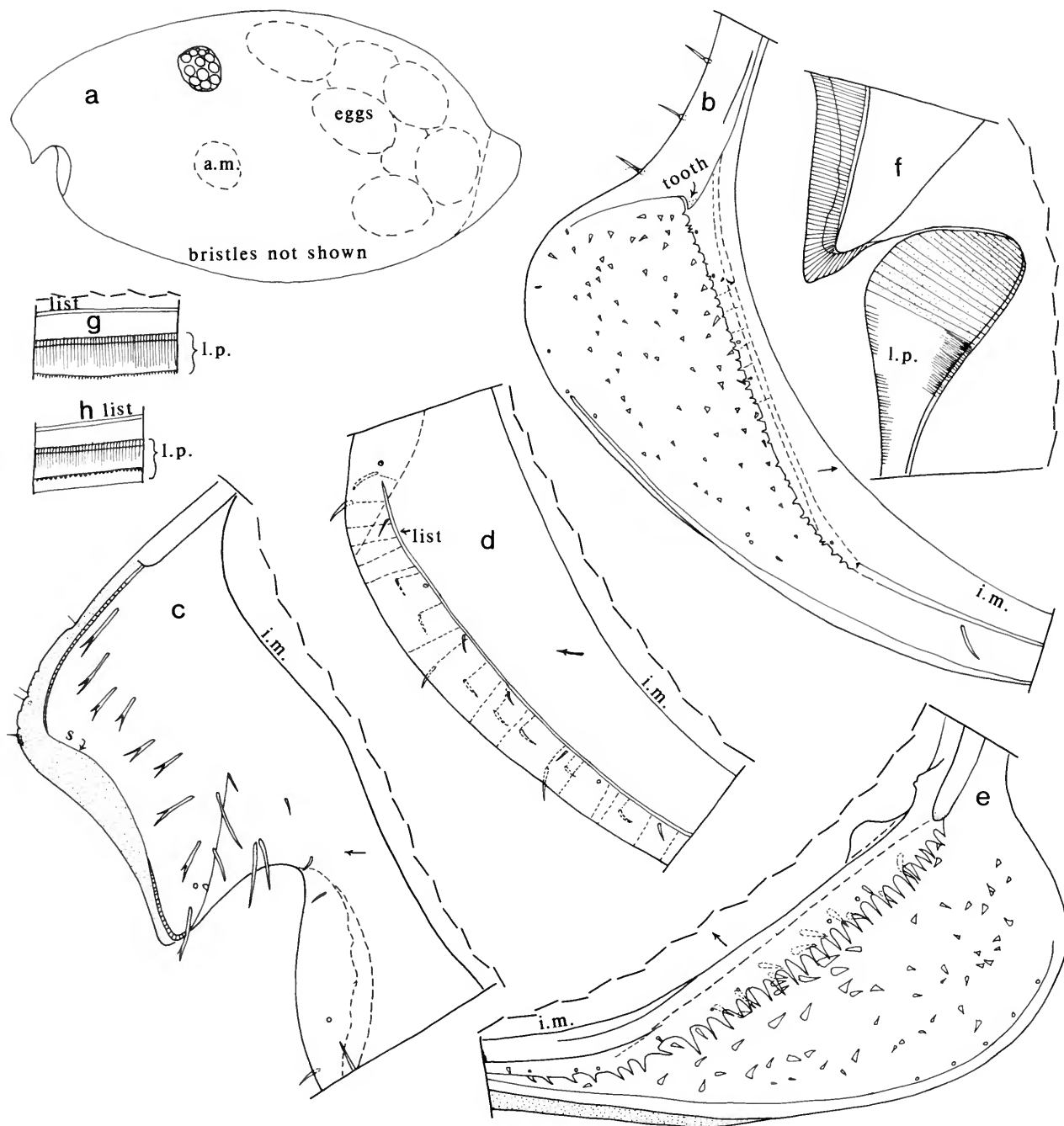


FIGURE 27.—*Cypridina spinula*, new species, USNM 158323, paratype, adult female: *a*, complete specimen from left side, length 1.48 mm; *b*, inner view of caudal process of left valve; *c*, inner view of rostrum of right valve; *d-h*, right valve: *d*, inner view of anteroventral margin; *e*, inner view of caudal process; *f*, inner view of lamellar prolongation of selvage in vicinity of rostrum and incisur; *g*, *h*, inner views valve showing lamellar prolongation of selvage along ventral margin at midlength and posteroventral margin, respectively.



FIGURE 28.—*Cypridina spinula*, new species, USNM 158323, paratype, adult female: a, medial view of left 1st antenna (d- and e-bristles of 8th joint not shown); b, c, medial views of endopodite and distal part of propodite of right and left 2nd antennae, respectively; d, medial view of left mandible; e, medial view of 3rd endopodial joint of left mandible showing 3 ventral bristles and medial claw; f, lateral view of 3rd endopodial joint of right mandible showing dorsal and lateral claws and lateral bristle; g, anterior view of left 5th limb (endites II and III and some bristles of endite I and exopodial joints 1 and 2 not shown); h, posterior view of right 5th limb (not all bristles shown); i, detail of 4th and 5th exopodial joints of right 5th limb, from h; j, anterior view of 1st exopodial joint of left 5th limb.

with few spines). Sensory bristle of 5th joint with 6 long proximal filaments, 2 short distal filaments, and bifurcate tip. 6th joint with short medial bristle with few marginal spines. 7th joint: a-bristle stouter than bristle of 6th joint but about same length; b-bristle about $\frac{2}{3}$ length of sensory bristle of 5th joint, bare; c-bristle long, about twice length of sensory bristle of 5th joint, with 7 marginal filaments (some with spines) and bifurcate tip. 8th joint (not all bristles shown): d-bristle reaching just past sensory bristle of 5th joint, bare with rounded tip; e-bristle similar to d-bristle but slightly shorter; f-bristle about same length as c-bristle, with 9 marginal filaments (all with spines) and bifurcate tip; g-bristle stout, very long, about twice length of f-bristle, with 10 marginal filaments (all with spines) and bifurcate tip.

Second Antenna (Figure 28b,c): Protopodite with small medial bristle with minute marginal hairs. Endopodite 1-jointed with 5 bristles (3 small proximal, then 1 about $\frac{1}{3}$ longer, and 1 more than twice length of smaller bristles) and 1 ventral filament-like bristle (slightly shorter than preceding bristle) with weak narrow rings and blunt tip. Exopodite: 1st joint with spines along concave margin; bristle of 2nd joint reaching 7th joint, with 6–8 ventral spines and narrowly ringed terminal section with papilla at tip; bristles of joints 3–8 with natatory hairs but no spines; 9th joint with 3 bristles (2 long with natatory hairs, 1 short, dorsal, bare); joints 3–8 with slender basal spines increasing in size distally; spine of 8th joint about same length as 9th joint; 9th joint with lateral spine slightly longer than length of joint.

Mandible (Figure 28d-f): Coxale endite well developed, spinous, with 2 stout terminal spines, 1 on each side of small triangular process; small bristle at base of endite. Basale (Figure 28d): ventral margin with 2 small a-bristles, 1 small b-bristle, 2 c-bristles (proximal short, distal long), 2 d-bristles (proximal short, distal long); dorsal margin with 3 bristles (1 distal to midlength, 2 terminal (lateral bare, medial spinous)); spines on medial and lateral surfaces (not shown). Exopodite about same length as dorsal margin of 1st endopodial joint, with terminal hirsute pad and 2 distal bristles (distal of these shorter and stouter than proximal). 1st endopodial joint with 4 ventral bristles (1 minute and 2 short medial, 1 long lateral). 2nd endopodial joint: ventral margin spinous, with 2 spinous single weakly ringed bristles with minute papilla at tip, and terminal paired bristles with pointed tips, medial unringed; dorsal margin with 4 long ringed bristles, 2 shorter ringed bristles (1 proximal and 1 distal to long bristles), and 5 short unringed bristles with bases medial to long bristles and with indistinct marginal spines (2nd bristle adjacent to proximal long bristle with stouter spines); medial surface with spines forming rows (not shown). 3rd endopodial joint with 2 pectinate claws, 1 smooth dorsal claw with broad hyaline dorsal edge (Figure 28f) [hyaline border of the dorsal claw of *C. serrata* var. *affirmans* mentioned by Skogsberg (1920:322)], 1 bare ringed lateral bristle (with tubular tip) near dorsal edge of joint, and 3 bristles with tubular tips near ventral edge of joint

(longest ringed distally, with proximal ventral bulge and proximal ventral spines; next-to-longest ringed, with few proximal ventral spines; shortest minute, unringed) (Figure 28e).

Maxilla (Figure 29a-g): Endite I with 7 bristles (2 claw-like, with long proximal spines and pectinate distally, 2 long with long proximal spines and pectinate distally, 3 with long proximal and short distal spines and with triaenid tips) (Figure 29e); endite II with 5 bristles (1 bare, ringed, posterior; 2 stout with long proximal spines and pectinate distally; 2 slightly shorter pectinate) (Figure 29f); endite III with 5 bristles (1 short, bare, ringed, posterior; 4 with long proximal spines and either bare or with short spines distally) (Figure 29b). Coxale with plumose dorsal bristle (Figure 29a). Basale with 2 short widely separated bristles near ventral margin and none near dorsal margin (Figure 29a). Exopodite hirsute along outer edge, with 1 proximal hirsute bristle and 2 terminal bristles (inner hirsute, outer shorter and with indistinct short marginal spines) (Figure 29a). Endopodite (Figure 29a,c,d,g): 1st joint with dorsal hairs forming rows, 1 ringed alpha-bristle with long marginal spines, and 2 ringed beta-bristles (outer with stout marginal spines, inner shorter with small spines); cutting tooth bifurcate (Figure 29c); 2nd joint with 3 bare ringed a-bristles, 3 ringed b-bristles (longest pectinate proximally and with long spines distally, others pectinate), 2 ringed c-bristles (posterior with widely separated minute spines, other shorter bare), and 3 stout pectinate d-bristles (posterior ringed distally, others stouter, unringed) (Figure 29a,d,g).

Fifth Limb (Figure 28g-j): Anterior tooth-like process of protopodite absent. Endite I with 6 spinous bristles; endite II with 4 spinous and pectinate bristles, 1 small bare unringed tooth-like bristle, and 1 small ringed anterior bristle set back from inner edge; endite III with 6 spinous and/or pectinate bristles and 1 small bare pointed tooth-like bristle (not all bristles shown in Figure 28g). 1st exopodial joint: main tooth with proximal peg (tip minutely bifurcate) and 6 cusped teeth (Figure 28h); ringed bristle (with long spines at midlength) present proximal to peg; anterior side with 3 bristles forming row (inner bristle long stout with long proximal spines and pectinate distally; middle bristle slender, almost as long as inner bristles, with long spines near middle and short spines distally; outer bristle short, with long proximal and short distal spines) and 1 slender bristle (with long proximal hairs) closer to outer edge of joint (Figure 28g,j). 2nd exopodial joint with 3 pectinate a-bristles (smallest and middle bristles ringed, longest unringed), 3 pectinate ringed b-bristles (outer b-bristle with long spines near midlength) (Figure 28g,h), and posterior c-bristle and anterior d-bristle, both with long proximal and short distal hairs. 3rd exopodial joint: inner lobe with 3 bristles (1 short ringed proximal with long proximal and short distal spines, 1 unringed terminal on small pedestal with few distal spines, 1 ringed terminal with short marginal spines); outer lobe hirsute, with 2 ringed bristles with short marginal spines (Figure 28g,h). 4th and 5th joints fused, hirsute, with 3 ringed



FIGURE 29.—*Cypridina spinula*, new species, USNM 158323, paratype, adult female: *a-d*, right maxilla: *a*, lateral view (endites not shown); *b*, endite III, anterior to left; *c*, lateral view of cutting tooth and proximal part of beta-bristles of 1st endopodial joint; *d*, lateral view of beta- and delta-bristles of 2nd endopodial joint. *e-g*, left maxilla: *e, f*, endites I and II, respectively, anterior to right; *g*, medial view of beta- and gamma-bristles of 2nd endopodial joint. *h*, medial view of left 6th limb; *i*, 7th limb; *j*, tip of opposite 7th limb to that shown in *i*; *k*, medial view of claw 1 of left lamella of furca (illustrated claw with teeth) and lateral view of right lamella (teeth not shown); *l*, anterior of body showing left lateral eye, medial eye and Bellonci organ, anterior process, and upper lip; *m*, medial view of right genital organ with attached spermatophore (lower disc on illustration).

bristles (1 proximal, 2 terminal) with short marginal spines; very low process bearing several fairly stout spines present between proximal and terminal bristles (Figure 28*i*).

Sixth Limb (Figure 29*h*): With 3 or 4 small bare epipodial bristles. Endite I with 1 or 2 small plumose medial bristles and 1 stout spinous terminal bristle; endite II with 2 plumose medial bristles and 2 stout spinous terminal bristles; endite III with 2 stout spinous terminal bristles and 1 short bristle (with indistinct short marginal spines) between them; endite IV with 2 spinous terminal bristles (medial of these shorter). End joint with 7–9 bristles (4–6 spinous bristles with bases on or just medial to edge, followed by small space and 1 spinous bristle with base set medially some distance from edge, then small space and 2 plumose bristles with bases on edge); medial surface of limb (including endites and end joint) hirsute; lateral surface of end joint with long spines close to anterior and ventral edges. (Right limb of USNM 143323 aberrant in having the 2 plumose posterior bristles of end joint fused along proximal $\frac{1}{4}$.)

Seventh Limb (Figure 29*i,j*): Each limb with 10 bristles: 4 proximal (2 on each side), each with 3 bells, and 6 terminal (3 on each side), each with 3 or 4 bells. Terminal comb with 7 teeth (longest tooth in middle, end tooth on each side of comb short with fairly blunt tip) (Figure 29*j*). Peg opposite comb short indistinct.

Furca (Figure 29*k*): Each lamella with 9 claws; claws 2 and 4 nonarticulated, remaining claws articulated; claw 3 more slender than claw 4 but about same length; claws 4–9 decreasing in width and length; all claws with slender teeth along posterior margins (not shown); claw 1 with fairly large distal medial teeth. Anterior edge of each lamella with few spines; claw 1 of right lamella anterior to claw 1 of left lamella by about width of claw measured at its base.

Bellonci Organ (Figure 29*l*): Short with narrow pointed process at tip.

Eyes: Lateral eye without pigment, well developed with 14 large and 3 small amber-colored divided ommatidia (small ommatidia at dorsal end and medial to larger ommatidia) (Figures 27*a*, 29*l*). Medial eye unpigmented, bare, slightly smaller than lateral eye (Figure 29*l*).

Upper Lip (Figure 29*l*): With 2 fairly short unpaired anterior tusks, each with wide glandular openings at tip, and 2 pairs of posterior tusks (each of anterior paired tusks with 3 or 4 glandular openings at tip; posterior paired tusks narrower and longer, with 5 or 6 glandular openings along posterior edge and 1 at tip).

Genitalia (Figure 29*m*): Sclerotized oval at each side of body anterior to furca. Spermatophore attached only on oval of right side.

Anterior of Body (Figure 29*l*): With rounded process between medial eye and upper lip.

Posterior of Body: Evenly rounded.

Y-Sclerite: Typical for subfamily.

Pigmentation: None in carapace or appendages.

Eggs: USNM 158323 with 11 eggs in marsupium (not all shown in Figure 27*a*). USNM 193643, 3 specimens: 1 with 15 large unextruded eggs, 2 with 8 and 13 eggs in marsupium, respectively. (An A-1 female (USNM 193643) having appendages containing within them the appendages of the adult has numerous small unextruded eggs in the ovaries.)

DESCRIPTION OF ADULT MALE (Figure 30).—Carapace similar in shape to that of adult female (Figure 30*a*).

Surface Bristles: 2 (instead of 3 as on female) small anteroventral bristles with bases on lateral side near valve edge; otherwise bristles, in general, similar to those of adult female but not examined in detail.

Infold: Rostral infold with 6 or 7 double bristles forming row paralleling anterior margin (Figure 30*b*); 3 or 4 long bristles (single or with minute branch near midlength) along oblique list; 2 bristles near inner end of incisur and 1 small bristle proximal to their bases; remaining bristles not examined in detail but, in general, similar to those of adult female. Broad list of caudal process with stiff flap with 33 stout spines along posterior edge on right valve (Figure 30*c*) and about 40 smaller spines on left valve; right valve with about 10 bristles below flap; numerous small-to-large bristles on infold of caudal process posterior to list. Small indistinct tooth on bar just dorsal to list of caudal process better developed on left valve.

Selvage: Similar to that of adult female.

Carapace Size: USNM 193642, length 1.58 mm, height 0.84 mm.

First Antenna: Joints 1–4 similar to those of adult female. 5th joint smaller than that of adult female (about same size as that of joint 4 except ventral margin longer than dorsal margin); sensory bristle with 8 long proximal filaments, 2 short distal filaments, and bifurcate tip. 6th joint with short medial bristle with few marginal spines. 7th joint (Figure 30*d*): a-bristle about same length as bristle of 6th joint but slightly stouter, with few spines; b-bristle reaching just past tip of sensory bristle of 5th joint, with stout proximal filament (with sucker and small process distal to sucker), 2 slender distal filaments (proximal with small spine followed by 5 small suckers, distal with small spine followed by 6 small suckers), and indistinct minute filament near tip; c-bristle about 5 times length of b-bristle, with stout proximal filament (with sucker and small process distal to sucker), followed by 1 small ringed filament, 1 slender distal filament (with small spine followed by 4 small suckers), 1 long bare diaphanous filament, 5 long distal diaphanous filaments (each with a proximal spine), and minute filament near tip. 8th joint: e-bristle about $\frac{2}{3}$ length of b-bristle, bare with blunt tip; d-bristle almost as long as b-bristle, bare with blunt tip; f-bristle same length as c-bristle, with 1 bare proximal slender diaphanous filament, followed by 6 slender diaphanous filaments (each with proximal spine), and minute filament near tip; g-bristle half length of f-bristle, with about 10 slender filaments (most with proximal spine) and minute filament near tip.

Second Antenna: Quite similar to that of adult female.

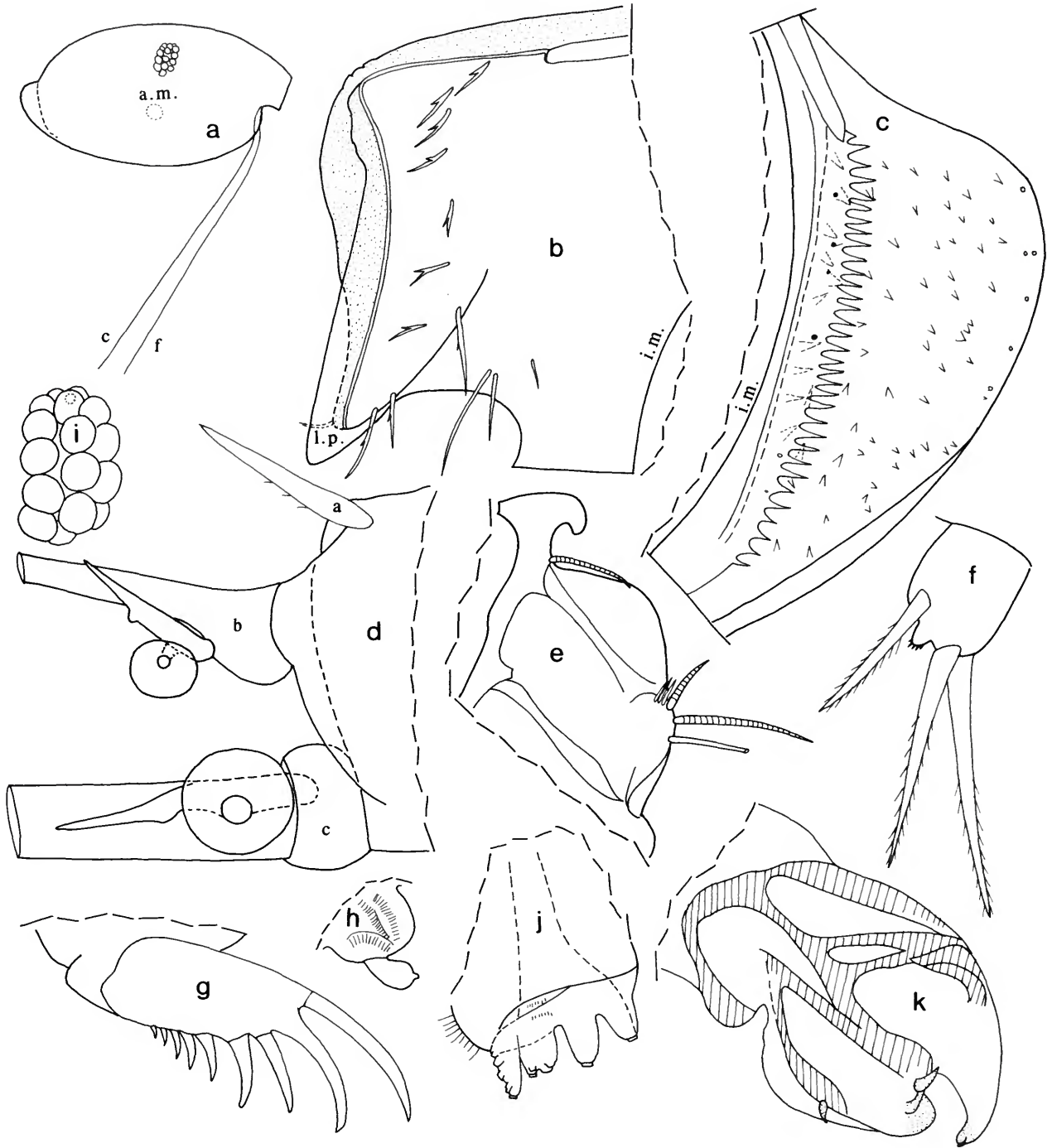


FIGURE 30.—*Cypridina spinula*, new species, USNM 193642, paratype, adult male: *a*, complete specimen from right side with *c*- and *f*-bristles of right 1st antenna, length of carapace 1.58 mm; *b*, inner view of rostrum of right valve; *c*, inner view of caudal process of right valve; *d*, medial view of tip of right 1st antenna showing bristles of 7th joint; *e*, medial view of endopodite and distal part of protopodite of left 2nd antenna; *f*, posterior view of fused 4th and 5th exopodial joints of right 5th limb; *g*, right lamella of furca; *h*, medial eye and Bellonci organ; *i*, right lateral eye; *j*, upper lip, anterior to right; *k*, lateral view of left copulatory organ, anterior to left.

Protopodite with distal medial bristle (Figure 30e). Endopodite 1-jointed, with 3 small anterior proximal bristles, followed by 2 longer bristles (proximal about half length of distal), then distal filament shorter than longest bristle (Figure 30e). Exopodite: 1st joint with few spines along concave dorsal margin; bristle of 2nd joint reaching 6th or 7th joint, with 6 or 7 ventral spines, no hairs; bristles of joints 3–8 long, with natatory hairs, no spines; 9th joint with 3 bristles (1 short bare dorsal, 2 long with natatory hairs); joints 6–8 with slender basal spines; spine of 8th joint about same length as 9th joint; 9th joint with slender lateral spine about same length as joint.

Mandible: Similar to that of adult female.

Maxilla: 2nd endopodial joint: outer a-bristle with few proximal spines, both c-bristles bare. Limb otherwise similar to that of adult female.

Fifth Limb: Epipodite with 35 bristles (not counted on adult female). Spinous process on fused 4th and 5th exopodial joints longer than that of female (Figure 30f). Limb otherwise similar to that of female.

Sixth Limb: Both limbs of USNM 193642 with 2 epipodial bristles. Endite I with 2 small plumose medial bristles and 1 stout spinous terminal bristle; endites II–IV similar to those of adult female. Both end joints of USNM 193642 with 9 bristles, otherwise similar to those of adult female.

Seventh Limb: Each limb with 9 or 10 bristles: 3 or 4 proximal (1 or 2 on each side), each with 3 bells, and 6 terminal (3 on each side), each with 4 bells or less. Terminal comb obscured on both limbs of USNM 193642, longest tooth in middle; small peg opposite comb.

Furca (Figure 30g): Differs from that of adult female in having claw 4 articulated.

Bellonci Organ (Figure 30h): Similar to that of adult female.

Eyes: Lateral eye with 15 large and 2 small amber-colored divided ommatidia (small ommatidia located at dorsal edge of eye and medial to large ommatidia); no pigment between ommatidia (Figure 30a). Medial eye unpigmented, bare, height about half maximum length of lateral eye (Figure 30h).

Upper Lip (Figure 30j): Similar to that of adult female.

Genitalia (Figure 30k): Well-developed lobes on each side of body anterior to furca.

Posterior of Body: Evenly rounded, bare.

Y-Sclerite: Same as that of adult female.

Pigmentation: None in carapace or appendages.

DESCRIPTION OF EMBRYO (Figure 31).—Carapace unattached along free margin, without projecting caudal process; rostrum not visible in lateral view but tip represented by minute point in medial view (Figure 31e); valves uncalcified and with irregular shape (Figure 31a,d); umbo on dorsal margin in vicinity of medial eye and heart.

Carapace Size: USNM 193651F, length 0.27 mm, height 0.28 mm; USNM 193651G, length 0.29 mm, height 0.23 mm.

First Antenna (Figure 31f): Joints 1–8 well defined; joints 1–4 and 6 bare. 5th joint with 1 long bare ventral bristle. 7th joint with 2 bristles. 8th joint with 2 or 3 bristles.

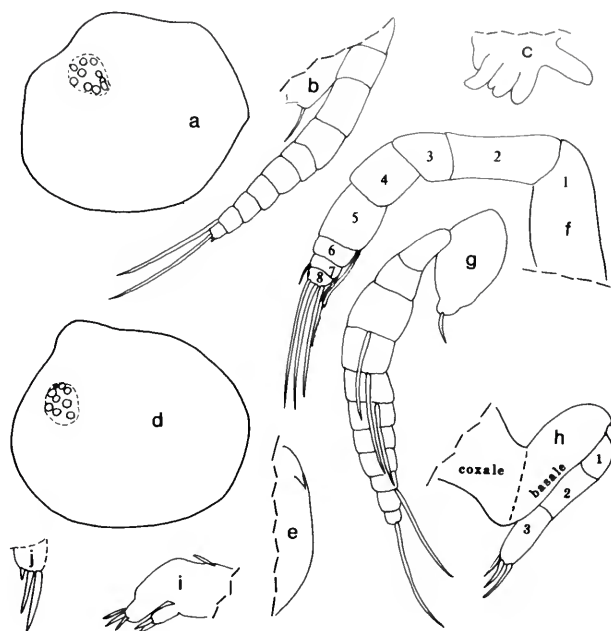


FIGURE 31.—*Cypridina spinula*, new species. USNM 193651F, paratype, embryo: a, complete specimen showing location of left lateral eye, anterior to left, length 0.27 mm; b, lateral view of endopodite and exopodite of left 2nd antenna (not all exopodial bristles shown); c, upper lip, anterior to right. USNM 193651G, paratype, embryo: d, complete specimen showing location of left lateral eye, length 0.29 mm; e, anterior of right valve showing minute indication of pointed rostrum; f, 1st antenna; g, 2nd antenna; h, mandible; i, maxilla; j, lateral view of right lamella of furca. All drawings of appendages made without cover slip and with $\times 40$ objective and $\times 15$ ocular.

Second Antenna (Figure 31b,g): Endopodite with single filament. Exopodite with 10 or 11 joints; bristles bare (not all exopodial bristles shown).

Mandible (Figure 31h): With total of 3 terminal claws or bristles.

Maxilla (Figure 31i): Single endite (or exopodite) with 2 terminal bristles. Coxale with dorsal bristle. 2nd endopodial joint with 2 terminal bristles.

Fifth, Sixth, and Seventh Limbs: Not observed. (5th limb could be present but not resolved.)

Furca (Figure 31j): Obscured but with about 3 claws (whether articulate or nonarticulate not resolved).

Upper Lip (Figure 31c): Similar in overall structure to that of adult female.

Lateral Eye (Figure 31a,d): Well developed with 10 amber-colored ommatidia.

Pigmentation: None observed in carapace or appendages.

REMARKS.—2 embryos were present in vial from night plankton trap 6 (sand substrate), which had many specimens of *C. spinula*. Because of the lack of a distinct rostrum and incisor

on the carapaces the embryos are interpreted to have been aborted and not the 1st free-living instar. Illustrations are based on limbs not covered by cover-slip and viewed at $\times 600$ ($\times 40$ objective, $\times 15$ ocular) and not all bristles are resolved at that magnification.

DESCRIPTION OF INSTAR II MALE (Figure 32a-n).—Carapace similar in shape to that of adult female (Figure 32a, b).

Infold: Infold of rostrum with 3 bristles; 2 bristles near inner end of incisor (Figure 32b). Bar forming list of caudal process of right valve with about 10 stout spines along posterior edge of flap (Figure 32e); no spines observed along list of caudal process of left valve.

Carapace Size: USNM 193612A, length 0.70 mm, height 0.43 mm; USNM 193651B, length 0.70 mm, height 0.39 mm; USNM 193651H, length 0.62 mm (distorted), height 0.39 mm; USNM 193651K, length 0.71 mm, height 0.43 mm.

First Antenna (Figure 32a,f): 3rd joint with 2 bristles (1 ventral, 1 dorsal); 4th joint with 1 short dorsal bristle. Sensory bristle of 5th joint with 2 stout proximal filaments, 2 distal short slender filaments, and bifurcate tip. 6th joint with short medial bristle near dorsal margin. 7th joint: a-bristle short; b-bristle with minute proximal filament (Figure 32f); c-bristle long with filaments. 8th joint: d- and e-bristles long bare; f-bristle about same length as c-bristle, with short filaments; g-bristle about $\frac{1}{3}$ longer than c- and f-bristles, with short filaments.

Second Antenna (Figure 32g): Protopodite with distal medial bristle. Endopodite small, 1-jointed, with 1 short terminal bristle followed by long terminal filament. Exopodite: bristle of 2nd joint reaching 5th joint, with 2 ventral spines; joints 3–8 with long bristles with natatory hairs; 9th joint with 3 bristles (1 long with natatory hairs, 1 about same length as combined joints 3–9, 1 very short, dorsal); joints 3–8 with short basal spines; spine of 8th joint about $\frac{1}{3}$ length of 9th joint; 9th joint with lateral spine about same length as basal spine of 8th joint; joints 3–8 with indistinct minute spines along terminal margin.

Mandible: Coxale and exopodite similar to those of adult female. Basale differs from that of adult female in lacking long d-bristle. 1st endopodial joint with 3 bristles (1 long with short spines, 1 short spinous, 1 minute). 2nd endopodial joint: ventral margin with 1 short pointed bristle distal to middle and paired short pointed terminal bristles; dorsal margin with 1 short proximal bristle, 3 long bristles, and 2 short bristles with bases proximal and medial to proximal long bristle; medial surface with spines forming rows. 3rd exopodial joint differs from that of adult female in having 2 bristles (1 long, 1 short) instead of 3 near ventral edge.

Maxilla: Endite I with 6 spinous bristles; endites II and III each with 5 bristles. Coxale with short hirsute bristle. Basale with 2 ventral bristles (proximal near base of exopodite and very short). Exopodite similar to that of adult female. 1st endopodial joint with spinous dorsal margin, 1 alpha- and 1

beta-bristle, and single rounded cutting tooth. 2nd endopodial joint with 3 a-bristles, 2 b-bristles, 1 c-bristle, and 3 d-bristles (Figure 32h).

Fifth Limb: Endites I, II, and III with about 6, 6, and 7 bristles, respectively (not all shown in Figure 32i). 1st exopodial joint (Figure 32i,j): main tooth with proximal bristle, small indistinct smooth proximal peg, and 2 stout cusped teeth; anterior side with 2 bristles forming row (inner bristle long stout, outer bristle about half length of inner bristle). 2nd exopodial joint with 2 pectinate a-bristles, 3 pectinate b-bristles (outer bristle with spines near midlength), and posterior c-bristle and anterior d-bristle, both with long proximal and short distal hairs (Figure 32i,j). 3rd exopodial joint: inner lobe with 2 bristles (1 short proximal, 1 longer terminal); outer lobe hirsute, with 2 terminal bristles. 4th and 5th joints fused, with 3 bristles and short process bearing spines. (Bristles of exopodial joints 3–5 not shown.)

Sixth Limb (Figure 32c): Single endite with 1 terminal bristle; end joint spinous but without bristles.

Seventh Limb (Figure 32d): Small thumb-like, without bristles or terminal comb.

Furca (Figure 32c,k): Each lamella with 5 claws; claws 2 and 4 nonarticulated; claw 4 broader than claw 3; claw 1 with distal medial teeth; all claws with small teeth along posterior edges.

Bellonci Organ (Figure 32l): With pointed tip.

Eyes: Lateral eye with 10 large and 2 small amber-colored ommatidia (small ommatidia on dorsal end of eye and medial to larger ommatidia); no pigmentation between ommatidia (Figure 32a). Medial eye unpigmented, bare (Figure 32l).

Upper Lip (Figure 32m) and Y-Sclerite (Figure 32c,n): Similar to those of adult female, except for posterior paired tusks of upper lip having fewer glandular openings.

Posterior of Body (Figure 32n): Posterodorsal corner with few stiff spines.

Pigmentation: None in carapace or appendages.

DESCRIPTION OF INSTAR II FEMALE (Figure 32o-t).—Carapace similar to that of instar II male (Figure 32o).

Carapace Size: USNM 193612B, length 0.70 mm, height 0.43 mm; USNM 193651J, length 0.70 mm, height 0.40 mm.

First Antenna: Except for bare b-bristle, limb similar to that of instar II male.

Second Antenna, Mandible, Maxilla, Fifth Limb (Figure 32p), Sixth Limb (Figure 32q), Seventh Limb (Figure 32r), and Furca (Figure 32q): Similar to those of instar II male.

Bellonci Organ: Fragmented.

Eyes: Lateral eye with 10 large and 2 small divided amber-colored ommatidia (small ommatidia at dorsal end of eye and medial to large ommatidia) (Figure 32o,s); no pigmentation between ommatidia. Medial eye fragmented.

Upper Lip (Figure 32t), Posterior of Body, and Y-Sclerite (Figure 32q): Similar to those of instar II male.

Pigmentation: None in carapace or appendages.

DESCRIPTION OF INSTAR III MALE (Figure 33).—Carapace of USNM 193651E somewhat higher than that of adult female,

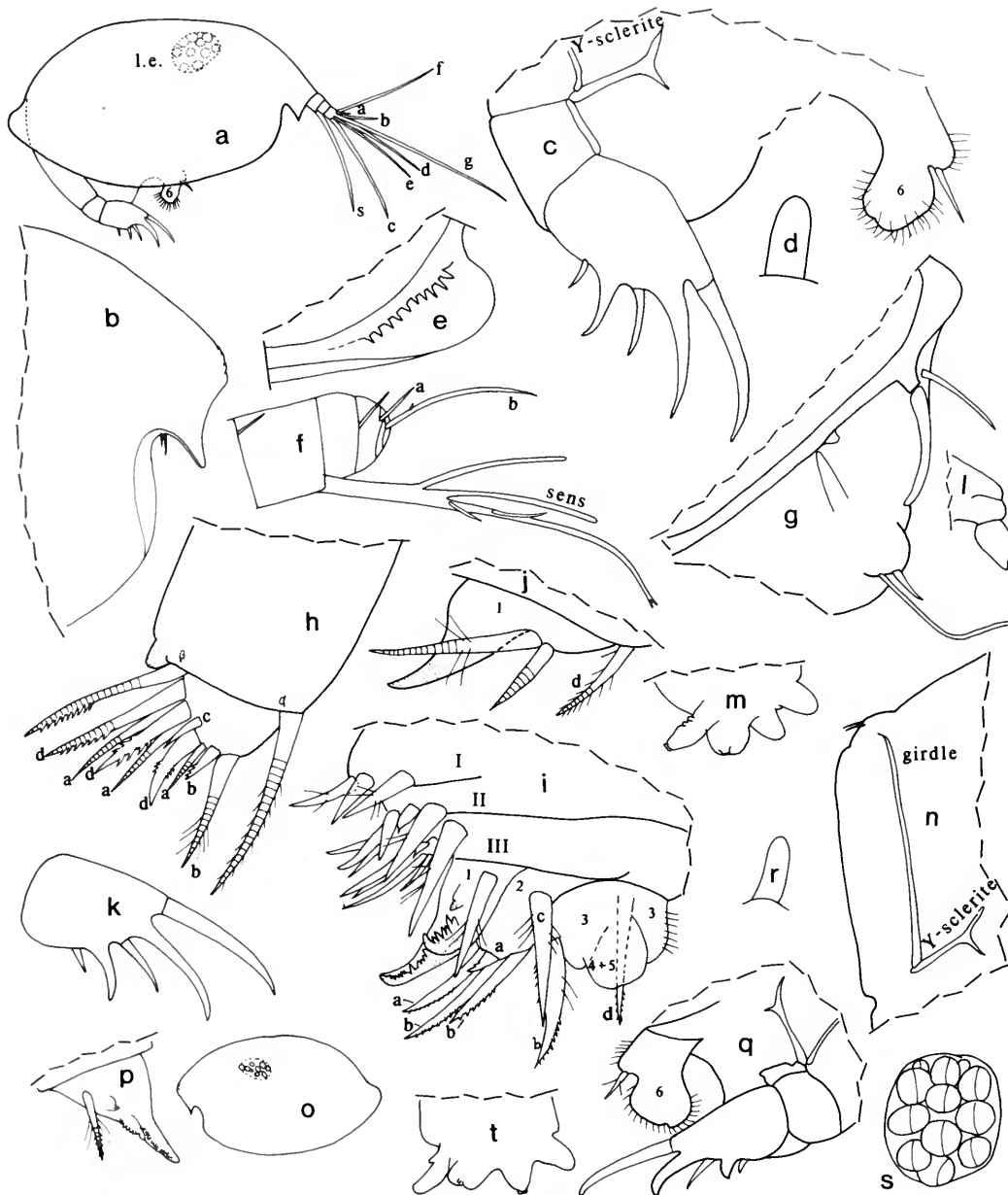


FIGURE 32.—*Cypridina spinula*, new species. USNM 193612A, paratype, instar II male: *a*, complete specimen from right side showing extended right 1st antenna (filaments on bristles not shown), right 6th limb, and furca, carapace length 0.70 mm; *b*, anterior of right valve; *c*, part of body showing 6th limb, right lamella of furca, and internal sclerites; *d*, left 7th limb. USNM 193651B, paratype, instar II male: *e*, inner view of caudal process of right valve; *f*, medial view of distal end of left 1st antenna (only *a*- and *b*-bristles of joints 7 and 8 shown); *g*, medial view of endopodite and distal part of protopodite of left 2nd antenna; *h*, medial view of endopodite of left maxilla; *i*, posterior view of right 5th limb (some endite bristles not shown); *j*, anterior view of 1st exopodial joint and *d*-bristle of 2nd exopodial joint; *k*, right lamella of furca; *l*, medial eye and Bellonci organ; *m*, upper lip, anterior to right; *n*, posterior of body showing posterodorsal spines and internal sclerites. USNM 193651J, paratype, instar II female: *o*, complete specimen from left side, length 0.70 mm. USNM 193612B, paratype, instar II female: *p*, posterior view of 1st exopodial joint of right 5th limb; *q*, posterior of body from left side showing left 6th limb, furca, and internal sclerites; *r*, left 7th limb; *s*, right lateral eye; *t*, upper lip, anterior to right.

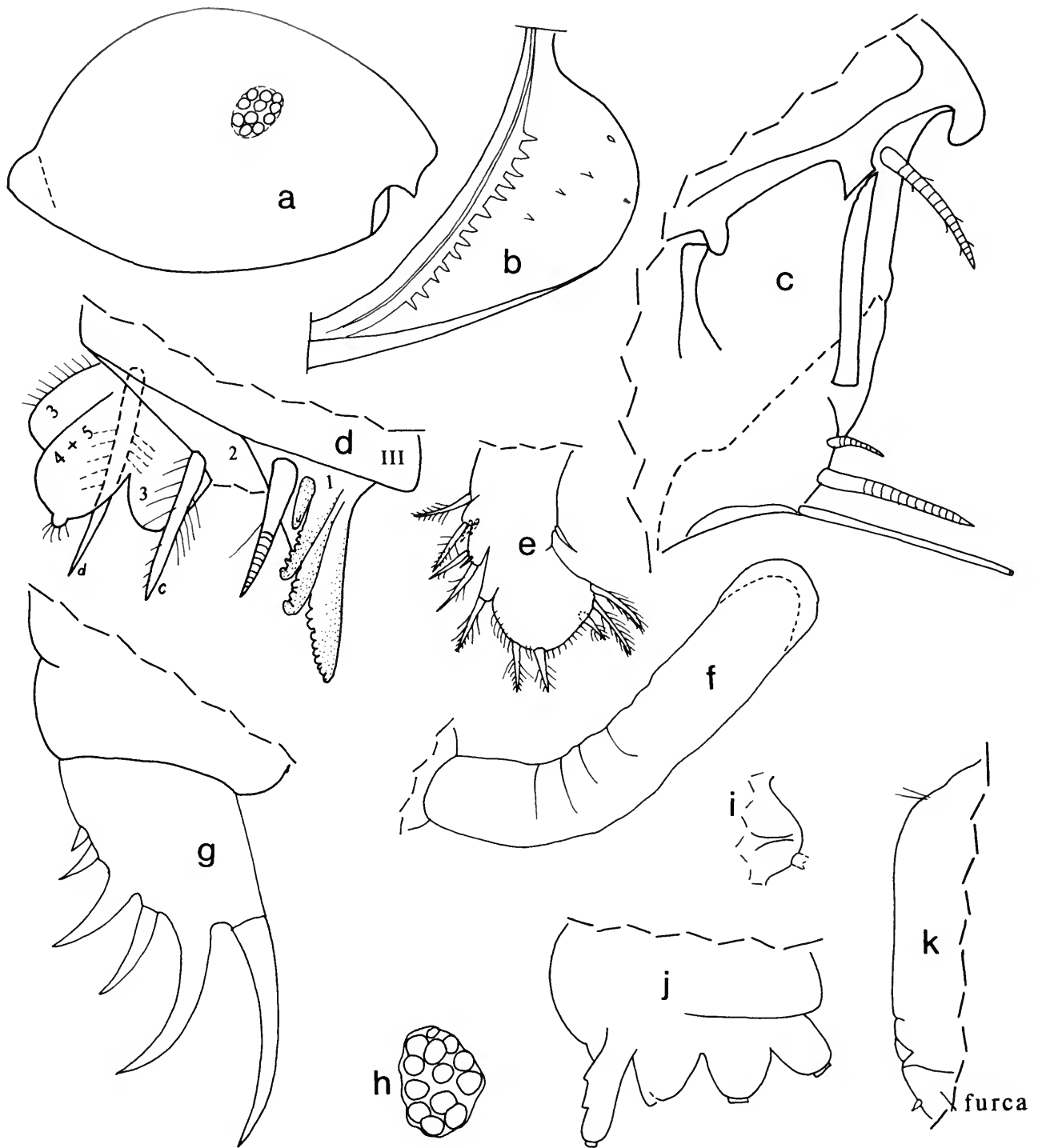


FIGURE 33.—*Cypridina spinula*, new species, USNM 193651E, paratype, instar III male: *a*, complete specimen from right side, length 0.82 mm; *b*, inner view of caudal process of right valve; *c*, medial view of endopodite and distal part of protopodite or left 2nd antenna; *d*, posterior view of right 5th limb (endite bristles and most bristles of exopodial joints 2-5 not shown); *e*, lateral view of left 6th limb; *f*, 7th limb; *g*, right lamella of furca; *h*, medial view of left lateral eye; *i*, medial eye and proximal part of Bellonci organ (distal end fragmented); *j*, upper lip, anterior to right; *k*, posterior of body showing posterodorsal spines.

otherwise similar (Figure 33a).

Infold: Caudal process of right valve with about 13 spines along posterior edge of flap of list (Figure 33b); list of left valve with smaller spines.

Carapace Size: USNM 193651E, length 0.82 mm, height 0.51 mm.

First Antenna: Joints 1–4 and 6 similar to those of adult female. Sensory bristle of 5th joint with 4 stout proximal filaments, 2 short slender distal filaments, and bifurcate tip (distal of stout filaments almost reaching tip of stem and with proximal short filament near base). 7th joint: a-bristle short spinous; b-bristle with 2 minute proximal filaments; c-bristle long with marginal filaments. 8th joint: d- and e-bristles long bare; f- and g-bristles long with marginal filaments (f-bristle with 4 filaments, g-bristle with more).

Second Antenna: Protopodite with 1 distal bristle with few marginal spines. Endopodite 1-jointed with 1 small anterior bristle, 1 longer terminal bristle, and 1 longer terminal filament (Figure 33c). Exopodite: bristle of 2nd joint just reaching 6th joint, with 7 ventral spines; branch otherwise similar to that of adult female.

Mandible: Coxale, basale, exopodite, and 1st endopodial joint similar to those of adult female. 2nd endopodial joint: ventral margin with 1 single pointed distal bristle and paired pointed terminal bristles; dorsal margin with 1 short proximal bristle, 4 long bristles, and 2 short bristles with bases on medial side near proximal of long bristles; medial surface with spines forming rows. 3rd endopodial joint similar to that of adult female except for having only 2 bristles near ventral margin (1 long lateral, 1 shorter medial) instead of 3.

Maxilla: Coxale with short dorsal bristle. Endite I with 7 bristles; endites II and III each with 5 bristles. Basale with distal ventral bristle (area of proximal ventral bristle obscured). 1st endopodial joint and exopodite similar to those of adult female. 2nd endopodial joint with only 2 b-bristles, otherwise similar to that of adult female.

Fifth Limb (Figure 33d): Endite I fragmented; endite II with 6 bristles; endite III with 7 bristles. 1st exopodial joint: main tooth with proximal bristle, small digitate proximal peg, and 3 cusped teeth; anterior side with 3 bristles (similar to those of adult female) forming row. 2nd exopodial joint with 2 a-bristles, 3 b-bristles, 1 posterior c-bristle, and 1 anterior d-bristle. 3rd, 4th, and 5th exopodial joints similar to those of adult female. (Not all bristles shown.)

Sixth Limb (Figure 33e): With 1 epipodial bristle. Endite I with 1 terminal bristle; endite II with 2 small medial bristles and 1 long terminal bristle; endite III with 2 stout terminal bristles and 1 small bristle between them; endite IV with 1 stout terminal bristle. End joint with 5 bristles (2 spinous bristles (with bases on medial side near edge) followed by wide space and 1 spinous bristle with base set medially some distance from edge, then 2 plumose bristles with bases on edge). Limb with hairs and spines similar to those of adult female.

Seventh Limb (Figure 33f): Elongate, bare.

Furca (Figure 33g): Each lamella with 6 claws; claws 2 and 4 nonarticulated; claw 4 stouter but about same length as claw

3; teeth of claws similar to those of adult female.

Bellonci Organ: Broken off medial eye of specimen examined (Figure 33i).

Eyes: Medial eye unpigmented bare (Figure 33i). Lateral eye with 12 large and 2 or 3 small ommatidia (small ommatidia on dorsal end of eye and medial to larger ommatidia) (Figure 33a, h).

Upper Lip (Figure 33j): Similar to that of adult female.

Genitalia: None observed.

Posterior of Body (Figure 33k): Posterodorsal corner with 2 or 3 stiff spines.

Y-Sclerite: Similar to that of adult female.

Pigmentation: None in carapace or appendages.

DESCRIPTION OF INSTAR IV FEMALE (Figure 34).—Carapace of USNM 193651D not as high as that of adult female, otherwise similar (Figure 34a).

Infold: List of caudal process of right valve with about 19 spines along posterior edge of flap (Figure 34b); list of left valve with smaller spines.

Carapace Size: USNM 193651D, length 1.00 mm, height 0.47 mm.

First Antenna: Joints 1–4 and 6 similar to those of adult female. Sensory bristle of 5th joint with 6 long stout proximal filaments followed by 2 short slender filaments and bifurcate tip (Figure 34c). Joints 7 and 8: b-bristle bare; remaining bristles similar, in general, to those of adult female but marginal filaments not counted.

Second Antenna: Protopodite and exopodite similar to those of adult female. Endopodite 1-jointed with 2 short anterior bristles, 1 longer terminal bristle, and 1 longer terminal filament (Figure 34d).

Mandible: Coxale, basale, exopodite, and 1st and 3rd endopodial joints similar to those of adult female. 2nd endopodial joint: ventral margin with 2 single distal pointed bristles and paired pointed terminal bristles; dorsal margin with 1 short proximal bristle, 4 long bristles, and 2 bristles with bases on medial side near proximal of long bristles.

Maxilla (Figure 34e): Endite I with 7 bristles; endite II with 5 bristles; endite III with about 5 bristles. Basale with 2 ventral bristles (1 proximal near base of exopodite, other distal). Coxale, exopodite, and endopodite similar to those of adult female. (Not all bristles shown.)

Fifth Limb (Figure 34f,g): Endites I–III each with 6 bristles. Main tooth of 1st exopodial joint with proximal bristle, small peg, and 4 pectinate teeth (Figure 34g); exopodite otherwise similar to that of adult female.

Sixth Limb (Figure 34h): With 2 small epipodial bristles. Endite I with 1 small medial bristle and 1 long spinous terminal bristle; endite II with 2 small medial bristles and 2 stout terminal bristles; endite III with 2 stout terminal bristles and 1 small bristle between them; endite IV with 2 terminal bristles (medial of these shorter). End joint of left limb of USNM 193651D with 7 bristles (3 spinous anterior bristles followed by space and 2 spinous bristles with bases set medially some distance from edge, then 2 plumose bristles); end joint of right limb of USNM 193651D aberrant, with 4 bristles (1 anterior, 1

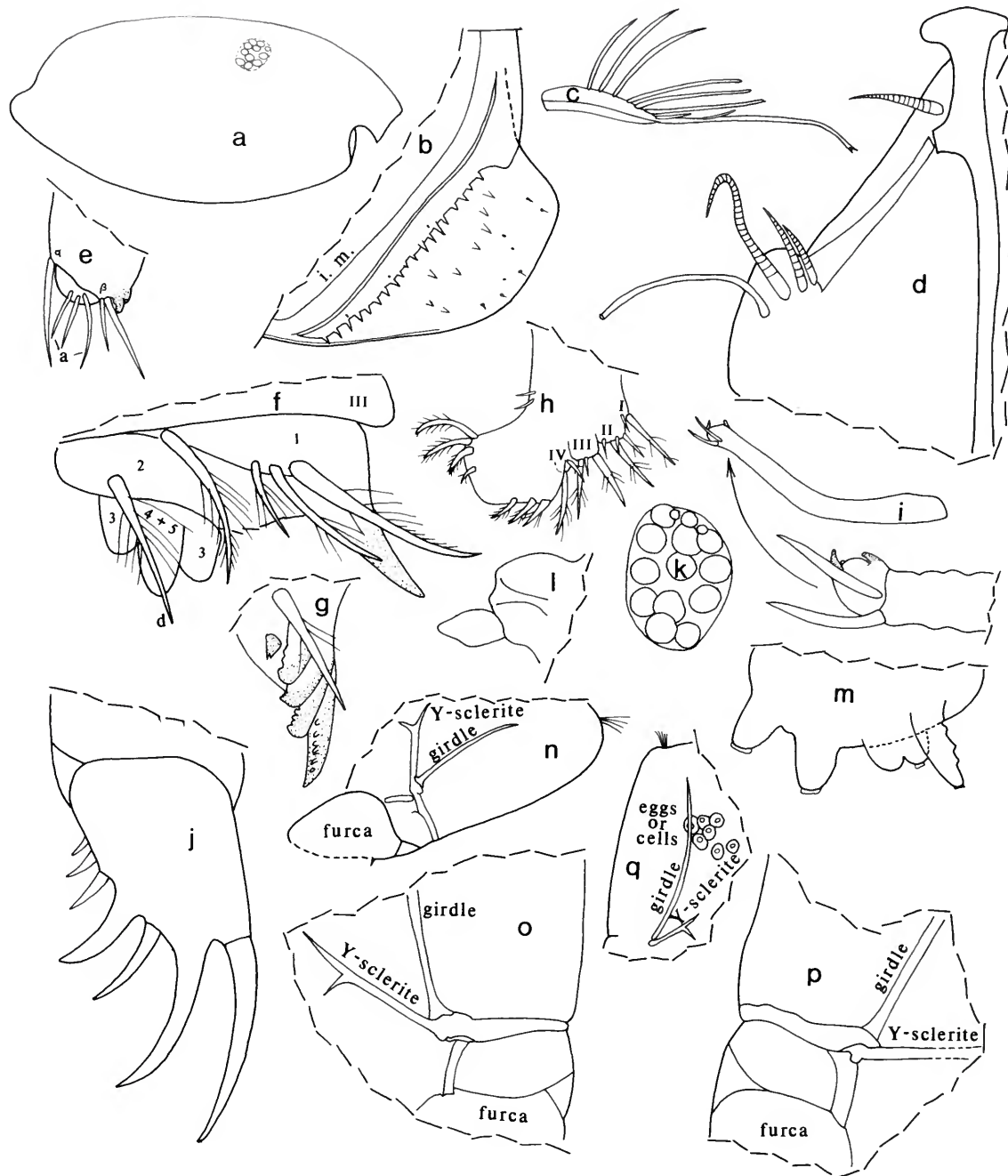


FIGURE 34.—*Cypridina spinula*, new species, USNM 193651D, paratype, instar IV female: *a*, complete specimen from right side, length 1.00 mm; *b*, inner view of caudal process of right valve; *c*, medial view of sensory bristle of 5th joint of left 1st antenna; *d*, medial view of endopodite and distal part of protopodite of right 2nd antenna; *e*, lateral view of distal end of left maxilla (only *a*-bristles of 2nd endopodial joint shown); *f*, anterior view of right 5th limb showing bristles of 1st exopodial joint and *d*-bristle of 2nd exopodial joint; *g*, main tooth of 1st exopodial joint of left 5th limb as seen through anterior side; *h*, medial view of left 6th limb; *i*, left 7th limb with detail of tip; *j*, right lamella of furca; *k*, medial view of right lateral eye; *l*, medial eye and Bellonci organ; *m*, upper lip, anterior to left; *n*, posterior of body from left side showing posterodorsal spines and internal sclerites; *o*, detail of sclerites in *n*; *p*, detail of sclerites of right side of posterior of body; *q*, posterior of body from right side showing internal eggs or cells.

near middle, 2 posterior).

Seventh Limb (Figure 34i): Weakly developed, without proximal bristles and with 2 indistinct diaphanous terminal bristles. Terminus with single tooth and proximal peg.

Furca (Figure 34j): Each lamella with 7 claws; claws 2 and 4 nonarticulate; claw 4 broader than claw 3 but about same length. Armament of claws similar to those of adult female.

Bellonci Organ (Figure 34l) and *Upper Lip* (Figure 34m): Similar to those of adult female.

Eyes: Medial eye similar to that of adult female (Figure 34l). Lateral eye with 12 large, 1 medium, and 2 small ommatidia (medium and small ommatidia on dorsal edge of eye medial to larger ommatidia) (Figure 34a,k).

Genitalia: None observed.

Posterior of Body (Figure 34n,q): Posterodorsal corner with tuft of spines.

Y-Sclerite: Right sclerite of USNM 193651D similar to that of adult female (Figure 34p,q); left sclerite aberrant, fused to sclerite extending to posterior of body dorsal to furca (Figure 34o).

Pigmentation: None in carapace or appendages.

Eggs (Figure 34q): Posterior part of body of USNM 193651D with small cells present in usual location of unextruded eggs of adult but whether they are eggs is unknown. (Eggs not previously reported in the A-2 stage of myodocopids.)

DESCRIPTION OF INSTAR V FEMALE (Figure 35).—Carapace similar in shape to that of adult female (Figure 35a).

Infold: Not examined in detail but, in general, similar to that of adult female. Bar forming list along anterior end of caudal process covered by broad stiff flap with 31 stout spines along posterior edge on right valve and much smaller spines on left valve.

Selvage: Similar to that of adult female.

Carapace Size: USNM 193651C, length 1.23 mm, height 0.66 mm.

First Antenna: Similar to that of adult female (b-bristle bare).

Second Antenna (Figure 35b): Protopodite similar to that of adult female. Endopodite 1-jointed with 4 bristles (2 small proximal, followed by 1 slightly longer, and 1 more than twice length of smaller bristles) and 1 filament about same length as long bristle but more slender at base. Exopodite: 1st joint without spines along concave margin; bristle of 2nd joint reaching 6th joint, with 9 or 10 ventral spines; lateral spine of 9th joint about same length as joint; exopodite otherwise similar to that of adult female.

Mandible: Coxale, basale, exopodite, and 1st and 3rd endopodial joints similar to those of adult female. 2nd endopodial joint: ventral margin spinous, with 2 single distal bristles and terminal paired bristles; dorsal margin with 4 long bristles, 1 short proximal bristle, and 2 short bristles with bases medial to proximal 2 of long bristles; medial surface with spines forming short rows.

Maxilla: Limb similar to that of adult female.

Fifth Limb (Figure 35c,d): Endite I with 6 bristles; endites II and III obscured, each with about 5 or 6 bristles. 1st exopodial joint: main tooth with proximal peg with digitate tip and 5 cusped teeth (longest tooth with 11 marginal cusps, some larger than others) (Figure 35d); ringed bristle (with few long spines) proximal to peg; anterior side with 3 bristles forming row (inner bristle long stout and pectinate distally (without long spines present on adult female), middle bristle with long spines near middle and short distal spines, outer bristle short with long proximal spines) and 1 slender bristle (with long proximal hairs) closer to outer edge of joint (could be on protopodite) (Figure 35c). Remaining exopodial joints similar to those of adult female. (Not all bristles shown.)

Sixth Limb: With 2 or 3 epipodial bristles. Endites I and II with 2 short proximal medial bristles and 1 long terminal bristle; endite III with 2 stout terminal bristles and 1 short terminal bristle between them; endite IV with 1 stout terminal bristle. End joint with 8 or 9 bristles (5 or 6 spinous bristles with bases on or just medial to edge, followed by small space and 1 spinous bristle with base set medially some distance from edge, then small space and 2 plumose bristles with bases on edge).

Seventh Limb (Figure 35e,f): Each limb with 2 bare diaphanous proximal bristles (1 on each side) on joints 8–10 (counting from distal end) and 6 distal bristles (3 on each side: 2 bare and diaphanous; 1 weakly ringed and with 2 bells). Terminus prolonged, with 5 terminal teeth and proximal peg.

Furca (Figure 35f): Each lamella with 8 claws; claws 2 and 4 nonarticulate; claw 3 more slender and slightly shorter than claw 4; claws 4–9 decreasing in width and length.

Bellonci Organ (Figure 35h): Similar to that of adult female.

Eyes: Medial eye similar to that of adult female (Figure 35h). Lateral eye with 15 amber-colored ommatidia (12 on surface and 3 small, beneath larger surface ommatidia and at dorsal end of eye) (Figure 35a,g) (not all ommatidia shown in Figure 35a).

Genitalia: Small lobe anterior to furca may be anlage of genital organ.

Posterior of Body (Figure 35f): Posterodorsal corner with tuft of spines.

Y-Sclerite (Figure 35f): Similar to that of adult female.

Eggs: Rosette of 12 small unextruded eggs on each side of body of USNM 193651C (Figure 35f).

Pigmentation: None in carapace or appendages.

COMPARISONS.—The carapace of *C. spinula* differs from those of *C. spina*, *C. americana* (Müller, 1890), and *C. amphicantha* (Müller, 1906) in having many spines on the infold of the caudal process and in lacking bristles along the anteroventral margin. The endopodite of the 2nd antenna of *C. spinula* differs from that of *C. lepidophora* (Müller, 1906), *C. sinuosa* (Müller, 1906) and *C. inermis* (Müller, 1906) in having 6 rather than 4 bristles. The furca of *C. spinula* differs from that of *C. natans* (Brady, 1898) and *C. acuminata* (Müller, 1906) in having claw 2 nonarticulated. The carapace of *C. spinula* differs from those of *C. dentata* (Müller, 1906), *C. multipilosa*

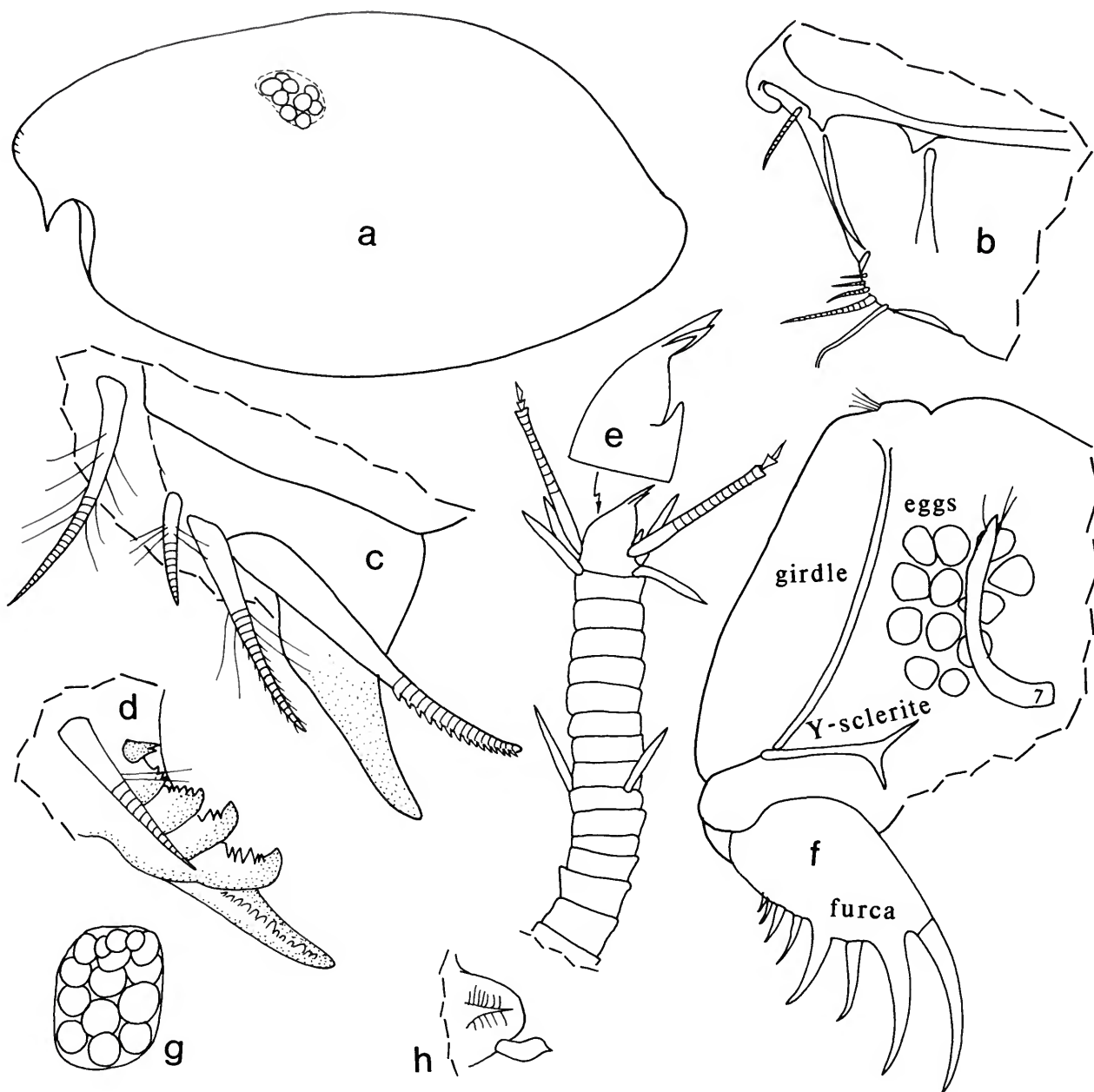


FIGURE 35.—*Cypridina spinula*, new species, USNM 193651C, paratype, instar V female: a, complete specimen from left side, length 1.23 mm; b, medial view of endopodite and distal part of protopodite of right 2nd antenna; c, anterior view of 1st exopodial joint of right 5th limb; d, posterior view of main tooth of left 5th limb; e, 7th limb with detail of tip; f, posterior of body from right side; g, medial view of left lateral eye; h, medial eye and Bellonci organ.

Poulsen, 1962, *C. inermis* (Müller, 1906), *C. acuminata* (Müller, 1906), *C. sinuosa* (Müller, 1906), and *C. nana* Poulsen, 1962, in not having bristles along the anteroventral

margin.

The male furca of *C. spinula* differs from that of *C. serrata* (Müller, 1906) in having claw 3 articulated. The right valve of

TABLE 6.—Comparison of selected morphological characters of adult females of *C. serrata* and *C. spinula*.

Character	<i>Cypridina</i>	
	<i>serrata</i>	<i>spinula</i>
Carapace length of female (mm)	1.6–1.9 ^a	1.48–1.53
Spines on list of caudal process of right valve	12–18 ^a	34
Bristles of endopodite of 2nd antenna	5–6 ^a	6
Spinous b-bristles on end joint of maxilla	1 ^b	3
Anterior bristles on 1st exopodial joint of 5th limb	3 ^b	4
Bristles on fused 4th and 5th exopodial joints of 5th limb	4 ^b	3
Bristles of 7th limb	8 ^b	10

^aData from Müller (1906) and Skogsberg (1920).

^bData from Skogsberg (1920).

the female *C. spinula* has about 15 large bristles beneath the list of the caudal process, whereas, none were mentioned or illustrated for *C. serrata* by either Müller (1890) or Skogsberg (1920). Additional morphological characters of adult females of *C. spinula* and *C. serrata* are compared in Table 6.

ONTOGENY AND SEXUAL DIMORPHISM (Table 7).—*C. spinula* has 5 juvenile instars but only the last 4 are in the present collection. The presence or absence of filaments on the b-bristle was used to identify the sex of juveniles. The shape of the carapace of juveniles and adults of both sexes are similar. The number of spines on the list of the caudal process of the right valve increased from 10 on instar II to over 30 on instar V and the adult.

First Antenna (Table 7): Bristles on joints are distributed in the same way as on *C. spina*. The number of filaments on the sensory bristle of the 5th joint increased from 4 on instar II to 8 on the adult female and 10 on the adult male.

Second Antenna (Table 7): The bristles of the 2nd antenna are distributed in the same way as on *C. spina*.

Mandible (Table 7): Except for having 2 instead of 1 a-bristle on the basale of instar II, the distribution of bristles on the mandible is quite similar to that of *C. spina*.

Maxilla (Table 7): The basale of instars II–V and adults have the same number of bristles (2). The 1st endopodial joint has 1 beta-bristle on instar II and 2 on succeeding stages. The 2nd endopodial joint has 2 b-bristles on instars II and III and 3 on later instars and adults. In other respects the distribution of bristles is similar to that of *C. spina*.

Fifth Limb (Table 7): Endites of instar II and later stages have about the same total number of bristles. The 1st exopodial joint has 2 anterior bristles on instar II, 3 on instar III, and 4 on succeeding stages. The main tooth has 2 pectinate teeth on instar II and 1 pectinate tooth is added on each succeeding stage, as on *C. spina*. The fused 4th and 5th exopodial joints have 3 bristles on all stages. In other respects the distribution of bristles is similar to that of *C. spina*.

Sixth Limb (Table 7): The limb of instar II has only 1 bristle, and the limb of later stages has many. The adult limb has 3 or 4 epipodial bristles on the female and only 2 on the male.

Seventh Limb (Table 7): The limb of instar II is thumb-like and bare; that of instar III is elongate and bare. The limb of female instar IV bears 2 diaphanous bristles without bells, and a single terminal tooth. The limb of female instar V bears 2 proximal diaphanous bristles without bells, 6 terminal bristles

TABLE 7.—Distribution of selected characters on instars of *Cypridina spinula* (F = female, M = male; d = dorsal, v = ventral; nd = no data).

Character	Instar						Adult	
	II		III	IV	V	M	F	
	M	F	M	F	F			
Carapace								
average length (mm)	0.68	0.70	0.82	1.00	1.23	1.58	1.49	
Caudal process of right valve: spines on list	10	10	13	19	31	33	34	
First Antenna								
1st joint: bristles	0	0	0	0	0	0	0	
2nd joint: bristles	0	0	0	0	0	0	0	
3rd joint: bristles (v/d)	1/1	1/1	1/1	1/1	1/1	1/1	1/1	
4th joint: bristles (v/d)	0/1	0/1	1/1	1/1	1/1	1/1	1/1	
5th joint: filaments of sensory bristle	4	4	6	8	8	10	8	
6th joint: bristles	1	1	1	1	1	1	1	
7th joint: bristles	3	3	3	3	3	3*	3	
8th joint: bristles	4	4	4	4	4	4	4	

TABLE 7.—Continued.

Character	Instar							
	II		III	IV	V	Adult		
	M	F	M	F	F	M	F	
Second Antenna								
Endopodite: bristles and filament	2	2	3	4	5	6	6	
Exopodite, 9th joint: bristles	3	3	3	3	3	3	3	
Mandible								
Basale								
a-bristles	2	2	2	2	2	2	2	
b-bristles	1	1	1	1	1	1	1	
c-bristles	2	2	2	2	2	2	2	
d-bristles	1	1	2	2	2	2	2	
Dorsal bristles	3	3	3	3	3	3	3	
Exopodite: bristles	2	2	2	2	2	2	2	
1st endopodial joint: bristles	3	3	4	4	4	4	4	
2nd endopodial joint: bristles (v/d)	3/6	3/6	3/7	4/7	4/7	4/11	4/11	
3rd endopodial joint: bristles + claws	6	6	6	7	7	7	7	
Maxilla								
Endites I + II + III: bristles	16	16	17	17	17	17	17	
Coxale: bristles	1	1	1	1	1	1	1	
Basale: bristles	2	2	2	2	2	2	2	
Exopodite: bristles	3	3	3	3	3	3	3	
1st endopodial joint								
alpha-bristles	1	1	1	1	1	1	1	
beta-bristles	1	1	2	2	2	2	2	
2nd endopodial joint								
a-bristles	3	3	3	3	3	3	3	
b-bristles	2	2	2	3	3	3	3	
c-bristles	1	1	2	2	2	2	2	
d-bristles	3	3	3	3	3	3	3	
Fifth Limb								
Endites I + II + III: bristles	19	19	nd	18	18	19	19	
1st exopodial joint; Main tooth								
Proximal bristle	1	1	1	1	1	1	1	
Proximal peg	1	1	1	1	1	1	1	
Pectinate teeth	2	2	3	4	5	6	6	
Anterior bristles	2	2	3	4	4	4	4	
2nd exopodial joint								
a- + b-bristles	5	5	5	6	6	6	6	
c- + d-bristles	2	2	2	2	2	2	2	
3rd exopodial joint								
Inner lobe/outer lobe: bristles	2/2	2/2	3/2	3/2	3/2	3/2	3/2	
4th + 5th exopodial joints: bristles	3	3	3	3	3	3	3	
Sixth Limb								
Epipodite: bristles	0	0	1	2	2-3	2	3-4	
Endites I + II + III + IV: bristles	1	1	8	11	10	12	11-12	
End joint: bristles	0	0	5	7	8-9	9	7-9	
Seventh Limb: bristles								
	0	0	0	2	8	9-10	10	
Furca								
Claws (total)	5	5	6	7	8	9	9	
Claws (nonarticulate)	2	2	2	2	2	1	2	
Lateral eyes: ommatidia	12	12	14-15	15	15	17	17	

*b- and c-bristles bearing suckers.

(4 without bells and 2 with bells), and 5 terminal teeth. The limb of the adult male bears 9 or 10 bristles with bells and a terminal comb (number of teeth unknown). The limb of the adult female bears 10 bristles with bells and a terminal comb with 7 teeth.

Furca (Table 7): Each lamella of the furca of instar II bears 5 claws, and 1 claw is added in succeeding stages; the adult lamella bears 9 claws. On each lamella of the adult male only claw 2 is nonarticulated, whereas, on the adult female and juveniles studied (male and female instar II, male instar III, female instars IV and V) both claws 2 and 4 are nonarticulated.

Bellonci Organ, Medial Eye, Upper Lip, and Y-Sclerite: Similar on all stages.

Lateral Eye (Table 7): Well developed with 12 ommatidia on instar II, then increasing gradually to 17 ommatidia on adults. Relative size of male and female eyes not studied.

Genitalia: Female genitalia well developed on adult, and instar V female may have small anlage of genitalia. Male copulatory organ well developed on adult; male instars IV and V not examined.

Posterior of Body: Posterodorsal corner of body of instars II-V with tuft of spines, absent on adults.

PHILOMEDIDAE Müller, 1906

COMPOSITION.—The Philomedidae includes the subfamilies Philomedinae Müller, 1906, and Pseudophilomedinae Kornicker, 1967. Only the latter is present in the collection from Enewetak.

DISTRIBUTION.—World wide. Known depth range: intertidal to 4303 m (Kornicker, 1975, table 4).

PSEUDOPHILOMEDINAE Kornicker, 1967

COMPOSITION.—This subfamily comprises 5 genera of which only *Harbansus* was collected at Enewetak.

DISTRIBUTION.—Known southern limit: Great Barrier Reef, Australia (Kornicker, 1983a:181); known northern limit: 48°25'10"N, 122°35'50"W, Pacific Ocean. Not known from the Indian Ocean. Known depth range: intertidal to 3202 m (Kornicker, 1978:23).

Harbansus Kornicker, 1978

Harbansus Kornicker, 1978:13.

TYPE SPECIES.—*H. bradmyersi* Kornicker, 1978:24.

COMPOSITION.—*Harbansus* includes 11 species including *H. vix*, new species (in 2 additional records the species was left in open nomenclature (Kornicker, 1978:49)). Only the new species was collected in Enewetak.

DISTRIBUTION.— Same as subfamily.

Harbansus vix, new species

FIGURES 36–38

Harbansus sp. Kornicker, 1987b:217, 218, fig. 1a.

ETYMOLOGY.—From the Latin *vix* (with difficulty, barely).

HOLOTYPE.—USNM 158308, adult female on slide and in alcohol (unique).

TYPE LOCALITY.—Enewetak lagoon (from composite sample).

DISTRIBUTION.—Enewetak Atoll.

DESCRIPTION OF ADULT FEMALE (Figures 36–38).—Elongate with prominent rostrum and caudal process (Figure 36). Greatest height at anterior end of straight part of dorsal margin; ventral margin evenly rounded.

Ornamentation: 1 low anterodorsal rib extending posteriorly from anterior edge of rostrum; a 2nd stouter anterior rib with anterior end projecting past anterior edge of rostrum (Figures 36, 37b); posterodorsal corner of valve with low process not reaching posterior edge of valve; a 2nd low process present near ventral margin and anterior to caudal process; caudal process with subdued rib. Surface of valve with large fossae having scalloped edges (Figure 37a); fossae smaller and more widely separated in vicinity of central adductor muscle attachments near middle of valve. Long bristles on valve surface and along anterior and ventral margins (Figure 36) (not all bristles shown).

Infold: Rostral infold with 5–7 long bristles (Figure 37b); 2 bristles at inner end of incisur; 1 short bristle just ventral to inner end of incisur, and 1 short bristle at posterior end of 6 parallel ribs on anteroventral infold (Figure 37c); ventral infold just anterior to caudal process with 3 bristles; inner edge of infold of caudal process with 3 bristles; posterior infold with 1 small bristle; infold of caudal process with 7 setose bristles



FIGURE 36.—*Harbansus vix*, new species, USNM 158308, holotype, adult female, length 0.87 mm.



FIGURE 37.—*Harbansus vix*, new species, USNM 158308, holotype, adult female: *a-d*, left valve: *a*, detail of fossae and a bristle of outer surface from just posterior to central adductor muscle attachments; *b*, inner view of rostrum and incisur; *c*, inner view of anteroventral margin; *d*, inner view of caudal process. *e*, medial view of right 1st antenna; *f*, medial view of endopodite and distal part of protopodite of left 2nd antenna; *g*, medial view of left mandible; *h*, lateral view of distal end of right mandible (only longest and shortest claws shown of the 3 on the 3rd endopodial joint); *i*, posterior of body from right side showing right genitalia, furca and internal sclerites.

along anterior end of pocket (Figure 37d).

Selvae: Wide lamellar prolongation with fringe on outer edge present in vicinity of incisur, narrower along anterior and ventral margin; divided at inner end of incisur.

Carapace Size: USNM 158308, length 0.87 mm, height 0.44 mm.

First Antenna (Figure 37e): 1st joint with few distal medial spines forming row. 2nd joint with ventral and dorsal spines and 1 spinous dorsal bristle. 3rd joint with few ventral spines and 3 bristles (1 ventral, 2 dorsal). 4th joint with 5 bristles (3 ventral, 2 dorsal). 5th joint: sensory bristle with 1 or 2 short proximal filaments and 1 short and 3 long terminal filaments excluding stem (stem with 2 minute spines at tip, filaments with only 1). 6th joint fused to 5th, with medial bristle about same length as 5th joint. 7th joint: a-bristle longer than bristle of 6th joint, with terminal spine; b-bristle shorter than sensory bristle of 5th joint, with 2 subterminal filaments (stem with 2 spines at tip, filaments with only 1); c-bristle about same length as sensory bristle, with 1 short proximal filament and 3 terminal filaments excluding stem (stem with 2 spines at tip, filaments with only 1). 8th joint: d- and e-bristles of equal length, same length as sensory bristle, with blunt tips; f-bristle same length as c-bristle, with 2 short proximal filaments and 3 terminal filaments (stem with 2 spines at tip, filaments with only 1); g-bristle same length as c-bristle, with 1 short proximal filament and 3 terminal filaments excluding stem (stem with 2 spines at tip, filaments with only 1).

Second Antenna (Figure 37f): Protopodite bare. Endopodite 2-jointed: 1st joint with 2 short anterior bristles; 2nd joint elongate with 1 long spinous anterior bristle and small unringed terminal peg. Exopodite 9-jointed: 1st joint elongate with small terminal medial bristle; bristle of 2nd joint reaching just past 9th joint, with 8 stout ventral spines and 1 slender dorsal spine at tip, but no natatory hairs; bristles of joints 3–8 relatively short, with stout ventral spines, 1 slender dorsal spine at tip, but no natatory hairs; 9th joint with 2 bristles (longest ventral and about same length as combined lengths of joints 5–9, with 4 ventral spines but no natatory hairs; short bristle about half length of ventral bristle and with few slender distal spines); joints 5–8 with stout basal spine (spine of 8th joint about same length as 9th joint); 9th joint with small lateral spine; joints 2–8 with minute spines forming terminal row.

Mandible (Figure 37g,h): Coxale endite spinous, bifurcate, without bristle at base. Basale: medial side hirsute, with 3 small bristles in proximal ventral corner, 1 short bristle near midlength close to ventral margin; lateral surface near ventral margin with 2 short bristles near joint midlength; ventral margin with 1 terminal bristle; dorsal margin with 1 midbristle and 2 terminal bristles. Exopodite hirsute, about half length of dorsal margin of 1st endopodial joint, with 1 long subterminal bristle and 1 short terminal bristle. Endopodite: 1st joint: ventral margin with 3 bristles (1 short, 1 medium, 1 long); 2nd joint: ventral margin with bristles forming 2 distal groups

(proximal group with 2 bristles, distal group with 3 bristles including claw-like bristle) (Figure 37h); dorsal margin with bristles forming 2 groups near joint midlength (1 short bristle in proximal group, 4 in distal group); 3rd joint with 2 stout subequal claws, 1 minute dorsal claw, and 3 ringed bristles (claw-like ventral bristle of 2nd joint half length of longest claw of 3rd joint) (Figure 37h).

Maxilla (Figure 38a–c): Coxale with dorsal bristle. Endites I and II each with 6 bristles; endite III with 1 proximal and 6 distal bristles. Exopodite minute, with 1 short and 2 long bristles. Basale with 3 terminal bristles (2 ventral, 1 dorsal). Endopodite: 1st joint with 1 alpha- and 3 beta-bristles; 2nd joint with 2 stout claws, 1 shorter claw, and 6 bristles.

Fifth Limb (Figure 38d,e): With 3 endites (numbering of endites uncertain): Endite I with 2 bristles; endite II with 3 bristles; endite III with 9 bristles (Figure 38d). Exopodite: 1st joint: proximal outer edge with marginal spines and 2 bristles (distal with few long marginal spines) (Figure 38e); main tooth with 3 cusped teeth and 1 proximal smooth tooth (Figure 38e); spinous bristle on edge proximal to smooth tooth; 2nd joint: with large squarish tooth; anterior side with 1 small and 2 stout bristles; inner edge near the 3 anterior bristles with 1 small bristle (location of base of bristle obscured) (Figure 38d); inner lobe of 3rd joint well developed, with 2 terminal bristles; outer lobe of 3rd joint poorly developed, with 2 short bristles; fused 4th and 5th joints with total of 6 bristles (inner bristle with proximal bend).

Sixth Limb (Figure 38f,g): Epipodite with 1 short bristle (Figure 38g). Endite I with 3 short bristles with long proximal and short distal spines; endite III with 4 bristles with long proximal and short distal spines; endite IV with 4 or 5 bristles with long proximal and short distal spines; end joint narrow, with 5 bristles (with long proximal and short distal spines) separated by space from 2 hirsute bristles (Figure 38f,g); limb hirsute.

Seventh Limb (Figure 38h): 2 bristles in proximal group (1 on each side), each bristle with 3 or 4 bells and marginal spines; 6 bristles in distal group (3 on each side), each with 3–6 bells and marginal spines; terminus with comb of about 6 spinous teeth and opposing comb with about 4 shorter spinous teeth.

Furca (Figure 37i): Each lamella with 6 claws; claws 1, 2, 4 stout (primary), claws 3, 5, 6 narrow (secondary); claw 4 longer and stouter than claw 3; claw 1 with 2 rows of posterior teeth (teeth of medial row stouter, especially distal tooth); lamella following claw 6 with a minute spine and hairs.

Bellonci Organ: Absent.

Eyes: Medial eye absent. Lateral eye small, unpigmented, with 5 amber-colored ommatidia (Figure 38i).

Upper Lip (Figure 38i): Consisting of single hirsute lobe with minute anterior process.

Genitalia (Figure 37i): Consisting of indistinct sclerotized ring on each side of body anterior to furca.

Posterior of Body: Evenly rounded.

Y-Sclerite (Figure 37i): Branching distally.

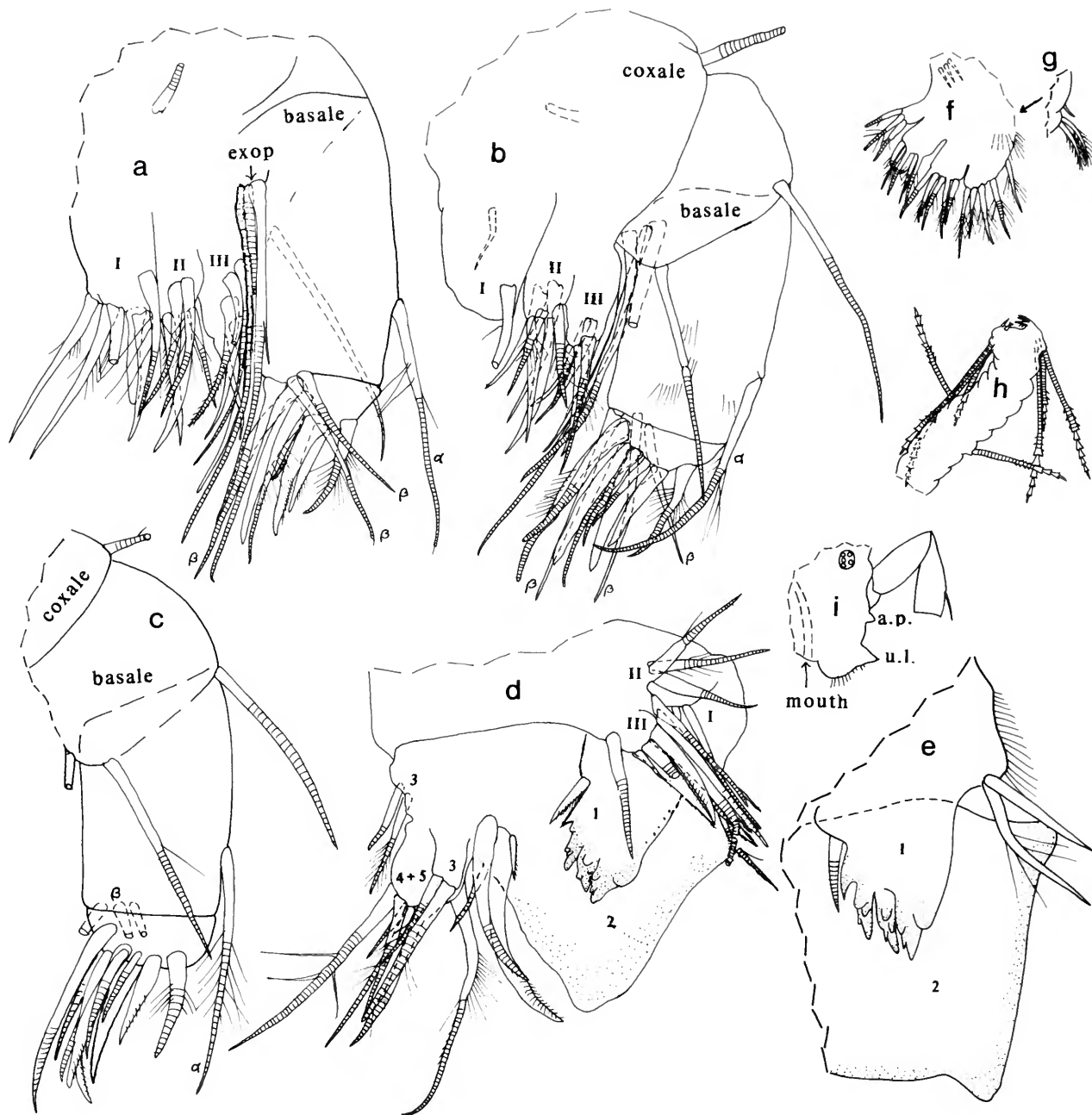


FIGURE 38.—*Harbansus vix*, new species, USNM 158308, holotype, adult female: a, lateral view of right maxilla; b, c, medial views of left maxilla (not all bristles shown); d, anterior view of left 5th limb (not all bristles shown); e, detail from d; f, 6th limb (epipodial bristle and 2 posterior bristles of end joint fragmented and not on illustrated limb); g, epipodial bristle and 2 posterior bristles of end joint of 6th limb; h, 7th limb; i, anterior of body from right side showing joints 1 and 2 of right 1st antenna, right lateral eye, anterior process, upper lip, and mouth (esophagus dashed).

COMPARISONS.—*H. vix* differs from *H. slatteryi* Kornicker, 1983a, in having fewer ribs on the carapace and in having a small terminal peg on the 2nd endopodial joint of the female 2nd antenna. *H. vix* differs from *H. barnardi* Kornicker, 1978, in having a narrower caudal process, an endopodite of the female 2nd antenna with 2 instead of 3 bristles on the 1st joint and a terminal peg rather than a bristle on the 2nd joint, and a shorter ventral claw-like bristle on the 2nd endopodial joint of the female mandible. *H. vix* differs from *H. paucichelatus* (Kornicker, 1958) and *Streptoleberis crenulata* Brady, 1880 (= genus and species inquirenda (Müller, 1912:51; Kornicker, 1978:51)) in not having natatory hairs on the exopodial bristles of the 2nd antenna. *H. vix* differs from *H. mayeri* Kornicker, 1978, *H. bradmyersi* Kornicker, 1978, *H. dayi* Kornicker, 1978, *H. boweni* Kornicker, 1978, and *H. schornikovi* (Kornicker and Caraion, 1977) in having 3 rather than 2 bristles in the distal group of bristles on the ventral margin of the 2nd endopodial joint of the mandible, and in other characters (Kornicker, 1978, table 2). *H. rhabdion* (Kornicker, 1970a) is much larger than *H. vix*, has a ventral bristle on the 2nd joint of the 1st antenna, and is without lateral eyes. *H. vix* also differs from other species of *Harbansus* in having no Organ of Bellonci.

RUTIDERMATIDAE Brady and Norman, 1896

COMPOSITION.—This family includes 3 genera: *Rutiderma* Brady and Norman, 1896, *Alternochelata* Kornicker, 1958, and *Scleraner* Kornicker, 1975. Only *Rutiderma* is in the collection from Enewetak.

DISTRIBUTION.—Rutidermatidae have been reported between latitudes of 45°N and 53°S at depths of intertidal to 560 m (possibly deeper, but records questionable (Kornicker, 1975:657; 1983b:16)), but are usually collected on the continental shelf (Cohen and Kornicker, 1987:2).

Rutiderma Brady and Norman, 1896

Rutiderma Brady and Norman, 1896:673.

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

COMPOSITION.—*Rutiderma* comprises 26 species (in 11 additional records the species was left in open nomenclature (Cohen and Kornicker, 1987:7, 8)).

DISTRIBUTION.—Same as for family. Known depth range intertidal to 317 m.

Rutiderma vox, new species

FIGURES 39–42

Rutiderma sp. Kornicker, 1987b:217, 218, fig. 1b.

ETYMOLOGY.—From Latin *vox* (voice, sound, call).

HOLOTYPE.—USNM 158309, ovigerous female on slide and

in alcohol.

TYPE LOCALITY.—Enewetak lagoon (from composite sample).

PARATYPES.—Enewetak lagoon: Composite sample: USNM 158316, 1 adult male on slide and in alcohol; USNM 158314, 1 adult female and 1 adult male in alcohol. Midwater trawl off Bokandretok Island: USNM 193636, 2 ovigerous females and 3 adult males in alcohol. Sta A, plankton trap 6, sand substrate: USNM 193650, 1 adult male in alcohol.

DISTRIBUTION.—Enewetak Atoll.

DESCRIPTION OF ADULT FEMALE (Figures 39, 40a–d, 41).—Carapace with broadly curving anterodorsal and ventral margins; posterodorsal margin straight forming obtuse angle with vertical posterior margin (Figure 39). Each valve with lateral alate process terminating anteriorly at vertical rib and reaching posterior edge of valve only at posterodorsal corner. Short rostrum forming right angle with anterior margin of valve ventral to rostrum in lateral view (Figures 39, 40a). Caudal process short, triangular; process of right valve of holotype more slender than that of left (Figures 39, 40b,c).

Ornamentation (Figures 39, 40d): Carapace with 3 horizontal ribs: dorsal rib paralleling anterodorsal margin and with 6 radial riblets extending to valve edge (most ventral of the radial riblets extending onto rostrum); middle rib just dorsal to central adductor muscle and terminating posteriorly on dorsal corner of alate process; and ventral rib just ventral to central adductor muscle attachments and terminating posteriorly on ventral corner of alate process. Middle and ventral ribs connected anteriorly by vertical rib extending past ventral rib and terminating ventrally at anteroventral corner of valve. 6 radial riblets along ventral margin of valve not reaching ventral horizontal rib. Straight posterior edge of alate process with several minute processes projecting posteriorly. Small posteri-



FIGURE 39.—*Rutiderma vox*, new species, USNM 158309, holotype, adult female, length 0.91 mm.

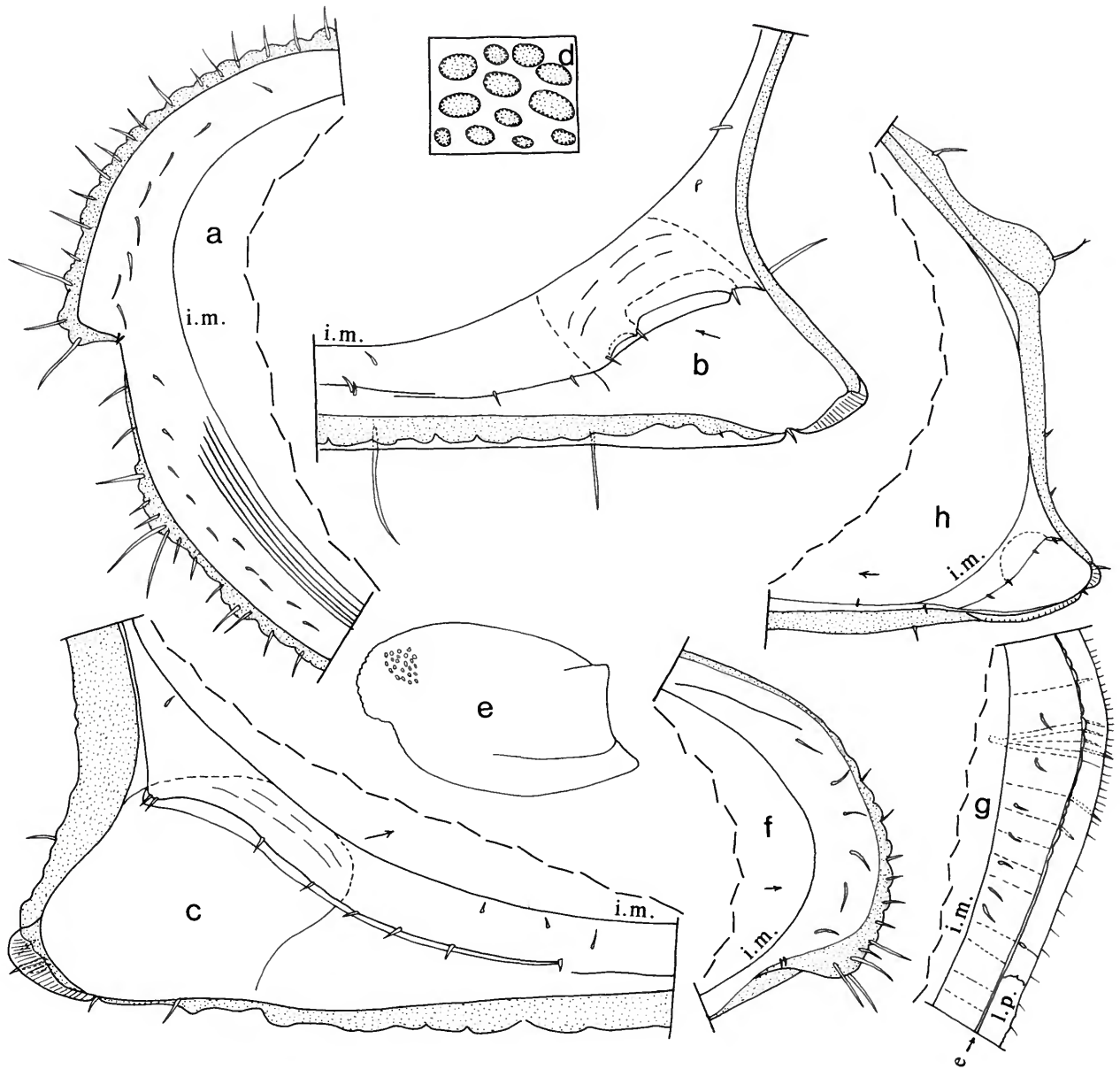


FIGURE 40.—*Ruiderma vox*, new species. USNM 158309, holotype, adult female: *a*, *b*, inner views of anterior and posterior of right valve, respectively; *c*, inner view of caudal process of left valve; *d*, fossae of outer surface of carapace, from left valve near ventral edge. USNM 158316, paratype, adult male: *e*, complete specimen from left side showing representative fossae, length 1.0 mm; *f*, *g*, inner views of rostrum and anteroventral margin of left valve, respectively (dashed line represent pore canals and bristles, not all of latter shown); *h*, inner view of posterior of right valve.

only pointing process at midlength of straight posterodorsal valve margin; small process at midheight of straight vertical posterior edge of left valve. Valve surface with abundant oval fossae with minute papillae along edge and at bottom (Figure

40*d*). Anterodorsal and ventral margins of valves with minute scallops. Edge of valves with long and short bristles, some long bristles with broad base (not shown), additional bristles sparsely distributed on valve surface.

Infold: Rostral infold with 8 bristles parallel to anterodorsal margin and 2 small bristles at inner end of incisur (Figure 40a); anteroventral infold with 10 bristles forming row parallel to valve edge, and 6 striae proximal to bristles (only 5 of these shown in Figure 40a); ventral infold anterior to caudal process with 10 small bristles, mostly along narrow list but some proximal to list. Infold of caudal process forming "pocket" with anterior lip (edge of lip is continuation of list) with 3 or 4 bristles (1 or 2 at dorsal end, 1 at midheight, 1 ventral) and narrow transparent vellum (Figure 40b,c,h); posterior infold dorsal to caudal process with 2 small bristles (Figure 40b).

Selvage: Lamellar prolongation divided at inner end of incisur and at ventral edge of caudal process on each side of small bristle (Figure 40b,c,h). Prolongation along anterior, anterodorsal, anteroventral selvages, and anterior part of ventral selvage with hirsute fringe along outer edge; fringe not observed elsewhere.

Carapace Size: USNM 158309, length 0.91 mm, height 0.67 mm. USNM 158314, length 0.91 mm, height 0.68 mm. USNM 193636, 3 specimens: length 0.90 mm, height 0.63 mm; length 0.91 mm, height 0.64 mm; length 0.95 mm, height 0.64 mm.

First Antenna (Figure 41a,b): 1st joint bare. 2nd joint with proximal dorsal hairs, lateral spines forming row in distal dorsal corner, dorsal bristle with short marginal spines, and distal spinous lateral bristle. 3rd joint short, fused to 4th joint, with 2 spinous dorsal bristles, and 1 spinous ventral bristle. 4th joint with 3 spinous bristles (2 ventral, 1 dorsal). Sensory bristle of long 5th joint with 2 short proximal dorsal filaments, 2 minute distal dorsal hairs, and terminal spine (not shown). 6th joint short, fused to 5th joint, with short spinous medial bristle. 7th joint short, with spinous a-bristle longer than bristle of 6th joint, b-bristle shorter than a-bristle (proximal $\frac{1}{3}$ unringed, broad; and distal $\frac{2}{3}$ narrower, ringed), and long c-bristle slightly shorter than sensory bristle of 5th joint, with short proximal filament, 2 minute distal hairs, and terminal spine (Figure 41b). 8th joint: d- and e-bristles bare with short blunt papilla at tips; f-bristle stout, with short proximal filament and terminal spine; g-bristle long, with fairly long proximal filament. Right limb of USNM 158309 aberrant in having bristles only partly extruded as if ecdysis incomplete.

Second Antenna (Figure 41c): Protopodite bare. Endopodite 1-jointed with 3 or 4 small bare bristles. Exopodite: 1st joint with short bent medial spine on distal corner close to ventral margin; bristle of joint 2 reaching past 9th joint, with minute rounded spines along ventral margin; bristles of joints 3–5 longer than bristle of 2nd joint but much shorter than bristle of 6th joint, with rounded ventral spines similar to those of bristle of 2nd joint; joints 6–8 with long bristles with natatory hairs, no spines; 9th joint with 6 bristles (3 long and 1 short, all with natatory hairs, and 2 minute, bare); joints 2–5 with minute indistinct spines forming rows.

Mandible (Figure 41d): Coxale endite well developed, bifurcate with long slender and short stout spines. Basale: dorsal margin with 3 slender bristles; proximal ventral corner

with 4 bristles (2 stout pectinate, 2 slender); medial side near ventral margin with 3 bristles. Exopodite absent. 1st endopodial joint triangular, with 2 short ventral bristles and long medial spines. 2nd endopodial joint: dorsal margin with 3 short proximal bristles; ventral margin with 2 minute a-bristles; terminal margin with small b-bristle in form of small round process with terminal spine, c-bristle in form of stout claw (with serrate dorsal margin, small proximal dorsal tooth, and tip with serrate inner margin), and 2 slender lateral d-bristles; medial surface with long spines on proximal half. 3rd endopodial joint: 3 slender medial a-bristles, b-bristle slender claw-like, and c-bristle stout claw-like with truncate tip.

Maxilla (Figure 41e): Endite I with 2 pectinate claws and 2 ringed spinous bristles; endite II with 2 pectinate claws and 4 ringed bristles; endite III with 3 pectinate claws, 2 distal ringed bristles, and 1 proximal ringed bristle. Coxale with short bare dorsal bristle. Basale with 3 distal bristles (1 dorsal spinous, 1 medial at joint midwidth, spinous, 1 ventral). Exopodite with 1 short and 1 long bristle. 1st endopodial joint with 1 spinous alpha-bristle and 1 spinous beta-bristle. 2nd endopodial joint with spines forming rows, 2 stout pectinate claws (inner claw longer), 2 short spinous bristles dorsal to claws, 1 short spinous bristle with base just medial to base of stout inner claw, and 2 spinous a-bristles.

Fifth Limb (Figure 41f-h): Epipodite with 34 hirsute bristles. Endite I with 3 short spinous bristles; endite II with spines forming row and 4–6 bristles; endite III with 4 bristles. 1st exopodial joint with 4 teeth (Figure 41f,g): proximal tooth small, smooth; 2nd to 4th teeth larger and with marginal cusps; 1 spinous bristle proximal to smooth tooth, and 1 longer bristle on margin adjacent to middle tooth. 2nd exopodial joint comprising large flat sclerotized tooth having 3 lobes along inner edge (Figure 41h), each lobe with 2 marginal teeth; posterior side of joint with 1 long proximal bristle and 2 shorter bristles at midlength. Inner lobe of 3rd exopodial joint with 3 bristles (2 spinous and 1 with widely separated marginal spines), outer lobe with 2 spinous bristles. Fused 4th and 5th exopodial joints with total of 4 spinous bristles.

Sixth Limb (Figure 41i): 1 short epipodial bristle. Endite I small with 3 bristles (2 short with long spines, 1 long with short spines); endite II small with 2 bristles (shortest with long marginal spines, other with short spines); endite III small, with 2 long bristles with few short marginal spines; endite IV small with 2 long bristles with indistinct short marginal spines. End joint with 7 bristles (3 long slender anterior bristles (with short marginal spines) on short quadrate lobe projection; following 2 bristles stout, hirsute proximally and with short spines distally; 2 posterior bristles stout, hirsute).

Seventh Limb (Figure 41j): Terminus with 6 bristles (3 dorsal, 3 ventral), distal bristle on each side with 2 bells, other bristles with 5, all with distal marginal spines (spines not shown); 4 bristles proximally (2 dorsal, 2 ventral), each with 3 bells and distal marginal spines. Tip with opposing indistinct combs (each tooth of comb with trifid tooth on each side, but

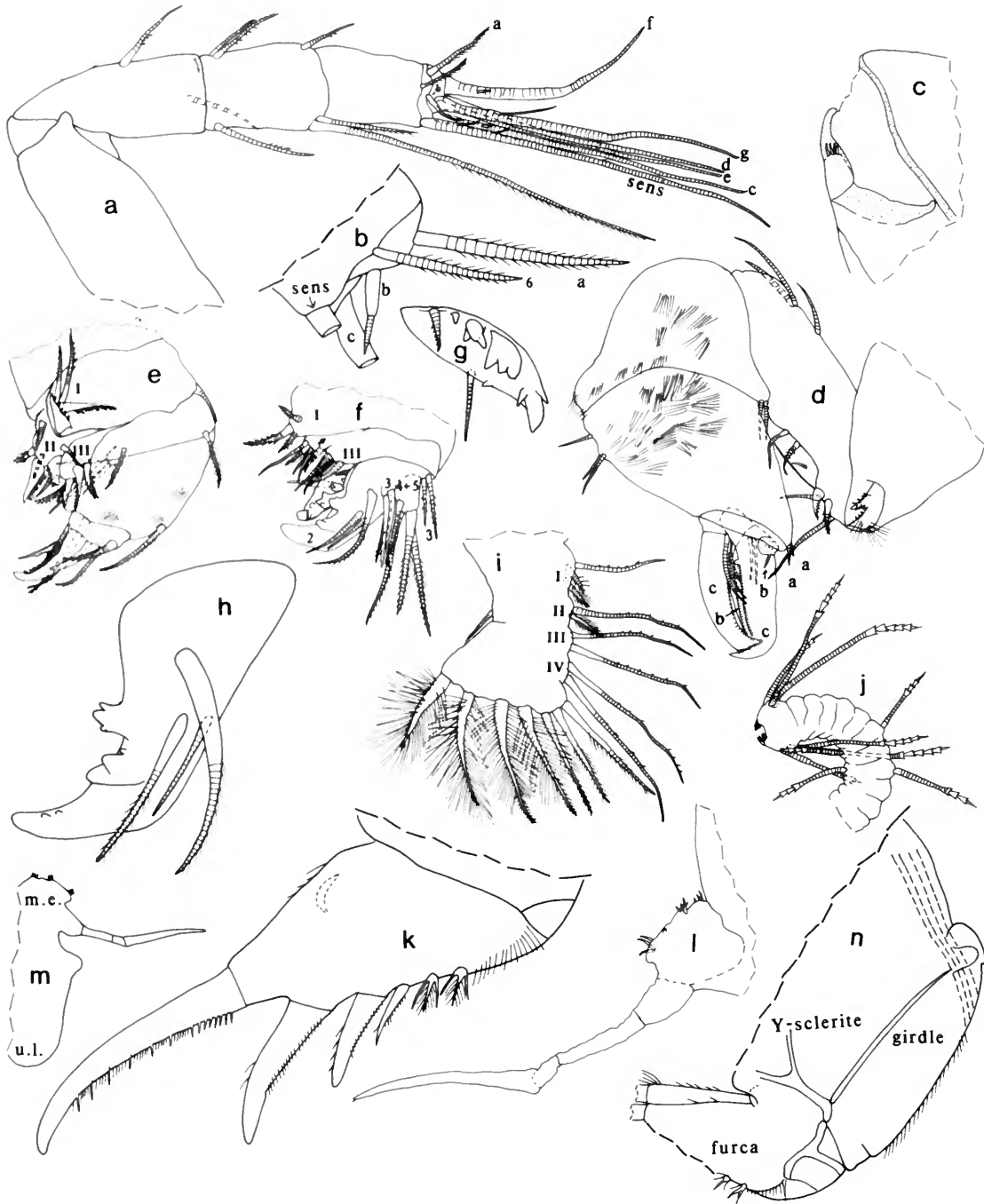


FIGURE 41.—*Ruiderma vox*, new species, USNM 158309, holotype, adult female; *a*, medial view of left 1st antenna; *b*, detail from *a* showing some terminal bristles; *c*, medial view of endopodite and distal part of propodite of right 2nd antenna; *d*, medial view of right mandible; *e*, medial view of left maxilla (exopodite dashed); *f*, 5th limb; *g*, main tooth of 1st exopodial joint of 5th limb shown in *f*; *h*, detail of 2nd exopodial joint of 5th limb shown in *f*; *i*, 6th limb; *j*, 7th limb; *k*, left lamella of furca; *l*, medial eye and Bellonci organ; *m*, anterior of body showing medial eye and Bellonci organ, anterior projection at midheight, and upper lip; *n*, posterior of body from left side showing part of furca and internal sclerites.

number of teeth not resolved with certainty).

Furca (Figure 41k,n): Each lamella with 3 stout claws followed by 3 slender claws; claws 1–3 with distal ends slightly offset and without marginal teeth, and with tips rounded; tip of claws 4–6 pointed; anterior margins of claws 1–4 with few small hairs or spines; claw 1 with medial and lateral teeth along posterior margin, some lateral teeth longer than others; claw 2 with slender closely spaced teeth more numerous than on claw 1; claws 5 and 6 very slender and indistinct, trifurcate; claws 1–3 with long hairs forming row near base (not shown); anterior edge of each lamella with few short hairs; right lamella with long hairs near insertion of claw 1; long lateral hairs present on lamellae following claw 6; right lamella slightly anterior to left lamella.

Bellonci Organ (Figure 41l,m): Elongate with 2 sutures or creases delimiting short segment proximal to midlength, with minute spine on pointed tip.

Eyes: Medial eye unpigmented (light amber color), with short dorsal filaments; eye in lateral view with dorsal part projecting anteriorly (Figure 41l,m). Lateral eyes absent.

Upper Lip (Figure 41m): Simple, rounded.

Genitalia: Not observed.

Anterior of Body (Figure 41m): With rounded lobe at midheight.

Posterior of Body (Figure 41n): With hairs along posterior margin and low rounded lobe on posterodorsal corner.

Y-Sclerite (Figure 41n): Branching distally with dorsal branch more slender than ventral branch. Girdle with ventral end at Y-sclerite and dorsal end not reaching posterior margin of body.

Eggs: USNM 158309 with 1 well-developed egg (showing some partly developed appendages) in marsupium. USNM 193636, 2 specimens, each with 4 eggs in marsupium.

Gut Content: USNM 193636 (adult female) with large whole nematode coiled in gut with one end extending into esophagus.

DESCRIPTION OF ADULT MALE (Figures 40e–g, 42).—Carapace more elongate than that of female and with rostrum forming obtuse angle with anterior margin of valve ventral to rostrum (Figure 40e); each valve with alate process not extending anteriorly past midlength of valve. Caudal process triangular in lateral view.

Ornamentation: Valve surface with abundant oval fossae similar to those of adult female (Figure 40e); anterior edge of rostrum with minute scallops (Figure 40f). Edge of valves with long and short bristles, some long bristles with broad base; additional bristles sparsely distributed on valve surface.

Infold and Selvage (Figure 40f,g): In general, similar to those of adult female, except without striae on anteroventral infold proximal to bristles (Figure 40g).

Carapace Size: USNM 158316, length 1.00 mm, height 0.57 mm. USNM 158314, length 0.99 mm, height 0.57 mm. USNM 193636, 3 specimens, length 0.96 mm, height 0.60 mm; length

0.94 mm, height 0.55 mm; length 0.95 mm, height 0.58 mm.

First Antenna (Figure 42a): 1st joint with medial spines. 2nd joint with medial spines forming rows, lateral spines forming row near distal margin, 1 spinous dorsal bristle, and 1 slender distal lateral bristle. 3rd joint short, trapezoidal, with well-developed medial suture and less-developed lateral suture separating it from 4th joint, and 3 spinous bristles (1 ventral, 2 dorsal). 4th joint with 3 or 4 bristles (2 or 3 ventral, 1 dorsal). 5th joint small, wedged medially between 4th and 6th joints near ventral margin; sensory bristle with stout proximal part bearing numerous slender filaments at its tip (not all filaments shown) and stem with 2 minute proximal hairs; tip of stem missing on USNM 158316. 6th joint slightly longer than 4th joint, with short spinous medial bristle near distal ventral corner. 7th joint: a-bristle spinous, about same length as bristle of 6th joint; b-bristle about twice length of a-bristle, with 2 marginal filaments; c-bristle long, stout, with about 10 marginal filaments. 8th joint: d- and e-bristles about $\frac{1}{4}$ longer than b-bristle, bare with blunt tips; f-bristle similar to c-bristle; g-bristle about same length as e-bristle, with short proximal filament.

Second Antenna: Protopodite with tuft of short lateral hairs at dorsal distal corner near insertion of exopodite (not shown). Endopodite 3-jointed (Figure 42b): 1st joint short, with 5 small anterior bristles; 2nd joint elongate, with 2 small bristles near midlength; 3rd joint elongate, reflexed on 2nd, with 1 short proximal bristle and 2 minute slender subterminal bristles. Exopodite: 1st joint elongate with minute medial spine near middle of distal margin; length and width of 2nd joint equal, with long spines forming row along distal margin near dorsal edge, and bare ventral bristle (bristle not reaching distal end of 3rd joint); 3rd joint $2\frac{1}{2}$ times length of 2nd joint; 4th to 9th joints decreasing in size distally along exopodite, and with combined length about $\frac{1}{4}$ length of exopodite; bristles of joints 3–8 long with natatory hairs, no spines; 9th joint of left limb of USNM 159316 aberrant (right limb of specimen missing), fused to 8th, with 1 short bristle with few subterminal natatory hairs, 1 long bristle with natatory hairs, and 1 long bristle bifurcating at $\frac{1}{3}$ length of bristle, each distal branch with natatory hairs.

Mandible (Figure 42c): Coxale endite represented by small spine near midlength of joint. Basale: dorsal margin with bristles forming 2 groups near midlength (1 bristle in proximal group, 2 in distal group); medial surface with spines forming oblique rows (spines not shown), 3 short bristles in proximal ventral corner, and 2 short bristles near midlength of ventral margin. Exopodite finger-like, hirsute, with minute indistinct blunt process near tip (process not shown). 1st endopodial joint: medial surface spinous (spines not shown); ventral margin with 2 bristles near midlength. 2nd endopodial joint: medial surface spinous; dorsal margin with bristles forming 2 proximal groups (1 bristle in proximal group, 2 in distal);



FIGURE 42.—*Rutiderma vox*, new species, USNM 158316, paratype, adult male: *a*, medial view of left 1st antenna; *b*, lateral view of endopodite left 2nd antenna; *c*, lateral view of right mandible; *d*, maxilla; *e*, 5th limb (not all bristles shown); *f*, 6th limb; *g*, 7th limb; *h*, posterior of body from right side showing copulatory organ and furca; *i*, anterior of body from left side showing left lateral eye, medial eye and Bellonci organ, and upper lip.

ventral margin with 2 a-bristles, 1 b-bristle, 1 c-bristle, and 2 smaller d-bristles. 3rd endopodial joint with 3 a-bristles, 1 b-bristle, and 1 stout c-bristle with ventral spines.

Maxilla (Figure 42d): Limb minute, indistinct, details difficult to resolve. Endites with weakly developed bristles, some with long spines. Coxale with slender bare dorsal bristle. Basale with 1 slender dorsal bristle and 1 slender bristle at midwidth. Exopodite small with 1 slender short bristle and 1 long hirsute bristle. 1st endopodial joint hirsute, with 1 slender alpha-bristle and 1 hirsute beta-bristle. 2nd endopodial joint hirsute, with 2 stout bristles (ventral longer) and 5 slender bristles.

Fifth Limb (Figure 42e): Limb reduced. Epipodite fragmented, with 25 hirsute bristles on remaining part (not shown). Endites I and II each with 3 small bristles; endite III with 3 slender bristles, 1 long stout ringed bristle, and 2 weakly developed unringed finger-like bristles. 1st exopodial joint with 3 short weakly developed finger-like bristles and 1 ringed bristle. 2nd exopodial joint with 3 finger-like bristles and 1 ringed bristle. 3rd exopodial joint with 3 weakly developed bristles on inner lobe and 2 ringed bristles on outer lobe. 4th and 5th exopodial joints fused, with total of 4 ringed bristles.

Sixth Limb (Figure 42f): 1 short epipodial bristle. Endite I with 3 short bristles; endite II with 1 short and 1 long bristle; endite III with 2 long bristles (distal twice length of other); endite IV with 2 long bristles. End joint with 6 bristles (2 long bristles on short quadrate lobe (anterior bristle with short spines, posterior bristle stouter, hirsute proximally and with short spines distally); following 2 bristles stout, hirsute proximally and with short spines distally; following 2 bristles stout hirsute).

Seventh Limb (Figure 42g): Terminus with 4 bristles (2 ventral, 2 dorsal), each with 4 bells and distal spines; 4 proximal bristles (2 dorsal, 2 ventral), each with 2 or 3 bells and distal spines. Tip with opposing combs, each with 3 minute teeth, middle tooth of each comb longer and bare, each lateral tooth of comb with few marginal spines.

Furca (Figure 42h): Lamellae and claws 1-3 more slender than those of female, claws 5 and 6 more distinct than those of female; all claws with slender teeth along posterior edges.

Bellonci Organ (Figure 42i): Similar to that of adult female.

Eyes: Lateral eye well developed with 15-18 divided amber-colored ommatidia; area between ommatidia also amber colored (Figure 42i). Medial eye about same size as lateral eye, without pigment, with short dorsal filaments (Figure 42i).

Upper Lip (Figure 42i): Similar to that of female.

Genitalia (Figure 42h): On each side of body elongate copulatory limb bearing minute processes and lobe with bristles.

Anterior of Body (Figure 42i): With broad anterior projection at midheight.

Posterior of Body (Figure 42h): With hairs along posterior margin and low rounded lobe on posterodorsal corner.

Y-Sclerite: Similar to that of female (Figure 42h). Girdle with ventral end at Y-sclerite and dorsal end reaching posterior margin of body (Figure 42h).

COMPARISONS.—*R. vox* differs from *R. normani* Poulsen, 1965, in not having a serrate list on the infold of the caudal process of the right valve, and from *R. darbyi* Kornicker, 1983c, in not having a serrate list on the infold of the caudal process of the left valve. The female *R. vox* differs from the female *R. lomae* (Juday, 1907) in having a longer caudal process, fewer bristles on the list of the caudal process, a shorter b-bristle on the 7th joint of the 1st antenna, an endopodite of the 2nd antenna without a minute bristle near middle of its margin, and a slightly stouter 4th claw on the furca. *R. vox* differs from *R. judayi* McKenzie, 1965, in not having a deep indentation at midheight of the posterior edge of the alate process on each valve. *R. vox* differs from *R. gerdhartmanni* Kornicker, 1975, *R. chessi* Kornicker and Myers, 1981, *R. sterreri* Kornicker, 1981a, *R. arcuatile* Kornicker, 1983c, *R. cohenae* Kornicker, 1983c, and *R. kalkei* Kornicker, 1983c, in having marginal teeth on the 3 lobes of the 2nd joint of the female 5th limb. The female *R. vox* differs from the female *R. compressum* Brady and Norman, 1896, *R. rostratum* Juday, 1907, *R. leloeuffi* Kornicker, 1975, and *R. tridens* Kornicker and Caraion, 1978, in not having a prolonged tip on the c-bristle of the 2nd endopodial joint of the female mandible. *R. vox* differs from *R. hartmanni* Poulsen, 1965, *R. pax* Kornicker, 1984, and *R. licinum* Kornicker, 1983c, in not having an upturned tip on the c-bristle (claw) of the 2nd endopodial joint of the female mandible. The list of the caudal process of the female *R. vox* is longer and more oblique than that of the female *R. dinochelatum* Kornicker, 1958.

SARSIELLIDAE Brady and Norman, 1896

COMPOSITION.—This family includes 2 subfamilies: Sarsiellinae Brady and Norman, 1896, and Dantyninae Kornicker and Cohen, 1978. Only Sarsiellinae are in the collection from Enewetak.

DISTRIBUTION.—The known latitudinal range of members of this family is 63°N and 73°29'S, and the known depth range is intertidal to 4758 m (Kornicker and Caraion, 1980:2).

SARSIELLINAE Brady and Norman, 1896

COMPOSITION.—This subfamily comprises 13 genera including the new genus *Metasarsiella* proposed herein. Four genera are in the collection from Enewetak: *Anscottiella*, *Eusarsiella*, *Ancohenia*, and *Metasarsiella*.

DISTRIBUTION.—Same as for Sarsiellidae.

Key to the Genera of SARSIELLINAE

(Adult and Instar IV females)

1. Furca without secondary claws between primary claws 2
 Furca with secondary claws between primary claws 9
2. Furca with only claw 1 nonarticulate 3
 Furca with at least 2 claws nonarticulate 6
3. Furca with 7 claws *Parasarsiella*
 Furca with 6 claws *Metasarsiella*, new genus
 Furca with 5 claws 4
4. First antenna without d-bristle *Adelta*
 First antenna with d-bristle 5
5. Seventh limb with terminal teeth *Eusarsiella*
 Seventh limb without terminal teeth *Sarsiella*
6. Furca with claws 1, 2, and 3 nonarticulate *Junctichela*
 Furca with claws 1 and 2 nonarticulate 7
7. First antenna with claw-like c-, f-, and g-bristles *Anscottiella*
 First antenna with bristle-like c-, f-, and g-bristles 8
8. Infold of caudal process with spinous bristles forming row along list; posterior
 infold without 2 setal bristles *Cymbicopia*
 Infold of caudal process without spinous bristles forming row along list; posterior
 infold with 2 setal bristles *Eurypylus*
9. Furca with claw 4 nonarticulate 10
 Furca with claw 4 articulated 11
10. First antenna with claw-like f- and g-bristles *Ancohenia*
 First antenna with bristle-like f- and g-bristles *Chelicopia*
11. Infold of caudal process with spinous bristles forming row along list; posterior
 infold without 2 or 3 setal bristles; only claw 1 of furca nonarticulate
 *Spinacopia*
 Infold of caudal process without spinous bristles forming row along list; posterior
 infold with 2 or 3 setal bristles; only claw 1, or both claws 1 and 2 of furca
 nonarticulate *Neomuelleriella*

***Ancohenia* Kornicker, 1976**

Ancohenia Kornicker, 1976b:6.

TYPE SPECIES.—*Ancohenia hawaiiensis* Kornicker, 1976b:7, by monotypy.

COMPOSITION.—*Ancohenia* comprises 2 species: *A. hawaiiensis* Kornicker, 1976b, and *A. robusta* (Brady, 1890).

DISTRIBUTION.—The genus is known only from the Pacific Ocean. *A. hawaiiensis* has been reported from Hawaii (Kornicker, 1976b:12) and Rangiroa Atoll, Tuamotu Archipelago (Hartmann, 1984:122). *A. robusta* has been reported from Fiji (Brady, 1890:513), and is reported herein from Enewetak Atoll.

EMENDED DIAGNOSIS.—Diagnosis emended to include proximal bristles on 7th limbs of adult male.

First Antenna: f- and g-bristles of 8th joint of female short, claw-like; these bristles on adult male claw-like proximally, bristle-like distally.

Second Antenna: Endopodite of adult male 3-jointed.

Mandible: Adult male with well-developed hirsute exopodite, endopodite with stout claw on each joint, and claw on 2nd endopodial joint with blunt tip.

Seventh Limb: Adult male limb well developed, with terminal bristles, with or without proximal bristles, and with bare terminus.

Furca: Main claws 1, 2, and 4 nonarticulated; secondary claws 3, 5, and sometimes 6 articulated.

***Ancohenia robusta* (Brady, 1890)**

FIGURES 43–47

Pleoschisma robusta Brady, 1890:513 [probably only part], pl. 4: figs. 13, 14(?).

Sarsiella robusta.—Brady, 1897:94, pl. 17: figs. 14, 15.—Müller, 1912:42.

Eusarsiella robusta.—Poulsen, 1965:83.

Ancohenia robusta.—Kornicker, 1981a:12, figs. 4, 5.

Ancohenia sp. Kornicker, 1987b:217, 218, fig. 1f.

HOLOTYPE.—None selected. Syntypes at the Hancock



FIGURE 43.—*Ancohenia robusta* (Brady), USNM 158312, adult male, length 1.01 mm.

Museum, Newcastle upon Tyne, England.

SYNTYPE LOCALITY.—Vuna Point, Taveuni, Fiji, in tide pools.

MATERIAL.—Enewetak lagoon: Midwater trawl off Bokandretok Island: USNM 193623, instar III female on slide and in alcohol. Sta A, plankton trap 6, night, coral substrate: USNM 193649, 1 adult male in alcohol. Sta B, plankton trap 7, night, coral rubble substrate: USNM 193661, 1 adult male: Composite sample: USNM 158311, adult male on slide and in alcohol; USNM 158312, adult male in alcohol.

DISTRIBUTION.—Fiji; Enewetak Atoll.

SUPPLEMENTARY DESCRIPTION OF ADULT MALE (Figures 43–45).—Carapace with shallow incisur and truncate posterior (Figure 43).

Ornamentation: Surface with abundant shallow fossae each with peripheral minute spines (Figure 43); surface between fossae with scattered short bristles, most with small bulbous tips (not all shown on Figure 43); numerous bristles and small spines along anterior and ventral margins, some bristles with broad basal part. Posterior half of dorsal margin with low nodes forming row (Figure 43).

Infold: Anterior infold with small bristle near inner margin ventral to incipient rostrum (Figure 44a). Infold anterior to low caudal process with 4 bristles near midwidth, and 3 or 4 smaller bristles near inner margin (not all shown in Figure 44b). Posterior infold with 2 setal bristles (Figure 44b).

Selvae: Wide lamellar prolongation with marginal fringe along anterior, ventral, and posterior margins.

Central Adductor Muscle Attachments (Figure 45e): Consisting of numerous ovoid individual attachments.

Carapace Size: USNM 158311, length 1.00 mm, height 0.80 mm; USNM 158312, length 1.01 mm, height 0.77 mm; USNM 193649, length 0.99 mm, height 0.80 mm; USNM 193661,

length 1.01 mm, height 0.76 mm.

First Antenna (Figure 44c): 1st joint bare. 2nd joint with 1 spinous dorsal bristle. 3rd and 4th joints fused; 3rd joint with 1 spinous dorsal bristle; 4th joint with 2 bristles (1 ventral, 1 spinous dorsal). 5th joint wedged ventrally between 4th and 6th joints; sensory bristle with bare stem and proximal cup with abundant slender filaments with proximal rings. 6th joint elongate with small spinous medial bristle. 7th joint: a-bristle spinous, about same length as bristle of 6th joint; b-bristle slightly longer than a-bristle, bare except for minute terminal spine; c-bristle bristle-like, longer than c-bristle, with 2 marginal filaments (on left limb of holotype filaments together, on right limb filaments widely separated) (distal part of bristle broken off illustrated limb). 8th joint: d- and e-bristles long with blunt tips, d-bristle shorter than e-bristle; f- and g-bristles claw-like, unringed in proximal part, ringed in distal part, both bristles about same length as e-bristle; f-bristle with short filament proximal to midlength; g-bristle with 2 filaments.

Second Antenna: Protopodite bare. Endopodite 3-jointed (Figure 44d): 1st joint elongate, with 2 small anterior bristles (illustrated right limb with hair-like foreign growth on 1st joint absent from left limb); 2nd joint long, narrow, with 2 long bristles with marginal spines; 3rd joint elongate, reflexed, with 2 minute subterminal bristles and several minute ridges. Exopodite: 1st joint with minute terminal medial process (Figure 44d); bristle of 2nd joint long, with about 15 proximal ventral spines, and distal natatory hairs; bristle of 3rd joint with long proximal ventral hairs followed by about 8 ventral spines, then natatory hairs; bristles of joints 4–8 with natatory hairs, no spines; 9th joint with 2 bristles (1 long with natatory hairs, 1 short bare).

Mandible (Figure 44e): Coxale endite consisting of small medial spine near ventral margin. Basale: medial side with 3 short proximal bristles near ventral margin; ventral margin proximal to midlength with 3 short bristles; dorsal margin with 2 short bristles. Exopodite consisting of well-developed hirsute process. Endopodite: ventral margin of 1st joint with 1 stout claw and 2 small bristles, stout claw with small marginal spines projecting vertically; ventral margin of 2nd joint with stout terminal claw with short marginal spines projecting vertically, tip of claw blunt, nozzle-like, a minute medial spine-like bristle may be present distal to base of claw but difficult to resolve; dorsal margin of 2nd joint with long bristle at midlength; 3rd joint with long bare curved terminal claw with pointed tip, short ventral bristle, and minute dorsal bristle.

Maxilla (Figure 45a): Limb reduced. 3 endites with total of about 13 weak bristles, some with spines (endites not shown). Coxale with 1 bristle. Exopodite with 3 bristles. 1st endopodial joint with 1 weak alpha-bristle and 1 weak beta-bristle; 2nd endopodial joint with about 7 weakly developed bristles.

Fifth Limb (Figure 45b): Epipodite with 35 hirsute bristles. Exopodite reduced: 1st joint with 2 bristles; remaining joints with total of 8 bristles. Endite without bristle (? always).

Sixth Limb (Figure 45c): Endite I with 2 or 3 small bristles. Endite II (this endite could be interpreted to be part of end joint



FIGURE 44.—*Ancohenia robusta* (Brady), USNM 158312, adult male: *a*, inner view of anterior of left valve; *b*, inner view of posterior of right valve; *c*, medial view of left 1st antenna (proximal filaments of sensory bristle not shown); *d*, inner view of distal part of protopodite, endopodite, and 1st joint of exopodite of right 2nd antenna; *e*, medial view of right mandible; *f*, anterior of body from left side showing left lateral eye, medial eye and Bellonci organ, and upper lip; *g*, distal end of medial eye and Bellonci organ viewed under cover slip.

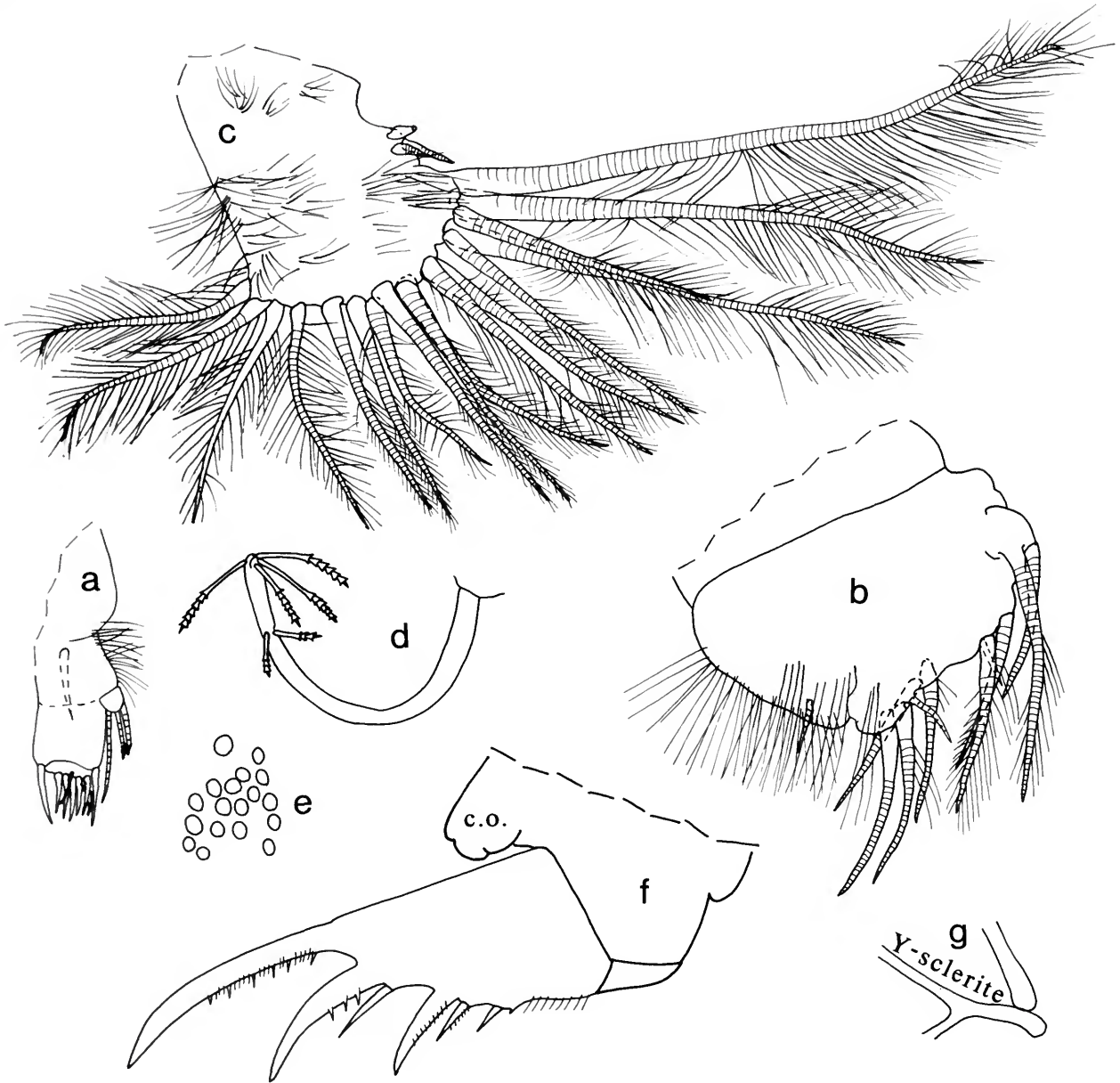


FIGURE 45.—*Ancohenia robusta* (Brady). USNM 158312, adult male: *a*, maxilla (endites and some bristles not shown); *b*, 5th limb; *c*, 6th limb; *d*, 7th limb. USNM 158311, adult male: *e*, central adductor muscle attachments of right valve, anterior to right; *f*, left copulatory organ and left lamella of furca; *g*, left Y-sclerite and ventral end of girdle.

but is separated from it by small indentation in margin) with 5 long spinous and hirsute bristles. End joint with 12 spinous and hirsute bristles.

Seventh Limb (Figure 45*d*): Limb of USNM 158312 long with 2 terminal paired bristles (each pair on small mound, each

bristle with 6 bells but no marginal spines) and 2 proximal bristles, 1 on each side, each bristle with 3 bells but no spines; terminus without comb teeth. USNM 158311 without 7th limbs (absence interpreted to be aberrancy, but more specimens needed to affirm interpretation).

Furca (Figure 45f): Each lamella with 6 claws; claws 1, 2, 4 stout and fused to lamella; claws 3, 5, 6 small, articulated; 1 or 2 small spines and long hairs on lamellae following claws; claws 1–5 with teeth along posterior margins. (Furca missing from USNM 158312.)

Bellonci Organ (Figure 44f,g): Elongate, broadening distally, with round tip.

Eyes: Medial eye without pigment, bare (Figure 44f,g). Lateral eye smaller than medial eye, unpigmented, with 8 or 9 light amber-colored ommatidia (Figure 44f).

Genitalia (Figure 45f): Small copulatory organ on each side of body but not examined in detail.

Posterior of Body: Evenly rounded, bare.

Y-Sclerite (Figure 45g): Typical for family.

DESCRIPTION OF FEMALE INSTAR III (Figures 46, 47).—Carapace oval in lateral view; posterior margin truncate; posteroventral corner less rounded than posterodorsal margin but caudal process not evident in lateral view (Figure 46a).

Ornamentation (Figure 46a-f): Surface with small indistinct fossae visible only where concretions present in shell (Figure 46b), and with minute indistinct spines (Figure 46d-f). Bristles with pointed tips (some with broad basal part) present along anterior, ventral, and posterior edges of valve and on lateral surface close to anterior and ventral margins, sparse elsewhere (Figure 46a-c, e); bristles with bulbous tips widely distributed on valves except close to free margins (some bulbous tips collapsed, appearing cup-like) (Figure 46a,b). With transmitted light numerous small pores evident, but these may be internal and not on valve surface (Figure 46a).

Infold: Ventral infold with minute bristle near inner edge ventral to valve midheight (Figure 46c). Infold in posteroventral corner with 3 small bristles near inner margin and 2 sets of minute paired bristles closer to inner margin (not all bristles shown in Figure 46d,f). Posterior infold with 2 setal bristles and with minute bristle close to inner margin (Figure 46d,f).

Selvae: Wide lamellar prolongation along anterior, ventral, and posterior margins, with marginal fringe in vicinity of caudal process, with individual widely separated marginal hairs along ventral margin.

Central Adductor Muscle Attachments (Figure 46a): Consisting of numerous ovoid individual attachments.

Carapace Size: USNM 193623, length 0.88 mm, height 0.69 mm.

First Antenna (Figure 47a,b): 1st joint broad, bare. 2nd joint with distal dorsal bristle. 3rd and 4th joints fused; 3rd joint short with 2 bristles (1 ventral, 1 dorsal); 4th joint long with 2 bristles (1 ventral, 1 dorsal). Sensory bristle of long 5th joint slender, with terminal papilla (Figure 47b). Medial bristle of 6th joint small. 7th joint: with small lateral pore near b-bristle (Figure 47b); a-bristle about $\frac{1}{3}$ longer than bristle of 6th joint and stouter, ringed, spinous; b-bristle shorter than a-bristle, bare; c-bristle about $\frac{1}{3}$ longer than sensory bristle of 5th joint, with terminal papilla. 8th joint: d-bristle slightly shorter than sensory bristle, bare with blunt tip; e-bristle almost twice length

of d-bristle and slightly shorter than c-bristle, bare with blunt tip; f-bristle claw-like, slightly shorter than d-bristle; g-bristle claw-like, slightly longer than d-bristle.

Second Antenna (Figure 47c): Protopodite bare. Endopodite with small terminal thumb-like process and 2 short proximal bristles. Exopodite 9-jointed: 1st joint with small straight medial terminal spine; 2nd joint about twice length of 3rd joint; joints 3–8 decreasing in size gradually; joint 9 minute, less than $\frac{1}{2}$ length and width of joint 8; bristle of 2nd joint with hair-like proximal ventral spines and distal natatory hairs; bristles of joints 3–8 with natatory hairs, no spines; 9th joint with small bare dorsal bristle and long bristle with few proximal ventral spines and distal natatory hairs.

Mandible (Figure 47d,e): Coxale with long hairs along ventral margin; endite consisting of small proximal medial spine near ventral margin (Figure 47d). Basale: ventral margin with 3 small bristles (2 proximal with bases on medial surface); dorsal margin with 2 small distal spines. Exopodite absent. Endopodite: 1st joint with medial spines, 1 minute ventral spine proximal to main claw, and sinuate dorsal margin (Figure 47e); 2nd joint with small subterminal dorsal spine and main ventral claw; 3rd joint minute, with small dorsal spine and longer ventral spine, both at base of main claw.

Maxilla (Figure 47f,g): Endite I with 6 bristles, endite II with 4 bristles, endite III with 5 bristles (Figure 47f). Coxale with short anterior bristle. Basale with 1 lateral bristle near exopodite. Exopodite with 3 bristles (1 long, 2 short). 1st endopodial joint with pectinate alpha-bristle and spinous beta-bristle; 2nd endopodial joint with 2 lateral a-bristles, 1 medial c-bristle, and 5 pectinate terminal bristles (middle bristle shorter than others).

Fifth Limb (Figure 47h): Epipodial appendage with 35–37 bristles (3 proximal bristles shown in Figure 46i); single endite with 1 short bristle. Exopodial joints fused: 1st joint with 2 long bristles; 2nd joint with 1 minute proximal bristle and 3 long terminal bristles; joints 3–5 with total of 7 bristles (interpretation: 2 proximal on outer lobe of 3rd joint, 1 minute and 2 long on inner lobe of 3rd joint, and 2 long on 4th plus 5th joints).

Sixth Limb (Figure 47i): With 2 endites; endite I with 2 bristles (1 short stout and 1 long slender on right limb; 2 short stout subequal on left limb); endite II with 4 bristles (1 long, 3 short). End joint with 4 bristles (2 long, 2 short) on anterior part and separated by space from 3 long bristles on posterior part (anterior part could be considered 3rd endite); posterior edge of limb hirsute.

Seventh Limb (Figure 46i): Elongate, bare. (7th limb of instar IV present inside limb of USNM 193623, 4 bristles visible, each with 2 or 3 bells).

Furca (Figure 47j): Each lamella with 6 claws; claws 1, 2, 4 nonarticulated; claws 3 and 5 articulated; claw 6 weakly articulated or nonarticulated; claw 3 much smaller and more slender than claw 4; tips of long claws blunter than tips of short claws; claws 1–5 with teeth along posterior margin and spines along anterior margin; posterior margin of claw 6 bare or with

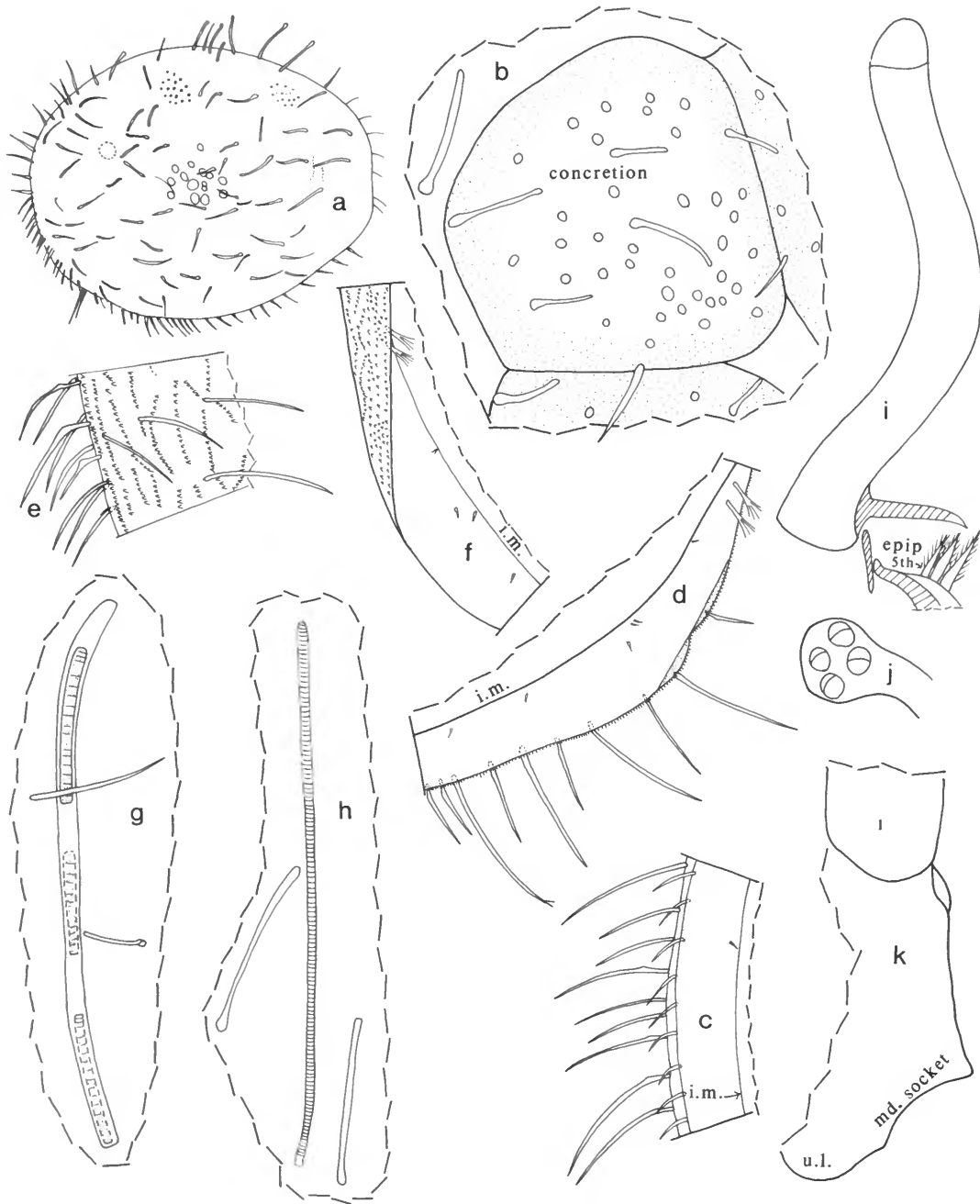


FIGURE 46.—*Ancohenia robusta* (Brady), USNM 193623, instar III female: *a*, complete specimen from left side, length 0.88 mm (dashed oval in upper left side of illustration indicates location of lateral eye; solid ovals at midlength and midheight represent central adductor muscle attachments; small ovals or dots near dorsal margin represent pores or fossae); *b*, detail of concretions in right valve with small ovals representing fossae (note some bristles with pointed tips and others with bulbous tips); *c*, inner view of anterior of right valve; *d*, inner view of posteroventral and posterior margin of right valve; *e*, anterior margin of left valve showing bristles and minute surface spines; *f*, inner view of anteroventral and posterior margin of left valve (2 setal bristles are on infold); *g*, *h*, 2 bristles and an elongate foreign growth on left and right valves, respectively; *i*, left 7th limb and 3 spinous bristles of epipodite of 5th limb (sclerites are lined); *j*, lateral eye; *k*, anterior of body.

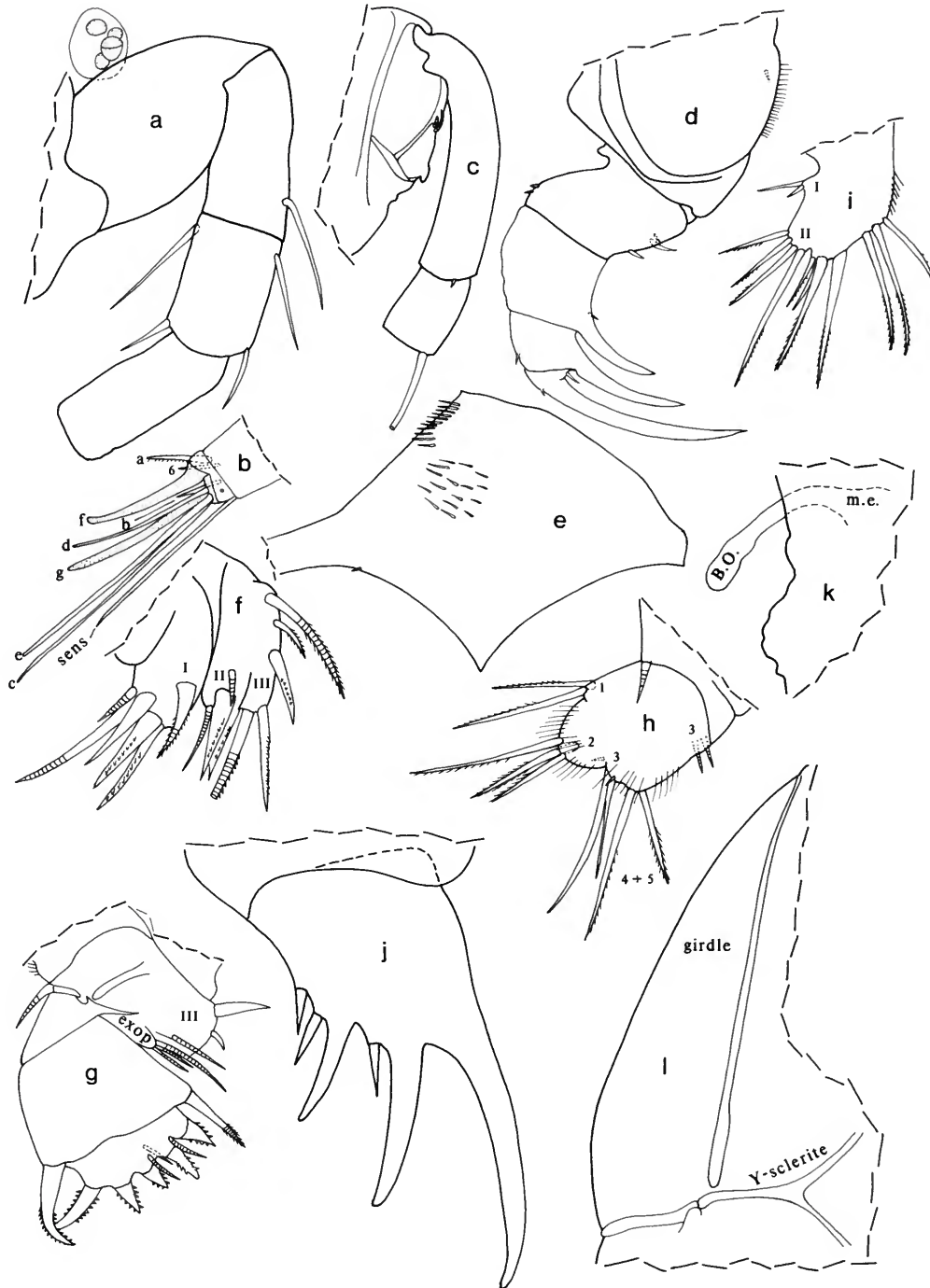


FIGURE 47.—*Ancohenia robusta* (Brady), USNM 193623, instar III female: *a*, right lateral eye and joints 1–5 of right 1st antenna; *b*, lateral view of distal end of left 1st antenna; *c*, medial view of distal part of protopodite, endopodite, and exopodial joints 1 and 2 of left 2nd antenna; *d*, lateral view of left mandible; *e*, medial view of spines on 1st endopodial joint of right mandible; *f*, medial view of endites I, II, and III of right maxilla; *g*, lateral view of left maxilla (not all endite bristles shown); *h*, 5th limb; *i*, medial view of right 6th limb; *j*, right lamella of furca; *k*, medial eye and Bellonci organ from left side; *l*, posterior of body from right side showing internal sclerites.

few teeth; claw 1 of both lamellae with long hairs forming row near base; ventral edge of left lamella with long spines following claw 6; anterior margin of right lamella anterior to left lamella by width of base of claw 1, and with few spines.

Bellonci Organ (Figure 47k): Elongate, broadening distally, with round tip.

Eyes: Medial eye obscured but not pigmented (Figure 47k). Lateral eye not pigmented (ommatidia colored light amber, and between ommatidia lighter amber), each eye with 4 ommatidia (Figures 46j, 47a).

Upper Lip (Figure 46k): Evenly rounded.

Anterior of Body (Figure 46k): Triangular projection on each side just dorsal to socket at base of mandible.

Posterior of Body (Figure 47l): Evenly rounded, bare.

Y-Sclerite (Figure 47l): Typical for subfamily.

Epizoa or Epiphyte: USNM 193623 with long closely segmented filament attached near dorsal margin of right valve (Figure 46h). A 2nd filament with internal structures attached near anterior of left valve of same specimen (Figure 46g).

REMARKS.—The male *A. robusta* differs from the male *A. hawaiiensis* in having 2 short rather than long proximal ventral bristles and 2 rather than 3 dorsal bristles on the basale of the mandible, and 2 rather than no proximal bristles on the 7th limb. The 6th limb of the male *A. robusta* from Enewetak has 17 bristles compared to 13 on the 6th limb of a male from Fiji illustrated by Kornicker (1981a, fig. 5e).

Because of the presence of bristles with bulbous tips on the carapace of *A. robusta*, I reexamined a carapace of a female paratype (USNM 193623) of *S. hawaiiensis* and observed bristles with bulbous tips. These were not mentioned in the description of the species by Kornicker (1976b:7), but are visible in SEM micrographs of an adult male (Kornicker, 1976b, fig. 10e,f).

Eusarsiella Cohen and Kornicker, 1975

Eusarsiella Poulsen, 1965:79 [nomen nudum].

Eusarsiella Cohen and Kornicker, 1975:23 [designated type species].—Kornicker, 1986b:41 [emended].

TYPE SPECIES.—*Sarsiella tumida* Scott, 1905:369, by subsequent designation (Cohen and Kornicker, 1975:23).

COMPOSITION.—This genus comprises 57 species. To the 50 species listed by Kornicker (1986b, table 3) are added the new species *E. chessi* described herein, *E. styx* Kornicker and Iliffe, 1989b, and the following new combinations of species that had been referred to *Sarsiella* by Hall (1987): *E. claviformis* (Hall, 1987:738), *E. serrata* (Hall, 1987:743), *E. springthorpei* (Hall, 1987:747), *E. reticulata* (Hall, 1987:751), and *E. asciformis* (Hall, 1987:755).

DISTRIBUTION.—World-wide between latitudes of about 63°N and 37°S, generally found in bays, lagoons, and on the continental shelf and upper slope, but recently collected in an anchialine cave in Bermuda (Kornicker and Iliffe, 1989b:32). Usually collected in waters of normal marine salinity, but also

found in waters of lower and higher salinity (18–40.5%). Known depth range intertidal to 1120 m (Kornicker, 1986b:41).

Eusarsiella chessi, new species

FIGURES 48–51

ETYMOLOGY.—The species is named for James R. Chess who collected the specimens.

HOLOTYPE.—USNM 193616, adult male on slide and in alcohol.

TYPE LOCALITY.—Enewetak lagoon, midwater trawl off Bokandretok Island.

PARATYPE.—Enewetak lagoon: Composite sample, USNM 193609, 1 instar II on slide and in alcohol (sex unknown).

DISTRIBUTION.—Enewetak Atoll.

DESCRIPTION OF ADULT MALE (Figures 48, 49).—Carapace elongate with shallow incisur and elongate caudal process (Figure 48, 49a); stout lateral process overhanging incisur (Figure 49b); ventral margin with lateral overlap (Figure 49b).

Ornamentation (Figures 48, 49a): Each valve with lateral ribs: lower rib just ventral to central adductor muscle attachments, extending from process overhanging rostrum to spinous process just anterior to caudal process; dorsal rib extending from spinous process at anterodorsal corner of valve to spinous process near posterodorsal edge of valve; posterior ends of dorsal and ventral ribs connected by thin vertical rib; left valve with narrow rib just within dorsal margin terminating posteriorly on low spinous process (Figure 49a). Ventral margin with 5 spinous processes; narrow low rib extending from 1st ventral process to the rib just ventral to central adductor muscle attachments; low spinous lateral process proximal to 4th ventral process; caudal process with low spinous lateral process near midlength (Figure 49a). Valve surface with shallow fossae having minute inward-pointing peripheral bristles with fairly blunt tips (Figure 48). Similar bristles, some longer than others, widely distributed over valve surface, spinous processes, and ribs; tip of most short bristles pyramidal, but some tips slightly bulbous; anterior end of valve dorsal to incisur with abundant bristles 2 or 3 times length of shorter bristles and with bulbous tips (bulbous tips not shown in Figure 48 but are shown in enlarged detail in Figure 49b); most spinous processes with abundant short bristles and also with 1 or more long pointed bristles (Figure 48); outer edges of anteroventral margin and anterior $\frac{2}{3}$ of ventral margin with abundant long pointed bristles, some with broad part near base. Tip of caudal process with short slender pointed bristles and 2 longer pointed bristles, 1 near ventral and 1 near dorsal corners of process. Long pointed bristles sparsely distributed on lateral surfaces of valve. Valve coated with gelatinous substance covering all except the long pointed bristles.

Infold (Figure 49b): Anterior infold with minute bristle posterior to incisur, just ventral to valve midheight. Infold of

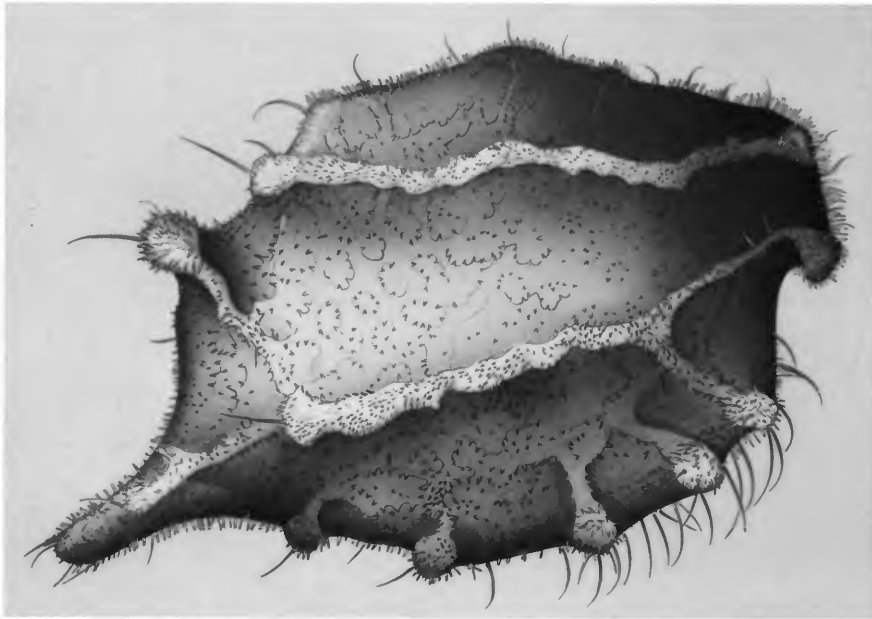


FIGURE 48.—*Eusarsiella chessi*, new species, USNM 193616, holotype, adult male, length 1.31 mm.

caudal process with 4 small bristles forming vertical row near anterior end, and 1 or 2 additional bristles near inner margin of infold; posterior infold with 2 setal bristles.

Selvage: Broad lamellar prolongation with smooth outer edge along free margins (detail in Figure 49b); prolongation cut squarely at tip of caudal process.

Carapace Size: USNM 193616, length without caudal process 1.10 mm, length with caudal process 1.31 mm, height 0.78 mm.

First Antenna (Figure 49c,l): 1st joint bare. 2nd joint with 1 dorsal bristle. 3rd joint short, fused to 4th joint, with 2 bristles (1 dorsal, 1 minute ventral); 4th joint with 2 bristles (1 dorsal, 1 ventral). 5th joint wedged ventrally between 4th and 6th joints; sensory bristle with broad proximal cup with abundant thin filaments (filaments not shown) and long stem with 4 short distal filaments and bifurcate tip (filaments and tip of stem with terminal papilla). Long 6th joint with short proximal concavity on ventral margin and short terminal medial bristle near dorsal margin. 7th joint: a-bristle slightly longer than 6th joint, with marginal spines; b-bristle slightly longer than a-bristle, with terminal papilla; c-bristle long with 4 short distal filaments with terminal papilla and stem with 2 terminal papillae. 8th joint: d- and e-bristles long, bare, with blunt tips; f-bristle long with 4 short distal filaments with terminal papilla and stem with 2 terminal papillae; g-bristle long with 4 short distal filaments with terminal papilla and stem with 2 terminal papillae.

Second Antenna: Protopodite bare. Endopodite 2-jointed

(Figure 49d): 1st joint with 2 small proximal anterior ringed bristles; 2nd joint elongate with 2 minute terminal ringed bristles. Exopodite: 1st joint with small recurved medial terminal spine; bristle of 2nd joint long, with 8-11 stout proximal ventral spines, few proximal dorsal hairs, and distal natatory hairs; bristles of joints 3-8 long, with few proximal dorsal hairs, distal natatory hairs, and with following number of stout proximal ventral spines on bristles of each successive joint: 7-9, 4-6, 5 or 6, 2, 2, 3; joint 9 with 2 bristles (1 long ventral with natatory hairs, no spines; 1 short dorsal with short marginal hairs); joints 3-7 with small spines forming row along distal margins.

Mandible (Figure 49e): Coxale endite represented by small proximal medial spine. Basale: proximal ventral corner with 5 small ringed bristles (3 medial, 2 on margin); medial surface with 1 small ringed bristle near ventral margin just proximal to joint midlength; dorsal margin with 1 short bristle distal to midlength and 2 terminal bristles (medial long stout; lateral shorter and slender); all basale bristles with slender unringed knife-like tips. Exopodite well developed, hirsute, with base on lateral side of basale and tip extending onto medial side of 1st endopodial joint. Endopodite: 1st joint: dorsal margin with proximal indentation to accommodate exopodite; medial surface with abundant long hairs near dorsal margin, long hairs forming proximal transverse row, short spines forming 6 transverse rows (distal row extending onto dorsal margin), and also 1 short terminal row near ventral margin; ventral margin

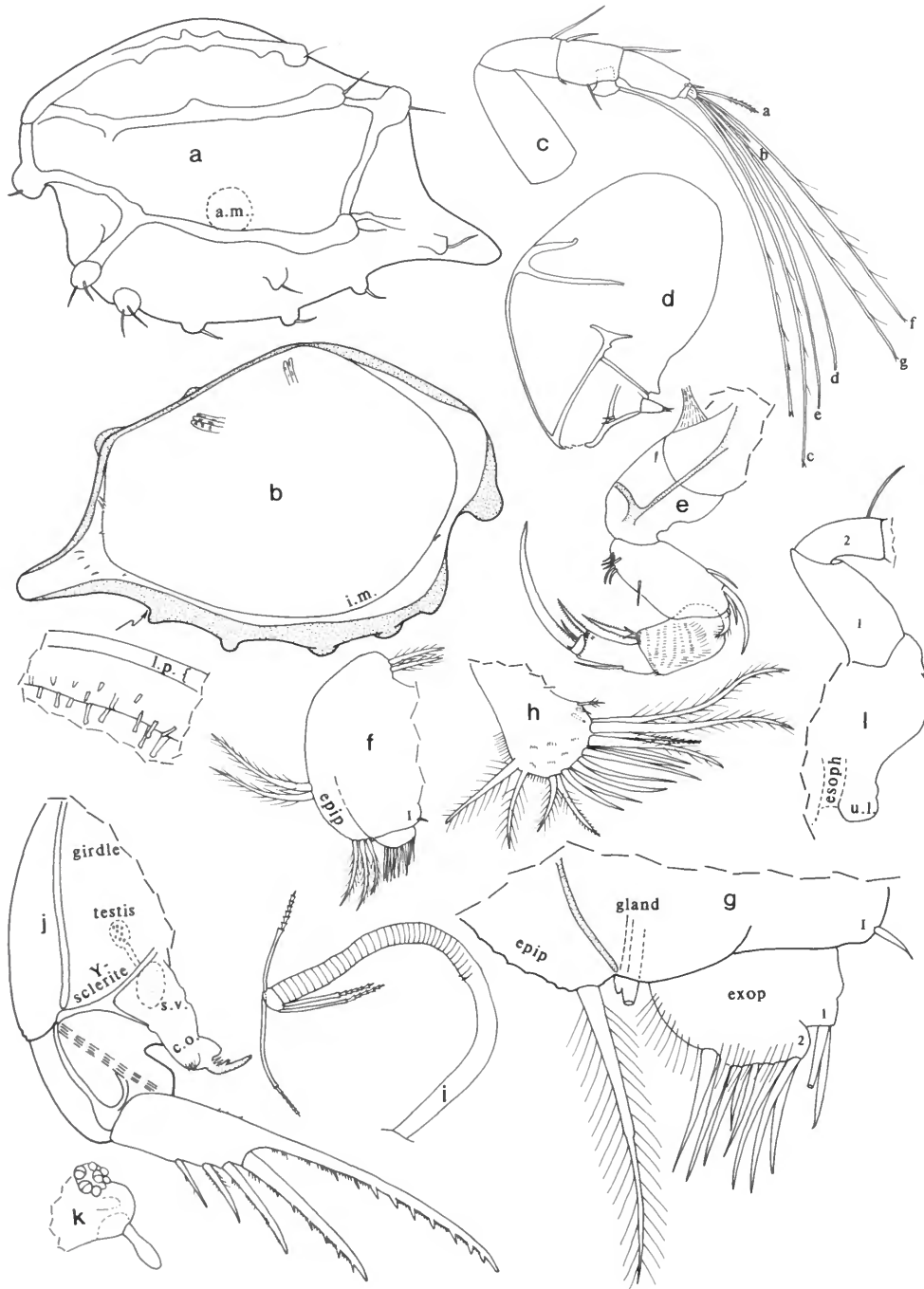


FIGURE 49.—*Eusarsiella chessi*, new species, USNM 193616, holotype, adult male: *a*, complete specimen from left side, length 1.31 mm; *b*, inner view of left valve with detail of ventral margin; *c*, lateral view of right 2nd antenna (proximal filaments of sensory bristle of 5th joint not shown); *d*, medial view of protopodite and endopodite of right 2nd antenna; *e*, medial view of left mandible; *f*, lateral view of right 5th limb (only 7 of the epipodial bristles shown); *g*, lateral view of distal end of right 5th limb (only 1 of the epipodial bristles shown); *h*, lateral view of right 6th limb; *i*, 7th limb; *j*, posterior of body showing right copulatory organ, right lamella of furca, and internal sclerites; *k*, right lateral eye, medial eye and Bellonci organ; *l*, anterior of body showing joints 1 and 2 of right 1st antenna, upper lip, and esophagus.

with stout unringed terminal claw (with minute proximal perpendicular spines along dorsal and ventral margins) and 2 small ringed bristles (with slender unringed knife-like tips) medial to base of claw. 2nd joint: dorsal margin slightly undulate, with 1 slender ringed bristle (with slender unringed knife-like tip) proximal to joint midlength; ventral margin with stout unringed terminal claw (with minute perpendicular dorsal and ventral spines); medial surface with small spines forming terminal row. 3rd joint with stout unringed terminal claw (with few indistinct minute proximal spines along ventral margin), 2 small ringed bristles ventral to base of claw, and 1 minute indistinct unringed spine-like bristle medial to dorsal edge of claw. (Rings of ringed bristles not shown.)

Maxilla: Minute with weakly developed bristles.

Fifth Limb (Figure 49f,g): Protopodite with 37 spinous bristles. Single endite with 1 small bristle. Exopodite small (Figure 49g): 1st joint with 2 bristles; 2nd joint with 3 bristles; 3rd, 4th, and 5th joints with indistinct sutures separating them, hirsute, and with total of 5 bristles. Small ?glandular process on margin just distal to epipodite.

Sixth Limb (Figure 49h): Single endite with 3 small ringed bristles (2 medial, 1 terminal). End joint with 2 hirsute posterior ringed bristles separated by short space from 13 anterior ringed bristles (5 long with medial bases, long proximal hairs, and short distal spines; 7 long with lateral bases and long marginal hairs; not all spines and hairs shown on Figure). Lateral surface of limb with spines forming rows, medial surface hirsute.

Seventh Limb (Figure 49i): Very long with 4 bristles on

terminal segment, each with 6 or 7 bells and no marginal spines. Terminal segment with smooth distal margin.

Furca (Figure 49j): Each lamella with 5 claws; claw 1 nonarticulated, others articulated; all claws with teeth along posterior edges, some longer than others, especially on claws 1 and 2; claw 4 with teeth along anterior margin similar in size to those along posterior margin; claw 5 with few indistinct minute posterior teeth; left lamella with 4 stout spines following claw 5, none on right lamella; anterior margin of right lamella with few minute spines. Right lamella anterior to left by width of base of claw 1.

Bellonci Organ (Figure 49k): Elongate, broadening distally, with rounded tip.

Eyes (Figure 49l): Medial eye unpigmented, bare. Lateral eye smaller than medial eye, with 7 amber-colored divided ommatidia.

Upper Lip (Figure 49l): Evenly rounded, bare.

Genitalia (Figure 49j): Elongate lobes on each side of body anterior to furca; distal lobe with elongate hook-like sclerotized terminal process with tooth at base and 2 bristles along concave margin. Seminal vesicles appearing as amber-colored ovals when viewed in transmitted light (stippled in Figure).

Posterior of Body (Figure 49j): Evenly rounded, bare.

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

DESCRIPTION OF INSTAR II (Figures 50, 51).—Carapace oval in lateral view with long narrow caudal process (sex unknown) (Figure 50).

Ornamentation (Figures 50, 51a): Posterodorsal margin with

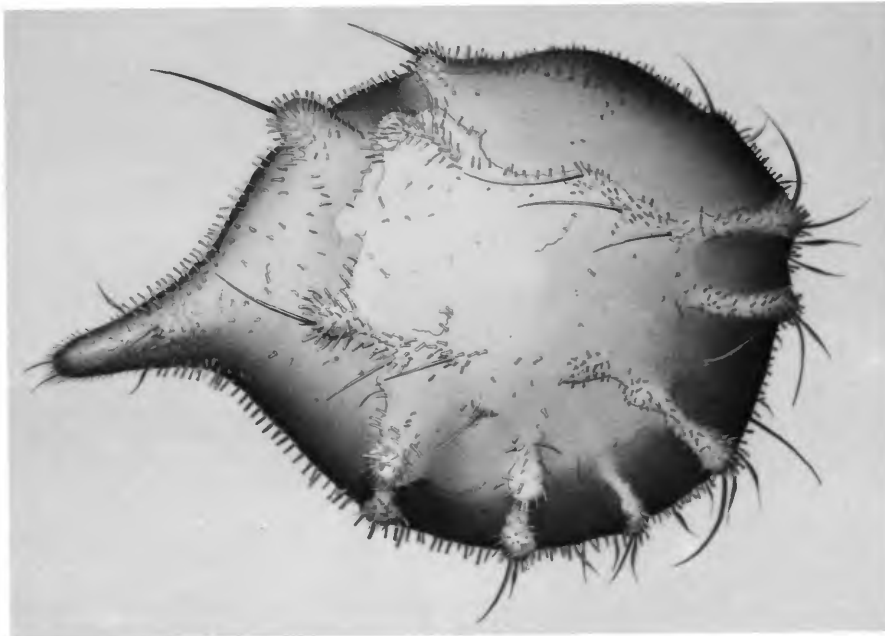


FIGURE 50.—*Eusarsiella chessi*, new species, USNM 193609, paratype, instar II (sex unknown), length 0.64 mm.

2 projecting processes each with dense covering of short bristles and a long terminal bristle; anterior and ventral margins, each with 3 similar processes perpendicular to valve edge, each with covering of small bristles and 1 or 2 long terminal bristles (long bristle missing from posterior ventral process of illustrated right valve, but present on left valve); lateral surface of each valve with 2 indistinct weakly developed horizontal ribs (1 above and 1 below valve midheight); ribs with high density of short bristles on them (density similar to that on processes), each rib terminating posteriorly on small process covered with short bristles (only process on lower rib with long terminal bristle), and terminating anteriorly on upper and lower processes of anterior margin; upper rib with row of 2 or 3 long bristles along anterior half; lower rib with row of 2 or 3 long bristles; anterodorsal margin dorsal to upper anterior process with single long bristle on low node. Tips of short bristles bulb-like and coated by continuous gelatinous film; long bristles on processes and ribs slender and tapering from base to tip; some bristles (shorter than long bristles on processes but longer than short bristles with bulb-like tips) along anterior and ventral valve edges have broad part near base or at bristle midlength (Figure 51a); 1 or 2 bristles of that type also on anterior and ventral processes. Small bristles with bulb-like tips widely scattered over valve surface between ribs and processes (not all shown in Figure 50). Posterior edge of caudal process with 2 short pointed bristles projecting posteriorly (Figures 50, 51b); 2 bristles on caudal process (1 on dorsal margin, other on ventral margin) have thin thread-like tips (Figure 50, 51b). (Fossae not visible on decalcified shell of USNM 193609 but few curved lines on shell suggest that they might have been present when it was calcified.)

Infold: Anterior infold with small bristle near inner margin ventral to valve midheight (Figure 51a). Infold of caudal process with 2 small bristles near anterior end and 1 small bristle on list ventral to process (Figure 51b). Posterior infold just dorsal to caudal process with 2 setal bristles (Figure 51b).

Selva: Wide lamellar prolongation with smooth outer edge present along anterior, ventral, and posterior margins of valve; posterior end of prolongation at tip of caudal process forms square (Figure 51b).

Central Adductor Muscle Attachments (Figure 51k): Comprising 11 ovoid attachments.

Carapace Size: USNM 193609, length including caudal process 0.81 mm, length excluding caudal process 0.64 mm, height 0.55 mm.

First Antenna (Figure 51c): 1st joint bare. 2nd joint with few indistinct dorsal spines and short distal dorsal bristle. 3rd and 4th joints fused; 3rd joint short with 2 bristles (1 ventral, 1 dorsal) reaching 5th joint [note ventral bristle of 3rd joint not short as on adult male]; 4th joint with 1 dorsal bristle reaching midlength of 5th joint. Sensory bristle of long 5th joint with 3 minute filaments and terminal papilla. 6th joint fused to 5th, with short medial bristle near dorsal margin. 7th joint: a-bristle about 3 times length of bristle of 6th joint; b-bristle slightly

longer than a-bristle, bare with terminal papilla; c-bristle slightly longer than sensory bristle of 5th joint, with 2 minute filaments and terminal papilla. 8th joint: d- and e-bristles slightly shorter than sensory bristle, bare with blunt tips; f-bristle about twice length of b-bristle, with terminal papilla; g-bristle same length as sensory bristle, with 2 minute filaments and terminal papilla. Not all filaments shown on bristles of joints 5, 7, and 8.

Second Antenna (Figure 51c,d): Protopodite bare. Endopodite 1-jointed, with 1 short proximal anterior bristle, and 1 minute terminal bristle on low node (Figure 51c,d). Exopodite: 1st joint with small recurved medial terminal spine; bristle of 2nd joint long, with numerous slender ventral spines but no natatory hairs; bristles of joints 3-8 long, with stout ventral spines and distal natatory hairs; 9th joint with 2 bristles (1 minute bare dorsal, other long with ventral spines and distal natatory hairs).

Mandible (Figure 51e,f): Coxale endite represented by small medial spine proximally near ventral margin (not shown). Coxale with stiff spines (with bases on lateral side) along ventral margin. Basale with 4 small bristles on or near ventral margin; and dorsal margin with 1 small bristle distal to joint midlength and 2 minute subterminal bristles. Exopodite represented by small terminal process inward from dorsal margin of basale (Figure 51f). Endopodite: 1st joint with medial spines (not shown in Figure 51e but visible in Figure 51f), small terminal spine-like bristle on dorsal margin, and minute bristle near base of main claw; main claw with minute proximal spines along dorsal edge. 2nd joint with minute terminal bristle on dorsal margin and stout ventral claw. 3rd joint with short ventral bristle and minute dorsal bristle, both at base of main claw.

Maxilla (Figure 51g,h,n): Coxale with short anterior bristle (Figure 51h). Endite I with 6 bristles, endite II with 3 bristles; endite III with 6 bristles (Figure 51g). Basale with 1 bristle near base of exopodite. Exopodite with 2 bristles (longer bristle with spines). Endopodite (Figure 51h): 1st joint with pectinate

FIGURE 51 (opposite page).—*Eusarsiella chessi*, new species USNM 193609, paratype, instar II (sex unknown): a, inner view of anterior margin of right valve; b, inner view of caudal process of right valve; c, upper part of anterior of body from right side showing right lateral eye, right 1st antenna, endopodite and distal part of protopodite of right 2nd antenna; d, medial view of protopodite, endopodite, and joints 1 and 2 of exopodite of right 2nd antenna; e, medial view of left mandible (coxale endite and medial spines of 2nd endopodite joint not shown); f, lateral view of part of endopodite of left mandible (dashed spines are on medial side of joint 1); g, medial view of endites I, II, and III of left maxilla; h, lateral view of left maxilla (only 2 of the bristles of endite III shown); i, lateral view of left 5th limb (only 1 of the bristles of epipodite shown); j, lateral view of left 6th limb; k, posterior of body from right side showing 7th limb, central adductor muscle ends (ovals), right 6th limb, right lamella of furca, and internal sclerites; l, medial eye and Bellonci organ; m, anterior of body from left side showing proximal part of joint 1 of left 1st antenna, medial eye and Bellonci organ, and upper lip; n, posterior view of body (venter to left) showing central adductor muscle and maxillae and 6th limbs.



alpha-bristle and spinous beta-bristle; 2nd joint with 2 lateral bare a-bristles, 1 medial bare c-bristle, and 5 stout pectinate terminal bristles (middle bristle shorter).

Fifth Limb (Figure 51i): Epipodite with 32 bristles. Single endite with 1 short bristle. Exopodite: 1st joint with 2 bristles; 2nd to 5th joints hirsute, fused, with total of 9 bristles (interpretation of bristle distribution: 2nd joint with 3 bristles; inner lobe of 3rd joint with 3 bristles, outer lobe with 1 bristle, 4th plus 5th joints with 2 bristles).

Sixth Limb (Figure 51j,k,n): Comprising 2 hirsute lobes with long spinous bristle between them.

Seventh Limb (Figure 51k): Small, thumb-like.

Furca (Figure 51k): Each lamella with 5 claws; claw 1 nonarticulated, others articulated; all claws with teeth along posterior edges, some teeth longer than others, especially on claw 1; anterior margin of lamellae with few slender spines; 4 stout spines present on left lamella following claw 5, none on right lamella. Right lamella anterior to left by width of base of claw 1.

Bellonci Organ (Figure 51l,m): Elongate, broadening distally, with rounded tip.

Eyes: Medial eye unpigmented, bare (Figure 51l,m). Lateral eye smaller than medial eye, unpigmented, bare, with 5 small amber-colored ommatidia (Figure 51c).

Upper Lip (Figure 51m): Evenly rounded, bare.

Anterior of Body (Figure 51m): Triangular projection on each side of body just dorsal to insertion of mandible.

Posterior of Body (Figure 51k): Evenly rounded, bare.

Y-Sclerite (Figure 51k): Typical for subfamily.

REMARKS.—The genera *Sarsiella* and *Eusarsiella* are distinguished by the absence/presence of terminal teeth on the female (adult and A-1 instar) 7th limb. Therefore, it is not possible to determine to which genus *E. chessi* belongs. It is tentatively referred to *Eusarsiella* herein because members of that genus are much more common.

COMPARISONS.—The ornamentation of the adult male resembles somewhat that of *E. carinata* (Scott, 1905) from Ceylon, of which only the carapace, furca, 1st antenna, and Bellonci organ are known; the Bellonci organ illustrated by Scott (1905, plate 2: fig. 41), unlike that of *E. chessi*, is segmented proximally. The ornamentation of the carapace of *E. chessi* also resembles that of *E. claviformis* (Hall, 1987:738) of which only the adult female is known, but the carapace of the female has flat-topped pustulose ornamentation absent on *E. chessi*, and longer spinous protuberances than on *E. chessi* (although the adult female of *E. chessi* is unknown, the spines and processes of the carapaces of male and female sarsiellids generally resemble each other). The carapace of the male *E. chessi* also resembles that of the male *E. "carinata"* (Kornicker, 1958), but the endopodites of the 2nd antennae differ. *E. chessi* is only the 4th member of the genus known to have bristles on the 7th limb of the adult male (Kornicker, 1986b, table 3).

Anscottiella Kornicker, 1975

Scottiella Poulsen, 1965:64 [homonym].

Anscottiella Kornicker, 1975:607 [nomen novum].

TYPE SPECIES.—*Sarsiella crispata* Scott, 1905:369, monotypy.

COMPOSITION.—Kornicker (1975:607) referred to *Anscottiella* the following species: *A. crispata* (Scott, 1905), *A. setifera* (Poulsen, 1965), *A. similis* (Scott, 1905), and *A. gracilis* (Scott, 1905). Kornicker and McKenzie (1976:347) referred one of these, *A. setifera*, to *Eurypylus* Brady, 1869, as *E. setifera*. Kornicker and Caraion (1978:47) referred *A. similis* and *A. gracilis* to *Junctichela* Kornicker and Caraion, 1978, as *J. similis* and *J. gracilis*, respectively. At present *Anscottiella* includes 3 species: *A. crispata*, *A. tumidicosta* Hall, 1987, and *A. vertex*, new species.

DISTRIBUTION.—*Anscottiella crispata*: Sri Lanka, depth unknown; Thailand, 2 m depth; *A. tumidicosta*: Australia, 2 m depth; *A. vertex*: Enewetak Atoll, shallow.

REMARKS.—The type species *S. crispata* was described from specimens collected in the vicinity of Sri Lanka (Scott, 1905:369); only the carapace and furca were described and illustrated (Scott, 1905:369, pl. 1: figs. 7, 8, pl. 2: fig. 42). In the illustration of the furca (Scott, 1905:369, pl. 2: fig. 42) claws 1 and 2 of the furca are articulated, but this is assumed to be in error. Scott (1905:369) described the carapace of *A. crispata* as having "conspicuous ridges," and ridges are shown in both the ventral and dorsal halves of the illustrated carapace (Scott, 1905, pl. 1: fig. 7). Poulsen (1965:65) described the carapace of specimens from the vicinity of Thailand, which he referred to *A. crispata*, as having 2 large posterodorsal "bulges with roundly crenate margins," but he does not mention ridges, nor does he illustrate ridges on the ventral half of the female carapace (Poulsen, 1965, fig. 18a). Thus, there is doubt that the Sri Lanka and Thailand specimens are conspecific; however, the ridges on some specimens of *A. vertex* are more subdued than on other specimens, so perhaps degree of rugosity also varies on *A. crispata*.

DIAGNOSIS.—1st antenna of female with claw-like c-, f-, and g-bristles; furca with 2 stout nonarticulated claws followed by 2 small articulated claws.

Anscottiella vertex, new species

FIGURES 52-56

Anscottiella sp. Kornicker, 1987b:217, 218, fig. 1c.

ETYMOLOGY.—From the Latin *vertex* (top, peak, whirl, eddy).

HOLOTYPE.—USNM 158317, ovigerous female on slide and in alcohol.

TYPE LOCALITY.—Enewetak lagoon (from composite sample).

PARATYPES.—Enewetak lagoon: Composite sample: USNM

158313, 1 adult male on slide and in alcohol; USNM 193608, 2 juveniles (instars III, IV) in alcohol. Sta 039-69: USNM 158301, 1 ovigerous female in alcohol. Midwater trawl off Bokandretok Island: USNM 193617, 1 ovigerous female in alcohol; USNM 193624, 1 adult male in alcohol; USNM 193638, 5 ovigerous females, 2 adult females, 1 juvenile, all in alcohol. Sta A, plankton trap 6, night, coral reef substrate: USNM 193647, 1 specimen in alcohol. Sta B, plankton trap 7, night, coral reef substrate: USNM 193663, 1 specimen in alcohol.

DISTRIBUTION.—Enewetak Atoll.

DESCRIPTION OF ADULT FEMALE (Figures 52, 53a-f, 54).—Carapace oval in lateral view with slightly projecting caudal process (Figures 52, 53a,d). Posterodorsal part of valve slightly bulbous. Incipient rostrum indicated by small lobe extending past valve edge at midheight of anterior margin (Figure 53e). Valves without gelatinous coating.

Ornamentation (Figures 52, 53a, d-f): Surface with large fossae and low ribs (Figures 52, 53a); posterodorsal part of shell with 2 low bulges with dorsal of 2 lower than other (Figure 53d). Anterior and ventral margins of valves with numerous bristles (Figure 53e), some with broad bases; additional bristles sparsely distributed over valve surface. Posteroventral corner of valve with closely spaced bristles (Figures 52, 53a,d,f). Surface of valves between fossae as well as at bottom of fossae with minute papillae (Figure 53e,f).

Infold: Anterior infold with small bristle at midheight of valve just ventral to incipient rostrum (Figure 53e). Posterior infold with 2 setal bristles (Figure 53f). Inner edge of posterior and ventral infolds in vicinity of caudal process with 6 or 7 bristles (Figure 53f). Narrow list near midwidth of infold extending from midheight of anterior margin of valve (Figure 53e) to point on ventral infold anterior to valve midlength.

Selvae: Lamellar prolongation with bare outer edge along anterior and ventral valve margins. Lamellar prolongation at ventral and dorsal ends of short posteroventral corner of valve with long diaphanous marginal filaments difficult to resolve (Figure 53f). Lamellar prolongation between posterodorsal corner of valve and 2 posterior dorsal setal bristles with fringe of hairs (not shown).

Central Adductor Muscle Attachments (Figure 53b,g): About 16 ovoid muscle bundles.

Carapace Size: USNM 158317, length 0.80 mm, height 0.62 mm. USNM 158301, length 0.85 mm, height 0.70 mm. USNM 193617, length 0.81 mm, height 0.64 mm. USNM 193638, 3 specimens, length 0.79 mm, height 0.67 mm; length 0.80 mm, height 0.64 mm, length 0.80 mm, height 0.67 mm.

First Antenna (Figure 54a,k): 1st joint bare. 2nd joint with spines forming 2 rows on dorsal margin and dorsal bristle with few indistinct spines. 3rd and 4th joints fused; 3rd joint with 2 bare bristles (1 dorsal, 1 ventral), both almost same length as combined lengths of 3rd and 4th joints; 4th joint with 2 bare terminal bristles (1 dorsal, 1 ventral). 5th joint slightly longer



FIGURE 52.—*Anscottiella vertex*, new species, USNM 158317, holotype, adult female, length 0.80 mm.

than combined lengths of 3rd and 4th joints, with long ringed sensory bristle (bare except for terminal spine) about same length as combined ventral margins of joints 2–5. 6th joint minute, fused to 5th, with ringed bare medial bristle shorter than width of 5th joint. 7th joint: a-bristle ringed, slightly longer than bristle of 6th joint, bare except for terminal spine; b-bristle about $\frac{3}{4}$ length of a-bristle, bare, unringed, slightly shorter than a-bristle; c-bristle about same length as sensory bristle of 5th joint, claw-like in proximal unringed $\frac{3}{4}$, bristle-like in ringed distal $\frac{1}{4}$, bare except for terminal spine. 8th joint: e-bristle about same length as c-bristle, d-bristle slightly shorter, both ringed, bare, with blunt tips; f-bristle about $\frac{2}{3}$ length of c-bristle, claw-like in unringed proximal $\frac{2}{3}$, bristle-like in ringed slightly offset distal $\frac{1}{3}$, bare except for terminal spine, bristle broadens at base; g-bristle bare, slightly longer than f-bristle, claw-like, unringed, with rounded bare tip.

Second Antenna: Protopodite bare. Endopodite 1-jointed, not projecting past margin of protopodite, with 2 minute anterior bristles (Figure 54b,c). Exopodite: 1st joint with small terminal medial bristle; bristle of 2nd joint long, with 15–18 slender proximal spines along ventral margin and distal natatory hairs; bristle of 3rd joint with 6–8 slender proximal ventral spines and distal natatory hairs; bristles of joints 4–8 with only natatory hairs; 9th joint with 2 bristles (long ventral bristle with few proximal ventral spines and distal natatory hairs; short dorsal bristle bare).

Mandible (Figure 54d): Coxale endite consisting of small stout spine near ventral margin; ventral margin of coxale distal to endite spinous. Basale: ventral margin with 6 small bristles; dorsal margin obscured on both limbs of holotype. Endopodite: dorsal margin with slight proximal undulation; 1st joint with stout ventral claw, slender spines forming terminal row on

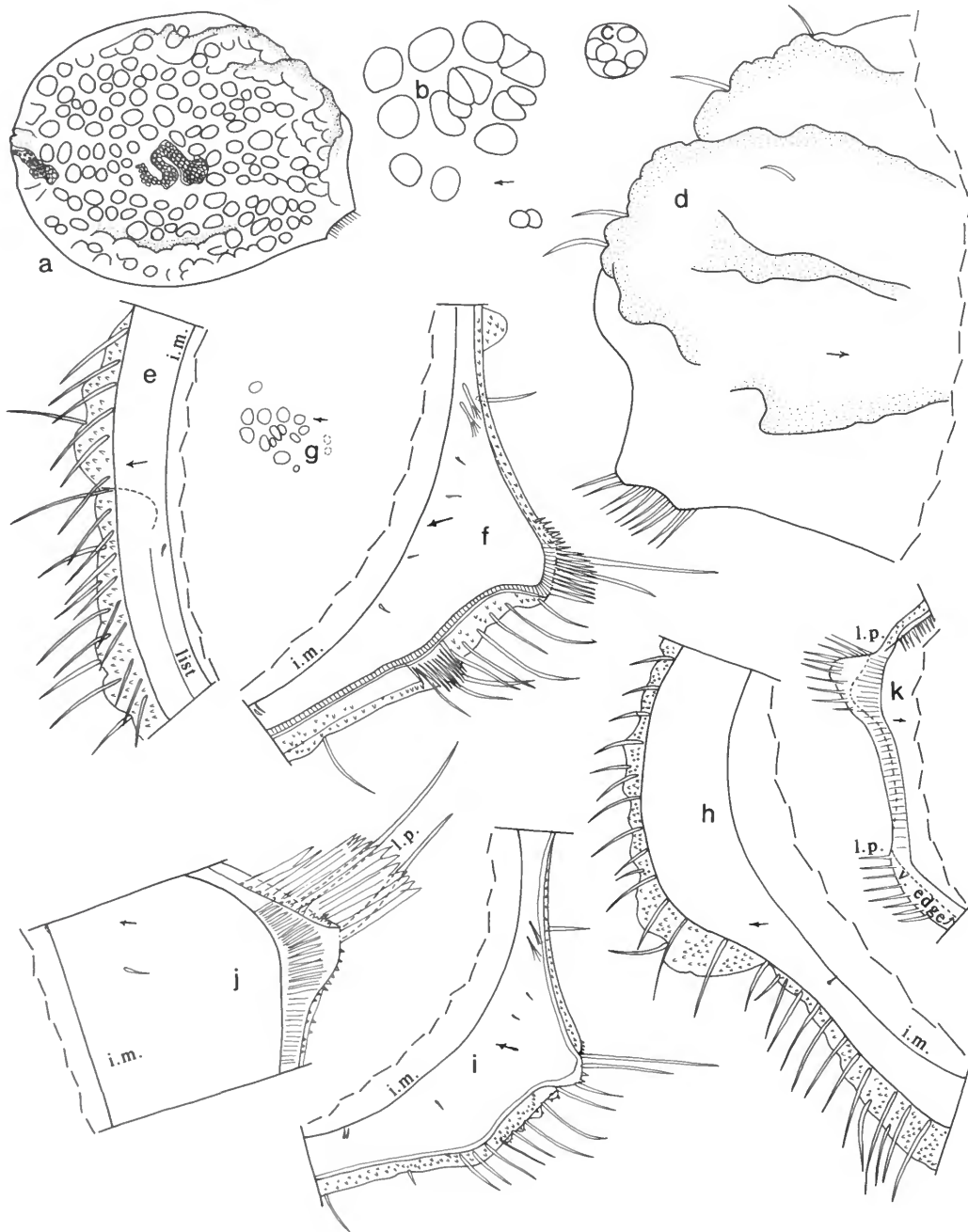


FIGURE 53.—*Anscottiella vertex*, new species. USNM 193617, paratype, adult female, length 0.81 mm: *a*, complete specimen from left side (note foreign cells forming cluster near middle and at anterior edge); *b*, central adductor muscles ends projecting from left side of body, anterior to left; *c*, left lateral eye. USNM 158301, paratype, adult female: *d*, posterior end of right carapace. USNM 158317, holotype, adult female: *e*, inner view of anterior of left valve; *f*, inner view of posterior of right valve; *g*, ends of central adductor muscles projecting from left side of body, anterior to left. USNM 158313, paratype, adult male: *h*, inner view of anterior of right valve; *i*, inner view of posterior of right valve; *j*, inner view of posteroventral corner of right valve showing diaphanous filaments along outer edge of lamellar prolongation of selvage and 2 stout bristles on valve edge; *k*, inner view of lamellar prolongation along caudal process of left valve (dashed line indicates valve edge).

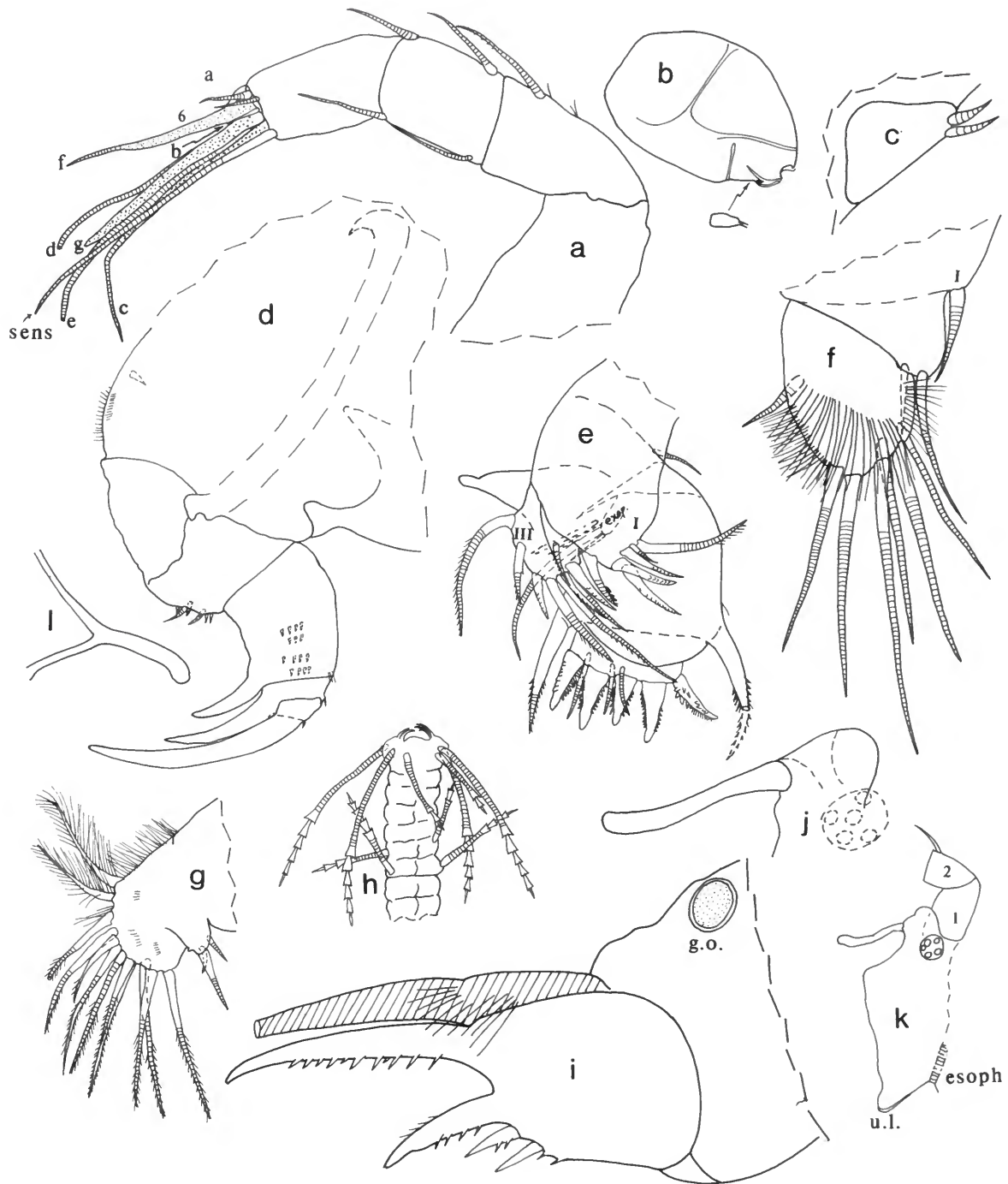


FIGURE 54.—*Anscottiella vertex*, new species, USNM 158317, holotype, adult female: *a*, medial view of right 1st antenna; *b*, medial view of protopodite and endopodite (with detail of latter) of left 2nd antenna; *c*, lateral view of endopodite of right 2nd antenna; *d*, lateral view of right mandible; *e*, medial view of maxilla; *f*, 5th limb; *g*, 6th limb; *h*, 7th limb; *i*, part of posterior of body from left side showing left genitalia (stippled), left lamella of furca, and part of right lamella (lined); *j*, right lateral eye (dashed), medial eye and Bellonci organ; *k*, anterior of body showing joints 1 and 2 of right 1st antenna, left lateral eye, medial eye and Bellonci organ, upper lip, and esophagus (lined); *l*, lateral view of left Y-sclerite, anterior to left.

dorsal margin, and stouter medial spines; 2nd joint with stout ventral claw and minute, terminal, dorsal, spine-like bristle; 3rd joint with stout terminal claw and 1 minute, indistinct, dorsal, spine-like bristle and similar ventral bristle.

Maxilla (Figure 54e): Protopodite with triangular transparent process. Endite I with 5 or 6 bristles (1 short bare, 1 long spinous, 3 or 4 pectinate); endite II with 4 bristles (1 slender, 3 shorter, pectinate); endite III with 5 bristles. Coxale with small bare dorsal bristle. Basale with short bristle close to exopodite. Exopodite obscured, with 3 bristles (1 long, 2 short). Endopodite: 1st joint with alpha- and beta-bristles of equal length, both spinous; 2nd joint with 2 bare a-bristles, 1 bare c-bristle, and 5 pectinate end bristles (middle bristle shorter than others).

Fifth Limb (Figure 54f): Epipodite with 28 bristles. Single endite with bare bristle reaching end of 1st exopodial joint. 1st exopodial joint with 2 bare terminal bristles; joints 3–5 fused, hirsute, with total of 7 bare bristles.

Sixth Limb (Figure 54g): Single endite with 3 bare bristles. End joint with 10 bristles with short marginal spines followed by 2 hirsute bristles (hirsute bristles shorter than most spinous bristles). Posterior edge of limb with long hairs, lateral surface with shorter hairs forming rows.

Seventh Limb (Figure 54h): Each limb with 4 proximal bristles, 2 on each side, each with 2–4 bells, and 6 terminal bristles, 3 on each side, each with 2–5 bells. Terminus with opposing combs, each with 2 or 3 curved teeth (teeth of one comb longer than teeth of other comb).

Furca (Figure 54i): Each lamella with 2 stout nonarticulated claws with rounded tips (not shown), and 2 smaller secondary articulated claws with pointed tips; following 4th claw 1 small spine on right lamella and 2 larger spines on left lamella. Claw 1 with single row of 8 stout teeth and 3 smaller teeth; claw 2 with 4 stout teeth, claw 3 with 2 or 3 teeth, claw 4 without teeth; claw 1 of right lamella with long medial hairs in vicinity of base; claw 2 with few hairs along anterior margin.

Bellonci Organ (Figure 54j,k): Elongate, gradually broadening in distal half, tip rounded.

Eyes: Medial eye unpigmented, bare (Figure 54j,k). Lateral eye unpigmented, with 5 light amber-colored ommatidia (Figures 53c, 54j,k).

Upper Lip (Figure 54k): Simple rounded.

Genitalia (Figure 54i): Small oval ring on each side of body proximal to furca.

Anterior of Body (Figure 54k): Broadly projecting anteriorly.

Posterior of Body: Evenly rounded, bare.

Y-Sclerite (Figure 54l): Typical for subfamily.

Eggs: USNM 158317 with 2 eggs in marsupium and also unextruded eggs; USNM 158301, USNM 193617, and 2 specimens of USNM 193638 each with 3 eggs in marsupium.

Gut Content: USNM 158301 with 2 whole crustaceans in gut.

Epizoa or Epiphytes: Outer surface of left valve of USNM 193617 with clusters of minute cells near middle and anterior

edge (Figure 53a).

DESCRIPTION OF ADULT MALE (Figures 53h–k, 55, 56).—Carapace elongate with well-developed incisure and with slightly concave posteroventral corner (Figures 53h–k, 55). Valves without gelatinous coating.

Ornamentation (Figures 53h–k, 55): Carapace with curved rib lying just below anterodorsal margin, with small riblets extending from rib to anterodorsal valve margin. Horizontal rib ventral to central adductor attachment muscles and extending from ventral end of curved rib to posterior part of valve anterior to posteroventral corner. Short diagonal rib in posterodorsal part of valve. Surface of valve between ribs with large fossae. Minute papillae on valve surface and at bottom of fossae (Figure 53h,i). Bristles forming dense row in vicinity of caudal process (Figure 53i–k); additional bristles along anterior and ventral margins of valve and sparsely distributed on lateral surface (Figure 53h).

Infold: Anterior infold with small bristle near inner margin ventral to rostrum (Figure 53h). Posterior infold with 2 setal bristles. Infold of posteroventral corner with 7 small bristles near inner margin (Figure 53i).

Selvage: Broad lamellar prolongation with long marginal hairs present along anterior margin of rostrum, anteroventral valve margin, and anterior half of ventral valve margin; broad lamellar prolongation without marginal hairs along posterior half of ventral margin; broad lamellar prolongation at ventral and dorsal ends of posteroventral corner of valve with long fringe of wide diaphanous filaments difficult to resolve (Figure 53j,k); lamellar prolongation of posteroventral corner between ventral and dorsal diaphanous filaments with no marginal hairs; lamellar prolongation in vicinity of 2 posterior setal bristles with bare margin.

Carapace Size: USNM 158313, 0.70 mm, height 0.47 mm; USNM 193624, length 0.76 mm, height 0.51 mm.



FIGURE 55.—*Anscottiella vertex*, new species, USNM 158313, paratype, adult male, length 0.70 mm.

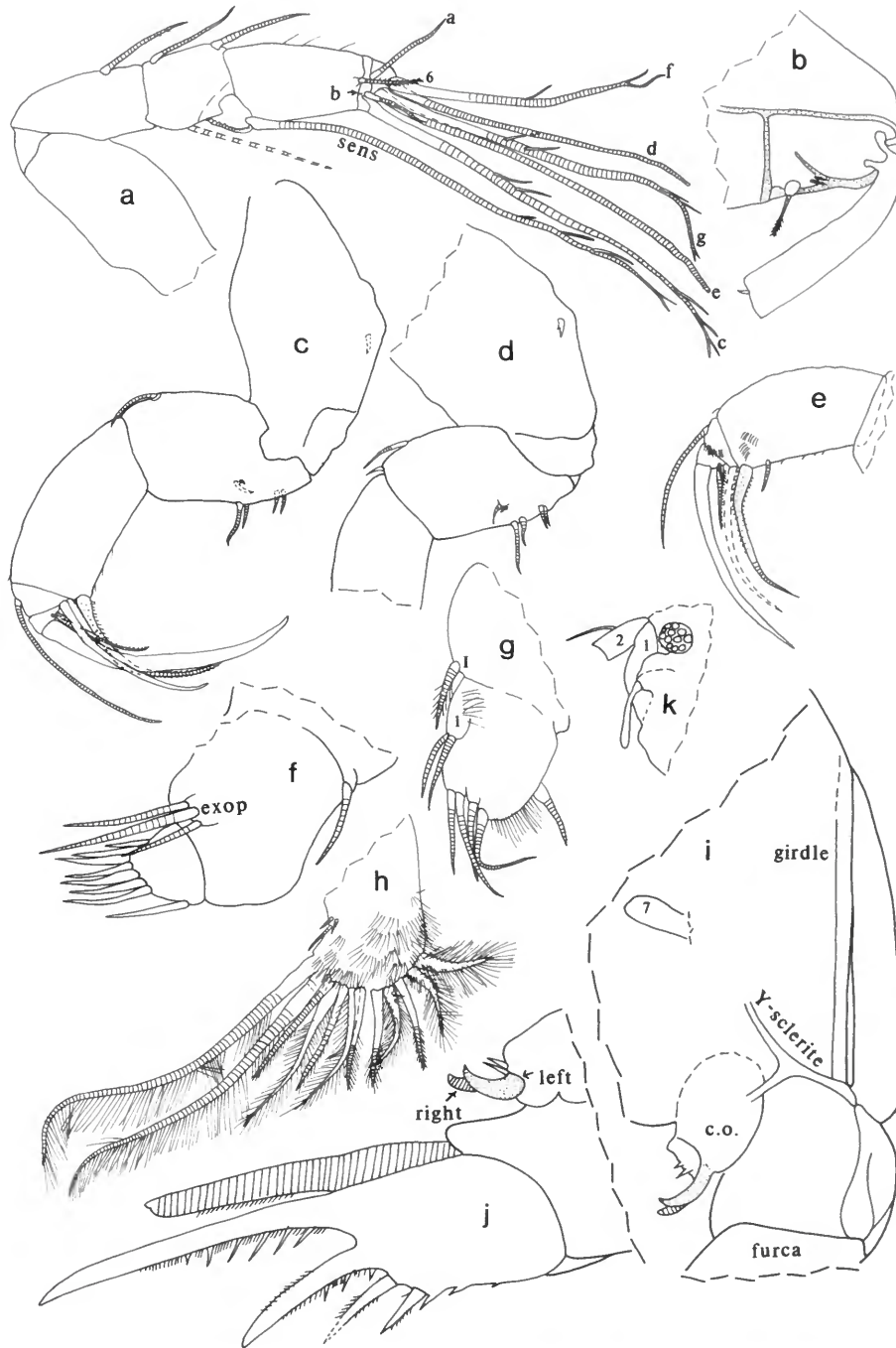


FIGURE 56.—*Anscottiella vertex*, new species, USNM 158313, paratype, adult male: *a*, medial view of left 1st antenna (proximal filaments of sensory bristle of 5th joint not shown); *b*, medial view of distal part of protopodite, endopodite, and 1st joint of exopodite of left 2nd antenna; *c*, lateral view of left mandible; *d*, medial view of proximal part of right mandible; *e*, medial view of distal part of right mandible; *f*, maxilla; *g*, 5th limb (epipodite not shown); *h*, 6th limb; *i*, posterior of body from left side showing 7th limb, copulatory organs (left organ stippled, right organ lined), proximal edge of furca, and internal sclerites; *j*, tip of copulatory organs, left lamella of furca, and anterior part of right lamella (lined) (tip of claw 1 of right lamella missing); *k*, anterior of body showing joints 1 and 2 of right 1st antenna, left lateral eye, medial eye and Bellonci organ.

First Antenna (Figure 56a): 1st joint bare. 2nd joint with dorsal bristle with few indistinct spines. 3rd and 4th joints fused; 3rd joint with dorsal bristle; 4th joint with 2 bristles (1 ventral, 1 dorsal; ventral bristle obscured on illustrated left limb and length of bristle obtained from right limb). 5th joint wedged ventrally between 4th and 6th joints; sensory bristle with cup-like proximal part with abundant filaments (not shown); stem with 3 distal filaments and bifurcate tip. Long 6th joint with dorsal spines and short spinous medial bristle. 7th joint: bare a-bristle longer than bristle of 6th joint; b-bristle bare, shorter than a-bristle; c-bristle reaching past distal end of sensory bristle of 5th joint, with 2 filaments near midlength, 2 subterminal filaments, and bifurcate tip. 8th joint: d- and e-bristles long with blunt tips, d-bristle slightly shorter than e-bristle; f-bristle about same length as e-bristle, with 1 filament near midlength and bifurcate tip; g-bristle similar to c-bristle. (Proximal part of c-, f-, and g-bristles unringed, claw-like, but ringed bristle-like distal part of each bristle much longer than on female bristles.)

Second Antenna (Figure 56b): Protopodite bare. Endopodite 2-jointed (Figure 56b): 1st joint with 2 small anterior bristles; 2nd joint small with 1 spinous terminal bristle. Exopodite: joint proportions similar to those of female limb; 1st joint with small terminal medial bristle (Figure 56b); bristles of joints 2 and 3 with proximal ventral spines and distal natatory hairs; bristles of joints 4–8 with natatory hairs, no spines; 9th joint with 2 bristles (long bristle with few proximal ventral spines and distal natatory hairs, short bristle bare).

Mandible (Figure 56c,d,e): Coxale endite consisting of small stout spine near ventral margin. Basale: ventral margin with 6 small bristles; dorsal margin with 1 short distal bristle and 1 minute spine-like terminal bristle. 1st endopodial joint with few distal ventral spines, 0 or 1 short distal ventral bristle, 1 stout terminal ventral bristle (unringed claw-like in proximal $\frac{2}{3}$, ringed bristle-like in distal $\frac{1}{3}$; surface covered with minute papillae), slender distal medial spines forming rows, and few terminal dorsal spines; 2nd endopodial joint short, with 1 long dorsal bristle, 1 long curved ventral claw (more slender at base than stout terminal bristle of 1st joint); 3rd joint with stout terminal claw, 1 slender ventral bristle with marginal papillae, and 1 minute medial bristle. Exopodite absent.

Maxilla (Figure 56f): Limb reduced; endites small with weak bristles (not shown); coxale with bare dorsal bristle. Exopodite with 3 strong bristles. 1st and 2nd endopodial joints with total of 8 weak bristles.

Fifth Limb (Figure 56g): Limb reduced. Epipodite with 32 hairs bristles (not shown). Single endite with 1 bristle. Endopodite hairs: 1st joint with 2 bare bristles; joints 2–5 fused, with total of 5 or 6 bare bristles, all with pointed tips.

Sixth Limb (Figure 56h): Single endite with 3 small bristles. End joint with 2 very long hairs anterior bristles followed by 9 or 10 shorter spinous or hairs bristles (4 or 5 spinous bristles with bases on medial edge of joint, 3 hairs bristles with bases on lateral edge of joint, followed by 2 hairs

bristles); medial surface of limb hairs.

Seventh Limb (Figure 56i): Minute, bare.

Furca (Figure 56i,j): Claws 1 and 2 nonarticulated, claws 3 and 4 articulated; lamellae following claws with 2 or 3 small spines; claws 1 and 2 with long and short teeth along posterior edges; claw 2 also with slender spines along anterior margin; claws 3 and 4 with small spines along anterior and posterior margins; right lamella slightly anterior to left lamella. Claw 1 of illustrated right lamella aberrant in having tip missing and only short teeth along posterior edge. (Claws 1 and 2 longer and with longer posterior teeth than same claws of female; claw 1 without long medial hairs at base as on female claw.)

Bellonci Organ (Figure 56k): Elongate, broadening in distal half, tip rounded.

Eyes: Medial eye unpigmented, bare (Figure 56k). Lateral eye about same size as medial eye, unpigmented, with 10–12 ommatidia (Figure 56k).

Genitalia (Figure 56i,j): Copulatory limb on each side of body anterior to furca; limb consisting of lobes with terminal hook-like process and few small bristles.

Anterior of Body (Figure 56k): Similar to that of female.

Posterior of Body (Figure 56i): Evenly rounded, bare.

Y-Sclerite (Figure 56i): Similar to that of female.

DEVELOPMENT.—USNM 193608, 2 specimens, instars III and IV, were not examined in detail but both have 4 furcal claws, with claws 1 and 2 nonarticulated and claws 3 and 4 articulated, and a 6th limb with many bristles. The 7th limb of instar III is elongate without bristles, whereas the 7th limb of instar IV bears strongly tapered bristles.

COMPARISONS.—*A. vertex* differs from specimens of *A. crispata* described by Poulsen (1965:65) mainly in having the endopodite of the male 2nd antenna with 2 joints rather than 1, but also in having 1 instead of 2 endites on the male and female 6th limbs, spinous rather than bare bristles on the end joint of the female 6th limb, and a marginal fringe on the lamellar prolongation of the selvage along the anterior and ventral margins of the male carapace. *A. vertex* differs from *A. tumidicosta*, of which only the female is known, in having slender rather than stubby claws on the 1st, 2nd, and 3rd endopodial joints of the mandible, and in not having a terminal node on the endopodite of the 2nd antenna.

Metasarsiella, new genus

ETYMOLOGY.—From the Greek *meta* (between, among, near) plus *sarsiella*.

TYPE SPECIES.—*Metasarsiella vibex*, new species, by monotypy. Gender feminine.

COMPOSITION.—Known only from the type species.

DISTRIBUTION.—Enewetak Atoll.

DIAGNOSIS (ADULT FEMALE).—1st antenna with c-, f-, and g-bristles not claw-like; d-bristle present. 6th limb with single endite. Tip of 7th limb with teeth. Each lamella of furca with 6

claws; claw 3 about same width and length as claw 4; claw 1 nonarticulated; claws 2–6 articulated. Genus based mainly on furca.

COMPARISONS.—*Metasarsiella* differs from species of *Sarsiella*, *Eusarsiella*, and *Adelta* in having 6 rather than 5 furcal claws. *Adelta* also lacks a d-bristle on the 1st antenna. *Parasarsiella* has 7 furcal claws and the 6th limb has 2 endites. Other genera of the Sarsiellinae differ from *Metasarsiella* in having a furca with well-defined secondary claws between primary claws or at least 2 claws nonarticulated.

Metasarsiella vibex, new species

FIGURES 57–60

Sarsiella sp. Kornicker, 1987b:217, 218, fig. 1e.

ETYMOLOGY.—From the Latin *vibex* (mark, weal).

HOLOTYPE.—USNM 158310, adult female on slide and in alcohol.

TYPE LOCALITY.—Enewetak lagoon (from composite sample).

PARATYPE.—Enewetak lagoon: Composite sample, USNM 158318, 1 juvenile male in alcohol (instar III or IV).

DISTRIBUTION.—Enewetak Atoll.

DESCRIPTION OF ADULT FEMALE (Figures 57–59).—Carapace oval in lateral view with elongate caudal process pointing posteriorly and slightly ventrally (Figure 57). Stout alar projection extending past posterior edge of valve near valve midheight (Figure 58c). Rostrum represented by minute step in anterior margin at valve midheight (Figure 58a). Valve outer surface without gelatinous coating.

Ornamentation (Figure 57): Stout peripheral rib present slightly inward from valve margin except near caudal process where rib forms angle extending onto posterodorsal alar projection. Small riblets extending outward from peripheral rib and intersecting valve edge along dorsal, anterior, and ventral valve margins. 2 horizontal ribs present: upper rib extending anteriorly from posterior end of alar projection, and lower rib ventral to central adductor muscle attachments. A subdued rib present on caudal process at process midheight. Surface of valve with large ovoid fossae with small spines or papillae around periphery and at bottom (Figure 57). Smaller pits, some with minute central spine or bristle, on surface of ribs and scattered on valve surface between fossae (detail in Figure 57). Bristles, some with broad base, fairly numerous along anterior (Figure 58a) and ventral valve margins and sparsely distributed on valve surface.

Infold: Anterior infold with 1 small bristle near inner margin ventral to incipient rostrum (Figure 58a). Infold of caudal process with 6 bristles (Figure 58b–d); 2 smaller bristles along inner margin of infold in vicinity of caudal process (1 anterior to process and 1 on ventral infold just anterior to process) (Figure 58c). Posterior infold with 2 setal bristles (Figure 58b–d).

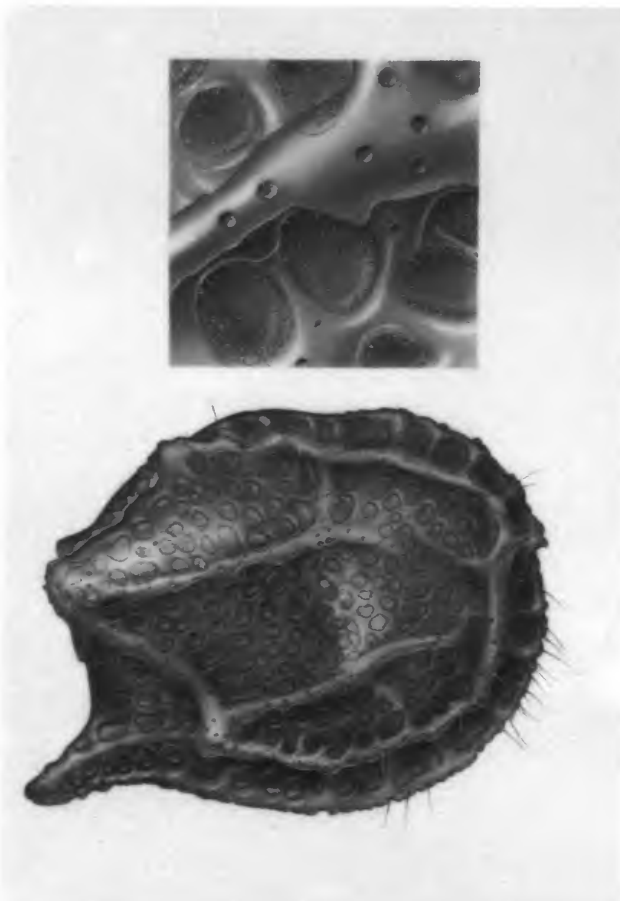


FIGURE 57.—*Metasarsiella vibex*, new species, USNM 158310, holotype, adult female, length 0.79 mm.

Selvage: Broad lamellar prolongation with marginal fringe present along anterior, ventral, and posterior margins, including posterior edge of caudal process.

Central Adductor Muscle Attachments (Figure 58e): Consisting of about 14 individual scars.

Carapace Size: USNM 158310, length including caudal process 0.79 mm, length excluding caudal process 0.72 mm, height including caudal process 0.61 mm.

First Antenna (Figure 59a): 1st joint bare. 2nd joint with few ventral spines and 1 dorsal bristle with indistinct marginal spines. 3rd and 4th joints fused; 3rd joint with dorsal and ventral bristle of similar length, both reaching just past distal end of 4th joint; 4th joint with short dorsal bristle almost reaching midlength of 5th joint, and longer ventral bristle reaching to end joint. 5th joint narrower but longer than combined 3rd and 4th joints; sensory bristle with 2 minute indistinct spines at midlength and terminal spine. 6th joint

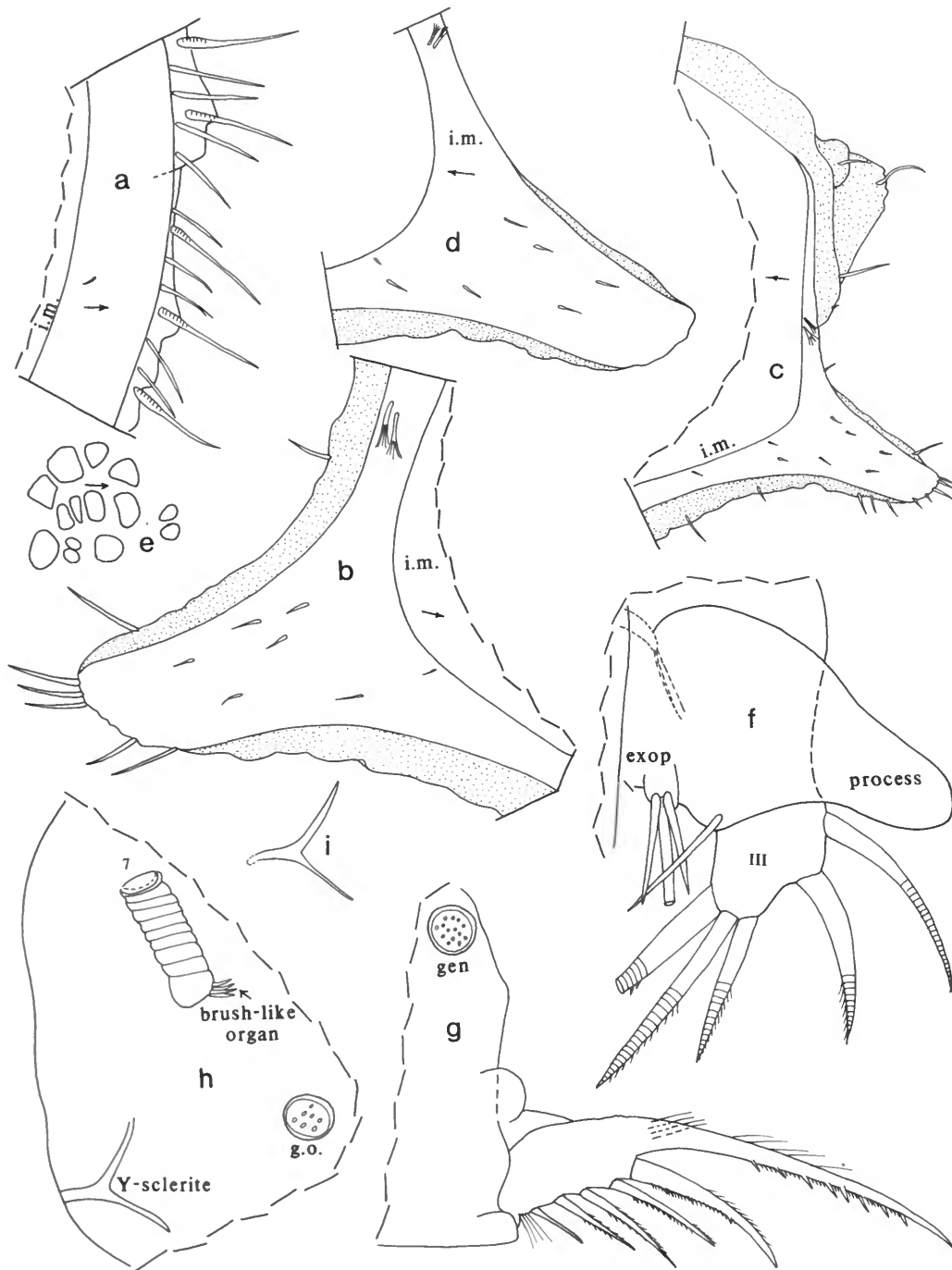


FIGURE 58.—*Metasarsiella vibex*, new species, USNM 158310, holotype, adult female: *a*, inner view of anterior of left valve; *b*, inner view of posterior of left valve; *c*, inner view of posterior of right valve; *d*, inner view of anterior of right valve; *e*, central adductor muscle attachments on right valve, anterior to right; *f*, lateral view of thumb-like process of either protopodite or basale, endite III, and exopodite of left maxilla; *g*, part of posterior of body from right side showing right genitalia and right lamella of furca; *h*, part of posterior of body from right side showing proximal end of 7th limb, brush-like organ, right genitalia, and distal part right Y-sclerite; *i*, right Y-sclerite, anterior to right.

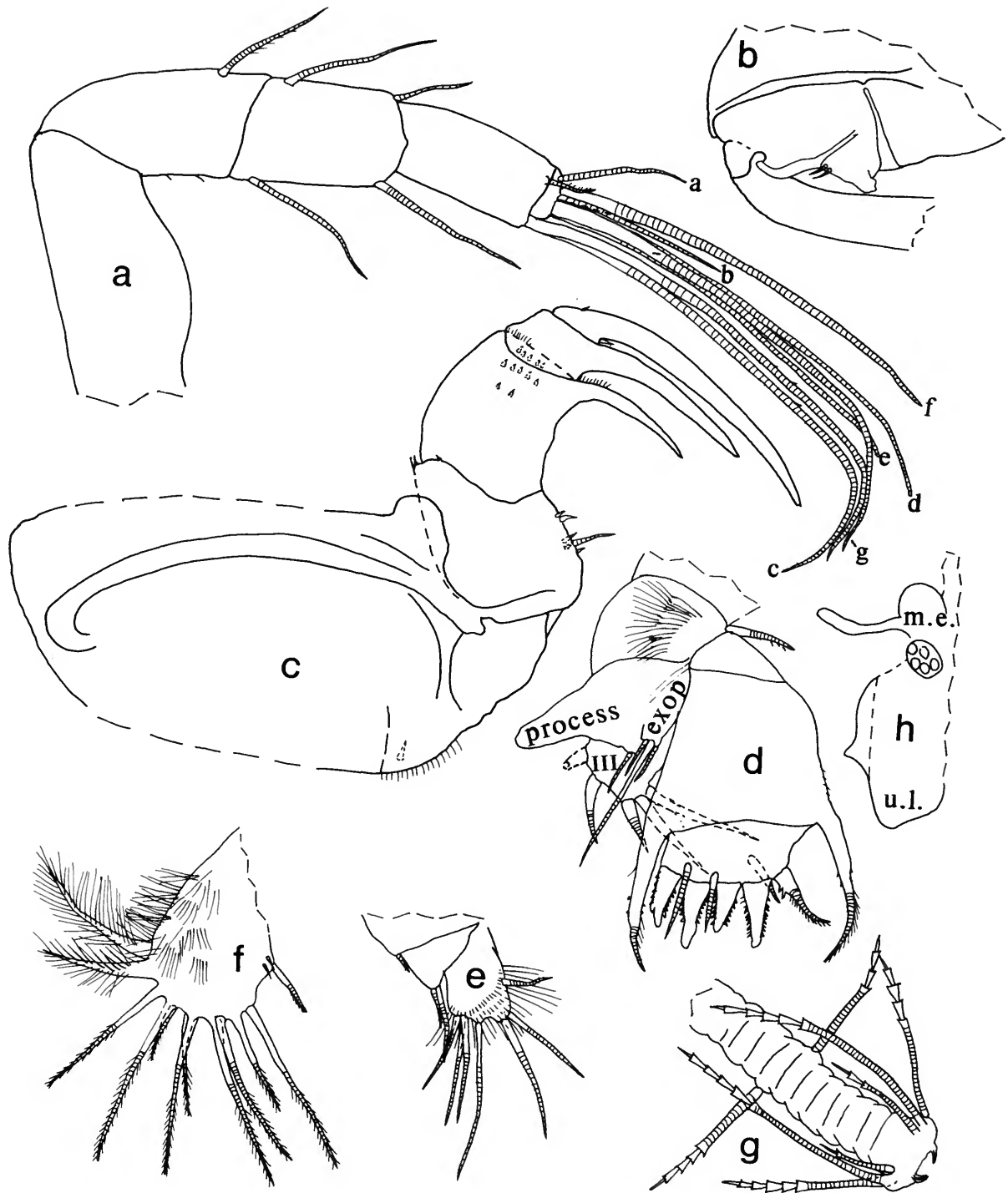


FIGURE 59.—*Metasarsiella vibex*, new species, USNM 158310, holotype, adult female: *a*, medial view of left 1st antenna; *b*, medial view of distal part of protopodite, endopodite, and part of joint 1 of exopodite of right 2nd antenna; *c*, lateral view of right mandible; *d*, lateral view of right maxilla (not all endite bristles shown); *e*, 5th limb; *f*, 6th limb; *g*, 7th limb; *h*, anterior of body showing medial eye and Bellonci organ, left lateral eye, and upper lip.

inferred to be minute and fused to 5th joint, with small spinous medial bristle. 7th joint: a-bristle bare, about 3 times length of bristle of 6th joint; b-bristle bare, about $\frac{1}{3}$ longer than a-bristle; c-bristle about same length as sensory bristle of 5th joint, with minute indistinct distal spine and terminal spine. 8th joint: d- and e-bristles slightly shorter than c-bristle, bare with blunt tips; f-bristle shorter than c-bristle, with terminal spine; g-bristle about same length as c-bristle, with minute indistinct proximal spine and terminal spine.

Second Antenna (Figure 59b): Protopodite bare. Endopodite with single joint with 2 short anterior bristles and short terminal process (process could be considered 2nd joint) (terminal process with irregular tip on illustrated right limb but tip evenly rounded on left limb of same specimen). Exopodite: 1st joint with small curved medial terminal bristle; bristle of 2nd joint long, with 10–13 slender proximal ventral spines and distal natatory hairs; bristle of 3rd joint with 5–8 slender ventral spines proximal to midlength and distal natatory hairs; bristles of joints 4–8 long with natatory hairs; 9th joint with 1 long ventral bristle with natatory hairs and 1 short bare dorsal bristle.

Mandible (Figure 59c): Coxale endite represented by small medial spine near ventral margin. Basale: ventral margin with 5 or 6 small bristles; dorsal margin with 2 small terminal spine-like bristles; lateral surface with small terminal spine near dorsal margin (spine may represent exopodite). Endopodite: 1st joint with distal medial spines forming rows, and stout terminal claw with proximal dorsal spines; 2nd joint with stout terminal claw; 3rd joint with stout terminal claw with 2 minute bristles near its base (1 ventral, 1 dorsal).

Maxilla (Figures 58f, 59d): Protopodite (basale?) with thin transparent thumb-like process. Endite I obscured but with about 5 bristles, some claw-like; endite II obscured but with about 4 bristles; endite III with 5 bristles. Coxale with fringe of long hairs and short dorsal bristle with few indistinct spines. Basale with 1 short bristle near exopodite. Exopodite with 1 long and 2 short bristles. Endopodite: 1st joint with 1 alpha-bristle and 1 beta-bristle, each with few proximal teeth and spines distally; 2nd joint with 2 lateral a-bristles, 1 medial c-bristle, and 5 stout pectinate end bristles (middle bristle shorter than others).

Fifth Limb (Figure 59e): Single endite with 1 short bristle. Exopodite hirsute, interpreted to have 5 joints: 1st joint with 2 bristles; joints 2–5 fused, with total of 7 bristles (3 on 2nd joint, 1 each on inner and outer ends of 3rd joint, and total of 2 on 4th and 5th joints).

Sixth Limb (Figure 59f): Limb hirsute in posterior half. Single endite with 3 bristles. End joint with 9 bristles with short marginal spines followed by 2 hirsute posterior bristles.

Seventh Limb (Figure 59g): 6 bristles in terminal group, 3 on each side, each bristle with 1–5 bells; 2 bristles in proximal group, 1 on each side, each bristle with 3 or 4 bells. Terminus with opposing combs, each with 2 or 3 curved teeth.

Furca (Figure 58g): Each lamella with 6 pointed claws; claw 1 nonarticulated, claws 2–6 articulated; 3rd and 4th claws

about same length, and also about same width at base; claws 1–5 with teeth along posterior margin and hairs along anterior margin; long hairs present at base of claw 1; some teeth on claw 1 longer than others; teeth more slender distally on claw 2; teeth restricted to proximal half on claw 3; on claws 4 and 5 teeth restricted to proximal part, but anterior hairs extend to tip; 2 minute teeth on each lamella following claw 6; right lamella slightly anterior to left lamella.

Bellonci Organ (Figure 59h): Elongate, broadening in distal half, with rounded tip.

Eyes (Figure 59h): Medial eye unpigmented bare. Lateral eye unpigmented, with 5 ommatidia.

Upper Lip (Figure 59h): Evenly rounded.

Genitalia (Figure 58g, h): Small round disc on each side of body anterior to furca.

Brush-Like Organ (Figure 58h): Several small bristles near base of 7th limb.

Anterior of Body (Figure 59h): With triangular process at midheight on each side.

Posterior of Body (Figure 58h): Evenly rounded.

Y-Sclerite (Figure 58h,i): Typical for subfamily.

Eggs: USNM 158310 with 3 eggs in marsupium.

DESCRIPTION OF JUVENILE MALE (INSTAR III OR IV) (Figure 60).—Carapace with oblique posterior dorsal to caudal process, otherwise similar to that of adult female (Figure 60a). Ornamentation similar to that of female except ribs less developed (Figure 60a). Surface fossae and pits and central adductor muscle attachments similar to those of adult female (Figure 60b (not all muscle attachments shown)).

Carapace Size: USNM 158318, length including caudal process 0.58 mm, length excluding caudal process 0.49 mm (placement of anterior boundary of caudal process subjective), height including caudal process 0.46 mm.

First Antenna (Figure 60b): 1st joint bare. 2nd joint with 1 dorsal bristle reaching just past midlength of fused 3rd and 4th joints. 3rd joint with dorsal and ventral bristle, both reaching past distal end of 4th joint. 4th joint with dorsal bristle reaching middle of 5th joint, and ventral bristle almost reaching distal end of 5th joint. 5th joint with long ventral sensory bristle. 6th joint fused to 5th, with small terminal medial bristle. 7th joint: a-bristle short; b-bristle less than twice length of a-bristle; c-bristle long, about same length as sensory bristle of 5th joint. 8th joint: d- and e-bristles slightly shorter than c-bristle, with blunt tips; f-bristle about $\frac{3}{4}$ length of c-bristle; g-bristle about same length as c-bristle.

Second Antenna (Figure 60b): Protopodite bare. Endopodite 2-jointed: 1st joint obscured; 2nd joint elongate with 1 short distal anterior bristle. Exopodite: left limb aberrant having only 8 joints: joints 2–7 with long bristles similar to those of adult female; 8th joint with 1 long and 1 short bristle (bristles not shown); right limb similar to that of left limb except for having 9 joints as on adult female; bristles similar to those of adult female.

Mandible and Maxilla: Similar to those of adult female

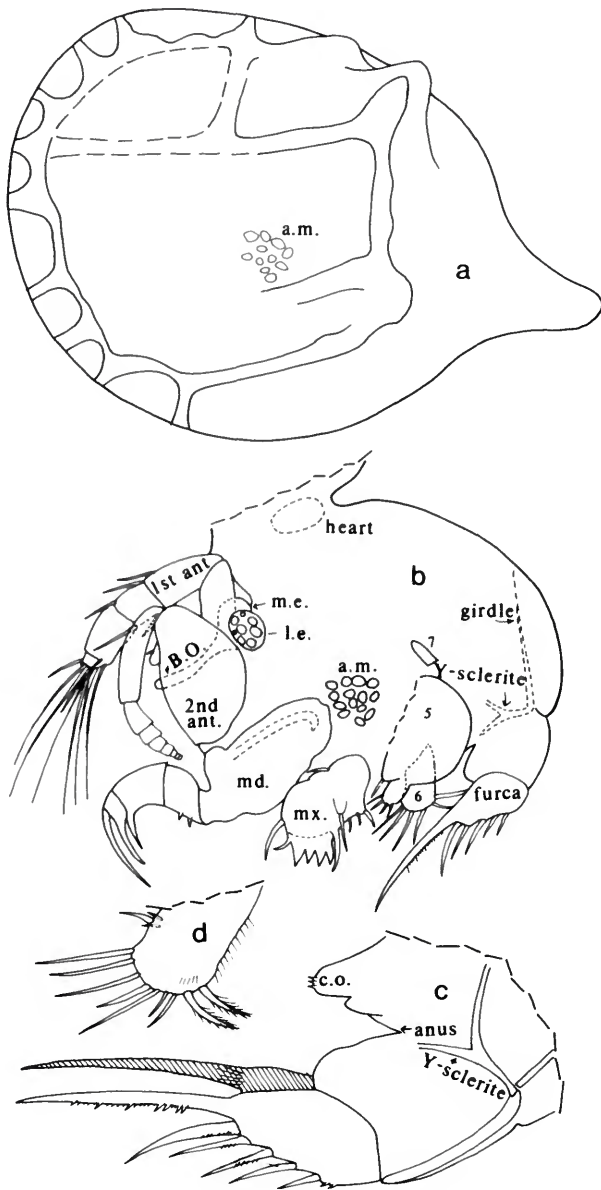


FIGURE 60.—*Metasarsiella vibex*, new species, USNM 158318, paratype, instar III or IV male: *a*, complete specimen from left side, length 0.58 mm; *b*, body and appendages as seen through translucent left valve (only appendages of left side shown; not all bristles shown); *c*, posterior of body showing left copulatory organ, left lamella of furca and anterior of right lamella (lined), and internal sclerites; *d*, 6th limb.

(Figure 60b).

Fifth Limb (Figure 60b): Epipodite with 26 hirsute bristles. Single endite with short bristle. Exopodite similar to that of adult female.

Sixth Limb (Figure 60b,d): Single endite with 3 small bristles. End joint hirsute, with 7 bristles (whether or not these bristles are spinous could not be resolved) followed by 2 hirsute bristles.

Seventh Limb (Figure 60b): Short, thumb-like, bare.

Furca (Figure 60b,c): Similar to that of adult female in having 6 claws with only claw 1 nonarticulated. Each lamella with 2 minute teeth following claw 6. Right lamella slightly anterior to left (Figure 60c).

Bellonci Organ (Figure 60b), **Posterior of Body**, and **Y-Sclerite** (Figure 60b,c): Similar to those of adult female.

Eyes (Figure 60b): Medial eye unpigmented. Lateral eye same size as medial eye, unpigmented, with 8 amber-colored ommatidia.

Genitalia (Figure 60c): Small lobe on each side of body bearing 3 indistinct, minute, unringed, terminal bristles or processes.

REMARKS.—In order to have a whole paratype the juvenile (USNM 158318) described above was not dissected. The shell of the specimen is translucent, which permitted a view of the appendages. The large size of the lateral eye compared to that of the adult female, the large number of ommatidia (8 compared to 5 in the adult female eye), the presence of a 2nd joint bearing a bristle on the endopodite of the 2nd antenna and, especially, a small poorly developed copulatory organ on each side of the body all indicate the specimen to be male. The presence of a ventral bristle on the 4th joint of the 1st antenna and a well-developed 6th limb indicate that the specimen is not younger than a stage III instar (Hiruta, 1983:673). The oblique posterior margin of the shell when compared to that of the adult female, as well as the poorly developed copulatory organ, indicate that the specimen is not adult. If the species has 5 instars, which is the number of instars of known species of Sarsiellidae (Hiruta, 1983:675), USNM 158318 is either the 3rd or 4th instar.

CYLINDROLEBERIDIDAE Müller, 1906

COMPOSITION.—The Cyndroleberididae comprise 3 subfamilies: Cyndroleberidinae, Cyclasteropinae, and Asterop-teroninae. Only the first two are represented in the present collections.

DISTRIBUTION.—World-wide at depths from intertidal to abyssal.

CYLINDROLEBERIDINAE Müller, 1906

COMPOSITION.—The Cyndroleberidinae comprise 17 genera, including a new genus proposed herein. Only 3 are in the collections from Enewetak: *Cyndroleberis* Brady, 1868, *Heptonema* Cohen and Komicker, 1975, and *Monoasterope*, new genus.

DISTRIBUTION.—Same as for family.

Cylindroleberis Brady, 1868*Cylindroleberis* Brady, 1868:127.

TYPE SPECIES.—*Cypridina mariae* Baird, 1850:257, pl. 17: figs. 5–7, subsequent designation (Sylvester-Bradley, 1961:Q402).

COMPOSITION.—Nine species are referred to this genus, of which *C. mariae*, the type species, is not well known. The other 8 species are *C. nodulifera* (Poulsen, 1965), *C. grimaldi* (Skogsberg, 1920) (includes *C. grimaldi* var. *vicina* Skogsberg, 1920), *C. minuta* (Poulsen, 1965), *C. verrucosa* (Poulsen, 1965), *C. thailandica* (Poulsen, 1965), *C. bacescui* Kornicker and Caraion, 1974, *C. variabilis* Kornicker, 1970b, and *C. kliei* Kornicker, 1976a. Some early descriptions of species that may be members of this genus are poor (see discussions by Skogsberg (1920:518–522) and Kornicker and Bowman

(1967:17–19)). The long exopodite of the mandible of *C. rangiroaensis* Hartmann, 1984 (Hartmann, 1984, fig. 4), indicates that it is not a member of the genus *Cylindroleberis* sensu Poulsen (1965:434), in which the exopodite is “very short, not more than 1/4 of the length of the 1st endopodite joint.”

DISTRIBUTION.—Mediterranean Sea; in vicinity of Thailand, Philippine Islands, and west coast of Africa; Red Sea; off Isle of Skye (Inner Hebrides); and Enewetak Atoll. In general, members of the genus have been collected between longitudes of about 20°W to 160°E and between latitudes of about 58°N and 26°S. The adult male of *C. nodulifera* was collected on the surface of the Red Sea at night using artificial light (Poulsen, 1965:447), but species are generally part of the benthos in shallow water (intertidal to 52 m) (Kornicker and Caraion, 1974:29).

Key to the Species of *Cylindroleberis*(does not include *C. mariae*)

1. 6th limb, anterior margin with 1 endite bristle *C. verrucosa*
6th limb, anterior margin with 2 endite bristles 2
2. 6th limb, anteroventral corner including lateral flap with 5–8 bristles 3
6th limb, anteroventral corner including lateral flap with 2–4 bristles 5
3. Mandible, dorsal margin of basale with 3 or 4 midbristles *C. kliei*
Mandible, dorsal margin of basale with 0–2 midbristles 4
4. 1st antenna, 5th joint of male with proximal protuberance on dorsal margin, 2nd joint of female with bulge on dorsal margin *C. bacescui*
1st antenna, 5th joint of male without proximal protuberance, 2nd joint of female without bulge *C. grimaldi*
5. Maxilla, proximal endite with 2 long bristles *C. nodulifera*
Maxilla, proximal endite with 3 long bristles 6
6. Mandible, dorsal margin of basale with 3 midbristles *C. thailandica*
Mandible, dorsal margin of basale with 2 midbristles *C. minuta*
Mandible, dorsal margin of basale with 0 or 1 midbristle *C. variabilis*

Because the size of the carapace is useful in identifying some species, lengths are listed below (nd = no data).

Species	Carapace length in mm		Source
	male	female	
<i>C. bacescui</i>	2.02	1.83–1.91	Kornicker and Caraion (1974:34, 36)
<i>C. grimaldi</i>	1.7–1.75	1.53–1.7	Skogsberg (1920:510, 515)
<i>C. grimaldi</i> var. <i>vicina</i>	nd	1.54–2	Skogsberg (1920:518)
<i>C. kliei</i>	1.95	1.72–1.78	Kornicker (1976a:2,6,7)
<i>C. mariae</i>	nd	2.33	Kornicker and Bowman (1967:17)
<i>C. minuta</i>	nd	1.1–1.2	Poulsen (1965:436)
<i>C. nodulifera</i>	1.4–1.5	nd	Poulsen (1965:447)
<i>C. thailandica</i>	nd	1.25	Poulsen (1965:444)
<i>C. variabilis</i>	1.46–1.58	1.37–1.40	Kornicker (1970b:19; herein)
<i>C. verrucosa</i>	nd	1.56	Poulsen (1965:440)

Cylindroleberis variabilis Kornicker, 1970

FIGURES 61-64

Cylindroleberis variabilis Kornicker, 1970b:19, figs. 13, 14.
Cylindroleberis sp. Kornicker, 1987b:217.

HOLOTYPE.—USNM 125625, adult female on 3 slides and in alcohol.

TYPE LOCALITY.—Sacol Island, Zamboanga Province, Philippines.

MATERIAL.—Enewetak lagoon: Plankton trap 7, night, coral rubble substrate: USNM 158320, 1 adult male on 2 slides and in alcohol; Composite sample: USNM 158319, 1 A-2 female in alcohol. Midwater trawl off Bokandretok Island: USNM 193633, 1 A-1 female on slide and in alcohol; USNM 193639, 1 adult male in alcohol.

DISTRIBUTION.—Philippine Islands; Enewetak Atoll.

REMARKS.—A supplementary description of the adult female of the species is presented below based on restudy of the holotype and a paratype (USNM 125626) from the Philippine Islands. The adult male and the A-1 and A-2 females are described for the first time based on specimens from Enewetak.

SUPPLEMENTARY DESCRIPTION OF ADULT FEMALE (Figure 61*a-c*).—Paratype: Surface of carapace with numerous pores giving illusion of hairs. Processes on infold of caudal process between list and posterior edge of valve scoop-like and drawn out giving illusion of flap-like bristles.

Mandible: Holotype: Short spinous bristle between b- and c-bristles of 2nd endopodial joint mentioned by Kornicker (1970b:22) is a cleaning bristle with base on medial side of ventral margin.

Maxilla: Holotype: Small proximal lateral bristle present at midheight of basale, and small distal lateral bristle present near ventral margin of basale proximal to long terminal bristle (Figure 61*a*) (These 2 bristles are in addition to bristles of basale illustrated by Kornicker (1970b, fig. 14*a*)).

Sixth Limb: Holotype: Small proximal bristle present on medial side near midwidth of limb (bristle not mentioned by Kornicker (1970b:22) (Only anterior of posteroventral bristles shown on skirt of illustrated limb (Figure 61*b*)).

Lateral Eye (Figure 61*c*): Paratype: With 19 ommatidia and black pigment between ommatidia.

DESCRIPTION OF ADULT MALE (Figures 61*d-i*).—Carapace elongate with straight parallel ventral and dorsal margins (Figure 61*d,e*); inner end of incisur at, or slightly ventral to, valve midheight; posterodorsal corner of valve rounded; usual vertical row of hairs present near posterior end of each valve. Outer surface smooth but with numerous minute pores. Ventral edge of incisur slightly undulate and with narrow outer rib joining valve edge at anteroventral corner of valve (Figure 61*g*); margin of each valve extends past edge of valve at posteroventral corner (on Figure 61*h,i* outer surface of valve indicated by stippling).

Infold: Rostral infold dorsal to ascending list with 43 bristles

of which about 13 are longer (mostly near tip of rostrum); 5 long bristles forming horizontal row posterior to ascending list (Figure 61*f*); anteroventral infold with about 30 bristles of which 11 are longer and form row just within valve edge. Narrow list with anterior end on anteroventral infold (close to inner end of incisur) continues along ventral infold and forms outer edge of broad list along posteroventral and posterior infold. Ventral infold with 10 widely spaced bristles between list and valve edge (posterior 2 bristles longer than others); posteroventral infold with 4 or 5 bristles (at infold midwidth) between broad list and valve edge (Figure 61*h*). Broad list on posteroventral and posterior infold with about 20 broad flap-like bristles and about 15 small bristles (generally only 1 bristle between adjacent flap-like bristles) (Figure 61*h,i*). Posterior infold between broad list and posterior end of valve with 5 scoop-like processes (Figure 61*h,i*).

Selvage: Lamellar prolongation of selvage absent along ventral edge of incisur.

Carapace Size: USNM 158320, length 1.58 mm, height 0.73 mm; USNM 193639, length 1.46 mm, height 0.73 mm.

First Antenna (Figures 61*d, 62a,b*): 1st joint bare. 2nd joint with stout dorsal bristle with long anterior spines, and slender lateral bristle with base dorsal to joint midheight. 3rd joint triangular with concave medial and oblique lateral suture separating it from 4th joint; short ventral margin with minute bristle; long dorsal margin with 6 bristles (2 proximal bristles with long proximal and short distal anterior spines, followed by 1 shorter bristle with short marginal spines, then 1 longer bristle with long proximal and short distal anterior spines, and a pair of bristles (lateral bare, medial with long proximal spines)). 4th joint with short dorsal margin with long bristle with minute indistinct marginal spines (base of bristle on medial side of joint), and longer ventral margin with 2 slender bare terminal bristles (lateral about twice length of medial). 5th joint short (longer on medial side) with stout sensory bristle with abundant thin filaments (few filaments at tip only slightly stouter than others); suture separating 5th and 6th joints visible but indistinct. 6th joint with long undulate dorsal margin; 6th and 7th joints fused except near dorsal edge between bristle of 6th joint and a-claw of 7th joint where short sclerotized bar indicates boundary; boundary along ventral margin unclear, but either at sclerotized bar at about midlength of combined 6th and 7th joints or at small sclerotized bar close to base of c-bristle of 7th joint. 7th joint (Figure 62*b*): a-claw short, bare, with base on short pedestal; b-bristle about twice length of a-claw, with 5 marginal dorsal filaments; c-bristle very long (about 1½ times length of carapace (Figure 61*d*)), with 27 short marginal dorsal filaments. 8th joint (Figure 62*b*): d-bristle absent; e-bristle about same length as b-bristle, bare with blunt tip; f-bristle same length as c-bristle, with 25 short marginal ventral filaments; g-bristle about 1½ times length of b-bristle, with 4 marginal dorsal filaments. Thin, oblong, sclerotized, flange-like projection present lateral to bases of bristles of 8th joint (Figure 62*a*).

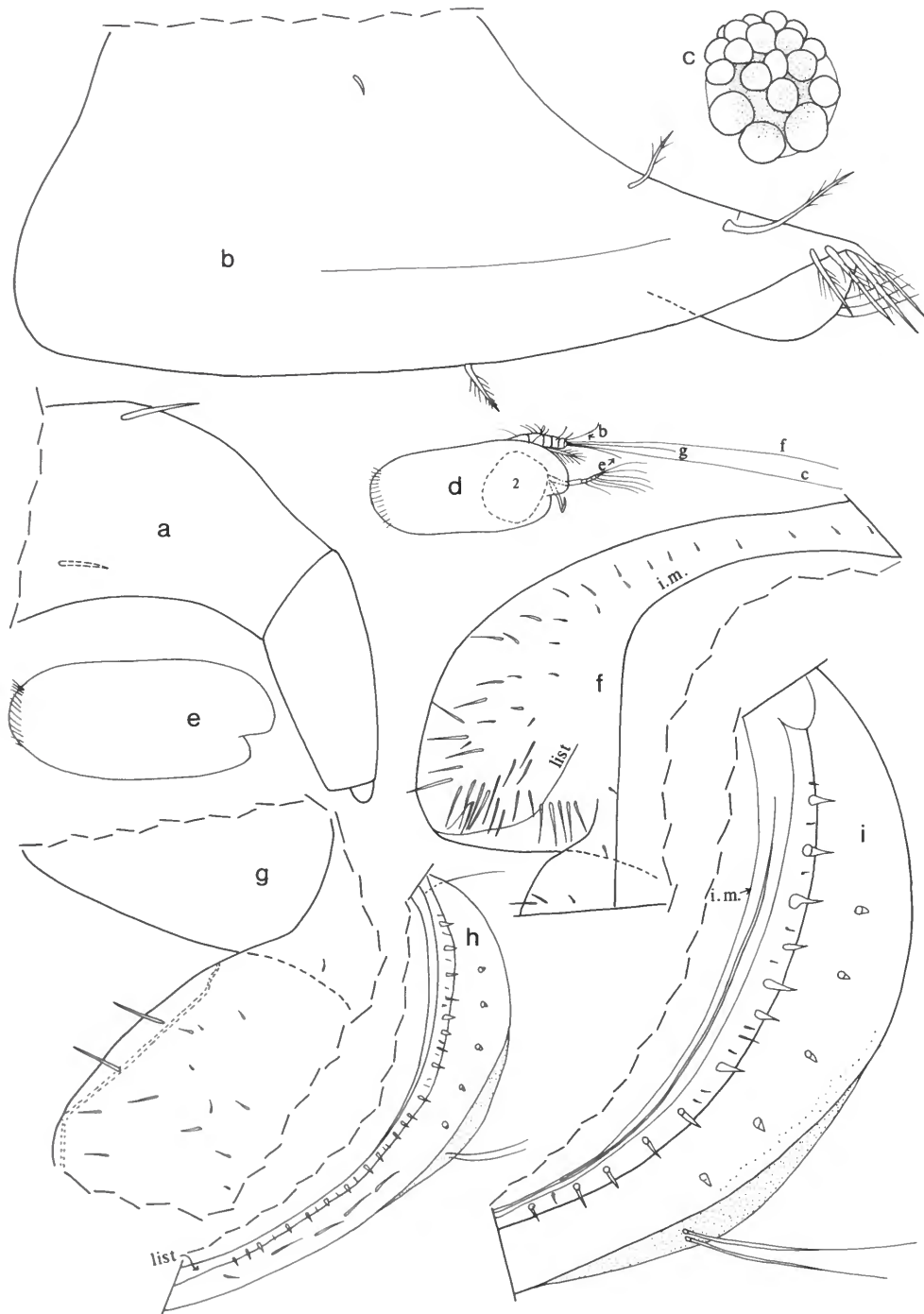


FIGURE 61.—*Cyindroleberis variabilis* Komicker. USNM 125625, holotype, adult female: *a*, medial view of distal part of basale of left maxilla showing small distal lateral bristle near ventral margin and distal dorsal bristle; *b*, medial view of left 6th limb (only anterior bristle of posteroventral bristles shown). USNM 125626, paratype, adult female: *c*, left lateral eye. USNM 158320, adult male: *d*, complete specimen showing projecting 1st and 2nd antennae; *e*, complete carapace from right side, length 1.58 mm. *f-i*, inner views of right valve: *f*, rostrum; *g*, incisur area (rostral bristles not shown); *h*, posterior end; *i*, detail from *h*.

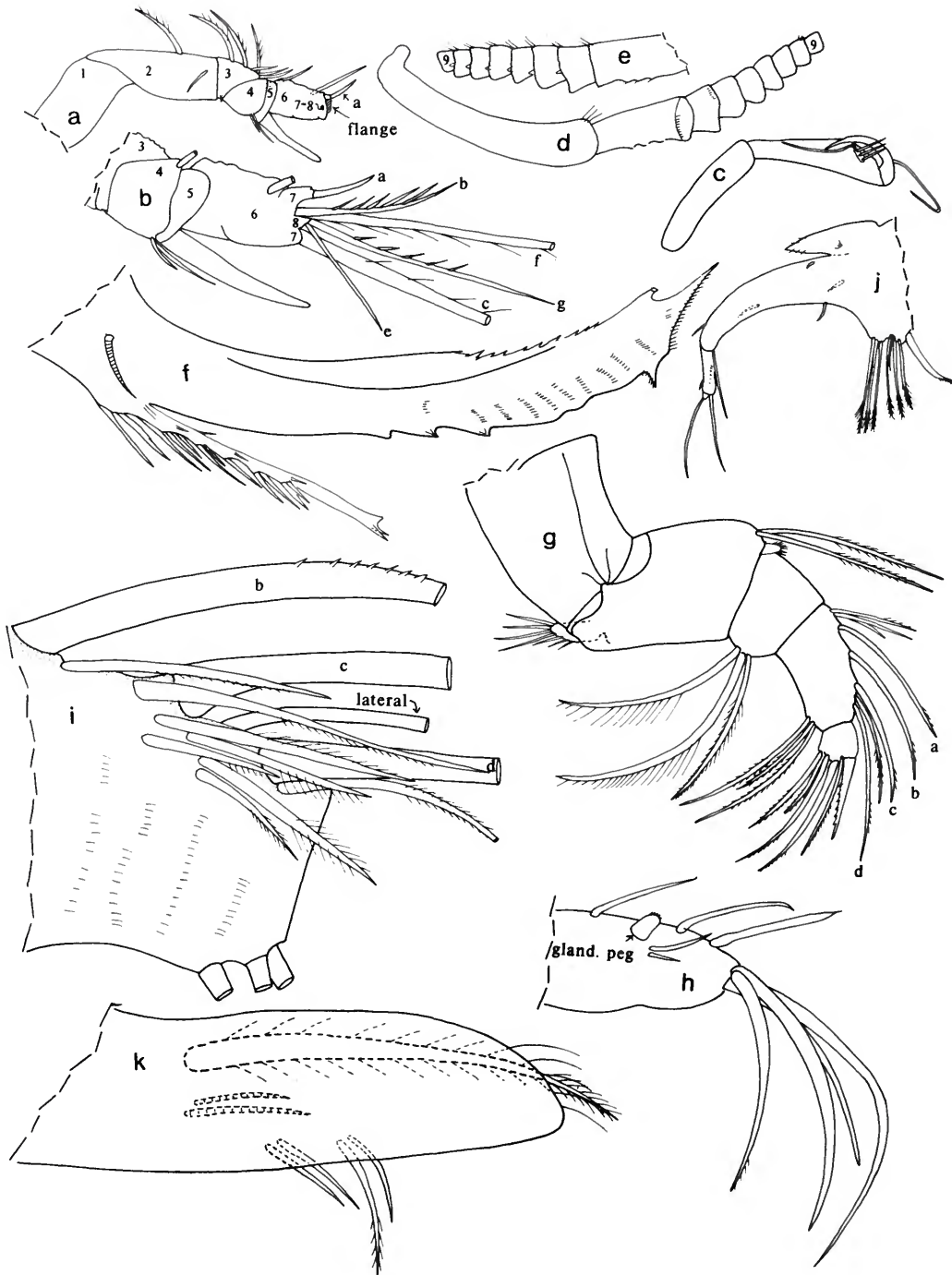


FIGURE 62.—*Cylindroleberis variabilis* Komicker, USNM 158320, adult male: a, lateral view of right 1st antenna (filaments of sensory bristles of 5th joint not shown; only a-bristle of joints 7 and 8 shown; short flange lateral to bases of bristles of 8th joint lined); b, medial view of distal end of left 1st antenna (filaments of sensory bristle of 5th joint not shown); c, lateral view of endopodite of right 2nd antenna; d, medial view of exopodite of right 2nd antenna (bristles not shown); e, lateral view of joints 2-9 of exopodite of right 2nd antenna (bristles not shown); f, medial view of coxale endite of right mandible; g, lateral view of right mandible (coxale endite and medial bristles of 2nd endopodial joint not shown); h, basale endite of right mandible; i, medial view of distal part of 2nd endopodial joint of left mandible; j, medial view of right maxilla; k, medial view of comb of left 5th limb.

Second Antenna: Protopodite without either spines or distal medial bristle. Endopodite 3-jointed (Figure 62c): 2nd joint with 3 medial bristles decreasing in length distally along joint (distal bristle $\frac{3}{4}$ length of proximal bristle); small protuberance present on medial side adjacent to base of proximal bristle. 3rd joint reflexed, with proximal bristle about $\frac{1}{4}$ longer than joint. In folded position, pointed tip of 3rd joint resting within furrow of 2nd joint (Figure 62c). Exopodite (Figure 62d,e): 1st joint with hairs but no distal medial bristle; bristle of 2nd joint about twice length of combined lengths of joints 2–9, with natatory hairs, no spines; joints 3–8 with long bristles with natatory hairs, no spines; 9th joint with 4 bristles (3 long, 1 short), all with natatory hairs, no spines; ventral margin of 2nd joint undulate with 3 low processes bearing minute spines (undulate margin not previously noted on members of subfamily); joints 3–8 with long hairs forming row in distal dorsal corner, and with small lateral spine (Figure 62d); joints 2 and 3 with few indistinct minute spines along distal medial margin; 9th joint without lateral spine. USNM 158320 with left limb missing.

Mandible (Figure 62f-i): Coxale endite (Figure 62f): small bristle at base of ventral branch; ventral branch with spines forming 6 closely spaced oblique rows; tip of branch with 2 ventral spines and sharp dorsal corner; ventral margin of dorsal branch with 3 pointed processes followed by 2 low rounded processes and short main spine; edge between main spine and terminal spine with short spines; terminal spine short with few hairs at base; dorsal bristle set back from terminal spine (only stump of bristle present on both limbs of USNM 158320); dorsal margin proximal to bristle serrate. Basale endite with 4 slender end-bristles (bare or with few indistinct short hairs), 3 slender bristles each with terminal spine, 2 dwarf bristles, and glandular peg (Figure 62h). Basale: ventral margin with proximal U-shaped depression (dashed in Figure 62g); dorsal margin with 2 long terminal bristles with indistinct marginal spines (Figure 62g). Exopodite short (about $\frac{1}{4}$ length of dorsal margin of 1st endopodial joint), hirsute terminally, with 2 short subterminal bristles (Figure 62g). Endopodite (Figure 62g,i): 1st endopodial joint with 3 spinous ventral bristles. 2nd joint: dorsal margin with 3 short slender proximal bristles (bare or with few indistinct marginal spines), stout a-, b-, c-, and d-bristles, all with anterior spines; medial side with 7 cleaning bristles (1 just distal to b-bristle, 1 just proximal to c-bristle, 2 adjacent to c- and d-bristles) and 1 long spinous bristle just distal to d-bristle; lateral surface with 1 long spinous bristle between c- and d-bristles but none between b- and c-bristles (not all bristles shown in Figure 62i); ventral margin with 3 spinous terminal bristles. 3rd endopodial joint with stout claw with ventral teeth, and 5 spinous bristles (including 1 medial bristle (with abundant short marginal spines) near ventral margin and shorter than claw, 1 lateral bristle (with distal dorsal spines) just ventral to claw and slightly longer, and 3 stout terminal bristles (ventral with abundant spines, others with fewer and less distinct spines)) (Figure 62g).

Maxilla (Figure 62j): Epipodite fairly short, not quite reaching middle of dorsal margin of basale, triangular with pointed tip with few hairs. Endite I with 1 short and 3 long bristles; endite II with 3 long bristles. Basale: dorsal margin with 2 small bristles (1 proximal, 1 distal) with bases on medial surface (proximal bristle with tip broken off on both limbs of USNM 158320); ventral margin with 1 short proximal bristle (not pointing posteriorly), 1 small bristle near ventral margin at joint midlength, and long terminal bristle; lateral side with 1 small proximal bristle near joint midheight; dorsal hairs few, indistinct. Endopodite: 1st joint spinous, with small alpha-bristle and long beta-bristle; 2nd joint with terminal bristle slightly shorter than beta-bristle of 1st joint.

Fifth Limb: Epipodite with 61 bristles. Comb with stout spinous exopodial bristle extending past end of comb, 2 slender bristles just ventral to base of stout bristle, and 2 pairs of bristles near ventral margin (Figure 62k).

Sixth Limb (Figure 63a): Medial surface with 2 minute proximal bristles near midwidth (obscured on illustrated left limb; 2 bristles shown are from right limb); proximal and distal endites each with single bristle with long marginal hairs. Skirt with 4 spinous bristles at anterior end and 15 bristles along ventral and posteroventral margins (9 short bristles with long proximal and short distal spines followed by 6 longer plumose bristles). Lateral flap with hairs along anterior end; limb hirsute.

Seventh Limb (Figure 63b): Each limb with 6 bristles in proximal group (3 on each side), each with 2–4 bells, and 6 bristles in distal group (2 bristles on ring proximal to terminus (1 on each side), each with 3 bells, and 4 bristles on terminus (2 on each side), each with 2–4 bells). Terminus with opposing combs, each with 9–11 spinous teeth (whether or not teeth bear spines not resolved).

Furca (Figure 63c): Each lamella with 9 articulated claws decreasing in length posteriorly along lamella; posterior 3 claws slender but none bent posteriorly; claws 1–5 with minute teeth along posterior edges (teeth along each claw about same length); claws 1–4 with minute distal spines along anterior edge.

Bellonci Organ (Figure 63d): Elongate, broadening at midlength, tip coiled (may be aberration).

Eyes (Figure 63d): Lateral eye unpigmented, with 19 ommatidia (USNM 193639). USNM 158320 with both lateral eyes fragmented and with only 6 amber-colored ommatidia remaining in left eye (Figure 63d) and none in right eye. Medial eye bare, unpigmented, about same size or slightly larger than lateral eye.

Upper Lip (Figure 63e): Paired lobes, each with 5 long anterior hairs and numerous short hairs, no spines.

Genitalia (Figure 63f): Small, each limb comprising 1 lobe with 2 or 3 bristles and 1 bare lobe.

Posterior of Body (Figure 63c): Evenly rounded; short segment dorsal to dorsal end of girdle with long spines.

Y-Sclerite (Figure 63c): Typical for subfamily.

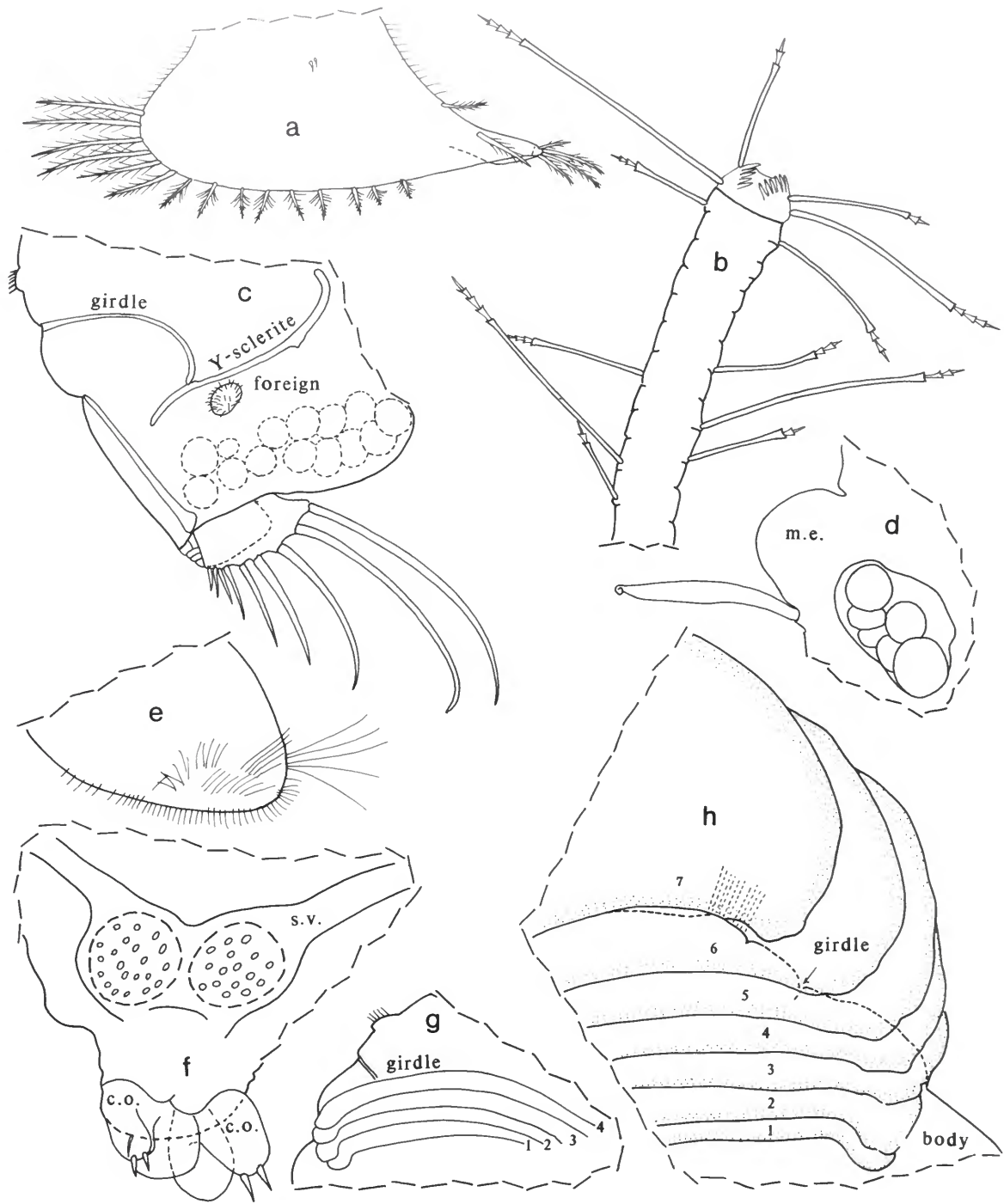


FIGURE 63.—*Cylindroleberis variabilis* Komicker, USNM 158320, adult male: *a*, medial view of left 6th limb; *b*, left 7th limb; *c*, posterior of body from right side showing right lamella of furca, internal sclerites, fuzzy foreign globular body, and internal globular bodies (dashed), possibly bacteria; *d*, left lateral eye, medial eye and Bellonci organ; *e*, right lobe of upper lip, anterior to right; *f*, anterior or posterior view of copulatory organs and vas deferens; *g*, posterodorsal corner of body from right side showing marginal spines and 4 of 7 gills; *h*, posterior of body from left side showing distal ends of gills.

Gills (Figure 63g,h): Well developed, 7 on each side.

REMARKS.—USNM 158320 is infested with globular bodies appearing opaque and white in reflected light and transparent and amber colored in transmitted light, possibly bacteria. Attached to the outer surface of the body as well as inside the carapace are additional globular bodies covered with small spines; these also may be bacteria. Internal globular bodies and 1 exterior fuzzy body are shown in Figure 63c.

DESCRIPTION OF A-2 FEMALE.—Carapace elongate with slightly convex ventral and dorsal margins, posterior evenly rounded; inner end of incisur at valve midheight; unlike adult male, margin of valve at posteroventral corner not overhanging valve.

Carapace Size: USNM 158319, length 0.88 mm, height 0.48 mm.

First Antenna: Both limbs missing from specimen.

Second Antenna: Protopodite bare. Endopodite 3-jointed with terminal filament. Exopodite: bristle of 2nd joint bare; joint 9 with lateral spine and 3 bristles (1 long, 2 short); joints 5–8 with basal spines (spine on joint 8 about half length of joint 9).

Mandible: Basale endite with 4 end bristles, 1 triaenid bristle, 2 dwarf bristles, and glandular peg. Basale with 2 long terminal dorsal bristles. Exopodite small, about $\frac{1}{4}$ length of dorsal margin of 1st endopodial joint, hirsute distally, and with 2 small bristles. Endopodite: 1st joint with 3 long ventral bristles. 2nd joint: ventral margin with 3 terminal bristles; dorsal margin with stout a-, b-, c-, and d-bristles, without bristles proximal to a-bristle; medial surface with 2 cleaning bristles adjacent to c-bristle, and 1 longer bristle distal to d-bristle; lateral side with long bristle between c- and d-bristles. 3rd joint with straight claw and 5 bristles.

Sixth Limb: Bristle of lower endite about twice length of bristle of upper endite, both slender and with spines. Anterior tip of skirt with 3 spinous bristles; posteroventral margin with 5 short spinous bristles followed by 3 longer plumose bristles; presence of minute proximal bristles on medial surface not determined.

Seventh Limb: With 4 tapering bristles in proximal group (2 on each side), each with 1 or 2 bells, and 4 tapering bristles in distal group (2 on each side), each with 1 or 2 bells. Distal group comprises 2 bristles on terminal segment, 1 bristle on subterminal ring just proximal to terminal segment, and 1 bristle on ring just proximal to subterminal ring. Terminus with opposing combs, each with few teeth.

Furca: Each lamella with 7 claws; last claw bristle-like, bent backward as well as upward and lying along lateral side of lamella.

Eyes and Bellonci Organ: Missing from specimen.

Upper Lip: Similar to that of adult male.

Posterior of Body: Posterodorsal corner evenly rounded with small segment bearing long spines; margin hirsute ventral to dorsal end of girdle.

Y-Sclerite: Anterior end broad.

Gills: Well developed, 7 on each side.

DESCRIPTION OF A-1 FEMALE (Figure 64).—Carapace similar in shape to that of A-2 female (Figure 64a).

Infold: Infold of caudal process with 4 scoop-like processes between list and posterior shell margin.

Central Adductor Muscle Attachments (Figure 64a): Comprising about 7 oval attachments.

Carapace Size: USNM 193633, length 1.13 mm, height 0.55 mm.

First Antenna (Figure 64b): 1st joint bare. 2nd joint with spinous dorsal bristle and short lateral bristle. 3rd and 4th joints forming square; straight suture separating joints more strongly developed on lateral side. 3rd joint: short ventral margin with minute bristle; long dorsal margin with 6 bristles (proximal with many long spines, 2nd–4th shorter and with few long spines, 5th and 6th paired (lateral longer and with short spines; medial with long spines)). 4th joint: ventral margin with 2 bare terminal bristles (lateral about twice length of medial); dorsal margin with long bare terminal bristle with base on medial side. Sensory bristle of 5th joint with short proximal filament and 6 long terminal filaments, each with terminal papilla. 6th joint with bare medial bristle. 7th joint: a-claw shorter than bristle of 6th joint; b-bristle about $\frac{1}{3}$ longer than a-claw, with 3 distal marginal filaments (filaments and tip of stem with terminal papilla); c-bristle about $\frac{1}{3}$ longer than b-bristle, with 5 marginal filaments (filaments and tip of stem with terminal papilla). 8th joint: d-bristle absent; e-bristle about same length as b-bristle, bare with blunt tip; f-bristle bent dorsally, with 5 filaments (filaments and tip of stem with terminal papilla); g-bristle shorter than c-bristle, with 4 filaments (3 proximal, 1 distal) (filaments and tip of stem with terminal papilla).

Second Antenna: Protopodite bare. Endopodite 3-jointed with long terminal filament with blunt tip (Figure 64c). Exopodite: bristle of 2nd joint with ventral spines; bristles of joints 3–7 with proximal ventral spines and natatory hairs; 9th joint with 3 bristles (1 long with natatory hairs, 2 short); some joints with small basal spine.

Mandible: Basale: dorsal margin with 2 long bristles of same length but without midbristle. Exopodite about $\frac{1}{4}$ length of dorsal margin of 1st endopodial joint, with 2 small bristles. Endopodite: 1st joint with 3 long ventral bristles; dorsal margin of 2nd joint with 1 small proximal bristle, stout a-, b-, c-, and d-bristles (c-bristle stouter than others), and 1 lateral bristle between c- and d-bristles (medial bristles near dorsal margin not counted); ventral margin of 2nd joint with 3 terminal bristles; 3rd joint with stout straight dorsal claw and 5 bristles.

Maxilla and Fifth Limb: Not examined in detail but appearing similar to those of adult male.

Sixth Limb: Not examined in detail but with 4 bristles at anterior end of skirt.

Seventh Limb: Proximal group with 6 bristles (3 on each side), each tapering slightly distally and with 2 or 3 bells; terminal group with 6 tapering bristles (including 2 bristles on ring proximal to terminus (1 on each side, each with 2 bells), 4

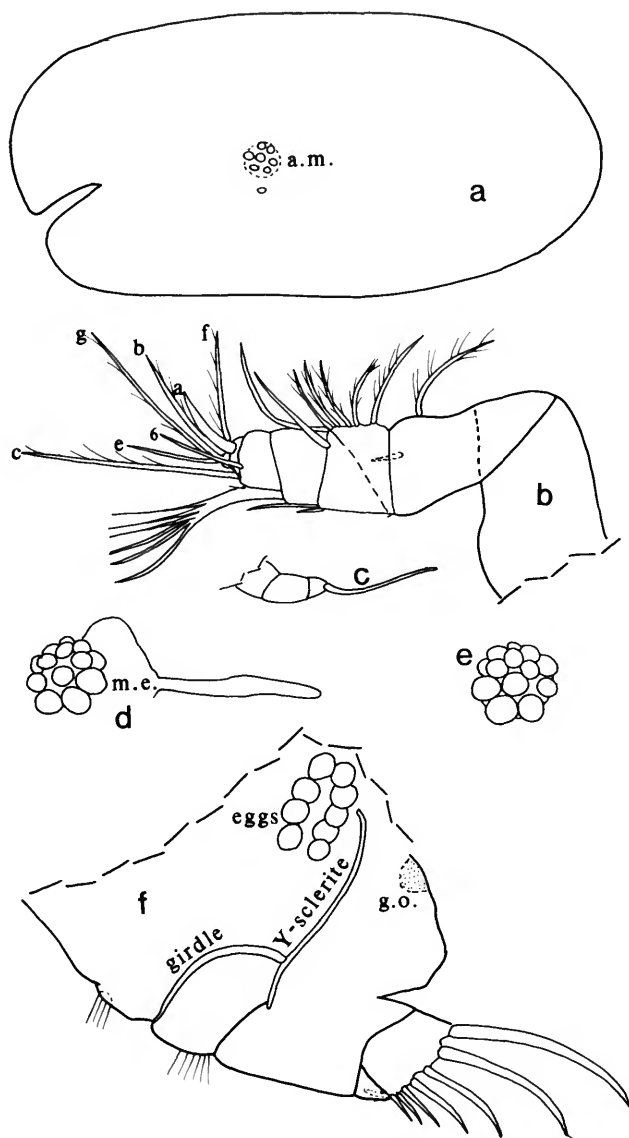


FIGURE 64.—*Cyindroleberis variabilis* Kornicker, USNM 193633, instar A-1 female: a, complete specimen from left side, length 1.13 mm; b, medial view of right 1st antenna; c, medial view of endopodite of right 2nd antenna; d, right lateral eye, medial eye and Bellonci organ; e, left lateral eye; f, posterior of body from right side showing internal eggs, anlage of genitalia (stippled), and right lamella of furca.

bristles on terminus (2 on each side, each with 1–3 bells)). Terminus with opposing combs, each with about 10 spinous teeth.

Furca (Figure 64f): Each lamella with 8 claws; last claw bristle-like, bent backward as well as upward and lying along lateral side of lamella.

Bellonci Organ (Figure 64d): Broad near midlength, tip rounded.

Eyes (Figure 64d,e): Lateral eye unpigmented, with 13 ommatidia. Medial eye unpigmented, about same size as lateral eye, bare.

Upper Lip: Paired lobes, with several long anterior hairs and abundant shorter and slenderer hairs, no spines.

Genitalia: Undeveloped, but small amber-colored sclerotized area in vicinity of genitalia may be anlage (Figure 64f).

Posterior of Body (Figure 64f): Margin ventral and dorsal to posterior end of girdle with spines.

Y-Sclerite (Figure 64f): Typical for subfamily.

Gills: Well developed, 7 on each side.

Eggs (Figure 64f): Small unextruded eggs within ovaries.

VARIABILITY.—The number of dorsal bristles at joint midlength on the basale of the mandible of this species is variable. The adult female holotype has 1 dorsal bristle at midlength on the left limb and none on the right, and an adult female paratype has no dorsal bristles at midlength on either limb (Kornicker, 1970b, table 5); the adult male and the A-1 and A-2 females from Enewetak have no dorsal bristles at midlength on either limb. Skogsberg (1920:513) stated that the basale of some specimens of *C. grimaldi* have 1 dorsal bristle at midlength on the left limb and 2 on the right, but that none were observed with 2 on both limbs. Skogsberg (1920:518) reported the absence of dorsal bristles at midlength on an A-1 male *C. grimaldi* var. *vicina*. The number of dwarf bristles on the basale endite of the mandible is also subject to intraspecific variability. Kornicker (1970b, table 5) observed 1 dwarf bristle on the basale endite of the holotype of *C. variabilis* and 2 on a paratype, both adult females; the adult male and A-2 female from Enewetak have 2 dwarf bristles. Skogsberg (1920:518) reported 3 dwarf bristles on the right limb of the A-1 male *C. grimaldi* var. *vicina*, and only 2 on the adult male and female *C. grimaldi*; he attributed the 3 bristles to “accidental variation.”

REMARKS.—The lateral eyes of specimens of *C. variabilis* from Enewetak, unlike those from the Philippine Islands, are without black pigment. This is attributed herein to the pigment not being preserved in the Enewetak specimens. The furca of the adult females from the Philippine Islands have 10 claws on each lamella of the furca compared to 9 on the adult male described herein. The difference is attributed to either sexual dimorphism or intraspecific variability. Further study with additional material might show that the Enewetak and Philippine specimens are not conspecific.

Heptonema Cohen and Kornicker, 1975

Heptonema Poulsen, 1962:328 [nomen nudum].

Heptonema Cohen and Kornicker, 1975:23 [designated type species].

TYPE SPECIES.—*Heptonema serrata* Poulsen, 1965:329, subsequent designation by Cohen and Kornicker (1975:23).

COMPOSITION.—Including the new species described herein,

4 species are referred to this genus: *Heptonema serratum* Poulsen, 1965, *H. keiensis* Poulsen, 1965, *H. latum* Kornicker, 1986c, and *H. homelix*, new species.

DISTRIBUTION.—Atlantic continental shelf off North America; West Indies; East Indies; and Enewetak Atoll. Known depth range 5–210 m.

Key to the Species of *Heptonema*

1. 1st antenna with 6 dorsal bristles on 3rd joint and 2 ventral bristles on 4th joint; mandible with 1 bristle at midlength on dorsal margin of basale; 6th limb without bristles on posteroventral margin of skirt* 2
1st antenna with 4 or 5 dorsal bristles on 3rd joint and 1 ventral bristle on 4th joint; mandible without bristle at midlength on dorsal margin of basale; 6th limb with many posteroventral bristles on skirt 3
2. 7th limb with 6 proximal bristles (3 on each side) *H. keiensis*
7th limb with 4 proximal bristles (3 on 1 side, 1 on other) *H. latum*
3. 1st antenna with 4 dorsal bristles on 3rd joint *H. serratum*
1st antenna with 5 dorsal bristles on 3rd joint *H. homelix*, new species

*Poulsen (1965:337) interpreted the absence of posteroventral bristles on the skirt of the 6th limb of the juvenile *H. keiensis* that he described to be a juvenile character; however, the presence of bristles on the 7th limb indicates that the specimen is at least a stage IV instar; on a stage IV instar bristles are present on the posteroventral margin of the skirt if they are present on the adult.

Heptonema homelix, new species

FIGURES 65–67

ETYMOLOGY.—From the Greek *homelix* (of the same age).

HOLOTYPE.—USNM 193637, adult female on slide and in alcohol.

TYPE LOCALITY.—Enewetak lagoon (from midwater trawl off Bokandretok Island).

PARATYPE.—Enewetak lagoon: Sta A, plankton trap 6, night, coral reef substrate: USNM 193646, 1 A-2 male on 2 slides and in alcohol.

DISTRIBUTION.—Enewetak Atoll.

DESCRIPTION OF ADULT FEMALE (Figures 65, 66).—Carapace elongate with parallel ventral and dorsal margins; anterior and posterior margins evenly rounded; incisor just ventral to valve midheight (Figure 65a); indistinct thin line present with dorsal end near inner end of incisor and ventral end intersecting anteroventral valve margin (Figure 65b). Minute pores penetrating through shell abundant (representative pores shown in Figure 65b). Long bristles sparsely distributed on valve surface (Figure 65b).

Infold: Infold dorsal to incisor with 5 bristles along rostral list, 11 bristles between list and incisor, and about 40 bristles dorsal to list, most on outer half of infold (Figure 65c); about 35 bristles on broad anteroventral infold; about 20 bristles along ventral infold to point opposite lowermost hyaline flap-like

bristle on posterior list. List beginning at inner margin of infold just ventral to inner end of incisor, extending along ventral infold and continuing on posterior infold where it broadens; posterior list with about 20 broad transparent flap-like bristles and about 34 minute bristles (1–3 bristles between each pair of flap-like bristles) (Figure 65d); about 15 small bristles but no processes between posterior list and posterior valve margin. Anterodorsal vestment proximal to infold with long hairs (Figure 65c). Anteroventral list with transparent lamellar prolongation with smooth outer edge (Figure 65c). Selvage without lamellar prolongation.

Central Adductor Muscle Attachments (Figure 65a,e): Consisting of about 15 individual ovoid attachments.

Carapace Size: USNM 193637, length 1.11 mm, height 0.66 mm.

First Antenna (Figure 65f): 1st joint with lateral spines forming rows. 2nd joint with spines forming lateral rows extending onto dorsal margin, 1 long dorsal bristle (with long spines) and 1 short bare lateral bristle. 3rd and 4th joints short, fused. 3rd joint with 5 dorsal bristles (proximal bristle single and with long spines, following 2 paired and with long spines, next 2 paired (lateral with long spines, medial with short spines)) and 1 small ventral bristle. 4th joint with deeply concave distal margin, 1 long dorsal bristle with short spines, and 1 short bare ventral bristle. Sensory bristle of 5th joint with short stout stem and 7 long terminal filaments, each with

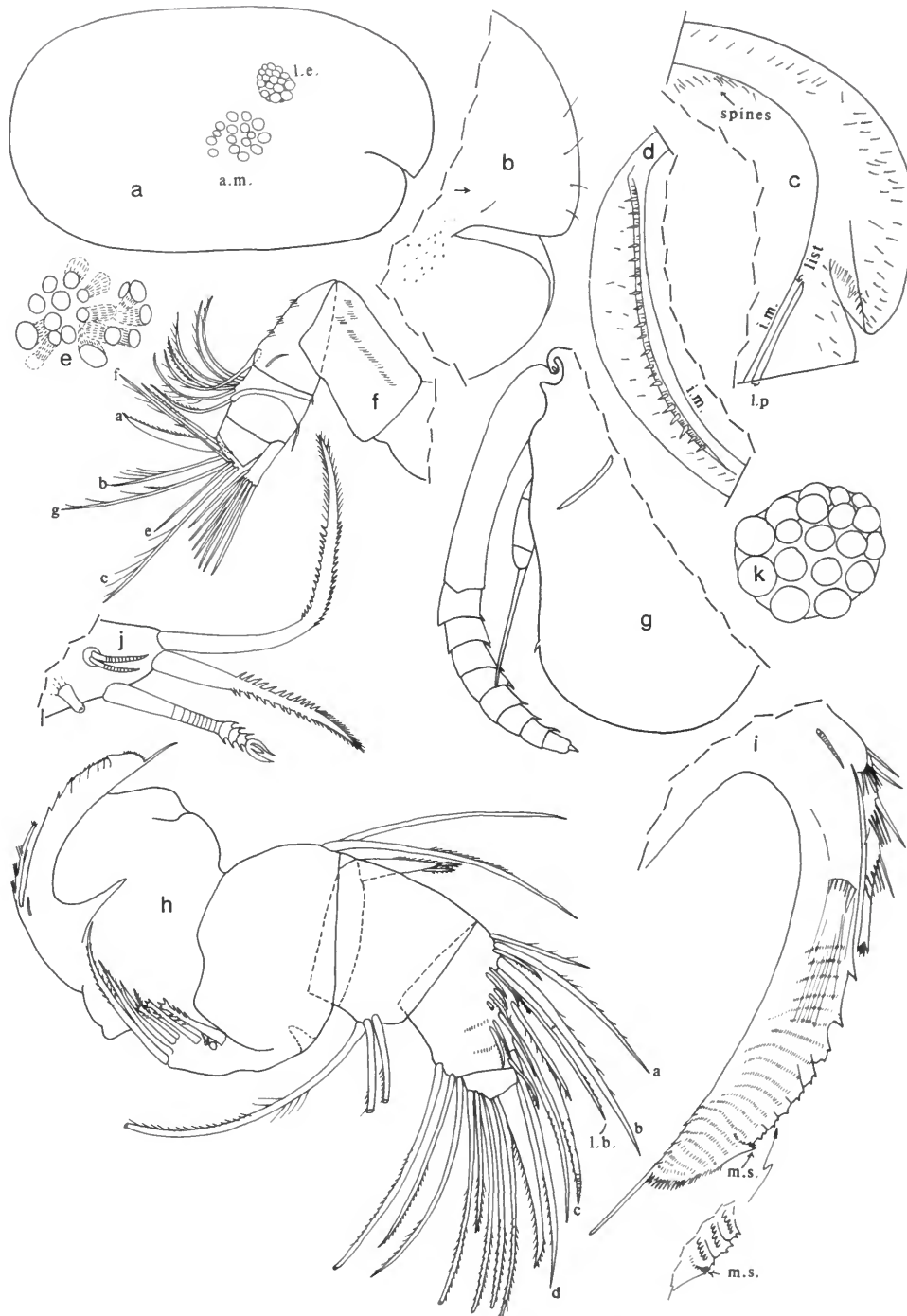


FIGURE 65.—*Heptonema homelix*, new species, USNM 193637, holotype, adult female: *a*, complete specimen from right side, length 1.11 mm; *b*, anterior of right valve with representative surface pores indicated by dots; *c*, inner view of anterior of left valve; *d*, inner view of posterior of left valve; *e*, ends of central adductor muscles projecting from left side of body, anterior to left; *f*, lateral view of left 1st antenna; *g*, lateral view of left 2nd antenna (exopodal bristles not shown); *h*, medial view of left mandible; *i*, detail of coxale endite shown in *h*; *j*, medial view of basale endite of right mandible; *k*, left lateral eye.

terminal papilla (not shown). Medial bristle of 6th joint long and with short spines. 7th joint: a-claw about same length as bristle of 6th joint, bent dorsally, and with abundant minute teeth along dorsal concave margin; b-bristle slightly longer than a-claw, with 4 distal marginal filaments (filaments and tip of stem with terminal papilla); c-bristle almost twice length of a-claw, with 5 marginal filaments (filaments and stem with terminal papilla). 8th joint: d-bristle absent; e-bristle about same length as a-claw, bare with minute terminal papilla; f-bristle bent dorsally, about $\frac{3}{4}$ length of c-bristle, with 4 marginal filaments (filaments and stem with terminal papilla); g-bristle about same length as c-bristle, with 4 marginal filaments (filaments and stem with terminal papilla). Terminal papillae of bristles of 5th, 7th, and 8th joints not shown in Figure 65f.

Second Antenna (Figure 65g): Protopodite with small distomedial bristle and spines along dorsal edge; left limb only with small tooth proximally on ventral margin (aberrant?) (Figure 65g). Endopodite 3-jointed with long terminal filament. Exopodite: long 1st joint bare; bristle of 2nd joint reaching 9th joint, with slender ventral spines, no natatory hairs; bristles of joints 3–7 with few small slender spines near midlength and natatory hairs; bristle of 8th joint with only natatory hairs; 9th joint with 3 bristles (1 long and 1 medium with natatory hairs, 1 short); joints 2–8 with slender basal spines; 9th joint with lateral spine; joints 3–6 with minute spines forming distal row (several spines along inner corner stouter than others).

Mandible (Figure 65h–j): Coxale endite (Figure 65i): Ventral branch: with 3 oblique rows of spines and 2 minute teeth at tip (1 ventral, 1 dorsal) with 3 slender spines between them. Dorsal branch: ventral margin with 2 proximal single triangular teeth (each with small lateral tooth on proximal edge), followed by 6 low teeth with 2 or 3 cusps, and small main spine with minute spines along proximal edge; margin between main spine and tip of branch spinous; terminal spine not observed, either minute or absent; long nonarticulated bristle at dorsal corner of tip; indistinct dorsal margin of branch with few serrations near tip; medial surface of branch with long spines forming transverse proximal row followed by minute spines forming about 20 transverse rows; lateral surface of branch with minute spines forming transverse rows and 5 or 6 small knob-like processes forming rows on ventral teeth (detail in Figure 65i). Small ringed medial bristle present near base of ventral branch. Basale endite with 4 spinous end bristles, 3 triaenid bristles (with 3 pairs of teeth excluding terminal pair), and 2 dwarf bristles near glandular peg (Figure 65j). Basale (Figure 65h): dorsal margin with 2 long terminal bristles and no bristle at midlength; ventral margin as well as medial and lateral surfaces bare; U-shaped boss for attached muscles near midlength of ventral margin (dashed in Figure 65h). Exopodite $\frac{2}{3}$ – $\frac{3}{4}$ length of dorsal margin of 1st endopodial joint, hirsute with 2 short hirsute subterminal bristles. 1st endopodial joint with 3 long ventral bristles (2 with both long and short marginal

spines, 1 (shortest) with only short spines). 2nd endopodial joint: ventral margin with 3 long terminal bristles with short marginal spines; dorsal margin with small proximal bristle (base slightly on medial side) and stout spinous a-, b-, c-, and d-bristles (c-bristle much stouter than others and ringed only near tip); lateral surface with long spinous bristle (same length as a-bristle) between b- and c-bristles, and long spinous bristle between c- and d-bristles; medial surface with minute spines forming few distal transverse rows, 9 or 10 cleaning bristles (1 short near base of a-bristle, 1 or 2 short near base of b-bristle, 3 short forming oblique row midway between b- and c-bristles, 4 longer forming oblique row just proximal to c-bristle), and 1 short slender spinous bristle just distal to d-bristle (not all marginal spines shown on bristles in Figure 65h). End joint with dorsal claw (with abundant long spines on ventral margin and 5 or 6 minute teeth at tip of dorsal margin) and 5 spinous bristles (including 1 bristle (medial) shorter than others).

Maxilla (Figure 66a): Epipodite with pointed tip reaching to about midlength of dorsal margin of basale, with few distal hairs. Endite I with 1 short and 2 long bristles; endite II with 3 long bristles. Basale: lateral side with 1 proximal bristle (with terminal papilla) near midheight; medial side with 1 proximal bristle (with terminal papilla) near midheight; dorsal margin with 1 short distal bristle; ventral margin with 1 backward pointing proximal bristle, 1 minute distal bristle, and 1 long spinous terminal bristle. Endopodite: 1st joint with short alpha-bristle and very long beta-bristle; 2nd joint with terminal bristle shorter than beta-bristle of 1st joint. Medial side of basale with transparent spinous velum overlapping proximal part of 1st endopodial joint (foreign substance?). (Because of debris it could not be ascertained whether the beta-bristle and the terminal bristle of the 2nd endopodial joint bear marginal hairs.)

Fifth Limb (Figure 66b): Comb with stout spinous exopodial bristle reaching past end of comb, 2 small bristles just ventral to base of stout bristle, and 2 pairs of bristles close to ventral margin; 2 additional lateral bristles present almost on ventral margin near anterior end of comb; anterior margin of comb with long hairs dorsal to marginal bristles; ventral margin with lateral spines forming row extending past margin, and 25 spinous bristles.

Sixth Limb (Figure 66c): Minute medial bristle present in proximal anterior corner; anterior margin hirsute, with upper and lower endites indicated by minute suture, each with medial bristle (bristle of lower endite longer). Lateral flap hirsute but without bristles; anterior corner of skirt with 2 short bristles; posterior half of ventral margin of skirt with 11–13 short spinous bristles; posterior of limb hirsute, straight; posteroventral corner angular; medial side with long hairs along anterior and ventral margins, and minute spines forming proximal rows.

Seventh Limb (Figure 66d): Each limb with 6 proximal bristles (3 on each side) and 6 distal bristles (3 on each side); bristles with 2–4 bells. Terminus with opposing combs, each

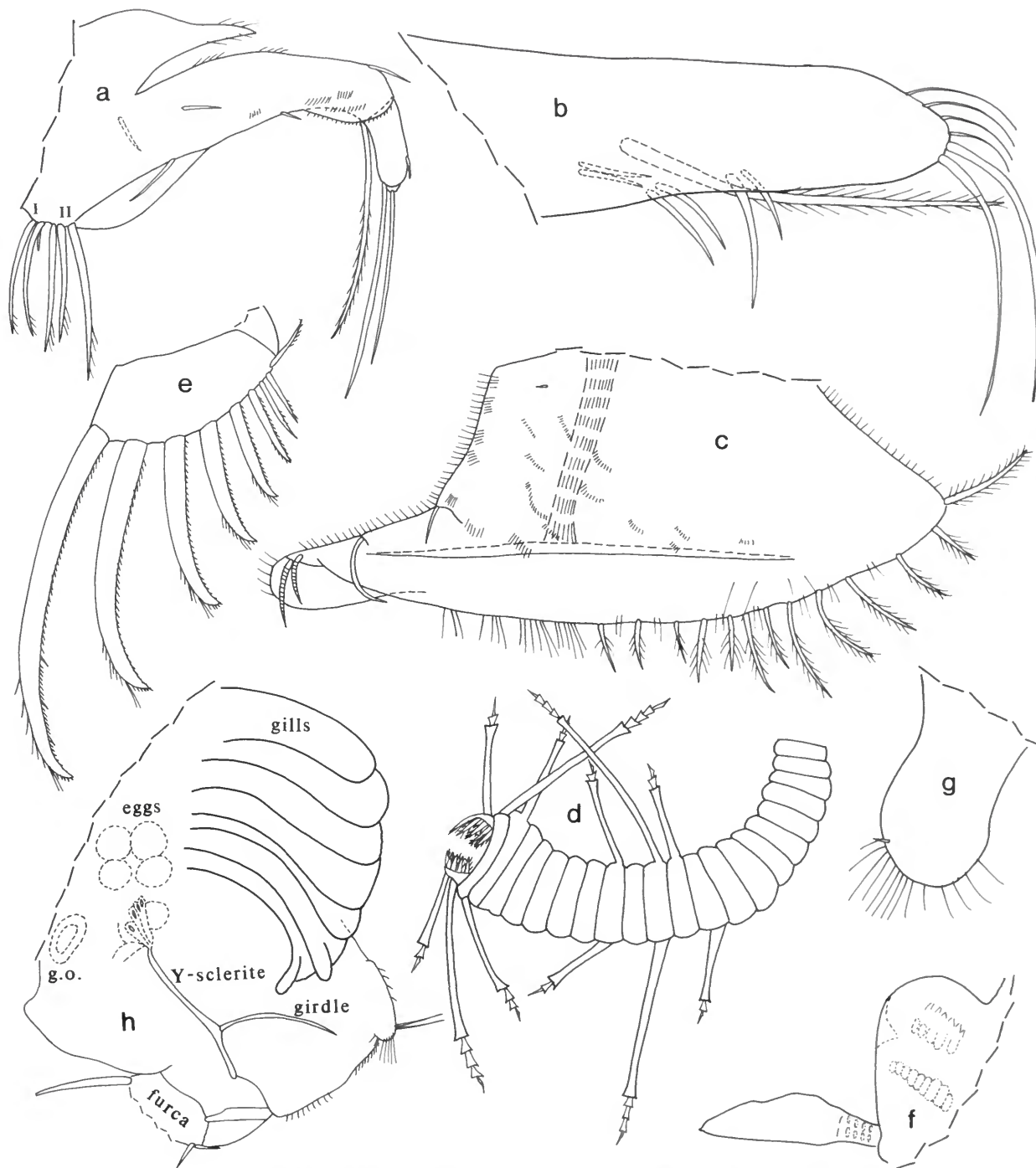


FIGURE 66.—*Heptonema homelix*, new species, USNM 193637, holotype, adult female: *a*, medial view of left maxilla; *b*, medial view of comb of left 5th limb (anterior end with 4 hairs and 2 long bristles); *c*, medial view of right 6th limb; *d*, 7th limb; *e*, left lamella of furca; *f*, medial eye and Bellonci organ; *g*, left lobe of upper lip, anterior to left; *h*, posterior of body from left side showing gills, unextruded eggs, genitalia, part of furca, and internal sclerites.

with 9 or 10 spinous teeth.

Furca (Figure 66e,h): Each lamella with 9 claws, last claw bent backward; tips of claws 1–6 curved slightly backward; claws 1–7 or 8 with teeth along posterior edge; claw 1 with 3 of the distal teeth longer than others, otherwise teeth similar in size (not arranged in sets of varying sizes); teeth of claws 1–3 and possibly others forming medial and lateral row along posterior edges of claws; claw 9 with few teeth along anterior margin; anterior margins of claws 1–7 with distal spines, minute terminal teeth, and few subterminal long straight hairs; ventral edge of lamella immediately following 9th claw bare; right lamella anterior to left by width of claw 1 at base.

Bellonci Organ (Figure 66f): Proximal part narrow with about 5 internal segments (segments not reflected by surface sutures); distal part broad proximal to organ midlength, then tapering to narrow rounded tip with minute pointed terminal process.

Eyes: Medial eye unpigmented, bare (Figure 66f). Lateral eye about same size or slightly larger than medial eye, with 18 amber-colored ommatidia; without pigment between ommatidia (Figure 65a,k).

Upper Lip (Figure 66g): Each lobe with long hairs and minute slender anterior spine.

Genitalia (Figure 66h): Oval amber-colored structure on each side of body anterior to furca.

Posterior of Body (Figure 66h): With hairs and spines; posterodorsal corner with rounded bulge with long spines.

Y-Sclerite (Figure 66h): Unbranched, typical for subfamily.

Gills (Figure 66h): Well developed, 7 on each side.

Eggs (Figure 66h): USNM 193637 with several unextruded eggs.

DESCRIPTION OF A-2 OR A-3 MALE (Figure 67).—Carapace with straight ventral margin and convex dorsal margin; incisur just ventral to valve midheight (Figure 67a,b).

Infold: Not examined.

Carapace Size: USNM 193646, length 0.75 mm, height 0.43 mm.

First Antenna (Figure 67c,n): 1st joint with lateral spines forming rows in dorsal half, and medial spines forming rows in both ventral and dorsal halves. 2nd joint: dorsal margin with spines forming rows and 1 long spinous recurved bristle; lateral side with short spines forming row along distal margin and short spinous bristle; medial side with spines forming rows. 3rd joint short, triangular, with well-defined distal margin; short ventral margin with small bristle; dorsal margin with 4 bristles (2 single proximal with long proximal and short distal spines, 2 paired distal (lateral with long proximal and short distal spines, medial with only short spines)). 4th joint short, concave, merging near midwidth with distal margin of 3rd joint, suture between 4th and 5th joints deeply concave but weakly defined (defined best on lateral side); dorsal margin with stout recurved bristle with short spines; ventral margin with short ringed bristle. Sensory bristle of long 5th joint stout, with 6 long terminal filaments (1 less than on adult female)

with minute papilla at tip. Minute 6th joint fused to 5th, with long spinous medial bristle. 7th joint: a-claw about same length as bristle of 6th joint, with abundant spines along dorsal margin; b-bristle longer than a-claw, with 3 long marginal filaments (filaments and stem with minute terminal papilla); c-bristle about twice length of a-claw, with 5 marginal filaments (filaments and stem with terminal papilla) (c-bristle broken off illustrated limb). 8th joint: d-bristle minute, indistinct; e-bristle about same length as a-claw, bare with minute terminal papilla; f-bristle bent dorsally, with 4 marginal filaments (filaments and stem with terminal papilla); g-bristle slightly shorter than c-bristle, with 4 marginal filaments (filaments and stem with terminal papilla).

Second Antenna (Figure 67d): Protopodite with spines forming rows along distal dorsal margin and small distal medial bristle. Endopodite 3-jointed: 1st joint short, bare; 2nd joint longer than 1st and with poorly defined short distal bristle on lateral side; 3rd joint slender, elongate, with rounded bare tip and long proximal filament with minute terminal papilla. Exopodite: 1st joint long, bare; bristle of 2nd joint reaching 9th joint, with ventral spines, no hairs; bristles of joints 3–8 long, bare, with slender ventral spines and natatory hairs; 9th joint with 3 bristles (1 long with natatory hairs, 1 short (about same length as combined joints 2–5) with short hairs, 1 minute, dorsal, with small spines); joints 5–8 with small basal spine, 9th joint with lateral spine; joints 3–8 with minute spines forming distal row (several spines along inner corner of joints stouter than others).

Mandible (Figure 67e): Coxale endite: ventral branch with spines forming 3 oblique rows; tip obscured on limb examined, but with several spines; dorsal branch broken off both limbs examined. Basale endite with 4 spinous end bristles, 2 triaenid bristles (each with 2 or 3 pairs of spines excluding longer terminal pair), and 2 dwarf bristles near glandular peg. Basale and exopodite similar to those of adult female. 1st endopodial joint with 2 or 3 long spinous ventral bristles. 2nd endopodial joint: ventral margin with 3 long terminal spinous bristles; dorsal margin with slender bare a-bristle and stouter spinous b-, c-, and d-bristles (c-bristle stouter than others and shorter than d-bristle); lateral surface with 2 long slender bristles (1 between b- and c-bristles and the other between c- and d-bristles); medial surface with 4 cleaning bristles (1 just distal to base of a-bristle, 1 just proximal to base of b-bristle, and 2 forming oblique row between c- and d-bristles) and 1 short slender spinous bristle just distal to d-bristle (not all spines shown on bristles). End joint with dorsal claw (with abundant long spines on ventral margin and 6 minute teeth at tip of dorsal margin) and 5 spinous bristles (including 1 bristle (medial) shorter than others).

Maxilla (Figure 67f): Similar to that of adult female but without transparent velum overlapping 1st endopodial joint (velum of adult probably a foreign substance).

Fifth Limb: Similar to that of adult female, except ventral margin of comb with only about 19 bristles.

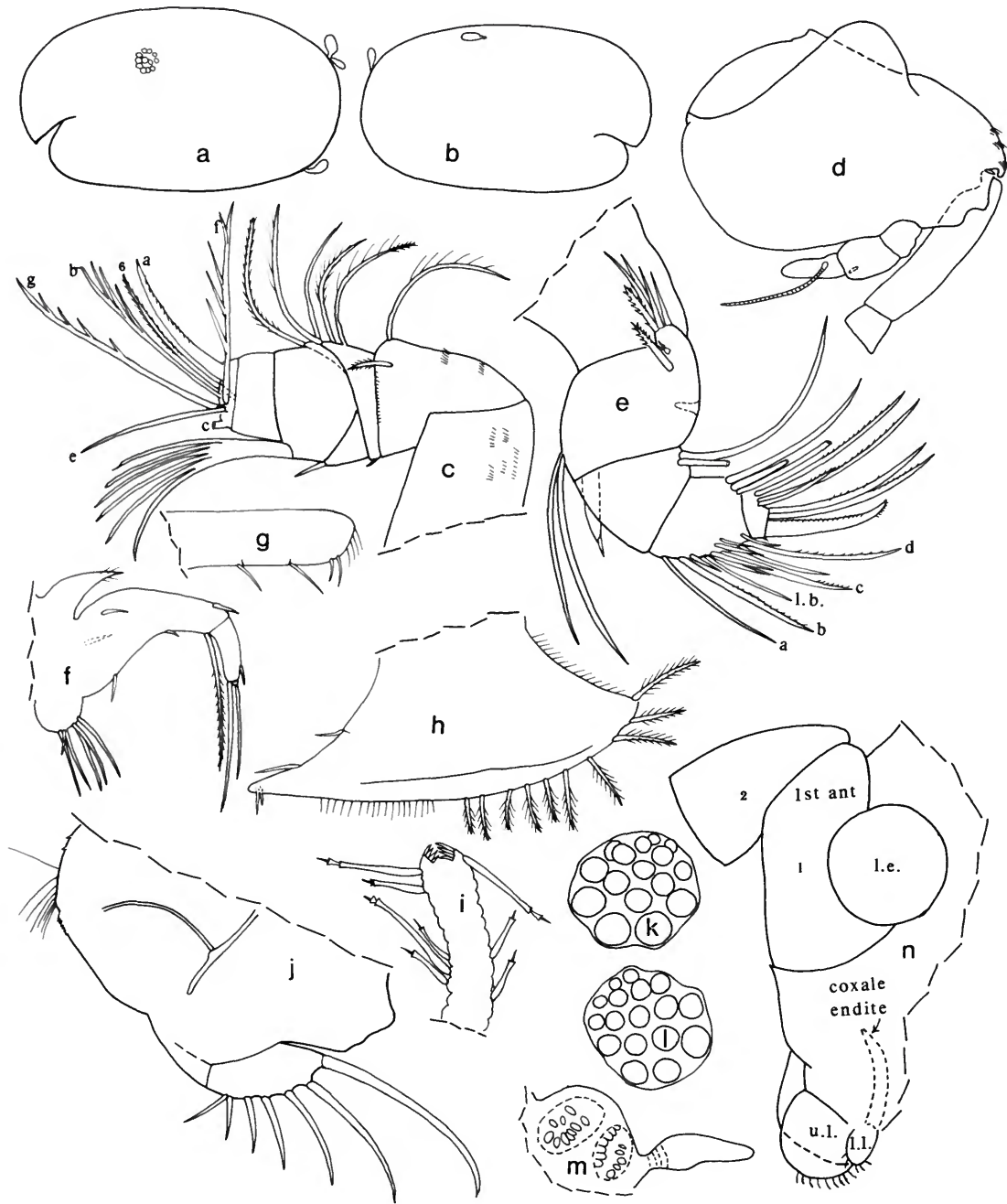


FIGURE 67.—*Heptonema homelix*, new species, USNM 193646, paratype, A-2 or A-3 male: *a*, *b*, complete specimen from left and right sides, respectively (note unknown foreign sacs attached to shells), length 0.75 mm; *c*, lateral view of left 1st antenna; *d*, medial view of left 2nd antenna (only joints 1 and 2 of exopodite shown); *e*, medial view of right mandible (coxale endite not shown); *f*, medial view of left maxilla; *g*, ventral view of anterior end of skirt of left 6th limb (2 longer bristles on lower edge are bristles of endites); *h*, lateral view of left 6th limb; *i*, 7th limb; *j*, posterior of body from right side showing left lamella of furca and internal sclerites; *k*, *l*, left and right lateral eyes, respectively; *m*, medial eye and Bellonci organ; *n*, anterior of body from left side showing joints 1 and 2 of left 1st antenna, outline of left lateral eye, lips, and dashed outline of coxale endite of mandible within esophagus.

Sixth Limb (Figure 67g,h): Presence or absence of medial bristle in proximal anterior corner could not be ascertained because both limbs mounted with medial side down and limbs opaque. Upper and lower endites and anterior corner of skirt with bristles similar to those of adult female. Posterior half of ventral margin of skirt with 10 short spinous bristles; posterior margin of skirt slightly concave, hirsute, and with angular posteroventral corner; medial side of limb with long hairs along anterior and ventral margins.

Seventh Limb (Figure 67i): Each limb with 5 or 6 proximal bristles (2 or 3 on each side, each with 1 or 2 bells) and 3 or 4 distal bristles (1 or 2 on each side, each with 1 or 2 bells); all bristles strongly tapering distally (juvenile character). Terminus with opposing combs, each with 5 or 6 spinous teeth (spines not shown). Proximal bristles on each side comprising either 1 long bristle (with 2 bells) between 2 short bristles, each with 1 bell, or 2 short bristles, each with 1 bell.

Furca (Figure 67j): Each lamella with 7 claws, last claw bent backward; teeth of claws similar to those of adult female; tips of claws 1–5 bent slightly backward; anterior margin of claws 1–4 with long straight subterminal hairs; ventral edge of lamella following claw 7 bare.

Bellonci Organ (Figure 67m): Proximal part narrow with faint sutures; distal part broad proximal to organ midlength, then tapering to bare rounded tip.

Eyes: Medial eye unpigmented, bare (Figure 67m). Lateral eye larger than medial eye, with 16 or 17 amber-colored ommatidia (13 or 14 ommatidia on lateral surface of eye and 3 or 4 beneath surface); eye without pigment between ommatidia (Figure 67a,k,l,n).

Upper Lip (Figure 67n): Each lobe with long hairs but no spines; lower lip comprising hirsute flap on each side of mouth.

Posterior of Body (Figure 67j): Posterodorsal corner with long spines on low bulge.

Y-Sclerite (Figure 67j) and *Gills*: Similar to those of adult female.

Epizoa (Figure 67a,b): Carapace of USNM 193646 with attached protistans or possibly foreign egg sacs.

DEVELOPMENT.—USNM 193646 is referred to the A-2 or A-3 rather than the A-1 stage because of its small size and the strong taper of the bristles of the 7th limb. Because an important character of the genus is the presence of 7 filaments on the sensory bristle of the 5th joint of the 1st antenna of the adult female, the presence of only 6 filaments on the A-2 (or A-3) male is of particular interest, and indicates that caution is needed in identifying juveniles. The dorsal margin of the 3rd joint of the 1st antenna bears 4 bristles on the A-2 (or A-3) male and 5 on the adult female. Each lamella of the furca bears 7 claws on the A-2 (or A-3) male and 9 on the adult male.

COMPARISONS.—The mandibular basale of *H. homelix* differs from those of *H. latum* and *H. keiensis* in lacking a bristle at midlength on the dorsal margin. The adult *H. homelix* differs from the adult *H. serratum* in having 5 rather than 4

dorsal bristles on the 3rd joint of the 1st antenna, no bare ventral bristles on the end joint of the 6th limb, and a broader Bellonci organ.

Monoasterope, new genus

ETYMOLOGY.—From the Greek *mono* (one, single, alone) in reference to the presence of only 1 bristle on the endopodite of the maxilla.

TYPE SPECIES.—*Monoasterope bex* herein.

COMPOSITION.—Known only from the type species.

DISTRIBUTION.—Enewetak Atoll.

DIAGNOSIS OF FEMALE.—Carapace small, ovoid, with smooth surface. Rostral infold of carapace with relatively few bristles. Infold of caudal process without ridge between broad list and shell edge.

First Antenna: Joints 1–7 separated by distinct sutures. Dorsal margin of 3rd joint with 6 bristles. Sensory bristle of 5th joint with 6 terminal filaments and no proximal filament. 8th joint: d-bristle minute or absent; e-bristle well developed.

Second Antenna: Endopodite weakly 2-jointed, with long terminal filament.

Mandible: Exopodite reaching past midlength of dorsal margin of 1st endopodial joint. Dorsal margin of 2nd endopodial joint without claws and with long lateral bristle between b- and c-bristles.

Maxilla: 1st and 2nd endopodial joints fused and with total of 1 bristle (terminal).

Sixth Limb: Posterodorsal margin of skirt broadly rounded.

Seventh Limb: Terminal combs with few teeth.

Furca: With claws decreasing in length posteriorly along lamella.

Bellonci Organ: Elongate.

Gills: Rudimentary.

COMPARISONS.—The new genus is proposed because of the unusual maxilla of the type species, which bears a total of just 1 bristle on fused 1st and 2nd endopodial joints. A similar maxilla was reported for 2 species referred to *Bruuniella* Poulsen, 1965, by Kornicker (1981b:14; 1986c:89) but the 1st antenna and mandible of the latter species clearly shows them to be closely related to the type species of *Bruuniella* (Poulsen, 1965:323), which has a normal maxilla (1st endopodial joint with an anterior alpha-bristle and a posterior beta-bristle, and 1st and 2nd endopodial joints not fused). Rudimentary gill-like structures of the type species of *Monoasterope* are unusual in the subfamily, having been described previously only on *Parasterope longungues* Poulsen, 1965. No gills were observed by Poulsen (1965:327) on the 2 specimens of the type species of *Bruuniella* that he studied. Carapace shape and small size also are similarities between *Bruuniella* and *Monoasterope*, but the unusual 1st antenna and mandible of members of *Bruuniella* do not suggest a close relationship with *Monoasterope*.

Monoasterope bex, new species

FIGURES 68-70

Parasterope sp. Komicker, 1987b:217.ETYMOLOGY.—From the Greek *bex* (cough).

HOLOTYPE.—USNM 158623, 1 ovigerous female on slide and in alcohol.

TYPE LOCALITY.—Enewetak lagoon (from composite sample).

PARATYPE.—Enewetak lagoon: Composite sample: USNM 193615, 1 A-1 female in alcohol.

DISTRIBUTION.—Enewetak Atoll.

DESCRIPTION OF ADULT FEMALE (Figures 68, 69).—Dorsal and ventral margins convex; lateral outline slightly tumid; incisur just below valve midheight (Figure 68a).

Infold: Infold behind rostrum with 6 bristles forming row just above and parallel to incisur, and 11 bristles forming 1 or 2 rows parallel to anterior margin of rostrum (Figure 68b); anteroventral infold with 1 small bristle at inner end of incisur followed by short space and 12-14 bristles forming row parallel to valve margin (Figure 68c); 1 bristle on ventral infold anterior to valve midlength; 4-6 bristles on ventral infold between valve midlength and lowermost hyaline flap-like bristle on posterior list. List beginning near inner margin of incisur, extending along ventral infold and continuing on posterior infold where it broadens; posterior list with about 17 broad transparent flap-like bristles and 7-10 small bristles (not more than 2 bristles between adjacent flap-like bristles) (Figure 68d); 1 bristle between ventral end of broad list and posterior margin of valve (Figure 68d); numerous pore canals (about 40) along posterior edge of valve (not shown).

Selvage: No lamellar prolongation observed.*Carapace Size*: USNM 158623, length 0.80 mm, height 0.59 mm.

First Antenna (Figure 69a): 1st joint: lateral surface with long spines on dorsal half; medial surface with long indistinct hairs, and short spines forming rows at distoventral corner. 2nd joint: lateral surface with 1 short spinous distal bristle, and spines along dorsal margin and forming row near distal margin; medial surface with few minute spines forming rows; dorsal margin with spinous bristle. 3rd joint short, triangular, delimited by well-defined sutures; ventral margin with minute bristle; dorsal margin with 6 spinous bristles; 3rd and 4th joints together wider than long. 4th joint: distal margin deeply concave on both medial and lateral surfaces; ventral margin with 2 bare terminal bristles just reaching distal end of 6th joint; dorsal margin with long spinous bristle. Sensory bristle of 5th joint with 6 terminal filaments including stem (base of proximal filament just past distal end of 8th joint). 6th joint with spinous medial bristle about same length as a-claw of 7th joint. 7th joint: a-claw with short marginal spines; b-bristle longer than a-claw, with 2 short filaments followed by 3 longer

terminal filaments including stem; c-bristle about twice length of a-claw, with 4 short filaments near midlength and 1 near tip; 7th and 8th joints fused. 8th joint: d-bristle absent or represented by indistinct minute spine (not shown); e-bristle about same length as b-bristle, bare with blunt tip; f-bristle bent dorsally, slightly longer than b-bristle, with 4 short filaments near midlength and 1 short filament near tip; g-bristle about same length as c-bristle, with 4 short filaments near midlength and 1 near tip.

Second Antenna (Figure 69b): Protopodite with small distal medial bristle, and spines forming row in distal dorsal corner (Figure 69b). Endopodite weakly 2-jointed: 2nd joint separated from 1st by suture, and with long terminal filament. Exopodite: 1st joint with few long distal hairs on dorsal margin, without terminal medial bristle; bristle of 2nd joint reaching 9th joint, with spines along ventral margin; bristles of joints 2-8 with slender ventral spines and natatory hairs; 9th joint with 3 bristles (1 long with ventral spines and lateral hairs, 1 medium with natatory hairs, 1 short (obscured, but probably bare)) and without lateral spine; joints 2-8 with minute spines forming row along distal margins, but without basal spine.

Mandible (Figure 69c,d): Coxale endite: dorsal branch broken off on USNM 158623 but tip illustrated in Figure 69c; tip of ventral branch obscured; ventral branch with spines forming 4 rows; small bristle near base of branch (Figure 69d). Basale endite with 4 pectinate end bristles (teeth slightly decreasing in size distally along bristle), 2 triaenid bristles with 3 or 4 pairs of marginal spines excluding terminal pair, 1 fairly long dwarf bristle (about $\frac{3}{4}$ length of triaenid bristle), and glandular peg; dorsal margin of basale with 2 long spinous terminal bristles; ventral margin bare; medial surface with few spines in rows. Exopodite about $\frac{2}{3}$ length of dorsal margin of 1st endopodial joint, hirsute, with 2 short subterminal bristles. Endopodite: 1st joint with 3 ventral bristles (2 with long spines and 1 with short spines). 2nd joint: ventral margin with 3 terminal bristles with short spines; dorsal margin with stout a-, b-, c-, and d-bristles (b-, c-, and d-bristles with ventral spines along midlength); c-bristle stouter than others; 1 fairly long bare bristle proximal to a-bristle; 1 long slender lateral bristle between b- and c-bristles (almost as long as c-bristle); 1 long slender lateral bristle (with short spines) between c- and d-bristles (as long as d-bristle); medial side with 1 cleaning bristle between b- and c-bristles, 3 cleaning bristles forming oblique row between c- and d-bristles, and 1 long bristle with short marginal spines just distal to d-bristle (almost as long as d-bristle). 3rd joint with stout dorsal claw with stout spines along ventral margin, and 4 long bristles and 1 short bristle, all with short marginal spines.

Maxilla (Figure 69e,f): Epipodite slender, pointed, reaching to about midlength of basale, hirsute near tip (epipodite not shown). Endite I with 4 bristles (3 long, 1 short); endite II with 3 long bristles. Basale: medial surface near dorsal margin with 2 short bristles (1 proximal, 1 terminal); dorsal margin and

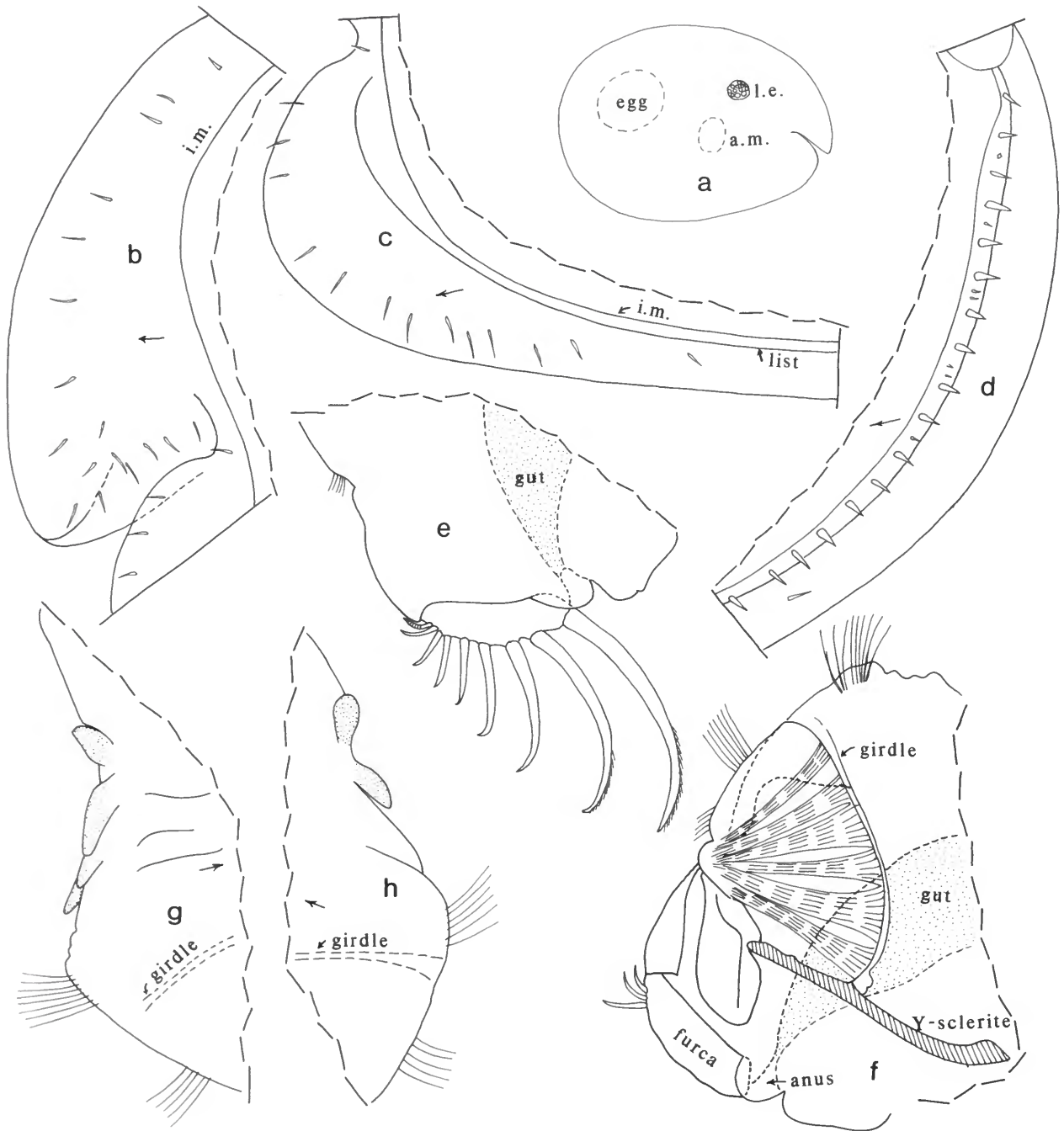


FIGURE 68.—*Monoasterope bex*, new species, USNM 158623, holotype, adult female: *a*, complete specimen from right side showing outline of single larva, length of carapace 0.80 mm. *b-d*, inner views of right valve: *b*, rostrum; *c*, anteroventral margin; *d*, posterior. *e*, posterior of body from right side showing right lamella of furca and gut (stippled); *f*, posterior of body from right side showing internal sclerites (Y-sclerite lined), muscles extending to girdle, gut (stippled), and 3 posterior bristles of right lamella of furca; *g, h*, posterior of body from right and left sides, respectively, showing rudimentary gills (stippled).



FIGURE 69.—*Monoasterope bex*, new species, USNM 158623, holotype, adult female: *a*, lateral view of left 1st antenna; *b*, medial view of distal part of protopodite, endopodite, and joints 1-5 of exopodite of left 2nd antenna; *c*, tip of endite of mandible (dorsal bristle broken off); *d*, medial view of right mandible (dorsal branch of coxale endite broken off); *e*, lateral view of left maxilla (epipodite not shown); *f*, medial view of right maxilla (lateral bristle of basale, epipodite, and endites not shown); *g*, medial view of comb of right 5th limb; *h*, medial view of anterior part of left 6th limb; *i*, lateral view of right 6th limb; *j*, 7th limb; *k*, dorsal view of upper lip; *l*, lateral eye; *m*, medial eye and Bellonci organ.

medial surface hirsute (not all hairs shown); ventral margin with short proximal bristle (oriented posteriad), minute distal bristle, and long plumose terminal bristle; lateral surface with short proximal bristle. Endopodite: 1st and 2nd joints fused, with bare terminal bristle slightly longer than endopodite.

Fifth Limb (Figure 69g): Lateral surface of comb with stout spinous bristle reaching past end of comb, 2 short slender bristles just ventral to base of spinous bristle, 4 bristles near ventral margin at midlength, and 1 proximal and 2 distal bristles almost on ventral margin.

Sixth Limb (Figure 69h,i): Medial surface with 1 short spine in proximal anterior corner, and 2 short endite bristles near anterior margin; anteroventral corner of skirt with 1 long hirsute bristle; lateral flap with hairs along distal edge; posteroventral margin with 12 hirsute bristles.

Seventh Limb (Figure 69j): Proximal group with 4 bristles (2 on each side), each with 3 or 4 bells. Distal group with 6 bristles, 3 on each side (2 on next to last ring, each with 3 bells; 4 on terminus, each with 3 or 4 bells). Terminus with opposing combs, each with 4 or 5 spinous teeth.

Furca (Figure 68e,f): Each lamella with 9 claws of which 2 posterior claws curve posteriorly and have slender tips, last claw with indistinct distal rings; claws 1–6, possibly others, with teeth along posterior margins (teeth along each claw similar in size); claws 1 and 2 with distal spines along anterior margins; tips of claws 2–4 bending posteriorly, almost hook-like; right lamella slightly anterior to left.

Bellonci Organ (Figure 69m): Elongate, crinkled in proximal fourth, broader near midlength, with rounded tip.

Eyes: Medial eye bare, unpigmented (Figure 69m). Lateral eye slightly smaller than medial eye, unpigmented, with about 16 amber-colored ommatidia (Figures 68a, 69l).

Upper Lip (Figure 69k): With a pair of hirsute anterior lobes, each lobe with 2 anterior spines (1 much stouter than other); saddle between lobes with 2 small anterior spines. Hirsute lateral flap on each side of mouth.

Posterior of Body (Figure 68e-h): Part between apex of internal muscles and posterior end of girdle with long hairs at midheight and shorter stiffer hairs near apex. Dorsum evenly rounded with long hairs forming row on each side.

Y-Sclerite (Figure 68f): Normal for subfamily.

Gills (Figure 68g,h): Rudimentary, represented by 2–4 small processess on each side of posterodorsal part of body; tips colorless in contrast to amber-colored body.

Eggs (Figure 68a): USNM 158623 with 1 well-developed embryo (with valves formed) in marsupium.

Gut Content (Figure 68e,f): Unidentified minute particles.

DESCRIPTION OF A-1 FEMALE (Figure 70).—Carapace similar to that of adult female but with straighter ventral margin, and less tumid in lateral view (Figure 70a).

Infold: Not examined in detail but, in general, similar to that of adult female.

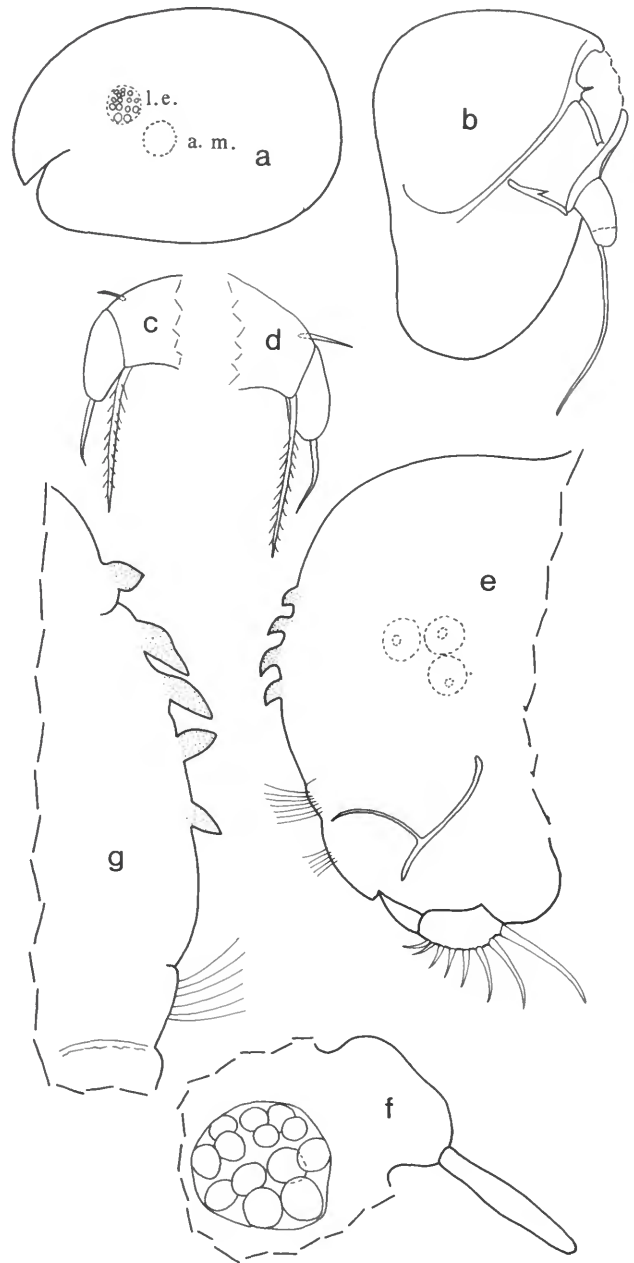


FIGURE 70.—*Monoasterope bex*, new species, USNM 193615, paratype, A-1 female: a, lateral view of complete specimen showing left lateral eye and location of central adductor muscle attachments (dashed circle), anterior to left, length 0.70 mm; b, medial view of protopodite and endopodite of left 2nd antenna. c, d, distal ends of maxillae: c, lateral view of left limb; d, lateral view of right limb. e, posterior of body from right side showing right lamella of furca, gills (stippled), internal sclerites, and unextruded eggs (dashed circles); f, right lateral eye, medial eye, and Bellonci organ; g, posterior of body from left side showing gills (stippled).

Carapace Size: USNM 193615, length 0.70 mm, height 0.48 mm.

First Antenna: Missing from USNM 193615.

Second Antenna (Figure 70b): Right limb missing on USNM 193615. Protopodite of left limb with small medial bristle similar to that of adult female. Endopodite weakly 2-jointed, with terminal filament offset from midwidth. Exopodite similar to that of adult female, 9th joint with 3 bristles.

Mandible: Right limb missing from USNM 193615. Left limb similar to that of adult female.

Maxilla (Figure 70c,d): Similar to that of adult female.

Fifth Limb: Epipodite with 46 hirsute bristles. Comb not examined in detail but, in general, similar to that of adult female.

Sixth Limb: Similar to that of adult female except skirt with only 9 posteroventral bristles.

Seventh Limb: 4 strongly tapered bristles in proximal group (2 on each side), each with 2 or 3 bells. Terminal group with 6 bristles (2 on ring proximal to terminus, 1 on each side; 4 on terminal segment, 2 on each side), each with 2 or 3 bells. Terminus with opposing minute combs, each with 2 or 3 teeth.

Furca (Figure 70e): Each lamella with 8 claws; posterior 2 claws oriented posteriad, appearing flexible, bristle-like, but unringed; claws 1 and 2 with distal spines on anterior margins; claws 1-5, possibly others, with teeth along posterior margins; teeth on each claw about same size; right lamella slightly anterior to left lamella by about width of claw 1 at base.

Bellonci Organ (Figure 70f): Broadening at midlength, with rounded tip.

Eyes: Medial eye bare unpigmented (Figure 70f). Lateral eye with 13-15 amber-colored ommatidia, without pigment between ommatidia (Figure 70a,f).

Posterior of Body (Figure 70e,g) and *Y-Sclerite* (Figure 70e): Similar to those of adult female.

Gills (Figure 70e,g): With 4 or 5 rudimentary structures projecting from posterior of body on each side. Structures colorless in contrast to amber-colored body.

Eggs: USNM 193615 with 3 small unextruded eggs (Figure 70e).

Gut Content: Unidentified minute particles.

CYCLASTEROPINAE Poulsen, 1965

COMPOSITION.—The Cyclasteropinae include 3 tribes: Cycloleberidini Hartmann, 1974, Cyclasteropini Poulsen, 1965, and Tetraleberidini Kornicker, 1981c. Only the first is represented in the present collections.

DISTRIBUTION.—Widespread in shelf waters from about 46°S in the vicinity of New Zealand to about 42°N in the Mediterranean, but with 1 questionable locality in the vicinity of Alaska. Except for 1 sample at 1100 m off Mauritania,

members of the subfamily have not been collected deeper than about 290 m (Kornicker, 1981c:72).

CYCLOLEBERIDINI Hartmann, 1974

COMPOSITION.—The Cycloleberidini comprise 3 genera: *Cycloleberis* Skogsberg, 1920, *Alphaleberis* Kornicker, 1981c, and *Leuroleberis* Kornicker, 1981c. Only *Leuroleberis* is in the collections from Enewetak.

DISTRIBUTION.—Mediterranean Sea, Atlantic Ocean; western Indian Ocean, Pacific Ocean, and in the vicinity of Australia and New Zealand; absent from the Arctic and Antarctic. Depth range intertidal to 96 m, but also collected in a surface tow; a record of 1100 m off Mauritania is considered atypical or questionable (Kornicker, 1981c:78).

Leuroleberis Kornicker, 1981

Leuroleberis Kornicker, 1981c:91.

TYPE SPECIES.—*Leuroleberis sharpei*, Kornicker, 1981c:97.

COMPOSITION.—Six species are referred to this genus: *Leuroleberis zealandica* (Baird, 1850), *L. orbicularis* (Brady, 1897), *L. poulsenii* (Moguilevsky and Ramírez, 1970), *L. mackenziei* Kornicker, 1981c, *L. sharpei* Kornicker, 1981c, and *L. surugaensis* Hiruta, 1982. Only 1 specimen of this species, a juvenile male, was collected at Enewetak, and it is left in open nomenclature as *Leuroleberis* species A.

DISTRIBUTION.—Eastern and Western Pacific Ocean, Western South Atlantic, and in the vicinity of Australia and New Zealand. Known depth range intertidal to 146.3 m (Kornicker, 1981c:91).

Leuroleberis species A

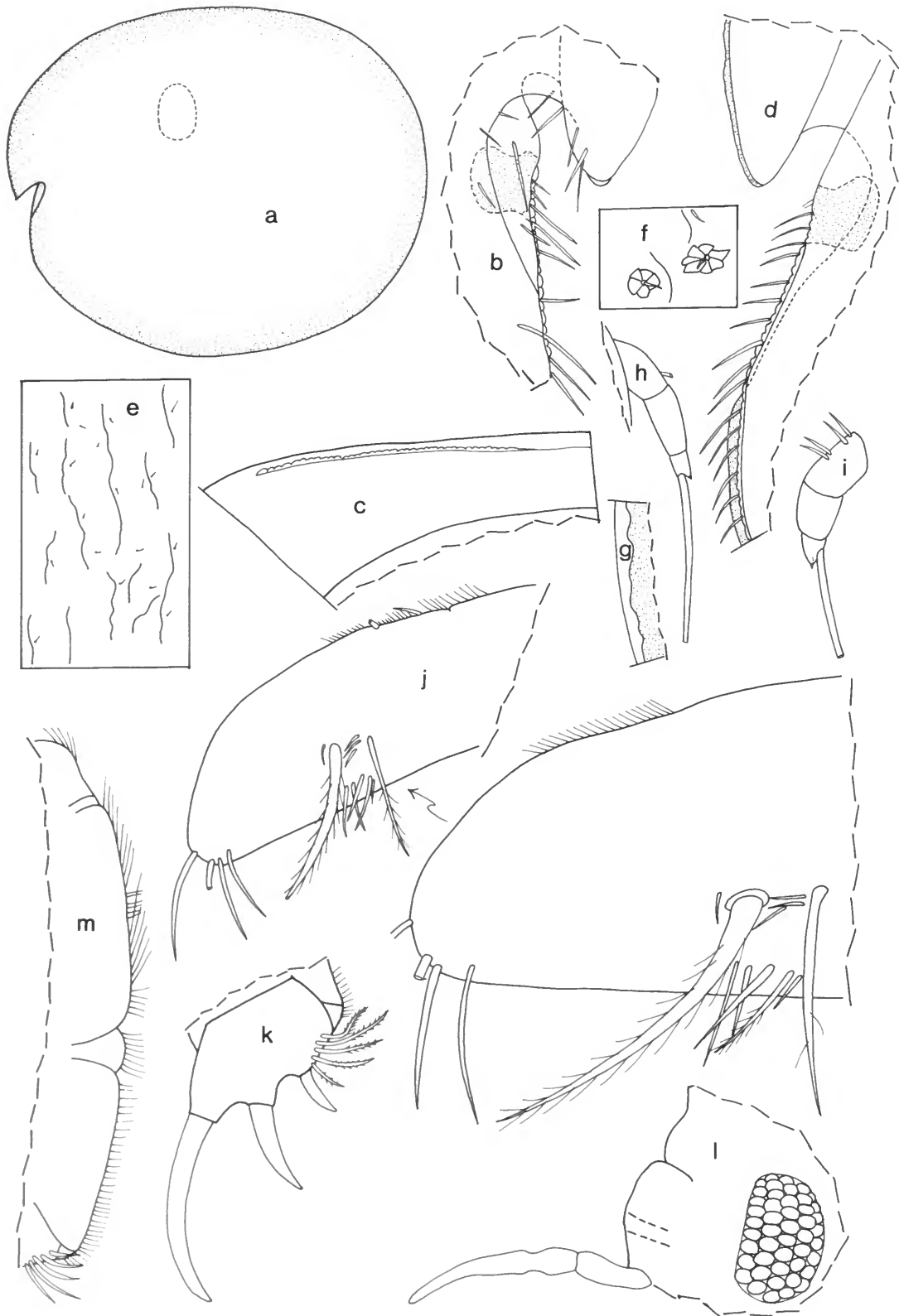
FIGURE 71

MATERIAL.—Enewetak lagoon: Midwater trawl off Bokan-dretok Island, USNM 193618, 1 juvenile male instar ?IV.

DISTRIBUTION.—Enewetak Atoll.

DESCRIPTION OF JUVENILE MALE (INSTAR ?IV) (Figure 71).—Carapace oval in lateral view with short incisur (Figure 71a).

Ornamentation (Figure 71b,d-g): Anterior edge of rostrum and anteroventral margin with smooth narrow ridge having undulating but not scalloped inner edge (Figure 71g). Each valve with short lumen near lower end of incisur (Figure 71b, d). In lateral view valve extending past valve edge along anteroventral and ventral margins (Figure 71d). Anteroventral edge scalloped on right valve (Figure 71b,d), smooth or slightly uneven on left valve. Anteroventral and ventral edges of valve with long bristles forming row (Figure 71b,d); 2 or 3 shorter bristles along valve edge anterior to lumen (Figure 71b). In transmitted light at magnification $\times 300$ each valve with



abundant minute pores. Surface of valve with short ridges (Figure 71e); short bristle emerging from closed pore posterior to most ridges (Figure 71e). Valve surface with sparsely distributed bristles emerging from open pores with a single rim centered within a stellate pattern of ridges (Figure 71f). Neither fossae, nor bristles emerging from pores with concentric rims observed.

Infold: Rostral and anterodorsal infold with numerous bristles, mostly in 2 rows paralleling outer edge of valve. List with anterior end just ventral to lumen continues along ventral margin and broadens along posteroventral and posterior infold; anteroventral list with lamellar prolongation; anteroventral and ventral list with about 50 slender bristles forming row along list edge; posteroventral and posterior list with numerous long and short bristles with bases inward from outer list edge. Anteroventral infold with about 12 bristles forming row between list and valve edge.

Selvage: Broad lamellar prolongation with fringed edge along lower edge of incisur; prolongation narrow with smooth outer edge along anterior and ventral margins of valve; lamellar prolongation along dorsal margin anterior to anterior juncture with long marginal fringe.

Central Adductor Muscle Attachments: Typical for genus.

Dentition (Figure 71c): Right valve only with minute teeth forming row along dorsal edge anterior to anterior juncture.

Carapace Size: USNM 193618, length 2.50 mm, height 2.17 mm.

First Antenna: 1st joint with long and short hairs on medial surface. 2nd joint with hairs along ventral margin, proximally on dorsal margin, and near terminal edge of medial surface; dorsal margin with 2 proximal and 1 terminal bristles; lateral side with 2 or 3 distal bristles. 3rd joint with 4 bristles along long dorsal margin and 0 or 1 bristle on shorter ventral margin. 4th joint with 1 terminal bristle on short dorsal margin and 2 terminal bristles on longer ventral margin. Sensory bristle on long 5th joint with 2 short proximal and 7 long terminal filaments. Short 6th joint with long bare medial bristle. 7th joint: a-bristle bare, claw-like; b-bristle reaching just past tip of sensory bristle of 5th joint, with 5 or 6 marginal filaments with terminal papilla; c-bristle longer than b-bristle, with many

marginal filaments. 8th joint: d- and e-bristles about same length as sensory bristle, bare with blunt tips; f-bristle bent dorsally, shorter than sensory bristle, with 5 marginal filaments with terminal papilla; g-bristle about same length as c-bristle, with 7 marginal filaments with terminal papilla.

Second Antenna: Protopodite with few long hairs along ventral margin and 1 small distal medial bristle. Endopodite 3-jointed (Figure 71h,i): 1st joint with 0–2 short proximal bristles and 1 or 2 small distal bristles; 2nd joint with 0 or 1 small bristle; 3rd joint with minute terminal spine-like process and long subterminal bristle. Exopodite: 1st joint with small straight distal medial bristle; bristle of 2nd joint reaching past 9th joint, with 11 minute ventral spines and without natatory hairs; bristles of joints 3–8 with stout ventral spines and natatory hairs; 9th joint with 4 bristles (1 short, dorsal, and with short marginal hairs, 1 medial with natatory hairs, 2 long with ventral spines and natatory hairs); joints 2–8 with basal spines increasing in length on distal joints; basal spine of 8th joint about $\frac{2}{3}$ length of 9th joint; 9th joint with 3 lateral spines (dorsal and ventral spines about same length as basal spine of 8th joint, middle spine shorter); joints 2–8 with few minute spines forming short distal medial row.

Mandible: Coxale endite: ventral branch with spines forming 5 oblique rows; tip of branch with 2 ventral teeth and 1 terminal tooth with digitate tip; a fairly long slender bristle present near proximal end of branch; ventral margin of dorsal branch with 3 triangular processes (proximal with 3 teeth along posterior edge) and 3 backward curving processes (with teeth along anterior margin) proximal to short main spine; main spine with minute spines along anterior margin; tip of branch usually bearing bristle broken off specimen examined and not observed; dorsal margin of branch with few minute spines opposite curving processes on ventral margin. Basale: endite with 12 long bristles with distal spines and minute triaenid tips and 1 dwarf bristle; ventral margin of basale with 6 triaenid bristles and 3 subterminal bristles (2 long spinous, 1 minute bare); 1 minute proximal medial bristle near ventral margin; dorsal half of medial surface of basale with few long hairs; dorsal margin with 2 short distal bristles (only stumps remaining on limb examined) and 2 long stout terminal bristles. Exopodite with hirsute tip reaching just past distal end of dorsal margin of 1st endopodial joint, with 2 bare ventral bristles (proximal longer). Endopodite: 1st joint with 6 ventral bristles. 2nd joint: medial surface with about 17 cleaning bristles; dorsal margin with about 9 bristles; ventral margin with 4 bristles forming 2 distal groups, with 2 bristles in each group. 3rd joint with 3 long subequal claws (dorsal claw shorter and with few, minute, ventral teeth proximally), 1 long spinous lateral bristle, and 2 short, slender, ventral bristles with short marginal spines.

Maxilla: Endites with 3 long and 1 short bristle followed by 5 long bristles. Basale: medial surface spinous, with 3 small bristles dorsal to distal endite, 1 proximal bristle near dorsal margin, 10 short bristles forming row near ventral margin, 3 long distal bristles followed by 2 short bristles (all near ventral

FIGURE 71 (opposite page).—*Leuroleberis* species A, USNM 193618, instar ?IV male: a, complete specimen from left side showing location of left lateral eye (dashed circle), length 2.50 mm; b, part of anterior of right valve showing lumen (stippled); c, inner view of teeth along upper edge of right valve, anterior to left; d, inner view of part of anterior of right valve (infold bristles not shown); e, detail of short ridges and small bristles on outer surface of left valve anterior to midlength, anterior of valve to left; f, detail of small bristles within stellate pattern of ridges on outer surface of left valve, anterior of valve to left; g, outer surface of anteroventral margin of left valve showing undulating inner edge of peripheral ridge; h, i, medial views of endopodites of left and right 2nd antennae, respectively; j, lateral view and detail of comb of left 5th limb; k, left lamella of furca; l, left lateral eye, medial eye and Bellonci organ; m, posterior edge of body from left side showing spines and posterior bristles of left lamella of furca (gills not shown).

margin), and 1 long terminal ventral bristle; distal edge of dorsal margin missing on limb examined but stump of stout bristle present. Endopodite: 1st joint with short bare distal alpha-bristle and long terminal beta-bristle; 2nd joint with 6 long bristles. Exopodite represented by short lateral lobe with 2 small terminal bristles.

Fifth Limb (Figure 71j): Dorsal margin of comb hirsute and with 2 small minute proximal bristles. Exopodial bristles: 2 long bristles, 4 minute bristles near bases of long bristles, and 5 small bristles ventral to minute bristles and near ventral margin.

Sixth Limb: 2 epipodial bristles. Limb not examined in detail but with numerous bristles, typical for genus.

Seventh Limb: Single limb examined with 36 bristles (17 on 1 side, 19 on other); segments of limb narrow, some with 1 bristle on each side but most with only 1 bristle; bristles with 2–5 bells except for 1 minute proximal bristle without bells; bristles tapered (juvenile character). Terminus with opposing combs with many spinous teeth.

Furca (Figure 71k): Each lamella with 3 stout primary claws followed by 5 bristles; bristle following claw shorter and slenderer than next bristle; left lamella with bristles close to claw 3, right lamella with bristles separated from claw 3 by space; primary claws with teeth forming lateral and medial rows along posterior edges (teeth not shown); some stouter

teeth with 1 or 2 smaller teeth between them; bristles with small spines along both margins; few spines on proximal bristle stouter than those on distal bristles; right lamella anterior to left by about width of claw 1 at its base.

Bellonci Organ (Figure 71l): Elongate, with suture proximal to midlength; distal segment with short broad part separated from longer tapered part by narrow saddle; tip rounded.

Eyes (Figure 71l): Medial eye amber colored in part, bare. Lateral eye slightly larger than medial eye, with about 46 amber-colored ommatidia, without black pigment.

Upper Lip: Comprising 2 hirsute lobes without spines.

Posterior of Body (Figure 71m): Hirsute without lobate dorsal process.

Gills: Well developed.

DISCUSSION.—USNM 193618 is interpreted to be a male because the end joint of the endopodite of the 2nd antenna has a terminal spine and subterminal bristle. The presence of many bristles on the 7th limb indicates that the specimen is not younger than an instar IV. The relatively short 3rd endopodial joint of the 2nd antenna indicates that it could not be older than an instar V. Because the bristle of the 3rd endopodial joint of the 2nd antenna is barely subterminal, it is more likely that the specimen is an instar IV rather than an instar V. The juvenile does not have any distinctive characters permitting it to be considered a new species, and because of its early stage cannot be referred with certainty to a known species.

Appendix 1

Station Data with Specimens Collected

Bikini Atoll

Crossroads Project, 1946, in the Marshall Islands, Leonard P. Schultz and Captain Earl S. Herald aboard U.S.N. *Bowditch*. (Collections made prior to nuclear bomb test.)

Sta S-46-46, 30 Mar 1946, U.S.N. *Bowditch* Anchorage, Bikini lagoon off Bikini Island, light at night. 25 fish and a half pint of crustaceans collected by Leonard P. Schultz and Vernon Brock.

Cypridinodes plax: USNM 193621, 1 adult female; USNM 193622B, C, 2 adult females.

Sta S-46-112, 24 Apr 1946, U.S.N. *Bowditch* Anchorage, Bikini lagoon, light at night. Collected by Leonard P. Schultz.

Cypridinodes plax: USNM 193644, 1 adult female.

Sta S-46-114, 25 Apr 1946, U.S.N. *Bowditch* Anchorage, Bikini lagoon, marine light at night. Collected by Leonard P. Schultz.

Cypridinodes plax: Holotype, USNM 193620, 1 adult female.

Enewetak Atoll

Enewetak Atoll Diving Expedition, September–October 1969. Participants: C. Allan Child, C.E. Dawson, Richard Grant, Erle Kaufman, Porter Kier, Thomas Phelan, John Pojeta, Thomas Waller, and crew of R/V *Kenton*.

Sta 039-69, 11°21'48"N, 162°21'10"E, 12 Oct 1969, collected by C. Allan Child, Enewetak (Fred) Island, lagoon side, north end of island at marine pier, low tide, water depth $\frac{1}{3}$ –2 m, scrapings of piling.

Cypridina spina: USNM 158622, 1 ovigerous female.

Ancohenia robusta: USNM 193649, 1 adult male.

Anscottiella vertex: USNM 158301, 1 ovigerous female.

Enewetak Atoll Field Study, May 1979. Participants: Edmund S. Hobson and James R. Chess. Myodocopid ostracodes received from James R. Chess.

Midwater trawl, 22 May 1979, 2030 hrs, 5 m depth, Enewetak lagoon, off Bokandretok (Walt) Island. Collected by James R. Chess.

Codonocera sp.: USNM 193619, 1 instar I; USNM 193625, 1 instar I.

Cypridina dentata: USNM 193658, 1 A-1 male.

Cypridina spina: USNM 193640, 1 adult male; USNM 193641A, 1 instar V male; USNM 193641B, 2 adult females and 2 instar V females.

Cypridina spinula: USNM 193642, 1 adult male; USNM 193643, 2 ovigerous females, 1 adult female with large unextruded eggs, plus 9 specimens, mostly juveniles.

Skogsbergia strophinx: USNM 193626, 1 adult female.

Ancohenia robusta: USNM 193623, 1 instar III female.

Anscottiella vertex: USNM 193617, 1 ovigerous female; USNM 193624, 1 adult male; USNM 193638, 5 ovigerous females, 2 adult females, 1 juvenile.

Eusarsiella chessi: Holotype, USNM 193616, 1 adult male.

Rutiderma vox: USNM 193636, 2 ovigerous females, 3 adult males.

Cylindroleberis variabilis: USNM 193633, 1 A-1 female; USNM 193639, 1 adult male.

Heptonema homelix: Holotype, USNM 193637, 1 adult female.

Leuroleberis sp. A: USNM 193618, 1 juvenile male (instar ?IV).

Sta A, 25 May 1979, intermittent-current station, station faced a low section of the interisland reef adjacent to Bokandertok (Walt) Island and periodically was in currents with a velocity up to 25 cm/sec that streamed off reef at that point. Station encompassed a pair of patch-reefs a few meters apart in about 5 m of water, and about 50 m from both Bokandretok (Walt) Island and the lagoon drop-off. Collected by Edmund S. Hobson and James R. Chess.

Plankton trap 6, night, sand substrate.

Cypridina spinula: USNM 158323, 1 ovigerous female; USNM 193651A, 1 adult male, 1 adult female; USNM 193651B, 1 instar II male; USNM 193651C, 1 instar V female; USNM 193651D, 1 instar IV female; USNM 193651E, 1 instar III male; USNM 193651F, 1 embryo (lost); USNM 193651G, 1 embryo; USNM 193651H, 1 instar II male; USNM 193651I, 1 instar II female; USNM 193651K, 1 instar II male.

Rutiderma vox: USNM 193650, 1 adult male.

Plankton trap 6, night, coral reef substrate.

Cypridina spina: USNM 193648, 1 ovigerous female, 2 adult females, 1 instar V female.

Cypridina species indeterminate: 2 embryos.

Paravargula trifax: Holotype, USNM 158322, 1 adult female.

Ancohenia robusta: USNM 193649, 1 adult male.

Anscottiella vertex: USNM 193647, 1 specimen.
Heptonema homelix: USNM 193646, 1 A-2 male.

Sta B, 26 May 1979, station shielded from currents, in lee of high section of interisland reef midway between Enewetak (Fred) and Medron (Elmer) Islands. Station encompassed a pair of patch-reefs in about 8 m of water. Collected by Edmund S. Hobson and James R. Chess.

Plankton trap 7, night, coral reef substrate.

Cypridina spina: USNM 158321, 1 ovigerous female; USNM 193662A, 1 instar IV male; USNM 193662B, 1 instar II male; USNM 193662C, 1 adult female, 1 instar V female; USNM 193662D, 1 adult male.

Anscottiella vertex: USNM 193663, 1 specimen.

Plankton trap 7, night, coral rubble substrate.

Cypridina spinula: USNM 193659, 1 adult male, 1 adult female, 2 juveniles.

Skogsbergia strophinx: Holotype, USNM 158307, 1 adult male; USNM 193660, 6 specimens.

Ancohenia robusta: USNM 193661, 1 adult male.

Cylindroleberis variabilis: USNM 158320, 1 adult male.

Sta B, 30 May 1979, same station data as 26 May 1979.

Plankton trap 10, night, coral reef substrate.

Cypridina spina: USNM 193652A, 1 instar V male; USNM 193652B, 5 adult females and 1 instar V male; 8 USNM 193652C, 1 instar IV female; USNM 193652D, 1 instar V male; USNM 193652E, 1 adult male; USNM 193652F, 1 instar V female.

Skogsbergia strophinx: USNM 193653, 3 adult females.

Plankton trap 10, night, coral rubble substrate.

Skogsbergia strophinx: USNM 193654, 1 adult female.

Cypridina dentata: USNM 193655A, 1 A-1 male; USNM 193655B, 1 A-1 female; USNM 193656, 1 A-1 male.

Composite sample, 20–30 May 1979, from various airlift and emergence trap samples, 3–7 m of water. Collected by Edmund S. Hobson and James R. Chess.

Cypridina spina: Holotype, USNM 193610, 1 adult female; USNM 193613, 1 instar III male; USNM 193657, 1 instar V female.

Cypridina spinula: Holotype, USNM 193611, 1 adult female; USNM 193612A, 1 instar II male; USNM 193621B, 1 instar II female; USNM 193614, 1 instar V female.

Harbansus vix: Holotype, USNM 158308, 1 adult female.

Ancohenia robusta: USNM 158311, 1 adult male; USNM 158312, 1 adult male.

Anscottiella vertex: Holotype, USNM 158317, 1 ovigerous female; USNM 158313, 1 adult male; USNM 193608, 2 juveniles.

Eusarsiella chessi: USNM 193609, 1 instar II (sex unknown).

Metasarsiella vibex: Holotype, USNM 158310, 1 adult female; USNM 158318, 1 juvenile.

Rutiderma vox: Holotype, USNM 158309, 1 ovigerous female; USNM 158314, 1 adult female, 1 adult male; USNM 158316.

Cylindroleberis variabilis: USNM 158319, 1 A-2 female.

Monoasterope bex: Holotype, USNM 158623, 1 ovigerous female; USNM 193615, 1 A-1 female.

Appendix 2

Number of Cuspate Teeth on the Main Tooth of the Fifth Limb of Selected Species of the Cypridinidae

(A dash indicates no data available.)

Species	Instar					Adult	Source
	I	II	III	IV	V		
AZYGOCYPRIDININAE							
<i>Azygocypridina imperator</i>	-	-	-	-	-	6	Kornicker (1970a:19)
<i>Azygocypridina imperialis</i>	1	2	3	4	5	6	Kornicker (1989:57)
<i>Azygocypridina lowryi</i>	-	-	-	-	-	6	Kornicker (1985:700)
<i>Azygocypridina ohtai</i>	-	-	-	-	-	5	Hiruta (1981a:54)
<i>Azygocypridina rudjakovi</i>	-	-	-	-	-	6	Kornicker (1970a:14)
<i>Azygocypridina tanseimaruae</i>	-	-	-	-	-	5	Hiruta (1981b:33)
<i>Isocypridina quatuorsetae</i>	-	-	-	-	-	6	Kornicker (1975:215)
CYPRIDININAE							
CYPRIDININI							
<i>Amphisiphonostira naviformis</i>	-	-	-	-	-	6	Poulsen (1962:251)
<i>Bathyvargula parvispinosa</i>	-	-	-	-	-	6	Poulsen (1962:220)
<i>Bathyvargula walfordi</i>	-	-	-	-	5	-	Poulsen (1962:224)
<i>Codonocera cruenta</i>	-	-	-	-	-	6	Poulsen (1962:322)
<i>Codonocera cuspidata</i>	-	-	-	4	5	6	Kornicker (1986a:133)
<i>Codonocera elongata</i>	-	-	-	-	-	6	Poulsen (1962:326)
<i>Codoconcera goniacantha</i>	-	-	-	-	-	5	Poulsen (1962:315)
<i>Codonocera mortenseni</i>	-	-	-	-	-	6	Poulsen (1962:322)
<i>Codonocera polygonia</i>	-	-	-	-	-	5	Poulsen (1962:317)
<i>Codonocera stellifera</i>	-	-	-	-	-	6	Poulsen (1962:330)
<i>Codonocera suerstoni</i>	-	-	-	-	-	4	Poulsen (1962:318)
<i>Codonocera weberi</i>	-	-	-	-	-	5	Poulsen (1962:328)
<i>Codonocera species</i>	1	-	-	-	-	-	Herein
<i>Cypridina acuminata</i>	-	-	-	-	-	6	Poulsen (1962:260)
<i>Cypridina americana</i>	-	-	-	-	-	6	Kornicker (1987a:179)
<i>Cypridina multipilosa</i>	-	-	-	-	-	6	Poulsen (1962:268)
<i>Cypridina nana</i>	-	-	-	-	-	6	Poulsen (1962:271)
<i>Cypridina serrata affirmans</i>	-	-	-	-	-	6	Skogsberg (1920:326)
<i>Cypridina spina</i>	-	2	3	4	5	6	Herein
<i>Cypridina spinula</i>	-	2	3	4	5	6	Herein
<i>Cypridinodes asymmetrica</i>	-	-	-	-	-	6	Poulsen (1962:299)
<i>Cypridinodes concentrica</i>	-	-	-	-	-	6	Kornicker (1979:21)
<i>Cypridinodes favus</i>	1	-	-	4	-	6	Poulsen (1962:285)
<i>Cypridinodes inermis</i>	-	-	-	-	-	6	Poulsen (1962:293)
<i>Cypridinodes minuta</i>	-	-	-	-	-	6	Poulsen (1962:306)
<i>Cypridinodes plax</i>	-	-	-	-	-	6	Herein
<i>Cypridinodes reticulata</i>	-	-	-	-	-	6	Poulsen (1962:289)
<i>Doloria isaacsi</i>	-	-	-	-	-	6	Kornicker (1975:121)
<i>Doloria levinsoni</i>	-	-	-	-	-	6	Kornicker (1975:110)
<i>Doloria levis</i>	-	-	-	-	-	6	Skogsberg (1920:232)
<i>Doloria mawsoni</i>	-	-	-	-	-	6	Kornicker (1975:124)
<i>Doloria pectinata</i>	-	-	-	-	-	6	Skogsberg (1920:243)
<i>Doloria sarsi</i>	-	-	-	-	-	6	Kornicker (1987c:887)
<i>Doloria septenaria</i>	-	-	-	-	-	6	Kornicker (1975:115)
<i>Hadacypridina biscayensis</i>	-	-	-	-	-	6	Kornicker (1989:27)
<i>Hadacypridina bruuni</i>	-	-	-	-	-	6	Poulsen (1962:232)
<i>Macrocypridina castanea</i>	1	2	3	4	5	6*	Poulsen (1962:126)
<i>Macrocypridina rotunda</i>	-	-	-	-	-	6	Poulsen (1962:143)

Species	Instar						Source
	I	II	III	IV	V	Adult	
<i>Melavargula japonica</i>	-	-	-	-	-	6	Poulsen (1962:227)
<i>Melavargula nana</i>	-	-	-	-	-	6	Poulsen (1962:229)
<i>Metavargula adinothrix</i>	-	-	-	-	-	6	Komicker (1975:137)
<i>Metavargula ampla</i>	-	-	-	-	-	6	Komicker (1970a:8)
<i>Metavargula bilix</i>	-	-	-	-	-	6	Komicker (1989:36)
<i>Metavargula bradfordae</i> (male)	-	-	-	-	-	5	Komicker (1979:12)
<i>Metavargula hex</i>	-	-	-	-	-	5	Komicker (1989:42)
<i>Metavargula iota</i>	-	-	-	-	-	6	Komicker (1975:140)
<i>Metavargula optilus</i>	-	-	-	-	-	6	Komicker (1968:446)
<i>Metavargula quintuplex</i>	-	-	-	-	-	5	Komicker (1989:31)
<i>Monopia flaveola</i>	-	-	-	-	-	6	Poulsen (1962:275)
<i>Paracypridina aberrata</i>	-	-	-	-	-	6	Poulsen (1962:248)
<i>Paracypridina floridaensis</i>	-	-	-	-	-	6	Komicker (1984:12)
<i>Paradoloria angulata</i>	-	-	3 ^b	-	-	-	Poulsen (1962:156)
<i>Paradoloria australis</i>	-	-	-	-	-	6	Poulsen (1962:156)
<i>Paradoloria dorsoserrata</i>	-	-	-	-	-	6	Poulsen (1962:149)
<i>Paradoloria lippa</i>	-	-	-	-	-	6	Komicker (1989:17)
<i>Paradoloria nuda</i>	-	-	-	-	-	6	Poulsen (1962:153)
<i>Paradoloria pellucida</i> (male)	-	-	-	-	-	5	Hanai (1974:120)
<i>Paradoloria vanhoeffeni</i>	-	-	-	-	-	6	Poulsen (1962:160)
<i>Paravargula ensifera</i>	-	-	-	-	-	6	Poulsen (1962:211)
<i>Paravargula hirsuta</i>	-	-	-	-	-	6	Poulsen (1962:207)
<i>Paravargula nanipollex</i>	-	-	-	-	-	4-5 ^c	Komicker (1970b:6)
<i>Paravargula trifax</i>	-	-	-	-	-	6	Komicker (herein)
<i>Pterocypridina alata</i>	-	-	-	-	-	6	Poulsen (1962:239)
<i>Pterocypridina birostrata</i>	-	-	-	-	5	-	Poulsen (1962:244)
<i>Pterocypridina dedeckeri</i>	-	-	-	-	-	5	Komicker (1983b:9)
<i>Pterocypridina excreta</i>	-	-	-	-	-	6	Poulsen (1962:242)
<i>Pterocypridina sex</i> (female)	-	-	-	-	-	4 ^d	Komicker (1983b:15)
<i>Pterocypridina sex</i> (male)	-	-	-	-	-	3 ^d	Komicker (1983b:17)
<i>Rheina prex</i>	-	-	-	4	-	6	Komicker (1989:50)
<i>Rugosidoloria serrata</i>	-	-	-	-	-	5	Komicker (1975:201)
<i>Sheina orri</i> (male)	-	-	-	-	-	4	Komicker (1986d:642)
<i>Siphonostra hallex</i>	-	-	-	-	-	6	Komicker (1975:149)
<i>Siphonostra spinifera</i>	-	-	-	-	-	5 ^e	Skogsberg (1920:311)
<i>Skogsbergia curvata</i>	-	-	-	-	-	6	Poulsen (1962:168)
<i>Skogsbergia crenulata</i>	-	-	-	-	-	6	Poulsen (1962:172)
<i>Skogsbergia galapagensis</i>	1	2	3	4	5	6	Komicker and Iliffe (1989a, table 8)
<i>Skogsbergia lernerii</i>	-	-	-	-	-	6	Komicker (1984:19)
<i>Skogsbergia lernerii</i>	1	2	3	4	5	6 ^f	Cohen (1983, table 2; 1988, in litt.)
<i>Skogsbergia menezii</i>	-	-	-	-	-	6	Komicker (1970b:13)
<i>Skogsbergia minuta</i>	-	-	-	-	-	6	Poulsen (1962:166)
<i>Skogsbergia squamosa</i>	-	-	-	-	-	6	Komicker (1974:6)
<i>Skogsbergia strophinx</i>	-	-	-	-	-	6	Herein
<i>Vargula antarctica</i>	-	-	-	-	-	7	Skogsberg (1920:268)
<i>Vargula ascensus</i>	-	-	-	-	-	6	Komicker (1979:20)
<i>Vargula bullae</i>	-	-	-	-	-	6	Poulsen (1962:185)
<i>Vargula contragula</i> (male)	-	-	-	-	-	3	Cohen and Morin (1986:20)
<i>Vargula? danae</i>	-	-	-	-	-	6	Komicker (1975:183)
<i>Vargula dentata</i> (male)	-	-	-	-	-	5	Komicker (1975:187)
<i>Vargula graminicola</i>	-	-	-	-	-	6	Cohen and Morin (1986:7, 8)
<i>Vargula hilgendorffii</i>	1	2	3	4	5	6	Hiruta (1980:145)
<i>Vargula ignitula</i>	-	-	-	-	-	6	Cohen and Morin (1989:327)
<i>Vargula kuna</i>	-	-	-	-	-	6	Morin and Cohen (1988:635)
<i>Vargula lucidella</i>	-	-	-	-	-	6	Cohen and Morin (1989:327)
<i>Vargula lusca</i>	-	-	-	-	-	6	Komicker (1975:192)
<i>Vargula magna</i>	-	-	-	-	-	6	Komicker (1984:33)
<i>Vargula megalops</i>	-	-	-	-	-	6	Skogsberg (1920:274)

Species	Instar						Source
	I	II	III	IV	V	Adult	
<i>Vargula micamacula</i>	-	-	-	-	-	6	Cohen and Morin (1989:327)
<i>Vargula mizonomma</i>	-	-	-	-	-	6	Morin and Cohen (1988:635)
<i>Vargula noropsella</i>	-	-	-	-	-	6	Cohen and Morin (1989:327)
<i>Vargula norvegica</i>	-	-	-	-	-	6	Skogsberg (1920:256)
<i>Vargula plicata</i>	-	-	-	-	-	6	Poulsen (1962:191)
<i>Vargula psammobia</i>	-	-	-	-	-	6	Cohen and Morin (1989:327)
<i>Vargula puppis</i>	-	-	-	-	-	6	Poulsen (1962:188)
<i>Vargula scintilla</i>	-	-	-	-	-	6	Cohen and Morin (1989:327)
<i>Vargula sekiguchii</i>	-	-	-	-	-	6	Hiruta (1984:57)
<i>Vargula shulmanae</i>	-	-	-	-	-	6	Cohen and Morin (1986:12, 13)
<i>Vargula spinosa</i>	-	-	-	-	-	6	Poulsen (1962:195)
<i>Vargula spinulosa</i>	-	-	-	-	-	6	Poulsen (1962:197)
<i>Vargula stathme</i>	-	-	-	-	-	6	Kornicker (1975:195)
<i>Vargula subantarctica</i>	-	-	-	-	-	6	Kornicker (1975:177)
<i>Vargula sutura</i>	-	-	-	-	-	6	Kornicker (1975:169)
<i>Vargula tsujii</i>	-	-	-	-	-	6	Kornicker and Baker (1977:222)
<i>Vargula tubulata</i>	-	-	-	-	-	6	Poulsen (1962:200)
GIGANTOCYPRIDININI							
<i>Gigantocypris agassizi</i>	1	-	3	4	5	6*	Poulsen (1962:35)
<i>Gigantocypris danae</i>	1	2	-	4	5	6*	Poulsen (1962:95)
<i>Gigantocypris muelleri</i>	1	2	3	4	5	6*	Poulsen (1962:70)

*Poulsen (1962:126) considered it probable that 2 or more molts occur during the adult stage of this species.

^bPoulsen (1962:156) considered the specimen he described to be "probably the next-to-last larval stage." Because of the 7th limb of the specimen being bare and the 6th limb bearing many bristles, I interpret it to be the 3rd instar.

^cKornicker (1970b:6) did not give the number of cusped teeth. I reexamined the 5th limbs of the holotype (USNM 125499). The limbs are oriented on the slide with their posterior sides down so that I could not resolve with certainty whether the main tooth comprises 4 or 5 cusped teeth.

^dKornicker (1983b) stated that the main tooth has 5 cusped teeth and a proximal peg. The female holotype (USNM 157760) and male allotype (USNM 158364) were reexamined. The female has 4 and the male 3 strong cusped teeth; both have 1 small triangular proximal tooth with a digitate tip; I believe the tooth to be equivalent to the peg generally present proximal to the cusped teeth in the Cypridinidae, because no other peg could be seen with certainty. A long bristle that appears to be terminal on the main tooth in the illustration by

Kornicker (1983b, fig. 7d) is one of the anterior bristles of the joint, and not part of the main tooth.

^eSkogsberg (1920:312) stated that the specimen described is a female with large eggs in its ovaries, and mentions also investigating "a larva, presumably in the last larval stage. The larva agreed in practically every detail with the type specimen." I think it quite possible that the type specimen is an A-1 female, a stage which often has eggs in the ovaries in other species.

^fCohen (1983, table 2) listed 5-7 teeth on adults of *Skogsbergia leneri*, but at my request kindly reexamined the specimens and observed that adults (5 females including USNM 158473MM and USNM 157163, and 3 males including USNM 158473HH and 158473GG) consistently have 6 cusped and that instars I to V have 1 to 5 cusped teeth (Cohen, 1988: in lit.).

^gPoulsen (1962:54, 81, 103) interpreted species of *Gigantocypris* to have 6 juvenile stages, with instars V and VI having 5 cusped teeth in the main tooth of the 5th limb. As discussed elsewhere I have tentatively concluded that *Gigantocypris* has only 5 juvenile instars.

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